



IBM Systems and Technology Group

Replacing Sysplex Timers: Migrating to Server Time Protocol in the Development Lab

z/OS Integration Test

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Agenda

STP Overview

- What is STP
- STP Terminology
- z/OS Integration Test Resources
- z/OS Integration Test Workload Mix
- Baseline - Data Center Sysplex Timer® Topology
- Planning and Availability Considerations

STP Migration Experiences

- Step through ETR to Mixed CTN migration experiences
 - ETR Timing Network (Sysplex Timer®) to a Mixed CTN Stratum 1 Timing Network
 - Mixed CTN Stratum 1 to Stratum 2 transition
 - Mixed CTN Stratum 2 to Stratum 1 transition
 - Mixed CTN transition back to ETR
- Step through ETR to STP-Only CTN Migration experiences
 - Migration from an ETR Timing Network to a Mixed-CTN,
 - Migration from a Mixed-CTN to an STP-Only CTN
 - Reverse Migration from an STP-Only CTN back to a Mixed CTN

Questions

What is STP?

- Message based time synchronization protocol
 - Based on Network Time Protocol (NTP) - an industry standard
 - Meets future, more stringent time synchronization requirements
- Uses Coupling links for time-message exchanges
 - Scales as processors and messaging technologies improve
 - Dedicated Timer links not required
- Allows GDPS distances to extend beyond the current 40 Km limit
 - Limits set by coupling protocol and links
- Implemented in zSeries z990, z890 & System z Licensed Internal Code (LIC)
 - Not available on 2064, 2066, 9672 Gx servers
 - Cannot replace the 9037 Sysplex Timer for earlier generations of servers
- Each system and CF in a STP Network capable of being a time server

STP Terminology

- **STP-capable server/CF**
 - Any server above the zSeries z900, z800 generation (type 2064,2066) with the STP Licensed Internal Code (LIC) installed
- **STP-enabled server/CF**
 - STP-capable server/CF with STP Feature Code 1021 installed
- **STP-configured server/CF**
 - STP-enabled server/CF with a CTN ID assigned
 - STP message exchanges can take place
- **CTN - Coordinated Timing Network**
 - Collection of servers that are time synchronized to a time value called Coordinated Server Time (CST)
 - *CTN ID - Servers / Coupling Facilities (CFs) that make up a CTN are all configured with a common identifier made up of “ETR Net ID” – “STP ID”*
 - *Mixed CTN - A Mixed CTN is one where the Sysplex Timer provides the timekeeping information to a heterogeneous mix of both ETR synchronized servers and servers that are synchronized with the Coordinated Server Time (CST).*
 - *STP-only CTN - All servers/CFs synchronized with CST which does not require a Sysplex Timer.*

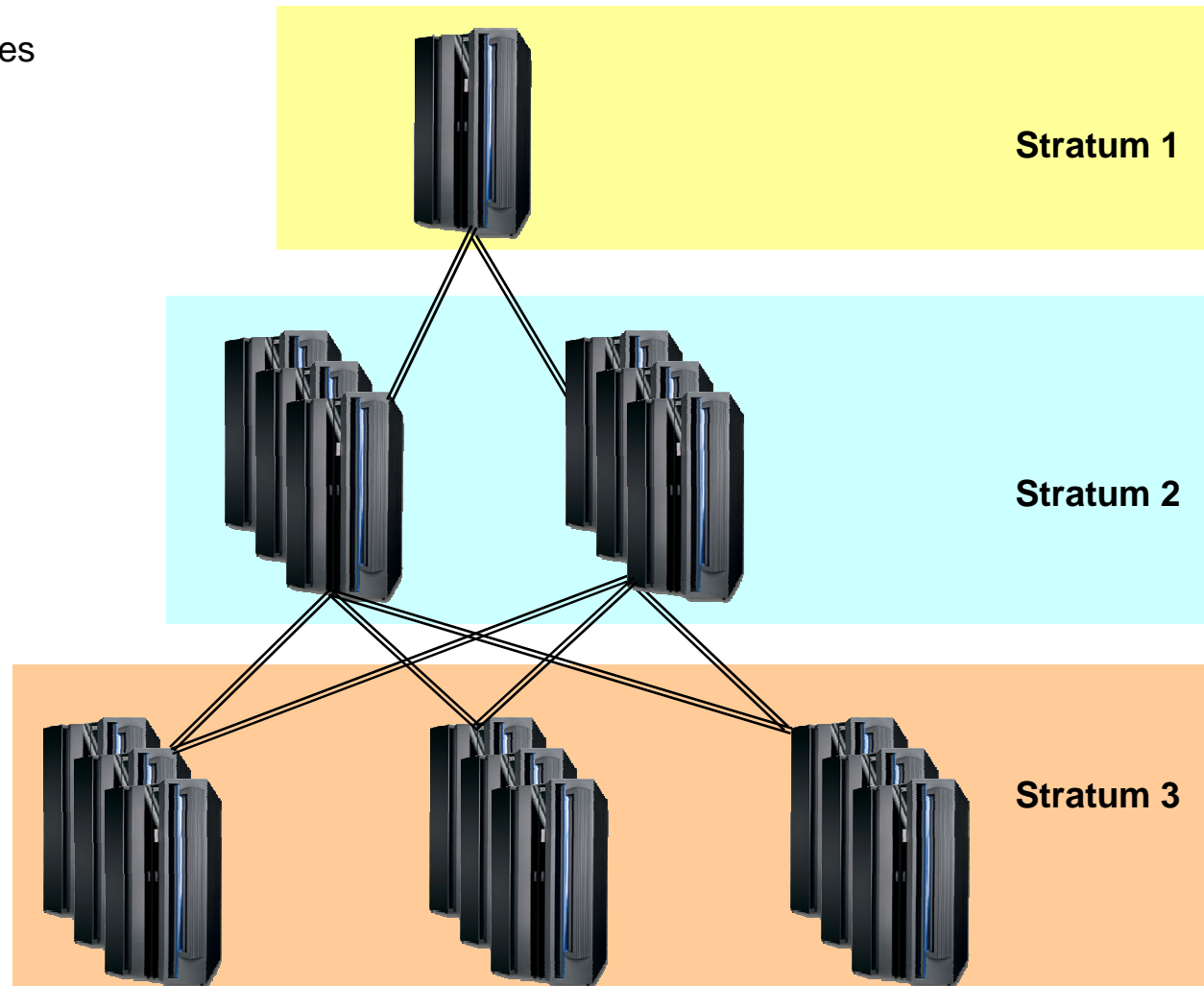
STP Terminology

■ Stratum

STP distributes time messages in layers, or stratum.

The top layer, (Stratum 1) distributes time messages to the layer immediately below it (Stratum 2).

Stratum 2 in turn distributes time messages to Stratum 3.



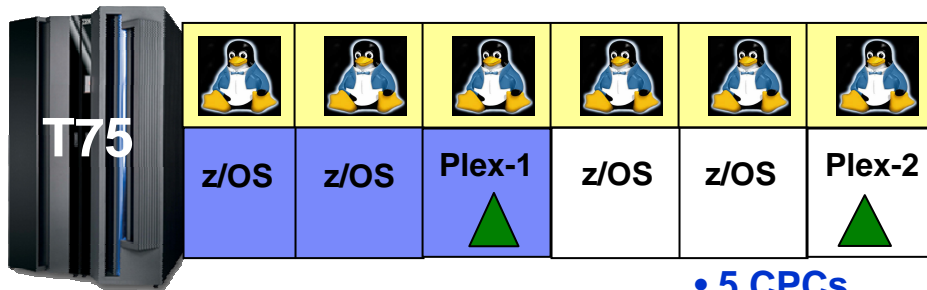
More about Mixed CTN

- Provides a concurrent migration path that supports legacy servers
 - Legacy servers will remain connected to Sysplex Timer
 - STP capable servers can be enabled and configured in a Mixed CTN using the same unique CTN ID.
 - Time Source for the Timing network will remain the Sysplex Timer
 - STP configured servers receiving timing signals from the Sysplex Timer are called Stratum 1 servers.
 - STP configured servers can be further configured to receive timing signals from one or more STP configured servers via existing coupling links
 - A stratum 2 server receives timing signals from a stratum 1 server
 - A stratum 3 server receives timing signals from a stratum 2 server
 - If CF links are not configured between 2 servers that require time synchronization, dedicated STP timing only links will need to be configured
- New servers can be added to the Parallel Sysplex without requiring additional ETR links
- Concurrent reverse migration to ETR Timing is supported
- Can extend GDPS support up to 100 Km, with certain configurations

More about STP-only CTN

- Replaces the Sysplex Timer completely
 - Legacy servers will not operate in the same Parallel Sysplex
 - All servers are STP configured using the same CTN ID.
 - Time Source for the Timing network will be a single stratum 1 server
 - Current Timer Server will be one of two servers assigned the following roles
 - Preferred Time Server
 - Optionally a Backup Time server in the case of PTS planned/unplanned outage
 - Optionally an Arbiter
 - All other servers are stratum 2 or stratum 3 and receive timing signals from the CTS via existing coupling links, including BTS and Arbiter
 - If CF links are not configured between 2 servers that require time synchronization, dedicated STP timing only links will need to be configured
- STP-only CTNs can be configured and initialized without a Sysplex Timer
- Concurrent migration is also supported, as well as concurrent reverse migration back to Mixed CTN
- Timer Operations are done solely from the Sysplex Time dialog on the HMC/SE for the CTS
- Can extend GDPS support up to 100 Km

z/OS Integration Test Data Center Overview



z9-EC: 2094-S38
392GB – 38CP

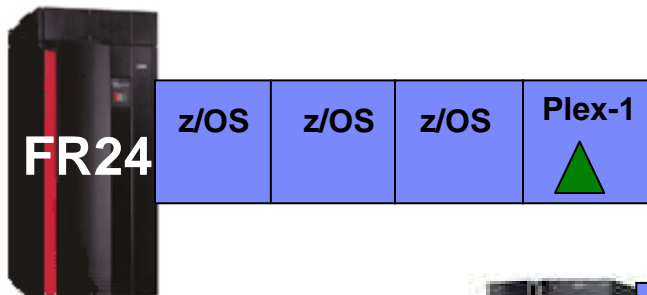
- 5 CPCs
- 13 z/OS® Servers
- 11 Linux® Images
- 5 ICFs

- 2 Parallel Sysplexes®
- CF Duplexing

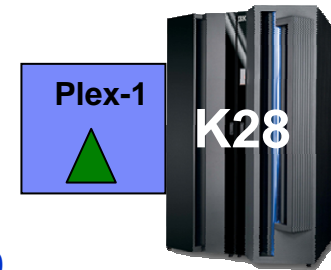
- Two 9037 Sysplex® Timers
- Storage
- ESS, DS6000, DS8000, TS3500



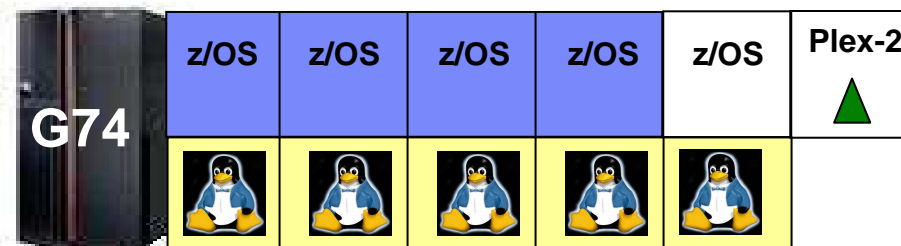
z9-BC : 2096-S07
16GB – 4 CP



z900 : 2064-212
32GB – 16CP

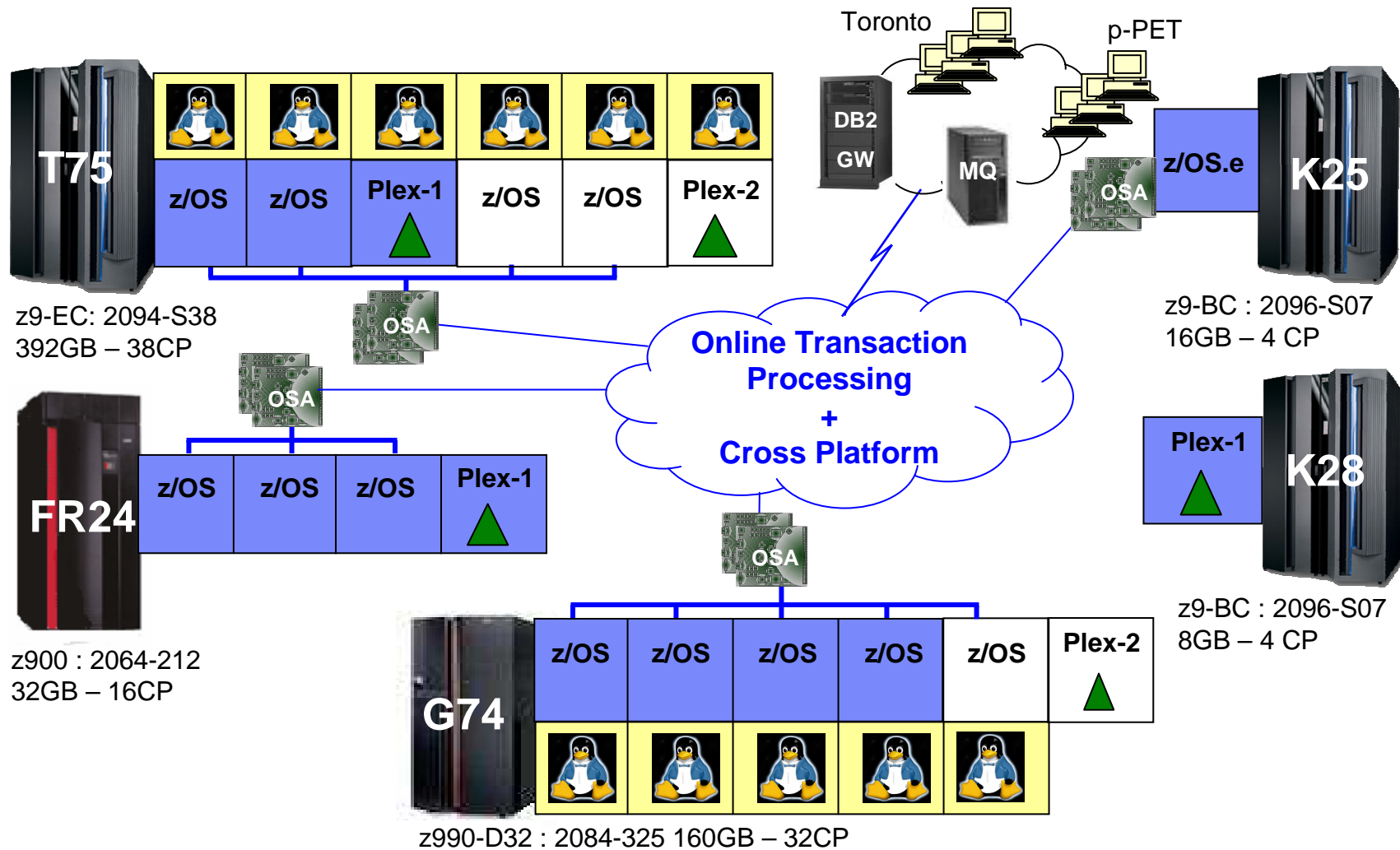


z9-BC : 2096-S07
8GB – 4 CP

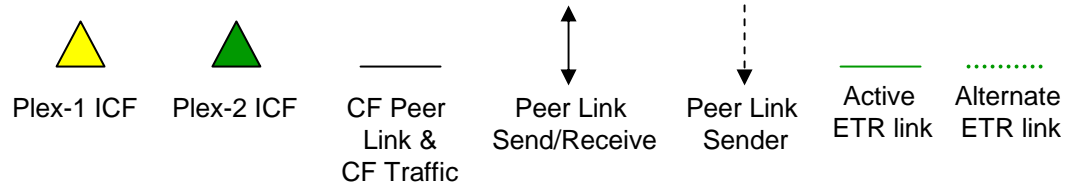
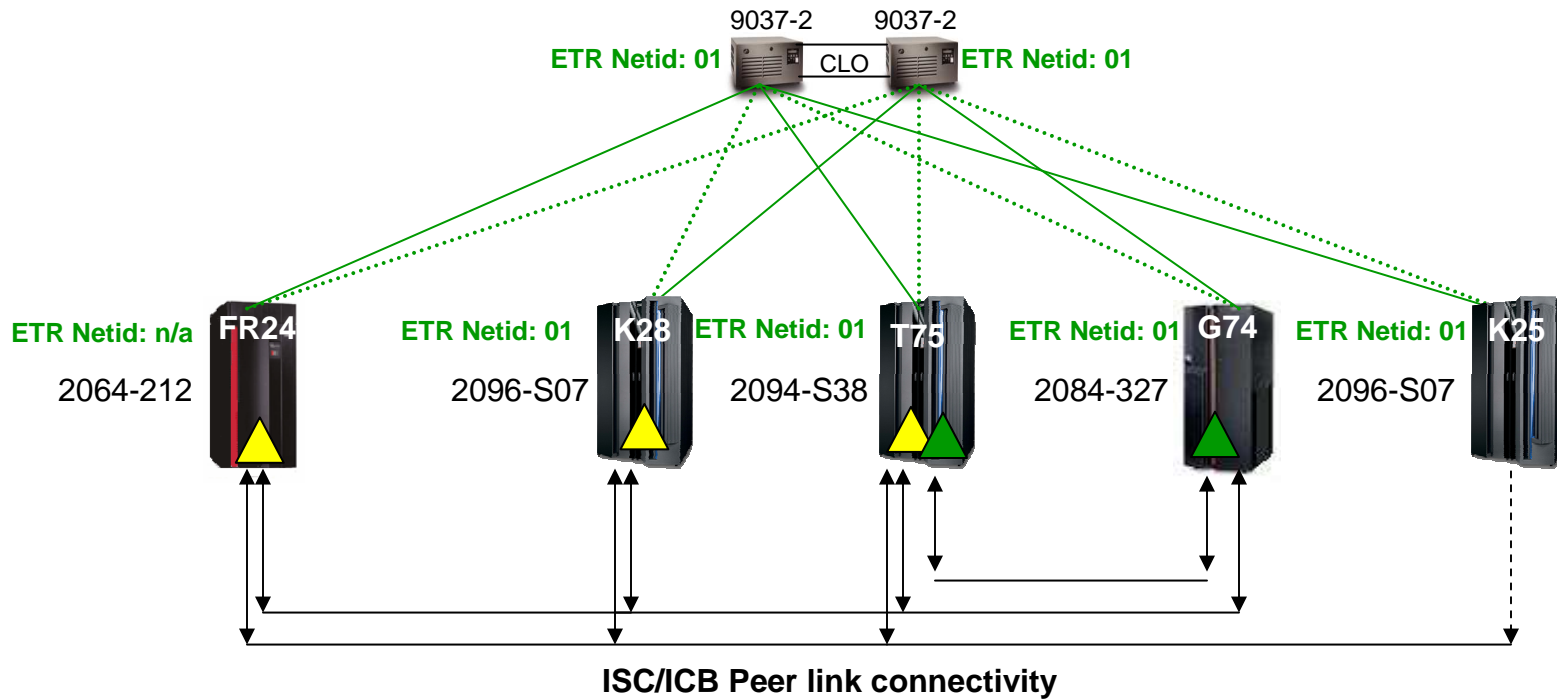


z990-D32 : 2084-325 160GB – 32CP

z/OS Integration Test Data Center Workload Mix



z/OS Integration Test Data Center Sysplex Timer[®] Topology



z/OS Messages with ETR Timing Networks

- Pre – R7
 - **D ETR**

```

-D ETR
IEA282I 10.32.29 ETR STATUS 245
SYNCHRONIZATION MODE = ETR
CPC PORT 0      ACTIVE ==> CPC PORT 1
OPERATIONAL      OPERATIONAL
ENABLED          ENABLED
ETR NET ID=00    ETR NET ID=00
ETR PORT=07      ETR PORT=07
ETR ID=00        ETR ID=01
  
```

- **D XCF,SYSPLEX,ALL**

```

IXC335I 10.34.20 DISPLAY XCF 547
SYSTEM  TYPE SERIAL LPAR STATUS  TIME      SYSTEM STATUS
ST1      2094 81FC  04    09/06/2006 10:34:20  ACTIVE
ST8      2064 1514  07    09/06/2006 10:34:15  ACTIVE
ST7      2064 1514  06    09/06/2006 10:34:15  ACTIVE
ST4      2064 1514  02    09/06/2006 10:34:15  ACTIVE
ST6      2094 81FC  0D    09/06/2006 10:34:17  ACTIVE
ST3      2096 432D  11    09/06/2006 10:34:18  ACTIVE
ST5      2094 81FC  02    09/06/2006 10:34:15  ACTIVE
TP3      2064 1514  04    09/06/2006 10:34:16  ACTIVE
ST2      2094 81FC  0C    09/06/2006 10:34:16  ACTIVE
  
```

z/OS Messages with ETR Timing Networks

- R7
 - D ETR remains the same
 - D XCF,SYSPLEX,ALL

-D XCF,S,ALL

IXC335I 11.02.37 DISPLAY XCF 141

SYSTEM	TYPE	SERIAL	LPAR	STATUS	TIME	SYSTEM STATUS	
TPN		2064 1526	09	09/06/2006 11:02:36		ACTIVE	TM=ETR
JB0		2084 B52A	01	09/06/2006 11:02:34		ACTIVE	TM=ETR
Z0		2064 1526	01	09/06/2006 11:02:34		ACTIVE	TM=ETR
JA0		2084 B52A	2A	09/06/2006 11:02:35		ACTIVE	TM=ETR
J90		2064 1526	05	09/06/2006 11:02:33		ACTIVE	TM=ETR
JE0		2084 B52A	22	09/06/2006 11:02:35		ACTIVE	TM=ETR
J80		2094 299E	07	09/06/2006 11:02:36		ACTIVE	TM=STP
JF0		2094 299E	06	09/06/2006 11:02:33		ACTIVE	TM=STP
JC0		2084 B52A	0C	09/06/2006 11:02:33		ACTIVE	TM=ETR
JH0		2096 FE2D	01	09/06/2006 11:02:35		ACTIVE	TM=ETR

Planning and Availability

Planning

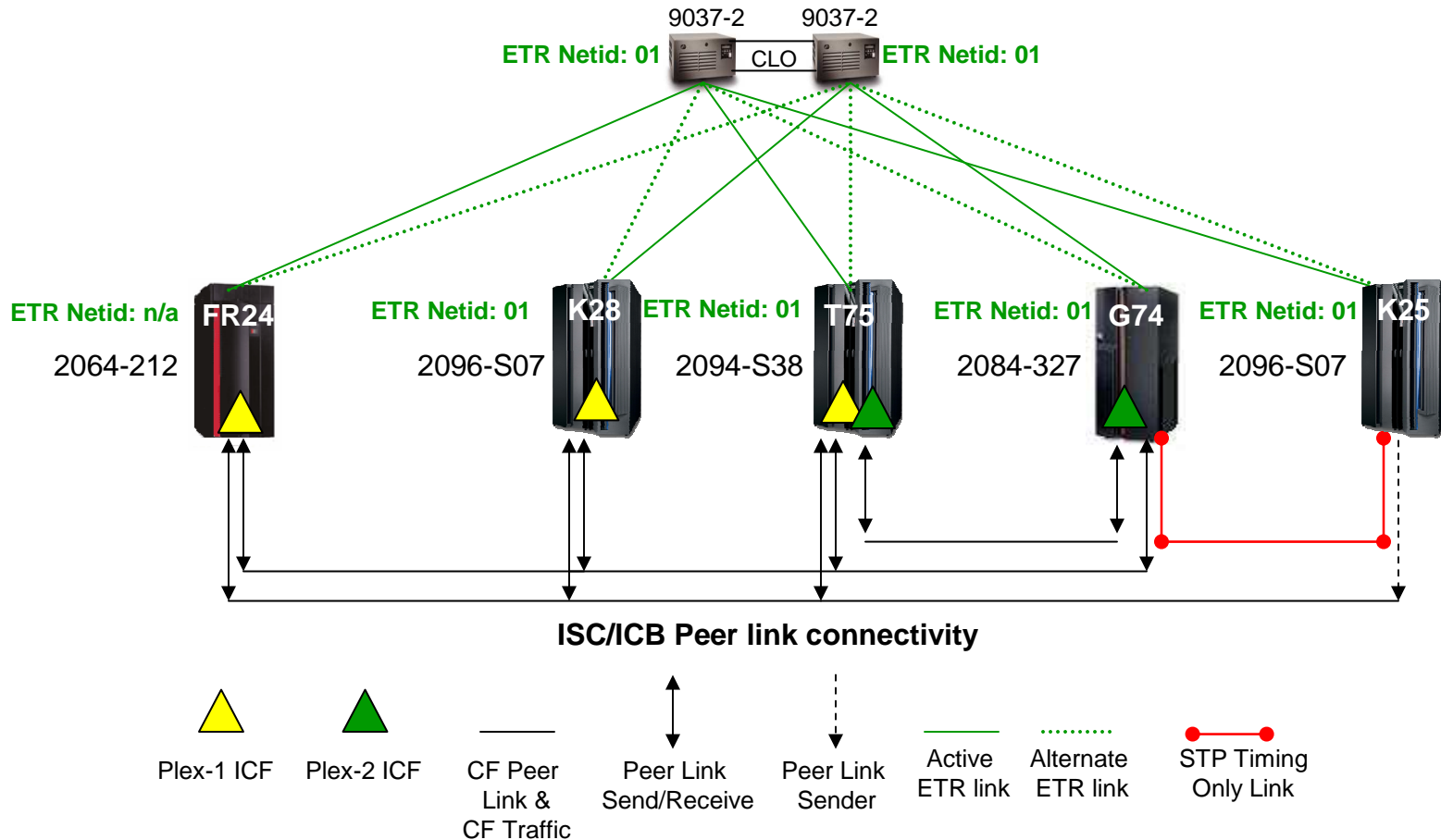
- System Assurance Product Review
- We relied on the IBM® Redbook, *Server Time Protocol Planning Guide* SG24-7280

Availability

- At no point would a single point of failure exposure be tolerated by our team.
- Each migration step had to ensure that equal, or better, timer resiliency would be maintained.
- STP timing-only links were needed to close one such exposure
 - *STP timing only links are coupling peer links that allow two servers to be synchronized using STP messages, when a CF does not exist at either end of the peer link.*

Planning and Availability STP timing-only links

All STP-enabled CPCs now have fully redundant peer link connectivity to every other STP-enabled CPC in the data center (via STP timing-only links, or via CF Peer links)



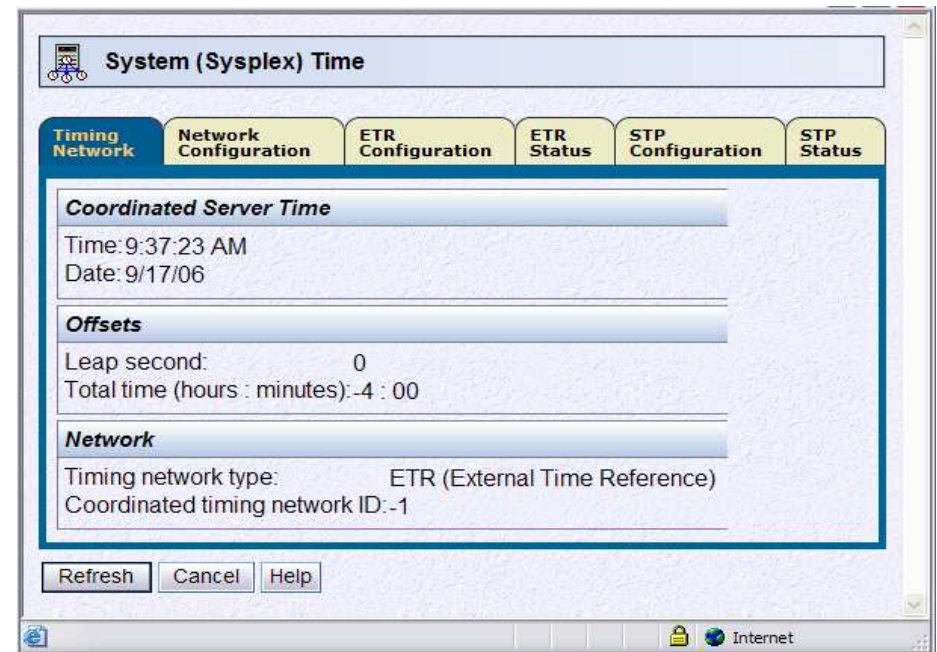
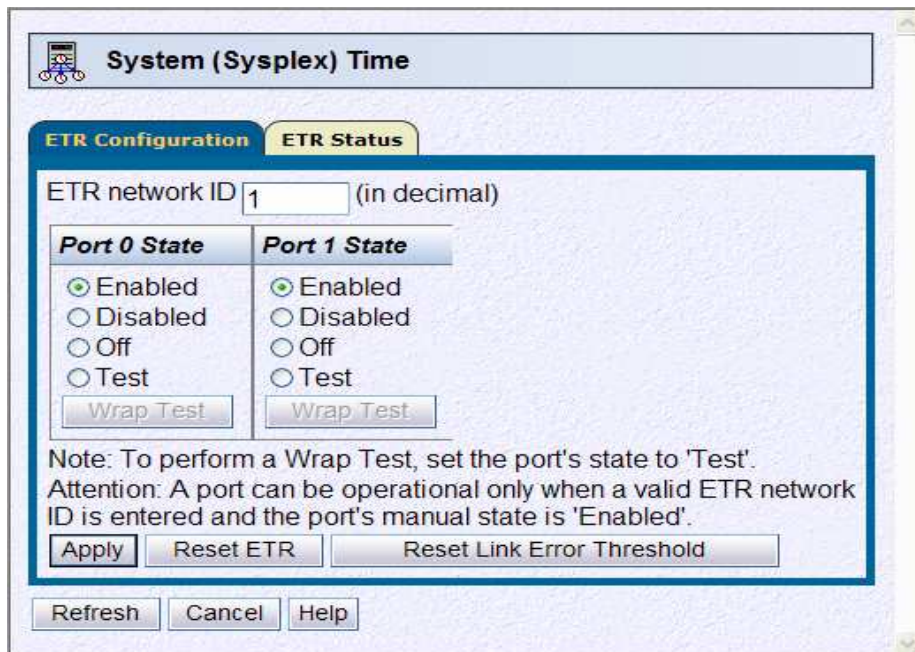
STP Migration Experiences

HMC/SE System (Sysplex) Time Task

There are now a total of six tabs that can be displayed on the System (Sysplex) Time panel.

Without the STP feature installed

All six tabs are displayed only if the server (CPC) has at least one External Time Reference (ETR) card installed and the STP feature is installed

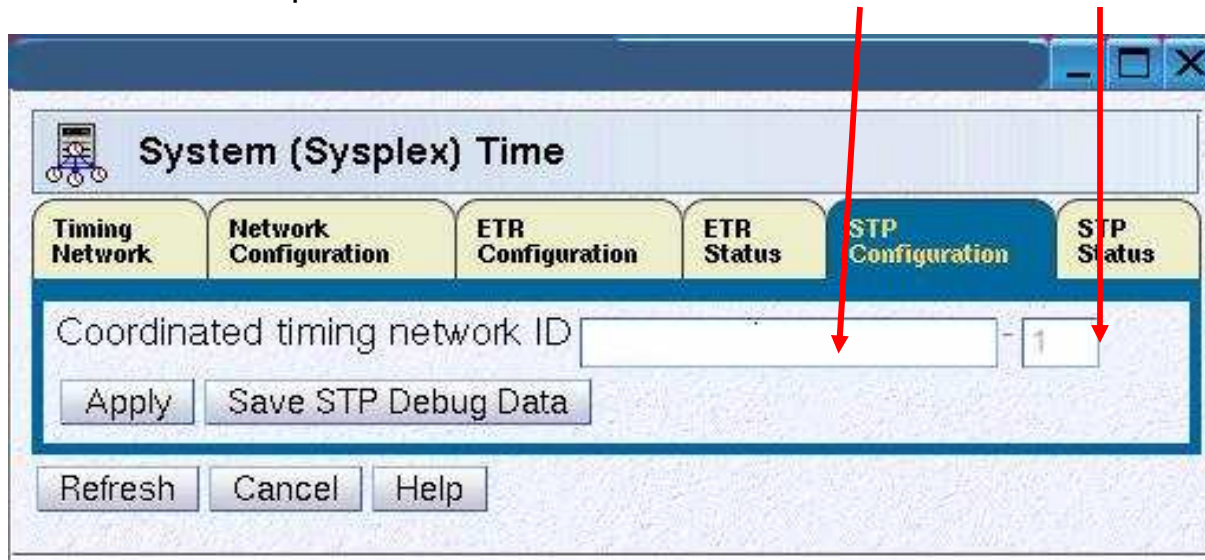


CTN ID Configuration & Verification

Coordinated Timing Network Identification (CTN ID)

Involves defining a matching CTN ID on each STP-enabled CPC.

- The System (Sysplex) Time task's STP Configuration panel is used to configure the CTN ID
- The CTN ID is comprised of two fields in the form of **STP ID** – **ETR Netid**.



System (Sysplex) Time

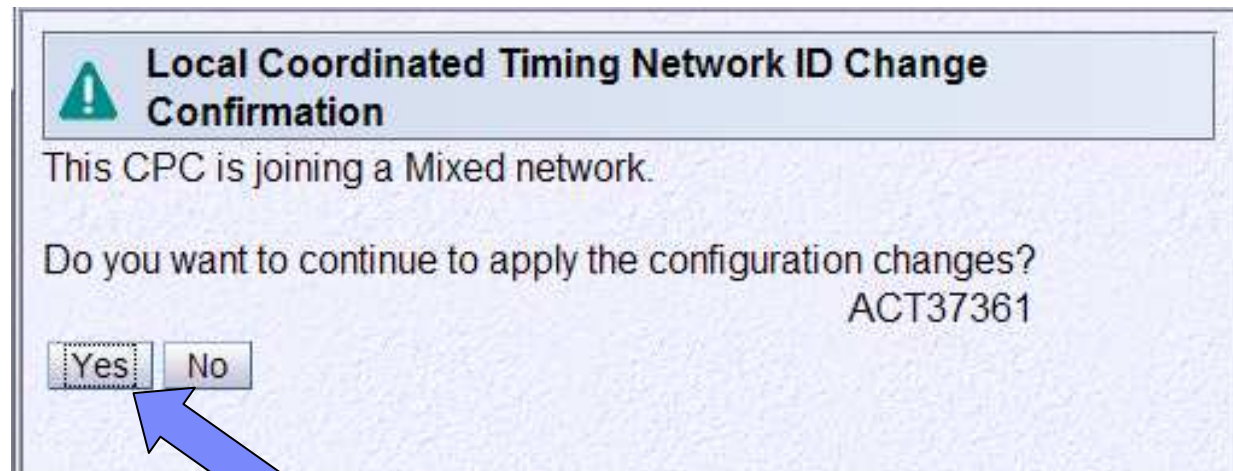
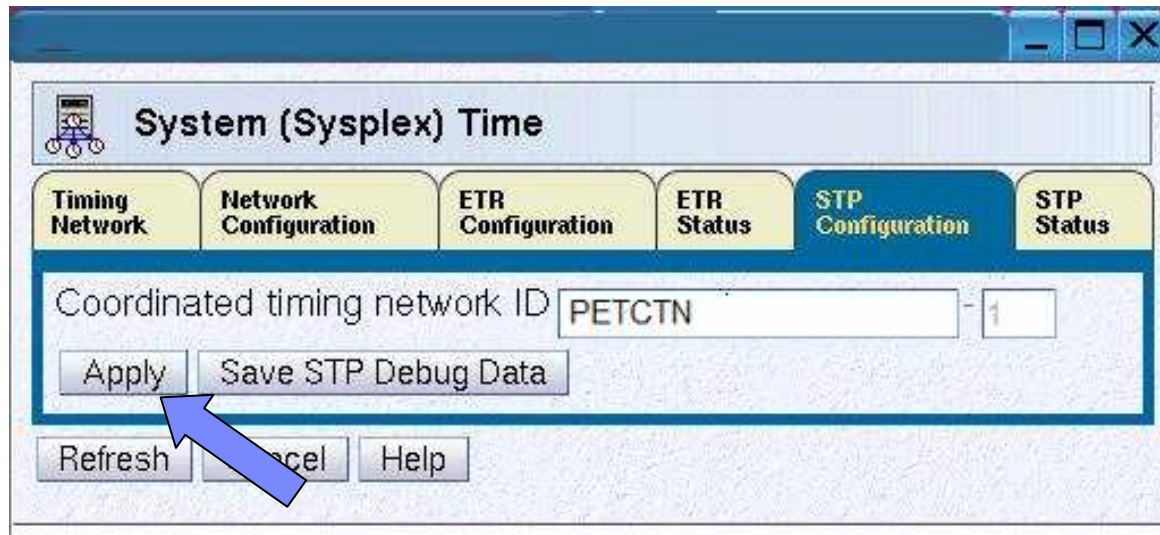
Timing Network | Network Configuration | ETR Configuration | ETR Status | **STP Configuration** | STP Status

Coordinated timing network ID -

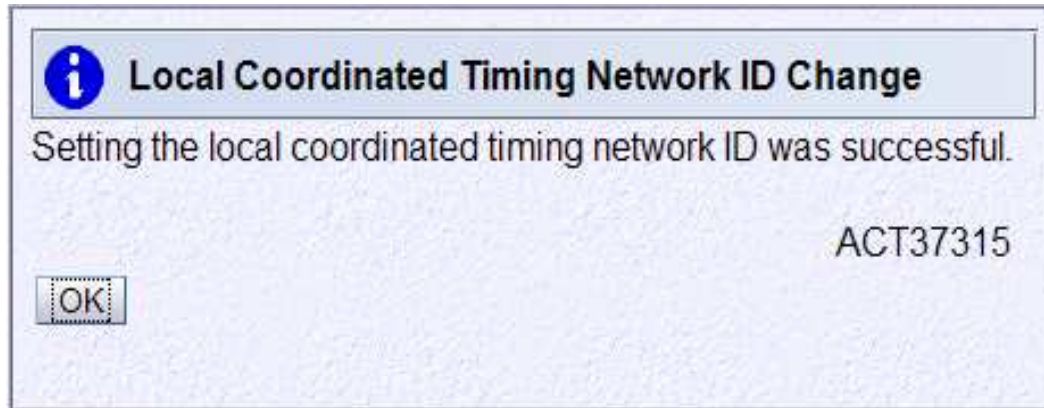
Apply | Save STP Debug Data

Refresh | Cancel | Help

CTN ID Configuration & Verification



CTN ID Configuration Verification



Unsolicited z/OS® acknowledgment message

**IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED
 FOR SYSTEM: JH0
 PREVIOUS ETR NETID: 01
 CURRENT CTNID: PETCTN -01**

Solicited via D ETR

```
IEA282I 11.24.16 TIMING STATUS
SYNCHRONIZATION MODE = ETR
CPC PORT 0 <==ACTIVE      CPC PORT 1
OPERATIONAL                OPERATIONAL
ENABLED                    ENABLED
ETRNETID=01                ETR NETID=01
ETRPORT=04                 ETR PORT=04
ETR ID=00                  ETR ID=01
THIS SERVER IS PART OFTIMING NETWORK PETCTN -01
```

STP Status - System (Sysplex) Time Task

System (Sysplex) Time

Timing Network | Network Configuration | ETR Configuration | ETR Status | STP Configuration | **STP Status**

Timing state: Synchronized
 Usable clock source: Yes
 Timing mode: ETR (External Time Reference)
 Stratum level: 1
 Maximum timing stratum level: 3
 Active STP version: 1
 Maximum STP version: 1

System Information

Local STP Link Identifier(s)	Remote Directly Attached System Type-Model-MFG-Plant-Sequence-Tag	System Name	Stratum Level	Active STP Version	Maximum STP Version

Local Uninitialized STP Links

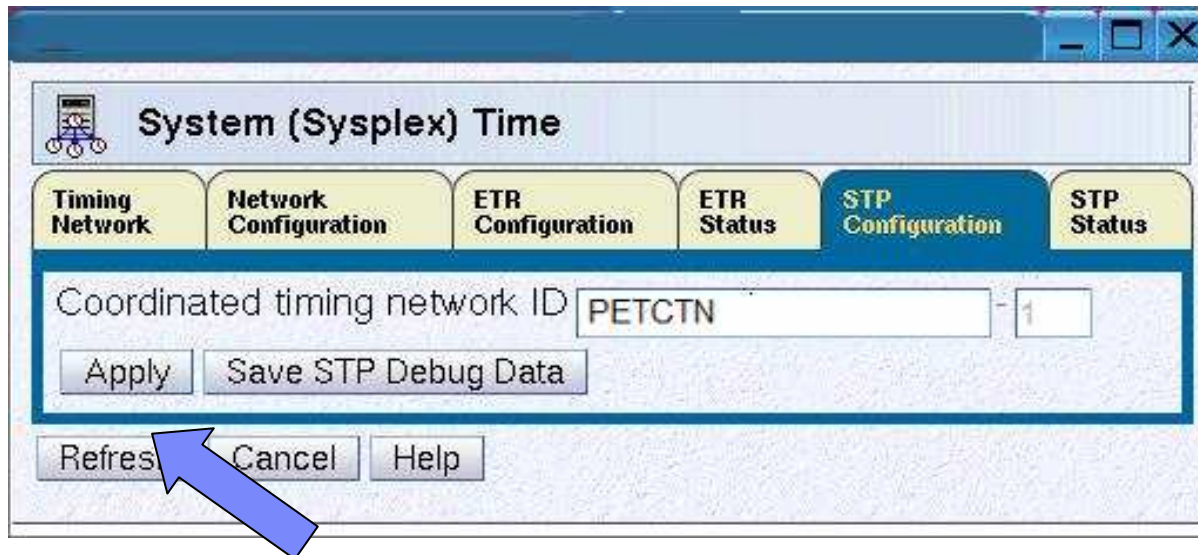
Local STP Link Identifier	STP Link Type	Uninitialized Reason Code	Detail Code
0018	Coupling-peer	Outgoing ESP command reject	Configuration error
001E	Coupling-peer	Outgoing ESP command reject	Configuration error
0118	Coupling-peer	Outgoing ESP command reject	Configuration error
0119	Coupling-peer	Outgoing ESP command reject	Configuration error
0180	Coupling-peer	Outgoing ESP command reject	CF response
0181	Coupling-peer	Outgoing ESP command reject	Configuration error
0188	Coupling-peer	Outgoing ESP command reject	CF response
0189	Coupling-peer	Outgoing ESP command reject	Configuration error

Refresh Cancel Help

Done

STP Configuration Panel

Configure a matching CTN ID on a second STP-enabled CPC



STP Status – Two Configured CPCs

This CPC maintains timing synchronization provided by the Sysplex Timers®

Two CPCs with matching CTN IDs are now successfully exchanging STP messages over 4 links

System (Sysplex) Time

Timing Network | Network Configuration | ETR Configuration | ETR Status | STP Configuration | **STP Status**

Timing state: Synchronized
 Usable clock source: Yes
 Timing mode: ETR (External Time Reference)
 Stratum level: 1
 Maximum timing stratum level: 3
 Active STP version: 1
 Maximum STP version: 1

System Information

Local STP Link Identifier(s)	Remote Directly Attached System Type-Model-MFG-Plant-Sequence-Tag	System Name	Stratum Level	Active STP Version	Maximum STP Version
0018,0108,0120,0128	002096-S07-IBM-02-0000000EE8ED-0000	K25	1	1	1

Local Uninitialized STP Links

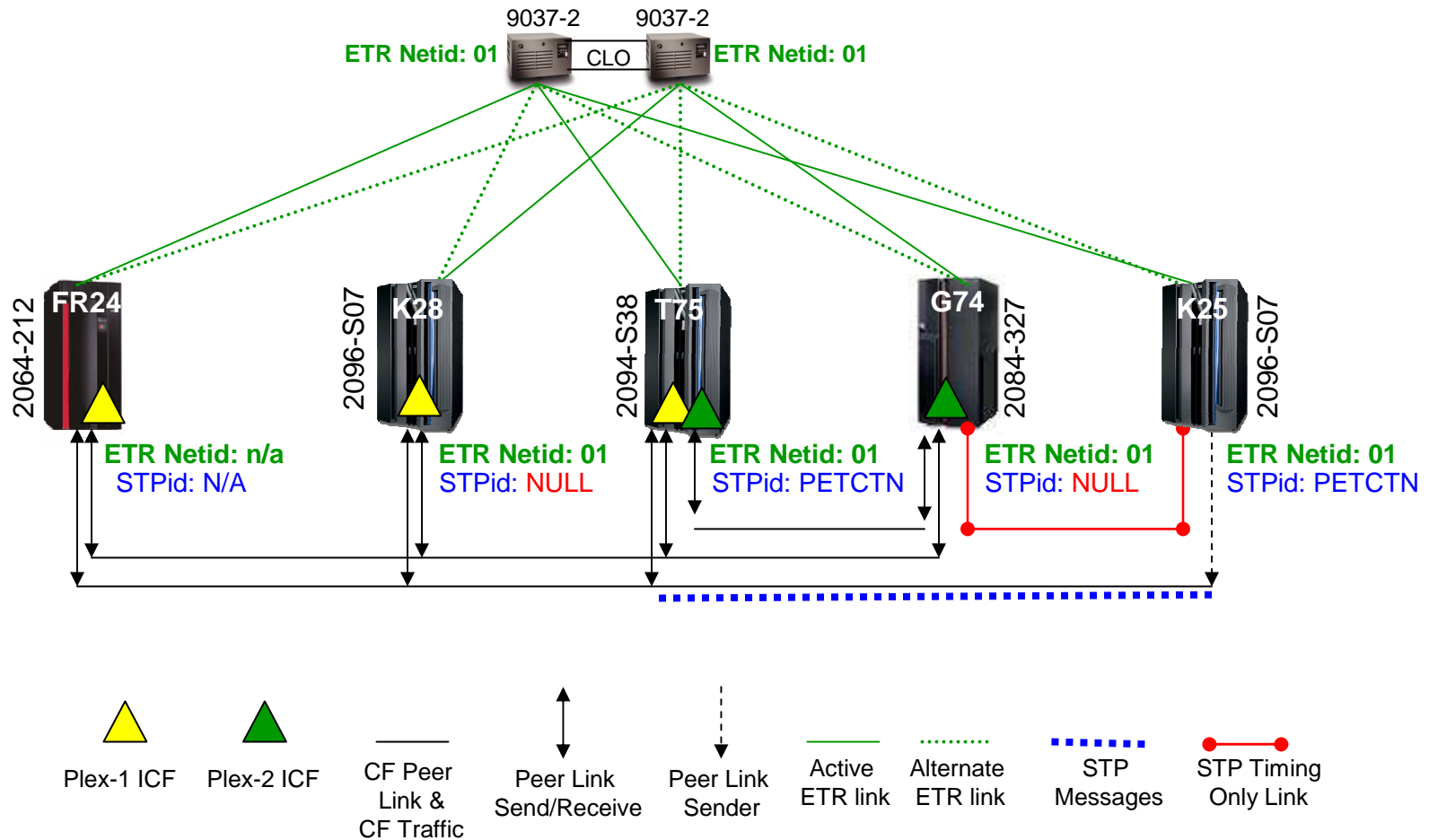
Local STP Link Identifier	STP Link Type	Uninitialized Reason Code	Detail Code
0016	Coupling-peer	Outgoing ESP command reject	Configuration error
001E	Coupling-peer	Outgoing ESP command reject	Configuration error
0100	Coupling-peer	Outgoing ESP command reject	CF response
0101	Coupling-peer	Outgoing ESP command reject	Configuration error
0109	Coupling-peer	Outgoing ESP command reject	CF response
0110	Coupling-peer	Outgoing ESP command reject	Configuration error
0111	Coupling-peer	Outgoing ESP command reject	CF response
0118	Coupling-peer	Outgoing ESP command reject	CF response

Refresh Cancel Help

Done

Mixed CTN Topology 2 STP-configured CPCs

STP signals are now being exchanged over existing CF peer links between the T75 and K25 CPCs



Lather, Rinse, Repeat...

All 4 of the STP-capable CPCs in the data center have now been successfully configured
K28, K25, T75 and the G74 CPC (G74 HMC view)

System (Sysplex) Time for G74

Timing state: Synchronized
 Usable clock source: Yes
 Timing mode: ETR (External Time Reference)
 Stratum level: 1
 Maximum timing stratum level: 3
 Active STP version: 1
 Maximum STP version: 1

System Information

Local STP Link Identifier(s)	Remote Directly Attached System Type-Model-MFG-Plant-Sequence-Tag	System Name	Stratum Level	Active STP Version	Maximum STP Version
0013,0101,0110,0111,0310,0318,0380,0490,0491,0508	002094-S54-IBM-02-0000000C299E-0000	T75	1	1	1
0023,0108,0300,0510	002096-S07-IBM-02-00000005430D-0000	K28	1	1	1
0100,0680	002096-S07-IBM-02-0000000EE8ED-0000	K25	1	1	1

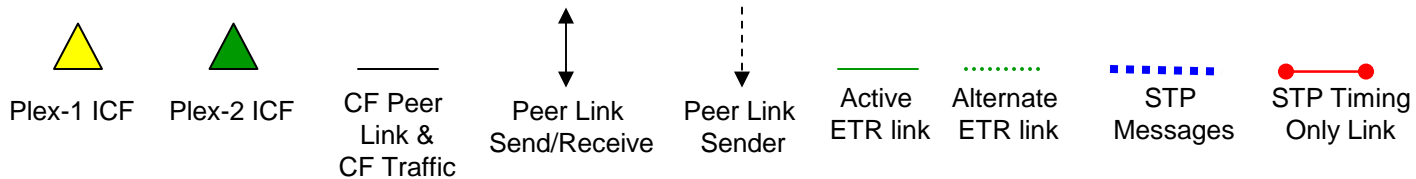
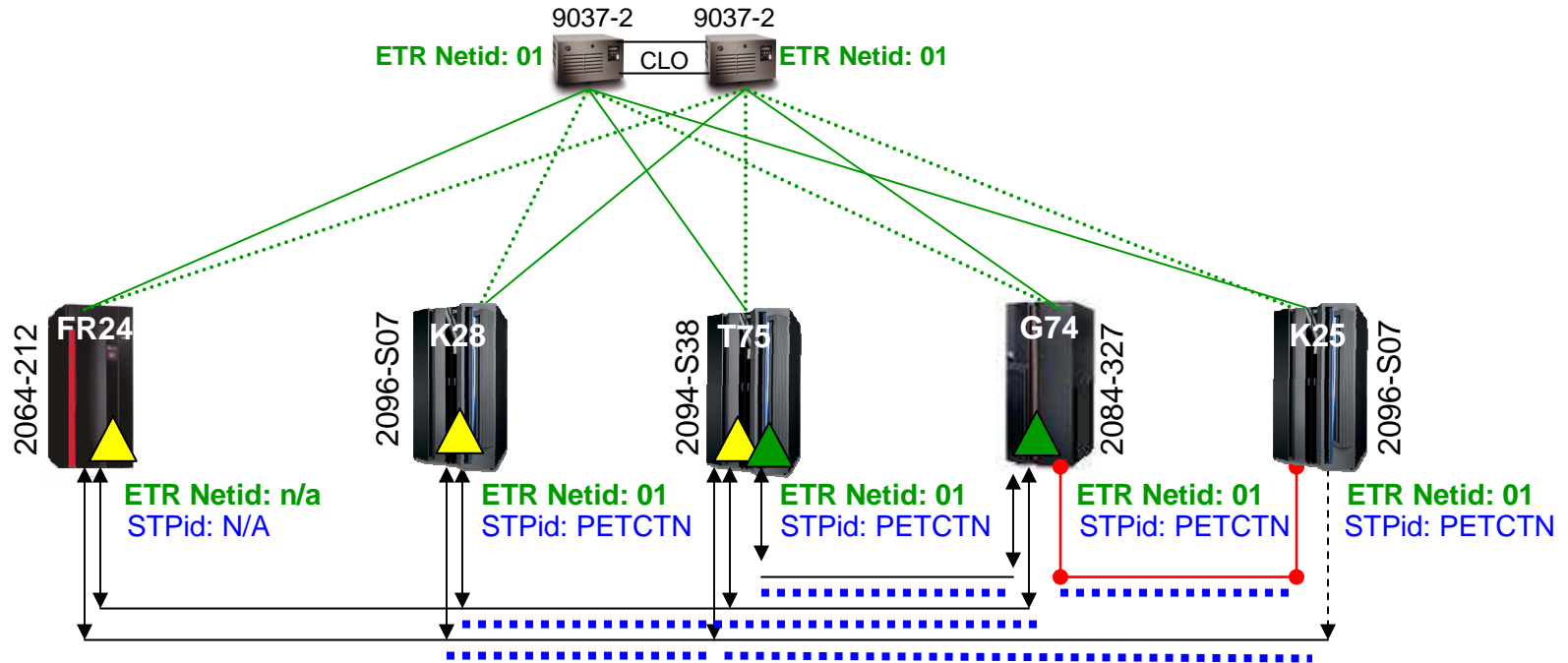
Local Uninitialized STP Links

Local STP Link Identifier	STP Link Type	Uninitialized Reason Code	Detail Code
0109	Coupling-peer	Outgoing ESP command reject	CF response
0118	Coupling-peer	Offline	
0119	Coupling-peer	Outgoing ESP command reject	CF response
02A0	Coupling-peer	Outgoing ESP command reject	CF response
02B0	Coupling-peer	Outgoing ESP command reject	CF response
0381	Coupling-peer	Offline	
0481	Coupling-peer	Outgoing ESP command reject	CF response
0500	Coupling-peer	Outgoing ESP command reject	CF response

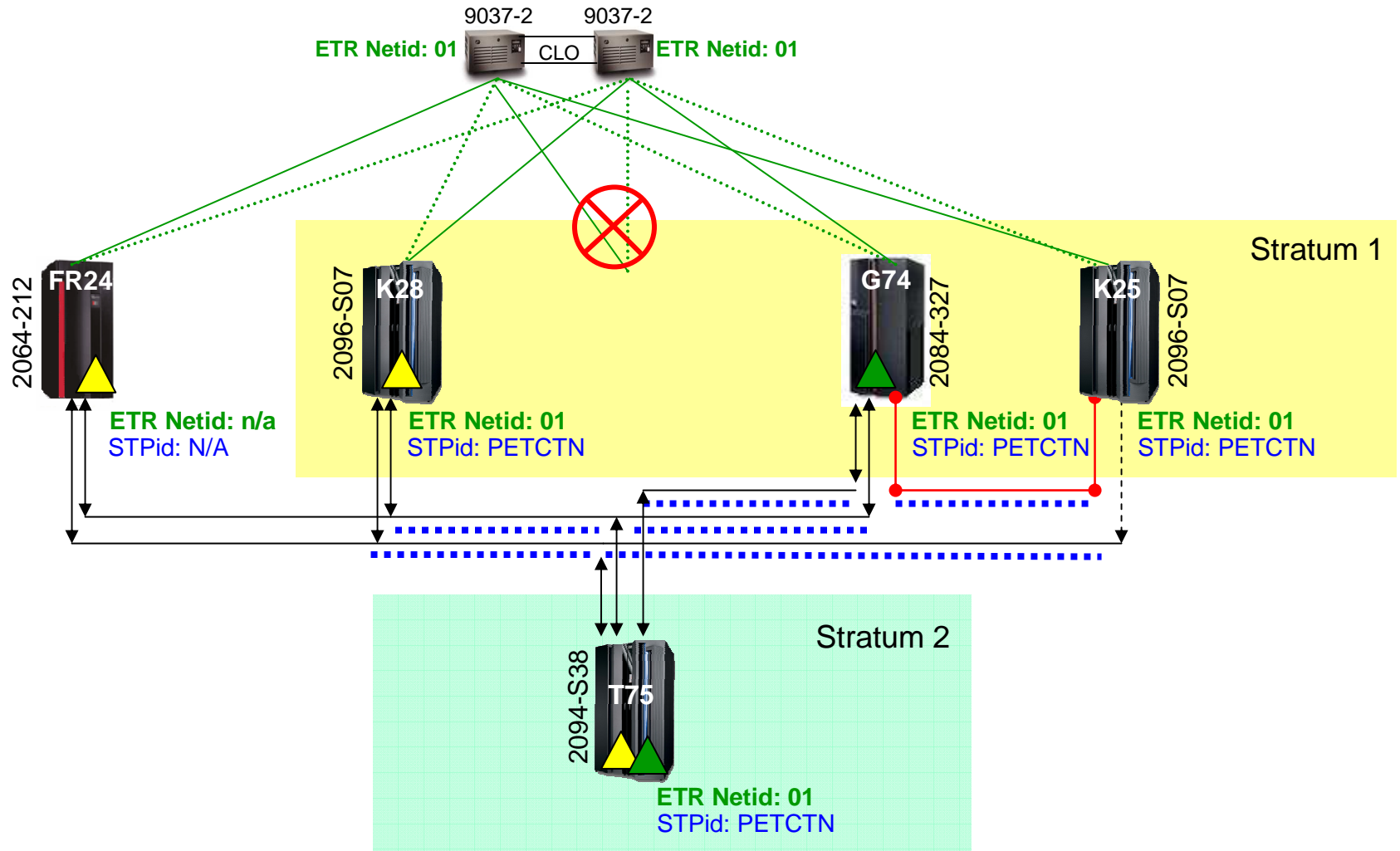
Buttons: Refresh, Cancel, Help

Done

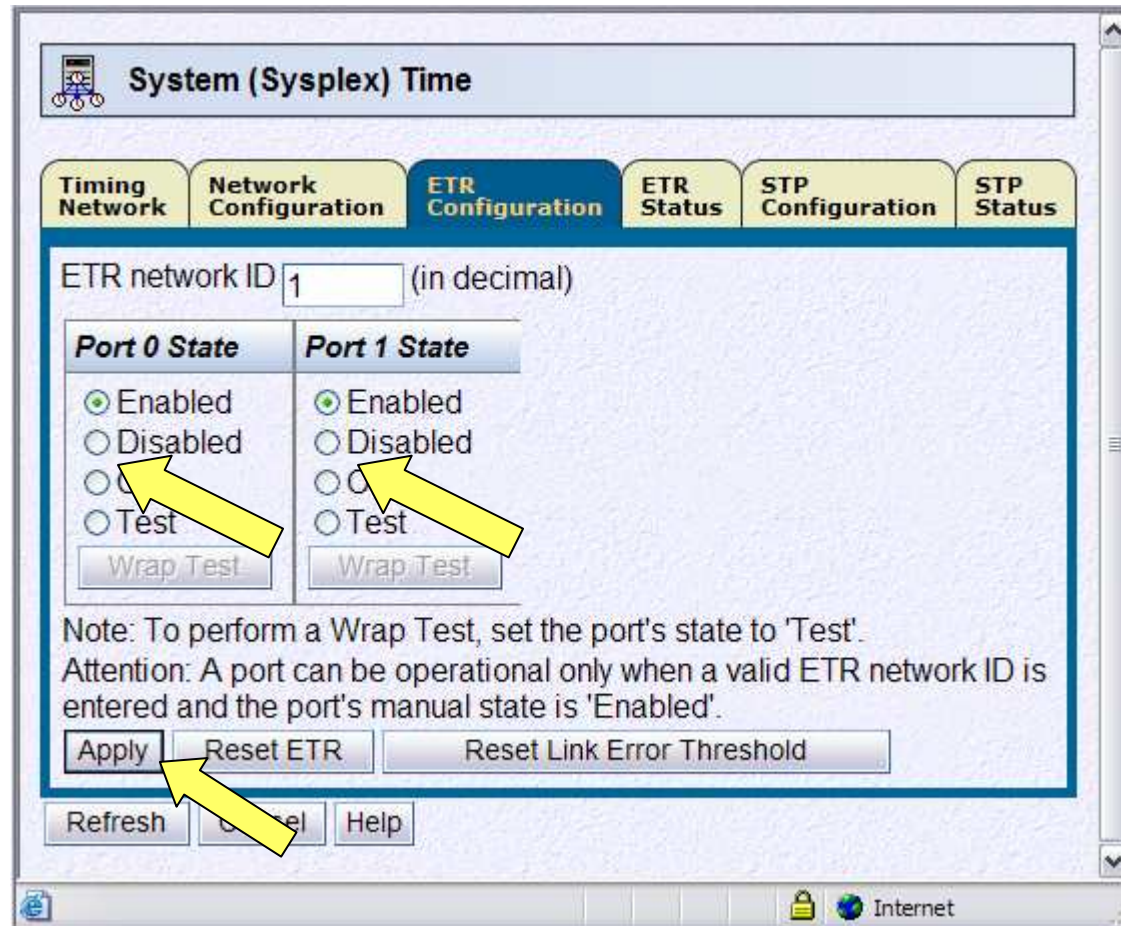
Mixed CTN Topology 4 STP-configured CPCs




Mixed CTN Topology Stratum 1 to Stratum 2 Transition



Mixed CTN Topology Stratum 1 to Stratum 2 Transition



Mixed CTN Topology Stratum 1 to Stratum 2 Transition

 **Port State Change Confirmation**

You have requested to change the manual state of an 'enabled' port.

The action you requested can result in active images being removed from the sysplex if you continue.

Do you want to continue to save the configuration changes?

ACT37388

Mixed CTN Topology Stratum 1 to Stratum 2 Transition

Apply ETR Configuration

The ETR configuration data was saved successfully.

To view the current status of the EAF ports, use the ETR Status page.
ACT37301



z/OS® images residing on the CPC where the ETR ports were disabled will post messages IEA393I and IEA380I

```
15:08:49.64 *IEA393I ETR PORT 0 IS NOT OPERATIONAL. THIS MAY BE A CTN  
CONFIGURATION CHANGE.
```

```
15:08:49.64 *IEA393I ETR PORT 1 IS NOT OPERATIONAL. THIS MAY BE A CTN  
CONFIGURATION CHANGE.
```

```
15:08:49.64 IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE.
```

z/OS Message ID Changed

The “Display ETR” (D ETR) command issued on any of the z/OS® images residing on the T75 CPC confirmed that they were operating on a Stratum 2 CPC

```
D ETR  
IEA386I 15.38.10 TIMING STATUS 798  
SYNCHRONIZATION MODE = STP  
THIS SERVER IS A STRATUM 2  
CTNID = PETCTN -01  
NUMBER OF USABLE TIMING LINKS = 17
```

It is important to note that the z/OS® message ID returned from the D ETR command has changed from **IEA282I** to **IEA386I** when **STP is configured on a CPC**. (May be a planning consideration for any automation product that keys off of this message ID).

In addition, the SYNCHRONIZATION MODE reflects that the CPC is now synchronized to the STP facility.

The rest of message IEA386I describes timing network information, such as the Stratum, the CTN ID and the number of usable peer links that the CPC is receiving timing signals over.

z/OS Message Enhanced

Issuing the z/OS “Display,XCF,Sysplex,All” command on any z/OS® image in the sysplex will also show that all of the z/OS® images operating on the T75 CPC have a Timing Mode (**TM=**) of **STP**.

D XCF,S,ALL

IXC335I 10.45.43 DISPLAY XCF 529

SYSTEM	TYPE	SERIAL	LPAR	STATUS	TIME	SYSTEM STATUS	TM=	
TPN		2064	1526		09	08/26/2006 10:45:38	ACTIVE	TM=ETR
J80		2094	299E		07	08/26/2006 10:45:43	ACTIVE	TM=STP
JC0		2084	B52A		0C	08/26/2006 10:45:38	ACTIVE	TM=ETR
Z0		2064	1526		01	08/26/2006 10:45:40	ACTIVE	TM=ETR
JA0		2084	B52A		2A	08/26/2006 10:45:40	ACTIVE	TM=ETR
JB0		2084	B52A		01	08/26/2006 10:45:38	ACTIVE	TM=ETR
J90		2064	1526		05	08/26/2006 10:45:38	ACTIVE	TM=ETR
JH0		2096	FE2D		01	08/26/2006 10:45:40	ACTIVE	TM=ETR
JF0		2094	299E		06	08/26/2006 10:45:40	ACTIVE	TM=STP
JE0		2084	B52A		22	08/26/2006 10:45:40	ACTIVE	TM=ETR

STP Status Panel Verifications

System (Sysplex) Time

Timing state: Synchronized
 Usable clock source: Yes
 Timing mode: STP (Server Time Protocol)
 Stratum level: 2
 Maximum timing stratum level: 3
 Active STP version: 1
 Maximum STP version: 1

System Information

Local STP Link Identifier(s)	Remote Directly Attached System Type-Model-MFG-Plant-Sequence-Tag	System Name	Stratum Level	Active STP Version	Maximum STP Version
0008,0100,0390	002096-S07-IBM-02-0000000EE8ED-0000	K25	1	1	1
0018,0180,0188,0190	002096-S07-IBM-02-00000005430D-0000	K28	1	1	1
0028,0181,0191,0198,0308,0310,04B0,04B1,0511,0519	002084-D32-IBM-00-00000001B52A-0000	G74	1	1	1

Local Uninitialized STP Links

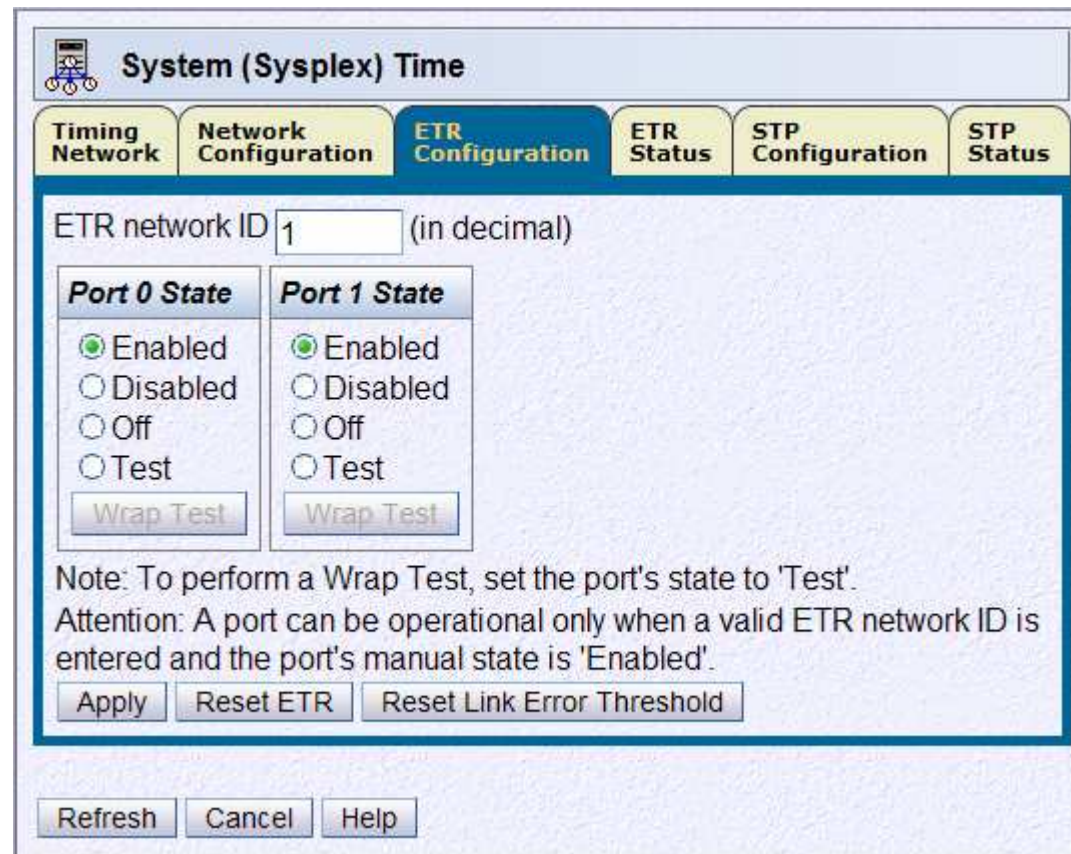
Local STP Link Identifier	STP Link Type	Uninitialized Reason Code	Detail Code
0101	Coupling-peer	Offline	
0290	Coupling-peer	Outgoing ESP command reject	CF response
02B0	Coupling-peer	Outgoing ESP command reject	CF response
02B1	Coupling-peer	Outgoing ESP command reject	CF response
0300	Coupling-peer	Outgoing ESP command reject	CF response
0301	Coupling-peer	Offline	
0318	Coupling-peer	Outgoing ESP command reject	CF response
0510	Coupling-peer	Outgoing ESP command reject	CF response

Buttons: Refresh, Cancel, Help

Status: Done

Mixed CTN Topology Stratum 2 to Stratum 1 Transition

The ETR Configuration panel is used to enable the ETR ports



The screenshot shows a web-based configuration interface for a network device. The main title is "System (Sysplex) Time". Below the title are several tabs: "Timing Network", "Network Configuration", "ETR Configuration" (which is selected and highlighted in blue), "ETR Status", "STP Configuration", and "STP Status".

Under the "ETR Configuration" tab, there is a text input field for "ETR network ID" with the value "1" and the text "(in decimal)" to its right. Below this are two columns of radio button options:

Port 0 State	Port 1 State
<input checked="" type="radio"/> Enabled	<input checked="" type="radio"/> Enabled
<input type="radio"/> Disabled	<input type="radio"/> Disabled
<input type="radio"/> Off	<input type="radio"/> Off
<input type="radio"/> Test	<input type="radio"/> Test

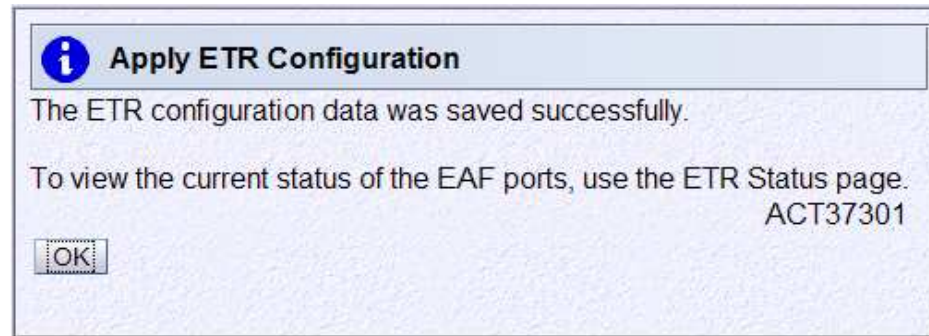
Below the radio buttons are two "Wrap Test" buttons, one for each port. At the bottom of the configuration area, there are three buttons: "Apply", "Reset ETR", and "Reset Link Error Threshold".

Below the configuration area, there are three buttons: "Refresh", "Cancel", and "Help".

Note: To perform a Wrap Test, set the port's state to 'Test'.
Attention: A port can be operational only when a valid ETR network ID is entered and the port's manual state is 'Enabled'.

Mixed CTN Topology Stratum 2 to Stratum 1 Transition

A panel confirming that the ETR ports were successfully enabled is then displayed

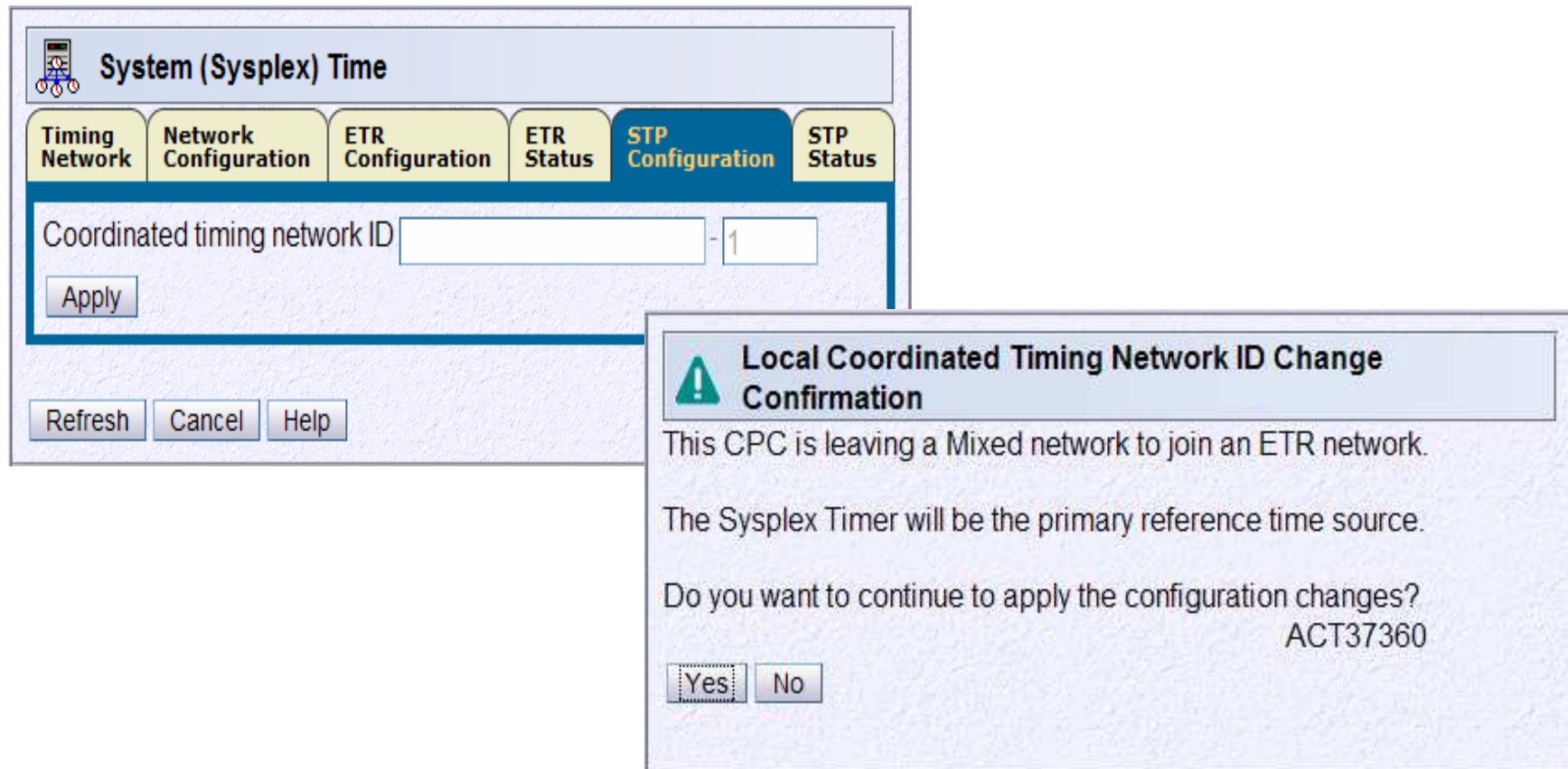


z/OS images residing on the respective CPC will post a message for each ETR port that has been enabled

**IEA267I ETR PORT 0 IS NOW AVAILABLE.
IEA267I ETR PORT 1 IS NOW AVAILABLE.
IEA260I THE CPC IS NOW OPERATING IN ETR MODE.
IEA273I TOD CLOCKS DYNAMICALLY ADVANCED TO MAINTAIN
ETR SYNCHRONISM.**

Mixed CTN to ETR Transition

The final step for completely reversing out of a Mixed CTN and returning to the original ETR timing mode is to remove the STP ID portion of the CTN ID for each STP-configured CPC



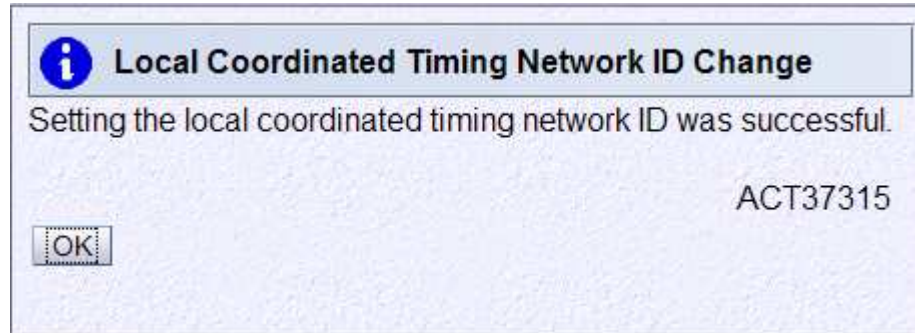
The screenshot displays the 'System (Sysplex) Time' configuration window. The 'STP Configuration' tab is active, showing a 'Coordinated timing network ID' field with a value of '1'. Below the field is an 'Apply' button. At the bottom of the window are 'Refresh', 'Cancel', and 'Help' buttons.

A confirmation dialog box is overlaid on the window. It has a title bar with a warning icon and the text 'Local Coordinated Timing Network ID Change Confirmation'. The dialog contains the following text:

This CPC is leaving a Mixed network to join an ETR network.
The Sysplex Timer will be the primary reference time source.
Do you want to continue to apply the configuration changes?
ACT37360

At the bottom of the dialog are 'Yes' and 'No' buttons.

Mixed CTN to ETR Transition



The following z/OS message captures illustrate how z/OS® recognized that the CTN ID had changed.

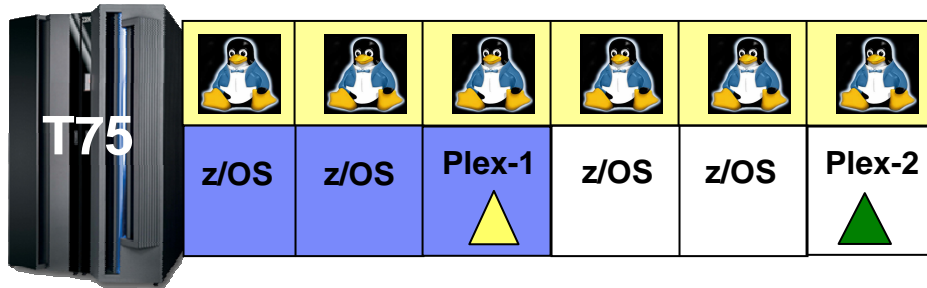
Unsolicited

**IXC438I COORDINATED TIMING INFORMATION
HAS BEEN UPDATED 717
FOR SYSTEM: JC0
PREVIOUS CTNID: PETCTN -01
CURRENT ETR NETID: 01**

Solicited

RO JB0,D ETR	
IEA282I 12.15.52 TIMING STATUS 448	
SYNCHRONIZATION MODE = ETR	
CPC PORT 0 <== ACTIVE	CPC PORT 1
OPERATIONAL	OPERATIONAL
ENABLED	ENABLED
ETR NET ID=01	ETR NET ID=01
ETR PORT=04	ETR PORT=04
ETR ID=00	ETR ID=01

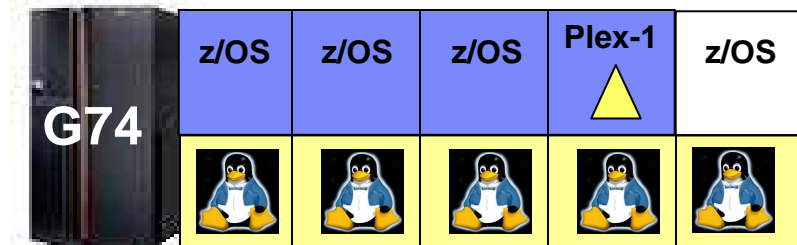
z/OS Integration Test Revised Data Center Topology



z9-EC: 2094-S38
392GB – 38CP

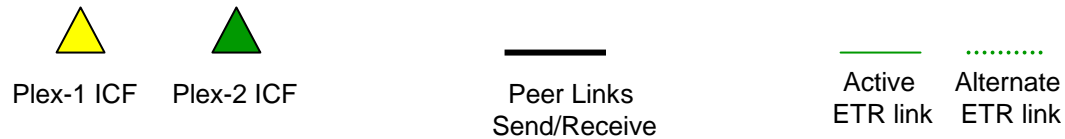
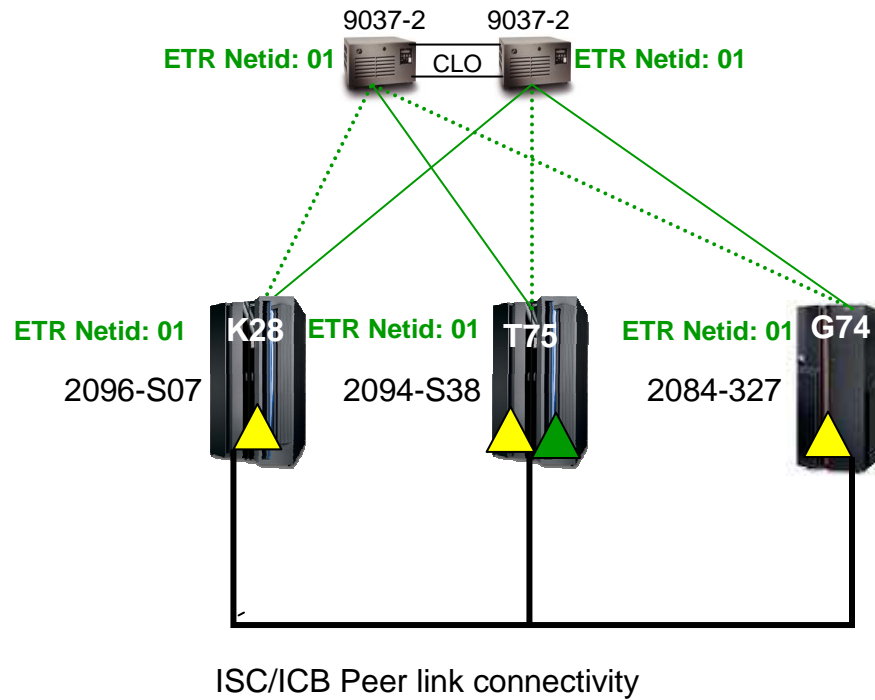


z9-BC : 2096-S07
8GB – 4 CP



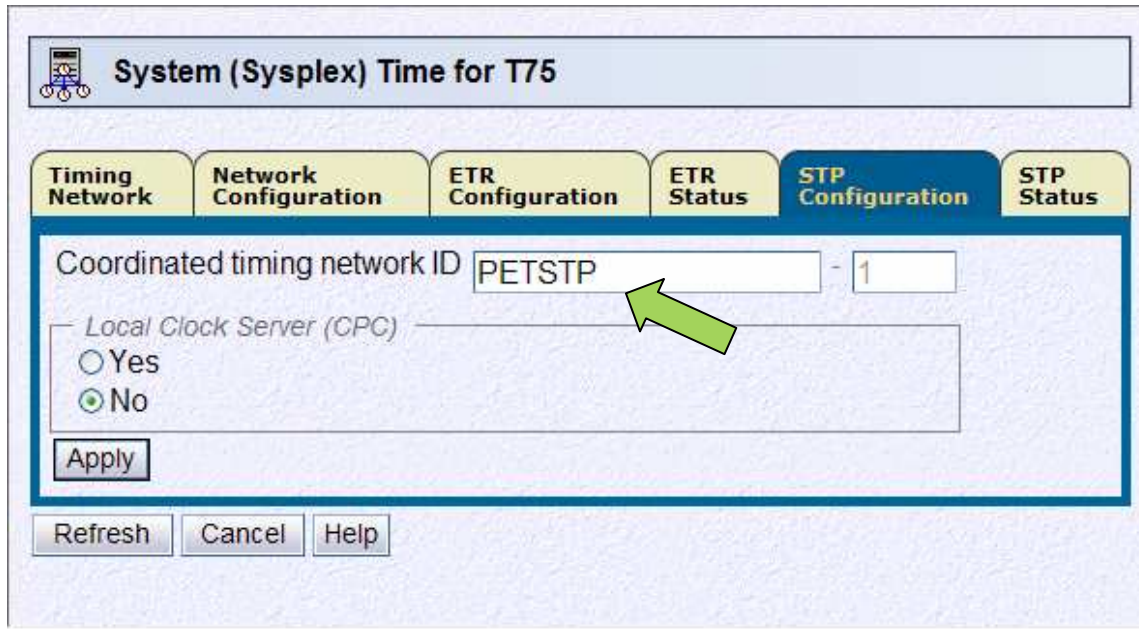
z990-D32 : 2084-325 160GB – 32CP

z/OS Integration Test Revised Sysplex Timer® Topology



STP Configuration Panel

Migration to a Mixed CTN: Configure the STPId portion of the CTNid



System (Sysplex) Time for T75

Timing Network Network Configuration ETR Configuration ETR Status **STP Configuration** STP Status

Coordinated timing network ID: PETSTP - 1

Local Clock Server (CPC)

Yes

No

Apply

Refresh Cancel Help

**IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 121
FOR SYSTEM: JF0
PREVIOUS ETR NETID: 01
CURRENT CTNID: PETSTP -01**

This message is repeated for all of the other images on the T75 CPC

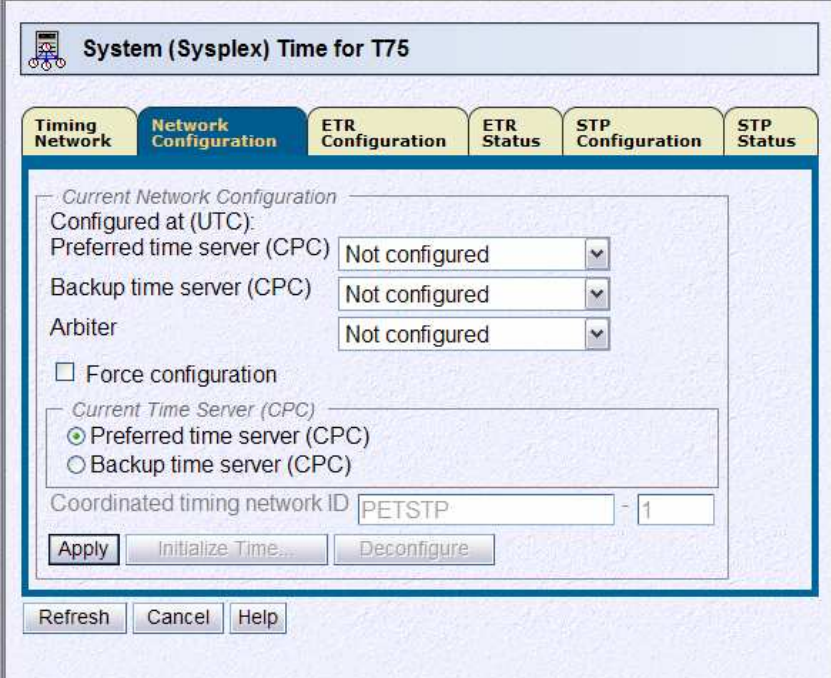
Preferred, Backup and Arbiter Assignments

At a minimum, a Preferred Time Server (PTS) must be selected.

- If additional CPCs are available, (i.e.: configured with matching CTNids), then selecting a Backup Time Server (BTS) is optional.
- If a Backup Time Server is selected, and another STP configured CPC is available, then an Arbiter can be selected.

Selection Criteria

- Location (if multi-site CTN)
- CPC Technology levels
- Maintenance considerations
 - CFCC upgrades is one example
- Available connectivity
 - even though Stand Alone Coupling Facility seems like a good choice, there are no z/OS messages to monitor



System (Sysplex) Time for T75

Timing Network | **Network Configuration** | ETR Configuration | ETR Status | STP Configuration | STP Status

Current Network Configuration

Configured at (UTC):

Preferred time server (CPC) Not configured

Backup time server (CPC) Not configured

Arbiter Not configured

Force configuration

Current Time Server (CPC)

Preferred time server (CPC)

Backup time server (CPC)

Coordinated timing network ID PETSTP - 1

Apply Initialize Time... Deconfigure

Refresh Cancel Help

Preferred, Backup and Arbiter Assignments

Our Selection Criteria

PTS: Preferred Time Server

- T75 most powerful and most current technology

CTS: Current Time Server

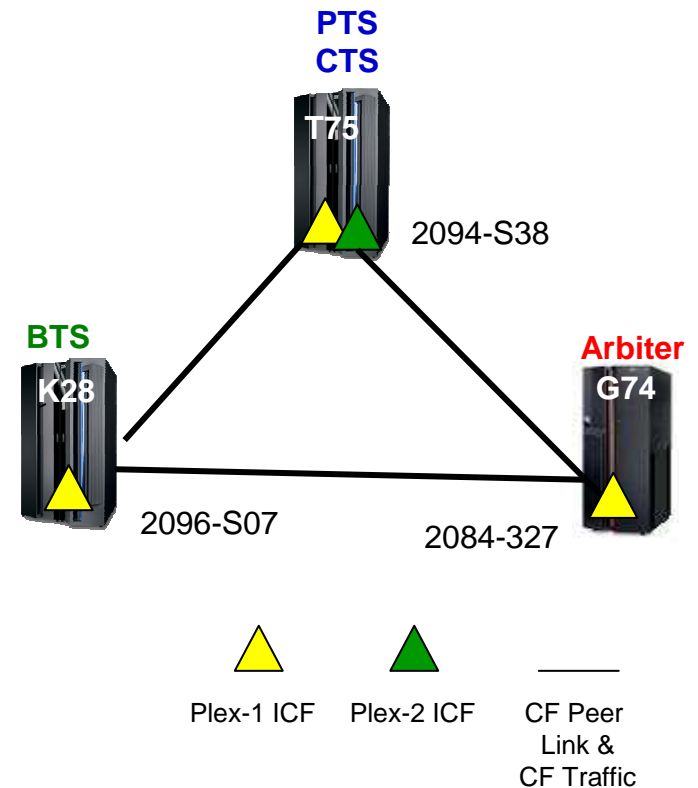
- Begin with the PTS being the CTS (default)
 - then move the CTS role over to the BTS later

BTS: Backup Time Server

- Our data center will be moving within the next 6-8 months
- K28 is the next highest, most current technology
 - K28 has redundant connectivity to all other CPCs
 - Downside: K28 is a SACF, so we will not receive any STP related z/OS messages
- Demonstrate CTS movement prior to data center move

Arbiter:

- G74: this is in support of a triad recommendation.



STP-Only Network Configuration

System (Sysplex) Time for T75

Timing Network | **Network Configuration** | ETR Configuration | ETR Status | STP Configuration | STP Status

Current Network Configuration

Configured at (UTC):

Preferred time server (CPC) **Not configured** ▼ **Drop Down list**

Backup time server (CPC) **Not configured**

Arbiter

Force configuration

Current Time Server (CPC)

Preferred time server (CPC)

Backup time server (CPC)

Coordinated timing network ID -

Apply Initialize Time... Deconfigure

Refresh Cancel Help

System (Sysplex) Time for T75

Timing Network | **Network Configuration** | ETR Configuration | ETR Status | STP Configuration | STP Status

Current Network Configuration

Configured at (UTC):

Preferred time server (CPC) **T75 (STP ID: PETSTP)** ▼

Backup time server (CPC) **K28 (STP ID: PETSTP)** ▼

Arbiter **G74 (STP ID: PETSTP)** ▼

Force configuration

Current Time Server (CPC)

Preferred time server (CPC)

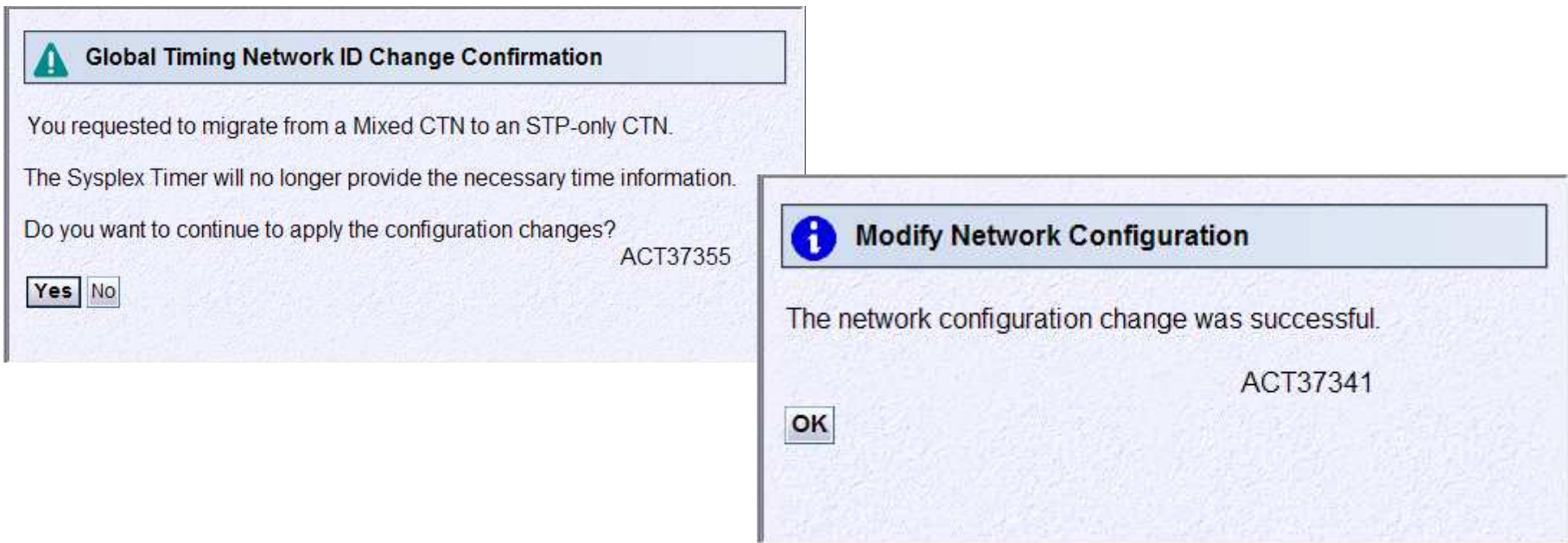
Backup time server (CPC)

Coordinated timing network ID -

Apply Initialize Time... Deconfigure

Refresh Cancel Help

STP-Only Network Configuration Messages



Global Timing Network ID Change Confirmation

You requested to migrate from a Mixed CTN to an STP-only CTN.
The Sysplex Timer will no longer provide the necessary time information.
Do you want to continue to apply the configuration changes? ACT37355

Modify Network Configuration

The network configuration change was successful.
ACT37341

Unsolicited z/OS messages

***IEA393I ETR PORT 0 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE.**
***IEA393I ETR PORT 1 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE.**
IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE.

z/OS STP-Only Network Configuration Messages

Unsolicited z/OS messages

IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 718
FOR SYSTEM: J80
PREVIOUS CTNID: PETSTP -01
CURRENT CTNID: PETSTP

*IXL162E CF REQUEST TIME ORDERING: **REQUIRED AND WILL NOT BE ENABLED** 147
COUPLING FACILITY 002084.IBM.00.0000000**1B52A**
PARTITION: 24 CPCID: 00
REASON: CTNID MISMATCH. CF CTNID: PETSTP

*IXL162E CF REQUEST TIME ORDERING: **REQUIRED AND WILL NOT BE ENABLED** 148
COUPLING FACILITY 002094.IBM.02.0000000**C299E**
PARTITION: 23 CPCID: 00
REASON: CTNID MISMATCH. CF CTNID: PETSTP

*IXL162E CF REQUEST TIME ORDERING: **REQUIRED AND WILL NOT BE ENABLED** 149
COUPLING FACILITY 002096.IBM.02.0000000**5B96F**
PARTITION: 01 CPCID: 00
REASON: CTNID MISMATCH. CF CTNID: PETSTP

STP-Only Network Configuration Messages

Unsolicited z/OS messages indicating that “XCF” recognizes the mismatched CTNid and will attempt to hold the sysplex together long enough...

```
*IXC439E ALL SYSTEMS IN SYSPLEX UTCPLXJ8 ARE NOT SYNCHRONIZED 724
  TO THE SAME TIME REFERENCE.
SYSTEM: JF0 IS USING CTNID: PETSTP -01
SYSTEM: J80 IS USING CTNID: PETSTP
SYSTEM: JA0 IS USING CTNID: PETSTP -01
SYSTEM: JB0 IS USING CTNID: PETSTP -01
SYSTEM: J90 IS USING CTNID: PETSTP -01
SYSTEM: JC0 IS USING CTNID: PETSTP -01
SYSTEM: JE0 IS USING CTNID: PETSTP -01
```

...so that the CTNid change can propagate across all of the systems in the sysplex.

```
*IXC439E ALL SYSTEMS IN SYSPLEX UTCPLXJ8 ARE NOT SYNCHRONIZED 129
  TO THE SAME TIME REFERENCE.
SYSTEM: JF0 IS USING CTNID: PETSTP
SYSTEM: J80 IS USING CTNID: PETSTP
SYSTEM: JA0 IS USING CTNID: PETSTP -01
SYSTEM: JB0 IS USING CTNID: PETSTP
SYSTEM: J90 IS USING CTNID: PETSTP
SYSTEM: JC0 IS USING CTNID: PETSTP
SYSTEM: JE0 IS USING CTNID: PETSTP
```

STP-Only Network Configuration Messages

Synchronized Timing was successfully propagated across all z/OS images and CFs

IXC435I ALL SYSTEMS IN SYSPLEX UTCPLXJ8 ARE **NOW SYNCHRONIZED** 531
TO THE SAME TIME REFERENCE.

SYSTEM: JF0 IS USING CTNID: PETSTP

SYSTEM: J80 IS USING CTNID: PETSTP

SYSTEM: JA0 IS USING CTNID: PETSTP

SYSTEM: JB0 IS USING CTNID: PETSTP

SYSTEM: J90 IS USING CTNID: PETSTP

SYSTEM: JC0 IS USING CTNID: PETSTP

SYSTEM: JE0 IS USING CTNID: PETSTP

IXL161I CF REQUEST TIME ORDERING: **REQUIRED AND ENABLED** 155
COUPLING FACILITY 002084.IBM.00.00000001**B52A**
PARTITION: 24 CPCID: 00

IXL161I CF REQUEST TIME ORDERING: **REQUIRED AND ENABLED** 156
COUPLING FACILITY 002094.IBM.02.00000000**C299E**
PARTITION: 23 CPCID: 00

IXL161I CF REQUEST TIME ORDERING: **REQUIRED AND ENABLED** 157
COUPLING FACILITY 002096.IBM.02.00000000**5B96F**
PARTITION: 01 CPCID: 00

STP-Only z/OS Display Messages

D ETR on a z/OS image running on the Current time server/Preferred time server

IEA386I 11.48.49 TIMING STATUS

SYNCHRONIZATION MODE = STP

THIS SERVER IS A STRATUM 1

CTN ID = PETSTP

THE STRATUM 1 NODE ID = 002094.S54.IBM.02.0000000C299E

THIS IS THE PREFERRED TIME SERVER

D ETR command to a z/OS image running on the Arbiter server

IEA386I 11.51.38 TIMING STATUS SYNCHRONIZATION MODE = STP

THIS SERVER IS A STRATUM 2

CTN ID = PETSTP

THE STRATUM 1 NODE ID = 002094.S54.IBM.02.0000000C299E

THIS IS THE ARBITER SERVER

NUMBER OF USABLE TIMING LINKS = 8

D XCF,S,ALL command now shows:

IXC335I 11.48.43 DISPLAY XCF

SYSTEM	TYPE	SERIAL	LPAR	STATUS	TIME	SYSTEM STATUS
J80	2094	299E	07	06/30/2007	11:48:43	ACTIVE TM=STP
JC0	2084	B52A	0C	06/30/2007	11:48:38	ACTIVE TM=STP
JA0	2084	B52A	2A	06/30/2007	11:48:40	ACTIVE TM=STP
JB0	2084	B52A	01	06/30/2007	11:48:38	ACTIVE TM=STP
J90	2094	299E	05	06/30/2007	11:48:38	ACTIVE TM=STP
JF0	2094	299E	06	06/30/2007	11:48:40	ACTIVE TM=STP
JE0	2084	B52A	22	06/30/2007	11:48:40	ACTIVE TM=STP

STP-Only Panel Verifications

System (Sysplex) Time for T75

Timing Network | Network Configuration | ETR Configuration | ETR Status | **STP Configuration** | STP Status

Coordinated Server Time
Time: 11:42:38 AM
Date: 6/30/07

Offsets
Leap second: 0
Total time (hours : minutes): -4 : 00

Network
Timing network type: STP-only CTN
Coordinated timing network (CTN) ID: PETSTP -
CTN time source: Time inherited from a previous connection to a Sysplex Timer

Adjustment Steering... Adjust Time... Adjust Leap Seconds... Adjust Time Zone...

Refresh Cancel Help

System (Sysplex) Time for T75

Timing Network | Network Configuration | **ETR Configuration** | ETR Status | STP Configuration | STP Status

ETR network ID (in decimal)

Port 0 State
 Enabled
 Disabled
 Off
 Test
 Wrap Test

Port 1 State
 Enabled
 Disabled
 Off
 Test
 Wrap Test

Note: To perform a Wrap Test, set the port's state to 'Test'.
 Attention: A port can be operational only when a valid ETR network ID is entered and the port's manual state is 'Enabled'.

Apply Reset ETR Reset Link Error Threshold

Refresh Cancel Help

System (Sysplex) Time for T75

Timing Network | Network Configuration | ETR Configuration | ETR Status | **STP Configuration** | STP Status

Coordinated timing network ID -

Local Clock Server (CPC)
 Yes
 No

Apply

Refresh Cancel Help

STP-Only Panel Verification – STP Status

System (Sysplex) Time for T75

Timing Network
Network Configuration
ETR Configuration
ETR Status
STP Configuration
STP Status

Timing state: Synchronized
 Usable clock source: Yes
 Timing mode: STP (Server Time Protocol)
 Stratum level: 1 ←
 Maximum timing stratum level: 3 ←
 Active STP version: 1
 Maximum STP version: 1

System Information

Local STP Link Identifier(s)	Remote Directly Attached System Type-MFG-Plant-Sequence	System Name	Stratum Level	Active STP Version	Maximum STP Version
0018,0180,0188,0190	002096-IBM-02-00000005B96F	K28	2 ←	1	1
0028,0181,0191,0198	002084-IBM-00-00000001B52A	G74	2 ←	1	1

Local Uninitialized STP Links

Local STP Link Identifier	STP Link Type	Uninitialized Reason Code	Detail Code
0008	Coupling-peer	Link failure	
0101	Coupling-peer	Offline	
0290	Coupling-peer	Link failure	
02B0	Coupling-peer	Link failure	
02B1	Coupling-peer	Link failure	
0300	Coupling-peer	Link failure	
0301	Coupling-peer	Offline	
0319	Coupling-peer	Link failure	

Refresh Cancel Help

STP-Only Reverse Transition Back to a Mixed CTN

System (Sysplex) Time

Timing Network | **Network Configuration** | ETR Configuration | ETR Status | STP Configuration | STP Status

Current Network Configuration
 Configured at (UTC): 6/30/07 9:27:00 PM
 Preferred time server (CPC): T75 (STP ID: PETSTP)
 Backup time server (CPC): K28 (STP ID: PETSTP)
 Arbiter: G74 (STP ID: PETSTP)

Force configuration

Current Time Server (CPC)
 Preferred time server (CPC)
 Backup time server (CPC)

Coordinated timing network ID: PETSTP - 1

Apply Initialize Time... Deconfigure Cancel Migration to...

Refresh Cancel Help

Migration to Mixed CTN Confirmation

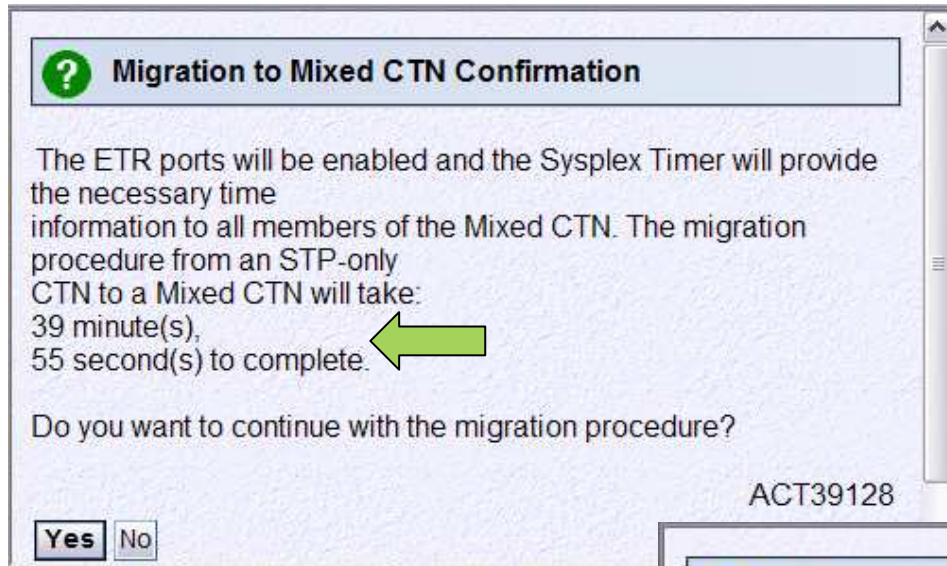
You requested to migrate from an STP-only CTN to a Mixed CTN. This request affects all members of the STP-only CTN. The Current Time Server (CPC) will no longer provide the necessary time information to all members of the STP-only CTN. Verify that the ETR network ID portion of the CTN ID you entered is the same as the ETR network ID of the Sysplex Timer that this server (CPC) is connected to.

Do you want to start the migration procedure?

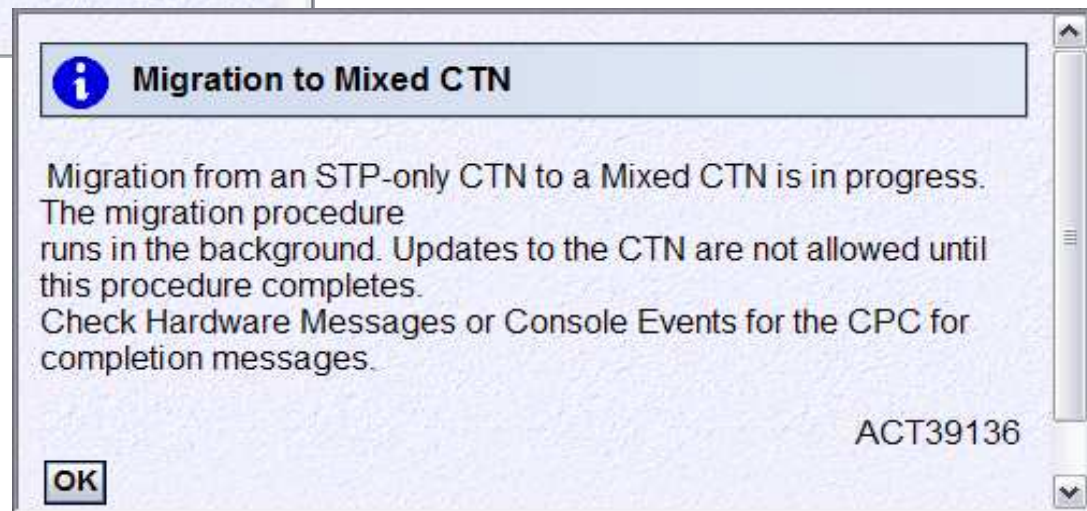
ACT37354

Yes No

STP-Only Reverse Transition to Mixed CTN Confirmation without ETS



Wish we had an ETS connection...
...would not have to wait nearly 40 minutes
to synchronize back to the Sysplex Timers.



STP-Only Reverse Transition to Mixed CTN In Progress

System (Sysplex) Time

Timing Network | **Network Configuration** | ETR Configuration | ETR Status | STP Configuration | STP Status

Current Network Configuration

Configured at (UTC): 6/30/07 9:27:00 PM

Preferred time server (CPC): T75 (STP ID: PETSTP) ▼

Backup time server (CPC): K28 (STP ID: PETSTP) ▼

Arbiter: G74 (STP ID: PETSTP) ▼

Force configuration

Current Time Server (CPC)

Preferred time server (CPC)

Backup time server (CPC)

Coordinated timing network ID: PETSTP -

Apply | Initialize Time... | Deconfigure | **Cancel Migration to Mixed CTN** ←

Note: The migration procedure from an STP-only CTN to a Mixed CTN is in progress. Some task buttons have been disabled because updates to the CTN are not allowed until this procedure completes.

Refresh | Cancel | Help

STP-Only Reverse Transition to Mixed CTN Panel Verifications

System (Sysplex) Time

Timing Network | Network Configuration | ETR Configuration | ETR Status | STP Configuration | STP Status

Timing state: Synchronized
 Usable clock source: Yes
 Timing mode: ETR (External Time Reference) ←
 Stratum level: 1
 Maximum timing stratum level: 3
 Active STP version: 1
 Maximum STP version: 1

System Information

Local STP Link Identifier(s)	Remote Directly Attached System Type-MFG-Plant-Sequence	System Name	Stratum Level	Active STP Version	Maximum STP Version
001E,0110,0121,0131	002094-IBM-02-0000000C299E	T75	1	1	1
0016,0101,0130,0139	002084-IBM-00-00000001B52A	G74	2	1	1

Local Uninitialized STP Links

Local STP Link Identifier	STP Link Type	Uninitialized Reason Code	Detail Code
0018	Coupling-peer	Offline	
0100	Coupling-peer	Link failure	
0109	Coupling-peer	Link failure	
0111	Coupling-peer	Link failure	
0118	Coupling-peer	Link failure	
0129	Coupling-peer	Link failure	
0138	Coupling-peer	Link failure	

Refresh Cancel Help

System (Sysplex) Time

Timing Network | Network Configuration | ETR Configuration | ETR Status | STP Configuration | STP Status

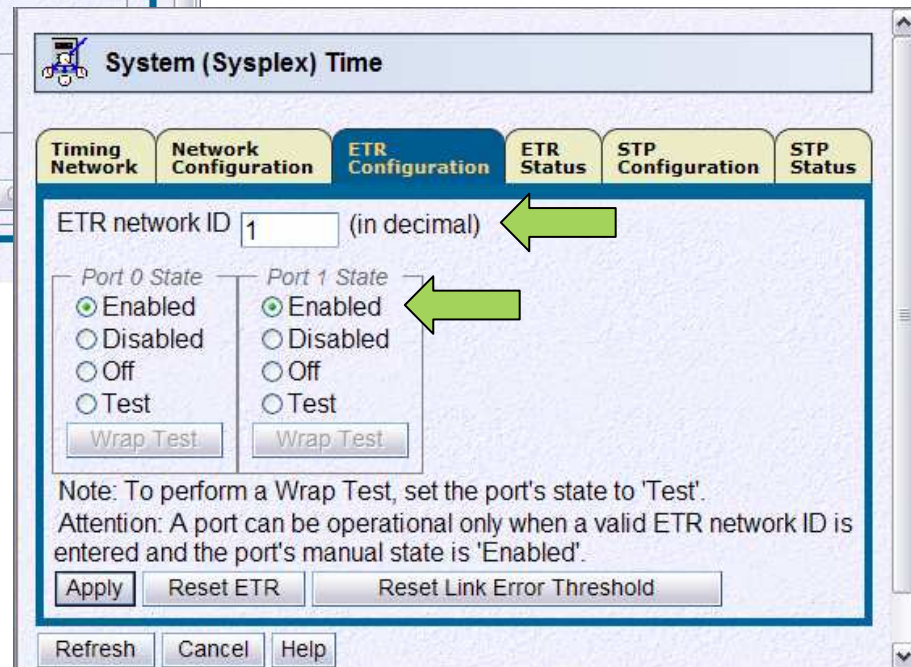
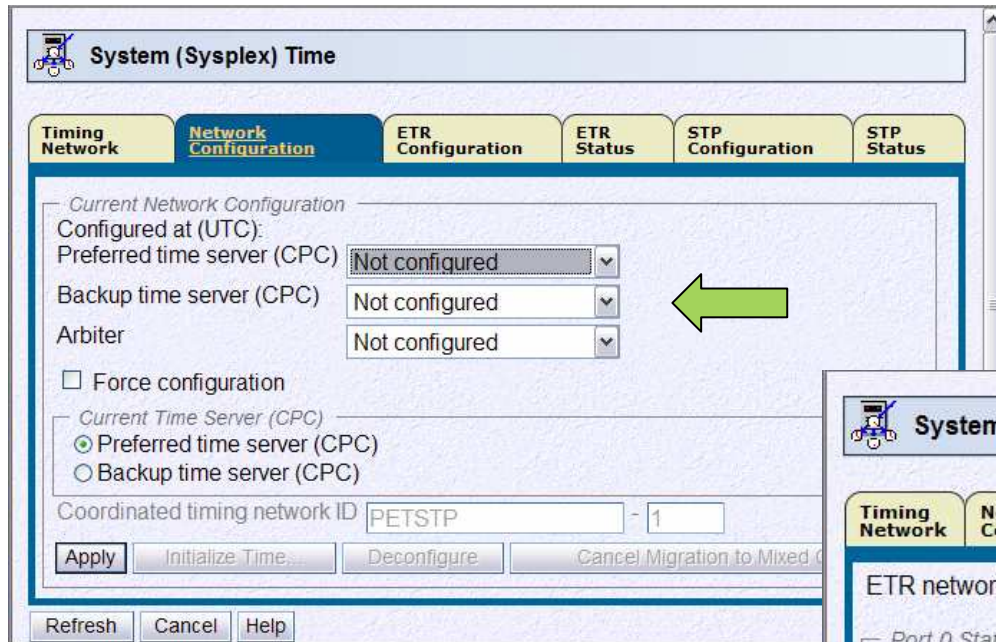
Coordinated Server Time
 Time: 6:41:22 PM
 Date: 6/30/07

Offsets
 Leap second: 0
 Total time (hours : minutes): -4 : 00

Network
 Timing network type: Mixed CTN ←
 Coordinated timing network (CTN) ID: PETSTP - 1
 CTN time source: Sysplex Timer connection

Refresh Cancel Help

STP-Only Reverse Transition to Mixed CTN Panel Verifications



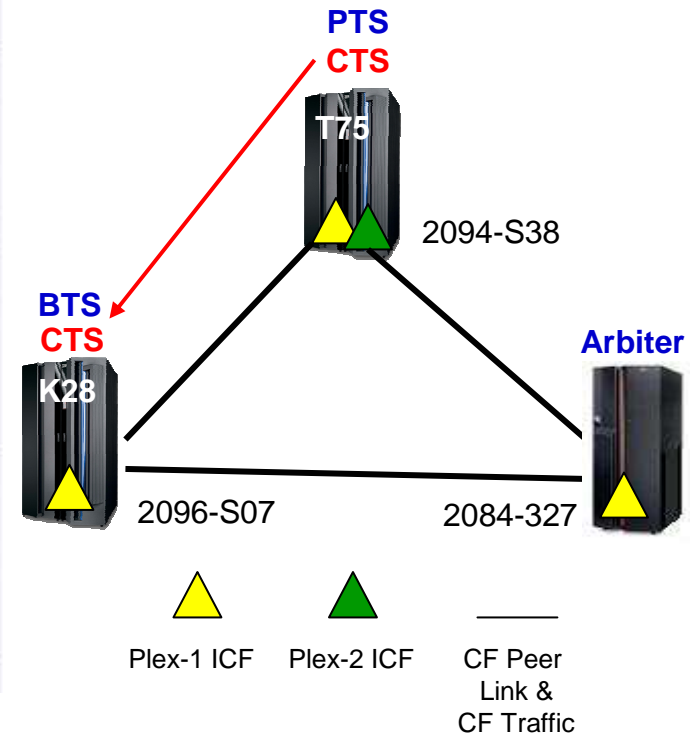
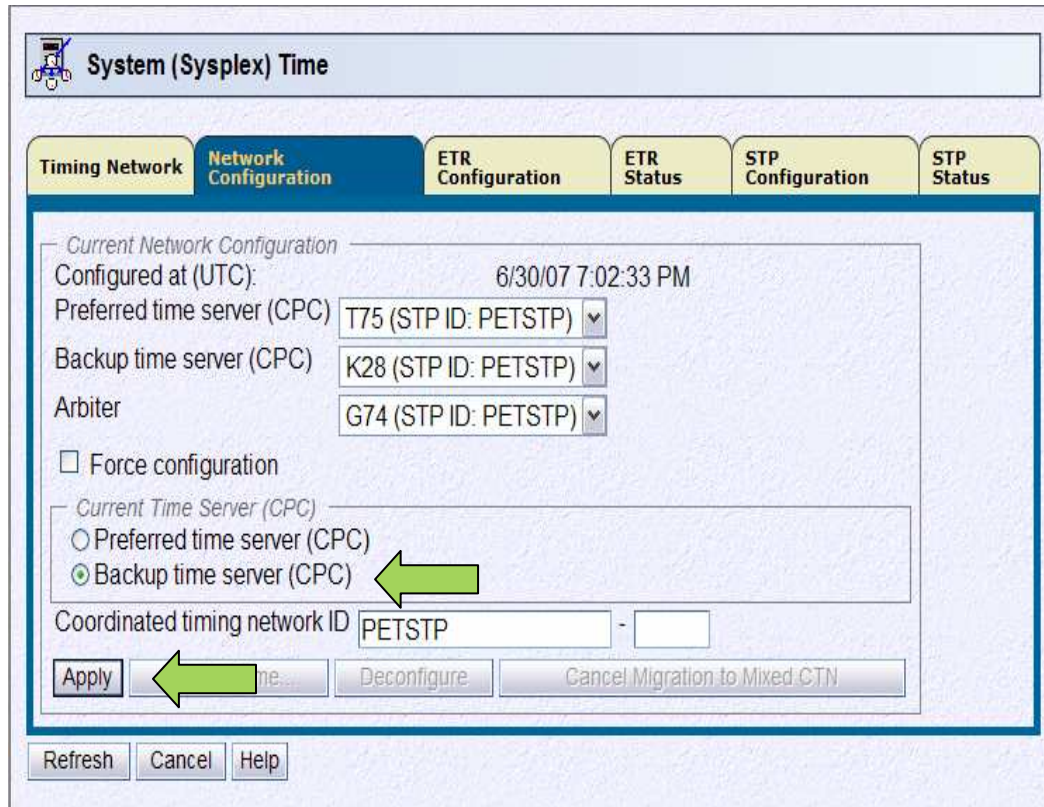


Questions?




Backup

CTS Reassignment




From the BTS (K28) System (Sysplex) Time Task...
 ...the CTS assignment is “pulled” from the PTS (T75)
 ...not “pushed” to the BTS
 in other words, this configuration change is initiated from the BTS, not from the PTS

STP-Only CTS Reassignment Confirmations

 **Network Configuration Change Confirmation**

You requested to change the network configuration of your STP-only CTN.
Do you want to continue to apply the configuration changes?

ACT37357

 **Modify Network Configuration**

The network configuration change was successful.

ACT37341

STP-Only CTS Reassignment Confirmations

No messages originate from the SACF (K28) which is now the CTS.

Therefore, issuing a D ETR to a z/OS image on each CEC will show...

- ...the Preferred Time Server is no longer the CTS, or it would be the Stratum 1 node
- ...that both of these CECs are now at **Stratum 2**
- ...the Stratum 1 **node descriptor** matches that of the K28 SACF
- ...the **Arbiter** has not changed roles, or Stratum level

```
IEA386I 18.20.13 TIMING STATUS    FRAME LAST F   E  SYS=J80
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 2
CTN ID = PETSTP
THE STRATUM 1 NODE ID = 002096.S07.IBM.02.00000005B96F
THIS IS THE PREFERRED TIME SERVER
NUMBER OF USABLE TIMING LINKS = 8
```

```
IEA386I 18.21.38 TIMING STATUS    FRAME LAST F   E  SYS=JA0
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 2
CTN ID = PETSTP
THE STRATUM 1 NODE ID = 002096.S07.IBM.02.00000005B96F
THIS IS THE ARBITER SERVER
NUMBER OF USABLE TIMING LINKS = 8
```

STP-Only CTS Reassignment Panel Confirmations

System (Sysplex) Time

Timing Network | Network Configuration | ETR Configuration | ETR Status | **STP Configuration** | STP Status

Timing state: Synchronized
 Usable clock source: Yes
 Timing mode: STP (Server Time Protocol)
 Stratum level: 1

Maximum timing stratum level: 3
 Active STP version: 1
 Maximum STP version: 1

System Information

Local STP Link Identifier(s)	Remote Directly Attached System Type-MFG-Plant-Sequence	System Name	Stratum Level	Active STP Version	Maximum STP Version
001E,0110,0121,0131	002094-IBM-02-0000000C299E	T75	2	1	
0016,0101,0130,0139	002084-IBM-00-00000001B52A	G74	2	1	

Local Uninitialized STP Links

Local STP Link Identifier	STP Link Type	Uninitialized Reason Code	Detail Code
0018	Coupling-peer	Offline	
0100	Coupling-peer	Link failure	
0109	Coupling-peer	Link failure	
0111	Coupling-peer	Link failure	
0118	Coupling-peer	Link failure	
0129	Coupling-peer	Link failure	
0138	Coupling-peer	Link failure	

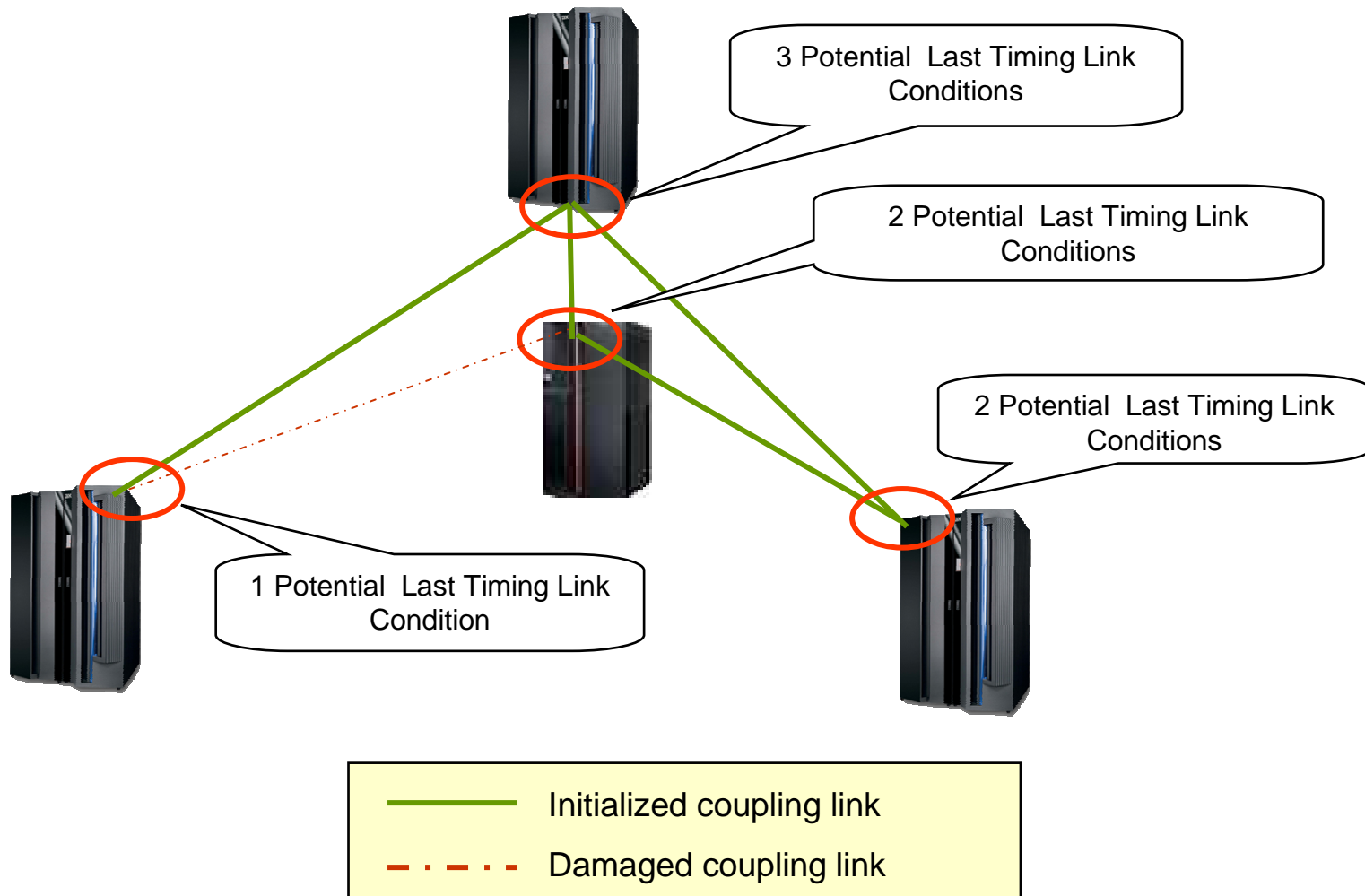
Refresh | Cancel | Help

Server Time Protocol “Last Path Validation”

the “last timing link...”

- ❑ ...is the last coupling link that is being used to deliver STP timing between two IBM System z servers (z9 EC, z9 BC, zSeries® 890 and 990)
 - A single server can potentially have multiple “last timing links”
 - Therefore, the “last timing link” is not necessarily the server’s last online coupling link
- ❑ A “last timing link” condition occurs when the following two conditions are true:
 1. The Physical Channel Identifier (PCHID) is initialized for STP timing and is the only remaining PCHID between two IBM System z servers (z9 EC, z9 BC, zSeries® 890 and 990)...
 - ...in either a Mixed or STP-only Coordinated Timing Network (CTN)
 2. The Channel Path Identifier (CHPID) status is online to only one logical partition...
 - ...the CHPID has only one partition remaining in its access list.
- ❑ Loss of the “last timing link” may cause a loss of timing synchronization for all system images on the server that is being synchronized (Stratum 2 or Stratum 3).
 - ...in either a Mixed, or in an STP-only CTN

A thousand words...



Server Time Protocol “Last Path Validation”

z/OS Safeguards are provided to prevent accidentally removing a “last timing link”

New messages in z/OS® V1R7 and higher indicate when a “last timing link” condition exists

IEA382I THIS SERVER HAS ONLY A SINGLE LINK AVAILABLE FOR TIMING PURPOSES

- ***Unsolicited Informational message that is issued when z/OS® V1R7 (and higher) recognizes that the server it resides on has gone from having more than one “STP initialized coupling link” connected to another server down to having only one “STP initialized coupling link” connected to that same server.***
 - “STP Initialized coupling link” is when STP messages are successfully being exchanged between two IBM System z servers (z9 EC, z9 BC, zSeries® 890 and 990) over the respective externally defined coupling link.

IEE148I CHP(xx) NOT RECONFIGURED - WOULD REMOVE A CPC-CRITICAL STP TIMING LINK

- ***In response to explicit CHPID reconfiguration attempts on z/OS® V1R7 or higher servers***
 - CF CHP(xx),OFF
 - CF CHP(xx),OFF,FORCE

Must now use either the Hardware Management Console (HMC), or the Support Element (SE) to reconfigure the Channel Path off for this “last timing link”

IEE148I CHP(xx) NOT RECONFIGURED - SERVICE PROCESSOR FAILURE

- ***While this is not a new message, it will also be issued on z/OS® V1R6 (and earlier) systems when an attempt is made to remove a “last timing link” .***
 - **z/OS® V1R6 (or earlier) levels neither support, nor recognize the STP feature.**
 - However, z/OS® V1R6 (or earlier) can still reside on servers that are configured in a STP Mixed CTN as long as the server(s) they reside on remain connected to at least one IBM 9037 Sysplex Timer®.

STP Last Path Validation HMC Chpid Reconfiguration

Must use the HMC (or SE) to reconfigure the last Channel Path off

Configure Channel Path On/Off

Toggle the CHPIDs to the desired state, then click "Apply".
 If there is a "Not allowed" Message for a CHPID, then click "Details..." to get more information.
 The operating system will not be notified when CHPIDs are configured off.
 The next operation from the operating system to the CHPID will cause an error.
 If possible, configure CHPIDs using the operating system facilities, rather than the Hardware Management Console (HMC)

Image name: K25 ZOSEJH0

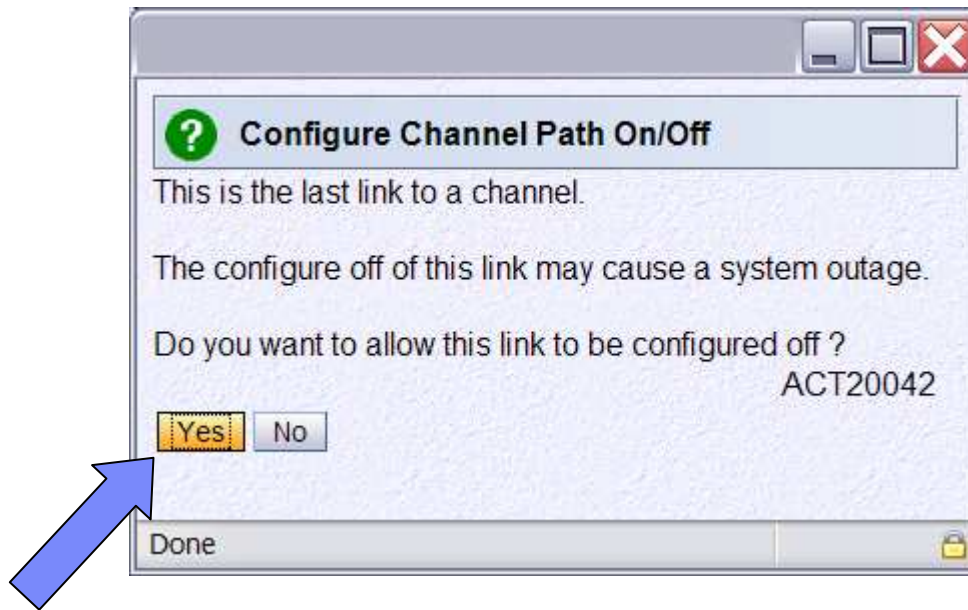
Select	CHPID	Current State	Desired State	Message
<input type="checkbox"/>	0.00	Online	Online	
<input type="checkbox"/>	0.01	Online	Online	Not allowed
<input type="checkbox"/>	0.02	Online	Online	
<input type="checkbox"/>	0.04	Online	Online	
<input type="checkbox"/>	0.05	Online	Online	
<input type="checkbox"/>	0.09	Online	Online	
<input type="checkbox"/>	0.0A	Online	Online	
<input type="checkbox"/>	0.0F	Online	Online	
<input type="checkbox"/>	0.10	Online	Online	
<input type="checkbox"/>	0.12	Online	Online	
<input type="checkbox"/>	0.13	Standby	Standby	
<input type="checkbox"/>	0.14	Standby	Standby	

Details...

Apply Select All Deselect All Toggle All On Toggle All Off Toggle Cancel Help

Done

STP Last Path Validation HMC Chpid Reconfiguration



STP Last Path Validation HMC Chpid Reconfiguration

Can now select and then “Toggle” the Channel Path off

