Non-disruptively Migrating z/VM and Linux Guests in Their Entirety

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Agenda

Introductions

Hierarchy of Availability

Business Continuance Tools

z/VM and z/OS Platform Convergence

Estimating Migration Effort

New FDR ABR support

Summary

Introductions

- Who am I?
  - Michael MacIsaac
  - Product Manager for z/VM and Linux
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- Who are you?
  - An Innovation Data Processing customer?
  - An FDRPAS on z/OS customer?
  - A z/VM & Linux only shop?
  - Using z/VM SSI?
  - Is SMAPI configured?

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Hierarchy of Availability

- Hierarchy of availability (lower to higher)
  - High Availability
    - No unplanned outages
  - Continuous Operations
    - No planned outages
  - Continuous Availability
    - No outages

"Continuous Availability" is the new "HA"

Source: "*High Availability Architectures For Linux on IBM System z*" Version 2, June 15, 2010 by Steve Wehr, Scott Loveland and Harriet Morril of IBM

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Tools in your Continuous Availability Toolbox

- Resilient hardware with dynamic features
  - Mainframe, PR/SM, standby memory/CPUs, etc.
- z/VM and Linux resiliency features
  - Hot plugging memory, CPUs, file systems
- HA software
  - Oracle RAC, IBM WAS XD, IBM DB2 HADR, etc.
- Business continuance hardware and software tools
  - Flashcopy, TimeFinder, ShadowImage local disk mirroring
  - PPRC, SRDF, TrueCopy & GDPS remote disk replication
  - z/VM 6.2+ SSI and LGR
  - Innovation FDRPAS for z/OS & FDRPASVM for z/VM

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z/VM SSI and LGR

- Single System Image (SSI)
  - 2-4 z/VM "member" systems share and coordinate resources
  - This becomes an "SSI cluster"
- Live Guest Relocation (LGR)
  - Running Linux systems can move cross-LPAR or CEC
  - Can eliminate planned outages
  - Non-disruptively moves memory and CPU, but not disk

**Living up to
"Non-disruptively Migrating z/VM and
Linux Guests in Their Entirety"**

- Customers tell us they are configuring SSI & LGR to:
  - Eliminate planned outages
  - Allow for non-disruptive hardware maintenance
  - Protect themselves against local disruption
  - Work during normal business hours
- FDRPASVM extends the scope of SSI & LGR objectives
  - While SSI & LGR are relocating memory and CPU…
  - FDRPASVM concurrently relocates z/VM & Linux disk storage

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**FDRPASVM –
Non-disruptively moves disk**

- Non-disruptively moves DASD of running systems
  - User and CP-owned volumes
  - Copies entire source volume(s) to target(s)
  - Monitors changed tracks on source volume
  - Copies changed tracks
  - Swaps all I/O operations to use target volume(s)
- Generally Available in January 2014
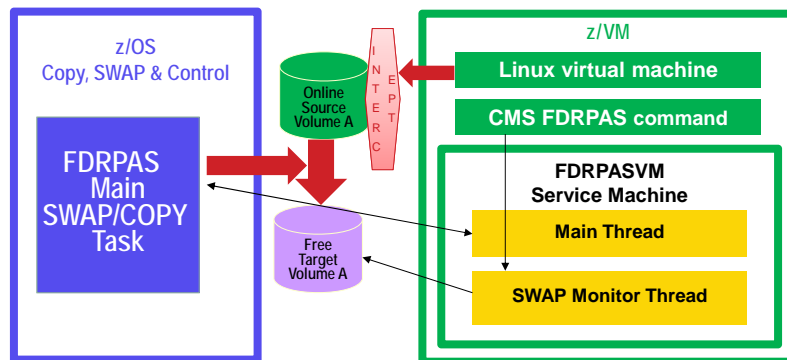- Non-disruptive migration to new storage systems

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FDRPASVM Functions

- FDRPASVM supports non-disruptive migration of:
  - Minidisk volumes (PERM)
  - Full-pack and DEDICATEd volumes
  - CP-owned (must have two PAGE and two SPOOL volumes)
  - Smaller to larger volumes (ex: 3390-9 to 3390-27)
- FDRPAS functions:
  - SIMSWAP – Simulate and validate main swap task
  - SIMSWAPMON – Simulate and validate monitoring updates
  - SWAPDUMP – Create point-in-time copy of volume(s)
  - SWAP – Copy and swap volume(s)

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FDRPASVM Components

z/OS
Copy, SWAP & Control

FDRPAS
Main
SWAP/COPY
Task

Online
Source
Volume A

INTERCEPT

Free
Target
Volume A

z/VM

Linux virtual machine

CMS FDRPAS command

FDRPASVM
Service Machine

Main Thread

SWAP Monitor Thread

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FDRPASVM IS EASY TO INSTALL & USE

- 3 files:
  - CALCDASD EXEC – understand the environment
  - EXTRFDRP EXEC – unwind DISTPIPE (saves typing)
  - FDRPASVM.DISTPIPE – the product code
- 2 virtual machines:
  - PASMAINT – stores the binaries
  - FDRPASSV – FDRPAS service virtual machine
- 1 CMS command:
  - FDRPAS – with many subcommands
    - MONITOR TYPE SWAP
    - MONSTAT
    - STOP

FDRPASVM Overview

- FDRPAS and FDRPASVM at a low level
  - Install z/VM "intercepts" to monitor source volume changes
  - z/OS main SWAP task copies source to target volume
  - FDRPASVM passes changes to z/OS main SWAP
  - z/OS main SWAP task recopies changed tracks
  - Uses z/VM HYPERSWAP when source and target are in sync
  - Target volume transparently becomes the source volume
  - Remove FDRPASVM intercepts

FDRPAS z/OS Migration Report

```
FDR233  CPUB    (SERIAL# 02E2062818)
ACKNOWLEDGES THE SWAP OF VOL=VM1887  - HTC 2107900 TO HTC 2107900
FDR233  VMLAB63B (SERIAL# 04E2062818)
ACKNOWLEDGES THE SWAP OF VOL=VM1887 AND HAS JOINED IN SWAP OF
UNIT=1887 TO B887
...
OPERATION STATISTICS FOR 3390 VOLUME..................VM1887
                    CYLINDERS ON VOLUME.............10,017
                    DATASETS PROCESSED....................0
                    BYTES READ FROM DASD.....7,593,410,036
                    DASD TRACKS SWAPPED...........154,127
                    UPDATED TRACKS RECOPIED..........3,873
                    DASD EXCPS.....................10,418
                    TARGET DASD EXCPS..............10,371
                    CPU TIME (SECONDS)..............2.257
                    ELAPSED TIME (MINUTES)............2.6
                    SWAP TIME........................2.4
   FDR SUCCESSFULLY COMPLETED
```

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Automating…from z/VM

z/OS Job Submission… from z/VM

- Submit JCL job(s) from z/VM to z/OS
  - Using FILETYPE=JES mode of the z/OS FTP server
  - Using the VMFTP tool to process output from FTP
- All in a REXX "wrapper"
- White paper describing how to at :
- http://www.fdr.com/Manuals_CurrentVersion/JCLfromVM.pdf

New: z/OS job submission from Linux

- See https://sites.google.com/site/mike99mac/JCLusingFTP.pdf

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FTP Session Overview

- **Submit JCL jobs through FTP**

```
==> ftp zOS.ftp.server
ftp> z/OS credentials
...
ftp> site filetype=jes
...
ftp> put myjob.jcl
...
ftp> get <jobid>.x
...
ftp> quit
```

View and Manage z/OS devices from z/VM

- DUCB
  - Send a job to z/OS and **D**isplay **UCB**(s)
- VUCB
  - Send a job to z/OS and **V**ary **UCB**(s) online or offline
- QLABEL
  - Query the label of DASD volumes and report

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Can You Estimate the Migration Effort?

FDRPASVM provides tools to help you determine…

- How much DASD space is on my systems?
  - CALCDASD EXEC reports on type and size of DASD

- Do my volumes have problem VTOCs?
  - QLABEL EXEC reports on VTOC types

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CALCDASD EXEC

- Needs no arguments if all DASD "belongs" to z/VM

      ==> `calcdasd`

- Can take rdev-range if not all DASD "belongs" to z/VM
      ==> `calcdasd 1880-1887`
- Counts 3390-1s, -2s, -3s, -9s –As (EAVs) and "other sizes"
- Identifies CP-Owned, SYSTEM and ATTACHED disks
- Can report on free, offline and PAV alias devices
- Combination of `Q DA, Q rdev, Q ALLOC` and `Q DA DETAILS`

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Tools to help you …

- Request a copy of any of these EXECs by e-mailing:
  - support@fdrinnovation.com

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Testimonial…
from a Large Financial Institution

Non-Disruptive Migration

"The business units requirements that rely on Linux volumes have made it very difficult for us to schedule outages to move their systems. FDRPASVM now allows us to move them non-disruptively like FDRPAS does for our z/OS volumes."

A Large Financial Company

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What benefits did customer realize?

- The biggest benefit is the ability to be able to now move ALL our mainframe (including z/VM and z/Linux ECKD data) around non-disruptively.
- Perform technology refreshes and move data around for performance improvements without having to engage our Business Units and BU application teams and negotiate for long-duration outage windows.
- This saves time and helps us to absolutely minimize our planned outages throughout the year.
- Keeps the systems up making money for the firm.

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ABR Version V54L83 (GA June 2015)

Full-volume backup and restore of z/VM volumes and Linux DASD. The advantages of using PGM=FDRABR instead of PGM=FDR are:
- Simpler JCL
    - No need for separate DISK*x*/TAPE*x* statements for each volume
    - Backups can be automatically stacked on multi-file tapes without special JCL
- Uniformity of backups; VM & Linux can be included with MVS backups
- VM and Linux volumes can be included in ABR reports
- VM and Linux volumes can be included in FDRDRP and FDRABR restores

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How to Start

Volume Initialization
- z/VM and Linux volumes are initialized for ABR processing using ABRINIT as done for z/OS volumes
- Specify VMVALID operand on the DEFAULT statement

```
//ABRINIT  EXEC PGM=FDRABRM
…
 DEFAULT  VMVALID
 ABRINIT  VOL=VM0001,GEN=4            New
```

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Full-Volume FlashCopy* using ABR

```
//FDRABR    EXEC PGM=FDRABR,REGION=0M
…
  FCOPY     TYPE=FDR,RTC=YES
  MOUNT     VOL=VM047D,FLASHUNIT=047C
  MOUNT     VOL=VM047F,FLASHUNIT=047E
```

- Only full-volume backups are supported
- FDRINSTANT is required

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Full-Volume DUMP after FlashCopy

```
//FDRABR    EXEC PGM=FDRABR,REGION=0M
…
  DUMP      TYPE=FDR,FCOPY=(USE,REL),RTC=YES
  MOUNT     VOL=VM047D
  MOUNT     VOL=VM047F
```

The FCOPY= option of USE informs ABR to dump
the offline copy of the volumes specified on the
MOUNT= commands and the REL option informs
ABR to perform a FLASHCOPY WITHDRAWL
function after the offline volumes are processed.

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FDRABR Volume Backup Report

```
//FDRABRP  EXEC PGM=FDRABRP,REGION=0M
…
  PRINT CATLG,VOL=(VM047D,VM047F)
```

VOLSER	GEN	CYCLE	TYPE	DUMP	DATE	TAPE FILE DATA SET NAME	COPY	FILE	TAPE VO
VM047D	03	00	FDR		2015.157	FDRABR.VVM047D.C1000300	1	1	E04018
	02	00	FDR		2015.156	FDRABR.VVM047D.C1000200	1	1	E04017
	01	00	FDR		2015.155	FDRABR.VVM047D.C1000100	1	1	E04006
VM047F	04	00	FDR		2015.157	FDRABR.VVM047F.C1000400	1	2	E04018
	03	00	FDR		2015.156	FDRABR.VVM047F.C1000300	1	2	E04017
	02	00	FDR		2015.155	FDRABR.VVM047F.C1000200	1	2	E04006
	01	00	FDR		2015.141	FDRABR.VVM047F.C1000100	1	1	E04033

Full-Volume RESTORE

z/VM volume restored as part of ABR restores

```
//FDRABR   EXEC PGM=FDRABR,REGION=0M
…
  RESTORE   TYPE=FDR,CONFMESS=NO,DYNTAPE,
            MAXDD=1000,ONLINE
  SELECT    VOL=VM047D,GEN=CURRENT,CYCLE=00
  SELECT    VOL=VM047F,GEN=CURRENT,CYCLE=00
```

If you are licensed for FDRDRP, then change:

• PGM=FDRABR to PGM=FDRDRP

• TYPE=FDR to TYPE=DRP

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User Testimonial
Benefits
Q & A

Key Points Summary

- "Continuous Availability" is the new "HA"
- z/VM SSI is a powerful HA tool
- FDRPASVM is a unique complementary HA solution to – move running systems & migrate to new DASD hardware
- FDRPASVM has tools to assist:
  - Estimate the migration effort
  - Interface with z/OS
- FDR ABR now supports z/VM and Linux
- More z/OS solutions to be leveraged on z/VM

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Resources

- This presentation:
  - Has been made available to the VM Workshop
- My e-mail address – feel free to contact me
  mmacisaac@fdrinnovation.com

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QUESTIONS?

Thank you!