iTV and XMPP – a promising combination

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Abstract

Instant Messaging (IM) has the potential to become one of the killer applications of iTV (Quico, 2003). However, several factors make it difficult to provide a good implementation of IM applications. For example, the high needs of scalability and interoperability with existing IM services. This paper proposes to use the IETF standard XMPP (Extensible Messaging and Presence Protocol – also called Jabber) to implement IM, as it reveals itself to be very well adapted to the requirements on iTV middleware platforms like the Multimedia Home Platform (MHP) (ETSI DVB, 2002). Moreover, the use of XMPP doesn’t limit itself to IM. The flexible architecture of XMPP enables a plethora of possibilities like easily adding new interactive services and creating a middleware for inter-application communication.

Keywords
Interactive Television, iTV, Instant Messaging, IM, Multimedia Home Platform, MHP, Set-top Box, XMPP, Jabber.

2. Introduction

Since several years now, instant messaging (IM) has turned out to be an extremely popular service for computers and other devices. In spite of this, a lot of research still has to be done in the adoption for iTV (Quico, 2003).

Although most of the concepts and functionality of traditional IM are reusable for iTV, there are some core differences:
- The audience: iTV targets a much broader audience. Not all users are used to working with a computer, so the usual prerequisites cannot be expected.
- Limited graphics and interaction: low resolution of TV display, distant viewing, simple remote control, problems with colours and narrow lines...
- Limited resources on a set-top box: limited processing power, memory and storage space.

Many different IM systems and protocols exist. We propose the use of the IETF standard XMPP (also called Jabber) to implement an IM system for iTV. XMPP is the standard IM protocol and makes use of XML to encode its packets. The base protocols are defined in the RFC 3920 and 3921.

3. XMPP protocol for IM implementation

3.1 Advantages of XMPP

By choosing a client/server architecture, lightweight protocols and limited communication scenarios (client/server and server/server), thin clients can be created. The more complex and resource-demanding issues fall under the responsibility of the server (presence and status management, packet routing, user account management, storing user or configuration information...). This makes XMPP an excellent candidate for implementation on limited resource environments like a set-top box.

The client/server architecture has other benefits that we won’t discuss in detail because they are not specific to iTV: security and privacy, no firewall or NAT issues, centralized control over the domain (i.e. enforcing policies or ensuring QoS) and scalability.

The core XMPP protocols support the main IM features:
- Different types of messages: normal (email-like messages, one-on-one chat, group chat).
- Exchanging presence information and managing subscriptions, contact lists and privacy lists (blocked users).
- Channel encryption (TLS) and authentication (SASL).
- End-to-end signing and object encryption.

It is however possible to add new extensions while staying compliant with the standard. Clients are free to invent their own protocols, protect them with custom XML namespaces, and still send them over generic XMPP networks. ((Shigeoka, 2002), p. 16). A list of existing extensions can be found at http://www.jabber.org/jeeps/jeplist.shtml.

A side effect of using XMPP is that it is possible to interact with any device supporting an XMPP client (PC, mobile phone, PDA...). Through a special server-side translation service called gateway, an XMPP client
can also interact with other IM services (AIM, ICQ, MSN Messenger, Yahoo! Instant Messenger, ...), as well as with other technologies (SMS, email, ...). Another interesting feature of XMPP, called resources, enables users to simultaneously log in on the same account with different clients (and devices). Thanks to this, users that already have an account can reuse it without side effects.

Finally, by adhering to the XMPP protocols, we only have to implement an XMPP client, and use it to register on a ‘normal’ XMPP server. Open-source XMPP client libraries are already available in Java and need only little adaptation to be of use in an MHP environment such as for example (JiveSoftware.org, 2005). Thanks to these existing tools, the IM client developer can concentrate on issues more specific to iTV like interface design and usability.

3.3 Disadvantages of XMPP

There are some drawbacks associated with the use of XMPP.

By using XML, the application is less bandwidth efficient, and the parsing can be quit resource demanding. Nevertheless we can use a XMPP dedicated parser that uses less resources.

The fact that no direct communication is possible between clients could be a serious handicap for some applications, especially those exchanging a lot of data. There however an extension (non-final at this time) available (Eatmon et al., 2004) which allows out-of-band data exchange.

Another limitation is caused by the use of distributed servers and the fact that there is no standard way of specifying QoS requirements: In general (although it is possible to define new extensions that add these features), there are no QoS guarantees throughout the XMPP network. This means that there is no guarantee for the time of delivery, the order of delivered packets nor that the packet will arrive once and only once (Shigeoka, 2002).

Finally, none of the extensions must be supported to be XMPP compliant. A client can thus not rely on support of a particular extension throughout the network. (Extension support can be determined by Service Discovery (Eatmon et al., 2005)). The selection of extensions to add to a client has to be done carefully especially when having an implementation for MHP in mind. Each extension makes the client more resource consuming.

4. Adding services with chatbots

XMPP also enables developers to create new services for iTV with minimal modifications to the client. This can be done by using automated chatbots. Chatbots are applications that autonomously behave like an IM user.

A user can use messages to query or subscribe to a chatbot that can provide a service. Some interesting services for iTV that could be implemented using chatbots are message translation, customer support, information services (time, weather, stock, horoscopes, news, yellow pages …) and message storage.

5. XMPP as middleware

XMPP can also be used for building distributed applications. This can be achieved by letting applications use the XMPP client as middleware, adding an extra layer of network abstraction. This enables applications to send data and even procedure calls, through the XMPP network (see also (Karneges, 2003)).

In fact there exists a standardized extension (Adams, 2002) providing a method of encoding RPC requests and responses in XML, and a proposed extension that “defines a binding of SOAP to XMPP” (Forno and Saint-Andre, 2005). This way, the use of XMPP on the set-top box could provide a lightweight implementation for RPC or even SOAP.

Examples of applications that could benefit from an XMPP middleware are: online and multiplayer games, T-commerce and educational applications.

6. Conclusion

We conclude that XMPP is well adapted to be used on limited device platforms such as a set-top box. That is why it is an excellent candidate for implementing an IM client on the MHP platform. Its flexible and lightweight architecture and protocols also makes it suited for many other usages, like inter-application communication and RPC. People planning to use it should however be aware of its disadvantages.

An implementation of an XMPP client illustrating the principles discussed in this paper should be available by the end of June.

References


