Enterprise Extender: Concepts and Considerations

SHARE 2010 Summer Technical Conference

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IBM z/OS Communications Server Design

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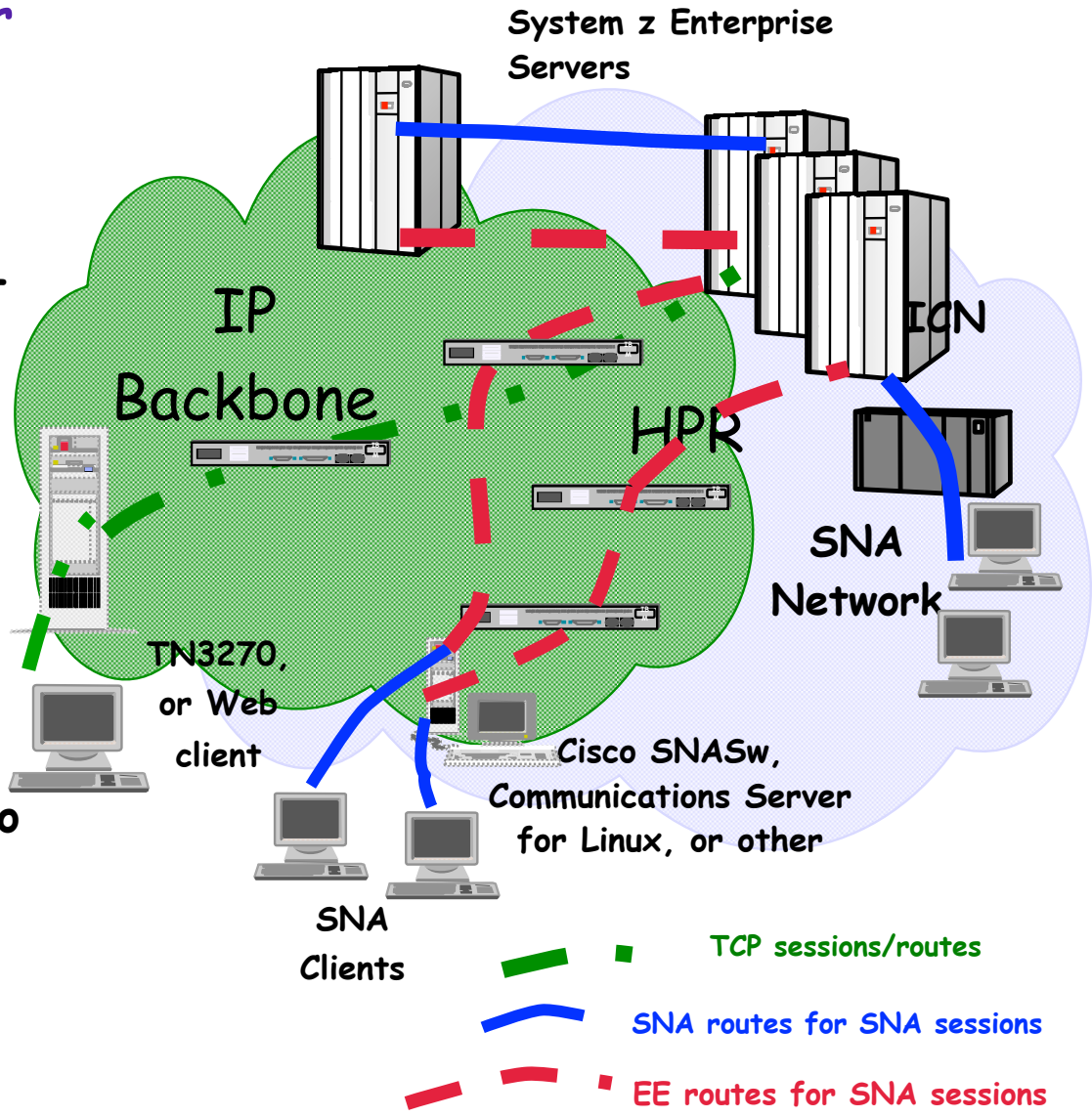
Agenda

- What is Enterprise Extender?
- Planning for Enterprise Extender
- Defining and Operating EE on z/OS
- Enterprise Extender Scenario

What is Enterprise Extender?

What is Enterprise Extender?

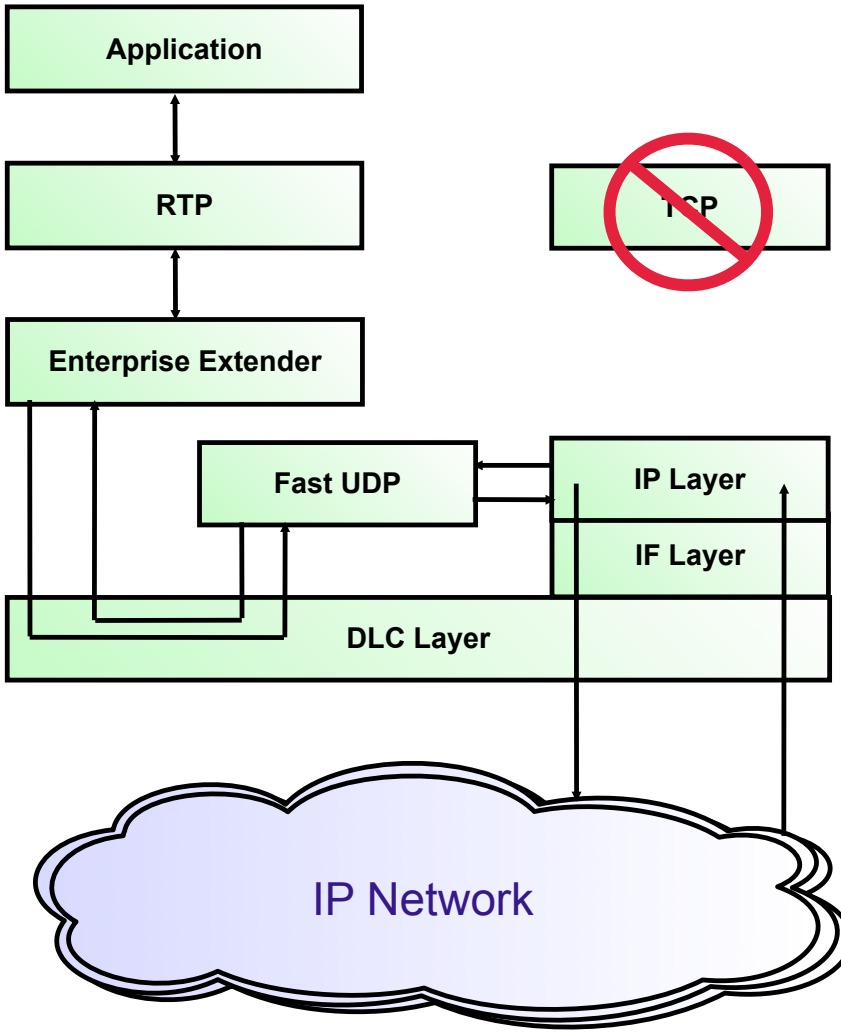
- Allows use of IP network for SNA sessions
  - EE allows enablement of IP applications and convergence on a single network transport while preserving SNA application and endpoint investment.
- Conceptually, IP network looks like APPN/HPR TG in session route
  - An EE link represents IP connectivity from this host to the specified IP address or host name.
- Typically isolates SNA footprints to the "outside" of the network.



Advantages of Enterprise Extender

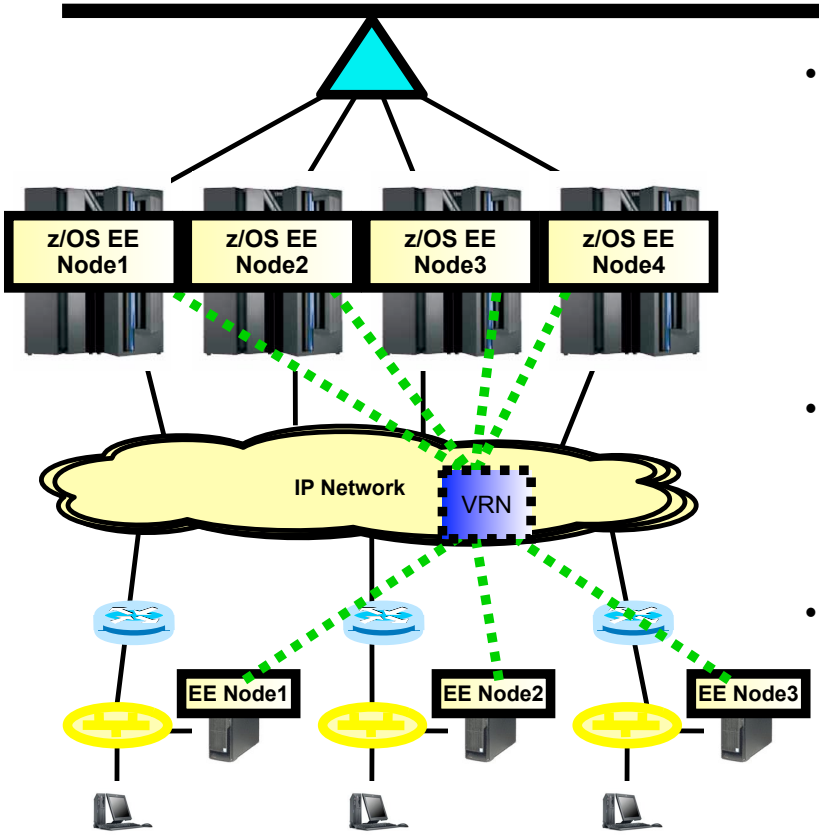
- SNA transport over native IP network
  - Native IP routing within network maximizes router efficiency
  - Enables SNA applications to take advantage of advances in IP routing
  - SNA traffic can exploit OSA Gigabit Ethernet & HiperSockets
  - EE can use any System z9 or zSeries IP network connection
- No changes to SNA applications
- End-to-End failure protection and data prioritization
  - SNA priority mapped to IP Type of Service (TOS)
- EE works with IPSEC and SNA Session Level Encryption
  - EE Connection Network requires HOSTNAME-based definitions to work with NAT

Enterprise Extender on z/OS



- For Enterprise Extender, z/OS CS implemented a separate UDP layer (Fast UDP) optimized for EE communications
- Fast UDP communicates with EE (the APPN over UDP component in VTAM) via the IUTSAMEH device

EE Connection Network



- A connection network is an APPN technology that reduces the need for predefining APPN links between nodes that are connected to a shared transport facility, such as a LAN or general IP network.
- The shared transport facility (the IP network in the EE case) is represented as an APPN Virtual Routing Node (VRN).
- In this example topology, all EE nodes can send EE packets directly to each other without defining links to all the other nodes.
- The combination of EE with connection network technology is generally recommended with the objective of reducing the amount of link definitions that are required and to allow EE endpoint to endpoint communication to flow directly between the associated IP endpoints.
- For more information on connection network, see the follow-on presentation at:

http://ew.share.org/client_files/callpapers/attach/SHARE_in_Denver/S3206SR100305.pdf

Planning for Enterprise Extender

Planning for Enterprise Extender

- Products which have Enterprise Extender:
  - z/OS
  - Communications Server for AIX, Linux, and Windows
  - PCOMM
  - i5/OS
  - Cisco SNASw
  - Microsoft HIS
- Some products have EE Global Connection Network
  - z/OS
  - CS/Windows and PCOMM
  - Cisco SNASw

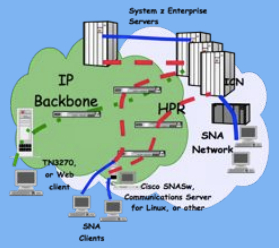
Enterprise Extender Planning

- Planning issues
  - Must implement VTAM APPN first and understand subarea/ APPN interoperability
    - This may be an educational/skill issue
  - IP Routing and Addressing
    - Virtual IP address is required
    - Dynamic Routing should be used to allow redundancy
  - APPN Link Weights
    - EE-specific TGPs are provided with VTAM. It is recommended that you use one of these TGPs, such as GIGENET, or a customized TGP with a capacity value representing the likely available bandwidth between the two EE endpoints.
  - Router setup if prioritization in network is desired
  - If using EE with z/OS CS IPSec on V1R10, APAR PK93190 is strongly recommended to improve throughput

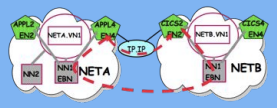
z/OS CS: EE Evolution

IBM Comm Server

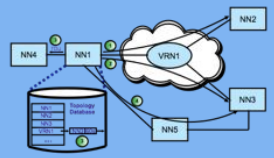
EE First Provided on OS/390 V2R7
March 1999



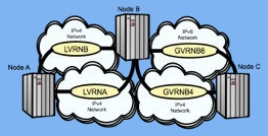
EE Global Connection Network
October 2001



EE Connection Network Reachability Awareness
September 2004

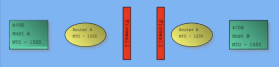


Multiple VRN, IPv6 Support, and EE NMI
March 2004

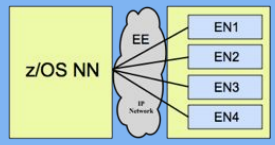


EE Connectivity Test Command
September 2006

Path MTU Discovery for EE
September 2008



Progressive Mode ARB
September 2009



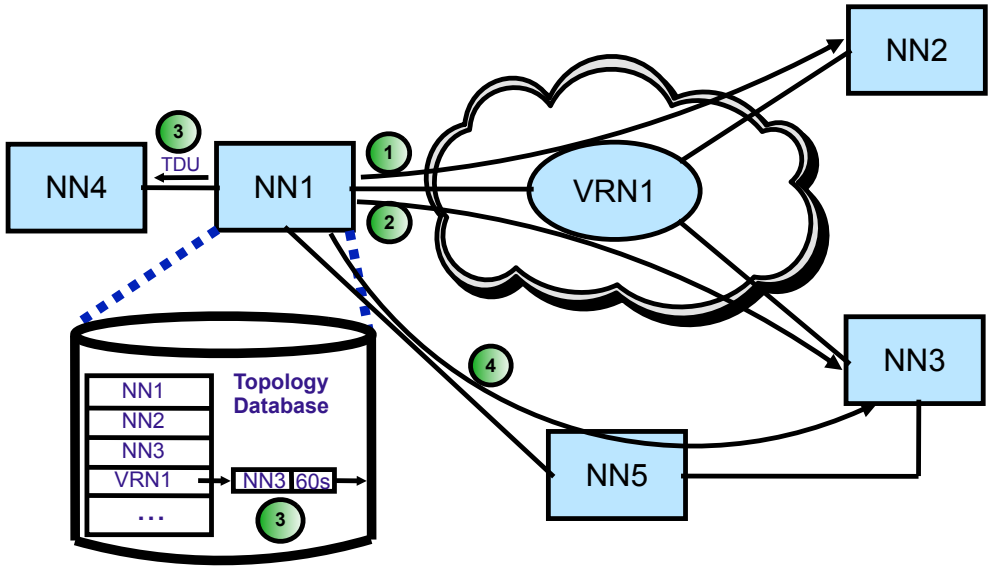
EE Health Verification
September 2010

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011

Evolution of EE

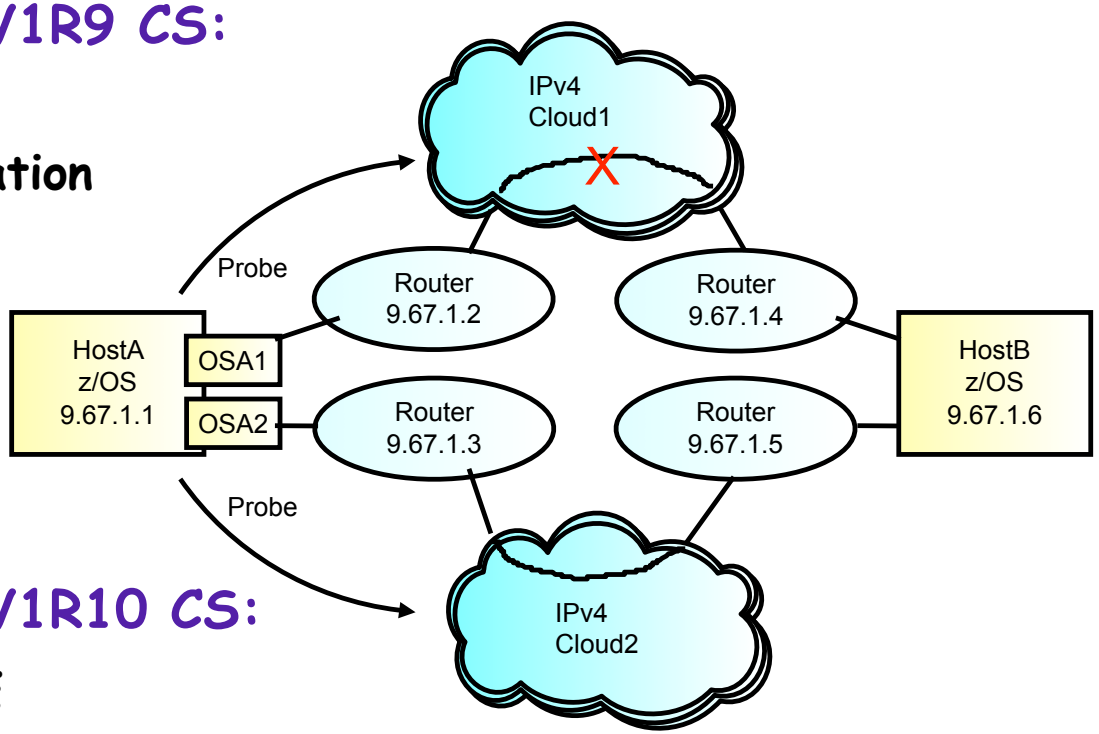
z/OS CS: EE Evolution ...

- Enterprise Extender was first made available on the host in CS for OS/390 V2R7 (or via PTF to V2R6) in early 1999
- Subsequent CS for OS/390 and z/OS CS releases through z/OS V1R8 added enhancements such as:
  - Global connection network
  - HPR route test
  - Dial usability enhancements
  - IPv6 support
  - Multiple connection network support
  - NAT compatibility
  - EE model PU support
  - VARY ACT,UPDATE support for EE XCA major node
  - EE connection network reachability awareness
  - DISPLAY EE command
  - DISPLAY EEDIAG command
  - EE Connectivity Test Command



z/OS CS: EE Evolution...

- EE enhancements in z/OS V1R9 CS:
  - HPR Message Enhancements
  - HPR Path Switch Summarization
  - EE Enhanced Packet Loss Tolerance
  - EE LDLC Granularity
  - Local MTU Discovery for EE



- EE enhancements in z/OS V1R10 CS:
  - Path MTU Discovery for EE
  - RTP Pipe Session Limit Control
  - TGN Parameter for EE model PUs

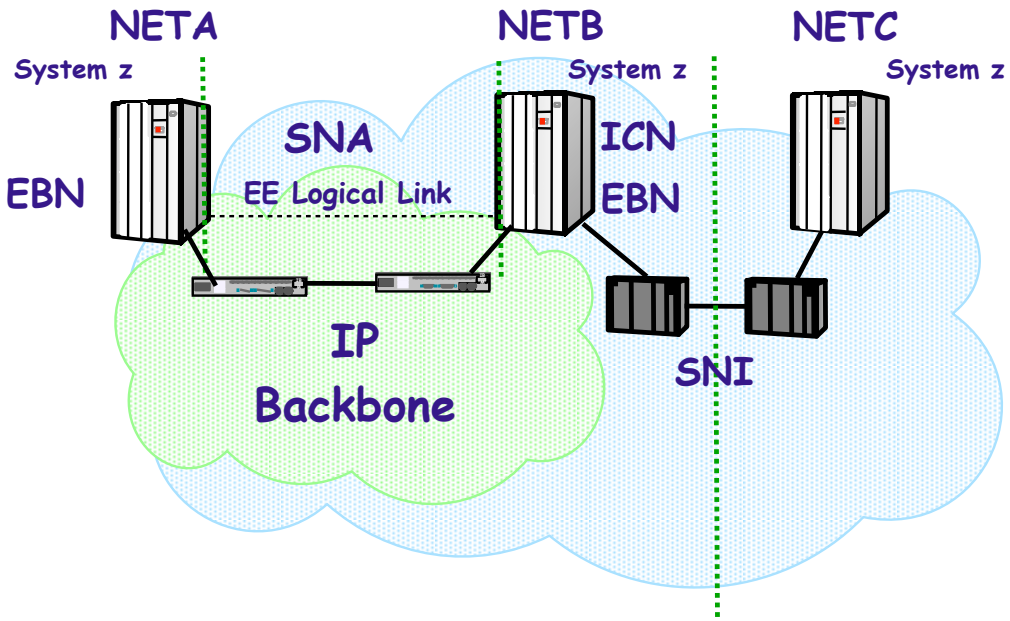
- EE enhancements in z/OS V1R11 CS:
  - Progressive Mode ARB
  - HPR Path Switch Delay

- EE enhancements in z/OS V1R12 CS:
  - EE Connection Health Verification
  - EE Multipath Control

EE/EBN As An SNI Alternative

- An SNI gateway:
  - Must connect to another SNA subarea node.
  - Complex to define and configure
  - Requires an NCP
- APPN multiple network connectivity
  - APPN's alternative to SNI for SNA connectivity between different APPN NET IDs
  - Implemented via Extended Border Node (EBN)
    - VTAM on z/OS, z/VSE and z/VM can be EBNs
- An EE/EBN endpoint:
  - Must connect to another APPN network node (preferably another EBN)
  - Availability advantages of HPR with z/OS EBN

- If a z/OS VTAM is configured for both EE/EBN and SNI connectivity, and in addition is configured as an Interchange Node (ICN), it can interconnect the SNI partner with the EE/EBN partner and support SNA sessions between the SNI partner and the EE/EBN partner
  - NETA LUs can establish sessions with NETC LUs via the NETB interchange node



SNI to EE/EBN Considerations

- Partner network also needs to define APPN, BN, EE
  - VSE and VM VTAM do not provide EE
  - IP addressing coordination
- With SNI, sessions between nodes in different networks normally route through 3745s directly to partners
  - With Border Node - sessions may route through VTAMs acting as BNs (HPR routing)
    - Global Connection Network should be considered
  - Security considerations include:
    - SME changes or use of DSME instead
      - See "Practical Guide to Optimizing APPN and EBN Searches" in SHARE Denver (Summer 2009) proceedings
    - Firewalls must allow UDP packets on ports 12000-12004
    - If defining an EE Connection Network over an IP network which employs Network Address Translation (NAT), you must define the virtual routing node's addressability using the HOSTNAME operand (not the IPADDR operand)

Defining and Operating EE on z/OS

z/OS CS Enterprise Extender Definitions

- VTAM Definitions:
  - Start Options
    - Must consider: IPADDR, HOSTNAME, and TCPNAME
    - Should consider: EEVERIFY, HPRCLKRT, HPRPSDLY, HPRPSMSG
  - XCA Major Node for EE DLC (Medium=HPRIP)
  - Switched Major Nodes for Linkstations
- TCP/IP Definitions:
  - Profile Definitions:
    - Port reservations - by default and recommendation, EE uses PORTS 12000-12004 and TOS C0,C0,80,40,20 (respectively)
    - IUTSAMEH device and link (or use DYNAMICXCF)
    - Static VIPA address
  - Other considerations:
    - Dynamic routing is recommended but not required
    - EE uses five UDP sockets (total, not 5 per connection)

EE XCA Major Node

```
XCAEEGVN  VBUILD TYPE=XCA
PORTEE    PORT   MEDIUM=HPRIP
GRPEEP    GROUP  DIAL=YES,AUTOGEN=(10,E,X),                    *
                 CALL=INOUT,ISTATUS=ACTIVE,IPADDR=10.1.1.1
```

- Only one XCA with MEDIUM=HPRIP may be active
  - AUTOGEN is used to specify the maximum number of EE partners expected to be concurrently active
- Coding DYNPU=YES on GROUP allows dynamic definition of APPN PUs (CNxxxxxx)
  - Coding DYNPU=YES is not needed for connection network links to be dynamically defined
- A local EE IP address (or a hostname that will resolve to that address) can be specified at the GROUP level
- The IPADDR keyword is IPv4-only. IPv6 support requires the HOSTNAME keyword.

EE Switched Major Node Coding

- Has CPNAME (and NETID, if different) of EE partner
  - DWACT=YES causes "dial-out" to occur when SWNET activated
  - PATH Statement contains IP address or HOSTNAME of EE partner for dial-out
    - PATH statement not needed if partner always dials-in

```
CSS1SWEE VBUILD TYPE=SWNET
CSS1PUE  PU     ADDR=22,DWACT=YES,TGP=FASTENET,                  *
                DISCNT=NO,CONNTYPE=APPN,PUTYPE=2,                *
                CPNAME=CSS1,NETID=CSSNET,REDIAL=3,               *
                REDDELAY=30,DWINOP=NO
CSS1EEPT PATH   IPADDR=9.82.5.120,GRPNM=GRPEEP
```

  - If DWINOP=YES specified, it is recommended that it only be coded on one end of the EE connection to prevent dial conflicts

Importance of TG Characteristics

- **Recommendation**: Assign Transmission Group Profiles (TGPs) that reflect the media type being used.
- **Especially Important**: Coding TGPs for EE TGs and VR-TGs.
- The set of TGPs shipped with VTAM (in the IBMTGPS member) may be used as examples.
  - **It is recommended that you customize the CAPACITY operand on the TGP to reflect the media speed of your network's underlying connectivity.**
  - **V1R8 provided five additional TGPs for IBMTGPs:**
    - FASTENET, GIGENET, HIPERSOC, FICON, FICONEXP

Recommendation: Use D TOPO,ORIG=,DEST= commands to verify APPN connectivity, capacity values, and weights

Example: `D NET,TOPO,ORIG=CP1,DEST=CP2,APPNCOS=#CONNECT`

Coding TG Characteristics with EE

- IBM provides several TGPs in a member called IBMTGPS
  - TGPs are a set of link characteristics like CAPACITY, SECURITY, COSTBYTE, etc. which may be associated with an APPN link
  - Like other Switched Definitions, the TGP associated with an EE link is coded on the PU in the Switched Major Node

```
CSS1SWEE VBUILD TYPE=SWNET
CSS1PUE  PU     ADDR=22,TGP=FASTENET,DISCNT=NO,                  *
                 CPNAME=CSS1,NETID=CSSNET,PUTYPE=2
CSS1EEPT PATH   IPADDR=9.82.5.120,GRPNM=GRPEEP
```

- Alternatively, individual link characteristics may be coded on the link definition

```
CSS1SWEE VBUILD TYPE=SWNET
CSS1PUE  PU     ADDR=22,CAPACITY=100M,PDELAY=NEGLIGIB,DISCNT=NO,*
                 CPNAME=CSS1,NETID=CSSNET,PUTYPE=2
CSS1EEPT PATH   IPADDR=9.82.5.120,GRPNM=GRPEEP
```

- EE XCA specifies Connection Network Link TGPs (or link parms):

```
XCAEE      VBUILD TYPE=XCA
PORTEE     PORT   MEDIUM=HPRIP
GRPEE      GROUP  DIAL=YES,AUTOGEN=(10,E,X),                    *
                  CALL=INOUT,ISTATUS=ACTIVE,                    *
                  VNNAME=CSSNET.HPRIP,TGP=FASTENET
```

EE Links: Associated "Control Flow" RTP Pipes

- When a new RTP pipe needs to be activated, a network flow known as an HPR Route Setup is sent along the route to be used for the RTP
  - This flow gathers information during both request and reply phases, such as
    - Automatic Network Routing labels to be used for the pipe
    - Minimum link speed along the path
  - A route setup also flows during HPR path switch to learn similar information about the new path

- EE is what the HPR architecture refers to as a "control flows" media, meaning that the delivery of route setups and CP-CP message flows is assured by setting up dedicated RTP pipes over the connection:
  - Route Setup RTP - The first time a route setup must flow over the connection, a route setup RTP is activated:
    - Only used to carry route setup replies and requests
    - Is associated with the link, and will be deactivated when the EE connection is deactivated
  - CP-CP RTP(s) - If CP-CP sessions come up over the connection, they will be placed on an RTP pipe (or pipes) dedicated to carrying CP-CP sessions
    - Conwinner and Conloser CP-CP sessions can come up over the same pipe or over two separate pipes
  - No explicit route setup flow is required to activate the CP-CP RTPs or the route setup RTP over an EE link.

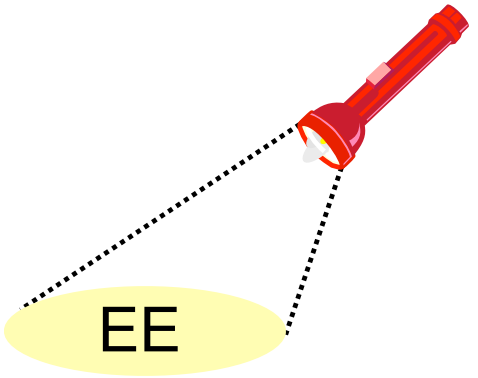
EE Links: Detecting Problems

- The EE Logical Data Link Control (LDLC) layer monitors the EE connection, and will terminate the EE connection if contact is lost with the partner
  - The LDLC inactivity trigger is controlled by three parameters on the PORT statement:
    - LIVTIME: The amount of time of inactivity before LDLC tests the connection
    - SRQTIME: The amount of time LDLC waits for a response to its test
    - SRQRETRY: The number of times the test is retried
  - The connection will be terminated if no activity/response for a duration of approximately:

    LIVTIME + ((SRQRETRY+1) * SRQTIME)
  - The LDLC parameters can also be coded at the GROUP level (as of V1R9)

Display EE Command

- The DISPLAY EE operator command provides details about Enterprise Extender connectivity
- Three basic forms:
  - General information
    - Basic XCA settings
    - Local IP addresses and/or hostnames
    - RTP pipe and LU-LU session counts
    - Connection counts
  - Specific connection information
    - Local IP address and/or hostname
    - PU information
    - LDLC information
    - Data transfer statistics
  - Aggregate connection information
    - Local IP address and/or hostname
    - Connection counts
    - Aggregate data transfer statistics



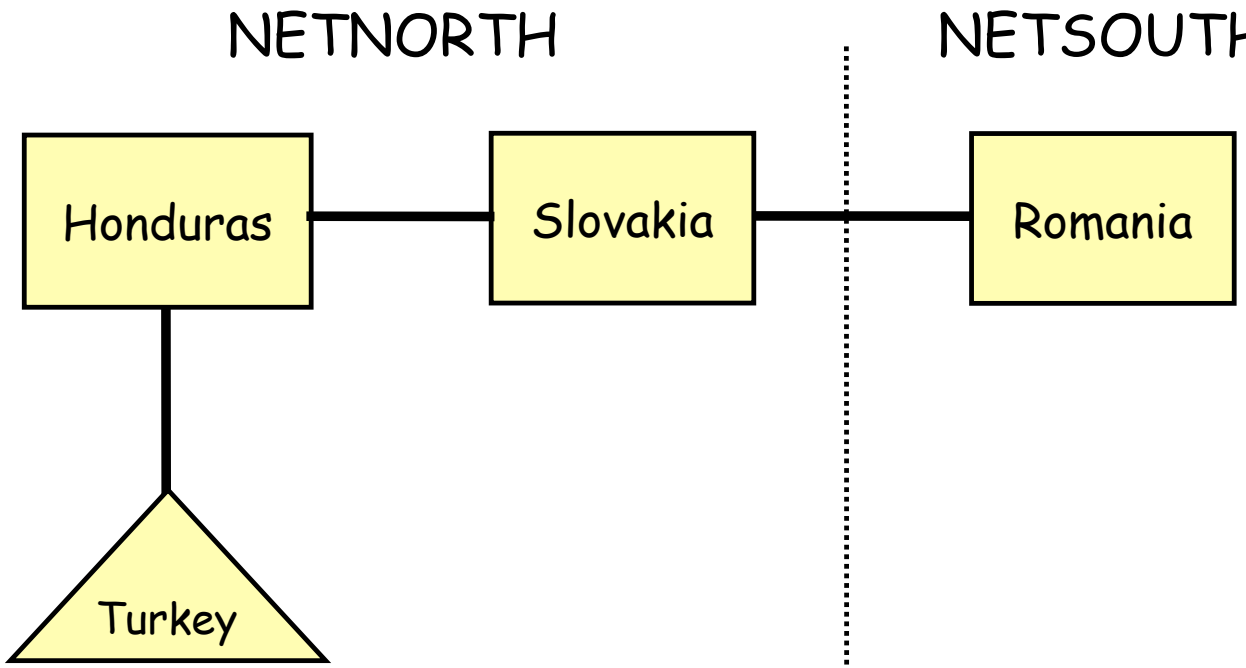
EE Connectivity Test Command

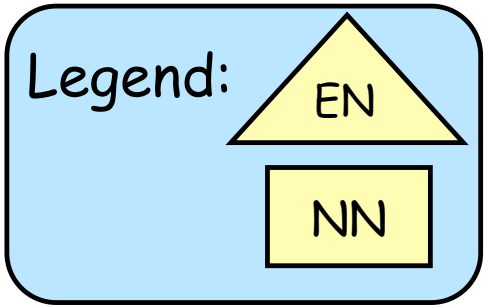
- The Enterprise Extender connectivity test command is useful in debugging various network problems. This command can be used to test an existing Enterprise Extender connection, or it can be used to assist in diagnosing why an EE connection cannot be established.
- The EE connectivity test will verify:
  - EE line availability
  - Address resolution capability
  - EE partner reachability
    - The output generated from this request will show the reachability to the remote EE endpoint over all five UDP ports reserved for EE.
    - When multipath is enabled for EE, the EE connectivity test is repeated for each valid TCP/IP interface which routes EE traffic.

```
D NET,EEDIAG,TEST=YES,LIST=DETAIL,ID=ETU2HO
 ...
IST2067I EEDIAG DISPLAY ISSUED ON 07/11/07 AT 10:41:12
IST1680I LOCAL IP ADDRESS 197.51.125.1
IST1680I REMOTE IP ADDRESS 197.51.153.1
 ...
IST924I -------------------------------------------------------------
IST2133I INTFNAME: LMTU2BR55                INTFTYPE: MPCPTP
IST2134I   CONNECTIVITY SUCCESSFUL                              PORT: 12000
IST2137I     1  197.51.155.14               RTT:     1
IST2137I     2  197.51.153.1                RTT:     4
IST2134I   CONNECTIVITY SUCCESSFUL                              PORT: 12001
IST2137I     1  197.51.155.14               RTT:     2
IST2137I     2  197.51.153.1                RTT:     4
IST2134I   CONNECTIVITY SUCCESSFUL                              PORT: 12002
IST2137I     1  197.51.155.14               RTT:     2
IST2137I     2  197.51.153.1                RTT:     5
IST2134I   CONNECTIVITY SUCCESSFUL                              PORT: 12003
IST2137I     1  197.51.155.14               RTT:     2
IST2137I     2  197.51.153.1                RTT:     6
IST2134I   CONNECTIVITY SUCCESSFUL                              PORT: 12004
IST2137I     1  197.51.155.14               RTT:     3
IST2137I     2  197.51.153.1                RTT:     5
 ...
```

Enterprise Extender Scenario

Configuration Diagram





Definitions at Turkey

```
TUXCAGN  VBUILD TYPE=XCA
TUPORTGN PORT   MEDIUM=HPRIP
*
TUGPEE   GROUP  DIAL=YES,CALL=INOUT,                                  X
                AUTOGEN=(5,EV4,P),DYNPU=YES,ISTATUS=ACTIVE
*********************************************************************
* LOCAL VRN                                                         *
*********************************************************************
TUGVL01  GROUP DIAL=YES,CALL=INOUT,VNNAME=NETNORTH.LVRN,               X
               AUTOGEN=(5,LV01,P),DYNPU=YES,VNTYPE=LOCAL,              X
               HOSTNAME=TUVIPA2.AREA51.SVT390.COM,                     X
               ISTATUS=INACTIVE,TGP=V002,CAPACITY=100M
*********************************************************************
* GLOBAL VRN                                                        *
*********************************************************************
TUGVG01  GROUP DIAL=YES,CALL=INOUT,VNNAME=CROSSNET.GVRN,               X
               AUTOGEN=(5,GV01,P),DYNPU=YES,VNTYPE=GLOBAL,             X
               HOSTNAME=TUVIPA3.AREA51.SVT390.COM,                     X
               ISTATUS=INACTIVE,TGP=V003
```

Excerpt from Start List:

```
  ...
IPADDR=197.51.125.1,
NETID=NETNORTH,
NODETYPE=EN,
SSCPNAME=TURKEY,
TCPNAME=TCPSVT,
  ...
```

```
TOIP     VBUILD TYPE=SWNET
******* TO HONDURAS
ETU2HO   PU     TGP=EEV4,TGN=4,NETID=NETNORTH,                        X
                CPCP=YES,CPNAME=HONDURAS,                             X
                PUTYPE=2,CAPACITY=24M
PTU2HO   PATH   GRPNM=TUGPEE,REDIAL=10,REDDELAY=120,                  X
                IPADDR=197.51.153.1
```

Definitions at Honduras

```
HOXCAGN  VBUILD TYPE=XCA
HOPORTGN PORT   MEDIUM=HPRIP
*
HOGPEE   GROUP  DIAL=YES,CALL=INOUT,                              X
                AUTOGEN=(5,E,P),DYNPU=YES,ISTATUS=ACTIVE
```

```
TOIP     VBUILD TYPE=SWNET
*
EHO2SL   PU     TGP=EEV4,TGN=4,NETID=NETNORTH,                    X
                CPCP=YES,CPNAME=SLOVAKIA,                         X
                PUTYPE=2,CAPACITY=24M
PHO2SL   PATH   GRPNM=HOGPEE,                                     X
                IPADDR=197.11.115.1
*
EHO2TU   PU     TGP=EEV4,TGN=4,NETID=NETNORTH,                    X
                CPCP=YES,CPNAME=TURKEY,                           X
                PUTYPE=2,CAPACITY=24M
PHO2TU   PATH   GRPNM=HOGPEE,                                     X
                IPADDR=197.51.125.1
```

Excerpt from Start List:

```
  ...
IPADDR=197.51.153.1,
NETID=NETNORTH,
NODETYPE=NN,
SSCPNAME=HONDURAS,
TCPNAME=TCPSVT
  ...
```

Definitions at Slovakia

```
SLXEE    VBUILD TYPE=XCA
SLPORTGN PORT   MEDIUM=HPRIP
*
SLGPEE   GROUP  DIAL=YES,CALL=INOUT,                                  X
                AUTOGEN=(5,E,P),DYNPU=YES,ISTATUS=ACTIVE
*********************************************************************
* LOCAL VRN                                                         *
*********************************************************************
SLGVL01  GROUP  DIAL=YES,CALL=INOUT,VNNAME=NETNORTH.LVRN,             X
                AUTOGEN=(5,LV01,P),DYNPU=YES,VNTYPE=LOCAL,            X
                HOSTNAME=SLVIPA1,ISTATUS=INACTIVE,TGP=V002,           X
                CAPACITY=100M
*********************************************************************
* GLOBAL VRN                                                        *
*********************************************************************
SLGVG01  GROUP  DIAL=YES,CALL=INOUT,VNNAME=CROSSNET.GVRN,             X
                AUTOGEN=(5,GV01,P),DYNPU=YES,VNTYPE=GLOBAL,           X
                HOSTNAME=SLVIPA1,ISTATUS=INACTIVE,TGP=V004,           X
                CAPACITY=100M
```

Excerpt from Start List:

```
  ...
BN=YES,
IPADDR=197.11.115.1,
NETID=NETNORTH,
NODETYPE=NN,
SSCPNAME=SLOVAKIA,
TCPNAME=TCPSVT,
  ...
```

```
TOIP     VBUILD TYPE=SWNET
*
ESL2RO   PU     TGP=EEV4,TGN=4,NETID=NETSOUTH,                        X
                CPCP=YES,CPNAME=ROMANIA,                              X
                PUTYPE=2,CAPACITY=24M
PSL2RO   PATH   GRPNM=SLGPEE,                                         X
                HOSTNAME=ROVIPA1
*
ESL2HO   PU     TGP=EEV4,TGN=4,NETID=NETNORTH,                        X
                CPCP=YES,CPNAME=HONDURAS,                             X
                PUTYPE=2,CAPACITY=24M
PSL2HO   PATH   GRPNM=SLGPEE,                                         X
                IPADDR=197.51.153.1
```


Definitions at Romania

```
ROXEE    VBUILD TYPE=XCA
ROPORTGN PORT   MEDIUM=HPRIP
*
ROGPEE   GROUP  DIAL=YES,CALL=INOUT,                                  X
                AUTOGEN=(5,E,P),DYNPU=YES,ISTATUS=ACTIVE
*********************************************************************
* GLOBAL VRN                                                        *
*********************************************************************
ROGVG01  GROUP  DIAL=YES,CALL=INOUT,VNNAME=CROSSNET.GVRN,              X
                AUTOGEN=(5,GV01,P),DYNPU=YES,VNTYPE=GLOBAL,            X
                HOSTNAME=ROVIPA1,ISTATUS=INACTIVE,TGP=V004,            X
                CAPACITY=100M
```

```
TOIP     VBUILD TYPE=SWNET
*
ERO2SL   PU     TGP=EEV4,TGN=4,NETID=NETNORTH,                         X
                CPCP=YES,CPNAME=SLOVAKIA,                              X
                PUTYPE=2,CAPACITY=24M
PRO2SL   PATH   GRPNM=ROGPEE,                                          X
                HOSTNAME=SLVIPA1
*
ERO2BR   PU     TGP=EEV4,TGN=4,NETID=NETSOUTH,                         X
                CPCP=YES,CPNAME=BRAZIL,                                X
                PUTYPE=2,CAPACITY=24M
PRO2BR   PATH   GRPNM=ROGPEE,                                          X
                IPADDR=197.51.155.1
```

Excerpt from Start List:

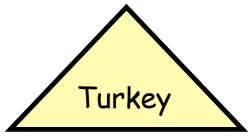
```
  ...
BN=YES,
IPADDR=197.11.116.1,
NETID=NETSOUTH,
NODETYPE=NN,
SSCPNAME=ROMANIA,
TCPNAME=TCPSVT,
  ...
```

Turkey: Initialization

Starting VTAM

```
 ...
IST020I VTAM INITIALIZATION COMPLETE FOR CSV1R8
IST1348I VTAM STARTED AS MIGRATION DATA HOST
 ...
IST1137I TUXEEI IS ACTIVE, TYPE = XCA MAJOR NODE
IST1132I TUSEEI IS ACTIVE, TYPE = SW SNA MAJ NODE
 ...
EZZ4313I INITIALIZATION COMPLETE FOR DEVICE IUTSAMEH
EZZ4324I CONNECTION TO 197.51.125.1 ACTIVE FOR DEVICE IUTSAMEH
IST1685I  TCP/IP JOB NAME = TCPSVT
IST1680I  LOCAL  IP ADDRESS 197.51.125.1
 ...
D NET,EE,LIST=DETAIL
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = EE
IST2000I ENTERPRISE EXTENDER GENERAL INFORMATION
IST1685I TCP/IP JOB NAME = TCPSVT
IST2003I ENTERPRISE EXTENDER XCA MAJOR NODE NAME = TUXEEI
IST2004I LIVTIME = (10,0)     SRQTIME =    15  SRQRETRY =     3
IST2005I IPRESOLV =    0
IST2231I CURRENT HPR CLOCK RATE = STANDARD
IST924I -------------------------------------------------------
IST2006I PORT PRIORITY =  SIGNAL    NETWORK     HIGH   MEDIUM     LOW
IST2008I IPPORT NUMBER =   12000      12001    12002    12003   12004
IST2008I IPTOS VALUE   =      C0         C0       80       40      20
IST924I -------------------------------------------------------
IST1680I LOCAL IP ADDRESS 197.51.125.1
IST2009I RTP PIPES =          0      LU-LU SESSIONS      =          0
IST2010I INOPS DUE TO SRQRETRY EXPIRATION                 =          0
IST2013I AVAILABLE LINES FOR PREDEFINED EE CONNECTIONS    =          5
IST2014I ACTIVE PREDEFINED EE CONNECTIONS                 =          0
IST2015I ACTIVE LOCAL  VRN EE CONNECTIONS                 =          0
IST2016I ACTIVE GLOBAL VRN EE CONNECTIONS                 =          0
IST924I -------------------------------------------------------
IST2017I TOTAL RTP PIPES =          0     LU-LU SESSIONS =          0
IST2018I TOTAL ACTIVE PREDEFINED EE CONNECTIONS           =          0
IST2019I TOTAL ACTIVE LOCAL  VRN EE CONNECTIONS           =          0
IST2020I TOTAL ACTIVE GLOBAL VRN EE CONNECTIONS           =          0
IST2021I TOTAL ACTIVE EE CONNECTIONS                      =          0
IST314I END
```

NETNORTH



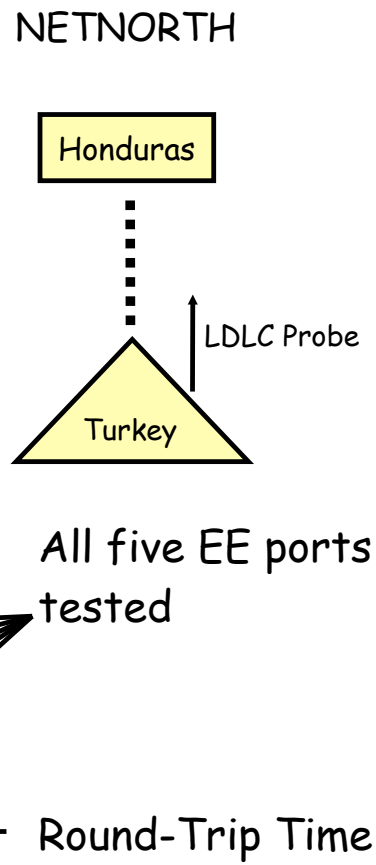
EE XCA and switched major nodes activated from config list

No EE connections active yet

Turkey: Connectivity Test

Verify that EE is possible to Honduras (Turkey's NNS)

```
D NET,EEDIAG,TEST=YES,IPADDR=(197.51.125.1,197.51.153.1)
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = EEDIAG
IST2119I ENTERPRISE EXTENDER DISPLAY CORRELATOR: EE000006
IST2067I EEDIAG DISPLAY ISSUED ON 07/05/07 AT 10:18:54
IST1680I LOCAL IP ADDRESS 197.51.125.1
IST1680I REMOTE IP ADDRESS 197.51.153.1
IST2023I CONNECTED TO LINE EV4001
IST2126I CONNECTIVITY TEST IN PROGRESS
IST314I END
IST350I DISPLAY TYPE = EEDIAG
IST2130I ENTERPRISE EXTENDER CONNECTIVITY TEST INFORMATION
IST2119I ENTERPRISE EXTENDER DISPLAY CORRELATOR: EE000006
IST2131I EEDIAG DISPLAY COMPLETED ON 07/05/07 AT 10:19:04
IST2132I LDLC PROBE VERSIONS: VTAM = V1           PARTNER = V1
IST1680I LOCAL IP ADDRESS 197.51.125.1
IST1680I REMOTE IP ADDRESS 197.51.153.1
IST924I -------------------------------------------------------------
IST2133I INTFNAME: LMTU2ME56              INTFTYPE: MPCPTP
IST2134I   CONNECTIVITY SUCCESSFUL                        PORT: 12000
IST2137I     2  197.51.153.1               RTT:     4
IST2134I   CONNECTIVITY SUCCESSFUL                        PORT: 12001
IST2137I     2  197.51.153.1               RTT:     5
IST2134I   CONNECTIVITY SUCCESSFUL                        PORT: 12002
IST2137I     2  197.51.153.1               RTT:     5
IST2134I   CONNECTIVITY SUCCESSFUL                        PORT: 12003
IST2137I     2  197.51.153.1               RTT:     6
IST2134I   CONNECTIVITY SUCCESSFUL                        PORT: 12004
IST2137I     2  197.51.153.1               RTT:     6
IST924I -------------------------------------------------------------
IST2139I CONNECTIVITY TEST RESULTS DISPLAYED FOR 1 INTERFACES
IST314I END
```

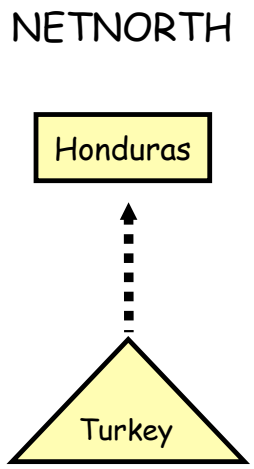


Turkey: Establish NNS

Activate Connection from Turkey to Honduras

```
V NET,DIAL,ID=ETU2HO
IST097I VARY ACCEPTED
IST2180I  DYNLU = YES FOR NETNORTH.HONDURAS SET FROM ETU2HO
IST590I  CONNECTOUT ESTABLISHED FOR PU ETU2HO   ON LINE EV4001
IST1086I APPN CONNECTION FOR NETNORTH.HONDURAS IS ACTIVE - TGN = 4
IST241I VARY DIAL COMMAND COMPLETE FOR ETU2HO
IST1488I  ACTIVATION   OF RTP CNR00001 AS ACTIVE  TO NETNORTH.HONDURAS
IST1096I CP-CP SESSIONS WITH NETNORTH.HONDURAS ACTIVATED

D NET,EE,LIST=DETAIL
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = EE
IST2000I ENTERPRISE EXTENDER GENERAL INFORMATION
IST1685I TCP/IP JOB NAME = TCPSVT
IST2003I ENTERPRISE EXTENDER XCA MAJOR NODE NAME = TUXEEI
IST2004I LIVTIME = (10,0)     SRQTIME =    15  SRQRETRY =     3
IST2005I IPRESOLV =    0
IST2231I CURRENT HPR CLOCK RATE = STANDARD
IST924I -------------------------------------------------------------
IST2006I PORT PRIORITY =  SIGNAL    NETWORK     HIGH   MEDIUM     LOW
IST2008I IPPORT NUMBER =   12000      12001    12002    12003   12004
IST2008I IPTOS VALUE   =      C0         C0       80       40      20
IST924I -------------------------------------------------------------
IST1680I LOCAL IP ADDRESS 197.51.125.1
IST2009I RTP PIPES =          1     LU-LU SESSIONS      =          2
IST2010I INOPS DUE TO SRQRETRY EXPIRATION                 =          0
IST2013I AVAILABLE LINES FOR PREDEFINED EE CONNECTIONS    =          4
IST2014I ACTIVE PREDEFINED EE CONNECTIONS                 =          1
IST2015I ACTIVE LOCAL  VRN EE CONNECTIONS                 =          0
IST2016I ACTIVE GLOBAL VRN EE CONNECTIONS                 =          0
IST924I -------------------------------------------------------------
IST2017I TOTAL RTP PIPES =          1     LU-LU SESSIONS =          2
IST2018I TOTAL ACTIVE PREDEFINED EE CONNECTIONS           =          1
IST2019I TOTAL ACTIVE LOCAL  VRN EE CONNECTIONS           =          0
IST2020I TOTAL ACTIVE GLOBAL VRN EE CONNECTIONS           =          0
IST2021I TOTAL ACTIVE EE CONNECTIONS                      =          1
IST314I END
```



Conwinner & conloser CP-CP sessions

CPSVCMG (CP-CP) RTP pipe

Four lines left for additional EE connections

Turkey: LU-LU Session Active

An LU-LU session is initiated from Honduras: Examine the RTP list and EE connections

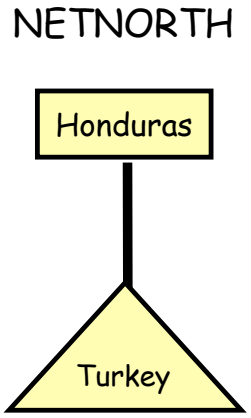
```
IST1488I  ACTIVATION   OF RTP CNR00002 AS PASSIVE TO NETNORTH.HONDURAS
IST1488I  ACTIVATION   OF RTP CNR00003 AS PASSIVE TO NETNORTH.HONDURAS

D NET,RTPS
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = RTPS
IST1695I PU NAME       CP NAME      COSNAME SWITCH CONGEST STALL SESS
IST1960I CNR00003 NETNORTH.HONDURAS EEV4     NO     NO     NO      1
IST1960I CNR00002 NETNORTH.HONDURAS RSETUP    NO     NO     NO      0
IST1960I CNR00001 NETNORTH.HONDURAS CPSVCMG   NO     NO     NO      2
IST2084I 3 OF 3 MATCHING RTP PIPES DISPLAYED
IST314I END

D NET,EE,LIST=DETAIL
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = EE
IST2000I ENTERPRISE EXTENDER GENERAL INFORMATION
IST1685I TCP/IP JOB NAME = TCPSVT
IST2003I ENTERPRISE EXTENDER XCA MAJOR NODE NAME = TUXEEI
IST2004I LIVTIME = (10,0)     SRQTIME =    15  SRQRETRY =     3
IST2005I IPRESOLV =    0
IST2231I CURRENT HPR CLOCK RATE = STANDARD
IST924I -------------------------------------------------------------
IST2006I PORT PRIORITY =  SIGNAL    NETWORK     HIGH   MEDIUM     LOW
IST2008I IPPORT NUMBER =   12000      12001    12002    12003   12004
IST2008I IPTOS VALUE   =      C0         C0       80       40      20
IST924I -------------------------------------------------------------
IST1680I LOCAL IP ADDRESS 197.51.125.1
IST2009I RTP PIPES =          3      LU-LU SESSIONS      =          3
IST2010I INOPS DUE TO SRQRETRY EXPIRATION                 =          0
IST2013I AVAILABLE LINES FOR PREDEFINED EE CONNECTIONS    =          4
IST2014I ACTIVE PREDEFINED EE CONNECTIONS                 =          1
IST2015I ACTIVE LOCAL  VRN EE CONNECTIONS                 =          0
IST2016I ACTIVE GLOBAL VRN EE CONNECTIONS                 =          0
IST924I -------------------------------------------------------------
IST2017I TOTAL RTP PIPES =          3     LU-LU SESSIONS =          3
IST2018I TOTAL ACTIVE PREDEFINED EE CONNECTIONS           =          1
IST2019I TOTAL ACTIVE LOCAL  VRN EE CONNECTIONS           =          0
IST2020I TOTAL ACTIVE GLOBAL VRN EE CONNECTIONS           =          0
IST2021I TOTAL ACTIVE EE CONNECTIONS                      =          1
IST314I END
```

Route setup pipe

LU-LU session pipe

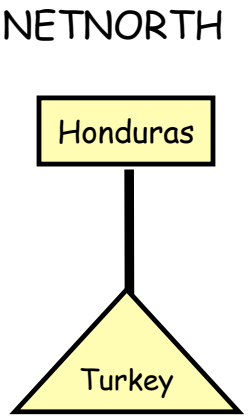


3 RTP pipes carrying 3 LU-LU sessions (including the 2 CP-CP sessions) over 1 EE connection

Turkey: Examine RTP Pipe

Examine the RTP pipe for the LU-LU session to Honduras

```
D NET,ID=CNR00003,E
IST097I DISPLAY ACCEPTED
IST075I NAME = CNR00003, TYPE = PU_T2.1
IST1392I DISCNTIM = 00010 DEFINED AT PU FOR DISCONNECT
IST486I STATUS= ACTIV--LX-, DESIRED STATE= ACTIV
IST1043I CP NAME = HONDURAS - CP NETID = NETNORTH - DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2178I RPNCB ADDRESS 3AACC800
IST1963I APPNCOS = EEV4 - PRIORITY = HIGH
IST1476I TCID X'1920930C00010540' - REMOTE TCID X'19208FC700010501'
IST1481I DESTINATION CP NETNORTH.HONDURAS - NCE X'D000000000000000'
IST1587I ORIGIN NCE X'D000000000000000'
IST1967I ACTIVATED AS PASSIVE ON 07/05/07 AT 10:20:40
IST1477I ALLOWED DATA FLOW RATE = 1100 KBITS/SEC
IST1516I INITIAL DATA FLOW RATE = 1100 KBITS/SEC
IST1841I ACTUAL DATA FLOW RATE = 0 BITS/SEC
IST1511I MAXIMUM NETWORK LAYER PACKET SIZE = 8065 BYTES
IST1478I NUMBER OF UNACKNOWLEDGED BUFFERS = 0
IST1479I RTP CONNECTION STATE = CONNECTED - MNPS = NO
IST1959I DATA FLOW STATE = NORMAL
IST1855I NUMBER OF SESSIONS USING RTP = 1
IST1697I RTP PACING ALGORITHM = ARB RESPONSIVE MODE
IST1480I RTP END TO END ROUTE - RSCV PATH
IST1460I TGN  CPNAME              TG TYPE      HPR
IST1461I   4  NETNORTH.HONDURAS   APPN         RTP
IST875I ALSNAME TOWARDS RTP = ETU2HO
IST1738I ANR LABEL                TP           ER NUMBER
IST1739I 8001001001000000         *NA*         *NA*
IST231I RTP MAJOR NODE = ISTRTPMN
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST355I LOGICAL UNITS:
IST080I ECHOHOZ  ACT/S----Y
IST314I END
```



Initial rate is approx. 5% of CAPACITY

Route used by the pipe

DLC PU used by pipe (EE PU in this config)

A great deal of additional detail about an RTP pipe can be revealed by specifying HPRDIAG=YES when displaying the pipe

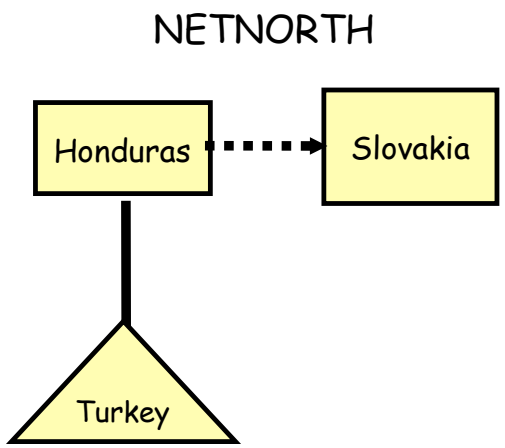
Honduras: Connect to Slovakia

Activate the Honduras to Slovakia connection

```
V NET,DIAL,ID=EHO2SL
IST097I VARY ACCEPTED
IST2180I  DYNLU = YES FOR NETNORTH.SLOVAKIA SET FROM EHO2SL
IST590I  CONNECTOUT ESTABLISHED FOR PU EHO2SL   ON LINE E0000001
IST1086I APPN CONNECTION FOR NETNORTH.SLOVAKIA IS ACTIVE - TGN = 4
IST241I VARY DIAL COMMAND COMPLETE FOR EHO2SL
IST1488I  ACTIVATION   OF RTP CNR00003 AS PASSIVE TO NETNORTH.SLOVAKIA
IST1488I  ACTIVATION   OF RTP CNR00002 AS ACTIVE  TO NETNORTH.SLOVAKIA
IST1096I CP-CP SESSIONS WITH NETNORTH.SLOVAKIA ACTIVATED
```

Verify Honduras' connections

```
D NET,TOPO,LIST=ALL,ID=HONDURAS
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = TOPOLOGY
IST1295I CP NAME           NODETYPE ROUTERES CONGESTION  CP-CP WEIGHT
IST1296I NETNORTH.HONDURAS NN       1        NONE        *NA*  *NA*
IST1579I                   ----------------------------------------
IST1297I                   ICN/MDH  CDSERVR  RSN         HPR
IST1298I                   NO       NO       2           RTP
IST1579I                   ----------------------------------------
IST1223I                   BN       NATIVE   TIME LEFT   LOCATE SIZE
IST1224I                   NO       YES      15          16K
 ...
IST1299I TRANSMISSION GROUPS ORIGINATING AT CP NETNORTH.HONDURAS
IST1357I                                                 CPCP
IST1300I DESTINATION CP    TGN      STATUS   TGTYPE      VALUE WEIGHT
IST1301I NETNORTH.TURKEY   4        OPER     ENDPT       YES   *NA*
IST1301I NETNORTH.SLOVAKIA 4        OPER     INTERM      YES   *NA*
IST314I END
```

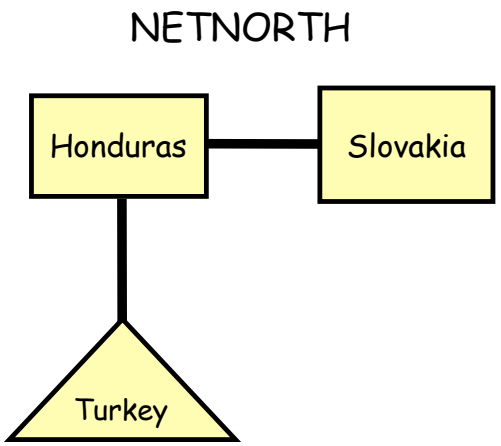


Honduras has an endpoint TG to Turkey and an intermediate routing TG to Slovakia

Honduras: Examine RTPs and EE

After starting an LU-LU session (not shown) to Slovakia, examine RTP pipes and EE connectivity

```
D NET,RTPS
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = RTPS
IST1695I PU NAME       CP NAME       COSNAME SWITCH CONGEST STALL SESS
IST1960I CNR00007 NETNORTH.TURKEY    EEV4      NO      NO      NO      1
IST1960I CNR00006 NETNORTH.TURKEY    RSETUP    NO      NO      NO      0
IST1960I CNR00005 NETNORTH.SLOVAKIA  EEV4      NO      NO      NO      1
IST1960I CNR00004 NETNORTH.SLOVAKIA  RSETUP    NO      NO      NO      0
IST1960I CNR00003 NETNORTH.SLOVAKIA  CPSVCMG   NO      NO      NO      1
IST1960I CNR00002 NETNORTH.SLOVAKIA  CPSVCMG   NO      NO      NO      1
IST1960I CNR00001 NETNORTH.TURKEY    CPSVCMG   NO      NO      NO      2
IST2084I 7 OF 7 MATCHING RTP PIPES DISPLAYED
IST314I END
D NET,EE,LIST=DETAIL
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = EE
IST2000I ENTERPRISE EXTENDER GENERAL INFORMATION
IST1685I TCP/IP JOB NAME = TCPSVT
IST2003I ENTERPRISE EXTENDER XCA MAJOR NODE NAME = HOXEEI
IST2004I LIVTIME = (10,0)     SRQTIME =    15  SRQRETRY =     3
IST2005I IPRESOLV =    0
IST2231I CURRENT HPR CLOCK RATE = STANDARD
IST924I -------------------------------------------------------------
IST2006I PORT PRIORITY =  SIGNAL    NETWORK     HIGH    MEDIUM     LOW
IST2008I IPPORT NUMBER =   12000      12001    12002    12003   12004
IST2008I IPTOS VALUE   =      C0         C0       80       40      20
IST924I -------------------------------------------------------------
IST1680I LOCAL IP ADDRESS 197.51.153.1
IST2009I RTP PIPES =          7      LU-LU SESSIONS      =          6
IST2010I INOPS DUE TO SRQRETRY EXPIRATION                 =          0
IST2013I AVAILABLE LINES FOR PREDEFINED EE CONNECTIONS    =          3
IST2014I ACTIVE PREDEFINED EE CONNECTIONS                 =          2
IST2015I ACTIVE LOCAL  VRN EE CONNECTIONS                 =          0
IST2016I ACTIVE GLOBAL VRN EE CONNECTIONS                 =          0
IST924I -------------------------------------------------------------
IST2017I TOTAL RTP PIPES =          7     LU-LU SESSIONS =          6
IST2018I TOTAL ACTIVE PREDEFINED EE CONNECTIONS           =          2
IST2019I TOTAL ACTIVE LOCAL  VRN EE CONNECTIONS           =          0
IST2020I TOTAL ACTIVE GLOBAL VRN EE CONNECTIONS           =          0
IST2021I TOTAL ACTIVE EE CONNECTIONS                      =          2
IST314I END
```



The conwinner & conloser CP-CP sessions to Slovakia are on different RTP pipes

Honduras: Examine EE Connection to Slovakia

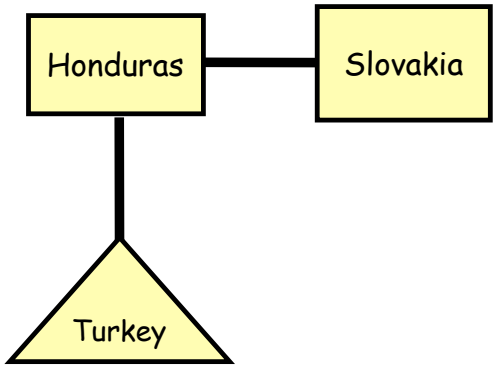
Examine EE connection to Slovakia

```
D NET,EE,LIST=DETAIL,ID=EHO2SL
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = EE
IST2001I ENTERPRISE EXTENDER CONNECTION INFORMATION
IST075I NAME = EHO2SL, TYPE = PU_T2.1
IST1680I LOCAL IP ADDRESS 197.51.153.1
IST1680I REMOTE IP ADDRESS 197.11.115.1
IST2022I EE CONNECTION ACTIVATED ON 07/05/07 AT 10:22:15
IST2114I LIVTIME:    INITIAL =   10   MAXIMUM =    0   CURRENT =   10
IST2023I CONNECTED TO LINE E0000001
IST2025I LDLC SIGNALS RETRANSMITTED AT LEAST ONE TIME    =          0
IST2026I LDLC SIGNALS RETRANSMITTED SRQRETRY TIMES       =          0
IST2009I RTP PIPES =          4      LU-LU SESSIONS      =          3
IST2027I DWINOP  = NO      REDIAL = *NA*        REDDELAY =       *NA*
IST2028I KEEPACT = YES
IST2029I MTU SIZE = 1464
IST924I -------------------------------------------------------------
IST2030I PORT PRIORITY = SIGNAL
IST2036I   NLPS SENT           =                 793  ( 000K )
IST2037I   BYTES SENT          =                3239  ( 003K )
IST2038I   NLPS RETRANSMITTED  =                   0  ( 000K )
IST2039I   BYTES RETRANSMITTED =                   0  ( 000K )
IST2040I   NLPS RECEIVED       =                 794  ( 000K )
IST2041I   BYTES RECEIVED      =                3475  ( 003K )
IST924I -------------------------------------------------------------
IST2031I PORT PRIORITY = NETWORK
IST2036I   NLPS SENT           =                1663  ( 001K )
IST2037I   BYTES SENT          =              239642  ( 239K )
IST2038I   NLPS RETRANSMITTED  =                   0  ( 000K )
IST2039I   BYTES RETRANSMITTED =                   0  ( 000K )
IST2040I   NLPS RECEIVED       =                1660  ( 001K )
IST2041I   BYTES RECEIVED      =              230297  ( 230K )
IST924I -------------------------------------------------------------
IST2032I PORT PRIORITY = HIGH
IST2036I   NLPS SENT           =                  41  ( 000K )
IST2037I   BYTES SENT          =                2595  ( 002K )
IST2038I   NLPS RETRANSMITTED  =                   0  ( 000K )
IST2039I   BYTES RETRANSMITTED =                   0  ( 000K )
IST2040I   NLPS RECEIVED       =                  42  ( 000K )
IST2041I   BYTES RECEIVED      =                2426  ( 002K )
```

EE switched PU

IP address pair

NETNORTH



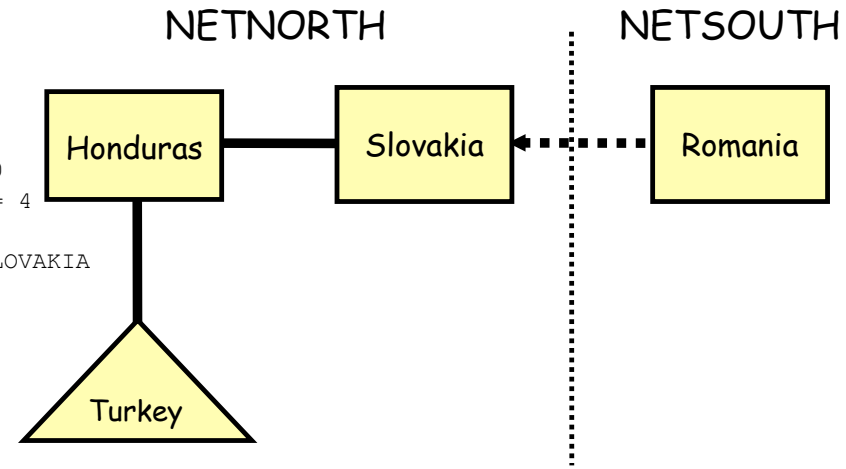

```
  ...
IST924I
-------------------------------------------------------------
IST2033I PORT PRIORITY = MEDIUM
IST2036I   NLPS SENT           =                   0  ( 000K )
IST2037I   BYTES SENT          =                   0  ( 000K )
IST2038I   NLPS RETRANSMITTED  =                   0  ( 000K )
IST2039I   BYTES RETRANSMITTED =                   0  ( 000K )
IST2040I   NLPS RECEIVED       =                   0  ( 000K )
IST2041I   BYTES RECEIVED      =                   0  ( 000K )
IST924I
-------------------------------------------------------------
IST2034I PORT PRIORITY = LOW
IST2036I   NLPS SENT           =                   0  ( 000K )
IST2037I   BYTES SENT          =                   0  ( 000K )
IST2038I   NLPS RETRANSMITTED  =                   0  ( 000K )
IST2039I   BYTES RETRANSMITTED =                   0  ( 000K )
IST2040I   NLPS RECEIVED       =                   0  ( 000K )
IST2041I   BYTES RECEIVED      =                   0  ( 000K )
IST924I
-------------------------------------------------------------
IST2035I TOTALS FOR ALL PORT PRIORITIES
IST2036I   NLPS SENT           =                2497  ( 002K )
IST2037I   BYTES SENT          =              245476  ( 245K )
IST2038I   NLPS RETRANSMITTED  =                   0  ( 000K )
IST2039I   BYTES RETRANSMITTED =                   0  ( 000K )
IST2040I   NLPS RECEIVED       =                2496  ( 002K )
IST2041I   BYTES RECEIVED      =              236198  ( 236K )
IST314I END
```

Total NLPS (network layer packets) and total bytes sent, received, and retransmitted over this EE connection

Romania: Connect to Slovakia

Activate cross-net connection from Romania to Slovakia

```
V NET,DIAL,ID=ERO2SL
IST097I VARY ACCEPTED
IST2180I  DYNLU = YES FOR NETNORTH.SLOVAKIA SET FROM ERO2SL
IST590I  CONNECTOUT ESTABLISHED FOR PU ERO2SL   ON LINE E0000000
IST1086I APPN CONNECTION FOR NETNORTH.SLOVAKIA IS ACTIVE - TGN = 4
IST241I VARY DIAL COMMAND COMPLETE FOR ERO2SL
IST1488I  ACTIVATION   OF RTP CNR00003 AS ACTIVE  TO NETNORTH.SLOVAKIA
IST1096I CP-CP SESSIONS WITH NETNORTH.SLOVAKIA ACTIVATED
```



Verify Romania's connection

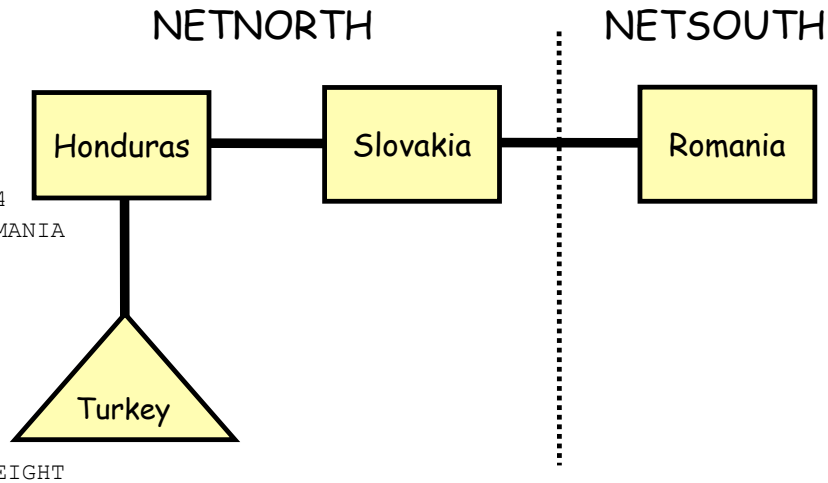
```
D NET,TOPO,LIST=ALL,ID=ROMANIA
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = TOPOLOGY
IST1295I CP NAME           NODETYPE ROUTERES CONGESTION  CP-CP WEIGHT
IST1296I NETSOUTH.ROMANIA  NN       1        NONE        *NA*  *NA*
IST1579I                   ----------------------------------------
IST1297I                   ICN/MDH  CDSERVR  RSN         HPR
IST1298I                   NO       NO       6           RTP
IST1579I                   ----------------------------------------
IST1223I                   BN       NATIVE   TIME LEFT   LOCATE SIZE
IST1224I                   YES      YES      15          16K
 ...
IST1299I TRANSMISSION GROUPS ORIGINATING AT CP NETSOUTH.ROMANIA
IST1357I                                                CPCP
IST1300I DESTINATION CP    TGN      STATUS   TGTYPE      VALUE WEIGHT
IST1301I NETNORTH.SLOVAKIA 4        OPER     INTERCLUST  YES   *NA*
IST314I END
```

The TG to Slovakia is an "intercluster" TG (a cross-subnet link)

Slovakia: Verify Connections

Messages at Slovakia when connection is established with Romania:

```
IST2180I  DYNLU = YES FOR NETSOUTH.ROMANIA  SET FROM ESL2RO
IST590I  CONNECTIN  ESTABLISHED FOR PU ESL2RO   ON LINE E0000003
IST1086I APPN CONNECTION FOR NETSOUTH.ROMANIA IS ACTIVE - TGN = 4
IST1488I  ACTIVATION   OF RTP CNR00008 AS PASSIVE TO NETSOUTH.ROMANIA
IST1096I CP-CP SESSIONS WITH NETSOUTH.ROMANIA ACTIVATED
```



Verify Slovakia's connections:

```
D NET,TOPO,LIST=ALL,ID=SLOVAKIA
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = TOPOLOGY
IST1295I CP NAME           NODETYPE ROUTERES CONGESTION  CP-CP WEIGHT
IST1296I NETNORTH.SLOVAKIA NN       1        NONE        *NA*  *NA*
IST1579I                   ----------------------------------------
IST1297I                   ICN/MDH  CDSERVR  RSN         HPR
IST1298I                   NO       NO       6           RTP
IST1579I                   ----------------------------------------
IST1223I                   BN       NATIVE   TIME LEFT   LOCATE SIZE
IST1224I                   YES      YES      15          16K
 ...
IST1299I TRANSMISSION GROUPS ORIGINATING AT CP NETNORTH.SLOVAKIA
IST1357I                                                CPCP
IST1300I DESTINATION CP    TGN      STATUS   TGTYPE      VALUE WEIGHT
IST1301I NETNORTH.HONDURAS 4        OPER     INTERM      YES   *NA*
IST1301I NETSOUTH.ROMANIA  4        OPER     INTERCLUST  YES   *NA*
IST314I END
```

For More Information

URL	Content
http://www.twitter.com/IBM_Commserver	IBM Communications Server Twitter Feed
http://www.facebook.com/IBMCommserver	IBM Communications Server Facebook Fan Page
http://www.ibm.com/systems/z/	IBM System z
http://www.ibm.com/systems/z/hardware/networking/index.html	IBM System z Networking
http://www.ibm.com/software/network/commserver/zos/	IBM z/OS Communications Server
http://www.ibm.com/software/network/commserver/z_lin/	IBM Communications Server for Linux on zSeries
http://www.ibm.com/software/network/ccl/	IBM Communication Controller for Linux on System z
http://www.ibm.com/software/network/commserver/library	IBM Communications Server Library - white papers, product documentation, etc.
http://www.redbooks.ibm.com	IBM Redbooks
http://www.ibm.com/software/network/commserver/support	IBM Communications Server Technical Support
http://www.ibm.com/support/techdocs/	Technical Support Documentation (techdocs, flashes, presentations, white papers, etc.)
http://www.rfc-editor.org/rfcsearch.html	Request For Comments (RFCs)
http://publib.boulder.ibm.com/infocenter/ieduasst/stgv1r0/index.jsp	IBM Education Assistant

- Recommended Redbooks:
  - SG24-7359-00 Enterprise Extender Implementation Guide
  - SG24-7334-00 A Structured Approach to Modernizing the SNA Environment
  - SG24-5957-00 Migrating Subarea to an IP Infrastructure