IST Content4All
Architecture of a Cross-Media Virtual Community Platform

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Abstract

The paper is presenting implementation of an open-source cross–media platform for communication and information exchange, developed under the IST Content4All research project. The framework is taking advantage of new distribution methods such as "peer–to–peer" networks, combines them with traditional distribution channels while aiming at creation of virtual communities which meet both individual users' and businesses' needs.

1 Introduction

The advances in communications and multimedia presentation technology provide a community with a variety of complementary terminal and access technologies [1]. Based on these, and exploiting the pervasive nature of modern information devices and services, each individual may remain in touch with his friends, even on the move, and never to get a feeling of "getting lost and all alone".

The convergence of telecommunication services indeed puts the formerly independent communication (phone), entertainment (TV) and information management (PC) devices on a common denominator, but is not directed towards a unified service development in which any of the above mentioned devices represent an exact substitute to the others. Due to technical restrictions it is impossible to provide the exact same user experience on such a wide range of devices; furthermore, these devices must exploit their complementary nature and properties.

IST Content4All (C4All), "Cross-platform Tool for Community Content Publishing" [2] is an EC-funded research & development project within the 6th framework, which deals with content creation, storage and distribution.. Its general objective is to provide an open-source cross–media platform under which sharing, communication and management of content is to be provided using broadcast, wired and wireless distribution channels, running on varied communication terminals.

The objectives of the project cover sociological, business and technical aspects of cross-media services for leisure, entertainment and communication. During the project, societal and citizen trends, related to cross-media leisure & entertainment, building of virtual/affinity communities together with business and legal challenges as well as methodologies in the Cross-media publishing market are being studied. Most importantly, an open-source framework is being developed, consisting of intelligent media management methodologies for publishing/distribution over heterogeneous devices, exploiting broadcast, client-server and peer-to-peer distribution channels.

The framework is being prototyped for evaluation purposes as a demonstrator in the tourism-information sector. The prototype will also serve to simulate varied business models for the cross-media market.

2 Cross-media

The expression of "cross–media" denotes publishing of a message or communication via multiple media outlets, such as printed materials, TV broadcast, cellular phone and/or the Web. The platform is being developed to provide tools for integrated content production and management, which is to be delivered and accessed on a wide range of devices; the use of more than one media type to support a single theme or story is assumed [3].

According to its definition [3], "cross–media does not just exist by the juxtaposition of different devices and platforms, but finds its relevance when the common message or story or goal is spread on the different platforms and when the supporting interaction takes place on these different platforms". The main objective is therefore to take advantage of each supported platform's benefits, e.g. the comfort of watching a directed TV broadcast in a sofa, the convenience of a PC terminal for content manipulation and, nevertheless, the ubiquity of wireless handhelds. Behind the terminals, the power of distributed and centrally managed content distribution and messaging is also exploited in balanced way.

Classical media like television or press are evolving to the cross–media concept gradually, exploiting daily advances in technology, and are having a rich historical context. With the appearance of Internet–based media services in the 90's, like the World Wide Web, these were considered as an additional type of media besides radio, television, movies, magazines or newspapers. The Internet is nowadays not to be considered as a synonym for these services as it has matured from an instance of content repository to an information and communication resource which drives the integrated media production, ready to be delivered over a range of varied devices (see Figure 1). Internet can therefore be considered as a main driving force and an integration point in the cross–media rise and evolution.

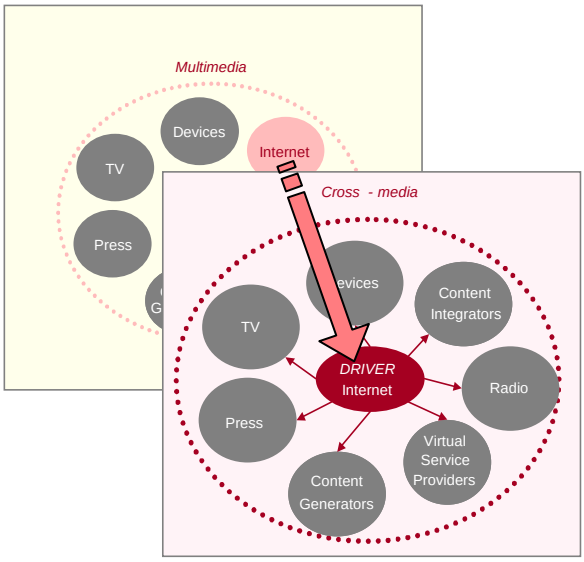

Figure 1:
The role of Internet in Cross–media services

While in the printing and publishing industry cross–media has been mostly centred on productivity, in the broadcast industry these changes are becoming integrated in each link of the communication chain. Cross–media is affecting the creation of content, since digital storytelling across different media challenges the traditional linearity of stories. Stories are becoming non–linear and thought to be interpreted across different platforms in a complementary way. The challenge of the cross–media services is how to integrate interactive television, press, Internet and mobile technologies to produce satisfying content.

One of the social implications facilitated by the Internet technology is the creation of effective virtual communities; the value of such communities can be greatly enhanced by exploiting the cross–media concept. The community participation is no longer restricted to a single type of media which contributes to a number of potential community members. One of the strongest trends in virtual communities is for the members to be actively involved in the creation of content, preferably by using facilities of mobile devices. A successful community must posses: a clearly defined purpose, witch must include a sustainable business model; a dynamic infrastructure, terms of use and community rules, member generated content, a healthy "immune system" and a set of tools for self organisation.

To demonstrate the power of a cross media platform an online travel community has been chosen, which is based on peer–to–peer technology, vitalized by a publisher and supported by all the required utilities providing a successful user experience. In Content4All the cross–media concept is therefore resulting in (1) creation of a Global European Virtual Community, oriented into the field of travel and tourism, based on peer–to–peer and client-server technology in which users can share and download content and communicate to each other by using various terminals, and (2) development of a technology for content distribution across different devices (iDTV, PC, PDA, mobile phone), which all contribute to the central theme of the project from their own strengths.

3 System architecture

The C4All platform consists of four functionality groups [4]:

1. *Communication platform*, which stands for managing the different communication protocols, used between the C4All devices to supply the user with the required functionality regarding instant messaging or sharing content.
2. *Content Management platform*, which handles the aspects of content management regarding storage, search and retrieval. By content, both (1) audio, video, pictures and text published by the end-users as well as (2) packaged content (e.g. videos, websites, and applications) produced and distributed throughout broadcast networks (TV) or the Internet by publishing companies is envisioned.
3. *Community Management platform* or moderation is envisioned to manage the user community. The Community Management platform is provided to complement content management with additional relevance evaluation mechanisms. In that sense, the integration tools for cross-media publishing and the dynamics of participation taking place among the community users are clearly separated.
4. *User Profiling platform* is related to user configuration and parameterisation, allowing user profile management.

3.1 Communication

The C4All platform relies on a wire range of communications protocols, like DVB, P2P, Jabber or the HTTP protocol; some communication protocols are proprietarily developed exclusively for internal communication among the C4All modules.

Client/server communication within C4All relies predominately on a standard HTTP-POST protocol. This method of communication serves predominately for:

User registration, as the process of adding new users. The data entered during user registration is being stored in the C4All Central Server in order to make it available from any communication device. During registration of a new user, the central server assigns a unique user ID, which is the unique reference ID on which all stored information about the activities of this user is based. During the registration process, the user has to provide the basic information needed for later login into the system (i.e. user name and password) and at least one user profile.

User sign-in procedure is a process of entering a user credentials in order to gain access to the system. By doing this, you will inform to the network system that you are online and ready to send and receive information. The login process refers to the process of accessing a system by identification of the user in order to obtain credentials to permit access. It is an integral part of system security procedure. The log out is being handled through session time outs, as regular sign-out procedure cannot always be assured.

Content Management allows the client applications to communicate content to the C4All repository. The client/server approach may either be used for content management, resolution and browsing of centralised or distributed content repository. Standard HTTP and HTTP-POST protocols are in use to achieve this functionality.

Peer-to-peer networking represents fundamental component of the C4All platform and allows for a distributed peer-to-peer cross-media distribution among iTV, Internet enabled desktops, and wireless portable devices such as PDA's and Mobile phone terminals. For this architecture a P2P platform for exchange of content, running on multiple devices has been designed. Due to a number of different devices, used in the P2P network, a modular design is used, which enables the usage of lightweight versions for mobile devices with somewhat limited functionality as well as fully functional versions for servers and personal computers, set-top boxes, etc. P2P networking allows super-distribution of content items in a network of peers.

The communications protocols used by the P2P C4All platform are:

- JXTA P2P protocol for searching, browsing and downloading files from other peers
- P2P mobile gateway to overcome the restrictions of JXTA protocol on mobile devices.

The P2P functionality within the Content4All project supports basic content search, sharing and retrieval, and instant messaging among users. For Content and Group Management Services, a more conservative, centralized service is implemented.

Messaging stands for the functionalities which handles the presence, the chat (instant messaging) and also allows for a direct file transfer. All the communication related to these features is managed by the Jabber protocols.

Presence encompasses the connectedness and availability of a user (more precisely, of a Jabber ID - JID), and presents the ability to know when someone is online and available. Jabber defines 5 different presences that can be set for a user: Normal, Free for Chat, Away, Extended Away and Do Not Disturb.

Chat is a form of real-time electronic communications where participants type what they want to say, and it is repeated on the screens of all other participants in the same chat. The chat service is a service that provides instant messaging functionality. Chat messages consist of text messages and can only be sent to users who are online and have opened the chat service window. One or more users can be involved in a chat session at a time. With the chat service users will be able to contact their buddies any device, anytime.

File Transfer is a service where users are able to transfer files directly from one to another. The transfer process will be initiated by the first user, while the reception of data is to be approved by the receiving user.

Broadcasting is a method of communication which is within the platform only available to certain communication terminals (iDTV set-top boxes). This method of communication allows for reception of related broadcasted content but also provides the primary channel for application distribution.

3.2 Content Management

Cross-media functionality is based on intelligent management tools that handle content across different platforms. The core of the system is based on a content management system (CMS) which is also implemented as a physical file system for content storage. The mechanism for content referencing across multiple platforms (ITV, PC, mobile device) is based on existing standards like TV-Anytime and the MPEG-21. A database system also includes utilization of a physical storage for the content metadata. The CMS

provides basic functionality such as creating, editing or removing of a specific data item.

Provision of quality access to cross-media content requires detailed and modular specifications of content descriptions, enabling personalized experience of advanced and user-oriented services.

- Metadata for content types is based on standards like MPEG-7, TV Anytime for video, CDDB for music, Dublin Core/IMS for text represent the fundament of the metadata structure.
- Mapping mechanisms for different metadata schemas are defined to ensure cross-content compatibility.
- Metadata editing tools facilitate editing of content descriptors by end users.

The metadata fill-in may be performed automatically or manually.

3.3 Community Management

The creation of a community is a requisite for the C4All project that does not present an innovative challenge by itself. The originality of the platform provides:

- Creation of a moderated P2P community.
- Maintenance of relevance evaluation for a cross-media community.

Nowadays, the common feature of all types of interaction included in P2P services is that they take place in real time. Therefore, the sort of interaction produced among the users is instantaneous, spontaneous and ephemeral. The C4All architecture introduces evaluation tools of published content, thus analyzing the relationships among the users and giving an additional value to the platform by exhaustive control of the published content.

There exist two methods of moderation of virtual communities: Centralized moderation and shared moderation.

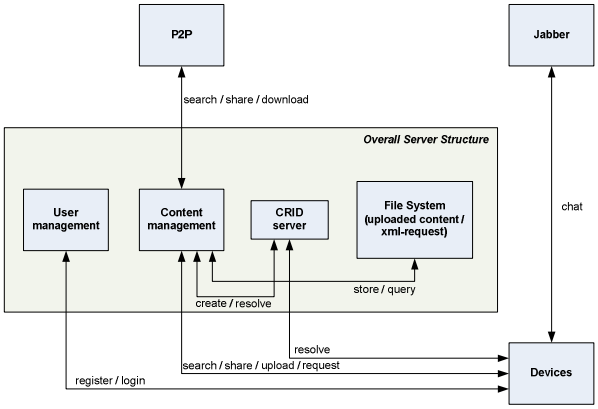

Figure 2: overall structure of the C4All platform

3.4 User Profiling

User profiling is related to the user interface on one hand and user related information like user profile, preferences, permissions, etc on the other hand. One of the features of the C4All Platform is the device independence and portability. For example, when the user creates a bookmark using one device (PC, for example), this new bookmark will appear on other devices instantly. The functionality is ensured via central server in order to save the user's bookmarks, preferences, etc., which are later accessible from any of devices.

Figure 2 shows the overall structure of the C4All platform and the functional interacting of the C4All end devices with the whole platform.

4 Conclusion

The Content4All platform is currently at the final stage of development, with trials foreseen in Autumn 2006. The basic functionality is achieved and a demonstrator is available at the Project's website [2]. The system architecture is currently being verified, with more results to follow after the user's trials conduction.

Acknowledgement

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