

Consolidate-Virtualize-Simplify
A New WAVE...
in Multi-platform Data Protection
and
Enterprise Data Protection
FDRSOS
with
EMC z/SOS & IBM zDDB

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INNOVATION Data Processing
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Overview

Enterprise Storage Protection is NOT the same as it's always been. New technology makes it easier than ever to back up and recover all your data.

FDRSOS, from INNOVATION Data Processing, leveraging EMC z/SOS (formerly Enterprise Storage Platform, ESP) and IBM zDDB (z/OS Distributed Data Backup) multi-platform access, in conjunction with EMC TimeFinder and IBM FlashCopy consistent point-in-time replication, storing backups on EMC DLm 880/890 and IBM TS7680 ProtecTIER de-duplication appliances is a new way to ensure the resiliency of your enterprise business applications.

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Executive Summary



There is too much data & it's difficult to adequately protect.

Now there is a New WAVE of...

Multi-Platform Disaster Recovery & Distributed Data Protection.

- The IBM zDDB and EMC z/SOS announcements mark a new era of responsiveness.
- INNOVATION is delivering a new version of FDRSOS that combines with EMC z/SOS and TimeFinder, as well as with IBM zDDB and FlashCopy.
- The result is the fastest, least disruptive and most efficient z/OS solution for EMC VMAX and IBM DS8700/8800 multi-platform disaster recovery and distributed data protection available today!



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- The IBM zDDB and EMC z/SOS announcements mark a new era of responsiveness.
- INNOVATION is delivering a new version of FDRSOS that combines with EMC z/SOS and TimeFinder, as well as with IBM zDDB and FlashCopy.
- INNOVATION works closely with EMC and IBM to insure its data protection, business continuance and business resiliency solutions are fast, simple, secure and make your storage perform the very best it can for you.

The result...

- The fastest, least disruptive and most efficient z/OS solution for EMC VMAX and IBM DS8700/8800 multi-platform disaster recovery and enterprise data protection available today!

The problem...there is too much data!



- Surveys show 81% of respondents state data/storage growth is their biggest challenge, as they attempt to manage hundreds of distributed Open Systems backup servers that are all trying to move backup data across the same TCP/IP links their enterprise is depending on for communications...

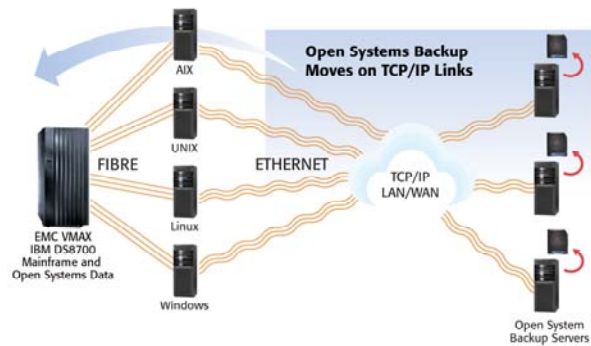


Everyone can agree...business information is priceless...

However the backups to protect it, take too long and are taking longer and longer.

Surveys show 81% of respondents state data/storage growth is their biggest data protection challenge...from a Symantec Press Release edited by StorageNewsletter.com on Tuesday, July 6th, 2010.

How do we improve on this...

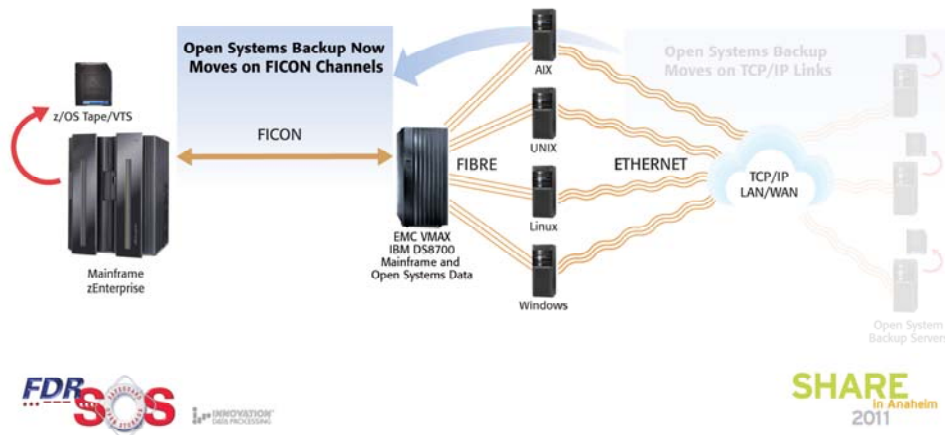


Conventional multi-platform data protection solutions typically depend on multiple distributed Open Systems backup servers, each with its own disk storage and external tape, transporting distributed data over corporate TCP/IP communication networks.

How do we improve on this...SIMPLE!



- Consolidate distributed data protection...to a System z moving enterprise backup data on high performance FICON.



How do we improve on this...SIMPLE!

Consolidate distributed data protection...to System z and move backup data on high performance FICON channels, reducing the amount of time it takes to protect the data as well as the amount of backup storage you use.

Multi-platform data protection technologies are continuing to evolve particularly in the System z mainframe environment; for VMAX and DS8700/DS8800 customers running z/OS the solution to this problem is the combination of INNOVATION FDRSOS with EMC z/SOS (multi-platform access feature of Symmetrix VMAX Storage Systems), IBM zDDB (z/OS Distributed Data Backup feature of the DS8700/DS8800 Storage Systems) together with EMC TimeFinder and IBM FlashCopy.

Consider...this integrated solution



- Conceptually just about every one agrees...
System z mainframes can help meet enterprise goals of “Consolidation”, “Virtualization”, and a “Green Data Center.”
- ...but now there is a wave of new technologies to make it real.
 - FICON access to EMC VMAX and IBM DS8700/8800 open systems disk dramatically reduces Open Systems backup time, while allowing z/OS mainframe sites to centralize multi-platform disaster recovery and enterprise data protection.
 - Instant hardware replication makes backup non-disruptive.
 - High capacity VTL and de-duplication appliances significantly reduce backup storage requirements.
- FDRSOS, EMC z/SOS w/TimeFinder and IBM zDDB w/FlashCopy...are the New Wave.



System z mainframes can help meet enterprise goals of “Consolidation”, “Virtualization”, and a “Green Data Center”

...and now there is something new to help:

- FICON access to EMC VMAX and IBM DS8700/8800 Open Systems disk dramatically reduces open systems backup time, while allowing z/OS mainframe sites to centralize multi-platform disaster recovery and enterprise data protection.
- Instant hardware replication makes backup non-disruptive.
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FDRSOS, EMC z/SOS w/TimeFinder and IBM zDDB w/FlashCopy...are the New Wave...and a new way to provide multi-platform disaster recovery and distributed data protection.”

What are we talking about?



INNOVATION & IBM Distributed Data Protection Solutions

- **FDRSOS...z/OS** Multi-Platform Disaster Recovery Protection for Distributed Data
- **SOSINSTANT...** Point-in-Time Disaster Recovery Protection for Distributed Data
- **UPSTREAM/SOS...** z/OS Multi-Platform File Level Protection for Distributed Data
- **EMC z/SOS and IBM zDDB...** VMAX and DS8700/8800 mCode Facilities Allowing Multi-Platform FICON Access to Open Systems Data
- **EMC TimeFinder and IBM FlashCopy...** VMAX and DS8700/8800 mCode Facilities to Instantly Make Full Volume Point-in-Time Copies



What are we talking about?

INNOVATION Software & IBM distributed data protection solutions

- **FDRSOS...**
z/OS Multi-Platform Disaster Recovery Protection for Distributed Data
- **SOSINSTANT...**
Point-in-Time Disaster Recovery Protection for Distributed Data
- **UPSTREAM/SOS...**
z/OS Multi-Platform File Level Protection for Distributed Data
- **EMC z/SOS and IBM zDDB...**
VMAX and DS8700/8800 mCode Facilities Allowing Multi-Platform FICON Access to Open Systems Data
- **EMC TimeFinder and IBM FlashCopy...**
VMAX and DS8700/8800 mCode Facilities to Instantly Make Full Volume Point-in-Time Copies

How do you implement this integrated solution?



- EMC z/SOS and IBM zDDB are a new way to...
 - consolidate mainframe and distributed data protection.
 - extend z/OS data protection to enterprise servers.
 - move data on high-performance FICON instead of TCP/IP networks.
- INNOVATION FDRSOS is a new way to...
 - reduce distributed data disaster recovery backup and recovery times.
 - conserve CPU resources.
 - cut backup storage requirements.
 - extend the value of z/OS scheduling, tape management & security.
- INNOVATION SOSINSTANT is a new way to...
 - Make enterprise data protection non-disruptive using EMC TimeFinder or IBM FlashCopy.



A new way to...

- ... consolidate mainframe and distributed data disaster recovery.
- ... extend z/OS data protection to enterprise servers.
- ... improve distributed data backup and restore.
- ... cut distributed data backup CPU and storage resources.
- ... advance enterprise business continuance and disaster recovery.
- ... extend the value and reach of existing investments.

EMC z/SOS and IBM zDDB... are a new way



*The EMC z/SOS and IBM zDDB announcements are...
the start of a new era of responsiveness and a new way...*

- ...to extend z/OS levels of reliability, accessibility and security to Linux on System z, AIX, Linux x86-64, Novell OES2, UNIX and Windows enterprise server platforms.
- ...to consolidate mainframe and distributed data protection by extending z/OS data protection to enterprise servers.
- ...to move distributed data across high-performance FICON channels instead of over TCP/IP networks.
- EMC z/SOS and IBM zDDB are the fastest, least disruptive and most efficient solutions for EMC VMAX and IBM DS8700/8800 multi-platform disaster recovery and distributed data protection available today!



The EMC z/SOS and IBM zDDB announcements are... the start of a new era of responsiveness and a new way...

...to consolidate mainframe and distributed data protection

...extending z/OS data protection to distributed servers...

Bringing unmatched IBM z/OS SysPlex levels of reliability, accessibility, security and performance to Linux on System z, AIX, Linux x86-64, Novell OES2, UNIX and Windows enterprise server platforms.

...moving distributed data across high-performance FICON channels instead of on TCP/IP networks.

...a multi-platform data protection solution that can simplify heterogeneous backup environments by consolidating and managing them through the mainframe.

...providing the capability to perform non-disruptive backup and rapid restore of enterprise server distributed data over high-performance FICON links.

... the result is the fastest, least disruptive and most efficient z/OS solution for EMC VMAX and IBM DS8700/ DS8800 Storage Systems multi-platform distributed data disaster recovery and enterprise business data protection available today!

INNOVATION FDRSOS, with EMC z/SOS or IBM zDDB...is a new way



- ...to consolidate hundreds of Open Systems backup servers onto one z/OS backup server running on System z.
- ...to directly read and write the same VMAX, DS8700/8800 volumes used by the Open Systems business applications themselves.
- ...with SOSINSTANT and EMC TimeFinder or IBM FlashCopy to keep critical and revenue-generating applications online without compromising information security.



INNOVATION FDRSOS is a new way to extend z/OS data protection to Linux on System z, AIX, Linux x86-64, Novell OES2, UNIX and Windows data residing on EMC VMAX and IBM DS8700/DS8800 storage systems.

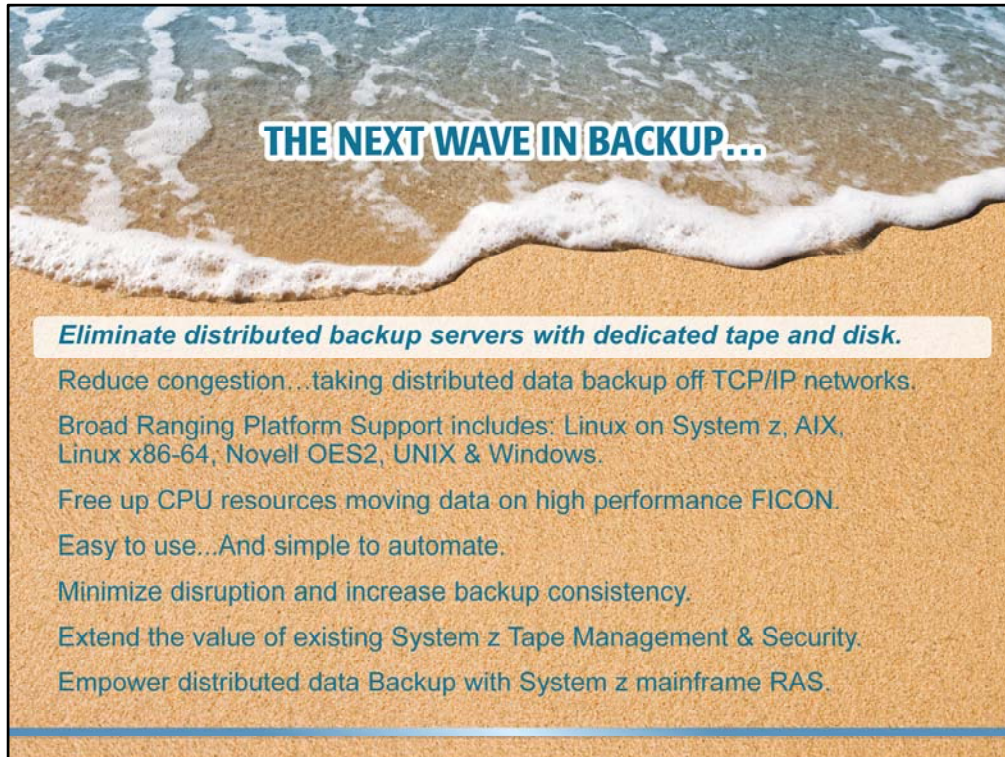
INNOVATION FDRSOS...seamlessly integrates with z/SOS and zDDB to directly read and write the same enterprise server disk volumes used by the Open Systems business applications themselves.

Only FDRSOS, with z/SOS or zDDB multi-platform access, can transfer data at high performance FICON megabytes per second versus TCP/IP network megabits per second.

FDRSOS offers the advantage of using existing high-speed mainframe tape and disk backstore under the control of z/OS auto-operations scheduling, tape management and data access security.

Non-Disruptive Disaster Recovery Backup Protection.

SOSINSTANT integration with EMC TimeFinder and IBM FlashCopy enables backup operations to provide “crash” consistent disaster recovery protection even as fully functional business application systems continue using distributed data without interruption.



THE NEXT WAVE IN BACKUP...

Eliminate distributed backup servers with dedicated tape and disk.

- Reduce congestion...taking distributed data backup off TCP/IP networks.
- Broad Ranging Platform Support includes: Linux on System z, AIX, Linux x86-64, Novell OES2, UNIX & Windows.
- Free up CPU resources moving data on high performance FICON.
- Easy to use...And simple to automate.
- Minimize disruption and increase backup consistency.
- Extend the value of existing System z Tape Management & Security.
- Empower distributed data Backup with System z mainframe RAS.

INNOVATION FDRSOS and SOSINSTANT, running on a System z mainframe under z/OS and employing EMC z/SOS with TimeFinder and IBM zDDB with FlashCopy: Eliminate distributed backup servers with dedicated tape & disk.

Before... EMC z/SOS and IBM zDDB...

Technology • Connections • Results

- Multiple Open Systems Backup Servers...
- Moving Distributed Data Across TCP/IP Links

- 1 Multiple Open Systems backup servers
- 2 Data moving across TCP/IP links
- 3 Separate backup environment for mainframe and distributed data

Mainframe zEnterprise
 Mainframe and EMC VMAX IBM DS8700
 Open Systems Data EMC VMAX IBM DS8700
 AIX
 UNIX
 Linux
 Windows
 ETHERNET
 TCP/IP LAN/WAN
 Open System Backup Servers

FDR **SOS** **INNOVATION**
SHARE
 In Anaheim
 2011

Enterprises today depend on a mix of mainframe and distributed data. Increasingly environments that consolidate mainframe and Open Systems platforms are becoming the norm. Yet there are separate backup environments for mainframe and distributed data.

Notwithstanding, advances in network-oriented data protection technology vast data warehouses that continue to expand, and far-flung internet-based customers exacerbate the problem to the point where skipping backups in order to keep business systems available may seem the only choice.

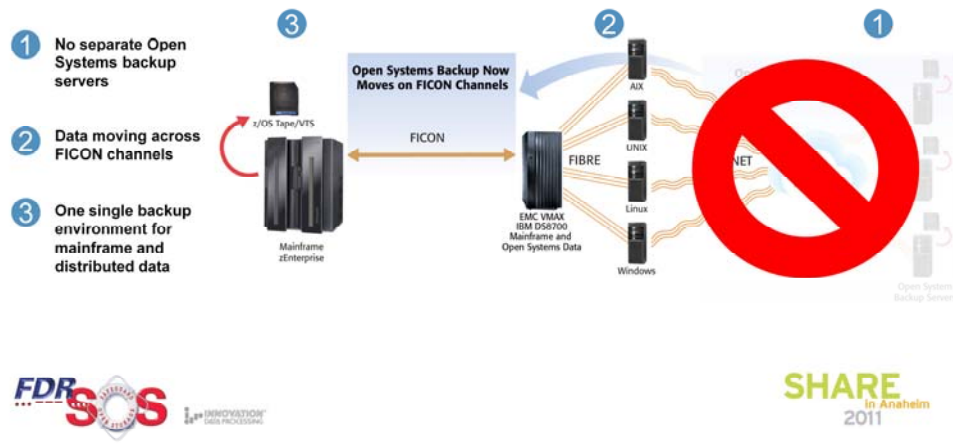
Many enterprises find the sheer volume of distributed data is overwhelming their TCP/IP communication networks, backup windows and available backup storage; consuming critical processor cycles while tying up processors and peripherals. The conventional answer to this problem has been to deploy more Open Systems backup servers each with its own disk and tape storage.

Additionally, Data Protection is not only a question of backup. Business resiliency also depends on reliable “rapid” restore, but with data moving across TCP/IP links, not just backup but recovery as well, always has its own degree of uncertainty and is never “as rapid as you would like”.

After...with FDRSOS and EMC z/SOS or IBM zDDB...



- Moving Distributed Backup Data on FICON Channels



z/SOS enterprise server and zDDB “distributed” data volumes have two connections one for general read/write (from distributed enterprise servers) and the other for multi-platform read/write (from System z).

FDRSOS running on a System z issues FBA commands to z/SOS and zDDB multi-access volumes to back up and recover them.

FDRSOS on Systems z can also take a non-disruptive backup using an EMC TimeFinder or IBM FlashCopy point-in-time copy technology and put the backup data to System z tape, disk or an EMC DLM 880/890 and IBM TS7680 VTL with de-dupe backstore.

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Empower distributed data Backup with System z mainframe RAS.

Take Distributed Data Backup Off the Network to Reduce Congestion and Shrink the Backup Window.

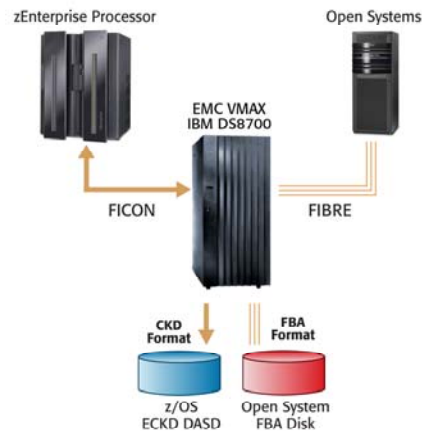
Significant reductions in CPU time and increases in data transfer speed shorten the backup window, reduce network congestion and cut recovery time as FDRSOS, UPSTREAM/SOS (and FDR/UPSTREAM with z/OS HyperSockets) take enterprise server distributed data backup off congested corporate TCP/IP networks.

Understanding how z/SOS and zDDB Multi-Platform Access Works...



z/SOS and zDDB are microcode features that allow z/OS to access

- mainframe (ECKD) data
- distributed (FBA) data

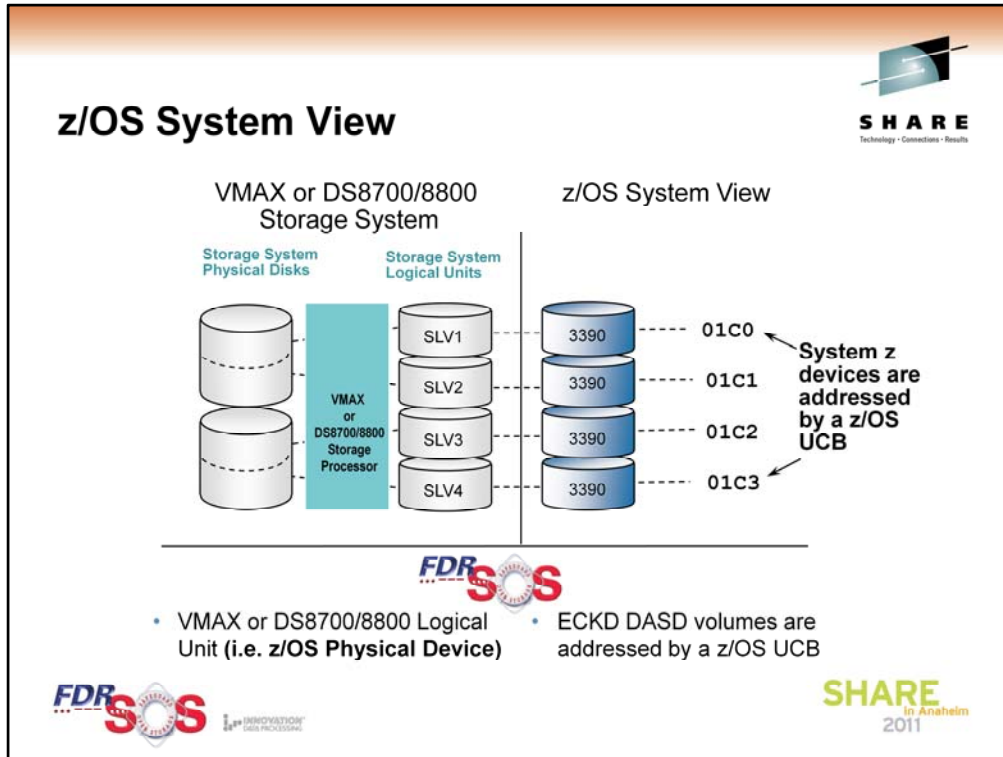


Understanding how z/SOS and zDDB Multi-Platform Access Works...

Modern storage systems separately virtualize logical volumes for both Open Systems and System z mainframe access on internally managed FBA disk, (sometimes spoken of though not particularly correctly as SCSI disk). This is because Open Systems and System z mainframe operating systems each use a different disk recording format and command set. The mainframe uses a variable length record with a data length field (count), a record key and data i.e. count key data (CKD) and extended count key data (ECKD) formats. Open Systems employ a fixed length block architecture (FBA) format.

Conventionally neither mainframe nor Open System programs are able to understand the other's format. Consequently Open System processors were traditionally only given access to the Open System fixed block architecture (FBA) format disks and System z processors access to only the mainframe format ECKD disk.

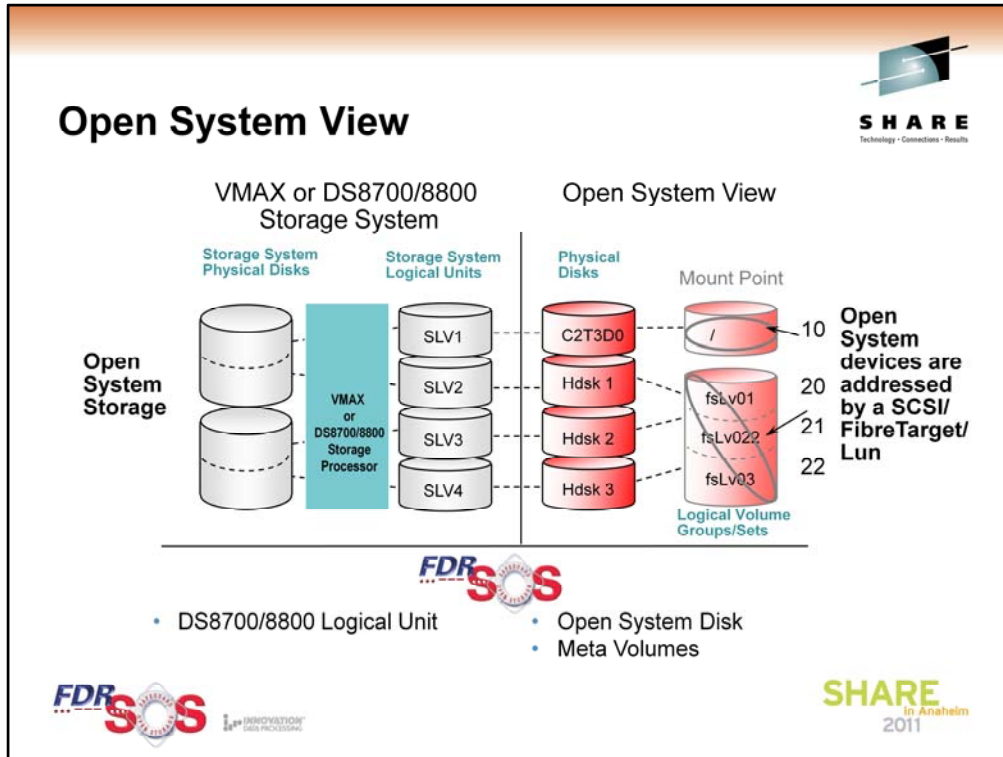
INNOVATION Data Processing partnering with EMC and IBM changes that, enabling through a unique combination of the EMC z/SOS and IBM zDDB microcode, special INNOVATION software (i.e. FDRSOS) and System z mainframe FICON to protect enterprise server Open Systems format disks residing in multi-platform access capable storage systems.



This is an overview for z/OS CKD/ECKD format disks.

Starting from the left you see the physical disks installed in the VMAX or DS8700/8800 storage system. They may have various capacities and speeds. The VMAX and DS8700/8800 storage processors make the physical disks appear to be one or more VMAX or DS8700/8800 logical volumes.

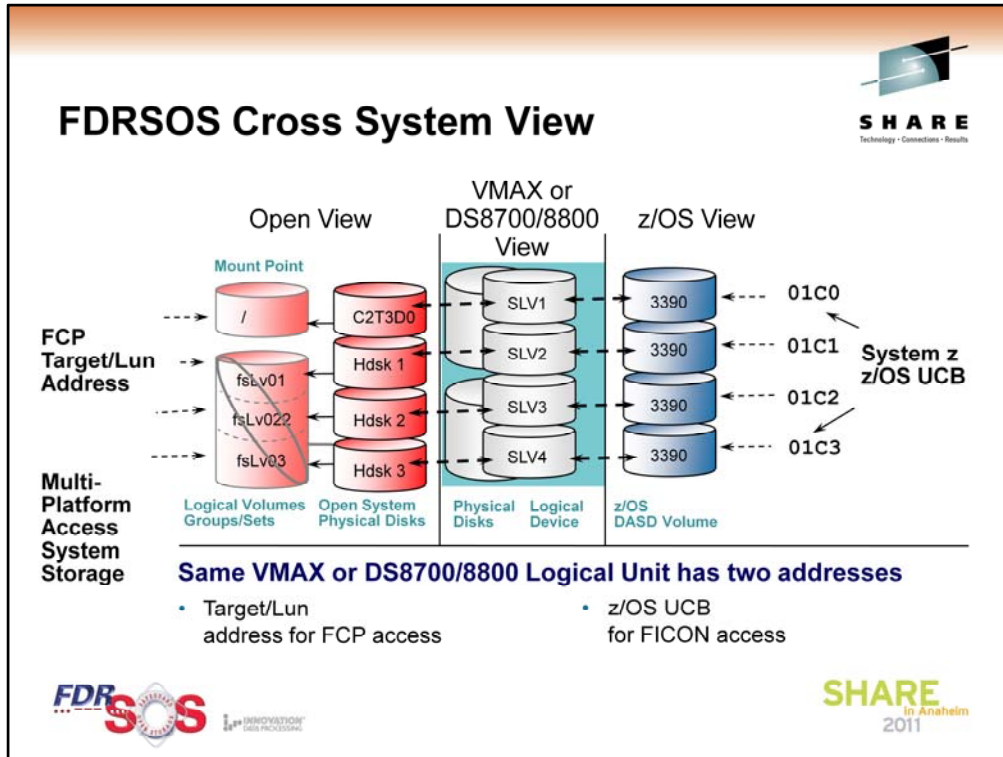
These logical volumes are then initialized for the mainframe (CKD) format. Each logical VMAX, DS8700/8800 volume appears to the System z as a 3390 physical volume and is assigned a z/OS device address in the System z HCD and z/OS I/O configuration.



This is an overview for Open System disks in a VMAX or DS8700/8800.

The VMAX and DS8700/8800 storage processors make the physical disks appear to be one or more logical volumes. The logical volumes do not have to match the physical disks. For example, a given 73GB physical disk may be made to appear as seven 10GB logical volumes.

From the viewpoint of the Open Systems host the VMAX, DS8700/8800 logical volumes are “physical disks”. Each one has a SCSI (i.e. Fibre channel) address. The Open System host server may access each logical volume as a single disk, or may group them into a volume group using a Logical Volume Manager or database software.



The key to understanding z/SOS and zDDB is that the VMAX and DS8700/8800 microcode allows Multi-Platform Access. Now with z/SOS and zDDB open volumes can have two connections; one for general read/write (from enterprise servers) and the other for backup read/write (from System z).

The same Open System “disk” can be assigned two storage system hardware device addresses. One is a FCP device address for Open System access and the other a FICON device address for z/OS access. FDRSOS uses the FICON z/OS device address.

THE NEXT WAVE IN BACKUP...

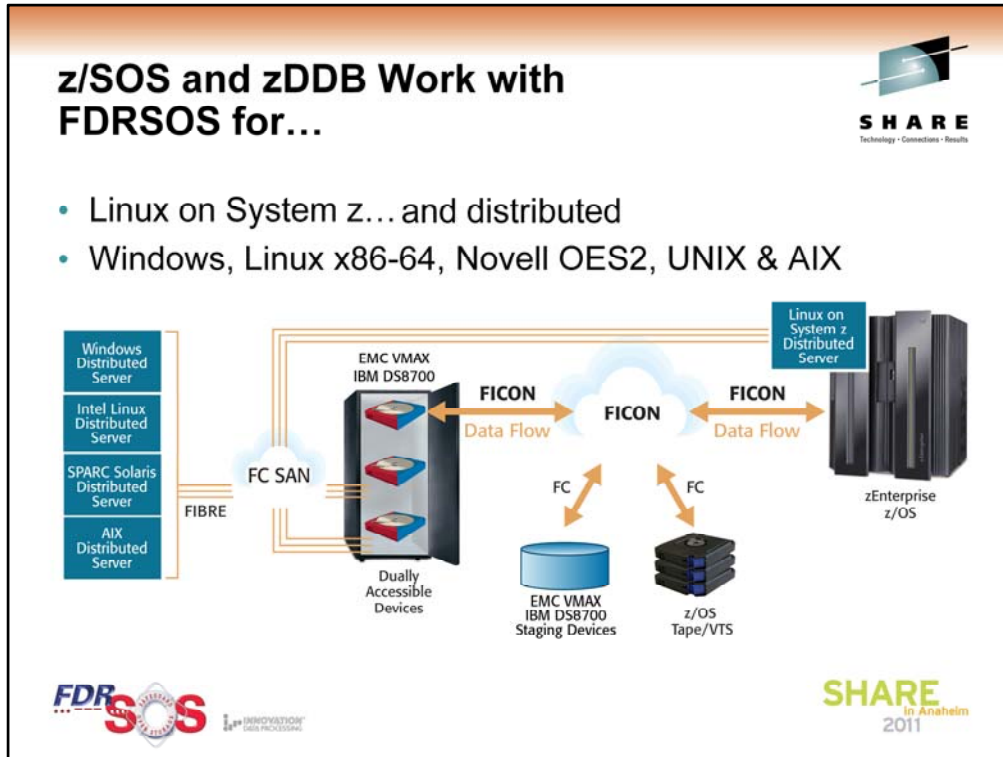
- Eliminate distributed backup servers with dedicated tape and disk.
- Reduce congestion...taking distributed data backup off TCP/IP networks.

***Broad Ranging Platform Support includes:
Linux on System z, AIX, Linux x86-64, Novell OES2, UNIX & Windows.***

- Free up CPU resources moving data on high performance FICON.
- Easy to use...And simple to automate.
- Minimize disruption and increase backup consistency.
- Extend the value of existing System z Tape Management & Security.
- Empower distributed data Backup with System z mainframe RAS.

Broad Ranging Platform Support.

The FDRSOS, UPSTREAM/SOS and FDR/UPSTREAM family allow centralization of z/OS based multi-platform disaster recovery and distributed data protection for a wide range of Open Systems hosts including Linux on System z, (SUSE and Red Hat), AIX, Linux x86-64, Novell OES2, UNIX and Windows.



FDRSOS – A Multi-Platform Distributed Data Disaster Recovery Solution.

Benefit

FDRSOS multi-platform mainframe (System z) distributed data protection does NOT move data across the corporate communications network. Data transfer is on high performance System z FICON channels and does not consume TCP/IP CPU cycles.

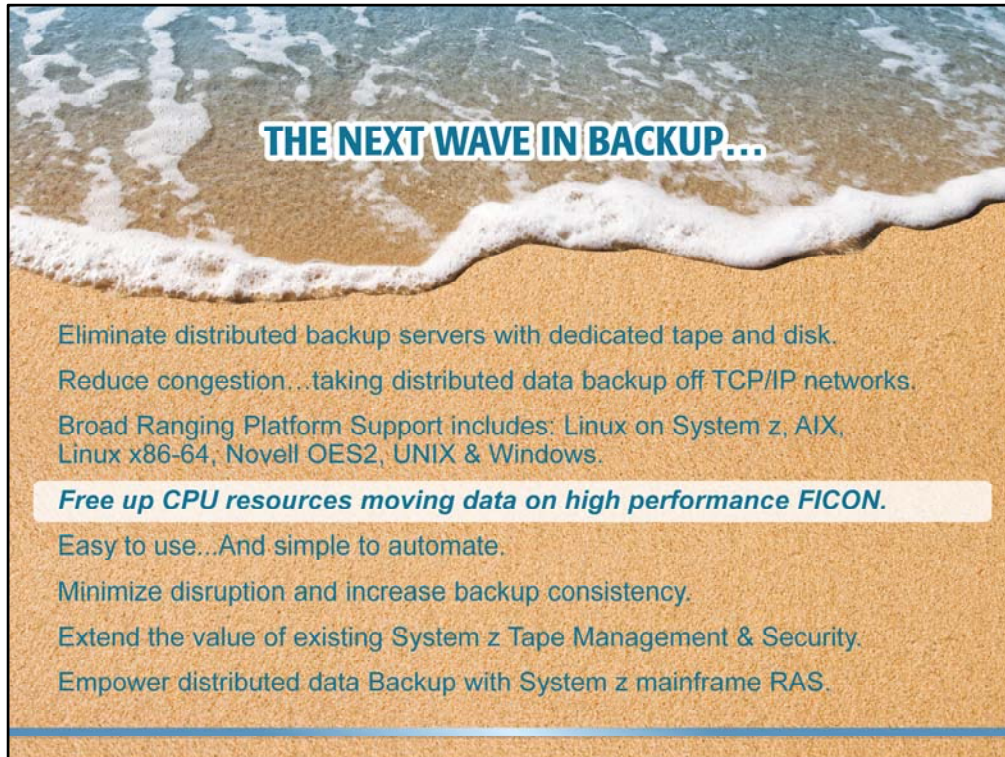
Considerations

Data to be backed up must reside in a storage controller with a multi-platform access feature (i.e. z/SOS for EMC VMAX and zDDB for IBM DS8700 and DS8800).

Performance Expectations

Performance expectations on properly configured FICON connections are in the range of 100 MB/sec per data stream. The data transfer rate depends on physically accessing the data on the z/SOS or zDDB enterprise disks, but backup at volume level is extremely low overhead as it does not open and read file systems.

The FDRSOS aggregate data transfer rate is only limited by the number of Open Systems disks available for concurrent access, the storage controller capacity and FICON channel configuration.



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Significant reductions in CPU time and increases in data transfer speed, result as z/SOS and zDDB allows FDRSOS and UPSTREAM/SOS to take distributed data disaster recovery for Open Systems enterprise server protection off the TCP/IP network, and move the backup data on high performance System z FICON channels.

What is different with z/SOS or zDDB & FDRSOS...?



- Much higher data transfer performance
- Significant reductions in CPU time...

	TCP/IP	FDRSOS	Comparison
Performance MB/sec	< 50	+/- 200	FDRSOS is more than four times faster
CPU Usage Millions of Instructions/GB	> 1200	+/- 50	TCP/IP takes more than 24 times as much CPU



FDRSOS full volume backup CPU and Wall Clock times will vary depending on the specifics of the System z processor and the tape subsystem in use.

Generally, FDRSOS full volume backup will use fewer than 50 million instructions per gigabyte of data transfer.

Throughput expectations using mainframe (System z) tape and VTL systems can be in excess of 500 GB/hr per tape drive, while recording the full capacity of the disk.

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Easy to use...And simple to automate.

- Minimize disruption and increase backup consistency..
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Easy-to-use...And simple to automate.

Though z/SOS and zDDB multi-platform access disks are not really standard z/OS volumes, FDRSOS and z/SOS or zDDB combine to provide familiar z/OS services and commands; i.e. a z/OS VOLSER in the volume label, with MOUNT and VARY commands that establish a pseudo-online status allowing familiar z/OS console commands to provide status information just as if the multi-platform access capable volumes were conventional z/OS disk volumes.

FDRSOS itself uses standard z/OS JCL and simple control statements.

FDRSOS makes it extremely to... BACKUP z/SOS and zDDB volumes



```
//DUMP      EXEC  PGM=FDRSOS,REGION=0M
//FDRSUMM   DD    SYSOUT=*
//SYSPRINT  DD    SYSOUT=*
//TAPEA     DD    DSN=BACKUP.SC2T3D0(+1),DISP=(,CATLG),UNIT=TAPE
//SYSPRINA  DD    SYSOUT=*
//SYSIN     DD    *
           DUMP  TYPE=FULL
           MOUNT VOL=C2T3D0,TAPEDD=A
```

NOTE:

//TAPEAA DD will create a duplicate copy for vaulting

FDRSOS is a full-volume physical backup of the entire Open Systems disk.



FDRSOS backing up one z/SOS or zDDB disk volume.

The TAPEA DD statement defines the backup dataset
(The last character “A” can be any alphanumeric or national character).

A matching SYSPRINA is for messages for the backup to TAPEA.

Note that you can create a duplicate backup by including
a TAPEAA DD statement (the last (A) character repeated twice).

A MOUNT statement specifies the VOLSER of the zDDB open systems disk and
the last character of the TAPEx DD statement; i.e. A.

This creates a full-volume physical backup, containing every sector of the multi-
platform access z/SOS or zDDB disk.

FDRSOS backup/restore of a complete VMAX or DS8700/8800 logical volume is a
data protection practice best suited for the protection of large databases and
disaster recovery.

FDRSOS RESTORE of a... z/SOS or zDDB volume



```
//RESTORE EXEC PGM=FDRSOS ,REGION=0M
//FDRSUMM DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
//TAPE1 DD DSN=BACKUP . SC2T3D0 ( 0 ) ,DISP=OLD
//DISK1 DD UNIT=SYSALLDA ,VOL=SER=C2T3D0
//SYSIN DD *
        RESTORE TYPE=FULL
```

FDRSOS restores a full-volume physical image of the entire Open Systems disk.



FDRSOS restoring the z/SOS or zDDB backup from the previous example.

This is a physical full-volume restore.

Optionally, a MOUNT statement can specify the FDRSOS zDDB disk VOLSER and the name of the cataloged backup data set, which will be dynamically allocated eliminating the need for the DISK DD.

```
MOUNT VOL=C2T3D0 ,BACKUPDSN=BACKUP . SC2T3D0 ( 0 )
```

A full volume restore overlays all of the directory information on the volume, consequently it should be dismounted from the Open System or the Open System brought down prior to the restore and then re-booted at the completion of the restore.

FDRSOS, by default prompts the operator for permission before a restore.

Defining z/SOS and zDDB volumes in HCD...



- In HCD, the z/OS options for a z/SOS or a zDDB device will look similar to this:

```
View Device Parameter / Feature Definition Row 1 of 6
Device number . . . : 01E0 Device type . . . : 3390
Parameter/ Value Req. Description
Feature
OFFLINE Yes Device considered online or offline at IPL
DYNAMIC Yes Device supports dynamic configuration
LOCANY Yes UCB can reside in 31 bit storage
ALTCTRL No Separate physical control unit path
SHARED Yes Device shared with other systems
```

- Define VMAX z/SOS and DS8700/8800 zDDB disks as Device Type 3390, even though they are NOT z/OS volumes.
- Mark z/SOS and zDDB disks as OFFLINE devices, this prevents z/OS from attempting to access them at IPL time.
- Attempts to vary z/SOS and zDDB disks online to z/OS will fail and result in error messages, however...the devices will remain accessible to FDRSOS.



z/SOS and zDDB disk z/OS HCD (Hardware Device Configuration) entry.

The HCD device entry for z/SOS and zDDB disks is simply a normal 3390 with OFFLINE YES.

Attempts to vary z/SOS VMAX or DS8700/8800 zDDB disks online to z/OS will result in error messages, however...the devices will remain accessible to FDRSOS.

z/OS VOLSER makes z/SOS and zDDB volumes easy to manage...



```
//LABEL      EXEC  PGM=FDRSOS ,REGION=0M
//STEPLIB    DD   DISP=SHR,DSN=fdrsos.loadlib
//SYSPRINT   DD   SYSOUT=*
//SYSUDUMP   DD   SYSOUT=*
//SYSIN      DD   *
  LABEL      TYPE=SOS
  MOUNT      UNIT=01E0 ,SETVOL=41HD07
  MOUNT      UNIT=01E1 ,SETVOL=32HD10
  *          *          *          *          *          *
  MOUNT      UNIT=01EA ,SETVOL=C2T3D0
```



z/OS VOLSER makes z/SOS and zDDB disk volumes easy to manage...

You label a z/SOS and zDDB disk volume (using the FDRSOS LABEL function), for much the same reason you would use a z/OS utility to label a conventional z/OS disk. The label allows it to be uniquely identified when it is brought online for use.

Using FDRSOS label z/SOS and zDDB disks with a z/OS-style VOLSER. This is, just as with a z/OS volume, a one time operation.

z/SOS and zDDB stores the VOLSER label (6 alphanumeric characters) and other FDRSOS information in a section of the logical volume reserved for FDRSOS, that is not part of the disks conventionally accessible area.

It is the FDRSOS LABEL function storing the VOLSER in the z/SOS and zDDB disk volume's z/OS UCB that makes it easily accessible through simple JCL.

Verifying z/SOS and zDDB disks... are accessible



Issue a z/OS DEVSERV PATHS command for the zDDB device addresses:

`DS P,21e0,16`

IEE459I 09.33.39 DEVSERV PATHS 685

UNIT	DTYPE	M	CNT	VOLSER	CHPID=PATH	STATUS		
RTYPE	SSID	CFW	TC	DFW	PIN	DC-STATE	CCA	DDC
021E0	3390	,	F	000	E#21E0	18=X 17=X		
021E1	3390	,	F	000		18=X 17=X		
021E2	3390	,	F	000	E#21E2	18=X 17=X		
021E3	3390	,	F	000	E#21E3	18=X 17=X		
021E4	3390	,	F	000	E#21E4	18=X 17=X		
...								
021EE	3390	,	F	000		18=X 17=X		
021EF	3390	,	F	000		18=X 17=X		

***** SYMBOL DEFINITIONS *****
F = OFFLINE X = INDETERMINATE FAILING UNIT



Verify z/SOS and zDDB disks are accessible...

Additionally just as you might with z/OS volumes, in advance of using a z/SOS or zDDB device it's always a good practice to use the z/OS DS PATHS command to ensure there is no problem accessing them.

The z/OS console DS PATHS command can verify that you have access to z/SOS and zDDB disks after you add them to the active configuration, both before using FDRSOS to LABEL them and after. With it you can check that the multi-platform z/SOS and zDDB disks are defined to the z/OS IO configuration and have at least one valid path that can reach the device.

The example above of a DS PATHS command shows only some of the disks were labeled. The VOLSER is filled in on those that FDRSOS labeled, even though they appear offline (F).

The channel path status of (X) "indeterminate failing unit" confirming the z/OS Path Command successfully reached the FBA format volume which it understandably could not read.

Vary z/SOS and zDDB disks “ONLINE”



* FDRSOS VARYON output:

```
FDR001 FDRSOS VER.5.4/74P - INNOVATION DATA PROCESSING DATE=2010.196
FDR303 CARD IMAGE -- VARYON TYPE=SOS,PRINT=STATUS
FDR303 CARD IMAGE -- MOUNT UNIT=220*
```

```
FDR213 PSEUDO MOUNTED PATH=2204 VOL=E#2204-IBM-NUMBER=X'FF11-115F'
```

```
FDR216 STATUS SCSI VOLUME UNIT=2204 VOL=E#2204-IBM-NUMBER=X'FF11-115F
FDR216 UNIT=2204 LINUX EXT2 VOL W/UUID-->82A23E7A-5C33-4EA7-8514-24...
FDR216 UNIT=2204 18,432 MB SIZE 777 MB FREE 4096 BLKSIZE
```

...

...

```
FDR213 PSEUDO MOUNTED PATH=2201 VOL=E#2201 - IBM-NUMBER=X'FF11-115C'
```



Vary z/SOS and zDDB volumes “ONLINE”.

The FDRSOS VOLSER in the z/OS UCB of a z/SOS and zDDB disk will not persist across an IPL. However, if the FDRSOS LABEL function has been run against z/SOS and zDDB enterprise volumes, to restore the VOLSER to the volume's UCB, you can simply run an FDRSOS VARYON after an IPL.

A best practice is to include the FDRSOS VARYON command in the system IPL procedure so that after any IPL all the z/SOS and zDDB disks are immediately available to FDRSOS.

FDRSOS can also identify the creating operating system and most disk formats. The PRINT=STATUS operand (available on most FDRSOS commands) directs FDRSOS to identify the format of the z/SOS and zDDB disks. The example above shows the disk is a Linux format.

After an FDRSOS Backup/Restore...of a z/SOS or zDDB disk Check the Stats...



```
//DUMP      EXEC  PGM=FDRSOS,REGION=0M
//TAPEA    DD   DSN=BACKUP.SC2T3D0(+1),DISP=(,CATLG),UNIT=TAPE
//TAPEAA   DD   ... will create a duplicate copy for vaulting
//SYSPRINA DD   SYSOUT=* ... for the status report
          DUMP   TYPE=FULL,PRINT=STATUS
          MOUNT  VOL=C2T3D0,TAPEDD=A
FDR216 UNIT=01EA IS A SUN SOLARIS VOLUME WITH VOL NAME OF NONAME
      WITH A LABEL OF IBM-DS8700/8800-5063 cyl 8860 alt2W ITH A MOUNT POINT OF
      /m01
FDR122 OPERATION STATISTICS FOR SOS VOLUME.....C2T3D0
      BYTES ON VOLUME.....4,355,850,240
      * * * * *
      BYTES ON BACKUP.....4,364,783,536
      * * * * *
      CPU TIME (SECONDS).....11.942
      ELAPSED TIME (MINUTES).....4.7
      BACKUP TIME (EXCLUDING MOUNTS).....4.2
      BACKUP COPY 1 ON TAPE DSN=BACKUP.SC2T3D0.C1  VOL=900013
      BACKUP COPY 2 ON TAPE DSN=BACKUP.SC2T3D0.C2  VOL=900022
FDR002 FDR DUMP SUCCESSFULLY COMPLETED VOL=C2T3D0
```



Check the Stats after an FDRSOS Backup/Restore.

FDRSOS always prints a block of statistics for any backup or restore. This abbreviated example shows the volume label, the size of the disk in bytes, the number of bytes on the backup tape (slightly larger because of control information), CPU time used by the backup, the elapsed time of the backup, and the elapsed time after subtracting time spent waiting for tape mounts. The data set name and volume serials of the backup data set are shown (both copies if requested). Restore statistics are similar.

THE NEXT WAVE IN BACKUP...

Eliminate distributed backup servers with dedicated tape and disk.
Reduce congestion...taking distributed data backup off TCP/IP networks.
Broad Ranging Platform Support includes: Linux on System z, AIX, Linux x86-64, Novell OES2, UNIX & Windows.
Free up CPU resources moving data on high performance FICON.
Easy to use...And simple to automate.

Minimize disruption and increase backup consistency.

Extend the value of existing System z Tape Management & Security.
Empower distributed data Backup with System z mainframe RAS.

Non-Disruptive Consistent Disaster Recovery Protection.

SOSINSTANT integration with EMC z/SOS and TimeFinder as well as with IBM zDDB and FlashCopy enables backup operations to provide “crash” consistent disaster recovery protection even as fully functional distributed business application systems continue using enterprise data without interruption.

BreakTHROUGH Technology

- EMC z/SOS with EMC TimeFinder
- IBM zDDB with IBM FlashCopy
- FDRSOS with SOSINSTANT
 - Non-Disruptive...
 - Multi-Platform Disaster Recovery Protection for Distributed Data
 - Write Consistent Multi-volume...
 - Instant Hardware Volume Replication

The diagram illustrates a data replication architecture. On the left, a 'zEnterprise Processor' is connected to an 'Open Systems' server on the right. Two lines, labeled 'FICON' and 'FIBRE', connect them to a central storage unit. This unit is labeled 'FlashCopy Timefinder' and 'EMC VMAX IBM DS8700'. The 'SHARE' logo is visible in the top right and bottom right corners of the slide.

SHARE
Technology • Connections • Results

SHARE
In Anaheim
2011

FDR SOS INNOVATION Data Processing

Break Through Technology...

EMC TimeFinder and IBM FlashCopy technology point-in-time copy brings a dramatic improvement to disaster recovery protection and business resiliency; i.e. an almost instant point-in-time copy followed by a non-disruptive backup.

Even the fastest conventional backup pales in comparison with the promise of continuous 24x7x365 availability that comes with the introduction of TimeFinder and FlashCopy distributed data disaster recovery protection.

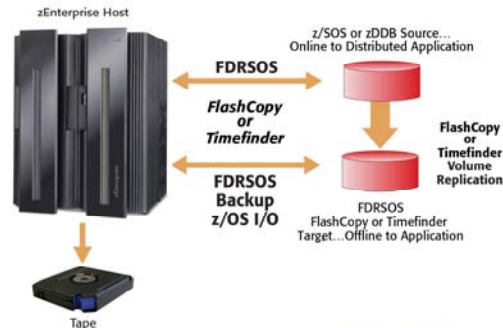
The benefits of instant crash consistent point-in-time hardware replication in conjunction with a non-disruptive software backup are universal and consistent across all operating system platforms.

SOSINSTANT...and TimeFinder or FlashCopy Provide Non-Disruptive Disaster Recovery Protection



Benefits of FDRSOS with z/SOS and TimeFinder or zDDB and FlashCopy...SOSINSTANT provides...

- Disaster recovery backup without long application downtime.
- Eliminate unacceptable recovery time with rapid recovery from disk.
- Simple...
uses a common z/OS interface.
- Fast...
does an instant copy of the source to a target disk.
- Non-Disruptive...
backup of the target disk.



Benefits of z/SOS w/TimeFinder or zDDB w/FlashCopy and SOSINSTANT

Disaster recovery backup protection without long application downtime.

TimeFinder and FlashCopy are fast...

The storage system does a quick hardware copy for a non-disruptive backup...

And eliminated unacceptable recovery time with rapid recovery from disk.

SOSINSTANT simplifies distributed data replication...

A common z/OS interface simplifies hardware point-in-time replication.

The storage system hardware does an instant copy of the source to a target.

FDRSOS does a non-disruptive backup of the target disk.

SOSINSTANT...Non-Disruptive BACKUP of z/SOS TimeFinder CLONE volumes



```
//SNAP EXEC PGM=FDRSOS,REGION=0K
...
SNAP TYPE=SOS
MOUNT VOL=E#21EA,SNAPUNIT=21E1
MOUNT VOL=E#21EB,SNAPUNIT=21E2
...
/*
//DUMP EXEC PGM=FDRSOS,REGION=0M
//FDRSUMM DD SYSOUT=*
//TAPEA DD DSN=BACKUP.AE#21EA(+1),DISP=(,CATLG),UNIT=TAPE
//TAPEB DD DSN=BACKUP.AE#21EB(+1),DISP=(,CATLG),UNIT=TAPE
...
//SYSPRINA DD SYSOUT=*
... (includes a SYSPRINx for B and C)
//SYSIN DD *
DUMP TYPE=FULL,SNAP=USE,MAXTASKS=3
MOUNT VOL=E#21EA,TAPEDD=A
MOUNT VOL=E#21EB,TAPEDD=B
```



SOSINSTANT Non-Disruptive BACKUP... of TimeFinder CLONE point in time copies of z/SOS volumes.

Using SOSINSTANT with TimeFinder CLONE simply divide an existing FDRSOS volume backup into two steps (may be in one job or two).

The first SOSINSTANT step will capture all the point-in-time images of the selected source volumes using FDRSOS SNAP. This will take only a few seconds per volume. MOUNT statements in the first step, specify the VOLSER of the active business system z/SOS disks and z/OS UCB device addresses of z/SOS target disks that are offline to the business applications.

The second FDRSOS step non-disruptively creates the backup, reading the point-in-time copy images instead of the active business system disks.

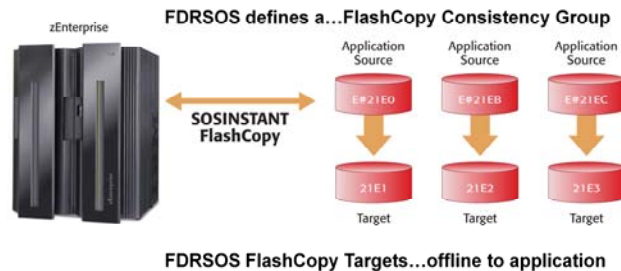
SNAP=USE – tells FDRSOS to read the TimeFinder CLONE of the source created by the SNAP step. FDRSOS remembers the device address of the device most recently used as a TimeFinder CLONE target of a source volume. Consequently MOUNT statements in the second step, simply specify the VOLSER of the active business system z/SOS disks and the TAPE DD of where to write the backup. MAXTASKS specifies the maximum number of z/SOS enterprise volumes that will be dumped concurrently in this step.

SOSINSTANT... Non-Disruptive Consistent Multi-volume Protection and FlashCopy Consistency Group



SOSINSTANT can create multiple point-in-time backups in parallel.

- Multi-volume point-in-time replication uses FlashCopy Consistency Groups.
- Stops I/O to all volumes in the FlashCopy Consistency Group [queue full].
- Creates crash consistent copies of multiple volumes at a single point-in-time.



SOSINSTANT employing FlashCopy Consistency Group technology can create crash consistent point-in-time backups of databases without quiescing enterprise applications, which typically employ journaling or logging features to support recovery from a crash consistent backup.

Consistency Group FlashCopy replicates multiple disks in parallel at a single point-in-time, ensuring the I/O integrity and data consistency of the group by preventing applications from issuing dependent writes during the FlashCopy process.

SOSINSTANT consistent FlashCopy operations also significantly reduce the overall instant run-time by creating the FlashCopy replicas of multiple volumes in parallel, instead of in a serial volume by volume manner.

SOSINSTANT...FlashCopy BACKUP of a zDDB Consistency Group



```
//FLASH EXEC PGM=FDRSOS,REGION=0K
CONFCOPY TYPE=SOS
MOUNT VOL=E#21EA,FLASHUNIT=21E1
MOUNT VOL=E#21EB,FLASHUNIT=21E2
MOUNT VOL=E#21EC,FLASHUNIT=21E3

//DUMP EXEC PGM=FDRSOS,REGION=0M
//FDRSUMM DD SYSOUT=*
//TAPEA DD DSN=BACKUP.AE#21EA(+1),DISP=(,CATLG),UNIT=TAPE
//TAPEB DD DSN=BACKUP.AE#21EB(+1),DISP=(,CATLG),UNIT=TAPE
//TAPEC DD DSN=BACKUP.AE#21EC(+1),DISP=(,CATLG),UNIT=TAPE
//SYSPRINA DD SYSOUT=*
... (includes a SYSPRINx for B and C)
//SYSIN DD *
DUMP TYPE=FULL,FCOPY=(USE,REL),MAXTASKS=3
MOUNT VOL=E#21EA,TAPEDD=A
MOUNT VOL=E#21EB,TAPEDD=B
MOUNT VOL=E#21EC,TAPEDD=C
```



Consistent FlashCopy of a group of zDDB volumes.

Using SOSINSTANT with FlashCopy, you would simply divide an existing FDRSOS volume backup job into two steps (this may be in one job or two).

The first FLASH step, using FDRSOS CONFCOPY, will capture consistent point-in-time images of all the specified source volumes. This will take only a few seconds depending on the number of volumes. MOUNT statements in the first (FLASH) step, specify the VOLSER of the active distributed business system zDDB disks and the z/OS UCB device addresses of the zDDB targets.

The second DUMP step, non-disruptively creates the backup. The FCOPY=USE command, tells FDRSOS to read the FlashCopy point-in-time target images of the source volumes created by the FLASH, instead of source volume itself.

FDRSOS remembers the device address of the device most recently used as a FlashCopy target of a source volume. Consequently, MOUNT statements in the second step, simply specify the VOLSER of the active distributed business system zDDB disks and the TAPE DD of where to write the backup.

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Free up CPU resources moving data on high performance FICON.
Easy to use...And simple to automate.
Minimize disruption and increase backup consistency.

Extend the value of existing System z Tape Management & Security.

Empower distributed data Backup with System z mainframe RAS.

Extend the value of existing System z storage hardware and z/OS Multi-Platform File Transfer, Tape Management, Scheduling & Security software.

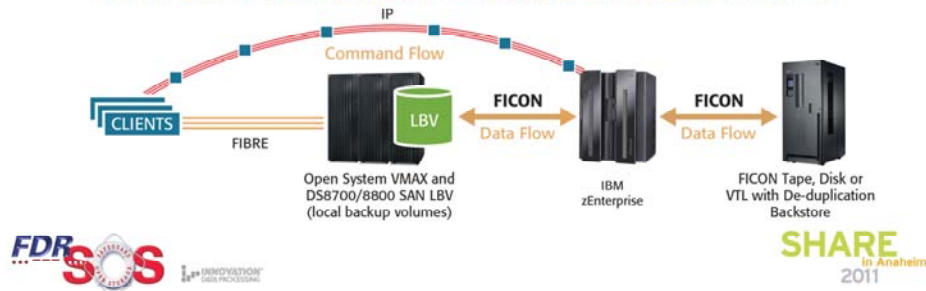
Maximize the value of existing z/OS multi-platform FTP, tape management (RMM, CA1), auto-operations, scheduling and security software (RACF, ACF2, Top Secret) by extending it to provide distributed data protection.

UPSTREAM/SOS: Extends z/OS Multi-Platform data protection to File Level



- z/OS Multi-Platform Incremental Backup and File Level distributed data protection for...AIX, Linux, UNIX, Windows & Linux on System z.
- All backup data travels on FICON channels.
- Only control data travels on the TCP/IP network.
- zDDB also extends FDR/UPSTREAM File Transfer.

UPSTREAM/SOS Data Flow, Incremental and File backup/restore is over FICON



Multi-Platform data protection w/ incremental backup & file recovery

UPSTREAM/SOS, an FDRSOS option, employs z/SOS & zDDB multi- platform access to extend z/OS distributed disaster recovery protection with incremental back up and file level recovery for AIX, Linux, UNIX, Windows and Linux on System z, without putting backup data on your network.

UPSTREAM/SOS also provides online database backup agents for ORACLE, IBM DB2, MS Exchange and Lotus Notes hot backup, with administrative control of data base and file level selection via the UPSTREAM Director GUI.

Data travels between FDR/UPSTREAM Client s running on enterprise server hosts and the z/OS UPSTREAM/SOS Backup Server via z/SOS & zDDB local backup volume s (aka. LBV, transfer disk/volume) over high-performance System z FICON Channels to FICON tape, disk or VTL with de-dupe.

Benefits...same as FDRSOS plus:

- File level backup and recovery.
- Incremental backup of only changed data files.
- Hot online backup of large database warehouses.
- Cuts backup and recovery time.
- Reduces tape, disk and VTL backstore requirements.
- Takes FDR/UPSTREAM File Transfer off the communication network.

Apply Mainframe Resources to Disaster Recovery and Distributed Data Protection



Using System z Backup Storage.

- VTL – EMC DLm, IBM TS7700, Luminex Gateway w/SEPATON ...
- De-duplication – EMC DLm 960 / MDL1000, IBM ProtecTIER TS7680, Luminex Gateway w/EMC|Data Domain ...
- Physical Tape Library – IBM TS3400, TS3500. ORACLE/STK SL8500.
- Physical Tape – IBM TS1120, TS1130, ORACLE/STK T10000B & C.
- Disk – EMC VMAX/SYMMETRIX, HDS VSP/USPv, IBM DS8700/8800.

Under the control of z/OS.

- Auto-ops scheduling (CA-Scheduler, IBM TWS/OPC...).
- Tape management (CA1, RMM, TLMS...).
- Data access security (RACF, ACF2, Top Secret...).



Extend the value of existing Systems z hardware and z/OS software.

z/OS multi-platform disaster recover and distributed data protection extends the value of existing resources...

System z Storage Hardware

- VTL
EMC DLM and MDL...IBM TS7700 ... Luminex w/SEPATON
- De-duplication Appliances
EMC DLm88/890...IBM ProtecTIER TS7680... Luminex w/EMC|DataDomain
- Physical Tape Library
IBM TS3400, TS3500
- Physical Tape
IBM TS1120, TS1130
- Disk
EMC VMAX, HDS VSP, IBM DS8700/8800...

z/OS Software

- Auto-ops scheduling (CA-Scheduler, IBM TWS/OPC...).
- Tape management (CA1, RMM, TLMS...).
- Data access security (RACF, ACF2, Top Secret...).

De-duplication reduces backup storage requirements and improves media utilization.



De-duplication is a natural complement to Multi-Platform z/OS distributed data protection.

Ratio	to 1	Saved	Stored
	3	67%	33%
	12	92%	8%
	16	94%	6%
	20	95%	5%
	25	96%	4%
	50	98%	2%

Customer Average



INNOVATION Data Processing

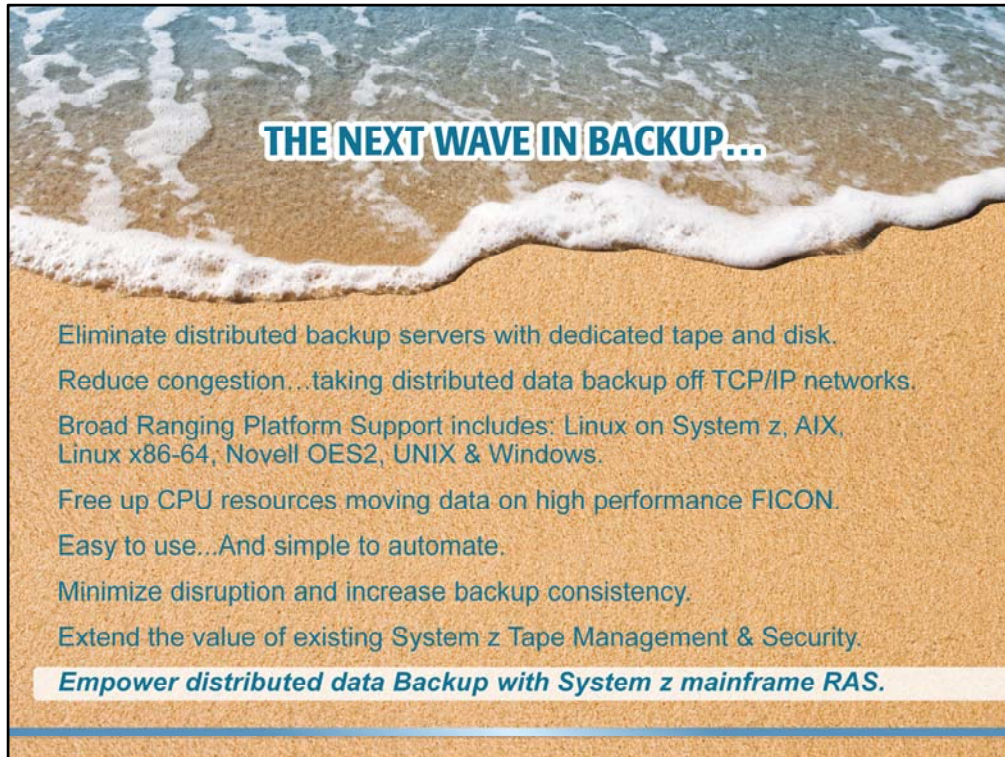
SHARE In Anaheim 2011

De-duplication is a natural complement to z/SOS, z/DDB and INNOVATION Distributed Data Disaster Recovery Protection (FDRSOS) and Business Continuity (SOSINSTANT) Solutions.

INNOVATION is working in collaboration and sharing our data stream layouts with Data Domain, EMC, IBM and Luminex, to make mainframe and open systems de-duplication look its very best, especially when used in conjunction with INNOVATION software solutions.

De-duplication validation testing and reports from customer experience show good de-duplication ratios for all our products; FDRABR, FDRSOS, FDR/UPSTREAM and RESERVOIR. Put succinctly, test results and customer experience show when these dedupe solutions recognize data that already exists (from previous backups), it is not re-written to the back store.

Your results may vary, but if only 4% of what you backup is actually changing between backups you can expect to see a 25 to 1 reduction in backup storage, because when you store the backup the de-dupe appliance will store only that additional 4% of the data that is actually changing.



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- Easy to use...And simple to automate.
- Minimize disruption and increase backup consistency.
- Extend the value of existing System z Tape Management & Security.

Empower distributed data Backup with System z mainframe RAS.

A new technology...to bring the unmatched levels of IBM z/OS SysPlex and EMC VMAX or IBM DS8700/8800 reliability, accessibility, security and performance to disaster recovery and distributed data protection.

What others are seeing...



- High Performance (MB/Sec) and High Efficiency (MIP/GB).

Backup 16GB / 65,536 Files	GB	MB/Sec	Elapsed Time Min	CPU MI/GB (Only Task)	Mainframe CPU Seconds
TCP/IP <u>limited by 100 m/bit connection</u>	16.4	7.6	36.0	1200	158.6
FDRSOS Disaster Recovery Backup	18.4	93	3.3	30	4.5
UPSTREAM/SOS Incremental Backup	16.4	21	13.3	450	59.3



Tests conducted at INNOVATION labs illustrate...

TCP/IP network backup uses much more CPU time than SOS.

Million instructions per GB of Backup

FDRSOS 30

UPS/SOS 450

TCP/IP 1,200

**Mileage may vary but compare 30 to 1200
(40 X more instructions and in this case 35 time more CPU time)**

And

TCP/IP network backup takes much more wall clock time...

At least twice as much, as FDRSOS, and usually much, much more.

[Tests run on z9-BC-S07 (2096-O02) rated 120.4 MIPS/CP w/2GB FICON]

What others are saying...about



The way the mainframe and EMC z/SOS for Symmetrix can virtualize, consolidate and simplify multi-platform data access...

- **EMC...**
Brian Gallagher,
President Symmetrix and Virtualization Product Group

"The mainframe is playing a key role in the journey to the private cloud because of its ability to consolidate and simplify management of virtual workloads."



What others are saying...

EMC VMAX z/SOS provides...advanced multi-platform data access.

- **EMC...**Brian Gallagher, President Symmetrix and Virtualization Product Group in recent announcements, "*The mainframe is playing a key role in the journey to the private cloud because of its ability to consolidate and simplify management of virtual workloads.*"

What others are saying...



IBM DS8700 zDDB provides...multi-platform data access.

- **IBM...**

Allen Marin – IBM Enterprise Disk Marketing

“z/OS Distributed Data Backup (zDDB) provides the capability to perform backup of Open Systems data residing on the IBM System Storage DS8700, over high performance FICON connections. This multi-platform backup solution can help clients simplify their heterogeneous backup environments by consolidating and managing them through the mainframe.”



What others are saying...

IBM DS8700 zDDB provides...
advanced multi-platform data access.

- **IBM...** According to Allen Marin, IBM Enterprise Disk Marketing spokesman, “The z/OS Distributed Data Backup feature provides the capability to perform backup of Open Systems data on the IBM System Storage DS8700 over high performance FICON connections. This multi-platform backup solution can help clients simplify their heterogeneous backup environments by consolidating and managing them through the mainframe.”

What others are saying...about



The way EMC z/SOS and IBM zDDB provides... multi-platform disaster recovery and enterprise data protection.

- **Customers...** *“This technology will allow users to consolidate and replace hundreds of distributed Open Systems backup servers, their tapes and their associated peripheral storage, with FDRSOS running on a System z mainframe utilizing existing z/OS Tape Management and Security Systems.”*
- **Consultants...** *“Having all of a company’s backup and archive data managed within a single environment offers compelling advantages.”*



What others are saying...

EMC VMAX z/SOS and IBM DS8700/8800 together with FDRSOS provide... multi-platform disaster recovery and enterprise data protection.

- **Customers...** *“I’m very familiar with the FDRSOS technology”, says an executive, who is responsible for strategic decisions concerning storage at an large financial and banking institution. “There is no doubt this technology will allow users to consolidate and replace hundreds of distributed Open Systems backup servers, their tapes and their associated peripheral storage, with FDRSOS running on a System z mainframe utilizing existing z/OS Tape Management and Security Systems.”*
- **Consultants...** *Phil Payne, Sievers Consulting, “...providing the tools to enable platform independence. Open Systems platforms sometimes have very weak or even no provisions for properly protecting corporate data. Having all of a company’s backup and archive data managed within a single environment offers compelling advantages.”*

Your Take Away...



There is too much data & it's difficult to adequately protect...

- INNOVATION is joining forces with EMC & IBM...to bring you the next wave in distributed data protection z/SOS and zDDB with FDRSOS.
- FDRSOS with z/SOS and zDDB can help you consolidate hundreds of distributed Open Systems backup servers onto one z/OS backup server running on System z.
- SOSINSTANT with z/SOS and TimeFinder or zDDB and FlashCopy lets you keep critical and revenue-generating applications online without compromising information security.



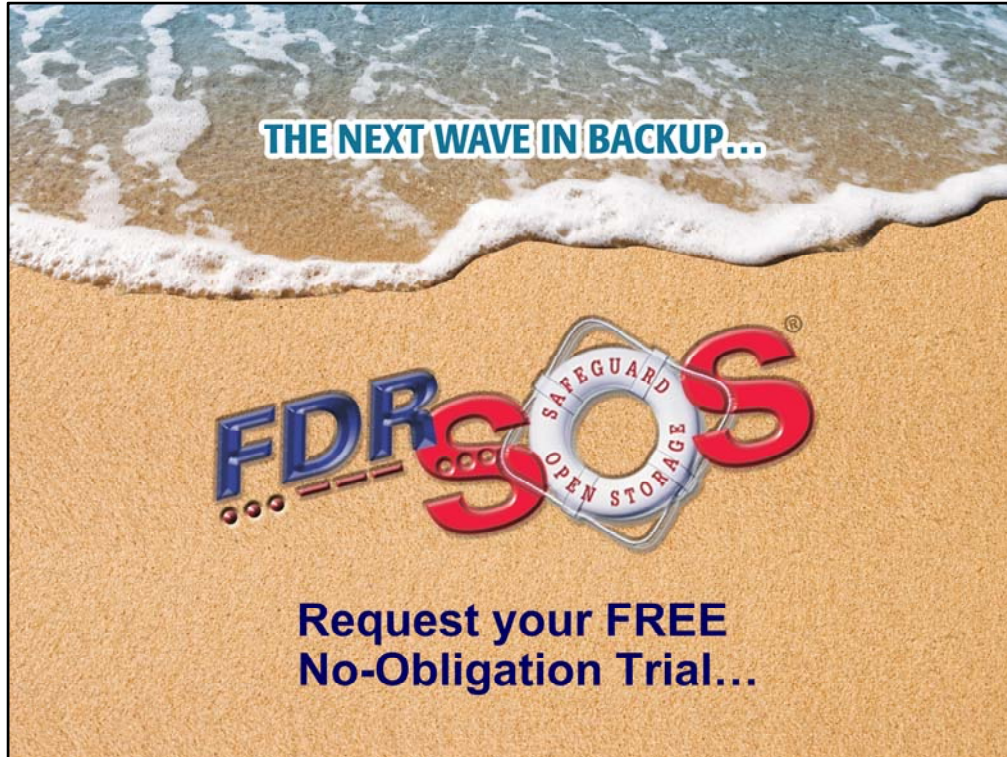
The take away you should remember...

There is too much data & it's difficult to adequately protect...

EMC, IBM & INNOVATION...are joining forces bring you the next wave in distributed data protection...z/SOS and zDDB with FDRSOS.

FDRSOS with z/SOS and zDDB can help you consolidate hundreds of distributed Open Systems backup servers onto one z/OS backup server running on System z.

SOSINSTANT with TimeFinder and FlashCopy let you keep critical, revenue generating applications online without compromising data integrity.



FDRSOS with EMC z/SOS and IBM zDDB Multi-Platform Disaster Recovery and Distributed Data Protection

INNOVATION offers FREE No-Obligation Trials for all its products.
Request a FREE Trial now...or a FREE Concepts and Facilities Guide.

Contact INNOVATION...

Call: 973-890-7300

E-mail: sales@fdrinnovation.com

Visit: <http://www.innovationdp.fdr.com>



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