Massively Multiplayer Games As a Source of Terrorist Simulant Data

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August 2003

ABSTRACT: Massively Multiplayer Games could be used to generate simulant data for terrorist detection data mining research projects. Games could be used to create large qualities of data that is free of statistical artifacts that would likely affect other sources of simulated data. In order to get access to such data, DOD would need to either contract with game providers to set up servers specifically for data generator, or else would need to arrange for the construction of a new multiplayer game. Such a new game could also be used for training, to assist in the creation of terrorist "signal" training data, and for exploration of red team scenarios.

DOD may also benefit by working directly with gaming vendors to develop fraud-detection technology. Such technology would concentrate on identifying players that cheat, harass other players, and return to games after they are banned. It is hypothesized that models capable of identifying the signature of such players would be well suited to identifying the signature of terrorists in information space.

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1. Executive Summary and Recommendations

Between 500,000 and 1.5 million people in the United States spend between 20 and 40 hours each week immersed in the simulated worlds of online Massively Multiplayer Games (MMPGs). There are many ways that these games could be incorporated into DOD counter-terrorism data mining research projects.

- **Transactional information generated by a game could be used as a source of surrogate training data for the development of terrorist-detection models.** Such data would have the advantage that it would not need to be treated with the same security precautions as real data from commercial or government databases. But some privacy issues would nevertheless remain, and care would need to be taken to assure that models developed with this surrogate data would work properly when used with actual data.

- **Multiplayer-Games can be created in which researchers could actually play the roles of terrorists and counter-terrorists.** By studying what people do inside such games, researchers could learn lessons that might prove valuable in actual counter-terrorist practices. These games could also be used for training purposes.

- **DOD could partner with the providers of online games to develop models that could detect undesirable players based on their behavior.** It is hypothesized that models which could detect aberrant player behavior could similarly be used to detect terrorists.

To pursue such a strategy, a number of problems must be solved:

- **Most game vendors are primarily concerned with making money** and are not readily enthusiastic about working with DOD.

- **Although the "terms of service" employed by games typically give users no privacy rights, many game users nevertheless have an expectation of privacy.** *Many people contacted for this report believe that game vendors will not be willing to share game data with DOD.* An existing game company would almost certainly experience negative publicity if it is publicized that they are sharing player information with DOD. One solution would be to set up special game servers that would be explicitly used for data collection.

- **Today's games were not designed to generate surrogate data for DOD.** It may make more sense to develop games specifically for this purpose, rather than to try to work with existing systems and vendors.

2. Background on MMPGs

Between 500,000 and 1.5 million people in the United States currently spend between 20 and 40 hours a week immersed in the simulated worlds of online Massively Multiplayer

Games (MMPGs).[2] Today's leading games are *Lineage* (NCSoft), *EverQuest* (Sony). *Ultima Online* (Electronic Arts), *Final Fantasy Online* (Final Fantasy Online), *Dark Age of Camelot* (Mythic) and Roughly a dozen new games are expected to launch within the next two years. MMPGs produced $600 million in revenue in the US in 2002 and are expected to reach $1.5 billion by 2006 ($3.2 billion globally)[3].

Most MMPG players are male with ages ranging between 18 and 35 — a somewhat older cohort than players of multi-player online games, PC games, and console games. Players typically spent the first month in a "confused phase," where they are learning how to play the game and are likely to quit. After that, they enter a "game play" phase that lasts between 1 and 4 moths, where the game is learned and play becomes enjoyable. Following this is an extended socialization phase, where the games are played largely for the enjoyment of the game community. This phase typically lasts two years, after which time the player has mastered the game, exhausted the community, and moves on.

Online Gaming Fast Facts

Worldwide Online Game Subscription Revenues, Calendar 2002:	$425 Million USD
US Online Game Subscription Revenues, Calendar 2002:	$158 Million USD

Estimated Worldwide Subscribe Bases, Top 20 MMPGs:
1. Lineage – 500,000+ *
2. Everquest – 450,000
3. Ultima Online – 250,000
4. Final Fantasy Online – 225,000
5. Dark Age of Camelot – 220,000
6. Ragnarok – 130,000
7. Laghaim – 120,000 *
8. Mu – 120,000 *
9. The Sims Online – 80,000
10. Asheron's Call – 80,000
11. Asheron's Call 2 – 40,000
12. Anarchy Online – 38,000
13. Earth & Beyond – 35,000
14. Shadowbane – 30,000
15. Planetside – 25,000
16. Motor City Online – 20,000
17. Eve – 18,000
18. Neocron – 15,000
19. World War II Online – 13,000
20. Gemstone III – 10,000

* Because cyber-café game accounts inflate subscriber numbers, these numbers are based on concurrent usage figures.
Source: The Themis Report on Online Gaming 2003

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[2] Nobody knows for sure how many people are actually involved in Massively Multiplayer games because many hard-core gamers play multiple games simultaneously or, in some cases, have multiple accounts within the same game. There are also a significant number of dormant game accounts — accounts that continue to be billed, but which are not actively being used. The International Game Developer's Association suggests that between 1 and 1.5 million individuals are currently playing these games. Linden Laboratory and Mad Doc Software, on the other hand, both suggest that the number is closer to 500,000.

[3] Jarett, Alex, et all, *IGDA Online Games White Paper 2nd Edition --- March 2003*, International game developer's association, http://www.igda.org.

Online games date to the early 1970s. These early systems had small numbers of players playing one-on-one or in small groups. The rise of the Internet as a mass phenomena gave rise to large-scale social environments. Early environments, called MUDs[4] and MOOs[5], were text-based role-playing games based on the original Adventure concept. In 1997 Electronic Arts launched *Ultima Online*, the first MMPG to gain a significant following. This game combined high-quality graphics with a client/server architecture, allowing hundreds and eventually thousands of players to compete simultaneously within a single world environment, which *Ultima* called a "shard."[6]

Ultima Online was followed by Sony Online Entertainment's *EverQuest*, and Mythic Entertainment's *Dark Age of Camelot*. Although *Ultima* featured largely undirected play, *EverQuest* was highly task oriented and, possibly as a result, appealed to a much larger audience. Today *EverQuest* reportedly has 500,000 subscribers, while *Ultima Online* and *Dark Age of Camelot* have 200,000 subscribers each.

Depending on the particular game, MMPGs can be played through an Internet-connected PC, a networked game console, or both. These systems connect over the Internet to a cluster of servers that present a more-or-less unified world-view to the game participants. In Spring 2003 the server cluster for a typical shard could handle between 2000 and 4000 simultaneous players.

2.1 Games, Players and Characters

Most MMPGs today are role-playing fantasy and science fiction systems. Notable exceptions are the World War II Online game operated by Playnet, and the virtual environments operated by There, Inc. and Linden Lab.

Unlike traditional online games, in which players engage in a single game session lasting at most a few hours, players in MMPGs spend a dozen or more hours every week immersed in a persistent environment. Each player controls one or more virtual characters. Characters travel through the virtual world, accumulate possessions, increase their character's *skill* and *status*, and occasionally engage in battle. Characters can also communicate with other characters – usually about matters pertaining to the game, but on other topics as well. (Off-topic chatter, such as discussions about recent television shows, is a major source of annoyance for some players.)

Upon joining a game, a player is allowed to choose the *race* of their character (e.g., *Do you want to be a Human, an Elf, or something else?*). Unfortunately, the complexity of these games requires that players receive significant training before they are ready to interact with other players within the virtual environment. Most games accomplish this training through the use of "quests" which take place shortly after new players enter the game. Quests give players an opportunity to become familiar with the game environment and controls. This spares other users the pain of dealing with "newbie" users while they learn how to use the game's controls. For some games, quests are also the primary tool by

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[4] Multi User Dungeon

[5] MUD, Object Oriented

[6] In the mythology of *Ultima Online*, the whole world existed as a single crystal that was broken into an infinite number of "shards" before the game began. Thus, each shard is a reflection of the one true world, with the same geography, but with different people and objects.

which players can increase the skill and magical capabilities of their characters. Quests typically take between 5 and 100 hours of playing time.

In addition to player-controlled characters, all games feature Non-Player Characters (NPCs). Such characters can either be game staff or else "robots" that are operated by programs. Staff are useful for answering questions, while robots are useful for performing mundane tasks such as redeeming game money for magical armor. Monsters are invariably NPCs.

After the quest, players are free to get about the real business of the game, whatever that happens to be. Typically players align themselves with one group of players against another group of players, but most games also have capacity for solo operators as well. Some games allow players to collect items and transfer items to other players. Games are increasingly responsible for transactions in the real-world: it is not uncommon for magical objects or even complete characters to be sold on eBay for hundreds or even thousands of dollars. Some game companies have attempted to restrict such transactions or "get a piece of the action." But attempts to eliminate this underground economy have been generally unsuccessful; they may even be unlawful if courts determine that virtual objects obtained through "work" are actually "property."

Likewise, attempts on the part of game management to restrict communication between different game players have generally been unsuccessful. For example, *Dark Age of Camelot* prevents players that are a member of one realm from communicating with players that are members of the other two realms. To circumvent such restrictions, a player can simply sign up for two accounts — one on each side. Once those accounts are created, one character can be used as a spy. Such spying is a violation of Mythic's rules, but such rules can be very difficult to enforce.

As with any complex social system, some players are inappropriately aggressive towards other players. For example, a notice on one game company web site states: "An unfortunate situation has arisen in several currently-available online games where some game players go out of their way to ruin the gaming experience for other players by killing them repeatedly, stealing their monster kills, and generally making a nuisance of themselves."[7] Players interviewed for this report noted that such murders, as well as sexual harassment, can be quite common in these games: some women play exclusively under male names to avoid unwanted attention.

Because of the open nature of some games, it can be very difficult to actually ban people. What gets banned instead are credit-card numbers: a banned human then needs to create a new account with a new credit-card (and sometimes with a new name).

2.2 Game Technology

MMPGs are properly thought of as large-scale distributed client/server transaction processing systems. The key components of these systems are:

Servers. Game servers are created with the same haphazard collection of technology that is used to create other Internet-based transaction processing systems. Game servers typically host on Linux or Windows 2000 servers. Authoring languages for server-side components include C++, Java, perl, and increasingly python. Game servers typically use

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[7] http://www.darkageofcamelot.com/faq/

memory to retain current configuration and database servers (typically MySQL) to maintain long-term state.

Clients. Game clients run on Microsoft Windows, game consoles such as the Sony PlayStation and Microsoft XBOX, and occasionally on MacOS or Linux. Because high-quality animation and speed are critical, clients are typically authored in C++, although some games make use of Shockwave. Because the clients run on a potentially hostile system, game vendors need to minimize opportunities for reverse engineering. One way to do limit risk is to limit the information that each client receives, so that the client never "knows" more than client's player is supposed to know. Likewise, hit/miss decisions in combat are best made on the server, rather than on the client.

Reality Engine. Together the game server and clients create virtual reality that is shared (or is mostly shared) between the game participants. These software systems can be seen as working together to create a "Reality Engine." The Reality Engine must guarantee that all game players experience all significant game events in the same way: if Draken kills the evil witch, Jared must also see that the evil witch is dead. Better, if Draken steals 5 coins from Jared, Draken's stock of coins must increase by 5 and Jared's must decrease. Some games have *physics-based engines* which attempt to model physics of the real world. Others opt for a world that does not strictly follow conventional physics, but which is nevertheless internally self-consistent.

Database. The database maintains the state of the entire virtual world. Some systems use a traditional relational database use as Microsoft SQL Server or Oracle. Other systems, such as *Ultima Online*, hold the entire "database" in the computer's memory and only write it to a flat disk file when the world is migrated from one server to another. The newest games under development store the world database in a distributed object system that can be scaled across any number of servers..

Client-to-Server Communications. Some game systems open a persistent TCP/IP connection from the client to the server, while others attempt to encapsulate all game transactions inside of http transactions to minimize the impact from some firewalls. Communications can be in XML or a binary format.

Player-to-Player Communications. Players typically communicate both within the game and outside of the game. Most of the games allow direct communication between players, typically through the use of peer-to-peer "chat" or "voice chat" systems (e.g., Roger Wilco). Vendors will set up message boards. Most message boards support email interfaces.

In all popular games, players have also set up their own communication networks that exist outside of the game. These are typically hosted on free websites. Some are password-protected. These websites can be a very important part of the game experience, a place where strategy is developed, teams are formed, and allegiances are forged.

Middleware. Because of the cost and complexity of developing a major game, and because of the need for ongoing support, most game publishers have decided to develop their games in-house rather than rely on third-party game authors. Nevertheless, game developers are increasingly making use of middleware companies to provide complex and critical game components.

2.3 Cheating and Crime in Virtual Worlds

Beyond the traditional forms of crime and graft that affect all online services, the world of MMPGs have some special forms of crime.

- **Murder.** Most of the games disallow player characters from killing other player's characters, yet this sort of player-versus-player activity happens all the time. Players who repeatedly kill other players can be banned from the system.

- **Sexual harassment and rape.** As all games allow gender-identified characters and text messaging between players, there have been repeated cases of sexual harassment. Such harassment can progress beyond verbal abuse in some virtual environments.

- **Cheating and collusion.** It is possible for players to exploit bugs in the game servers, clients or management. One popular cheat is called "duping" (duplicating), in which objects are cloned without cost.[8] Other bugs allow objects to be colored with unusual or unique colors. Some cheats allow players to see through walls, or conquer "invincible" opponents. Players who cheat can be thought of as playing against the game designers, rather than playing against the game. Some cheaters to do so for the thrill: others do so for the money, as objects obtained through cheating can be sold on eBay or in other forums for real money.

  For example, a group of players might camp out at a location where a particular monster "spawns" in a game. The players are thus always poised to kill the monster and capture its spoils. In the process, the players can corner the market on the monsters' possessions. These items can then be sold at an inflated price on eBay.

  Cheating can damage a game by adversely affecting the game's economy or game community. Typically when a cheat is discovered the knowledge is passed from player to player. The more powerful the cheat, the slower the knowledge passes. The game company will work to fix the bug and, if possible, take punitive action against those who have exploited the flaw. "In most cases we will go in and

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[8] Here are two sample "cheats" distributed by the website uocheats.com:

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Increasing your Tailoring Skill Faster
Click on a sewing kit and then click on anything in your bag….you will
get the message "you can't use that on this object" but your skill will
increase

Become a GM Healer for a little gold
Step 1: Fill your backpack till it is full (125 items)

Step 2: Now try to use scissors on cloth and you will get the message
"you can't hold anymore items in the backpack"

The newly made bandages will be placed at your feet and no resources will
be used... if you made a macro for this you can become a GM healer very
quickly.
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instrument [the system]. We will watch it for three days and then kill everybody[9] associated with it," says one game vendor.

- **Scams.** The existence of cheats makes possible a wide variety of scams. For example, a "grief player" can approach another player and offer to dup a valuable object. The other player hands the object to the grief player, at which point the grief player kills the first player and leaves. Other scams include the sale of cheats on eBay or private websites — sometimes the cheats work, other times they don't. The sale of cheats that do not work for real money may constitute fraud under US law; the sale of cheats that do work may constitute conspiracy, especially if the cheats can be used to steal money or possessions from other players or the game vendor.

- **Account theft.** A hostile player can steal a username and password and then log in to another player's account. As with AOL username/password scams, a common way to steal this information is by impersonating the staff of the game.

- **Spies.** Many games prohibit spying — that is, players having multiple characters, one on one side, one on another, and feeding "secret" information between sides. Spies can be hard to find, as the player accounts may be under different credit card numbers registered to different people at different addresses.

- **Last Round Behavior.** When a player has decided to leave a game, occasionally the player will engage in extraordinarily aggressive anti-social behavior, typically directed against newcomers. For example, the player might go on a killing rampage, "murdering" between 20 or 30 other game characters in a single evening. These other players are typically new players who become most annoyed with the game and may quit the game themselves and ask for their money back.

- **Return of banned players.** Players are routinely banned from games for violating the games' rules or terms-of-service. These players routinely come back to the games using new credit card numbers, friends' credit cards, etc. Banned players can retain control of their gold or magical objects by distributing the objects to others in their "guild." Frequently, the only way to stop banned players from returning is to find all of the players in the guild and terminate all of their accounts.

Players who exhibit such behavior are frequently called "grief players." Those familiar with games say that an extremely small percentage of game players — less than 1% — engage in these behaviors. Yet these players are responsible for the vast majority of player complaints.

2.4 Challenges Facing the MMPG Industry

The MMPG industry now faces several important challenges:

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[9] That is, terminate the players' accounts and ban the players.

- **Limited customer base.** It is not clear how many more individuals can be convinced to spend 25 hours/week inside the games. Can the industry create an MMPG that will be appeal to individuals who can spend only five hours per week in the game?

- **Cost vs. revenue.** MMPGs are expensive to create and maintain,[10] yet the industry has not been able to charge the typical player more than $10-$15/month. New opportunities must be found for increasing per-customer revenue—especially since the number of MMPGs online is expected to double between now and 2005.

- **Economic outlook.** As a low-cost and highly addictive form of entertainment, MMPGs thrive in a poor economy. If the world economy improves, the user base for today's games may decline.

- **Expansion to wireless.** Given the massive number of wireless subscribers and the fact that cell phones are almost always online and connected to a data network, a number of companies are now attempting to expand MMPGs into the wireless space. To date, game vendors have failed to create compelling wireless content.

- **Player-created content.** Game vendors are experimenting with techniques for gamers to create more of their own content — both as a way of increasing the amount of online content, and to make the game more compelling for advanced players. "These games don't have enough moving parts," says Raph Koster of Sony Online Entertainment. [11] To date, the tools that have been developed are hard-to-use and few came players are capable of creating compelling content. New games, such as Second Life, are concentrating on player-created content. But critics argue that just as most people are not painters, programmers or novelists, most people inside the games should not be game designers.

3. MMPGs for DOD

MMPGs are potentially a rich source of data for DOD's terrorist detection data mining research projects. Three important ways that DOD researchers could use this data readily suggest themselves:

- **Games could be used to create surrogate background data, on which terrorist "signal" data could be superimposed.** Researchers would then be charged with building models that could detect this signal. It is not known how hard or easy it would be to "inject" a terrorist signal into the data set. Nor is it known how hard or easy this signal would be to distinguish from non-terrorist traffic.

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[10] According to IGDA, games typically cost between $5M to $30M to develop, with as many as 100 employees at the game company involved by the time the game reaches "beta-testing." Once deployed, games can require a full-time technical support person for every 5000 players; *EverQuest* has a support team with over 100 customer service reps for its 500,000 players. Assuming that a game costs $15/month and a 90% collection rate, this means that a highly-trained CSR is required for every $800,000 in revenue)

[11] http://www.skotos.net/articles/BTH_28.shtml

- **Alternatively, games could be used as a source of both surrogate background data and surrogate terrorist signal data.** For example, a model could be built that attempted to detect returning "banned" players who open accounts with new names and new credit card numbers based on their in-game behavior. Such a model would be useful for both DOD and the game providers.

- **Finally, new games could be used for counter-terrorism training and terrorist "red-teaming."** US Armed Forces have a long history of using war games and other kinds of simulation for training and experimenting with new tactics; games could be created to do the same for counter-terrorism efforts.

3.1 MMPGs as Surrogate Data Generators

There are many possible sources of data generated within the games, including:

- Character movement and travel within the simulated game environment.

- Character buy/sell transactions within the game environment.

- "Chat" and other forms of person-to-person communications.

Advantages of using MMPGs as a data source include:

- Because the data is being generated by hundreds of thousands of individual human beings, rather than mathematical models, the MMPG data will be more representative of the real-world data with which DOD is concerned. Specifically, game data should be superior to data that is generated from a statistical model.

- There should be fewer privacy concerns associated with data from MMPGs than with data collected from real-world sources. In part, this is because the MMPGs take place in a virtual world — a world that is owned and controlled by for-profit corporations. In addition, MMPG subscriber agreements generally give the game corporation ownership rights to the data generated inside the game.

Caveats include:

- Game-data may not be a good surrogate for other human activities. Cory Ondrejka of Linden Laboratory says that even though most games allow relatively unscripted behavior, in most games the object of the game is to advance characters from level to level, and players rapidly figure out the most efficient manner to do so. The reason that games typically hold players for two years, Ondrejka says, is that this is how long it takes for most players to master character development; at that point, the game ceases to be interesting.

- The nature of "normal" game activity is unclear. Synthetic data currently being used by DOD is based upon some sort of normalized data patterns from the real world. As the MMPG is not based on real-world models, it would require analysis on all ends of the spectrum to determine what is "normal" in the game world and how to do pattern analysis for Red/terrorist activity.

In addition to these in-game sources, vendors are in a position to provide DOD with additional information. *For reasons that will be discussed below, it is unlikely (and undesirable) that any of these sources will be used. However, the potential of these sources needs to be recognized, as people who are opposed to DOD's involvement with the game industry are sure to mention these possibilities in their comments.* Outside-game sources include:

- **Vendors routinely collect IP addresses, credit card numbers, and other information.** Such information could be analyzed by DOD-models running on the vendor's servers, or it could be provided to DOD.

- **Vendors monitor eBay and other online auctions for buy/sell transactions involving game items.** These transactions, when discovered, could be reported.

- **"Chat" on websites unaffiliated with the companies could be collected and reported.**

- **Game clients could search the game player's computer for personal or confidential information and then transport this information over an encrypted channel to the game vendor or to a third party.** Game clients could also collect typing dynamics information and even covertly enable microphones and cameras with which many home computers are now equipped. Although such action would be morally unacceptable, it would be permitted under the End User License Agreements under which the game clients are distributed. (In this the games are not unique: such spying is allowed under most EULAs currently in force, such as those employed by companies like Microsoft, AOL and Adobe.)

Such outside sources of data are not needed for the development of models that confine themselves to game data. Furthermore, the collection of data from these outside sources may be not be consistent with DOD goals, since it would invariably involve the collection of data on players, rather than on game characters. **For these reasons, collection and compilation of data from sources outside the game virtual worlds is not consistent with the goals of using games as generators of sanitized data and must be avoided.**

3.2 "Virtual Crime" as a Detection Problem

The types of cheating and crime in virtual worlds identified in Section 2.3 could be used as a surrogate for "terrorist signal." For example:

- A terrorist on a watch list is likely to travel under an alias or assumed name. This behavior is analogous to a banned player regain entry to a game using new credit card, perhaps a card that is registered to another person.

- The sharing of illegally duped objects between members of a "cheating guild" is analogous to terrorists amassing money and materials.

- The exchange of strategies for cheating is analogous to the distribution of terrorist techniques and training information.

- Game vendors have considered setting up "honey pots" of vulnerabilities to attract the attention of cheaters. These honey pots could then be monitored; as they are found by cheaters, the cheaters would be identified and could be eliminated from the game. Such a cat-and-mouse game between the vendors and the players is analogous to the process of infiltrating terrorist networks.

Online game vendors deal harshly with the likes of cheaters and trouble makers. There are rarely any provisions for due process or fair play: if a player is suspected of cheating, their characters are "killed," possessions seized, accounts canceled, and players banned from the company's games. (This heavy-handed approach may soon come under fire since there is a growing monetary value to game characters and property within the games. To date, however, game vendors have been successful in asserting their absolute ownership over the game space.) Non-cheating game players generally appreciate aggressive action directed against cheaters.

For all these reasons, an effective way for DOD to work with the MMPG industry might be to develop anti-griefing and anti-cheating models that could be run by the game vendors themselves. It's hypothesized that if these models are effective at finding griefers and cheaters within the virtual world, they might also be effective at finding terrorist signals in the real world.

3.3 MMPG Obstacles and Dangers

Obstacles are structural barriers that would make it difficult for DOD to work with today's MMPG vendors. Such barriers include:

- **Today's games do not generate transactions or information in a form that is readily usable by DOD researchers.** Most of today's games only archive data that is useful for debugging and for determining which players are cheating. Much data is not archived at all. Vendors will almost certainly be hesitant to add these capabilities to their existing systems, as such capabilities could slow systems down and represent added complexity and cost.

- **Games may have privacy policies that prohibit disclosure of information to third-party.**

- **Even if the game's "terms of service" specifically states that players should have no expectation of privacy,[12] players may still resent their character data being turned over to a "shadowy government agency."** It is unlikely that game vendors, who are operating in a cutthroat competitive environment, would risk losing customers and damage the long-term viability of their games.

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[12] Most games have "terms of service" agreements that grant players no expectation of privacy. For example, the *EverQuest* policy states: "By placing material on or communicating with the Stratics bulletin boards, forums or submitting material for publication you hereby grant to Stratics and their affiliates and related entities the royalty-free, perpetual, irrevocable, non-exclusive right and license to use, copy, modify, display, distribute and reproduce all such materials in any form, media, software or technology of any kind now existing or developed in the future. You also agree to indemnify, defend and hold Stratics harmless against any claims or costs, including attorneys' fees, arising from the use or distribution of those materials. You further grant Stratics the right to use your name in connection with the reproduction or distribution of such material.

- **Players may have significant privacy interests in their player and character data.** Many players may chose character names that are the same as online names they use elsewhere. As a result, players may demand that their player data itself be anonymized before it is shared outside of the game system — "they would want fake names for their fake people," says Keith McCurdy. "Basically, the game is about building notoriety and reputation for a character. They want to protect that character, like a child…. On the other hand, I bet you would find quite a few who would want to support anti-terrorism." McCurdy suggested that the privacy issues could be handled by permitting players to "opt-in" and optionally share their data with DOD.

- **The Children's Online Privacy and Protect Act (COPPA) requires specific consent of parents before children's information can be used by third parties.** Many websites specifically bar participation from children under 13 to avoid COPPA's onerous requirements for parental consent in writing. If children under 13 were playing these games, their data would need to be segregated.

- **The game vendors may not be interested in working with DOD.** Vendors might fear of adverse publicity if they are seen to be "spying" on their customers. Alternatively, vendors may simply see participation with DOD as a distraction from their primary mission of making money.

In addition to the obstacles noted in the previous section, working with game vendors could backfire and cause damage to DOD data mining research programs. Such possibilities represent dangers to DOD in pursuing a partnership with existing MMPG vendors:

- **DOD's motivation for looking at game data could be readily misinterpreted or misconstrued.** For example, players might think that DOD was looking for actual terrorists who have signed up to play the games![13]

- **DOD's reason for analyzing specific game could be misinterpreted as well.** For example, if DOD were to use "chat" sessions as the source for a terrorist-finding model, it might be inferred that DOD plans to find terrorist through widespread monitoring of commercial chat, email and instant-messaging systems.

3.4 Opportunities for Using Games at DOD

On July 30th, we held a workshop to discuss the opportunities, obstacles and dangers for collaboration between DOD and the MMPG industry.

Two strong possibilities emerged:

- **DOD could would with game publishers to set up special databases for use by DoD personnel.** One way to minimize the privacy issues is to set up special servers for use by DoD personnel. Reportedly, there are significant numbers of DoD personnel who are already playing MMPGs.

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[13] It is not far-fetched that players would think that DOD is looking for actual terrorists; in conducting the interviews for this paper, many people contacted made the same assumption, even after they were informed otherwise.

In order to obtain and maintain the interest of the game vendors, there would need to be the potential for them to make significant revenue. Participants suggested that games developed by overseas game publishers (especially South Korea and other Pacific publishers) might be far more interested in working with DoD than American firms, and that the cost of licensing these games might be significantly less.

- **Instead of concentrating on MMPGs, DOD could oversee the creation of a [non-massively] multiplayer game designed to be played by between 5 and 20 people.** Such a game could be used for a variety of training, data creation, and data visualization purposes. Such a game could be a "mod" to an existing game, or a completely new game created from scratch for this purpose. More aspects of this game are discussed in Section 3.5, Multiplayer "DOD World" below.

- **DOD could use games to further comparisons of red-red and red-blue activity.** A game that allowed a wide range of user choice would allow DOD to set up multiple red teams and compare their results. Alternatively, different "blue-team" strategies could be compared against the same or different red-team data sets.

Several possibilities were considered but rejected:

- **DOD researchers could obtain data from a live game** and use this data in the creation of counter-terrorism models. *This option was considered unlikely, as game publishers would likely fear player backlash over privacy issues.[14]*

- **DOD researchers could play a game-within-a-game on existing MMPGs.** For example, researchers playing terrorists could decide that an object such as a "+7 red magical hat" is actually a bomb and try to leave it next to a building. Other researchers playing counter-terrorists could try to find the individuals with the magical hat. This could be done with or without the cooperation of the game vendors. *While DOD researchers could play a game-within-a-game, without the cooperation of the game publisher it would not be possible to get large-scale transactional data out of the system.*

- **TIA could work with industry to develop a MMPG terrorist training and catching game.** One of the most straightforward suggestions was for DOD to assist in the creation of a game in which players could be either "terrorists in training" or "terrorist trackers." The danger with this approach is that it a highly-realistic simulation might yield practical training to would-be terrorists, while a less-than-realistic system would be of little use for the trackers.

Finally, one possibility is worthy of further exploration:

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[14] Alexander Marcis from The Themis Group noted that his organization had been unable to interest game publishers in a "banned player database" because of similar concerns over privacy issues.

- **DOD could work with a game vendor to develop griefer and fraud detection models that operate solely upon game data.** These modes could then be repurposed by DOD on other data sets.

  This proposal has the advantage that it would solve a problem that game vendors currently have without creating the privacy problems, since the game data would never leave the vendor's control.

  Weaknesses with this proposal are the fact that game developers and publishers have shown a reluctance to purchase other off-the-shelf technology to improve their games. Even if they did, it is unclear if the game vendors would be willing to work with DOD to start an open-ended research project. A third weakness is that game publishers would probably be interested in using out-of-game information, such as processor serial number or login/logout times — information that could greatly improve the detection models, but which would be inappropriate to use in the DOD context.
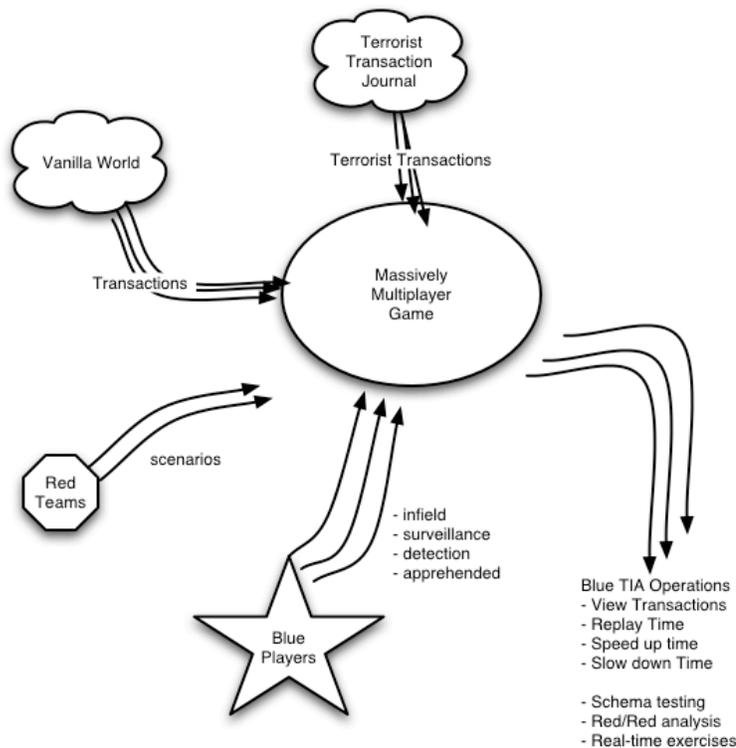
Figure 1: How a Massively multiplayer game might interact with Vanilla World.

3.5 Multiplayer "DOD World"

Instead of partnering with an existing game vendor, DOD could contract with game developers to create its own game system. Call this system "DOD World."

DOD World is envisioned as a LAN-based game that could be played by between 5 and 20 individuals at between one and three locations over the course of several days. The could be created as a "mod" or "modification" on an existing game using, or it could be

created from scratch using off-the-shelf game components available from "middleware" vendors. Participants at the workshop thought that the costs for such a game would be somewhere between $300,000 (for a low-end mod game) and $5 million (for a new game created from scratch).

The biggest challenge to creating a game for use by DOD would be developing the game scenario. **What precisely would be the goal of the game?** By it's very nature, terrorism is a fringe activity set against a large background of normal transactions. But normal behavior is not-exciting. It is unlikely that playing anything other than terrorist or non-terrorist would be exciting in the DOD World game. Once again, this speaks to building a multi-player game, rather than a massively-multiplayer game.

There are many reasons to suspect that a custom-built world might be better suited to collecting surrogate data than existing game systems:

- **More realistic surrogate data.** Instead of trying to take a database of game travel transaction data and map this into travel of virtual terrorists between airports, DOD World could have characters that are people who are actually taking airplanes, traveling by train, renting cars, and so on. The data for DOD World could come from existing GIS systems and contain building-level details for New York, Washington, San Francisco, and other cities.

- **Large-scale use of NPCs.** Existing MMPG systems make little use of program-controlled characters (called Non-Player Characters, or NPCs). Yet experience with PC games shows that NPCs can create an effective and believable game environment. An existing PC game company could be contracted to populate DOD World with thousands or even hundreds of thousands of NPCs driven off a variety of artificial intelligence engines. These NPCs could be the background characters on top of which the terrorist simulation is run.

- **Opportunity for physics-based modeling.** Existing MMPG developers have little incentive to add realistic physics models or other kinds of simulations into their systems. Yet such realism can be very important for a realistic simulation that focused on terrorism: does driving the car into the building make it collapse? What if the car is packed with explosives? What kind of explosives? DOD could contract with game developers to add "modules" to DOD World that would systematically increase the verisimilitude of the game environment: there could be a basic physics module, a weather module, a radiation module, a biological agent module, etc.

- **Controlled user population.** Because DOD would control admission to DOD World, there would be no risk that DOD would be accused of using the game for the purpose of domestic surveillance.

- **Better opportunities for training.** With realistic graphics, DOD World could also be used for training counter-terrorism practices. For example, the game could be used to train guards and commanders on actual attack scenarios such as the attack on Khobar Towers or the bombing of the US embassies in Africa. Such training does not require mathematically-perfect finite-element simulations, but

could instead be done with simulators that are commonly used in today's single-player PC games.

- **Better opportunities for data creation.** Currently, data is entered into Vanilla World through a text-base interface. DOD World could be used as an interface for adding complex attack scenarios into the Vanilla World database.

- **Better instrumentation.** DOD World would be properly instrumented so that all game data could be captured.

Dr. Charles Cohen at Cybernet Systems put it this way:

> *"Imagine a game like the Sims – Sim Terrorist – with a lot higher fidelity so you could see facial expression, realistic physical dimensions, etc. You have a woman who looks like she should weigh 110 lbs but her gait is something like 300 pounds. Maybe she is carrying something under her poncho? If you are immersed in such an environment that you could look at these people, it would train you to look at these people … to test people…*
>
> *"If we wanted one day to have outside security forces in Israel – not from the US, but from Switzerland – they wouldn't know the gestures and body language Israelis and Palestinians use. How can you tell if [a person] is upset? Does their face get stoic? Are they thinking, or are they pissed?"*

Dr. Ian Lane Davis at Mad Doc Software suggests that DOD World should be thought of as a multi-player game, but not a Massively Multiplayer Game. The majority of the characters in the game could be driven by Artificial Intelligence engines: only the terrorists and the terror-trackers would need to be run by humans. Such a game could be run on a LAN with perhaps 10 or 20 off-the-shelf computers; simulations could be set up, used for a few days (or a few weeks), and then shut down. Much of the game could be built from off-the-shelf software components. Noting that most of the cost for today's games are the story line and the graphics, Davis believes that DOD World could be build for perhaps $3 million.

DOD World, as envisioned here, would have several key differences from existing MMPGs:

- **DOD World would have dramatically fewer players than today's successful MMPGs.** It is unlikely that DOD, DoD, or even the entire US Government could allow 50,000 or more individuals to spend 20+ hours each week inside the game environment to the exclusion of their other duties. **Thus, DOD World would be a Multiplayer Game, but not a Massively Multiplayer Game.** For some advocates of MMPGs, this will be a significant stumbling block.

- **DOD World would lack player variety.** One of the attractions of today's game systems is that they have a wide range of people playing them. Because DOD World would have dramatically fewer players than today's MMPGs, DOD World's game player population would necessarily be far more homogeneous.

- **DOD World would not derive its user base from compelling content.** Most MMPG games use their graphics, content, story line, and community to attract players from other MMPG games. A purpose-built simulation would not need to compete for players.

3.6 "DOD MUD"

A "MUD" is a text-based multiplayer game. These games are descendants from the original text-based roll-playing computer games of Adventure (popularized in the 1970s at MIT) and Zork (text-based games created by InfoComm).

Here is an example transcript from the original Zork game; the user's input is in italics:

```
>WALK WEST
Carpentry Shop
You are in a room furnished with wooden shelves,
cabinets, mantels and moldings, all gracefully carved
out of fine wood. An array of precision tools adorn the
walls. The only exit is south....unless you want to
count the opening in the roof.

A carpenter gnome is sitting here, twiddling his
thumbs.

>UP
The opening is too high to reach.

>GNOME, BUILD A LADDER
"I'd be glad to, but not for free!"

>GIVE THE JEWELED MONKEY WRENCH TO THE GNOME
The gnome examines the jeweled monkey wrench carefully.

"Thank you," he exclaims, adding it to his collection
of tools.

>GNOME, BUILD A LADDER
"Oh, yes, your ladder. Unfortunately, I have no
lumber."

>GIVE THE LUMBER TO THE GNOME
The gnome accepts the supply of lumber.

>GNOME, BUILD LADDER
"Darn it! I'm fresh out of nails."

>GIVE NAILS
(to the gnome)
```

```
The gnome accepts the bunch of nails.

>GIVE THE LAMP TO THE GNOME
The gnome attempts to build a beautiful set of kitchen
cabinets out of the lamp. Finally, he gives up and
hands it back to you.
```

MUDs (short for Multi-User Dungeons) and MOOs (short for MuD, Object-Oriented) are outgrowths of the original text-based games. Designed in the late 1980s and early 1990s, MUDs were some of the first persistent multi-user environments. The MUD environment consisted of an assemblage of multiple rooms, each of which was connected with one or more other rooms. Each room could hold one or more individuals, robots and objects. Individuals could "pick up" or "drop" objects by issuing the appropriate text commands. Likewise, individuals could move from room to room.

One of the big innovations of MUDs was their use of player-created content, giving a second sense to the word "MUD." Players who were given capabilities could create new rooms, create objects within those rooms, and even write programs that would operate within the virtual world.

At the July 30th workshop, it was hypothesized by the attendees that many of the goals of incorporating games into a DOD data mining project could be accomplished through the use of MUDs and MOOs. Some of the advantages of MUDs and MOOs are:

- **MUDs and MOOs are cheap to deploy**. Most of the technology for creating a MUD or MOO that would be appropriate for DOD already exists: there are several MUD and MOO engines that are available for download. A single server can host hundreds of simultaneous MUD or MOO users. The main cost in deploying a MUD or MOO for DOD would be content creation and training.

- **MUDs and MOOs would allow DOD to focus on transactions, rather than on the verisimilitude of the simulation.** Within the text-based world of the MUD there is no need to hire animators and audio engineers: it is sufficient to have a storyline writer pen a few words, such as "The large yellow Ryder Truck that was previously reported stolen is now parked in front of the embassy on K street" or "You cut the rusted padlock and kick open the door. As the smoke clears, you notice that the back wall of the room is obscured by approximately fifteen crates. You take down one of the crates and pry off the lid with a crowbar; inside is straw and the glint of gunmetal. You hear voices behind you."

- **MUDs would provide a simple yet compelling for entering large amounts of transaction data into Vanilla World.** A MUD-like interface could elimiate much of the drudgery associated with creating terrorist-signal transactions for Vanilla World. The underlying mechanics of the MUD simulation could keep track of the locations of the terrorist characters, what they are holding, their bank accounts, etc. The Red Team players would then be free to create scenarios as simple or as complex as they wished, without having to worry about internal consistency.

- **DOD MUD could be created within the context of Groove.** The MUD or MOO on which DOD World is based could be built on top of the Groove Networks framework. The simplest way to do this would be to simply use Groove as a "front end" to an existing MUD or MOO server. A more elaborate approach would be to actually re-implement a MUD or MOO server within the Groove framework. (The first approach is merely an exercise in coding, but it would require the operation of a MUD server. The second approach is a research project.) Both of these approaches would have the advantage of easing the deployment of the DOD MUD client and enabling use of the MUD by many individuals over the Internet simultaneously within the Groove framework.

It's important to realize that even using a MUD would not be free. Several items would still be required:

- **DOD MUD would require a compelling storyline.** Vanilla World is fundamentally a very busy but very booring place. Considerable effort would be required to create an engaging storyline.

- **The MUD or MOO would still need to be instrumented.** Today's MUDs and MOOs are not designed to facilitate transaction collection. What's more, many of them are poorly written. It would take some programming time (weeks, though, rather than months or years) to appropriately modify the MUD to facilitate data collection.

3.7 Projected Costs and Timetables

Every person interviewed for this report stressed that it is far more expensive to create a game than many people outside the game industry imagine. According to the "Game Developer's 2nd Annual Salary Survey,"[15] salaries in the gaming industry average $66,334 plus $17,559 in bonuses for programmers; $53,184 to $90,000 for artists and art directors,; $45,700 to $62,700 for game designers; $55,645 to $96,697 for game producers; and $34,995 to $59,312 for audio engineers. All of these professions are required for creating a compelling game, adding to the cost of creating a new game.

Licensable technology in the gaming industry is priced in the low-to-mid six-figures. It is hypothesized that building a game from licensed technology would cost roughly $500,000 for licensing fees and perhaps another $500,000 in game development costs.

Beyond the initial game creation, it is important to realize that there are continued costs in maintaining a game. Jessica Mulligan stressed that the majority of development costs take place *after* a game launches, when bugs are found, and not before. She also noted that more than 60% of the monthly fee of commercial games goes right back into tech support and software maintenance issues.

Other costs associated with online are the operation of the servers, bandwidth, and traditional user support. These costs scale with the number of players; Bryant Durrell of Turbine said that setting up a game for 200,000 players by itself would cost between $3.5M and $5M — assuming that the game itself was already developed.

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[15] Olsen, Jennifer, "Game Developer's 2nd Annual Salary Survey," *Game Developer*, July 2002.

3.7.1 Option #1: Close Partnership with Existing MMPG Vendor on Griefer Analysis

This option would have a consultant identify one or more existing MMPG vendors that would partner with DOD for either the creation of a "Griefer Analysis System" or the setting up of DOD-specific servers designed for data collection.

Success will depend upon finding a receptive MMPG vendor. Since vendors are motivated by money (and only by money), the vendors will need to be sold on working with DOD. Two items that might motivate the vendors are:

1. The possibility that DOD money might be used to develop technology (such as the anti-griefer technology) that the game companies would like to develop themselves, but which is too experimental to justify developing as part of a business plan.

2. The possibility that an association with DOD might increase the user-base of the game. If DOD could plausibly argue that DoD might bring 20,000 to 50,000 new users to a game, that might attract the interests of the game vendors. (Even if the new users were on DoD-only servers.)

Possible partners: Sony, NCSoft, Electronic Arts, Mythic, Turbine.

Timeline	Action Item	Estimated Effort Level
September 2003	*Identify partner*	1 consultant with travel x 1 month
October 2003 — November 2003	*Develop project outline*	1 consultant with travel x 2 months
December 2003 — May 2004	*Hire key researchers.* *Commence either:* 1. *Setting up duplicate servers for us by DOD* 2. *Development of "griefer" identification system.*	1 project manager x 6 months 4 researchers x 6 months

3.7.2 Option #2: Commission and Develop "DOD World" Multiplayer Game

This option will create a multiplayer game that could be used for visualization of Vanilla world and counter-terrorist simulation. A simple game could be done as a "mod" (modification) of existing games in the $1million range. A more involved game would involve the construction of a new game from scratch using off-the-shelf parts.

Possible partners: Butterfly, Turbine, Cybernet Systems, Mad Doc Software, Themis Group

Timeline	Action Item	Estimated Effort Level
September 2003	*Develop project outline*	1 consultant with travel x 1 month
October 2003	Design initial DOD World MPG as a mod on existing systems	1 project manager
November 2003 — April 2004	*Construct DOD World MPG Mod*	$500,000 for technology purchase $100,000 for computer equipment Game development team:

Timeline	Action Item	Estimated Effort Level
		1 technical project manager x 6 months 3 game developers x 6 months 2 game artists x 6 months 1 game storyline writer
May 2004	*Technology Demonstration; play game scenario*	1 week game for 10 outsiders to play the game. $15,000 travel $10,000 workshop coordination Game development team
June 2004 — August 2004	*Additional technology integration building on what was learned at May demonstration*	Game Development Team
August 2004	*Technology Demonstration II*	1 week game for 25 people in multiple locations $40,000 travel $20,000 conference coordination
September 2004 — April 2005	*Integration of physics modeling package and further development of world simulator. Deployment of advanced AI*	$250,000 technology acquisition Game Development Team

Success of this project will depend upon carefully identifying the goals for the DOD World game.

3.7.3 Option #3: Commission and Develop "DOD MUD"

This option will create a MUD for use by DOD. Key elements of the MUD would include:

- Flexible time-line engine that makes Vanilla World transactions happen at the appropriate time within the simulated world.
- Simple-to-use text-based interface for viewing VW transactions and entering new ones.
- Instrumented MUD server, based on publicly available "Open Source" code.
- Groove interface to connect to the MUD server over SSL-encrypted links.

Timeline	Action Item	Estimated Effort Level
September 2003	*Develop project outline*	1 consultant with travel x 1 month
October 2003	Design initial DOD MUD based on Open Source MUD server and Groove interface.	1 project manager 1 MUD programmer 1 Groove programmer
November 2003 — February 2004	Populate DOD MUD World	Expand team to include: 1 Additional MUD programmer 1 game storyline writer
March 2004	*Technology Demonstration; play game scenario*	1 week game for 10 outsiders to play the game. No travel. (Game is low-bandwidth and can be played remotely over the Internet.)
April 2004 — May 2004	*Additional technology integration building on what was learned at May demonstration*	5 person game development team
June 2004	*Technology Demonstration II*	1 week game for 25-100 people.

Timeline	Action Item	Estimated Effort Level
		No travel.
July 2004 —	*Development of additional technology on top of DOD MUD. Possibilities include animation, visualization, etc.*	Open-ended.

(appendices follow)

A. MMPG Games and Vendors

The following table lists the significant MMPG vendors in the marketplace today and notes what contacts were made for the purpose of writing this report. It continues with a brief description of the more notable games.

Company	Game	Contact info	Status of contacts
Electronic Arts	*Ultima Online* *Origin*	Origin Systems 5918 West Courtyard Drive Austin, TX 78730-5036. 512-434-4263. www.uo.com bdonline@ea.com	Voice mail and email messages sent to Bing Gordon and Frank Gibeau in early June. No response.
FunCom	*Anarchy Online*	FunCom GmbH Dufourstrasse 131 8008 Zurich Switzerland Phone: +41 1 422 8977 Fax: +41 1 422 8984 http://www.funcom.com http://www.anarchy-online.com/ Funcom Inc. PO Box 14390 Durham, NC 27709-14390	*Non-US company; no contact attempted.*
Linden Lab	*Second Life*	577 2nd Street, Suite 200 San Francisco, CA 94107 phone: 415-243-9000 fax: +1 415-243-9045 www.lindenlab.com Cory Ondrejka Vice President of Product Development 415-243-9000 cory@secondlife.com	*Detailed interview with Cory Ondrejka on June 30th.*
Maxis (EA)	*The Sims*	Electronic Arts/Maxis 2121 N. California Blvd. #600 Walnut Creek CA,94596 US (925) 927-3830 http://www.thesimsonline.com/	Exchanged email with PR manager Robyn Rodota on 6/11; since then email messages have generated no response.
Microsoft	XBox Platform	Jallard@microsoft.com. VP of Interactive Games.	Despite referral from Barbara Fox, email messages sent on 6/1, 6/11 and 6/20 have generated no response.
Monolith Productions	*The Matrix Online*	Monolith Productions 10516 NE 37th Circle Kirkland, WA 98033 Phone: 425.739.1500	Monolith referred all questions to Brian Ullrich at Touchdown

Company	Game	Contact info	Status of contacts
		FAX: 425.827.3901 http://www.lith.com/ http://thematrixonline.warnerbros.com/	
Mythic	*Dark Age of Camelot*	Mythic Entertainment 4035 Ridge Top Rd, Suite 800 Room 8079 Fairfax, VA 22030-7403 tel +1 (703) 934-0446 fax +1 (703) 934-0447 http://www.darkageofcamelot.com/ Rob Denton, Mythic's vice president and chief technical brain. Lance Robertson, chief artist. Matt Firor, company producer.	Messages left for Denton, Robertson and Firor on 6/11 were not returned.
NCSoft	*Lineage* *City of Heroes*	Jeremy Gaffney jgaffney@ncaustin.com Director of Third Party Development	Telephoned on 6/23 and told to send email to Gaffney. Email sent on 6/23. No response.
Playnet	*World War II Online*	PlayNet Technologies, Inc. 1901 Central Drive, Suite 400 Bedford, TX 76021 817-358-7580 fax: 817-358-7585 http://www.playnet.com/ (Developed by Cornered Rat Software)[16]	*No contact initiated due to AT&T's involvement.*
Sony Online Entertainment	*EverQuest* (Stratics) *Star Wars: Galaxies*	Sony Online Entertainment, Inc. 8928 Terman Court San Diego, CA 92121 (858) 577-3100 http://*EverQuest*.station.sony.com/ Digital press kit: http://www.sonyonline.com/E3_2003/lineup.jsp Adam Joffe, CTO ajoffe@soe.sony.com Gordon Walton Raph Koster, Creative Director, Sony Online Entertainment Inc. rkoster@soe.sony.com	Spoke with Joffee by phone on 6/9. Sent email on 6/10 and 6/20, but no follow-up. Successful interview with Gordon Walton on 6/23.
Square Enix	Final Fantasy	6060 Center Drive, #100 Los Angeles, CA 90045 301-846-0331	*No contact attempted*
There	www.there.com	There, Inc. 165 Jefferson Drive Menlo Park, CA 94025-1114 Robert Gehorsam	*Email interview on 5/30.*

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[16] http://www.cdmag.com/articles/027/162/crs.html

Company	Game	Contact info	Status of contacts
		VP Strategic Initiatives rgehorsam@thereinc.com 212-964-5842 cell: 917-817-8107	
Touchdown Entertainment		Brian Ullrich 425-739-1569 bullrich@touchdownentertainment.com	*Spoke with Brian on 6/10; sent email on 6/12 and 6/20; no response.*
Turbine	*Asheron's Call* *Middle Earth Online*	Turbine Entertainment Software 350 University Ave Westwood, MA 02090 781-407-4000 http://turbinegames.com/ Jeff Anderson, CEO, 781-407-4007 Assistant: Lisa Enoch, 781-407-4147	*In-person interview conducted with Jessica Mulligan on July 1st*
Ubi Soft / Shadowbane	*Myst Online*	http://www.shadowbane.com/	*No contact initiated.*
Vivendi	*Lord of the Rings*		*No contact initiated.*
Vivendi / Blizzard	*World of Warcraft*		*No contact initiated.*

Traditional Fantasy / Sci-Fi MMPG

Ultima Online **(Origin / Electronic Arts)**

Released in 1997, *Ultima Online* was the world's first Massively Multiplayer game. *Ultima* has a fantasy role playing, Middle-Ages theme where players go on quests and do battle in the virtual world of Britannia. Players can interact with other players or with NPC (Non-player characters) — 'bots that are run by the computer system. Characters have professions (e.g. *warrior, blacksmith or magician*), can barter with each other, engage in battle, eat, and so on.

According to Origin's website (http://www.origin.ea.com/), more than 1 million copies of *Ultima Online* have been sold; there are currently 225,000 active players who average between 10 and 20 hours a week "immersed in the land of Britannia." The world is divided into "shards" (eg. servers); according to gamers.com there were 18 servers in May 2003.[17] *Ultima* has 15,000 player-run "guilds."

EverQuest **(Verant / Sony)**

Sony bills *EverQuest* as the "World's #1 Massively Multiplayer Online Game." *EverQuest* has a loyal following with an improving game technology base. The game is 3D with an extraordinarily detailed visual environment, cities, villages, dungeons, towers, and other environment. *EverQuest* players design their character from 15 races (Barbarian, Dark Elf, Dwarf, Erudite, Gnome, etc) and 15 job descriptions (Bard, Beastlord, Cleric, Druid, etc.)

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[17] http://www.gamers.com/game/24521

The *EverQuest* system runs on multiple servers, each supporting "over 2,000 players simultaneously." Five "expansion packs" give players different scenarios. Players can work alone or in teams.

Verant has a reputation of being somewhat heavy-handed in their dealings with players. The company has a strict policy prohibiting the sale of game items on eBay — a policy frequently broken.

Other games by Sony in development include::
- *EverQuest* II
- *Star Wars Galaxies*
- *Lords of EverQuest*,
- *Planetside*, "the world's first massively multiplayer online first-person action game," which shipped to stores on May 19th, 2003. [18]
  http://planetside.station.sony.com/

Anarchy Online (FunCom)

Set in the 250th century, *Anarchy Online* is a MMPG with science fiction and fantasy elements. Players must pick sides, either working for Omni-Tek, the giant mega corporation, or else joining one of many "Clans," a group of anarchists with many factions.

Anarchy has a reputation for being somewhat "buggy" when it was released; observers feel that those bugs significantly impacted the ability of the company to gain market presence. *Anarchy Online* is more explicitly sexual in its graphics than the other games.

Asheron's Call 1 & 2 (Turbine / Microsoft)

Another MMPG set in a fantasy world. Players can create their own characters, fight monsters, and chat with other players. Based on a 3D modeling engine with a "real" physics model.

Although Asheron's Call peaked at 100,000 players, by Summer 2003 the player population had dropped to 50,000. Asheron's call runs on multiple disconnected servers; characters cannot move from server to server. In 2002 it was not uncommon to have 2400 people logged on to the same server.

Asheron's Call is seen as Microsoft's entry into MMPG games, but the game was actually developed by Turbine Entertainment Software. Also underdevelopment by Turbine is Middle Earth Online, massive game based on the Lord of the Rings books. The website (http://www.lordoftherings.com/meo/) claims that the game will be available in "late 2004." Turbine has set up a website for discussing the game with future players.

Asheron's Call 2 was released in late 2002 as an upgrade to Asheron's Call. Graphics are dramatically improved. The "questing system" is improved: instead of finding objects within a dungeon, the player participates in a story and finds objects on a map. Character advancement is more restricted, following a set path. Initial character restrictions matter less than other games. Asheron's Call 2 has three kingdoms looking for player allegiance; PvP combat is governed by which geographical region a player currently resides within.

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[18] http://www.sonyonline.com/corp/press_releases/051903_planetside_ships.html

Dark Age of Camelot (Mythic)

"The world's fastest growing online role playing game based on the King Arthur legends, Viking mythology, and Celtic lore." Primarily designed as a Player vs. Player (PvP) gaming system, players join one of three groups battling for control of the virtual world: the Britons, the Celts, and the Norse. The game features complex 3D graphics.

Mythic says that its PvP system "strongly guides the player into conflict against members of opposing Realms…. Instead of having every player be able to fight any other player, as in Shadowbane, in Camelot, PvP is team based, where you can only fight characters in opposing Realms. This will encourage teamwork and cooperation among members of a Realm as they must band together to fend off attacks, raids, etc. from other Realms." The system also prohibits individuals from communicating with members of opposing Realms.

Dark Age of Camelot uses PvP combat as an integral part of player experience and advancement, rather than having combat being an optional part of the game experience. (Mythic has a "non-combat server," but players are encouraged to engage in combat.)

Despite the restrictions on PvP, it is possible to have spies in the *Dark Age* system. A player could create two accounts, one in Hibernia and one in Midgard. One character is used for gathering data; that information is then passed to players on the other side.

Mythic claims to be one of the oldest and most successful online gaming developers, with 12 years experience in the field.

The Matrix Online (Monolith Productions)

After developing many single-user and small-user group games, Monolith Productions has embarked on developing the MMPG game The Matrix Online,[19] loosely based on the popular *Matrix* movie trilogy.

Simulation MMPGs and Virtual Worlds

These systems are distinguished by those in the previous section in that they attempt to present a more "accurate" simulation of their virtual world. In general, players are more concerned with the mechanics of the simulation itself and the world that the simulation presents, rather than merely accepting the simulation as a framework for fantasy.

World War II Online

"A combined arms simulation in an online, persistent, action-packed 3D world." Players compete on servers playing either Allied or Axis powers. Simulation is physics-based, modeling people, tanks, aircraft, etc., as complex systems from component parts. "Players have complete control over battles and campaigns — the outcomes are not predetermined."

PlayNet's first game within the World War II Online system is called "Blitzkrieg." The game recreates the spring 1940 battle between France and Germany, inviting the user to "re-write history" and stop the German troops in France. The game claims a 1/4 scale map of Europe with accurate terrain modeling (implying a fantastic level of detail for the game simulation); thousands of simultaneous online players; first-person perspective (a

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[19] http://www.gamers.com/game/1168758/previews

shooter-style game); historically accurate weapons; physics and damage modeling; and integrated web-based services.

The Sims Online / Electronic Arts (Formerly Maxis)

The first Massively Multiplayer game not focused on fantasy or science fiction. Based on The Sims PC game, where the player manages a house of simulated people, directing them to eat, wash, sleep, go to work, and so forth. The Sims Online costs $49.95 plus $9.95/month to play.

Sims Online launched with substantial press coverage and was seen as the first "crossover" game — a hugely popular PC game come to the online world. But the game has largely flopped, in part because the online experience has not been compelling to the traditional Sims player.

Those in the game industry say that Sims Online should not be so quickly discounted. Detractors say that MMPGs have two components: role-playing and chatting. The Sims Online, they say dismissively, just has chatting.

There.Com

Comprehensive world simulation with physics-based 3D reality engine and economy. Still in beta testing.

Second Life / Linden Lab

Similar to There, this is another experimental social environment.

Middleware Providers

Because of the complexity of building MMPGs, several companies now market "middleware" technology designed to simplify the process. These companies include:

Big World Technologies www.bigworldgames.com	Australia	Developer of server and client engines for MMPGs
Butterfly www.butterfly.net	West Virginia	Developers of full-distributed game server technology.
Global Gaming Innovation www.global-gaming.com		MMPG server for first-person shooter games based on the Doom engine. Open Source.
Turbine www.turbinegames.com		Developers of Acheron's Call, Turbine also sells rendering and MMPG technology.
Zona.net www.zona.net		Provides a "complete network solution for Massive Multi-Player Online Games
Touchdown Entertainment www.touchdownentertainment.com		3D game development tools and technologies. Focus is on high-performance immersive rendering software.
Terraplay Systems AB www.terraplay.com	Solna Strandväg. 96 SE 171 54 Solna, Sweden	Game communications and management infrastructure.

	Tel:+46 8 764 91 00 Fax: +46 8 764 91 30 info@terraplay.com	Swedish company.
Cybernet Systems Corporations www.openskies.net		"Distributed network server technology for real-time data transfer of dynamic game network content."
Mad Doc Software www.maddocsoftware.com	15 Union St. Lawrence, MA 01840 978-687-8405 fax: 678-687-8295	Development house specializing in single-user games, advanced artificial intelligence, auditing, due diligence, and contract programming.
Quazal www.quazal.com	433 place Jacques-Cartier Suite 200 Montreal, QC, H2Y 3B1 Canada Phone: +1 (514) 395-4646 Fax: +1 (514) 395-6006	Net-Z system handles network communications and maintenance of distributed database.
Rebel Arts — www.rebelarts.com	22287 Mulholland Hwy #252 Calabasas, CA 91302	— "Ultra-scalable and fault tolerant network application platform upon which developers can build complex and robust mass communication online services." Claims to handle 100,000 or more simultaneous users on a single system.

Open Source systems:

Nevrax www.nevrax.org		Next-generation Open Source platform for creating Persistent Worlds
Twisted – www.twistedmatrix.com		Open source game development tools, including a communications framework, game server, chat server, and instant messaging.

Asterisks(*) indicate that the company was interviewed for this report.

B. Websites of Interest

http://camelot.allakhazam.com//
      Website specializing in information about *Dark Age of Camelot*.

http://pweb.netcom.com/~sirbruce/Subscriptions.html
      MMPG subscriber numbers over time.

http://amazon.com/
      Visit feedback forums for comments from users about *The Sims Online* and *Star Wars: Galaxies*.

http://gamers.com/)
>Ziff Davis website for all things relating to online gaming. Extensive online database of game companies and games.

http://gamers.com/cgw
>Computer Gaming World Magazine

http://www.idsa.com/
>Interactive Digital Software Association.

http://ign.com/
>Interactive Gaming Network. Message boards where the players get on and talk about the games, plan raids, hunt for spies, and exchange tactical information such as "Midguard's berserker's left axe is too powerful."

http://www.massivemultiplayer.org/
>Weblog for the Massively Multiplayer Gammers

http://www.play.net/
>Website for interactive games, especially World War II online.

http://www.pogo.com/
>Website for online gaming

http://www.shockwave.com/
>Website for demonstrating Macromedia's Shockwave technology. Many online games, but no MMPGs.

http://www.skotos.net/articles/BTH.shtml
>Jessica Mulilgan's column (1997-2003) on online gaming.

http://theowner.org/
>Website with a collection of Cheat Guides, bugs, hints, and "money makers."

http://uocheats.com/
>Choice cheats for the discriminating *Ultima Online* player; $15 for unlimited access.

http://zone.com/

3.7.4 <u>Specific References</u>

http://www.e3expo.com/conference_program/tracks_workshops/complete_speaker_list.shtml
>A complete list of speakers at the E3 2003 conference; movers and shakers in the world of online gaming.

http://www.skotos.net/articles/BTH_28.shtml
>"Playing the Game," by Jessica Mulilgan, June 25th, 2002. Article looks at the future of persistent world games and the companies.

http://coh.stratics.com/content/community/notices/scams.shtml
      "Known MMORPG Scams"

C. Questions that were asked

To evaluate the feasibility of using MMPGs as a data source, we formulated a number of questions and then attempted to contact the majority of game vendors in the MMPG world.

After initial contact, vendors were presented with a short introduction to our project and then asked to participate in a 10-15 minute interview. Depending on the nature of the interview, some of the following questions were asked:

Questions about vendors' game/games in general:
- Characterize the game/simulation/virtual environment. When did it launch? How many players are there?
- Characterize the players. What's the variation between the players? Ages? Backgrounds? Goals within the game?
- Characterize the server environment: How many simultaneous users on the server? Scalability?
- Characterize the virtual environment: Is environment task-oriented or open-ended? Opportunities for collaboration/competition/fighting? Do people work solo or in groups? Does the environment support complicated tasks that build over the course of hours/days/weeks?
- Do humans play both "good" and "bad" characters within the game?
- Is there any treachery, betrayal, or arbitrary attacks within the game that might be a surrogate for terrorist activities?

Questions about vendor technology:

- Does game environments generally the ability to capture transactional information on a massive scale?
- Are there currently human players in the game that might be considered to be "terrorists?"
- What other analogs might there be for terrorist behavior?
- Do you think that travel data within a game could be a reasonable surrogate for travel data in the real world?

D. Acknowledgements

Several individuals were extremely helpful in the preparation of this report:

- **(*)Dr. Charles J. Cohen, Vice-President, Cybernet Systems.** Cybernet is a technology developer and system integrator with significant DoD contacts. Cybernet has also developed the OpenSkies system, another MMPG middleware system. Cohen says that middleware companies have been generally unsuccessful at either selling their products or developing their own games. He expressed an

interest in working with DOD on the project. Cohen can be reached at 734-668-2567 or by email at ccohen@cybernet.com.

- **(*)Dr. Ian Lane Davis, CEO and "Mad Scientist" at Mad Doc Software.** Mad Doc is a small game developer located in Massachusetts. It has published its own games and has worked under contract with Microsoft, Maxis, and other firms in a variety of capacities, including auditing, deployment of advanced artificial intelligence software, and wireless development. One of Mad Doc's strengths is the use of AI technology to improve non-player characters in games, both single-user and multi-user games. Dr. Davis has a strong background in simulation and AI.. He can be reached at 978-687-8024 or ian@maddocsoftware.com

- **Bryant Durrell, Director of Technical Operations, Turbine Games.** Durrell is responsible for the operations of Asheron's Call that do not involve money or authentication. (Those issues are handled by Microsoft.) Mr. Durrell can be reached at 781-407-4156 or bdurrell@turbinegames.com.

- **Keith McCurdy, board member and acting Chief Strategy Officer at Rebel Arts.** McCurdy worked at Electronic Arts for 15 years, where he was VP for technology and CTO of the online business. He has extensive knowledge of both online game technology and online game users. He can be reached at 650-851-4045 or keith@rebelarts.com.

- **(*)Alexander Marcis, President, The Themis Group.** A graduate of West Point, Marcis is president of a consulting group that specializes in the online gaming industry. Marcis had many observations on the nature of games and is quite knowledgeable regarding the current level of game technology. He can be reached at 919-806-4477 or amarcis@themis-group.com.

- **Jessica Mulligan, Turbine.** Formerly a columnist and a consultant with The Themis Group, Mulligan has extensive background in gaming, online games, and building MMPGs.

- **Cory Ondrejka, Vice President of Product Development, Linden Lab.** Linden Lab has created a large-scale virtual environment called "Second Life" where the emphasis is on social interactions and the facilitation of user-created content. Originally the system was designed for large-scale weather simulations, and it still accurately models things like forest fires and cloud formations. Ondrejka can be reached at 415-243-9000 or cory@secondlife.com.

- **Jason Della Rocca, Program Director, International Game Developer's Association.** Della Rocca is quite knowledgeable of the online game industry. He provided a pointer to IGDA's report on online games and provided pointers to people within the industry who were receptive to being interviewed. A Canadian citizen, he can be reached at 514-822-1190 or at jason@igda.org.

- **(*)Gordon Walton, Sony Online Entertainment.** Having previously worked on *Ultima Online* and The Sims Online, Walton has extensive experience within the

MMPG industry. His descriptions on the problems of cheating and dealing with banned players were instrumental in developing those themes in this report. He can be reached at 512-250-3964 or gwalton@soe.sony.com.

- **(*)Mark Wirt, Chief Technology Officer and Vice President, Butterfly Engineering.** Wirt's company is building a MMPG middleware system that can model exceedingly large and complex worlds. He is quite knowledgeable about the current state of MMPG technology. His company has considerable market information regarding the current MMPG players. Prior to butterfly, he founded an Internet service provider and successfully sold it in 1999. Between 1989 and 1996 he was Directorate manager for Nichol's Countermeasuers Assessment Directorate, where he supervised and conducted the development of countermeasure concepts to strategic and tactical missile defense systems. He can be reached at 304-260-9520 or mark@butterfly.net

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* Note: starred entries indicate recommended follow-up for future work.