



Server Time Protocol Recovery Considerations (STP-only CTN with 2 servers)

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Agenda

- **STP Recovery Concepts**
 - Recovery design rules and terminology
 - Switch to Local Timing mode
- **STP-only CTN recovery (Backup Time Server (BTS) assigned)**
 - Server Offline Signal (OLS), Console Assisted Recovery
 - Failure scenarios
- **STP-only CTN recovery with Internal Battery Feature (IBF)**
- **Site failure scenarios**
- **External Time Source (ETS) Recovery**
 - ETS Recovery using NTP Servers
 - ETS Recovery using NTP Servers with PPS

STP-only CTN Terminology

▪ CTN

- Collection of servers that are time synchronized to a time value called Coordinated Server Time (CST)

▪ Server/CF roles

– Preferred Time Server/CF (PTS)

- Server that is preferred to be the Stratum 1 server

– Backup Time Server/CF (BTS)

- Role is to take over as the Stratum 1 under planned or unplanned outages, without disrupting synchronization capability of STP-only CTN

– Current Time Server/CF(CTS)

- Active S1 Server/CF

– Only one S1 allowed

- Only the PTS or BTS can be assigned as the CTS

- Normally the PTS is assigned the role of CTS – Active S1

- BTS typically is the Inactive S1

- BTS can take over as Active S1 or assigned Active S1 for planned actions

- PTS is the Inactive S1 in those cases

– Arbiter

- Provides additional means to determine if BTS should take over as the CTS under unplanned outages

ETR/STP availability/recovery requirements

■ **Availability**

- When primary source of time fails, applications that depend on time synchronization can continue processing **with data integrity**.
 - Parallel Sysplex
 - GDPS customers having multi-site sysplex require Site 2 systems to continue processing when Site 1 fails and vice versa
 - z/OS Global Mirror (XRC) that uses time stamps associated with data updates to make sure secondary copy of the data is consistent
 - Non-sysplex applications that may use other than coupling links for messaging

■ **ETR/STP recovery **must ensure data integrity** when time consistency cannot be maintained**

- Availability can be compromised but not data integrity
- Current designs (ETR and STP) have failure scenarios where availability is compromised, resulting in z/OS systems posting a WTOR

STP recovery design rules and overview

- **CANNOT** have two **Stratum 1** servers in timing network
- **Backup Time Server (BTS)** can take over as **Current Time Server (CTS)**, **active Stratum 1**, **only if** either:
 - Preferred Time Server (PTS) can indicate it has “failed”
 - PTS, if operational **MUST** surrender role of CTS
 - BTS can unambiguously determine the PTS has “failed”

Switch to Local Timing Mode

- **Server in ETR network or CTN becomes unsynchronized (S0 in CTN):**
 - z/OS system images running in ETR or STP timing mode switch to local timing mode.
 - Impact of switching depends on
 - PLEXCFG parameter in IEASYSxx, and
 - ETRMODE or STPMODE specified in CLOCKxx.
 - z/OS systems that specify:
 - PLEXCFG=MULTISYSTEM or PLEXCFG=ANY in IEASYSxx, and
 - ETRMODE YES or STPMODE YES in CLOCKxx
 - Issue a WTOR message to allow operator intervention to resolve the problem before a wait state is loaded
 - z/OS systems that specify ETRMODE YES and are running in ETR timing mode issue WTOR message IEA015A.
 - z/OS systems that specify STPMODE YES and are running in STP timing mode issue WTOR message IEA394A.

WTOR – IEA394A

- **WTOR allows time window to correct the problem and respond “*RETRY*” if problem corrected or “*ABORT*” if problem cannot be corrected**
 - “*ABORT*” will load wait state 0A2-158
- **Backup Time Server or another operational server in the CTN can be reconfigured to be the Current Time Server (CTS) before**
 - WTOR messages responded to with “*RETRY*”
- **New function in z/OS 1.7 for SFM to recognize that WTOR IEA394A issued**

IEA394A WTOR

```

2007055 10.12.34 SC74      IEC336I  STORAGE SUBSYSTEM X'8905' INITIALIZED
2007055 10.12.34 SC74      IEC336I  STORAGE SUBSYSTEM X'8904' INITIALIZED
2007055 10.12.34 SC74      IEA168I  VATLST00: VATLST DEFAULT USE ATTRIBUTE OF PRIVATE USED.
2007055 10.12.34 SC74      IEA168I  VATLST00: SYSTEM DEFAULT USE ATTRIBUTE OF PRIVATE USED.
2007055 10.12.34 SC74      CEE3739I LANGUAGE ENVIRONMENT INITIALIZATION COMPLETE
2007055 10.12.34 SC74      CUN2046I AN EMPTY UNICODE ENVIRONMENT HAS BEEN ESTABLISHED
2007055 10.12.34 SC74      CUN2005I CONVERSION ENVIRONMENT SUCCESSFULLY INITIALIZED
2007055 10.12.55 SC74      IEE389I  MVS COMMAND PROCESSING AVAILABLE
2007055 11.31.09 SC74      *00  IEA394A THIS SERVER HAS LOST CONNECTION TO ITS SOURCE OF TIME.

```

IF THIS EVENT OCCURRED ON SOME, BUT NOT ALL NETWORK SERVERS, THE LIKELY CAUSE IS A LINK FAILURE. TO FIX, ENSURE THAT EACH AFFECTED SERVER HAS AT LEAST ONE CORRECTLY CONNECTED AND FUNCTIONAL LINK.

IF THIS EVENT OCCURRED ON ALL NETWORK SERVERS, THEN THE LIKELY CAUSE IS A TIMING NETWORK FAILURE. TO FIX, REFER TO THE MESSAGE IEA394A DESCRIPTION IN MVS SYSTEM MESSAGES.

AFTER FIXING THE PROBLEM, REPLY "RETRY" FROM THE SERVICE CONSOLE (HMC). IF THE PROBLEM IS NOT CORRECTED, THIS MESSAGE WILL BE REISSUED AND YOU MAY TRY AGAIN. REPLY "ABORT" TO EXIT MESSAGE LOOP. PROBABLE RESULT: OA2-158 WAITSTATE.

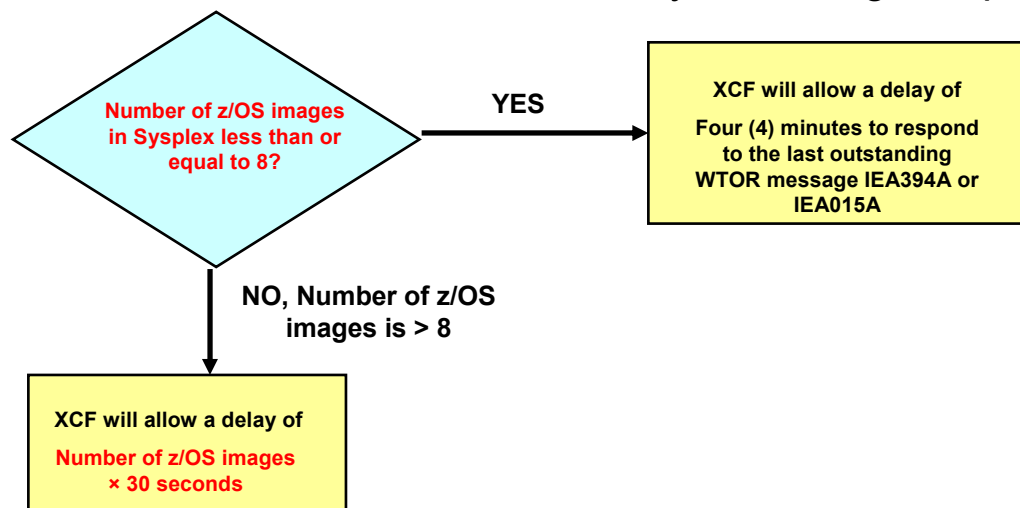
Command:

Priority (select this when responding to priority (red) messages)

Important: Priority message checkbox must be selected when responding to WTOR

Sysplex Failure Management (SFM) considerations

- **SFM allows installation to code a policy to define the recovery actions to be automatically initiated following detection of a Parallel Sysplex failure.**
 - Actions include fencing off the failed image that prevents access to shared resources, logical partition deactivation, or dynamic storage reconfiguration.
- **New function in z/OS 1.7 and higher for SFM to recognize that WTOR IEA015A or IEA394A issued**
 - WTOR message issued by all the z/OS images in the sysplex, the user is not time constrained to do timing network reconfiguration before replying to IEA0394A or IEA015A.
 - Once WTOR on the first system image responded to with “RETRY”,



- **z/OS system images will enter disabled-wait states should the user not be able to respond to the IEA394A or IEA015A WTOR message in the allotted time.**
- If the message is issued only on a subset of participating sysplex images, the SFM settings specified in the SFM Policy must be considered

STP Recovery terminology

- **Coordinated Server Time**
 - Coordinated Server Time (CST) represents the time for the CTN and is the time at a Stratum 1 server
- **Synchronization check threshold**
 - Server/CF considered to be in synchronized state if TOD clock within synchronization check threshold of CST
 - STP synchronization check threshold 50 microseconds
 - If TOD clock differs from CST by more than +/- 50 microseconds, server/CF becomes unsynchronized
 - Can become a Stratum 0 (S0) server/CF
- **Freewheel Interval**
 - Amount of time a Stratum 2 or Stratum 3 server can remain synchronized without receiving messages from its clock source
 - Approximately 1 second (Mixed-CTN)
 - Approximately 10 seconds (STP-only CTN)

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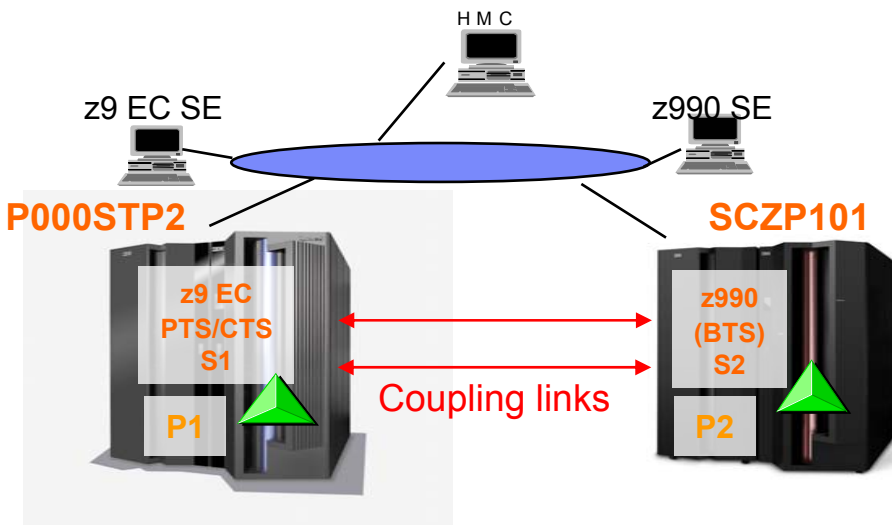
STP-only CTN with 2 servers/CFs

- **CTN only has a PTS and BTS assigned**
 - Arbiter NOT ASSIGNED
- **Assumption: PTS also assigned the CTS role**
- **CANNOT have two Stratum 1 servers in timing network**
- **Backup Time Server (BTS) can take over as Current Time Server (CTS), active Stratum 1, only if either:**
 - Preferred Time Server (PTS) can indicate it has “failed” or
 - BTS can unambiguously determine the PTS has “failed”
- **PTS, if operational MUST surrender role of CTS**
- **Combination of:**
 - Server Offline Signal (OLS- Channel going away signal) and
 - Console Assisted Recovery (CAR)
- **Used to determine if BTS can take over as CTS**

Server Offline Signal (OLS)

- **Server Offline signal (OLS) transmitted on a channel by the server to indicate that the channel is going offline**
 - Signals are independent of STP
- **Conditions when OLS transmitted by server include:**
 - Server or LPAR dump
 - Server Power off
 - Chpid configure off
- **OLS may not be transmitted for certain failures:**
 - Server or site power outage
 - Channel subsystem fails
 - System Assist Processor (SAP) recovery
 - Link failures

Console Assisted Recovery (CAR)



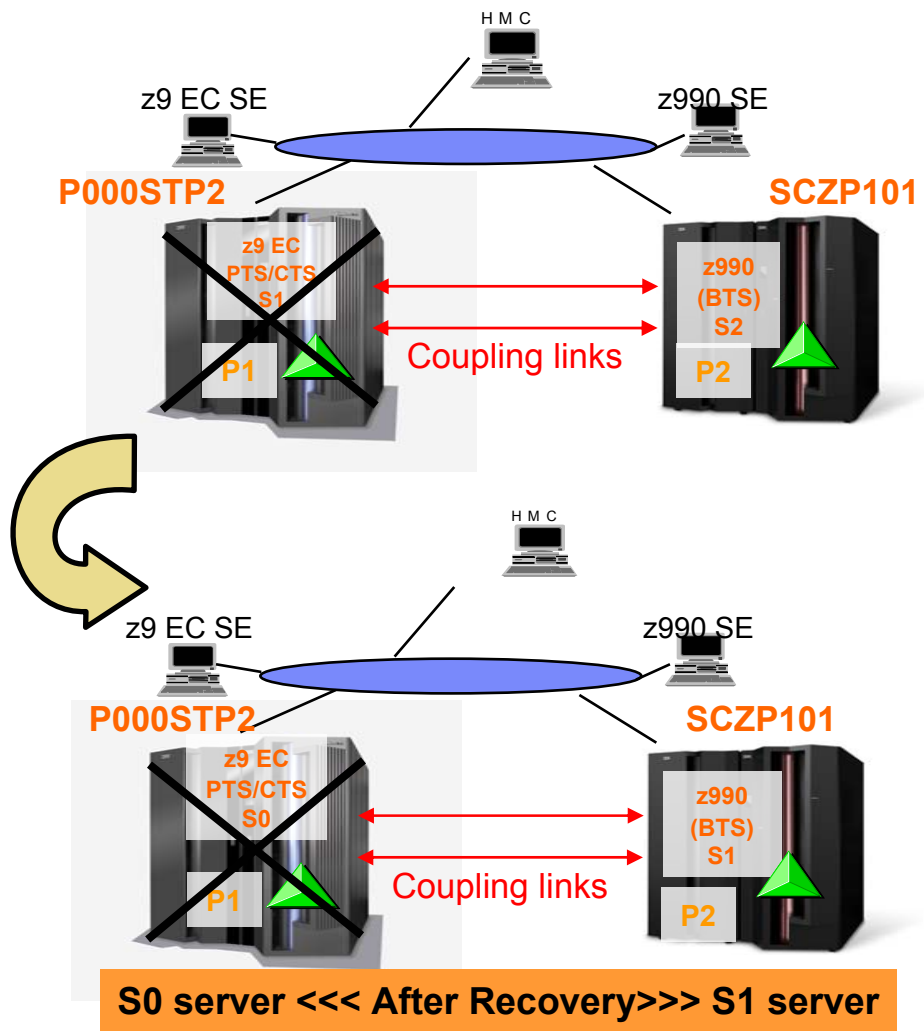
- **CAR uses HMC/SE LAN to determine**
 - CTS has failed or operational
 - BTS can take over as CTS
- **BTS initiates CAR process when:**
 - BTS has lost communication with the CTS
- **BTS sends command to its Support Element (SE) to determine the state of the CTS**
- **BTS SE communicates via HMC with CTS SE**
- **If CTS state determined to have “failed”**
 - BTS takes over as CTS
- **If CTS state “good” or “indeterminate”**
 - BTS CANNOT take over as S1
 - BTS eventually becomes unsynchronized at end of Freewheel Interval

P1, P2 in Parallel Sysplex

OLS and CAR Recovery Rules

- **Applicable in an STP-only CTN when optional BTS assigned, but Arbiter NOT assigned**
- **OLS rules applicable when two or more links between servers**
- **If Backup Time Server (BTS) receives OLS on **the last two** established STP paths to Current Time Server (CTS) within two seconds:**
 - BTS takes over as CTS (S1)
 - CAR used to confirm PTS has failed or has surrendered as CTS
- **If the PTS/CTS has sent OLS on **the last two** established STP paths to BTS within two seconds:**
 - PTS will surrender its role of CTS
- **If only a single link between PTS and BTS or OLS **on the last two established STP paths received more than 2 seconds apart:****
 - CAR used to determine if BTS can take over as CTS
 - OLS rules do not apply

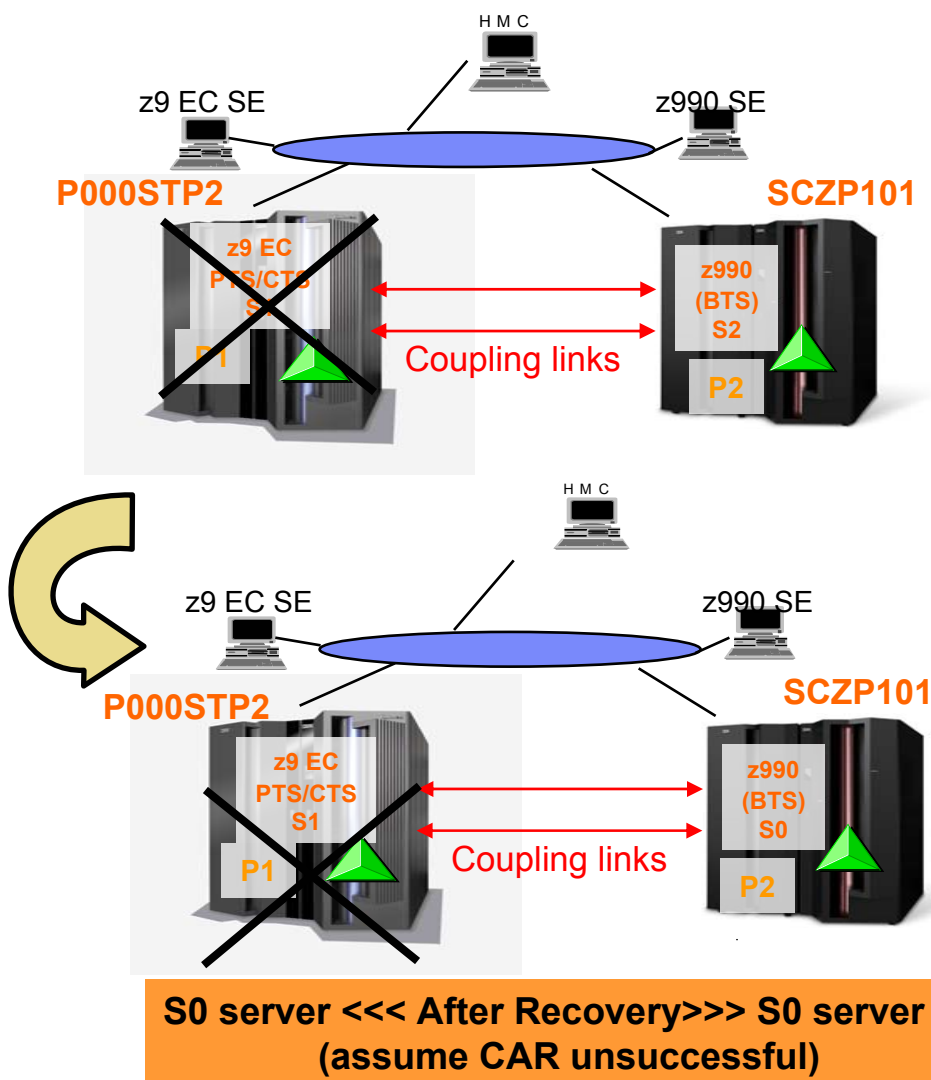
CTS failure – OLS on last two paths received within 2 secs



- **If BTS (SCZP101) receives OLS on last two STP paths to CTS (P000STP2) within 2 seconds**
 - BTS takes over as CTS (S1)
 - To assure only 1 CTS
 - PTS surrenders role of CTS
 - CAR confirms CTS has failed
- **z/OS systems on P000STP2 may have posted WTOR (IEA394A)**
- **z/OS systems on SCZP101 not affected**
- **STP user actions:**
 - Repair CTS (P000STP2)
 - STP does an automatic retakeover
 - P000STP2 joins as S2
 - Retakes role of CTS after verification checks
 - SCZP101 becomes S2

P1, P2 in Parallel Sysplex

CTS failure – OLS on last two paths NOT received within 2 seconds; CAR unsuccessful



- **BTS does not** receive OLS on last two established STP paths to CTS within 2 seconds:
- **BTS initiates “Console assisted recovery”**
 - BTS (SCZP101) SE attempts to determine state of CTS (P000STP2) by communicating via HMC with CTS SE
- **CTS (P000STP2) state “indeterminate”**
 - BTS CANNOT take over as S1
 - BTS eventually becomes unsynchronized at end of Freewheel Interval
 - z/OS systems (STPMODE YES) post WTOR (IEA394A)
- **STP User actions**
 - Reassign BTS as CTS
 - Respond with Retry to WTOR
 - **NOTE: When PTS rejoins, it will not re-takeover role of CTS, since roles reassigned**

P1, P2 in Parallel Sysplex

Reconfiguration after CTS Failure – BTS unsynchronized (S0)

- **Select System (Sysplex) Time task of SCZP101**
 - Server that will become the new CTS after reconfiguration
- **Select Network Configuration tab**
- **Assign SCZP101 as BTS and CTS**
- **Select “Force configuration”**
 - Since starting from Stratum 0
- **Respond “Retry” to each WTOR (IEA394A) posted**
 - Note that after responding to the first WTOR, the remaining WTORS in the Sysplex have to be responded to within approximately 4 minutes if up to 8 z/OS images (additional 30 secs per image if more than 8 images)

https://sczhmc1.itso.ibm.com - SCZHMC1: System (Sysplex) Time for S...

System (Sysplex) Time for SCZP101

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

Current Network Configuration

Configured at (UTC):

Preferred time server (CPC) P000STP2

Backup time server (CPC) SCZP101 (STP ID: ITSOPOK)

Arbiter Not configured

Force configuration

Current Time Server (CPC)

Preferred time server (CPC)

Backup time server (CPC)

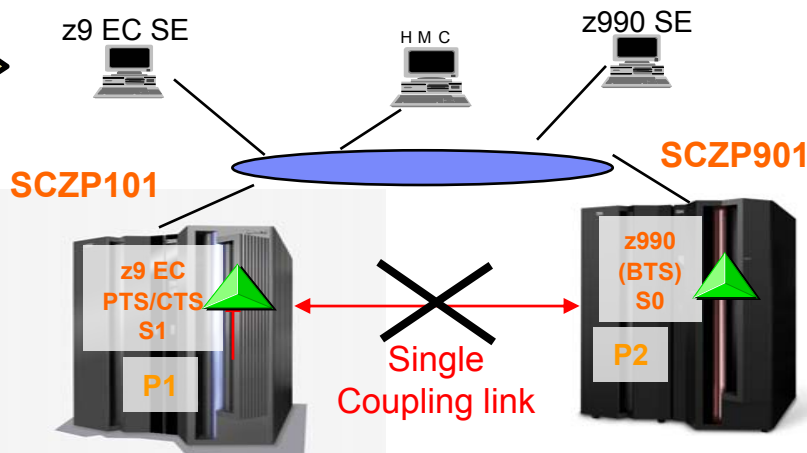
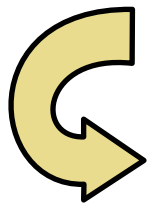
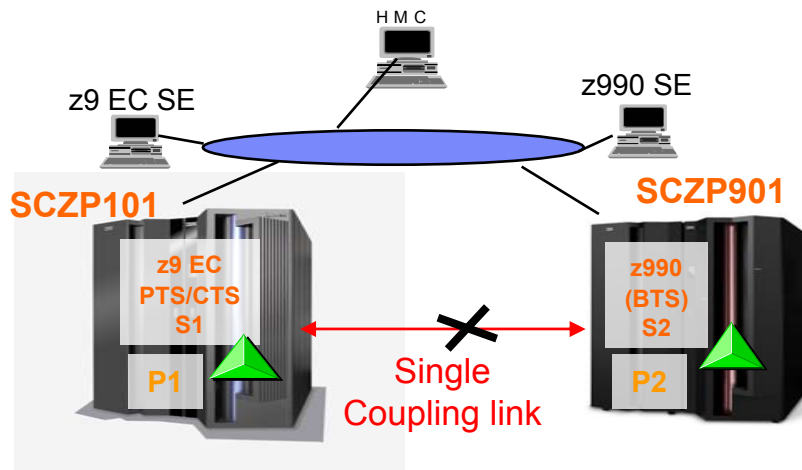
Coordinated timing network ID ITSOPOK -

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

Refresh Cancel Help

Done Internet

Last Link Failure



S1 server <<< After Recovery >>> S0 server

- **When multiple links configured between PTS and BTS, a single link failure results in**
 - BTS selecting redundant link
 - **Failure of last Coupling link between BTS and CTS**
 - CTS/PTS not affected
 - BTS loses communication with CTS
 - BTS initiates “Console assisted recovery”
 - CTS (PTS) state “good”
 - **BTS unsynchronized**
 - z/OS systems (STPMODE YES) on BTS post WTOR (IEA394A)
- STP User actions**
- Repair “failing” link
 - BTS joins CTN as S2
 - Respond with Retry to WTOR

P1, P2 in Parallel Sysplex

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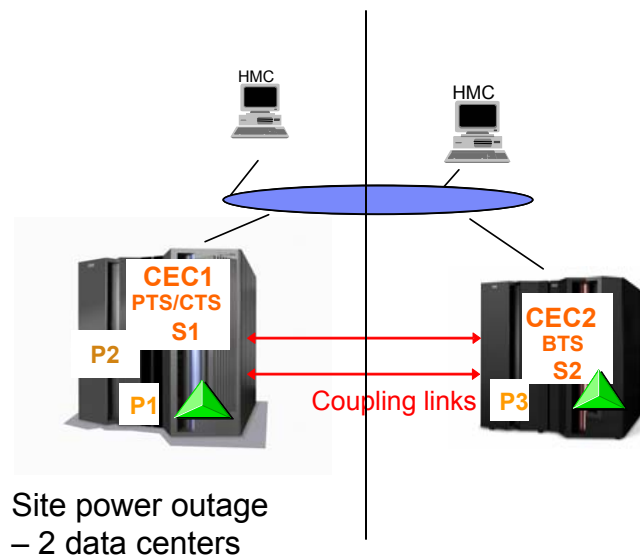
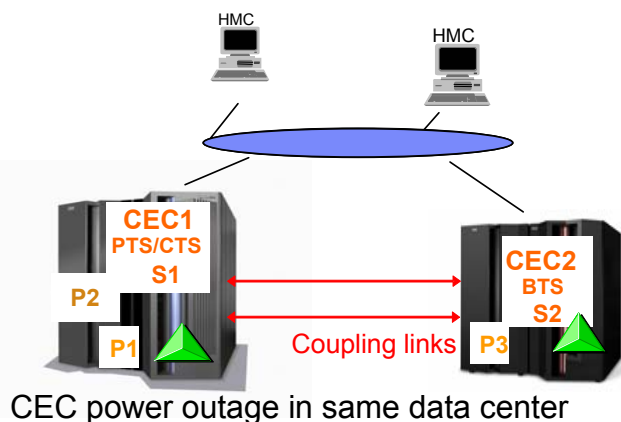
Power Outage PTS/CTS with Internal Battery Feature (IBF)

- **IBF is designed to enable PTS/CTS to reconfigure the BTS as the CTS if**

- Power outage of PTS/CTS
- Power outage of site where PTS/CTS and Arbiter are located

- **With IBF on CEC1**

- CEC1 power outage, enters IBF state
- CEC1 notifies CEC2 it is running on IBF
- CEC2 waits for 30 seconds to take action
 - Could be a power glitch
 - If notified within 30 seconds that CEC1 back to “normal power”, no further action
- If CEC1 in IBF state > 30 seconds,
 - CEC2 takes over as the CTS
 - CEC1 becomes S2 until IBF no longer functional and power drops
- CEC1 power resumes
 - Automatic re-takeover as PTS/CTS



IBF Recommendations

■ **Single data center**

- IBF only protects for server power outage
- CTN with 2 servers, install IBF on at least the PTS/CTS
 - Also recommend IBF on BTS to provide recovery protection when BTS is the CTS

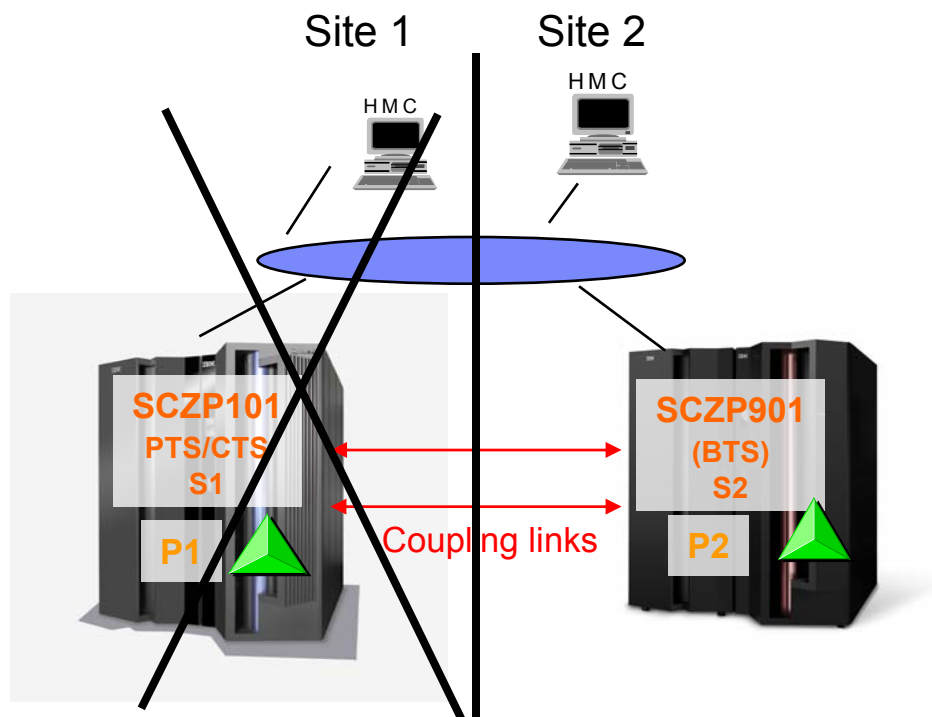
■ **Two data centers**

- IBF protects for both server and site power outage scenarios
- CTN with 2 servers (one in each data center) install IBF on at least the PTS/CTS
 - Also recommend IBF on BTS to provide recovery protection when BTS is the CTS

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STP-only CTN (Preferred and Backup assigned) Site 1 Failure

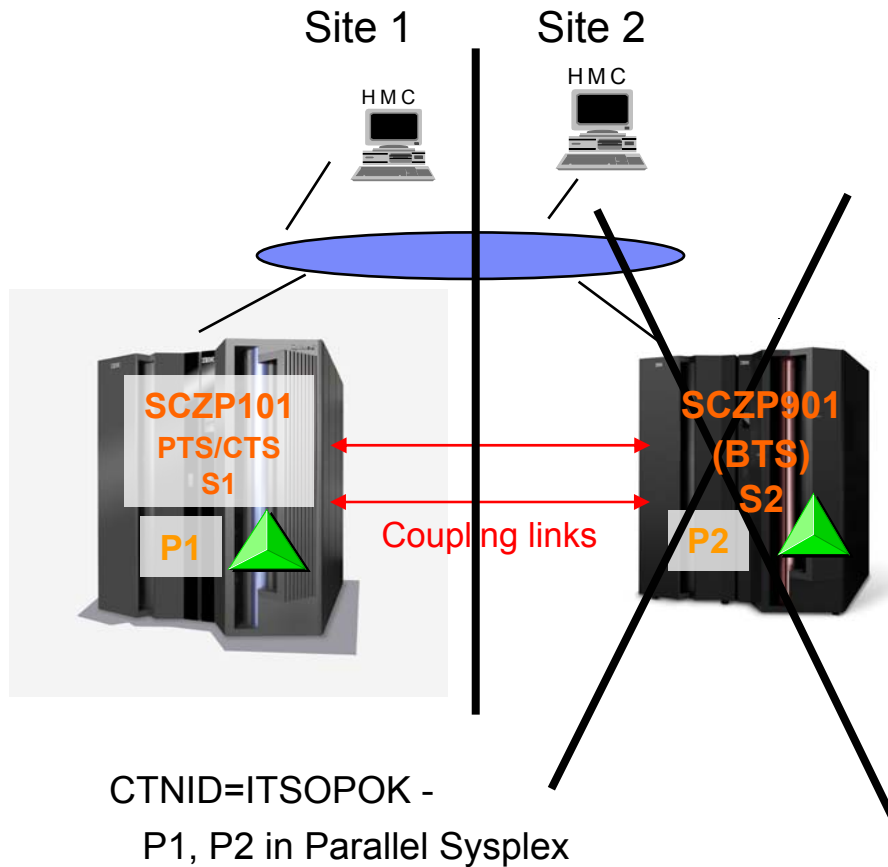


CTNID=ITSOPOK -
P1, P2 in Parallel Sysplex

- **BTS (SCZP901) loses all communication with CTS (SCZP101)**
 - BTS most probably does not receive OLS
 - BTS initiates “Console assisted recovery”
 - Results of “Console assisted recovery”
 - CTS state most probably indeterminate
 - **BTS eventually becomes unsynchronized at end of Freewheel Interval**
 - z/OS systems (STPMODE YES) in site 2 post WTOR (IEA394A)

- **STP User actions**
 - Reassign BTS as CTS
 - Respond with Retry to WTOR

STP-only CTN (Preferred and Backup assigned) Site 2 failure



- **PTS (SCZP101)**
continues role of CTS
- **z/OS systems in Site 1**
requiring **STPMODE**
YES not affected
- **STP User actions**
 - Restore Site 2

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ETS Recovery - **DISCLAIMER**

- The following section is intended to provide **ONLY** a basic overview of ETS Recovery
- For more detailed recovery information and the actions that must be taken in response to various failures, please see the ETS recovery information in
 - STP Planning Guide, SG24-7280
 - STP Implementation Guide, SG24-7281

ETS Recovery introduction

- **External time source in an STP-only CTN can be provided by:**
 - Using dial-out on the HMC
 - Using an NTP server (LAN connection)
 - Using an NTP server with a pulse per second output option (LAN connection and coaxial cable to the PPS port of an ETR card)
- **Limited recovery actions when ETS configured to use dial-out**
 - HMC attempts to redial if line is busy
 - Option to have more than one HMC act as a phone server
- **Regardless of the ETS option selected, failures associated with ETS do not affect the capability of servers in a CTN to stay synchronized with each other.**
 - As long as the timing state of the servers remains synchronized, z/OS images that depend on synchronization are not affected.
- **The only effect of unsuccessful recovery for an ETS failure is that the CTN will slowly drift away from ETS time**

NTP Server Redundancy Recommendations

- **At least one NTP server must be configured on the PTS/CTS**
 - Only the Current Time Server (CTS) makes time adjustments based on information from the NTP Server
- **Also recommended to configure at least one NTP server on the BTS**
 - Allows continuous NTP server access when BTS becomes the CTS
 - Time adjustments to the STP-only CTN when the PTS/CTS cannot access any of its NTP servers
- **If two NTP servers are configured, user is responsible for selecting preferred NTP server**
 - This NTP server is called the **selected NTP server**;
 - The other NTP server is called the **non-selected NTP server**.

Recommendations apply when using NTP servers with or without PPS

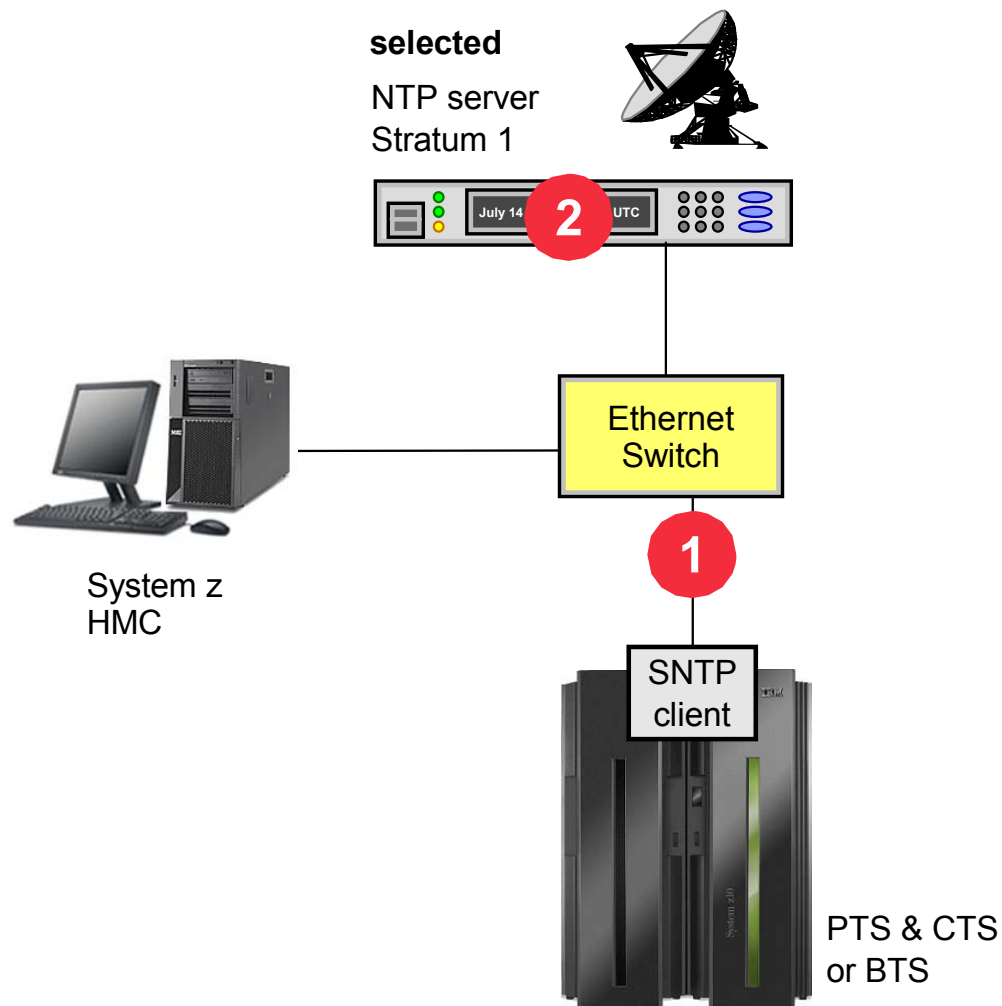
ETS Recovery design using NTP Servers

- **Configured NTP servers on the PTS/CTS are accessed once every 10 minutes by the SNTP client.**
 - Once every hour, assuming a successful access of the selected NTP server, the SNTP client sends a CST adjustment to the STP facility.
 - Normally, the SNTP client on the CTS uses the time information from the selected NTP server to perform the time adjustment.
 - The time information from the non-selected NTP server is only used when there is a failure associated with accessing time information from the selected NTP server.
- **Configured NTP servers on the BTS are also accessed once every 10 minutes.**
 - The BTS calculates a value for time adjustment based on this access, and communicates the information to the PTS over the coupling links.
- **If the PTS/CTS cannot access both its configured NTP servers, it will switch over to using the timing information sent from the BTS to steer the STP-only CTN.**

Order of Recovery actions – ETS using NTP Servers

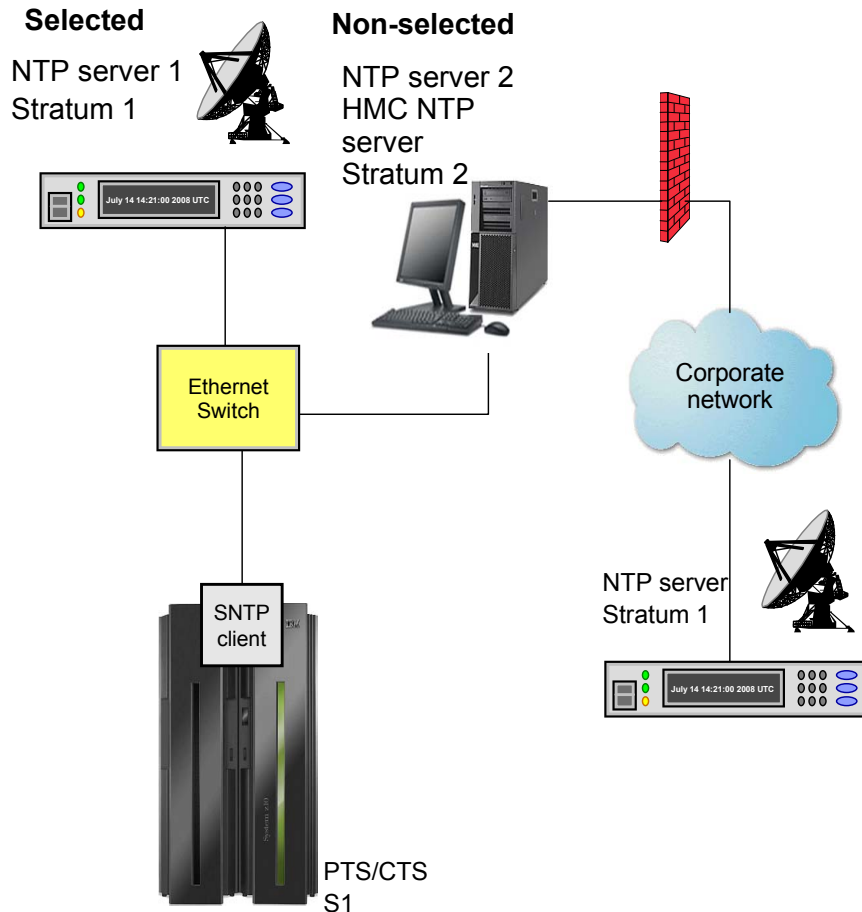
- **After two unsuccessful attempts (two hours) at sending a CST adjustment value based on selected NTP server,**
 - SNTP client will switch to sending timing adjustment information based on the non-selected NTP server
- **After two unsuccessful attempts (two hours) at sending a CST adjustment value based on non-selected NTP server,**
 - STP will steer CTN using calculation from BTS
 - BTS information could be based on:
 - Selected NTP server at the BTS, or
 - Non-selected NTP server, if valid data cannot be accessed from the selected NTP server
- **When STP is not able to switch to any operational NTP server, automatic base steering continues**
 - Base steering allows STP to compensate for the drift characteristics of the oscillator, thereby maintaining relatively good time accuracy at the Current Time Server, even if an ETS is not available.

Possible failures - ETS using NTP Servers



1. Loss of LAN connectivity between the Support Element and the NTP server
2. Complete NTP server failure or bad NTP data from the NTP server

Scenario 1 - Redundant NTP Servers on PTS/CTS

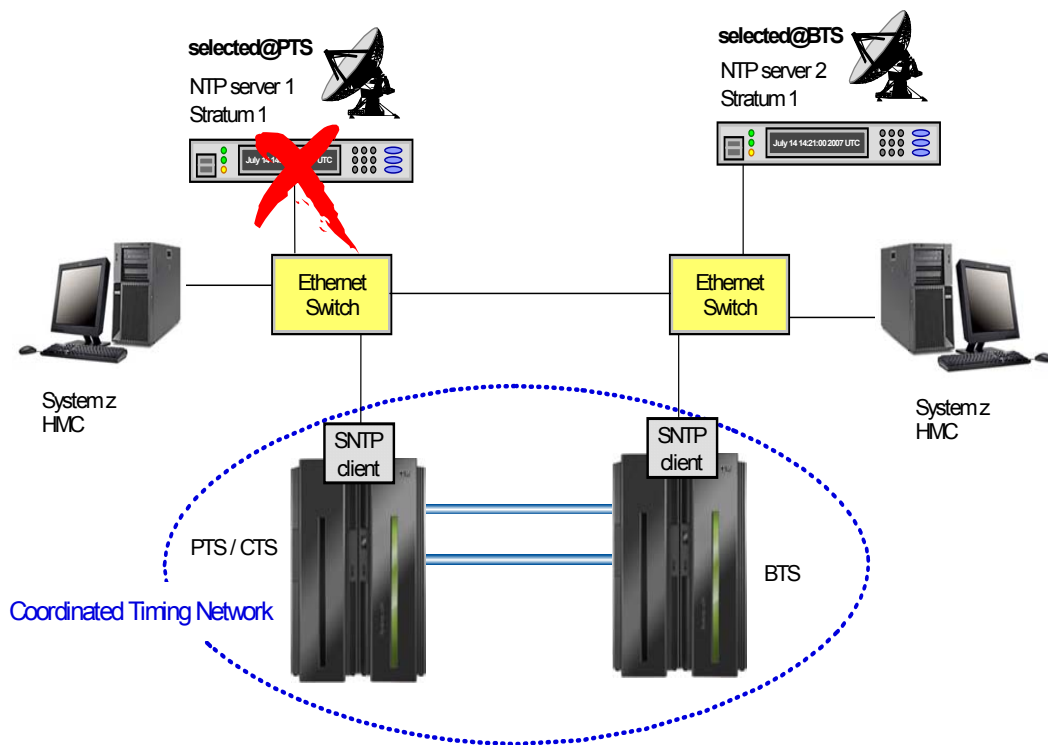


Recovery

- If selected NTP server becomes unavailable, BUT the non-selected NTP server is still available (failure **2**),
 - SNTP client will use non-selected NTP server as its ETS, and will continue steering CTN using timing information received from NTP server 2.
- Failure **1**
 - If failure is a LAN failure, **NO** recovery is possible, and CTN continues to use automatic base steering

- 1** Loss of LAN connectivity between the Support Element and the NTP server
- 2** Complete NTP server failure or bad NTP data from the NTP server

Scenario 2 - Redundant NTP Servers on PTS and BTS



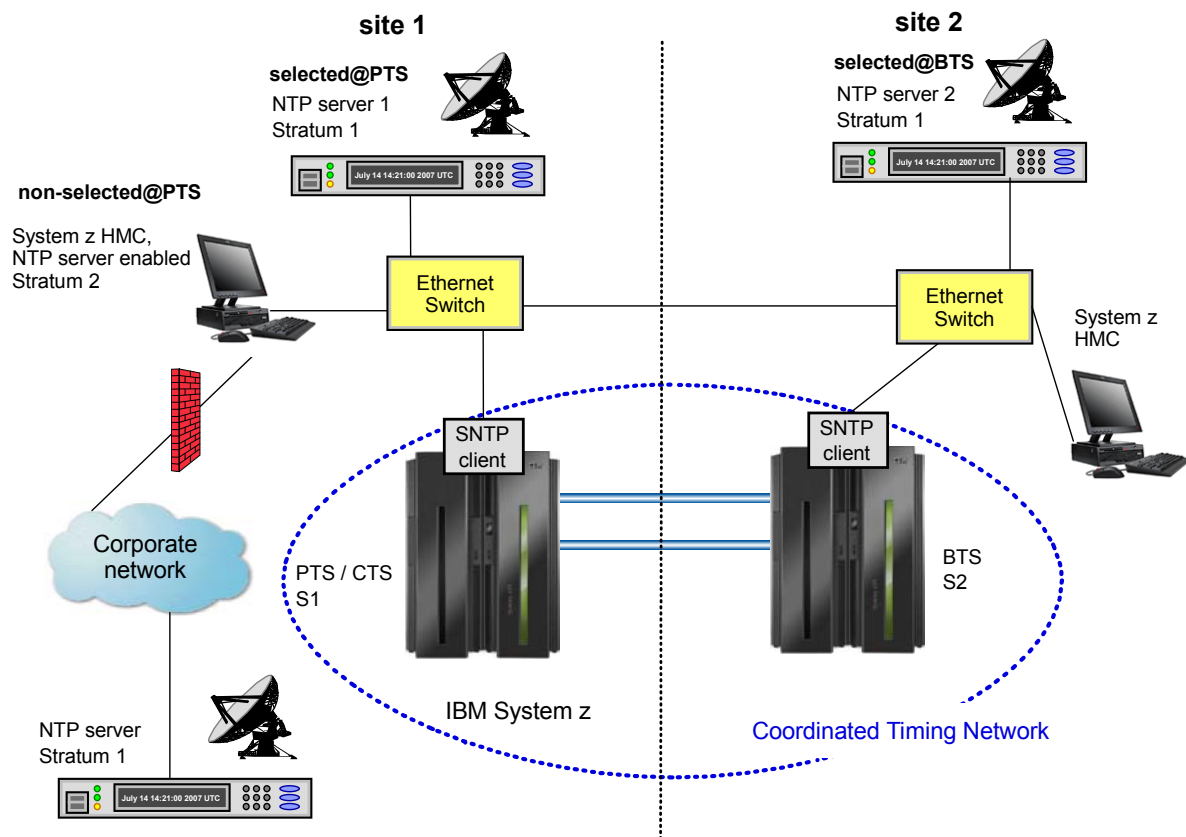
Recovery

- If PTS/CTS is not able to access NTP server 1 for two hours
 - Will start using time adjustment information sent by BTS approximately an hour later to steer the CTN.
- If BTS is not able to access NTP server 2 for two hours
 - NO recovery action.
 - However, problem should be corrected as soon as possible to maintain ETS redundancy.

Compared to Scenario 1:

- This configuration provides additional degree of continuous availability of NTP servers
- Suitable for a dual site implementation, with PTS and BTS in different sites.

Continuous NTP server availability - Enhanced Configuration



- **To provide even more redundancy, also consider configuring an additional NTP server on the HMC**
- The NTP server on the HMC is the non-selected NTP server at the PTS/CTS.
- If the selected NTP server fails at the PTS/CTS, the non-selected NTP server takes over the ETS role and provides the time information.
- In case both NTP servers in site 1 are not accessible for a certain period of time (for example because of LAN problems), the time adjustment information sent by the BTS will be used

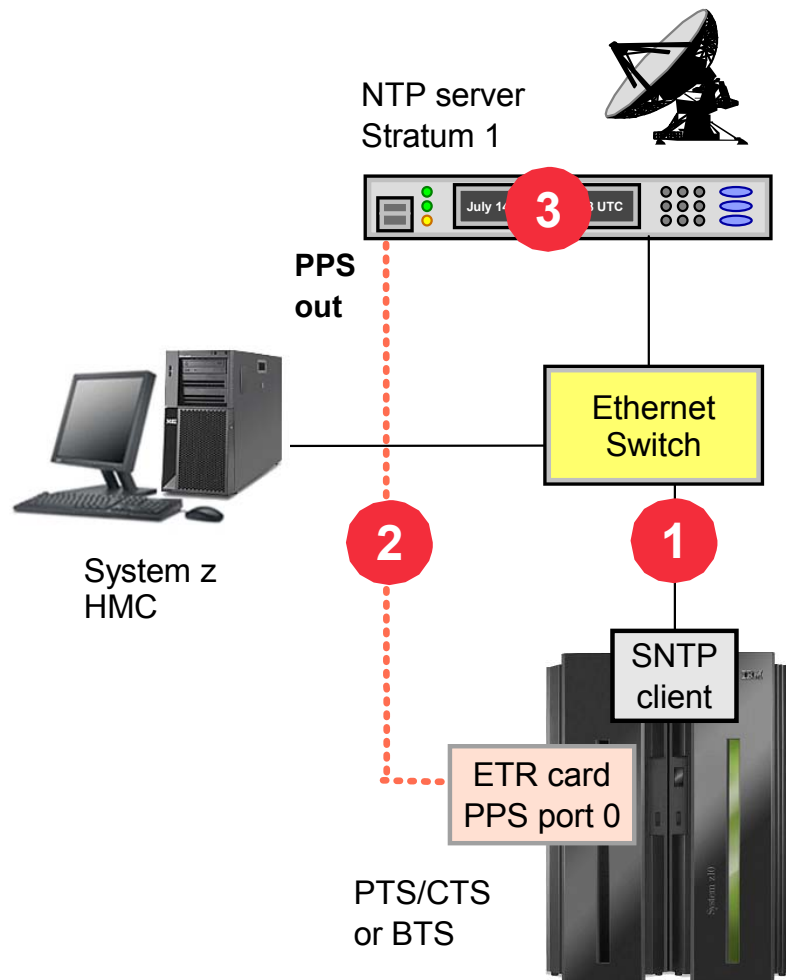
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ETS Recovery design using NTP Servers with PPS

- **Configured NTP servers on PTS/CTS are accessed once a minute by SNTP client.**
 - Once every 10 minutes, assuming successful access of **both** NTP servers, the SNTP client sends time adjustment information based on **both** NTP servers to the STP facility.
- **Configured NTP servers on BTS are also accessed once a minute by SNTP client**
 - Once every 10 minutes, time adjustment information based on **both** NTP servers sent to the STP facility on BTS.
 - Normally, STP facility on BTS uses the time information in conjunction with the PPS signal from the selected NTP server to calculate a time adjustment.
 - BTS then communicates this information to the PTS over the coupling links.
 - Adjustment calculation based on time information and PPS signal from non-selected NTP server on BTS only used when there is a failure associated with accessing time information or PPS signals from the selected NTP server.
- **If the PTS/CTS cannot access both its configured NTP servers, it will switch over to using the timing information sent from the BTS to steer the STP-only CTN.**

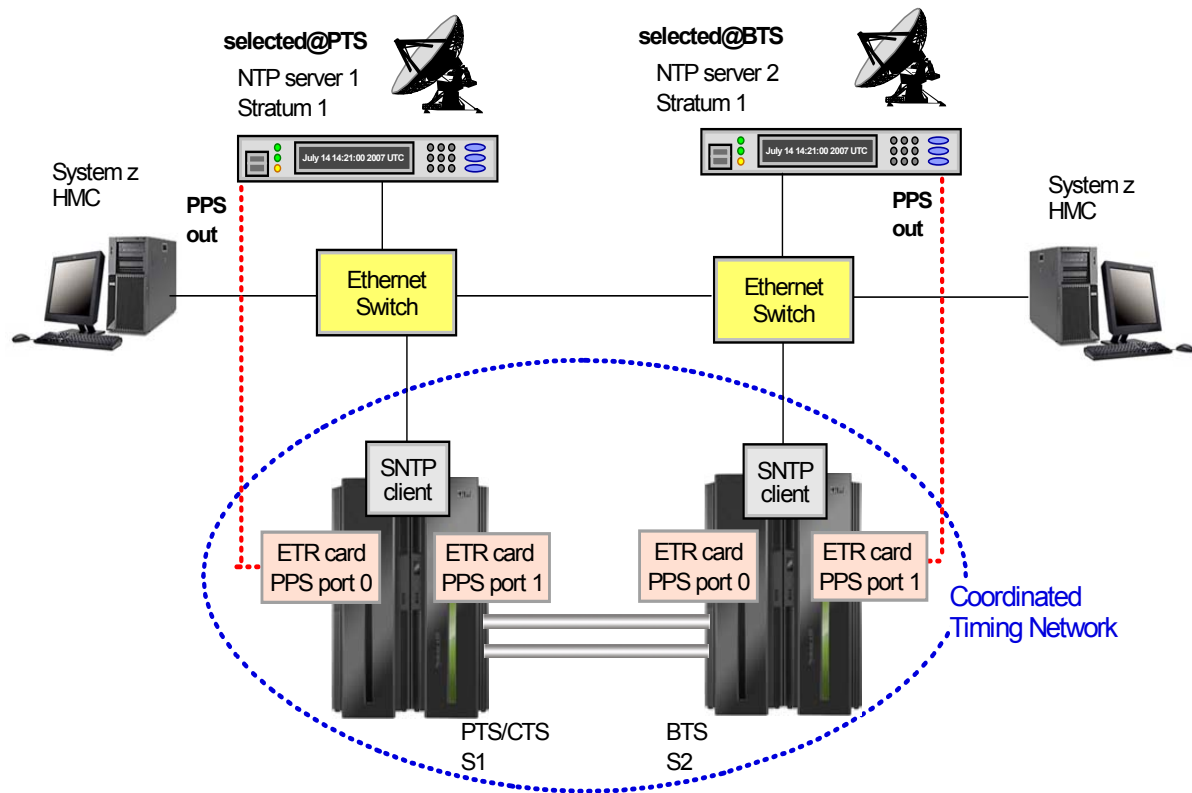
Possible Failures - ETS using NTP Servers with PPS



Possible failures

1. Loss of LAN connectivity between SE and NTP server or bad NTP data
2. PPS signal not received by PPS port on the ETR card.
3. Complete NTP server failure affecting both NTP data and PPS output of NTP server.

Order of Recovery actions - ETS using NTP Servers w/PPS



- If failure type **1**, STP will continue using PPS signals received on PPS port of the selected NTP server on the PTS/CTS.
- If failure type **2** or **3**, STP will switch to using time adjustment information received from BTS.

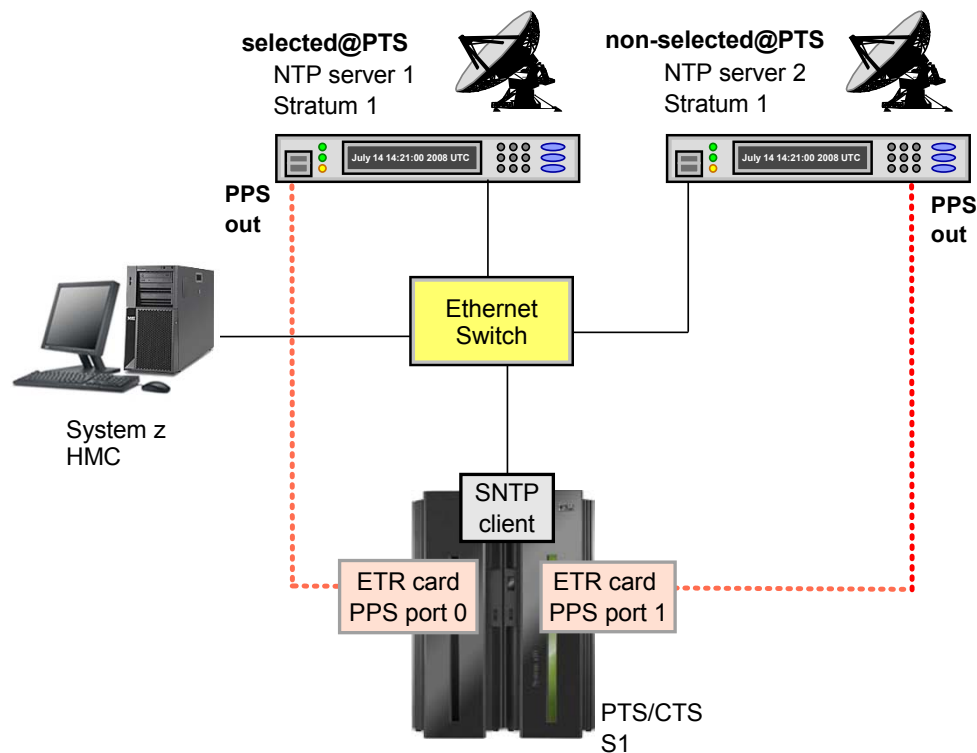
- 1** Loss of LAN connectivity between SE and NTP server or bad NTP data
- 2** PPS signal not received by PPS port on the ETR card.
- 3** Complete NTP server failure affecting both NTP data and PPS output of NTP server.

Note: Refer to SG247280 and SG247281 when NTP server with PPS configuration is different

Order of Recovery actions - ETS using NTP Servers w/PPS (continued)

- Regardless of the specific redundancy provided by an NTP server with PPS configuration
 - If PPS signals are not received **from** any of the configured NTP servers on the PTS/CTS and the BTS, **BUT** valid NTP data is available,
 - STP will continue using the NTP data for steering the CTN following the same recovery flow described in previous “ETS recovery using NTP servers” section
 - When STP is not able to switch to any operational NTP server, the automatic base steering continues.
 - Base steering allows STP to compensate for drift characteristics of the oscillator, thereby maintaining relatively good time accuracy at the Current Time Server, even if an ETS is not available.

Scenario 1 - Redundant NTP Servers with PPS on PTS/CTS



Recovery

- If NTP server 1 is not accessible by the SNTP client on the SE (failure **1**), BUT the PPS signal is still received on PPS port 0
 - NO recovery is required because STP will continue to steer the CTN using the PPS signals from NTP server 1.
- For failures **2** and **3** on NTP server 1, STP will switch to using the time information and the PPS signals from the non-selected server, NTP server 2.

1

Loss of LAN connectivity between SE and NTP server or bad NTP data

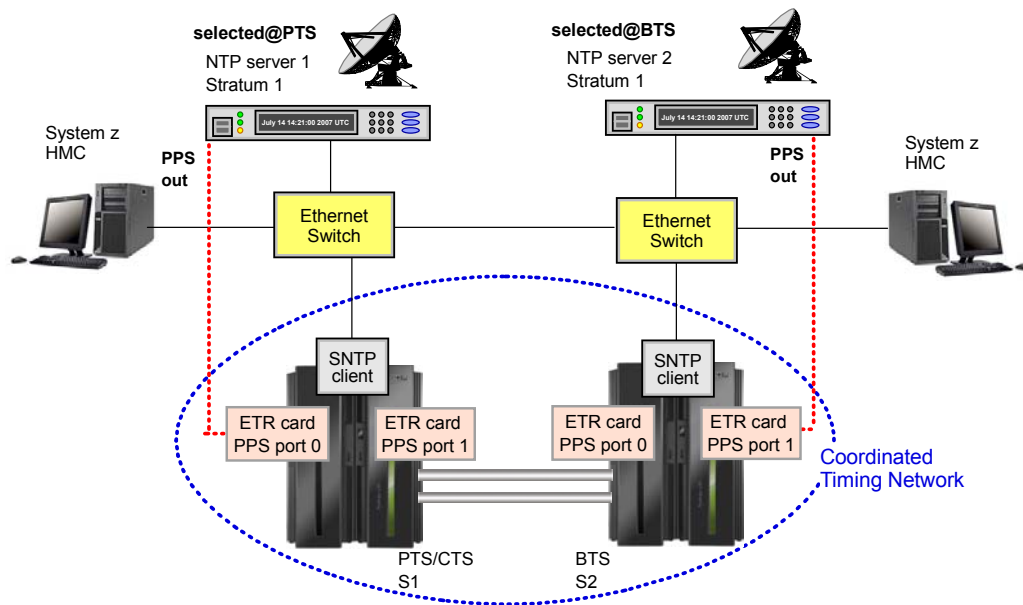
2

PPS signal not received by PPS port on the ETR card.

3

Complete NTP server failure affecting both NTP data and PPS output of NTP server.

Scenario 2 - Redundant NTP Servers with PPS on PTS and BTS



- 1 Loss of LAN connectivity between SE and NTP server or bad NTP data
- 2 PPS signal not received by PPS port on the ETR card.
- 3 Complete NTP server failure affecting both NTP data and PPS output of NTP server.

Recovery

- If NTP server 1 is not accessible by the SNTP client on the SE (failure 1), BUT the PPS signal is still received on PPS port 0
 - NO recovery is required because STP will continue to steer the CTN using the PPS signals from NTP server 1.
- For failures 2 and 3 on NTP server 1, the PTS/CTS will start using the time adjustment information received from the BTS, which is based on NTP server 2 and its PPS signals.
- For failures 1, 2 and 3 on NTP server 2
 - NO Recovery required

Summary

Summary – STP-only CTN

- **Configure for link redundancy**
- **Initialize configuration with the PTS assigned as the Current Time Server**
 - PTS, CTS must be assigned
- **Assign at least a Backup Time Server**
 - Can take over as CTS - active S1
- **If 3 or more servers in CTN, assign BTS and Arbiter**
- **For configuration across 2 sites**
 - Provide redundant routes for fiber links between sites
 - Use only **qualified** DWDMs
 - Locate the Arbiter in same site as PTS
 - Provides better recovery for scenarios when:
 - OLS may not be sent from CTS or
 - OLS may not be received by BTS

Summary – ETS Recovery

- **Failures associated with ETS and possible recovery actions do not affect the capability of servers in a CTN to stay synchronized with each other.**
- **The Current Time Server (CTS) is the only server that adjusts the Coordinated Server Time (CST) by steering it to the time obtained from an external time source (ETS). Either the PTS or the BTS can be the CTS.**
- **It is recommended to configure at least one unique NTP server or NTP server with PPS on the PTS and the BTS. Configuring an NTP server on the BTS provides two benefits:**
 - Access to an NTP server when the BTS becomes the CTS as the result of planned or unplanned recovery
 - Time adjustments to an NTP server when the PTS/CTS cannot access any of its NTP servers
- **Multi-site CTN configurations do not have any specific ETS redundancy considerations, other than the general recommendation to configure an NTP server both on the PTS and the BTS.**
- **The CTS assignment does not change as a consequence of an ETS failure.**

Additional Information

■ Redbooks®

- Server Time Protocol Planning Guide SG24-7280
- Server Time Protocol Implementation Guide SG24-7281
- Server Time Protocol Recovery Guide SG24-7380

■ Education

- Introduction to Server Time Protocol (STP)
 - Available on Resource Link™
 - www.ibm.com/servers/resourcelink/hom03010.nsf?OpenDatabase

■ STP Web site

- www.ibm.com/systems/z/pso/stp.html

■ Systems Assurance

- The IBM team is required to complete a Systems Assurance Review (SAPR Guide SA06-012) and to complete the Systems Assurance Confirmation Form via Resource Link

■ Techdocs and WSC Flashes

- <http://www-03.ibm.com/support/techdocs/atmastr.nsf/Web/Techdocs>
 - Search on “STP”



IBM Implementation Services for System z – Server Time Protocol (6948-J56)

Offering Description	<ul style="list-style-type: none"> • This offering is designed to assist clients to quickly and safely implement Server Time Protocol within their existing environments. STP provides clients with the capability to efficiently manage time synchronization within their multi-server infrastructure. Following best practices and using detailed planning services, IBM helps clients identify various implementation models and engage in the appropriate configuration required to effectively support STP for driving a more responsive business and IT infrastructure.
Program, Play, Industry Alignment	<ul style="list-style-type: none"> • Infrastructure Improvement; Energy Efficiency; Better performance and lower operational cost
Client Value (<i>enables customers to...</i>)	<ul style="list-style-type: none"> • Swift and secure implementation of STP for improved availability, integrity and performance • Improves multi-server time synchronization without interrupting operations • Enables integration with next generation of System z infrastructure
Target Audience	<ul style="list-style-type: none"> • Primarily core, Large Enterprise customers. • Existing z midrange clients
Key Competitors	<ul style="list-style-type: none"> • In house staff
Competitive Differentiation	<ul style="list-style-type: none"> • Leverages best practices with secure implementation • Short implementation time – lower risk • Provides support and facilitates knowledge sharing through IBM’s mainframe expertise
Proof Points & Claims for Client Value / Differentiation	<ul style="list-style-type: none"> • Need to safely implement a reliable replacement for Sysplex Timer® while maintaining continuous operations • Cost of providing and maintaining hardware, floor space and solution support for additional Sysplex Timer intermediate site • Lack of in-house expertise, skills and resources for implementing Server Time Protocol
Engagement Portfolio	<ul style="list-style-type: none"> • http://spimweb1.boulder.ibm.com/services/sosf/dyno.wss?oid=50423&loc=All&langcd=en-US#1
Offering Manager	<ul style="list-style-type: none"> • Anna Lee/Southbury/IBM, 512-590-8914, T/L: 268-9318

IBM Announces – IBM Implementation Services for System z – Server Time Protocol

Implementation of STP for improved availability and performance

Offering

Assist clients to quickly and safely implement Server Time Protocol within their existing environments. IBM helps clients identify various implementation models and engage in the appropriate configuration required to effectively support STP for driving a more responsive business and IT infrastructure

Customer Value:

- Improves multi-server time synchronization without interrupting operations*
- Enables integration with next generation of System z infrastructure*
- Swift and secure implementation of STP for improved availability, integrity, and performance*
- Reduces hardware maintenance and power costs while eliminating intermediate site requirements for Sysplex Timer*



**Leverages IBM's
knowledge and best
practices to help
implementation of
Server Time Protocol**

Reference Material - Terminology

▪ APAR	Authorized Program Analysis Report	▪ NTP	Network Time Protocol
▪ ARB	Arbiter	▪ PR/SM	Processor Resource / Systems Manager
▪ BTS	Backup Time Server	▪ PSIFB	Parallel Sysplex
▪ CF	Coupling Facility	▪ Infiniband	
▪ CTS	Current Time Server	▪ PTF	Temporary Program Fix
▪ CTN	Coordinated Timing Network	▪ PTS	Preferred Time Server
▪ DWDM	Dense Wave Division Multiplexer	▪ SW and	Software (programs operating systems)
▪		▪ SE	Support Element
▪ ETR	External Time Reference	▪ TPF	Operating System
▪ ETS	External Time Source	▪ UTC	Coordinated Universal Time
▪ FC	Feature Code		
▪ HMC	Hardware Management Console	▪ zVM	Operating System
▪		▪ zVSE	Operating System
▪ HCA	Host Channel Adapter	▪ z/OS	Operating System
▪ ICB	Integrated Cluster Bus	▪ z/VM	Operating System
▪ IPL	Initial Program Load		
▪ ISC	InterSystem Coupling Channel		
▪ LAN	Local Area Network		
▪ LIC	Licensed Internal Code		
▪ LPAR	Logically Partition		

Questions?



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Dankon
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ありがとうございます
Japanese

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Italian

நன்றி
Tamil

go raibh maith agat
Gaelic

Спасибо
Russian

감사합니다
Korean

תודה רבה
Hebrew

Thank You

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Breton

Danke
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děkuji
Czech

Mercés
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