Non-disruptively Migrating Linux Guests in Their Entirety

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CAVMEN
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INNOVATION® DATA PROCESSING

Agenda

- Introductions
- Hierarchy of Availability
- Business Continuance Tools
- z/VM and z/OS Platform Convergence
- Estimating Migration Effort
- Summary

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Introductions

- Who am I?
  - Michael MacIsaac
  - Product Manager for z/VM and Linux
  - mmacisaac@fdrinnovation.com
- Who are you?
  - An Innovation Data Processing customer?
  - An FDRPAS on z/OS customer?
  - Have z/VM & Linux in production/test/PoC?
  - A z/VM & Linux only shop?

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Introductions

Hierarchy of Availability

Business Continuance Tools

z/VM and z/OS Platform Convergence

Estimating Migration Effort

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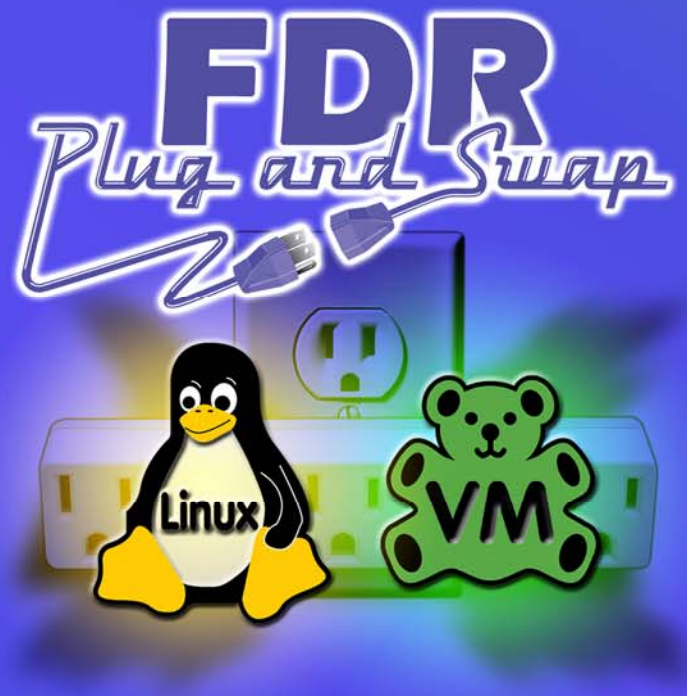

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Hierarchy of Availability

- Hierarchy of availability (lower to higher)
  - High Availability
  - Continuous Operations
  - Continuous Availability

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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High Availability

- High Availability (HA)
  - Provides service during defined periods, at agreed upon levels (SLAs)
    - Recovery Time Objective (RTO)
    - Recovery Point Objective (RPO)
  - Avoids **unplanned outages**
  - Employs failure detection, automatic recovery/failover, problem/change management, etc.

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Continuous Operations

- Continuous Operations (CO)
  - Avoids **planned outages**
  - Employs non-disruptive hardware and software upgrades and configuration changes
    - i.e. Use FDRPAS and FDRPASVM, or similar tools, for non-disruptive DASD migration in support of DASD technology upgrades

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Continuous Availability

- Continuous Availability (CA)
  - Delivers non-disruptive service to the end user, 24 hrs/day x 365 days/yr
  - No ***planned*** nor ***unplanned*** outages
  - Continuous operations + redundancy of any single point of failure and failover to the redundant components
    - i.e. GDPS/Hyperswap (IBM/Hitachi) and GDDR/Autoswap (EMC)

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Tools in Your “CO” Toolbox

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

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Introductions

Hierarchy of Availability

Business Continuance Tools (on z/VM and Linux)

z/VM SSI and LGR

FDRPASVM non-disruptive migration

z/VM and z/OS Platform Convergence

Estimating Migration Effort

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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
  - Memory and CPU are moved, but not disk
- Can prevent planned outages

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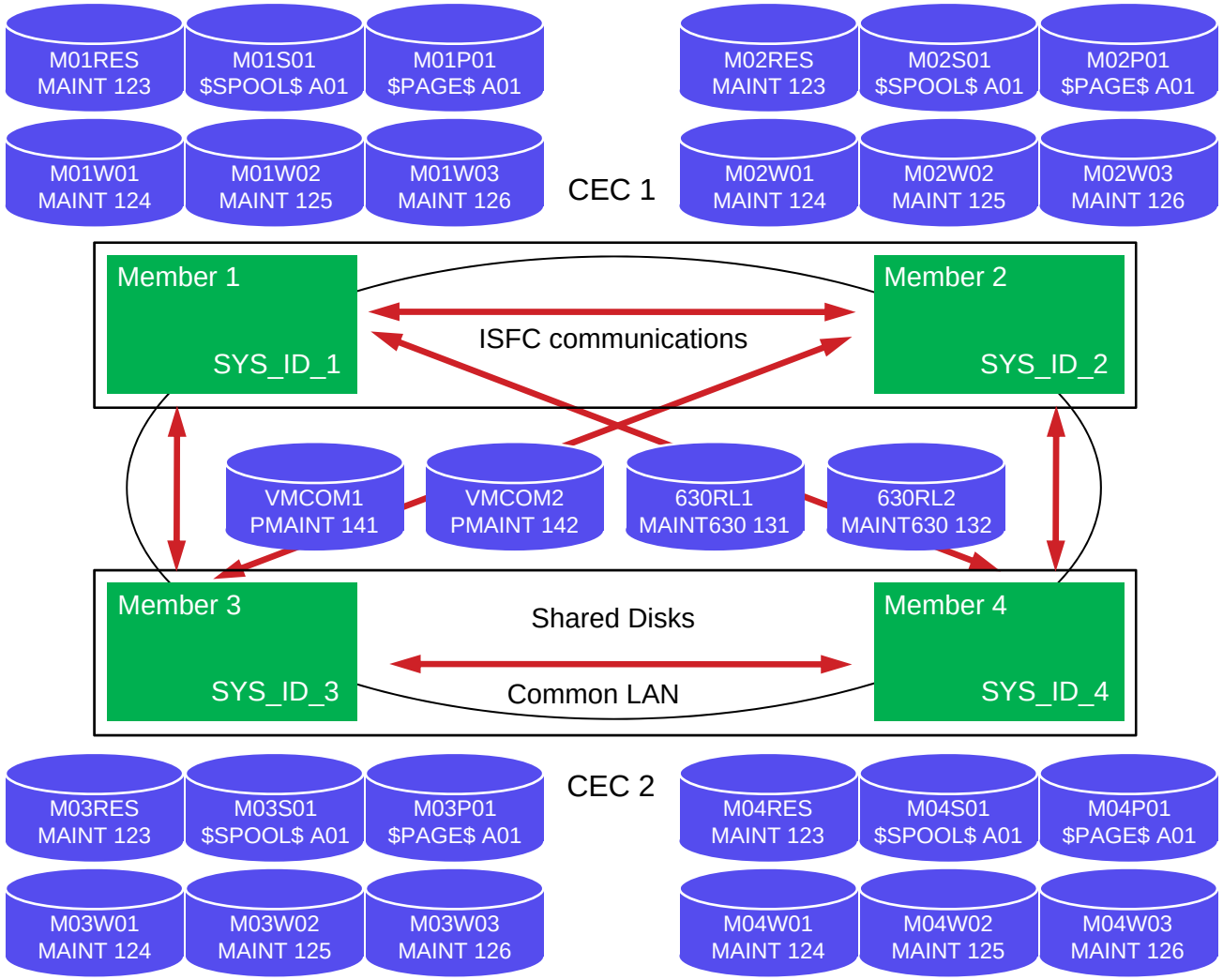
z/VM SSI Block Diagram



FDRPASVM

- Non-disruptively migrate DASD of running systems
  - 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)
- Beta tested at customer sites in 2013
- GA in January 2014
- Supports z/VM 5.4, 6.2 and 6.3
- Support for CP-owned volumes in October 2014
- Non-disruptively move to a new DASD storage unit

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FDRPASVM Functions

- FDRPASVM supports migration of
  - Minidisk volumes (PERM)
  - Full-pack and DEDICATEd volumes
  - Smaller to larger volumes (ex: 3390-9 to 3390-27)
  - CP-owned (must have two PAGE and two SPOOL volumes)
- 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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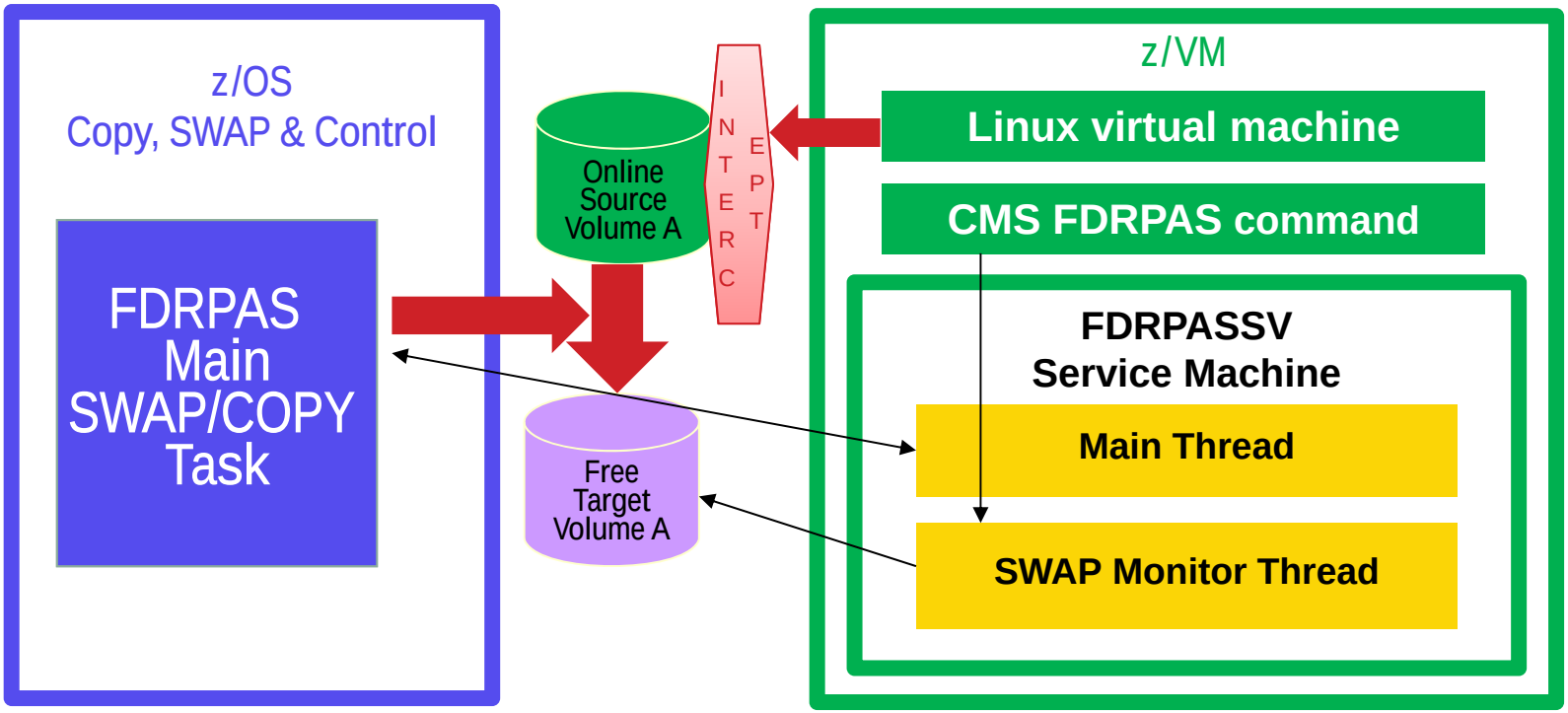
FDRPASVM Components



FDRPASVM Component Detail

- z/VM detail
  - Tracks changes to source device and swaps volser
  - System requirements
    - Service machine (FDRPASSV) is running
    - Source volume is **online**
    - Target volume is **online** and **FREE**
    - Monitor program started with FDRPAS command
- Start monitor on LPARs w/access to target volumes
  - Or vary volumes offline
- z/OS detail
  - Copies to target and recopies changed tracks
  - System requirements
    - Same source volume is **online**
    - Same target volume is **offline**
    - Invoke **FDRPAS** job using JCL or ISPF

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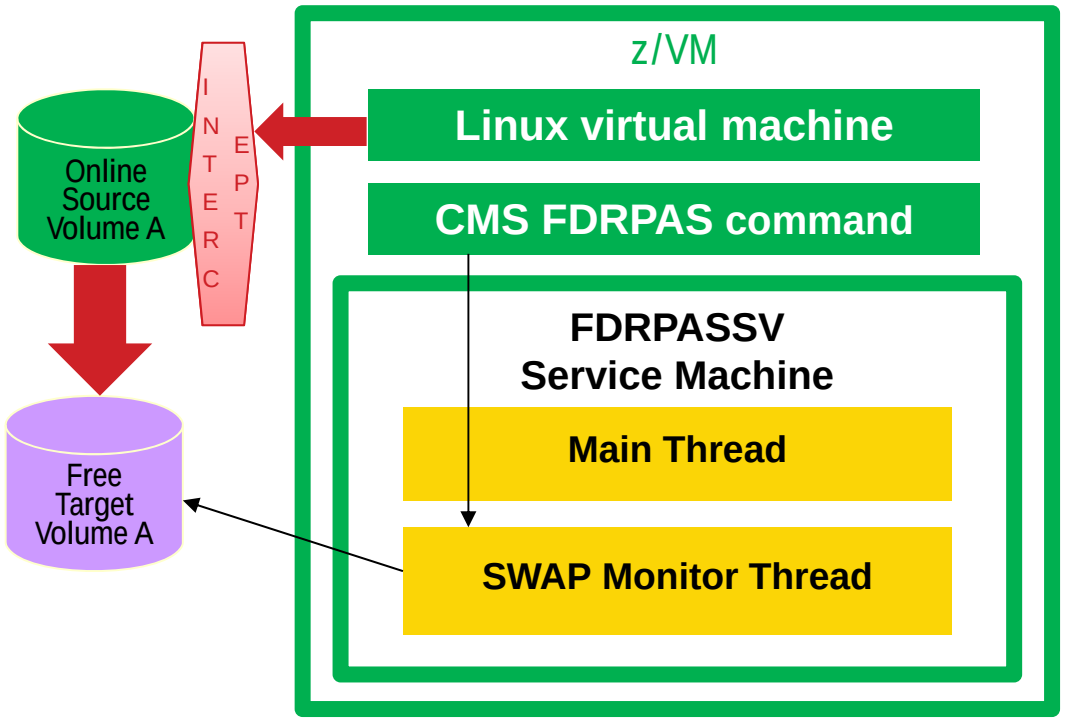
FDRPASVM Block Diagram



Installling FDRPASVM

- 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

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FDRPASVM Setup

- Service machine (FDRPASSV) is running
  - Logon to FDRPASSV interactively

```
...
DIAGNOSE 104 ALREADY DEFINED
...
PASIUCSM020I WAITING FOR AN EVENT TO PROCESS
```

  - Start FDRPASSV on AUTOLOG1 191 disk (mode F)

```
==> x profile exec f
...
/*****************************************************************/
/* Customer processing can be added here                         */
/*****************************************************************/
"CP XAUTOLOG TCPIP"           /* Autolog TCPIP                   */
"CP SET SIGNAL SHUTDOWN 300"  /* Allow guests  5 min to shut down*/
"CP XAUTOLOG FDRPASSV"        /* Start the FDRPASSV service machine */
...
```


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FDRPASVM on z/VM Volumes

- Example of swapping Linux on rdev **1887** to **B887**
- Source volume is **online**
- Target volume is online and **FREE**
  - Use CP QUERY <rdev> and DETACH commands:

```
==> q 1887 b887
DASD 1887 CP SYSTEM VM1887   2
DASD B887 CP SYSTEM VMB887   0
==> detach b887 system
DASD B887  DETACHED SYSTEM
==> q 1887 b887
DASD 1887 CP SYSTEM VM1887   2
DASD B887 VMB887
```

FDRPASVM on z/VM Monitoring

- Monitor target volume (e.g. from MAINT)
  - Access FDRPAS CMS command:

```
...
'EXEC VMLINK PASMAINT 691'
'SET LANG (ADD PAS USER'
...
```

  - Issue FDRPAS command for target volume:

```
==> fdrpas monitor type swap b887
...
REQUEST ACCEPTED
SEVERING IUCV CONNECTION
...
  * MSG FROM FDRPASSV: PASIUCSM009I 1 ELIGIBLE DEVICE(S) FOUND
```

  - Watch console on FDRPASSV:

```
...
PASMONVW080I DEVICE B887(B887) WAITING FOR SWAP INITIATION
```


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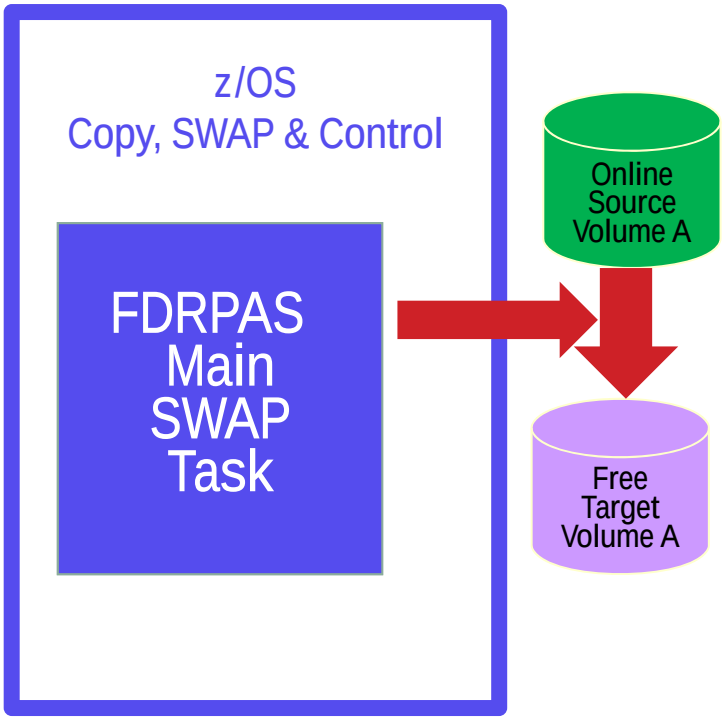
FDRPASVM z/OS Components



FDRPAS z/OS View of z/VM Volumes

- Source volume should be **online**
- Target volume is **offline**
  - Use DISPLAY and VARY commands

```
==> d u,,,1887
  UNIT TYPE STATUS        VOLSER     VOLSTATE
  1887 3390 OFFLINE                      /RSDNT
==> d u,,,B887
UNIT TYPE STATUS        VOLSER     VOLSTATE
  B887 3390 OFFLINE                      /RSDNT
==> v 1887,online
IEE302I 1887     ONLINE
==> d u,,,1887
  UNIT TYPE STATUS        VOLSER     VOLSTATE
  1887 3390 O             VM1887     PRIV/RSDNT
```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FDRPAS on z/OS Startup

- Invoke FDRPAS job in one of two ways
  - From a JCL job

```
==> submit
//PASTEST1 JOB ('PR=YES'),'ME',CLASS=M,
//   NOTIFY=ME
//*
//*******************************************************************
//*  FDRPAS                                                         *
//*******************************************************************
//*
//PASB    EXEC PASPROC
//PAS.SYSIN DD  *
*SIMSWAP TYPE=FULL,LARGERSIZE=OK,MAXTASKS=4,NONRESPONDING=FAIL
*SIMSWAPMON TYPE=FULL,LARGERSIZE=OK,MAXTASKS=4,NONRESPONDING=FAIL
*SWAPDUMP TYPE=FULL,LARGERSIZE=OK,MAXTASKS=32,NONRESPONDING=FAIL
 SWAP TYPE=FULL,LARGERSIZE=OK,MAXTASKS=32,NONRESPONDING=FAIL
 MOUNT VOL=VM1887,SWAPUNIT=B887
```

  - Using ISPF panels

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FDRPASVM Process Review

- FDRPAS and FDRPASVM “plumbing”
  - Install z/VM “intercepts” to monitor source volume changes
  - z/OS main SWAP task copies source to target volume
  - FDRPASSV swap thread passes changes to z/OS main SWAP
  - z/OS main SWAP task recopies changed tracks
  - Issue z/VM HYPERSWAP when source and target are in sync
  - Target volume becomes the source volume transparently
  - Remove FDRPASSV intercepts

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FDRPASVM z/VM Output

- On z/VM virtual machine invoking FDRPAS command
  - Messages from FDRPASSV:

```
...
* MSG FROM FDRPASSV: PASMONVT233I VMLAB63B (SERIAL# 04E2062818)
ACKNOWLEDGES THE SWAP OF VOL=VM1887 AND HAS JOINED IN SWAP OF UNIT=1887
TO B887
* MSG FROM FDRPASSV: PASMONVT241I FDRPAS SUCCESSFULLY COMPLETED SWAP OF
VOL=VM1887 TO UNIT=B887
```

  - Query source and target devices again:

```
==> q 1887 B887
DASD 1887 FDR3VM
DASD B887 CP SYSTEM VM1887   2
```


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FDRPAS z/OS Syslog Output

- JCL output (syslog)

```
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 HA
S 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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FDRPAS z/OS Customer Output

- From customer system in July, 2014

```
...
OPERATION STATISTICS FOR 3390 VOLUME.............volser
                 CYLINDERS ON VOLUME.............10,017
                 DATASETS PROCESSED...................0
                 BYTES READ FROM DASD.....7,465,766,880
                 DASD TRACKS SWAPPED.............151,535
                 UPDATED TRACKS RECOPIED..........1,281
                 DASD EXCPS......................10,217
                 TARGET DASD EXCPS...............10,103
                 CPU TIME (SECONDS)...............0.661
                 ELAPSED TIME (MINUTES).............2.8
                 SWAP TIME..........................2.5
FDR SUCCESSFULLY COMPLETED
```


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Living up to “in their entirety”

- A Linux running on LINUX154/SSI63B on DASD 189D with volser VM189D

```
# vmcp q userid
LINUX154 AT SSI63B
# vmcp q v 100
DASD 0100 3390 VM189D R/W      10016 CYL ON DASD  189D SUBCHANNEL = 0000

# ping vmlab2
PING vmlab2.idp.com (192.168.250.17) 56(84) bytes of data.
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=1 ttl=60 time=0.545 ms
...
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=9 ttl=60 time=0.415 ms
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=10 ttl=60 time=0.668 ms
...
--- at ping 10, started a SWAP JCL job of VM189D to 189E ---
...
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=11 ttl=60 time=0.521 ms
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=12 ttl=60 time=0.579 ms
...
--- at ping 50 from MAINT on SSI63B did a "VMRELO MOVE LINUX154 SSI63A" ---
...
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=49 ttl=60 time=0.644 ms
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=50 ttl=60 time=0.610 ms
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=56 ttl=60 time=0.856 ms
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=57 ttl=60 time=0.804 ms
```


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Living up to “in their entirety” (cont’d)


```
--- at approximately ping 144, SWAP job completed
...
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=145 ttl=60 time=0.588 ms
64 bytes from vmlab2.idpnj.com (192.168.250.17): icmp_seq=146 ttl=60 time=0.572 ms
...
--- killed the job at ping 146 ---
```

- Linux was running on LINUX154/SSI63B on DASD 189D with volser VM189D

```
# vmcp q userid
LINUX154 AT SSI63A
# vmcp q v 100
DASD 0100 3390 VM189D R/W      10016 CYL ON DASD  189E SUBCHANNEL = 0000
```

- Now Linux is running on LINUX154/**SSI63A** on DASD **189E** with volser VM189D

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Give FDRPASVM a Try

- Request a trial:
  - http://www.fdr.com/riskfreetrial/index.cfm

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Automating z/OS Job Submission from z/VM

- To drive z/OS JCL jobs from z/VM
- New paper describing how to:
  - 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 single REXX “wrapper”
  - Second wrapper for multiple job submissions
- See http://www.fdr.com/Manuals_CurrentVersion/JCLfromVM.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
```

SUBMIT EXEC

- **Wrap JCL job submission in a REXX EXEC**

```
/* EXEC to submit a JCL job using the VMFTP tool          */
Parse upper arg jobName .
If (jobName = '') Then Do                    /* no job name passed in    */
  Say 'Error: expected parameter JobName not found'
  Return 1
End
'STATE' jobName 'JCL *'                      /* check that file exists   */
if (rc <> 0) Then Do                         /* file not found => exit   */
  Say 'Error: File' jobName 'JCL * not found'
  Return 2
End
'VMFTP FTPJOB (PARM' jobName                 /* Invoke the VMFTP macro   */
```

FTPJOB VMFTP

- **Use VMFTP environment**

```
/* VMFTP Macro to submit a JCL job and extract output                  */
Parse upper arg jobName .                  /* get the one argument     */
system = 'myzos'                           /* target z/OS system       */
userID = 'myuserid'                        /* z/OS user ID             */
password = 'mypasswd'                      /* password: case sensitive */
jobFile = jobName||'.JCL'                  /* input file               */
                                           /* do the work              */
'open' system                              /* start the FTP session    */
…
userID                                     /* send the user ID         */
…
password                                   /* send the password        */
…
'site filetype=jes'                        /* set server to JCL mode   */
```


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FTPJOB VMFTP (cont'd)


```
'put' jobFile                          /* send the JCL job          */
…
jobNumber = Word(output.4, 7)          /* get job # from output     */
…
'get' jobNumber||'.X'                  /* retrieve the job output   */
…
'quit'                                 /* end the FTP session       */
…
```


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A Sample z/OS JCL Job


```
//MDMS JOB ('PR=YES'),'MIKE',CLASS=M,MSGCLASS=X
//STEP1    EXEC  PGM=SORT
//SYSIN    DD *
 SORT FIELDS=(1,75,CH,A)
/*
//SYSOUT   DD SYSOUT=*
//SORTIN   DD *
MERCURY
VENUS
EARTH
MARS
JUPITER
SATURN
URANUS
NEPTUNE
/*
//SORTOUT  DD SYSOUT=*
/*
```


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Example of Submitting One JCL Job


```
==> submit mdms
Job MDMS has been submitted - waiting for output ...
Output saved to JOB04838 X A
==> type job04838 x a
...
 !! END OF JES SPOOL FILE !!
EARTH
JUPITER
MARS
MERCURY
NEPTUNE
SATURN
URANUS
VENUS
 !! END OF JES SPOOL FILE !!
```


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Submitting Multiple JCL Jobs

- Put a wrapper around FTPJOB
- Input file:

```
==> type ftpjobs list

mdms
mdmc
nosuch
```

FTPJOBS EXEC


```
/* EXEC to automate JCL job submission using FTP and VMFTP tool   */
jobsFile = 'FTPJOBS LIST A'          /* file with JCL jobs to run  */
…
Do i = 1 To jobs.0                   /* check line for error msg   */
  Say 'Submitting job' jobs.i        /* info message               */
  'STATE' jobs.i 'jcl'               /* check if file exists       */
  If (rc = 0) Then                   /* file exists                */
    Call FTPjob jobs.i               /* FTPjob submits job         */
End
Exit
FTPjob: procedure                    /* to submit one job          */
Parse arg jobName                    /* get job name               */
'VMFTP FTPJOB (PARM' jobName         /* use VMFTP macro            */
…
Return
```


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Example of Submitting Multiple JCL Jobs


```
==> ftpjobs
Submitting job mdms

Job MDMS has been submitted - waiting for output ...
Output saved to JOB04841 X A

Submitting job mdmc

Job MDMC has been submitted - waiting for output ...
Error messages in JOB04842 X A:
   FDR316**   FDR  DID NOT FIND REQUESTED MOUNT SWAP VOL=73BSP1
…

Submitting job nosuch

DMSSTT002E File NOSUCH JCL not found
```

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INNOVATION® DATA PROCESSING

Estimating Migration Effort

- How much DASD space is on my systems?
- CALCDASD EXEC reports on type and size of DASD
  - 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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3390 DASD Sizes

Name	Cylinders	Notes
3390-1	1113	
3390-2	2226	
3390-3	3339	
3390-9	10017	
Small 3390-27	30051	3x size of 3390-9
3390-27	32760	Aka 3390-32k, not multiple of 1113
Small 3390-54	60102	6x size of 3390-9
3390-54	65520	Aka 3390-64k, largest directory size
Non-standard	< 65520	Any other size smaller than 65520
3390-A (EAV)	> 65520	Any other size larger than 65520

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CALCDASD Help


```
==> calcdasd help
Synopsis:
  Calculate the amount and types of DASD on a system and report

Syntax is:
  >>-CALCDASD-+---------------+-+-------------------------------+-><
              |-rdev----------| |                               |
              | <-----------< | '-(-+---------+--+----------+--+
              '-rdev1-rdev2---'     |-HELP----|  |          |
                                    |-SHORT---|  '-SortOpts-'
                                    |-FREE----|
                                    |-PAV-----|
                                    |-OFFLINE-|
                                    |-CSV-----|
                                    '-ALL-----'
SortOpts:
        --+------------+--+------------+--+------------+--
          |-SORTRDEV---|  |-SORTRDEV---|  |            |
          |-SORTVOLSER-|  |-SORTVOLSER-|  '-DESCENDING-'
          |-SORTMFG----|  |-SORTMFG----|
          '-SORTCYLS---'  '-SORTCYLS---'
```


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CALCDASD Help (cont'd)


```
Where:
  no rdev range:    Query all DASD (QUERY DASD)
  rdev range:       Query these addresses (QUERY rdev)
Options:
  HELP:             Show this screen
  SHORT:            Don't include one line of output/DASD device
  FREE|PAV|OFFLINE Report only on free/PAV/offline DASD
  CSV:              Generate a comma separated values file
  ALL:              Also show FREE, PAV and OFFLINE DASD (Q 0-FFFF)
Sort Options - primary and secondary sort fields:
  SORTRDEV:         Sort by real device address (default)
  SORTVOLSER:       Sort by volume serial number
  SORTMFG:          Sort by manufacturer
  SORTCYLS:         Sort by number of cylinders
  DESCENDING:       Sort in descending EBCDIC (default: ascending)

Examples:
  Create CSV file: pipe cms calcdasd (csv |> calcdasd csv a
  Send to a file:  pipe cms calcdasd (all |> calcdasd output a
```


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CALCDASD – Default Output


```
Run on VMLAB63B, V6.3(1302) at 07:50:34 EDT TUESDAY 10/21/14

Rdev Volser Mfg SSID CCA HPF Allocation      Model    Cylinders
---- ------ --- ---- --- --- ----------      -----    ---------
1880 63BRES HTC 9002 40  +   CP-Owned        3390-9       10017
1881 63BCOM HTC 9002 41  +   CP-Owned        3390-9       10017
1882 63BREL HTC 9002 42  +   System          3390-9       10017
1883 63BSP1 HTC 9002 43  +   CP-Owned        3390-9       10017
1884 63BPG1 HTC 9002 44  +   CP-Owned        3390-9       10017
1885 63BW01 HTC 9002 45  +   System          3390-9       10017
1886 VM1886 HTC 9002 46  +   System          3390-9       10017
1887 VM1887 HTC 9002 47  +   System          3390-9       10017
1888 VM1888 HTC 9002 48  +   System          3390-9       10017
188D 63BSP2 HTC 9002 4D  +   CP-Owned        3390-9       10017
188F 63BPG2 HTC 9002 4F  +   CP-Owned        3390-9       10017
Total volumes reported on: 11

Number of DASD models        CP-OWN SYSTEM  ATT'D  Total
3390-1s    (1113 cylinders):      0      0      0      0
3390-2s    (2226 cylinders):      0      0      0      0
3390-3s    (3339 cylinders):      0      0      0      0
3390-9s   (10017 cylinders):      6      5      0     11
3390-As     (sizes > 65520):      0      0      0      0
                              ----- ------ ------ ------
Total DASD models:                6      5      0     11
```


INNOVATION® DATA PROCESSING

CALCDASD – Default Output (cont'd)


```
Slot  Vol-ID  Rdev  Type   Status                  SSIOwner SysOwner
   1  63BRES  1880  Own    Online and attached     -------- --------
   5  63BCOM  1881  Own    Online and attached     -------- --------
  10  63BSP1  1883  Own    Online and attached     -------- VMLAB63B
  11  63BSP2  188D  Own    Online and attached     -------- --------
 254  63BPG2  188F  Own    Online and attached     -------- --------
 255  63BPG1  1884  Own    Online and attached     -------- VMLAB63B

CP-owned TDISK PAGE SPOOL and DRCT allocation:
    Type  Volumes   Cylinders        GB   % used
    ----  -------   ---------      ----  -------
   TDISK        0           0      0.00     0.00
    PAGE        2       20033     17.03     7.25
   SPOOL        2       20033     17.03     0.86
    DRCT        1          20      0.02    15.00
          -------   ---------      ----  -------
Total:           5       40086     34.07     4.06

Total cylinder allocation:
       Type        Cylinders        GB
       ----        ---------       ----
   CP-OWNED             60102      51.08
     SYSTEM             50085      42.57
   ATTACHED                 0       0.00
                    ---------    -------
Total DASD:            110187      93.65
```


INNOVATION® DATA PROCESSING

CALCDASD – Short Output


```
==> calcdasd (short
Number of DASD models          CP-OWN SYSTEM  ATT'D  Total
3390-1s    (1113 cylinders):        0      0      0      0
3390-2s    (2226 cylinders):        0      0      0      0
3390-3s    (3339 cylinders):        0      0      0      0
3390-9s   (10017 cylinders):        6      5      0     11
3390-As     (sizes > 65520):        0      0      0      0
                               ----- ------ ------ ------
Total DASD models:                  6      5      0     11

CP-owned volumes:
Slot  Vol-ID  Rdev  Type   Status                  SSIOwner SysOwner
   1  63BRES  1880  Own    Online and attached     -------- --------
   5  63BCOM  1881  Own    Online and attached     -------- --------
  10  63BSP1  1883  Own    Online and attached     -------- VMLAB63B
  11  63BSP2  188D  Own    Online and attached     -------- --------
 254  63BPG2  188F  Own    Online and attached     -------- --------
 255  63BPG1  1884  Own    Online and attached     -------- VMLAB63B
…
```


INNOVATION® DATA PROCESSING

CALCDASD – Short Output (cont'd)


```
CP-owned TDISK PAGE SPOOL and DRCT allocation:
    Type  Volumes   Cylinders         GB   % used
    ----  -------   ---------       ----  -------
   TDISK        0           0       0.00     0.00
    PAGE        2       20033      17.03     7.25
   SPOOL        2       20033      17.03     0.86
    DRCT        1          20       0.02    15.00
          -------   ---------       ----  -------
Total:           5       40086      34.07     4.06

Total cylinder allocation:
       Type        Cylinders         GB
       ----        ---------       ----
   CP-OWNED            60102      51.08
     SYSTEM            50085      42.57
   ATTACHED                0       0.00
                    ---------    -------
Total DASD:           110187      93.65
```

WARNING: only 2 spool volumes - use (DRAIN 51 on FDRPAS MONITOR command
WARNING: only 2 page volumes - use (DRAIN 51 on FDRPAS MONITOR command

INNOVATION® DATA PROCESSING

CALCDASD – rdev range


```
==> calcdasd 1880-1887

Run on VMLAB63B, V6.3(1302) at 08:25:05 EDT TUESDAY 10/21/14

Rdev Volser Mfg SSID CCA HPF Allocation      Model    Cylinders
---- ------ --- ---- --- --- ----------      -----    ---------
1880 63BRES HTC 9002 40  +   CP-Owned        3390-9       10017
1881 63BCOM HTC 9002 41  +   CP-Owned        3390-9       10017
1882 63BREL HTC 9002 42  +   System          3390-9       10017
1883 63BSP1 HTC 9002 43  +   CP-Owned        3390-9       10017
1884 63BPG1 HTC 9002 44  +   CP-Owned        3390-9       10017
1885 63BW01 HTC 9002 45  +   System          3390-9       10017
1886 VM1886 HTC 9002 46  +   System          3390-9       10017
1887 VM1887 HTC 9002 47  +   System          3390-9       10017
Total volumes reported on: 8

Number of DASD models         CP-OWN SYSTEM  ATT'D   FREE  Total
3390-1s    (1113 cylinders):      0      0      0      0      0
3390-2s    (2226 cylinders):      0      0      0      0      0
3390-3s    (3339 cylinders):      0      0      0      0      0
3390-9s   (10017 cylinders):      4      4      0      0      8
3390-As     (sizes > 65520):      0      0      0      0      0
                               ----- ------ ------ ------ ------
Total DASD models:                4      4      0      0      8
```


INNOVATION® DATA PROCESSING

CALCDASD – rdev range (cont'd)


```
CP-owned volumes:
Slot  Vol-ID  Rdev  Type   Status                  SSIOwner SysOwner
   1  63BRES  1880  Own    Online and attached     -------- --------
   5  63BCOM  1881  Own    Online and attached     -------- --------
  10  63BSP1  1883  Own    Online and attached     -------- VMLAB63B
  11  63BSP2  188D  Own    Online and attached     -------- --------
 254  63BPG2  188F  Own    Online and attached     -------- --------
 255  63BPG1  1884  Own    Online and attached     -------- VMLAB63B

CP-owned TDISK PAGE SPOOL and DRCT allocation:
    Type  Volumes   Cylinders        GB   % used
    ----  -------   ---------      ----  -------
   TDISK        0           0      0.00     0.00
    PAGE        2       20033     17.03     7.25
   SPOOL        2       20033     17.03     0.86
    DRCT        1          20      0.02    15.00
          -------   ---------      ----  -------
Total:           5       40086     34.07     4.06

Total cylinder allocation:
       Type        Cylinders        GB
       ----        ---------      ----
   CP-OWNED            40068     34.06
     SYSTEM            40068     34.06
   ATTACHED                0      0.00
                     ---------    -------
Total DASD:            80136     68.11
```


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CALCDASD EXEC

- Request a copy of CALCDASD EXEC, email:
  - support@fdrinnovation.com

INNOVATION® DATA PROCESSING

Introductions

Hierarchy of Availability

Business Continuance Tools

z/VM and z/OS Platform Convergence

Estimating Migration Effort

Summary

User Testimonial

Benefits

Resources

Q & A

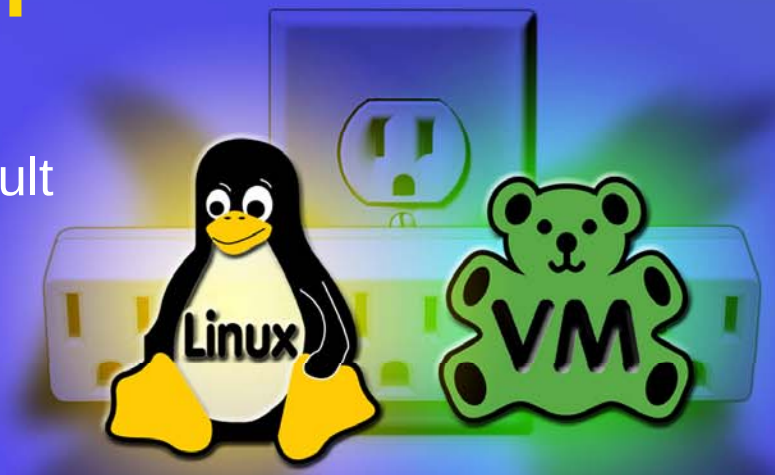
INNOVATION® DATA PROCESSING

User Testimonial

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



Benefits of FDRPASVM

- FDRPAS technology has a proven reliability record
- Over 1700+ customer migrations since 2001
- Supports concurrent processing:
  - Of many volumes
  - By many users
- You don’t have to bring z/VM or Linux systems down

FDRPASVM ~~Futures~~ Features

- Swapping of CP-Owned volumes:
  - SYS RES
  - PAGE*
  - SPOOL*
  - DIRECTORY
  - Checkpoint/Warm start cylinders

  ** Must have at least two volumes – will be drained*
- Swapping smaller to larger volumes:
  - Volume allocation table will reflect all PERM space

INNOVATION® DATA PROCESSING

Resources

- This presentation:
  - Will be uploaded to CAVMEN Web site
- Manuals
  - FDRPASVM V5.4L80 User Manual
    http://www.fdr.com/FDRPASVMdoc.pdf
  - FDRPAS, FDRMOVE, and FDRERASE Manual
    http://www.fdr.com/Manuals_CurrentVersion/FDRPAS_V54L80.pdf
- FDRPAS demo
  http://fdr.com/index.cfm?hptab=4&d=pasdemo
- Risk-free Trial
  http://www.fdr.com/riskfreetrial/form_rft.cfm
  - Choose “FDRPASVM product”
- My e-mail address
  mmacisaac@fdrinnovation.com

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Thank You…

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