User Experience: BCPii, FlashCopy and Business Continuity

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4:30 PM on Monday , March 10, 2014
Session Number 14953

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Trademarks

Agenda

Introduction

Level 1: Synchronous Replication

Level 2: Logical Copies

Level 3: DRP testing

Level 4: Offsite Backup Copy

Questions

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Technology · Connections · Results

Over 100,000 merchants

Over 50 million business transaction per month

Monthly turnover of 9 billion NIS

3.8 Million Cards 43 % market share

2 million card holders

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About me

- *Manager, Central Infrastructures at Isracard*

- *Responsible for z/OS, z/VM, Linux(z and x), enterprise storage*

- *2 teams – Mainframe OS, Linux and Storage*

- *My background is z/OS system programming, tuning and capacity planning*

- *7 years at Isracard*

The Challenges and Triggers

❑   Normal threats like floods, earthquake, fire

❑ Geo-political specific threats like terror and cyber attacks

❑ In November 2008 a large Israeli financial institute had a 60 hour outage due to a logical error that was replicated to the DR site.

❑ Compliance

❑ Financial Constraints

Isracard Infrastructure

z114   z114   z196   Z10 BC + CBUs   Z10 BC - ELS

z/OS

z/VM+Loz

IBM
DS8700   MM   IBM
DS8870

BC   BC

IBM
XIV   Synchronous
Replication   IBM
XIV

VMware, Windows,
Linux

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Isracard Mainframe Infrastructure Primary Site
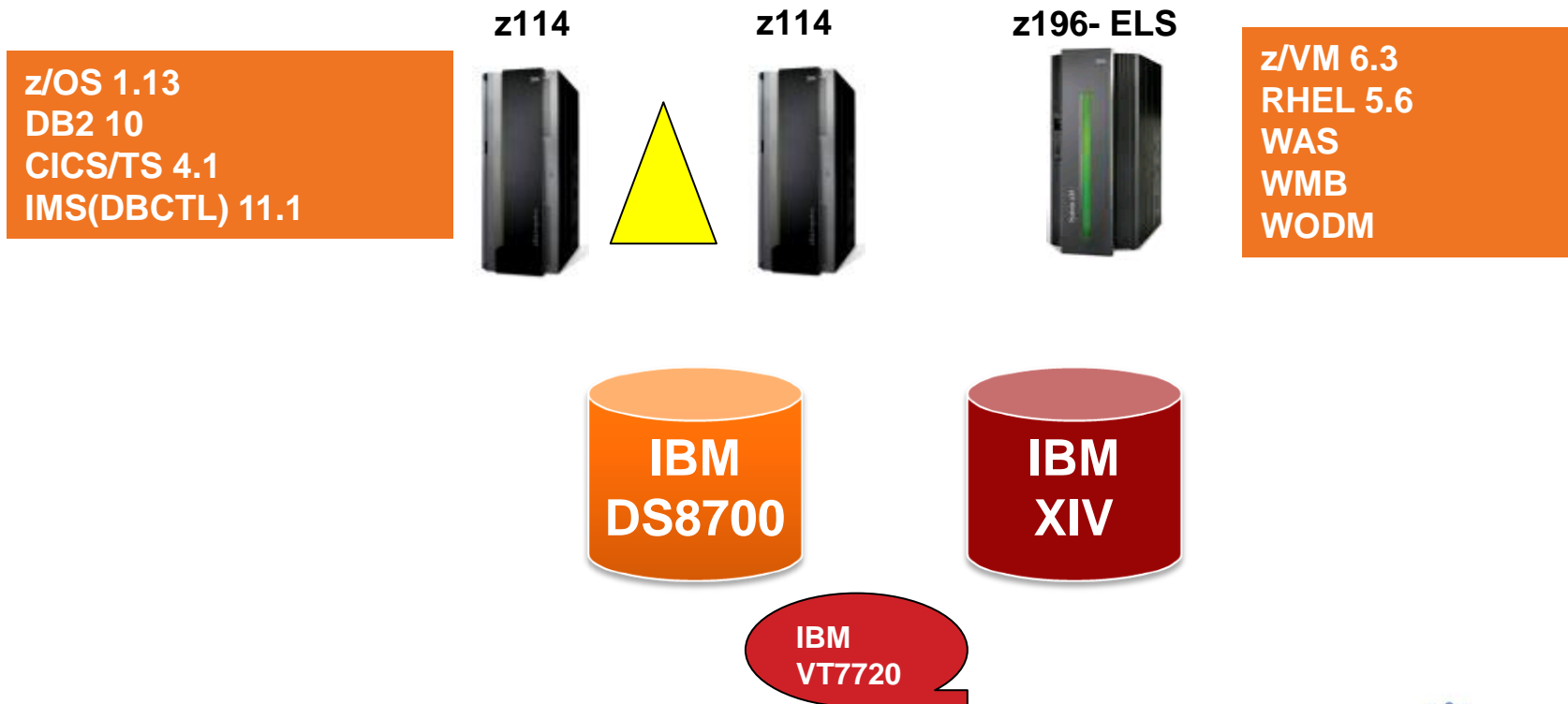
z114

z114

z196- ELS

z/OS 1.13
DB2 10
CICS/TS 4.1
IMS(DBCTL) 11.1

z/VM 6.3
RHEL 5.6
WAS
WMB
WODM

IBM DS8700

IBM XIV

IBM VT7720

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Questions

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Synchronous replication

➢ All production DASD are replicated to the DR site using Metro Mirroring(aka PPRC).

➢ Managed by Tivoli Productivity Center for Replication

➢ Approximately 16TB (9TB allocated) on 1800 volumes

➢ If one pair fails, I/O is frozen and all pairs are suspended creating a write dependent consistent mirror at the DR site(deals with the 'rolling disaster' scenario)

➢ I/O is released after a suspend(the other option is a sysplex wide outage). Availability preferred over mirror update.

➢ Monitored by hourly jobs

View / Modify Properties (Masger-DRP)

✅ Modifying VmGeneral Properties : IWNR1228I : Success : (Open Console) : **Completed**

Description
```
PPRC: Metro Mirror Session between disks
Bxxx-9xxx
```

ESS / DS Metro Mirror Options:

Basic Options:

☐ Reset Secondary Reserves
☑ Fail MM/GC if target is online (CKD only)

Metro Mirror Suspend Policy:

○ Hold I/O after Suspend
◉ Release I/O after Suspend

[OK] [Cancel]

Health Overview
Sessions
Storage Systems
Host Systems
Volumes
ESS/DS Paths
Management Servers
Administration
Advanced Tools
Console
About

Sign Out mshorkend

Health Overview

✅ Sessions
  ✅ 4 normal
  ⚠ 0 warning
  ⊗ 0 severe
Storage Systems
Host Systems
Management Servers
Remote Storage Systems
Remote Host Systems

Agenda

Introduction

Level 1: Synchronous Replication

Level 2: Logical Copies

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Level 4: Offsite Backup Copy

Questions

Logical Error Challenges

- If you have a software , hardware or application error that corrupts your data it gets replicated synchronously to your mirror

- Backups can help, but how do you get a consistent production copy?

- FLASH COPY is good but costly

- How do you check that your copy images are valid?

Our solution

- ➢ We take a space efficient flash copy of our production data every business day

- ➢ Two copies are kept: todays and yesterdays

- ➢ A third copy can be taken at any time(more on that later)

- ➢ After the copy is created, it is IPLed and data integrity is verified

- ➢ Only after it is verified, the previous days copy can be removed

- ➢ All automatic, using BMC/Control-M and Control-O,DSCLI and BCPii

Building Blocks(1/3):Space Efficient Flash Copy

Primary Site

Backup Site

16TB

16TB

7.4TB

| z/OS Production Bxxx Primary | MM → | z/OS Production 9xxx Secondary | z/OS Logical Copy 1 7xxx SEFC target | z/OS Logical Copy 2 8xxx SEFC target | z/OS DR test 6xxx SEFC target |

| z/VM Production Primary | MM → | z/VM Production Secondary | | | z/VM DR test FC target |

TEST
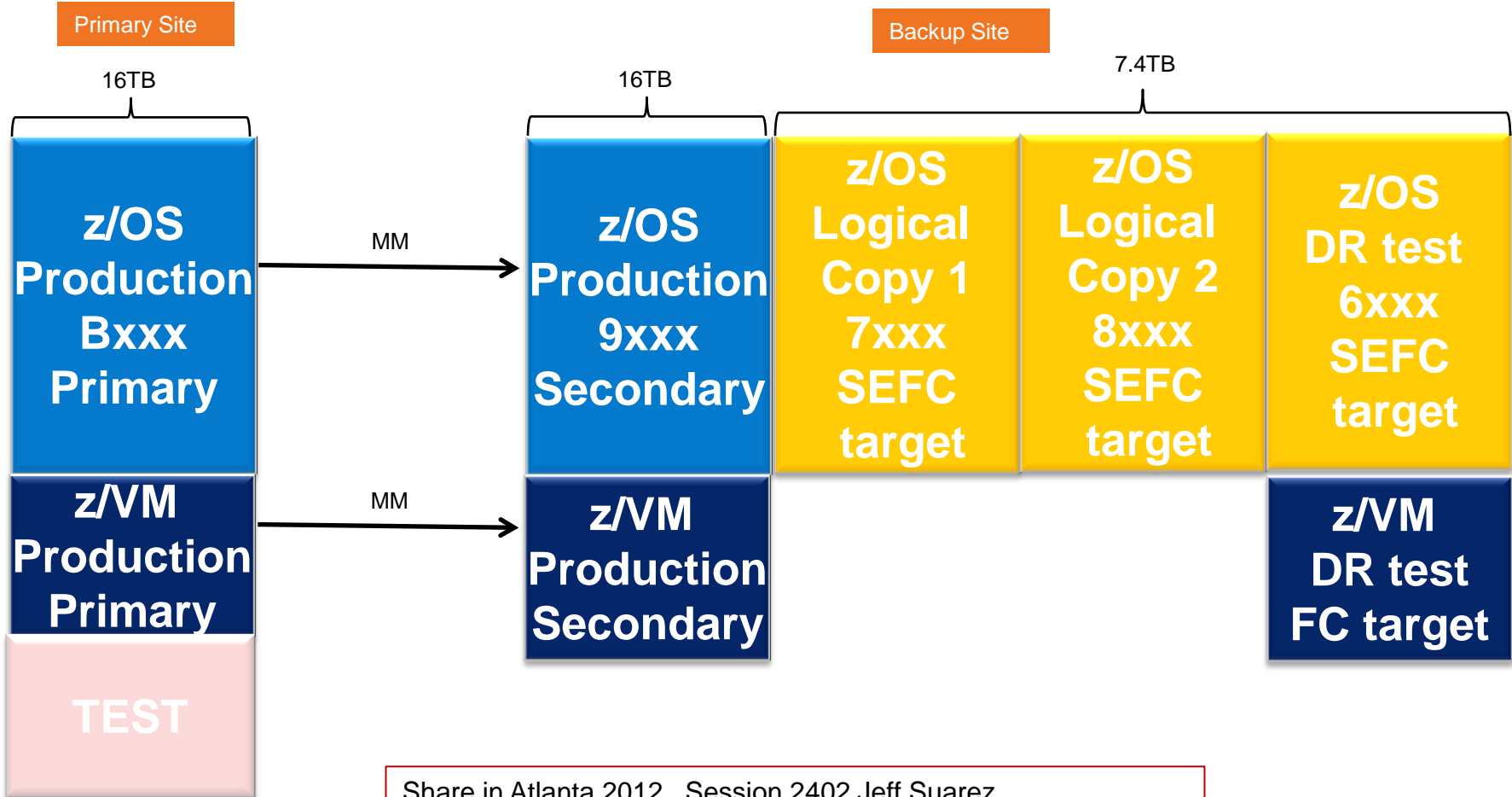
Share in Atlanta 2012 . Session 2402 Jeff Suarez
Share in Austin 2009. Session 3080. Linda Gundy

Building Blocks(2/3):BCPii

What is BCPii?

CPC1

CPC2

SE

SE

Process Control (HMC) Network

Authorized z/OS application

- Monitor status or capacity changes
- Obtain configuration data related to CPC or image
- Re-ipl an image
- Change temp. capacity
- Set activation profiles
- Etc..

CPC3

SE

HMC
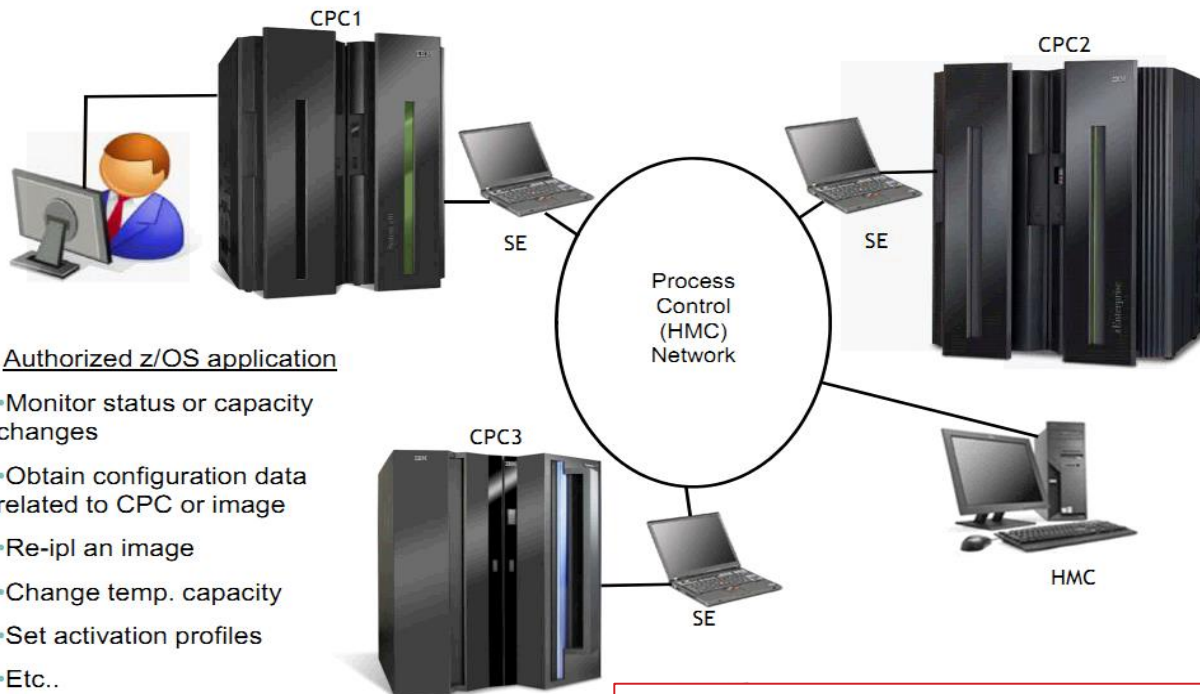
15048: What's New in BCPii in z/OS 2.1? Full REXX Support and Faster Data Retrieval, Wednesday, March 12, 2014: 8:00 AM-9:00 AM Grand Ballroom Salon C , Steve Warren

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Building Blocks(3/3)

- Control-M – z/OS and distributed scheduling
- Control-O – z/OS Automation
- DSCLI – command line interface to DS8870

The Big Picture

End of day processing		Create new Flash		IPL and Verify
z/OS	CTM	CSMCLI	CTM	BCPii+CTO

- When the job(on z/OS) indicating end of day processing has finished, a condition is raised by Control-M.

- This condition causes a DSCLI script to be run that creates the flash copy.

- When the script ends, Control-M raises a condition that causes a job on z/OS to run that activates the coupling facility and the z/OS image at the DR site.

- Another job monitors the IPL message log

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Creating the New Flash

```
cd \
cd "C:\Program Files\IBM\dscli"
echo ••••••••••••••••••••••••••••••••••••••••
date /t
time /t
dscli -cfg "C:\Program Files\IBM\dscli\profile\DS8700_DRP.profile" -hmc1 xxx.xx.52.211 -script c:\ControlM\rmflashmankal1.script >c:\ControlM\rmflashmankal1.log
dscli -cfg "C:\Program Files\IBM\dscli\profile\DS8700_DRP.profile" -hmc1 xxx.xx.52.211 -script c:\ControlM\flashmankal1.script >c:\ControlM\flashmankal1.log
dscli -cfg "C:\Program Files\IBM\dscli\profile\DS8700_DRP.profile" -hmc1 xxx.xx.52.211 -script c:\ControlM\unfreezeflashmankal1.script >c:\ControlM\unfreezeflashmankal1.log
exit
```

flashmankal1.script

```
mkflash -freeze -tgtse -necp -seqnum 01 9000-9018:7000-7018 9100-911F:7100-711F 9400-942F:7400-742F 9500-
952F:7500-752F 9600-963B:7600-763B 9700-973B:7700-773B 9800-98C7:7800-78C7 9900-99C7:7900-79C7 9A00-9AC7:7A00
-7AC7 9B00-9BC7:7B00-7BC7 9C00-9CC7:7C00-7CC7 9D00-9DC7:7D00-7DC7 9E00-9EB4:7E00-7EB4 9F00-9FEF:7F00-7FEF
unfreezeflash 90 91 94 95 96 97 98 99 9A 9B 9C 9D 9E 9F
lsflash -l 9000-9018
lsflash -l 9100-911F
lsflash -l 9400-942F
lsflash -l 9500-952F
lsflash -l 9600-963B
lsflash -l 9700-973B
lsflash -l 9800-98C7
lsflash -l 9900-99C7
lsflash -l 9A00-9AC7
lsflash -l 9B00-9BC7
lsflash -l 9C00-9CC7
lsflash -l 9D00-9DC7
lsflash -l 9E00-9EB4
lsflash -l 9F00-9FEF
```

For Consistency

Target is Space efficient

Copy on Write

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Automated IPL using BCPii

➢ Submit job that activates the coupling
➢ Submit job that listens on console traffic (of the IPLing image)
➢ Submit job that activates the z/OS image(load on activation set)
➢ Respond to WTORs using the listener job using CONTROL/O
➢ ControlO/Cosmos takes over the IPL process when it can
➢ When the system is up , run a CICS transaction (using the MODIFY command) to verify data integrity

Automated IPL Job

```
J E S 2   J O B   L O G   - -   S Y S T E M   S Y S E   - -   N O D E   I S R A C A R D

--- TUESDAY,    04 MAR 2014 ----
ICH70001I PRD3      LAST ACCESS AT 05:09:32 ON TUESDAY, MARCH 4, 2014
$HASP373 PSYGM15D STARTED - INIT IM   - CLASS Z - SYS SYSE
IEF403I PSYGM15D - STARTED - TIME=05.09.33
BCPIIACT Starting
BCPIIACT Preparing
BCPIIXEQ Driven
BCPIIXEQ Main
BCPIIXEQ Prepare
BCPIIACT Conecting to target CPC
BCPIIXEQ Driven
BCPIIXEQ Main
BCPIIXEQ Connect
BCPIIACT Conecting to target LPAR
BCPIIXEQ Driven
BCPIIXEQ Main
BCPIIXEQ Connect
BCPIIACT Querying current Status
BCPIIXEQ Driven
BCPIIXEQ Main
BCPIIXEQ Query
BCPIIACT CPC status ISRAB              MANKAL1   00000008 NOT_ACTIVATED
BCPIIACT to ask for approval
02 LPAR Activation approval  -  Please reply Y or N
R 2,Y
BCPIIACT activating LPAR ...
BCPIIXEQ Driven
BCPIIXEQ Main
BCPIIXEQ Command
BCPIIACT Querying after activation
BCPIIXEQ Driven
BCPIIXEQ Main
BCPIIXEQ Query
BCPIIACT CPC status ISRAB              MANKAL1   00000008 NOT_ACTIVATED
BCPIIACT Waiting ...
```

Listener Job – interact with console

```
02.06.09.37      IEA371I SYS0.IPLPARM ON DEVICE 8BB0 SELECTED FOR IPL PARAMETERS
02.06.09.39      IEA246I LOAD   ID M2 SELECTED
02.06.09.42      IEA246I NUCLST ID 00 SELECTED
02.06.09.45      IEA519I IODF DSN = IODF.IODFEC
02.06.09.48      IEA520I CONFIGURATION ID = SYSIM2  . IODF DEVICE NUMBER = 8BB0
02.06.09.50      IEA091I NUCLEUS 1 SELECTED
02.06.22.25    IEA370I MASTER CATALOG SELECTED IS CATALOG.MASTER.SYSI
02.06.22.41    IEA009I SYMBOLIC DEFINITIONS WILL BE READ FROM:
02.06.22.43            IEASYM00
02.06.22.46            IEASYM1I
02.06.22.49            IEASYMSI
02.06.22.68 *IEA247I USING IEASYSGB FOR z/OS 01.13.00 HBB7780
02.06.22.77  IEA007I STATIC SYSTEM SYMBOL VALUES
02.06.22.80            &SYSALVL.  = "2"
02.06.22.83            &SYSCLONE. = "1I"
02.06.22.86            &SYSNAME.  = "SYSI"
02.06.22.88            &SYSPLEX.  = "PLX1"
02.06.22.91            &SYSR1.    = "NSR132"



04.06.52.19    IXC419I SYSTEM(S) NOT SYNCHRONIZED: SYSI    SYSE    SYSB    SYSP
04.06.52.22 *    IXC420D REPLY I TO INITIALIZE SYSPLEX PLX1, OR R TO REINITIALIZE
04.06.54.91  IEE600I REPLY TO 00 IS;I
```

Automated IPL

```
RL:  IXC420D       LIB SYPO.CONTROLO.CTPO.RULES            TABLE:  MANKAL
COMMAND ===>                                               SCROLL===>  CRSI
+----------------------------------------------------------------------------
 ON SYSOUT    = MESSAGES JNAME PSYLISTN JTYPE    SMFID       SYSTEM
    PROCSTEP              PGMSTEP                              And/Or/Not A
 ON STRING    = IXC420D REPLY I TO                            COL      -
    JNAME           JTYPE        SMFID        SYSTEM         USERID
    ROUTE           DESC         CONSOLEID    CONSOLE
    APPEARED        TIMES IN        MINUTES                   And/Or/Not
 OWNER DCONOP    GROUP                        MODE PROD     RUNTSEC
 THRESHOLD
 DESCRIPTION IXC420D REPLY I TO INITIALIZE SYSPLEX SYSI, OR R TO
 DESCRIPTION
 ==============================================================================
 DO SET       = %%REPNUM = 00                              GLOBAL    N
 DO SET       = %%ANSWER = I                               GLOBAL    N
 DO SET       = %%CPC    = ISRAB                           GLOBAL    N
 DO SET       = %%LPAR   = %%MANKALTODAY                   GLOBAL    N
 /*
 DO SET       = %%ISSUECMD = %%CPC %%LPAR REPLY %%REPNUM,%%ANSWER  GLOBAL  N
 DO TSO       = EX 'SYPO.CONTROLO.CTPO.CLIST(BCPIICMN)' '%%ISSUECMD'
    WAITMODE    N                                TIMEOUT           STOP Y
    INITPROC                 SHARELOC N          IMMEDIATE N
 DO SHOUT     = TO OPER2             URGENCY R SYSTEM          CTO282I N
    MESSAGE %%MANKALTODAY - IXC420D - %%ANSWER
 DO
```

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Automated IPL

```
---------------------------- CONTROL-O COSMOS OBJECT STATUS  ------< D >-------- (OC)
COMMAND ===>                                                       SCROLL===> CRSR
O OBJECT    CURRENT   DESIRED   CLASS    MODE    STATUS
  CICSPIN1 DOWN      DOWN      CICS     FREE    STEADY DOWN
  CICSPTR1 DOWN      UP        CICS     FREE    CD=DU PR=IMSPDBC CICSPIS1
  CICSPIS1 DOWN      DOWN      CICS     FREE    STEADY DOWN
  CICSPIS2 DOWN      DOWN      CICS     FREE    STEADY DOWN
  CICSPHR1 DOWN      DOWN      CICS     FREE    STEADY DOWN
  CICSPBT1 DOWN      DOWN      CICS     FREE    STEADY DOWN
  CICSPMQ1 DOWN      DOWN      CICS     FREE    STEADY DOWN
  CICSPPXI DOWN      DOWN      STANDARD FREE    STEADY DOWN
====== >>>>>>>>>>>>>>>     NO MORE ENTRIES IN THE LIST     <<<<<<<<<<<<<<< ======
```

```
06.10.09 JOB06908 *MANKAL - *****************************************
06.10.09 JOB06908 *MANKAL - * THE CICS CHECK OF MANKAL ENDED OK  *
06.10.09 JOB06908 *MANKAL - *****************************************
```

Logical Copy - Recap
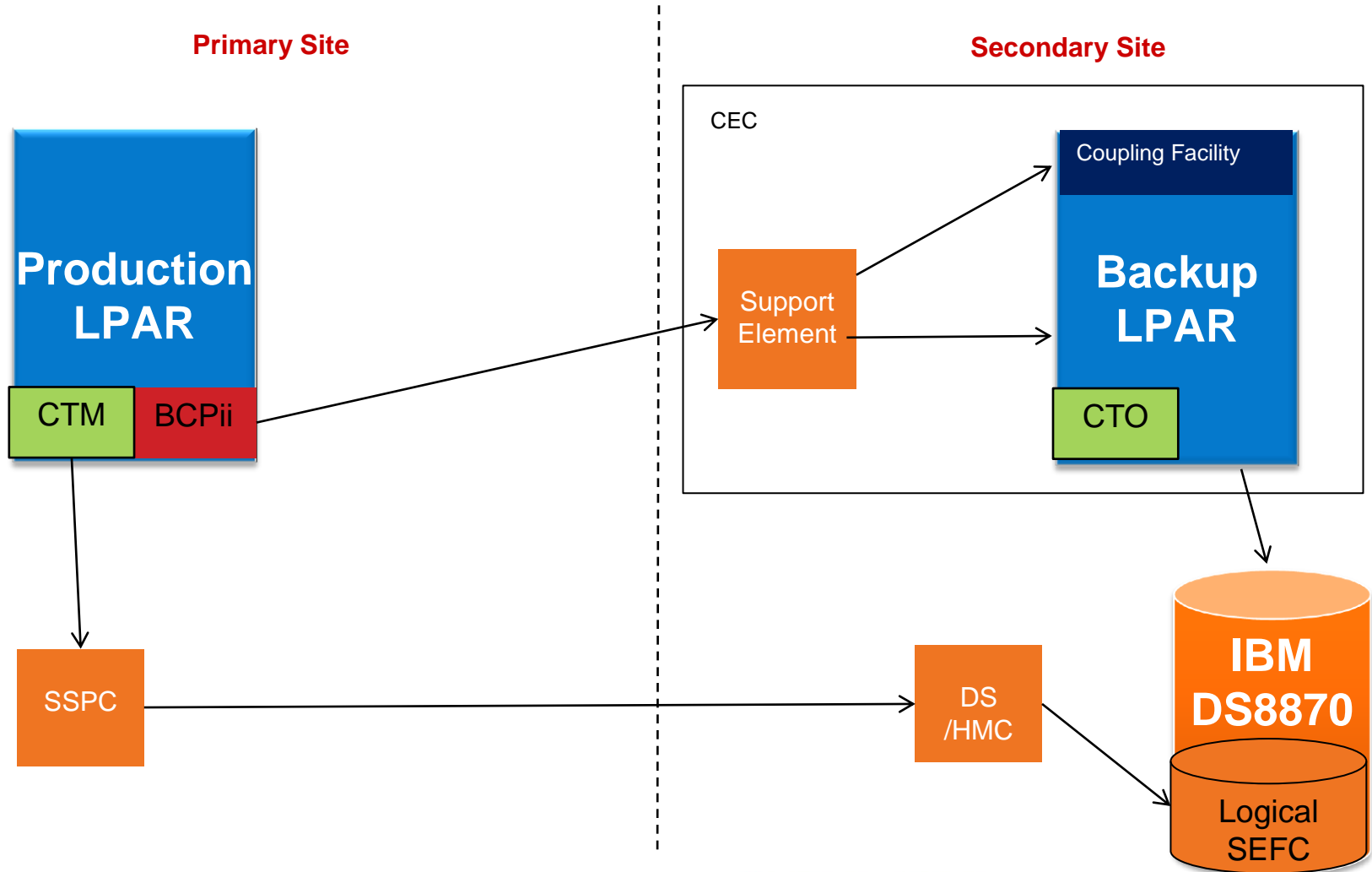
Logical Copy – side benefits

- A DR test every day!
- A true production environment which can be used to test new versions of software
- Improves MTTR – picks up errors at IPL time

SEFC– the downside

- SEFC impacts PPRC latency
- SEFC performance is impacted (affects DR tests)
- If we ever need to use it(which is highly unlikely), we will not IPL directly from the copy. We will have to restore some or all of our data to the primary volumes

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BCPii gotcha

- We had a problem responding to WTORs early in an IPL
- You need to set the HWI_CMD_OSCMD_PRIORITYTYPE field to HWI_CMD_PRIORITY

Agenda

Introduction

Level 1: Synchronous Replication

Level 2: Logical Copies

Level 3: DRP Testing

Level 4: Offsite Backup Copy

Questions

DRP testing – the limitations

➢We do not use the secondary PPRC volumes for DR testing

➢We never stop the mirroring

➢The User DR site and the IT DR center are 30km apart

DRP testing - How do we do it?

➢We take snapshots of our production secondary copies and use them
  ➢For z/OS it is another SEFC set
  ➢For zVM it is a FC set
  ➢For the distributed environment we use XIV snapshots
  ➢The VTL does not support snapshots(yet – coming soon), but we can read the production tapes. Scratches are taken from a special pool.
➢All communication between the primary site and the DR site is disconnected
➢Synchronous replication for the DS8K and XIV continues
➢A test runs for about 36 hours

Agenda

Introduction

Level 1: Synchronous Replication

Level 2: Logical Copies
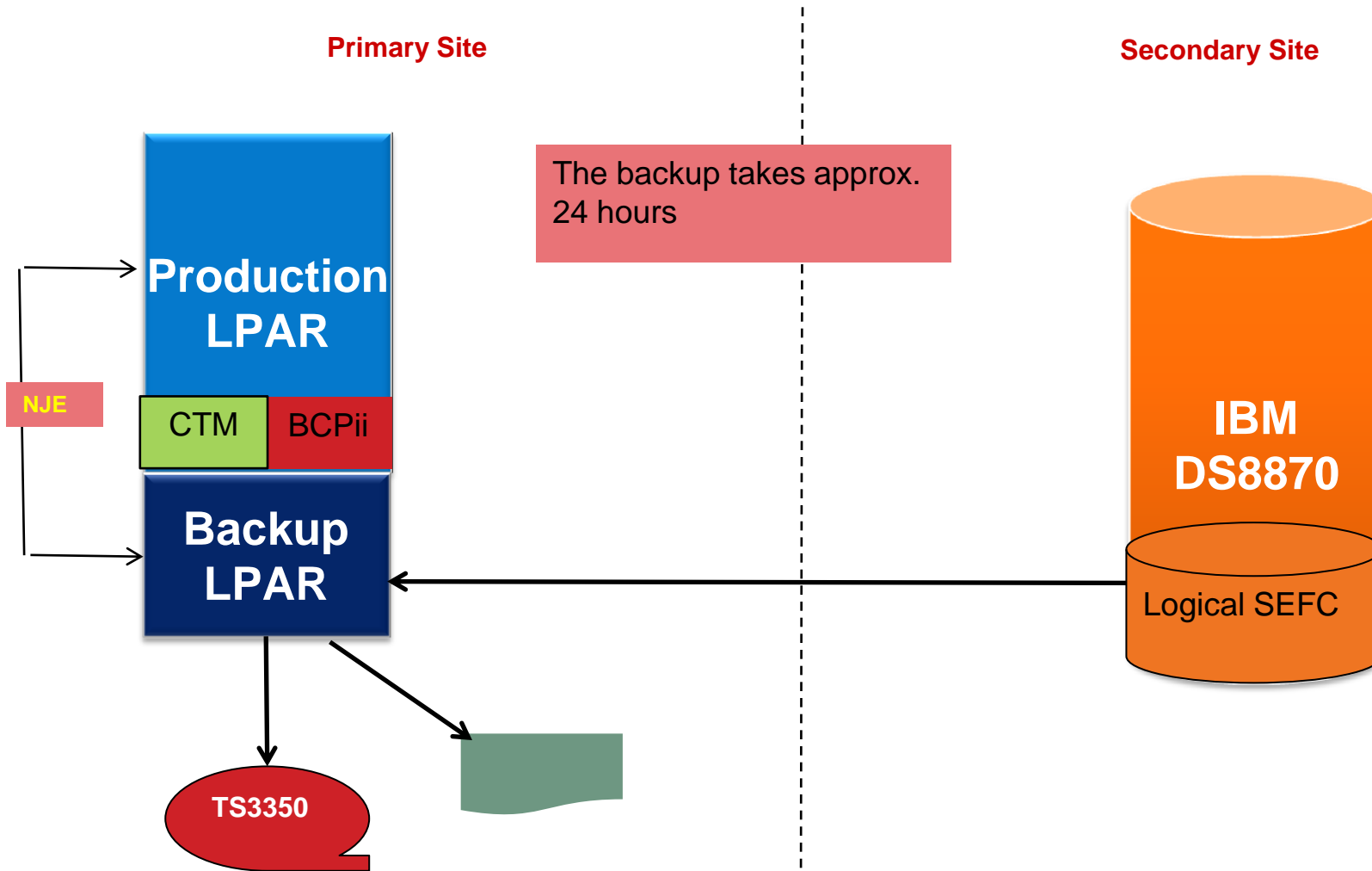
Level 3: DRP Testing

Level 4: Offsite Backup Copy

Questions

Offsite backup copy

- The financial compliance regulation laws require that we have a third copy(that is, at neither of our sites) of our data at a secured location

- The assumption is that this copy will be used if both sites are permanently unavailable.

- Every Friday morning we bring up an LPAR at our primary site that reads that mornings logical copy and dumps it to a TS3500.

- Cartridges and reports are exported and sent off site.

- Another LPAR is needed because you can't bring the logical copies online (same VOLSERS as the production).

Offsite Backup Copy

Primary Site

Secondary Site

The backup takes approx. 24 hours

Production LPAR

CTM | BCPii

NJE

Backup LPAR

IBM DS8870

Logical SEFC

TS3350

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Offsite backup copy - Output

- Cartridges that contain:
  - Our production data
  - Rexx and edit macros to customize the restore jobs at the new (unknown) site
- Hardcopy documentation
  - Requirements – Hardware, software
  - Inventory reports(created dynamically for each copy)
    - VOLSER to dataset mapping
    - Catalog structure

Next Steps

- Main site transfer and implement a three site solution
- Change DR drill methodology
- Implement Hyperswap with TPC on z/OS
- Replace DS8700 (at main site) with DS8870(3Q14)
- Re-evaluate SEFC due to limitations
- Re-evaluate offsite backup copy on cartridges and move to third copy on DASD
- Distributed environment – implement logical copy

Summary

Scenario	Protection
Primary site DS8xxx failure	Metro Mirror Copy
Primary site complete failure	MM copy + Backup CEC
Logical error that gets mirrored	Logical Copy
Both sites fail	Offsite backup copy

Questions ?