Towards Multicast Session Directory Services

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Abstract

The current increase in interest in Internet Multicast and Multimedia Applications is self-evident and has profited from such infrastructures as the Multicast Backbone (Mbone) and its applications and tools which are several years old now. However, an ad-hoc usage of some of this technology’s features, namely, session announcements and multicast addresses, do not scale easily.

The Session Description Protocol (SDP), a proposed standard, has been used and sometimes misused as a session directory tool to advertise multimedia sessions, without due attention to scalability, i.e., without taking into consideration the effect of the increasing number of simultaneous sessions being announced. A flat presentation of session announcements, with alphabetically ordered names, neither scale nor convey enough structured information to enable simple and efficient directory searches to pick up all the interesting sessions. This is what is really needed while keeping the directory manageable.

SDP and its companion Session Announcement Protocol (SAPv1) have enough scaling potential, if not misused. The quality of information presented to the user by popular tools, such as "sdr", may be enhanced to a level similar to that obtained via the familiar Internet search engines and browsing and filtering services. Instead of burdening the user with the task of browsing and filtering the flat directory space, that task could be assigned to a server, should the information made available in the session descriptions be conveniently organised. We propose that session directory information be structured and then disclosed by a Multicast Session Directory Service (MSDS). Session description fields in SDP, such as the value attributes "category" (a=cat;category;cat) and "type" (a=type;conference type;ctype) and selected description fields, such as "media", "repeat times", "time active", and so on, may be used to aggregate sessions in classes and even in a pre-arranged classification hierarchy. The user would then be able to query or browse MSDS servers.

The service itself would be announced either in multiple thematic or single well known multicast channels, with the directory structure being either port or time multiplexed, or made available as a server database.

Keywords: Session Directories, IP Multicasting, Multimedia Announcements, Session Description Protocol, Structured Browsing.

1 Introduction

IP Multicast [Gra97] and multicast applications assume a relevant role in most organisations, allowing for enterprises’ personnel communication, enterprises’ publicity or even for thematic discussion, using the Internet as a primer form of communication.

Low communication costs, rapid deployment, and the ability to deal with almost every media type [So1997], [Ah1998] (namely audio, video and even videoconferencing) make multicast applications very useful tools. End systems [Dec1989], routers and switches, along with Quality of Service (or even Class of Service) capable networks make multicast
applications feasible and large ISPs\(^1\) are now supporting native multicast access. So an easy manageable and searchable directory, where all interesting session information is conveyed is really needed. Popular tools, such as sdr [Han96], listen for SDP [HJ98] announcements which convey the following information:

- Name and purpose of session
- Time(s) the session is active
- The media comprising the session
- Information to receive those media (addresses, ports, formats and so on)

For non-reserved and non-administratively scoped [Mey98] multicast addresses this information is normally presented to the user as a simple alphabetic ordered list of "Session Name(s)"\(^2\). Unstructured session announcements and alphabetic ordered names neither scale nor convey enough structured information to enable efficient directory searches.

2 A Need for Structured Session Announcements

The multicast announcement of multimedia multicast sessions over the Mbone is a mechanism whereby session descriptors reach potential joining users within the multicast session scope. Besides its purpose of communicating the existence of a session, session descriptors are supposed to convey sufficient information to enable joining and participating in the session [HJ98]. In the SDP protocol the data on these descriptors are very narrowly geared towards letting the user check whether he is operationally able to join and participate, i.e., whether he has the resources needed to communicate in that session and to set up its local parameters. Only the SDP compulsory fields are in this class and have a precise grammar definition.

\(^1\)See, for instance, "Sprint Enables Native Multicasting to Boost Internet Performance", http://www.sprint.com/stemp/press/releases/9902

\(^2\)May be that’s why session names like "@ Name" or "-> Name" can be found

In what concerns enabling a user to decide whether the session is relevant to his interests, the protocol only provides for fuzzy fields such as session information ("i="), session name ("s=") and URI ("u=") leaving to the session creator to assign values from a non-defined set of terms, the only requirement being that characters from a specified character set should be used.

In spite of all of these obstacles, one still makes use of this information; so, SDP announcements are conveying important information!

Several models may be designed and one can even assume that specific information retrieval should be left to the user or user application. It is thought that the number of simultaneous sessions will grow significantly and so any user-side solution, i.e. to leave to the user application the handling of all SDP information for treatment, will not scale: surely it will not scale at user level, neither will it time-scale nor volume-scale.

Recognising that some structure on the terms to be used in the information conveyed to the user would be useful to this latter end, the use of the category value attribute "cat" is suggested for the SDP attribute field ("a="), a field explicitly mentioned in RFC2327 as the primary vehicle for extending SDP.

3 A New Scenario

The quality of the information made available to the user by SDR [Han96] may be enhanced to a level similar to that obtained via the familiar Internet search engines, browsing and filtering services. Instead of burdening the user with the task of browsing and filtering the flat directory space, that task could be assigned to a server, should the information made available in the session descriptions be conveniently organised.

Such a server would be required to handle information in the session announcement domain. Because the multicast form of session announcement prevails over the e-mail, the WWW and similar forms of announcements, the server would have to be capable of dealing with the ethereal multicast representation of the data.

An Information Retrieval (IR) model of directory information could be built based on this particular ethereal nature of the platform from which di-
rectory data concerning session contents are gathered. Indeed, session descriptions travelling in the network in the multicast packets may be viewed as a dual database of the classic host-distributed database — the network-distributed database. Several steps would have to be taken for such a session directory service to be built. We suggest the following:

1. To define which fields in the session descriptions are to convey terms to be used for directory purposes (e.g., the "a=m" field and specific attribute value "cat")

2. Establish a dictionary of terms and categories for those fields, (e.g., a thematic terms domain and terms within each theme)

3. To define a structure for the index having defined terms as search keys.

4. To conceive a session directory protocol specifying how directory clients submit queries to the directory server and how it replies back. Or else, how the server may be browsed or email the user.

5. To devise a presentation protocol to specify how the directory client displays the requested session information to the user.

4 Multicast Session Directory Service

But a session description in SDP does not convey enough information to enable sessions’ content based filtering, retrieval or browsing made by any potential session client [SM83].

We should even notice that new encoding standards are arising, allowing for enriched media descriptions; for instance, MPEG-4 encoding will allow object recognition and encoding, providing also synchronized text and metadata tracks, an enormous potential for Information Retrieval techniques and augmented information services such as text-based or object-based indexing.

To enable such useful capabilities several approaches may be accomplished by a server, such as: search the Internet for additional information about the session announced participants, being able to add the retrieved pointers into the service; search the historical logs of session announcements, being able to retrieve information related to past sessions; extract information from the session itself, whenever it is active (and whenever possible).

Finally all this enriched information would be made available by means of a Multicast Session Directory Service (MSDS), that should be in place very soon in order to enable, even a posteriori, clustering, by means of category or hierarchical groupings; this Multicast Session Directory Service, when in place, should prove itself as a useful user tool, a structure-builder and also an indexed multimedia browser: *just enough, but useful, standardization.*

Even having access to enough data, current applications do not present that information in a structured way. So, the MSDS server may use some session description fields (schedule, media, quality) parameters to aggregate different session in classes and even in a pre-defined classification hierarchy.

This aggregation may also be done using information gathered about the session and may be done using clustering algorithms [Ras92]. So the user browses through this hierarchy and eventually finds the session he wants [WVA+].

As browsing access is not appropriate for large information data bases, searching and filtering capabilities may be offered by the MSDS server, using the session metadata and also content related information.

![Multicast Session Directory Service](image_url)

**Figure 1: Multicast Session Directory Service**

There are several ways of making this service available. The most promising approaches seem to be:

- via multicast announcements using a single well known channel; this single, eventually IANA registered, well known channel could even carry Time-Division Multiplexed (TDM) or Port Multiplexed structured sessions information (see Figure 1);
• via multicast announcements using several (even thematic) multicast channels (Figure 1).
• via specific (unicast or multicast) server database;

Even if a single MSDS server would not scale, traditional solutions of network distributed servers, along with distributed filtering, retrieval [RMF97] and browsing tools, are easy to deploy.

5 Conclusions

Categorised, clustered or classified SDP/SAP announcements should be enforced in order to deal with scalability problems. However, today’s reality shows that unstructured announcements will persist. So, a new methodology to deal with SDP/SAP announcements has been proposed. The question on how to define a new Multicast Session Directory Service has been discussed and its advantages shown.

Also, different implementation scenarios, either alternative or complementary, of a new Multicast Session Directory Service were presented. There are questions needing further attention, such as: formal definition of sessions’ categorisation; the analysis of different approaches to the service (specific server versus specific multicast address information); deployment of indexing software to support a Multicast Session Directory Service; to account for private and/or encoded sessions accommodation and to analyse metadata indexing versus content indexing.

References
