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# SOA Architecture for Games Digital Distribution

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## ABSTRACT

This study aims to implement SOA in the field of digital distribution games, besides that the application of SOA in digital distribution games also has several benefits including helping the users of this game with the effectiveness of time used, besides using SOA on digital distribution games also increases connectivity with providers services in game service providers are more dynamic. In addition, using SOA in digital distribution games can also speed up standardization servers and application applications and provide bridges (data-bridges) between incompatible technologies.

**Key words:** Service Oriented Architecture (SOA), Digital Distribution, Video Games.

## 1.INTRODUCTION

Technological developments in the era of globalization have increased significantly enough to reach most human activities. Humans and technology coexist and complement each other's needs. Technology makes everything more practical and easy to do, so that human work that was previously difficult to do, can be realized easily, quickly, and efficiently. One example of technology that is often used is the internet. The presence of internet technology provides the benefits of unlimited and time communication. The use of the internet is not only for seeking information, but also for economic transactions called e-commerce[1].

Along with the development of the times, the speed of the internet has become increasingly fast allowing for e-commerce players to approve digital products online using digital distribution. Digital distribution is the delivery or distribution of multimedia content such as audio, video, software, and games, through online methods such as the Internet, so that it does not require physical media such as paper, CD-ROM, or DVD. Digital distribution generally supports products that can stand alone, while additional material that can be uploaded is called download content[2]. Bold distribution content consists of uploading and streaming, and generally books, movies, music, and games. Products that can be uploaded can be stored on the user's hard disk and can be used later, while streaming content can be accessed for a certain time, and cannot be stored permanently by the user.

There are several digital distribution channels developed in Indonesia, the Play Store belongs to the Android platform, Apple's App Store, then Steam belongs to the Valve company. Steam is a digital distribution that represents its products containing digital games that can be downloaded through the Steam application itself. Transaction on Steam has provided a sense of security for its users, because the
application will send instantly into the user's library after completing the process of purchasing the application.

Digital distribution games have been getting longer in the past few years, and now the more unavoidable of what already exists or the disk is getting left behind and downloads are the way in the future. However, not everyone is happy about that, because many people still hope to get the physical objects they buy, but more and more game sales are done through online services.

Apart from the main reason for completing digital video games is an accessible factor. Through digital distribution, there is no need to go to the store to buy games. Instead, just click a few buttons on the computer controller, wait for the game to be downloaded for some time and after that just play the game that you have finished downloading.

André Marchand & Thorsten Hennig-Thurau [3]examined various applications that can be accessed by many users and online app has these features: Efficiency for search (fast, easy to use, and easy to find) value (competitive price and good quality); and interaction (information, security, load time, and navigation) Make Steam create a feature to make it easier for users to find the desired application according to the desired category.

## 2.THEORETICAL FRAMEWORK

In this section we discuss current implementationapproaches and some pros and cons of the existing MMOGarchitectures.

### *A. Client-Server Architecture*

Some first person shooter online games like Quake and Doom typically use the client-server architecture. In this architecture a single server is responsible for handling of game states and clients Quake II [4]. Like almost all virtual reality games, also follows a popular server based topology in which a single server maintains the state of the game world. The game state is a collection of objects associated

with which a small part of the game world. These parts can be computer controlled player, terrain etc. Functions determine the actions of the player and allow freedom to interact with other players. At each iteration server is responsible for function invocation and assigning players actions. Bharambe et. also discusses to some extent the scalability analysis of Quake II. This architecture cannot be assumed to bear load of such a large number of users[5].

*B. Mirrored & Scalable client-Server Architecture*

This architecture is similar to client-server architecture but now each server maintains its own copy of game state. All copies of game states should be identical and there is critical requirement of synchronization between each server. Clients are now distributed amongst a number of servers which reduces the load on a single server. So this architecture presents flexibility in terms of scaling. This technique with the issue of synchronization between servers is discussed in Cronin E., Kurc A. R., Filstrup B., Jamin S. [6]. It is difficult to maintain this synchronization technique when large number of players are online in MMOG and the environment has become highly dynamic. In addition since each server has a local copy of whole game state, when network becomes highly scalable, additional resources may be needed on the server for brisk processing capabilities.

*C. Peer to Peer Games*

Game state is stored in peers and each peer is responsible for its own region. Peer to peer systems are not under the centralized control of the game server A[5]. Concept of multicasting is used where client in a periodic and distributed way send update to all other peers involved in a game session. This architecture consumes a lot of bandwidth too. It is also less reliable in terms of security as global game state is stored in local peer . So malicious peers can modify the game state and propagate to other peers. A specific middle-ware is also designed to work between application and network layer. This layer is specific to peer to peer games and very much application specific considering QoS concerns[7].

*D. Distributed Deployment techniques*

Some research designs including specific middle-ware design techniques have used server clusters to improve the scaling of server oriented design. Although server control is desirable for tight administrative policies in some cases, a distributed architecture can address many challenges. As discussed in previous section, scaling is the critical issue for MMOG which can be well addressed having distributed architecture[8]. Single point of failure risk in case of client-server architecture can also be eliminated by distributed architecture.

Main idea is to take advantage from locality of interest to distribute the game across several game servers and reduce computational constraints on each single server as well as bandwidth requirement [9]. These designs give ability to handle a very large number of simultaneous users and provide enough computational capability to simulate the gaming algorithms.

Distributed design can make use of third party server deployment also but comes with inter-node communication costs and latencies [5]. These distributed architectures belong to tightly coupled systems making strong assumptions about the interface of interconnected components. So changes in one component's interface reflect it to the entire components interface having significant impacts on all the components. As a result these systems are more difficult to modify and they require a retest of the entire components associated with the same interface. These systems also suffer limitations in independent and incremental development, lack of support to impedance mismatch and no dynamic real time adaptation.

Vleeschauwer et.al. [10] each game server assigns dynamic microcells, each of which contains a very small portion of the large game state. The Microcells can be distributed between servers to balance game load efficiently. It also proposes various methods for efficiently balancing the load. Also microcells depend on a single shared storage mechanism which can be a scalability issue and could potentially suffer from a large performance drawback in MMOG environment.

**Table 1:** State of the Art

| Journal | SOA architecture for E-commetce | SOA architecture for MMO Games | SOA for Serious Games |
|---|---|---|---|
| Luhach, 2014 | x | | |
| Arslan, 2012 | | x | |
| Carvalho, 2015 | | | x |

Various other related techniques have been presented in literatures. Assiotis and V. Tzanov [8] some improvements to microcell management are suggested. It particularly focussed on handling game events occurring near virtual boundaries that provided seamless transfer of objects between servers. It also describes an algorithm for dealing with hotspots, and discusses an algorithm that allows the entire game to scale horizontally. Work presented is more closely related to work presented in this paper. It describes the design and implementation of specific data centric publish subscribe (DCPS) middle-ware for network games D[7]. It provides some scalability related features but lacks in reliability concerns. QoS guarantee has not been assured by specific middle-ware.

## 3.RESEARCH METHOD

Service-oriented architecture (SOA) provides methods for independent and incremental development and integration of systems. Systems typically assume functionality around business processes and package them as interoperable "services" [11]. SOA also describes an information infrastructure which allows different applications to exchange data with one another as they participate in the related process.

Service Oriented Architecture ensures functionalities like[11]:

- Interoperability among the systems having different software
- Reusability of network resources
- Seamless flow of data from one side to other
- Monitoring and tracking of the information
- Scalability of the already deployed network

This standardized architecture is designed to better support the connection of various systems of systems and the sharing of data. It breaks down large applications into smallermodules as services and unifies different processes. Different groups of people both inside and outside of system can use these applications.

Data flow architecture, Event driven architecture and client server architecture are basic date orchestration approaches used by any service oriented architecture [10]. The basic requirement of any real time service oriented architecture is to ensure the quality of service. Real time service oriented architecture provides real time system operations and interaction between services and provides support to meet with strict timing constraints.

## 4.DISCUSSION

### *A. SOA Architecture for Digital Distribution*

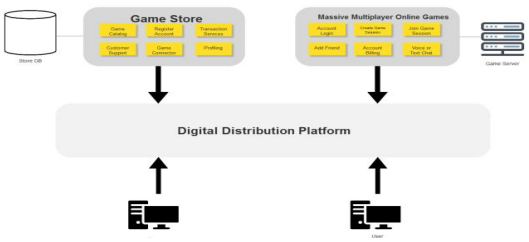


**Figure 1:**. SOA Architecture for Digital Distribution

### *B. Game Store*

Game Store is the provider of a game itself, which provide the digital copy of the game instead the physical one. Since the store is Digital, it requires services such as: (1) Game catalog. A game listing with additional feature to enhance user experience when browsing games; (2) Register Account. Enable user to create account which allow them to access exisiting feature; (3) Transaction Services. Use of credit card or gift card to buy games or digital item in the store; (4) Customer Support. Provide various assistance for the user experiencing problem related to the purchased games; (5) Game Connector: Enable digital game store to launch or connect with the game via API; (6) Profiling: Enable interaction, synchronization, and persistent feature across different games.

### *C. Massive Multiplayer Online Games*

MMO Games enable its player to play with another player through the internet connection. To facilitate the player, MMO games provide services such as:

1. Account Login: When game store connected with MMO games via digital distribution, account login become automated whenever the user launches the games.
2. Create Game Session: Enable player to create game session which allow another player to join the session in order to play together.
3. Join Game Session: Enable player to join other player game session in order to play together
4. Add Friend: A service to make player unlock feature when they become friend during in game
5. Account Billing: A service that keep track the player billing information
6. Voice or Text Chat: Allow player to interact with other player via voice chat with installed plugin, or basic text chat when player don't have microphone.

### *D. Implementation of SOA for Digital Distribution*

The current implementation of this type of service-oriented architecture is Steam from Valve corporation[12]. Valve Corporation create Steam to make player become more engaged to the game store by integrating the game store with the massive multiplayer online games.

In the previous section, we identified the key functionalities of interoperability among system that are relevant for Digital Distribution. In order to deliver a proof of concept, we applied our findings to propose the refactoring of an existing digital distribution, called "Steam" from Valve Corporation[13]. The digital distribution is already known for distributing popular massive multiplayer games such as Data 2 with peak player at 936,283, this number may increase during holiday season or major tournament. In order to play data 2, user must have Steam account, since data 2 is on Steam digital distribution many of data 2 feature are linked to Steam account such as, in game item which are transferred to the user Steam account, or every snapshot from the game are saved within the steam account and can be showed in Steam account profile. "Steam" implements some basic aspects of a Service-Oriented Architecture to provide adaptation features for interoperability. With this analysis, we show how the digital distribution can be expanded to further exploit the SOA paradigm.

This case study shows us how Valve Corporation integrate the game store and massive multiplayer online games in a way that promotes reusability and interoperability. For example, implementing the user profile as a service brings the immediate added benefit of decoupling the information about the player's achievements from the game itself via Steam profile, this promote interoperability. facilitating the player with various method of payment also promote reusability when buying games.

The downsides of applying this approach to digital distribution development involve the time and cost to refactor the code, and the increased complexity in how to test it[14]. For this reason, it is crucial that the future service-oriented architecture framework for digital distribution includes not only the specifications of the services and interoperability standards, but also

recommendations on how to minimize costs, and particularly how to perform customer satisfaction.

## 4.CONCLUSION

Based on the research that has been done, the application of SOA on digital distribution games is very helpful for the users of this game with the efficiency time used, besides using SOA in digital distribution games also increases connectivity with service providers in game service providers becoming more dynamic, besides using SOA in digital distribution games can also speed up standardization servers and application applications and provide bridges (data-bridges) between incompatible technologies

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