# PROVIDING COMMUNITY AND COLLABORATION SERVICES TO MMOG PLAYERS[*]

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## ABSTRACT

Most of Massively Multiplayer Online Games (MMOGs) aim to support and improve the community activities among their members. The Community Network Game (CNG) project has focused on services supporting players during their in-game community and collaboration activities. The tools we offer use an innovative technology, namely the In-game Graphical Insertion Technology (IGIT), which permits the addition of web-based applications without having to modify the game code. These tools follow a design adapted to the needs of MMOG players. They are provided by the so-called CNG Server and have been implemented based on recent advances in Web 2.0 technology. The in-game collaboration activities provided by the underlying framework are also enhanced using Peer-to-Peer (P2P) technology for the distribution of user-originated live video. In this paper, we concentrate our focus on the architecture of the server as well as on the design and implementation of the community and collaboration tools.

## KEYWORDS

Massively multiplayer online gaming, gaming communities, user-generated content, game adaptation, system design

## 1. INTRODUCTION

The Community Network Game (CNG) [5] is a research and innovation project funded by the European Commission to research and develop in-game community applications for MMOGs. Currently, many Massively Multiplayer Online Games (MMOG) providers offer various tools for building online communities and for sharing User-Generated Content (UGC) as an integral part of their games. Having a common look-and-feel of out-of-game features for different games is a recent trend and several game-adaptation frameworks were born for this purpose. Steam and XFire are such applications, with many surveys, like [4] and [8], mentioning XFire [10] to be the most important one among them. XFire provides a set of tools that is displayed in an overlay on top of the screen. It is a free product and does not change the game code. Some of the key features supported by Xfire are: text and voice chat, screenshot and video sharing, live video streaming, interaction with external Instant Messaging (IM) networks, web browsing, etc.. All these functions can be started in the game-screen without any player's obligation to leave the game window.

The progress beyond the current game adaptation products offered by CNG can be summarized in the following points. It should be noted that all technologies mentioned below are developed in an MMOG "independent" and "friendly" manner:

- Cutting-edge network technologies for live video sharing over Peer-to-Peer (P2P) [2].
- Game-oriented social networking, collaboration and video-editing tools.
- Innovative web technologies suitable for in-game rendering of online community and collaboration tools.
- Advanced game adaptation technologies allowing the user to replace 2-D textures and inserting 3-D objects in selected game scenes.

CNG makes use of In-game Graphical Insertion Technology (IGIT), which is an innovative technology permitting the replacement of game objects and the insertion of UGC as an overlay of the game scene in real-time. Using IGIT external web-based applications can be rendered, as a new layer on top of the game screen. In this way, innovative community and collaboration activities can be easily introduced as in-game features. It is important that IGIT functions are offered, without changing the game application in the MMOG client or in the server [3]. The MMOG "independence" allows the same technology to be used in multiple games, and therefore CNG consists a generic application with a single installation being able to address directly to multiple MMOGs and MMOG operators. The provision of the new community and collaboration features will be provided by a deployment separate from the MMOG delivery network and thus, by moving the processing and network load away from the MMOG server or content delivery network, new demanding features and applications of can be offered to the users.

The CNG community and collaboration tools are provided by the CNG Server, which consists the core of the CNG system. The implementation of the online community and collaboration applications is based on Web 2.0 technology, which is widely used for social and UGC-sharing activities. In this paper, we describe the high-level architectural design of the system components developed to support CNG community and collaboration tools. In addition, we provide a detailed description of the architectural elements, starting with details on the CNG Server's components and continuing with the online web applications. The most important aspects of system's design and implementation are described, including the used interfaces and protocols, the interaction of the system modules and the adopted technologies. We concentrate our focus on the features that distinguish the CNG services from a typical social networking system and we issue any design aspects that can contribute to future standardization processes for WWW and open social networking.

## 2. DESIGN & ARCHITECTURE

## 2.1 User Interface

The graphical design for widgets implementing the various tools follows a simple and clear approach, so as not to dominate the game scene, thus avoiding to distract the users, and to affect their in-game experience. The tools-widgets are web pages that are rendered inside the game window, through the IGIT technology, which allows the in-game display of web content.
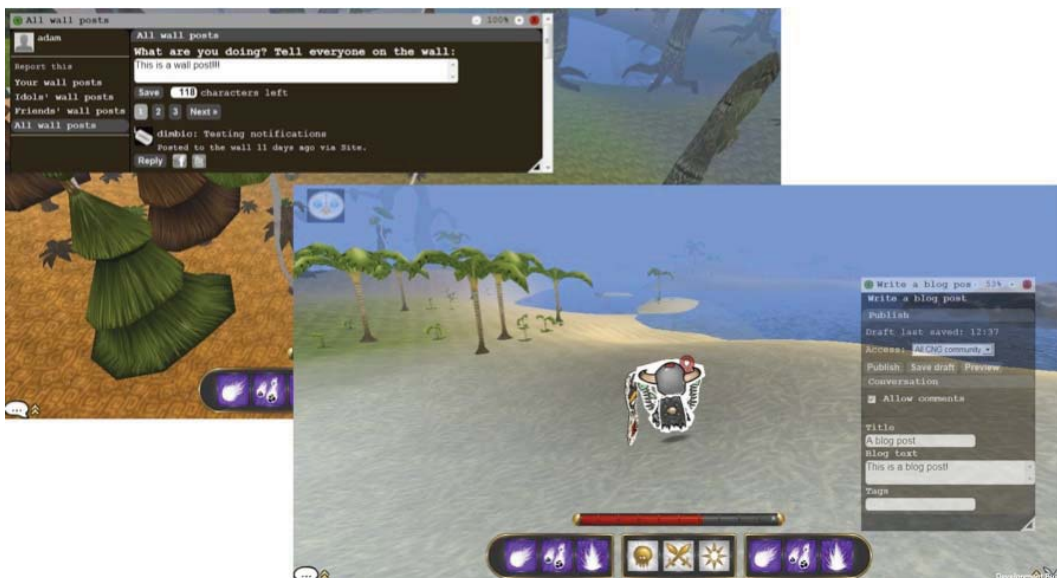


Figure 1. RedBedlams's "The Missing Ink" game with integrated CNG collaboration tools

The CNG tools use advanced web technologies to provide customizable layouts. This is required in order to allow both for different positioning options in the different games, since the CNG collaboration tools

should not overlap the game's on screen tools and options, and for the users' various preferences and styles. Different layouts can be used for different scenes of the same game and/or different views of the same scene.

The CNG tools appear as floating windows within the game screen and can be considered as part of the game. Thus the tools enhance the in-game experience without requiring the players' to break their gameplay to access external tools. Two different positioning, transparency setting and sizing options are depicted in the two screenshots of Figure 1 using the CNG framework with RedBedlam's "The Missing Ink" [9]. One shows a vertical alignment of the panes of the blogging widget, and the other shows a horizontal alignment of the panes of the "Wall" widget.

Although positioning the CNG collaboration tools outside the game window, e.g., next to right side of the game window, was an option, gamers strong expressed their preference for tools rendered on top of the game window.

The support of multiple game resolutions and screen sizes is a big challenge for the design of the CNG User Interface. The CNG online community and collaboration tools have been designed independent of the game resolution selected by the user. The independence from the game screen configuration is not just limited to the size of the CNG widgets but extends to their web content. When the session is initialized, the CNG Server dynamically generates the appropriate dimensions for the CNG windows, as well as the proper Cascading Style Sheet (CSS), using information for the game screen configuration sent by the CNG Client, in order to achieve a consistent layout for the CNG tools' windows.

## 2.2 Web Server

The web server, as part of the CNG Server, provides the online community and collaboration services. The web server consists of two components: the presentation-tier, which is the UI component, and the business logic-tier, which is the backend component. The implementation of the web server is based on the Elgg social networking engine [6].

The UI Component is the interface of the overall web server with the CNG Client side and in particular with the web-browser instances in it (at this point it should be recalled that the client side of the CNG system is executed within a container that, using instances of a web-browser, displays web content on top of the game screen). The UI component serves the client side with the user interface of the CNG Web 2.0 online collaboration tools, as web content (HTML, JavaScript and Flash objects). The web browser instances in the CNG Client side communicate directly with the UI component requesting these services' layout and content. Thus, the CNG user interface and the CNG Web 2.0 online collaboration tools can be updated and extended without the need to change the CNG Client. In addition the UI Component provides of the web-based interface used for the administration of the web server. This is only available to administrators of the CNG system (i.e. users with relevant privileges).

The Backend component is the mid-tier between the other parts of the system, i.e., the UI Component and the Database and it consists the core of the web server. The Backend component provides all the functionality that is related to the Web 2.0 community and collaboration applications of the CNG system. This includes the management of these web applications, and the management of users, access groups, and. all the other involved entities. Finally, the Backend component is located between all other components and the Database. This way it hides the schema and implementation details, decoupling the Database from the rest of the system.

The CNG Server component provides the ability to users to interact with their accounts in external social networks. Towards this direction, the system provides interconnection with Facebook and Twitter social networks with single sign-on functionality. An one-time setup phase has to be completed by the user in order to enable this feature. The user provides his credentials for his Facebook and Twitter account and authorize the CNG application to have access to his accounts. When completing this setup phase CNG server receives an access token from the external social networks and acquires permanent access. It is important to note that CNG Server does not store the user's credentials for obvious security reasons. Once the user authorizes the CNG application, then he is able to post the messages that are displayed in CNG Web tools to his his Twitter and Facebook walls. The server side does this posting, without prompting the user to enter his credentials. This procedure can be considered secure, as the access tokens are valid only for usage by the CNG application.

## 2.3 Chat Application

Chat application allows users to communicate in groups using instant messaging and voice while being logged in to the system. It also provides private chat between two users. In group chat, the users are able to enter virtual rooms that others have created and communicate with all the users of the room. It is obvious that the users of the room have to be online. However, in the case of private messaging, the messages sent to offline users will be delivered when the users log back in. At this time, a notification message for new chat messages is presented to the user. CNG Server is responsible for room management and also for access management.

The implementation of the web based Chat Application is based on Adobe Flash [1] technology. This technology was selected after examining the capabilities of other solutions like Java and HTML. Especially, the selection of HTML5 was discouraged, as it does not support voice capturing. In addition, Adobe Flash presented better animation quality when comparing with both HTML5 and Java applets.

Chat services require an infrastructure, which will enable them to operate. For this purpose, a media server is used as an application server. Red5 Media Server [7] was selected, as it is an open source multimedia server that supports media streaming features. While the user is connected to the system, the chat application maintains a permanent connection between the user and the media server. The user can retrieve data asynchronously without interfering with the display and behavior of the web page within the browser. Chat application can be considered both transmitter and receiver of data. It is able to capture voice and text messages and transmits them to the media server. In parallel, it can receive voice streams and messages and reproduce them in the client side.

## 2.4 Database

The database is an essential part of the CNG Server's architecture since it stores data for the CNG community and collaboration tools. The web server and the CNG tools are based on the Elgg social networking engine [6], and therefore CNG database schema is based on Elgg's schema. This schema models the entities and the general entity relationships, while it allows custom entities and relationships. In addition, it can store access rights to objects that can be used for authorization purposes.

The database schema provides two ways to store additional information to entities. The first way is the addition of metadata, which can be considered as adding attributes to an entity. This way is used in order to prevent altering the schema. The second way is the addition of annotations, which are generally information added by third parties like comments and ratings. Metadata and annotations are modeled by tables that store the strings of extra information, which are linked to the entities.

## 2.5 Administration & Monitoring

In online systems like CNG where many users are served at the same time, it is essential to monitor the system's performance and also the online tools usage using administrative and monitoring tools. There are many cases where administration and moderation must be applied when the users are free to interact with the online community. In these cases, the administrative tools are used in order to supervise the CNG community network and avoid the distribution of inappropriate content. Using the infrastructure of the CNG tools, the user can easily report to the administrator any user or content.

The administrative tools provide an interface for the administrators to manage the CNG system. The management can be done using network administration tools and a control panel for users' accounts administration, which actually provides full access to users of the system. This control panel supports operations for adding, removing, activating, deactivating a user and also resetting passwords and promoting users as system administrators.

Information about system usage can be considered valuable when analyzing complex online systems with many users. CNG monitoring tools log the users' activity within the CNG tools and intend to provide information on the users' behavior. These tools are able to provide detailed logs for each user or tool and aggregated visualized statistics. The monitoring procedure intends to analyze the traffic of the CNG tools usage at the highest possible level. The main functionality of monitoring tools relies on collecting real data and analyzing them in order to extract knowledge about the usage of CNG community tools. The system logs

every HTTP request and then extracts the requested URL and the HTTP request method. With this information it can map each request to a specific action of the user, like writing a wall post, viewing a live-stream, upload a file, etc..

The implementation has been based on the Elgg [6] framework's infrastructure, so that the monitoring tools are used in combination with existing online verification tools in order to provide a complete view of the system's behavior. CNG Server provides a system diagnostics tool that can be used for inspection of all the configuration information of the system, like the paths to the files installed in the web server and all the installed collaboration and community tools accompanied with necessary related details.

## 3. CONCLUSION

In this paper, we presented the online system that was developed as a part of "The Community Network Game" (CNG) project. CNG aims to provide online community and collaboration services to MMOG players. We presented an introduction to its key features, like the IGIT technology and the live video streaming over the peer-to-peer network. We described the high-level architectural design of the CNG system and highlighted the system's design and implementation for the provision the online community and collaboration tools. We showed the key features of the CNG Server and also covered some important aspects of the CNG Client. Our analysis included details on the user and administration interfaces, the element's structure and the functionality for both the CNG Server and Client.

## ACKNOWLEDGEMENT

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