

# Implementering af STP i Bankdata



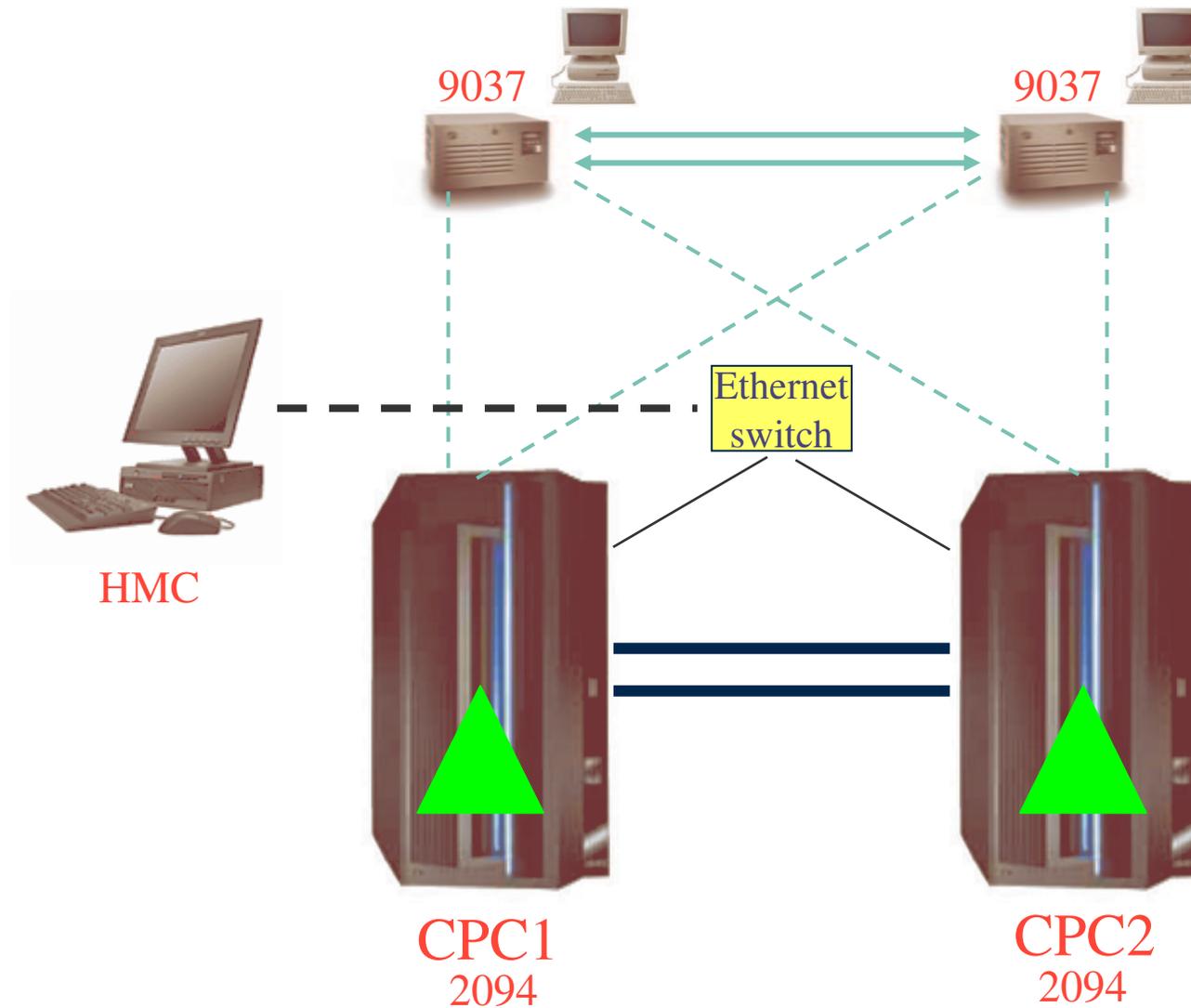
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**bankdata**

# Agenda

- Baggrund for STP i Bankdata
- Hurtig konklusion
- Introduktion til STP
- Implementering af STP i Bankdata
- Daglig håndtering af STP
- Fejlsituationer
- Referencemateriale
- Spørgsmål?

# Bankdata før juni 2007



# Baggrund for STP i Bankdata

- Etablering af driftscenter nr. to i 2007
- Sysplex Timer (9037) udgik af produktion 31. december 2006
- Dyrt at øge afstanden mellem eksisterende 9037'ere (f.eks. via 9036 ESCON Channel Extender)

# Hurtig konklusion

STP kan virke omfattende og besværlig

- mange nye begreber
- redbooks på 600+ sider

men

- opsætning og ibrugtagning er hurtig
- håndtering af STP er enkel
- Bankdata har ikke oplevet problemer overhovedet!

# Agenda

- Baggrund for STP i Bankdata ✓
- Hurtig konklusion ✓
- **Introduktion til STP**
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# Fakta om STP (1)

- STP = Server Time Protocol
- GA 31. januar 2007
- Message-baseret protokol til tids-synkronisering af z-servere og CF'er
- Med de stadig hurtigere processorer begynder det at knibe med entydige timestamps → STP adresserer dette
- Afløser for Sysplex Timer (9037)

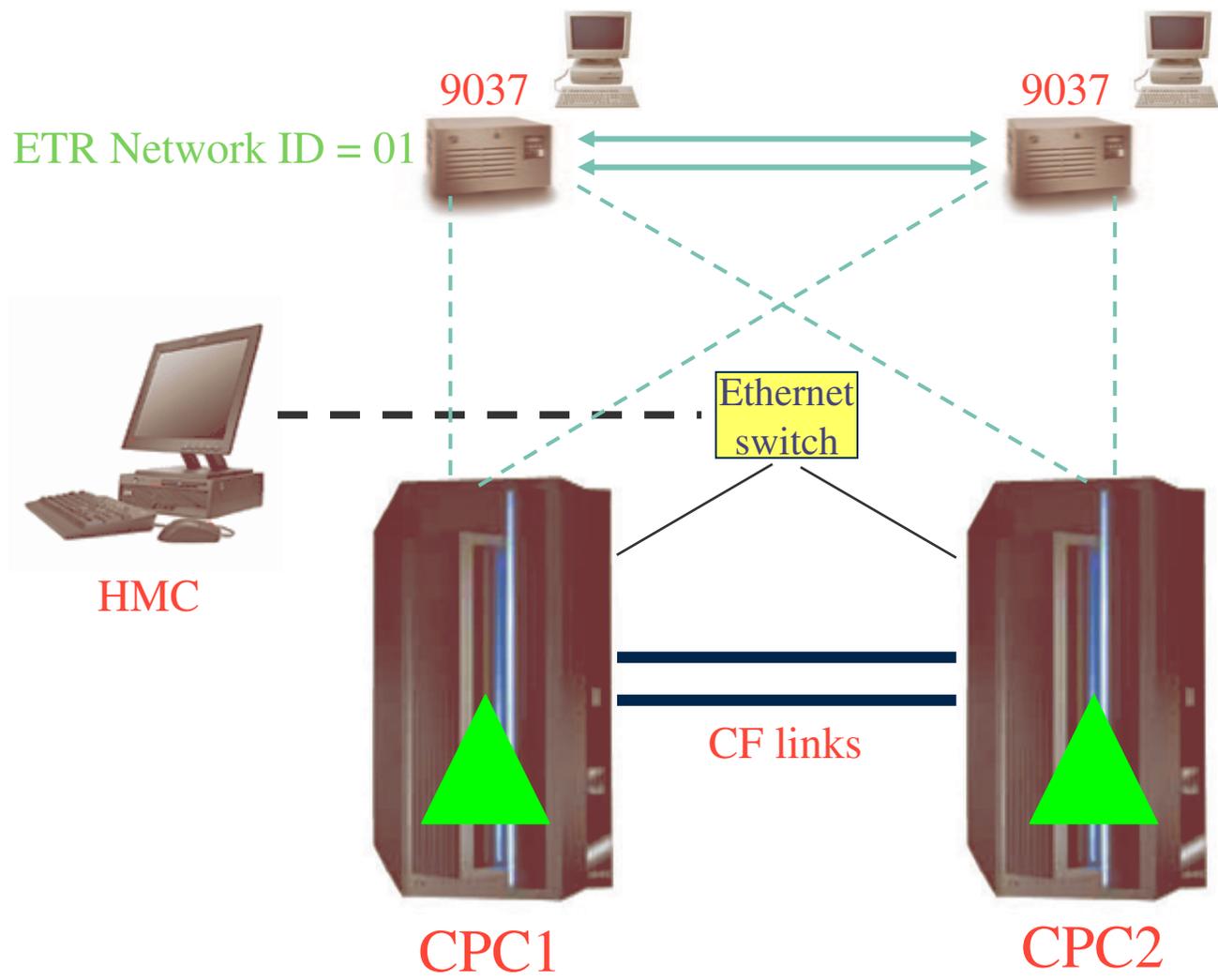
## Fakta om STP (2)

- STP håndteres fra HMC
- STP kan genbruge CF Links som Timer Links (alternativt Timer-only Links)
- Tillader brug af dial-out time service med faste intervaller (telefonforbindelse på CPC kan genbruges)
- Ingen mulighed for tilslutning af ekstern time source som satellit-forbindelse/ GPS-modtager – forventes i 2008!

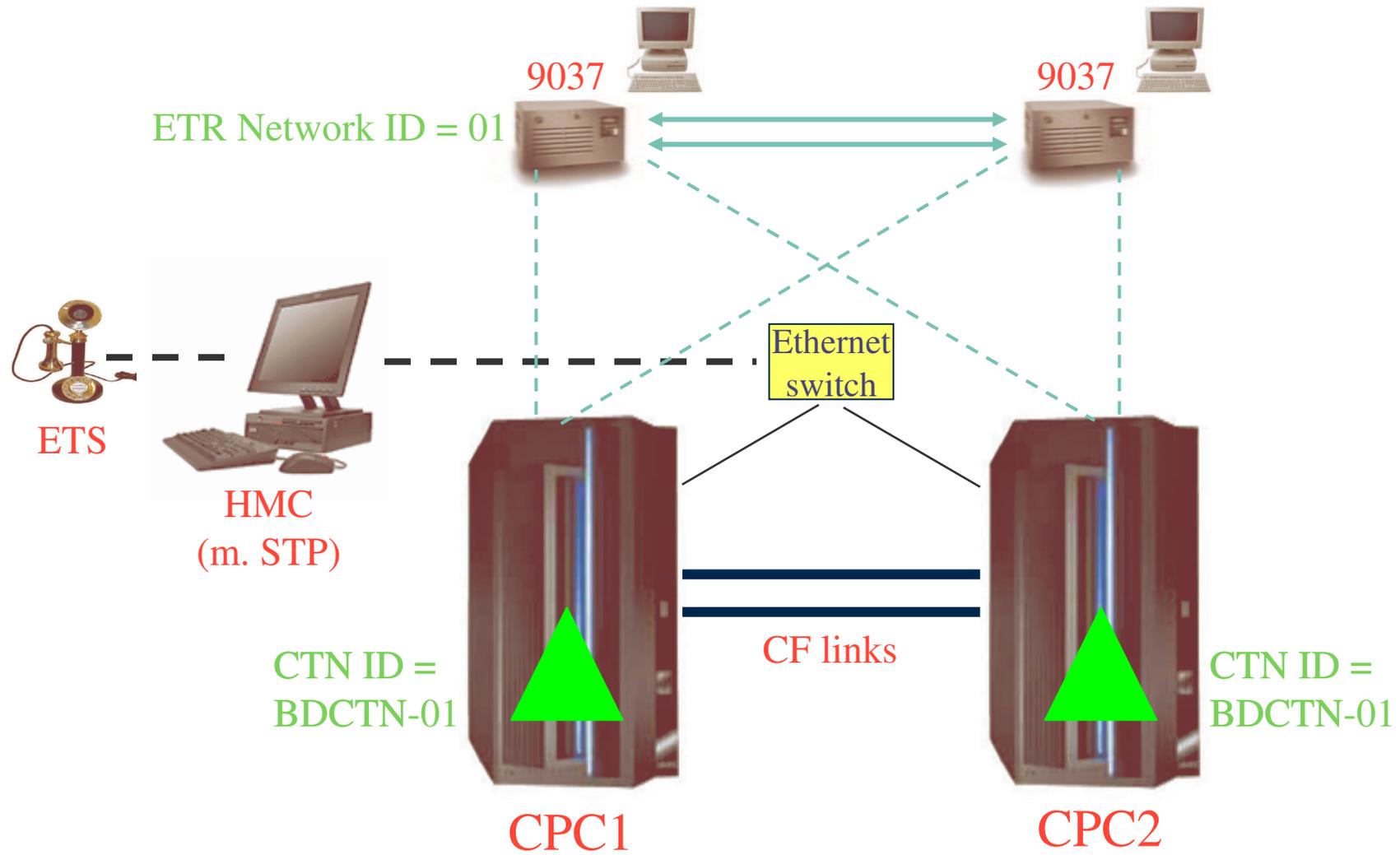
# STP begreber (1)

- **CTN** (Coordinated Timing Network) = servere tidssynkroniseret til Coordinated Server Time (CST)
- **Mixed CTN** = timing netværk med både ETR og STP-konfigurerede servere
- **STP-only CTN** = alle servere/CF'er synkroniseres til CST, ingen ETR-krav
- **CTN ID** = fælles ID for servere/CF'er i et timing netværk (f.eks. BDCTN eller BDCTN-01)

# Sysplex Timer (ETR Network)



# Mixed CTN



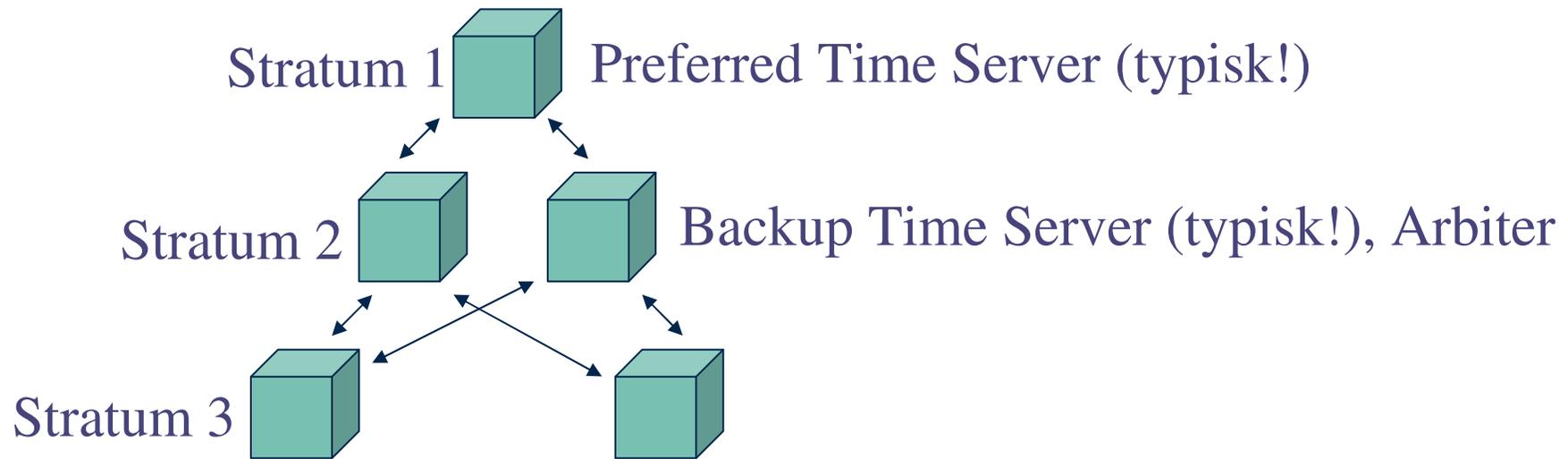
# STP begreber (2)

Server roller (CPC-niveau)

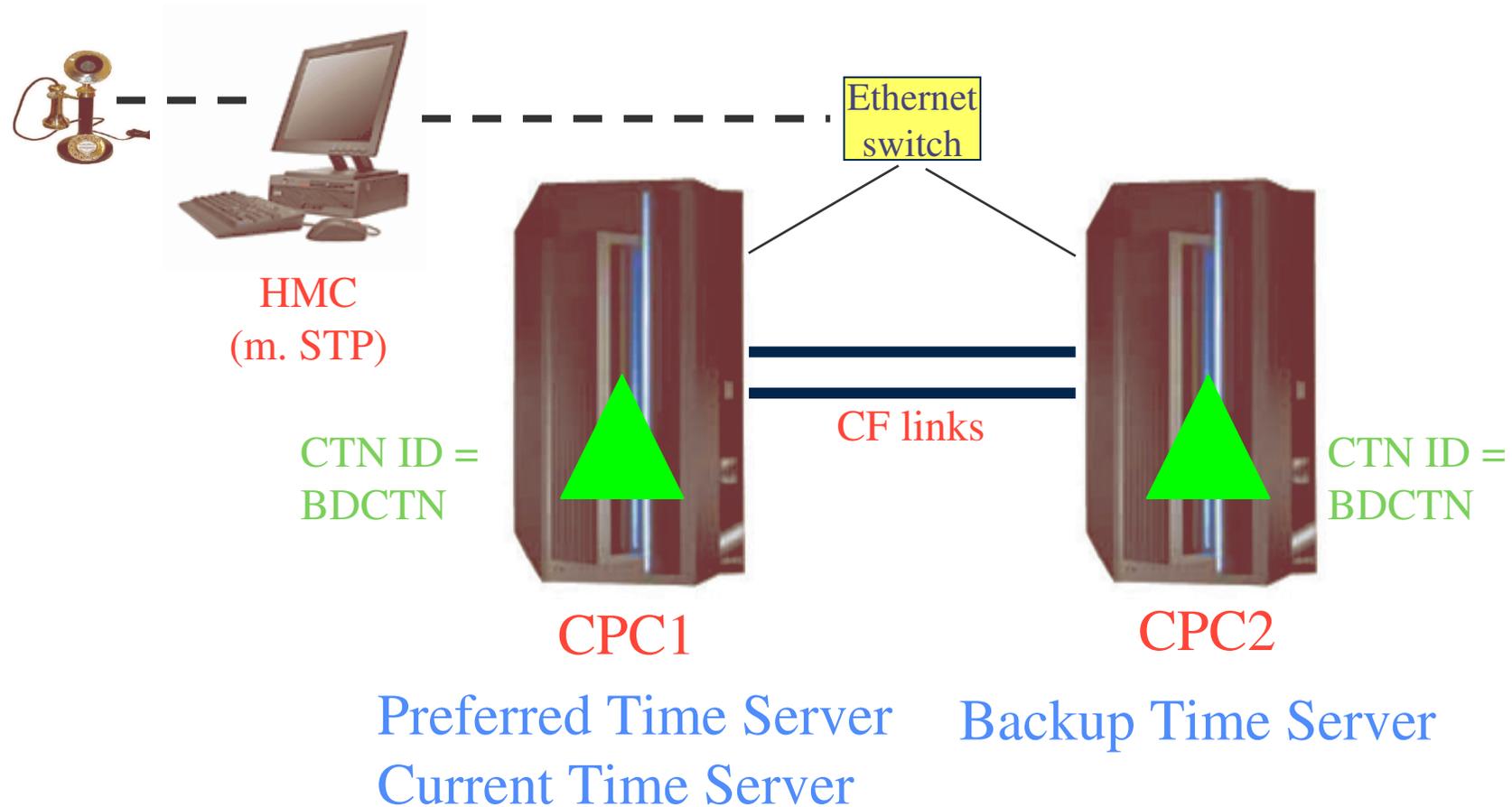
- **PTS** = Preferred Time Server
- **BTS** = Backup Time Server
- **CTS** = Current Time Server
- Arbiter Server

# STP begreber (3)

- Stratum = Et lag i et STP-timing netværk-hierarki.



# Server roller i "STP Only CTN"



# Ændringer med STP

- STP-adm. kræver logon på HMC med SYSPROG-user
- Nyt HMC-ikon: System (Sysplex) Time
- Deaktivering af CPC kræver evt. skift af server rolle
- Skift af tid ved sommertid/normaltid
- Sysplex Timer helt erstattet af dial-out fra HMC (f.eks. ugentlig)
- Nye detaljer på **D ETR** og **D XCF,S,ALL**

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# Implementering af STP (1)

- Kontrakt samt bestilling af STP
- Redbooks studeres:
  - STP Planning
  - STP Implementation Guide
- STP-selvstudie gennemgås
- HCD-generering ikke nødvendig!

# Implementering af STP (2)

- PSP-bucket gennemgås og PTF'er lægges på alle MVS'er (z/OS 1.8)
- IBM tester dial-out fra 9037 med følgende resultat:
  - Difference sammenlignet med satellittiden var 0,01-0,02 sek. = rigelig tilfredsstillende

# Implementering af STP (3)

- IBM opgraderer 9037 LIC med STP-support
- IBM lægger MCL'er med STP på 2094 (→ STP-capable servere)
- IBM aktiverer LIC til STP (→ STP-enablede servere)

# Implementering af STP (4)

- Alle MVS'er IPL'es med følgende tilføjelser til CLOCKxx-member:
  - STPMODE YES
  - STPZONE YES

## Vigtigt

Bevar ETRMODE YES, og tilføj STPMODE YES → muligt at skifte mellem ETR, Mixed CTN og STP-only CTN!

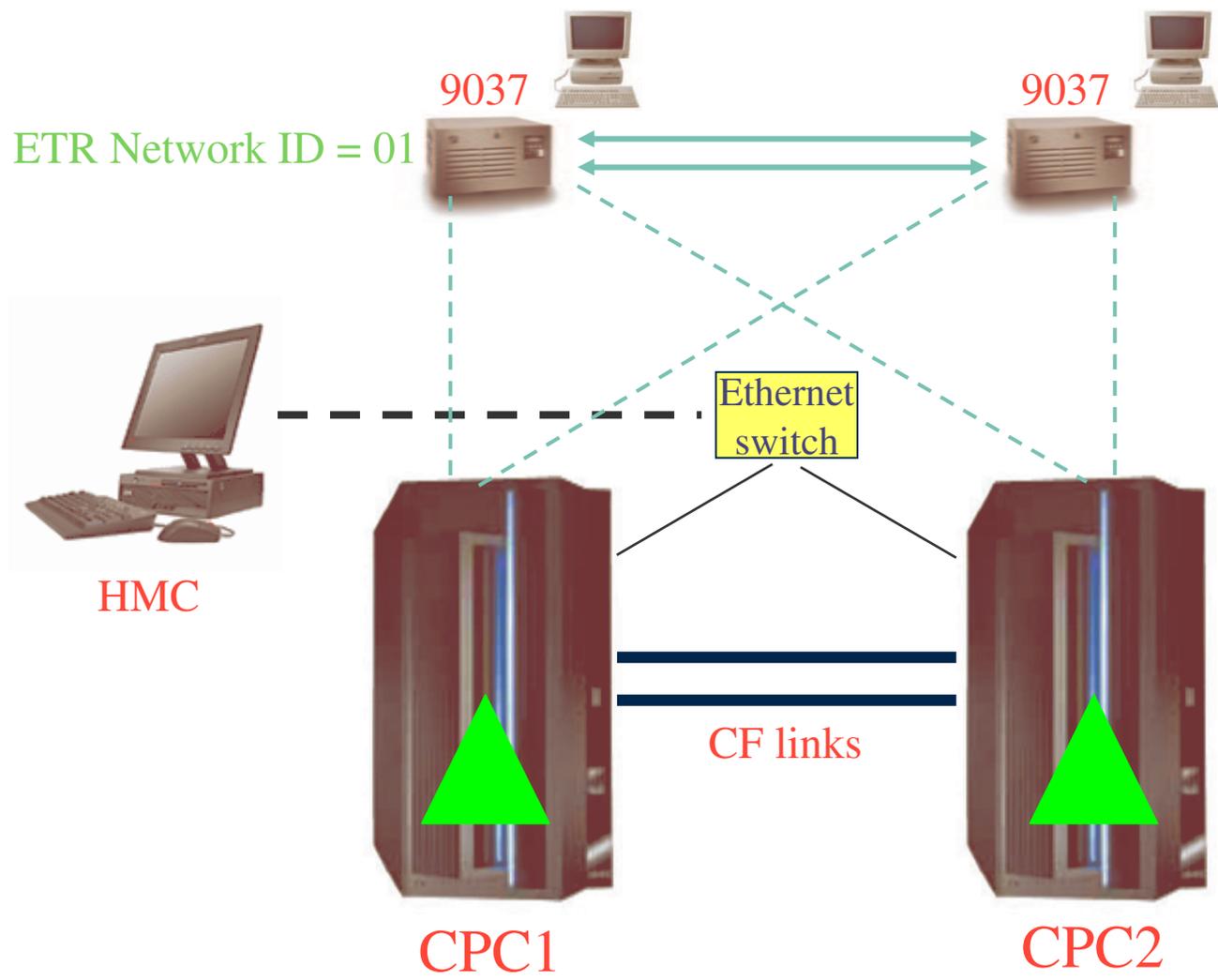
# Implementering af STP (5)

- En sen nattetime testes skift fra ETR til "Mixed CTN" og til "STP-only CTN" (se næste foils) – varighed ca. 1 time
- Skift (in flight) til STP i produktion – varighed ca. 10 min.
- Sysplex Timer pilles ned

**NB.**

STP foregår på CPC-niveau → berører alle LPAR's

# Sysplex Timer (ETR Network)



# D ETR (med 9037)

## D ETR

IEA282I 19.03.43 TIMING STATUS 537

SYNCHRONIZATION MODE = ETR

CPC PORT 0 <== ACTIVE

OPERATIONAL

ENABLED

ETR NET ID=01

ETR PORT=01

ETR ID=01

CPC PORT 1

OPERATIONAL

ENABLED

ETR NET ID=01

ETR PORT=01

ETR ID=02

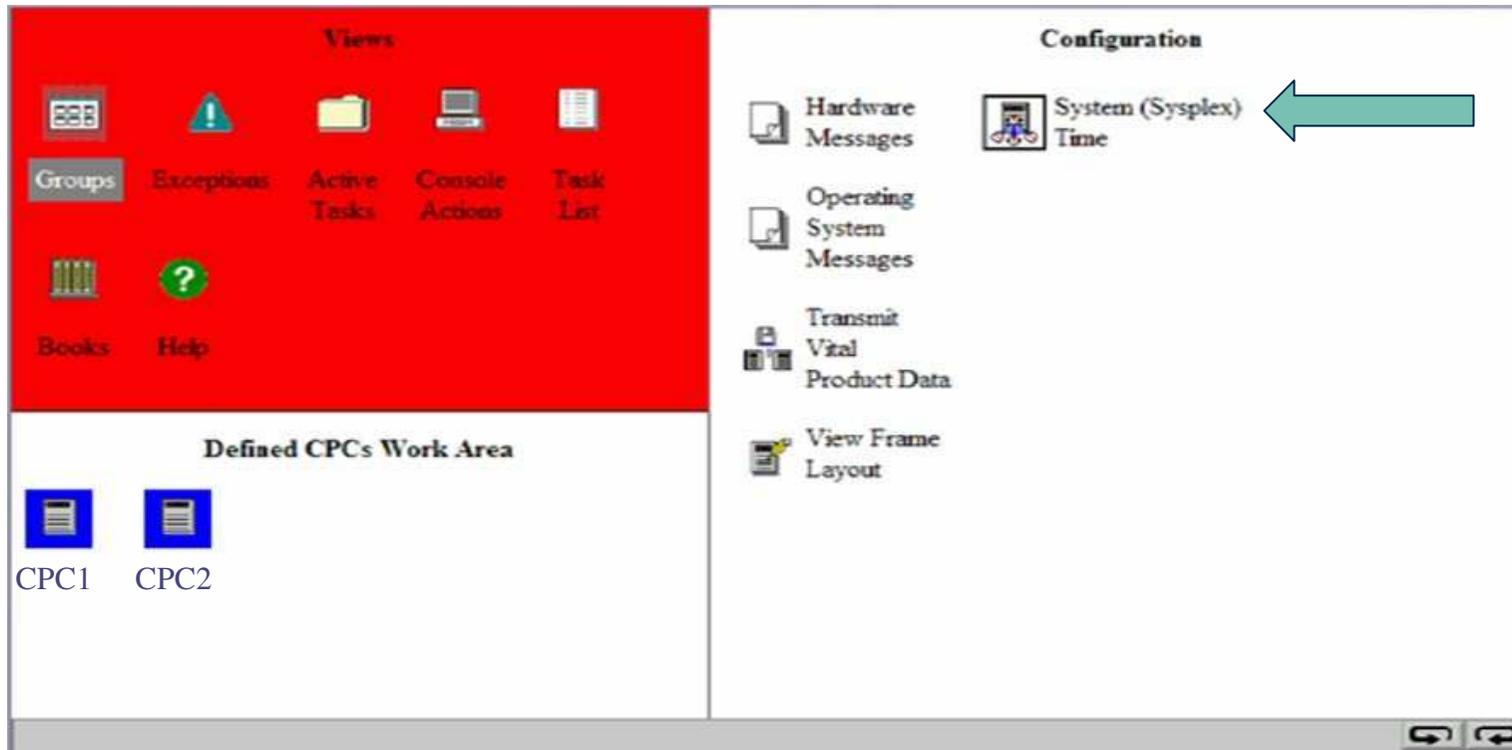
# D XCF,S,ALL (med 9037)

## D XCF,S,ALL

IXC335I 19.06.28 DISPLAY XCF 584

SYSTEM	TYPE	SERIAL	LPAR	STATUS	TIME	SYSTEM STATUS	
SYSA	2094	9FBB	01	06/23/2007	19:06:27	ACTIVE	TM=ETR
SYSB	2094	A6CB	01	06/23/2007	19:06:27	ACTIVE	TM=ETR

# System (Sysplex) Time



# Skift til Mixed CTN (1)

- CTN ID sættes ens på alle CPC'er.
- Servere er nu STP-configured.

System (Sysplex) Time

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

CPC1  
CPC2

Coordinated timing network ID  -

# Skift til Mixed CTN (2)

- ETR-forbindelser disables.

The screenshot shows a configuration window titled "System (Sysplex) Time". The "ETR Configuration" tab is active. The "ETR network ID" is set to "01 (in decimal)". Below this, there are two columns: "Port 0 State" and "Port 1 State". Each column has three radio button options: "Enabled", "Disabled", and "Off". In both columns, the "Disabled" option is selected. Below the radio buttons, there is an attention message: "Attention: A port can be operational only when a valid ETR network ID is entered and the port's manual state is 'Enabled'." At the bottom of the configuration area, there are three buttons: "Apply", "Reset ETR", and "Reset Link Error Threshold". At the very bottom of the window, there are three buttons: "Refresh", "Cancel", and "Help". On the right side of the window, there are two labels: "CPC1" and "CPC2".

System (Sysplex) Time

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

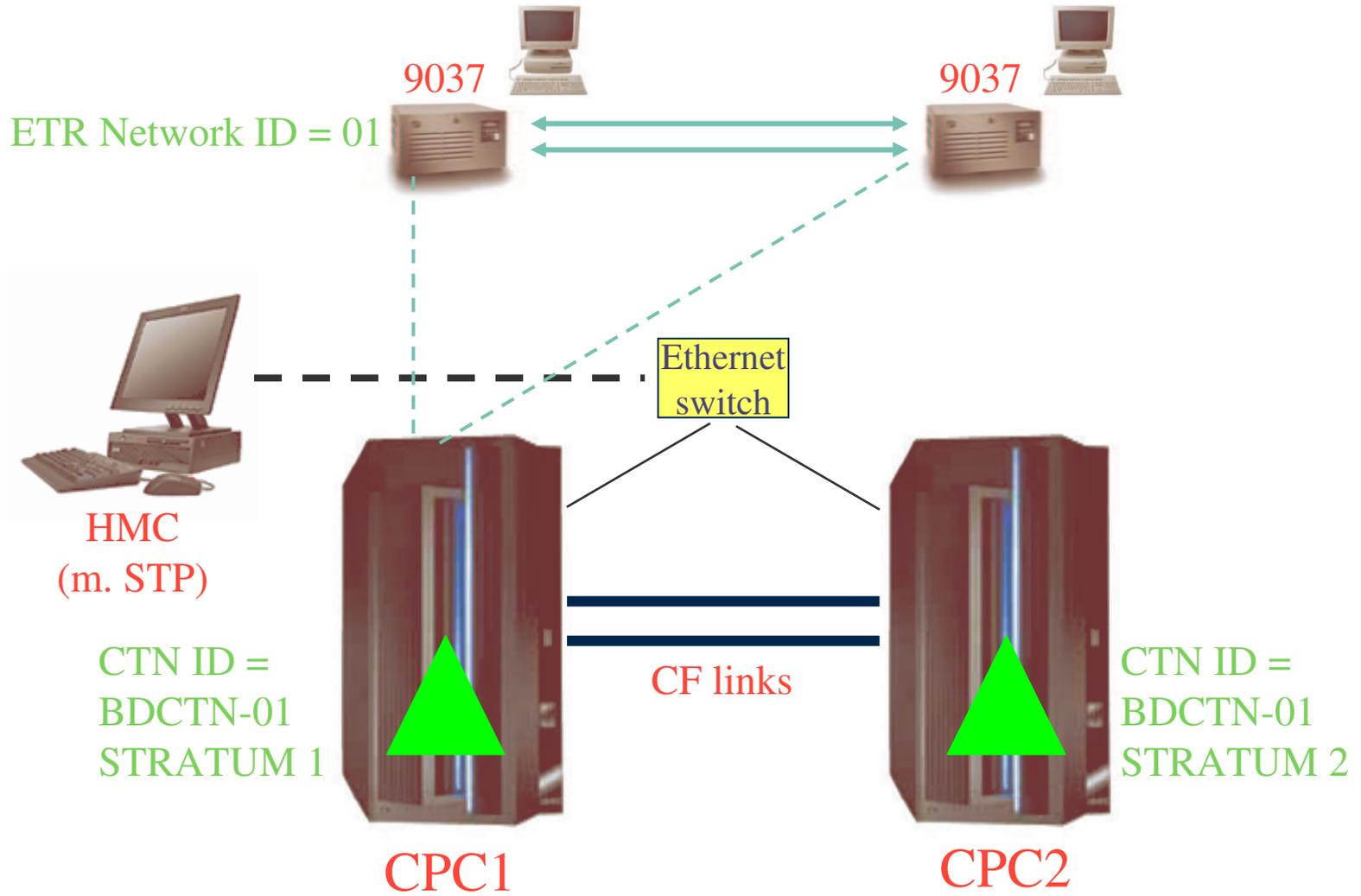
ETR network ID  (in decimal)

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

Attention: A port can be operational only when a valid ETR network ID is entered and the port's manual state is 'Enabled'.

CPC1  
CPC2

# Mixed CTN



# D ETR (Mixed CTN)

## D ETR

IEA282I 19.03.43 TIMING STATUS 537

SYNCHRONIZATION MODE = ETR

CPC PORT 0 <== ACTIVE

OPERATIONAL

ENABLED

ETR NET ID=01

ETR PORT=01

ETR ID=01

CPC PORT 1

OPERATIONAL

ENABLED

ETR NET ID=01

ETR PORT=01

ETR ID=02

THIS SERVER IS PART OF TIMING NETWORK BDCTN-01

# Mixed CTN -> STP-only CTN

**System (Sysplex) Time**

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

**CPC1**  
**CPC2**

**Current Network Configuration**

Configured at (UTC):  
Preferred time server (CPC) **CPC1** (STP ID: **BDCTN**)  
Backup time server (CPC) **CPC2** (STP ID: **BDCTN**)  
Arbiter **Not configured**

Force configuration

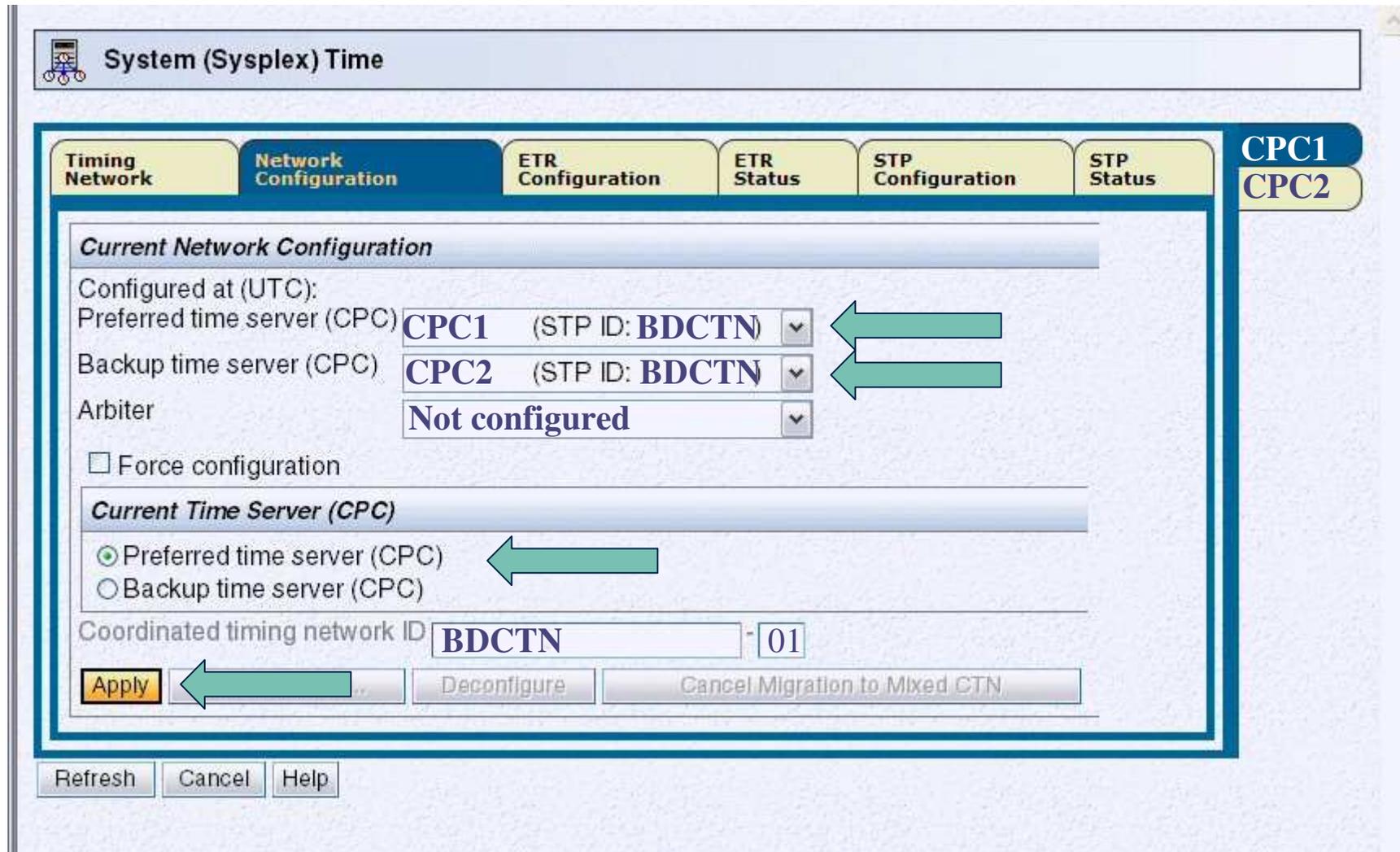
**Current Time Server (CPC)**

Preferred time server (CPC)  
 Backup time server (CPC)

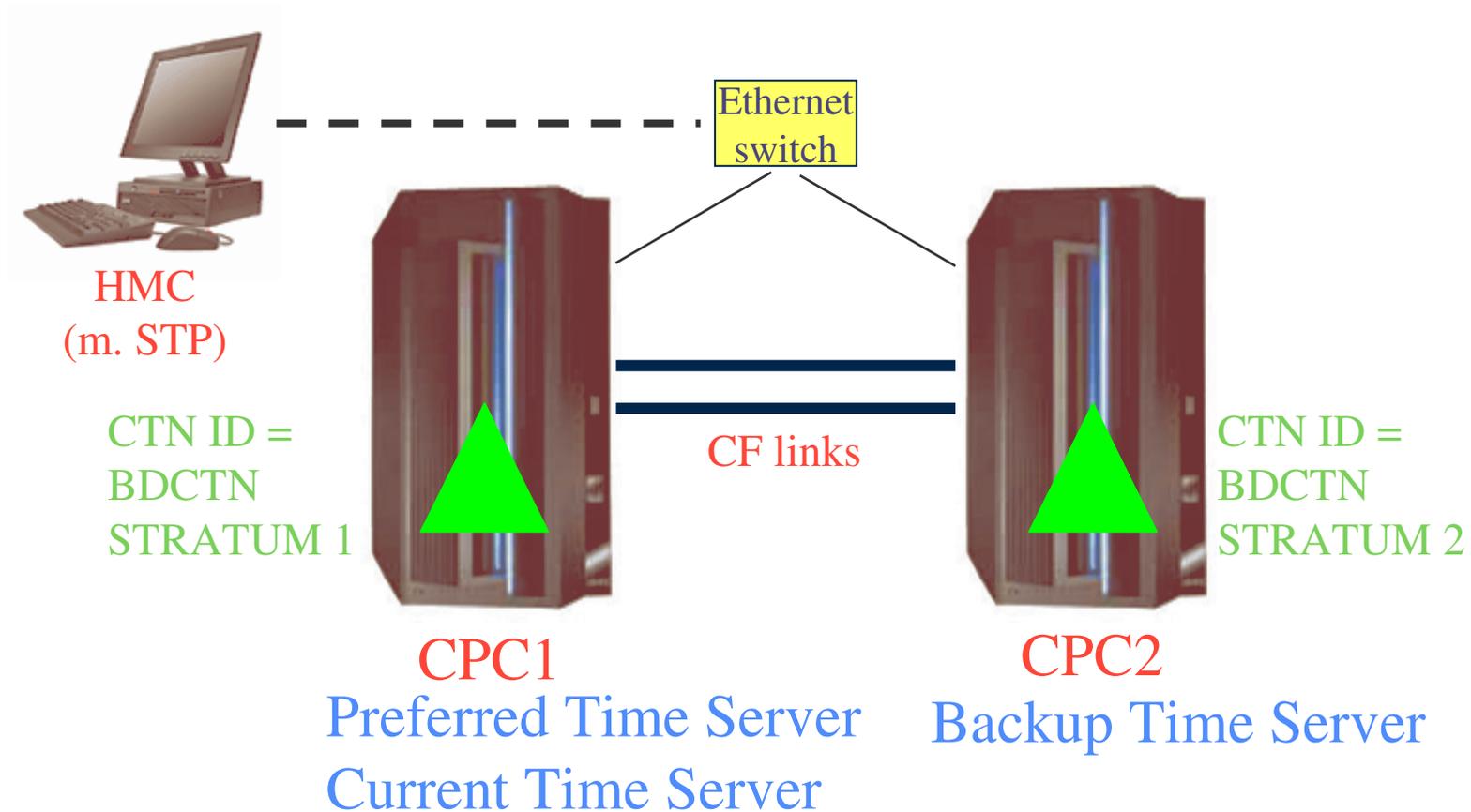
Coordinated timing network ID **BDCTN** - **01**

**Apply** | Deconfigure | Cancel Migration to Mixed CTN

Refresh | Cancel | Help



# STP-only CTN



# D ETR (STP-only CTN)

## D ETR

```
IEA386I 03.13.37 TIMING STATUS 662
SYNCHRONIZATION MODE = STP
  THIS SERVER IS A STRATUM 1
  CTN ID = BDCTN
  THE STRATUM 1 NODE ID = 002094.S18.IBM.51.00000007A6CB
  THIS IS THE PREFERRED TIME SERVER
  THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

## D ETR

```
IEA386I 03.13.52 TIMING STATUS 165
SYNCHRONIZATION MODE = STP
  THIS SERVER IS A STRATUM 2
  CTN ID = BDCTN
  THE STRATUM 1 NODE ID = 002094.S18.IBM.51.00000007A6CB
  THIS IS THE BACKUP TIME SERVER
  NUMBER OF USABLE TIMING LINKS = 12
  THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

# D XCF,S,ALL (STP-only CTN)

## D XCF,S,ALL

IXC335I 03.13.14 DISPLAY XCF 656

SYSTEM	TYPE	SERIAL	LPAR	STATUS	TIME	SYSTEM	STATUS
SYSA	2094	9FBB	05	06/10/2007	03:13:11	ACTIVE	TM=STP
SYSB	2094	A6CB	05	06/10/2007	03:13:14	ACTIVE	TM=STP

# Coordinated Server Time (1)

- Ved migrering fra Mixed CTN til STP-only CTN arves tid + total offset fra Sysplex Timer, men CTN har ikke defineret en time zone.

**System (Sysplex) Time**

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

**Coordinated Server Time**  
Time: 10:55:03 PM  
Date: 1/10/07

**Offsets**  
Leap second: 0  
Total time (hours : minutes): 2:00

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

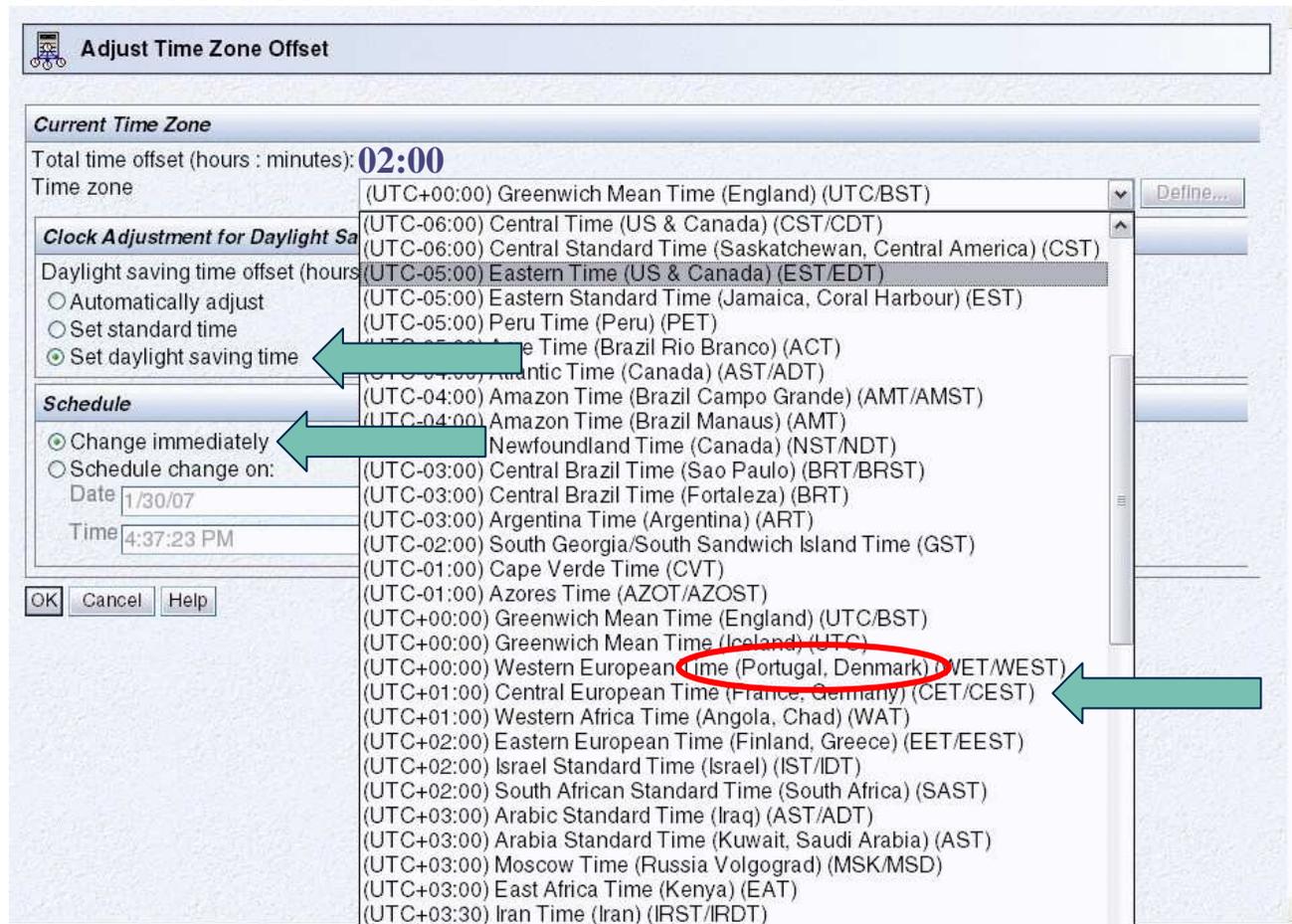
Adjustment Steering... | Adjust Time... | Adjust Leap Seconds... | Adjust Time Zone...

Refresh | Cancel | Help

CPC1  
CPC2

# Coordinated Server Time (2)

- Justering/opsætning af tid kan kun ske fra Current Time Server.



# Coordinated Server Time (3)

**System (Sysplex) Time**

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

**Coordinated Server Time**

Time: 11:06:59 PM  
Date: 1/10/07  
Time zone: **(UTC+01:00) Central European Time (France, Ger...**  
Currently: EST

**Offsets**

Leap second: 0  
Time zone offset from UTC: 01:00  
Daylight saving time (hours : minutes): 01:00

**Network**

Timing network type: STP-only CTN  
Coordinated timing network (CTN) ID: **BDCTN**  
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

CPC1  
CPC2

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# External Time Source

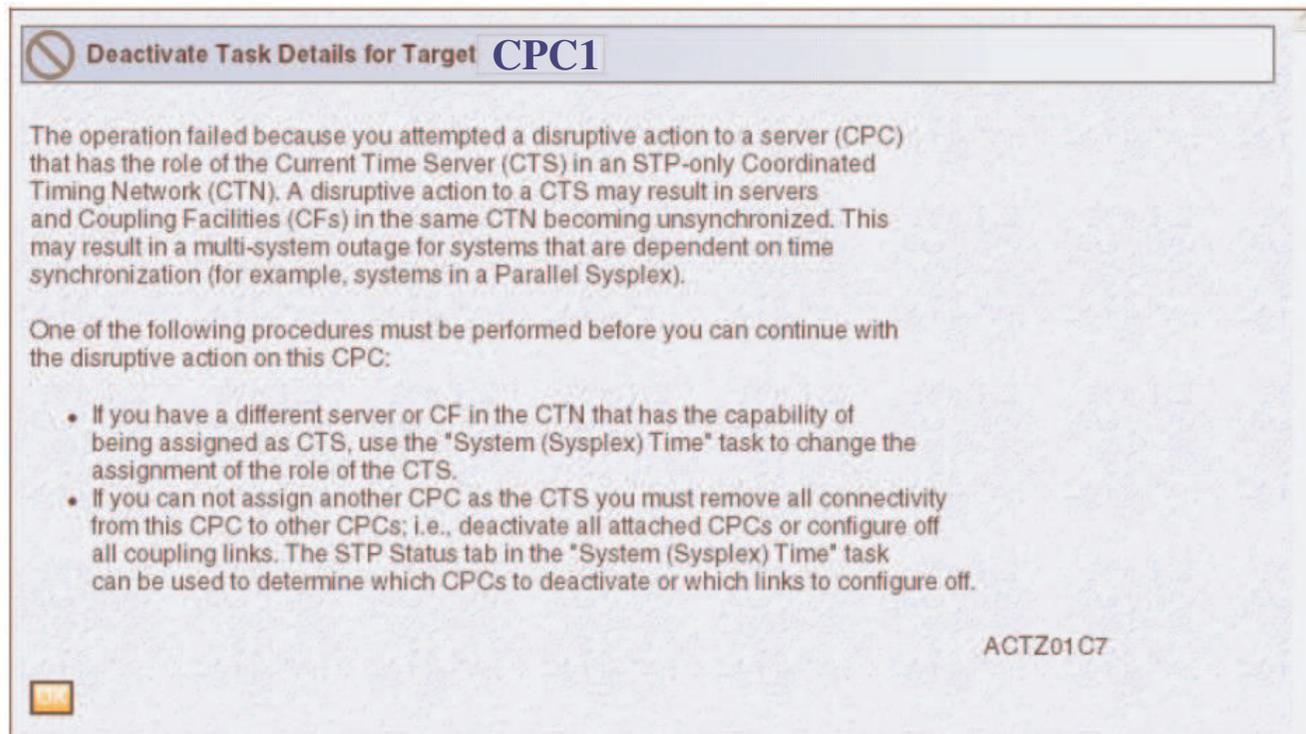
- IBM har sat CPC'en op til dial-out til ekstern kilde tre gange ugentligt – til erstatning for Sysplex Timer
- Eventuelle små tidsforskelle udlignes automatisk
- Fungerer uden problemer
- Frekvensen nedsættes til en uge



Please wait while the External Time Source is being queried.

# Deactivate af CTS-server

- Skift rolle før deactivate!



**Deactivate Task Details for Target CPC1**

The operation failed because you attempted a disruptive action to a server (CPC) that has the role of the Current Time Server (CTS) in an STP-only Coordinated Timing Network (CTN). A disruptive action to a CTS may result in servers and Coupling Facilities (CFs) in the same CTN becoming unsynchronized. This may result in a multi-system outage for systems that are dependent on time synchronization (for example, systems in a Parallel Sysplex).

One of the following procedures must be performed before you can continue with the disruptive action on this CPC:

- If you have a different server or CF in the CTN that has the capability of being assigned as CTS, use the "System (Sysplex) Time" task to change the assignment of the role of the CTS.
- If you can not assign another CPC as the CTS you must remove all connectivity from this CPC to other CPCs; i.e., deactivate all attached CPCs or configure off all coupling links. The STP Status tab in the "System (Sysplex) Time" task can be used to determine which CPCs to deactivate or which links to configure off.

ACTZ01 C7

OK

# Skift roller

**System (Sysplex) Time**

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

**CPC1**  
**CPC2**

**Current Network Configuration**

Configured at (UTC):

Preferred time server (CPC) **CPC1** (STP ID: **BDCTN**)

Backup time server (CPC) **CPC2** (STP ID: **BDCTN**)

Arbiter **Not configured**

Force configuration

**Current Time Server (CPC)**

Preferred time server (CPC)  
 Backup time server (CPC)

Coordinated timing network ID **BDCTN**

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

Refresh Cancel Help

# Skift til/fra sommertid

- Skift af tid kan kun ske fra Current Time Server.

The screenshot shows the 'System (Sysplex) Time' configuration window. The window has a title bar with a clock icon and the text 'System (Sysplex) Time'. Below the title bar are several tabs: 'Timing Network' (selected), 'Network Configuration', 'ETR Configuration', 'ETR Status', 'STP Configuration', and 'STP Status'. On the right side of the window, there are two labels: 'CPC1' and 'CPC2'. The main content area is divided into three sections: 'Coordinated Server Time', 'Offsets', and 'Network'. The 'Coordinated Server Time' section shows: Time: 11:06:59 PM, Date: 1/10/07, Time zone: (UTC+01:00) Central European Time (France, Ger..., and Currently: EST. The 'Offsets' section shows: Leap second: 0, Time zone offset from UTC: 01:00, and Daylight saving time (hours : minutes): 01:00. The 'Network' section shows: Timing network type: STP-only CTN, Coordinated timing network (CTN) ID: BDCTN, and CTN time source: Time inherited from a previous connection to a Sysplex Timer. At the bottom of the window, there are four buttons: 'Adjustment Steering...', 'Adjust Time...', 'Adjust Leap Seconds...', and 'Adjust Time Zone...'. A green arrow points to the 'Adjust Time Zone...' button. Below the main content area, there are three buttons: 'Refresh', 'Cancel', and 'Help'.

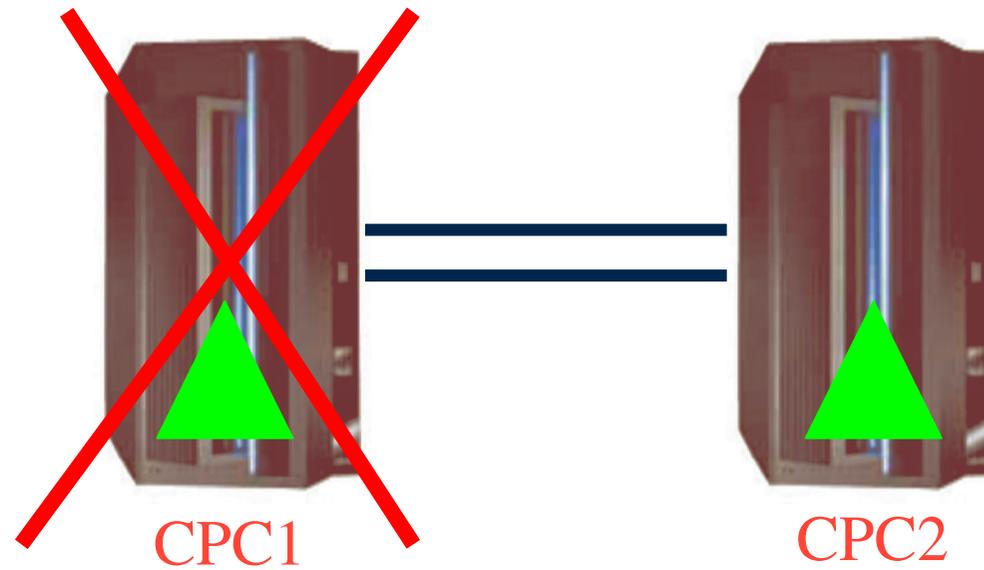
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# Fejlsituationer

- Håndtering af fejlsituationer afhænger af, hvor fejlen opstår (CTS, BTS, Arbiter eller i sidste Coupling link), og om der findes en BTS og en Arbiter.
- Alle mulige situationer beskrives i STP Implementation Guide.
- Enkelte situationer beskrives på følgende dias.

# Fejlsituation A (1)



CPC1

CPC2

Preferred Time Server  
Current Time Server

Backup Time Server

# Fejlsituation A (2)

- Et Offline Signal (OLS) sendes under følgende omstændigheder, når en path går offline :
  - Server eller LPAR dumper
  - Server power off
  - CHPID configure off
  - Kanalfejl
- OLS bruges kun ved "STP-only CTN" uden arbiter!

# Fejlsituation A (3)

- Modtager BTS OLS på alle STP-path'es til CTS, sker følgende helt automatisk:
  - Info via IXC-meddelelser og via "System (Sysplex) Time" på HMC
  - BTS overtager rollen som CTS og bliver ny Stratum 1
  - Når gamle CPC er klar igen, overtager den automatisk rollen igen som CTS

# Fejlsituation A (4)

- Hvis CTS fejler, og BTS ikke modtager OLS på alle timing links, sker følgende:
  - BTS modtager ikke længere tid fra CTS
  - BTS bliver usynkroniseret og bliver Stratum 0
  - IEA394A udstedes på HMC for alle MVS'er på BTS

# Fejlsituation A (5)

```
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.
```

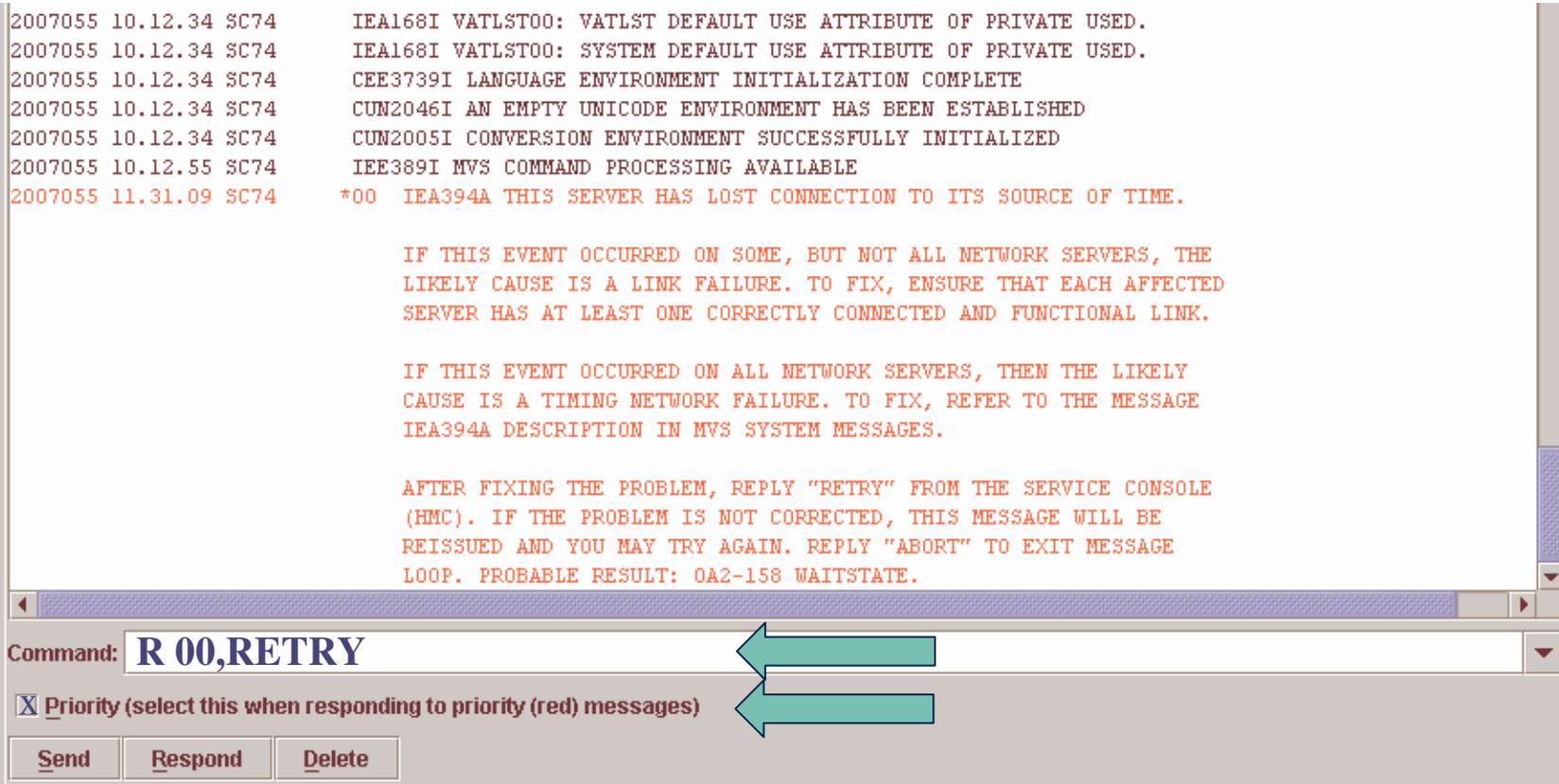
IF THIS EVENT OCCURRED ON SOME, BUT NOT ALL NETWORK SERVERS, THE LIKELY CAUSE IS A LINK FAILURE. TO FIX, ENSURE THAT EACH AFFECTED SERVER HAS AT LEAST ONE CORRECTLY CONNECTED AND FUNCTIONAL LINK.

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: 0A2-158 WAITSTATE.

Command: **R 00,RETRY**

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



# Fejlsituation A (6)

- Håndtering af IEA394A
  - Fire minutter til at svare på øvrige MVS'er, når der er svaret på den første → ellers waitstate!
  - Svar RETRY, når problemet er løst.
  - Svar ABORT medfører waitstate!
- Problemløsning
  - Sæt CTS til BTS i "System (Sysplex) Time" på HMC (se næste foil)

# Fejlsituation A (7)

**System (Sysplex) Time**

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

**CPC1**  
**CPC2**

**Current Network Configuration**

Configured at (UTC):  
Preferred time server (CPC) **CPC1** ▼  
Backup time server (CPC) **CPC2** (STP ID: **BDCTN**) ▼  
Arbiter **Not configured** ▼

Force configuration

**Current Time Server (CPC)**

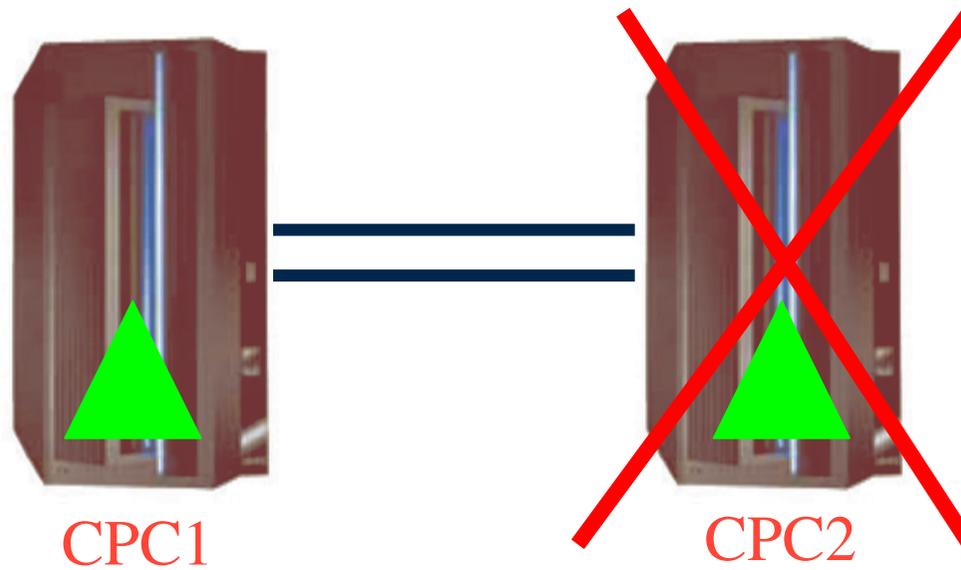
Preferred time server (CPC)  
 Backup time server (CPC) ←

Coordinated timing network ID **BDCTN** -

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

Refresh Cancel Help

# Fejlsituation B (1)



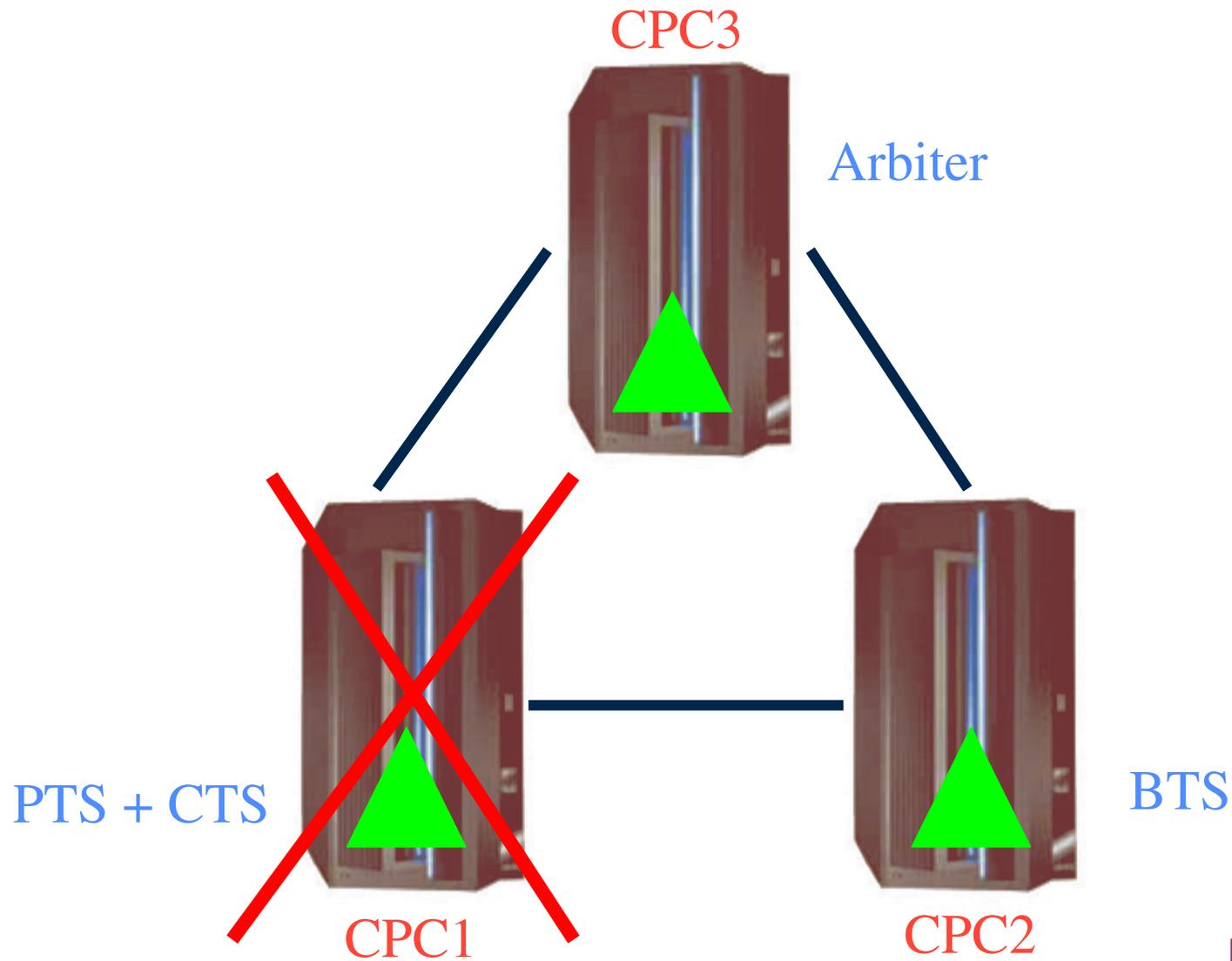
CPC1

CPC2

Preferred Time Server  
Current Time Server

Backup Time Server

# Fejlsituation C (1)



## Fejlsituation C (2)

- Her bruges Arbiter i stedet for OLS i fejlsituationer
- Hvis CTS fejler, kommunikerer BTS med Arbiter for at bekræfte, at forbindelsen til CTS er mistet, og CTS er død
- BTS overtager automatisk rollen som CTS
- Når PTS er kørende igen, overtager den automatisk rollen som CTS

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# Referencemateriale

## Redbooks

- Server Time Protocol Planning Guide, SG24-7280
- Server Time Protocol Implementation Guide, SG24-7281

## STP selvstudie

- [www.ibm.com/servers/resourcelink](http://www.ibm.com/servers/resourcelink)
- Vælg Education
- Vælg z9 EC
- Vælg Introduction to Server Time Protocol

# Spørgsmål?

kontakt evt.

[kia@bankdata.dk](mailto:kia@bankdata.dk)

bankdata

# Last timing link validation (1)

- Alle 12 Coupling links bruges også som Timing Links = backup for hinanden

D ETR:

IEA386I 09.14.30 TIMING STATUS 951

SYNCHRONIZATION MODE = STP

THIS SERVER IS A STRATUM 2

CTN ID = BDCTN

THE STRATUM 1 NODE ID = 002094.S18.IBM.51.00000007A6CB

THIS IS THE BACKUP TIME SERVER

NUMBER OF USABLE TIMING LINKS = 12

THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER

# Last timing link validation (2)

- Sættes alle (på nær en) Coupling links offline, fås følgende

D ETR:

IEA386I 09.14.30 TIMING STATUS 951

SYNCHRONIZATION MODE = STP

THIS SERVER IS A STRATUM 2

CTN ID = BDCTN

THE STRATUM 1 NODE ID = 002094.S18.IBM.51.00000007A6CB

THIS IS THE BACKUP TIME SERVER

NUMBER OF USABLE TIMING LINKS = 1

THIS SERVER HAS ONLY A SINGLE SOURCE OF TIMING SIGNALS

THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER

# Last timing link validation (3)

CONFIG CHP (xx), OFFLINE for den sidste kanal →

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

CONFIG CHP (xx), OFFLINE, FORCE → samme resultat

# Last timing link validation(4)

- Vil man i en **test-situation** omgå "Last timing link validation" er der to muligheder:
- CFCC-kommando på CF-partition:  

```
CON xx OFF FORCESTP
```
- eller se næste slide

# Last timing link validation(5)

Toggle the CHPIDs to the desired state, then click "Apply".  
If there is a "Not allowed" Message for a CHPID select that 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 the CHPIDs using the operating system facilities, rather than the Support Element (SE)

Select	CSS.CHPID:LPAR Name	Current State	Desired State	Message
<input type="checkbox"/>	0.54:ECF2	Standby	Standby	
<input type="checkbox"/>	0.54:TC8W01	Standby	Standby	
<input type="checkbox"/>	0.54:TC8W02	Standby	Standby	
<input checked="" type="checkbox"/>	0.54:TC8W03	Online	Online	Not allowed
<input type="checkbox"/>	0.54:TC8W04	Standby	Standby	

**Details...**

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

**? Configure Channel Path On/Off**

This is the last Timing Link for STP messaging to an attached Server.  
LPAR images relying on STP time synchronization may switch to Local Mode.  
Do you want to allow this link to be configured off ?

ACT20042

Yes No