Back to the Future: Creating Consistent Copies at Isracard

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Agenda

Introduction

Level 1: Synchronous Replication

Level 2: Logical Copies

Level 3: DRP testing

Level 4: Third Site Copy

Questions
Monthly turnover of 9 billion NIS

Over 100,000 merchants
Over 50 million business transaction per month
3.5 Million Cards
47% market share
2 million card holders
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
• 6 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 Mainframe Infrastructure

- **z114**
  - z/OS 1.13
  - DB2 10
  - CICS/TS 4.1
  - IMS(DBCTL) 11.1

- **z114**
  - z/VM 5.4
  - RHEL 5.6
  - WAS
  - Oracle
  - WMB

- **z196-ELS**

- **IBM DS8700**

- **IBM XIV**

- **IBM VT7720**
Agenda

Introduction

Level 1: Synchronous Replication

Level 2: Logical Copies

Level 3: DRP testing

Level 4: Third Site Copy

Questions
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
Complete your sessions evaluation online at SHARE.org/SanFranciscoEval
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

16TB

z/OS Production Bxxxx Primary

z/VM Production Primary

Backup Site

16TB

z/OS Production 9xxxx Secondary

z/VM Production Secondary

7.4TB

z/OS Logical Copy 1 7xxx SEFC target

z/OS Logical Copy 2 8xxxx SEFC target

z/OS DR test 6xxxx SEFC target

z/VM DR test FC target

Share in Atlanta 2012. Session 2402 Jeff Suarez
Share in Austin 2009. Session 3080. Linda Gundy
Building Blocks\(^{(2/3)}\): BCPii

What is BCPii?

- 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..

13035: BCPii Programming Beyond the Basics for the z/OS System Programmer
Steve Warren
Building Blocks (3/3)

- Control-M – z/OS and distributed scheduling
- Control-O – z/OS Automation
- DSCLI – command line interface to the SSPC (System Storage Productivity Center)
• When the job (on z/OS) indicating end of day processing has finished, a condition is raised by Control-M.
• This condition causes a script to be run on the SSPC that creates the flash.
• 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.
Creating the New Flash

```
cd "C:\Program Files\IBM\dsc"

flashmanka1_script

flashmanka1.script

mkflash -freeze -tqts -nscp -seqnum 01 9000-9018:7000-7018 9100-911F:7100-711F 9400-942F:7400-742F 9500-952F:7500-752F 9600-963F:7600-763F 9700-973F:7700-773F 9800-98C7:7800-78C7 9900-9AC7:7900-79C7 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 9000-991F
lsflash -l 9100-911F
lsflash -l 9400-942F
lsflash -l 9500-952F
lsflash -l 9600-963F
lsflash -l 9700-973F
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
```
Automated IPL

- Submit job that activates the coupling facility
- 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
- Control/O/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

**SYSTEM OUTPUT**

**SDFS OUTPUT DISPLAY**

**JOBID: 082908**

**DSID: 102**

**LINE: 6**

**COMMAND INPUT ===>

**SCROLL ===< CSR**

******************************************************************************

2012043 02.18.34.24  IEA371I SYS0.IPLPARM ON DEVICE 7BB0 SELECTED FOR IPL PARF
2012043 02.18.34.27  IEA246I LOAD ID M1 SELECTED
2012043 02.18.34.30  IEA246I NUCLST ID 00 SELECTED
2012043 02.18.34.33  IEA519I IODF DSN = IODF.IOFFD03
2012043 02.18.34.35  IEA520I CONFIGURATION ID = SYSIM1 . IODF DEVICE NUMBER =
2012043 02.18.34.38  IEA091I NUCLEUS 1 SELECTED
2012043 02.18.44.35  IEA370I MASTER CATALOG SELECTED IS CATALOG.MASTER.SYSI
2012043 02.18.44.65  IEA009I SYMBOLIC DEFINITIONS WILL BE READ FROM:
2001177 02.18.44.58  IEASYM00
2001177 02.18.44.61  IEASYM11
2001177 02.18.44.63  IEASYM31
2012043 02.18.44.82  *IEA247I USING IEASYSGB FOR z/OS 01.11.00 HBB7760
2012043 02.18.44.92  IEA077I STATIC SYSTEM SYMBOL VALUES
2001181 02.18.44.94  &SYSALVL. = "2"
2001181 02.18.44.97  &SYSCLONE. = "II"
2001182 02.18.45.00  &SYSTYPE. = "SYSI"  
2001182 02.18.45.02  &SYSPLEX. = "PLX1"
2001182 02.18.45.05  &SYSR1. = "NSR101"
2001183 02.18.45.08  &BCMVER. = "V6R3M0"
2001183 02.18.45.11  &BHPFTP1. = "SIV"
2001183 02.18.45.14  &BHPOSADM. = "032"
2001184 02.18.45.17  &BMCCVER. = "V2R2M25"
2001184 02.18.45.19  &BMCDVER. = "V10R1MK"
2001184 02.18.45.22  &BMCEVER. = "V2R2M26"

******************************************************************************

2012043 04.19.30.89  IXC404I SYSTEM(S) ACTIVE US IPLING: SYS1 SYSE SYSU
2012043 04.19.30.92  IXC419I SYSTEM(S) NOT SYNCHRONIZED: SYS1 SYSE SYSU
2012043 04.19.30.95  IXC420D Iophon I TO INITIALIZE SYSPLEX PLX1, OR R TO REIN
2012043 04.19.34.39  IEE6001 Iophon TO 00 IS;1

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Automated IPL
## Automated IPL

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<th>OBJECT</th>
<th>CURRENT</th>
<th>DESIRED</th>
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<th>STATUS</th>
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<td>CICS</td>
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<td>STEADY DOWN</td>
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<td>UP</td>
<td>CICS</td>
<td>FREE</td>
<td>CD=DU PR=IMSPDBC CICSPIS1</td>
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<tr>
<td>CICSPIS1</td>
<td>DOWN</td>
<td>DOWN</td>
<td>CICS</td>
<td>FREE</td>
<td>STEADY DOWN</td>
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<tr>
<td>CICSPIS2</td>
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<td>DOWN</td>
<td>CICS</td>
<td>FREE</td>
<td>STEADY DOWN</td>
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<tr>
<td>CICSPHR1</td>
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<td>CICS</td>
<td>FREE</td>
<td>STEADY DOWN</td>
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<tr>
<td>CICSPBT1</td>
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<td>CICS</td>
<td>FREE</td>
<td>STEADY DOWN</td>
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<tr>
<td>CICSPMQ1</td>
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<td>CICS</td>
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<td>STEADY DOWN</td>
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<tr>
<td>CICSPPX1</td>
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<td>DOWN</td>
<td>STANDARD</td>
<td>FREE</td>
<td>STEADY DOWN</td>
</tr>
</tbody>
</table>

(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

Primary Site

Production LPAR
- CTM
- BCPii

Secondary Site

CEC

Support Element

Backup LPAR
- CTO

IBM DS8700
- Logical SEFC
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, we will not IPL directly from the copy. We will have to restore some or all of our data to the primary volumes
**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: Third Site 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, 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 DS8700 and XIV continues
- A test runs for about 36 hours
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Third Copy

• The financial 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).
The backup takes approx. 13 hours.
Third 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

• Implement Hyperswap with TPC on z/OS
• For third copy – add stand alone IPL cartridge and test at a third site
• Distributed environment – implement logical copy
## Summary

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary site DS8700 failure</td>
<td>Metro Mirror Copy</td>
</tr>
<tr>
<td>Primary site complete failure</td>
<td>MM copy + Backup CEC</td>
</tr>
<tr>
<td>Logical error that gets mirrored</td>
<td>Logical Copy</td>
</tr>
<tr>
<td>Both sites fail</td>
<td>Third copy</td>
</tr>
</tbody>
</table>
Questions ?

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