# Passport/DPN-100 Networking
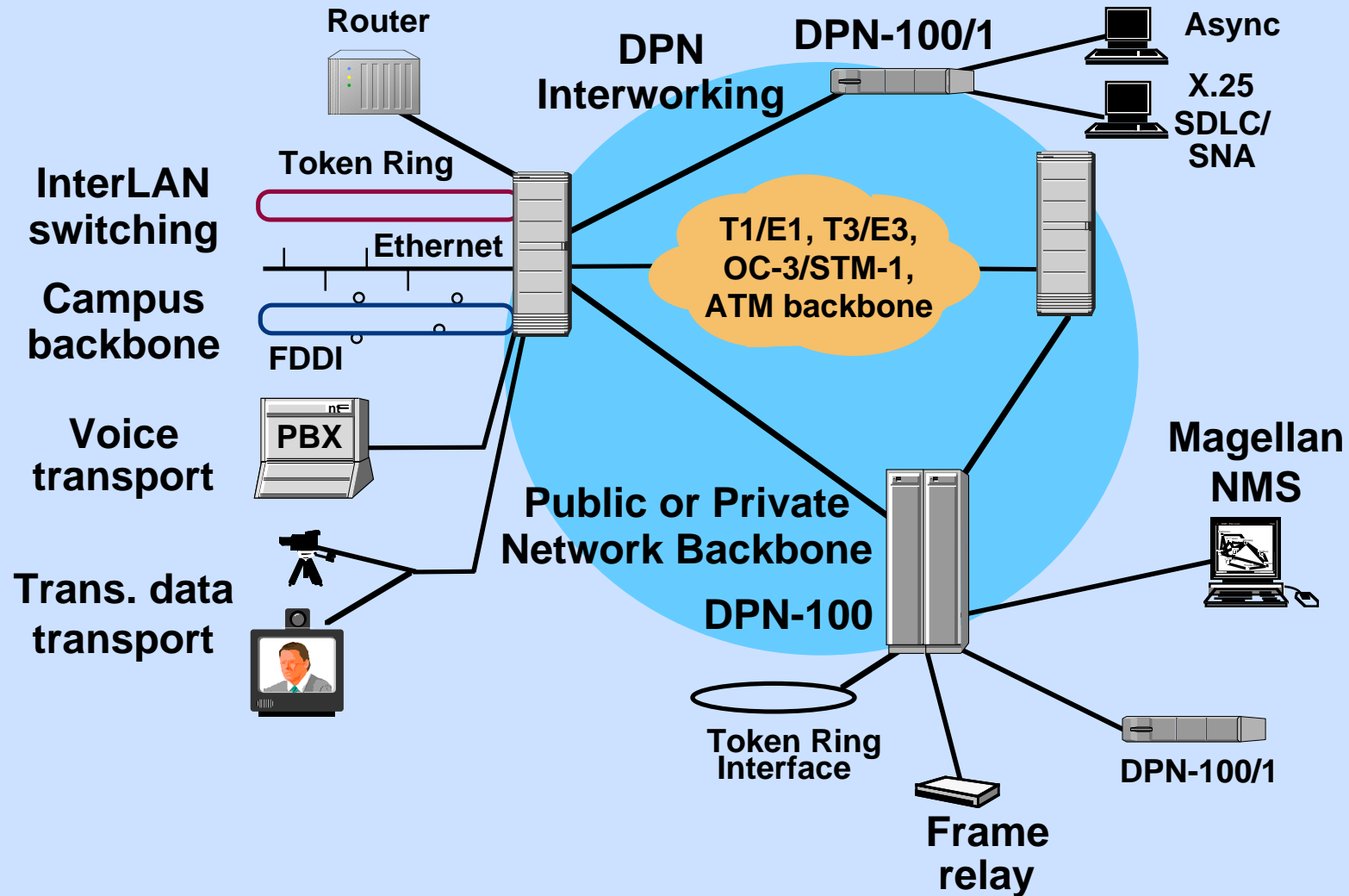
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# Agenda

- **Passport Networking Benefits**

- **Passport/DPN-100 Interworking**

- **Networking Considerations**

- **Passport Routing Features**

# Passport Network Vision



Router

DPN-100/1

Async

DPN Interworking

X.25 SDLC/ SNA

Token Ring

InterLAN switching

Ethernet

T1/E1, T3/E3, OC-3/STM-1, ATM backbone

Campus backbone

FDDI

Voice transport

PBX

Magellan NMS

Public or Private Network Backbone

Trans. data transport

DPN-100

Token Ring Interface

DPN-100/1

Frame relay

# Passport Networking Benefits

- **High-speed backbone and access**
  - backbone speeds up to T3/E3 (frame-based) or OC-3/STM-1 (ATM)
  - frame relay access speeds up to T3, HSSI rates

- **Network consolidation**
  - combine different traffic types on same platform
  - effective bandwidth utilization

- **Network simplification**
  - common network management platform
  - common network engineering tools
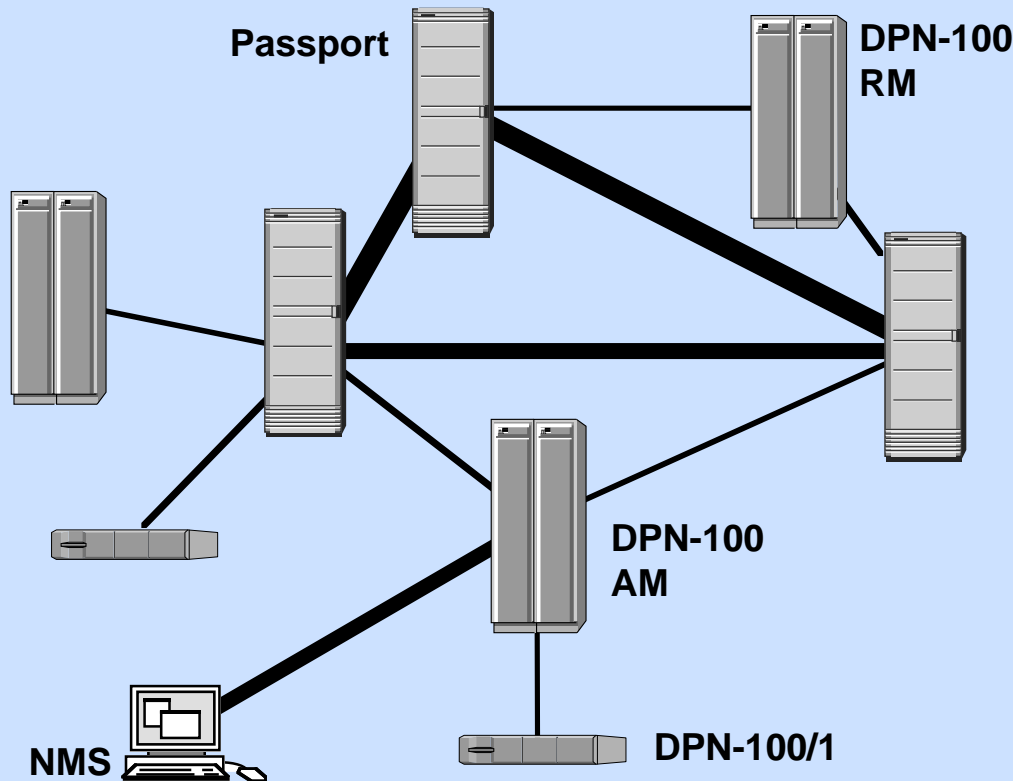  - common routing and call services

# Passport Networking Benefits

- **Technology evolution**
  - stepping stone to new technologies (e.g. ATM)
  - offer new services (e.g. LAN, video, high-speed frame relay)

- **Network growth**
  - capable of growing in a non-disruptive manner
  - hierarchical routing provides excellent scaling

- **Investment protection**
  - seamless DPN-100 interworking
  - common network management and engineering tools

# Agenda

- **Passport Networking Benefits**

- **Passport/DPN-100 Interworking**

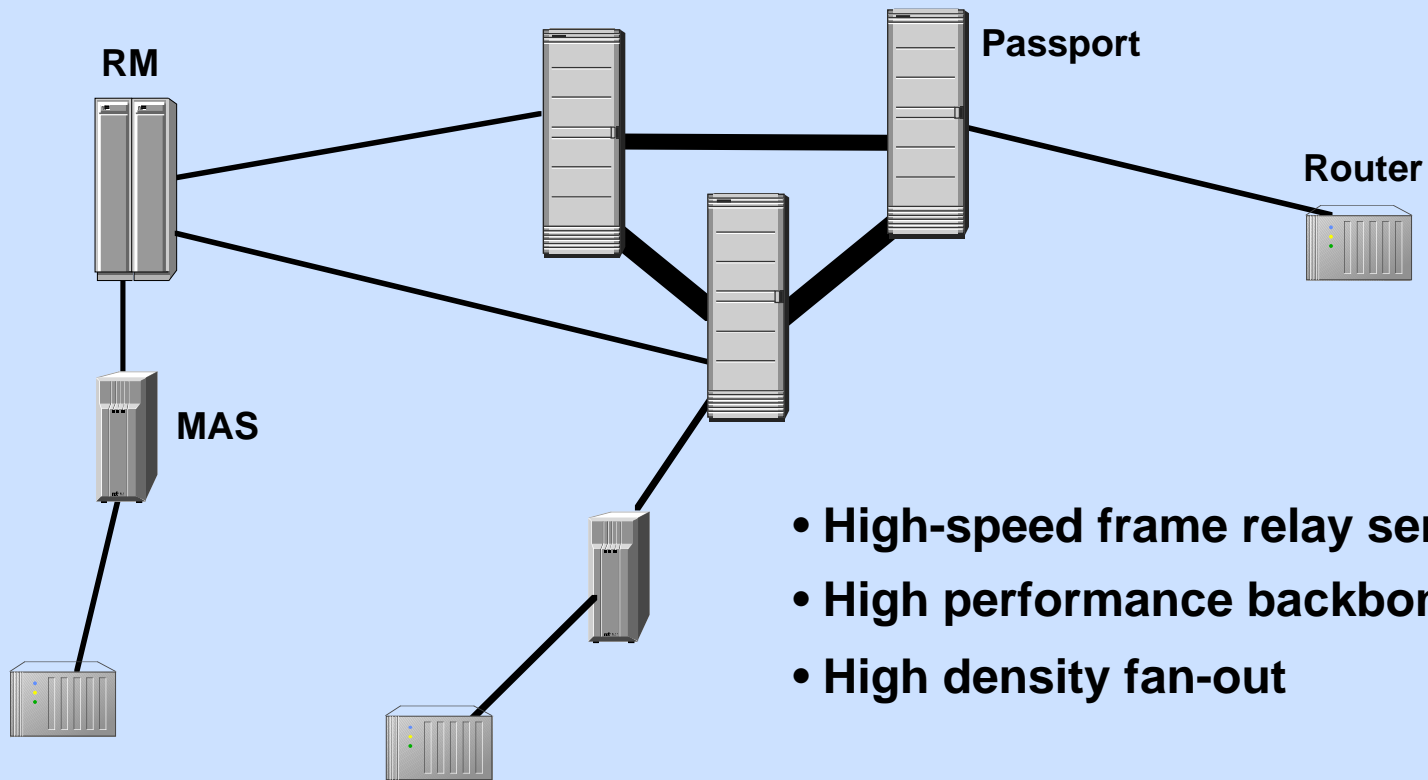- **Networking Considerations**

- **Passport Routing Systems**

# Passport/DPN-100 Interworking



Passport

DPN-100 RM

DPN-100 AM

DPN-100/1

NMS

- Wide variety of h/w interfaces
- High capacity multimedia backbone
- Transport of all DPN services
- Frame relay interworking
- Common network management
- Common routing
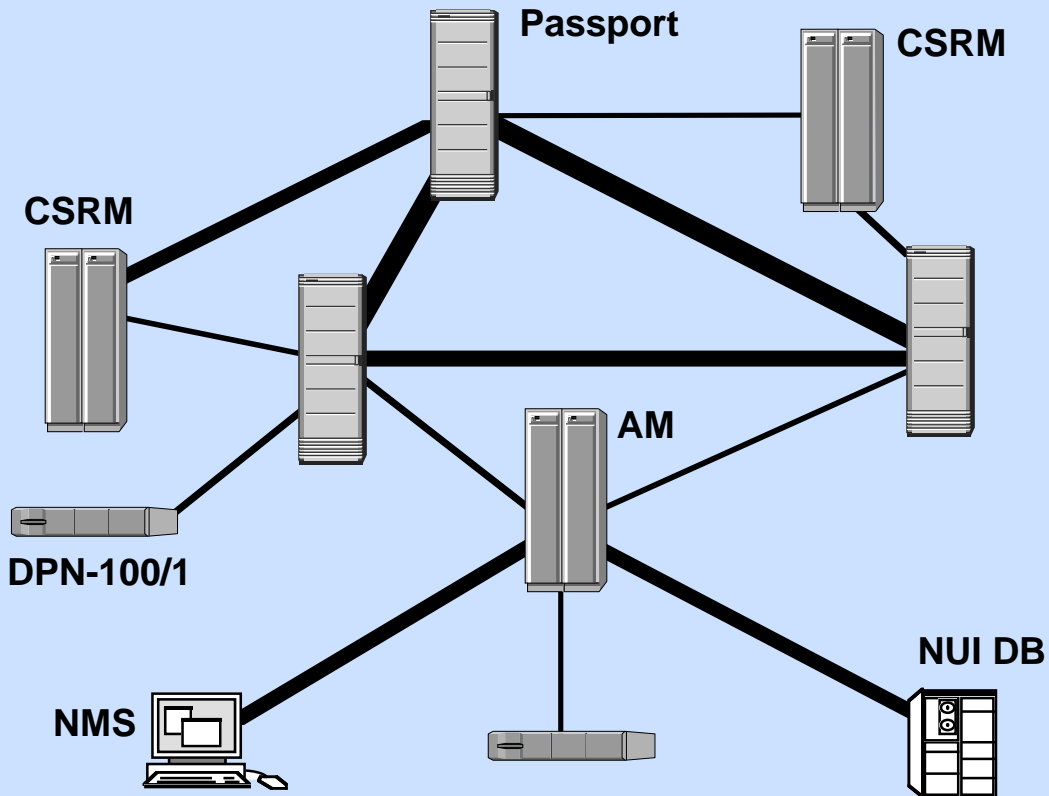- Common call services

**Seamless interworking with DPN-100**

# Frame Relay Interworking

**RM**

**Passport**

**Router**

**MAS**

- **High-speed frame relay service**
- **High performance backbone**
- **High density fan-out**

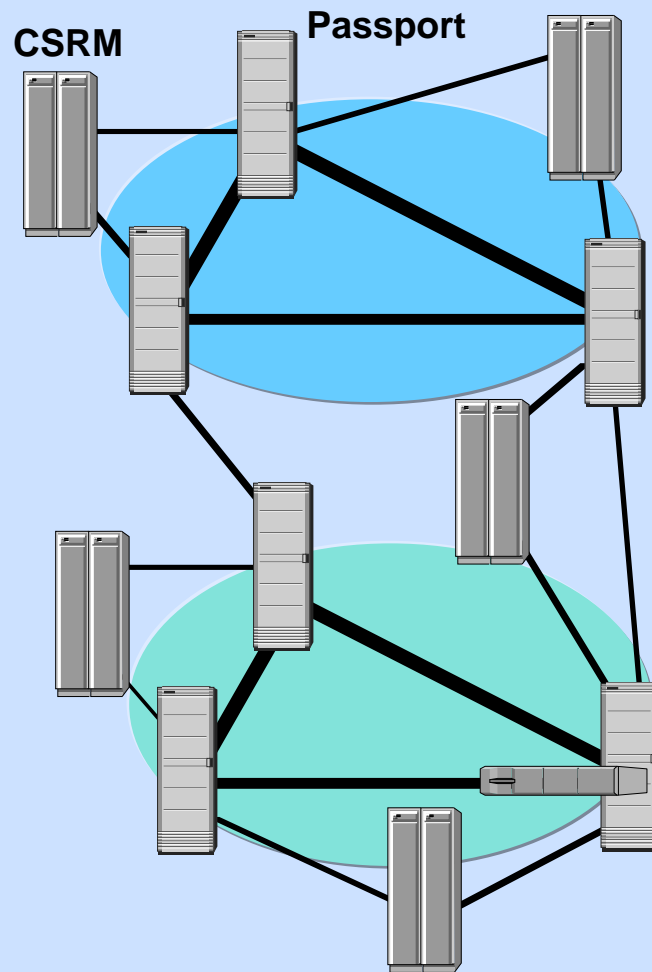**Seamless FR interworking and management**

# Seamless Call Services



- **Fully redundant**

- **Supports existing call  backup strategies**

- **Excellent scaling**

**Existing DPN-100 call services maintained**

# Agenda

- **Passport Networking Benefits**

- **Passport/DPN-100 Interworking**

- **Networking Considerations**

- **Passport  Routing Systems**

# Passport RID Subnets

CSRM    Passport

- One or more Passports share common RID

- Supports up to 1909 modules

- Subnets can interconnect directly
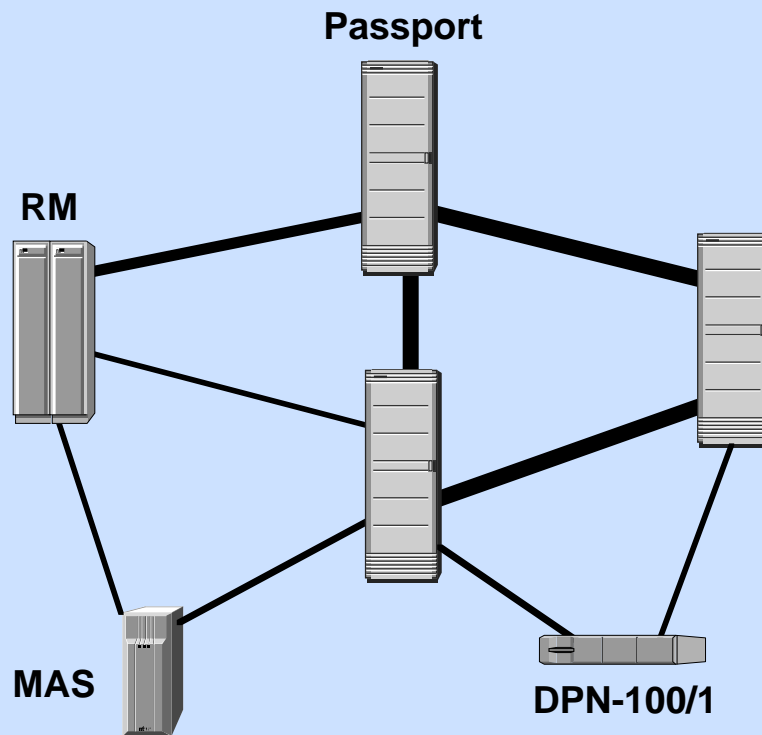
- Need resilient topology for each subnet

**RID subnets allow for large network scaling**

# RID Subnets Engineering

Criteria for partitioning into RID subnets:

- Geographical partitioning

- CSRM locations

- Exceed 1909 modules
(Passports + Access Modules)

- Network scaling

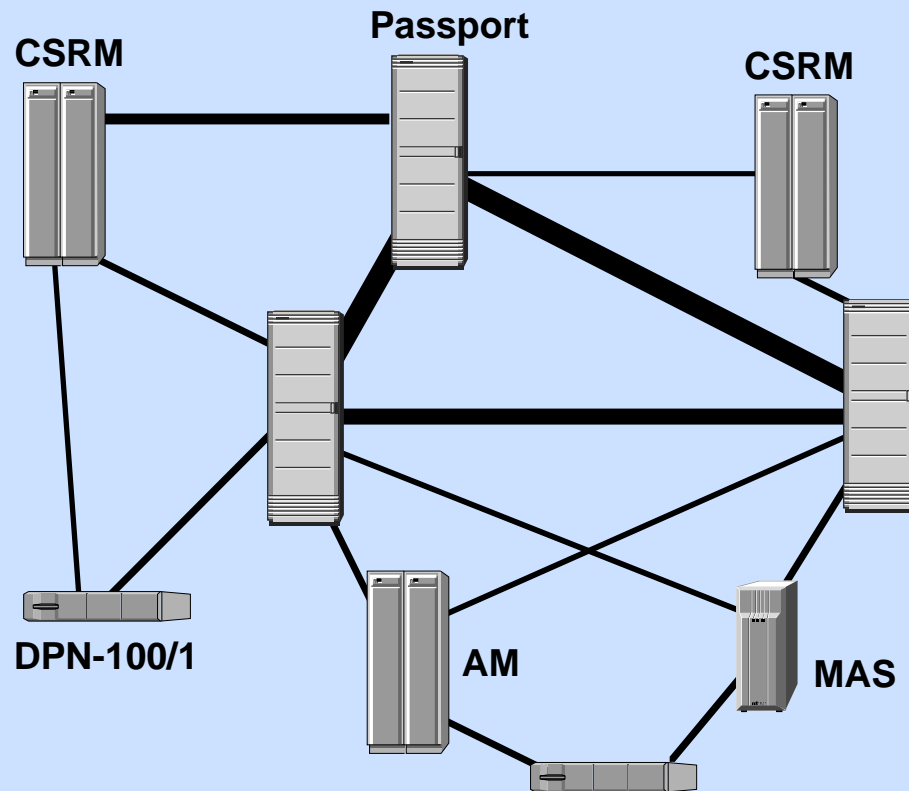# Interworking with RMs

**Passport**

**RM**

**MAS**

**DPN-100/1**

- **Dynamically selects best path**

- **Deterministic routing**

- **Networking features:**
  - **RID backup**
  - **RID splitting**
  - **RID substitution**
  - **Network services sharing**
  - **Tandem suppress**

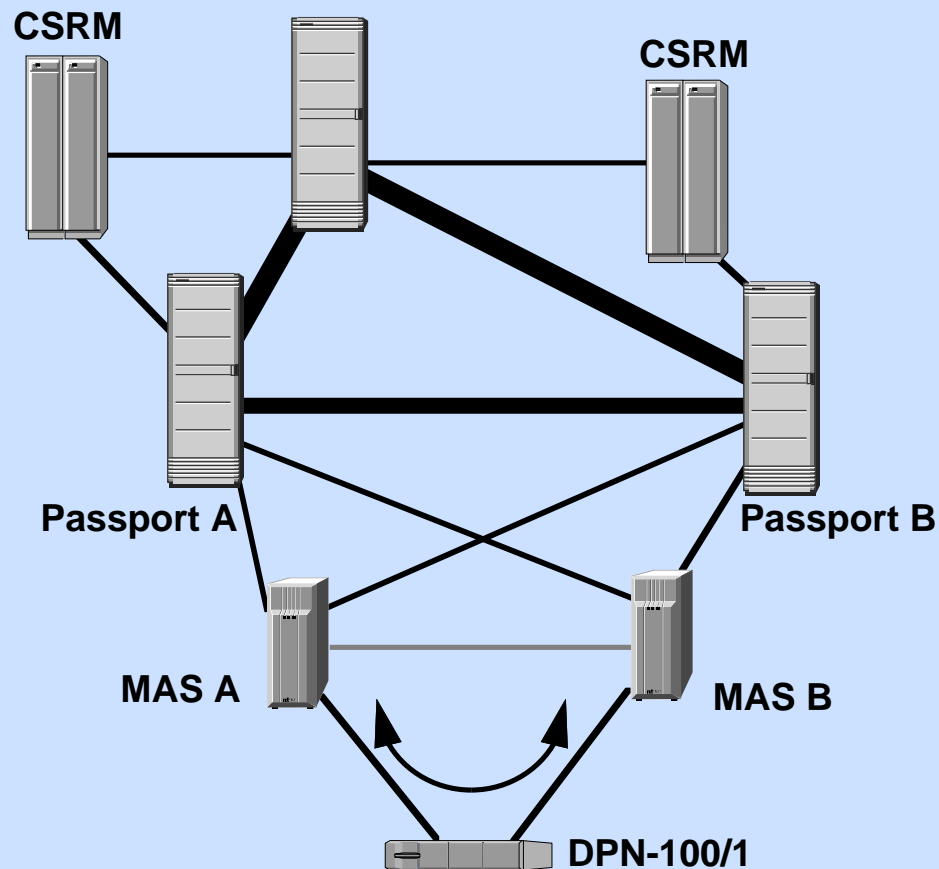**Smooth dynamic RM interworking**

# Interworking with AMs



- 28 AMs per cluster

- Dynamic DNA association to CSRMs

- AMs connect to 1 or 2 RID subnets, or RM and Passport
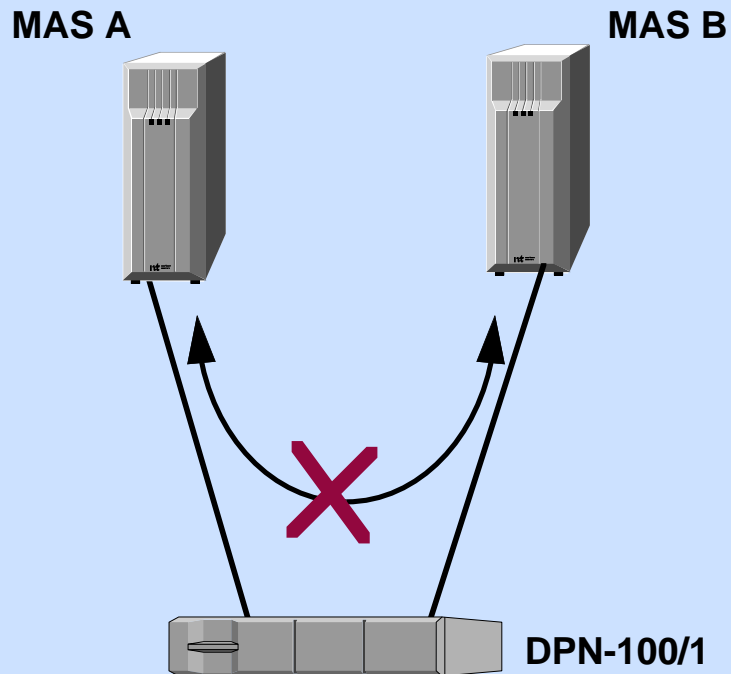
**Smooth dynamic AM interworking**

# Cluster Routing Considerations

**CSRM**

**CSRM**

**Passport A**

**Passport B**

**MAS A**

**MAS B**

**DPN-100/1**

## Strategies

- **Direct link between AMs**

- **AM tandem suppress**

- **Standby network links**

# AM Tandem Suppress

**MAS A**　　　　　　　**MAS B**



DPN-100/1
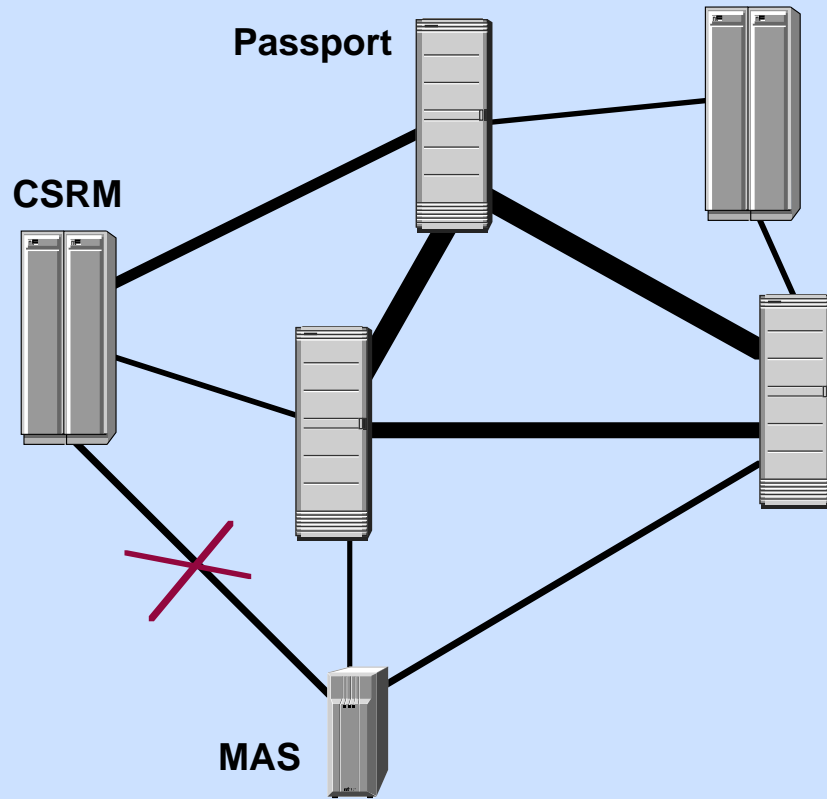
- **Simple provisioning**

- **Applicable to some RM topologies**

- **Dial backup network links (DBNL)**

## Provides traffic control within AM cluster
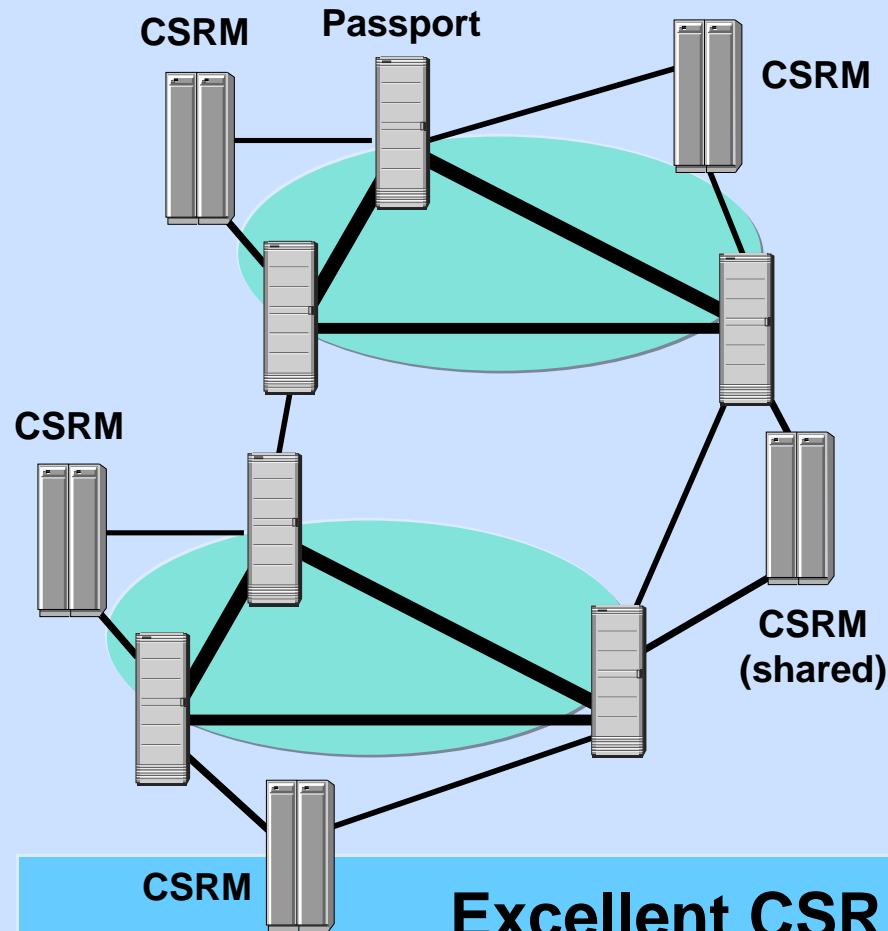
# AM Migration to Passport



Passport

CSRM

MAS

**Why migrate?**

- **High-speed backbone**

- **Simple MID reuse**

- **Simple routing around failure**

- **Increased MID fanout**

## Simple AM Migration!

# CSRM Engineering



CSRM   Passport   CSRM

CSRM

CSRM
(shared)

CSRM

- **Supports up to eight RID subnets**

- **Shared CSRMs for cost reduction**

- **Backup CSRM for extra redundancy**

- **Server redundancy across CSRMs**

**Excellent CSRM scaling!**

# Agenda

- **Passport Networking Benefits**

- **Passport/DPN-100 Interworking**

- **Networking Considerations**

- **Passport Routing Features**

# Passport Backbone Routing

- **Efficient traffic consolidation**
  - **DPN-100, LAN, voice and video**

- **Self-learning and self-healing routing systems**

- **Scaleable to support very large networks**

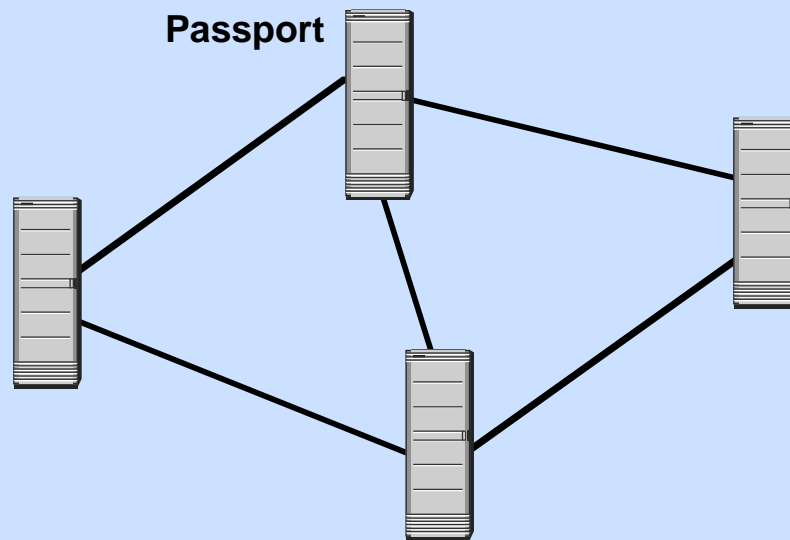- **Integrated congestion management and Routing Class of Service (RCoS)**

# Topology Management

Passport
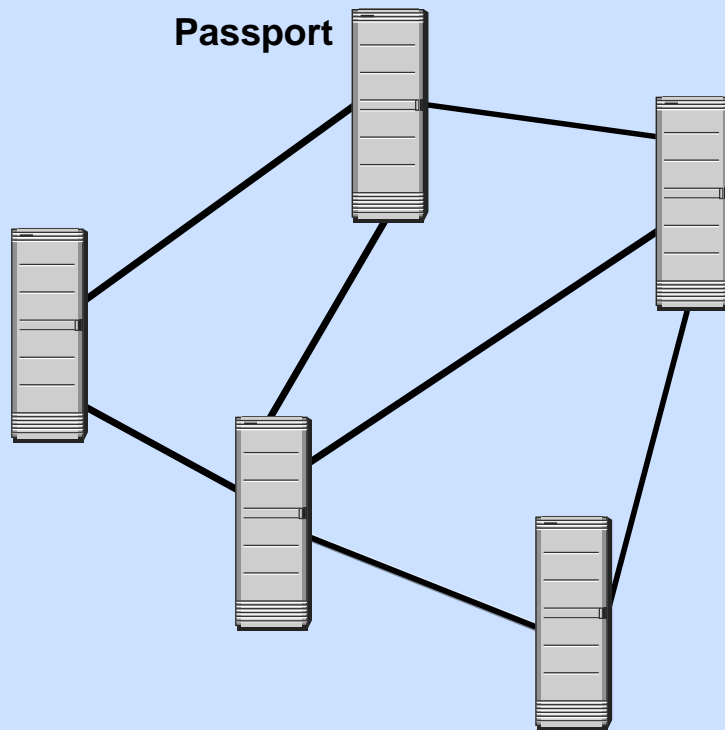
• OSPF based

• Self-learning

• Single base routing system

• Support for trunk groups, and logical networks

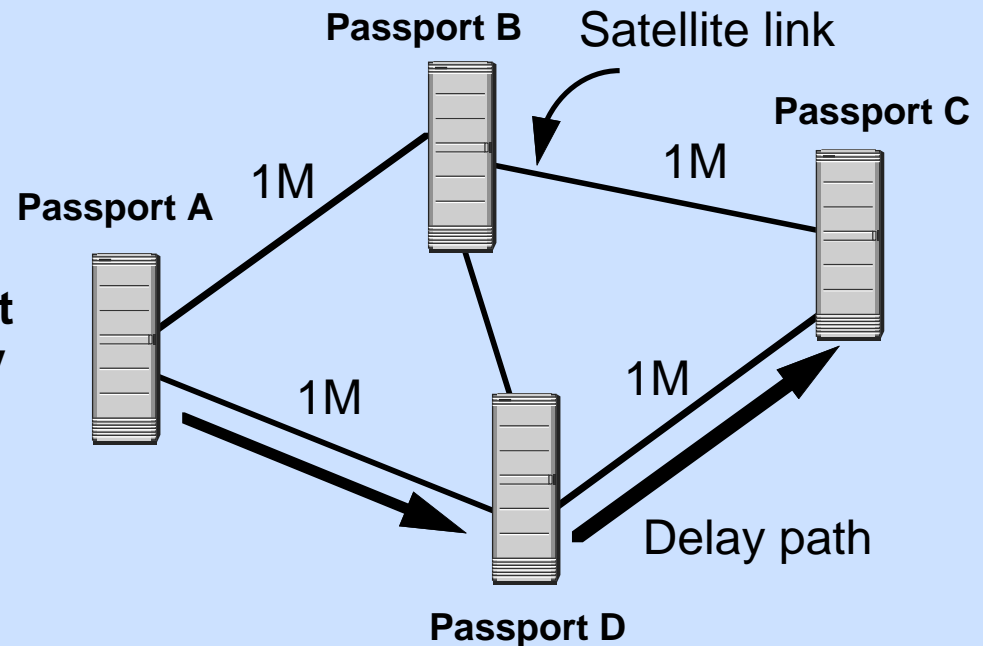**Efficient use of memory and processing power**

# Routing Overview

**Passport**



- **Up to two best paths selected to each destination**

- **Traffic from single VC stays on same link group**

- **Configurable packet forwarding**

**Architectural separation of routing from VC allows for excellent scaling**

# RCoS Routing

**Routing Class of Services (RCoS) offers:**

- **Delay and throughput CoS**

- **Multiple discard priorities set depending on packet priority**

- **Each trunk automatically determines speed and delay**

- **Override provisioning for both CoS**

**Passport B**   Satellite link

**Passport C**

**Passport A**   1M

1M

1M   1M

Delay path

**Passport D**

**Optimal RCoS routes established dynamically**

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# Packet Forwarding (Loadspreading)

- **Default routing behaviour**

- **All packets in a VC use same path**

- **Optimal when access port speeds are lower than backbone speeds**

- **Optimal when have large number of VCs or DLCIs**

**Destination A**

**A1**
**A2**
**A3**
**B1**
**B2**
**C2**
**C1**
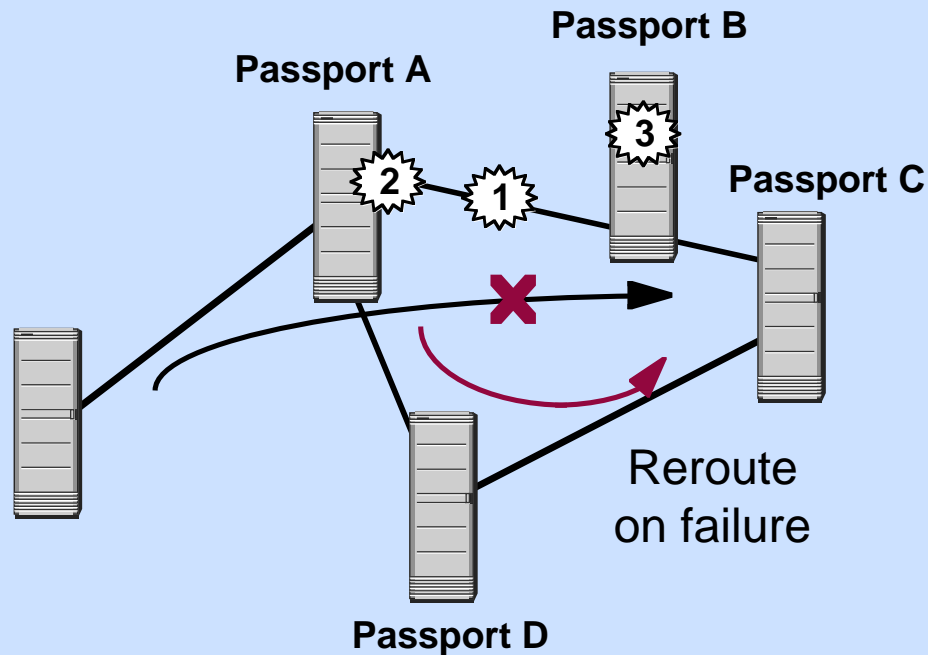
**Destination B**

**Destination C**
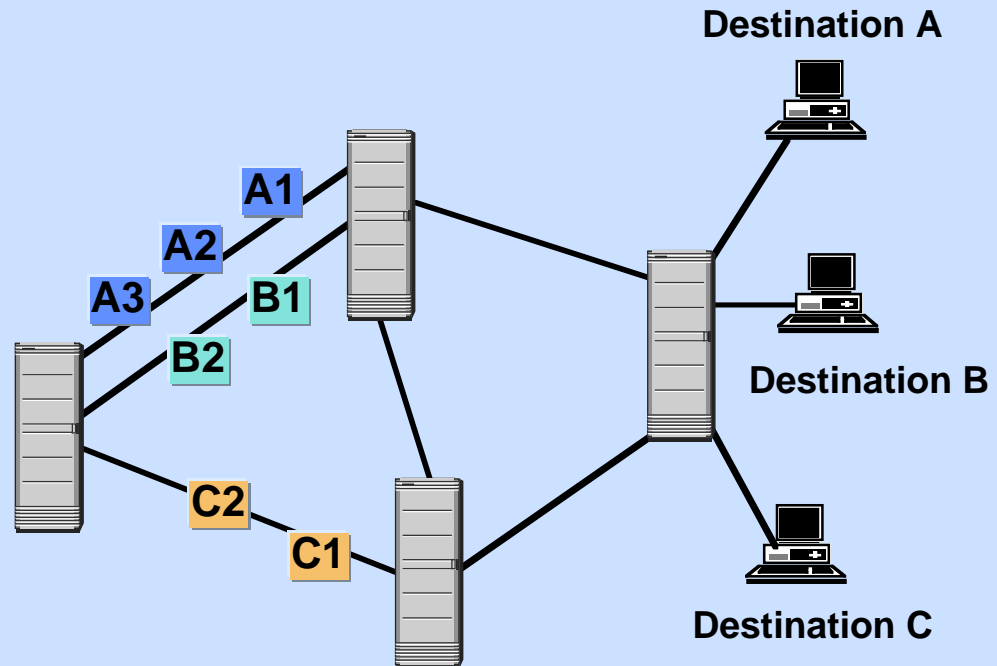
# Packet Forwarding (Loadsharing)

- Provisionable routing behaviour

- Packets shared across links in a link group

- Optimal when access port speeds equal backbone speeds

- Loadsharing proportional to link capacity

**Destination A**

**A1**

**A3**

**A2**

**B2**

**B1**

**Destination B**
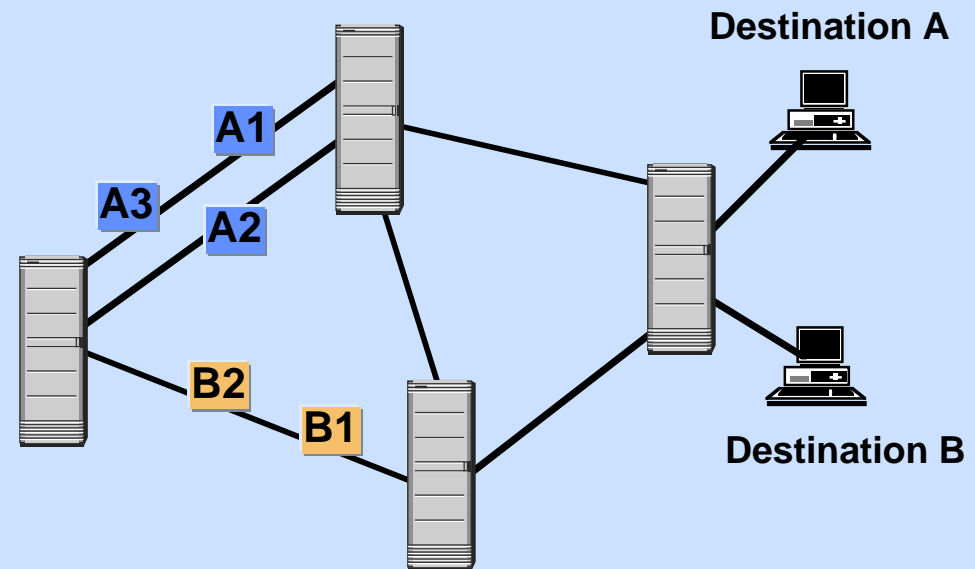
# Recovering from Trunk Failure

Passport B

Passport A
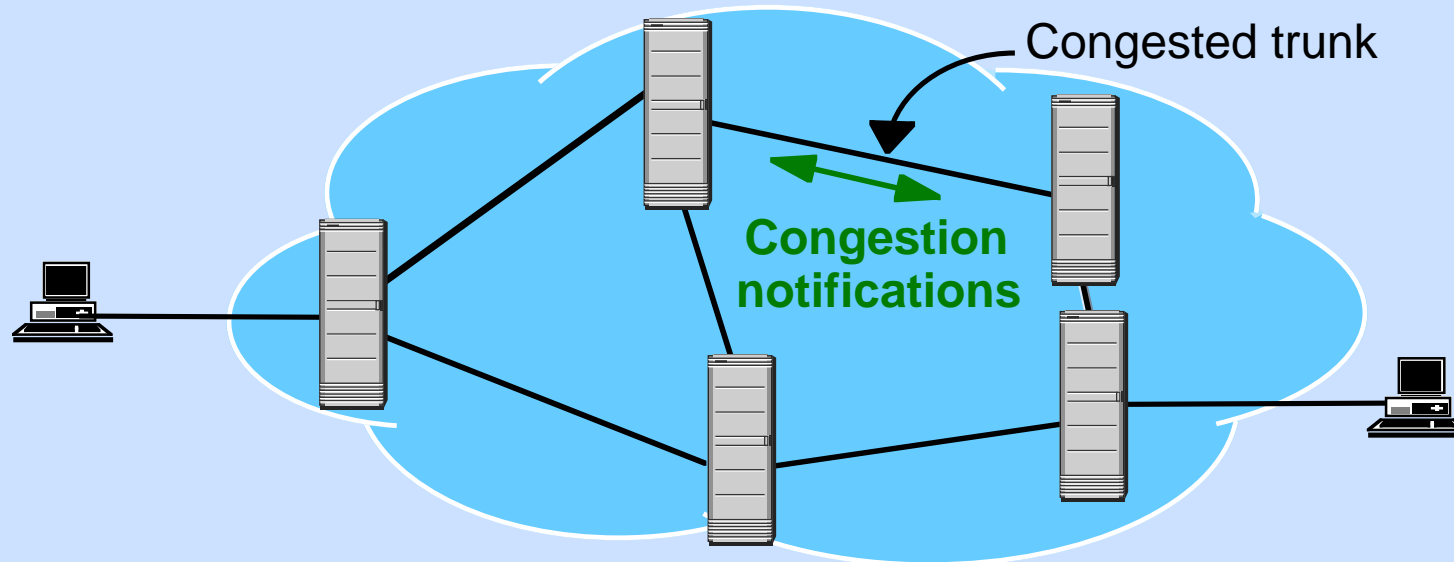
Passport C

Passport D

Reroute
on failure

**Fully automatic recovery
for all failure types:**

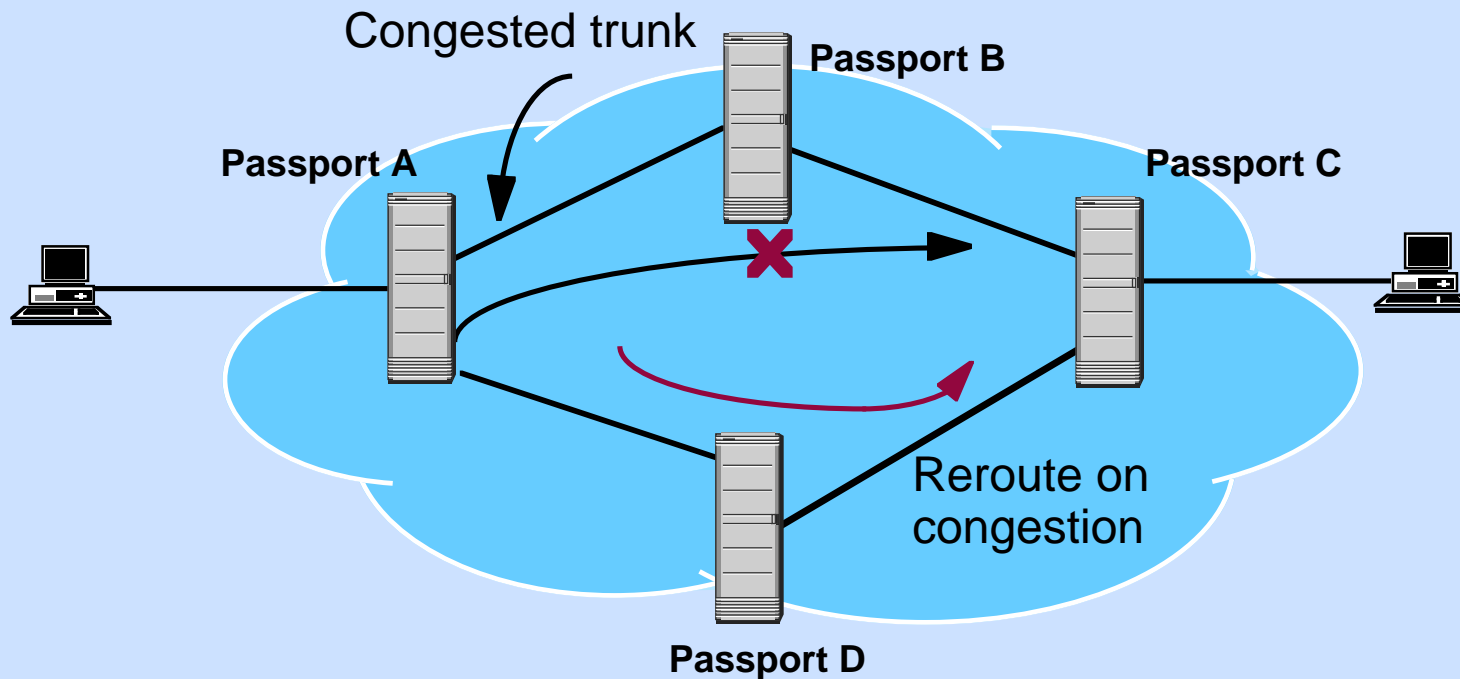1 **Physical trunk failure**

2 **Trunk FP failure**

3 **Switch failure**

**Instantaneous switchover transparent to end-user**

# Congestion Management
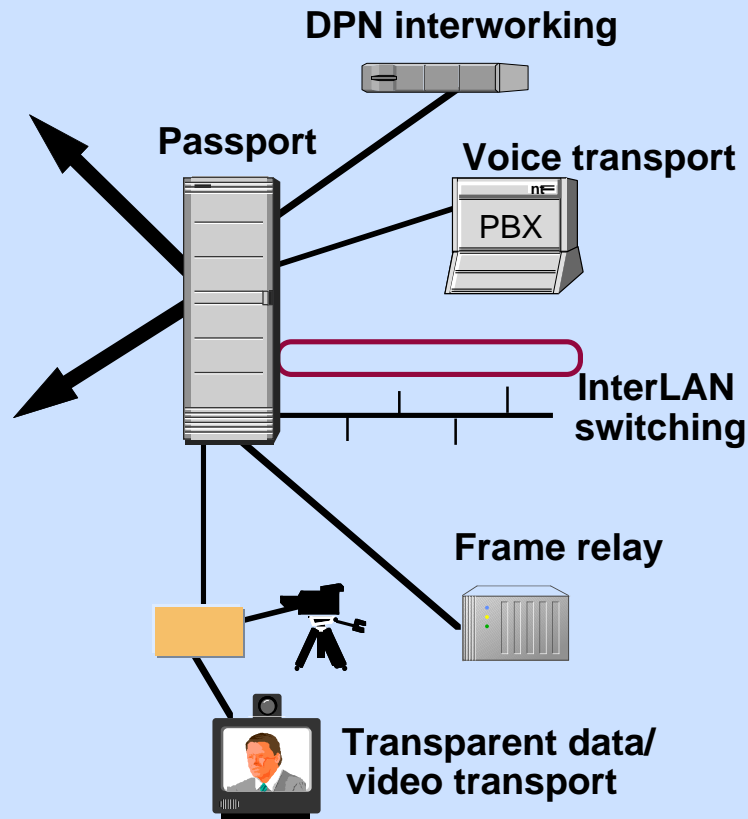


Congested trunk

Congestion notifications

- **Congestion avoidance:**
  - multipath loadspreading, rate enforcement, emission prioritization

- **Congestion handling:**
  - discard priority levels for all traffic types, notifications, overflow

- **Congestion response:**
  - rate adaptation, signaling, random drop and discard priority

# Rerouting Traffic on Congestion



Congested trunk

Passport B

Passport A

Passport C

Reroute on congestion

Passport D

**Instant rerouting of high reliability traffic**

# Network Evolution with Passport

**DPN interworking**

**Passport**

**Voice transport**

PBX

**InterLAN switching**

**Frame relay**

**Transparent data/ video transport**

- **High-speed backbone and access**
- **Network consolidation and simplification**
- **Technology evolution (ATM, new services)**
- **Network growth**
- **Investment protection**

**Growth and evolution with ease of integration**