RSVP and Q.2931

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1 ABSTRACT

This paper is about some of the problems seen with the integration of signaling for support of Integrated Services Internet over Broadband ISDN. in it we contrast the mechanisms employed by the Internet resource reservation protocol, RSVP with those of B-ISDN and Q.2931. We do not propose any solution, but try to give an indication of the direction that signaling for broadband networks must evolve to support more effectively the higher level services that most users will be employing.

2 INTRODUCTION

Broadband networks such as B-ISDN with ATM technology are aimed at supporting multiple bearer services. The Internet community has the same goals with its work on Integrated Services. In a previous paper[1], we describe these bearer service classes and how they may be implemented in switching systems in similar manners with regard to the packet or cell forwarding or *scheduling* strategies. We outlined how this convergence means that the layering of one set of services on the other could be achieved.

In this note, we look at the signaling protocols being proposed by the two communities differ, and show that there are some problems to be reconciled in the way that one signaling system might fit upon the other.

The ATM standards are moving from PVCs to SVCs. Signaling is now Q.2931, based on Q.931 from narrow band ISDN (digital telephony). Meanwhile, the Internet community is moving from merely providing best effort delivery to having a full-fledged reservation protocol and mechanism.

Internet *Signaling* is based on the RSVP draft standard which derives from work in the Mbone[3] community.

2.1 Interworking, Layering, Learning

IP(ng) will be implemented over many transmission technologies, including ATM. To enable efficient support of the many services envisaged for IP, direct use of the underlying transmission switching fabric's bearer service classes may be made. Specifically, IP reservations can be layered on ATM SVCs.

To do this, however, requires an API between RSVP and Q.2931 protocols or services. For such an API to be feasible, the semantics of the protocol mapping must be reasonable .

3 RSVP v. Q.2931

We can list a number of substantive differences between RSVP and Q.2931 at the moment:

- RSVP is receiver based (like Mbone)
- Q.2931 is sender based (like POTS)
- RSVP uses "soft state" (aka datagram)
- Q.2931 assumes "hard state" (aka VC)
- RSVP allows aggregation (filters)
- Q.2931 allows multiparty calls

Furthermore, with regard to the operating environment, there are a number of further important differences:

- RSVP assumes renegotiation as part of base model
- ATM does not allow renegotiation
- RSVP coexists with dynamic routing (but requires OPWA at least)
- Q.2931 assumes call setup time routing only

3.1 RSVP Filters

RSVP Filters allow a multiparty call to allocate resources for the sum of all the active sources For audio conferencing, or VR, this represents a massive efficiency gain We can also renegotiate (per RSVP refresh timer), therefore have adaptive reservations.

If probability of call acceptance is high, then RSVP makes more sense - simply add receivers to list. If probability of call acceptance low (underresourced net), then "NACK" style call setup (q.2931) makes more sense. It seems reasonable to believe that a network will be dimensioned fort the majority of users to be able to use the majority of applications most of the time that they wish to - just as todays' telephone networks rarely call block, and todays television networks rarely fail to deliver the channels required, the request to videoconference with colleagues, or play multiuser game with friends would normally be expected to be accepted. An optimistic approach to the signalling protocol removes the call setup latency or multiparty activities.

3.2 QoS Advertising

Base case RSVP assumes the receiver knows what the sender is sending (via out of band - e.g. conference management). This has to be extended to the case where receivers are also senders, or do not know the options for what they could choose to receive. If not, the sender needs to advertise through the network what quality of service their traffic might offer. RSVP has sender "PATH messages" to feed a One Pass With Advertising algorithm for "call" acceptance

3.3 Point-Point, Point-Multipoint and Multipoint-Multipoint

ATM supports pt-pt and pt-mpt calls. The Internet model supports Multipoint-Multipoint as well, as a base class of delivery. Essentially, the difference is that a group destination address within each and every packet means that the address can be used as a *rendezvous*, and source addresses within packets can be used to de-multiplex different streams.

Whilst it is possible to map Multipoint-Multipoint IP to a mesh of Point-Multipoint as in the earlier work on IP over ATM, and even to user an intelligent server as in the MARS work, it is not clear how well this will scale. RSVP well suited to Multipoint-Multipoint. [5] [6] [7] [8]

ATM (not a q.2931 issue) has problems with this.

4 ATM Point-Multipoint problems

Receivers need to de-multiplex streams from different senders If stream is not AAL1 (e.g. its AAL5), then the cells from each frame are interleaved, but the VCIs do NOT indicate the ultimate sources

There is not enough VCI/VPI space to have as many sources as some users/applications would like. At the moment, however, these applications are somewhat rare (the Distributed Simulation Internet has a requirement for 10,000 or more members of a group joining and leaving rapidly.) In many scenarios, MARS may be sufficient to carry signaling traffic.

4.1 Q.2931 - possible enhancements

An evolutionary approach to allowing ATM to enjoy the same facilities as IP would be:

1. Define ATM group addresses
2. Add "leaf join" (being done)
3. Add re-negotiation
4. Remove VC assumption, and make the "Call, In-progress, Pickup" cycle continuous rather than just at start
5. Expand cell fields used for group demuxing (AAL-M?)

5 Layering

For efficient delivery of IP on ATM, if cell training and VCI/VPI expansion were possible, we could optimise a lot (especially with EPD)

If Q.2931 becomes "soft", it could merge with RSVP (as the traffic models of integrated services Internet and B-ISDN are very similar so QoS mapping is easy)

6 Conclusions

We conclude by saying that:

- Open signaling is fundamental to the success of public networks - it is key to rapid deployment of existing and new services.

- Soft state is more open (extensible).
- Has its own problems (stability/dependability if the dynamic routing is poor)
- We have a large UK community able to test such systems - the Super-JANET (or followup) infrastructure.
- This could finally form a "Computer-Digital-Video-Telephony Integration!

References

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