A Distributed ATMARP Service Using SCSP

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Abstract

This document describes a method for distributing an ATMARP service within a LIS[1]. This method uses the Server Cache Synchronization Protocol (SCSP)[2] to synchronize the ATMARP server databases within a LIS. When SCSP is used to synchronize the caches of ATMARP servers in a LIS, the LIS defines the boundary of an SCSP Server Group (SG).

1. Introduction

An ATMARP Client implicitly registers (e.g., by sending an ATMARP Request for itself; see [1]) and refreshes its own ATMARP information with a single ATMARP server in its atm$arp-req-list table. In addition, the ATMARP Client uses the ATMARP service to gain access to and re-validate ATMARP information about other ATMARP Clients in its Logical IP Subnet (LIS). Since, there MAY be multiple ATMARP servers in a given LIS, and since any ATMARP server within the LIS MUST be
able to reply to ATMARP requests for ATMARP information about any 
ATMARP Clients within the LIS, there MUST be a method by which to 
synchronize ATMARP information across all ATMARP Servers within the 
LIS. The Server Cache Synchronization Protocol (SCSP) solves the 
generalized server synchronization/cache-replication problem for 
distributed databases, and thus SCSP MAY be applied to the ATMARP 
server database synchronization problem with the LIS. When SCSP is 
used to synchronize the caches of ATMARP servers in a LIS, the LIS 
defines the boundary of an SCSP Server Group (SG).

SCSP is defined in two parts: the protocol independent part and the 
client/server protocol specific part. The protocol independent part 
is specified in [2] whereas this document will specify the 
client/server protocol specific part where ATMARP is the 
client/server protocol.

2. Overview

All ATMARP servers belonging to a Logical IP Subnet (LIS)[1] are said 
to belong to a Server Group (SG). An SG is identified by, not 
surprisingly, its SGID which is contained in a field in all SCSP 
packets. All SCSP packets contain a Protocol ID (PID) field as well. 
This PID field is set to 0x0001 to signify that SCSP is synchronizing 
ATMARP server databases as opposed to synchronizing some other 
protocol’s databases (see Section B.2.0.1 of [2] for more details). 
In general, PIDs for SCSP will be assigned by IANA upon request given 
that a client/server protocol specific specification has been 
written. In the case of ATMARP, the client/server protocol specific 
specification was initially written at the same time as SCSP, and 
thus a PID=0x0001 was assigned by the author.

SCSP places no topological requirements upon an ATMARP SG. 
Obviously, however, the resultant graph of ATMARP servers must span 
the set of ATMARP servers to be synchronized. For more information 
about the client/server protocol independent part of SCSP, the reader 
is encouraged to see [2].

When an ATMARP SG is using SCSP for synchronization, a given ATMARP 
Client will use only one ATMARP server and it will use that server 
for remainder of its participation in the SG. This server is said to 
be the "serving ATMARP server." There needs to be some hysteresis on 
refreshes since every ATMARP Request may cause a cache update/refresh 
in the serving ATMARP Server, and such refreshes might cause 
excessive traffic if propagated to all ATMARP Servers in the SG. In 
the case of mere refreshes, where no change occurs to the ATMARP 
Server’s cache entry for the ATMARP Client, SCSP updates will occur 
at a maximum rate of once every 10+Random(2) minutes.
When an ATMARP client has left a server group (e.g., as the result of a crash), it MUST NOT rejoin the SG by generating new ATMARP requests to any other ATMARP Server than the one it previously used for a period of time greater than 20 minutes minus the time since the last ATMARP request was made by the ATMARP Client. This is necessary because no mechanism exists to tell the ATMARP service that the ATMARP Client has left the SG and because ATMARP Server table entries are valid for 20 minutes from the time the entries are created/updated.

3. Format of the CSA Record ATMARP Specific Part

CSA Records in SCSP contain a "Client/Server Protocol Specific Part" which contains the non-protocol independent information for a given server’s cache entry.

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        Hardware Type          |        Protocol Type          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     State     |  ATM Addr T/L |ATM SubAddr T/L| Proto Addr Len|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                ATM Address      (variable length)             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|              ATM SubAddress     (variable length)             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                 Protocol Address  (variable length)           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

With the exception of the State and unused fields, these fields contain the values specified in the ATMARP Request and Reply packets defined in [1] which are used to create, update, and access ATMARP server cache entries.

**Hardware Type**
- Defines the type of "link layer" addresses being carried. This value is the ATM Forum ‘address family number’ specified in [3] as 19 decimal (0x0013). This is the ar$hrd field defined in [1].

**Protocol Type**
- This field is the protocol type number for the protocol using ATMARP from [3]. (IP is 0x0800). This is the ar$pro field from [1].

**State**
- This field contains a value which represents the new state of the
client.

0 - New client available.
1 - Client entry has been updated.

Note that a time-out of a cache entry does not cause a CSA Record to be sent because, if everything is working properly then all ATMARP servers have the cache entry timing out at the same time. Thus, the individual servers would take the appropriate actions necessary.

ATM Addr T/L
This field contains the type and length of the ATM Address field. The type and length encodings are described in Section 8.7.3 of [1].

ATM SubAddr T/L
This field contains the type and length of the ATM SubAddress field. The type and length encodings are described in Section 8.7.3 of [1].

Proto Addr Len
This field contains the length of the Protocol Address field. For IPv4, the value is 4.

ATM Number
This is the ATM address of an address binding in an ATMARP server cache entry. The address, if specified, is E.164 or ATM Forum NSAPA.

ATM Subaddress
This is the ATM subaddress of an address binding in an ATMARP server cache entry. The subaddress, if specified, is an ATM Forum NSAPA. If null, no storage will be allocated.

Protocol Address
This is the internetwork address of an address binding in an ATMARP server cache entry.

4. Values for SCSP Protocol Independent Part

The following sections give values for fields of the SCSP Protocol Independent Part of the various SCSP messages.
4.1 Values for the SCSP "Mandatory Common Part"

Protocol ID = 0x0001
Sender ID Len = 0x04
Recev ID Len = 0x04

See Section B.2.0.1 of [2] for a detailed description of these fields.

4.2 Values for the SCSP "CSAS Record"

Cache Key Len = 0x04
Orig ID Len = 0x04

See Section B.2.0.2 of [2] for a detailed description of these fields.

References

[1] "Classic IP and ARP over ATM", Mark Laubach and Joel Halpern,

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