IGDA Online Games White Paper

2nd Edition – March 2003

Written by the IGDA Online Games Committee

Alex Jarett	Committee Chairman
Jon Estanislao	Committee Vice-Chairman and Editor
Elonka Dunin	Editor
Jennifer MacLean	Market Overview Section Editor
Brian Robbins	Business Models Section Editor
David Rohrl	Production and Design Section Editor
John Welch	Game Technology Section Editor
Jeferson Valadares	Online Publishers Section Editor

FORWARD

It is generally accepted now that the Internet and online games provide a tremendous opportunity for new forms of entertainment and for growing the game market at large. With the massive success of online games, ranging from games such as EverQuest to Bejeweled to Pogo and Shockwave, it's pretty clear that this opportunity is real and here to stay. Online features are now starting to take hold in the console wars. It's no longer a question of whether the console world will embrace online, but how much.

For the independent developer, the online world offers opportunities ranging from contrarian business models, to a less risky way to try out new ideas, to simply a way to work on different and cool projects.

But the independent developer is at a strategic disadvantage when it comes to the online world. Without access to research on what's actually happening in online, a developer can quickly find that any investments made will not get the returns needed. How many developers do you know who are working on the next “great” massively multiplayer game, but don't have any real idea how that game is going to find a market?

This project was designed to fill the information void. This particular version of the White Paper is now the second edition. The first version, published and presented in conjunction with the 2002 GDC, has had over 5000 downloads from the IGDA website (www.igda.org). Developers and publishers from all over the globe have read it and used the information to help them with their plans. For this year, we now present an updated version.

As you compare the two versions, you can't help but see how the market has grown. Just look at the publisher section and you'll see how many new publishers are now actively into online. Additionally, we’ve expanded the coverage of online games from just PC, web, and console games to preliminary coverage of wireless and interactive television. It's a very exciting time for the market!

I want to also point out how great it has been to experience the openness of the game community for this project. I’ve been impressed by the willingness of colleagues ranging from senior executives at companies such as Sony and EA to independent developers from across the globe to work together to create this document for the community at large. This White Paper is the result of their hard work. In another section of this document are all of the names of the people who worked on this edition. Please take a moment to review the people who were involved, and if you like their section, let them know!

A very special thanks goes out to all of these people who took time out of their busy schedules to help get this done. In particular, I’d like to thank Jon Estanislao for all of his hard work and dedication to this project. It was really Jon who kept this project alive this year, and his persistence and hard work in assembling, editing and working with the rest of the team is the reason why we have such a strong document again this year. Thanks Jon!

I'd also like to thank the IGDA Board that continues to believe in this project and helped give us the reach to get this done so quickly.

Finally, I’d like to thank the new leadership team for volunteering to continue this project! I’m proud to announce that John Welch and Jeff Valadares will be leading the committee next year. It’s really gratifying to see the committee continue!

I hope this document is of value to you for whatever project you are working on.

Alex Jarett
Chairman, IGDA Online Games Committee
ajarett@technologyexecutivesclub.com

CREDITS

Online Games Committee

IGDA Online Games Committee Chairman	• **Alex Jarett** President, BAP Games, LLC, and Technology Executives Club, Ltd. Email: ajarett@technologyexecutivesclub.com
IGDA Online Games Committee Vice-Chairman	• **Jon Estanislao** Manager, Business Development & Emerging Platforms, Activision, Inc. Email: jestanislao@activision.com
IGDA Online Games Committee Editors	• **Elonka Dunin** General Manager, Online Community, Simutronics Corporation • **Jennifer MacLean** Director, Subscriber Applications, Comcast Online Communications • **Brian Robbins** Software Engineer, Worlds Apart Productions • **David Rohrl** Senior Producer, EA Online • **Jeferson Valadares** Creative Director and Co-Founder, Jynx Playware • **John Welch** Vice President of Product & Technology, AtomShockwave Corp.

Contributors by Section

Market Overview	• **Jennifer MacLean (Section Editor)** Director, Subscriber Applications, Comcast Online Communications • **Kate Connally** Senior Director, Product Marketing, AtomShockwave Corp. • **Greg E. Mills** Business Development Manager, AOL Time Warner • **Bernard Yee** Vice President, Publishing, En-Tranz Entertainment
Business Models	• **Brian Robbins (Section Editor)** Software Engineer, Worlds Apart Productions • **Peter H. Friedman** Proprietor, Certified Public Accounting firm • **Daniel James** CEO, Three Rings Design • **Greg Mills** Business Development Manager, AOL Time Warner • **Derrick Morton** • **Terri L. Perkins** ARK Personnel Director, Anarchy-Online • **Ole Schreiner** Director of Customer Service, Funcom Inc • **Howard Schwartz** Managing Director, HJ Ventures International • **Patrick Smyth** President and Director, CYOP Systems International Inc. • **Xrjan Mathis Tvedt** ARK Manager, Funcom

	• **Gordon Walton** VP & Exec Producer-The Sims Online, Maxis/Electronic Arts
Production and Design	• **David Rohrl (Section Editor)** Senior Producer, EA Online • **Matthew Ford** Program Manager, Microsoft • **Daniel James** CEO, Three Rings Design • **Eric Zimmerman** CEO, Gamelab • **Kate Connally** Senior Director, Product Marketing, AtomShockwave Corp. • **Pete Isensee** Software Development Lead, Xbox Advanced Technology Group, Microsoft • **Mark de Loura** Manager of Developer Relations, Sony Computer Entertainment America • **Jay Minn** President, Blam! • **Mitzi McGilvray** Principal, Slam Dunk Productions • **Steve Meretzky** Creative Content Director, WorldWinner.com • **Gordon Walton** VP & Exec Producer-The Sims Online, Maxis/Electronic Arts
Game Technology Overview	• **John Welch (Section Editor)** Vice President of Product & Technology, AtomShockwave Corp. • **Travis Baldree** Producer/Software Engineer, WildTangent • **Michael Bayne** Three Rings Design, Inc. • **Alex Bratton** Founder of WebRPG; CTO of The Net Squad International • **Lee Crawford** CTO, Stadeon Inc. • **Shekhar Dhupelia** Online Architect, High Voltage Software • **Bertrand Duplat** President & CTO, Virtools • **Brad Edelman** Macromedia • **Peter Glover** Sr. Director, Product & Engineering, AtomShockwave Corp. • **Garr Godfrey** CTO, GameHouse • **Paul Holman** VP Technology, Sony Computer Entertainment Europe • **Pete Isensee** Lead Developer, Xbox Advanced Technology Group, Microsoft • **Daniel James** CEO, Three Rings Design, Inc. • **Lamont Lucas** Director, Systems Operations, AtomShockwave Corp.

	• **Wade Tinney** Partner/Game Designer, LargeAnimal • **Joseph Varet** Vice President, Groove Alliance • **Josh Welber** Partner/Technical Director, LargeAnimal • **Peter Wiese**
Online Publishers	• **Jeferson Valadares (Section Editor)** Creative Director and Co-Founder, Jynx Playware • **James Belcher** Consultant, Technology Practice, FIND/SVP • **Robert Buckley** Marketing Copywriter, Writer, Artist and Animator • **Larry Dunlap** Founder and Creative Director, Intelligent Life Games Author, Imperial Wars • **Michelle Sandoval** Office Manager, CFO, and Part-Owner, SharkByte Software Inc. • **Patrick Smyth** President and Director, CYOP Systems International Inc. • **Mike Wabschall** Director of Sales, Digital Mercenaries, Inc.

Biographies of all Committee Members and Contributors are located at the end of the White Paper in Section VII.

TABLE OF CONTENTS

I. INTRODUCTION

A. *Presentation of the Online Games White Paper at GDC 2003*

The IGDA Online Games Committee discussed the findings of the White Paper at the Game Developers Conference 2003 in San Jose, CA. A summary of the White Paper was included in the GDC 2003 proceedings. This White Paper is the complete version produced by the IGDA Online Games Committee and is electronically available at the International Game Developers Association website, at http://www.igda.org/online. The White Paper will be available for download at no charge for people who register at the website.

B. *Background and Purpose*

Background
Online games are an emerging market with many opportunities and challenges for game developers. While developers have expertise in designing and developing game experiences, they require additional knowledge about the business and technology implications of online games in order to maximize their chances for success in a growing and evolving marketplace.

Purpose
The IGDA commissioned an Online Games Committee to address the needs of game developers concerning online games. The purpose of the Online Games White Paper is to provide online games market statistics, business model descriptions, and technology summaries. Additionally, this White Paper provides online games examples and reference resources.

C. *Audience*

The audience of the Online Games White Paper includes independent game developers and development studios without significant business and technology resources, which plan to create online games.

D. *Scope*

Platforms within scope of White Paper
This White Paper includes information about online games played through the Internet via PCs and video game consoles (e.g., Sony PlayStation 2, Microsoft Xbox, and Nintendo GameCube).

Platforms with limited scope in the White Paper
This White Paper includes limited information about online games played through wireless devices (e.g., mobile phones, PDAs) or interactive television set-top boxes.

E. *Disclaimer*

This work was created and written by volunteers on behalf of the community at large. The White Paper content is based on the individual input of the contributors, and does not necessarily reflect the opinions of the companies that the individuals work for. Everyone worked their hardest, but no doubt there are inaccuracies and outdated information since this paper was originally written. The information was obtained from publicly available sources, including company websites, company annual reports and SEC filings, and news sites dedicated to games. If you find your company bio is incorrect, or you feel like we missed something, we apologize! Check out the IGDA website to see how to get involved for next year and help us set the record straight! Also, this information is intended for informational purposes. If you include it in a business plan or any business process, you are responsible for the information's use, accuracy, and success or failure. And please reference this White Paper as a source. Thank you!

II. MARKET OVERVIEW

A. *Introduction*

In the past five years, online games have grown to reach a large and diverse market. In addition to online-only games, which may be available through downloads or on CDs, in traditional retail channels or on the web only, PC games also frequently offer an online component, and console games are beginning to do so as well, causing the interactive entertainment subsection of online games to become in many ways an industry in itself. Because the player demographics, behaviors, and revenue models of the different types of online games vary tremendously, developers, publishers, and Internet service providers should analyze the distinctions carefully.

Online games are divided into six distinct types of experiences; within these divisions, the type of content, player behavior, platform, and revenue models also vary. However, by distinguishing both by type of game and by type of user, a matrix can be created that encompasses nearly every type of online interactive entertainment experience.

The six types of online games discussed below include: PC Massively Multiplayer games (MMPs, also frequently called Massively Multiplayer Online Role-Playing Games (MMORPGs), Persistent-State Worlds (PSWs), or Massively Multiplayer Online Games (MMOGs)); PC CD-Based Online Games; PC Web-Based Games; Console-Based games; Wireless platform games; and Interactive Television games. These types of games can be further defined by the consumer segment to which they appeal. We discuss the hard-core and mass markets segments in further detail, and also include an analysis of the problem of market cannibalization and the potential for the creation of new gaming segments.

Online games have in many ways revolutionized the interactive entertainment industry and have created an important new source of revenue and gamers. Most industry analysts agree that online games will continue to grow in raw usage, and will generate significant revenue, with predictions varying from $1.8 billion in revenue in 2005 according to IDC to $2.55 billion in revenue in 2006 according to Jupiter[1]. However, the source of the revenue increases remains a subject for debate.

[1] Becker, David. “Online game makers seek key to profits.” www.cnet.com, January 25, 2002.

Online Game Genre	Current US Market Size	Common Revenue Sources	Average Revenue Per Player (ARPP)	Potential Near-to-Medium Term Revenues
MMPs	Small; 1,000,000-1,500,000 players	Purchase, subscriptions, premium goods and services	$9.95-$12.95 per month	Medium; as ARPP increases, so will competition in genre. Biggest challenge is to grow core market size.
PC CD-based	Small; varies by title, but aggregate less than 5,000,000	Limited subscription matchmaking services	$0-$4.95 per month	Small; very few compelling services and low willingness to pay for content commonly provided at no charge
PC Web-based	Large; 50,000,000 or greater	Advertising, purchase, subscription	$0-$4.95 per month	Small; advertising subject to greater economic forces. Very low purchase/subscription rate and wide availability of comparable free content
Console	Small; approximately 800,000 online console players	Purchase, subscription, premium services	$0-$4.95 per month; Xbox Live costs $49.95 for one year of service	Small; limited content on GameCube and inconsistent offerings on PS2. Greatest potential comes with next generation of consoles in 2005
Wireless	Small but growing quickly; 10x growth in next 5 years	Advertising, purchase, subscription, premium services	$0-$4.95 per month	Small; advertising subject to greater economic forces. Low but growing purchase/ subscription rate and some availability of comparable free content.
Interactive Television	Small; few enabled advanced set-top boxes commercially deployed	Advertising, purchase, premium services	N/A	Small; low deployment rate, platform limitations, and use of games as loss leader create little potential revenue

B. *Online Game Products*

1. PC-Massively Multiplayer Games

The MMP Market

Massively Multiplayer (MMP) games are a specific genre of online games, and arguably one of the most successful at actually monetizing users. MMPs feature thousands of players (between 2000 and 4000 on most current game servers, with some games requiring multiple servers) playing simultaneously on a large persistent world 'map'. Players create alter egos in these persistent worlds, and guide them as they grow more powerful, accumulating wealth, powerful weapons and increased abilities. This dynamic differs from most session-based games, where a player's alter ego generally only accumulates successful "kills" against other players, though session-based RPGs such as *Diablo, Neverwinter Nights* and *Phantasy Star Online* allow characters to grow and remain persistent while 'worlds' are transient.

MMPs are client/server programs, with the company hosting the world on its own dedicated servers and bandwidth. Server installations vary from dual Pentium-type servers to much more powerful servers, running everything from Linux to Windows NT. MMPs are run as an ongoing service; the worlds are 'up' and available for play 24 hours a day, 7 days a week (except for maintenance reboots and inevitable crashes), allowing a stream of players to log in and play around the clock. This level of availability requires a dedicated customer service team to address any in-game issues, from bugs to player harassment disputes.

MMP players generally purchase a box at retail, and pay a monthly subscription fee to access the game – from $10-15 per month. MMP publishers have found a way to generate ongoing revenue from a user, but in turn have had to adopt a service business model – an often-difficult transition for retail-focused companies.

Multiplayer games have been around for decades, with the most successful ones generally being text-based games, such as those at www.play.net, which routinely have thousands of simultaneous users. In 1997, success was redefined with the much-anticipated arrival of EA's graphical MMORPG, Ultima Online (UO), which still boasts over 200,000 subscribers. Growth has flattened substantially over the last few years, but EA has been aggressive about hosting servers in Europe and Asia, expanding their player base in both continents while its competitors have lagged behind. Begun as an almost skunk works-like project often threatened with cancellation but championed by a powerful development executive, UO has emerged as one of EA's most important non-sports franchises. While other companies had attempted a graphical fantasy, RPG, persistent world prior to UO, no one had broken the 100,000-subscriber mark, and enjoyed the level of popularity and financial success that UO created.

Sony Online Entertainment (SOE)'s EverQuest expanded upon UO's success. Also begun as a skunk works project with a PlayStation development group at Sony, EQ has reached almost 500,000 subscribers, selling boxes, expansion packs and subscriptions at an impressive rate, while beating the other large-publisher UO challenger, Microsoft/Turbine's Asheron's Call, to the market in 1999. EverQuest is the MMP most frequently cited by game developers and the media as a model of online games because of its high subscriber base, expansion disks, and franchise strength; no other MMP has come close to EverQuest's success in the United States.

Companies continue to enter the MMP market, with mixed levels of success. The biggest revelation of 2002 was the success of Mythic Entertainment's Dark Age of Camelot (DAoC); Mythic claims that it reached 200,000 subscribers faster than any other MMP. The DAoC team made several interesting development decisions, most importantly launching with less content and planning for ongoing development to shorten the initial development times, and using their prior online experience to launch with a robust customer service and community team. In contrast, Funcom's Anarchy Online proved that bugs and insufficient customer service could ruin an impressive launch.

Despite the claim of "next-generation" massively multiplayer games, the products that hit in 2002 have largely been refinements of the existing (largely EverQuest-derivative) game design, with its flaws and strengths. This model's addictive "level treadmill" has the drawback of requiring players to spend a huge amount of time to advance in the game. If the market is to grow beyond gaming enthusiasts, clearly these games have to be rewarding to players who only have 5 hours a week to spend in these environments, not 25 hours a week.

In general, developers and publishers that experienced the most success embarked on an aggressive expansion plan, while companies that experienced financial and product issues were concerned with the long development cycles, larger budgets, infrastructure needs and new technical expertise required to launch a successful MMP, and thus adopted a 'wait and see' attitude. Other than the online powerhouses of large publishers (EA, Microsoft, and Sony), only Vivendi (Blizzard's *World of Warcraft* and an MMP based on Tolkien's Lord of the Rings books), Ubi Soft (*Shadowbane* and *Myst Online*) and *Square (Final Fantasy XI*) announced full-scale MMP efforts.

Case Study: NCsoft and Lineage

Korea-based NCsoft made US headlines by acquiring Richard "Lord British" Garriott's startup company Destination Games immediately after its formation in 2001, and many US-centric game industry pundits were startled to realize that NCsoft's Korean MMP, Lineage, boasted as many as 4 ***MILLION*** *paying gamers. These numbers aren't directly translatable to US subscribers as many players play through game rooms and use varied payment methods, like prepaid cards, but notice was certainly served: the markets ignored by the powerhouse publishers because of rampant piracy were now potentially viable. A number of other successful games in Asia: Ragnarok Online, Jin Yong, Stone Age – also thrived, though those markets became very crowded from locally-developed entries. These games, including Lineage, were noticeable because of their relatively primitive technologies – Lineage uses a 2D isometric perspective with fairly limited character customization that appears more like 1997's Ultima Online than even 1999's 3D EverQuest.*

NCsoft's US entrance was a non-event – Lineage debuted in the US to resounding indifference. As in Korea, the game was offered as a free download but with a fairly hefty $15/month service charge. Few takers emerged, perhaps due to Lineage's primitive graphics or lack of community-driven excitement. Meanwhile, Garriott's team began working on its project, code-named Tabula Rasa, while NCsoft's prior investment in another US MMP development team, Artifact, continued. NCsoft also began a small acquisition spree by signing projects, such as "Trade Wars: Dark Millennium", "City of Heroes", and an unannounced game from a Blizzard spin-off. "Lineage 2", using Unreal licensed technology, was well underway and began testing.

Eager to shore up its own business model in Asia (increasingly under attack from competitors such as Ragnarok Online) NCsoft also inked a deal to localize and launch EverQuest in Asia. Sony Online linked up with Taiwan Lineage "publisher" Gamania to hit the second largest online gaming market in Asia. However, one of EQ's big successes was providing a game system focused on player versus environment game play, creating a clear differentiation from the unintentionally customer-unfriendly player versus player gameplay found in Ultima Online's earlier release. In contrast, Lineage and other Asian games are built around player versus player dynamics, leading some to question whether US MMPs could thrive in Asia, or whether Asian MMPs would find a large audience in the US.

The US MMP Market

In 2002, Sony Online Entertainment's EverQuest still ruled the roost in the Western world, despite the launch of several EA.com subscription-based games. With numbers approaching 500,000 subscribers, an engine upgrade, a price boost and another expansion pack keeping the title fresh on the shelves, the EverQuest franchise didn't slow down much, even as SOE turns its attention to the PS2 (*EverQuest Online Adventures*) and EverQuest 2.

Still, notwithstanding EQ's many expansion packs (planned well into 2003), SOE's most-anticipated game is their flagship title developed for LucasArts, *Star Wars Galaxies*. With arguably the strongest MMP license ever, much is riding on SWG, as one of the two games developed in the Western hemisphere that has the real promise to attract a million subscribers.

While SOE has not shipped any non-EQ titles since its breakthrough, EA shipped four MMPs in 2001 and 2002: *Majestic, Motor City Online, Earth & Beyond*, and *The Sims Online* (TSO*)*. While these titles received significant attention and experimented with new game mechanics, such as episodic gaming, their commercial success has, so far, been limited. EA has placed considerable importance on the success of *The Sims Online*, the online version of the popular PC series. If *The Sims Online* can replicate the mass-market appeal of the PC franchise (8 million core units of *The Sims* sold, 24 million including expansion packs), the game can literally change the MMP marketplace. As of February 2003 however, TSO's numbers have been limited to only 40,000-50,000 paying subscribers instead of the hundreds of thousands that were hoped for. Maxis/EA still has hopes to reach a goal of 400,000 subscribers by the end of 2003 though, and no matter what, *The Sims Online* will likely be a hot topic in the gaming community for some time.

Anarchy Online from Funcom reportedly reached 60,000 subscribers quickly after launch, but while the game is much more stable and playable, AO seems to have lost momentum from its successful introduction, at least partially because of a lack of priority on customer service. Additionally, German publisher CDV launched *Neocron* at the end of 2002, with relatively little fanfare and middling reviews. Like AO, *Neocron* is set in a science fiction universe and focuses on FPS-like gameplay.

Asheron's Call 2 launched in early 2003, and seems to be the first title to begin to refine some of the problematic gameplay elements that dog the large-scale MMPs, while also providing a capable graphics engine. While AC2 still relies on the EQ model of leveling your character, it makes for a much better new player experience than anything that preceded it; new players, for example, are NOT faced with a spreadsheet-like form and asked to distribute points that will irrevocably affect the character's progress before the game begins.

Meanwhile, other titles wait in the wings: Blizzard's *World of Warcraft*, *Matrix Online* developed by Monolith in conjunction with Warner Brothers, *Lord of the Rings Online*, *EverQuest 2* and *Star Wars: Galaxies*. Whether these titles will expand the marketplace or simply cannibalize the existing user base remains to be seen, but as the market becomes increasingly crowded, licenses, marketing support, outstanding game experiences, and a strong customer-focused launch become increasingly important.

There is a sense that even with potential stumbles, this genre provides such a unique and compelling game experience that doubters will look like the same people who once thought video games was a niche market – especially given the emergence of networked consoles and Asian game players. Increasingly sophisticated server software will enable new types of gameplay, client graphics are becoming increasingly competitive with state-of-the-art retail games, and even small "indie" style MMP projects seek to find their own niche.

MMPs Worldwide

Asia has largely been ignored by most shelf-based US publishers because of the rampant piracy. But with online games, where most revenue is driven by subscriptions and not initial sales, piracy has become a non-issue. Also, the drive to broadband (South Korea has the largest broadband deployment per capita in the world, with about 60% of households with broadband) has made online games a bigger business in Asia than in the US/Europe, albeit with more primitive development standards and lower base level PC hardware. PC Game Rooms, clubs which feature networked PCs that are commonly used for MMPs, mitigate some of the hardware investment required, and now function as primary social gathering places for teens and young adults.

Japan is a market separate from the rest of Asia; it has much less of a piracy problem, a much higher per capita income, and an emphasis on wireless services rather than traditional Internet access. SquareSoft has yet to announce when it will export the *massively multiplayer online game Final Fantasy XI* to US shores, but claim in January 2003 that they are close to breakeven.

Despite the localization complications, US developers did have exports on their mind: Sony Online teamed with NCsoft to bring EverQuest to Korea (requiring a massive localization effort), while Dark Age of Camelot also arranged for Asia deployment. Ultima Online's success continued with Korean and Japanese servers, but didn't approach the usage of Lineage or other locally developed games. Still, games such as PvP-centric Shadowbane (published in the US by Ubi Soft but in Asia by Gathering of Developers co-founder Harry Miller's En-Tranz Entertainment) are braving the Asian market, while others such as Anarchy Online, EVE, and Neocron clearly have noticed and are attempting to replicate Lineage's success.

2. PC CD-ROM Games

Especially in genres such as real-time strategy and action, PC CD-based online play continues to be a "check-list" feature for most retail games. Some genres, and individual titles, incorporate this feature with more success than others; however, multiplayer support has become so ubiquitous that games lacking

this feature are almost always scrutinized. There are clearly some games that are designed as single-player experiences, yet suffer from a blanket criticism that the game lacks multiplayer support; for instance, much anticipated *Deus Ex 2: Invisible War* from the Ion Storm Austin studio of Eidos eschews multiplayer for a refined single player experience. In contrast, other games such as *Battlefield 1942*, discussed below, are almost exclusively designed for multiplayer enjoyment. Other games – notably, real time strategy (RTS) games – have benefited from not only including multiplayer options, but also from providing both compelling single and multiplayer experiences.

Online gamers who play instantiated or session-based online games – such as *Counter-Strike*, Diablo or Battlefield 1942 – usually find themselves on a single game map of up to 64 players. When all players leave the game, or a certain condition has been reached (number of kills to 'win', or other objectives) the game ends. While online multiplayer capabilities are now a feature set, the game publisher does not earn any incremental revenues from online play beyond the actual box sale – if that. Gabe Newell of Valve Software has often said he has not seen a penny of revenue from Korea from one of the most popular online games there, *Counter-Strike*.

However, multiplayer support rarely brings anything to the publisher other than increased box sales due to the popularity of Internet play. While this increase may generate substantial revenue, this model is an extension of the retailer's business with less clear returns than the traditional MMP subscription-based online games business and is often difficult to quantify. While matchmaking sites enable observers to monitor the popularity of different games, it is much more difficult to judge how many of those purchases would not have occurred without multiplayer support, as well as how many of the purchases are legal copies of the game. In this context, Valve's ongoing Steam project is noteworthy. Steam, a download distribution and digital rights management scheme for games, entered another beta period in early 2003. This software would allow companies to distribute games only to valid paying customers, which would potentially reduce piracy significantly. Whether this model is viable, and whether consumers want the security of owning a tangible good, has yet to be determined. Steam seems to be optimal if there is NO physical good at any point. Steam also needs a major title as a Steam-only game to drive its acceptance by the industry.

Case Study: Neverwinter Nights and Battlefield 1942

From this writer's perspective, the two most interesting PC CDROM online games in 2002 were Bioware's long-awaited Neverwinter Nights and EA's formidable Battlefield 1942. Neverwinter Nights (NWN), with its outstanding license and history, was highly anticipated by role-playing gamers and legions of "Baldur's Gate" fans. NWN's launch did not seem to affect the subscriptions of any massively multiplayer games; instead, NWN was a much different experience.

Rather than build a persistent giant world, and incur the associated infrastructure costs which that work entails, NWN shipped not only an RPG but also a fairly robust toolset, allowing players to create and host their own dungeons. These dungeons were meant to be plundered by the typical small group of players involved in traditional paper role-playing games; while NWN theoretically supports up to 64 players, real world play found that many more than the typical "RPG party of 6" tended to slow down network traffic – perhaps the effect of not having the client/server optimizations and dedicated hardware and bandwidth which games such as EverQuest and Ultima Online rely upon.

This toolset was highly touted – after all, various Quake and Unreal 'mods' not only demonstrated the breadth of fan base, but sometimes the depth as well, with many mods surpassing the levels found in the shipping game. Hosting your own levels – in effect, becoming a DungeonMaster (DM) in Dungeons & Dragons parlance was now within the reach of every owner of NWN. These created worlds could be as "persistent" as the DM wished – a game host could even require that players create (and leave) characters on a particular server.

However, several issues came to light after the initial excitement caused by "being your own DM in a computer RPG!" died down. First, while the tools provided were powerful for world building and scripting, it became apparent that there's a reason why there are professional content creation professionals.

Simply putting together worlds is a daunting task, not to mention then tuning experiences so that players are sufficiently challenged but not beaten into submission. The tools are powerful enough to require quite a bit of acquired/learned skill.

And, of those users who bother to put up game servers, the quality is quite variable too – players need to sort out which are the good DMs and those who aren't. And if the "quality pyramid" applies here, only a small percentage of hosts will be able to provide really good experiences for their players. While the Net is clearly a good medium for quick feedback, the fact that each server has a practical limit far under 64 users (especially given the limited bandwidth to the server) means that "letting the secret out" about any particular NWN world might see that server overrun – and no longer playable. And of course, there's no guarantee that a user will keep his/her server up for any particular time. In many ways, this dynamic unconsciously mimics the experiences traditional role-playing gamers have in finding a group of like-minded players, instead of improving the process as was likely the intention of the NWN development team.

Another breakthrough PC CDROM game that can be played online is EA's "Battlefield 1942" (BF1942). This first person shooter is set in World War II, and has amalgamated a number of different features. Like EA's "Medal of Honor", there's a strong historical feel, made especially vivid by associations with films such as "Saving Private Ryan"; like "Team Fortress", there are many "roles" to play in the game, and like "Command & Conquer: Renegade", there are several user-usable vehicles. The concept of the "electronic battlefield" with multiple vehicles and participants has been in the commercial games space since Spectrum Holobyte's "Falcon 3.0" series. But Battlefield 1942 made the game dynamics easily accessible and enormously entertaining.

BF1942 is set across four theaters of war – Eastern Europe, Western Europe, North Africa and the Pacific. Maps are spread across the theaters, giving players different challenges and tools. Players choose different equipment profiles, giving them abilities versus different enemy units. For example, a player equipped for infantry combat won't do much good against an armored vehicle. And there are a staggering number of vehicles: tanks, fighters and bombers, ships, boats and submarines. Many of these vehicles allow multiple players to man them, such as a driver and gunner for example (also used to excellent effect in multiplayer games of the Xbox shooter "Halo").

Fairly sophisticated gameplay goals were built into the game, apart from the various capture the flag or deathmatch options, requiring a base level of strategic planning and execution. And again, while the game supports 64 players, the author found no one able to play with so many people satisfactorily over an Internet connection. 64 players on a LAN, however, is reportedly an incredibly compelling experience, especially with the low latencies that a LAN provides.

3. PC Web-Based

Introduction

Web-based games are available through a web-only interface or by download. The most common form of web-based game is a java-based applet played through a browser. Downloadable and web-based games represent a relatively new market segment for the games industry. This segment is characterized by the ease of distribution—very small (usually less than 500K) java applets or 1-3 Megabyte files downloaded from the Internet—and the "newbie" gamer status of the consumers: people who do not play console-based or CD-ROM games. It is very easy to play a java applet or download a 1-3 Megabyte file from the Internet, and it is also very easy to get hooked on these games—the best performing titles are simple to learn, difficult to master.

These two factors—ease of distribution and a new market of game consumers—combine to make this segment of games one of the most interesting for the independent game developer. Still in the early stages of this market, it is fairly easy to get your game in front of a critical mass of consumers through a

proper distribution channel. And, if you can win the hearts and minds of this new generation of casual gamers, you can build significant loyalty within one of the fastest growing segments of the game industry.

The model for marketing downloadable games involves three stages: an online version that is very easy to learn and whets the appetite of those interested in better gameplay to download, a limited execution downloadable version which may have some key features crippled, and finally the "unlocked" version which offers unlimited usage and full features to paying consumers.

Web-based games, which make up the majority of this segment, are often marketed in similar ways, although they frequently depend more on advertising and less on purchases. Some developers have experimented with offering additional features, such as community tools, for fees; others offer advertising-free versions, or offer the ability to download versions of web-based games for a nominal price. Anecdotal evidence implies that, contrary to expectations, these models are highly complementary. When people download a version of a web-based game, usage of the web game generally goes up. Because people can play the game even when not connected to the internet, people develop an even higher affinity for the game, and will play online when possible, especially when community features like chat and leaderboards are in place.

It is estimated the market for downloadable games in 2002 is between $20 million to $30 million. Anecdotally, most publishers agree that a sizable percentage of these consumers are over the age of 30, and at least 50% are female. The market for web-based games is more difficult to quantify because revenue is susceptible to the fluctuations of the advertising market, but game sites are consistently top performers in overall Internet usage. Jupiter estimates that PC-based online games will generate over $750 million in advertising revenue in 2006[2].

Technology Platforms

The most important factor for success with a web-based downloadable game is accessibility: how easy is it to GET this game? Web-based games are almost always less than 1 MB, and frequently less than 500kb. Most downloadable games are less than 4 Megabytes, and the best performing titles are less than 2 Megabytes; web-based games ideally require a single click to start the play experience and have a minimal waiting period (often filled with instructions or advertising) before play begins. And once they've downloaded it or clicked the play button, does the majority of the online market have the right software and hardware loaded on their computer to play this game?

a) Software

Web-based games are written on a variety of platforms, including Java, Shockwave, Flash, and other 3D platforms such as Wild Tangent. Again, the most important concern is how easily the casual gamer can have a satisfying experience with your game. How long is the download? Does the game require special browser plugins? If a special download is required, check the stability and availability of the plugin. How easy is it to download? How easy is it to install? It is often best to stay a version or two behind the bleeding edge of plugins when making games for the casual gamer market since this market rarely invests in cutting edge machines or connections.

b) Hardware

Hardware is generally not an issue with Java-based games or 2D games written in the Shockwave or Flash platforms. However, as developers and consumers recognize the extra zing a 3D effect can have on a newbie gamer, great downloadable games will begin to take advantage of 3D technology. The most important factor in selecting a 3D platform is the extra hardware requirements—a special requirement for a new video card or a faster CPU can rapidly shrink the size of the addressable audience for a particular title. The best advice for game developers creating downloadable games is to test the entire game lifecycle—from online version to download and unlock—on your parents' computer; often, this is your target market, and this test

[2] Jupiter Games Model, 11/01.

can provide a good indication of whether you are expecting too much from your player's hardware.

Popular Sites

Casual games have risen to the top of popular entertainment content on the Internet. Casual games are relevant to a majority of Internet consumers, and web-based and downloadable games for this casual gamer audience provide a relatively easy path to traffic for an online publisher. For example, games enjoy prominent placement on every major portal, and the majority of these games are targeted towards the mass market. Most of these games are web-based, and many offer a small downloadable version as well. Internet Service Providers—both broadband and dial-up—recognize the success of games and have built out sections for games in their portals or proprietary services.

The most popular sites for web-based and downloadable games include Electronic Arts' pogo.com, a division of EA.com (http://www.pogo.com), Real's Real One Arcade (http://www.realonearcade.com/), Shockwave.com (http://www.shockwave.com), Yahoo! Games (http://games.yahoo.com) and Microsoft's The Zone (http://www.zone.msn.com). All of these sites have similar traffic patterns, averaging 8 million to 12 million unique users a month. Depending on the overall business model of the site, a site may promote the free online version of a game over the downloadable version. For example, Real One's strategy includes a proprietary desktop device that organizes and manages downloads as well as provides a spot for simple delivery of consistent marketing messages; Real One's games are metered by time, with the initial play free to the customer and purchase encouraged after the time limit has expired.

Types of Games

While web-based and downloadable games generally do not have high production budgets and therefore do not have strong differentiation with character, story or artwork, these games can vary widely in the types of gameplay offered.

Puzzle Games: The most popular genre is the level-based puzzle game, such as variations of the fifteen-year-old hit game *Tetris*. These games are easy to learn and control, with the strategy communicated in a sentence and the entire game controlled through the mouse. Due to the success of PopCap's *Bejeweled* and *Collapse*, there has been a rash of puzzle games marketed to casual gamers. This new content is exciting; however, very few of the "me-too's" can approach the success of the hits. The level-based puzzle game should be seen as a groundbreaking "first game experience" that introduces a customer to a site, not the "be all, end all" of games. Developers interested in creating new and differentiated titles should see these puzzle games as providing the basic familiar structure of games for a new generation of gamers.

Classic Card Games: Solitaire is a consistent usage driver on every site where it is available, as are classic games like Hearts and Spades. The combination of well-known rules and play mechanics, simple interfaces, and chat attract people from all demographic groups. While simplicity is emphasized in this area, explaining why Solitaire, Spades, and Hearts, with their easily understood rules, are consistent usage leaders, an opportunity also exists for content designed to appeal to specific game enthusiasts. For example, a number of sites offer Bridge tournaments, with rankings, sophisticated interface, and organized events; these sites generally charge a fee.

Arcade Classics: While some are puzzle-based in nature, arcade classics are proven addictive interactive games. Arcade classics can also take a step beyond the puzzle game to action-based games that dominate the console and CD-ROM market. Arcade classics also enjoy familiar game mechanics and often a recognized license, making the content accessible to the mass market.

Word Games: A variation of puzzle games, word games are extremely popular with the casual gamer crowd. Both crossword puzzles and other variations, such as Pogo.com's *Buzzwords*, have generated significant usage.

Features of Successful Titles

Successful web-based and downloadable games, whether puzzle or action-based, all share similar characteristics. They are all fun, easy to learn, difficult to master and addictive. Or in more formal parlance—the games are engaging, accessible, competitive and habitual. Most successful console and PC/CD-ROM games are engaging, competitive and habitual. However few of the developers of those traditionally distributed games have addressed the issue of accessibility as the developers of web-based titles have. These games, targeted towards and accepted by a wide audience including many people unfamiliar with traditional retail games, have innovated many accessibility features. As the market for downloadable games grows, pressure will be on developers to continually provide more varied gameplay within the familiar mechanics being established today.

Current conversion rates from downloader to paying customer are between 1% and 5%. Web-based games that are supported by advertising rely on traffic. In both cases, a large user base is required for financial success; unless these business models change significantly, the online web-based game market will be about mass-market hits. Your best investment in developer time should be to make sure **EVERYONE** has fun playing your game.

Below are some accessibility features worthy of mention:

1) Mouse-controlled: The most popular downloadable games are controlled by the simple point and click of the mouse. Adding other key controls just increases the learning curve and shrinks the market of happy, satisfied consumers for your game.

2) Simple scan of the screen: Look at the best games – *Collapse*, *Diamond Mine*, *Dynomite* and *Mahjong*. What is the commonality of gameplay? The player chooses their next move by simply scanning the screen. Players should be able to decide their next move by just scanning the screen.

3) Obvious options: Oftentimes developers are asked to make the games easier for the first time user. Too often the response is, “There is an easy setting in the options menu.” However, the people who most need the options don’t know they exist. The most sensitive options for first time players should be brought up to the top.

4) Casual gamers don’t read: Don’t make players read a list of rules. Help them to understand the rules as they play. Pop-up boxes can be really helpful here. Other hints like strategies displayed during level transitions work well. Developers should ask themselves, “Do I learn this game by playing it?”

5) Casual gamers don’t know there is more: Most people playing a casual game for the first time do not know there is deeper play available in a downloadable or paid version. Developers should definitely spell out the feature benefits of download at the end of each game. In addition to a list of features, players should be provided context. Tell them why they need each one—why would players care about saving game state or wanting more power-ups.

6) Casual gamers want to succeed: Give players three simple things to do to be good at the game.

Again, these are just a few accessibility tips. More exist and many more need to be created. Don’t be afraid to copy effective features of other games. A common feature set will only help to further standardize the first time player experience. With a common feature set across all games, developers can move on to emphasize more creative features like character and artwork. But for now, successful games tend to wrap novel game designs in familiar accessibility features.

4. Online Console Games

Taking console games online involves significant challenges. In addition to the historically low rate of peripheral sales other than controllers, the online console experience is complicated by their lack of a keyboard input device and the latency requirements of the fast-twitch games so popular on consoles.

Sony, Nintendo and Microsoft all introduced online adaptors for their consoles in 2002. However, these manufacturers have employed substantially different strategies in their entry into the online market.

Sony's PlayStation 2, which holds a commanding lead in market share for consoles with a US installed base of 16 million in early 2003[3], currently supports both broadband and narrowband connections through their online adaptor. The only equipment required to play online is the adaptor and a game that supports online play. Additionally, Sony allows individual publishers and developers to create and manage their online interfaces, communities, and payment options. This flexible approach has both advantages and disadvantages. Because the PlayStation 2 does not require broadband, it is accessible to every customer. Additionally, developers are incentivized to create online content because Sony allows them to use their existing infrastructure, interface, and community. For a company such as Electronic Arts that has invested significant capital in their online operations, this flexibility is a huge reason to support the PlayStation 2's online capability. However, because slow connection speeds are supported, the play experience can deteriorate significantly, and narrowband customers can create a divisive force in the community, either because they are ostracized or because the impact the play experiences of other customers in such a negative fashion. The developer flexibility can also complicate a player's experience. By using different accounts, names, user interfaces, and policies in each game (or from each publisher), the experience may be disjointed and confusing.

Microsoft's Xbox Live service provides a substantially different model. Customers purchase the Xbox Live Communicator, priced at $49.95, which includes a voice headset and a year of online play. Microsoft has not announced any payment plans or policies after the first year expires. Customers then create a single account and enter the Xbox Live service through a single interface, regardless of publisher. Additionally, Xbox Live requires a broadband connection. While these options significantly reduce developer flexibility, the interface and speed requirements may provide a significantly enhanced experience. By standardizing the interface, Microsoft creates an expectation of experience that they can consistently meet. Additionally, requiring broadband connectivity mitigates some of the frustration involved in playing games with vastly different connection speeds. Microsoft's online offering, in its initial phase, is designed specifically to appeal to the hard-core gamer. Microsoft has said publicly that it is very pleased with the performance of Xbox Live, although the console remains in a tight race with the Nintendo GameCube for the #2 market position in the United States[4].

Nintendo has been very quiet about their online plans. Their major online product so far has been the port of Phantasy Star Online, the first online console game by Sega, to the GameCube. Nintendo's plans may be complicated by their traditionally younger demographic. The Children's Online Privacy and Protection Act (COPPA) requires specific protections for children under 13 in their online activities. These requirements can be onerous for developers. Additionally, Nintendo may view their handheld market as more important for multiplayer use than the GameCube. Nintendo is also adopting a laissez-faire approach to online development similar to the PlayStation 2. Developers have substantial flexibility in creating and managing the online experience.

Several factors will impact the success of online console games. Broadband adoption rates must increase in order to provide the high-quality experience gamers are accustomed to. Console game developers must also learn to design good online games; as many PC developers have discovered, online games require different modes of competition, reward systems, and communication tools than their offline counterparts. Most likely, online console games will become a force in the market in the next generation of machines, which will likely include broadband connectivity as well as additional features that change the game console to a home entertainment system. Until that time, game developers can profit from online console opportunities by being aware of their target market, the substantial differences inherent in a successful online game, and the benefits and disadvantages of the Sony and Microsoft models.

[3] News.com
[4] News.com

5. Online Wireless Games

Online services in the US have traditionally lagged behind offerings in Japan and Europe, and games are no exception. While the slow adoption of 2.5G and 3G infrastructure and services has further impeded online wireless game services in the US, more companies are beginning to roll out advanced networks and hardware, priming the market for rapid growth over the next 5 years. IDC estimates an increase in mobile game players from 7 million in 2002 to over 70 million in 2007.

Games also represent an easy way to upsell additional data services and build customer loyalty by increasing switching costs. When so many cellular providers seem indistinguishable, the exclusive availability of a popular game is an outstanding service differentiator. Games will likely be bundled with other data offerings, and developers will most likely be paid in a combination of development fees and usage-based royalties.

It will be interesting to see companies attempt to replicate the success of European and Japanese offerings in the US; cultural and legal differences may make some paradigms inapplicable. For example, companies with less access to public transportation (to get people to the internet cafes), combined with greater fixed internet connectivity, may limit the gross number of advanced mobile service users and the revenue they generate because of the decreased opportunity to use the services and the cheap availability of a better alternative.

6. Interactive Television and Other New Media

As new devices such as set-top boxes begin to proliferate, their manufacturers and associated service providers search for ways to increase the box's value and application "stickiness". One of the most obvious ways to accomplish this goal is through games. However, the games provided through these platforms face a number of development and use constraints, and require specific expertise.

Currently, the potential market size for games provided through interactive television (iTV) in the United States is difficult to estimate. While games and peripheral services such as gambling and content on demand have enjoyed some success in European markets, iTV has been rolled out in a very limited scope in the United States, and the small scale of the product launches prohibit accurate usage models. In general, however, iTV audiences will likely mimic those of mass-market web-based and downloadable games. Both the technical limits of the platform and the size of the mass-market audience make simple puzzle, card, and arcade games the most likely successes on these new platforms.

However, the next generation of consoles may change this space completely. Many people speculate that the new consoles will include functionality such as Digital Video Recording, also known as Personal Video Recording, as found in TiVo. These devices may also act as home entertainment servers, managing digital media across the home. As details on the next generation of consoles emerge, game developers, publishers, and internet service providers would do well to pay close attention to the ways in which these new devices compete with or complement their products and services.

C. *Consumer Segments*

To generalize the online gaming market, there are two customer groups: the hard core and the mass-market online game player. The size of the online games audience is growing rapidly as more mainstream users are buying computers and going online. In addition, the introduction of online-enabled consoles will also add millions of new online game players and change the overall demographics of online game players. The mass-market online game players are the largest segment of online game players. This segment is defined as users who primarily play free online games such as word, puzzle, card, board, casino (not gambling) and game show games (*Price is Right*, *Jeopardy*, etc.). IDC estimated that there were 30.8 million casual PC online game players in 2002, with the number expected to grow to 55.4 million in 2004.[5]

[5] Analyst Schelley Olhava for IDC in her report, "From Fantasy Worlds to Backgammon: US Online Gaming Forecast and Analysis, page 6.

The hard-core online gaming audience is much smaller and includes users who primarily play online role-playing, strategy, shooter, action type of games. IDC estimated an audience of 8.4 million online hardcore PC gamers in 2004[6]. These two groups are not necessarily mutually exclusive. Many times hard core online game players will also play mass-market type of games such as free online card, board and casino games as a break from their deep, immersive game experiences.

1. Mass-Market Online Game Audience

Introduction

Historically, there are four main success factors that caused the mass-market online gaming audience to grow rapidly over the last four years:

(1) Availability

Historically, players had to search diligently to find free games, and most of what could be found offered limited game play value. For the average consumer, this was a major impediment to enjoying online games. Now, online games can be found through the home pages of all the major portals and Internet Service Providers. Furthermore, many online games sites award prizes for playing games, which have been a strong driver of growth and a valuable retention tool.

(2) Technology Barriers

In the past, consumers had to be very technically savvy to understand how to download and install an online game. Now, automatic download, install and launch mechanisms, and in-browser technologies such as Java, Flash, and Shockwave make online games remove almost all technical barriers. The majority of the online mass-market games require no installation at all with minimal to nonexistent wait times to launch a game.

(3) Consumer-Friendly Business Model

The majority of mass-market online game sites are free. Free web games supported by advertising eliminated a serious barrier to entry – cost. The sharp decline in online advertising revenues has created severe problems for many industries, including the online games industry, which is now scrambling to find new ways to monetize the mass-market online games traffic.

(4) Games for Dummies

Unlike games targeting a hard-core game player, mass-market online games are usually games with which everyone is already familiar (i.e., card, board, game shows, casino) or that one can learn to play in less than two minutes.

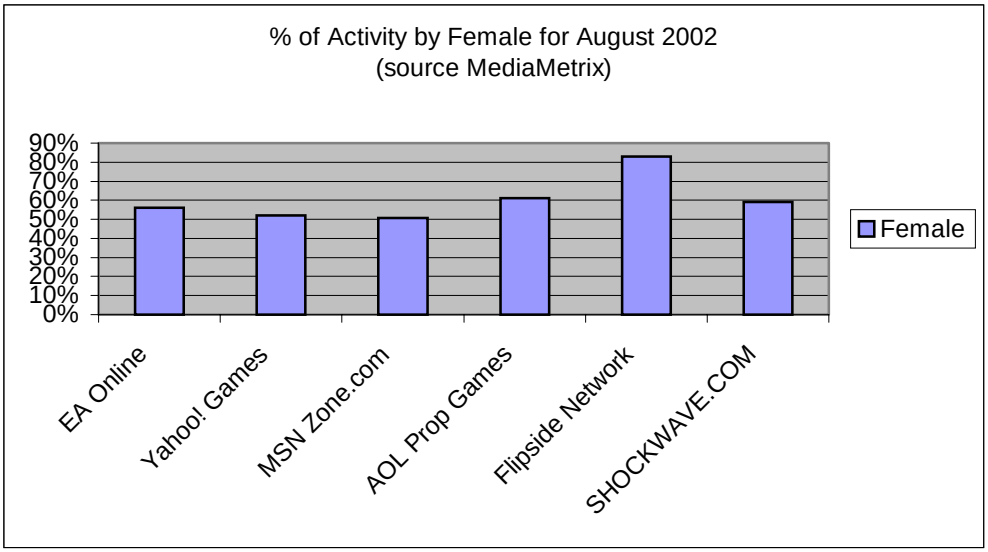
Mass-Market Games

As mentioned above, mass-market online game players primarily play free online games such as word, puzzle, card, board, casino and game show games. Online games in this category generally share the following characteristics:

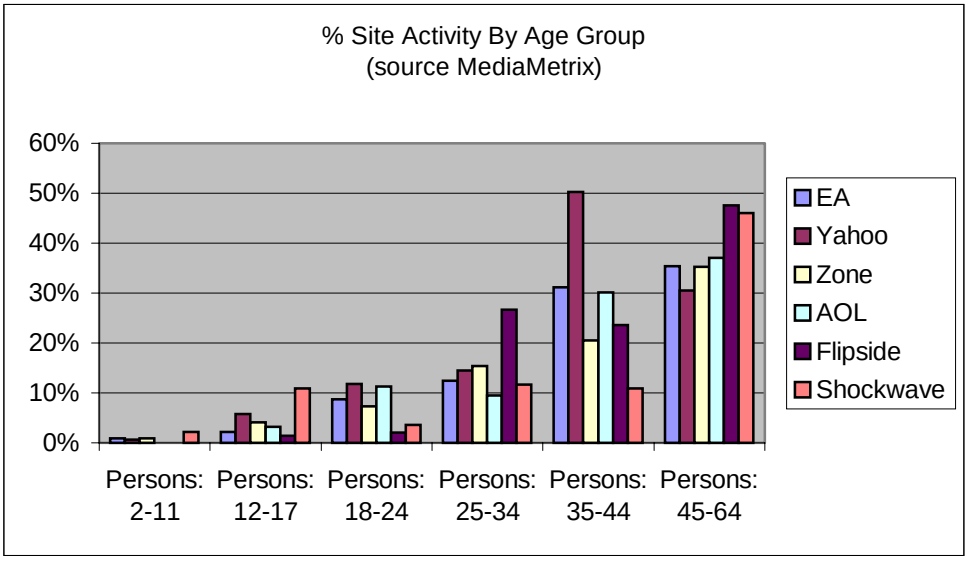
- Free (Advertising/Sponsorship driven)
- Game familiarity (Public domain and branded games)
- No to short game download (<500 kb)
- Non-immersive (Basic or minimal graphics)
- Quick and short game play rounds or experiences
- Low mental effort

Even though the demographics of mass-market online game players do differ from game to game and from platform to platform, there are some general similarities. For example, 55% of all activity on the five largest game publishers for the month of August 2002 was by women.

[6] Ibid.



As technology barriers fall and computers start to penetrate into mainstream America, the average age of online mass-market gamers skews older. Another factor is that there are more computers in the hands of the older generation. Since this generation is less likely to own game consoles, the computer has become an entry path to the world of games.



Mass-market online game players tend to play quick ten to twenty minute sessions to give them breaks in the day. They tend to play single player games but as they become more comfortable and knowledgeable about online gaming, some migrate to multiplayer online games. *The Sims Online* from Electronic Arts will be the first massively multiplayer online game that will try to attract many mass-market online game players.

2. Hard Core Game Player

Introduction

Although not as sizeable in terms of sheer number of players as the mass-market online games segment of the market, the hard-core online games segment has seen staggering growth in terms of both numbers and dollars. The major driver of this growth is the entry of the large game publishers (e.g., Electronic Arts, Microsoft, Sony, Sega) into the online games market, creating multiplayer and massively multiplayer games. Unlike the pioneers in the online games industry, these companies have money. Additionally, the popularity of multiplayer peer-to-peer or server-based games with a lower number of players (two to a few dozen gamers) has grown dramatically with the help of compelling game play, strong community involvement, and free matchmaking services (e.g., *Battle.net, GameSpy,* etc.). In addition, the launch of online-enabled consoles will grow the overall number of hard-core game players.

Hard Core Games

Hard core online game players primarily play online games such as role-playing, strategy, shooters, and adventure type of games. Online games in this category general share the following characteristics:

- Surcharged content (Client and/or online connect time)
- Large downloads or CD required (High quality graphics)
- Immersive environments
- Steeper learning curve

As the most understood segment of the market, hard-core gamers are young, predominantly male consumers. They also represent the smallest group of online gamers. They spend the most time playing games, often spending over 20 hours per month. For many gamers, this represents the largest single form of entertainment consumed. They are the least price-sensitive group, willing to spend money to play games and to play games online. They are mostly composed of hard-core PC gamers that have migrated to online PC games.

3. Platform Analysis

There are many devices that one can use to play online games, ranging from handheld devices, to consoles to computers. For any online game to be successful on any device, the game play has to be compelling and offer an enjoyable experience. In addition, the business model for each platform varies based on the structure of the value chain in each industry. Each device has its own advantages and disadvantages and many times is complementary to other devices. Wireless handheld devices offer game players the ability to play online and offline games while away from home. Even though handheld devices technically are not capable of offering online games that are graphically rich, hard-core game players still find simple classic Atari, sports or action games enjoyable to play on handheld devices. To date, the majority of games offered for handheld devices have been mostly for offline play.

Historically, computers have always been the main platform for online game playing and will continue to be so in the short term for both the hard-core and mass-market online game player. When next generation console machines all have hard drive and modems/Ethernet integrated with the console, consoles will rival, if not surpass, the computer as the main choice of online gaming platform. All platforms offer users the ability to play online games anywhere, anytime and grow the overall size of the game industry.

D. *Market Size Projections*

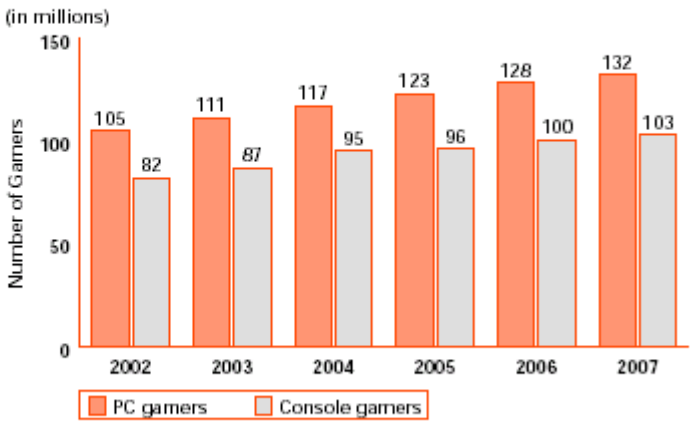
The value of the online games market is obviously dependent on both the gross size of the market as well as the average revenue per user. In many ways, the games market is mature. Growth is projected to slow over the next four years, with even the introduction of new console platforms in 2005 failing to significantly increase the total number of gamers. Additionally, it is important to note that the number of PC gamers includes the casual segment, which is generally unwilling to pay for games, plus that a single

individual may be counted multiple times in these projects. For example, someone playing games on a PC, PS1, PlayStation 2, and Xbox would count as 4 gamers.

The challenge for those people involved in the games industry is to create new ways of extracting revenue from their relatively stable market. Console revenues will follow the established pattern of decreases in the last years of the lifecycle, as well as substantial increases upon the introduction of a new generation of hardware. However, the development of online capabilities represents a significant opportunity to increase the life of a title and console through expansions, downloadable content, and premium community as well as create a new revenue stream as Microsoft has done with Xbox Live. PC games represent a more difficult challenge because their user base is more heterogeneous. Players on Pogo.com and GameSpy likely differ greatly in their game habits and attitude towards interactive entertainment in general. For this reason, it is especially important that PC developers and publishers understand their content, audience, and delivery channel--and that they ensure that all of these components are synchronized.

Electronic Games a Maturing Medium

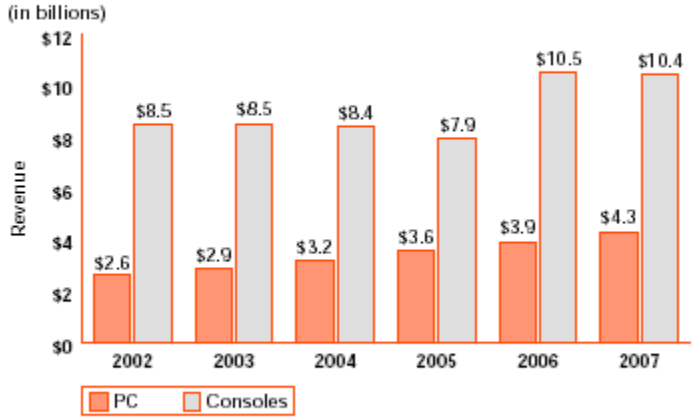
Fig. 1 Audience Growth by Platform, 2002–2007



Source: Jupiter Games Model, 10/02 (US only)

Despite Comparable Audience Sizes, Console Revenues Eclipse Those of PC

Fig. 2 Games Revenues by Platform, 2002–2007



Source: Jupiter Games Model, 10/02 (US only)

E. *Issues and Opportunities in Online Games*

1. Broadband Penetration

Perhaps the most important issue in online games over the next two years is the increasing rate of broadband penetration. Broadband penetration for US households increased from 10 million in 2001 to 16 million in 2002, out of approximately 60 million total online households[7]. As broadband penetration increases, the potential market for advanced online services also grows, making broadband connectivity requirements and the enhanced gameplay they support a viable position. Broadband growth also supports new distribution models, including streaming games on demand, and direct-to-consumer product offerings.

In addition, broadband technologies will enable developers to replicate the experience of low-latency LAN play on a large scale. Developing technologies like DOCSIS standardization for cable modems and Quality of Service (QoS) packet management that guarantees specific latency and speed will allow for advanced online gaming that can finally begin to approximate the traditional fast-twitch experience.

Finally, the growth of broadband introduces a new player to the interactive entertainment industry's value chain. As telephone and cable companies become the broadband service providers of choice, their influence on the type of broadband connection available both to the mass market and to gaming enthusiasts grows, as does their relative position in the ISP marketplace. If, for example, a publisher creates a product requiring broadband, the largest cable companies, Comcast Cable (3.8 million broadband subscribers) and Time Warner Cable (2.6 million broadband subscribers), each offer over 4 times the broadband subscribers as AOL (650,000 broadband subscribers)[8]. These companies will likely track online gaming closely, both to identify and meet the needs of the speed- and bandwidth-hungry gaming enthusiasts, and to partner with game companies to provide platforms and content for their subscribers as appropriate.

[7] Hansell, Saul. "As Broadband Gains, the Internet's Snails Fall Back." The New York Times, February 3, 2003.
[8] Ibid.

2. Mass-Market/Massively Multiplayer?

During the months leading up to the launch of *The Sims Online*, massively multiplayer gaming received press to a never-before-seen degree. *The Sims Online* and multiplayer gaming were featured in publications such as *Newsweek*, *USA Today*, and *Entertainment Weekly* that target the mass-market and discuss popular culture. This attention and widespread press has led many people to speculate on the possibility of massively multiplayer gaming evolving into a mass-market pastime, especially with titles with well-known licenses such as *Star Wars: Galaxies* on the horizon.

However, massively multiplayer games have not yet come close to reaching mass-market penetration, despite the recent launch of *The Sims Online*. In fact, as of February 2003, Electronic Arts has characterized *The Sims Online*'s performance as "disappointing"[9]. EA has noted that the strongest user ratings for the game seem to come from players perceived as mass-market, while the game's beta testers seem to have the most negative perceptions[10]. This feedback implies that it may be difficult to create a massively-multiplayer entertainment experience that satisfies both mass-market players and hard-core gamers, although EA plans multiple enhancements to *The Sims Online* which it believes will accomplish this goal[11].

It is too early to determine whether the ultimate success or failure of *The Sims Online* can serve as a paradigm for the migration of massively multiplayer games to a larger, non-gamer audience. Without additional examples, generalizing that a title cannot satisfy both the gamer and mass-market audiences is premature. As more titles with strong licenses and potentially wide appeal are launched in the next 24 months, the interactive entertainment industry will have additional evidence available as they seek to refine their market and product. However, developers seeking to expand their user base would do well to study publicly available feedback on potential crossover massively multiplayer games such as *The Sims Online* and *Star Wars: Galaxies* through sites such as Amazon.com; as players detail their opinions of the game as well as their perceptions of themselves, critical insights on moving massively multiplayer games to the mass market can be gained.

3. Market Cannibalization

Online games have enjoyed considerable success, both in terms of usage and revenue creation. Thanks to sites such as Pogo.com and games such as EverQuest, many companies are eager to expand their product and service offerings into online games. However, there are serious questions about the amount of content the current online game audience can support.

While it is unclear at what point new offerings begin to cannibalize existing content, every current game provider struggles with this issue. In some cases, a new offering can prompt "creative destruction", when a developer deliberately retires an existing game in favor of an update. In other cases, competitors may attempt to gain market share by implementing improved features and graphics or by targeting a slightly different segment.

The first step in assessing market cannibalization is to identify the current market, current competitors, and future entrants, as well as the assumptions used to provide this data. For example, for massively multiplayer games in the United States, last year's IGDA Online Games panel estimated the player universe to be between 1 million and 1.5 million "players"; if a person subscribed to two games, she would be considered two players. Panelists also thought that the prospects for expanding this market were generally poor because of the high amount of time commitment required to succeed in most massively multiplayer games available today. Because of a relative lack of empirical data, significant assumptions were made about the number of people playing massively multiplayer games, their playing habits, and their willingness to sustain multiple games at once. These assumptions may be inherently flawed. However, agreement amongst the panelists, as well as many analysts following the interactive entertainment industry, is a good indication that the assumptions have some merit.

[9] Richtel, Matt. "Fine Print in Electronic Arts' Results", The New York Times, February 3, 2003.
[10] Ibid.
[11] Ibid.

If we accept the current market size for massively multiplayer games as 1.5 million players, the next step in assessing cannibalization potential is to track existing games and their U.S. audiences. Traditional role-playing games such as *EverQuest*, *Asheron's Call*, *Dark Age of Camelot*, and *Ultima Online* probably include at least 1.2 million members of the total audience, again counting a single person who plays two of these titles as two distinct players. As we look at the product launches that have recently occurred or are planned for the next 18 months, including *EverQuest 2*, *EverQuest Online Adventures*, *Star Wars: Galaxies*, *The Sims Online*, and World of WarCraft, it becomes immediately apparent that market cannibalization will be a significant issue, and that even if every player left their current online game and moved to one of the 5 titles mentioned above (an unlikely event considering the amount of time invested in many players' characters), the average usage will be approximately 300,000 subscriptions, a significant decrease in *EverQuest's* current user base as well as a benchmark below the predicted user bases of many of these titles. Additionally, this scenario does not allow for any users to discover a lesser-known but outstanding title.

Market cannibalization, therefore, presents a number of interesting challenges to publishers and developers. For companies with successful massively multiplayer games currently available, they need to understand how they can prevent cannibalization by their competitors as well as maximize the benefit of creative destruction. Expansion disks are a well-known tactic for extending the life of massively multiplayer games. In another example, allowing a player to transfer their level 50 character from a game to its sequel would cement loyalty, contribute to the success of the sequel, and likely prevent the loss of the player altogether. For those companies looking to enter the online market, smaller developers and publishers must ask themselves how they plan to compete with well-known licenses and multimillion dollar marketing budgets. While this successful competition is possible, as demonstrated by Mythic's *Dark Age of Camelot*, it is not an easy task or a sure thing by any means.

4. Middleware

Another trend of note is the increasing number of companies offering enabling technology for online games, especially massively multiplayer online games. This middleware offering has the allure of helping developers cut costs and development time for key underlying technologies required in massively multiplayer games. Companies such as Zona, Butterfly, Quazal, Open Skies, and Rebel Arts promise similar goals, while the only existing technology licensor to actually have shipped a massively multiplayer game is Turbine, with *Asheron's Call 1 & 2*. Lithtech's own licensable system will likely be tested in its *Matrix Online* project.

The future design requirements and scope of MMPs are yet unknown given the current generation of games. Clearly there will be more challenging network and server designs as games in this genre become more sophisticated. Without knowing the direction and scope of the genre, it seems somewhat premature for a host of technology providers to be trumpeting various solutions. And since none of these technology providers have shipped MMPs, they are less likely to gain the confidence of a publisher or established developer. Remember, the two most popular 3D renderers came from hit games, while others have languished (though RenderWare no doubt played up its association with blockbuster *Grand Theft Auto 3*).

However, if the business model for these technology providers fits into the revenue model for MMPs and the middleware companies allow developers to get at least some useful code to begin prototype and development, middleware provides solutions that may be worth pursuing. Unfortunately, a relative lack of success hinders the mass adoption of middleware, and in many cases, the publishers who can afford the marketing budgets needed to create a success can also afford internal development teams instead of middleware. As of the writing of this paper, only Zona has made any significant announcement about its technology's adoption. Its products will be used by Taiwanese publisher Gamania, best known for Lineage. MMP middleware will have some market presence, but until middleware providers have experience "in the trenches" shipping games, and the design/technology parameters for the genre become more clearly defined, the middleware market will remain a chicken/egg dilemma.

III. BUSINESS MODELS

A. Introduction

Online gaming is expected to represent the future of the computer game industry. According to market research firm IDC, the value of the industry is expected to reach $1.8 Billion by 2005, up from $210 million in 2001. Similarly, market research firm Jupiter projects that the online gaming market will be worth $2.55 Billion in 2006; the bulk of the revenue coming from subscriptions. The highest projection comes from consulting firm Forrester Research, which projects that online game revenues will more than double each year from now to 2005, when the market will reach total sales of $4.3 billion. The console gaming market, which generated $9.4 billion in hardware and software sales in the United States in 2001, is seen by many analysts as being at the start of a five-year growth cycle, led by the simultaneous market presence of four advanced consoles: Sony's PS2, Microsoft's Xbox, and Nintendo's GameCube and Game Boy Advance.

B. PC Market – Massively Multiplayer and CD-Based Online

1. Developer/Publisher Relationships

To date nearly all live massively multi-player games have been developed internally by publisher studios, so there are few established precedents for developer/publisher deals. *Asheron's Call* is the only 'major' MMP that has been launched from a developer/publisher relationship. It is understood that Turbine was funded for at least the majority of development by Microsoft, and continues to receive royalties and/or development funding towards live support and expansion packs.

A number of developers are presently engaged to develop MMPs for publishing clients. These include Turbine (http://www.turbinegames.com) on *Asheron's Call 2* for Microsoft, Wolfpack on *Shadowbane* (http://www.shadowbane.com/) for Ubi Soft, Cryptic on *City of Heroes* (http://www.cityofheroes.com/) for NCsoft, and Climax for Games Workshop on *Warhammer Online*.

The details of these financial relationships are not public, but one would expect that a standard development royalty deal of advances and 10-25% royalty applies. One has to consider the division of labor between publisher and developer with respect to live operations and customer support -- in most cases live development and community management rests with the developer, but server operations, technical and in-game support with the publisher.

There are significant strategic implications for developer/publisher relationships for MMP games. It has been said that publishers will insist on source code rights and handling billing and customer service activities in order to protect themselves from unstable developers. It is likely that the reason the majority of MMP games have been internally developed so far is due to publishers wishing to retain the expertise necessary to develop and operate MMPs. As MMP development and operation skills become more widespread this strategic need may diminish and external development grows more attractive.

2. Revenue Models

a) Subscriptions

The MMP sector has firmly settled on a revenue model of flat monthly subscription supplemented by retail sales. Subscriptions have trended upwards from the $10 per month rate in 1997, towards $13, the price point of the www.play.net MMORPGs, *Dark Age of Camelot*, *EverQuest* (who raised their price from $9.89 to $12.99 recently) and the recently launched *Earth and Beyond*. *The Sims Online* however launched with a $10 per month rate.

b) Subscriber Numbers

Currently the leading US MMP game is *EverQuest*, with over 400,000 subscribers*. Dark Age of Camelot* has enjoyed a meteoric rise to over 200,000 subscribers, with *Ultima Online* also having over 200,000 subscribers. For an excellent look at MMP subscriber numbers over time, visit: (http://pweb.netcom.com/~sirbruce/Subscriptions.html)

Korean Market: The MMP market is much more developed in Korea, where PC Game Rooms and widespread broadband have catapulted online gaming into the mainstream. Lineage from NCsoft claims over 4 million 'subscribers', although over 60% of these play from Game Rooms that pay per-PC subscriptions, rather than per-player. NCsoft has also recently attempted moves into the U.S. and other Asian markets.

c) Retail

Retail sales provide a useful quick-hit income that helps to offset development costs. MMP games generally debut at full price of $50 and then discount from there. Retail is also a key marketing channel and retaining a presence in the retail channel is a primary reason for the common practice of issuing expansion packs and 'special editions'. Retail packages are generally packaged with a month of 'free' play, but require activation with a credit card number for later monthly subscriptions.

Earth and Beyond recently launched with the express intention of limiting distribution of retail units and thereby comfortably scaling server and support infrastructure to support players. This is a trend that others are likely to follow.

d) Premium Servers

EverQuest is the first of the graphical MMPs to offer a premium server, *EverQuest Legends*, for an increased monthly fee of $30. Premium subscribers gain access to additional content and increased supervision from gamemasters, including special Quests and other events. Simutronics (www.play.net) pioneered this practice, but *EverQuest* is the first large-scale game to attempt it, reportedly achieving over 5,000 premium subscribers so far.

e) Revenue from Customer Services

Whilst customer support is a principal operating cost, many MMP operators are finding methods to generate revenue from services. Particularly notable in this area is EverQuest's $30 charge to move players between servers -- a fee that has reportedly generated over $1 million for Verant.

Simutronics has also pioneered the practice of charging for special events moderated by GameMasters. For around $200, players can arrange a personalized in-game wedding ceremony. Special “small group” quest packages are also popular at around $60 per person, manned by GameMasters and often lasting a weekend.

f) Revenue from Character Sales

Ultima Online recently introduced a controversial pre-made character service, whereby players can purchase an advanced character for $30. These mid-range characters are available in various classes such as 'alchemist' or 'magician', with appropriate skills and statistics. Ultima Online has been the least aggressive of the major MMP games in attempting to limit the sale of characters and game objects over eBay, so this can be seen as an attempt to capture some of this 'black market' revenue. The vocal player base has been somewhat unhappy with this plan, but a quiet minority supports the scheme as they would rather pay a little more to avoid the many hours of humdrum activity necessary to build a character up to such levels.

g) Revenue from Object Sales

On a much smaller scale, the commercial text MUD *Achaea* has pioneered the practice of selling in-game objects and abilities (or rather, the potential to earn abilities). These sales are Achaea's sole revenue source, with some players enjoying the game entirely free whilst other high rollers

spend many hundreds of dollars. Whether this model scales to a larger audience remains to be seen; at least one new graphical MMP, *Project Entropia* is attempting the same model, but with the additional twist of supporting payouts back to players. The latter is very risky, both from a commercial and legal perspective.

Magic: The Gathering Online is the highest-profile launch in this category. Based on the original card games, Magic:TGO offers a free basic experience, but requires the player to purchase booster packs in order to obtain rare and useful items. As with *Achaea*, proponents argue that it is possible to compete successfully without spending significant money. Clearly there are delicate issues of design balance to ensure that money does not rule out fun gaming for skilled but less wealthy players.

h) Warning

A number of MMPs have launched badly, usually due to financial pressures, and consequently damaged their long-term viability. MMPs recoup their investment over several years, so to compromise one's reputation for the sake of a month or two may be short sighted.

3. Distribution

a) Retail Dominates US

As previously discussed, the common method of MMP distribution in the US and Europe is to sell the client as a full retail package. This acts as both a revenue generator and a powerful distribution and marketing channel to reach gamers. Additionally most current games amount to well over 150MB of data, making download somewhat impractical.

b) Download: The Future?

It is already commonplace for gamers to download game demos and, especially in the case of MMP games in beta-testing, large patches of over 100MB. Arguably future games will seek to remove the friction of the retail channel and distribute via download.

c) Alternative Distribution: Coverdisks, Free CDs

A number of companies have experimented with cover disks and free or low-cost CD distribution of mature games such as *EverQuest*, *Ultima Online* and *Lineage*. No figures have been released, but it is believed that these attempts have generally met with limited success. One possible reason that this has not met with more success is because the consumer does not have a purchase decision to validate, and they simply won't spend the time to learn the game. Game purchasers will typically invest a few hours to get into a game before deciding to give up or return it, while people who get it free are going to expect it to work in less than an hour. Downloadable or free MMP games may need to have a much easier and satisfying initial experience to succeed with this model.

4. CD games with multi-player features

It is increasingly commonplace for PC Games to ship with internet multi-player capabilities, usually including some kind of 'Lobby' service that allows gamers to meet online, match up and begin games. These services are almost always free of charge, supported by the retail sales and to some degree advertising, after TEN, Mpath and others failed to create subscription businesses, based on such Lobby services.

Blizzard's Battle.net service is the canonical example of such a service, supporting the tremendously successful *StarCraft* and *Diablo*. *Diablo 2's* very popular online play includes persistent characters, but lacks the ongoing upgrades, support and persistent world aspects of MMP games.

Publishers increasingly regard the expense of operating such Lobby services as a necessary cost of doing business. For publishers and therefore developers, there is little if any direct upside in such

operations, but Blizzard has shown that good multi-player functionality adds tremendously to a game's potential for retail success.

5. Customer Service Alternative: The Volunteer Model

Volunteers have historically provided customer service for their communities as far back as the communities were large enough to need it. BBS's, MUSH's, MUD's, MOO's and MMORPG's were almost exclusively built by and run by volunteers, even when connection costs were as high as $12 an hour to be a part of such a community. Over twenty years after the initial multi-player games, this model is still going strong and for good reason.

Volunteers often bring a passion and extensive knowledge to the game that could not be purchased at the current average rates of paid-for customer service representatives. Many players desire to have a more extensive role in the game than playing alone allows for. Players want advocates that are players themselves. Game companies need volunteers to be able to provide 24/7 customer service to thousands of players without raising subscription fees.

One misconception that is commonly seen in light of lawsuits regarding companies utilizing "free labor," is that there are no costs involved with using the volunteer model in terms of both money and time. This model is not the simplest to use and is not, contrary to popular belief, free. The volunteer model is a very reasonable way to provide an acceptable level of service in a MMORPG.

Considerations

Coding, communication, rewards, staffing and management must be taken into account when considering utilizing this method of customer service.

a) Coding

Adapting customer service tasks to make them available to volunteers requires extensive coding. A database to manage the volunteers themselves is needed, as well as commands for their use that will normally differ from that of paid staff. Coding is also required to make their clothing, title, or other appearance special to identify them as volunteers; provide methods of rewarding them; track their activity levels; and include quality control features.

b) Communication

In addition to internal corporate boards, emails, chat rooms, newsletters, web sites and internal communication methods, volunteers need their own system. Add into this that the volunteers will most likely be tele-workers from many different countries and with a wide range of backgrounds; it is easy to see that communication will always be an issue with such a program.

c) Rewards

In order to maintain a quality volunteer core, there must be rewards built into the system that will make this an attractive situation. Most games waive the fee for the volunteer's play accounts. Some games utilize credits per hour that can be transferred to the volunteer's play accounts; one game utilizes "points" per task that can be redeemed for virtual and "real life" merchandise. The top volunteer programs offer a variety of ranks, longevity rewards, parties and ceremonies to thank their volunteers.

d) Staffing

To provide 24/7 customer support, the game needs someone available at all times with access to higher-level commands (generally a paid representative) as well as volunteers. While a 168-hour week would require a minimum of 5 full time paid staff, you need 25 volunteers averaging 7 hours a week to provide the same coverage. (Of course, that is just to have one person available to assist players and does not include events,

supervision, training and the plethora of other tasks). Publishers/developers need about 200 or more volunteers for a medium sized MMORPG.

e) Management

Like any program, management is the single most important factor that will affect the quality of the program and the retention rate. While an employee customer support manager may have 10 to 50 paid staff to manage, it is likely the volunteer manager will oversee several hundred volunteers. Volunteers need to be recruited, screened, trained and supervised, and this is more than a full time job. No matter how good the program, there will always be a turnover due to the start of college, summer vacations, employment changes and life-changing events in the volunteers' lives. No volunteer program is ever "done". The constantly evolving entity requires constant nourishment and replenishment from management to thrive.

Volunteers can provide an excellent benefit to the players and to any game company. The game expertise, prior experience and passion for the product make them outstanding representatives. The myth that a volunteer program is "free" however is far from the truth. Creation and maintenance of such a program is a labor-intensive process that is still of some risk legally. *Anarchy Online*, which has one of the more successful and larger volunteer programs, continues to thrive and notes that the volunteers are rated by the players as equaling or exceeding the customer service provided by onsite customer service representatives. Funcom staff note that the desire for more volunteers frequently tops the players' list of requests in daily surveys and has led them to devote more resources to this model. The rewards of such a program are in the high quality of customer service and benefits to community relations rather than in actual labor cost savings.

C. PC-Market - Web-Based Games

1. Developer/Publisher Relationship and Fee Structure

In many cases the first person the developer must convince in order to successfully launch a game is the Publisher and thus they become an important part of the customer equation. It's imperative to know the Publisher's needs. In an analysis of the Publisher, the developer needs to carefully examine several issues to make sure they are offering as compelling a product as possible to negotiate the best deal possible:

a) Game Mix

What products does the Publisher currently offer and where are their weaknesses or holes in their offering that the Developer might be able to position a product into?

b) Platform

Publishers are resistant to bringing on games that don't integrate well with their backend. While Shockwave and Flash games are popular with movie and kids websites, the major online game sites are still dependent on Java games and the middleware that connects them to the core systems.

c) Demographics

Deciding how to design a game for a particular publisher should have a lot to do with their demographics. For example, what is the typical age, income level, and hobby interests of the publisher's target audience?

d) Gamer Type

Most games fall into or between the ten broad game categories: Puzzle, Arcade, Action, Strategy, Sports, Simulation, Cards, Casino, RPG and Word Games. When considering how to position a game or what markets to explore as a developer, it's important to know what the gamers in that type category are looking for in a game. Developers should look at successful titles in the game types they are working in, and analyze the features that those games provide,

for insight into how to build and market a successful title. Of course there are many category-busters that are hybrids of two or more categories, but the developer will still learn from what has been successful in the market in the types they are blending.

It is also important to examine the marketplace for a particular gamer type. Is the market for that genre saturated? Is the cost of development in the category prohibitive? Will the game bring anything new to the category? Answering these questions is important to help the developer decide how to approach the development and marketing of their games.

Puzzle games (such as *Cubis*, *Collapse*, and *Mahjong Solitaire*) continue to be the most popular single-player online games. Other developing niches include word games (such as *Text Twist* and *Spell Bound*). While it appears that a saturation point may be at hand for puzzle games, the appetite for them doesn't seem to be dissipating.

e) Gender

Although men still dominate the massive multiplayer world, the majority of mainstream online game players are women. Over 55% of all activity on the five largest game publishers for the month of August 2002 was by women. While this shouldn't cause developers to create overtly female-oriented themes into their games, it should definitely be considered in the process of eliminating what should not go into the game, such as to avoid offensive female stereotypes and other "high testosterone" hooks.

If a developer is trying to develop a game that will attract a mass audience, color selection, sprite design, audio, and gameplay elements should be upbeat and cheery with simple themes that will appeal to both sexes but especially women. These are the key similarities between the most successful online games.

f) Age

The average age of online gamers continues to increase. Part of this is due to the overall increase in the proportion of Baby Boomers in the general population. Another factor is that there are more computers in the hands of the older generation. As this group becomes more comfortable with computers they begin to discover games as an entertainment resource. Since they are less likely to own game consoles, online games have become an entry path to the world of games.

g) Experience

The first online games that were popular were very easy. As the experience level of a given group of gamers increases, so may their desire for more complex games.

2. Revenue Models

Revenue models for online games generally fall into three categories: advertising/sponsorship, pay-to-play, and skill-based gaming. Other types of revenue can also be generated through methods unique to the online environment.

a) Free Model

Free games generally rely on some sort of sponsorship or advertising. Even though the online advertising market has experienced a large drop in overall revenue over the last two years, the majority of mass-market online games are still supported by advertising and sponsorship opportunities.

(1) Sponsorship

Some games may be created and sponsored for a specific purpose, generally the promotion of an individual product or brand. These games derive their revenue from the sponsoring company, which pays for the development of the game, or a portion of the

game development, and recognizes value in the retention and messaging provided by games.

(2) Advertising

Revenue is generated through sales of banner ads, interstitial advertisements, pop-ups, rotating sponsorships, or other types of online advertising. Advertisers have demanded more than just banner ads, and game developers are creating content with advertising seamlessly integrated into the game. Selling the inventory and sponsorships require a talented advertising sales force in order to maximize revenue opportunities. Advertising sales are an area where an experienced distribution partner can add significant value to the online game business model. In addition, it will be important to know the demographics for each individual online game in order for the sales force to sell advertising inventory effectively for each game.

When developing a free game that depends on advertising to generate revenues, developers must be very conscious of building saleable advertising opportunities both in and out of the game. Advertising opportunities in games are beyond banner ads; companies favor targeted advertising that presents their product or brand in a memorable, compelling context instead. Developers of advertising-supported content should research, on an ongoing basis, the most common and most profitable trends in online advertising. *The Price is Right* on Gamesville is a great example of blending content and advertising into one. Additionally, a good game design for advertising-supported content should enable the easy rotation of art, sponsorships, and advertising so as to minimize the cost associated with supporting advertisements. For example, a card game should have art on the back of cards that can be easily rotated in and out in order to accommodate art supplied by a game sponsor.

b) Pay to Play

With the online advertising market greatly shrinking over the last two years, companies have been trying to find additional revenue streams other than advertising. Some of the most common revenue models are the following:

(1) Subscriptions

Subscription pricing is by far the most common variant; players generally pay a monthly fee that entitles them to unlimited usage during that month. The online role-playing games *EverQuest, Ultima Online* and *Asheron's Call* are examples of this pricing model. Subscriptions are required to support new game content creation and the underlying game infrastructure, such as large back-end server requirements. In addition, some online services such as Yahoo Games and Real are creating tiered levels in terms of access to features and games. Users that pay a monthly fee will gain access to features such as tournaments, ladders, creating private game rooms, and sometimes access to online games that are not accessible for non-paying online game users.

(2) One Time Payment

Another variant of the "pay for play" model is where users can pay a one-time fee to download and own a game. In this model, the game developer or publisher usually offers a free online version of the game that is a demo, a few levels, or the complete game. If one likes the game, one can purchase the complete game for usually $5-$20 and download it to one's computer. After purchasing the game, individuals can play the game offline for unlimited usage. Some major online games sites, including Shockwave.com and Real.com, are employing this model as an alternate form of retail game distribution.

(3) Rental/Games-on-Demand

Recently, some companies are beginning to launch new services that allow users to rent computer games. Users pay a one-time rental fee to gain access to a full version computer game or games for a two to three day period. Users download part of the

computer game and the rest of the game is streamed. One has to be online to play the game. One can also pay a monthly subscription fee to gain access to a larger library of computer games. Due to the size of computer games in general, this service is limited to broadband users only. A couple technology companies that provide this type of service include Exent Technologies and Stream Theory.

c) Advergaming

Advergaming is simply the combining of interactive gaming technology with an advertising message. Branding and products are incorporated into the game itself through either associative or demonstrative methods, meaning that the game can be used to demonstrate the use of a product or to associate the product with an activity or lifestyle. At its best, the advertising message becomes an integral part of playing the game, encouraging consumers to interact with the brand or product.

While the cost of producing an Advergame can be viewed as excessive, there are a number of benefits that justify these costs in the advertiser's eyes, particularly if branding is the goal. Advergames tend to be played over and over by the same individual, the act of which is brand-reinforcing. Advergames also help provide that all-crucial data that enables manufacturers to build new products around trends they see in their advergamer market segments. Data can also be used in customer relations management (CRM) efforts. Advergames are a fun and innovative fusion of non-intrusive advertising, permission marketing and branding. They are proof-positive that engaging customers can lead to more than just direct sales.

A few companies using Advergames are: Nike, Nabisco, Burger King, Quaker Oats, Jack Daniels, Subway, McDonald's, TGIFridays, Mars, Coca-Cola, Ford, Radio Shack, General Motors, Toyota, Procter & Gamble, Sony Entertainment, etc.

- Games offer a powerful and effective tool for delivering branding and advertising messages.
- Games and applications that entertain or are of value to the user are effective interactive branding solutions with many distribution options.
- Games encourage consumers to provide rich and valuable information through both registry and game play.
- Games create an environment where users interact by choice, making them much more valuable to advertisers. These campaigns have a much higher potential ROI than other forms of advertising because of the added value of customer information and ancillary revenue streams.
- Games offer the advertiser a cost-effective path to direct communication with the consumer.

(1) One Time Payment – Custom Game Development

Advertisers can pay a one-time fee to build a custom game that is branded to their company and then added to their web site. They can then re-use this game engine in future advergames/campaigns.

(2) Monthly Licensing Fees

Advertisers can pay monthly licensing fees for one or multiple games that already exist. (Essentially they are licensing the technology.) They can then brand this existing game engine to their company and add these games to their web site.

d) Skill-based Gaming

Skill-based gaming companies' business models are predicated on licensing the software to online communities, wireless networks and portals with high traffic bases. Games are either built in-house or licensed from developers and publishers on a licensing charge and/or revenue split. A player's fee is charged every time a tournament is played, and players also contribute to a prize pool that is divided among the winner(s). The fee is disbursed to the game developer or publisher

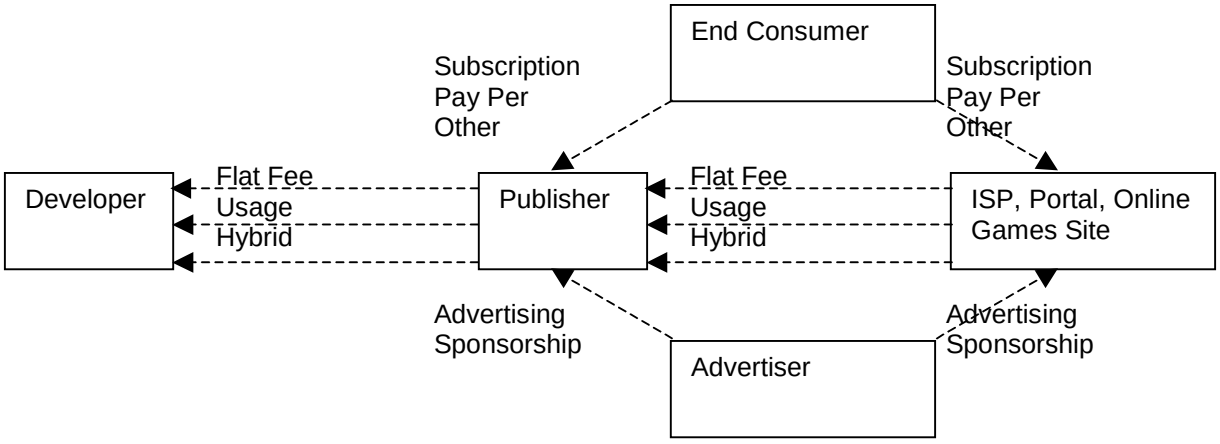
who owns the game being played, the server operator or portal that runs the tournament, and the transaction processor.

Games of skill have been likened to Peer-to-Peer wagering in that the Player is not 'wagering' against the house for a prize. This is not all together true, and a better example follows. Think of it like this...you and three buddies play golf. You pay a green fee to play on the course. That fee goes to the Skill Platform Company and its partners the portal operator and game publishers (if not developed in-house). You then decide to play skins for money. The golf course takes no part in that, and is therefore in compliance with most legal regulations with respect to the legality of 'Skill-Based Gaming'.

From an online user's standpoint, the player pays a fee so that he or she may register with, and gain access to any pay for play tournament of skill. After registering, the individual player may then deposit money into a tournament pool, out of which the winner(s) are paid. All of these 'pool' deposits are paid out to the winners. By structuring the software in this way, the Skill Gaming industry has differentiated itself from the I-Gambling one, as its software is neither based on chance nor accepts third party betting.

These true Skill Gaming companies do not profit from the size of a player's wager on his or her own skills. In fact, players don't 'wager' at all, they simply decide how much of a tournament entry into the pool they are willing to pay. They also do not profit from the size of the cash prize pool, nor does it profit if one player wins over another specific player.

The following chart depicts the cash and revenue relationships between the developer, publisher, consumer, online sites, and advertisers:



3. Costs

An online game requires resources to be spent on traditional game development expenses such as software development and marketing. However, online games differ from the traditional game business model in that they have two additional substantial cost centers: hardware and ongoing support.

Software Development – The cost of the software development of a game varies tremendously based on type of game, projected usage, supported platforms, and game lifecycle. For example, the cost of a Java version of *Solitaire* would be a fraction of the resources required to develop a massively multiplayer online universe such as *Dark Age of Camelot*. The platforms supported are simpler, the functionality of the game itself is far less, and the game lifecycle for a title such as *Solitaire* is potentially forever, while a game targeted to appeal to an experienced game player generally requires frequent updates and expansions. The more complex the game, the more likely that there is an ongoing software development cost.

Marketing – Marketing expenses vary depending on both the type of game and the publisher. If a game is available through a major portal or online games service, the portal or service will generally handle the majority of marketing and promotions of your game; however, if a game is self-published or available through a small independent site, marketing expenses may be larger because developers will need to spend more money to raise product awareness.

Hardware – Hardware costs can vary depending on game architecture; projected usage is also a key variable because more hardware is required to support more online users. Developers must be conscious of hardware constraints when designing and architecting a game, as hardware costs may add significant expense to the development and ongoing support of an online game. While potentially a large cost center, hardware also provides a good opportunity for distribution partners to add value through covering costs of associated hardware and networks. Hardware-conscious game design and publishing deals limit the "risk of popularity" (and resulting increased hardware requirements and costs) for the savvy game developer.

Bandwidth/Networking Costs – The costs of networking access, hosting, co-location, and other bandwidth-related activities are significant components for online games, particularly for MMORPGs, which can typically reach two to four times the original hardware costs on a monthly basis. Again, distribution partners may add significant value through covering part or all of this cost.

Ongoing Product Support – The cost center that most frequently surprises online game developers with experience in traditional game publishing is the requirement for ongoing product support. Even experienced online developers often do not pay enough attention to ongoing game support and enhancements; both elements are critical to extend the product life cycle of the game and to retain players. Traditional boxed-product games have limited product support. Online developers, on the other hand, must plan for significant technical and community support. Because technology (including operating systems, browsers, other software, and connection methods) changes so frequently, ongoing technical support requires substantial resources. Additionally, community support is a critical feature that distinguishes online and offline play, and online game players expect greater levels of support than traditional boxed-product players do, particularly for products or game services that are premium products and require subscriptions or other pay-for-play. It is also important for developers to note that community support may also generate incremental revenue in limited cases, depending on pricing. Ongoing product support is typically the largest variable cost in online game development and is well worth close attention.

Although community and technical support is a cost center, these functions also present a tremendous opportunity for developers and publishers to maximize their revenue. Player support is an online developer's most important source of member feedback on the game experience and technical problems. By fixing player-reported problems quickly, developers not only improve retention for existing titles but also make future titles more successful and less expensive by leveraging the gathered feedback from players and focus group testing for future products.

D. Console Market

Sony, Microsoft and Nintendo are all taking different business approaches with their respective console machines. The next few years will be ones of experimentation with each company learning from each other's success and failures. It will not be until 2005 and 2006 that more established business models will be in place with next generation consoles built with hard drives and modems/broadband adaptors. In addition, US household broadband penetration will be at a greater rate, which in turn will allow for additional revenue streams such as selling downloadable music, game expansions, etc.

1. Sony's PlayStation 2

a) Product Overview

In August 2002, Sony started selling its network adaptor that enabled PS2 users to play online-enabled PS2 video games on the Internet with either a broadband or dial-up connection. The network adaptor costs approximately $40 and also includes a mail-in offer for a free copy of *Twisted Metal: Black Online*, a Start-Up Disc with playable demos of *Frequency* and *Madden NFL 2003* and video demos of *ATV Offroad Fury 2, Tony Hawk's Pro Skater 4*, *Tribes Aerial Assault* and a bonus video. PS2 owners are responsible for paying for their own Internet connectivity but Sony will not charge any additional fees for playing PS2 online-enabled games. Game publishers and ISPs though do have the option to charge for PS2 connectivity or any matchmaking features or functionality. As of September 2002, there are six PS2 online-enabled games in the marketplace. At a future date, Sony plans on selling a PS2 hard drive peripheral at an additional cost to the consumer.

b) Business Model

Sony is taking a hands-off approach with its online connectivity strategy for PS2. Sony is not charging additional royalties or fees for game publishers creating PS2 online content. Game publishers are responsible for hosting, authentication, match making and any additional features they want to build into their PS2 online-enabled games. Currently, all Sony game publishers are offering PS2 online match making and other features for free to consumers. Some game publishers are hosting the match making functionality on their own servers while others can use third party providers such as GameSpy. Thus, the costs of hosting PS2 online-enabled games will vary from game publisher to game publisher. If game publishers do charge for some or all matchmaking functionality and features, the game publisher keeps all the money earned.

2. Nintendo's GameCube

a) Product Overview

Nintendo is selling separately a dial-up and broadband adaptor in Fall of 2002 for approximately $35 each. The first games that will be GameCube online-enabled will be Phantasy Star I and II from Sega. GameCube owners are responsible for paying for their own Internet connectivity but Nintendo will not charge any additional fees for playing GameCube online-enabled games. Identical to Sony, game publishers and ISPs do have the option to charge for GameCube connectivity or any matchmaking features or functionality.

b) Business Model

Nintendo's business approach to online connectivity for the GameCube is identical to Sony's business approach. Nintendo is also taking a hands-off approach with its online connectivity strategy. Nintendo is not charging additional royalties or fees for game publishers creating GameCube online content. Game publishers are responsible for hosting, authentication, match making and any additional features they want to build into their GameCube online-enabled games. Game publishers will be on their own to arrange their own hosting arrangements whether it be on their own servers or on a third party provider. If game publishers do charge for some or all matchmaking functionality and features, the game publisher keeps all the money earned.

3. Microsoft's Xbox

a) Product Overview

Microsoft launched its Xbox Live service officially on November 15, 2002. The service is available for broadband customers only. The starter kit costs approximately $50 and includes a headset for voice input and a one-year subscription service to Xbox Live. Xbox is ready to connect to broadband right out of the box, although Xbox owners are responsible for paying for their own broadband Internet connectivity. As a side note, Xbox already includes an 8 GB hard drive built into the console.

b) Business Models

Microsoft's online strategy is the exact opposite of Sony and Nintendo. Microsoft has a closed approach where game publishers and developers have to follow Microsoft's technical specifications for Xbox Live. Game publishers and developers have to offer online connectivity through authorized online Microsoft sites and third party game networks will be blocked.

E. Wireless Market

The growth of wireless gaming is the next step in the evolution of the video game industry. While Japan was the leader in wireless gaming technology, Europe has been getting a good reputation in developing SMS (Short Message Service), MMS (Multimedia Messaging Service) and Java games for a variety of Wireless ASPs (Application Service Providers) looking to develop their content. Now the US market is heating up, and both carriers and developers are determining how they may profit by the explosion of SMS and MMS technology in the North American marketplace. While games have been provided as a value-added service so far, there is a move towards gearing up both subscription and pay-for-play skill-based wireless apps.

Mobile content will see a sizable boost from wireless gaming, as the number of wireless gamers is expected to grow tenfold from 2002 to 2007, according to a November 19, 2002 report by IDC in Emarketer. The research firm's study, "Are We Having Fun Yet?: US Wireless Gaming Forecast, 2002-2007" predicts that from 7 million in 2002, there will be over 70 million US wireless gamers in five years.

IDC reports that wireless gamers will benefit from 2.5G and 3G (Third Generation Mobile Services) network upgrades that can offer more compelling content, better audiovisual capabilities and processing speeds of handheld devices, and games targeted to appropriate demographics. The study also indicates wireless operators will have an easier time migrating gamers to other wireless data services.

Carriers are rolling out packages that place emphasis on games, and value-added services such as SMS, stock quotes and email. For example, Nextel announced that in September it would launch a prepaid service called Boost Mobile, which offers a series of games designed to attract teens; a demographic that accounts for a growing segment of those with cellular phones. When Sprint PCS launched its Vision service in October 2002, it included 20 games, including *Pac-Man*, *Space Invaders*, and *MotoGP*, designed by companies such as Taito, ESPN, and Sega Mobile. These companies are licensing their games to the carriers, and working off both straight developer fees and revenue sharing.

Costing anywhere from $1 to $4 for 30 days (most games have to be downloaded again after the subscription period is up) these games also present carriers with a much-needed tool to derive additional revenue from existing subscribers. And carriers are also looking at additional revenues from emerging online gaming models such as pay-for-play skill gaming, P2P wagering and Internet casino revenues.

F. Legal and Taxation Issues

1. Legal Issues

a) International

In the financial projections of today's game developers, one assumes a worldwide basis for sales. Some countries, however, have started to censor certain types of games. These countries feel that they have a legal as well as a moral right to protect their citizens and their own revenue streams.

(1) Australia and Brazil

Australia and Brazil took the position that Take-Two's *Grand Theft Auto* was a violation of the country's inherent moral and ethical code and banned the game. Yet in 2002, neither Australia nor Brazil banned Take-Two's sequel, *Grand Theft Auto: Vice City*.

(2) China

In November 2002, China banned all individuals under the age of 16 from Internet cafes as a measure of restricting internet access.

(3) Greece

Another example to be considered is Greece. In 2002, due to an ongoing political scandal, the Greek legislature passed a law banning all computer gaming (gambling as well as console, online, and even handheld gaming). Arcades were shut down across Greece, tourists were instructed not to so much as bring a Game Boy into the country, and internet café owners were arrested for such things as (we're not making this up) allowing patrons to play online chess. To date, all cases have been dismissed by the Greek court, which went so far as to say that the law was unconstitutional. Notwithstanding, the Greek attorney general had filed an appeal in all cases.
It was recognized, by the gaming community as well as the EU legal community, that this was overkill. The EU legal community informed the Greek government that the law may violate the EU Constitution, and requested the Greek government to review the law in that light. As of late September 2002, approximately 50 people had been arrested under the ban, at which point the Greek government issued regulations clarifying that the new law is only applicable to internet gambling. The guidelines were welcomed by the gaming community, but the situation is still not entirely resolved. [12]

The above types of legislation can affect revenue streams in two manners: first, the loss of projected revenue from the country, and second, the potential litigation costs of trying to protect those revenue streams.

It is important to note that it is not just the international community that is attempting to regulate games. Many U.S. locales are also attempting to pass ordinances regulating gaming.

b) Defense Costs

The legal system is very creative in their approach of defending their clients. As the gaming industry has expanded, the some attorneys have decided to create a new legal defense: "the game made my client do it". As of this date, no court has accepted this defense. But that has not stopped the lawyers from continuing to raise this defense. Somewhere, and sometime in the future, some lawyer will win with this defense. If Murphy's Law holds constant, this will most likely happen in the middle of the game development cycle. The consequences will be either increased product liability insurance, or the requirement by publishers as well as distributors for the developer to have such insurance. An additional contingent expense would be a legal fund to defend the company against such litigation.

2. Taxation Issues

a) International Taxation of Web-Based Games

Web based games have stretched the legal definition of who has the right to tax the cash flow generated by those games. The definition in question is one of nexus. Prior to the Internet and mail-order, nexus was easy to establish. The physical location of the vendor was the location that could tax the transaction. Mail-order began to blur the importance of physical location. The Internet (or e-commerce) has diminished physical presence to a point where it is a minor factor in determining nexus. E-commerce utilizes servers. Web-based games also utilize servers in the same manner. A person logs onto the game server, pays a monthly subscription to play the game (*Odd World*, *Earth and Beyond*, etc.), or perhaps when the user purchased the software, it enabled him or her to access based multiplayer games (Battle.net, etc.). The international Organization for Economic Cooperation and Development (OECD) on January 9, 2001

[12] http://news.bbc.co.uk/2/hi/technology/2279042.stm

announced a change in its position in regards to servers. The OECD decided that a server could meet the definition of permanent establishment. The language adopted by the committee provides that computer servers can be considered to create a permanent establishment if "the business of an enterprise is wholly or partly carried along through the equipment." A central issue is whether the activities carried along through the server are merely preparatory or auxiliary. In which case they would not generate a permanent establishment or go beyond that threshold.

Other significant points made by the additions to the treaty commentary include conclusions that: a World Wide Web site does not by itself create a permanent establishment because it does not constitute a fixed place of business; a web site hosting arrangement typically does not result in permanent establishment status for an enterprise paying for space on a server it does not own; and no human intervention surrounding the server is required for a permanent establishment to exist. Notwithstanding the OECD, the United Kingdom has statutorily determined that a server located in the United Kingdom will not create nexus; thereby a nonresident United Kingdom gaming company who has their servers located in the UK will not be taxed (see exception regarding VAT) in the UK. Italy has determined that if you use a smart server, you have created a physical presence in Italy, and that Italy has the right to tax your income stream. The German Federal Tax Court in April 2002 took under consideration whether a computer server can constitute a permanent establishment to which income should be attributed for taxing purposes. As of the date this is being written, the Court has not published its determination. Australia has decreed that a server is a physical establishment. Therefore, if your server is in Australia your income flow will be taxed (this may explain why most Australian entities have their servers located in California). The United States, for federal purposes, has not issued any guidance on this matter. In the multistate arena, the states seem to be agreeing with the Italian position. Besides the issue of compliance with many taxing jurisdictions and its corresponding costs, the Pandora's Box of how to allocate the income between the shrink-wrapped product and the possible Internet use is mind numbing.

b) EU Taxation

Digitally downloading software is becoming an acceptable means of distribution. Countries have begun to defend their bricks and mortar businesses. In May of 2002, the European Union (EU) adopted a resolution that as of July 2003 digitally-purchased and downloaded software will be subject to VAT (Value-Added Tax). The issue of whether a company is a resident and physically located in an EU country is no longer pertinent. All digitally downloaded software will be liable for VAT tax. The tax rate is dependent on the location where the software was downloaded. The EU will require companies that are not located in the EU, to register for collecting VAT in an EU country of their choice. The additional compliance costs of registering in the EU, purchasing software that will track where the game is downloaded, and compute then computing the appropriate VAT tax of that locale, will now need to be included in projected expenses.

c) US Taxation

The U.S. has not officially taken a position in regards to digitally downloaded software. Yet, in the Treasury regulations that discuss foreign source income and foreign tax credits, the Internal Revenue Service has taken a similar position as the EU. Many states have not yet decided if downloading digital software is a taxable event in that state. The state sales tax project (SSTP) has determined that downloaded digital software is a taxable event. As of this date, 49 states and the District of Columbia have agreed to implement a SSTP. Due to further requested clarification by certain industries, the implementation of SSTP may come about as early as June 2003. To further exasperate this issue, the multistate tax commission floated a trial balloon on August 13, 2002 that stated that if a company has $500,000 of sales or 25 percent of their total sales in a state, then that company is taxable in that state (income and/or franchise tax).

The Federal Mobile Telecommunications Act of 2002 has been ratified by 50 states and the District of Columbia. One of the components of the act states that for nexus/state taxation purposes any downloaded service is to be taxed by the state/locality where the end-user's (the

customer's) billing address is located. It is easy for the states to expand this theory so that the service fees paid for PC online gaming are taxable in the state where the player is residing.

d) Taxes on the Wireless Market

In the wireless market, once again the legal issue of nexus arises. Individuals are paying for services. One of the services can be downloading and playing games. This service could either be bundled or subscribed to separately.

The EU will be treating these services similarly as it does for downloaded software (see above).

The U.S. federal government has enacted the U.S. Federal Mobile Telecommunications Sourcing Act. This act defines who has the right to tax services associated with mobile telecommunications. In brief, the address of the primary customer is what dictates who can tax the services provided. It is inconsequential if the services are subscribed to individually or bundled. As of this date, all states and the District of Columbia (except for Montana) have adopted this act and the sourcing definitions. There is some curious confusion in some of these states that have adopted this act though. Some states have determined that digitally-downloaded software is not taxable in their state. Therefore, these states have the legal right to tax that income flow but have chosen not to do so as of today.

The game developer must determine if they want to have the right to download software directly to mobile telecommunications hardware or to license the software to a third party and get royalty payments. If downloading the software directly, the game company is responsible for the compliance costs of tracking the transaction, charging the correct tax rate and filing in multiple states. If the game company decides to license the product to a third party and just get royalty payments, the company may be liable in certain states based on the economic benefit rule. Either way, the cost of compliance must now be taken into consideration in projected expenses of game development.

e) IP and Taxes

Utilization of a third party publisher may no longer shield the game developer company from U.S. multistate taxation. It has been an ongoing battle as to who owns the intellectual property rights of a game. Developers have increasingly wanted to keep the IP rights. Certain states have determined that the use of IP rights in their state makes any economic benefit derived from those rights as taxable in that state. Therefore, developers now must weigh maintaining their IP rights against compliance costs of having to file and pay taxes in those states.

IV. ONLINE GAMES PRODUCTION AND DESIGN

A. *Introduction*

Writing in a unified way about designing and producing online games is a challenge. Games in this category include both the game industry's least expensive and time-consuming products to develop (e.g. wireless games) and also some of its most expensive and lengthiest products (top-of-the-line massively multiplayer games). Some games in this category ship on multiple CDs or DVDs, while others must fit their entire code and asset base into a few hundred kilobytes. Some are targeted for the hardest of the hard core while others seek to engage the most casual and uncommitted of audiences. Because of the differences in audience, delivery media, and expected production values, it is critical that producers of online games thoroughly understand their target audiences and the production constraints to deliver an appropriate product.

One thing that most online games do share is the fact that they exist as services as well as products. These games are designed to be played over a long period of time — either through extended interaction or through frequently repeated brief interactions. This provides developers and publishers with strong incentives to create highly optimized designs that will keep players engaged and with the opportunity to take direct feedback and modify their products on an ongoing basis. Because so much of the revenue of typical online games derives from the player's ongoing commitment to the game (delivering subscription dollars, ad views, or serial purchases of new low-priced downloads), understanding and delighting the audience through a well-targeted design is absolutely critical to an online game's survivability and success.

B. *PC Market – Massively Multiplayer and CD-Based Online*

1. Production Subsection

a) Introduction

The production of massively multi-player games is an expensive, time-consuming and technically non-trivial undertaking. Although the category is arguably in its infancy, with its share of train-wrecks, the development process is increasingly better understood.

b) Project Constraints

Large-scale MMPs are notoriously expensive to develop, with budgets reportedly ranging from under $5M to over $30M. The cost of large teams on long production cycles is compounded by significant up-front costs in establishing network and server infrastructure, and the customer support teams to service players.

Arguably these high costs are not intrinsic to the MMP genre, but stem from the combination of complex engineering requirements with the overall games industry trend for greater quantities of expensive content, especially art. Smaller development shops can produce cheaper MMPs by avoiding content-heavy designs or genres, and by licensing middleware and/or using open-source. By following this strategy, Mythic has shown that commercial success is not necessarily related to budget excess.

Like any game and software project, MMPs are difficult to schedule accurately. In practice most MMPs have taken three to four years to launch. When considering the scheduling of an MMP project it is critical to budget significant time for alpha, beta and stress tests.

Many large-scale commercial MMPs have very large teams, up to 100 in beta testing, distributed as one might expect: around twenty in art, engineering, and design with a fistful of managers and a growing customer support staff.

As an MMP moves into external testing and prepares for launch, the live team will begin to staff up. The live team will likely include staff for community and game management, general customer service, and network operations.

It is in the nature of support to scale with subscriber numbers fairly evenly. Keeping one step ahead of the player population requires that these teams staff up ahead of launch. A ratio of roughly 5,000 subscribers to each fulltime support operative is arguably reasonable, with EverQuest fielding a support team of well over 100 to service their 400,000+ subscribers.

Alongside the support team works a live development team, responsible for adding gameplay, content, and the all-important bug fixes. The composition of the team mirrors that of the development team, perhaps with reduced numbers and some turnover of personnel. After three years, some team members may be keen to work on something new, and some game development personnel find the challenges of maintaining and expanding an online game less fulfilling than building products.

c) Process Issues

MMP Games tend to share the same major component parts, including client software, game servers, game database, account database, account authentication server, patching server, and web server (it is increasingly common for MMP games to embed web pages or extend the user experience to the web, allowing players to browse game data such as top player lists and guild information from outside the game).

It's not clear how commonly games are prototyped thoroughly, if at all, but most games have made major changes during development and after launch. Most developers probably follow a 'spiral development' model, producing an initial implementation and then refining it iteratively from there. This works well only with a robust technical infrastructure. This is one area in which teams with established technology score highly. Mythic developed *Dark Age of Camelot* rapidly (approximately two years) and relatively cheaply (estimated less than $5M) with their field-tested infrastructure from earlier products.

The complex technical aspects and gameplay ecologies of MMP games necessitate long testing periods with real users. Alpha tests can begin internally, particularly when a large developer and QA group is on-hand, later rolling in enthusiastic players.

An early goal should be to test server and infrastructure scalability through 'stress tests' that are critical to expose bottlenecks and make realistic assessments of future hardware needs.

Beta tests often grow to over a hundred thousand testers, with the game increasingly mature and at least theoretically feature-complete. Some successful MMP developers, notably NCsoft, advise a 'launch small and early' strategy. By getting players in the game early the developer can focus on popular aspects of the game, rather than spending man-years working on features that languish in obscurity.

Online games also have the advantage of allowing the developer to regularly patch the game, eliminating bugs, tweaking gameplay and adding new features. A robust patch tool is a key part of the client engineering.

d) Risk Management

MMPs represent a major investment and are beset by technical, creative and competitive risks. The engineering aspects are substantially more complex than single-player games, and require skills not yet common in the games industry. Arguably the recruitment of engineers with non-gaming backgrounds helps to introduce better processes and engineering techniques, yet there is little substitute for direct experience of client-server game development. Tools and middleware are becoming available in the MMP area (Zona, Butterfly, Quazal, Turbine and others) but have yet to be broadly adopted.

Creative and competitive risks are illustrated by the prevalence of fantasy role-playing games in the MMP category. This author feels that new developers would be wise to seek alternative genres to broaden their appeal and avoid increasingly heavyweight competition (*Star Wars: Galaxies, EverQuest 2*, *Middle-Earth Online*, etc.)

The substantial financial risks associated with MMPs make publishers understandably nervous. To reduce risk the author recommends thorough prototyping and an incremental development process that exposes the game to players early and often. Finally scheduling is a tremendous area of uncertainty, but, in this author's opinion, publishers should be cautious not to jeopardize their entire investment by forcing the game to a schedule.

2. Design Subsection

a) Interaction Patterns

(1) How do players interact with a Massively Multiplayer Game in ways that may be different from a standalone PC or console game?

In an MMP, players need the social aspect to be just as good as the gameplay. Also, many players are keenly aware of their status relative to one another; and they need to feel that they are constantly on a path to advance that status.

Players in MMP's should benefit from socializing with each other, via trade, complementary skills, cooperative activities, and so on. They also need interesting things to talk about, sharing strategies and secrets, which become the catalyst for deeper conversation. They need icebreakers, just like at a good cocktail party: things that elicit an opening remark that can start up a conversation.

However, at least in this author's opinion, MMP's can go too far by requiring a high level of mature cooperation in order for the game to work well. Unfortunately people are not always as sensible or altruistic as you'd like, so the game dynamics need to hold up even if people are acting rude or cold to each other, or do not cooperate even when it makes sense to do so.

Lastly, games need to discourage or make impossible antisocial or "grief" play that allows a few players to make many others miserable or angry.

(2) How long does a MMP player typically play?

It's not at all uncommon for a play session to last three to six hours. Twelve hours or more at a stretch is not typical, but definitely not unheard of, either.. The median time played per week by a player can be about a dozen hours: half play less than that, half play more—in some cases a great deal more. Extremely dedicated players can spend literally half their life in the game.

(3) How long do players typically continue to play MMP's?

The answer to that remains to be seen: these games have remarkable longevity even after the genre offers games one or more generations more advanced. The social webbing in these games is very strong, and the gameplay becomes just a backdrop for these friendships. We are finding that once a game reaches critical mass it is likely to maintain its player base for many years, with the average longevity of a single player's stay lasting about two years.

b) Building Equity

The more someone plays a MMP, the more reason they have to stay. In most cases, the player has a persistent persona that grows more powerful as time goes on, so there is more to lose by

moving onto another game. Also, as the social connections get more numerous, the prospect of becoming a nameless stranger again in another game becomes less attractive. Players can build up virtual businesses and residences, and leaving these behind can be as traumatic as a similar move in real life.

A philosophical view would propose that our effect upon each other's minds is the only reality, and in a MMP, though the places and things are virtual, the friendship and mutual entertainment there are as real as any other kind (the venue may be virtual but the emotions are real).

c) Game Mechanics and Interface Differences

The things that make a MMP great don't fundamentally differ from that which makes any game great. However a few of these classic aspects are more important in an MMP, and some are unique.

A MMP needs to be tolerant of network latency. In order for the game to not feel overly sluggish or removed from the player--a flaw in any game--care must be taken to clearly present when the player has requested an action and the action is pending, even if the action does not "really" occur for a second or so. Sometimes this requires some relaxation of the laws of reality, allowing players in the same game world to witness events in a trivially mismatched way.

Game mechanics in a MMP can greatly differ from solo games since the most interesting dynamics involve the interaction of multiple human minds working in concert. Allowing players to combine or oppose their abilities in interesting ways is very satisfying, and unique to multiplayer games. Delightful emergent phenomena arise from the chaotic system of interacting players.

Another interesting issue around game mechanics in an MMP is that any game mechanic that drives a large number of service calls may need to be revised. Mechanics that would be acceptable in stand-alone game where customer service is not as available can become huge service burdens in an MMP. Service calls are an excellent indicator of design elements that are not accessible to the average player. Also online game designs always have to consider whether a mechanic will be misused and become unbalancing to the game or an exploit.

Lastly, not to overlook the obvious: a MMP typically can not or should not have the classic pausing, game saving, and "learn by failing" as used in solo games. This can change the game design very deeply; it can be a more fundamental shift than a designer may account for when changing from solo games to MMP's.

C. *PC Market – Web-Based and Downloadable*

1. Production Subsection

a) Intro/Prologue

Because of their small scope, web and downloadable games provide a fantastic venue for exploring interesting core gameplay and the nuances of the balancing and tuning process. The lower financial stakes make it possible to explore a variety of interesting and unusual topics and game mechanics. However, as with any kind of game, creating a web game that is truly innovative and groundbreaking is challenging (however, because of the low budgets and relatively straightforward, they are also quite duplicable). This does not mean developers can ignore production constraints. Even a small web game can go wildly over budget and schedule without proper planning and management.

b) Project Constraints

Successful producers of web and downloadable games must learn to live within tight constraints. Advances for single-player games in this category are typically five-figure deals and many publishers expect developers to self-fund in exchange for a share of revenue. This generally

means that the team must be small and the schedule must be brief, typically a 3-5 person team working for about 3-6 months (including QA). Multiplayer games may be somewhat larger with advances in the low six figures and 6-12 month development schedules, and it is not uncommon to see massively multiplayer games that take 24-36 months to develop.

Most successful games in this space target the mass market at a low price point, so they must be palatable to users who connect to the Internet via dialup. Developers need to watch their file sizes quite carefully. Successful web games (which may be downloaded each time the user starts them up) typically have a 200-500 KB download profile, including all code, graphics and sounds. Successful downloadable games tend to be 1.5-3 MB in total, though some distributors have had success with mass-market downloads as large as 8 MB.

Web and downloadable games are often under less date pressure than retail products except for those timed to external events such as a movie release or sports season. This creates an opportunity to make the games highly polished before they are released, but developers should be careful not to invest so much in the polish cycle that the games become unprofitable.

There are many readily available benchmarks for success in this category, though success can be measured in a variety of ways. Publishers often measure web games by their peak usage; you can easily find the games with the highest traffic by going to portals that display the number of players in each game, such as www.pogo.com or www.zone.com. Success in generating traffic to the web version of a game also typically results in more downloads. Many developers and publishers create successful business strategies in the web game space by selling a string of sponsorships for their games regardless of usage; you can see a variety of games like this on www.shockwave.com or www.zone.com and see which games seem to attract the largest variety of sponsors over time.

c) Process Differences

Because of the reduced production layer in web and downloadable games, it is critical that the game be highly polished, tuned, and balanced. As a result, the “fit and finish” portion of a web game’s schedule can be disproportionately long — as much as half the total project schedule. This is offset by the fact that teams can expect to spend far less time iterating on art and audio assets than on larger game projects.

For developers working in a typical developer/publisher model, there will usually be requirements for the publisher’s look and feel to be integrated into the game – often into framing and peripheral elements. This can create an unpredictable amount of work if not explicitly specified in the contract. Many publishers also require that developers integrate their APIs for server-based services such as chat, rewards/loyalty points, high scores, etc. This will typically add a few days to the project, but may impose unexpected requirements (such as the requirement to support specific Java draw methods).

Qualifications for development team members are not significantly different than with other games. The technical environment is somewhat different than retail game development (Flash, Director, Java, and network coding instead of C, DirectX, and RenderWare), and this impacts the programming, asset development, game design, and project management skills and strategies.

Because web games are relatively simple and the development environments for coding them often require few or no custom tools, it is relatively simple to get a first working prototype of a game. In the case of multiplayer games, however, it may require some time to get the network technology functioning and integrated with the game clients.

d) Risk Management

Given that the time and costs involved in building a web/downloadable game are much lower than for a typical standalone PC or console game, risks are not usually managed as assiduously here as in other areas of game development.

As usual, producers should be mindful of exposure from licensors. In the world of advergaming, ad agencies will impose their sensitivities along with the sponsors/licensors, so approvals may require additional time or iteration.

Changing technology is an issue with all forms of digital games, but it is particularly exacerbated in a web environment. Web developers must contend with a dizzying variety of OS's, browser versions, processor speeds, connection speeds, and plug-ins. The time required to download a plug-in can turn a player away from your game, and sometimes the installation process can leave them on another site entirely. While some plug-ins are becoming ubiquitous (such as Java, Flash, and Shockwave), choose your plug-ins with care and try to minimize your risks by targeting your game at technology that is one or two generations behind the bleeding edge.

2. Design Subsection

a) Interaction Patterns

Web game designers usually design for a short attention span. Often a game is played in a browser window, and the game is in competition with email, chat clients, animated banner ads, and other internet-based activities and distractions. Offline distractions can also be an issue, for example sometimes parents will play a game for a few minutes while a child is sleeping or otherwise occupied, but the parent will not want to get involved in a long duration game in case their child suddenly needs their attention. For these and other reasons, some of the most popular web games are designed for rapid entry and relatively short playing times (2-10 minutes per game). Attention span is very short online, and few players will sit through long animated intros (if they get through the download time, that is).

The flip side of this challenge is that players can easily access a variety of web games, and if you don't continue to provide them with new challenges, they will move on to others. So it is important to design for beginners as well as advanced players and to reward return and repeat play. Many web games have a variety of difficulty settings, a range of levels, episodically updated content, or other ways of extending the life of play. Of course, multiplayer games that include social interaction, competition for high scores, community interaction, and other multiplayer play elements provide their own intrinsic rewards for repeat play.

The short-attention-span online audience also does not tolerate frustration. If the game is hard to understand or doesn't function intuitively, most casual gamers will leave. It is very important to pay attention to the functionality and features of other successful online titles. By repeating a few key game features across a number of titles, the independent game community can develop game mechanics and user interfaces with more consistency. More consistent games are easier for audiences to learn and ultimately will open up the market for more differentiated, creative game concepts and design.

For downloadable web games, the game player typically begins the relationship with a title by playing the online version. Average play sessions range from two minutes to twenty minutes. Downloading and installing the game on the personal computer is a step beyond casual play on the online version. Players typically proceed to the downloadable version for one of two reasons:

- **Higher quality experience**: Offline play does not tie up phone lines—important for the vast majority of the audience on dial-up connections. Offline play is also full-screen and usually advertising-free, typically with enhanced graphics and sound.
- **More competitive or instructional gameplay**: Downloadable versions of games offer more levels and better gameplay. Downloadable versions appeal not only to competitive players, but also to players who want to learn more about the game. Downloadable versions can include "untimed" or "puzzle" modes that cater to players who want to improve their gameplay. Whether for skilled players or those eager to improve, good game design should provide a path for all levels of gamers to build loyalty to the game.

b) Building Equity

For a web-based game that is receiving advertising revenue, it is almost always better to have players playing the game for as long as possible. Other models, such as a pay-to-download or a subscription service, do not economically require long play times, but if players are happy, they will continue to download games and subscribe.

Equity in an online game is built on many levels. It is important for a game to be intrinsically fun and rewarding as a player interacts with it. It is also particularly important in a web game for the interface around the game to be easy to use: logging in, loading and saving games, and posting high scores should all be streamlined processes. However, perhaps the most important aspect of a web game in regards to building equity is the larger community in which the game is embedded. A wonderful game in a lackluster game portal or website will hardly ever become a popular game. In the case of very large online games, the game site itself can become a community site. But whether your games is embedded in a larger game community, or generates its own, the community aspect of online game design is crucial. This is a very large design topic, which is covered elsewhere in this document.

c) Game Mechanics and Interface

The audience for web games is generally much broader than retail games. Your potential audience is anyone that happens to use the Web. For this reason, simple and accessible game mechanics and interaction often make for the most popular web games.

There is no single formula for success. Popular web games include action puzzle games such as PopCap's *Bejeweled*, social games such as Jellyvision's *Acrophobia*, and arcade nostalgia games such as Wild Tangent's *Blasterball Wild*.

D. *Online Skill-Based Games*

1. Production Subsection

a) Intro/Prologue

The term "Online Skill-Based Games" will be used in this section to refer specifically to online skill games that are offered in a cash tournament model, in which players pay cash entry fees to play against other players in the hopes of winning cash or merchandise prizes. Some of these games are directly head-to-head experiences (e.g. chess), and others are essentially single-player experiences where a player's score is compared against other players' scores to determine a winner or winners. To date, virtually all games offered by companies in this market space have been "casual" games. Games that players are familiar with, or games that are similar to games that players are already familiar with, generally do better and are the norm.

b) Project Constraints

Budgets for online skill-based games are low, mostly in the $5,000 to $25,000 range. A typical team is just two to four people: typically, an artist (or a fraction thereof), one or two programmers, and a designer/director. Schedules are similarly small, typically one to two months. Some games involve downloading a game kernel to reside permanently on the user's hard drive; others – such as Shockwave- or Java-based games – do not. Because the majority of players of online skill-based games are not yet equipped with broadband, and because they are not passionately devoted to particular titles, download sizes of well under a megabyte are expected.

c) Process Differences

Being online games, it is easy to improve and expand games beyond initial release, adding new features or variations (such as graphics for a new card deck in a solitaire game, or additional questions for a trivia game). And, since repeat business is crucial to the economic model of online skill-based games, keeping the content constantly fresh is crucial.

d) Risk Management

Because the projects are small and manageable, and because the majority of Online Skill Game development is re-creating familiar games for which many examples exist to study and model, the risks of this type of development are quite low.

2. Design Subsection

a) Interaction Patterns

Individual game experiences are quick – 1 to 10 minutes. However, player sessions (composed of many game experiences) can last indefinitely. Some players will play just a few games per session; other players play for many hours straight. Retention is also highly variable; some players play the game one day and then never again; other players play day after day for a year or longer.

b) Building Equity

Because of the cash or prize reward mechanisms, equity occurs naturally. As a player's skill at a game improves, his/her risk-reward ratio also improves. However, many sites feature a ranking system for matching players against others with similar skill level. Such a ranking system obviously mitigates a good part of this natural equity accrual.

c) Game Mechanics and Interface

Because of the casual nature of online skill-based games and the weakly committed user base, a simple user interface, and rules that can be explained in a few bullet points, are both critical. However, the two biggest design issues with online skill-based games are luck-elimination and cheating-prevention.

- Because the legality of the economic model is based on these games being games of skill, eliminating factors of luck and randomness from the game is critical, even if it means changes that move the game away from the desirable familiarity to players.
- Because money is on the line, cheating is more prevalent in online skill-based games than in other online games. Only by designing anti-cheating features into the games during development, plus vigilant monitoring and updating of games post-release, will a company be able to stay ahead of cheaters.

E. *Console Market*

1. Intro/Prologue

At the time of the writing of this White Paper, creating online games for the current generation of consoles is an emerging art. The major console manufacturers' network support is still in its early stages, and as their implementations evolve, the relevance of this section will slowly move out of focus. It is therefore recommended that for more precise details on the production and design challenges you will face in building an online title, you contact your console manufacturer at the early concept stage of your title's existence.

The differences in approach between Xbox, PlayStation 2, and GameCube present a variety of challenges to the online console game creator. The PlayStation 2 and GameCube provide a more open environment at the cost of requiring you to choose or design your network libraries; Xbox Live, on the other hand, is a closed service but provides you with an integrated set of online services, including authentication, matchmaking, friends, statistics storage and content delivery. Each of these approaches has unique benefits and deficiencies.

2. Production Subsection

a) Project Constraints

Online console game projects have longer schedules and larger budgets than single player console games. Multiplayer network games require additional development time and testing time, particularly for tuning the multiplayer experience and building the online user interface (player lists, matchmaking screens, and so forth). In addition, time should be allocated for an online beta test period. Because there have been very few online console games prior to the current generation, there are not many well-established points for comparison. Perhaps the most well-regarded online console game is *Phantasy Star Online*, released for the now defunct Sega Dreamcast.

The amount of extra time and money that will need to be dedicated to a console title to bring it online varies according to the feature set chosen. A sports game which simply allows updated roster downloads, or a first-person shooter that allows you to download new character skins, will take significantly fewer resources to develop than a multiplayer puzzle game which utilizes a lobby to enable matchmaking, allows LAN multiplay, and implements voice-over-IP and text chat via keyboard.

Developers of online console titles must have expertise in both console development and multiplayer networking, a rare combination. Designers and producers must understand the sensibilities of the console market as well as the slightly different multiplayer gaming market. Although each of these markets is understood individually, the places where they overlap and diverge is not yet well recognized.

Producing online console titles requires some special consideration one might not explore in the PC space. For example, are you planning to have your title perform adequately when played over analog modem, or will it only work if the player has broadband? Can players in different territories (for example, Japan and the U.S.) play together? Will players on one console be allowed to play against players on another, or on the PC? Each console manufacturer has its own policies on what is allowable, and what is suggested. Since these policies continue to evolve, please check with your manufacturer before making these very important decisions.

b) Process Differences

Online titles for game consoles go through many of the same phases of development as online titles for the PC. An SDK (Software Development Kit) must be chosen or designed, the game must spend extra time tuning for online play, and time for a beta period must be planned into the schedule.

When considering adding an online experience to a console title, the first decision that must be considered is which SDK to use. On the Xbox this is simple, you use the Xbox Live SDK. On the PlayStation 2 and GameCube, you may choose the SDK from the console manufacturer, purchase middleware from companies such as Sega.com and GameSpy, or write your own.

Like online PC game development projects, online console projects should plan for an extended testing/tuning phase and online beta period. Balancing the online experience for a variety of connection speeds is a unique challenge that takes a significant amount of tuning. After tuning, both Microsoft and Sony provide a beta-test program you can take advantage of, which allows you to get early feedback on the quality of your online experience with a larger player base. Producers should expect to include a beta period of two to four weeks in their production schedule.

As with all console games, online titles must be certified by the console manufacturer before they can be published. In addition to standard console requirements (save game handling, controller restrictions, and so on), online titles must adhere to an additional list of requirements regarding the user interface. This is to ensure that the player is provided with a consistent experience, one that maximizes ease of entry and keeps the learning curve fairly gentle. An additional week to

two weeks should be allowed for this extra bit of certification, and titles that fail certification should expect to go through a complete re-certification process after changes are made.

c) Risk Management

There are a number of risks in developing an online title for a console. The most significant risk is simply that the online game console experience is new, and relatively unexplored. Many online console services have come and gone, including console-based online services such as for Sega Dreamcast. Also, the market for online players is small in comparison to the total number of console owners, especially now at the beginning of the lifespan for online console titles. All three major consoles require the purchase of a peripheral or subscription to enable online play, and even then the owner must be willing to overcome "the last fifty feet problem": the distance that a cable must stretch, from the game console to the nearest phone jack or Ethernet connector. Xbox Live is network-enabled right out of the box, but can only accommodate broadband connections. Sony PlayStation 2 can accommodate dialup connections, but players must first purchase a network adaptor. Because of these risks, many publishers are choosing to make the online game experience an extension to their existing title, as opposed to designing an experience specifically around online play.

Security is also a very significant issue, and one that should not be taken lightly. Cracking the security of online titles on PCs is a popular pastime for hackers; there is no reason to believe this will be any different on consoles. Xbox Live combats this by implementing security throughout its structure, including encrypting network traffic and authenticating it at the network stack layer. The PlayStation 2, GameCube and various other middleware packages all provide various levels of security that should be examined carefully. Previously published methods of crack protection should also be explored as a supplementary approach. Code-hacking tools such as Game Shark and Action Replay are particularly nasty implements for hacking game security, and they should also be addressed by the online console game.

3. Design Subsection

a) Interaction Patterns

Online console gaming is a unique customer space. When you ask console gamers about their favorite style of play, most will respond that they like playing on the couch with their friends. They're already in the mindset of playing with or against other people that they know personally. This is different from online PC gamers, who, with the exception of LAN games, prefer to play in front of the computer by themselves, against other unseen and usually unknown players who are online. Online console gamers want the ability to play with their friends, and whether their friend is sitting on the couch next to them or across the country shouldn't really matter.

Having a way to play online with your friends, no matter their location, is a key feature for online console games. The Xbox Live SDK includes a "friends" feature specifically to enable this functionality. SDKs for other consoles also include similar functionality, or have it planned. Some online libraries include functionality to enable a single sign-on across games, so that friends can find each other no matter what game they are currently playing. Some games also allow messages from friends to interrupt gameplay, while others explicitly disallow this approach.

b) Building Equity

Creating a community around your online console title is the most important component to ensuring a title's staying power. This is not so different from online PC games. Players need a place to go to talk about the game, to make fun of each other afterward, or brag about their accomplishments. Whether this is done via chat or via text input is not as important as simply ensuring that there is some forum for communication between players.

Providing ongoing additional content is another popular way to extend the life of your online title. Allowing your players to download new skins, levels, vehicles, rosters, and so on will maintain

their interest even as other titles ship. Persistent statistics, including wins, losses, and leaderboards, will encourage players to compete against each other for bragging rights. Online tournaments are supported by most of the online SDKs.

For online PC games, the ability of the player to create their own modifications to the game is an interesting dynamic that has increased the popularity of many titles. The "Counter-Strike" mod, for example, has extended the popularity of the "Half Life" franchise well past the standard game lifecycle. This is a dynamic which is difficult to reproduce on consoles, simply because the creation of new content is more simply performed on a PC. Nevertheless, some online console titles have already shipped which allow players to create their own levels, then upload them to the publisher's server for download by others, or use them when running a server on their own console to play against friends. This phenomenon has been extraordinarily popular in the PC space, and it's very likely that we'll see this grow in the future on the console side as well.

c) Game Mechanics and Interface

One of the unique challenges of console interfaces as compared with PCs revolves around the simplicity of the controller and the lack of a keyboard or mouse. Most online PC players are extremely adept at using the keyboard and mouse combination. The console's controller, however, is uniquely suited to the style of games most commonly found on a console, and it can seem unnatural to also use this controller for other online-navigation functions. Fortunately there are additional options available for online console game designers. The use of voice is gaining popularity, especially as all Xbox Live games now have the capability to use voice input as well as the controller. On the PlayStation 2, voice input is also encouraged (such as used in *SOCOM: US Navy Seals*), and USB keyboard and mouse input are other intriguing options. European PlayStation 2 game designers may want to consider the use of video in their online titles as well, as a USB camera (EyeToy) is shipping in that territory in early 2003.

In general, console games tend to be more action-oriented than their PC brethren, so online console games to this date all have used a somewhat shorter game cycle "heartbeat" than PC console titles. Popular online console genres include sports and racing games, where a match is over in five minutes or so. Massively-multiplayer titles are not yet prevalent on game consoles but are definitely an area of interest that is actively being explored.

F. *Wireless Market*

1. Intro/Prologue

Producing game titles for the wireless platform offers a variety of opportunities and challenges. The short development cycle, the electronic distribution and direct billing solutions offered by the various carriers all contribute to a unique opportunity for even the smallest development team. However the challenges of disparate standards, the need to support multiple rapidly-changing handsets, and the slow adoption rate of new services and hardware by the general public are still proving to be major hurdles for publishers, developers and carriers alike.

2. Production Subsection

a) Project Constraints

(1) Budgets

The typical budgets for wireless game projects range from $100,000 for AAA multi-player titles supporting multiple standards to self-funded work for revenue share. Most budgets range in the $10K to $50K range, depending on the scope of the project.

(2) Schedules

Typical schedules, excluding testing time, range from three weeks all the way up to 5-6 months for large scale or problematic games.

(3) Benchmark Titles

Publishers that are leading the way on the J2ME and BREW platforms in the US are THQ Wireless, Sega Mobile and JAMDAT Mobile. J2ME is an abbreviation for Java 2 Platform Micro Edition, Sun Microsystems' version of an online application development platform. J2ME allows developers to use Java and the J2ME wireless toolkit to create applications and programs for wireless and mobile devices. BREW stands for Binary Runtime Environment, an open-source on-line application development platform for wireless CDMA devices from Qualcomm. Native BREW applications are written in C or C++, and BREW supports programming in other languages, such as Java and XML. WAP-based titles are not considered in this discussion.

Titles in the A category would include *Tiger Woods PGA Tour Golf, Tony Hawk's Pro Skater 4,* and *Diamond Mine* by JAMDAT Mobile, *Monkey Ball* and *Puyo Puyo* by Sega Mobile, and *Moto GP* and *Tetris* by THQ Wireless.

(4) Team Sizes

Most wireless game titles can be done with a very small team: Programmer, Artist, and Producer/Designer. The publisher will also provide a Producer and a Test Department. Rarely would a game require more than these team members.

(5) Unique Team Skills Required

The programmer should be very versatile, ideally with experience from the old days of the Atari/Amiga era, who can stay within very small memory footprints and also be savvy about client/server networking issues and cutting edge back-end support.

The great draw of wireless games is the multitude of unique and connected users who would expect to be able to compete or cooperate with each other. Designers should be able to exploit this unique attribute of the medium.

Finally the artist will also need to be someone experienced in pixel-by-pixel work, as screens tend to be in the range of 96 x 128. The art has to be created often in three sets: Black and White, Grayscale and 8-bit color.

(6) Unique Challenges in Wireless

In J2ME and BREW development, there are several factors that balance out the benefits of not requiring manufacturing and distribution of CDs, boxes and manuals.

- Multiple Handsets – Each carrier has a different set of handsets
- Availability of Handsets – Often it is difficult to get pre-release handsets to test
- Multiple Interface Standards – Each handset manufacturer has their own set of interface design, i.e. with and without directional pads, soft keys, audio, vibration and more.
- Small memory footprints – For example, 30K is a suggested limitation on certain carrier's phones.
- General restrictions – Telephones are designed to conserve batteries and make voice calls. Issues such as backlight-on duration pose unforeseen challenges to the wireless developer.

b) Process Differences

The testing process for different carriers can be difficult to manage. The carriers are still learning about game and software testing. Some carriers outsource their testing to third party companies but many of these testing firms are also learning about the special needs of game software. A typical developer has their own internal testing, the publisher's testing and finally the carrier's testing hurdles to overcome.

Because the scale of development is small, the budgets tend to be very limited as well. That makes management of risk a top priority for producers of wireless titles. Even problems that create small delays in the development schedule can easily eat up any contingencies and profits in a development deal. It is unrealistic to expect large royalties from wireless games, until the adoption of J2ME and BREW enabled phones rises significantly AND the general public views their phones as a viable game platform.

c) Risk Management

Because the emulation kits tend to be poor substitutes for actual handsets and because handsets are difficult to receive in advance of their release, developers may have to rely heavily on guesswork until they can procure actual hardware. Furthermore, even if the developer has a handset to test, the carrier's system of downloading test apps to the phone may be buggy and time-consuming. For example, it takes approximately 10 minutes to make a code change and see it run on a Motorola J2ME phone. This makes the development process arduous at best.

An additional factor to keep in mind, is the high rate of turnover on handsets. In some markets, the typical user will stick with a single cell phone for two years or more before upgrading to a newer model. But in other markets, such as Japan, many users are upgrading their handset as often as once every six months.

Performance on cell phones for Java and BREW apps vary greatly, so the tuning of physics, for example, becomes very tricky since the frame rate of your game can vary widely from phone to phone. The publisher will set a minimum hardware standard for the product, but since the market is still small, most publishers want to support the widest segment of the audience possible. Therefore, the developer must create the game so that the quality of the title remains high even on extremely slow-performing handsets.

3. Design Subsection

a) Interaction Patterns

Cell phone players are looking for a quick fix activity. Typical play times are in the 5-minute range. If there are networking elements in the title, the connection time must be optimized to provide the best possible performance. It's best to look at the typical player as an impatient person who is looking to fill a small gap in their schedule with an entertaining experience.

Some handsets are able to save the progress of a game locally or via network, so that the player can continue even if the phone powers down. Other games, such as puzzle games, have a simple high score table to encourage players to come back and try to beat their last score.

However as new phones with high resolution LCD color screens, J2ME support, and fast network connection speeds come to market, audiences will eventually expect RPGs, action and sports titles on par with Game Boy games.

b) Building Equity

So far, wireless games are seen as quick distractions. To that end, high score tables have been the typical equity building solution. But with 2.5G networks coming online and subscription models becoming more prevalent, players will be able to create profiles and characters that continue to grow – similar to early 8-bit console games--and save their progress either locally or via network.

It is much easier to maintain a subscriber than to generate new sales for each new download. Many organizations foresee that wireless games will have "push" upgrades or server side upgrades to help players develop loyalty to specific titles.

c) Game Mechanics and Interface

A typical set of interfaces for phones includes a Directional Pad, 2 Soft Keys, and the number pad. Most games rely on the four directions of the navigation pad and so designing for wireless handsets can be compared to the NES (Nintendo Entertainment System) game pad (4 directions, 2 buttons). Also it is important to consider left and right-handed players when laying out button schemes.

Further considerations are that each carrier has strict usage guidelines on the use of programmable keys and hardware manufacturers also impose their own standards. Because of this constant tug of war, interface design is one of the most critical issues to solve in any wireless game title.

The complexity of mechanics and depth will vary depending on the genre of the game. One example, *JAMDAT Bowling*, uses a simple timing bar and a single action key for the whole game. This combination of simplicity in mechanics with an easy, one-handed interface has proven to be successful in the initial launches of the game for BREW and J2ME.

Mechanics and interface continue to evolve as the hardware and network technology improve with each new release. The designer must keep in mind that simple networked games are what the market will demand in these early days.

G. *Interactive Television Market*

1. Production Subsection

a) Intro/Prologue

iTV Game development has a set of unique challenges. Individuals who have been in the game development business since the 80's will find a certain sense of nostalgia as they attempt to produce compelling visuals in only sixteen colors or within code so compact that it takes up less than 20% of an old 5.25" floppy disk. There is also an opportunity to be a pioneer as you create entertainment for one of the most common household devices, the television.

b) Project Constraints

Prior to undertaking any iTV production, it is important to understand and plan for the numerous constraints you will encounter:

- **Partners -** Producing games for iTV involves working with numerous partners. Each of these partners will likely require deliverables from you. They will assist in integration and may potentially require approval over the final product. Your success will be limited by the weakest link of this chain. If one partner is not timely in providing deliverables or approvals, this can impact the entire development schedule. The partners can include:
    - **The Developer -** This is the group responsible for the development and production of the actual game. A typical development team for iTV may include one full time artist, one full time programmer, a part time audio engineer and a part time Producer/Project Manager/Game Designer.
    - **Carrier -** A carrier provides the layer between the game and the customer. The customer typically interacts with the carrier (usually via their set-top box) to obtain the game. Carriers include Comcast, DirecTV, AT&T, and AOL, to name a few.
    - **Middleware Company -** These companies provide the layer of technology that works between the game and the carrier. They may also be in the business of providing full backend solutions to the carrier. Examples include Liberate, Microsoft and OpenTV.

- **The Hardware Company -** This is the group that creates the set-top boxes. Examples include RCA, Toshiba and Mitsubishi. You can also potentially work on content for hardware that has not yet been released, but this means you will be at the mercy of the hardware company to obtain appropriate software tools, boxes and support.

- **The Publisher -** This is typically the entity paying for the development. The publisher may also be the owner of the brand (the licensor). They will require an approval process. The publisher will typically maintain relationships with the middleware and carrier companies.

- **The Licensor -** Depending on the content you are working with, a licensor may also be involved in the development/approval process. This group could potentially supply assets and style guides. They of course will also quite likely require an approval on how their brands appear in the final product. Licensors could include companies such as Disney, Time Warner, etc.

- **Budgets -** Business models are still very liquid in the world of iTV, but margins are incredibly tight. This is partly due to the numerous partners who will each want to take part in the success of your work. Most iTV games are small in scope and have budgets in the $5-$30K range with only a 2-3 month development cycle.

- **Hardware -** Development hardware can typically cost in the $50-$70K range, 2 to 3 times the entire development budget for an individual project. This means that only serious developers with cash or a strong relationship with someone who owns the hardware can work in this space. Also, the development systems may have a proprietary OS or be in a language other than English.

- **Integration -** Environment testing cannot occur until the game has been integrated onto the targeted service, which is done at the mercy of the carrier. Bug fixes after the game has been integrated will need to be integrated and tested again.

- **Audience -** The software will be delivered via a closed system exclusively to the subscribers of your carrier. Their number of subscribers will limit the success of your title. For example, if the targeted service has 100,000 subscribers and you expect a 5% penetration, you will have 5,000 people playing your game.

c) Process Differences

Development for iTV games may not actually take place on the targeted hardware OR in the targeted environment. It is typical for an iTV game to be developed on a PC, then ported to the iTV development hardware and later deployed onto an iTV network.

Additionally, due to the numerous partners involved in the deployment of the game, early processes must be adapted to ensure these partners are meeting their deliverable commitments. Contingencies should be in place if hardware, code or information is not forthcoming as mandated by the project schedule.

Testing should also be thought out ahead of time. Because developers probably cannot quickly or inexpensively configure a testing environment for iTV, plan for much of the final testing to be done in homes through beta testing or at a configuration lab. Developers will need to plan accordingly when scheduling and allocating testing resources and budgets.

d) Risk Management

Because developers may not actually develop on the target device/environment, there will be inherent risks such as unforeseen system compatibility or integration issues that may not arise until Alpha or Beta. This means the riskiest portions of the development may not be able to be

front-loaded. Developers should plan for extended Alpha and Beta cycles to work through these issues.

2. Design Subsection

a) Interaction Patterns

Consumers will interact with iTV games either by standard remote control or an input device specific to the set-top box. These input devices are much better suited for controlling games but most carriers will strongly discourage requiring this hardware. Unless there is a compelling reason to limit users by requiring a specific input device, you should design for interaction with a remote control. Because the audience is composed of extremely casual consumers, the user interface for iTV games should be as simple and intuitive as possible.

Latency and inconsistent timing in delivering data are huge issues in iTV game design. Data for iTV games is delivered via a carousel queuing scheme, typically in packets of 100K or less. The carrier controls what information appears on that carousel and when it appears, so there is no way for the developer to govern when a player receives their packet of information. This translates to small file sizes, which will be delivered at intermittent times. Because of this, turn-based and single-player games are best for iTV.

b) Building Equity

Once the game is launched on a network, success will be contingent upon return traffic. By planning for and including certain features or functionality in the games, return traffic can increase with minimal effort. According to Laura Buddine of IACTA (an iTV developer), the following methods are suggested to help build game equity:

- Talk to, listen to and react to your users. Building customer loyalty will help drive community around your products.
- Incorporate tools that facilitate community. This can include simple email rings, in-game chat, and message boards.
- Allow for the users to have their name in lights. Examples of this can include leader boards or the inclusion of user-submitted content (such as trivia questions, photographs, art, etc.) in your games.
- Host tournaments and marathons for your game or suite of games.
- If appropriate, allow opportunities for people to build their own "persona" in the game, such as avatars or custom profiles.
- Incorporate a Point or Reward System similar to that used by pogo.com and iWin.com.

Benchmark titles in this category include variations of old favorites such as *Taipei*, *Solitaire*, *Battleship* and *Bejeweled*. Each of these games utilizes a proven gameplay mechanic and an easy to learn but nearly impossible to master game logic.

c) Game Mechanics and Interface

When designing content for iTV, it is important to remember where the consumer is and what he or she is likely doing. In other words, they are probably sitting on a sofa, approximately eight feet from the television screen, with a remote in one hand and a soda in the other. The mantra for interface design on iTV must be "keep it simple". Keep text on screens to a minimum, and fonts large, as the consumer will probably not be sitting as close to the TV as they might be to a computer screen.

The broadest range of iTV devices support just sixteen colors for animated art and 24-bit background images. One of the greatest challenges will be to make your game look great on a device in which people are accustomed to seeing TV quality video.

V. GAME TECHNOLOGY OVERVIEW

A. *Introduction*

I am an experienced technologist at an independent development shop who has been assigned a project to develop an online game. What contemporary platforms, tools, and architectures are available, when are they suitable, and what are the pro's and con's of each that I should consider in architecting my game?

In this section, we will attempt to answer the above question by looking at common technical architecture patterns in various types of games and what tools and platforms are available for implementations. The material presented includes some technical detail, as we target experienced technologists; we assume that the reader is well versed in game development tech-speak.

Independent game developers have limited budgets and schedules and, generally speaking, range from one-person shops to teams of no more than five or six core contributors to a project. As such, we focus on web browser and downloadable Internet-only online gaming, as opposed to PC CD-ROM and console gaming. This area is the most accessible and immediately profitable for the independent developer.

Developing games for mobile devices is akin to developing for the web-based audience in terms of the scope of development. Discussion of some of the wireless platforms is included in other sections of this White Paper. In this section, we include discussion of the J2ME platform, the dominant platform for mobile gaming. There will doubtless also be even further emphasis on wireless gaming in next year's White Paper.

No discussion about online gaming would be complete without a look at the consoles and we close out with a quick assessment of the approaches taken by Sony, Microsoft and Nintendo.

The Internet technology landscape offers a multitude of options including many relatively recent innovations. We focus on platforms that are widely available, technically stable, cost effective for the independent developer and likely to be supported for the foreseeable future. Many potentially amazing technologies will fail one of these tests and thus be excluded from presentation here, but that doesn't mean you shouldn't consider them for your product.

B. *Types of Online Games*

There are two fundamental types of Internet games: those played directly in the web browser and those that require a separate download and installation. Web browser games are the simplest; most are developed in Flash, Shockwave, or Java and execute directly in the browser with no need for a separate download and installation. Additionally, technologies from Groove Alliance, Virtools, and WildTangent are starting to gain traction in the market.

Downloadable games execute directly on a particular native platform, such as Windows XP or Macintosh OS X. Generally speaking, developers will package all files necessary for execution into a Windows and/or Macintosh installer. Users download and execute the installer appropriate for their operating system and then run the game from their desktop. It is common for developers to release both web and downloadable versions of the same game, using the web version to generate awareness and advertising revenue and the downloadable version to generate consumer sales.

The web versus downloadable categorization applies to both single-player and multiplayer games. However, because of the far greater complexity involved with multiplayer games, we discuss them in two separate sections, one on single-session games and another covering multiplayer games where game play persists across multiple gaming sessions.

1. Web Browser Games

The three revenue models driving their development further categorize games running in a web browser. The revenue models imply characteristics of design such as depth, duration and quality of game play and the attention and file size spent on graphics and sound. These in turn yield technical requirements that affect the choice of platform.

a) "Just for Fun"

The simplest web games are stand-alone 2D games created "just for fun" or to take advantage of turnkey advertising units such as banners and pre-play commercials. These are typically created in Macromedia Flash, Macromedia Director or Java and they play back using the Flash Player, Shockwave Player or Java Virtual Machine (JVM) embedded in the browser. The Shockwave platform dominated web gaming until a few years ago, but in the past two years Flash has become more powerful and JVMs more widespread. In most cases, one person does the programming, the art and the audio, although it isn't uncommon to see teams of two or three working together, each providing one or more of the aforementioned specialties.

b) "Advergames"

The next level of complexity comes with 'advergames', which sometimes add deeper game play, often add more user preference and customization features (choose your vehicle, music track, color, etc.), and almost always add player data collection, deep sponsor branding and product placement. They are generally designed more for up-front uniqueness and visual impact than long-term playability, as the companies funding the projects are looking for rapid and broad market penetration as opposed to deep game play experiences. Keeping file size low is very important because viral distribution is a core value proposition to the advertiser.

Advergames are also commonly developed with Flash and Director, as the tools are powerful enough and the licensing model is very friendly. Java is rarely used because the advanced graphics required to impress brand marketers are extraordinarily challenging to implement using only Java 1.1. Newer technologies from 3D Groove, WildTangent, and Virtools are starting to gain traction, although the big advergaming projects seen to date using their technologies by and large have been sold and created by the developer of the technology. They offer an alternative to Director for high-end web browser games. Each has its own plusses and minuses, discussed later.

Unfortunately, it is difficult to offer hyperlinks to advergames, as marketing campaigns are temporal and links that work today might not be functional tomorrow.

c) Upseller or Teaser Games

The most complex and polished web browser games tend to be those designed as online versions of a paid download game. They exist to introduce and addict users to a basic game play mechanic and art sensibility, and then to tease them into downloading the "full version". They must be easily accessible, both in terms of player technology and game design, as they are the entry point to the purchaser funnel. Java and Director/Shockwave lead the pack in terms of quantity and popularity of upseller games, but recently there have been some great games released in Flash and WildTangent.

2. Downloadable Games

As different genres of media mature, market trends shape the genre and influence the way it is distributed. Media is often repurposed and rechanneled, as demonstrated by cinema's shift to television, then video, and now DVDs enriched with interviews and bonus documentaries. Similarly, arcades and consoles paved the way for CD-ROM distribution for home computers. Now, the Internet offers the opportunity to distribute games electronically directly to the devices used for consumption, possibly sounding the death toll for "brick-and-mortar" retail distribution.

The so-called 'shareware' model has been around for a long time. Recall the "please mail me a check for $9.95 if you like the program" pitch? For twenty years, this was a niche business model; the vast majority of consumer software sales happened at retail counters. When Bulletin Board Systems gave way to Internet Service Providers in the mid-nineties, nothing really changed. Technologies enabling electronic purchase and delivery have been around for many years, but retail still dominated; mass-market consumers simply weren't ready to shop electronically. Recently, this is starting to change.

Technologists often make the mistake of thinking a market will arise to support a new product simply because that product is an amazing, efficient, cost-effective, spectacular product. Inevitably, they often are proven incorrect. A 'market' is the intersection of a product, and the population of consumers who are to consume that product.

Thus we observe that the simple availability of instantly downloadable game products (no matter how good or "cool" they were) meant very little until other necessary conditions began to emerge; a mass market of game consumers needed to be born. The rapid popularization of the Internet resulted in a rising comfort level with computer technology and the availability of time for consumption of an online product. Top web sites stepped in to offer web-based game content funded by paid advertising, thus creating a customer-base of millions of daily gamers where none existed before. Still, a gulf remained between high quality paid content, generally available only on CD-ROMs, and simplistic and often gimmicky web games.

The crash of the online ad market in 2001 changed everything. Funding for free content dried up and developers and publisher web sites alike started looking for a new model. Simultaneous with the appearance of a business case, technology stepped up to make downloading and installing software and credit card payment processing a breeze for both the vendor and the consumer. The folks at Real and Shockwave.com recalled the shareware model of old and began to offer games for sale starting in early 2001. Quick success gained quick notoriety, and the number of developers and publishers engaged in the shareware business skyrocketed.

Traditional retailers still dominate traditional gaming. By and large, purchases made online are still fulfilled by snail mail, not email, and recent consolidation means that brick-and-mortar companies own most of the online retailers. The success of shareware is due to the creation of a new market, with "casual gamers" consuming "casual games". However, the success has been too overwhelming to ignore, and if casual gamers are sophisticated enough to purchase games online, certainly more traditional gamers will flock to the practice as broadband Internet connections allow gigabyte-plus downloads to be far less time consuming than a trip to the mall. Moreover, as the quality (and file size) of casual games increases, the line is beginning to blur. We predict it won't be long before gamers will be buying the latest shooters and RPG's via Ethernet… for their game consoles as well as their PCs.

The downloadable game process for casual games on the PC (and Mac) looks like this:

1. A player discovers the availability of a downloadable game either by direct online marketing (email, banner ad, etc.) or by advertisement from within the "web version" of the download game.
2. The player downloads the game installer to his or her computer.
3. The player executes the game installer, clicking through a series of dialogs.
4. The player launches the installed game, generally via a desktop icon. The installed game is generally 'locked' in some way to cripple play and encourage the player to purchase the 'full version' of the game. During the early phase of this phenomenon, this meant limiting game features. More recently, developers have learned that best results were achieved by instead limiting minutes of game play (*e.g.* ten executions, twenty game starts, two hours of game play).
5. The game presents an 'upsell screen' communicating the limitations and instructing the player how to 'unlock' the game.
6. To unlock, players click a button to visit the distributor's web site, where they may complete a secure form using a credit card to purchase an unlock 'key'.
7. The key is delivered via email.
8. The player copies the key from the email message and pastes it into the game.

9. The game is now forever unlocked.

The technologies used to implement the process described above are very approachable for the savvy independent gamer. They are discussed throughout the remainder of this section.

3. Single-Session Multiplayer Games

Single-session multiplayer games represent the largest category of multiplayer games. Nearly any game that allows two or more players to join play over a network connection falls into this category. Every genre of game is represented in the universe of single-session multiplayer games, including: classic board games such as chess, checkers, and backgammon; card games such as Hearts and Spades; casino games; first-person 3D shooters; and sports arcade games ranging from snowboarding to billiards.

Because Massively Multi-player (MMP) games are often role-playing games, significant information about the player's character and progress is saved between game sessions. In contrast, single-session multiplayer games save little information about the player between sessions. Exception examples include user authentication data, player ratings and casino winnings. These data chunks can be either stored on the end-user's machine or on the server (the latter being a requirement whenever a secure solution is desired).

From a design perspective, successful multiplayer games work best when the social experience is tuned to the audience. This may vary significantly from genre to genre. For example, some 3D shooters could be described as games which "allow teenage boys to trash-talk while fragging each other". Parlor games allow users to leisurely chat without negatively affecting the pace of play. Another import design component of multiplayer games is the lobby system. A successful lobby system allows users ample time to socialize before entering a game. More importantly, it gives users the power to select their opponents.

Client software development environments are represented by the usual suspects, including: Director/Shockwave, Flash, Java, WildTangent, and C/C++.

The server development options range from a ground-up do-it-yourself architecture, to open-source core architectures, to closed-source commercial packages. Common server programming languages are Java and C/C++.

The amount of game logic supported by the server is an import technical design consideration. Some servers perform sign-on and lobby logic only. The client handles all game logic; game messages are either merely routed through the server or are shuttled directly between game clients in a peer-to-peer manner. Other games contain all game-specific logic on the server; clients simply present the game's state through the UI, accept user input and send/receive network messages.

Additional considerations include the network protocol to be supported by the game (UDP vs. TCP, for example). UDP is faster for arcade style-games but does not guarantee message delivery. TCP is slower because it has more service overhead but is more reliable. Message format is important too. For example, XML is easy to parse and commonly understood, yet results in large messages. Custom message formats are smaller and faster to transmit, yet require tricky coding to be supported by clients like Flash.

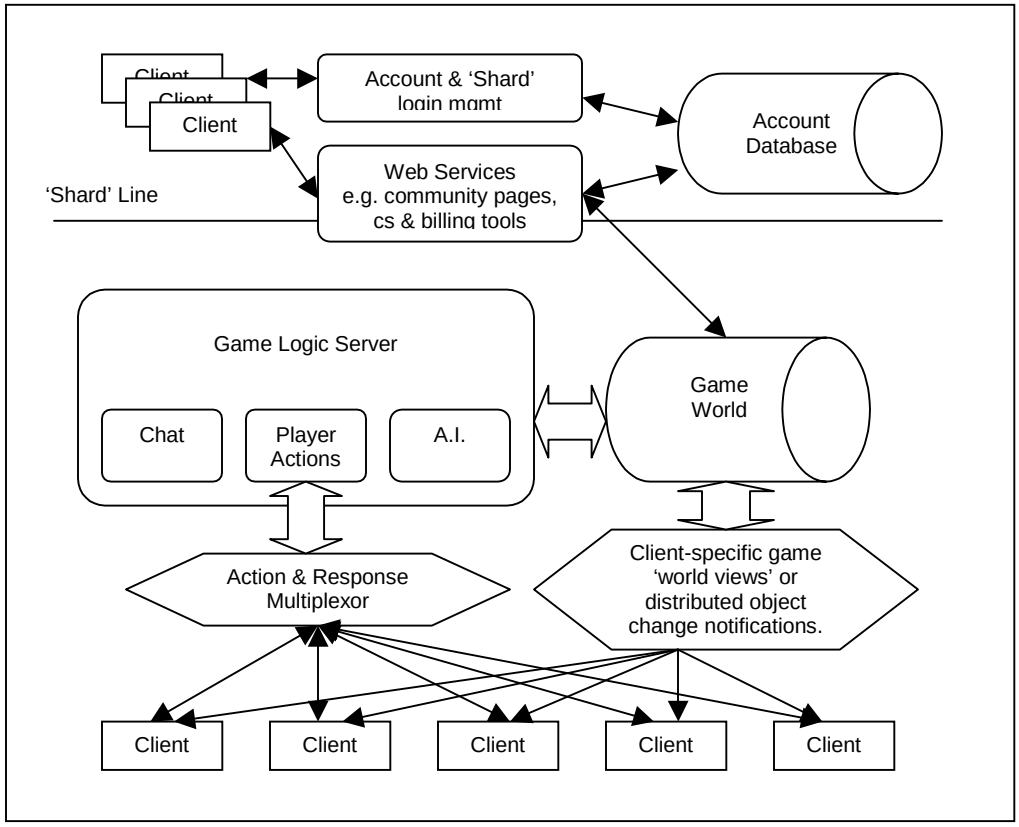
4. Persistent World Multiplayer Games

Persistent world games, otherwise known as Massively Multi-player (MMP) games or Massively Multiplayer Online Role Playing Games (MMORPGs) and so forth, arguably represent the leading edge of online games development in terms of technological complexity, resource requirements and business models. Examples of MMP games from the CD-ROM space include *EverQuest* and *The Sims Online*. Graphical MMP games in the Internet space (as opposed to text-based MUDs) have been steadily increasing in quantity since the mid-1990s, and we expect to see several launch in the next year. They operate as a service over the Internet -- players connect via client software to a central server array where the game world is stored and managed. The technical problems of such client-server systems are

substantial, requiring specialized and non-trivial engineering and operational (up-time, customer support) capabilities. MMP games are generally offered for-pay only, with a short trial period to allow potential customers to get a taste of game play.

a) MMP Architecture

With the important caveat that MMPs are sophisticated engineering projects with no single "best" or standard solution, the following diagram example presents a functional, highly simplified view of a MMP architecture:



In general terms MMPs tend to operate by the above architecture, from bottom up:

- The client acts purely as an input device and view to the game world model. Actions are requested from the game server, usually queued by a separate process to the game logic. Responses and confirmations may be returned similarly, or via the client's view of the game world, which is updated as the relevant section of the game world changes (for example by updates to subscribed local distributed objects, or periodic updates on movements and actions in local 3D space). Note that it is critical for MMP developers to obey the "never trust the client" maxim, and wherever possible to minimize the need for communications between client and server.

- Distinct "shard" worlds are managed by different server clusters, and each shard is usually split between multiple physical services in large-scale MMPs. Because of the varied techniques used to accomplish this distinction, we have not featured this aspect in the diagram. The most common technique is to locate different world "zones" on separate servers, with limited interaction between players on distinct zones. A more sophisticated technique dynamically balances players in one continuous world between physical

servers.

- The “Game Logic Server” may accomplish all the tasks associated with managing the game world model and providing ancillary services to players (e.g. chat, NPC AI) or these tasks may be divided between physical servers on functional lines. Processor-intensive AI or cross-zone (or Shard) Chat, for example, might sometimes be better done by separate machine(s), although this can present substantial issues in edge-cases (does chat lag when everyone gossips at once?)

- The Game World may be held in memory or in a database, or some combination of the two. This varies according to implementation. The most common technique is to commit important transactions (e.g. gold wins, kills) to an SQL database, but hold non-critical data (e.g. positions, health) in memory to reduce processing overhead.

- The use of web interfaces for account management is already quite standard, and increasingly games are using web services to deliver in-game information. These services may be aggregated across shards. Customer service tools are included here, although these may be custom client code rather than web services. It is worth noting that billing and other customer service tools are non-trivial, though often neglected until late in development.

- The use of a common account login server and “director” to send clients to appropriate shards and/or zone servers is also commonplace. In some architectures “directors” remain in between the clients and physical servers, acting as load-balancers and introducing some fault-tolerance.

Other common technology components include a patch download server, along with patching tools on the client.

b) Server Hardware and OS

Hardware configurations vary considerably according to design, but a common pattern is for there to be a one set of login/director servers per shard, with around ten “zone” servers handling the world states, connecting to a single large database server with RAID storage for critical transactions. Most of the major MMPs with the exception of those published by Microsoft have standardized on Linux as the operating system of choice, running by and large on cheap, generic x86 architectures.

c) Server Languages

Server-side implementation is free of the platform-specific requirements of the client, although not free of performance considerations: the number of simultaneous players supported by a single box is an important factor in profitability, although perhaps not so critical as bandwidth. For this reason along with overall familiarity, most servers are written in C++, although Java and increasingly Python are worth considering, especially if your team has established expertise, or if you choose to use middleware based on these platforms. In all practicality the difference in language performance is minimal when compared to the differences that efficient design and careful optimization can make to performance. One of the most substantial server and bandwidth overheads in 3D MMPs is the constant analysis of positional data and broadcast of deltas to relevant clients. Optimization and design-around in this area alone will vastly outweigh the performance impact of any language choice.

d) Client Platforms

To date most MMP clients have been platform-specific, developed in C++ primarily for Windows, with the occasional port to the Mac or Linux. Standard programming environments such as Visual C++ are used along with DirectX and often third-party libraries such as NetImmerse (*Dark Age of Camelot*). Given the familiarity of many PC game engineers with this type of development

environment and the Windows-only nature of most games, C++ is a fine choice. Additionally the prevalence of retail client distribution developers has emphasized graphical quality on the client, with consequent requirements for performance, high production values and costs.

e) Third-party Platforms for MMP Development

A number of companies and organizations are now offering middleware platforms to accelerate MMP development. A few examples are:

- Big World Technologies - www.bigworldgames.com
- Butterfly.net - www.butterfly.net
- Global Gaming Innovation - www.global-gaming.com
- Nevrax - www.nevrax.org
- Silver Platter Software (formerly Horizon) - www.silverplattersoftware.com
- Terraplay - www.terraplay.com
- Touchdown Entertainment (formerly LithTech) - www.touchdownentertainment.com
- Turbine - www.turbinegames.com
- Twisted - www.twistedmatrix.com
- Quazal (formerly Proksim) – www.quazal.com
- Zona.net – www.zona.net

With the exception of Turbine, none of the above have yet to launch a commercial MMP game based on their technology. The latter two are particularly worth considering for an independent developer eager to avoid high up-front costs or royalties.

C. *Game Client Tools and Platforms*

Now that we have had an introduction to the various types of Internet-based online games, let's take a closer look at the technology platforms used to implement them.

1. Macromedia Flash & Flash Player

The Macromedia Flash Player (www.macromedia.com/software/flash/) has evolved into a rich multimedia runtime application, with its last two major releases adding a scripting language, video, and networking to its original vector graphics and animation capabilities. Still great for ads and simple animations, Flash is now also for rich Internet applications, including games. The key to Flash is that it uses vector graphics technology, which results in small file sizes that are ideal for web environments. Unlike bitmapped images that are optimized for a single resolution, vector images can adapt to multiple display sizes and resolutions. The Flash Player itself is also very small, weighing in at only just over 800KB, so the installation and upgrade process is almost instantaneous for people on broadband connections, and painless for modem users as well.

The Flash Player has an extremely high penetration rate. It comes pre-installed on most new PCs and a December 2002 report by NPD Research, the parent company of MediaMetrix, shows that 98% of all PCs in operation today can play Flash content. Over 70% of the market is already on the latest version, Flash MX (www.macromedia.com/software/player_census/flashplayer/).

Flash content is created using the Macromedia Flash MX authoring tool. Once familiar with the tool and its programming mode, Flash authoring offers rapid prototyping, iterative development, and easy integration of art and technical assets. Experienced users will be able to create re-usable components that can be shared across projects. Flash content does not need to be redesigned or modified to work across different platforms. The Flash file format is platform-independent and Flash content may be trusted to operate identically for all versions of the player. Thus, the author need only create a single deliverable to support multiple platforms. The Flash Player handles platform versioning invisibly – if a user accesses

content requiring a newer version of the Player, then clicking on a dialog box permits the upgrade to take place in the background. Once the upgrade completes, the content begins playing.

There is a performance tradeoff, however: you aren't going to code a complex 'twitch' game in Flash MX. This is partially due to the vector-based nature of Flash. It cannot be 'optimized' without hardware support for vector-based graphics and alpha-channel compositing. That said, we expect Macromedia to include a major performance boost with the next release of the Player, further raising the bar on the type of games one could author in Flash. Judging by previous release history, we expect the next Flash Player to become available in late 2003 or early 2004.

If you are developing a game that demands high performance, you'll have to either wait or choose another technology, but if you can live with the speed delivered by Flash today there is simply no better tool/player for delivering beautiful games quickly that can be downloaded in a jiff by people on a number of platforms. If you can't live with the performance of Flash for game play but you are attracted by its utility for navigation, consider using Flash as an embedded technology to make the splash and menu screens easier to implement and change. Shockwave includes extensive support for embedded Flash and it has even been ported to the PlayStation 2.

The retail price for Macromedia Flash MX is $499, or it can be purchased as part of the Studio MX suite for $899 along with the latest version of Macromedia *Dreamweaver*, *Fireworks* and *FreeHand*. Educational and upgrade discounts are also available.

a) Benefits

- **Polished Graphics**. Anti-aliased vector graphics look great – and they scale.
- **Compact**. The engine and content are both quite small, giving short download times.
- **Ubiquitous**. Flash is already available on 98+% of desktops.
- **Cross-platform**. Flash player works consistently across platforms.
- **Secure**. Flash movies run in a safe security-sandbox. Macromedia has proven itself committed to responding quickly if/when issues arise.
- **Solid future**. Macromedia is committed to the future of Flash Player, making enhancements/improvements and bringing it to an expanding list of devices that already includes Palm, PocketPC and PlayStation 2. Expect to see it everywhere.

b) Considerations

- **Learning curve**. When getting started, it is great to have a mentor. Flash has a somewhat unconventional non-linear storyboard-oriented interface that will be somewhat disorienting to a programmer expecting a procedural interface. There are numerous newsgroups, email lists, and books available.
- **Graphics Speed**. Flash is ideal for games such as *Tetris* or *Checkers* – games with high-polish, but relatively little motion. For games with more motion, you may need to use a smaller size or lower quality. On machines faster than 1 GHz, this is less of an issue, but on slow machines with complex scenes, expect to target about 12 frames per second (depending on visual complexity).
- **Script Speed**. Flash's scripting language, Actionscript, is slow in the current version. If your game needs to make a lot of calculations very quickly, it may not be appropriate for Flash.

2. Macromedia Director & Shockwave Player

Macromedia Director Shockwave Studio (http://www.macromedia.com/software/director/) is a multimedia-authoring environment that can be used to develop games for web display via the Shockwave plug-in or as standalone executables on either Macintosh or Windows platforms. The names can be confusing. 'Director' is the authoring tool that is not very commonly known outside of the interactive web/CD-ROM business. 'Shockwave', a much better known term, is the name of the browser plug-in/control that enables web playback of content authored in Director. It also happens to be the name of a web site where one can find a plethora of Flash, Shockwave, Java, Groove, WildTangent and C/C++ games.

Director is an excellent choice for the creation of both browser-based and downloadable games. It supplies a robust playback environment whose performance generally exceeds that of Java in terms of media manipulation and graphics. Its programming language has a gentle learning curve for anyone with experience in Java or C++, and it is accessible to those who are not. It supports most media types you would want in a game and supplies a good level of compression and compression control. Its main drawback as a web delivery platform is the large (still considerably smaller than the Java) plug-in download. However, the install base for version 8 is sizable, especially among games consumers, and the Shockwave plug-in auto-installs in Internet Explorer 5 and up.

In Director, all media, text and script resources are treated as 'Members' inside of 'Casts' (the reader may note that much of Director's nomenclature is loosely based on a theater metaphor) and can then be accessed by name or number. Cast members of any type may either be created using a separate application or dynamically during authoring or run-time. Director casts may be either 'internal' or 'external'. Internal casts are compiled into the main executable, a `.dcr` file for Shockwave playback or an `.exe` for standalone execution. External casts are compiled into separate `.cct` files that can be linked and unlinked dynamically at runtime – a very powerful feature for moderating downloads in online games.

Director programming is done using Lingo, a proprietary language that is robust and object-oriented (supporting single inheritance). Director compiles Lingo scripts into byte code and the runtime environment performs automatic garbage collection. Although Director also allows for the use of a timeline (called the 'Score') for placement of assets within a game, experienced developers consider it best to use Lingo to control the flow of the application rather then relying on the Score. There are a number of reasons for this:

- Games typically have a **non-linear flow of control** (i.e. conditional branching) and the Score is inherently linear.
- Using sprites in the Score sets **limits on the scope of objects**, whether they are interface or game objects. If you want to refer to visual elements, for example, you need to know where you are at in the Director timeline.
- It is much more **time-consuming to make revisions** and to keep the Score up-to-date over the course of production.

The unique programming model employed by Director is reminiscent of its heritage as a leading tool used to create interactive CD-ROMs in the days before the Internet. With the rise of the Internet, the Shockwave Player was conceived to enable programmers to port their CD-ROM content to the web.

A plug-in API supports the creation of 'Xtras' that extend the basic functionality of Director for both executable and Shockwave programs. They are usually written in C or C++, but can also be developed in Lingo. Most of the time, Xtras are written to supply programs with operating system functionality that is prohibited by the Director environment and/or Shockwave security sandbox. There is a long list of Xtras created by third party developers, and Macromedia itself supplies a number of useful Xtras with Director. Their 3D Authoring, Multiuser, and XML Xtras provide functionality that is particularly attractive for game developers:

- The **3D Authoring Xtra** is a full-featured 3D engine that supports hardware acceleration and can be combined with the free Havoc Xtra for realistic 3D physics simulations. While the performance of the 3D Xtra depends heavily on hardware acceleration, it is a well-structured engine with high-level support for a variety of desirable game development features (i.e. Lingo-control over skeletal animation, accessible scene graph, dynamic textures, DX7 and OpenGL support, etc.). Macromedia's 3D engine is only available in Director version 8.5 and above, and requires users to have the 8.5 plug-in to view 3D content.
- The **Multiuser Xtra** allows for TCP/IP and (in version 8.5 and above) UDP/IP socket-based networking in both a client-server and peer-to-peer model. For the developer who prefers not to write their own server component, the Multiuser Server that ships with Director provides essential lobby and player-matching functionality. There are several third party Java-based servers available as well.

- The **XML Xtra** supplies a quick XML parser that is great for transferring data of any complexity in online games. Unfortunately, the output from the Xtra is a deeply nested list structure that is somewhat cumbersome to use. We created a code module that converts this structure into an easy-to-manipulate object hierarchy.

3. Java

Java (java.sun.com) began life with the promise of 'write once, run anywhere'. While this is certainly more so than with any other comparable, contemporary language, it hasn't become the panacea once envisioned. On the other hand, Java has become a viable and practical platform, and of all the tools mentioned in this paper it is the only one that is entirely free. (There are many third party development environments and class libraries that are not free, but there is no charge for the core Java libraries and run time.) It is important to wade through the rhetoric and see Java for what it is and isn't in the context of game development.

Java was originally developed to serve as a portable platform for content delivery on interactive set-top boxes. The media group within Sun found themselves grappling with an explosion of portability, compiler, library, and security issues as they attempted to develop atop a variety of commercial hardware platforms and they invented Java to soothe the pain.

The real commercial emergence of Java was as an embedded environment in browsers for the delivery of interactive content. The portability and security features of Java made it the ideal choice for embedding in browsers that needed to execute unknown content in a secure 'sandbox'. However, inconsistent implementation (for whatever reason) of the Java environment across competing browser products defeated the original 'write once, run anywhere' promise. Since then, Java in the browser (a.k.a. applets) has largely been replaced by other more prevalent and task-specific technologies such as Macromedia Flash and Dynamic HTML.

Since those early days, Java has evolved considerably. Java 2 was launched as a successor to the original Java and comes in three 'editions' -- each one tailored for a specific class of problems. The original Java has gone on to become Java 2 Standard Edition (J2SE). – a Java platform targeting a desktop environment. The Java 2 Enterprise Edition (J2EE) has emerged as a superset of the J2SE intended for deployment in enterprise and server-oriented environments. Finally, Java 2 Micro Edition (J2ME) has emerged as a slimmed-down Java platform for resource-limited devices (CPU, memory, interface, connectivity, etc.) that still might benefit from the Java platform.

We'll now go on to consider the J2SE and J2ME platforms as these are the two most relevant to game development and deployment. J2EE is a set of enterprise-grade technologies not directly relevant (though not un-useful) to game development.

a) Java 2 Standard Edition

Java 2 Standard Edition (java.sun.com/j2se/) is the desktop edition of the Java platform. It provides an extensive array of class libraries and is available on a wide variety of platforms including Windows, Macintosh, and various UNIXes (yes, including Linux).

It is worth quickly pointing out the differences between the J2SE Software Developer's Kit (SDK) and the J2SE Java Runtime Environment (JRE). The SDK is the software developer kit that includes the compiler and tools necessary for Java development. These are the tools you would need to author games in Java. The JRE, on the other hand, provides simply the necessary tools to run Java-based applications. This is the platform your audience would need (at a minimum) to run your Java-based titles.

b) Core Capabilities

Java as a programming language is an elegant, object-oriented language that is a pleasure to develop in after C and C++. It has automatic garbage collection and a rich bundled class library

that makes it easy to tackle many programming problems inherent in game development. Java also includes high-level support for network programming and multithreading built-in.

The basic platform contains a powerful framework for developing portable user interfaces including support for pluggable look-and-feels. Included are look-and-feels designed to mimic the appearance of the various environments to which Java has been ported (Windows, Unix, Macintosh, etc.). The underlying Abstract Windowing Toolkit (AWT) provides the low-level support for windowing system and user interface capabilities while the layered Java Foundation Classes (JFC) provide the high-level pluggable UI componentry.

J2SE includes the Java 2D API (java.sun.com/products/java-media/2D/) for advanced 2D graphics. This is a powerful API for 2D game programming and includes a vast array of features for implementing 2D games. Java 2D supports both windowed and full-screen modes, as well.

c) Extending Java

Java provides a standard mechanism for platform extension via native code called Java Native Interface (JNI). This makes it practical to use Java as a scripting language while leveraging any existing libraries and allowing you to implement more performance-oriented operations in native code.

In particular, the Java 3D API (java.sun.com/products/java-media/3D/) is one such extension that provides advanced 3D APIs built atop existing underlying graphics technologies (OpenGL and Direct3D). While this extension is available only on a limited number of platforms, it is a strong candidate for mid-tier 3D game development (compare to Shockwave w/ the 3D Xtra). Until Java 3D becomes a core component of the Java platform, however, you will need to ensure that your customers install the Java 3D extensions alongside your Java 3D-based games.

d) Java Delivery Mechanisms

A variety of delivery mechanisms exist for packaging and delivering Java-based content to your audience. These include:

- Applets
- The Java Plug-in
- Java Web-start
- Prepackaged applications (w/ and w/o the JRE)

Many commercial and open-source browsers include built-in support for Java content in the form of applets. Unfortunately, these platforms tend to support earlier Java specifications (Java 1.x) and are inconsistent and often buggy in their implementations. This makes this platform unstable and largely unsuitable for the production deployment of games.

The Java Plug-in (java.sun.com/products/plugin/) from Sun gets around this problem by providing a plug-in for these modern browser platforms that allows applets embedded in web pages to be executed using a locally installed Java 2 JRE. This provides a suitable platform for deploying game content via web pages but leaves you in the position of needing to require the JRE be installed on client desktops. The current JRE download weighs in at almost 8 Megabytes and is a non-trivial hurdle for the would-be gamer to surmount en route to your content.

Java Web Start (java.sun.com/products/javawebstart/) is a similar technology from Sun that is also bundled with the Java 2 JRE. Web Start is similar to the Java Plug-in in that its purpose is to allow Java content accessed via the web to run in a controlled Java 2 environment independent of the browser platform. Unlike the Java Plug-in, Web Start is geared towards running full-scale applications from the web. Web Start-initiated Java applications run in their own virtual machine sandbox and are not bound to the originating web page as applets are. Web Start provides support for managing downloaded applications (read: games) locally and is a strong tool for deploying games where the JRE download is not perceived to be too much of a barrier.

Another option for delivering Java applications is to use one of the many commercial and open-source tools for packaging a Java application as a native platform installer. These installer tools even permit you to include the JRE in the installation process, making for a simpler and better experience for the user.

Finally, US District Judge J Frederick Motz has recently ordered Microsoft to include Java in its .NET-enabled products (Windows, Internet Explorer). If, at the end of what will certainly be a lengthy appeals process, this order stands then we may finally have reached the day where a stable Java platform may be expected everywhere.

e) Java 2 Micro Edition

Java 2 Micro Edition (java.sun.com/j2me/) is an optimized (read: slimmed-down) version of the Java environment specifically designed for consumer devices smaller and less-powerful than a conventional personal (desktop) computer. J2ME is intended to run on devices with:

- Limited CPU speed – not likely measured in GHz
- Limited memory size – as little as 128kb
- Limited network connectivity – no high-speed connection, limited protocol support
- Limited input/output interfaces – small screen, numeric keypad, etc.

Today J2ME can be found in many modern cellular telephones and personal digital assistant (PDA) platforms. (See wireless.java.sun.com/device/ for a current listing of J2ME-capable devices.)

f) J2ME Configurations and Profiles

J2ME must deal with a broad spectrum of devices in terms of scale, intended use, and capabilities. To deal with this fact, J2ME introduces the notion of configuration and profile to further complicate the definition of what comprises a J2ME platform. A configuration defines the low-level characteristics of the platform including virtual machine, core class libraries and language features. A profile extends a configuration with additional APIs that are device- and purpose-specific.

The profile most frequently seen in the wild is the Mobile Information Device Profile (MIDP) which runs atop the Connected Limited Device Configuration (CLDC). This profile is for very limited devices with intermittent access to network connectivity and is the J2ME profile present on current Java-capable cell phones. The CLDC configuration defines a stripped-down virtual machine called the KVM that lacks certain features found in the J2SE JVM, most notably support for the float and double variable types.

Another emerging profile is the Personal Profile (and evolution of Personal Java) which runs atop the Connected Device Configuration (CDC) which includes yet another virtual machine, the CVM. This platform targets huskier devices with greater processing power and network connectivity (e.g., set-top boxes or other network appliances).

These are just a couple of the many emerging profiles possible in the J2ME realm. Typically you will develop a game for J2ME for a specific profile and this title will be appropriate for a wide range of devices in this profile (in general, a class of device defined by scale and intended-use). Additionally, many of the profiles and all configurations nest in a superset/subset fashion and content developed for a given profile will typically port readily to more powerful profiles.

g) J2ME Device Capabilities

Current J2ME devices represent the first generation of Java-capable consumer devices. The typical device has 128kb for program, stack, and heap space and sports a 120x120 screen that may or may not be in color. Network connectivity is likely intermittent and only HTTP protocol is guaranteed to be supported. Many carriers limit the size of content downloaded to these devices to a scant 64kb, inspiring very compact codebases.

While this makes a challenging platform for the delivery of complex, real-time games, it is nonetheless capable of service as a gaming platform (be creative!) for many types of games. The promise is that these devices will only get more powerful and more widespread as time passes, and will represent a growing audience for you, the game developer.

h) J2ME Content Delivery

Content download to a J2ME device, also referred to as Over-The-Air provisioning (OTA), typically occurs through HTTP download of a Java Application Descriptor (JAD) file followed by the download of the associated Java Archive (JAR) file containing associated Java classes and resources.

J2ME uses something called a Mobile Information Device Profile (MIDP). In the MIDP world, executable content is delivered in the form of MIDlets (compare to J2SE's applets) which are described in the JAD file and delivered via the JAR file.

Today, most cell phones possess WAP (Wireless Application Protocol) browsers that may be used to browse through WML-based sites. J2ME content may be downloaded and installed in response to selection of a link to a web-hosted JAD file (and associated JAR) embedded in a WML (Wireless Markup Language) page. Other device-specific mechanisms are often found, as well.

i) What the future holds for J2ME

J2ME has a rich future ahead of it. The current line-up of devices represents the first generation of J2ME devices and bigger and more powerful devices are soon to follow. Java, in the form of new profiles, will continue to be embedded in other consumer products. Before long, J2ME-capable devices will outnumber J2SE-capable devices, and whole new markets and environments for game content will have arrived.

j) Some Parting Thoughts on Java

Due perhaps to some early stumbles and a long-standing reputation for poor performance, Java has not become as widespread a platform for game development as perhaps it could and should be. Java is a suitable platform for large classes of game development today and as processors get faster, memory sizes grow and compilation technology improves, this author believes that Java will increasingly become a suitable platform for your next project. Java brings considerable value to the table (and some costs too) that should not be hastily overlooked. Furthermore, as games continue to offload more and more of their work to muscle-bound video cards and increasingly spend their time waiting for the next packet to arrive from the game server, there's less and less reason not to consider Java in spite of its reputation as C's slower brother.

As interpreted, embeddable languages go (LISP notwithstanding), Java is as mature as they come. This author recommends that you consider using Java as an embedded scripting language within your next game title instead of "rolling your own" self-optimized C look-alike. It's my belief that you'll inherit a secure and well designed language and be able to leverage the abundance of development tools, libraries, and – most importantly – debuggers that are out there.

The age-old complaint for not using or embedding Java used to be the size of the Java runtime environment that would need to be bundled with the title. However, after downloading my first gigabyte demo yesterday (ahem, EA), I have come to the conclusion that this is clearly no longer an issue.

In short order you won't be able to find a cell phone or PDA that lacks a Java runtime environment. The same invasion is occurring in set-top boxes, stereo components, wristwatches and refrigerators (for some strange reason). Don't forget these platforms as they too are viable devices for gaming!

k) Interesting Java Gaming Links

- Micro Java Network - www.microjava.com
- Java Gaming - www.javagaming.org
- Midlet.org - www.midlet.org

4. 3D Groove

3D Groove (www.3dgroove.com) is a platform for deploying console-quality 3D videogames to Web browsers or via executable files. First introduced in 1999, 3D Groove is now available in two trademarked versions: 3D Groove SX and 3D Groove GX. Both versions of 3D Groove are designed to deliver maximum playback performance to the widest possible audience through proprietary software rendering technology, and to support rapid authoring through an intuitive yet robust API. Both versions have fully documented SDKs available for licensing to professional game developers.

The complete 3D Groove GX browser plug-in is 550Kb. It is compatible with both Windows (Internet Explorer ActiveX control or Netscape plug-in) and Mac OS 9 & X (Netscape plug-in or Quicktime 5 plug-in). GX can also optionally be deployed as a 500Kb Windows/Mac OS Xtra for Shockwave 7.0+.

The GX authoring suite includes various trademarked applications and utilities, such as: (i) GrooveBuilder, the authoring IDE with real-time console, visual asset management and byte-code compiler and (ii) GrooveFactory, a conversion and editing tool for 3D art. GrooveBuilder saves a complete game project into one cross-platform file, deployable via any HTTP web server. This GX project file (.GRV) contains all media types, including geometric models, textures, sprites, sound, script code, and binary data, all compressed with proprietary GrooveSqueeze algorithms. GrooveFactory allows graphic artists to import 3D polygonal art from commercial packages such as 3D Studio MAX, LightWave, OBJ, DXF, 3DMF and MiniCAD models, post-edit them, and save them in compact binary format.

The GrooveScript authoring language is a high-level interpreted language with garbage collection, dynamic-type variables, fixed type memory pointers (for low level and advanced programmers) and is similar to Lingo and JavaScript in syntax. GrooveScript can directly access any image, vertex or sound buffer (or protected memory buffers allocated through script), giving developers the same low level controls that C/C++ developers enjoy, but with the simplicity and flexibility of an OOP interpreted language.

GX's 2D sprite engine features rotation, scaling, vector based free-form deformation, pinning, picking with alpha fall-through, alpha blending, scaling, adding, blue- and green-screening and solid/alpha maps in both 8-bit palletized and RGB modes. For 3D rendering GX features a proprietary software renderer as well as Direct3D and OpenGL hardware-accelerated rendering. The software renderer has been optimized for smooth framerates on low end PCs even with dynamic cameras, and supports many high-end features such as single-pass dual texture mapping, blend and additive alpha modes, bump mapping, displacement mapping, bilinear filtering, and anti-aliasing. The scene graph provides polygon-precise collision detection and shape picking, native hierarchies, and keyframe character animations with SLURP interpolation controlled from script.

3D Groove SX was created to allow the development of robust 3D games in Macromedia Director for deployment via Shockwave. This platform was used to create the hit Shockwave.com titles *Real Pool* and *Tank Wars*, among many others. 3D Groove SX is deployed as a 390Kb Xtra plug-in for Shockwave 7.0+ on both Windows and Mac OS.

SX games are authored in the Director IDE using Lingo to control the SX Authoring Xtra via a proprietary high-level API (SX authoring is supported in Director 7.0-8.0 only). SX offers developers the ease and familiarity of the Lingo/Director authoring environment, but has a limited feature set and lower rendering and script execution performance compared to GX. The SX art path uses the same GrooveFactory

importing tool described above. Completed games are saved and deployed as a self-contained .DCR file and execute as a standard Shockwave movie.

3D Groove SDK development licenses are free for professional developers. Fees for commercial release licenses are negotiated directly with Groove. Release license fees are typically $5,000 per title per platform (Windows, MacOS) for worldwide distribution licenses.

5. WildTangent

WildTangent, Inc. (www.wildtangent.com) is a provider of technology and services for high-end online games. WildTangent's core technology is a browser ActiveX control called the Web Driver. It handles all the compression and streaming aspects of an online game, music visualizer or business application, while supporting 3D animations and texturing with real-time 3D rendering. By interfacing directly with DirectX, the Web Driver allows the creation of interactive content. It takes advantage of hardware acceleration, scaling content for each user's machine so that users will experience the same quality of graphics regardless of the speed of their CPU and connection.

The Web Driver is currently in its 8th version, which is curiously numbered Web Driver 3.1. It weighs in at just over one Megabyte in size. As of January 2003, there are more than 36 million active Web Driver users. Because of the DirectX dependency, the WildTangent Web Driver currently supports only Windows-based machines.

The Web Driver 3.0 SDK, released July 2002, allows development of multimedia web applications. This SDK contains tools, documentation, demos, how-to's and tutorials for both learning the application or preparing for distribution. The SDK contains the latest release of the Web Driver, Updater, WTStudio, and *3D Studio Max* and *Maya* exporters. WTStudio can be used to build a 3D world, or it can be exported from Max or Maya to a COM-enabled language to drive the action. It is available to developers for free and downloadable at Developer Central on the WildTangent web site. A licensing fee is required once a developer uses a piece of content for commercial purposes.

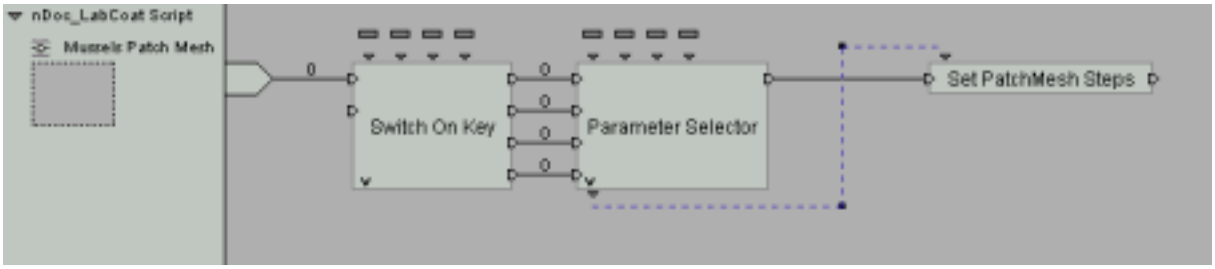
6. Virtools

Virtools Dev (www.virtools.com) is an authoring platform for developing interactive real-time 3D content, that costs about $5000. Used to produce both offline and online games, Virtools Dev is built on several components:

- the Behavior Engine
- the Render Engine
- a Library of over 400 standard behavior building blocks

Varying levels of access to these components are made possible via the Schematic graphical interface, the Virtools Scripting Language (VSL), or the C++ SDK.

The Schematic, Virtools Dev's main interface, is a graphical user interface that lets users drag and drop behavior building blocks and attribute them to objects. Developers can assemble sequences of behaviors to create 3D content with complex interactivity. The resulting scripts are visual representations of the interactivity's underlying algorithmic structure.



The Schematic: Virtools Dev Graphical User Interface

At the core of Dev's behavior engine are the individual behaviors. They provide descriptions of potential actions and reactions for objects and characters, over time or in relation to their environment. By using behaviors to script interactivity, users define actions, zones and timers to trigger dynamic content changes.

a) Virtools Dev Advantages

- Virtools solutions are compatible with market standard software and 3D modelers.
- Accessible to programmers and non-programmers alike.
- Ensures easy reuse of work in future projects and streamlined production management.
- Constantly evolving thanks to additions of new behavior building blocks to the standard library.

Virtools Dev provides a common interface with access to various state-of-the-art game production technologies. Development modules to enhance programming possibilities are created by Virtools, and in partnership with market leaders:

- Virtools Physics Pack, developed in collaboration with Havok
- Virtools AI Pack (artificial intelligence)
- Virtools Multiuser Pack

Virtools Dev claims to be created with the game production cycle in mind. For both offline and online games, Dev reportedly can be integrated into existing development workflow at any point in the production process.

- For **Prototyping**: Create working mock-ups that make it possible to test game play from the start and modify game play iteratively.
- For **Production**: Use Virtools as an IDE to benefit fully from Dev's collaborative workspace offered.

b) Virtools Web Player

The Virtools Web Player is a free, downloadable plugin (800KB) for IE/Netscape available for PC and Mac, which lets end users access interactive games made with Virtools Dev. Virtools solutions include media compression and delivery systems to facilitate content deployment on the Internet.

D. *Server-side Platforms*

1. Web Servers

a) Apache

Apache (http://httpd.apache.org) is the most popular web server currently in use. It offers a choice of process-per-request models or the faster (but currently less tested) hybrid process/thread model. In addition to being free, it is one of the most configurable, well-documented and stable web servers out there. It offers hundreds of free modules for download that allow you to customize it to any requirements you may have, as well as an open API for writing your own. For example, SSL functionality can be added via any of at least three free modules, or several other methods exist for authenticating users directly to a database hidden behind the web server. And as the most popular web server out there, endless examples and HOWTO type documents exist that should let even a rank amateur get exactly the setup they want.

b) Zeus

While not free, the Zeus Web Server, (http://www.zeus.com) is generally considered the fastest web server there is. The company also has a software load balancing solution that may allow for

the stability of having multiple front-end web servers without the hardware costs associated with a traditional load balancer. Their site lists a 2 CPU single-host license for Zeus Web Server at $1700.

In any event, for most applications, you'll want more than one webserver running in parallel. Load balancing runs from the free and braindead (via round-robin DNS) through various and costly hardware and software solutions. Simple low traffic applications can get away with round-robin DNS but more complicated applications and those involving SSL should go for an actual load balancer. (This author notes that Cisco LocalDirectors are available on eBay for sub-$1000)

Also, as mentioned below, many application servers can double as a front end web server, although for security and stability reasons you may prefer to have your application servers hidden from the internet at large by using a front end web server to deal with the vast majority of requests and only proxy dynamic requests back to the app server[s].

2. Server-side Programming Languages

a) Java 2 Enterprise Edition (J2EE), Servlets, JSP, and More

Servlets are the server-side analog of applets, and allow for the execution of Java code in a server environment (typically on the web server or another related server). The servlet API provides a wealth of networking and process management code used to create centralized web services.

JavaServer Pages (JSP) are the Java equivalent of Microsoft Active Server Pages (ASP). JSPs are basically a shorthand for creating servlets that generate output intended for a web browser. A Servlet designed to create an HTML page is Java code with embedded HTML markers (basically in "print" statements). An equivalent JSP page is an HTML page with embedded Java code (scripts) – the servlet turned inside out.

JSPs are useful to game programmers who need to provide users with a graphically interesting view of remote data in a web browser. Sample uses include high scores lists, chat systems, and player matching. They allow web page designers experienced with the Java syntax to develop web pages with embedded Java commands identified by special tags. The pages are automatically compiled into servlets for execution either when deployed or when first accessed by a user. The main advantage to JSPs is that they eliminate the need for difficult-to-maintain interface classes used only to generate raw HTML pages. Instead, web pages are designed and maintained in tools such as Macromedia Dreamweaver or Adobe Home Site and the snippets of Java code embedded in those pages are pulled out by the application server -- those interface classes are generated automatically.

Except for the convenient shorthand offered by JSPs to web clients, the functionality of a server side application will be accessed by a game client through direct calls to the application via the typical web services model. When the security of information is important, such as for financial transactions or account logins, these direct calls are best handled over secure connections such as SSL to help prevent protocol snooping. Outside of actual game play, calls are often made via the HTTP protocol, whereas within game play itself programmers generally utilize direct socket connections to the remote service.

b) Perl

Perl is one of the most readily available scripting languages and has been used in numerous server side applications for quite some time. It provides excellent pattern matching and text manipulation capabilities for those familiar with the concept of regular expressions. Database integration libraries are available for most databases and the CPAN installation system allows administrators or end-users the ability to install or update modules from public repositories easily. Historically, Perl did not handle multi-threading well, but more recent releases have improved

threading support considerably, although some developers still do not believe that any of them are stable enough for production use.One of Perl's biggest challenges comes from one of its strengths – Perl has quite a bit of flexibility in how the code is structured, making it easy for an undisciplined developer to create difficult to maintain or re-use code. Also, while mod_perl allows Perl to be used in a web server context without recompiling each time, traditional CGI use would force the Perl script to recompile itself for each request, creating very significant overhead. This is fine for a server being hit a few times a minute, but will not scale much past that.

Online Perl links:

- http://www.perl.org
- http://www.cpan.org

c) PHP

PHP (www.php.net) is arguably the easiest scripting language to get started with. It is a general-purpose scripting language intended primarily for web development and typically supported by web servers. It features a simple C/C++ style syntax and has heavy community support. PHP excels at its ease of use in building low to moderately complex systems and works with most open source and commercial databases. PHP is free and modules are available for most popular web servers and platforms. One of PHP's drawbacks is that until recently, most PHP code was more structured than object-oriented, making code re-use a bit more challenging. PHP is free and open source and is usually enabled via a plugin to a web server (mod_php for apache, for example). Many free PHP applications for discussion boards and other useful website add-ons are available for download.

Online PHP Links:

- http://www.php.net
- http://www.devnetwork.net

d) Microsoft .NET / C# / ASP

The .NET framework is a feature-rich platform for developing, deploying, and executing distributed applications. A great deal of new functionality and much of the cryptic windows API has been rolled into a stream-lined, easy to use, and object-oriented hierarchy of namespaces and classes that developers can use to build console applications, traditional fat client applications, web applications, web services and daemon processes. The .NET framework promises to consolidate the programming model for these types of applications. Using the .NET framework a developer can incorporate features such as displaying windows and dialog boxes, creating threads, verifying security credentials, accessing databases, connecting to the Internet, programming sockets, providing web services to clients, and so on.

.NET supports many of the same features that the Java platform does. Most notably, .NET code compiles into an intermediate language, called of all things "Intermediate Language", which is similar in concept to Java's byte codes. Theoretically, we get platform independence assuming .NET is ported to other platforms (see the Mono project, which is an effort to build an open source implementation of .NET at www.go-mono.com). Intermediate Language supports object orientation, interfaces, strong data typing (for language interoperability) and robust error handling. The Common Language Runtime (CLR) is responsible for Just-In-Time (JIT) compiling Intermediate Language into native code at runtime. The CLR also handles garbage collection, application security, and application domain isolation. Microsoft has also addressed key issues with code deployment, or "DLL Hell" as developers call it, by encapsulating chunks of code into assemblies which are self-contained, and self-describing. There are no registry entries to mess with and deployment is often as simple as a file copy.

If you are programming against the .NET framework, everything is treated as an object, even the program itself. For Java developers, this isn't a stretch at all. For everyone else, it represents

some degree of change from what you are used to. C# is Microsoft's newest language that was written from the ground up to take advantage of all the latest and greatest features that .NET has to offer. C# is a simple, modern, object-oriented, and type-safe programming language derived from C, C++ and Java. Syntactically, they are all similar.

ASP.NET is the next evolution of Active Server Pages (ASP). ASP pages are very popular for building web applications of low to medium complexity; however they aren't without their disadvantages. ASP pages are not compiled; everything is interpreted, which limits the amount of code re-use across different parts of a web application as well as to other applications. Additionally, ASP pages do not benefit from compile time error detection like their ASP.NET counterparts. ASP.NET pages are not interpreted; they are compiled much like JSP servlets. However, as said above, everything in .NET is an object, even an ASP.NET page. In fact, the compiled page itself inherits the .NET library class System.Web.UI.Page. Creating well-structured, OO code couldn't be easier now and promises to reduce the amount of spaghetti code found in some ASP web applications.

3. Application Servers

Application servers are server-side middleware products generally used to provide an integration layer between distributed clients and centralized data stores. The most common application servers in use today provide a harness for running business logic coded in Java servlets (and JSPs). They provide horizontal services including naming services, configuration management, session management, security services, and database connection pooling.

Higher end servers that support the full J2EE (Java 2 Enterprise Edition) feature set specified by Sun may be referred to as "J2EE-compatible". J2EE in general is a better fit for medium to high complexity systems because of its fairly steep learning curve. Most of the well known J2EE application servers such as ATG's Dynamo and BEA's WebLogic carry steep price tags (approaching or exceeding hundreds of thousands of dollars) and are thus excluded from presentation herein.

a) Apache/Jakarta – Tomcat

Tomcat (jakarta.apache.org/tomcat/) is the official reference implementation for the Java Servlet and Java Server Pages (JSP) technologies. Tomcat is a free, open source tool that integrates well with most web servers or can function as a stand-alone web server itself. It is important to point out that Tomcat was designed as a reference implementation and sandbox for testing the evolving JSP and Servlet standards, and as such has not been extensively optimized for performance. Many developers do not feel that it is stable enough or fast enough for production use. In addition, compiling a custom version of Tomcat is not a trivial operation, so if you go this route, consider using a precompiled package available from the Jakarta site.

Tomcat is available for most operating systems, including Windows, Macintosh and most/all flavors of Unix. Tomcat 5.x is the upcoming major release of Tomcat that implements the Servlet 2.4 and JSP 2.0 specifications.

Custom JSP tag libraries (jakarta.apache.org/taglibs/) are available to speed development by providing a variety of standard functionality. As long as the developer is careful to keep any 'business logic' removed from the user interface code in the JSP files, code re-use can go a long way with JSP and custom tags.

b) Macromedia – JRun (J2EE)

JRun (www.macromedia.com/software/jrun/) is an application server provided by Macromedia. The software is free for developers and costs approximately $900 per production server. JRun includes a fully functional web server and a variety of tools to help speed development and deployment in the J2EE world. The application server provides built-in Macromedia Flash MX player connectivity, allowing Flash to connect to EJBs and java classes resident on the server. Macromedia heavily pushes their FlashRemote technology with allows surprisingly sophisticated Flash applications to communicate via XML to a web service, and potentially to a database lurking behind it

c) Macromedia – *ColdFusion MX*

ColdFusion MX from Macromedia (www.macromedia.com/software/coldfusion/) allows creation of interactive, database-driven web sites through wizards or scripting. ColdFusion is also available in a version that runs on top of J2EE servers to provide ColdFusion's scripting and development capabilities running in a J2EE environment. ColdFusion costs between $1300 and $3500 per server, depending on the environment, and runs on most server operating systems.

d) JBoss Group – JBoss Application Server (J2EE)

JBoss (www.jboss.org) is an open source J2EE application server provided by the JBoss Group LLC, who spend 50% of their time on the free software and 50% of their time consulting. The application server itself is free, with additional service and support available for a fee. It had over two million downloads in 2002. JBoss incorporates many advanced features such as JMX (Java Management extensions) and clustering. It may be an excellent choice for projects that require a J2EE server but that don't have a large budget available for the server software infrastructure. There wasn't much in the way of platform documentation available on the JBoss web site, but we believe it to run on Windows, Macintosh and most/all flavors of UNIX.

e) Resin (close to J2EE)

Resin, from Caucho Technology Inc. (www.caucho.com), is a fast servlet and JSP engine that was first released in January 1999. The software is made available under the Caucho Developer Source License, which provides development free of charge and requires that licenses be purchased for production and deployment. The price of Resin core technology has remained at $500 since it went on the market in 2000. In 2001, Caucho introduced Resin-CMP that has now been combined with EJB functionality for the release of Resin Enterprise, which took place in the second quarter of 2002. Priced at $1000 per server, Resin Enterprise is an affordable solution that combines EJB with core servlet and JSP technology and web services. Resin Enterprise is highly scalable and works on all major operating systems.

Servlets and JSP pages can take time: they may need to query databases, read files, and calculate. Each static web server, like Apache, may be underused and can support multiple Java processes. Load balancing lets sites scale by adding new servers as demand increases. Load balancing increases reliability because Resin will automatically try another Java server if one fails. As an illustration, if one web server has a 1% chance of failure, two web servers balanced by Resin have a 0.01% chance of simultaneous failure.

Resin includes a full-featured HTTP/1.1 web server dedicated to serving fast Java dynamic content. While Resin is tuned for dynamic content, its static file performance matches or beats Apache's static performance. Many, if not most, sites that use Resin, will use its web server for all their web server requests. Resin encourages separation of content from style with its XSL support. Servlets can generate simple XML and use an XSL filter to format results for each client's capability, from palm pilots to Mozilla.

Resin supports the latest Servlet 2.3 specification from Sun. Its performance, even as a separate process connected by sockets, outperforms native Apache modules like mod_perl and mod_php. Processing of JSP 1.2 files is the simplest use of Resin. Resin simplifies creating Java classes by automatically recompiling and reloading the Java when the source changes.

Resin is not J2EE-certified and Caucho is not planning on going through that process, saying that it is much too expensive for the prices they sell Resin at. Currently, Resin-EE supports almost all of J2EE. The missing pieces are RMI support for EJB, the JCA, and .ear support. (There may be some other minor missing parts).

f) Which one should I choose?

The server side technology set you select depends on a number of factors:

- What is the current or desired future skill set of your team?
- What is the complexity of the server side application you need to deploy?

- How important is code re-use weighed against time to market for this project?
- How important is raw performance?

If you need to perform basic integration of a game client to a high score list shown on a web site, then technologies such as PHP or Perl will be a better choice for quick implementation. If you intend a very sophisticated web site environment with longer-term extensibility, J2EE servers such as Apache, Jakarta, JBoss and JRun may be a better fit. The nice thing about the J2EE standard is that unless you code to manufacturer-specific extensions, it is trivial to port applications from one server to another. For example, a non-newbie Java developer or administrator should be able to wake up in the morning with a working system running on Tomcat and leave for an early dinner that night having deployed the application to a fresh installation of JRun.

There is an important server application design principle to be aware of – don't over engineer. As long as you can design in the ability to split the application across multiple servers, you should be able to relatively inexpensively scale the application when the need arises. Hardware is almost always less expensive than development time and effort. Spend your optimization time where it counts most, for example inside of the game server to minimize the amount of time spent processing a request.

4. Databases

The database system is an essential part of more sophisticated online games, providing a persistent memory to record and subsequently query any and all data related to the game. This data can range from the hair color of each player's avatar to the credit card number associated with a particular account.

Further, this data could have historical tracking which would be useful for game tweaking or for marketing purposes. This type of data tracking is known as data warehousing or sometimes data-mining. An example of data warehousing would be to record the average time each player is logged into the game over some period of time, and be able to average that across all users and across different regions. This type of data may help in making decisions about how and where your servers are deployed, or to help sell in-game advertising to potential sponsors.

No matter how the database is used, it must include several fundamental pieces: speed, security, stability and programmability. Speed and stability are obvious features that any game platform would desire, but security is another aspect of a technology platform that cannot be stressed enough. Great care must be taken when handling sensitive customer information, especially credit card information, so it makes sense to gravitate towards solutions proven in the field for their robust security.

In addition, programmability can be very important, depending on the complexity and nature of the game's requirements. Most modern databases support the Standard Query Language (SQL), while some vendors also add custom language extensions on top of SQL that further take advantage of their key features. Additionally, if more programmability is desired within the database to reduce strain and complexity on the application servers, then a database that allows custom packages to be written in C/C++ or Java may be of more importance.

The free-software / open-source movement of recent years has resulted in several good database options for the independent game developer. Many of these programs not only meet a majority of the above criteria, but also are much simpler and easier to administer than larger vendor offerings. Further, while some may argue that large "enterprise" database systems offer a much bigger variety of features, in fact many of these features are unnecessary for the needs of the independent game developer, and actually require more work to secure and maintain than going with a "lean-and-mean" solution.

a) MySQL

The best-known and usually best choice among these free database systems is MySQL (www.mysql.com). MySQL is an open-source package considered by many people to be one of the fastest and most robust database systems available. Recent benchmarks show MySQL to be

faster than many of the expensive commercial database engines available, and it supports the majority of the most commonly offered database features. Most importantly for the small developer, it is considered to be easy to secure and administer.

For deep programmability, MySQL offers open-source extensions that allow C++ or Java hooks directly into the core database engine. This is important, as one of the drawbacks of a MySQL implementation is that many of the "enterprise" applications and tools that may come bundled with a commercial offering are not found here. Although some rudimentary tools are included or easily found, good data warehousing tools and more complex administration GUIs are the exception, rather than the norm. While deep hooks are available and interesting to some programmers, most will be content with the JDBC, ODBC, and C++ connectivity that makes it possible to read data from and write data to the database from virtually any modern programming language.

The low overhead and easy administration of MySQL, along with the open-source nature of the product, translate to a low total-cost-of-ownership (TCO) for the independent game technology platform. This low TCO is vital to the independent game developer as budget is usually one of the most rigid parts of their development cycle.

In the opinion of this author, when raw speed for little-to-no cost is the prime requisite, the independent developer can't find a better solution than a MySQL database implementation. The extensibility of its C++ and Java connectors allow the developer to develop any custom features or tools they require. MySQL offers a powerful raw engine and support for most of the ANSI-standard SQL feature-set, with an open-source GNU license whose price can't be beat.

To go along with your MySQL database (or virtually any other database that supports JDBC), we recommend SourceForge's *SQuirreL SQL Client* (squirrel-sql.sourceforge.net), a free open-source graphical Java program that will allow you to view the structure of a JDBC compliant database, browse the data in tables, and issue SQL commands.

b) PostgreSQL

(http://www.postgresql.org) PostgreSQL is another free and open source database, but with an emphasis on standards compliance and portability. Running on 34 UNIX platforms along with windows, this fully ANSI SQL compliant database also complies with ACID and boasts an excellent free support group as well as a for-hire professional support group should you require that level of service. For high volume requirements, PostgreSQL supports database replication and boasts a quicker multiple row storage strategy called MVCC. It also supports a wide range of native plugins for every major programming language.

Before you start your project, consider why you are using a database. The programming and performance hits can be considerable. Do you really need persistence across executions of the program, or is it acceptable to potentially lose data in the case of an unexpected shutdown? For example, even the largest of casual gaming web sites might consider the speed and simplicity of storing data in memory to be preferable for applications such as high score lists. You could augment such a strategy by periodically writing out data to a flat file and coding the server with an option to read from that flat file at startup.

Another interesting option that is more sophisticated than storing data in custom data structures in memory is to use an embedded B-tree-based database, such as *BerkeleyDB* (www.sleepycat.com).

5. Digital Rights Management (DRM)

The 'shareware' business model has been around ever since it was possible to download bits from a public server. The model was to make games and other programs available for free and then on startup screens and in the *README* files to plead with users to send a check via snail mail to support the developer if they were pleased with the software and intended to use it again. The model survives to this date, with innovations addressing problems of security and efficiency.

The old model had no facility to protect the intellectual property of the programmer from theft; it was based entirely on the honor system. While some people paid, even the best programmers made only side profits from the practice. Nobody has ever built an empire by leaving the decision to pay entirely to the consumer. Indeed, software piracy runs rampant in the console and CD-ROM gaming industry today despite enormous efforts by national governments and industry groups. The old model was also highly inefficient. Even honest consumers might not remember to mail a check once they were through tapping keys.

Today, the software that is freely available on public servers is generally a 'trial' version that is crippled in some way. Some developers allow the software to run for a limited amount of time or number of executions after the first execution. Some choose to limit the feature set available. Others use a combination of the two approaches. In virtually all cases, an electronic key is used to unlock the full functionality of the software, which was present the entire time but simply locked away. The key is generally tied to both the particular game and the particular user's name to limit abuse. Keys are generated at the point of sale and displayed on the screen and/or emailed to the purchaser along with instructions on how to download and install the software.

In order to unlock the full functionality of trial software, users must copy the key and paste it into the designated field, generally located on the splash screen, along with any other identifying information that might be required. In most cases, that's the extent of the protection; if a key is compromised other people may use it to unlock the software, though such reuse of keys is against the law. Requiring personal identification such as a first and last name to be used along with the key seems to go some ways towards keeping owners from posting keys to public web sites or otherwise distributing them broadly to friends, but they do get passed along and sometimes posted. Most developers and distributors consider this security model to be acceptable because:

- The process is simple and dependable for unsophisticated users.
- It succeeds in getting most people who actually would purchase the software to purchase it rather than pirate it.
- Market acceptance is more important than ultra-tight security at this early stage of establishing a mass market for downloadable shareware games.
- The solution can be coded and managed in-house by distributors and easily integrated into games by developers.

One further enhancement is to have the unlock process conduct a behind-the-scenes handshake with a central server to ensure that the key has not been overused before allowing the game to unlock. The down side of this approach is that users must be connected to the Internet to unlock the game, which is becoming less and less of an issue as universal connectivity is becoming a reality, especially for early adopting consumers purchasing games online. This scheme is not foolproof: clever hackers could take a legitimately purchased installation and create their own installer for the file image. Clever programmers could alter the model to tie the installed image to characteristics of the machine. The battle wages on…

There are companies who sell highly advanced software to wrap games in a secure blanket and eliminate all but the most sophisticated hackers and pirates. Such companies have been around for several years, but at this time the more advanced solutions have not gained tremendous market support. Reasons include user complexity, implementation complexity, and licensing cost. As the market matures, developers and distributors **will** move to more and more secure solutions; what those solutions look like is not yet clear.

There is one foolproof way to ensure that only one person is using a software license at any given time: authenticate the use of the game each time it is played. Perhaps one reason behind the success of MMORPGs is that it does someone little use to copy the CD-ROM, as there is no single player version of the game and only one person can usually be logged into an account at any one time. As an example of this, Shockwave.com recently launched the first online games subscription where the full premium version of many shareware games can be played online-only for a monthly fee.

6. Online Payment Processing

How does this magic unlock key actually get purchased and delivered to paying customers? The general idea is that a customer completes a secure online purchase transaction to transfer payment to the seller. Then, after the transaction is complete, the seller sends the key to the customer. There are a variety of ways to do this, some accessible to even the small independent developer.

The *Yahoo! Store* (store.yahoo.com) is a very basic approach for processing purchase transactions. The cost is very low – around $50 per month for the service plus 5% of each transaction. Setup time for a few products takes a matter of hours, and the required merchant bank account application process is streamlined by an arrangement between Yahoo! and Paymentech. The store operates in two modes: one allowing a successful purchase to result in an immediate download, and the other sending a real-time message to a trusted server, for example to initiate a process that generates a key and emails it to the purchaser. This solution worked for Shockwave.com for quite some time and it is still the solution of choice for many small developers.

PayPal (www.paypal.com) offers another low cost, easy to implement solution for processing online payments. Historically, PayPal only accepted payments from users who held PayPal accounts, which severely limited its utility for selling to the mass market, but they recently expanded their service to accept credit cards, which should alleviate this problem, and to support a recurring billing model to support online subscription. Fees seem to be in line with the *Yahoo! Store* solution, but the authors of this paper have no direct experience with PayPal.

The next step up from using a service such as Yahoo! Store or PayPal is to build your own shopping cart application using technologies discussed in this paper, such as a J2EE application server and a database. You must also form a direct relationship with a merchant bank such as Paymentech (www.paymentech.com) or InterCept Payment Solutions (www.epx.com) to handle the actual credit card transactions.

E. *Case Studies*

We now look at several projects from leading developers who have utilized the products mentioned in this paper to create games for the various revenue channels and publishers also mentioned throughout the paper. In previous sections, we exerted some amount of editorial liberty to keep discussions focused on technology and to ensure that similar issues were discussed concerning various platform providers. In this section, we let the developers have a little more free rein, which is something you should keep in mind as the reader.

1. Case Study #1: Tools & Techniques Used at Large Animal Games

Although tools are widely used in the development of PC and console games, we believe they are under-utilized in the development of smaller-scale online games. At Large Animal Games (www.largeanimal.com), we find that using tools increases efficiency and makes managing complex projects easier. Tools allow us to be more flexible in our development, even under a tight schedule. We are strong believers in the philosophy of data driven design and many of the tools we use are there to facilitate (and enforce) this approach.

Until the latest revision of consoles and until a few years ago on the PC platform, you had to code ‘at the metal’ to be able to achieve competitive performance levels. Only with the latest platforms has it become possible to use libraries, layering, third-party ingredients, etc. to compose a game experience. As machines become even faster, it makes sense to continue this trend towards greater levels of abstraction in order to gain further levels of efficiency in the development process.

Modern games typically have a very large number of parameters that control the behavior and nature of the game (enemy logic, terrain features, object behaviors, etc.). The point of data driven design is to decouple coding and game content as much as possible. By factoring these out into a non-code metadata layer, designers, artists and level designers can make changes to the game assets and game play without requiring a programmer at each step. In a nutshell, you achieve several key gains:

- game behavior can evolve without affecting code
- code can evolve without affecting game behavior
- different teams can work on each

In this section we will discuss the Large Animal custom toolset. Macromedia Director is currently our primary development tool; the tools we'll mention were developed in Director/Lingo and incorporated into a production process built around Director. That being said, these types of tools could be developed in nearly any language and are useful to game development in almost any environment. Although there are advantages to developing these sorts of tools oneself, it may be more cost-effective to buy tools or libraries from 3rd parties, especially if the source code for the tools comes with the license. The types of tools we use and recommend fall into two main categories:

- **Asset Management Tools**: asset creators, importers, and packagers.
- **Game Data Creation and Control Tools**: level design, interface design and music design tools, as well as more general utilities for manipulating the output of those tools.

Tools from each of these categories integrate with, and are knit together by reusable code modules (simulation engines, UI libraries, runtime database libraries, etc.) Throughout this section, we'll use italics for our tool names and block type for our code module names.

a) Asset Management Tools

We have developed a trio of asset management tools that interlock with a custom resource management code module to help manage the creation, integration and packaging of online game assets.

(1) Asset Creator

Once production begins on any Large Animal game, the first task for the lead artist is the creation of a spreadsheet with a row for each art resource that the game requires. Often several sheets are created, one for each discrete asset category (interface graphics, game graphics, etc.). The *Asset Creator* reads this spreadsheet and creates a corresponding file hierarchy complete with dummy graphic(s) for each asset. It is important to note that each resource may include several assets; for example an animation with 10 frames would have 10 assets but be considered one resource. In this case, the *Asset Creator* creates a subdirectory for that single resource which includes 10 dummy frames. This tool allows everyone in the project to see what assets there are, and to change the assets in the game simply by changing the sheet and rerunning the tool. It also provides programmers with "graybox" art that they can use to implement and demonstrate functionality while awaiting real assets. As artists update assets they can simply replace the dummies in the file system. The game's sound designer also uses the *Asset Creator*.

(2) Asset Importer

In spite of Director's cast library system, keeping all the assets in a game up-to-date manually can be tedious and time-consuming. The *Asset Importer* not only imports all assets from the *Asset Creator*'s file system into Director, but also creates a new, runtime accessible spreadsheet that can contain additional fields that describe game-specific properties of the assets. Once the resources have been imported, their properties can be easily modified by editing the spreadsheet in Microsoft Excel. In a game that involves a physical simulation, for example, the game designer could use the spreadsheet to provide default physical properties for the resources such as mass, surface friction and so on. At runtime, a code module reads in the *Asset Importer*'s resource file and creates a resource database. Access to this database is controlled by a `resource manager`, which supplies resource objects encapsulating all relevant information about a given resource. This framework also guarantees that a missing resource will not cause the game to

break; instead the `resource manager` can simply create an internal error message and return a default resource to the client.

(3) Asset Packager

One of the great strengths of Director for online games is the external cast library. Using path information from the *Asset Importer*-created spreadsheet, or cast member property information, the *Asset Packager* creates external cast files filled with resources that can be loaded and linked at runtime. So for example, in a game with multiple environments, the game can load only those assets needed for a specific environment and download other environment's assets as needed over the course of play.

Using these asset management tools, all relevant game information is stored in external data files and the process of working with that information is automated. This saves tremendous amounts of time and brings an invaluable flexibility to the game development process. If the assets in a project need to be reorganized in some way because the game flow or download strategy has changed, one can simply change the spreadsheet, re-run each of the asset tools, and rebuild the game without changing any game code.

b) Game Data Creation and Control Tools

We refer to in-game copy, game configuration information, level descriptions and interface designs and other non-rich media assets (anything that is not sound or image) as "game data". At Large Animal, we endeavor to store all game data in external spreadsheets whose first two rows define the field names and field types for the data being included. We then use our generalized Text File Parser to bring the data into the game in a custom code module that supplies relational access to these data sets at runtime. Similar to the Resource Manager described above, a data manager supplies a single, fault tolerant point of access to all game data. While in some cases, such as with in-game copy, these game data spreadsheets must be populated manually, we've developed three data creation tools that also generate external data files, which are then incorporated into the game and parsed in the same way as those created manually. These tools consist of: a *GUI Creator*, a *Music Composer*, and a *Level Designer*.

(1) GUI Creator

One of the biggest time saving tools is the *GUI Creator* tool we have written for laying out user interfaces and defining mappings between interface components and their controlling code objects. To do this we create a separate Director project into which GUI assets are imported using the same tools as in the real game. We then use the Director Stage and Score to layout GUI components visually and to represent the GUI hierarchy within a given component set. Custom behaviors allow us to specify which type of object a given component should use as a controller and the object hierarchy for each component. We use Director's built-in property inspector to set visual properties of the interface components. We then use the tool to create a text output file that is read into the actual game and used to create the interface hierarchy dynamically as needed.

To go along with this tool we have created a GUI code module, which can configure itself from the information contained in the layout data file. Thus, the GUI code is de-coupled from the game code and implementing a new GUI simply requires a programmer to implement message mapping within component instances corresponding to meaningful commands in the game.

(2) Music Composer

In the continual pursuit of smaller application sizes for online and downloadable games, music is often the first category of assets to be cut back. To address this, we created a simple multi-track music sequencer tool that allows a sound designer to create a piece of music from smaller loop sequences. The *Music Composer* tool outputs text composition files that are read in at runtime by a composition playback code module. Using this strategy and the right library of loops, a great variety of music can be included in a game

without a correspondingly large amount of data. The text file generated by *Music Composer* can be referenced by other tools (such as *Level Designer*, described below) so that level designers can incorporate music files into different points in the game.

(3) Level Designer

Most console and CD-ROM games use some kind of visual level design tool during production; we wanted to bring the same technique to bear on our development process. We developed a relatively abstract *Level Designer*, which is made up of several loosely coupled modules, allowing us to use the same designer for very different game projects by simply modifying or extending existing components. We use a simple, two-method interface to publish game objects to our level designer(s). This approach has worked well in creating everything from puzzle games to RPG's to action sports games.

One important goal with any level design tool is to make it easy for coders to expose functionality to designers in a clear, robust fashion. The functional divisions in *Level Designer* correspond to separate code modules:

- The cursor module implements whatever functionality needed to allow the designer to interact with the game world, e.g. select, deselect, move objects, and so on.
- The design state module keeps track of the state of the designer and allows additional states to be implemented. For example, a character-based simulation might require modes for object placement, path placement, etc.
- The object interface module displays data about different game world objects made available through a single interface within each game object. It also handles setting game object properties if they are changed in the designer.
- The serialization module processes the game world to create the appropriate level file format for that game type.

Throughout the previous discussion of tools we have referred to custom code modules designed to work with these tools. In a sense, these reusable modules are themselves another kind of tool. While some of the tools we've described, such as the *Asset Management* trio, do not require any particular runtime modules to be useful, we've found that the largest return on our investment in tools comes when using code modules that are designed to take advantage of external data sources. For example, having a resource manager code module that integrates with the output from our Asset Tools has dramatically increased the value of those tools.

(4) Conclusions

The types of tools described above are useful in any sort of game development, but they are most often discussed in the context of large-scale PC and console games. We've found that tools like these are just as valuable when developing smaller-scale games, affording us much greater flexibility and efficiency during the development process. This allows us to spend more time working on making the game fun, rather than just making the game work. While the initial cost of a specialized production tool and the additional learning and integration time that a new tool will require can be significant, we've found that the return from this investment can cover those costs within just a few projects. In fact, we feel that our commitment to data-driven design and the creation of custom tools that support this approach are a big part of the reason we have remained profitable over the past several years.

2. Case Study #2: Triclops, from Uccello Software

- *Technology: Online game is Flash 5 Player, download game is Flash 6 Player*
- *Available on: RealOne Arcade, Shockwave.com (triclops.shockwave.com)*

Triclops is an animated puzzle game with great looking graphics where the player creates and removes groups of triangular pieces from a triangular playing board while racing against the clock. *Triclops* was launched with a feature-limited free web version, along with a download version.

The flexibility of the Flash platform made it effortless to support multiple versions on virtually all Macintosh and Windows platforms released in the last eight or so years. At periodic milestones throughout the development process, a Flash movie (a `.swf` file) was easily deployed both on the web and as a platform-specific executable. The Flash MX authoring tool makes it easy to create a "Projector" which is the Flash Player with a `.swf` built into it, for both Windows and Macintosh.

Triclops benefited greatly from the file size strength of the Flash platform. The online game is a compact and quick load, which helps attract a broad audience, since even for dial-up players the game loads in less than a minute. Likewise, the full download of the offline game is tiny at just under 1.1MB.

During development, a few techniques were used to help overcome the performance limitations of Flash:

a) Look-up Tables

An age-old programming technique called “look-up tables” was used to perform calculations in advance. For example, as the triangles fall, they move along a circular arc. Computing this motion required multiplying the radius of the motion times the sine and cosine of the current angle. These computations are expensive and slow in Actionscript, Flash’s programming language. However, the radius never changes and we noted that rounding to an integer number of degrees (0-359) provided sufficiently smooth animation. Therefore, we computed an array of 360 elements in advance to hold the product of the radius with the sine of each degree. (Note that cosines are the same as sines, but shifted 90 degrees, so it's not necessary to have two arrays.) Thus, the calculation is reduced to an array look-up as the game is animating, since this table can be built as start-up time.

b) Quality Mode

By default, Flash achieves high quality anti-aliased graphics using 4x over-sampling. On faster machines (1 GHz and greater), *Triclops* has no problem achieving a high frame rate, even with such high quality, anti-aliased graphics. However, *Triclops* monitors its frame rate and if it detects that the frame rate is dropping, it dynamically lowers the render quality. This is an extremely effective technique; significant speed improvements were possible on low-end machines by simply lowering the render quality (using the `global _quality` property) to reduce the fidelity of the anti-aliasing. Users with slower machines are somewhat used to lower quality graphics anyway, but they would not be as tolerant of noticeably skipping animation or of slowdowns in game play.

3. Case Study #3: Collapse, by GameHouse

- *Technology: Online game is Java 1.1, download is C++*
- *Available on: Microsoft Zone, RealOne Arcade, Shockwave.com, Yahoo! Games, others*

Collapse! was supposed to be fun. Most people will say it IS fun, but what I mean is that the reason it exists was to give a GameHouse (www.gamehouse.com) programmer a much needed, *fun* escape from working on multiplayer poker games for months on end. It has turned into the most successful game of all time (ok, not yet, but it is our most popular). *Editor’s note: We believe it to be the highest grossing shareware title of all time and that its sequel, Collapse II, promises to eclipse the success of its forerunner.*

The original *Collapse!* was written using Java 1.0 but will make use of some Java 1.1 methods if available. From start to finish, including development, quality testing and game balancing, the production lasted approximately 3 months. *Collapse!* is a very simple game, but the process of simplifying it; boiling it down to its essence and building just the right amount on top of that, takes time and talent. Besides, an Internet game, especially a popular one, is never really “finished”. Changes are constant; whether it is to

build in advertising of one form or another, make bug fixes, add security or modify for a specific website, development is ongoing.

The download size of the "final" game, including graphics, audio and code, was approximately 90Kb, small enough to download in under 1 minute on virtually any internet connection (it has since grown with added features, but remains small). All graphic assets are loaded from a single file to minimize download time, and the Microsoft CAB file containing the code is smaller than the ZIP file with the code, so the download size in non-Microsoft browsers is slightly larger.

The Java version of *Collapse!* uses an IP lock mechanism and supports expiration dates so that the game cannot be copied and used on unlicensed websites and we can "revoke" licenses by letting them expire. No server software is required to support the licensing, except that the game must be loaded via HTTP to work properly.

When we planned to start selling the game, we made the decision to port the game to C++. There were several advantages; we could get better performance and security would be better, but the primary reason was to keep the download size reasonable. Installing the JRE with the game would increase the download size by 800%, something that didn't seem reasonable. Another reason is that when shipping with a 3rd party component, like Java, you run a very high risk that the component will be updated in a way that breaks your product. Our C++ version of *Collapse!* has no component requirements (but it does use DirectSound if available).

The conversion from Java to C++ was very easy. We created C++ implementations of the most common Java classes and used search/replace a lot. Most of the work was in freeing all of the memory, since Java is garbage-collected. It took approximately 3 weeks to get a C++ version of *Collapse!* running that was identical to the Java version. It took another 3 weeks to update the graphics (all of the graphics were remade to be larger and higher quality) and add the features specific to the C++ version. Including the installer and security code, the size of the downloadable was 1.3 Megabytes.

Of course, picking the right platform and tools is the easy part. Putting together a talented and creative team is the hard part. *Collapse!* involved the efforts of over 10 people, including 3 programmers, 3 artists, several testers, a team leader, a game designer, and invaluable input from our entire staff and beta testers.

4. Case Study #4: Blasterball Wild II, by WildTangent

- *Technology: WildTangent Web Driver*
- *Available on: Shockwave.com, Hewlett-Packard & Compaq computers, others*

Blasterball II was built on a very short timeline – about a month and a half, and then a further 2 weeks of QA testing to finish. The team consisted of one programmer, who also served as artist and sound designer, and 1 musician.

Blasterball II was written entirely in Java. It used the WildTangent WebDriver as a graphics layer. Since the WebDriver supports Direct3D and has its own software rasterizer, Blasterball II works with or without 3D acceleration – although users with supported 3D acceleration will see increased graphical quality and effects. The WebDriver is currently a Windows-only technology, built upon DirectX, so platform is limited to Windows 98, ME, 2000, and XP.

Blasterball II works as a browser-based game and as a standalone application. We developed a standalone launching and purchasing system that supports hosted browser windows and Java applets. This means that we only have to write our games once, with no need to maintain a separate code base for downloadable applications.

Using Java, it was relatively quick to prototype basic game play. As a very C-like language, it is generally a simple process to port existing code from C/C++ applications, or other similar languages. We have

been developing with Java for several years so we have a large body of experience and code to draw from, which makes prototyping very easy.

A large concern with browser-based games is bandwidth – it is important that users wait for as little time as possible to get to the meat of the game. Using the WebDriver, which has built-in asynchronous media loading, it was a simple process to stream files on an as-needed basis. In addition, `.zip` compression was used on bundles of files that were needed at the same time to minimize download threads and HTTP requests and further speed up the download process.

The final game ended up at about 2.5MB, including 10 game backgrounds, 100 levels, five 1-2 minute music tracks, 40 sound effects, and 125 sprites. The final download package included the WebDriver standalone installer to make sure that the user's first-play experience was as painless as possible; this added only one Megabyte to the download.

In the end, *Blasterball II* turned out to be quite playable on most machines – both low-end, and high end. Frame rates tended toward 70 FPS on modern machines, while on older systems 20-30 FPS was the norm.

5. Case Study #5: InkLink, by Shockwave.com

- *Technology: Shockwave 8 Player, POP.X Multi-player server*
- *Available on: Shockwave.com*

InkLink (inklink.shockwave.com) is a single-session multiplayer draw-and-guess game that launched on shockwave.com in the fall of 2000. InkLink is available as a free, web-based game on shockwave.com and is supported by advertising revenue.

The user experience starts with a robust lobby system, which allows players to browse through all the rooms in the system before selecting one. Each game room can contain up to eight players. The game's dictionary contains approximately 1500 words. When a player's turn comes up, they are presented with a secret word. The player draws the secret word while the rest of the room tries to guess.

Director/Shockwave was selected as the client technology for multiple reasons. The Shockwave browser plug-in comes with a multi-user protocol. Additionally, Lingo syntax contains pixel manipulation commands required to transmit and render the players' doodles.

The core server software architecture is HearMe's POP.X software. POP.X was selected because it supports the same protocol as Macromedia's Multi-User Server (MUS). Macromedia's MUS is licensed with every copy of Director 8 and can be used for no additional cost. Unlike MUS however, POP.X runs on Sun's Solaris operating system. This was a critical operational consideration for shockwave.com in order to keep a homogenous production server environment.

The core server software is augmented by substantial InkLink-specific Java code. Each player's client connects to the server and is represented on the server by an instance of a client-proxy class. All game logic takes place on the server. The client software only accepts user input, sends/receives network messages and changes the UI presentation in response to server messages.

For nearly three years, InkLink has been one of the most popular games on shockwave.com. The game's extensive lobby system and simple design has been critical to its success. However, the development, deployment and maintenance did not come without its lessons.

The server software, POP.X, is currently orphaned, since the vendor, HearMe (f/k/a MPath), is no longer in business. Before closing shop, HearMe did transfer support services to a new company. However, the software's lifecycle stage is support only: no significant new versions or refinements are planned. To protect against situations like this, it would be helpful to negotiate that a binary-only license should revert to a source-code license in the event the product is discontinued.

A source-code or open-source license for the server software is valuable even from the onset of a project. Commercial multi-user server products usually are not deployed at a large number of licensed sites. Development, debugging and tuning become much easier with visibility to the inner workings of the system.

The game server is a cluster of machines that cannot be easily scaled. Shockwave.com aggressively designed the server application so that the entire universe of players and game rooms is visible, real-time, to the rest of the system. This fully visible universe is difficult to scale: the addition of a server box provides a diminishing increment of simultaneous user capacity. Future iterations of InkLink will reduce the amount of communication required between servers.

6. Case Study #6: *Yohoho! Puzzle Pirates* by Three Rings Design

- *Technology: Game is Java 2, download only*
- *Status: Expected to launch in Q2 2003*

Yohoho! Puzzle Pirates (www.puzzlepirates.com) is a massively multi-player Pirate game featuring puzzle games as its core gameplay. It has been developed in 18 months by Three Rings, a small company with an initial team of three, grown to six over the first year. In designing *Yohoho!* there were a number of key objectives:

- **Game design:** fun, ease of use over realism, depth of game play through player interaction.
- **Technical:** simple, rapid development, reliable, maintainable.

Yohoho! makes a good case study of a compact MMP game achievable by an independent team, albeit one with considerable prior experience with this kind of development.

a) Technology Platform

Puzzle Pirates has been developed in Java 1.4 on Linux, for deployment on Windows (98 and up), Linux, and Mac OSX (soon). Three Rings has a policy of using open source software wherever possible, for both reasons of transparency, ease of use, and cost.

(1) Client Platform: Java

Java was chosen as our client development platform for a number of reasons. The strongest influence being the development team's prior experience with the technology in making simpler web games and in developing large-scale distributed systems. The availability of production quality open source libraries that aid development of both the client and server is also important, as we have limited developer and financial resources.

Using Java for the client, game server and web server allows us to share code across the board which has proven a boon to maintenance and minimized development effort. We are considering additional plans to reuse our client code for standalone versions of our puzzles deployed to J2ME-enabled mobile devices.

Deploying the client with a known JVM is critical in minimizing our support costs and ensuring that the game functions reliably given its complexity. Using JNLP, the Java Network Launching Protocol, to deploy our application allows us to deploy with a specific JVM and handles the downloading and updating of code and game media. Open source implementations exist as well as a reference implementation from Sun called Java Web Start which is bundled with their Java runtime.

(2) Server OS: Linux

Considering our desire to use Java on the server side, we were strongly incentivized to use an operating system with a robust, high performance Java Virtual Machine. At the moment, this means Win32, Linux or Solaris. Our experience with the total cost of

administering and maintaining Unix-based system steered us heavily away from a Win32 platform. Given our small budget, the choice between (free) Linux on inexpensive x86 servers vs. (expensive) Solaris on (expensive) Sparc servers was not a choice at all. Additionally, the bevy of free software tools for maintaining large Linux installations has been a boon to our development of a low-maintenance production server environment.

(3) Database: MySQL

MySQL was chosen to minimize cost and because of prior experience developing and maintaining systems using its technology. It has the additional benefit of allowing transaction-protected tables to coexist with higher-performance non-transactional tables. Given the widely varying persistence needs of an MMP game, this has been beneficial in achieving performance where necessary while carefully protecting more important information such as in-game financial transactions.

Various open source JDBC (a Java database access API) drivers are available for MySQL. We chose the mm.mysql drivers, one of the more popular and highly performing implementations.

(4) Web: Apache/Tomcat

Web components of MMP games are becoming increasingly important, especially given the large quantity of derivative information that is of interest to players (e.g. top ten lists, directories of social groupings, etc.). *Yohoho!* takes the additional step of making a web interface available within the game and relying on the web interface as the primary mechanism for viewing certain information (e.g. users' puzzle ratings) and taking certain game actions (e.g. forming a crew).

To meet our web needs, we chose the Apache web server and the Tomcat servlet container, both of which are entirely free. Tomcat and Apache are widely used, have thriving development communities that are very responsive to and supportive of developers making use of their software, and perform better than or comparably to their commercial competitors.

Those web services that are tightly integrated with the game are developed in Java which allows us to share code between the client, server and web services. We are additionally using PHP for certain of our web services that need not be as tightly integrated with the game and thus would benefit less from code reuse.

(5) Development Environment

Our internal development environment is also heavily based around free software. Code and art resources are shared using CVS, a version control system that doubles as a file distribution system. Because all development files are stored in CVS, each developer maintains a mirrored copy of the resources they need on their workstation, eliminating the need for a networked file server.

Code development is done using Sun's JDK, the free Jikes Java compiler from IBM and the Apache Ant build system from the Apache Jakarta group. None of the programmers happen to use an integrated development environment, but that is more a matter of personal preference than lack of support.

The art pipeline is comprised mainly of custom tools (written in Java and deployed internally via Java Web Start), CVS and scripts that automatically update from CVS and rebuild the entire game periodically.

b) Technology Design

(1) Network layer

Yohoho!'s architecture is client/server and built upon an abstraction layer of distributed objects. The internally developed distributed object system is a lightweight, event-based framework for sharing information, reacting to changing state and explicitly invoking procedures over the network. Along with our entire game development library, we will be releasing the distributed object framework as an open source library following the deployment of *Yohoho!*

(2) Toolkit-based architecture

Because of the unique nature of puzzle games and our focus on highly refined, polished game elements, we have not gone the traditional route of developing a game "engine" with scripting support that is then used to create the bulk of the game experience. Instead we built an ecology of toolkits that can be used to develop specific games that are then integrated into the system.

This toolkit-based approach allows us fine grained control over the resulting puzzle, while minimizing, as much as possible, the redundant elements of puzzle development. To the extent that puzzles are similar, we have factored the code into a toolkit for developing puzzles of that nature and at the same time developed a framework that simplifies the process of connecting the puzzling results (score, winner, etc.) into the overall game so that they can influence the users' higher level goals, whether those be sailing a ship, battling a monster or crafting a smart Captain's hat from basic resources.

(3) Isometric pre-rendered world

When on land, a pirate moves around in an isometric pre-rendered world. This is achieved with an internally developed engine that is far from sophisticated, but provides satisfactory performance and the necessary features for this component of the game. As walking around on an island is not the focus of a pirate's experience, we have not devoted a great deal of time to adding fancy features to the isometric engine.

Getting Java to achieve reasonable rendering performance has been challenging and has required much experimentation on each of our supported platforms to properly take advantage of spotty hardware acceleration. Though we did not end up writing any native code for rendering, this is one area where we certainly acknowledge that the tradeoffs may favor taking the pain of supporting platform-native rendering engines over using Java directly.

(4) Minimal bandwidth requirements

Due to the network-efficient nature of the distributed object system that serves as a basis for information exchange in our architecture, as well as our lack of need to continually broadcast state updates for characters in the world, our bandwidth requirements are minimal: currently less than one Megabit average outgoing traffic per thousand users. We have made conscious choices in our game design to minimize the amount of information that needs be shared among players and we have remained ever vigilant about conserving bandwidth during development.

c) Issues during Development

(1) Java

Java has been tremendously helpful in many regards, but is not without its sometimes glaring limitations. In many cases we were able to work around limitations in the Java platform, but on a few occasions we have had to write native code to provide support for critical features that are not possible with the current Java release. Some of these issues include:

- Lack of high resolution timer support (on Win98, timing values may be off by up to 50ms)
- Poor support in Swing for "active" rendering
- Omissions in Java's support for hardware accelerated images
- Difficulty in managing overall memory footprint due to lack of visibility into Java's in-memory representation of objects and non-Java-heap memory use by various standard libraries
- Lack of control over key repeat
- Many of Java's standard libraries and services were implemented with a serious lack of regard toward extension and customization
- Ongoing issues with sound playback and incompleteness in the Java Media Framework

(2) Keeping trim

Given our desire to make the game available by download over the web, we developed a draconian budget for sound and image media that could be included in the game. Fortunately, our focus is not on creating a lush virtual world but rather fun game play, which does not inherently require rich and diverse visuals.

Through optimization and reuse of graphical elements and an art style that lends itself toward more highly compressible images, we have managed to maintain a total download size in the neighborhood of 30 to 35 Megabytes. We are investigating the possibility of demand downloading some game media both to further reduce the initial download size and to open up our ability to continue to expand the world.

Additionally, we have structured the media management to allow a CD-deployed version of the game to use more detailed animations, additional animations for circumstances that the downloadable game visualizes with text or static images, and higher quality sound effects and music.

F. *The Consoles*

1. Sony PlayStation 2

Sony Computer Entertainment (SCE) launched online game options in Japan and North America in 2002, in both regions becoming the leading online console gaming platform. In North America, *SOCOM: US Navy Seals*, the first online console game with voice communication between players, and Electronic Arts' *Madden NFL 2003* have become instant online hits with thousands of regular players taking part. In Japan, there are already over 100,000 PlayStation 2 Computer Entertainment Systems connected to the network.

Sony Computer Entertainment Europe (SCEE) will be launching a PlayStation 2 broadband network gaming service in Spring 2003 beginning with the U.K. This will be followed by a phased rollout into Germany, France, Spain, Australia, and other SCEE territories throughout 2003. The rollout will feature a Broadband Gaming Pack, which includes a PlayStation 2 Ethernet Network Adaptor, an online game and a start-up disc featuring demos of upcoming online games. This pack will enable PlayStation 2 owners to access online multiplayer games through a participating Broadband network. It will be sold at the same price as a regular PlayStation 2 game through selected retail and B2C channels.

a) Title Support

A wide range of network-enhanced games will be launched to support the PlayStation 2 online agenda. These will be available through selected retail and B2C channels and will include:

- *SOCOM: US Navy Seals*, *Hardware: Online Arena*, *Destruction Derby Online Arena*, *Twisted Metal Online*, *Frequency 2*, *My Street*, *ATV Offroad*, *This is Football 2004* and *World Rally Championship Online* from Sony Computer Entertainment studios

- A completely new PlayStation 2 version of EverQuest, one of the world's most successful online games, from Sony Online Entertainment
- Network-enhanced games from key SCEE partner publishers such as Capcom, Electronic Arts, Activision, Take 2 and Eidos

b) Open Approach

SCE's philosophy is to have a very diverse and inclusive platform that will enable content companies, games publishers and ISP portals to provide consumers with the broadest selection of new online experiences and entertainment from a variety of sources. The network will not be constrained by any one company acting as a gatekeeper of the content or the consumer.

Publishers are free to create their own network game services, work with leading middleware companies (for example *Tony Hawk's Pro Skater 3* and *4* uses GameSpy), or collaborate with SCEE. Developers are free to select their own technical solutions, opt for middleware, or choose PlayStation 2 oriented solutions provided by SCE.

Likewise, consumers can opt for broadband solutions from either our network partners (who are working to create the best network environment for gaming) or other ISPs who use standard Internet connection protocols through both cable and ADSL connections.

However, the existence of a secure online environment is a crucial long-term consideration for gamers and content providers alike. The PlayStation 2 network will benefit from the proprietary SCE-developed Dynamic Network Authentication System (DNAS) that will offer a secure environment for business partners and consumers.

c) Challenges

The challenges that Sony faces are common with other consoles - broadband is growing fast, but is still in its infancy; "broadband" varies in quality (even within the same country); some broadband operators have encouraged the adoption of USB connection solutions, which are not ideal for connection sharing in a multiple device household (e.g. PC or Mac and PlayStation 2); and in some homes, the current broadband connection may be some distance from the living room TV to which the PlayStation 2 is connected.

d) Current Status

SCEE has already started network game trials, working closely with broadband network partners, which will grow during the early part of 2003 with consumers enrolling on the Sony public website (see links from http://www.playstation.com/).

Sony's initial research suggests that between one third and one half of the ever-growing population of broadband users already have PlayStation 2's in their homes (and thus are prime candidates to play network games). Sony expects that the launch of PlayStation network gaming will further encourage consumers to connect to broadband.

2. Microsoft Xbox Live

The Xbox Live online service from Microsoft is the network infrastructure that supports multiplayer games on the Xbox console. From a player's perspective, Xbox Live provides global gamer names, persistent friends' lists, a standard way to invite your friends to play, plus voice communication. From a developer's perspective, Xbox Live provides a simple interface to an integrated set of online services, including authentication, matchmaking, friends, statistics storage and content delivery.

a) Project Approach

Xbox Live is designed to support a wide range of multiplayer games, from head-to-head sports games to massively multiplayer role-playing games. In its initial version (released November 2002), the Live service focuses primarily on peer-to-peer style games like sports titles and first-person shooters. The Live service includes typical server-side components that many games

require: authentication, matchmaking, friends' management, storage of game statistics, and content enumeration and download.

Xbox Live game projects have longer schedules and larger budgets than single player console games. Multiplayer network games require additional development time and testing time, particularly for tuning the multiplayer experience and building the online UI (player lists, matchmaking screens, and so forth). In addition, time must be allocated to an online beta period. Because there are very few online console games, there are not many well-established points for comparison. Perhaps the most well-regarded online console game is Phastasy Star Online, released for the now defunct Sega Dreamcast.

Xbox Live developers must have expertise in both console development and multiplayer networking, a rare combination. Designers and producers must understand the sensibilities of the console market as well as the slightly different multiplayer gaming market. Although each of these markets is understood individually, the places where they overlap and diverge is not yet well recognized.

b) Risk Management

There are a number of risks in developing for Xbox Live. The primary risk is that Live is a new and unproven service. Many online services have come and gone, including console-based online services (e.g. Sega Dreamcast). The market for online players is small in comparison to the total number of console owners. For instance, Xbox Live requires players who have a broadband connection in their living room along with a willingness to pay for the service, a fairly small percentage of consumers. In comparison, Sony is not limiting their market to broadband, but is allowing players with narrowband to play on PlayStation2. Sony is also not currently charging a separate fee for their online service. However, PS2 owners must buy a network adaptor; Xbox is network-enabled out of the box.

c) Game Mechanics and Interface

One of the most impressive low-level features of Xbox Live is the commitment to security. Secure communications are essential for a successful online game. Online developers spend significant time and effort building secure transport mechanisms to prevent cheating. The beauty of the Xbox Live mechanism is that it's completely hidden and automatic. Network traffic is encrypted and authenticated at the network stack layer. Consoles and players are automatically verified and authenticated during sign in. In this feature area, Xbox Live simplifies the life of developers considerably.

One of the unique challenges of console interfaces revolves around the simplicity of the controller and the lack of a keyboard or mouse. Most online PC players are extremely adept at using the keyboard and mouse combination. Having to use only a controller seems much less natural to a PC gamer. Fortunately, the Xbox Live Starter Kit ships with a voice communicator, so all Xbox Live gamers have a voice input device as well as a controller.

Voice is one of the most compelling aspects of Xbox Live. All Xbox Live titles support voice, and most support it without a "touch-to-talk" controller mechanism – the gamer simply speaks into the microphone and the voice is transmitted to the other players. In addition, Xbox Live includes voice masking technology that hides distinguishing voice characteristics, allowing younger players and females to safely play online. The majority of game designers find that voice is faster, more natural, and much more expressive than keyboard communication.

Designing games around voice technology is one of the unique aspects of Xbox Live. Voice allows games an extraordinary new capability. Current generation games have only scratched the surface of this feature.

3. Nintendo GameCube

We were not able to identify the appropriate contact for the “inside scoop” at Nintendo – hopefully that person will contact us for next year’s paper! – but we were able to find some information on the Nintendo web site (http://www.nintendo.com/online/faqs.jsp#buymodem). Their strategy appears to be similar to the “open approach” of the PlayStation 2, where publishers supply their own back-end solutions.

Sega's *Phantasy Star Online: Episode 1 & 2* is the only game that is currently compatible with the Broadband Adapter and Modem Adapter, which each sell for $34.95 on the Nintendo web site. Once they have the hardware and game software in hand, gamers can sign up to play over the Internet. The online service carries a monthly service charge (which Sega calls a “hunter’s license”) of $8.95 and is available through Sega.com.

VI. ONLINE PUBLISHERS

A. *Introduction*

The online publishers section provides a high-level overview of selected traditional publishers, mobile game publishers and online game sites. In addition to the company background, information is provided regarding announced plans or strategies for online games. The companies include the top 20 game publishers, some top online-only game publishers, and some of the top mobile game publishers. The information provided was compiled from publicly available information and includes sources such as company websites, annual reports, SEC filings, online news sites for the games industry, and game industry publications. A review of the publisher's announced investments should highlight for developers the opportunities available for working with the publishers based upon their strategies. Finally, as corporate information is constantly changing, readers are suggested to visit online publishers' websites to obtain the latest information.

B. *3DO*

1. Website Address

http://www.3do.com

2. Address

200 Cardinal Way
Redwood City, CA 94063
+ 1 (650) 385-3000

3. Publisher Overview

Date of Establishment:	*1991*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*US$ 53 million*
Key Brands:	*Might and Magic, High Heat Major League Baseball, Army Men, Cubix Robots for Everyone*

4. Description

3DO is a developer and publisher of branded interactive entertainment software. The company was incorporated in California in September 1991 and commenced operations in October 1991. Founder, chairman, and CEO Trip Hawkins owns about 39% of the company. 3DO acquired Cyclone Studios in November 1995, Archetype Interactive Corporation in May 1996 and certain assets of New World Computing, Inc. in June 1996. 3DO currently has an active subsidiary in the United Kingdom, 3DO Europe, Ltd. 3DO's software products are available on a variety of platforms including PCs, the PlayStation game console, the PlayStation 2 computer entertainment system, the Nintendo 64 game system, and the Nintendo Game Boy Color and Game Boy Advance hand-held game systems. Betting on the development of the video game industry, 3DO has focused their product development efforts on the "next generation" consoles from Sony, Nintendo and Microsoft, along with personal computers.

5. Online Strategy

Per the company, if Internet-based game play becomes popular, it may opt to develop products and establish a viable Internet business model to remain competitive. It was also issued a patent in 1999 that would supposedly allow the company to create a new genre of Internet-based games and related business models for such entertainment products. However, at this point in time, 3DO has not made public any strategic plans for pushing its game franchises and key licenses into the Internet, except for multi-player functionality in some titles. Presently, 3DO operates its own online store, through which customers can purchase select boxed games via their fulfillment service.

6. Source

3DO 2002 Annual Report, 3DO Website, Hoovers.com

C. *AOL TIME WARNER*

1. Website Address

http://www.aoltimewarner.com

2. Address

22000 AOL Way
Dulles, VA 20166
+1 (703) 265-2741

3. Publisher Overview

Date of Establishment:	*2001 (merger)*
Number of Employees:	*7000*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*America Online, People, Time Inc, TBS Superstation, CNN, Warner/Music/Group, HBO, ICQ, AOL Time Warner, Fortune, Turner, Time Warner Cable, New Line Cinema*

4. Description

America Online is a division of AOL Time Warner, the world's leader in interactive services, Web brands, Internet technologies, and e-commerce services. With its hallmark focus on providing convenient, easy-to-use services for the mass-market consumers, America Online has played a major role in creating the consumer online experience worldwide and is leading the development of the next-generation Internet. With the focus on its consumers, AOL seeks to build a global medium as central (and more valuable) to people's lives as the telephone or television.

5. Online Strategy

AOL is one of the world's most respected and valued companies by connecting, informing and entertaining people everywhere in innovative ways that will enrich their lives. Time Warner Cable's Road Runner service is leading the broadband-only ISPs in the U.S. Currently in development are innovative new services, including server-based personal video recording, home networking and a version of the AOLTV service that can be accessed through the Time Warner Cable digital cable box in customers' homes. AOL announced plans to develop interactive services for consumers in the world's largest market, China. Currently, AOL and Electronic Arts are partners. EA.com is the online division of the leading third-party developer of console software titles worldwide, Electronic Arts. EA.com powers the game channel for all of the AOL brands and services through a five-year $85 million marketing agreement. The deal is structured so that EA receives 70% of the revenue from advertising on AOL and 95% of the subscription revenue. AOL is responsible for ad sales and marketing the site to its users. EA.com offers 61 games in the EA Free Online Section. The games on the site are MMOG's—the popular *Ultima Online* and *Motor City Online*, with *The Sims Online* & *Earth and Beyond* due out soon. In addition, EA.com acquired Pogo Corporation, the leading provider of online mass market games.

Time Warner's America Online sees broadband as the key to their future.

6. Source

America Online Website, AOL Time Warner Website, Electronic Arts website, Credit Suisse First Boston Sector Review – May 15, 2002

D. *ACTIVISION*

1. Website Address

http://www.activision.com

2. Address

3100 Ocean Park Boulevard
Santa Monica, California 90405
+ 1 (310) 255-2000

3. Publisher Overview

Date of Establishment:	*1979*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*US$ 786 million*
Key Brands:	*Tony Hawk's Pro Skater, Mat Hoffman's Pro BMX, Shaun Palmer's Pro Snowboarder, Kelly Slater's Pro Surfer, Shaun Murray's Pro Wakeboarder, Travis Pastrana's Pro MotoX, Spider-Man, X-Men, The Fantastic Four, True Crime, Pitfall Harry*

4. Description

Activision is a video game specialist, distributing hit titles for all the console platforms as well as Game Boy, Game Boy Advance and other handheld game devices. They have grown to become one of the top 3 game companies in the world. If there is any downside to their business, it is a dependency on hit titles. The *Tony Hawk* franchise has grossed over $435 million during its first 3 versions and according to Richard Kotick, CEO and president, *Tony Hawk* produced just about 30% of Activision's revenues for fiscal 2002. This year, Activision intends to introduce 65 games, a 36% increase over the 42 released in the prior fiscal year. They have also invested heavily in other extreme sports titles as companion products to *Tony Hawk*, such as the Mat Hoffman's *Pro BMX* biking game. Activision has major licenses from Disney, Marvel, Star Trek, and Star Wars. Kotick says 80% of expected revenues will come from predictable franchises.

5. Online Strategy

Activision's conservative attitude to costs is reflected in its approach to online gaming, since Robert Kotick, Chairman, CEO and Director, is anxious not to waste cash on an unproven concept. According to him, Activision needs "to find out which business models work here. At the moment, there's no broadband audience, no software and nothing to appeal to the consumer. Online probably won't be meaningful until 2006. Until then, we will build existing areas of expertise." In the wireless space, Activision has been active through licensing and co-publishing agreements with JAMDAT Mobile, Digital Bridges, and Mforma to release wireless games based on their Activision O2, Star Trek, and Atari 2600 classic games.

6. Source

Activision 2002 Annual Report, Activision Website, BusinessWeek Online, Nasdaq International Magazine

E. *ACCLAIM*

1. Website Address

http://www.acclaim.com

2. Address

One Acclaim Plaza
Glen Cove, NY 11542
+1 (516) 656-5000

3. Publisher Overview

Date of Establishment:	*1987*
Number of Employees:	*600*
Net sales (as of August 31 2002):	*US$ 197 million*
Key Brands:	*Burnout, Turok, Shadow Man, Fur Fighters, Dave Mirra BMX, Mary Kate and Ashley Olsen*

4. Description

Acclaim Entertainment Inc., founded in 1987, develops, publishes, distributes and markets, under its brand names, video and computer games for popular interactive entertainment consoles and PCs. In fiscal 2002, the Company plans to release a total of approximately 50 titles for these platforms. The Company develops its own software in its six software development studios located in the United States and the United Kingdom, which includes a motion capture studio and a recording studio in the United States, and contracts with independent software developers to create software for the Company. Regarding software distribution, Acclaim has a competitive advantage over other software publishers because it directly distributes to more than 50,000 stores in more than 50 countries worldwide. With its excellent reputation as a distributor, Acclaim is frequently rewarded distribution rights to a variety of entertainment software from major publishers worldwide. Looking ahead to the future, Acclaim will continue to capitalize on its creative and technological resources and the Company's highly regarded marketing and distribution capabilities to become a leading third party developer and publisher of interactive content for next generation systems. The Company also develops and publishes strategy guides relating to its software and issues "special edition" comic magazines from time to time to support its time valued brands, *Turok* and *Shadow Man*.

5. Online Strategy

In addition to supporting dedicated consoles, portables and PC games, Acclaim is looking ahead to the growing popularity of Internet games by establishing its own online division, Acclaim Online. Acclaim Online is committed to creating a new form of games by enhancing the company's core brands, giving them Internet connectivity; building online communities, and delivering exciting new multiplayer game play over the Internet using Acclaim's exclusive NetSpine technology.

6. Source

Acclaim Website, Market Guide, Hoovers.com

F. *ARUSH ENTERTAINMENT*

1. Website Address

http://www.arushentertainment.com

2. Address

13951 N. Scottsdale Rd.
Suite 233
Scottsdale, AZ 85254
+1 (480) 609-8665

3. Publisher Overview

Date of Establishment:	*1999*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Devastation, Duke Nukem, Feeding Chole, Hunting Unlimited, Monkey Brains, Primal Prey*

4. Description

Based in Scottsdale, Ariz., ARUSH Entertainment is a global entertainment software publisher. ARUSH operates as a division of World Entertainment Broadcasting Corporation (WEB Corp.) which publishes its software for sale in retail stores and on the Internet. ARUSH is an innovator in episodic game delivery. From development to publication to broadcast of games targeted at the mainstream player, ARUSH is an innovator in episodic game delivery. Just as television evolved from the motion picture industry, episodic interactive entertainment will evolve from the "gamer's game" to "everyone's entertainment". ARUSH is targeting the growing mass-market of PC, game console, PDA and cell phone owners with more easily digestible and addictive content. Early in 2001, ARUSH introduced GameCapsule, an exciting and completely new dynamic game delivery system that will make downloading games almost as much fun as playing them.

5. Online Strategy

ARUSH offers a unique content delivery system - the GameCapsule. Combined with premium content, the GameCapsule allows internet game publishers and distributors to quickly and easily add a new revenue source to their site, while streamlining the marketing, purchasing and downloading of game content. Adding in Digital Rights Management to protect the intellectual property of the game developers, the GameCapsule is designed as a total solution for delivering premium content. Any company can use the GameCapsule, from top portals with high traffic looking for something new, to entertainment sites looking to capitalize on already hot properties. Since it is a turnkey solution, the GameCapsule does not require significant investment of money, technology or manpower. Plus, it can be privately labeled to emphasize the site's brand. There is even a dynamic area where promotions, marketing messages or other content can be inserted.

6. Source

Arush Website

G. *CAPCOM*

1. Website Address

http://www.capcom.com

2. Address

1-3 Uchihiranomachi, 3-chome, Chuo-ku
Osaka 540-0037, Japan
+ 81 (6) 920-3635

3. Publisher Overview

Date of Establishment:	*1979*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*US$ 473 million*
Key Brands:	*Resident Evil, Street Fighter, Breath of Fire, Mega Man*

4. Description

With offices in Tokyo and Osaka, Japan; Sunnyvale, California; London, England; and Hong Kong, China, Capcom Co. Ltd. is a global leader in the interactive entertainment industry. Established in Japan in 1979, Capcom produces video games for Sony, Nintendo, and Microsoft game consoles and personal computers, as well as Game Boy systems. It also makes coin-operated arcade machines. The company has created many popular game franchises, including Street Fighter (more than 500,000 coin-operated units and 24 million console games sold), Mega Man (more than a dozen titles and Capcom's official mascot), and Resident Evil (more than 16 million units sold). The company also licenses its titles for movies, cartoons, books, action figures, and comics. Subsidiary Capcom USA operates four Nickel City locations in California and one in Illinois.

5. Online Strategy

Capcom has recently announced that it will participate with other companies in distributing content over the Internet via Xsido's soon-to-be-launched ESD service. Xsido has announced that it is building out an e-commerce system and Content Delivery Network to market to ISPs and multiple service operators (MSOs). Thereafter, tentatively slated for late 2002, it will launch its content delivery service, and will also be launching products such as connectivity hardware and emulators which will allow users to play Dreamcast software on the PC and set-top boxes. Xsido intends to first implement ESD of Dreamcast games for Sega products, and will subsequently enable download sales for Capcom and other game developers and publishers, such as Namco. Because the Softbank group has invested in the startup, it is thought that the new service will first be deployed in Japan via Yahoo Broadband, but both Yahoo and Xsido have refused to comment.

6. Source

Capcom Website, Hoovers.com, Xsido Website

H. *CODETOYS*

1. Website Address

http://www.codetoys.com

2. Address

Innopoli 2
Tekniikantie 14, 02150 Espoo
Finland
+358 (9) 439-3040

3. Publisher Overview

Date of Establishment:	*2002*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Who Wants To Be A Millionaire?, Trivial Pursuit, Zobmondo!!, E.T. - The Extra-Terrestrial, Zobmondo, Subbuteo*

4. Description

Codetoys is a premier provider of complete mobile entertainment services. It acts globally in co-operation with its customers and partners - operators, handset manufacturers and brand and content owners - to help them succeed in the growing mobile entertainment market. Codetoys designs, develops and markets ready-to-play interactive entertainment services for all types of mobile devices and technologies.

5. Online strategy

The company has the industry's most complete set of mobile games and services based on globally recognized brands, and it has released the mobile versions of high profile brands such *as Who Wants To Be A Millionaire?*, *Trivial Pursuit*, *Zobmondo!!*, *E.T. - The Extra-Terrestrial*, and *Subbuteo*. Codetoys has established customer relationships with leading mobile operators in more than 30 countries, making its games the most widely available mobile games in the world.

6. Source

Codetoys Website

I. *CRAVE ENTERTAINMENT*

1. Website Address

http://www.cravegames.com

2. Address

19645 Rancho Way
Rancho Dominguez, CA 90220
+1 (970) 392-7022

3. Publisher Overview

Date of Establishment:	*1997*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Battlezone, Earthworm Jim, Asteroids, Broken Sword II, Filler Loop, UFC Throwdown, UFC Tapout, The Lost, Kubuki Warriors, Whirl Tour, Mace Griffin: Bounty Hunter, Global Operations, Battle Realms, H20verdrive, Freedom Force, X-Bladz*

4. Description

Formed in 1997 and headquartered in Los Angeles, Crave Entertainment, Inc., is an independent game publisher poised to become a leader in the world's interactive entertainment software industry. The company publishes games for major gaming platforms, including personal computer and next generation consoles from Sony, Nintendo and Microsoft. Crave Entertainment is ranked among the top 20 domestic videogame publishers in the United States. With a highly skilled management team and strong alliances as a third-party games publisher, Crave continues to align itself with top names in the industry. The company draws much of its success from exclusive deals with leading game developers from around the world as well as licensing agreements with some of the foremost franchises in popular culture. Crave boasts successful relationships with developers Liquid Entertainment, Irrational Games, Genki, Warthog, Dream Factory and Opus. Additionally, Crave continues to work closely with international game publishers Electronic Arts and Ubi Soft Entertainment to ensure strong product distribution throughout Europe and Asia. Crave's impressive portfolio covers a wide range of genres, including action, adventure, strategy, role-playing, racing, fighting and simulation. Premier franchises currently include critically acclaimed titles such as pay-per-view fighting phenomenon "*Ultimate Fighting Championship," "Freedom Force," "Battle Realms*" and "*Global Operations*."

5. Online Strategy

In 2002, Crave Entertainment established online interaction over the internet for its game "Global Operations", where two teams are able to compete against each other. Crave also offers online pay-per-view fighting games such as "Ultimate Fighting Championship," "Freedom Force," and "Battle Realms."

6. Source

Crave Website, GameZone

J. *CYBIKO WIRELESS GAMES*

1. Website Address

http://www.cybiko.com

2. Address

One Tiffany Pointe, Suite 105
Bloomingdale, IL, USA
+1 (630) 529-1029

3. Publisher Overview

Date of Establishment:	*1999*
Number of Employees:	*50+*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Blazing Boards, CybikoXtreme, Cyrace, Ki-tai, MotoGP, Phat Cash, Snood, xXx*

4. Description

Cybiko Wireless Games, Inc., headquartered in Bloomingdale, IL, is a complete wireless software solution provider with deep experience in development services including enterprise, Internet, and wireless applications. The company's US office houses the majority of its design staff, led by John Newcomer, developer of the famed *JOUST* arcade game. CWG has assembled one of the most talented groups of offshore developers in its offices in Moscow, Russia. All CWG programmers must have at least a Master's degree and grade at or above 90 percent on standard IQ tests.

Cybiko Wireless Games (CWG) specializes in the design and development of high quality games and applications that can be ported to different platforms and wireless devices.

5. Online strategy

CWG's key focus is on development of wireless gaming and applications that provide not only a strong relationship with hardware manufacturers and carriers, but also create strong and innovative new intellectual properties that expand the boundaries of wireless entertainment. These include gaming engines that use real time multiplayer game play as well as 3D graphics.

6. Source

Cybiko web site, CWG's U.S. Office

K. *DIGITAL BRIDGES*

1. Website Address

http://www.digitalbridges.com

2. Address

3 Pitreavie Court
Pitreavie Business Park
Dunfermline
KY11 8UU U.K.
+ 44 (1) 383-723234

3. Publisher Overview

Date of Establishment:	*1998*
Number of Employees:	*80+*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Men in Black II: Same Planet New Scum, Space Invaders, Scooby Doo*

4. Description

Digital Bridges is building the foundation enabling technology and developing the partnerships with both wireless operators and consumer media owners in order to create a Global Wireless Entertainment Network. It has two internal development studios that produce cutting edge services for the Wireless Internet. The studios have undertaken some 25 game development projects specifically for the Wireless Internet, including some of the most popular services to date released into this medium.

5. Online strategy

Digital Bridges' goal is to make mobile Internet entertainment services available to the widest possible number of users, avoiding any dependence on proprietary handset technologies. Digital Bridges announced in October 2002 that they have begun a major rollout of their Java games and download services in the company's key markets across the globe. A wide array of Digital Bridges' Java and download entertainment services are being made available across multiple distribution channels, including retail outlets, mobile network operators, media companies, Web portals and Internet service providers to reach an unparalleled number of consumers.

6. Source

Digital Bridges Website

L. *EIDOS INTERACTIVE*

1. Website Address

http://www.eidos.com

2. Address

651 Brannan Street, 4th Floor
San Francisco, CA 94107
+1 (415) 547-1200

3. Publisher Overview

Date of Establishment:	*1990*
Number of Employees:	*567*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Hitman, Tomb Raider, Commandos, Time Splitters, Panzer Claws, Legaia, Mister Mosquito, Mad Maestro, Spring Break, Deus Ex, Soul Reaver, and Blood Omen*

4. Description

Eidos is a developer and publisher of entertainment software. The Group's primary focus is on the development of its own content through its internal development resources, augmented by relationships with external development studios. The Group has a broad-based publishing portfolio built around key franchises such as *Tomb Raider, Championship Manager, Soul Reaver* and *Commandos*, and original titles expected to have franchise potential. Eidos develops and publishes advanced entertainment software products. It develops video editing systems is subsequently expanding its activities to include developing proprietary, software-based video compression technology to be used in CD-ROM and video telephony applications. The *Tomb Raider* franchise - first launched in November 1996, has over 17 million units sold to date. Further acquisitions of stakes in proven software houses, including in November 1998, Crystal Dynamics (creator of Gex and Soul Reaver) and, in August 1999, Pyro Studios (creator of Commandos). Other strategies include co-publishing deals with Japanese publishers for game titles such as Resident Evil (Capcom) and Final Fantasy (Squaresoft), and selective use of prestigious globally recognised licenses, such as the exclusive worldwide ones for the Olympics and UEFA Champions League, together with an Official Formula One license.

5. Online Strategy

Newly released games, such as *Time Splitters 2*, will have online capability through Xbox Live and PlayStation Online. PC-based games published by Eidos Interactive support multiple players through the internet.

6. Source

Eidos Website, Yahoo! Finance

M. *ELECTRONIC ARTS*

1. Website Address

http://www.ea.com

2. Address

209 Redwood Shores Parkway
Redwood City, CA 94065
+1 (650) 628-1500

3. Publisher Overview

Date of Establishment:	*1982*
Number of Employees:	*3500*
Net sales (as of March 31 2002):	*US$ 1700 million*
Key Brands:	*Madden NFL, Harry Potter, Lord of the Rings (movie rights), The Sims, FIFA Soccer, NBA Live, Need for Speed, James Bond, Ultima*

4. Description

Electronic Arts Inc., incorporated in 1982 and reincorporated in 1991, is a videogame software publisher. It operates in two principal business segments globally. The Company's EA Core business segment creates, markets and distributes entertainment software. The EA.com business segment creates, markets and distributes entertainment software that can be played or sold online, and manages subscriptions of online games and Website advertising. The Company creates, markets and distributes interactive entertainment software for a variety of hardware platforms. As of March 31, 2002 (fiscal year-end 2002), the Company was actively marketing approximately 90 titles, comprising over 120 stock keeping units (SKUs) that were published by its development divisions and subsidiaries, EA Studios. The Company introduced 35 EA Studios titles in 2001 and 32 in 2002. In fiscal 2002, the Company had 16 titles that sold over one million units. For fiscal 2002, the Company had one title, *Harry Potter and the Sorcerer's Stone*, published on four different platforms, which represented approximately 12% of its total fiscal 2002 net revenues.

5. Online Strategy

EA.com represents Electronic Arts' online and e-commerce businesses. EA.com develops, publishes and distributes online interactive games. EA.com's business includes subscription revenues collected for Internet game play on its Websites, Website advertising, sales of packaged goods for Internet-only-based games and sales of Electronic Arts games sold through the EA.com Web store. Electronic Arts began development of its initial online product, Ultima Online, during fiscal 1996. The Company shipped Ultima Online during fiscal 1998, and began development of its online business during the same year. EA.com's Websites include EA.com, individual marketing sites for Electronic Arts' games or studios and the Games Channel on America Online, which launched in the second half of calendar 2000. The majority of the Company's subscription revenues have been generated by *Ultima Online, Ultima Online: The Second Age*, *Ultima Renaissance*, *Ultima Online Third Dawn* and *Ultima Online Lord Blackthorn's Revenge* (collectively referred to as *Ultima Online*) and *Motor City Online*. In addition, its packaged goods revenues for online-only games have primarily been generated by these titles. The end customer registers for EA.com's online service to enjoy online play on a month-to-month subscription basis. EA.com expects to release *Earth & Beyond* and *The Sims Online*. In addition, EA.com generates advertising revenues on the World Wide Web and the AOL Games Channel. On February 28, 2001, EA.com acquired Pogo Corporation (Pogo). Pogo operates an ad-supported games service that reaches a broad consumer market. Pogo's Internet-based family games focus on easy-to-play card, board and puzzle games. In fiscal 2002, EA.com eliminated its free games offering under various channels on the site and redesigned the site to reflect this change in strategy. As part of this redesign, EA.com eliminated the majority of its games on the EA Games Channel and integrated its remaining browser-based games with Pogo free

games subsequent to the Pogo acquisition. EA.com offers free games on its site under the following three brands: Pogo, EA Games and EA Sports brand.

6. Source

EA 2002 Annual Report, SEC Filings, Yahoo! Finance, Multex Investor

N. *EUNIVERSE(SKILLJAM)*

1. Website Address

www.skilljam.com
www.euniverse.com

2. Address

6060 Center Drive, Los Angeles, CA 90045
Phone: (310) 215-1001
Fax: (310) 215-1089

3. Overview

Date of Establishment:	*1999*	
Number of Employees:	*146*	
Sales (6/30/2002):		*$11 Million*
Key Brands:		*www.skilljam.com*

4. Description

eUniverse, Inc., incorporated in 1999, operates a network of Websites and e-mail newsletters that provides millions of users with entertainment content, as well as products and services.

In fiscal 2002, the company's revenue was generated from a combination of paid third-party advertising on its network of sites and its suite of proprietary products and services. The Company's proprietary products and services include offerings in the lifestyle, fitness, health, entertainment and impulse merchandising categories. Revenues from its proprietary products and services are generated primarily from subscriptions, activity-based items and purchases of merchandise.eUniverse is exploring the potential expansion of its operational and revenue-generating reach outside of the United States. The Company is focusing on the European and Asian markets, but had made no definitive moves into either market as of March 31, 2002.

5. Online Strategy

eUniverse, Inc. operates a network of Websites and e-mail newsletters that provides millions of users with entertainment content, as well as products and services. The eUniverse network includes Flowgo (www.flowgo.com), an entertainment Website; comedy site Madblast (www.madblast.com); dating site Cupid Junction (www.cupidjunction.com); health and fitness site Fitness Heaven (www.fitnessheaven.com), and an e-mail newsletter network that delivers entertaining and informative content to millions of opt-in subscribers with such titles as Infobeat, IntelligentX and GossipFlash. Similar to a television network, eUniverse continually adds new programming that provides its users with products and entertainment. In December 2001, the Company purchased the assets of VIZX Corporation, which held assets known on the Internet as eMusicGames.com and SportsTriviaClub.com.

6. Source

Company Website, SEC Filings, Yahoo! Finance, Multex Investor

O. *INFOGRAMES*

1. Website Address

http://www.infogrames.com

2. Address

1 Place Verazzano
69252 Lyon Cedex 09
France
+33 (4) 37-64-30-00

3. Publisher Overview

Date of Establishment:	*1983*
Number of Employees:	*Unknown*
Net sales (as of June 30 2002):	*US$ 770 million*
Key Brands:	*Stuntman, Dragon Ball Z, The Legacy of Goku, Test Drive, Men In Black, Alien Escape, Backyard Sports, Roller Coaster Tycoon, Civilization, Unreal, Stuntman, Neverwinter Nights, Grand Prix, Taz, Driver, The Matrix, Looney Tunes (TM), Mission Impossible, Terminator, Harley-Davidson, Survivor, Tintin*

4. Description

Infogrames Entertainment is one of the world's leading publishers and distributors of video games for all consoles (Microsoft, Nintendo, Sega and Sony), personal computers (PCs), and Macintosh hardware, as well as all available interactive platforms. In 1999 through 2000, Infogrames purchased a number of game developers and publishers, including Hasbro Interactive, catapulting it to a number 2 position in the interactive entertainment industry. Its retail-driven business model is a very successful brick & mortar traditional design.

5. Online Strategy

Infogrames is missing from the online game business. It makes no corporate statement about its strategy and remains silent about its plans in this arena. This stance may change as Microsoft and Sony expand their console units into the Internet, but as of this writing, Infogrames is content to consolidate their acquisitions and reap the benefits of a hot video game market.

6. Source

Infogrames Website

P. *INTERPLAY*

1. Website Address

http://www.interplay.com

2. Address

16815 Von Karman Avenue
Irvine, CA 92606
+1 (949) 553-6655

3. Publisher Overview

Date of Establishment:	*1983*
Number of Employees:	*277*
Net sales (as of March 31 2002):	*Unknown*

Key Brands:	*Baldur's Gate, Giants: Citizen Kabuto, Icewind Dale, Run Like Hell, Alone in the Dark, Hunter, The Matrix, Star Trek, Galleon, MDK, AD&D*

4. Description

Interplay Entertainment Corp. is a worldwide developer and publisher of interactive entertainment software for both core gamers and the mass market. Interplay offers a broad range of products in the action/arcade, adventure/role-playing game and strategy/puzzle categories across multiple platforms, including Sony PlayStation 2, Microsoft Xbox, Nintendo GameCube and PCs. Interplay and its two divisions, Black Isle Studios and Digital Mayhem did not release any PC titles in 2002. This reinforced their signals to focus on the next generation console market. Video game console net revenues were up 95% to $8.8M for the six months ended June 30, 2002 from the previous period in 2001. Interplay largely attributes this increase to their Xbox title, *Hunter: The Reckoning*.

5. Online Strategy

Interplay has utilized online functionality in past PC titles. They have made pledges to research and develop leading technologies like online game play in regards to next generation consoles. However, as of Oct. 2002, they have not publicly released plans for an online console title.

6. Source

SEC Filings, Interplay Website

Q. *JALECO*

1. Website Address

http://www.jaleco.com

2. Address

119 West Tupper Street
Buffalo, NY 14202
+1 (716) 853- 7529

3. Publisher Overview

Date of Establishment:	*2002*
Number of Employees:	*210*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Fighter Ace, Evernight, Game of Life, Nightcaster, Lost Continents, Em@il Games, Maximum Risk, Axis & Allies Online, Shockwave Golf, UltraCorps, Rumble in the Void, The SARAC Project, VR1 Crossroads*

4. Description

Jaleco Entertainment is a technological partnership of the brands, technologies, and talents of three companies that is now capable of developing, publishing, and providing a broadband infrastructure to support global online gaming. In Fall of 2002, Game developer VR1 Entertainment and publisher Jaleco USA completed a merger into a new company called Jaleco Entertainment. The new company is the result of the acquisition by Pacific Century CyberWorks Japan (PCCW-J) of both VR1 and Jaleco, and the subsequent reorganization of these subsidiaries. PCCW-J, the parent company, was established in January 2000 by PCCW Ltd., one of Asia's leading integrated communications companies. The new company plans to publish nine titles on six different platforms in the fourth quarter of 2002, including *Trailer Park Tycoon, Fighter Ace 3.5*, and a number of action and adventure games for the Game Boy Advance, PlayStation 2, and GameCube. Previous to this merger, PCCW-J engaged extensively in driving broadband Internet content, infrastructure, and distribution throughout Japan via alliances and

through significant investments in related companies, which include B-Factory, a leading i-Mode content supplier and Tomen Mediacom, one of the largest independent cable MSO operators in Japan. To ensure high quality entertainment for this broadband network, PCCW-J decided to acquire VR1 Entertainment, a leading developer of massively multi-player online entertainment technologies and gaming titles. VR1 had already created gamer favorites *Fighter Ace, Evernight* and *Nightcaster*, a first-party Microsoft Xbox title. In 2002, PCCW-J also acquired the premier Japanese gaming publisher, Jaleco. The US division of Jaleco is well known for its games: *Carrier, Tetris Plus* and *Bases Loaded*.

5. Online Strategy

In addition to developing and publishing online games, which support large numbers of online players, Jaleco Entertainment is developing a graphic multiplayer game for 2003 called Lost Continents. And, in addition to online games themselves, Jaleco Entertainment has released technology to refine and improve the online gaming experience itself. VR1 Conductor is a group of sophisticated networking layer tools and technologies designed to help mitigate the effects of latency in multiplayer games and other online applications. It prioritizes packets, sets bandwidth limits, and accommodates varying modem speeds by monitoring client and server CPU and network performance. It also facilitates network administrative functions such as security, billing and application management, and provides relational database support for sharing data across multiple servers, saving user data, and providing real-time application data to lobbies and other application-launching facilities. VR1 Conductor is utilized by leading Internet service providers (ISPs), online services and telephone companies in North America, Japan, Germany, France, Great Britain, the Netherlands, and South Korea.

6. Source

Jaleco Website, Gamasutra

R. *JAMDAT MOBILE*

1. Website Address

http://www.jamdatmobile.com

2. Address

3415 S. Sepulveda Blvd., Suite 500
Los Angeles, CA 90034
+1 (310) 636-3100

3. Publisher Overview

Date of Establishment:	*2000*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Baseball, Diamond Mine, Solitaire, JAMDAT Bowling, Tony Hawk's Pro Skater 4, World Cup Soccer, Mine Field, Mummy Maze, Puzzle Penguin, Gladiator II, Trivia, EA Sports Tiger Woods PGA Tour*

4. Description

JAMDAT Mobile Inc. is a leading provider of entertainment applications, enabling technologies, reporting systems, and services to worldwide wireless carriers, handset manufacturers and application developers. JAMDAT Studios publishes wireless entertainment applications created by leading game developers featuring the world's most recognizable brands for BREW, J2ME and other next-generation platforms. JAMDAT's GLADIATOR franchise demonstrated scalability and reliable multiplayer capability en route to becoming one of the most successful wireless games in the world. JAMDAT Studios partners with developers to publish content featuring top sports and entertainment brands to the world's leading wireless carriers. In the role of publisher, JAMDAT Studios acts as an intermediary between brand licensors, game developers and wireless carriers. Developers benefit from JAMDAT Studios carrier

relationships and its ability to match developer entertainment applications with platforms like BREW, J2ME, and iAppli and the needs of particular wireless carriers. Entertainment applications published by JAMDAT Studios for today's platforms have become leaders in minutes of use, total games played and other key metrics. JAMDAT is poised to extend its leadership in the wireless publishing space as new platforms are adopted by leading wireless carriers around the world. JAMDAT has co-publishing and licensing agreements with several of the world's most established interactive entertainment companies, and welcomes additional partnership opportunities with companies seeking to bring their leading brands to the wireless medium. The company's current publishing and licensing partners include Electronic Arts, THQ, Infogrames, Activision, Cybird, and M-Dream.

5. Online strategy

JAMDAT Studios developers have created exciting wireless entertainment applications for publication on next-generation wireless platforms - including BREW, J2ME and iAppli. JAMDAT Mobile has created a proprietary suite of technologies that accelerate the development, hosting and monitoring of multiplayer games and communities on wireless networks. These components form the foundation for the premium mobile entertainment services that JAMDAT provides to carriers, device manufacturers, and corporate clients.

6. Source

Jamdat Mobile Website

S. *KONAMI*

1. Website Address

http://www.konami.co.jp

2. Address

3-1 Toranomon, 4-Chome, Minato-ku
Tokyo 105-6021, Japan
+81 (3) 3432-5610

3. Publisher Overview

Date of Establishment:	*1969*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Suikoden, AirForce Delta Storm, Castlevania, Circle of the Moon, Contra, Shadow of Destiny, Frogger, NFL Primetime, Metal Gear Solid 2, Zone of the Enders, WTA Tour Tennis, International Superstar Soccer*

4. Description

Konami was first established in Osaka, Japan in 1969 as an amusement machine manufacturer. Since then, the company has successfully grown with increased product lines, and now has evolved to a total computer entertainment enterprise. In 1998, Konami became a $700 million dollar publicly traded company in Tokyo with over 2000 employees worldwide. Konami has offices in North and South America, Europe, and Asia, as well as several studios in Japan. There are over 1000 qualified R&D staff focusing on developing sophisticated, highly enjoyable entertainment products for the worldwide video game audience. They employ cutting-edge technology with extensive research to produce the most competitive products, which are the reasons for Konami's current outstanding reputation in the industry. In the arcade game field alone, a new generation of graphics, game design, and player interactivity is born and replaced every six months.

5. Online Strategy

They have expanded and enhanced business areas by active utilization of M&A and business alliances, and promoted building up of structure to enable each business to generate profit independently. Strategic capital and business alliances between HUDSON SOFT CO., LTD. and the Company was established in August 2001, promoting cooperation in production of mobile & online games and sharing of management resources. In addition, a capital and business alliance with Genki Co., Ltd. was established in January 2002 to enhance our distribution function. These alliances have added new content to Konami Group and are expected to generate synergistic effects among group businesses and new potential for contents business. Due to a decrease of general demand, global decline of capital expenditure centering on the IT industry, industrial hollowing out, sluggish stock prices and employment insecurity, corporate earnings and individual expenditures remain weak and the Japanese economical situation has been tough and severe. In such an environment, Nintendo GameCube and Microsoft Xbox were released and energized the entertainment industry. With PlayStation 2 and Game Boy Advance, a full line-up of consumer-use game platforms created excitement not only in the Japanese but also in the U.S. and European markets. Conversely, the commercial-use amusement machine market has declined due to advancement of consumer-use game machines and diversification of entertainment. To expand sales in this market, development of innovative amusement machines with originality is required.

6. Source

Konami Website, London Stock Exchange Filings

T. *MFORMA*

1. Website Address

http://www.mforma.com

2. Address

5350 NE Carillon Point
Kirkland, WA 98033
+1 (206) 389-4901

3. Publisher Overview

Date of Establishment:	*2001*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Air Aces, Alien Fish Exchange, Bunny Hop, Casino, Carrier Force, Chop Suey Kung Fu, Dog Fight, Data Clash, Final Innings Baseball, Gangsters, Merchant Princes, Parlor, Short Circuit, Spooksville, Star Trek Nemesis, Top Gun, and Touch Trivia*

4. Description

Mforma offers the first totally integrated mobile solutions platform for the wireless industry. It combines an existing suite of highly compelling wireless services built on a common development platform to deliver a solution to the mobile operator for managing and deploying wireless data services. Mforma acquired nGame Limited of the UK, an industry leading aggregator of wireless gaming and entertainment content, in 2002. The new combined company, now called the Mforma Group, is the world's largest wireless content distributor outside Japan and the first and only company to offer wireless carriers a single source for content of any kind. The nGame acquisition is the fifth by Mforma, which continues to evaluate additional acquisition targets in its mission to consolidate the best technology, tools, and content in the wireless data industry.

5. Online strategy

Mforma provides games for mobile phone platforms. Its recent merger with nGame allows it to offer a large selection of high quality game content with wide appeal to all ages of mobile phone users.

6. Source

Mforma Website

U. *MICROSOFT*

1. Website Address

http://www.microsoft.com

2. Address

One Microsoft Way
Redmond, WA 98052-6399 USA
+1 (425) 882-8080

3. Publisher Overview

Date of Establishment:	*1975*
Number of Employees:	*47600*
Net sales (as of March 31 2002):	*US$ 28370 million*
Key Brands:	*Flight Simulator, Age of Mythology, Dungeon Siege, NFL Fever, Mercenaries, Asheron's Call, Links, MechWarrior*

4. Description

Over the last few years, Microsoft went from being basically not in the games business at all to being a very serious player in the games market today. In 1999, they had two of the top-five sellers worldwide. *Age of Empires II* was a best-selling game in the US, UK, and Germany at the same time. *Links* is the no.1 golf title in the US. Microsoft also has taken great strides in the console market, with the Xbox (released in Fall 2001), Microsoft's future-generation video game console system that delivers high quality graphics and audio gameplay experiences and new online gaming scenarios.

5. Online Strategy

The corporate mission describes Microsoft's stance as "... taking advantage of key market opportunities in the consumer space with emerging businesses such as MSN, devices and games..." The MSN Gaming Zone is Microsoft's site for online personal computer gaming. It offers a mix of free, downloadable, and multi-player games for players with retail CD ROM packages. Their biggest subscription game is expected to be the MMORPG *Asheron's Call 2*, a radical sequel of the original *Asheron's Call*, under development by Turbine Entertaiment and due for release in the Winter of 2003. In Fall 2002, the broadband port on the back of the Xbox console will become the key to the Xbox's world of online gaming. Called Xbox Live, Microsoft is offering an online gaming service that lets you play multiplayer Xbox games on the Internet via broadband. The subscriber must own an Xbox, have broadband Internet service, and purchase a subscription. The Xbox Live Starter Kit includes a 1-year subscription to Xbox Live and the Xbox Communicator, which plugs into an Xbox controller and facilitates all voice communication with other players. Xbox Live will enable gamers to play online, find friends easily, talk to other players during gameplay through the Xbox Communicator headset and download current statistics, new levels and characters to their Xbox hard drive.

6. Source

Microsoft Website, MSN Gaming Zone, Xbox Live! Website

V. *MIDWAY*

1. Website Address

http://www.midway.com

2. Address

2704 West Roscoe Street
Chicago, Illinois 60618
+1 (773) 961-2222

3. Publisher Overview

Date of Establishment:	*1988*
Number of Employees:	*570*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Mortal Kombat, Ready 2 Rumble Boxing, NFL Blitz, San Francisco Rush Extreme Racing, Gauntlet, Spy Hunter, Rampage, Cruisin' USA, Defender, MLB Slugfest, Red Card Soccer*

4. Description

Midway Games Inc. develops and publishes interactive entertainment software for play on all the major new generation home videogame consoles and handheld game platforms, including Sony's PlayStation 2 computer entertainment system, Microsoft's Xbox and Nintendo's GameCube and Game Boy Advance. In June 2001, Midway exited the coin-operated arcade games business due to the contraction of the arcade game market. Midway controls the intellectual property rights to hundreds of classic videogame titles, including titles originally released under the Midway, Williams and Atari brands. Midway continues to expand their sports category—well noted for their "over the top" action in games such as *NFL Blitz*.

5. Online Strategy

As of Oct. 2002, Midway has not publicly announced plans for online game play in their next generation console titles.

6. Source

Midway Website, SEC Filings

W. *NAMCO*

1. Website Address

http://www.namco.co.jp

2. Address

2-1-21, Yaguchi, Ota-ku
Tokyo 146-8655, Japan
+81 (3) 3756-2311

3. Publisher Overview

Date of Establishment:	*1955*
Number of Employees:	*2097*
Net sales (as of March 31 2002):	*US$ 1231 million*
Key Brands:	*Ace Combat, Dead to Rights, Klonoa, Moto GP, Mr. Driller, Pac Man, Point Blank, Soul Calibur, Tekken, Time Crisis*

4. Description

Namco Inc. is an established entertainment developer and publisher with business divisions focusing on the development for Coin-Op game machines and home videogame consoles, the production and marketing of various media and the operations of theme parks and restaurants. Namco's console game software products largely consist of converted popular arcade games but also include original titles. Namco's current titles are developed for the PS2, GameCube and Xbox.

5. Online Strategy

Namco announced this year that it is considering participation in online gaming services to be launched by Microsoft in 2002. Apart from online console gaming, Namco is emphasizing Web and mobile communication development by producing and distributing content for wireless devices such as NTT DoCoMo Inc's I-mode service, KDDI Corporation's 'ezplus' internet service and for J-Phone Co., Ltd.'s products.

6. Source

Namco Website

X. *NCSOFT*

1. Website Address

http://www.ncsoft.co.kr

2. Address

Seung Kwang Bldg, 143-8, Samsung-dong, Kangnam-gu
135-090, Seoul, Korea
+82 (2) 2186-3300

3. Publisher Overview

Date of Establishment:	*1997*
Number of Employees:	*550*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Tabula Rasa, Lineage, City of Heroes, Gameting, Shining Lore*

4. Description

NCsoft, headquartered in Samsung Dong, Seoul, was established in March 1997. NCsoft is now the largest game company in Korea and its headquarters not only serves as a development studio for online games such as *Lineage, Lineage II* and *Gameting* but also as a service center for a variety of other games. NCsoft's goal is to become a leading global online game publisher through a new business model that incorporates online game services, web community services, mobile services, billing engines and World Service Centers (WSC). Thus far, NCsoft has established itself in Taiwan, the U.S., Hong Kong and Japan, and is leading the online game market in total number of subscribers. It is running beta services in China and will deploy commercial services within the end of this year. In the future, it plans to foray into Europe, Latin America and South East Asia. NCsoft is also providing financial backing to the legendary Garriott brothers to develop the next global hit game after *Lineage*. Other major NCsoft games in the works include *Tabula Rasa* (a working project name) and *Lineage II*. In line with this business philosophy, NCsoft has made an equity Investment in Phantagram and Phantagram Interactive. NCsoft will soon publish worldwide their online game, *Shining Lore*. *Shining Lore* is a 3D game that has surpassed over one million users in just five months since starting trial service in Korea on March 20. NCsoft has acquired publishing rights to *Shining Lore* and now holds all rights to domestic and overseas game service, including server operations/web site rights. NCsoft is also pursuing a strategic alliance at the company level to publish new games created by Phantagram, in addition to Shining Lore. The company is expected to have a large influence on the domestic and overseas game market in the future

due to its intention to continue to widen the range of games it offers, to acquire rights to new and promising games, and continue to grow its user base worldwide.

5. Online Strategy

An overriding global trend is the use of the Internet for entertainment networks. NCsoft intends to provide digitalized entertainment anytime, anywhere just by logging on the Internet. Apart from developing games for itself, NCsoft also aspires to become a global online game publisher that incubates and services online games with high potential. Earlier this year, NCsoft forged a strategic alliance with Sony Online Entertainment (SOE) to provide services for the popular game *EverQuest* in Korea, Hong Kong and Taiwan. It also announced that it would publish the much-anticipated online game, *City of Heroes*, by Cryptic Studios, Inc. worldwide. And, of course, there is its strategic alliance with Phantagram to publish *Shining Lore*, a highly popular online game, as well as acquire a diversified user base. All these actions are helping NCsoft to position itself as a global online game publisher.

6. Source

NCsoft Website, Gamasutra

Y. *NEXON*

1. Website Address

http://www.nexon.com

2. Address

KangnamGu YoksamDong
Seoul, Korea
+82 (2) 2185-0448

3. Publisher Overview

Date of Establishment:	*1994*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*US$ 25 million*
Key Brands:	*CrazyArcade, The Kingdom of the Winds*

4. Description

Created in 1994, Nexon is one of the oldest online game companies in the world, focusing from MMORPGs to lighter online games. Nexon has a portfolio of over 10 online games.

5. Online Strategy

Nexon is an online entertainment aggregator, working with other online game developers and publishers to facilitate the growing demand for online entertainment in the Asian region. All areas, ranging from server hosting to billing and customer support are covered.

6. Source

Internal Contacts

Z. *NINTENDO*

1. Website Address

http://www.nintendo.co.jp

2. Address

11-1 Kamitoba hokotate-cho, Minami-ku

Kyoto 601-8501 Japan
+83 (75) 662-9600

3. Publisher Overview

Date of Establishment:	*1889*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*US$ 4473 million*
Key Brands:	*Pokémon, Mario, Donkey Kong, Zelda*

4. Description

Nintendo Co., Ltd., of Kyoto, Japan, is the acknowledged worldwide leader in the creation of interactive entertainment. To date, Nintendo has sold more than one billion video games worldwide, created such industry icons as Mario and Donkey Kong and launched franchises such as *The Legend of Zelda* and *Pokémon*. Nintendo manufactures and markets hardware and software for its popular home video game systems, including Nintendo 64 and Game Boy - the world's best-selling video game system. As a wholly owned subsidiary, Nintendo of America Inc., based in Redmond, Washington, serves as headquarters for Nintendo's operations in the Western Hemisphere, where more than 40 percent of American households own a Nintendo game system

5. Online Strategy

Nintendo Co., Ltd. and its consolidated subsidiaries strive to create new and unique hardware systems and interactive video games, utilizing advanced computer technology in both the home entertainment and handheld gaming environments. Nintendo seeks to provide consumers with a “world of entertainment”, which is both innovative and fun with creative elements they have never experienced.

6. Source

Nintendo Website

AA. *NUVOSTUDIOS*

1. Website Address

http://www.nuvostudios.com

2. Address

300 Brannan Street
Suite 410
San Francisco, CA 94107, USA
+1 (415) 882-7778

3. Publisher Overview

Date of Establishment:	*1998*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Mobile Madness, Nu-Space, NSYNC: Get to the Show, Stunt Puppy and Tetris*

4. Description

NuvoStudios is the leader at developing entertainment content for wireless devices. Profitable since day one, the talented NuvoStudios team of engineers, artists, and producers is dedicated to creating the best possible games in the marketplace. NuvoStudios develops titles for major publishers such as Disney, THQ, Infogrames, Midway, and Mattel, as well as wireless gaming publishers Sorrent, JAMDAT and Digital Bridges. The NuvoStudios game Nu-Space is a first on a mobile phone: a 3D space fighter game.

5. Online strategy

NuvoStudios Inc. is the developer behind the first widely publicized cell phone games for the US marketplace -- Tetris and WWF: Mobile Madness for THQ. NuvoStudios Inc. develops cutting-edge games for a variety of platforms, including Java, BREW, J2ME, Pocket PC, Palm OS and Windows. NuvoStudios is also a licensed developer for Nintendo's Game Boy Advance, having developed the popular *NSYNC: Get to the Show* Game Boy Color title for StuntPuppy. NuvoStudios' *Nu-Space* game made its big-screen debut during the Keynote Address, Monday March 25, 2002 at the JavaOne conference in San Francisco.

6. Source

NuvoStudios Website

BB. *REAL.COM*

1. Website Address

http://www.realnetworks.com

2. Address

PO Box 91123
Seattle, WA 98111-9223
+1 (206) 674-2700

3. Publisher Overview

Date of Establishment:	*1994*
Number of Employees:	*807*
Net sales (as of March 31 2002):	*US$ 188.9 million*
Key Brands:	*Unknown*

4. Description

RealNetworks started as Progressive Networks in 1994 and got a real boost in 1997, when Microsoft became a minority stakeholder and RealNetworks went public. The firm fell out of favor with Microsoft when it alleged that Windows Media Player interfered with the operation of RealPlayer. Real Networks now sells media servers and distributes a lot of content through its RealOne player, which combined RealPlayer with its RealJukebox music streaming service. RealArcade is its software for online game distribution.

5. Online Strategy

As of July 2002 RealNetworks said that 4.5 million people had downloaded RealArcade Software, and that over 700,000 had purchased premium online games via the software. RealNetworks bundles RealArcade subscribership as part of its RealOne SuperPass, allowing subscribers to download one game per month, in addition to accessing music and other entertainment streams. RealArcade is a game distribution center for the software of other developers, making RealNetworks a game publisher/distributor.

6. Source

Real Networks Website

CC. *SEGA*

1. Website Address

http://www.sega.co.jp

2. Address

2-12 Haneda 1-Chome
Ohta-ku
Tokyo 144-8531, Japan
+81 (3) 5736-7034

3. Publisher Overview

Date of Establishment:	*1954*
Number of Employees:	*2733*
Net sales (as of March 31 2002):	*US$ 1555 million*
Key Brands:	*Centipede, Crazy Taxi, House of the Dead, Mortal Kombat, NBA Showtime, Phantasy Star Online, Sonic the Hedgehog, Baku Baku Animal, Flicky, Pengo, Puyo Puyo, Sega Fast Lane, Sega Pet TV, Sega Snowboarding*

4. Description

Sega had been a major player in the arcade and console space since the mid 80s. The firm found particular success with the Sega Genesis, providing an alternative to the kid-oriented fare on Nintendo's SNES system with fighting games such as Mortal Kombat and gory/scary games such as Aliens. Having dropped its last gaming console, the Dreamcast, in 2001, the firm has reshaped itself as strictly a software developer for consoles, wireless handsets, PDAs, and arcade games. To take advantage of the growing market for games that can be played on the new generation of wireless phones with color screens, Sega Mobile plans to publish seven game offerings for vision-enabled mobile phones.

5. Online Strategy

Sega has been focusing on the online business for some time now. Many of the later Dreamcast games had online features. Now that Sega is a multi-platform publisher, it is using its brands, technology and knowledge in the online space. Two key Sega titles are multiplayer - *Chu Chu Rocket and Phantasy Star Online* (PSO). PSO is likely to figure largely in Sega's online plans as the company announced its release on GameCube, Xbox, and PC. *Sega's Phantasy Star Online I & II* are the premiere online games for Nintendo's GameCube. The firm also has built online multiplayer gaming into its football and basketball games for both the PS2 and XBox, *NFL 2K3* and *NBA 2K3*. The company ceded its interest in ISP/online game arena Sega.com in 2002 to Japanese concern Isao. Sega.com hosts games for the defunct Dreamcast console through the end of 2002, and its other online games going forward. The bigger driver of its online gaming business will be the major consoles' own networks. Sega has arguably had more experience than any other company with delivering online experiences on console platforms. In the arcade space, Sega is involved with an initiative to link up arcade centers with high-speed cable networks allowing players at different locations to play against one another. Finally, in the mobile arena, Sega is involved with content on DoCoMo's iMode platform by leveraging its strong brands such *as Chu Chu Rocket* and *VirtuaFighter*. Sega Mobile has already started producing games for wireless phones and PocketPC devices, but has not yet announced any such games with an online component in the US market--likely because wireless carriers are leery of their customers getting into matches against customers of other carriers and creating business for the competition. Sega Mobile is taking the approach of being a content provider on wireless networks. It charges a monthly usage fee (US$3.99) for game access that is added to the monthly cell phone bill. Games are downloaded to the phone from the Sega website (http://www.sega.com/mobile/games).

6. Source

Sega Website, Sega Annual Report, The Standard Company Index, Gamasutra, wirelessgamingreview.com, Yahoo! Finance

DD. *SHOCKWAVE.COM*

1. Website Address

http://www.shockwave.com

2. Address

600 Townsend Street, Ste 125W
San Francisco, CA 94103

3. Publisher Overview

Date of Establishment:	*2001*
Number of Employees:	*50*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Cueball Alley 3D Pool, Jigsaw Puzzle, Tamale Loco, DJ Fu: Wax Attack*

4. Description

Macromedia created Shockrave.com in the summer of 1997 (launched February 1998) as a showcase for entertainment authored with their tools. Shockrave.com later evolved into Shockwave.com, and in October 1999 it was spun out of Macromedia as an independent entity that now supports all popular online platforms, including Macromedia Shockwave Player, Macromedia Flash Player, Java, the WildTangent WebDriver and other ActiveX controls as well as download-only game technologies. As a separate company, Shockwave.com does not own or have any responsibility for Macromedia's Shockwave or Flash technologies, with the sole exception of the distribution of the Shockwave Player. Shockwave.com acquired AtomFilms in January 2001 and changed the company name to AtomShockwave Corp. The company operates three principal sites: www.shockwave.com, a games site offering a deep selection of interactive entertainment; www.gameblast.com, a premium games subscription channel launched in November 2002; and www.atomfilms.com, a destination featuring short films and animations. AtomShockwave revenues come from (1) direct-to-consumer game download sales, (2) game subscription sales, (3) ad sales, (4) custom sponsorship and 'advergaming' deals, and (5) syndication of content to other companies. In addition to Macromedia, which owns around 30% of AtomShockwave, other investors include Sequoia Capital and Intel Capital. The company's last round of financing was for $22MM in March 2001. It is focused on achieving profitability without further infusion of capital.

5. Online Strategy

The company does some internal and funded external development, but acquires most of its content via licensing deals with independent developers. The way for new developers to get in the door with Shockwave.com is to submit a complete game or a substantial prototype that gives a good demonstration of the intended art, design, and technology components of the game. Shockwave.com is especially interested in evaluating new content targeted at teens (for potential sponsorship deals) as well as easy to learn, difficult to master downloadable games targeted at the newbie/casual audience. From a technical perspective, accessible 3D and multiplayer games are particularly attractive to Shockwave.com.

6. Source

Atomshockwave Website, Internal Contacts

EE. *SIMUTRONICS*

1. Website Address

http://www.play.net

2. Address

349-A Main Street
Gaithersburg, MD 20877
+1 (301) 330-0726

3. Publisher Overview

Date of Establishment:	*1987*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*GemStone III, DragonRealms, Hercules & Xena: Alliance of Heroes, Modus Operandi, CyberStrike, Hero's Journey*

4. Description

Simutronics is one of the most venerable companies in the online games business, founded in 1987 by David Whatley, who remains President and CEO. EVP Neil Harris is responsible for business development. Simutronics initially operated successfully for many years in partnerships with online services, especially GEnie and AOL. With the growth of the Internet and the change in AOL's pricing, Simutronics moved to the web in 1997, taking many of their players with them. Traffic partnerships were established with Lycos, ATT Worldnet, and Microsoft's Internet Gaming Zone, the latter of which is still in place. Simutronics' business is still firmly based on text-based MUDs, primarily its key products *GemStone III* and *DragonRealms*. Subscribers pay a $12.95 monthly fee to play each game, with Premium and Platinum subscriptions available for $30 and $40 per month, respectively. Premium subscribers enjoy in-game benefits such as a private room, and Platinum subscribers enjoy a private game world. Simutronics has been very successful in selling 'ticketed' online events run by customer service representatives, such as in-game weddings and special weekend quests. Simutronics is also known for producing one of the early graphical online multiplayer games, *CyberStrike*, winner of the first ever "Online Game of the Year" award from *Computer Gaming World* magazine. *CyberStrike* has since been upgraded and released at retail by Sony as *CyberStrike 2*. Simutronics pioneered and refined the use of volunteer staff to support their games, including a well-developed Mentor system to foster new players.

Simutronics has a graphical massively multiplayer game in development called *Hero's Journey*, though a launch date has not yet been announced. The company has also recently been devoting resources to upgrading and enhancing current titles, such as *DragonRealms* which released a "Hot Harvest Nights" expansion in 2002. Simutronics has considerable revenues from its established games, and it is profitable.

5. Online Strategy

Simutronics provides important technologies and services for those looking to target the online market. These include a sophisticated and proven platform, billing and customer service infrastructure, hosting of the server farm and distribution through their play.net web site.

6. Source

Simutronics Website, Simutronics Representatives

FF. *SONY ONLINE*

1. Website Address

http://www.sonyonline.com

2. Address

Sony Online Entertainment
8928 Terman Court

San Diego, California 92121
+1 (858) 577.3100

3. Publisher Overview

Date of Establishment:	*1995*
Number of Employees:	*Unknown*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*EverQuest, Star Wars Galaxies, PlanetSide, JEOPARDY! ONLINE, The Dating Game Online, Wheel of Fortune Online, Infantry, Tanarus, Cosmic Rift Online*

4. Description

Sony Online Entertainment (SOE), the online gaming division of Sony Pictures Digital Entertainment, is an interactive entertainment network, which creates, develops and provides online games for the personal computer, online and console markets. Sony Online Entertainment is a worldwide leader in providing massively multiplayer online entertainment and produces an array of games from simple card and trivia games to more strategic, tactical and role-playing persistent interactive worlds. With more than 13 million registered users. SOE's award-winning website, The Station (www.station.com) hosts a variety of entertaining games and player communities spanning numerous genres. The Station offers more than 40 fun-filled games and a far-reaching community with news, shopping, chat, popular movie mini-sites, and a wide variety of entertaining games. SOE provides premier online services allowing game enthusiasts to play games, find online teammates and opponents, attend organized fan events both in game and in real life, join communities, forums, chat rooms and message boards and more.

5. Online Strategy

The Station is the first mainstream online gaming site to make a commitment to both the growing Mac gaming audience as well as the PC. Registration at The Station is free. Once users have become part of the community they can invite others to join them for online multiplayer games, chat and more. The Station's casual games online (puzzles, casino, classic board games, & game show games) are free to registered users. *Cosmic Rift Online*, *Infantry* and *Tanarus* are offered to Station Pass members for $6.95 per month or $4.95 per month for current *EverQuest* subscribers. The Station also offers *EverQuest*, one of the most successful massively multiplayer online games ever, at a subscription rate of $12.95 per month. SOE has an array of new online games in development such as *PlanetSide*, *Star Wars® Galaxies*, *EverQuest® II*, and an online-only console game for the PlayStation 2, *EverQuest Online Adventures*.

6. Source

Sony Online Website, The Station Website

GG. *SQUARE*

1. Website Address

http://squaresoft.com

2. Address

1-8-1
Shimomeguro, Meguro-ku
Tokyo 153-8688 Japan
+81 (3) 5496-7111

3. Publisher Overview

Date of Establishment:	*1986*
Number of Employees:	*Unknown*

Net sales (as of March 31 2002): *Unknown*
Key Brands: *Final Fantasy, SaGa Frontier, Legends of Mana, Kingdom Hearts*

4. Description

Square's business centers on its Final Fantasy (FF) franchise. The series has sold over 30 million copies worldwide so far. Square has stumbled recently, with the expensive box-office failure of its Final Fantasy movie, for which it had set up Square USA as a subsidiary. Square USA closed and Square President Hisashi Suzuki resigned as a result of the movie's poor showing. Square also has had technical problems and slow subscribership for its Play Online website, which was designed to host an online version of FF. The firm is looking to a new offline PS2 FF game involving Disney characters called *Kingdom Hearts* to help restore profitability.

5. Online Strategy

Square has said that it needed 200,000 subscribers for Play Online to reach profitability, and it reached that number in December 2002. Square is aiming for twice that many by March 2003*. Final Fantasy XI*, the online version of the company's fantasy-based role-playing game, has been a money loser for Square since its May release in Japan. Square spent about 2 billion yen (US$16 million) to begin the online service, and an additional 1 billion yen to augment the offering with features such as e-mail services. The company was forced to extend a "free-service period" by a month until the end of June after a rush of players overloaded Square's servers, bringing the game to a halt. The troubled debut for *Final Fantasy XI*' was a further setback for Square, which shuttered its movie business after amassing a 14 billion yen loss last year. Square's ability to make a profit may provide a boost for the online game market as Microsoft Corp. and Sony Corp. roll out Web-based games. The firm has not announced additional online plans for any of the major consoles, whose online services it may view as competition.

6. Source

Square Corporate Website, Gamasutra, Yahoo! Finance, Bloomberg

HH. *TAKE-TWO INTERACTIVE*

1. Website Address

http://www.take2games.com

2. Address

575 Broadway
New York, NY 10012
+1 (212) 334-6633

3. Publisher Overview

Date of Establishment: *1993*
Number of Employees: *662*
Net sales (as of March 31 2002): *Unknown*
Key Brands: *Grand Theft Auto, Serious Sam, Max Payne, Spec Ops Ranger Elite*

4. Description

Take-Two Interactive Software Inc., incorporated in 1993, develops, publishes and distributes interactive software games worldwide. The Company's software operates on personal computers and video game consoles manufactured by Sony, Nintendo and Microsoft. The Company develops software internally and engages third parties to develop games on its behalf. Take-Two publishes its products under its Rockstar Games, Gathering of Developers, Talonsoft and Take-Two labels. The Company's Rockstar Games subsidiary released *Grand Theft Auto 3* for Sony's PlayStation 2. The Company also released *Max Payne* for Microsoft's Xbox and Sony's PlayStation 2, and Take-Two has a strong line-up of additional

PlayStation 2 titles, including *State of Emergency* and a sequel to *Midnight Club*. The Company's Gathering of Developers is also producing several personal computer (PC) games to market, such as the highly anticipated *Duke Nukem Forever*. In August 2002, the Company formed Rockstar Vancouver through the acquisition of Barking Dog Studios, Ltd. Take-Two's Jack of All Games domestic distribution subsidiary previously sold the Company's software, as well as third-party software, hardware and accessories to retail outlets in the United States. Take-Two develops software titles through its internal development studios, Talonsoft, Rockstar Canada, DMA Design Limited (the developer of *Grand Theft Auto 3*) and PopTop Software (the developer of *Railroad Tycoon 2* and *Tropico*). The Company also maintains a development studio focusing on games for the Nintendo Game Boy Color platform in the United Kingdom under the name Tarantula, as well as a recently acquired development studio in Austria under the name Neo. As of October 31, 2001, Take-Two's internal development studios and product development department employed personnel with the technical capabilities to develop and localize (translate into foreign languages) software titles for all major game platforms and territories.

5. Online Strategy

Take-Two will publish products globally under three labels only: Rockstar Games, Gathering of Developers and Gotham Games. Gotham Games is being launched to specifically focus on publishing outstanding content accessible to consumers of all ages at a variety of price points. The Company's cornerstone Rockstar Games label will continue to focus on the creation of original content for console video game systems, and the expansion of its proprietary intellectual properties. The Company's Gathering of Developers label will be used for the development of products for the PC platform.

6. Source

Take-two Website, SEC Filings, Yahoo! Finance, Multex Investor

II. *TDK MEDIACTIVE*

1. Website Address

http://www.tdk-mediactive.com

2. Address

4373 Park Terrace Drive
Westlake Village, CA 91361
+1 (818) 707-7063

3. Publisher Overview

Date of Establishment:	*1990*
Number of Employees:	*44*
Net sales (as of March 31 2002):	*US$ 31 million*
Key Brands:	*Casper, Shrek, Robotech, The Land Before Time, Tonka, Corvette, Aquaman, Dinotopia*

4. Description

TDK Mediactive (formerly Sound Source Interactive), is engaged primarily in developing, publishing, distributing and marketing interactive entertainment software based on well-recognized intellectual content. Using TV, movie, and book characters, TDK Mediactive creates entertainment software for PCs, handheld computers, and game consoles. Many of the Company's products are based on the licensed content of major motion picture studios and other intellectual property holders including DreamWorks SKG, Vivendi-Universal Studios, Mattel, Inc., Classic Media, DC Comics, Hallmark Entertainment Distribution LLC, BDSP Inc., The Jim Henson Co., General Motors Corp., Infogrames Interactive, Inc. and others. The Company also publishes titles for personal computers on a case-by-case basis. The Company publishes (or intends to publish) titles for Sony PlayStation, Sony PlayStation 2, Microsoft Xbox, Nintendo GameCube, Nintendo Game Boy Advance and Nintendo Game Boy Color. Some license agreements include rights for content for pocket personal computers and cellular phones. On May 23,

2002, the Company announced a strategic agreement with Activision, Inc. to co-develop and co-publish video games. Additionally, TDK Mediactive and Activision have agreed to co-develop and co-publish a yet to be announced title originating from Activision's portfolio of video game brands. Throughout the co-publishing relationship TDK Mediactive and Activision will maintain control over development and marketing of their respective properties and licenses, while pooling their substantial collective industry expertise, resources and global brands. The Company has co-published three personal computer titles with Activision Value, a subsidiary of Activision, Inc., and has announced that it will jointly develop four more titles for the current year. The agreement with Activision is based on a "first look" arrangement on new titles proposed by the Company. TDK Corporation (through its US subsidiary) owns approximately three-fourths of the company. This includes the development, distribution, marketing and publishing of video games for console and handheld electronic entertainment platforms.

5. Online Strategy

The Company intends to support most interactive software categories, including children's, action, adventure, driving, fighting, puzzle, role-playing, simulation sports and strategy. Online capability for selected games may be provided initially through internet connectivity for consoles, pocket personal computers and cellular phones.

6. Source

TDK Mediactive Website, Hoovers.com, Market Guide, Yahoo! Finance

JJ. *TERRA LYCOS*

1. Website Address

http://www.terralycos.com

2. Address

Vía de las Dos Castillas, 33
Edificio Ática I
28224 Pozuelo de Alarcón
Madrid España
+34 (91) 452-3000

3. Publisher Overview

Date of Establishment:	*2000*
Number of Employees:	*3196*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Terra.com, lycos.com, AnimationExpress.com, Angelfire.com, A Tu Hora, Gamesville.com*

4. Description

The new Terra Lycos is one of the most popular Internet networks in the U.S., Canada, Europe and Asia and is the leading portal to Spanish and Portuguese-speaking markets. Terra Lycos (formerly Terra Networks) wants to break new ground and devour competition on the Internet. Formed from the 2000 acquisition of US portal giant Lycos by the former subsidiary of Spanish phone company Telefónica, Terra Lycos controls a massive network of more than 140 Web sites in 20 languages and more than 40 countries. The company reaches some 115 million users each month, and is also a world-leading ISP and wireless service provider. Terra Lycos has expanded its entertainment offerings in addition to making staff cuts and taking other cost-cutting measures in its struggle to become profitable. It generates sales through advertising, subscription fees, and e-commerce. Telefónica owns 37% of the company.

5. Online Strategy

Since March 19, 2002, Terra Lycos said it had started a new subscription-based online gaming service. They marketed to 50 percent of its 4.4 million users that connect to the Web via broadband – often through work. Web surfers play PC games without having to buy the software. Terra Lycos hopes to get one percent of the $210 million revenue generated by online games over the course of a year. They see two pockets within their network – young adults and older more broadly appealing mass market consumers on Gamesville. Gamesville.com, part of Lycos Network, offers free games, cash prizes and more. Gamesville offers a variety of games which include cards, bingo, word games, Casino style and puzzle and board games. They are a major broadband player in Spain with the launch of Multimedia Zone, the market's first content offering for ADSL users, with a catalog of more than 12,000 online games and videos and animated content

6. Source

Terra Lycos Website, LATAM NEWS, Hoovers

KK. *THQ*

1. Website Address

http://www.thq.com

2. Address

27001 Agoura Road, Ste 325
Calabasas Hills, CA 91301
+1 (818) 871-5000

3. Publisher Overview

Date of Establishment:	*1990*
Number of Employees:	*595*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*World Wrestling Federation (WWF), Rugrats, Power Rangers, Scooby-Doo!, Tetris, Red Faction, AstroSmash, Home Run Derby 2002, MotoGP, Snood, Tetris, and WWF Mobile Madness*

4. Description

THQ develops games based on a number of licensed intellectual properties, having recently produced games based on *Scooby-Doo*, *Jimmy Neutron*, and the *Power Rangers*. The firm is currently developing games based on *Star Wars* and the next Pixar movie *Finding Nemo*. THQ develops for all the major consoles, is a major publisher of Game Boy games, and has a wireless division which is targeting the handset market. THQ Wireless is dedicated to developing content exclusively for the emerging mobile entertainment arena. The firm has not yet announced any online wireless games, and is instead focusing on single-player games which do not require connectivity with other players or to a central server. THQ Wireless is based in Calabasas, CA, but will have an international focus with much of its business conducted through its offices in Europe. Additionally, THQ announced an expansion to its previously announced publishing agreement with Siemens AG's Information and Communication Mobile division. The two companies are currently developing an advanced mobile gaming engine for use on next-generation Java phones. This new engine will provide game developers with a universal game Application Programming Interface (API) for Java-based mobile phone development. This API will simplify the process of developing and maintaining game software on evolving wireless devices. THQ Wireless recently announced a technology partnership with JAMDAT Mobile. Capitalizing on the alignment of retro-gaming and first-generation Java phones, THQ is publishing Java versions of some early Intellivision titles. Nextel is the only wireless provider that offers an Intellivision game (*Astrosmash*) right now, but this spring Sprint will start serving them up, with other carriers sure to follow. THQ plans to release 7 more Intellivision games in 2002, including Skiing, Baseball, Hockey, Soccer, Basketball, *Shark! Shark!* and *Night Stalker*. THQ is also working to bring back other titles from the Intellivision library for the future

release. Not only is THQ resuscitating these old Intellivision gems, but they're making versions with real-time multi-player features. Through its partnership with Sprint PCS, THQ will release network-enabled Intellivision sports games on Sprint's 3G network.

5. Online Strategy

THQ suspended an online subscription service for its soccer game in the UK. The game, which was something of a fantasy sports game casting players as managers instead of players, did not draw enough subscribers to become profitable. THQ has a good headstart with the XBox, however. A demo version of the firm's *MotoGP* motorcycle game will be bundled with the starter pack for XBox Live. THQ also has published *WWF: With Authority*, a subscription-based online game with both fantasy sports and action game elements.

6. Source

THQ Corporate Website, THQ Annual Report, Gamasutra, Hoovers

LL. *TITUS INTERACTIVE*

1. Website Address

http://www.titus-interactive.com

2. Address

Parc de l'Esplanade
12, rue Enrico Fermi
77 462 Saint Thibault des Vignes, France
+33 (1) 60-31-04-03

3. Publisher Overview

Date of Establishment:	*1985*
Number of Employees:	*441*
Net sales (as of March 31 2002):	*US$ 119 million*
Key Brands:	*Down Force, Barbarian, Top Gun: Combat Zones, Virtual Kasparov, Planet Monsters, Prehistorik Man, Robocop, KAO the Kangaroo, Burning Metal, Space Cowboy, Chess 3D, Intergalactic Invaders, Virtual Pinball, Flam*

4. Description

Titus Interactive was founded in 1985 in Paris, France by Herve and Eric Caen. It is a developer and publisher of interactive entertainment for PCs, major console and handheld platforms, and the internet. In 1998 it acquired Digital Integration (London) and BlueSky Software (Los Angeles). In 1999 it acquired a 72% interest in Interplay Entertainment (Orange County, CA) and 100% interest in Virgin Interactive Entertainment (London). Titus Interactive sells its products in the U.S. and over 30 countries in Europe and Asia. Konami provides a distribution force in Japan. Titus Interactive has offices in Paris (headquarters), Los Angeles, London, Madrid, Hamburg, Oslo, and Tokyo. In 2003, Titus Interactive titles for the Game Boy Advance will include *Barbarian, Robocop*, and *Top Gun Firestorm*. Titles for the GameCube will be *Barbarian, Galleon, Baldur's Gate: Dark Alliance*, and *Top Gun Combat Zones*.

5. Online Strategy

The Titus Group provides online gaming capability over the internet utilizing http://www.eyeone.com for online game access, and http://www.lofex.net for European access to online sports, interactive sports games, and for placing online wagers.

6. Source

Titus Interactive Website

MM. *UBI SOFT*

1. Website Address

http://www.ubisoft.com

2. Address

28, rue Armand Carrel
93108 Montreuil Cedex France
+ 33 (1) 48-18-52-07

3. Publisher Overview

Date of Establishment:	*1986*
Number of Employees:	*1800*
Net sales (as of March 31 2001):	*US$ 228 million*
Key Brands:	*Rayman, Tom Clancy's Rainbow Six, Tom Clancy's Rogue Spear, Myst, Batman, The Settlers, F1 Racing Championship*

4. Description

Ubi Soft Entertainment is an international producer and publisher of interactive entertainment software. Ubi Soft develops its own products and also works in cooperation with well-known developers. Created in 1986, Ubi Soft has a presence in 18 countries, including the United States, Canada, Germany and China. The group distributes its own products and those of third-party producers in 52 countries. Ubi Soft Entertainment is one of the top three video game companies in Europe, distributing some 1,300 titles in more than 50 international markets. France accounts for 18% of its sales. The company's original works include *Rayman, Speed Devils*, and *F1 Racing Simulation*, and are published for most major game platforms, such as PCs, Sony PlayStation, Microsoft Xbox, and Game Boy. Ubi Soft also distributes titles from other publishers, including 3DO, LucasArts, and NewKidCo International. It has offices in 22 countries. In 2000-2001 Ubi Soft acquired major development studios as well as strong and international brands: Sinister Games (United States) - *Dukes of Hazzard, Shadow Company*; Red Storm Entertainment (USA) - games include the hits *Tom Clancy's Rainbow Six and Tom Clancy's Rogue Spear*, which have sold a total of more than 5 million copies around the world; Blue Byte Software, a major video game company in Germany - behind two of the most popular series in the history of video games in Germany: *The Settlers Series* and *The Battle Isle Series*; The entertainment division of The Learning Company, publisher of the *Myst* series, which has sold more than 10 million units sold worldwide, and other internationally-known games such *as Pool of Radiance, Prince of Persia, Chessmaster*, and *Harpoon*. The Group's strategy can be summarized as follows: acquisition of leading brands; internal growth; establishment of a global distribution network; and early positioning on new platforms.

5. Online Strategy

Ubi.com (beta stage) is a forthcoming portal offering downloads, community, news, exclusive promotions, online connections to multiplayer Ubi Soft games such as *Ghost Recon*, *Conquest* and *Conflict Zone*, and the opportunity to buy/pre-order new Ubi Soft titles. *Shadowbane* (2002) is a massively multiplayer online role-playing/strategy hybrid, currently in development and to be published by Ubi Soft. The game is being developed by Wolfpack Studios, based in Austin, Texas, and Ubi Soft expects it to attract several hundred thousand players and to generate in excess of 40 million dollars over the first 2 years of operations. According to Ubi Soft, the MMO market is a fast-growing sector in which current games have pulled in $40 to $50 million dollars annually, with 350,000+ subscribers playing an average of 20 hours a week per person.

6. Source

Ubi Soft Website, Hoovers.com

NN. *VIVENDI UNIVERSAL PUBLISHING*

1. Website Address

http://www.vivendiuniversalpublishing.com

2. Address

Batiment Energy 1 – Porte B
32, avenue de l'Europe
78457 Velizy – Villacoublay Cedex
France
+33 (1) 30-67-30-30

3. Publisher Overview

Date of Establishment:	*2000*
Number of Employees:	*1250*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Diablo, StarCraft, WarCraft, Half-Life, Spyro the Dragon, Crash Bandicoot, Lord of the Rings (book rights), Dark Age of Camelot*

4. Description

Vivendi Universal is a world leader in media and communications and operates in television, film, music, publishing, telecommunications and the internet. Vivendi Universal is also a major share holder in Vivendi Environment, the world leader in environmental services. These companies are: Universal Music Group (UMG), Vivendi Universal Entertainment (VUE) & Canal+Group, Vivendi Universal Net (VUNet), & Vivendi Universal Publishing (VUP). Vivendi Universal Games (VU Games) is the No.2 creator of PC games world wide. The division is a global reference in the gaming world, driven by the creativity of its studios.

5. Online Strategy

Vivendi Universal Games (VU Games) is a leading global publisher of multi-platform interactive entertainment. The North America-based studios Blizzard Entertainment, Sierra Entertainment, Black Label Games, Massive Entertainment Knowledge Adventure and Universal Interactive develop and publish some of the industry's best selling PC, console and online-based games. VU Games is strategic partners with Crave Entertainment, Fox Interactive, Interplay, Mythic Entertainment and Simon & Schuster, among others. This fall they announced to develop MMORPG games based on J.R.R. Tolkien's books and Marvel Superheroes. Using VU Games Nordic offices, they will partner with Panavision where they will concentrate on future online projects.

6. Source

Vivendi Universal Publishing Website, Vivendi Universal Games Website

OO. *WORLD WINNER INC.*

1. Website Address

www.worldwinner.com

2. Address

Corporate Headquarters
4077 Redwood Avenue
Los Angeles, CA 90066
Phone: 310-822-5565
Fax: 310-822-5265

Development Center
313 Washington Street, Suite 308
Newton, MA 02458
Phone: 617-928-0010
Fax: 617-928-0020

3. Overview

Date of establishment:	*1999*
Number of Employees:	*50+*
Sales (Approximate):	*Unknown*
Key Brands:	*www.worldwinner.com*

4. Description

Founded in 1999, WorldWinner is an Internet destination where people can play a variety of skill-based games while competing in head-to-head and large-scale tournaments against other people to win cash and merchandise prizes. Currently, 30 different interactive games are offered on the site including strategic card games, fast-paced arcade games and brain-teaser puzzles and trivia. WorldWinner is consistently ranked among Nielsen NetRating's top Web properties within the games category.

WorldWinner is embarking upon an entirely new site launch to accommodate the increase in player demand for more games, tournaments and features that help promote the community. WorldWinner will also soon release additional features - such as an improved tournament ranking system - that are expected to serve as a catalyst for greater competition and more chances to win cash.

They are currently aggressively marketing their product to major portals and have signed a variety of tier one partnerships with Yahoo!, Lycos, Infospace, Shockwave and numerous other premier Web properties to bring skill-based gaming to a wider audience of worldwide users.

WorldWinner has secured three rounds of funding from leading venture capital firms including Benchmark Capital, HarbourVest Partners, Zero Stage Capital and CommonAngels. Additionally, day-to-day operations are managed by seasoned professionals from the technology and gaming communities.

They are generating approximately $100,000 per day in total revenues.

5. Source

WorldWinner Inc.

PP. *YAHOO! GAMES*

1. Website Address

http://games.yahoo.com

2. Address

701 First Avenue
Sunnyvale, California 94089
+1 (408) 349-3300

3. Publisher Overview

Date of Establishment:	*1994*
Number of Employees:	*3564*
Net sales (as of March 31 2002):	*Unknown*
Key Brands:	*Unknown*

4. Description

Yahoo! Inc. is a leading global Internet communications, commerce and media company that offers a comprehensive branded network of services to more than 237 million individuals each month worldwide. As the first online navigational guide to the web, www.yahoo.com is the leading guide in terms of traffic, advertising, household and business user reach. It is the No.1 Internet brand globally and reaches the largest audience world wide. The company also provides online business and enterprise services designed to enhance the productivity and Web presence of Yahoo's clients. Yahoo! Core components consist of consumer services, marketing services, business and enterprise services and premium services. Yahoo! continues to provide essential consumer services to increase the value of the overall online user experience on Yahoo!

5. Online Strategy

Since September 22, 2002, Yahoo! Launched is subscription broadband service, called Games on Demand (gamesondemand.yahoo.com), offering users the chance to rent and play streaming PC games. The titles are from leading software companies, Activision, Infogrames, and Take Two.

6. Source

Yahoo! Corporate Website

VII. CONTRIBUTOR BACKGROUND

A. *IGDA Online Games Committee*

IGDA Online Games Committee Chairman

- **Alex Jarett, President, Technology Executives Club and BAP Games, LLC**
  Alex Jarett is a Chairman Emeritus of the International Game Developers Association (IGDA) and is the founder and Chairman of the IGDA's Online Games Committee. He is the President and founder of The Technology Executives Club (www.technologyexecutivesclub.com), the Midwest's largest professional education and networking association for technology and brick-and-mortar executives. Alex also formed the Broadband Entertainment Group, Ltd., a business development company specializing in online and digital entertainment. The first project for the group is the development of an online game developer for the mass-market audience called BAP Games, LLC (www.bapgames.com). BAP recently signed on with a confidential publisher for its first online project. Prior, Alex was Vice President and co-founder of Real Sports, LLC, where he successfully developed relationships with major publishers such as GT Interactive, ABC Sports Interactive/Disney Interactive, Ubi Soft, Hasbro, Infogrames and Microsoft, and major licensors such as IMS and Games Workshop. Alex has 22 years of business development and marketing management experience in the software and new technologies markets. He can be reached at: ajarett@technologyexecutivesclub.com.

IGDA Online Games Committee Vice-Chairman

- **Jon Estanislao, Manager of Business Development & Emerging Platforms, Activision, Inc.**
  Jon Estanislao is responsible for business development activities at Activision in the wireless, online/broadband, and interactive television gaming industries. Formerly, he was a strategy manager in the Communications, Media and Entertainment Industry practice of Accenture LLP. He specialized in the interactive entertainment industry and assisted clients, including console manufacturers and software publishers, with online strategies, competitive analysis, market entry, financial analysis, and customer registration. Jon has also been a speaker at interactive entertainment industry events, including last year's GDC. Jon has an MBA from the Anderson School at the University of California, Los Angeles (UCLA), a BS in Business Administration from Georgetown University, and a CPA in the State of California. He can be contacted at jestanislao@activision.com.

IGDA Online Games Steering Committee Members

- **Elonka Dunin, General Manager, Online Community, Simutronics Corporation**
  Elonka has done a little bit of everything, from programming to design to management, at Simutronics Corporation (www.play.net) since 1990. Born in Los Angeles, Elonka studied Astronomy at UCLA, and then joined the United States Air Force. She is a world-traveler who speaks several languages, and has visited every continent, including Antarctica. An amateur cryptographer, she has also won considerable acclaim with the cracking of "uncrackable" codes, and is currently helping out with the war on terrorism by teaching government agents about cryptography and what types of codes that Al Qaeda may be using. Elonka is a longtime member of the IGDA and has been attending the Game Developers Conference for more years than she can remember. She can be contacted at elonka@simutronics.com, or via AIM at ScreenName "elonka".

- **Jennifer MacLean, Director, Subscriber Applications, Comcast Online Communications**
  Jen's responsibilities as Director of Subscriber Applications at Comcast include product and business development for the country's largest high-speed internet provider, focusing on products and services such as interactive entertainment that showcase the benefits of a broadband connection. Jen has had a long and varied career in game development, specializing in online content. After beginning

her career at Microprose Software, she joined AOL in 1996 as a Product Manager in the Games Channel; during her tenure at AOL, she held numerous positions in the AOL brand programming division, concentrating in games. Jen is a frequent speaker at interactive entertainment industry events, and has earned a BA in International Relations from the Johns Hopkins University and an MBA with a concentration in International Business from the Columbia Business School. Jen resides in Valley Forge, Pennsylvania, with her husband. Jen can be contacted at jennifer_maclean@cable.comcast.com or at 215-640-8935.

- **Brian Robbins, Software Engineer, Worlds Apart Productions**
  Brian Robbins is a software engineer for Worlds Apart Productions, a developer of online trading card games and text-based RPGs. He is currently working on *The Lord of the Rings Online* Trading Card Game. Prior to Worlds Apart, he spent 3 years at CleverMedia developing web-based Shockwave and Flash games. Brian has presented at numerous industry conferences including GDC, WebDevCon, and Macromedia's UCON. He has a B.S. in Computer Science, and an MBA from the University of Denver. He currently lives in Denver where he can usually be found teaching his dog the next stupid pet trick. Brian can be contacted at brianr@worlds-apart.com.

- **Dave Rohrl, Senior Producer, EA Online**
  Dave Rohrl has been producing and designing video games for more than 7 years, delivering more than two dozen titles. Since joining Pogo.com in 2000 (and EA Online in 2001), Dave has spearheaded many of Pogo's most popular online games, including *Word Whomp*, *Tumble Bees*, *Hammerhead Pool*, and *Payday Freecell*, and has worked to develop new partnerships and business for EA Online. Previously, Dave worked at The Learning Company, where he led design and development on 10 PC and Mac titles. In previous incarnations, Dave also worked in senior roles in QA and Tech Support. Dave has been a game addict since age 8, when a neighbor gave him a copy of Avalon Hill's *D-Day* at a garage sale. He is actively involved in multiple German-style boardgaming groups.

- **Jeferson Valadares, Creative Director and Co-Founder, Jynx Playware**
  Jeferson Valadares is Creative Director and co-founder of Jynx Playware, a 12-person, 3-year-old game development company. He's also on the organizing committee of the Brazilian Workshop on Games and Digital Entertainment (WJogos) and on the Technical Consultative Advisory Board of the Game Design and Planning Graduation Course at the Universidade Anhembi Morumbi, Brazil. A B.S. and M.Sc. graduate, he does research on Artificial Intelligence applied to Computer Games. Amazingly, he STILL manages to come up with time for his favorite non-gaming related activity: reading.

- **John Welch, Vice President of Product & Technology, AtomShockwave Corp.**
  John Welch is responsible for acquiring and developing games and other interactive entertainment for the Shockwave.com brand. He is also responsible for the technical infrastructure of the company and its three web sites: atomfilms.com, shockwave.com, and gameblast.com. He has been with Shockwave.com since 1999. Prior to Shockwave.com, John spent time at Sega and with a consulting company that he co-founded. He holds Bachelor's and Masters degrees in Computer Science, the former from MIT and the latter from the University of Massachusetts. John is driven by the purpose of raising online gaming to greater mass-market appeal and commercial success, demonstrated by his involvement with the IGDA, GDC, E3, and other industry groups and events. He can be contacted at john@shockwave.com and john@twofish.com.

B. *Market Overview Section*

Jennifer MacLean (Section Editor)
See biography above

Kate Connally
Senior Director, Product Marketing, AtomShockwave Corp.
Kate manages the digital download business at AtomShockwave Corp. She oversees product selection, management and marketing for downloadable products on the Shockwave.com site, email channel and third-party distribution network. She joined Shockwave.com in 1999 and has played major roles in Business Development and Content Acquisition in addition to her current position in Product Marketing. Prior to AtomShockwave she was an Associate in the Menlo Park office of Advent International, a large, international venture capital firm, where she focused on Digital Media companies. She graduated with honors from Princeton University in 1994.

Greg E. Mills
Business Development Manager, AOL Games, surfmills@aol.com
Greg is currently responsible for business and content strategy for the AOL Games group. In addition, he is responsible for all industry and competitor analysis in the online gaming industry for AOL TW. Before joining AOL, Greg worked at WorldPlay Entertainment and at The 3DO Company in a variety of marketing and business development positions. Greg earned his M.B.A. from Santa Clara University and a B.A. in Economics from Pomona College.

Bernard Yee
Vice President, Publishing, En-Tranz Entertainment
Bernard Yee's experience lies in managing and designing online gaming businesses from product conception through launch. Bernard is responsible for shipping and maintaining the US-developed massively multiplayer game *Shadowbane* in the Asia Pacific region. In addition to Shadowbane, Bernard is responsible for product acquisition and internal product development at En-Tranz. He was Director of Programming at Sony Online Entertainment, publishers of *EverQuest and EverQuest Online Adventures* for the PS2, and the upcoming games *Planetside, Star Wars Galaxies* and *EverQuest 2*. Bernard has long experience managing the development of successful games including online properties, as Director of Creative Development at Disney Online/ABC Online, and Director of Product Development at ABC Interactive, which developed and published 1997's PC Football Game of the year*, Monday Night Football '98*. Bernard has lectured on online games and game development at GDC, IBM, NYU, Columbia, Northwestern and Hong Kong Polytechnic University. As an editor and analyst, he covered the emerging online gaming industry since 1994, authoring the first market report on online gaming for Jupiter Communications in 1996. As a consultant, Bernard has advised some of the most influential financial, technology and gaming companies on their online games strategy. Bernard attended Columbia University and Duke University Law School, and is an attorney with a specialization in entertainment and corporate law. He can be contacted at bernardy@aol.com or bernie@en-tranz.com.

C. *Business Models Section*

Brian Robbins (Section Editor)
See biography above

Peter H. Friedman
Proprietor, Certified Public Accounting firm
Peter H. Friedman is the proprietor of a Certified Public Accounting firm that specializes in economic/financial and taxation consulting for businesses. Mr. Friedman was endorsed by the Governor and the State Senators of the State of New Hampshire as the candidate for the position of Small Business Representative on the Internal Revenue Service Oversight Committee. He was granted approval by the Internal Revenue Service on the first Advanced Pricing Agreement under the new Internal Revenue Service provisions for small businesses. He has been invited, and attended the annual U.S. Securities and Exchange Commission Government-Business Forum on Small Business Capital Formation since 1992 and was consulted by Congressional Committees on the tax implications of Section 1202 and section 1045 of the Internal Revenue Code. Mr. Friedman was interviewed for the magazine Business 2.0 in regards to internet multistate taxation and was an expert witness at the ECommerce Tax Advisory Commission public forums. He has frequently lectured in front of various State Bar and CPA

Societies on multistate and international tax issues of electronic commerce and the Sarbanes-Oxley Act of 2002.His last speaking engagement was on US multistate issues at the seminar entitled “Emerging Issues in online Entertainment and Interactive Gaming Operations. He is currently a Director and the Chairman of the Tax committee of the New Hampshire Society of CPA’s. Mr. Friedman is licensed to practice in the states of New Hampshire and New York. Peter can be contacted at peter@peterfriedmancpa.com.

Daniel James
Game Designer and CEO, Three Rings Design
Daniel <daniel@threerings.net> is the founding game designer and CEO of Three Rings, a San Francisco startup developer of persistent world games. Three Rings' first project is Yohoho! Puzzle Pirates <www.puzzlepirates.com>, currently in public Alpha testing. Prior to Three Rings' Daniel was designer for Middle-earth Online and co-founder of a number of successful startups, including Avalon, believed to be the first commercial MUD on the internet.

Greg Mills
See biography above

Derrick Morton

Terri L. Perkins
ARK Personnel Director, Anarchy-Online
Terri began online gaming in 1994 and has worked with volunteer programs for Realms of Despair, Everquest and DragonRealms before taking on the position as Founder and Director of Personnel for Funcoms' Anarchy-Online advisor program. She has published several articles and chapters and provides consulting on MMORPG customer service. She can be reached at terri67@bellsouth.net.

Ole Schreiner
Director of Customer Service, Funcom Inc.
Ole Schreiner is currently the Director of Customer Service in Funcom Corp. Prior to joining Funcom, Mr. Schreiner worked as a Customer Service and business developer in Norway's largest telecom company. Mr. Schreiner has worked in several companies where his main focus has been customer relationship management and business development. Ole can be reached at oles@funcom.com.

Howard Schwartz
Managing Director, HJ Ventures International Howard Schwartz is currently the Managing Director of HJ Ventures International (www.HJVentures.com), a leading strategy and consultant firm focused on early stage companies and Venture Capital. Prior to HJ Ventures, he worked for several video game publishers including ASC Games, Acclaim, and Sega. Howard currently advises technology companies, including game developers, in preparing their business plans and developing their investor relationships. He can be reached at howie@hjventures.com.

Patrick Smyth
President and Director, CYOP Systems International Inc.
Patrick Smyth is currently the President & a Director of CYOP Systems International Inc. (NASDAQ CYOI.OB; an online skill gaming software provider. Prior to joining CYOP, he was the President of NextLevel.com Inc.; a digital marketing company specializing in new media, celebrity web-property management, and online streaming. In 1999 he founded and was President of Wiremix Media Inc.; a successful advertising and marketing agency specializing in online gaming and e-commerce. Prior to that, Mr. Smyth has worked with a number of companies including Starnet Communications International (OTC:WGMGY.OB), and Global Media Inc.(NAS:GLMC). He can be reached at www.skillarcade.com or 604-688-8859.

Xrjan Mathis Tvedt
ARK Manager, Funcom
Xrjan Mathis Tvedt is currently the ARK Manager and member of the Customer Service Managment team of Funcom Corp. Mr. Tvedts' experience and education in marketing led him to the game world where he worked with titles such as No Escape, Anarchy-Online , Shadowlands, The Longest Journey and other online games since 1999. He can be reached at mathis@funcom.com.

Gordon Walton
VP & Exec Producer -The Sims Online, Maxis/Electronic Arts
Gordon Walton has been authoring games and managing game development since 1977. He has personally developed over two dozen games and managed the development of hundreds of games. Gordon has spoken at every Game Developers Conference since it began, on topics ranging from game design to programming to business. He has had his own development company (twice), been Development Manager for Three-Sixty Pacific and Konami America, VP of Development for GameTek, Sr. VP and General Manager of Kesmai Studios, VP Online Services for Origin Systems *managing Ultima Online* and is current VP and Executive Producer of *The Sims Online* at Maxis.

D. *Production and Design Section*

David Rohrl (Section Editor)
See biography above

MMO Section
Matthew Ford
Program Manager, Microsoft
Matthew (mford@microsoft.com, stucco33@hotmail.com) started off programming shareware computer games, and sold his card games on the streets of New Orleans. Starting in 1994, he worked as an arcade game designer and producer at Atari Games. He then moved to Accolade to design and produce multiplayer PC game titles. Matthew now works in the Games division at Microsoft, where he is Lead Program Manager for *Asheron's Call 1* and *2* (PC online role-playing games) overseeing their production, design, and community. He also helps scheme Microsoft's multiplayer strategy and design for both the PC and Xbox.

Daniel James
Game Designer and CEO, Three Rings Design
See biography above

Web Games Section
Eric Zimmerman
CEO, gameLab
Eric Zimmerman has worked in the game industry for more than 10 years. He is Co-Founder and CEO of gameLab, a New York-based online game developer (www.gmlb.com). gameLab's award-winning titles, include *BLiX, LOOP*, and *LEGO JunkBot*. Some of Eric's pre-gameLab titles include the critically acclaimed *SiSSYFiGHT 2000* (www.sissyfight.com, created with Word.com) and the PC game *Gearheads*. Eric has taught game design and interactive narrative design at MIT's Comparative Media Studies program, New York University's Interactive Telecommunications Program, and the Digital Design MFA program at Parsons School of Design, and has lectured and published extensively about game design and digital culture. Eric is currently co-authoring two books about game design, to be published in 2003.

Kate Connally
Senior Director, Product Marketing, AtomShockwave Corp.
See biography above

Console Multiplay Section

Pete Isensee

Software Development Lead, Xbox Advanced Technology Group, Microsoft

Pete Isensee is the lead engineer of the Xbox Advanced Technology Group at Microsoft, where his current focus is Xbox Live, game networking, and C++ optimization techniques. He's been programming in the game industry for ten years, working on titles ranging from adventure stories to casual online games.

Mark DeLoura

Manager of Developer Relations, Sony Computer Entertainment America

Mark is the founding editor of the *Game Programming Gems* series of books, which are big hardback volumes full of programming nuggets from professional game developers. The third book in this series is currently under construction. Mark is currently the manager of developer relations at SCEA. He has also been editor-in-chief of Game Developer magazine, the lead software engineer in the developer support group at Nintendo of America, an arcade game programmer, and a game industry consultant. Prior to joining the game industry, Mark spent quite a few years working with virtual reality systems, and he's still a big VR fan. In the early 1990s he spent time at both of the top two virtual reality research institutions: the Human Interface Technology Lab at the University of Washington, and the Computer Science department at the University of North Carolina at Chapel Hill. He was also the co-moderator of the Usenet virtual reality newsgroups sci.virtual-worlds and sci.virtual-worlds.apps.

Wireless Game Section

Jay Minn

President and CEO, BLAM!

As the President of BLAM!, Jay leads a top notch team of technical and artistic talent in the continuing effort to lead the marketplace in digital entertainment. A former Lead Designer of Crystal Dynamics, Jay has designed several top-selling titles such at *Total Eclipse* and *Off-World Interceptor*. At BLAM! Jay has shipped *Off-World Interceptor Extreme* (PSX) for Crystal Dynamics and *Monkey Hero* (PSX) for Take Two Interactive. He prides himself in his ability to create a professional and creative environment at BLAM! while attracting and growing the best game development talent. As he forges long term relationships with venture funds, media companies and international content distributors, Jay looks toward the global market for entertainment as his playing field. Jay's experience in media includes designing, producing and writing *Jeopardy, Wheel of Fortune, Family Feud, Price Is Right* and other game show titles for the IN Television Network, an early interactive technology network.

iTV Section

Mitzi McGilvray

Executive Director, Slam Dunk Productions

Mitzi McGilvray is a game industry veteran who has spent the last fifteen years in the interactive entertainment business. She has managed both internal and external projects for console, wireless, internet and PC platforms. Mitzi has worked with such premiere game publishers as Electronic Arts, Midway, Activision, Maxis, and Time Warner Interactive. Just a few of her numerous production credits include *Michelle Kwan Figure Skating*, *NHL Hockey, March Madness, NCAA Football and Ted Nugent's Wild Hunting Adventure*. In 2001, Mitzi chose to become a game production consultant. This afforded her the opportunity to work on a more diverse range of titles and to provide a service she felt was needed in the game industry. To better position herself as a consultant, Ms. McGilvray formed a Limited Liability Corporation and invited several of her peers to join her in this new, virtual consulting environment. With meeting locations ranging from airports to restaurants to local Starbucks, the team utilizes a range of technologies such as AIM, cellphones (with unlimited long distance), Wi-Fi (for remote meetings) and broadband internet connections to stay in tune and in touch with the various projects they work together on.

Skill Gaming Section
Steve Meretzky
Creative Content Director, WorldWinner.com
Steve Meretzky has been designing games in a variety of genres since 1982 for Infocom, Activision, Legend Entertainment, and his own development company, Boffo Games. He is currently Creative Content Director at WorldWinner.com, where players can play games of skill in cash tournaments. Steve's list of notable titles includes: *Planetfall, The Hitchhiker's Guide to the Galaxy* (in collaboration with Douglas Adams), *A Mind Forever Voyaging, Leather Goddesses of Phobos, Zork Zero, Spellcasting 101: Sorcerer's Get All The Girls, Hodj 'n' Podj, The Space Bar, Word Cubes, Tile City, Picture Perfect*, and *Press Your Buck*.

General Input
Gordon Walton
VP and Executive Producer, The Sims Online, Maxis
See biography above

E. *Game Technology Section*

John Welch (Section Editor)
See biography above

Brad Edelman
Principal Engineer, Macromedia
Brad has been programming games and applications for over 20 years. His career includes contributions at Apple, Adobe and Macromedia, where he is currently a Principal Engineer. He holds a B.S. in Computer Science and Engineering from MIT.

Wade Tinney
Partner/Game Designer, Large Animal Games, wade@largeanimal.com
Wade has worked in interactive media since 1995 as a graphic designer, programmer, sound designer, creative director and producer. He's been designing games since 1997. He has a BA in Spanish Literature from the University of Delaware and an MFA in Design and Technology from Parsons School of Design, where he has also taught several courses in Game Design.

Josh Welber
Partner/Programmer, Large Animal Games, josh@largeanimal.com
Josh has worked as a programmer and game developer since 1997. He has developed both 2D and 3D game engines; server side applications (for games and tools). He has a long and abiding interest in game AI programming. Prior to 1997 he developed digital and analog art installations, taught math and designed and built furniture. He has a BA from New York University's Gallatin School and an MFA in Design and Technology from Parsons School of Design

Joseph Varet
Vice President, The Groove Alliance, Inc., info@3dgroove.com
Joseph directs sales, marketing, and production for The Groove Alliance, a leading publisher of "advergames" (branded promotional videogames). Previously he was Vice President of Corporate Development for KPE, a digital agency for the media and entertainment industry. Prior to KPE, Joseph was a member of Fox Television's business development team. He is a graduate of Harvard College.

Travis Baldree
Producer/Software Engineer, WildTangent

Bertrand Duplat
President & CTO, Virtools

Alex Bratton
Founder of WebRPG and currently CTO of The Net Squad International
Alex Bratton (bratton@thenetsquad.com or alex@bratton.com) is a technology entrepreneur who founded WebRPG in 1996, the largest online community for traditional paper and dice role-players. He also helped launch SportsAtHome, an online gaming community focused on sports fans, as its CTO. Alex now serves as the CTO of The Net Squad International providing the EmailRx email spam and virus protection managed service and continues his gaming related efforts, particularly in the wireless space.

Lee Crawford
CTO, Stadeon Inc.
Lee Crawford is Chief Technology Officer at Stadeon, a platform provider for mobile multiplayer games and interactive content. Lee is passionate about enabling the convergence of traditional and mobile devices in online gaming. Prior to Stadeon, Lee was VP Engineering and Operations at Shockwave.com. He also worked as Director of Engineering and Principal Architect of the Dreamcast Network at Segasoft Networks, the online gaming arm of Sega. Prior to this Lee spent several years at Thinking Machines Corp. working on massively parallel computers. Lee can be contacted at lee.crawford@stadeon.com or http://www.stadeon.com.

Shekhar Dhupelia
Online Architect, High Voltage Software
Shekhar (sdhupelia@hotmail.com) served as a lead engineer at Sony Computer Entertainment America (SCEA), where he helped architect the online solutions for all first-party PlayStation 2 titles. These included the launch titles *SOCOM: US Navy Seals, Twisted Metal: Black Online, NFL Gameday 2003*, and *Frequency*. He has also contributed to many other PlayStation 2 first- and third-party titles. He has written for the upcoming book *AI Game Programming Wisdom 2*, as well as books on Oracle and n-Tier Architectures. Shekhar has a BS in Computer Science from DePaul University.

Garr Godfrey
CTO, GameHouse

Daniel James
CEO, Three Rings Design, Inc.
See biography above

Michael Bayne
Three Rings Design, Inc.

Peter Glover
Sr. Director, Product & Engineering, AtomShockwave Corp.
Peter Glover is the Senior Director of Products and Engineering at AtomShockwave Corp. He currently manages the game development and site engineering teams for the websites www.shockwave.com and www.atomfilms.com. Peter has been in the interactive entertainment industry for about 8 years and has worked and consulted for numerous companies, including Accenture, Zenda Studio, LeapFrog Toys, SprocketWorks, and Macromedia.

Paul Holman
VP Technology, Sony Computer Entertainment Europe

Pete Isensee
Lead Developer, Xbox Advanced Technology Group, Microsoft
Pete Isensee is the lead engineer of the Xbox Advanced Technology Group at Microsoft, where his current focus is Xbox Live, game networking, and C++ optimization techniques. He's been programming in the game industry for ten years, working on titles ranging from adventure stories to casual online games.

Lamont Lucas
Director, Systems Operations, AtomShockwave Corp.

Peter Wiese

F. *Online Publishers Section*

Jeferson Valadares (Section Editor)
See biography above

James Belcher
James Belcher is a Consultant in the Technology Practice at FIND/SVP. At FIND/SVP since 2000, James specializes in a range of technology-related issues including computers, wireless telecommunications and the video game industry. Previously, he was a Research Manager at PSI Global, a market research and consulting firm serving the financial services industry. He admits to being a Mac user and film geek, but asserts he still has a social life. James can be reached at www.findsvp.com or jbelcher@findsvp.com.

Robert Buckley
Robert Buckley is a dedicated Xbox gamer and Halo fanatic who in real life is a marketing copywriter for telecom products, a published science fiction writer, and freelance digital fantasy artist and animator. Hooked on Zaxxon at an early age, his first game platform was a Coleco Vision. Robert can be reached at bob4z@yahoo.com.

Larry Dunlap
Larry Dunlap is the founder and creative director of Intelligent Life Games and author of Imperial Wars. He was a player, personal manager and studio owner in the music business for 17 years. In 1981 he founded and was CEO and Chairman of The Games Network, Inc. when the company went public, broadcasting computer games on the first all-digital television channel for cable television. Since then his career has been in technical fields, establishing CompUSA's national advanced training and since receiving his Certificate of Data Management from the University of Washington, designing major data systems for companies such as the Hallmark Channel. In 1999 he began working full time on Imperial Wars, a game concept based on years as an inveterate gamer, his experiences with TGN and a love of speculative fiction. He is a member of the IGDA, and past member of DAMA, and ASTD. Larry can be reached at www.intelgames.com or larry@intelgames.com.

Michelle Sandoval
Michelle Sandoval is the Office Manager, CFO and part owner of SharkByte Software Inc in Houston, TX USA. She spends her days and most nights helping the team to facilitate their efforts as they work on the debut title, *M.O.S. (Military Occupational Specialty*). She also handles the financial issues of SharkByte as well as assists in the coordination of all IGDA Houston chapter meetings. Michelle can be reached at www.sharkbyte.com or michelle@sharkbyte.com.

Patrick Smyth
See biography above

Mike Wabschall
Director of Sales, Digital Mercenaries, Inc.
Mike can be reached at mike@digital-mercenaries.com

VIII.CLOSING REMARKS

A. *Thanks & Feedback*

The discussions presented in this White Paper resulted from the efforts of a great number of game developers and industry executives. We hope that you enjoyed the presentation and that the information and case studies will prove valuable to you in your development projects in the months and years to come.

This White Paper is an ongoing project, and the technology landscape is a changing one. If you feel that we missed something essential – or, more importantly, if you would like to become involved in next year's White Paper – please send email with "Online Games White Paper" in the subject line to the following individuals:

- **John Welch**, Vice President of Product & Technology, AtomShockwave.com at john@shockwave.com or john@twofish.com.
- **Jeferson Valadares**, Creative Director and Co-Founder, Jynx Playware at jeff@jynx.com.br

Thank you!

IGDA Online Games Committee
www.igda.org/online

B. *About the IGDA*

The International Game Developers Association is an independent, non-profit association established by game developers to foster the creation of a worldwide game development community. The IGDA focuses on providing value to its members in the following areas: building community; providing a common voice; promoting relevant education and training; and the promotion of the art form of games. For more information visit IGDA online at: www.igda.org