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APPLICATION OF MULTICAST AND BROADCAST TO THE ATN INTERNET

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Summary: The future work plan of WG2 includes an item for the investigation of both multicast and broadcast procedures within the framework of the Internet SARPs. This paper presents the status of OSI multicast standardization and lays the framework for progressing multicast within the scope of the Internet SARPs.

1. Introduction

Within the ATN Internet, there may be some services which lend themselves to either a multicast or broadcast operation. In fact, the use of a broadcast media such as radio make the implementation of either broadcast or multicast easier and more effective.

The ISO and ITU-T committees responsible for the OSI Reference Model and the lower layer services have been working on multicast and broadcast architecture, services, and protocols for the last several years. This paper presents an overview of the status of multicast within those committees and proposes a way forward for the introduction of new services into the Internet SARPs.

2. Background

The addition of multicast procedures to the OSI protocols followed the work started in the IETF. The initial work focused on the need to define a set of terms and concepts that could guide the standards development. This work resulted in a set of working papers which laid the ground work for the concepts of multicast, broadcast, and groups.

The background work progressed to a point that simple extensions to the Network and Transport Layers to support multicast operation were started based on the success of multicast IP.

To assist in the addition of multicast procedures to the Internet SARPs the following terms are defined:

- broadcast - the sending of information from a single source to all possible destinations.
- multicast - the sending of information from a single source to a set of (potentially) 0 or more recipients identified by a group name.

The appropriate ISO and ITU-T documents for multicast operations are attached.

3. Multicast Architecture

Work is on-going within the ITU-T to develop extensions to the OSI Reference Model to support multicast operations.

4. Multicast Network Service and Protocol

The ISO and ITU-T recognized the utility of a multicast network protocol by analyzing the IETF work on the multicast IP proposals. In line with the extensions to IP, CLNP was amended to include provisions for multicast operation. In particular, the protocols and services of the Network Layer were modified by:

- adding multicast procedures to CLNP,
- adding multicast connectionless extensions to the Network Service,

- adding group addressing to the NSAP addressing structure within the Network Service, and
- adding multicast extensions to ES-IS.

4.1 Multicast CLNP

Additions were made to CLNP to incorporate multicast operation. These extension were equivalent to those added to IP for multicast IP. There were two main additions required to add multicast to CLNP:

- a new pdu type, and
- procedures for handling the new pdu and for backwards compatibility.

In order to handle multicast operation, CLNP was modified to include a multicast pdu. This pdu is used exclusively when sending a single pdu to multiple destinations. It requires that the sender of the pdu be identified by a unicast NSAP and that the receiver(s) be identified by a group NSAP. Further, procedures are added throughout CLNP to handle error cases and to ensure that flooding of a network does not take place.

4.2 Multicast Connectionless Network Service

Additions were also made to the Network Service to support multicast operation. These additions were limited to adding multicast service primitives.

Multicast Network Addresses

The most significant change to the Network Layer was the change to the definition of NSAP addresses to incorporate multicast addresses. The NSAP address structure now has a new branch restricted to only multicast addresses.

5. Multicast Transport Service and Protocol

The ISO and ITU-T extended the connectionless Transport Protocol to include the capability to pass multicast pdus. The extensions are similar to those proposed for the IETF's UDP.

6. SARPs Impact

If a multicast service were defined in the Internet SARPs, it may be possible to utilize that service in providing a one-way multicast data information service to a set of aircraft or ground systems. It is clear that the broadcast nature of radio transmission is a good fit for implementing a multicast service.

To add the ability to use multicast procedures within the ATN the Internet SARPs need the following changes:

- add provisions for the CLNP multicast extensions
- add provisions for the multicast NSAP addresses

- add provisions for the connectionless transport protocol and the multicast extensions

7. Recommendations

It is recommended that WG 2 consider the extensions to the Internet SARPs for multicast operation and to modify the Internet SARPs based on multicast provisions.