Data Protection for Open Systems with the FDR Products on your z/OS Mainframe

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Executive Summary
Enterprise Backup Pain Points

- Do you have issues meeting your backup window?

- Meeting your Recovery Time Objective?
- Meeting your Recovery Point Objective?

- Need to get a better Total Cost of Ownership?

- Do your backups need to be crash consistent?

- Are you being asked to do more with less?
- And if the answer is YES to any of the above, then stay tuned…

Are you tired of getting phone calls in the middle of the night because the Backups didn't work? Or worse because the restore didn't work? If so we have solutions for you…

Enterprise Backup Pain Points

Real Problems and new ideas:
- Many different backup solutions
  - Little islands with point solutions
- Backup taking longer
- Larger volume are necessary to handle data growth but require more time
- We need to reduce the amount of backup data
- Consolidating Linux puts more Linux data on the z/OS mainframe
  - But that is where there are systems and procedures for protection of that data
- Enterprise backup congests communication networks

Executive Summary

- Mainframe customers have NEW opportunities to expand their use of conventional z/OS mainframe with Linux on System z and Enterprise data protection solutions.
- If planning on z114/z196 zEnterprise Hybrid Computing with zEnterprise BladeCenter® Extension (zBX) with blades.

A New WAVE in Disaster Recovery and Distributed Data Protection

- The IBM z/OS Distributed Data Backup (zDDB) and EMC zSOS availability has started a new era of responsiveness & opportunity.
- INNOVATION is delivering the latest FDRSOS that combines with IBM zDDB and FlashCopy and EMC zSOS and TimeFinder.
- The result is the fastest, least disruptive and most efficient z/OS solution for disaster recovery of distributed data protection for IBM DS8700, DS8800, and EMC Symmetrix, DMX, VMAX.

Executive Summary

FDRSOS leads The New WAVE…
in Disaster Recovery for Distributed Data Protection.

- IBM zDDB and EMC zSOS with FDRSOS is the solution for…
  - …High speed Image backup across FICON channel instead of TCP/IP networks
  - …No network traffic and no TCP/IP usage
  - ….extend z/OS data protection to distributed servers
  - ….consolidate mainframe and distributed data protection
  - ….bare metal recovery for any array resident OS

- INNOVATION's FDRSOS…a mature, reliable player with a new look…
  - …extend the value of z/OS tape management & security systems
  - …improve distributed Data Disaster Recovery with reduced backup and recovery times

- INNOVATION SOSINSTANT is a new way to…
  - …advance distributed data disaster recovery backup with IBM FlashCopy and EMC TimeFinder.

INNOVATION's Enterprise Data Protection Solutions

- **FDR/UPSTREAM**
  a scalable, highly reliable, z/OS mainframe server resident file level data protection solution featuring network and HiperSockets data transfer.

- **FDRSOS**
  a simple alternative direct cross platform access solution for Open Systems disaster recovery backup. Bare metal recovery for virtualized environments.

- **UPSTREAM/SOS**
  combines the direct access technology of FDRSOS to extend the FDR/UPSTREAM mainframe resident solution with high speed robust off-network data transfer.

Centralized Enterprise Data Protection using z/OS Mainframe Infrastructure Strengths

- **Enterprise Data Protection Solution Benefits**
  - **Centralizes management, scheduling, tracking and auditing**
  - z/OS controls backup from Open Systems server to z/OS tape
  - Data reduction helps solve backup window problems
  - Efficient tape drive and tape media utilization
  - Meet Disaster Recovery time objectives
  - Strategic Direction to offload UPSTREAM
  - CPU processing to ZiiP engine(s)

Centralized Enterprise Data Protection
using z/OS Mainframe for DR

- Leverages your existing z/OS procedures and methodology
- Need floor system, z/OS tape management system and system/user catalogs
- Recover UPSTREAM started task & control files
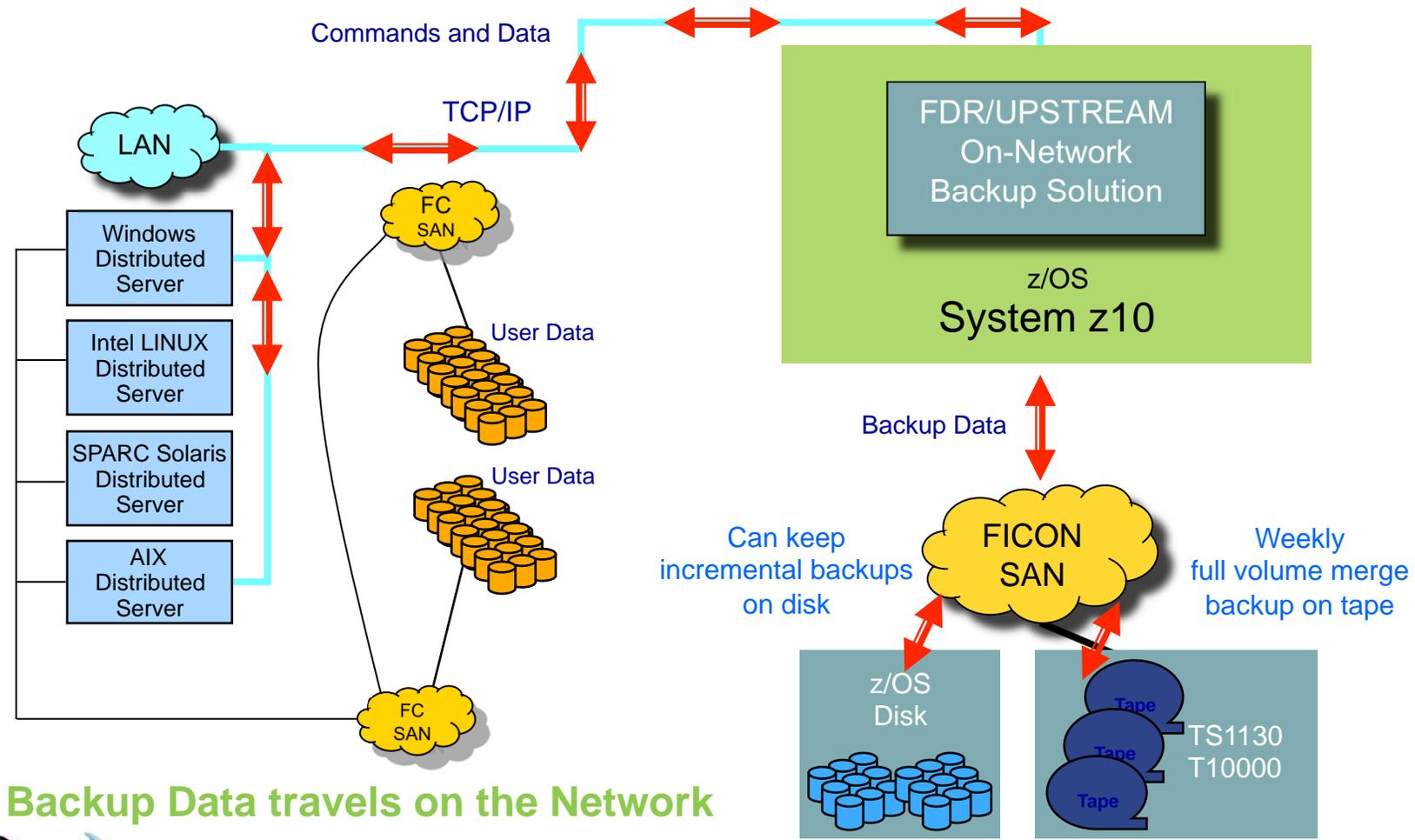- Decide what to restore
- Start restores

FDR/UPSTREAM –
On-Network Enterprise Data Protection

- Enterprise Data Protection for Linux on System z, AIX, Linux, UNIX and Windows storage.

- Command Data, Meta Data and Backup Data all Travel on the TCP/IP LAN or WAN Communications Network.

- Centralized z/OS Tape Management, Security and Scheduling

- Online Database Support for DB2/UDB, ORACLE, LOTUS Notes, SQL Server, MS Exchange, etc.

- Provides Data Deduplication Methods, Synthetic Merge Backup, Block Level Segment Support.

How FDR/UPSTREAM® Works…
On-Network Enterprise Backup

Commands and Data

TCP/IP

LAN

FC SAN

Windows Distributed Server

Intel LINUX Distributed Server

SPARC Solaris Distributed Server

AIX Distributed Server

User Data

User Data

FC SAN

FDR/UPSTREAM On-Network Backup Solution

z/OS
System z10

Backup Data

Can keep incremental backups on disk

FICON SAN

Weekly full volume merge backup on tape

z/OS Disk

Tape
Tape
Tape
TS1130 T10000

Backup Data travels on the Network

INNOVATION® DATA PROCESSING

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FDR/UPSTREAM Clients

- Linux on System z
- z/OS UNIX
- Windows
- Novell NetWare
- Novell OES2 Linux
- IBM AIX

- VMware
- HP-UX
- Sun Solaris
- Sun X86
- X86 Linux
- Linux for Power

FDR/UPSTREAM can work in many virtualized environments including: • z/VM • Vmware • Windows HiperV • XEN

UPSTREAM Administration Command/User Control

- JAVA GUI
  - DIRECTOR Interface
  - End-User Restore Interface
- TSO/ISPF
  - Interactive Control
  - Real Time Monitor
- Command Line/Character mode
- z/OS Batch

UPSTREAM System User Interfaces
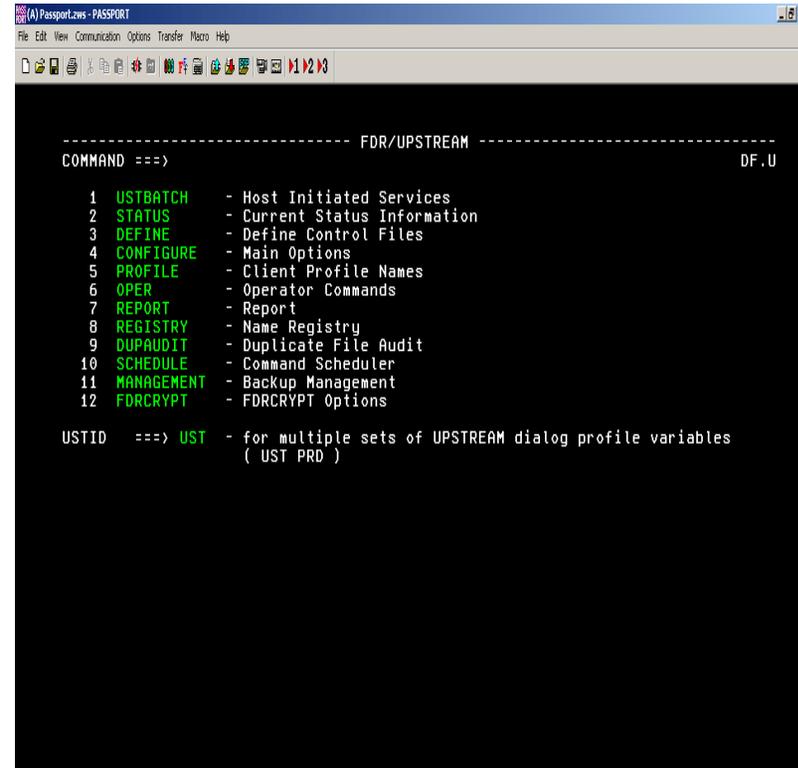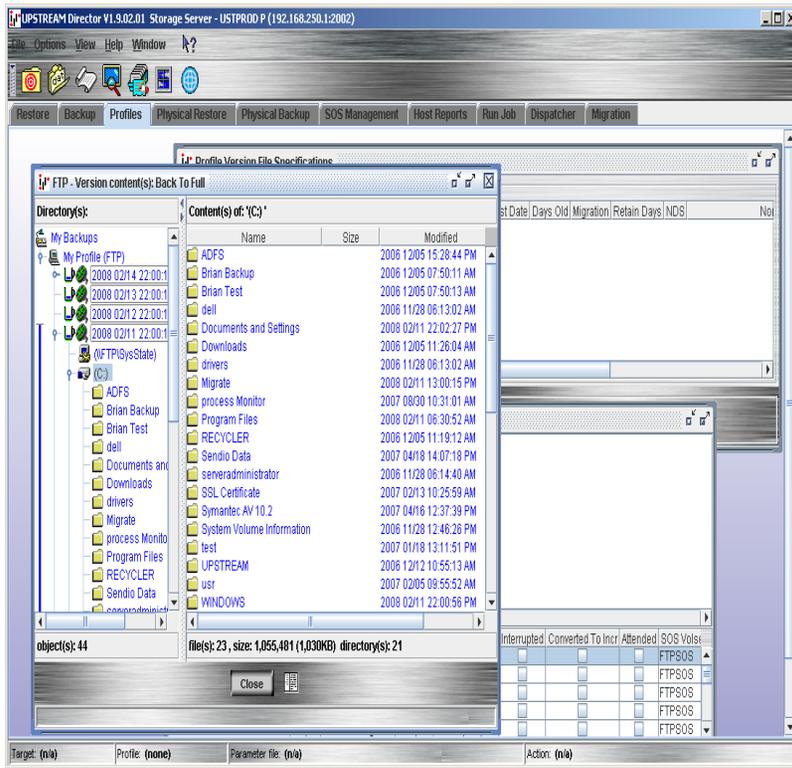
Data Reduction and De-duplication Technology Minimizes Data Transmission

- **Have too much data to backup?**

- **Advanced Data Reduction Technology Features employ De-Dupe Technology to reduce backup time**
  - Data Compression
  - Synthetic Full-Merge Backup
    - Logical File Granularity
    - Incremental Backup Processing
  - Block Level Segmented Backup Support
  - Exclude/Include
  - Migration or Disk Grooming of inactive data
  - Support for EMC/Bus-Tech/Data Domain/IBM & Luminex

Full Merge Synthetic Technology Minimizes Data Transmission
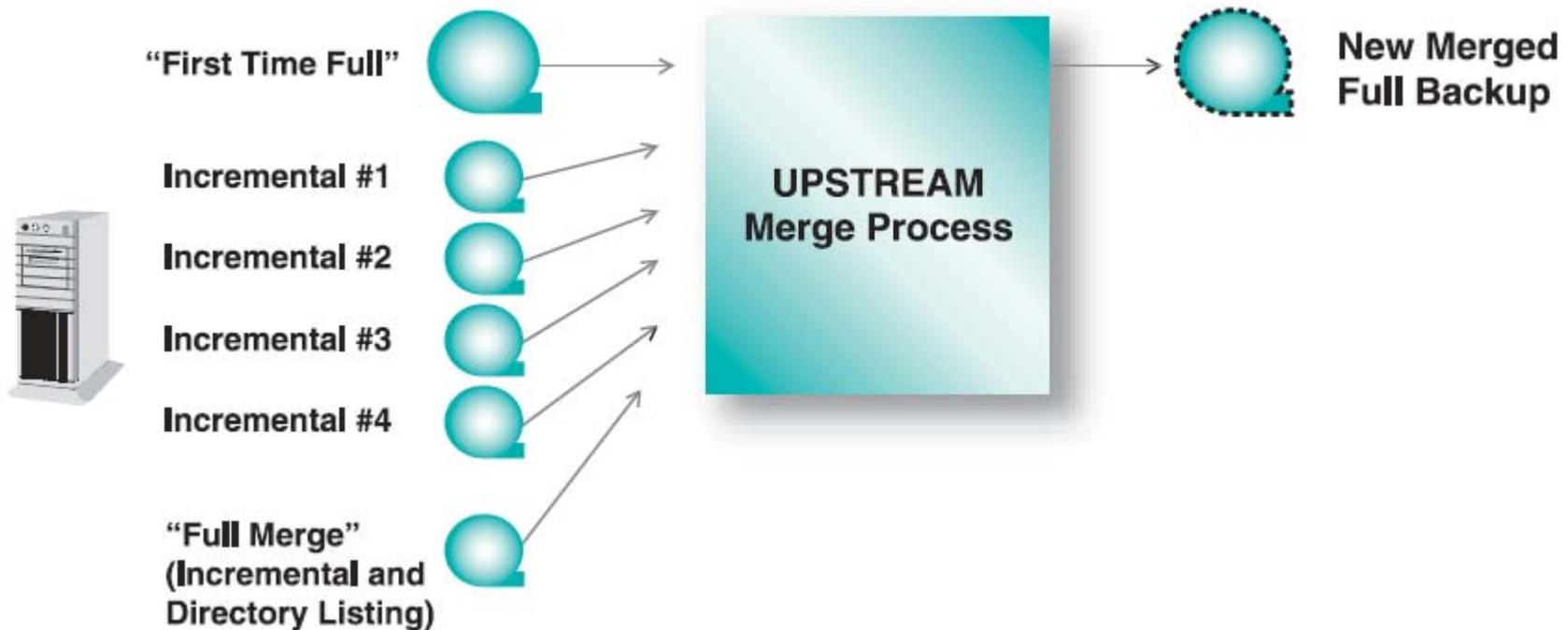
Backup Types and Methods

- Sequential DASD and Tape – physical or Virtual Tape
  - First Time Full
  - Non-Merge (looks like an incremental)
  - Merge
    - Incremental
    - Full
      - *Deferred*

- Backups are keyed by Profile Name and version date

- Every backup consists of File Sets

- Backup parameters are specified in the UPSTREAM batch job input stream and communicated to the client.

Backup Types and Methods
Continued...

- Combinations
  - All tape – Incremental and full backups to tape
  - Fulls on tape, incrementals on DASD
  - Deferred backups to DASD, merged to tape.
- DASD Backup dataset migration considerations
  - Available space
  - Tape unit availability

BATCH Interface – USTBATCH

- Initiate Backups, Restores, File Transfers, Run Functions, and *UPSTREAM commands*

- Can wait for process completion

- Can initiate multiple, concurrent operations

- Used as the interface to host based JOB scheduling systems (CA-7, OPCA, etc.)

- Allows return code checking and automation support

- Allows for the full specification or override of all workstation parameters

- Central point for all logging

USTBATCH Utility

- Batch job requester to the UPSTREAM Started Task – does not communicate directly with the "target" Client

- Uses SNA/APPC LU6.2 conversation to the UPSTREAM started task

- Can wait to report on process completion via the "CONV=WAIT" parameter

- Supports "Restarts" and "Retries"

- Retrieves and logs the UPSTREAM started task log messages relevant to this request.
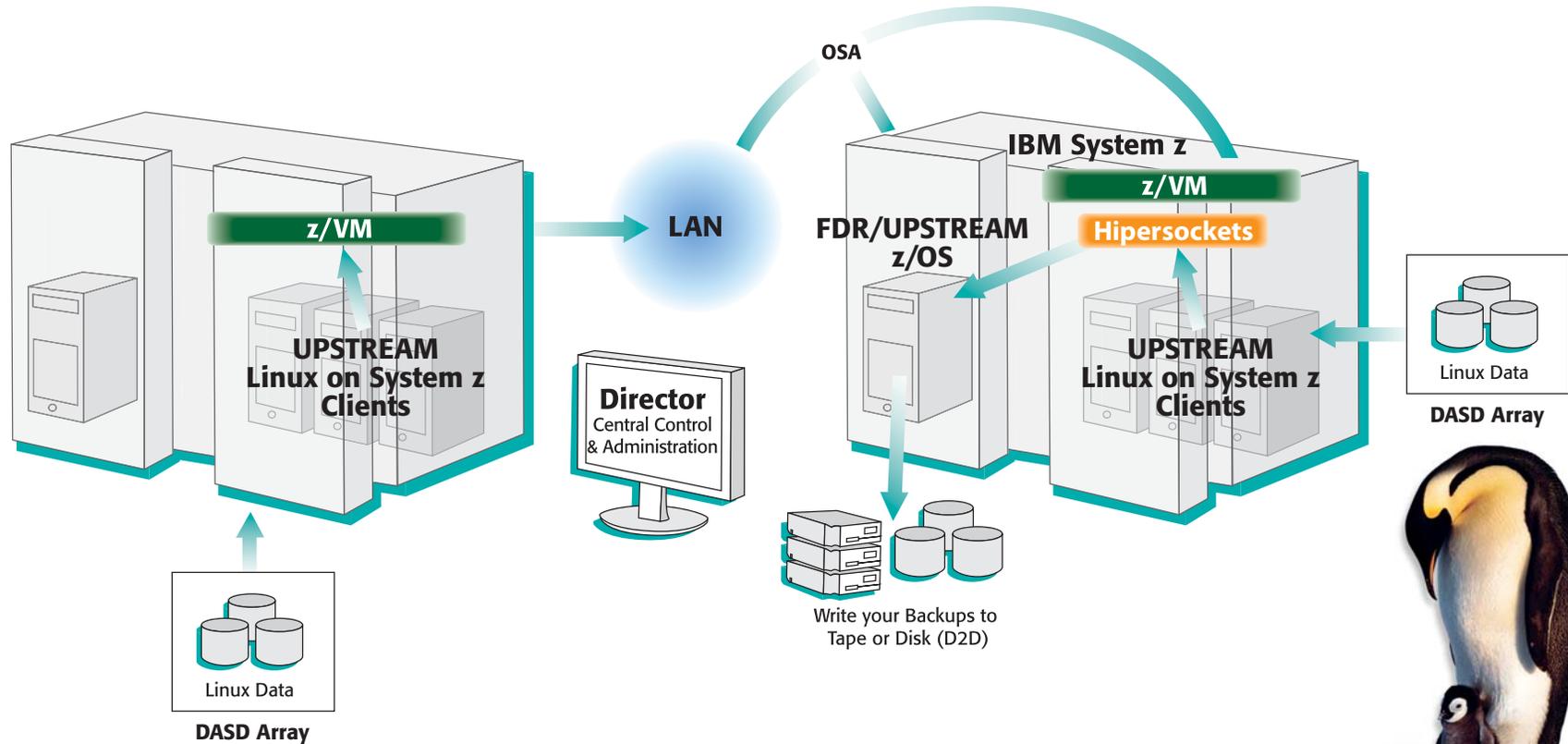
USTBATCH Utility

- Can initiate one or several processes from one batch job
- Use the ISPF panels to generate the USTBATCH job input parameters
- Can target a client by
  - IP address
  - Upstream "Registered Name"
  - DNS name

z/OS BATCH JOB for Backup

```
//USTBATCH    EXEC    PGM=USTBATCH
//STEPLIB      DD      DISP=SHR,DSN=USTSALES.UPSTREAM.LOAD
//SYSUDUMP     DD      SYSOUT=*
//USTLOG       DD      SYSOUT=*
//USTPARM      DD      *
TARGNAME=LINUX1
ACTION 1              * BACKUP
BACKUPPROFILE ISYS
MERGE 1
STORAGETYPE 3        * SEQ. TAPE
COMPRESSLEVEL 0      * NO COMPRESSION
RESTARTTYPE 2        * RESTART IF NOT COMPLETED
*
SPEC /*
SPECTYPE 0           * INCLUDE
SUBDIRECTORIES Y
SPEC /opt/user/*
SPECTYPE 1            * EXCLUDE
ENDPARM
/*
```
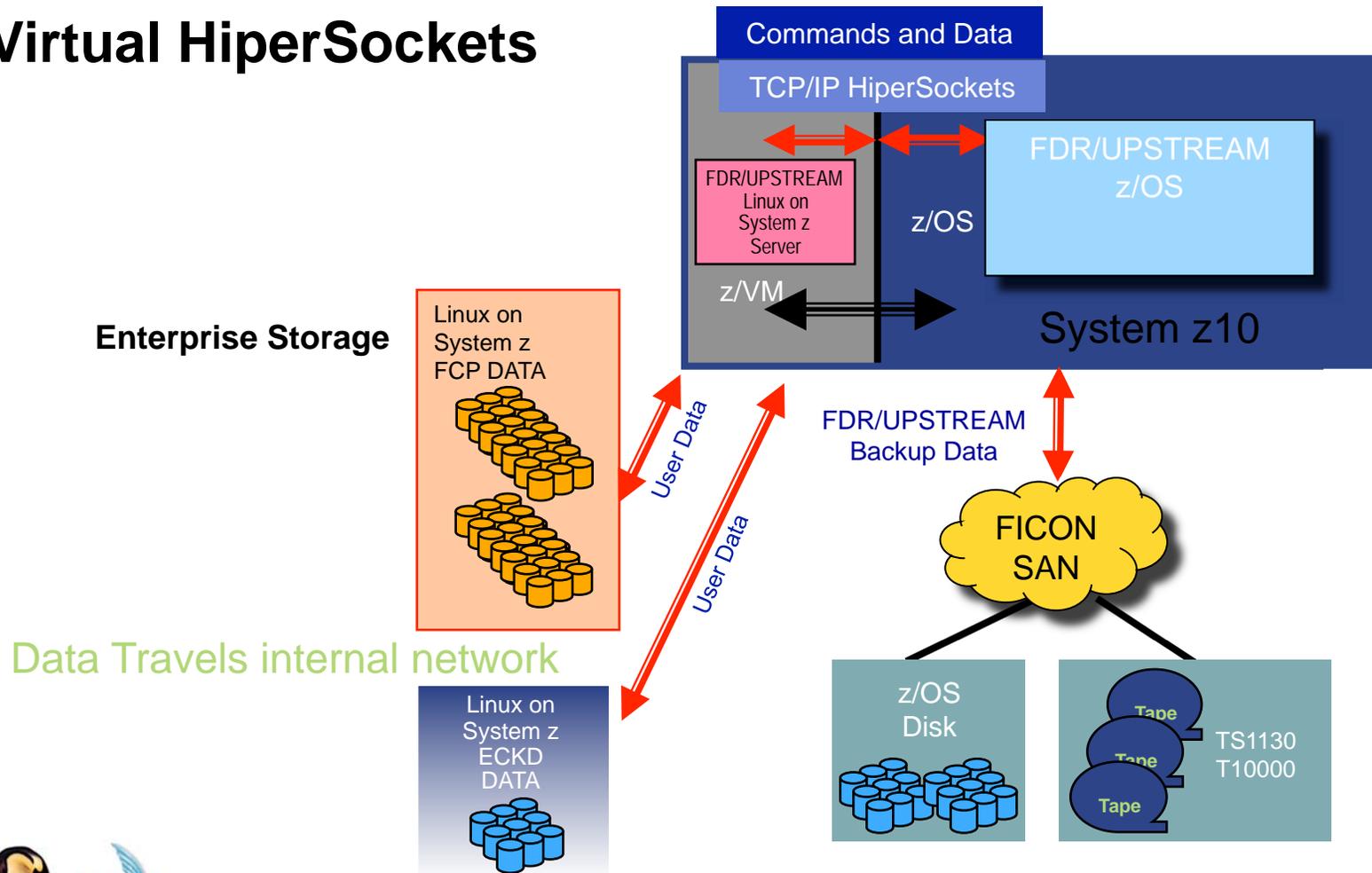
UPSTREAM LINUX on System z

OSA

LAN

z/VM

**UPSTREAM
Linux on System z
Clients**

Director
Central Control
& Administration

DASD Array
Linux Data

IBM System z

z/VM

FDR/UPSTREAM
z/OS

Hipersockets

**UPSTREAM
Linux on System z
Clients**

Write your Backups to
Tape or Disk (D2D)

DASD Array
Linux Data

FDR/UPSTREAM for Linux on System z Internal Network Backup

Virtual HiperSockets

Commands and Data

TCP/IP HiperSockets

FDR/UPSTREAM
Linux on
System z
Server

z/OS

FDR/UPSTREAM
z/OS

z/VM

System z10

Enterprise Storage

Linux on
System z
FCP DATA

User Data

User Data

FDR/UPSTREAM
Backup Data

Data Travels internal network

Linux on
System z
ECKD
DATA

FICON
SAN

z/OS
Disk

Tape
Tape
Tape

TS1130
T10000

UPSTREAM LINUX on System z

- SuSE and Red Hat Linux on System z in z/VM or LPAR
- A z/OS server-based backup solution
- Employs Centralized control using existing z/OS tape management, scheduling, automation, and security systems
  - Extensive database and file system support
  - Admin, user and z/OS Batch interfaces
  - Deduplication/data transfer reduction
  - Familiar z/OS operational procedures
  - File level Client support
  - "Rescuer" File level Bare-metal recovery

UPSTREAM LINUX on System z

- Exploits HiperSockets connectivity
- On-Line Database Agents for Oracle, DB2, and Domino
- Extensive file system features:
  - Hard links, symbolic links, owners,
  - Reiser, ext2, ext3, GFS, XFS, NFS, MAPFS, GPFS, single file system support, etc.
  - Support for Extended attributes and Security Enhanced Linux SELinux
  - Support for user specified file systems

Linux on System z RESCUER

- The easiest way to do Disaster Recovery for Linux for System z

- Automated system state backup during normal UPSTREAM backups as a pre-backup step

- Single step DR restore for most Linux on System z distributions

- Supports RHEL5, RHEL6, Suse10 and 11

Linux on System z RESCUER

Here is how it works:

- The 'rescuer-setup' command is run on the system being backed up as a pre-backup job.

- All the needed system state information is stored as an integral part of the backup

- Issue the command 'rescuer <PROFILE>'

- The RESCUER does the rest.

Example Pre-Job Step for RESCUER

```
//*    RUN PRE-JOB FOR RESCUER
//*
//PREJOB    EXEC PGM=USTBATCH
//STEPLIB   DD    DISP=SHR,DSN=USTEST.UPSTREAM.LOAD
//USTLOG    DD    SYSOUT=*
//USTPARM   DD    *
APPLPREF=UPSTR
USAPPL=UPSTREAM
LOGMODE=#INTER
MAXRETRY=0
CONV=WAIT
*
TARGNAME=target.system.registered.name
ACTION 5
JOBOPTIONS 35
*
SPEC /opt/fdrupstream/rescuer-setup
ENDPARM
```

Example of Recovery with RESCUER of Linux for System Z 'zl2001' from profile MYZLINUX

- cd /opt/fdrupstream

- ./rescuer MYZLINUX

- RESCUER will by default only output two lines
  - Recovery of "zl2001" from profile MYZLINUX started at: Wed Nov 16 12:22:33 EST 2011.
  - Recovery of "zl2001" completed successfully at: Wed Nov 16 12:28:45 EST 2011.

- In this example: 1.4GB in 76,730 files restored in 6 minutes

FDRSOS –
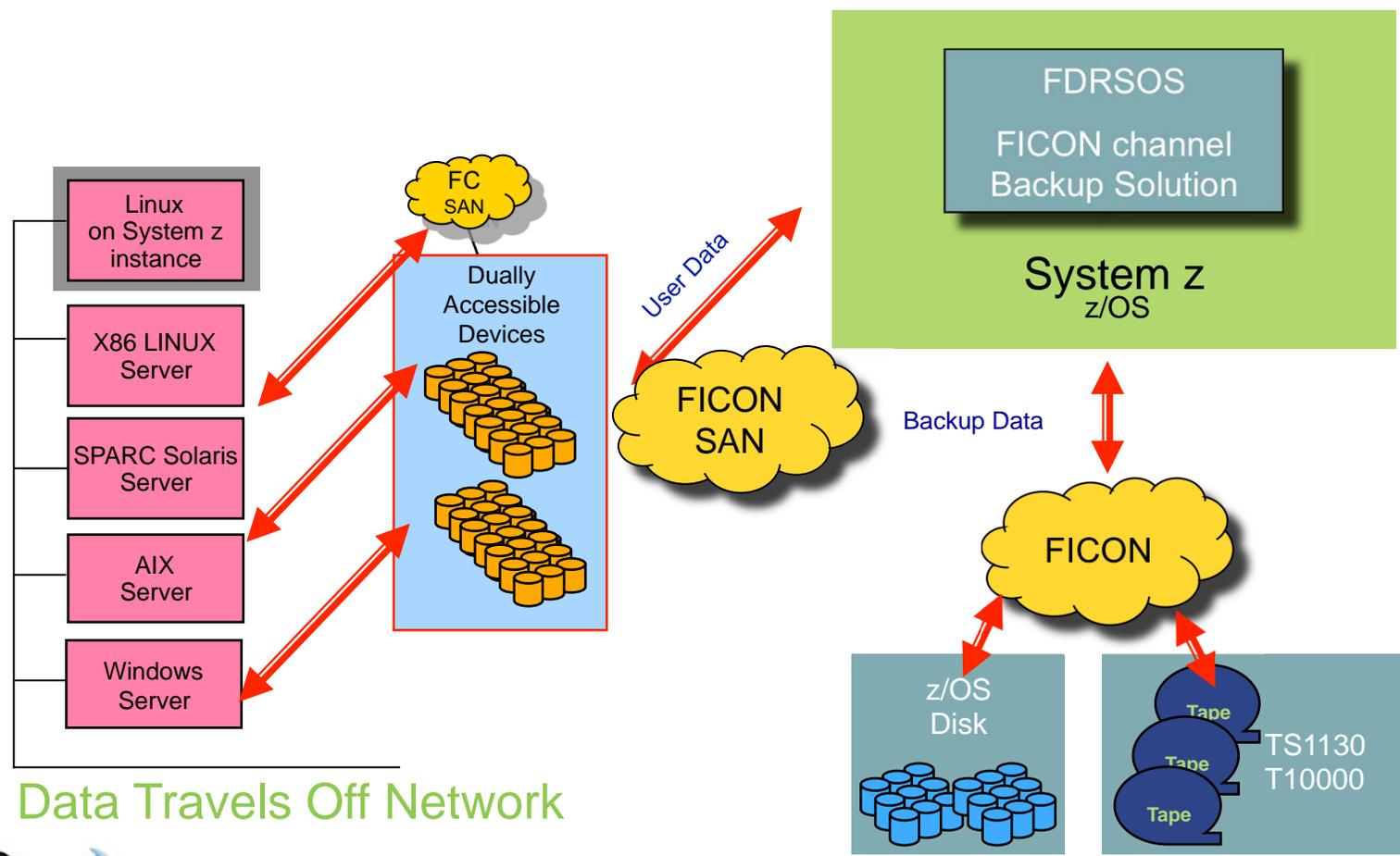# Off-Network Cross Platform Data Protection

- High Speed FICON Image level backup/restore
- Takes the z/OS shared DASD concept and extends it to open systems platforms
- Supports IBM and EMC arrays
- Agent-less technology
- No network traffic…i.e. no TCP/IP usage
- Straight forward bare metal recovery of the open systems operating system and data files
- Data travels to z/OS storage devices across FICON channels
- Mainframe data protection for Linux, UNIX, Windows, etc.

FDRSOS Supports…

- Backup and recover large amounts of open systems data in less time with no negative impact on corporate networks.
- Production less constrained by a shrinking backup window
- Protect your current mainframe hardware and software investments by using **existing** mainframe resources to protect Linux on System z and distributed enterprise storage
- **Extend** mainframe security and automated operations to non-disruptive open systems data protection
- Well-suited for large databases
- Makes duplicate offsite copy simultaneously
- Supports TimeFinder & FlashCopy volumes

How FDRSOS® Works…
Off-Network Agent-less Backup Solution

Linux on System z instance
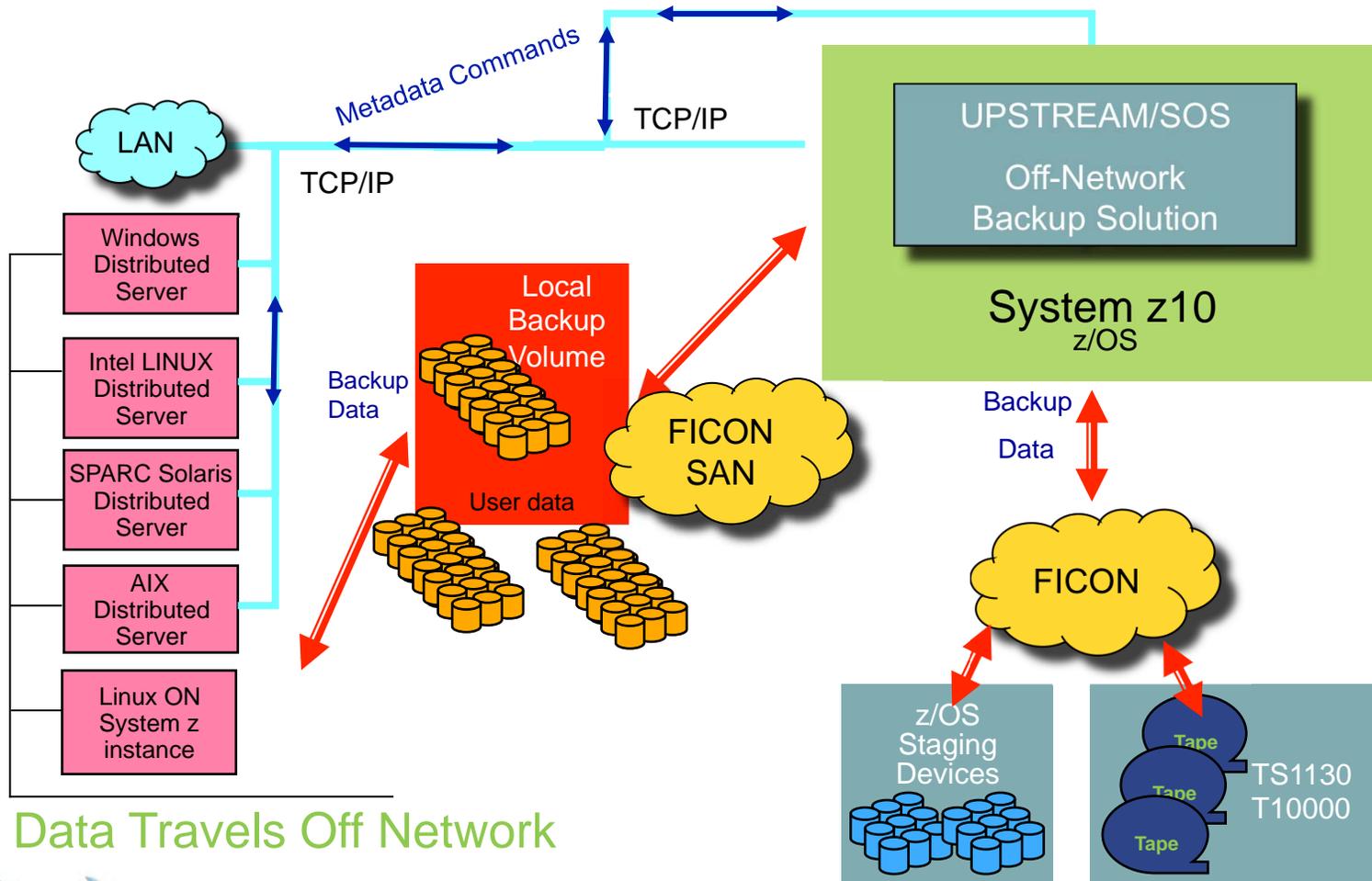
X86 LINUX Server

SPARC Solaris Server

AIX Server

Windows Server

FC SAN

Dually Accessible Devices

User Data

FICON SAN

FDRSOS
FICON channel Backup Solution

System z
z/OS

Backup Data

FICON

z/OS Disk

Tape
Tape
Tape
Tape
TS1130
T10000

Data Travels Off Network

INNOVATION DATA PROCESSING®

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UPSTREAM/SOS® –
Off-Network, File Level Data Protection

- Provides High speed FICON data connection between open systems data and z/OS storage devices

- Only UPSTREAM Meta data travels on the TCP/IP network

- Enterprise Data Protection at the file level for AIX, Linux, UNIX, Windows and Linux on System z

- Supported by all UPSTREAM clients (except z/OS UNIX)

UPSTREAM/SOS
Storage Controller Data Transfer

Metadata Commands

LAN

TCP/IP

TCP/IP

UPSTREAM/SOS

Off-Network
Backup Solution

System z10
z/OS

Windows
Distributed
Server

Intel LINUX
Distributed
Server

SPARC Solaris
Distributed
Server

AIX
Distributed
Server

Linux ON
System z
instance

Backup
Data

Local
Backup
Volume

User data

FICON
SAN

Backup

Data

FICON

z/OS
Staging
Devices

Tape
Tape
Tape

TS1130
T10000

Data Travels Off Network

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GREEN…
Performance (MB/S) and Efficiency (MIP/MB)

UPSTREAM TCP/IP Network Performance limited by 100 mb connection	MB Calc	MB/Sec Calc	CPU MIP/MB (in millions) per MB Task Only	Mainframe CPU Seconds	Elapsed Time
TCP/IP Avg 16GB 16 Files	16,384	8	1.23	157.5	34.4
TCP/IP Avg 16GB 65,536 Files	16,384	7	1.24	158.6	36.0

UPSTREAM/SOS Off network transfer disk	MB Calc	MB/Sec Calc	CPU MIP/MB (in millions) per MB Task Only	Mainframe CPU Seconds	Elapsed Time
UPSTREAM/SOS Avg 16GB 16 Files	16,384	34	0.35	44.3	7.9
UPSTREAM/SOS Avg 16GB 65,536 Files	16,384	21	0.45	59.3	13.3

FDRSOS Cross Platform Access	MB Calc	MB/Sec Calc	CPU MIP/MB (in millions) per MB Task Only	Mainframe CPU Seconds	Elapsed Time
FDRSOS Avg 16GB 16 Files	18,432	93	0.12	17.0	3.3
FDSOS Avg 1616GB 65,536 Files/65	18,432	91	0.12	17.0	3.3

…MILEAGE MAY VARY

System z Cross Platform Access Benefits Summary

- Totally integrated Business Solution for Enterprise Data Protection built on z/OS proven technology.
- Non-disruptive backup solutions supporting continuous business operation for Linux on System z and Open Systems data platforms.
- Extends investment in existing mainframe resources; CPU, ATL tape silos VTL, tape drives and staff.
- Protects the customers software investment by utilizing existing tape library management software.
- Extends mainframe security to non-disruptive Open Systems data protection.
- Extends mainframe automated operations to non-disruptive Open Systems data protection.

Summary

- **INNOVATION's solutions leverages the latest technological innovations to virtualize, simplify and green all of its enterprise business resiliency solutions…**

- **INNOVATION is a single source for enterprise data protection and business resiliency solutions addressing z/OS, Linux on System z, Linux on Power, Linux on x86, Novell NetWare/OES2, UNIX, Windows, Client/Server, SAN and direct attach storage providing:**

  - High Performance Data Protection
  - Enterprise Data Protection
  - Non-Disruptive Business Continuance

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RELIABLE BACKUP!
Protect Open Systems
with the Big Iron…
your z/OS mainframe

SHARE
Technology · Connections · Results