Accredited Standards Committee
X3, INFORMATION PROCESSING SYSTEMS

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To: X3S3.3

From: D. Marlow (NSWC)

Re: Tutorial Viewgraphs on the connectionless-mode multicast extensions

NSWC has prepared this tutorial in support of the multicast extensions to the connectionless-mode protocols. Contributions X3S3.3/92-145 (Extensions to CLNP) and X3S3.3/92-146 (Extensions to the ES-IS Routeing Protocol) have already been forwarded on to SC6. Contributions X3S3.3/91-387R1 (Extensions to the connectionless-mode transport protocol) and X3S3.3/92-229 (Extensions to the connectionless-mode Network service) are pending discussion at the June X3S3.3 meeting in Raleigh, North Carolina. The presentation material provided here is intended to support discussion on these topics at the SC6 July meeting in San Diego.

U.S. discussion on this input is planned for the ANSI X3S3.3 committee's June 1992 meeting in Raleigh, N.C.

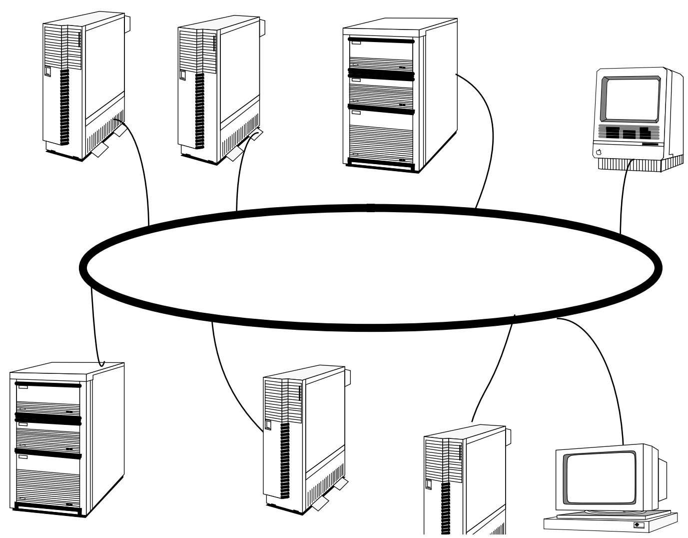
Approach for Providing OSI

Connectionless-mode Network and Connectionless-mode Transport Multicast

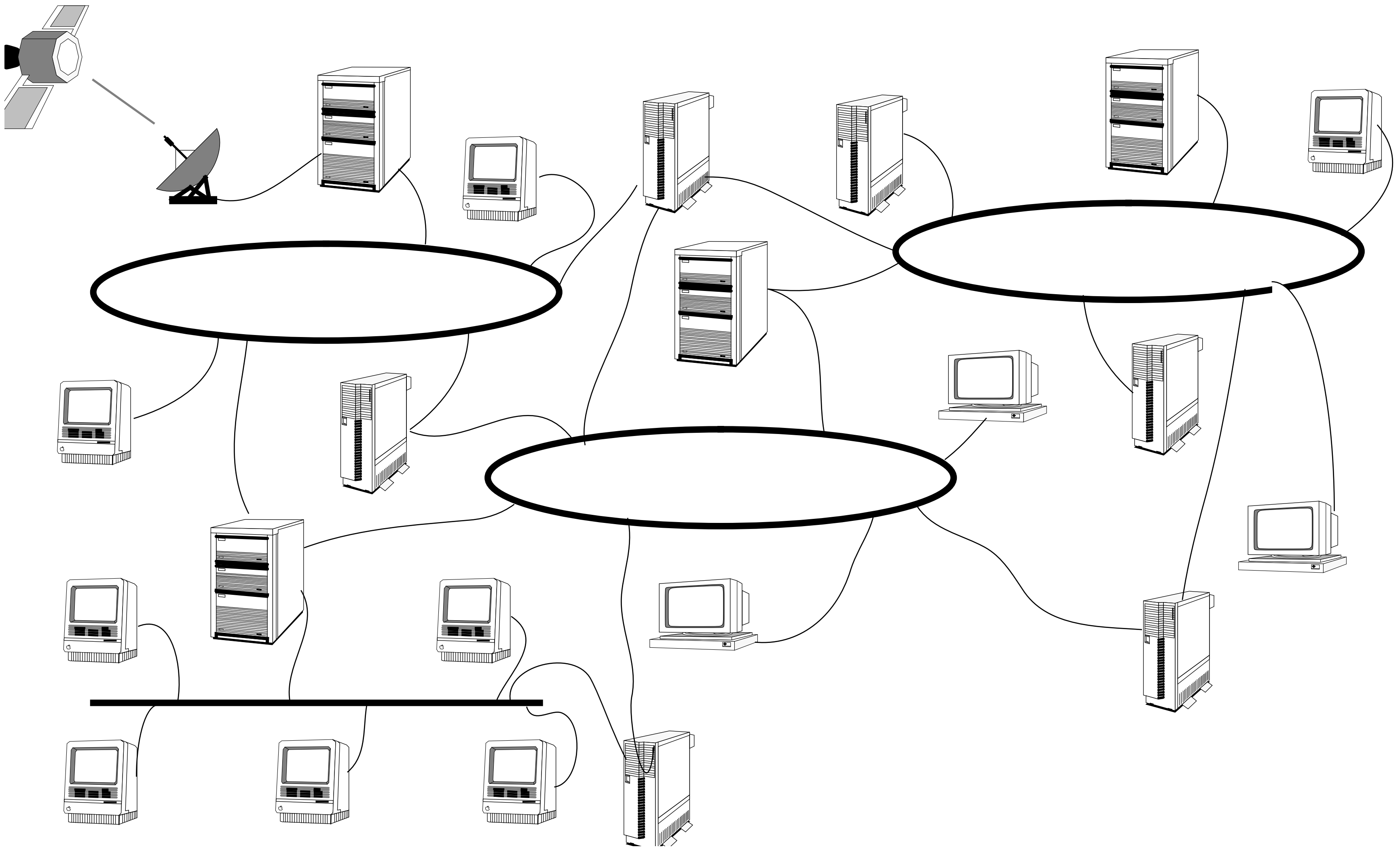
David T. Marlow

OSI Connectionless-mode Multicast

- Multicast transmission
  - In multicast transmission, a protocol-data-unit (PDU) is sent out to some number of the interconnected stations.
    - Broadcast where the PDU is sent to <u>all</u> stations is a subset of multicast.
  - LAN Standards (i.e. FDDI) provide the necessary hooks for transfer across a LAN



Target Environment



Multicast Requirement

- Why is multicast capability important?
  - A number of advantages exist for having multiple stations receiving the very same transmission
    - Can provide very efficient service (Bandwidth reduction)
    - Can provide rapid dissemination of time critical data (e.g. power alerts)
    - Certain applications are better served (e.g. resource discovery)

Multicast status

- Protocols are needed to provide transmissions across a set of subnetworks (i.e. an internet).
  - Within the OSI set of protocols there are no provisions for multicast above the Data Link (i.e. LAN) level.
    - Thus there is no direct way for an Application entity to access a multicast service.
  - Not only are there not the protocols, no provisions have been made for group addressing.
- Multicast capabilities are discussed as being either Connectionless or Connection-oriented (or somewhere in between (HSTP)).
  - Internet community has developed a set of connectionless protocols
  - CCITT has initiated development of a connection-oriented approach.

OSI Connectionless Multicast Development

- In the development for the OSI High Speed work it was recognized that a connectionless multicast capability was needed.
  - Pushing for international (ISO) standards in this area
- Goal is to provide the OSI environment the capabilities of Internet Multicast
  - Based on the techniques developed by S. Deering in RFC 1112
    - Multicast destinations are identified by Group NSAP addresses
    - Any End System can listen in on any Group NSAP address
    - Set of listeners maybe dynamic and unbounded
    - Senders need not be listeners or know any information concerning the listeners
  - Make use of any advantage that exists due to the OSI approach.
  - Terminology
    - Group - used with addressing
    - Multicast - used with PDUs and transfer actions

Approach for Providing OSI Connectionless-mode Transport Multicast

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Connectionless Transport (ISO 8602)

- ISO 8602 provides all the functionality needed for supporting connectionless multicast at the Transport level. There are three simple wording changes to permit the use of underlying Network layer multicast facilities (if they exist). Other issues investigated:
  - Addressing
    - The present addressing capabilities of ISO 8602 (Transport selectors) appears adequate
  - Group Management
    - Utilize the underlying connectionless group management capabilities which will be built into the CLNP, ES-IS and IS-IS Intra-Domain protocols
    - Additional services may be needed to support dynamic groups. Solve by making use of the services (possibly new) provided at the Network layer.
  - Use with OSI Directory Services
    - No extensions needed.

Changes proposed to ISO 8602 to support multicast transfer

Introduction - Proposed amendment has a short introduction

1. Scope and Field of Application

Change the end of the first point (a) under paragraph 1 from "to one peer transport entity;" to:

to one or more peer transport entities;

3. Definitions

Add to the end of 3.3.2:

The destination-transport address may identify a group of Transport Service users connected to different network entities depending on the services used and provided by the network service provider.

5. Overview of the transport protocol

Add a new sentence at the end of 5.2:

Depending on the services provided by the Network service, a transport user may be able to send data to a group of other transport users and receive PDUs intended for a group of transport users via the use of the Destination address parameters in Table 3.

Approach for modifying the Network Service Definition to Provide Connectionless-mode Multicast

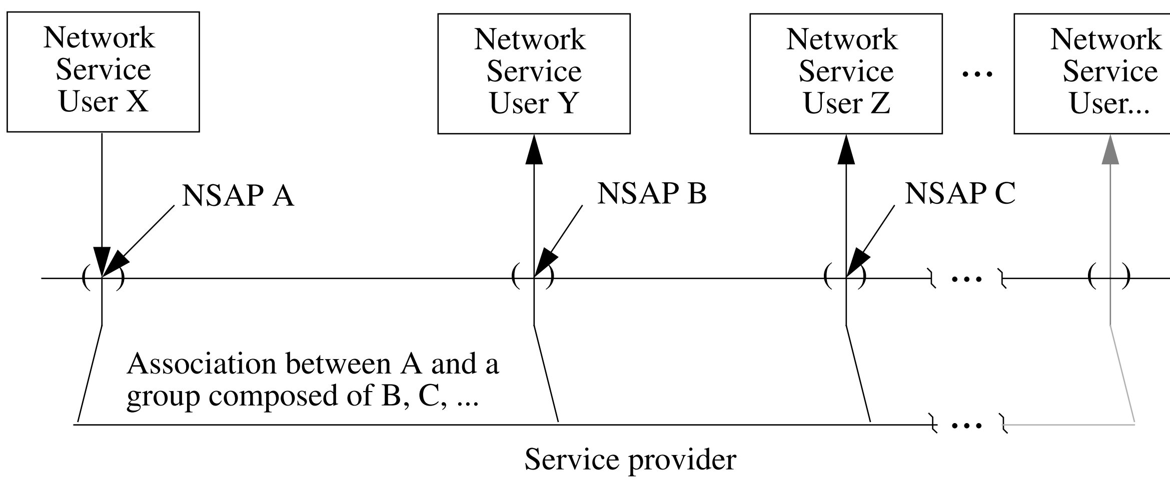
David T. Marlow

Extensions to the connectionless-mode Network service

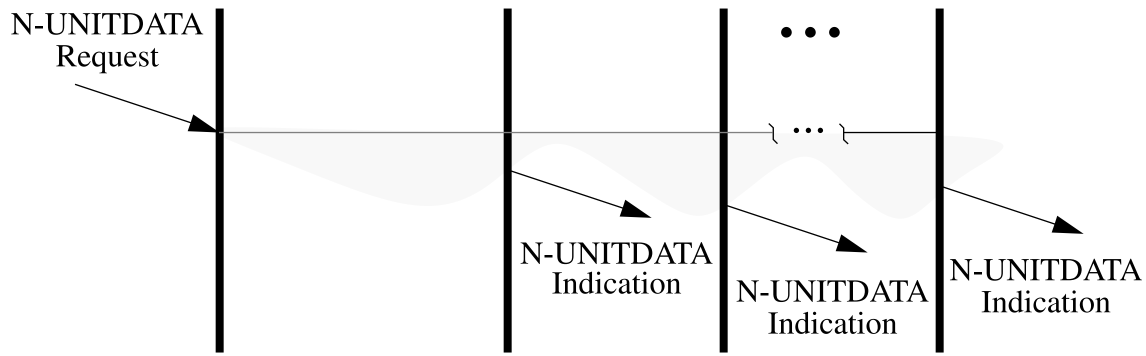
- Multicast extensions for the connectionless-mode Network service fit naturally into:
  - ISO 8348 Addendum 1
  - current draft of CCITT Recommendation X.213
- No new functionality needed to support UNITDATA transfer
- New functionality is needed to support passing information from the Network service user to the provider to enable registration (and de-registration)
  - Such functionality is the subject for multicast extensions to the ES-IS protocol

Extensions to the Network service definition Addendum on Connectionless-mode transmission (ISO 8348 Addendum 1)

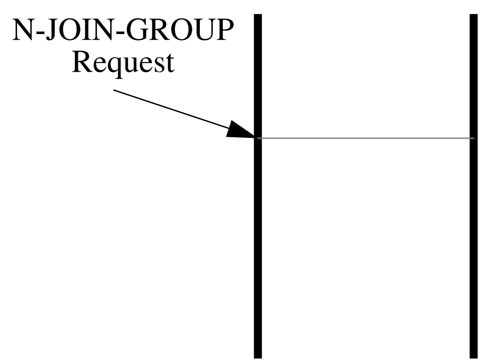
- Provides the extensions to support multicast transfer
  - Added two additional primitives to support NS Users registration and de-registration of specific group NSAP addresses
  - Provides a multicast time sequence diagram
  - Provides a model for multicast transmission
  - Provided modifications to wording concerning "a pair of NSAPs"



Multicast Primitives for the Connectionless-mode Network Service Definition

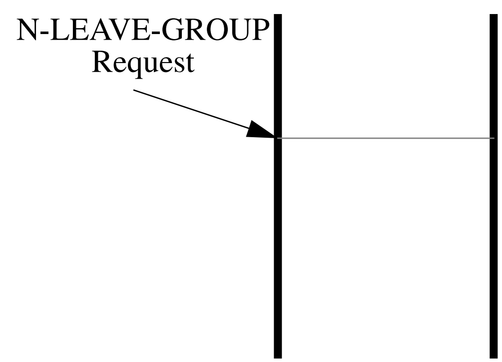


Sequence of primitives in a multicast network-connectionless-mode transmission
(a)



N-JOIN-GROUP Primitive

(b)



N-LEAVE-GROUP Primitive

(c)

Approach for modifying the ES-IS Routeing Exchange Protocol (ISO 9542) to Provide for connectionless-mode Multicast

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ES-IS Routeing Protocol Extensions

- Multicast extensions are needed for ESs to inform ISs of the multicast PDUs (identified by a group NSAP address) that they wish to receive
- Other issues still need to be investigated
  - Design must be done in conjunction with the multicast extensions to IS-IS Intra-Domain Routeing Exchange protocol
  - The association of a group SNPA address with a group NSAP address

ES-IS Routeing Protocol Extensions

- Multicast will require changes to the current connectionless routeing protocols
  - e.g. ES-IS Query Configuration function, if implemented will need to be handled a different way.
- Utilize the basic ES-IS operation with a new PDU type to support the dynamic interaction of multicast End Systems with multicast Intermediate Systems
  - End System Group Hello (ESGH)
    - Uses a “All Connectionless Multicast Network Entities” SNPA address
- Functionality supported:
  - Intermediate Systems are informed of multicast PDUs needed via the End Systems periodically sending their lists of group NSAP addresses they wish to receive
    - Damping Supported
- NO IMPACT ON NON-MULTICAST IMPLEMENTATIONS OF ES-IS

Approach for modifying CLNP (ISO 8473)

to Provide for connectionless-mode Multicast

David T. Marlow

Multicast Extensions for CLNP

- Changes brought in as optional functionality
  - Intermediate systems perform optional functions based on recognizing a destination NSAP address as being multicast
    - Header Format Analysis Function
    - Route PDU Function
  - End Systems are required to source a multicast PDU on every subnetwork to which they are attached
- NO IMPACT on non-multicast CLNP implementations
- PDU needs to marked as multicast in addition to making the destination address "easily distinguishable"
  - Support "cut through switching"
- Provides a new CLNP PDU type: "Multicast Data (MD)".
- Issues to discuss
  - Sourcing of multicast PDUs on all subnetworks
  - Scope control of multicast transmissions