



NETWORKERS 2004

DESIGNING AND DEBUGGING AN SNASWITCH ENTERPRISE EXTENDER SOLUTION TO REPLACE SNA ROUTING IN THE DATA CENTER

SESSION RST-2800

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Agenda

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- **Concepts**
- **Design Considerations**
- **Configuration Basics**
- **Troubleshooting Tools**

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Concepts

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What Is Your Network Like?

- SA -> APPN -> HPR -> EE
- DLSW+
- FEP migration (esp. SNI)
- OSA Express
- Cisco APPN/PSNA NN migration
- SNASw
- Connection network
- IPv6

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Concepts

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- IP in the network and data center
- SNA switching services
- Branch Network Node (BrNN)
- Dependent LU Requestor (DLUR)
- Enterprise Extender (EE)
- Connection networks
- IPv6 and hostnames for EE

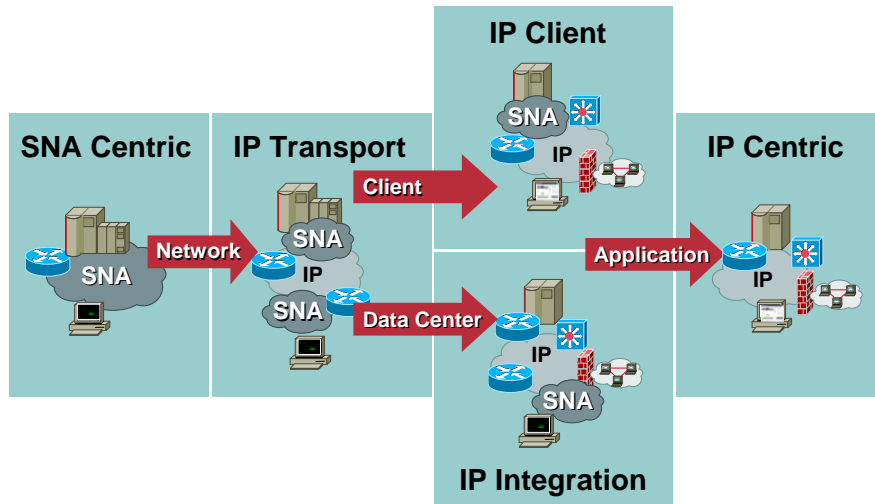
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SNA-to-IP Migration Strategies

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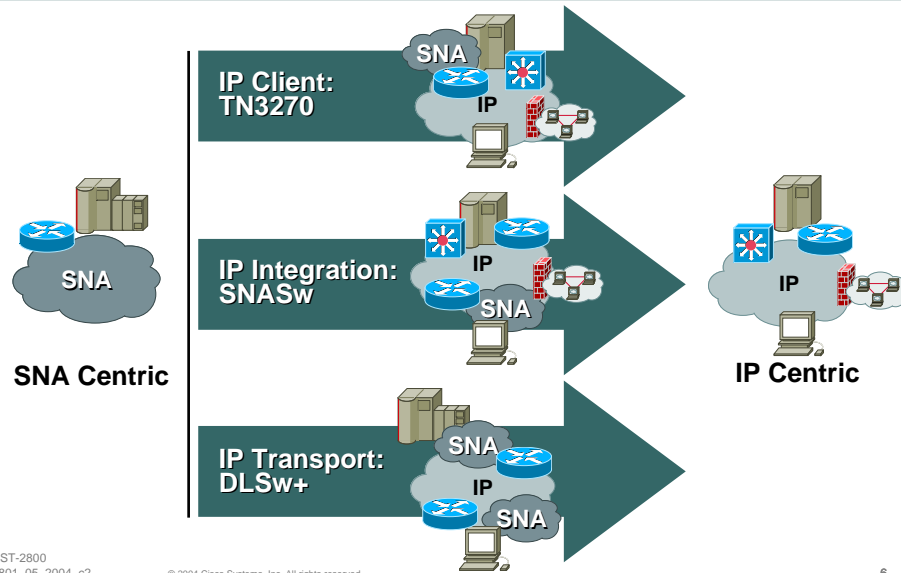
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SNA-to-IP Migration Solutions

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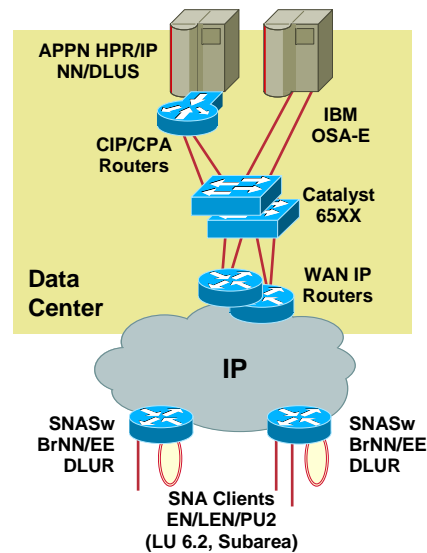
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SNA Switching Services (SNASw)

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- Cisco's 2nd generation APPN feature, Cisco IOS 12.1 and above
- Branch Network Node (BrNN) or Branch Extender (Bx or BEX) for APPN scalability
- DLUR support for peripheral SNA PU 2.0
- Enterprise Extender (EE) supports SNA over IP (UDP transport)
- APPN connection network, GVRN support, hostnames, and IPv6
- Simplified configuration and management, enhanced problem determination



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SNASw and DLSw+ Comparison

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| DLSw+ | SNASw |
|---|---|
| No SNA Routing | Provides SNA Routing Services |
| SNA/NetBIOS Transport over IP between DLSw+ Peering Routers | SNA Transport over IP between Host and SNASw (EE) Router |
| No SNA Boundary Function Support | SNA Boundary Function Support (DLUR) |
| SNA COS to IP TOS Mapping Requires APPN (SNASw) | Preserves SNA Session Priority by Mapping SNA COS to IP TOS |

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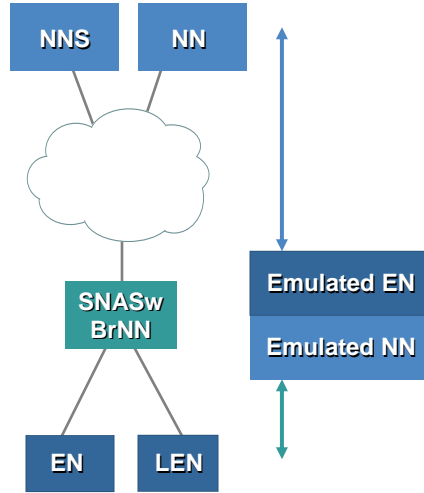
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What Is a Branch Extender (BrNN)?

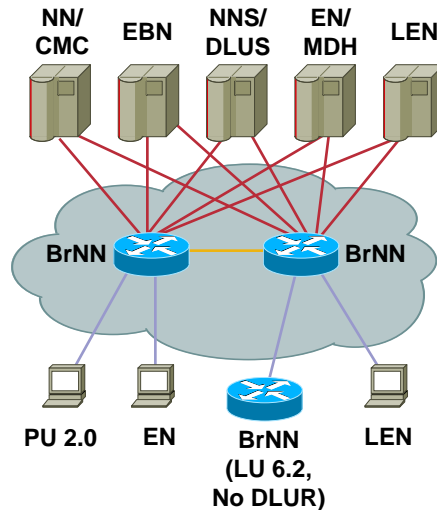
- Architected APPN hybrid node type
- BrNN looks like a NN to downstream devices
- BrNN looks like an EN to upstream VTAM NNs

NN to NN Broadcast traffic does not go to/from BrNN, topology exchanges are drastically reduced as well; result is enhanced network scalability



BrNN Connectivity

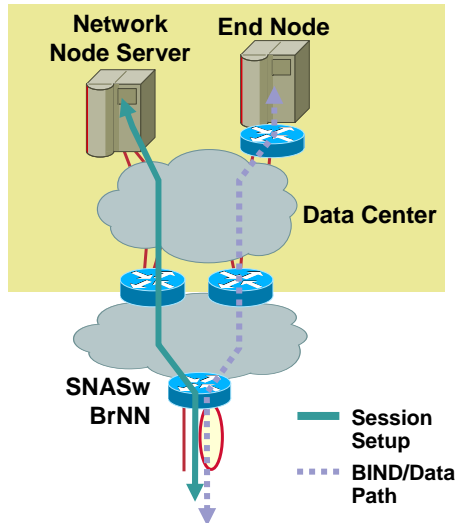
- **Upstream (uplink)** ———
 - BrNN requires a Network Node Server and Dependent LU Server (can be same)
 - Backup NNS/DLUS recommended
- **Peer (neutral link)** ———
 - Use connection network to connect BrNN peers
- **Downstream (downlink)** ———
 - No NNs
 - BrNN allowed only if not using DLUR (LU 6.2 sessions only)



Independent LU Session Setup

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- BrNN(EN) registers ILUs to NNS/VTAM
LEN ILU SLU requires location configuration (if not CP name)
- Locate find (OLU downstream) or locate found (OLU upstream) includes 'tail vectors'
- Route calculated based on APPN COS
- BIND must pass through BrNN
- Traffic routed from BrNN directly to/from correct application host



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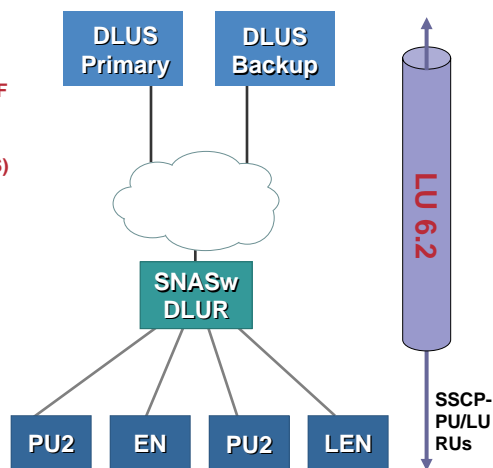
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Dependent LU Requestor (DLUR)

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- Requires APPN
- FEP replacement
LU addresses come from VTAM BF 'above the line'
SNASw provides session routing and boundary function (with DLUS)
- XID indicates ACTPU support
- LU 6.2 CPSVRMGR 'pipe' between DLUR/S
- SSCP-PU/LU RUs (i.e. ACTPU/LU) encapsulated
GDS 1500, PCID uniquely identifies traffic for each PU and it's subordinate LUs



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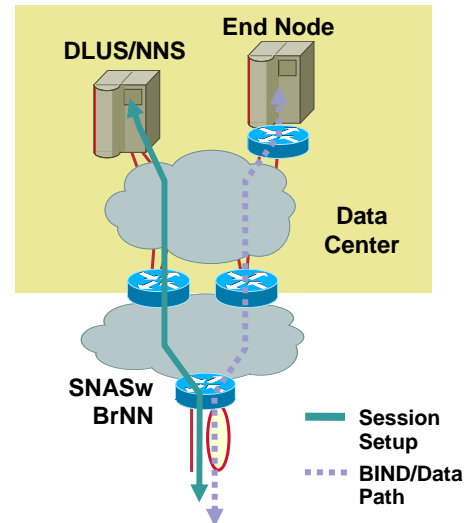
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Dependent LU Session Setup

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- **LU definitions on DLUS**
DLUR registers dependent LUs with DLUS for Border Node case
- TDUs provided from DLUR to DLUS as changes occur
- DLUR not involved in locate flows (except for special Border Node case)
- Route calculated based on APPN COS
- **BIND must pass through BrNN**
- Traffic routed from BrNN directly to/from correct application host



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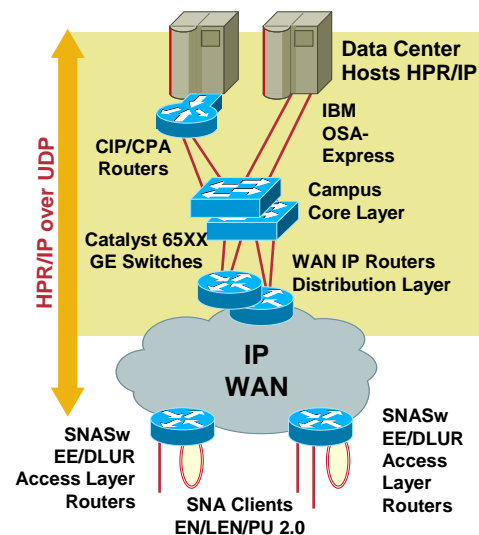
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Enterprise Extender (EE)

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- **HPR/IP over UDP (RFC 2353)**
- **Layer 3 IP routing end-to-end**
SNA/APPN nodes mapped to IP addresses
Utilizes IP dynamic routing algorithms (RIP2, OSPF)
- **Layer 4 HPR for reliability**
Provides end-to-end flow, error, and segmentation control (similar to TCP)
Automatically maps SNA COS to IP precedence bits, preserving SNA traffic prioritization (QoS)
Provides non-disruptive rerouting around link failures



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Advantages of SNASw EE

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- **Facilitate migration from Token Ring to Ethernet**
Gigabit Ethernet using Cisco Catalyst 65XX switch and IBM OSA Express (IBM G5 and higher) or Fast Ethernet (10/100) using CIP/CPA
- **Use existing IP backbone/data center**
- **Non-disruptive SNA session support (APPN/HPR)**
- **Eliminates points of failure in data center**
- **Optimal SNA QoS support over IP networks**
Packets marked according to COS priority on entry to IP network
- **Allows use of Global Connection Network**
- **Pushed to branch provides simplest, most resilient SNA solution**
No DLSW+, all IP routing, only points of failure are host and SNASw router, SNASw traces most effective
- **IBM/Cisco alliance—keep pace with IBM EE implementation**
Hostname, IPv6, alive timer reduction, etc.

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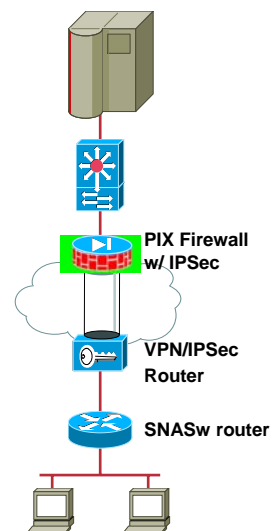
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Securing EE over the Intra/Internet

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- **Firewall**
You must allow UDP ports 12000-12004 through firewall for Enterprise Extender
outbound acl-num permit ip-address netmask 12000-12004
- **Virtual Private Network**
Can use IPSec with Internet Key Exchange (IKE) to secure the VPN tunnel
- **SNASwitch can be on same or different router**
If on same router must plan for CPU load



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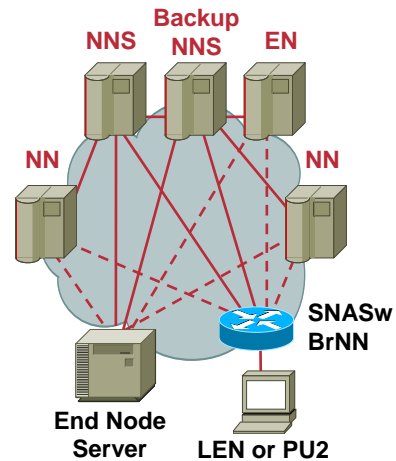
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Connection Network

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- Define two links (NNS/DLUS primary and backup), all others setup dynamically
- All nodes must be on common network, defining the same Virtual Routing Node (VRN)
- DLSW+, LAN or HPR/IP
- Very simple configuration
- LPARs added dynamically without EN config change
- May be required if more than 8 NN uplinks and running < Cisco IOS 12.2T (introduced >1K locate)
- Must be used to connect peer BrNNs
- Beware of older z/OS ICN restrictions



Dynamic Links over Connection Network Shown As Dashed Lines

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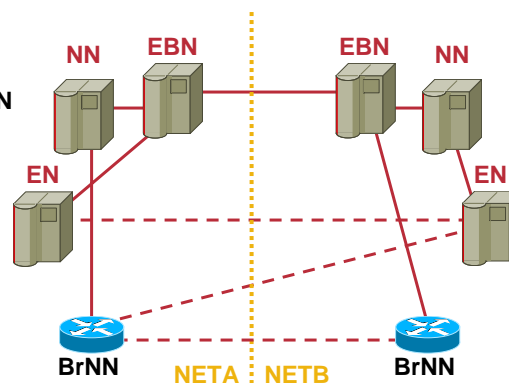
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Global Connection Network

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- Extends connection network over entire IP network...even across APPN network boundaries (SNI replaced by EBN)
- Only supported with Enterprise Extender
- Supported in all SNASw releases
- All SNASw virtual nodes are global
- z/OS and SNASw now enhanced to use HOSTNAME so that it works with NAT



Dynamic Links over Global Connection Network Shown as Dashed Lines

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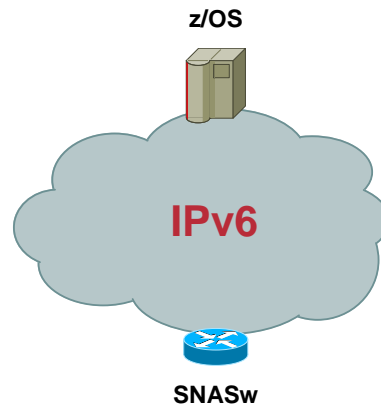
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EE IPv6 Support and Hostnames

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- SNASw previously only supported IPv4 addresses
- Current releases of z/OS and Cisco IOS support IPv4/IPv6 conversion
- z/OS and SNASw have added IPv6 capability for Enterprise Extender
- Hostnames must be used for IPv6 EE, can optionally be used for IPv4
- Hostname support allows connection network to work across NAT



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- Concepts
- **Design Considerations**
- Configuration Basics
- Troubleshooting Tools

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Design Considerations

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- QoS
- Redundancy
- SNASw placement
- Choosing a platform
- FEP/SNI migration

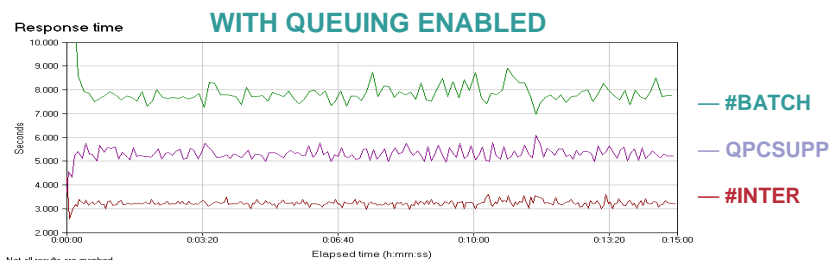
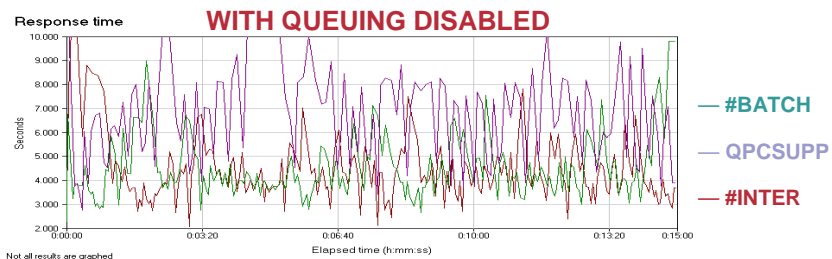
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EE: QoS Directly from CoS

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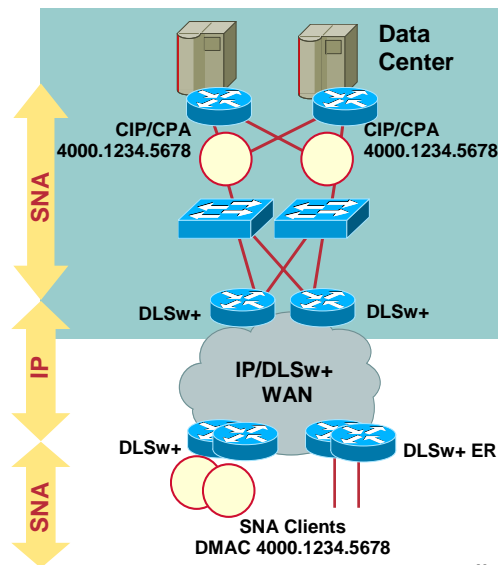
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Redundancy with DLSw+

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- **Head-end redundancy via multiple active peers/ports or back-up peers**
 - Up to 4 active peer paths cached
 - Default is fault-tolerant mode (first response)
 - Customize using cost
 - Load-balancing capability (round-robin or circuit count)
 - Source-route bridging required to support duplicate path/MAC
- **Ethernet redundancy or TR at the branch**



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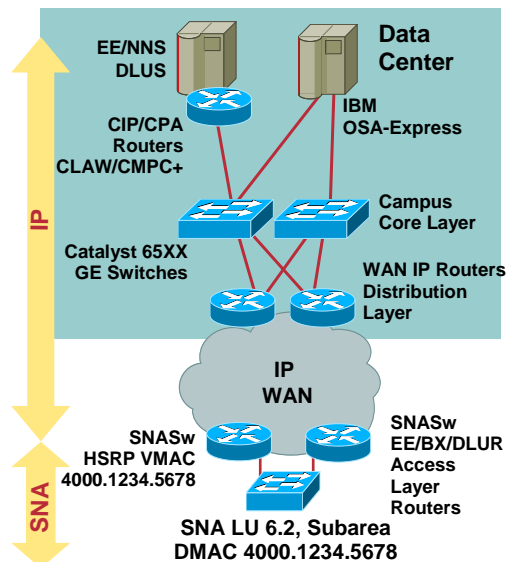
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Redundancy with SNASw EE

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- **IP replaces head-end L2 SRB redundant paths**
 - Creates a high-availability, failure-resistant media-independent infrastructure
 - Moves redundancy issues to layer 3 (IP)
- **HSRP (Ethernet) or TR at the branch**
 - HSRP supports duplicate mac addresses and multiple standby groups
 - HSRP can also take action based on interface event



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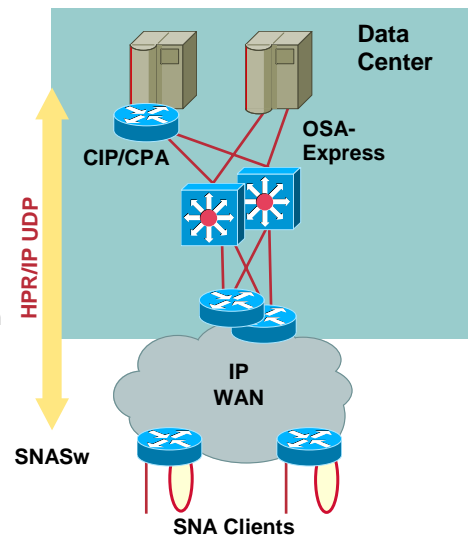
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Advantages of SNASw/EE to the Branch

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- SNASw with EE in branch routers converts SNA traffic to IP
- Simplest design, best practice
- Highest resilience and performance
- SNASw PD tools isolated on single branch
- Consider overall cost of branch EE product



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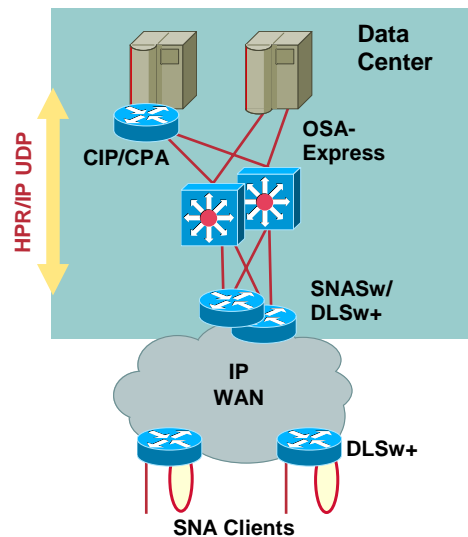
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Advantages of SNASw/EE in Data Center

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- Generally lower cost
- Don't have to change existing DLSw+ network
- SNASw can be on same router as TN3270 or DLSw (usually preferred) or can be on a separate router (must set up bridging in-between)



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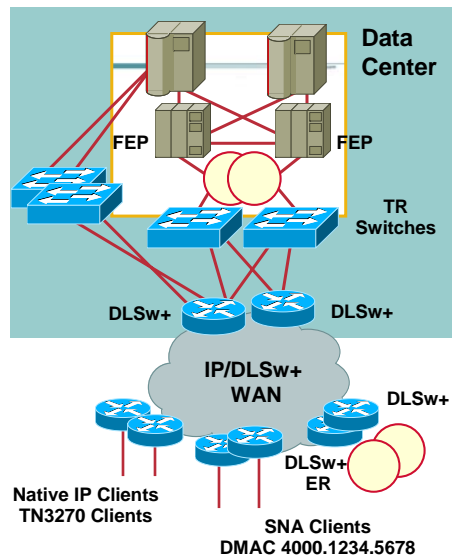
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Sample Customer: Problem

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- Still require SNA applications
- Want to move to IP in data center
 - Host is IP-enabled - z/OS 1.2
 - Use OSA/Express adapters
 - Already have native IP traffic and TN3270 clients
 - Remove FEPS and TR switches
 - Add additional Cat 6Ks to handle SNA traffic
 - Can implement GigE as needed for throughput
 - SNASw with Enterprise Extender to host
- Where to place SNASw routers?



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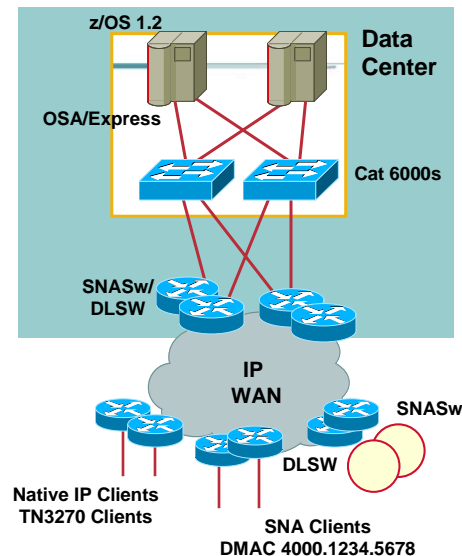
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Sample Customer: Solution

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- SNASw in data center for part of business which has plans of moving to IP only solution within 3 years
 - 'Temporary' solution to keep things working with FEP removal
 - Already have 7200s capable of taking on SNASw load
- SNASw at branch for part of business which plans to keep SNA for 5+ years
 - Mix of IP traffic from these branches made EE to the branch (CoS->ToS mapping) attractive
 - Needed to upgrade hardware already (platform was under-sized, lacked desired features)



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Selecting the Right Platform and Cisco IOS

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- **Platforms: low-end (branch), mid-range (distribution layer), high-end (data center)**
 26xxXM, 36xx, 37xx, 7200, 7500, RSM, new platforms as they become available
 High-end platform may require tuning (input queue)
- **Cisco IOS® software release 12.1 and higher**
 Separately purchased IOS feature, see CCO Software Center for SNASw IOS® image combinations
- **SNASw uses CPU and memory as needed**
 Allow capacity for network outages
 Transaction rate/size most significant factor
- **CPOC (Customer Proof of Concept) visit**



Cisco IOS 12.2 (Now GD) or 12.3 Recommended (Latest Maintenance Release from CCO)

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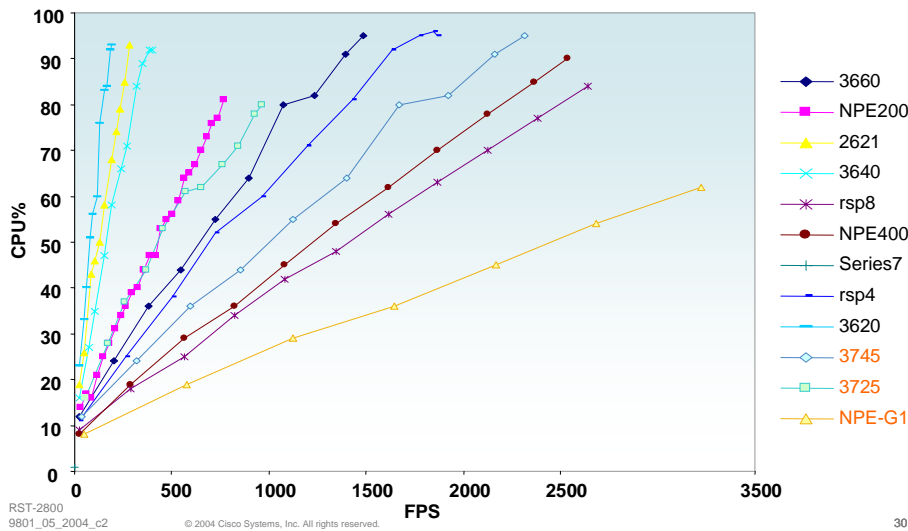
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SNASw Performance by Platform

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SNASw—EE CPU Load With Projected Performance for Newer Platforms



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FEP Replacement: Where SNASw Fits In

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- **Problems:**

- Cost/complexity of migrating applications to IP

- Changing connections to business partners: SNI support

- Protecting investment in serial based remote devices

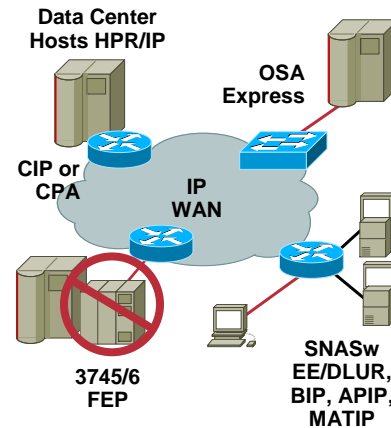
- **Solutions:**

- End goal is IP devices/applications, but until then...

- SNASw: dependent LU support, SNA(HPR) over IP

- SNI alternatives

- Serial conversion to IP (BIP—BISYNC, APIP—asynchronous point of sales, ALPS—airline protocols)



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Replacing SNI

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- SNASw does **NOT** play a role (used within a network, not between networks)
- SNI usually links to another company—making changes requires coordination, cooperation, and probably management support!
- Inventory who you are connected to and what type of sessions there are
- Use IP instead wherever possible (i.e. file transfer -> ftp)
- Current next preference is EBN/EE
- Other possibilities...

- EBN/HPR/ISR, EBN/CNN/ISR, Casual Connect, Adjacent (Single-sided) SNI, **new IBM LINUX/Cisco DLSW solution**

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Configuration Basics

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- **Control Point** (snasw cname)
- **DLUS** (snasw dlus)
- **Ports** (snasw port)
- **Links** (snasw link)
- **Location** (snasw location)

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Control Point and DLUS

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- **Three ways of defining control point...**
 - (config)# snasw cname NETA.ROUTER1
 - (config)# snasw cname NETA hostname
 - (config)# snasw cname NETA ip-address Ethernet0
- **Specifying primary and backup DLUS...**
 - Default (no statement -> use NNS host)
 - (config)# snasw dlus NETA.CMC1
 - (config)# snasw dlus NETA.CMC1 backup NETA.CMC2
 - (config)# snasw dlus NETA.CMC1 backup NETA.CMC2 prefer-active
 - (config)# snasw dlus NETA.CMC1 backup NETA.CMC2 retry 30 3

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Interfaces for Port Configuration

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- **IP (loopback preferred)**
 - hpr-ip (enterprise extender)
- **Real interfaces**
 - Ethernet, FDDI, ATM LANE, TokenRing
 - Can target HSRP standby mac-address
- **Virtual interfaces**
 - VTOK
 - VDLC
 - CIP/CPA, Frame Relay BAN, SRB, VTOK
 - DLSW+ remote (IP or direct) or local (QLLC or SDLC)

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SNASw Port: Examples

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```
(config)# interface loopback0
(config-if)#ip-address 172.18.51.28 255.255.255.0
(config)#snasw port EE hpr-ip loopback0 vname IP.IP

(config)# snasw port ETH0 Ethernet0 conntype len

(config)# source-bridge ring-group 50
(config)# snasw port DLSW vdlc 50 mac 4000.3640.ddf1
nns-required
```

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SNASw Link

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- Only need to define uplinks
- Downlinks (names start with @I) and neutral links (names start with @D) are created dynamically

```
(config)#snasw link HOSTA port EE ip-dest 171.62.14.10 nns
(config)#snasw link HOSTB port ETH0 rmac 4000.1234.1234
```

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SNASw Location

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- Only applies to LEN nodes
- Registers ILU with SNASw NNS **WHEN LEN NODE CONNECTS** so an upstream PLU can find the LEN ILU
- Not needed (registered automatically) if ILU name is LEN cpname, or if ILU always initiates the session
- Wildcards are allowed (in both names or only in owning-cp name)

```
(config)#snasw location MARTILU owning-cp NETA.MARTIN
```

```
(config)#snasw location NETA.LU* owning-cp NETA.CP*
```

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Putting It All Together

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```
snasw cpname NETA.R2612BR1  
snasw dlus NETA.MVSD backup NETA.MVSA  
snasw port ETH0EE hpr-ip Ethernet0/0 vname IP.IP  
snasw port TOK0 TokenRing0/0 conntype len  
snasw link MVSDEE port ETH0EE ip-dest 172.18.1.41  
snasw location MARTILU owning-cp NETA.MARTIN
```

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Customized Configuration

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- **snasw cpname**
 - max-pacing-window: ISR session max pacing window size
 - remove-rscvs: strips rscvs on all downstream BINDs (downstream LEN/NN)
 - station-segmentation: no interleaving of RUs for XID0 devices
- **snaswitch ip-precedence**
 - tos customization for EE traffic (low, med, high, network, Idlc)
- **snasw link**
 - host-dest: specifies destination hostname (ipv4 or ipv6)
 - tgp: low, med, high, or secure characteristics
- **snasw mode**
 - maps a COS name to a LOGMODE

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Customized Configuration (Cont.)

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- **snasw port**
 - conntype: non-EE only... nohpr, len, dyncplen
 - hostname: enables hostname (predefined or connection network, ipv4 or ipv6) for this port
 - ldlc: EE tuning of Idlc liveness timer (LIVTIME), short request retry timer (SRQTIME), and short request retry interval (SRQRETRY)
 - maxbtu: specify btu size when hidden
 - max-links: limits number of links on this port
 - nns-required: drops downstream links when NNS lost, can use another snasw
 - no-limres: treat dynamic CN links as non-limited resources
 - vname: virtual routing node (connection network)
- **snasw rtp**
 - pathswitch-timers: set HPR pathswitch timers (HPRPST-low, med, high, network)

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SNASw Display Commands

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#show snasw <object> [brief|detail] [filters]

| | |
|-------------------|--|
| directory | Show directory information |
| dlus | Show DLUS information |
| link | Show link information |
| lu | Show DLUR LU information |
| node | Show local node information |
| port | Show port information |
| pu | Show DLUR PU information |
| rtp | Show HPR RTP connection information |
| session | Show session information |
| statistics | Show statistics |
| topology | Show topology database information |

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Problem Determination Log (pdlog)

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- Internal SNASw message logging, always on (default buffer size 500Kb)
- Three classifications of messages: exception, information, problem
- Configuration: type of messages to be sent to console, buffer size and file path for uploading

(config)#snasw pdlog problem | exception | info [buffer-size size] [file *file-url*] [timestamp]]

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SNASw Data Link Control Tracing (dlctrace)

Cisco.com

- Internal cyclic buffer trace
- Very low overhead (less than 10% CPU)
- 'sniffer-like' trace of packets in and out of the APPN stack
- Optional filtering

**(config)#snasw dlctrace [buffer-size size] [file *file-url*] [timestamp]]
[frame-size size | autoterse] [format brief | detail | analyzer] [nostart]**

(config)#snasw dlcfiler [link *name*] [port name] [rmac *mac-addr*] [rtp *name*] [type [cls] [hpr-cnt!] [hpr-data][isr][xid]]

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SNASw Inter Process Signal Tracing (ipstrace)

Cisco.com

- Internal tracing between SNASw components
- Overhead of 15-25% CPU
- Configure with care, usually at request of Cisco Technical Assistance Center (TAC)

- Need to dump trace file for TAC to interpret (capture of show trace unusable)

```
(config)#snasw ipstrace [buffer-size size] [file file-url  
[timestamp]] [nostart]]
```

- Trace filtering specific to APPN stack components

```
(config)#snasw ipsfilter am | asm | bm ...
```

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Adding PD Tools to Your Config

Cisco.com

```
snasw pdlog exception file tftp://64.102.16.25/BR1-pdlog timestamp
```

```
snasw dlctrace buffer-size 3000 file tftp://64.102.16.25/BR1-dlctr  
timestamp
```

```
snasw ipstrace buffer-size 4000 file tftp://64.102.16.25/BR1-ipstrc  
timestamp
```

```
snasw cpname NETA.R2612BR1
```

```
snasw dlus NETA.MVSD backup NETA.MVSA
```

```
snasw port ETH0EE hpr-ip Ethernet0/0
```

```
snasw port TOK0 TokenRing0/0 conntype len
```

```
snasw link MVSDEE port ETH0EE ip-dest 172.18.1.41
```

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show snasw port

Cisco.com

- Ensure that ports are active; check associated interface if not

```
2612-BR1#show snasw port
```

```
Number of ports 2
```

| SNA Ports | | HPR | | | |
|-----------|----------|-----|-----|--------------|----------------|
| Name | State | SAP | SAP | Interface | Address |
| ----- | ----- | -- | -- | ----- | ----- |
| 1> ETH0EE | Active | | | Ethernet0/0 | 172.18.49.11 |
| 2> TOK0 | I/f Down | x04 | xC8 | TokenRing0/0 | 4000.0704.1776 |

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show snasw link

Cisco.com

- If defined links are not active, check target MAC or IP addresses
- Link name: @... → implicit link (downstream, connection network)
- Use "show snasw rtp" to show sessions on an HPR or HPR/IP link

```
2612-BR1#show snasw link
```

```
Number of links 2
```

| SNA Links | | | | | HPR | |
|-------------|--------|-----------|------------------|--------------|-------|-------|
| Link Name | State | Port Name | Adjacent CP Name | Node Type | Sess | Sup |
| ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 1> @I000002 | Active | TOK0 | NETB.MARTIN | LEN Node | 18 | No |
| 2> MVSDEE | Active | ETH0EE | NETA.MVSD | Network Node | 0 | Yes |

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show snasw rtp

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2612-BR1#show snasw rtp

Number of RTP connections 4

SNA RTP Connections

| RTP Name | Local TCID (hex) | Remote CP Name | State | COS | Sess |
|-------------|------------------|----------------|-----------|----------|------|
| 1> @R000001 | 0000000001000000 | NETA.MVSD | Connected | CPSVCMG | 1 |
| 2> @R000002 | 0000000002000000 | NETA.MVSD | Connected | CPSVCMG | 1 |
| 3> @R000004 | 0000000004000000 | NETA.MVSD | Connected | RSETUP | 0 |
| 4> @R000005 | 0000000005000000 | NETA.MVSD | Connected | SNASVCMG | 2 |

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show snasw session

Cisco.com

- CPSVCMG (CP-CP) sessions should be active to one upstream NN, and to downstream ENs (but not LENs); CPSVRMGR sessions to DLUS

2612-BR1#sh snasw sess

Number of local endpoint sessions 4

SNA Local Endpoint Sessions

| PCID (hex) | Partner LU Name | Link/RTP | Mode | COS |
|---------------------|-----------------|----------|----------|----------|
| 1> C3BBD36E95C5AC8C | NETA.MVSD | @R000005 | CPSVRMGR | SNASVCMG |
| 2> D51F15B05FB78DA1 | NETA.MVSD | @R000005 | CPSVRMGR | SNASVCMG |
| 3> C3BBD36E95C5AC8A | NETA.MVSD | @R000002 | CPSVCMG | CPSVCMG |
| 4> D51F15B05FB78D9A | NETA.MVSD | @R000001 | CPSVCMG | CPSVCMG |

Number of intermediate DLUR sessions 1

SNA DLUR Assisted Intermediate Sessions

| PCID (hex) | Primary LU Name | Secondary LU Name | Mode | COS |
|---------------------|-----------------|-------------------|------|----------|
| 1> C3BBD36E95C5A198 | NETA.ECHOMVSD | NETA.LEF00101 | | #CONNECT |

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show snasw dlus

Cisco.com

- **At least one DLUS must be active if there are PUs to be served**
- **Both primary and backup DLUS can be active**

2612-BR1#sh snasw dlus

Number of Dependent LU Servers 2

SNA Dependent LU Servers

| DLUS Name | Default? | Backup? | Pipe State | PUs |
|--------------|----------|---------|------------|-----|
| 1> NETA.MVSA | No | Yes | Inactive | 0 |
| 2> NETA.MVSD | Yes | No | Active | 1 |

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show snasw pu

Cisco.com

- **Downstream PUs should come up active; if the PU is not active and its name begins with @P, then ACTPU has not completed; you should check that the downstream link is active, check VTAM definitions and status, or perhaps the PUs are served by another DLUR; collect pdlog and dlc trace**

2612-BR1#sh snasw pu

Number of DLUR PUs 1

SNA DLUR PUs

| PU Name | PU ID | State | DLUS Name |
|-------------|----------|--------|-----------|
| 1> APPNMA29 | 05D00000 | Active | NETA.MVSD |

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show snasw pu detail

Cisco.com

- **“Detail” command shows FSM history, used for troubleshooting**

```
2612-BR1#sh snasw pu det name APPNMA29
Number of DLUR PUs 1
```

```
1>
PU name                               APPNMA29
Backup DLUS name                       APPNMA29
Active DLUS name                       NETA.MVSD
PU ID (IDBLK/IDNUM)                   X'05D00000'
PU location                             Downstream
PU status                               Active
DLUS session state                     Active
Automatic Network Shutdown support    Continuous
DLUS retry timeout (seconds)           0
DLUS retry limit                       0
DLUS pipe PCID                         X'D51F15B05E9ADF01'
DLUS pipe CP Name                      NETA.R2612BR1
PU FSM history                         (00,01)->(01,03)->(02,04)->(02,06)->(03,11)->(03,07)->04
```

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pdlog Display

Cisco.com

```
2612-BR1#
```

```
23:06:58: %SNASW-6-SS_LOG_12: INFO - 525 - CP-CP sessions established
23:06:58: %SNASW-3-EVENT: CP-CP sessions activated to NETA.MVSD
23:07:00: %SNASW-6-SM_LOG_37: INFO - 524 - LU6.2 session activated
```

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pdlog Display (Detail)

Cisco.com

2612-BR1#show snasw pdlog id 524 detail

Problem Determination Log Output

**** 00000524 - AUDIT 512:307 (0) ****

LU6.2 session activated

Local LU (Alias) = NETA.R2612BR1 (CISCO)

Partner LU (Alias) = NETA.MVSD (@I000001)

Mode name = CPSVCMG

Session identifier = C3BBD36E65297918

Session polarity = 02

Session type = 01

LS name = @R000001

LFSID = 01010000

From ../dcl/nsmfsm.c 1485 :at 10:14:01, 28 January 96

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dlctrace Display

Cisco.com

2612-BR1#show snasw dlctrace all

237325 TOK0 In sz:136 CONNECT_IN Rq

237326 @I000006 Out sz:151 CONNECT_IN +Rsp

237327 @I000006 Out sz:0 XID Null

237328 @I000006 In sz:96 XID 3 PN NETA.MARTIN xid:05D00000

237329 @I000006 Out sz:100 XID 3 PN NETA.R2612BR1 xid:FFF00000

237330 @I000006 In sz:96 XID 3 NP NETA.MARTIN xid:05D00000

237331 @I000006 Out sz:100 XID 3 NP NETA.R2612BR1 xid:FFF00000

237332 @I000006 In sz:96 XID 3 NP NETA.MARTIN xid:05D00000

237333 @I000006 Out sz:223 SET_MODE Rq

237334 @I000006 In sz:223 SET_MODE +Rsp

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dlctrace Display (Detail)

Cisco.com

2612-BR1#show snasw dlctrac detail id 237332
DLC Trace Output

```
237332 @1000006 In sz:96  XID 3 NP NETA.MARTIN  xid:05D00000
06:19:02.65, 7 March 1993
0000 326005D0 00000000 8034C100 00000080 *.-.).....A.....*
0010 00010B41 00078900 01000004 000E0CF4 *.....i.....4*
0020 D5C5E3C1 4BD4C1D9 E3C9D50E 09F7D3C9 *NETA.MARTIN..7LI*
0030 D5D2F0F0 F0F11028 00111104 0E02F5F6 *NK0001.....56*
0040 F2F1F2F5 F4F0F0F2 F1F01611 03130011 *2125400210.....*
0050 F8F5F6F5 F0F0F0F0 F0F0F0F0 F0F0F0F0 *85650000000000000*
```

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Manual Dumping of Traces and pdlog

Cisco.com

```
(config)# snasw dlctrace buffer-size 10000
```

```
2612-BR1#snasw dump dlctrace
```

```
Type of DLC trace file (b[rief], d[etail], a[nalyzer], q[uit]) [d]? analyzer
```

```
Address or name of remote host []? 64.102.16.25
```

```
Remote filename [2612-BR1-dlctrc]?
```

```
!!!!!!!!!!!![DLC trace dumped OK]
```

```
(config)# snasw dlctrace file tftp://64.1.1.2/BR1-dlc format analyzer timestamp
```

```
2612-BR1#snasw dump dlctrace
```

```
!!!!!!!!!!!![DLC trace dumped OK]
```

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Automatic Dumping

Cisco.com

- **To trigger the traces/pdlog dumping when getting**
12:03:40: %SNASW-4-DLUR_LOG_5: EXCEPTION - 433 -
CPSVRMGR pipe session failure
- **Configure:**
2612-BR1(config)#snasw msgdump DLUR_LOG_5
- **Must have file *file-url* coded in configuration statement for traces/logs to be dumped**
2612-BR1(config)# snasw dlctrace buffer-size 5000 file
tftp://64.1.1.2/BR1-dlctr timestamp

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Some Other Debugging Commands

Cisco.com

Useful in Problem Determination with CLS or DLSW

- **#debug cls (errors, state, message, vdlc)**
Cisco's link services component
- **#debug llc (errors, state, packet)**
llc2 component
- **#debug dlsw (peers, reachability)**
Handy when using snasw vdlc port
- **#show dlsw peers, circuits**
Handy when using snasw vdlc port

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SNA Network Ping Command

Cisco.com

```
2612-BR1#ping sna neta.mvsd
```

```
2612-BR1#
```

```
SNA APING successful
```

```
Partner LU name      NETA.MVSD
```

```
Mode name            #INTER
```

```
Allocate duration    176 ms
```

```
Duration statistics   Min = 20 ms  Ave = 22 ms  Max = 24 ms
```

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MIB Support

Cisco.com

- RFC 2455, APPN MIB
- RFC 2456, APPN-TRAP MIB
- RFC 2232, DLUR MIB

- HPR and HPR/IP MIBS not well designed, so not implemented by SNASw (or any other HPR product)

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Network Management Products

Cisco.com

- **Cisco Internetwork Status Monitor (ISM)**
 - Mainframe product, 3270 display, uses RUNCMD
 - Display/monitor SNASw information—ports, links, CPU (upcoming release)
- **OpenView, CiscoWorks 2000, Tivoli, etc.**
 - Manage the IP network for Enterprise Extender
- **NetView/VTAM**
 - Have visibility to SNASw as the DLUR of PUs, and connections to z/OS
 - New enhancements specifically for EE in the mainframe environment

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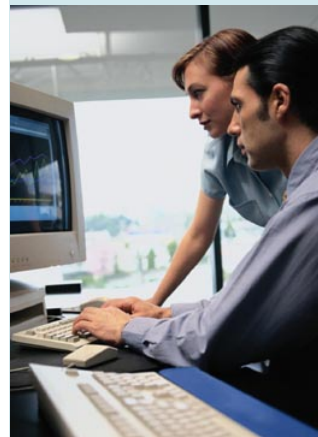
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Simple PD Exercise: PU Cannot Connect

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- **End-user just replaced old workstation; he calls the helpdesk to report that he cannot connect to the host**



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Check Status of PU on DLUS

Cisco.com

```
0280 D NET,ID=APPNRA12,E
0090 IST097I DISPLAY ACCEPTED
0090 IST075I NAME = APPNRA12, TYPE = PU_T2 204
0090 IST486I STATUS= CONCT, DESIRED STATE= CONCT
0090 IST1043I CP NAME = APUNAME, CP NETID = NETA, DYNAMIC LU = YES
0090 IST1589I XNETALS = YES
0090 IST136I SWITCHED SNA MAJOR NODE = SWAPPNRA
0090 IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
0090 IST1500I STATE TRACE = OFF
0090 IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
0090 IST1657I MAJOR NODE VTAMTOPO = REPORT
0090 IST355I LOGICAL UNITS:
0090 IST080I APULU1  CONCT   APULU2  CONCT   APULU3  CONCT
0090 IST080I APULU4  CONCT
0090 IST314I END
```

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Check DLUS Console

Cisco.com

```
0081 IST680I CONNECTION REQUEST DENIED - ID = ***NA*** PU GEN NOT SUPPORTED
0090 IST1354I DLUR NAME = NETA.PO      MAJNODE = ***NA***
0090 IST1394I CPNAME = NETA.APU      STATION ID = 020005D01983
0090 IST314I END
```

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Check Router Console

Cisco.com

```
1w3d: %SNASW-3-EVENT: Pipe to DLUS activated, DLUS name = NETA.MVSD
1w3d: %SNASW-3-DLUR_LOG_2: PROBLEM - 275 - REQACTPU rejected
1w3d: %SNASW-3-EVENT: APPN to DLUS deactivated, DLUS name = NETA.MVSD
```

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show snasw dlus

Cisco.com

```
pogo#sh snasw dlus
Number of Dependent LU Servers 1
```

```
SNA Dependent LU Servers
  DLUS Name  Default? Backup? Pipe State  PUs
-----
1> NETA.MVSD  Yes      No      Active    67
```

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show snasw pdlog

Cisco.com

```
**** 00000273 - AUDIT 512:592 (0) ****
A pipe to a DLUS has activated
From ../dcl/ndrrcv.c 156 :at 3:17:06, 10 March 00

**** 00000275 - PROBLEM 512:582 (0) ****
REQACTPU rejected with following sense code
From ../dcl/ndrpufsm.c 408 :at 3:17:06, 10 March 00

**** 00000276 - AUDIT 512:308 (0) ****
LU6.2 session deactivated
From ../dcl/nsmfsm.c 1288 :at 3:17:06, 10 March 00
```

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show snasw pdlog detail

Cisco.com

```
pogo#sh snasw pdlog id 275 detail
Problem Determination Log Output

**** 00000275 - PROBLEM 512:582 (0) ****
REQACTPU rejected with following sense code
Sense code = 0x08060000
DLUS name = NETA.MVSD
PU name = APPNRA12

From ../dcl/ndrpufsm.c 408 :at 3:17:06, 10 March 00
```

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Look Up Sense Code

Cisco.com

0806 Resource Unknown: For example, the request contained a name or address not identifying a PU, LU, SSCP, link, or link station known to the receiver or the sender.

Bytes 2 and 3 following the sense code contain sense code specific information. Settings allowed are:

0000 No specific code applies.

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Check in dlctrace

Cisco.com

```
pogo#sh snasw dlc all | i ReqActPU
607837 MVSDEE Out sz:284 HPR fmh5 DLUR Rq ReqActPU
607846 MVSDEE In sz:108 HPR fmh5 DLUR -Rsp ReqActPU 08060000
607912 MVSDEE Out sz:284 HPR fmh5 DLUR Rq ReqActPU
607921 MVSDEE In sz:108 HPR fmh5 DLUR -Rsp ReqActPU 08060000
607981 MVSDEE Out sz:284 HPR fmh5 DLUR Rq ReqActPU
607990 MVSDEE In sz:108 HPR fmh5 DLUR -Rsp ReqActPU 08060000
608050 MVSDEE Out sz:284 HPR fmh5 DLUR Rq ReqActPU
608059 MVSDEE In sz:108 HPR fmh5 DLUR -Rsp ReqActPU 08060000
pogo#sh snasw dlc all filter ReqActPU
DLC Trace Output
```

```
607837 MVSDEE Out sz:284 HPR fmh5 DLUR Rq ReqActPU
607846 MVSDEE In sz:108 HPR fmh5 DLUR -Rsp ReqActPU 08060000
607912 MVSDEE Out sz:284 HPR fmh5 DLUR Rq ReqActPU
607921 MVSDEE In sz:108 HPR fmh5 DLUR -Rsp ReqActPU 08060000
607981 MVSDEE Out sz:284 HPR fmh5 DLUR Rq ReqActPU
607990 MVSDEE In sz:108 HPR fmh5 DLUR -Rsp ReqActPU 08060000
608050 MVSDEE Out sz:284 HPR fmh5 DLUR Rq ReqActPU
608059 MVSDEE In sz:108 HPR fmh5 DLUR -Rsp ReqActPU 08060000
```

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Verify xid in dlctrace

Cisco.com

```
pogo#sh snasw dlc id 608050 detail
DLC Trace Output
```

```
608050 MVSDEE Out sz:284 HPR fmh5 DLUR Rq ReqActPU
TCID(2ECB1E72 BDD) DL(E8) BSQ(96) SM EM ST(86) SA(0 7F000019)
03:38:10.38, 10 March 2000
0000 C600D000 00000000 0000FF00 2ECB1E72 *F.).....*
0010 0000BDD 3004000A 000000E8 00000096 *.....Y...O*
0020 050E0000 00000001 00000086 00000000 *.....f....*
0030 00000000 5C000001 00000000 7F000019 *...*....."....*
0040 0B910129 0502FF00 03D00000 0422F0F0 *.j.....}....00*
0050 F6001007 D5C5E3C1 4BD7D6B4 AA3B5DC2 *6...NETA.PO...JB*
0060 14000108 78400004 61D8898C 00B01500 *..... ./Qi.....*
0070 00112C00 00000029 0B800041 023E0000 *.....*
0080 005F8132 5D05D019 83000080 38C10000 *.^a.)}.c....A..*
0090 00008000 010B7100 07890001 00000400 *.....l.....*
00A0 0E09F4D5 C5E3C14B C1D7E40E 09F7D3C9 *..4NETA.APU..7LI*
00B0 D5D2F0F0 F0F11028 00111104 0E02F5F6 *NK0001.....56*
00C0 F2F1F2F5 F4F0F0F2 F1F01611 03130011 *2125400210.....*
00D0 F8F5F6F5 F0F0F0F0 F0F0F0F0 F0F0F0F0 *856500000000000000*
00E0 1C460491 E3D90393 04089410 005ACC84 *...jTR.l.m..l.d*
00F0 FD039504 08964000 12281983 0E510101 *.n..o ....c....*
0100 00000000 00180000 00001260 CECFB8A8 *.....-...y*
0110 BF41263B 07D5C5E3 C14BD7D6 *.....NETA.PO *
```

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Check PU Definition on the DLUS

Cisco.com

```
APPNRA12 PU ADDR=01, X
  ISTATUS=ACTIVE, X
  MAXPATH=1, X
  MODETAB=ALAMODE, X
  MAXOUT=7,ANS=CONTINUE, X
  DLOGMOD=SX32702S, X
  USSTAB=USSSNA, X
  CPNAME=APUNAME
```

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Correct PU Definition (Host or Workstation)

Cisco.com

```
D NET,ID=APPNRA12,E
IST097I DISPLAY ACCEPTED
IST075I NAME = APPNRA12, TYPE = PU_T2.1 704
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1043I CP NAME = APU, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST1354I DLUR NAME = PO          MAJNODE = SWAPPNRA
IST136I SWITCHED SNA MAJOR NODE = SWAPPNRA
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST1657I MAJOR NODE VTAMTOPO = REPORT
IST355I LOGICAL UNITS:
IST080I APULU1  ACTIV  APULU2  ACTIV  APULU3  ACTIV
IST080I APULU4  ACTIV
IST314I END
```

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Agenda: What Did We Learn?

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- **Concepts**
 - SNASw is a BrNN, DLUR, and supports EE (the solution for replacing SNA routing in the data center)
- **Design Considerations**
 - SNASw in the branch is best practice (full benefits of COS to TOS mapping and redundancy via IP network)
- **Configuration Basics**
 - SNASw is very easy to configure
- **Troubleshooting Tools**
 - SNASw has the pdlog, dlctrace, and ipstrace which are powerful tools for tracking down problems

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Reference Materials

Cisco.com

SNASwitch

- **Technical documents—release guide, performance, etc.:**
<http://www.cisco.com/warp/public/cc/pd/ibsw/snasw/tech/>
- **Overview of SNASw functions:**
http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/fibm_c/bcfpart2/bcfvnet.htm#xtocid44
- **Configuration Guide:**
http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/fibm_c/bcfpart2/bcfsnasw.htm
- **White paper, SNASw or DLSW?:**
- http://www.cisco.com/warp/public/cc/pd/ibsw/ibdlsw/tech/dlsw_wp.pdf
- **SNASw CCO Web Site:**
- <http://www.cisco.com/go/snasw>
- **SNASw Design and Implementation Guide:**
- http://www.cisco.com/warp/public/cc/pd/ibsw/snasw/tech/snst_rg.htm
- **SNASw Migration Q&A:**
- http://www.cisco.com/warp/public/cc/pd/ibsw/snasw/migrate/prodliit/swsem_qp.htm

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Reference Materials

Cisco.com

- **FEP migration**
White paper, FEP replacement:
http://www.cisco.com/warp/public/756/partnership/ibm/fep_replacement.pdf
Redbook on FEP migration options: <http://publib-b.boulder.ibm.com/Redbooks.nsf/9445fa5b416f6e32852569ae006bb65f/acc5dfc540ebb3a85256a6800561b36?OpenDocument&Highlight=0,Migration>
SNI replacement white paper:
http://www.cisco.com/en/US/partner/netsol/ns340/ns394/ns74/ns322/networking_solutions_white_paper09186a008014cfce.shtml
Securing Mainframe Host-To-Host Connectivity
http://www.cisco.com/en/US/netsol/ns340/ns394/ns74/ns277/networking_solutions_white_paper09186a008021e837.shtml
- **Misc.**
AIW documents (for the more technically inclined...architecture and formats):
<http://www.networking.ibm.com/app/aiwdoc.htm>
DLSw+ Design and Implementation Guide
http://www.cisco.com/warp/public/cc/pd/ibsw/ibdlsw/tech/tadlt_rg.htm
SNA Internetworking Design and Implementation Guide
www.cisco.com/warp/public/cc/pd/ifaa/ifpz/chifpz/tech/dctil_rg.htm
Routing/QoS Redbook:
<http://www.redbooks.ibm.com/pubs/pdfs/redbooks/sq246297.pdf>
OSA/E Redbook: <http://www.redbooks.ibm.com/pubs/pdfs/redbooks/sq245948.pdf>

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Information on APARs

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II11220 – lists all z/OS informational APARs

Releases: HVT4301 = R301 = V4R3

HVT4401 = R401 = V4R4 = OS/390 R3 or R4

HVT4411 = R411 = V4R4.1 = OS/390 R5

HVT4501 = R501 = V4R5 = OS/390 R6

HVT4701 = R701 = V4R7 = OS/390 R7

HVT4801 = R801 = V4R8 = OS/390 R8 or R9

HVT510A = R10A = V5R1 = OS/390 R10

HVT6120 = R120 = V1R2 = z/OS V1R2 R12

HVT6140 = R140 = V1R4 = z/OS V1R4 R14

II11951 DLUR/DLUS for HVT4801, OS/390 R8 and R9

II12426 DLUR/DLUS for HVT510A, OS/390 R10

II12986 DLUR/DLUS for HVT6120, z/OS v1r2

II13456 DLUR/DLUS for HVT6140, z/OS v1r4

II12223 Enterprise Extender (EE)

II10953 HPR HVT4801, HVT510A, HVT6120, HVT6140

II11952 OSA Express (QDIO)

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Associated Sessions

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CCS-1500 SNASw Customer Experience

- **Wednesday, July 14**
- **Food will be provided so you can come from the previous break-out session!**
- **7-8pm—Ron Fuller of Bank One will outline his experience implementing SNASwitch and BIP as part of their FEP retirement effort.**
- **8-9pm—Bank One and a Cisco SNASwitch developer will be available to answer any of your questions regarding FEP replacement, SNASwitch, etc.**

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Q AND A



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- WHAT:** Complete an online session evaluation and your name will be entered into a daily drawing
- WHY:** Win fabulous prizes! Give us your feedback!
- WHERE:** Go to the Internet stations located throughout the Convention Center
- HOW:** Winners will be posted on the onsite Networkers Website; four winners per day

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