

Introducing...
FDRPASVM

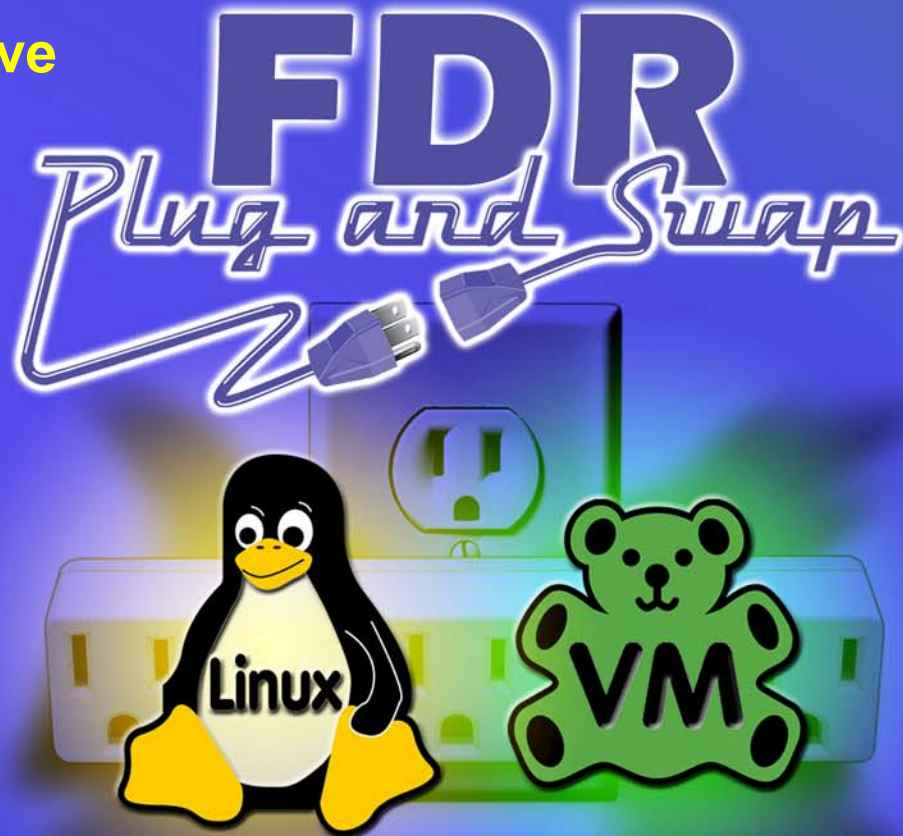
**A Solution for Non-disruptive
Migration of z/VM and
Linux on System z
Disk Volumes**

Michael MacIsaac
INNOVATION Data Processing
mmacisaac@fdrinnovation.com

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Agenda

- Introductions
- Towards “continuous availability”
- FDRPASVM overview
- FDRPASVM detail
- Summary



Introductions

- Who am I?
 - Michael MacIsaac
 - Product Manager for z/VM and Linux
 - mmacisaac@fdrinnovation.com



Towards Continuous 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 Morrill of IBM

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Towards Continuous Availability (cont'd)

- High Availability (HA)
 - Provides service during defined periods, at agreed upon levels (SLAs)
 - RTO
 - RPO
 - Avoids **unplanned outages**
 - Employs failure detection, automatic recovery/failover, problem/change management, etc.
- Continuous Operations (CO)
 - Avoids **planned outages**
 - Employs non-disruptive hardware and software upgrades and configuration changes



Towards Continuous Availability (cont'd)

- Continuous Availability (CA)
 - Delivers non-disruptive service to the end user, 24 hrs/day x 365 days/yr
 - No ***planned*** nor ***unplanned*** outages



Towards Continuous Availability (cont'd)

- Points of failure



Single Point of Failure	Probability of Failure	Cost to fix SPoF
System z hardware	Very Low	High
Disk Subsystem	Very Low	Medium
LPAR	Very Low	Low
z/VM	Low	Low
Linux	Low	Very Low
Application	High	Very Low

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

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Tools in Your Toolbox

- Good hardware with dynamic features
 - Mainframe, PR/SM, standby memory/CPU, etc.
- z/VM V6.2+ with SSI and LGR
 - 2-4 member SSI cluster share and coordinate resources
 - LGR – Move running Linux systems cross-LPAR or CEC
- Disk local mirroring and remote replication tools
- Dynamic z/VM and Linux features
 - Hot plugging memory, CPUs, file systems
- HA software
 - Oracle RAC, IBM WAS XD, IBM DB2 HADR, etc.
- Innovation FDRPAS for z/OS & FDRPASVM for z/VM



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- Introductions
- Towards “continuous availability”
- **FDRPASVM Overview**
- **FDRPASVM Detail**
- Summary



FDRPASVM Overview

- Migrate DASD of running systems non-disruptively
 - Copies entire source volume(s) to target (s)
 - Then copies all changed tracks ...
 - Swaps all I/O operations to use target volume(s)
- Beta tested at 4 sites in 2013
- GA in January 2014
- Supports z/VM 5.4, 6.2 and 6.3
- Move to a new DASD storage unit non-disruptively

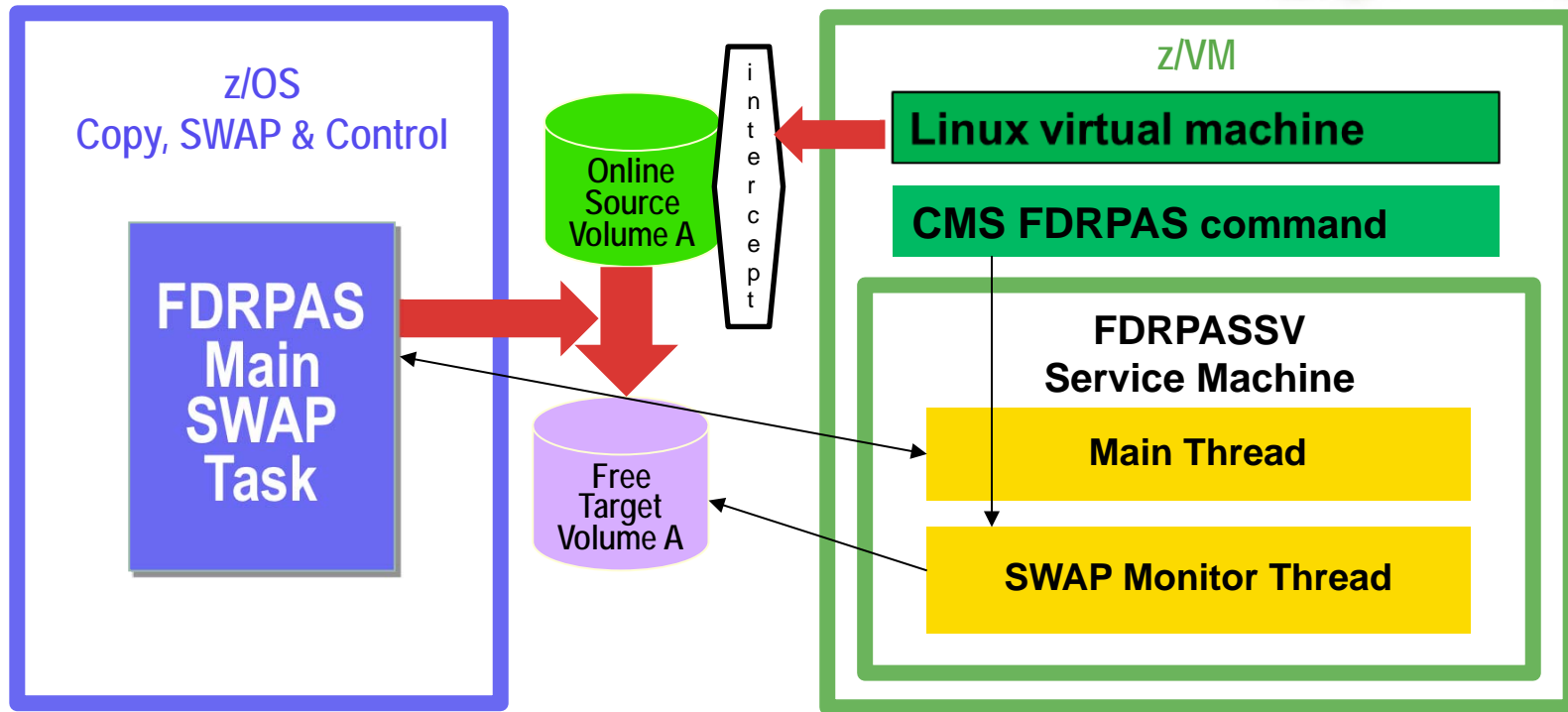


FDRPASVM Overview (cont'd)

- FDRPASVM allows active volumes to be swapped by tracking updates made by guests
- FDRPASVM supports migration of
 - Minidisk volumes (PERM)
 - Full-pack and DEDICATED volumes
 - Smaller to larger volumes (ex: 3390-9 to 3390-27)
- FDRPAS functions
 - SIMSWAP – Simulate and validate copy and swap
 - SIMSWAPMON – Simulate and validate monitoring updates
 - SWAPDUMP – Create point-in-time copy of volume(s)
 - SWAP – Copy and swap volume(s)



FDRPASVM Block Diagram



FDRPASVM Details

- Example of swapping Linux on rdev 1887 to B887
- z/VM detail
 - Service machine (FDRPASSV) is running
 - Source volume is **online**
 - Target volume is online and **FREE**
 - Monitor target volume w/FDRPAS command
 - FDRPAS MONITOR TYPE SWAP <vdev-spec>
- z/OS detail
 - Source volume is **online**
 - Target volume is **offline**
 - Invoke FDRPAS command using JCL job or ISPF interface
- Start monitor on LPARs w/access to target volumes



FDRPASVM on z/VM



- 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 MDC STOR 0M 256M" /* Limit minidisk cache in Cstor */  
"CP SET SIGNAL SHUTDOWN 300" /* Allow guests 5 min to shut down */  
"CP XAUTOLOG VSMGUARD" /* Start the SMAPI service machine */  
"CP XAUTOLOG FDRPASSV" /* Start the FDRPASSV service machine */
```

FDRPASVM on z/VM (cont'd)

- 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
==> det b887 system
DASD B887 DETACHED SYSTEM
==> q 1887 b887
DASD 1887 CP SYSTEM VM1887    2
DASD B887 VMB887
```



FDRPASVM on z/VM (cont'd)

- 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  
...
```

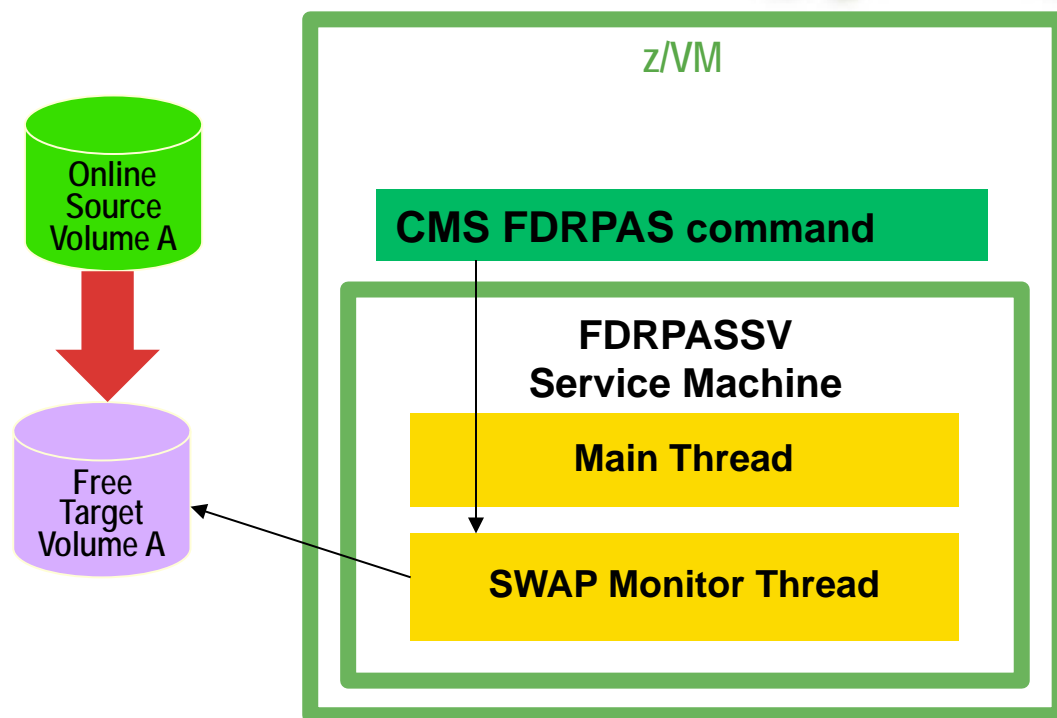
```
* MSG FROM FDRPASSV: PASIUCSM009I 1 ELIGIBLE DEVICE(S) FOUND
```

- Watch console on FDRPASSV

```
...  
PASMNVW080I DEVICE B887(B887) WAITING FOR SWAP INITIATION
```



FDRPASVM Block Diagram



FDRPAS on z/OS

- 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
```



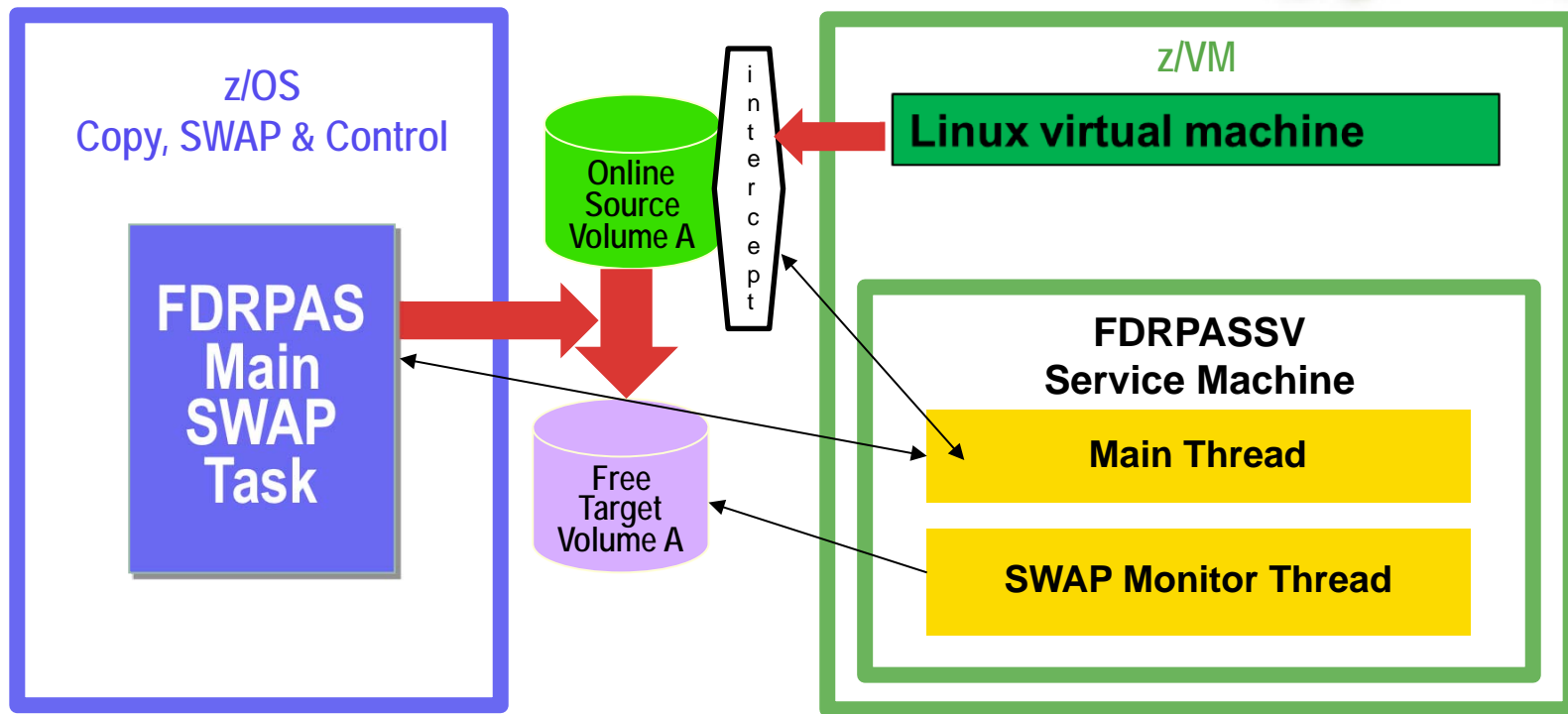
FDRPAS on z/OS (cont'd)

- Invoke FDRPAS command 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
```



FDRPASVM Block Diagram



FDRPASVM Process

- FDRPAS and FDRPASVM “plumbing”
 - z/VM “intercepts” installed 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
 - z/VM HYPERSWAP is issued when source and target are in sync
 - Target volume becomes the source volume transparently
 - FDRPASSV intercepts are removed



FDRPAS Output



- JCL output

```
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
```

FDRPASVM Output (cont'd)



- Back on MAINT on z/VM

- 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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Summary

- User testimonial
- Benefits
- Resources
- Q & A



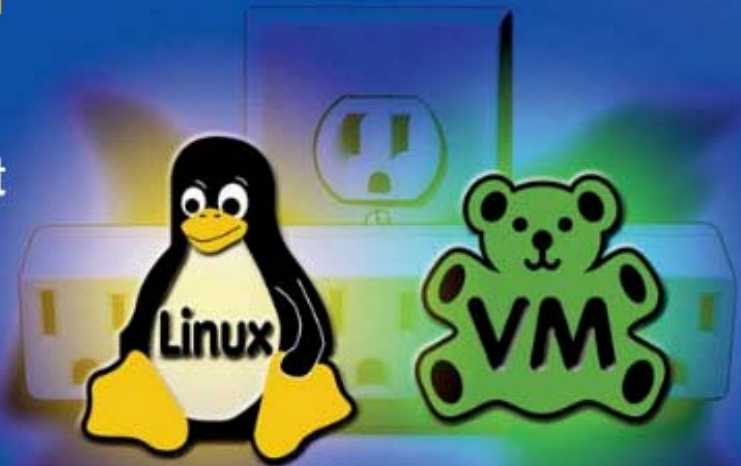
User Testimonial



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 for z/OS has a proven record of reliability
- Used in 1700+ data centers since 2001
- Supports concurrent processing of many volumes
- Don't have to bring z/VM* or Linux systems down



FDRPASVM Futures

- Swapping smaller to larger volumes:
 - Volume allocation table to reflect all PERM space (2Q 14)
 - Today: reflects source volume allocation table
- CP-Owned volumes:
 - To be supported (2Q 14)



Resources

- 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
- This presentation
http://www.fdr.com/FDRPASVM_Share2014



Resources (cont'd)

- FDR demos

<http://www.innovationdp.fdr.com/index.cfm?hptab=4#>

Click **View the FDRPAS product demo**

- Risk-free Trial

http://www.innovationdp.fdr.com/riskfreetrial/form_rft.cfm

Choose “FDRPASVM product”

- My e-mail address

mmacisaac@fdrinnovation.com



Thank You



CORPORATE HEADQUARTERS: 275 Paterson Ave., Little Falls, NJ 07424 • (973) 890-7300 • Fax: (973) 890-7147
E-mail: support@fdrinnovation.com • sales@fdrinnovation.com • <http://www.innovationdp.fdr.com>

EUROPEAN OFFICES:	FRANCE 01-49-69-94-02	GERMANY 089-489-0210	NETHERLANDS 036-534-1660	UNITED KINGDOM 0208-905-1266	NORDIC COUNTRIES +31-36-534-1660
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