

# Security in Online Games - Case Study: Second Life

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## Abstract

There do exist assets in the virtual worlds of online games which have to be protected. Our basis is the analysis of the participants, their assets and a threat analysis which is done for online games in general. This paper presents an adoption of this analysis to a real online roleplaying game called Second Life.

After a general introduction we present our objectives of our research project about the security in Online Games. The Security Analysis Strategy we have evolved is introduced to the reader. In chapter 2 we specify our Research Interest. Then, in chapter 3 we give an introducing overview to the Massively Multiplayer Online Roleplaying Game Second Life. Chapter 4 comprises the proof-of-concept of a general security analysis done by a case study of Second Life. Chapter 5 gives a conclusion and a future prospects.

*"Hi, my name is Ariel Voskhod. I am a famous painter and business woman. When I have started business one year ago I had to invest some money to establish my own enterprise. My task is to create fair and beautiful canvases which are bought from various people in my surrounding. You will be surprised at experiencing that I do not need any painting and no paint-brushes for my job. Where this is possible? It's the virtual world of Second Life. I am not real? Yes, I am not, but I do produce real assets and this is a hard job as I have to guarantee livelihood of my counterpart in real life."*

Ariel Voskhod is an avatar of the online roleplaying game Second Life. Her counterpart in real life is a human being, who spends her time in playing. While she is playing, she creates assets which can be sold in this virtual world. This is how she is supporting her income.

There are quite a few people who finished their jobs to make money in virtual worlds. This is what really happens at the moment - we have to realize that the effects and interdependencies between the real world and the virtual world are increasing. The consequence of this development is that in the virtual worlds of Online Games huge assets are generated. As a matter of fact, each successful business entail envious who try to harm the assets. Ariel Voskhod has recently experienced such a damage to her items when a copy-

bot produced unauthorized copies of her paintings. This led to a decrease in value of her paintings and she was not longer able to sell them. This makes clear that the assets do need protection.

## Objectives

As Online Games are and remain IT application systems this protection can be provided with IT security mechanisms. To achieve secure Online Games various steps have to be

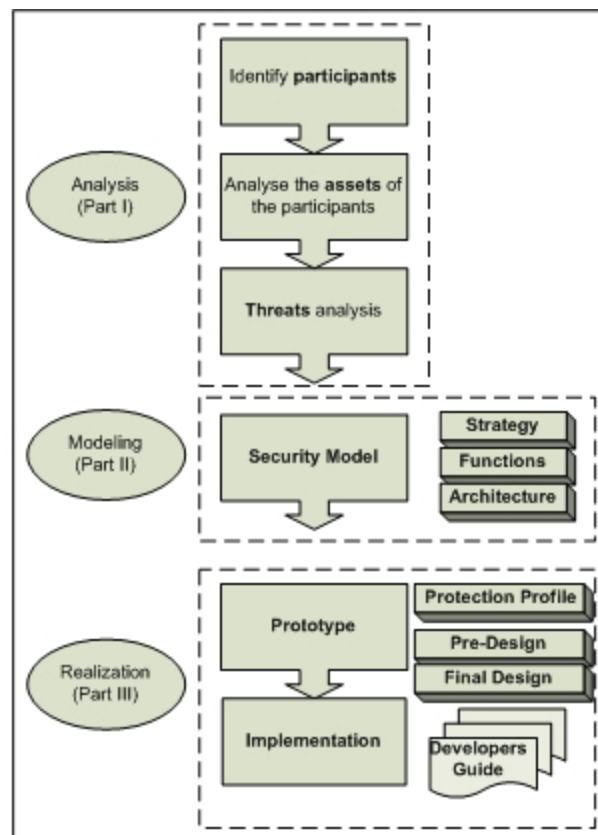


Figure 1: Security Analysis Strategy

taken. Therefore, we conceptualized a Security Analysis Strategy (Beyer 2007) which is the basis for further steps

to be undertaken. See Figure 1. Our aim is to give a recommendation for developers of Online Games on how to implement a secure games architecture which enables the protection of the assets of all participants. "Assets are entities that someone places value upon" (CommonCriteria 2006). In order to get to know which mechanisms we will need, we have to examine in a first step who the participants of the process are. After we have analysed their assets in a second step we are prepared to investigate the threats that focus the assets and may damage them (see Part I in Figure 1). As an example, data is an asset and the corresponding threat is the loss of data which can be performed by certain attacks, e.g. malicious software code. This basis analysis will give us the opportunity to define requirements for a secure games architecture (see Part II in Figure 1). To prove the feasibility of our approach we will prototypically implement it.

### Research Interest

At the moment we realize that there is something happening at the moment. This is the merging of virtual world and the real world. The virtual world has effects to reality and is able to change it. And the both worlds are serrated so narrow that sometimes it is difficult to say whether something is real or virtual. Especially Second Life has attracted so much attention - not only from the media. Quite a few research groups have discovered Second Life for research topics as well. Various issues are interesting, e.g. education (Robbins 2007), economy, marketing and social matters like communication.

Our research interest in Second Life is a bit more technical and regards security aspects in the game. The research questions we would like to answer to are the following.

1. What are the assets participants put value on?
2. How could someone threaten these assets?
3. Which mechanisms could be placed to protect the assets?

What we have done so far is the analysis of the participants and the analysis of assets and threats in general with no focus to a specific Online Game (Part I in Figure 1).

The participants who participate the gaming process are the player, the games provider and various interest groups (see Figure 2). In general an interest group is a group of players with to some extent the same ambitions in the game.

The players often join forces – a group of players we call interest group. Normally, this is a long-lasting binding. In Second Life, an interest group are the land owners and the players who have the same profession (designer, scripter, et cetera). A *guild* in Massively Multiplayer Online Roleplaying Games (MMORPG) is such an interest group. A guild is a group of players who cooperate, explore the world together or solve quests together. There might be other interest groups we did not mention here. There do exist assets in the game which are targets for attacks. The Second Life's speciality that the residents have the ownership of the objects even increases the relevance for our security reflection.

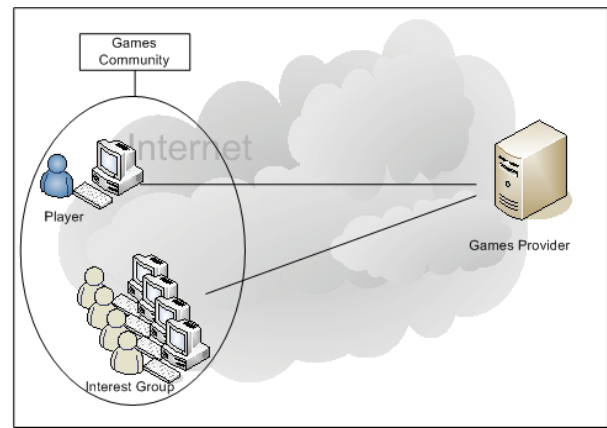


Figure 2: Protagonists of the Gaming Process

In this paper we want to present a case study of the MMORPG Second Life which is a proof of concept to verify our findings.

### A glimpse to Second Life

Second Life is a Massively Multiplayer Online Roleplaying Game which was created by the US Company Lindenlab. It was established in 2003 and reached approx. 3 million players worldwide by the end of January 2007 (Residents 2007). It is possible to be part of that virtual environment for free. A basic membership does not cost any money. If a player wants to own land he must have a premium membership for 9,95 dollars. The first time the player connects to the virtual world of Second Life he creates an avatar who is either male or female. The look of the avatar can be modified very granularly. The aim is to create a new life in the virtual world where you can achieve your dreams. It is meant to be the parallel identity of the player in the virtual world. With their avatars the player can create new things without any limit to imagination.

Figure 3 shows a typical scene in Second Life. The man on the lower left hand side, lets call him Wannabe Racer, is walking on the beach. As you can see he is wearing jeans and t-shirt which is not comfortable at the beach. In Second Life he has the possibility to buy trunks from other residents who designed one.

There are some characteristic features for Second Life which are quite different from the features of other Online Roleplaying Games. Firstly, the residents retain the **copyright** of their creations. This means that the user really own the items he creates and is therefore allowed to sell them. There are various possibilities to **earn money**. The avatar can either take a job or run a business himself. He can take a profession, become a designer, photographer, hairdresser and so on. There is wide variety of objects one can **sell and buy** like clothes, accessories, jewelry, cars, houses, arms, etc. This is a never ending list because every player can provide the implementation of his ideas without limitation to imagination. But this is not all, it is also possible to buy **virtual land**. "Islands are priced at US Dollar 1,675 for 65,536



Figure 3: Second Life Scene - At the beach

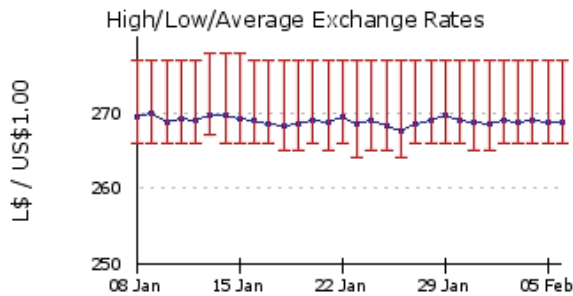


Figure 4: LindeX Market Data - Linden Dollar Exchange Rates

square meters (about 16 acres). Monthly land fees for maintenance are US Dollar 295” (SecondLife 2007).

Another speciality is the in-world **currency** Linden Dollar which is **exchangeable** for real-life dollar (Rymaszewski 2007). The exchange rate varies daily (see Figure 4) and is published through LindeX - the official Second Life Linden Dollar exchange.

In Second Life trade is an important part of the game. **Making real money** is also possible with other games, like World of Warcraft, but it is not really integrated into the game, so that the trade (sell and buy of accounts and items) is done via Ebay. But this is not really accepted by the games provider. But they do not really have a possibility to prevent this.

Via an in-game chat system the players can **communicate** with each other players. The communication aspect in Second Life is quite important for the following considerations.

The most prominent player in Second Life probably is Anshe Chung who is the owner of the continent 'Dreamland' (Rymaszewski 2007). She is a "Chinese-born language teacher living near Frankfurt, Germany" (BusinessWeek 2006). As Second Life becomes famous, more successful real-life companies create their digital

counterparts, e.g. adidas and IBM. This shows that it is possible to establish a business from Second Life to reality. And also real companies are interested in creating their virtual counterparts in the virtual world. As you can see the communication aspect is ostensible in Second Life where in other MMORPG's solving quests is the main target. Maybe this is the reason why Second Life becomes interesting for advertisers as well (BusinessWeek 2006).

To sum up, what you can do in Second Life? Create an avatar, explore the world, meet and talk to people, own virtual land, build and trade with objects, gamble, fight, learn and teach, do marketing, earn money, and this is just the beginning...

## Analysis of Assets and Threats

### The player

Imagine that Wannabe Racer has just bought a wonderful painting which was an ordered work to Ariel Voskhod, the famous paintress and was therefore of very high prize. Both Ariel and Wannabe are interested in the security protection of this objects. If it would be possible to an attacker to make unauthorized copies of the painting this would have a negative impact on both. Who the attackers are? It might be other players, the provider and other groups of players.

In fact not paintings but land are the most valuable items in Second Life. A speciality of Second Life is that people can buy land for real money and therefore own it. Especially islands are cost-intensive and therefore very valuable and important assets for the player.

A second asset of a player like Wannabe is the social contacts. Imagine Wannabe is an art lover and part of a social network of the art scene. The contact to the group is implemented via the friends list. If it would be possible to an attacker to manipulate the list or even delete the contacts Wannabe would loose almost completely the contact to his friends.

One of the most valuable thing in the game is the money (Linden\$). Because of the direct connection to reality and the guarantee for the integrity of the value is therefore needed.

But selling items is not the one and only possibility to earn money. Most of the content is user generated. A lot of jobs are offerd for modeling and scripting, what means to generate interaction for the avatar (e.g. the moon walk dance). The knowledge of how to script and build things is a crucial requirement to generate content. You need indepth knowledge about programming and creating 3D-models. As the majority of players are not able to do this, they buy this as a service from the 'scripters'. If you are a talented specialist you can be a freelancer and earn money by creating the items for others.

As it is in real life the first impression the people get of you is your appearance. The players can give their avatars

a very individual appearance. Besides, the avatar can be individualized by special haircuts and tatoos. The players pay a lot of money and spend a lot of time in styling their avatars, because it is their representation in the virtual world.

A more functional asset is the account data (username, password) which is the key to enter the virtual world. Without access to the game the user cannot participate. The protection of the account data prevents an attacker from direct access to the game and the assets. Threats like Social Engineering (e.g. Phishing) aim that direct access. The assets and threats of the player are structured in Table 1.

### **Interest groups**

The asset of social contacts do not only apply to the players but to the interest groups as well (contacts within the art scene). The assets and threats of the interest groups are structured in Table 2.

### **The Provider**

Lindenlab is the provider of Second Life. Not only the player have assets in the game but the providers too. An important asset of Lindenlab is the rule set. The most important rules are:

- The player is free to create everything he can imagine, this is only limited by technical abilities and fantasy.
- The player has the copyright of things he created and he decides which options (copy, give away) are possible with th items

This is a basic requirement for a flourishing trade. This trade exceeds what we know of trade in real life because the player is able to forbid the circulation of items. This enables the balance of the virtual world of Second Life: if the player would not have the possibility to prevent his items from being copied he would not be motivated in creating really smashing items. On the other hand, the players want to own high quality items and are willing to spend real money for it. This is the basis for the trade and the quality of the in-game world depends on it.

In difference to other MMORPG's the in-game world is mostly generated by the community and therefore develops dynamically. The assets and threats of the provider are structured in Table 3.

The meta asset of the provider Lindenlab is to earn money and is therefore dependent on the payments from the players. As mentioned above a basic account is free of charge. However, land and island owners have to buy their land and have to pay a monthly usage fee. Furthermore, there are fees for money transactions (exchange of Linden\$ to US\$).

### **Future Work**

This article contains the adoption of a general threats analysis for Online Games applied to Second Life. We have shown that all participants have assets that can be targeted

by attackers. This must not always be external hackers, the threats can also come from players, the provider or special interest groups.

All participants have different interests which have to be balanced. For reasons of immersion one could imagine that there must be an in-game institution which is obliged to ensure law and order in the virtual world. At the moment there is just the provider who is able to take actions. We have shown that items like houses are assets and of great importance for the player and need to be protected. But imagine that a player creates content which is right-wing extremist (swastikas at walls) or violates the law. Then it is essential that this content is deleted. But who is allowed to decide whether something is unethical? At the moment no jurisdiction is established for Second Life. And if it will be set up where will it take place, in-game or outside? As a matter of fact residents have already lost items, e.g. through malicious software (Linden 2006). We are awaiting first trials calling a case.

Our next steps will be to define the requirements to a secure game (part II in Figure 1) and the design and a prototypic implementation of a secure Online Game Architecture in order to finally establish a Developers Guide which shows how to create and implement a secure game. Therefore we will use a kind of criteria check list. For the security of IT systems and applications the Common Criteria (Common-Criteria 2006) are in practise and we want to apply these criteria to Online Games. The requirements will be defined through a Protection Profile (part III in Figure 1).

ASSET	SECOND LIFE	THREATENED BY	THREAT
Items	Painting, Land Clothes	Player Provider Interest Group	Reduction in Value (e.g. Copying) Total Loss (e.g. Theft)
Skills	Skripting		
Money	Linden\$	Player Provider Interest Group	Reduction in Value (e.g. Copying) Total Loss (e.g. Theft)
Avatar	Virtual Counterpart of Real Life	Player Provider	Unauthorized Modification
Social Contacts	Social Network of Art Lovers	Player Interest Group	Loss, e.g. Mobbing
Account Data	Username Password	Player Interest Group Provider External Attacker	Loss (e.g. Phishing, Closing Account)

Table 1: Assets and Threats of the Player

ASSET	SECOND LIFE	THREATENED BY	THREAT
Social Contacts	Social Network of Art Lovers	Player, Provider Interest Group	Loss, e.g. Data Loss on Server
In-game World	Mainland, Islands, Houses	Player, Provider Interest Group	Non-Availability

Table 2: Assets and Threats of Interest Groups

ASSET	SECOND LIFE	THREATENED BY	THREAT
Payments	Land Usage Fee Money Transaction Payments	Player Interest Group	Loss of Payments Refusal of Payment
Games Rules	Unrestricted Devel- opment Player sets Options for Items	Player Interest Group	Unauthorized Modification (e.g. Copybot)

Table 3: Assets and Threats of the Provider

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