Guidelines for NSAP Allocation in the Internet

Elie I. Mourad

August 12 1996

Guidelines for NSAP Allocation in the Internet

Introduction

- RFC 1629 obsoletes RFC 1237
- Internet becoming multi-protocol environment
- CLNP [Connectionless Network Protocol]
  - Routing
- Infrastructure requires address assignment
  - NSAP [Network Service Access Point]
  - 20 bytes for flexibility and scalability

Guidelines for NSAP Allocation in the Internet

- Introduction
- NSAP Requirements
- IS-IS Routing
- IDRP
- NSAP Hierarchical Routing
  - GOSIP V2
- Examples

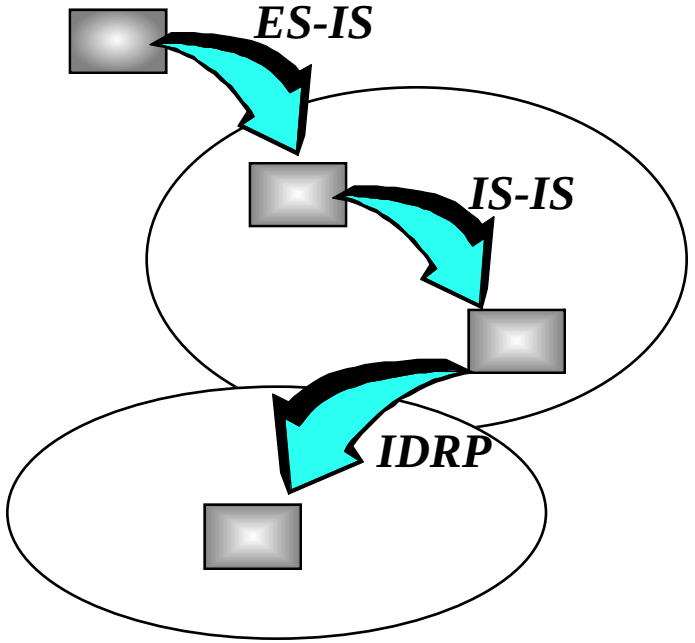
Guidelines for NSAP Allocation in the Internet

Definitions

- Internet has multiple administrative authorities
- Network Service Provider
  - Provides datagram switching services to customers
  - Regionals, Commercial providers, government backbones
  - Mesh with no fixed hierarchy
- Network Service Subscribers
  - Customers
  - Do not provide datagrams to other organizations
  - Campuses, Corporate sites, etc..

CLNP Traffic

- NSAP allocation issues related to routing
- CLNP traffic based on:
  - End-System to Intermediate system routing protocol [ES-IS]
  - intra-domain [IS-IS]
  - inter-domain routing protocol [IDRP]



Guidelines for NSAP Allocation in the Internet

NSAP Requirements

- Efficient operation of IS-IS routing
- Introduce topological information to reduce routing overhead in IDRP
- Hierarchy to support network growth
- Allow subscriber routing connected to more than one provider

Guidelines for NSAP Allocation in the Internet

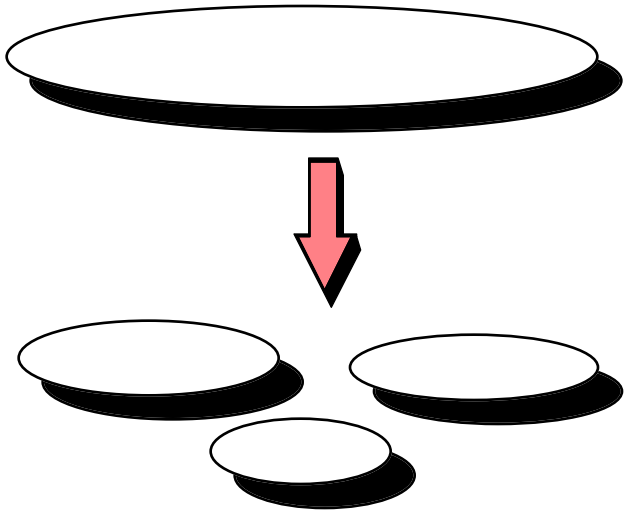
Background

- OSI Routing Standards
  - Routing exchanges between hosts [ES-IS]
    - ISO 9542
  - Routing exchanges between routers in the same domains [IS-IS]
    - ISO 10589
  - Routing among routing domains [IDRP]
    - ISO 10747

Guidelines for NSAP Allocation in the Internet

IS-IS

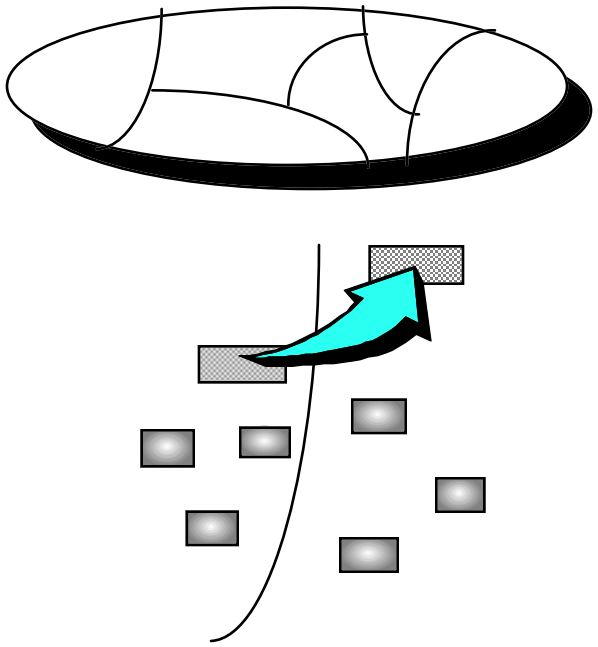
- Internetwork partitioned into domains
- Routing domain [RD] is a collection of ES & IS are under control of single administration (corporate network, backbone, etc..)
- RD boundaries are defined by NM by setting links to exterior
- No IS-IS routing messages are sent on exterior links



Guidelines for NSAP Allocation in the Internet

IS-IS

- IS-IS uses 2-level hierarchival routing
- Routing domain divided into areas [Level 1 subdomain]
  - Level 1 routers know topology (all routers and hosts in their area)
  - Level 1 routers that do not know topology or destination outside their area
  - Level 1 routers route all traffic outside their area to Lever 2 routers within their area
  - Level 2 routers know reachable level 2 addresses. They form level 2 subdomain.
  - Level 2 routers exchanges routing information outside their domain



Guidelines for NSAP Allocation in the Internet

OSI NSAP

- Flexible, variable length addressing format
  - Multi-Level hierarchical addressing
- Solves two critical problems:
  - Administer worldwide address space
  - Addresses which allows scalable routing in worldwide internet

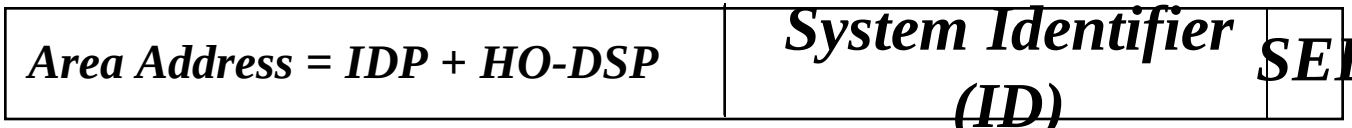
Guidelines for NSAP Allocation in the Internet

OSI NSAP

ISO address:

IDP = Initial Domain Part (Format and Authority standardized by ISO) = AFI + IDI
DSP = Domain Specific Part
AFI = Authority and Format Identifier, IDI = Initial Domain Identifier

IS-IS Routing:



Each router knows the length of ID and determines length of area address.
Length of area address can vary in each area of a domain.
Therefore area address does not have ot be any fixed length.

Guidelines for NSAP Allocation in the Internet

OSI NSAP

- Usually all nodes in an area have the same area address
- Possible to have more than one area address:
  - When changing an area address from A to B. Allow both area addresses to work at first
  - Merging areas A and B into one area
  - Partitioning area C into A and B

Guidelines for NSAP Allocation in the Internet

OSI NSAP

- Level 1 IS:
  - Route based on ID portion
  - Recognizes if destination address is within the area. If not route to nearest level 2 router
  - Cisco: station routing
- Level 2 IS:
  - Route based on prefix address
  - Prefers longest address match
  - Cisco: area routing

Neighbors

- Level 1 router
  - area address manually configured
  - refuse to become neighbor whose area address does not overlap
- Level 2 router
  - accepts any router to be neighbor regardless of area address
  - External links (routing to other domains)

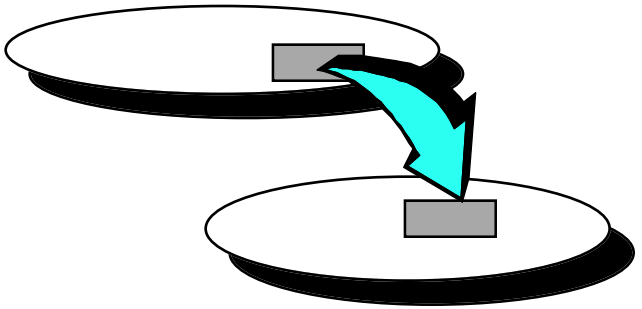
Broadcasting

- If each router announces link to all other routers $O(n^2)$
- Use a “pseudonode”. Each router reports to this node. Designated router reports Link State Packet to all other routers
- IS-IS authentication via a password
  - Initialize link
  - become member in an area or subdomain

Guidelines for NSAP Allocation in the Internet

IDRP

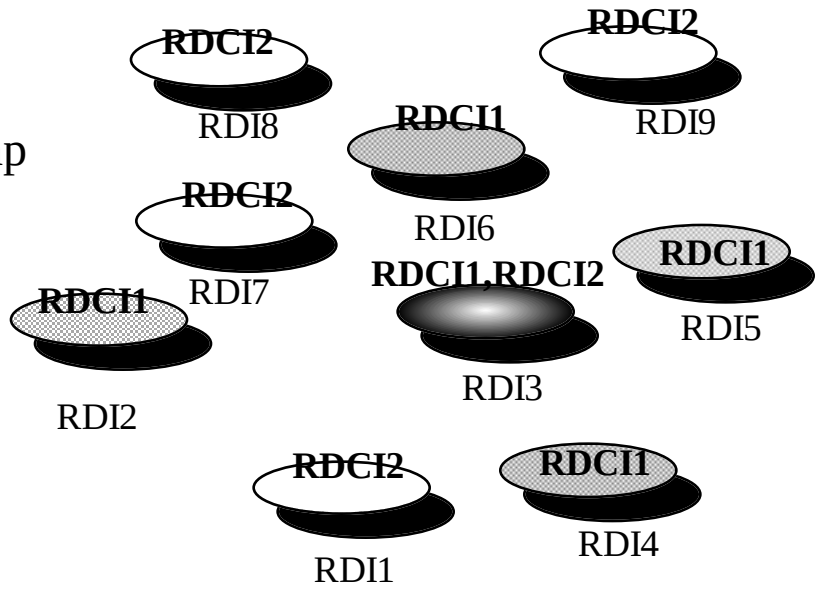
- Boundary Intermediate System [BIS]
  - router that participates in IDRP
- Adjacent domains are BIS that are external neighbors
- Internal BIS are BIS in same domain
- Internal neighbors don’t have to share common subnetwork



Guidelines for NSAP Allocation in the Internet

IDRP

- Set of connected domains = Routing Domain Confederation [RDC]
- One domain can belong to many RDC
  - Nested RDC
    - all members of the RDCs overlap
  - Disjoint RDC
    - no members in common
  - Overlap RDC
    - some members in common
- Each domain is assigned a unique Routing Domain Identifier [RDI]
- Each RDC has a unique Routing Domain Confederation Identifier [RDCI]
- RDCI and RDI assigned from same pool via NM



IDRP

- Grouping RDs into RDCs allows for routing aggregation and abstraction
- Reduction of topological information by replacing sequence of RDIs with since RDC
- Simplified route selection policies

Aggregation

- RDCs
  - Used to aggregate topology information
- Route aggregation mechanism. Network Layer Reachability Information [NLRI]
  - Complementary to RDC
  - Used to aggregate and provide data abstraction for routes

NSAP Routing

- Hierarchical Routing
  - Routing data abstraction and summarization
  - Reduce processing time, memory, transmission bandwidth
  - Scale to large networks
  - Example:
    - Provider gets a short address prefix
    - Assigns longer prefixes to the subscribers
    - Provider to provider reachability table is smaller
    - Recursive process

Guidelines for NSAP Allocation in the Internet

GOSIP Version 2

- **Efficient routing and decentralized NSAP administration**
- **47.0005.80 = US Government as Authority GOSIP v.2**
- **39.0840 = ANSI**
- **AFI + IDI + DFI + AA = Administration prefix**
- **Administration prefix + RD = Routing domain prefix**
- **Routing domain prefix + AA = Area address**

AFI = Authority and Format Identifier
IDI = Initial Domain Identifier (DCC for ANSI)
DFI = DSP Format Identifier
AA = Administrative Authority (ORG for ANSI)
ID = System Identifier

Packet switching AFIs

X.121	DATA	37, 53
ISO DCC	Data Country Code	39
F.69	Telex	41, 55
E.163	Public Network	43, 57
E.164	Public Network(B-ISDN)	45,59
ISO ICD	International Code Designator	47
Local	IDI = 0 no sub network	49

Guidelines for NSAP Allocation in the Internet

GOSIP v2

System	**osi.ncsl.nist.gov**
Organization	**NIST (47.0005.80.005A00.*)**
NSAP	**47.0005.80.005a00.0000.0001.e137.080020079efc.00**
	AFI.IDI.DFI.AA.Rsvd.RDI.ID.SEL

Guidelines for NSAP Allocation in the Internet

ISO-IGRP

System	**jaspar.NSD.3com.com**
Organization	**3Com (47.0004.0035.*)**
NSAP	**47.0004.0035.1100.0800.2003.2f7f.00**
	DOMAIN.AREA.ID.SEL

Guidelines for NSAP Allocation in the Internet

Europe - Finland

AFI	ICD	V	Network	TTA	FM	PA	Area	SW	MAC	SEL
1	2	1	3	1	2	1	1	1	6	1

System	datanet.tele.fi
Organization	Telecom Finland (47.0023.00.000003.00.0000.03.*)
NSAP	47.0023.00.000003.00.0000.03.00.01.1311.7710.4142.00

Guidelines for NSAP Allocation in the Internet

ATM Forum