E58

Backup with Tivoli and Disaster Recovery for z/VSE

Wilhelm Mild

IBM System z Expo
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San Antonio, TX

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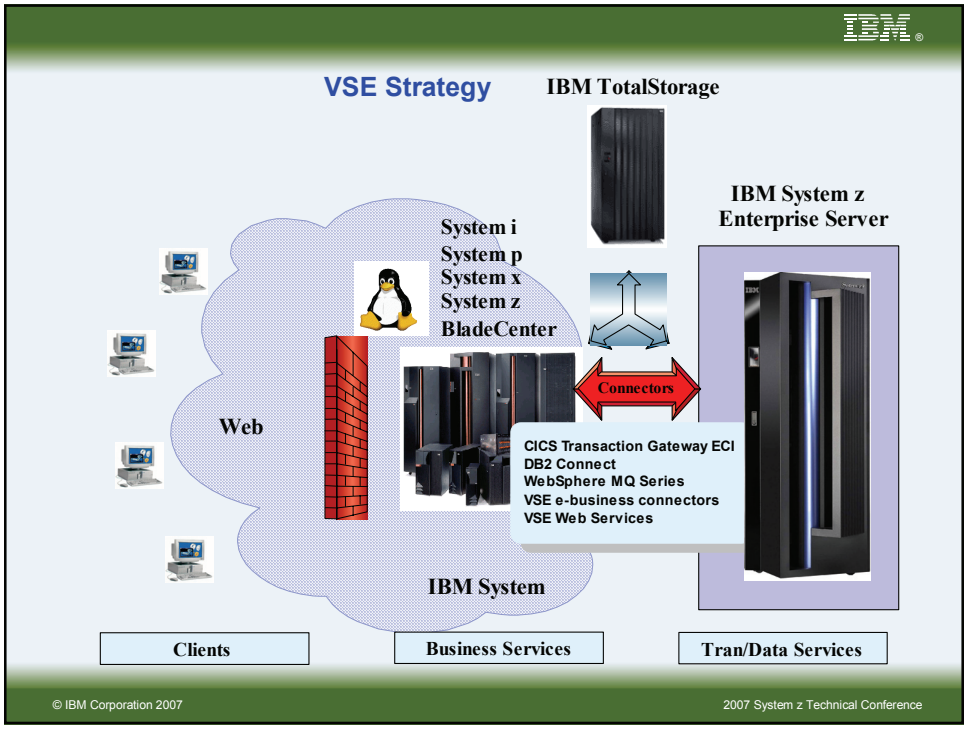
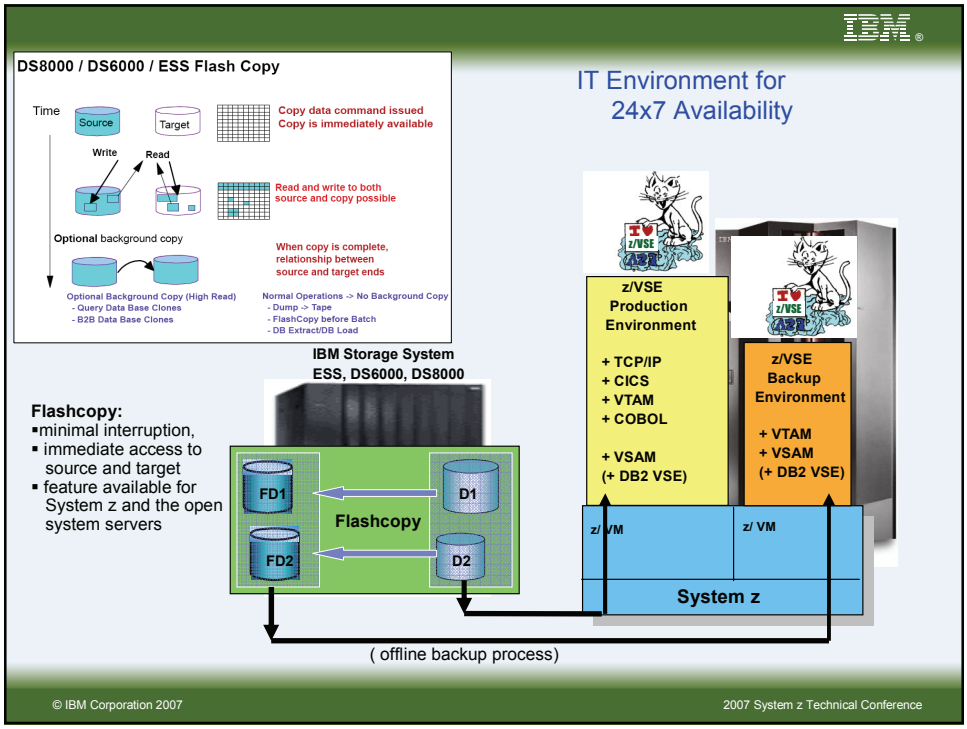


System z Storage Options for z/VSE

IBM TotalStorage	DS6000	ESS 750, 800, 800Turbo	DS8000
ESCON	**Not Avail**	**Yes**	**Yes**
FICON	**Yes**	**Yes**	**Yes**
FCP/SCSI	**Yes**	**Yes**	**Yes**


DS8000 / DS6000 / ESS Flash Copy
Time
Source
Target
Copy data command issued
Copy is immediately available
Write
Read
Read and write to both source and copy possible
Optional background copy
When copy is complete, relationship between source and target ends
Optional Background Copy (High Read)
- Query Data Base Clones
- B2B Data Base Clones
Normal Operations -> No Background Copy
- Dump -> Tape
- FlashCopy before Batch
- DB Extract/DB Load
IT Environment for 24x7 Availability
IBM Storage System
ESS, DS6000, DS8000
Flashcopy:
▪minimal interruption,
▪ immediate access to source and target
▪ feature available for System z and the open system servers
FD1
FD2
Flashcopy
D1
D2
z/VSE Production Environment
+ TCP/IP
+ CICS
+ VTAM
+ COBOL
+ VSAM
(+ DB2 VSE)
z/VSE Backup Environment
+ VTAM
+ VSAM
(+ DB2 VSE)
z/ VM
z/ VM
System z
(offline backup process)
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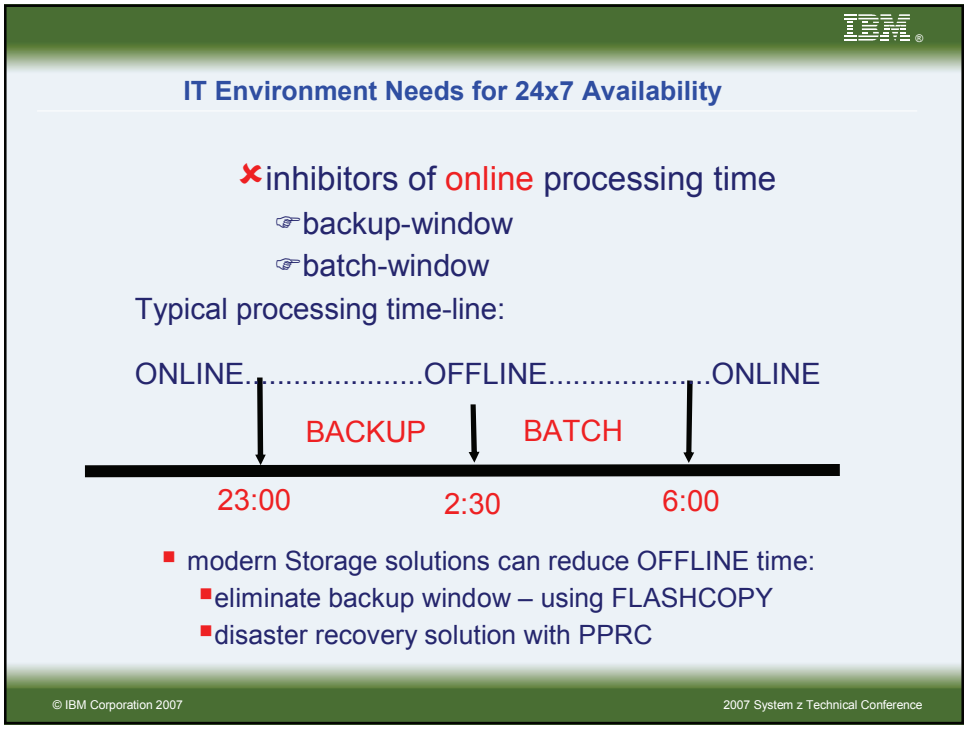
IT Environment Needs for 24x7 Availability
✘inhibitors of online processing time
☞backup-window
☞batch-window
Typical processing time-line:
ONLINE.....OFFLINE.....ONLINE
BACKUP
BATCH
23:00
2:30
6:00
▪ modern Storage solutions can reduce OFFLINE time:
▪eliminate backup window – using FLASHCOPY
▪disaster recovery solution with PPRC
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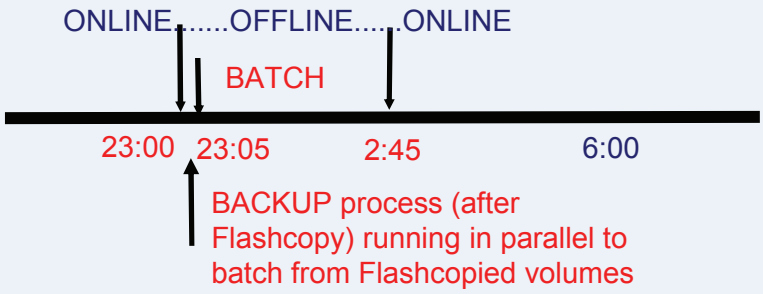
IT Environment Needs for 24x7 Availability

- modern Storage solutions can reduce OFFLINE time:
  - eliminate backup window – using FLASHCOPY

Typical processing time-line:



IBM TS1120 Tape Drive Encryption

The industry's first comprehensive end-to-end tape encryption

- **First encrypting tape drive - IBM System Storage TS1100 tape drive family**
  - **Standard feature on all TS1120 Tape Drives**
  - **Chargeable upgrade feature for existing TS1120 Tape Drives**
- **A new, innovative IBM Encryption Key Manager component for the Java platform™ component supported on a wide range of systems including:**
  - **z/OS, i5/OS, AIX, HP, Sun, Linux (incl System z), and Windows**
- **Integration with IBM tape systems, libraries**
- **Enhancements to Tivoli Storage Manager to exploit TS1120 encryption**
- **Integration with System z encryption key, policy management, security and cryptographic capabilities**
- **Complements existing System z Encryption Facility for z/OS program product**
- **New services and consulting for tape data encryption and key management**

TS1120
500 GB
100 MB/sec

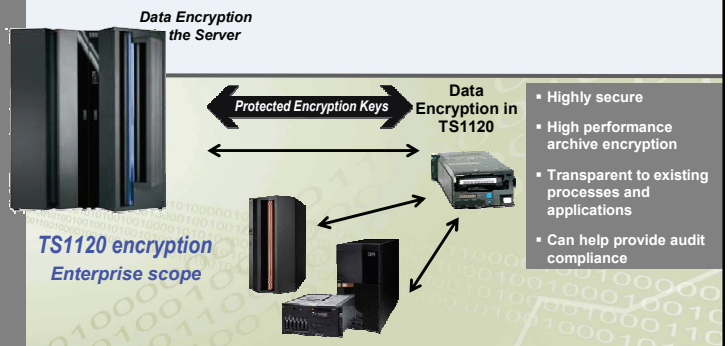
Encryption Key Manager

IBM TS1120 Tape Drive Encryption – SOD for z/VSE

SOD*: *"z/VSE V3.1 support of the TS1120 Tape Drive with encryption is planned for first half 2007. It is also IBM's intent to support z/VSE V4.1 (when made available) using Systems Managed Encryption with the TS1120. z/VSE support will require the Encryption Key Manager component running on another operating system other than z/VSE using an out-of-band connection."*

Centralized key management

- Help protect and manage encryption keys
  - Highly secure and available key data store
  - Long term key management
  - Disaster recovery capabilities
- Single point of control
  - Non-VSE, Java-based platform
  - TCP/IP connection to tape control unit

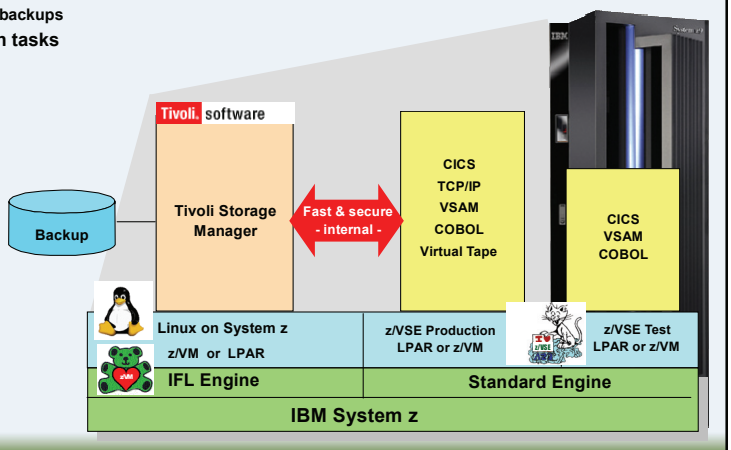


- Highly secure
- High performance archive encryption
- Transparent to existing processes and applications
- Can help provide audit compliance

* All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Unified backup / restore concept with TSM new with z/VSE 4.1

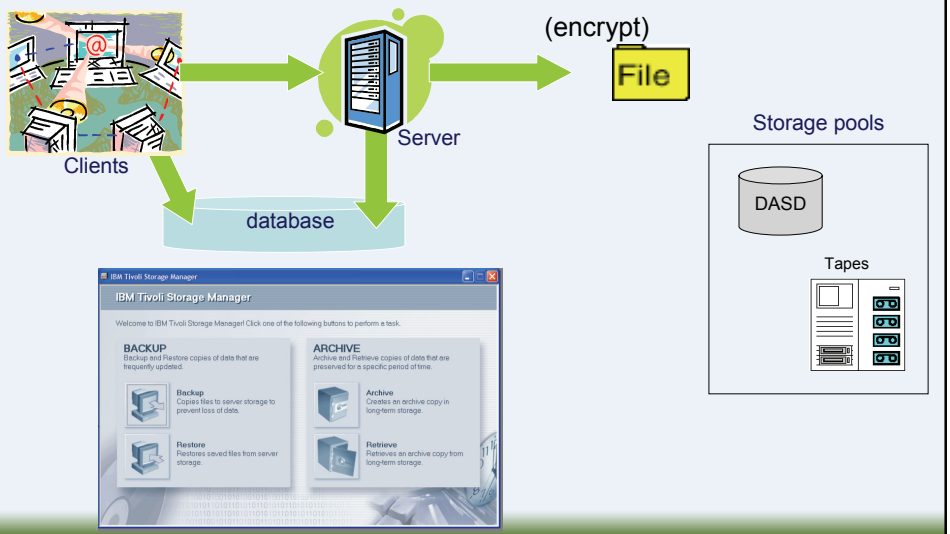
- **Backup and Restore**
  - Time based actions
  - progressive backups
  - Automation tasks



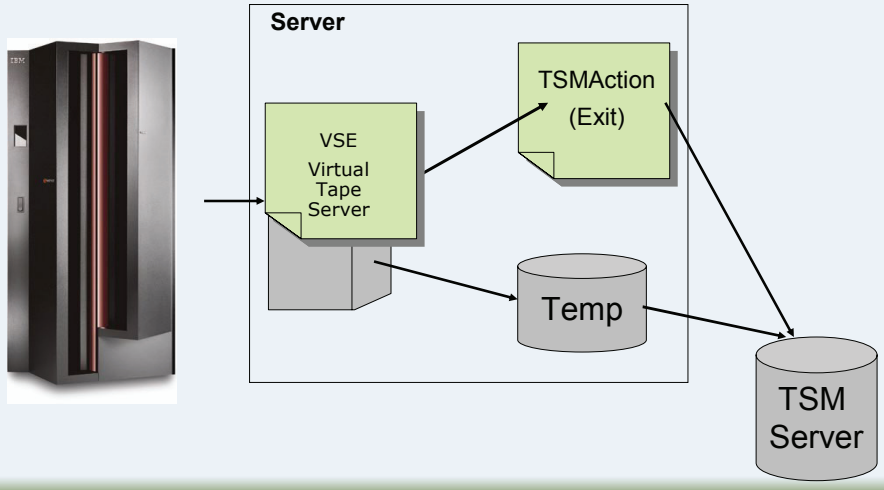
z/VSE Backups with Tivoli Storage Manager

- New with z/VSE 4.1
- Uses the TSM Command-Line interface (DSMC)
- Based on the VSE VTAPE Functionality
  - entire tape images will be stored via TSM
  - VTAPE OPEN/CLOSE Exit (are Actions)
  - On OPEN the tape image will be restored per TSM to the TSM server and can be accessed by VSE
  - On CLOSE the tape image will be saved per TSM to the corresponding storage pool (dasd or tape)

Tivoli Storage Manager - Architecture



Tivoli Storage Managers – Connection to z/VSE



Tivoli Storage Managers – used with z/VSE Backup

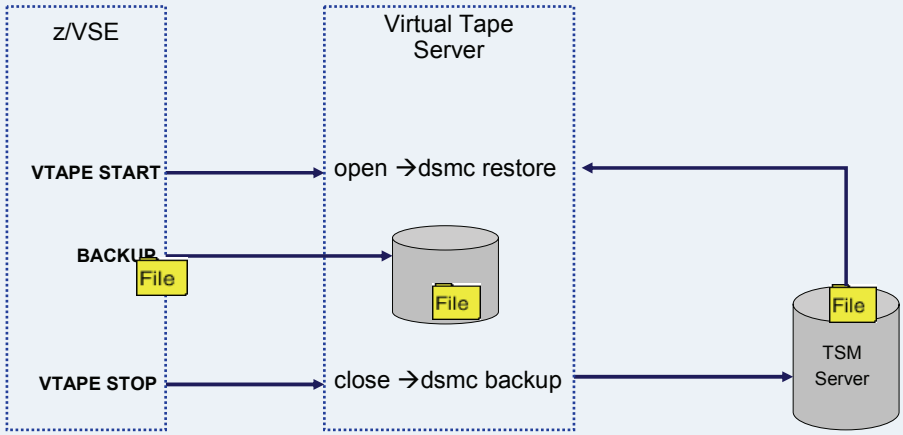
Backup of VSAM Clusters with TSM

```
* $$ JOB JNM=VSAMBKUP,DISP=L,CLASS=0
// JOB VSAMBKUP
// LIBDEF PHASE,SEARCH=IJSYSRS.SYSLIB
*  THIS JOB BACKS UP VSAM DATASETS
// DLBL IJSYSUC,'VSESP.USER.CATALOG',,VSAM
*
* THIS FUNCTION USES A VTAPE FOR OUTPUT
VTAPE START,UNIT=181,LOC=9.152.216.105,FILE='TSM:VSAM.AWS(BACKUP)',SCRATCH
// ASSGN SYS005,181
// EXEC IDCAMS,SIZE=AUTO
       BACKUP ( -
                VSAM.CONN.SAMPLE.DATA  -
                ... -
              ) -
              REW -
              NOCOMPACT -
              BUFFERS(3)
/*
// ASSGN SYS005,UA
VTAPE STOP,UNIT=181
/&
* $$ EOJ
```

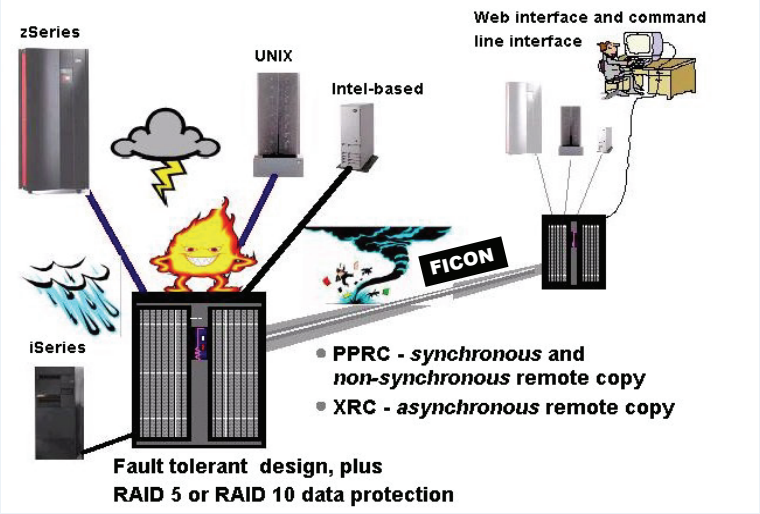
Syntax:
TSM:<name>(<mode>,<optionset>,
<fromdate>,<fromtime>)

mode	- BACKUP or ARCHIVE
optionset	- Name of configuration
fromdate	- date (for Restore)
fromtime	- time (for Restore)

Tivoli Storage Managers – Connection to z/VSE



Enterprise Storage solutions – disaster recovery (Peer to Peer remote Copy - PPRC)



Scenarios for Disaster Recovery with VSE

(1) Concepts of Disaster Recovery (DR)

(2) One active production site and one for DR

(3) Two active sites with production and test

(4) Borrowed Resources for Disaster Recovery

Concepts of Disaster Recovery with VSE

A Disaster Recovery is needed if the main systems are unable to work.

- Main machines
- Storage subsystems
- Communication of people with Data Center

Reasons for failures:

- Outage of power
- Natural catastrophe (Water, Wind, earthquake,…)
- Technical failures
  - Human error
  - Hardware errors and outages
- Political (terror)

Impact: Inability to be productive – loss of money

Major discussion areas

- **Possible Systems affected**
  - **Type of systems, relation, how many systems participate in the DR scenario**
- **System positions – Geographically**
  - **Distance between them for data mirroring**
- **Connectivity and attachments**
  - **Ability to replace each other w/o application/user adjusatments**
- **Separation of Data Stores**
  - **Logical connected data should reside on same side**
- **Network topology**
  - **Types of networks to be interconnected**
- **Operating Systems and application Landscape**
  - **Application execution based on operating systems**

Objectives for Disaster Recovery with VSE

Following Objectives are the same for Systems and Storage

•Minimize time of outage

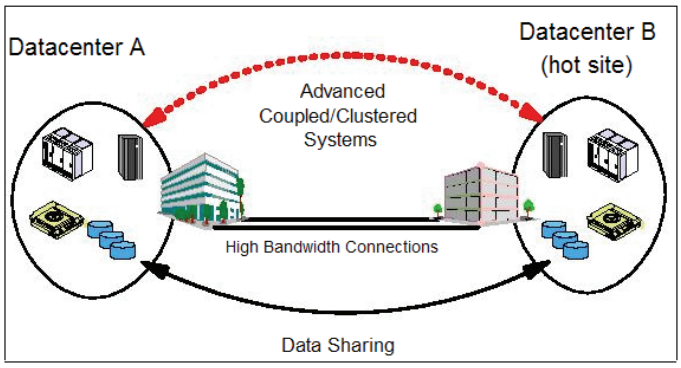
•Minimize affected systems in case of a disaster

•Minimize effort for a restart

Required knowledge in case of a DR:

•Special Communication hardware for the DR case – to avoid busy lines from users

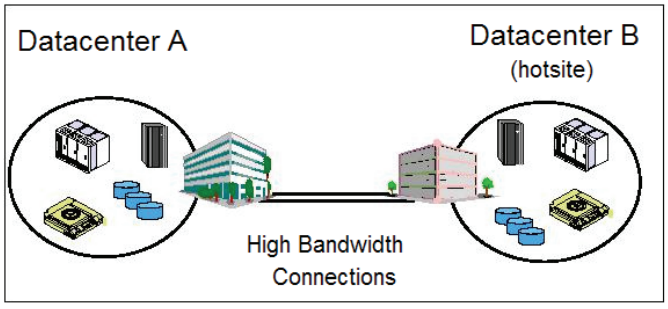
•Documentation of DR Process



Tier 6 - Zero data loss (advanced coupled systems)

This is the most expensive Disaster Recovery solution as it requires coupling or clustering applications, additional hardware to support data replication, and high bandwidth connections over extended distances. However, it also offers the speediest recovery by far.

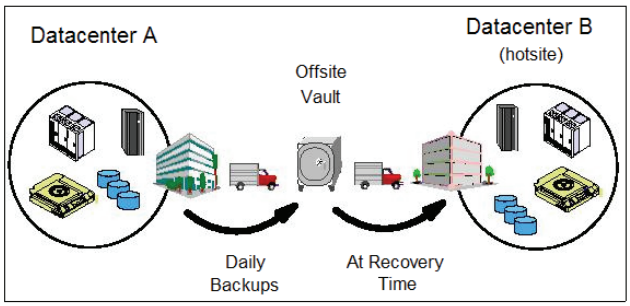
Note: The typical length of time for recovery is normally a few minutes.



Tier 5 - Two-site, two-phase commit

Tier 5 also requires partially or fully dedicated hardware on the secondary platform with the ability to automatically transfer the workload over to the secondary platform. We now have a scenario where the data between the two sites is synchronized by remote two-phase commit. The critical data and applications are therefore present at both sites and only the in-flight data is lost during a disaster. With a minimum amount of data to recover and reconnection of the network to implement, recovery time is reduced significantly.

Note: The typical length of time for recovery is usually less than 12 hours.



Tier 2 - Offsite vaulting with a hotsite (PTAM + hotsite)

Tier 2 installations rely on a courier (PTAM) to get data to an offsite storage facility. In the event of a disaster, the data at the offsite storage facility is moved to the hotsite and restored onto the backup hardware provided. Moving to a hotsite increases the cost but reduces the recovery time significantly. The key to the hotsite is that appropriate hardware to recover the data (for example, a compatible tape device) is present and operational.

Note: The typical length of time for recovery is normally more than a day.

System environment Agreements for DR

IBM special Agreements for Recovery:

- IBM Customer Agreement (ICA),
- IBM Agreement for Programs (IAP),
- International Program License Agreement (IPLA)

- The level of use acquired is documented in a Proof of Entitlement (PoE)
- "one install", (w/o other restrictions), allows a copy of the program on more than one machine under the customer's control, but only one program is authorized to be in use at any given time. Or customer may use the program **temporarily** on another machine, if the Designated Machine is inoperable.

It applies to all programs licensed under these agreements for:

• Backup use,

• Disaster Recovery (DR),

• BRS when a backup and recovery service is involved

System environment Agreements for DR

IBM defines 3 types of situations for programs running or resident on backup machines: "cold"; "warm"; and "hot".

Accepted actions concerning the copy of the program used for backup purposes:

- cold - a copy of the program may be stored for backup purposes on a machine as long as the program has not been started.
  - There is no charge for this copy.
- warm - a copy of the program may reside for backup purposes on a machine and is started, but is "idling", and is **not doing any work of any kind**.
  - There is no charge for this copy.
- hot - a copy of the program may reside for backup purposes on a machine, is started and is doing work. However, this program must be ordered.
  - There is a charge for this copy.

System environment Agreements for DR - continued

For the 'warm' situation - "Doing Work", includes:

- production,
- development,
- program maintenance,
- testing
- mirroring of transactions,
- updating of files,
- synchronization of programs, data or other resources (e.g., active linking with another machine, program, data base or other resource, etc.)
- any activity or configurability that would allow an active hot-switch or other synchronized switch-over between programs, data bases, or other resources to occur.

- A scheduled hardware outage, such as preventive maintenance or installation of upgrades, is NOT considered a backup situation.

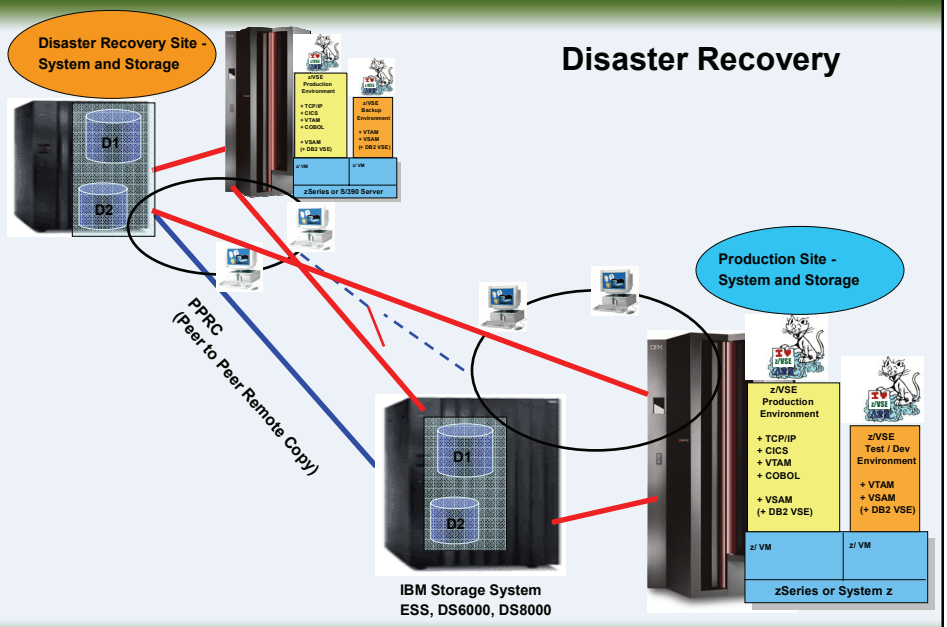
System environment Agreements for DR – continued (2)

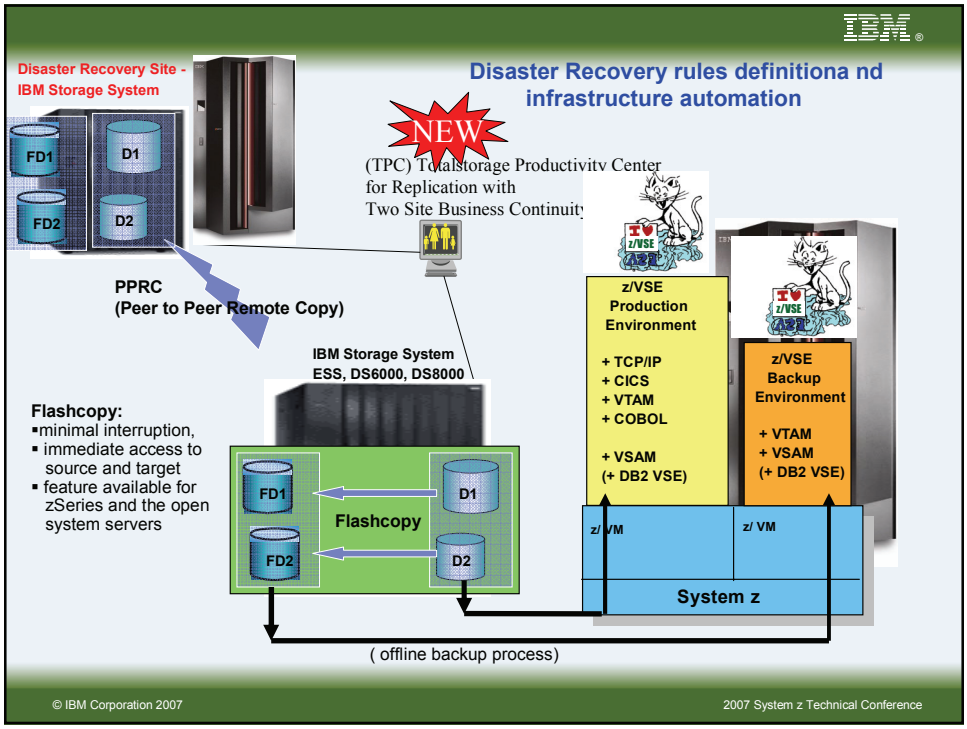
Preparation for emergency backup situations requires periodic tests – based on the requirements of system availability.

No extra program charges apply for these tests if:
- The number is appropriate (e.g., 1-3 tests per year)
- The duration is adequate, (e.g. 2 to 3 days per test).
- For more frequent tests required (e.g. for on-line systems running 24x7 critical customer business operation)
  - a shorter duration without exceeding the total hours of above guidelines.

There can be no productive output or work done from the tests and no development, program maintenance or testing as part of the tests. IBM has the right to review the customer's rationale for not licensing the IBM Program copy for the backup environment.

Disaster Recovery





Scenarios for Disaster Recovery with VSE

(1) Concepts of Disaster Recovery (DR)

(2) One active production site only and one for DR

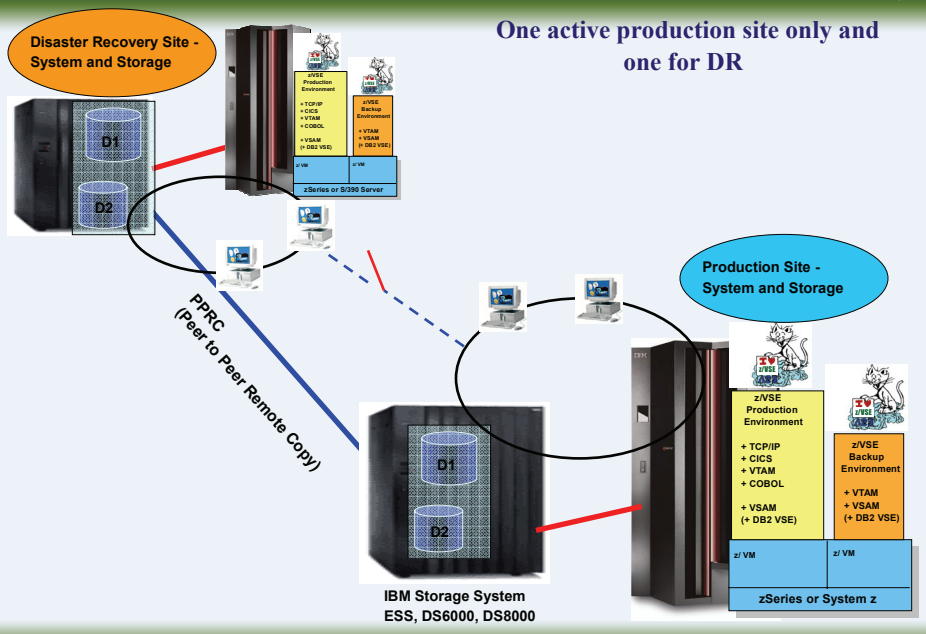
(3) Two active sites with production and test

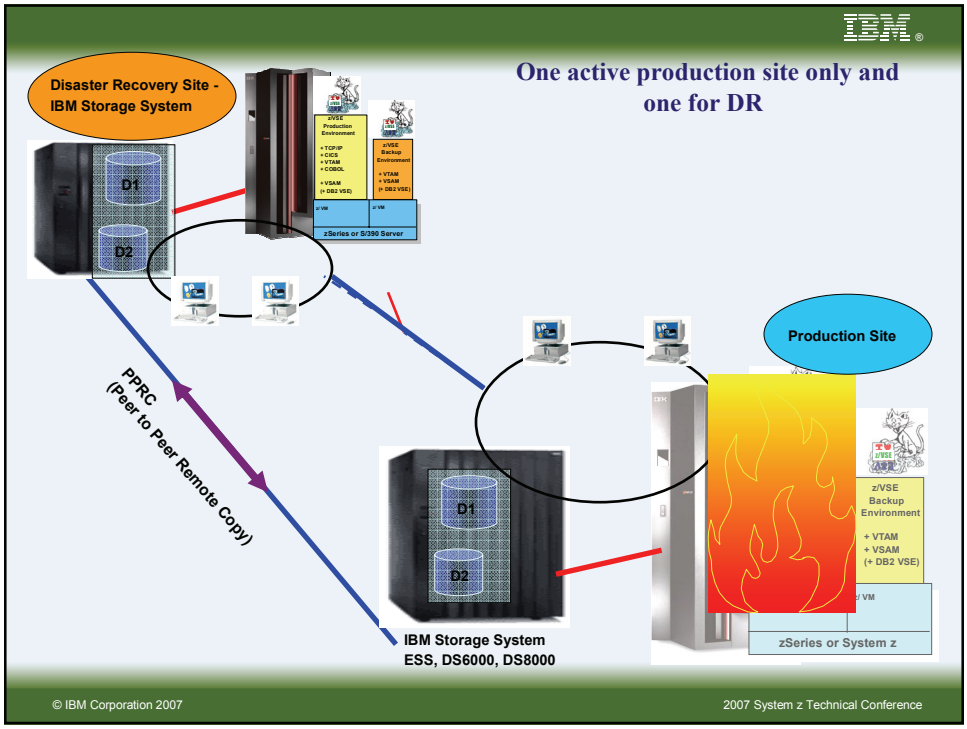
(4) Borrowed Resources for Disaster Recovery

(1) One active production site only and one for DR

Environment setup for disaster Recovery

- DR System
  - An IBM agreement is done to start this machine with the same power as the production site in Case of Recovery
  - An additional agreement can be made for increased capacity, to shorten the startup time of the VSE systems
  - A COLD environment setup - the System is switched off
  - A WARM environment setup - the System is idling
  - Both Systems are are able to connect to both Storage subsystems
    - (on the production and DR site)
- Storage Systems
  - The Production Storage system is connected to the one for DR
  - The DR Storage system is connected to the production Storage
  - Data is mirrored via PPRC (real time or asynchronous)
    - Enablement to switch the PPRC direction
- Network
  - Possibility to switch between the productional and DR network




IBM
One active production site only and one for DR
Disaster Recovery Site - IBM Storage System
D1
D2
zSeries or S/390 Server
PPRC (Peer to Peer Remote Copy)
Production Site
z/VSE Backup Environment
+ VTAM
+ VSAM
(+ DB2 VSE)
zSeries or System z
IBM Storage System ESS, DS6000, DS8000
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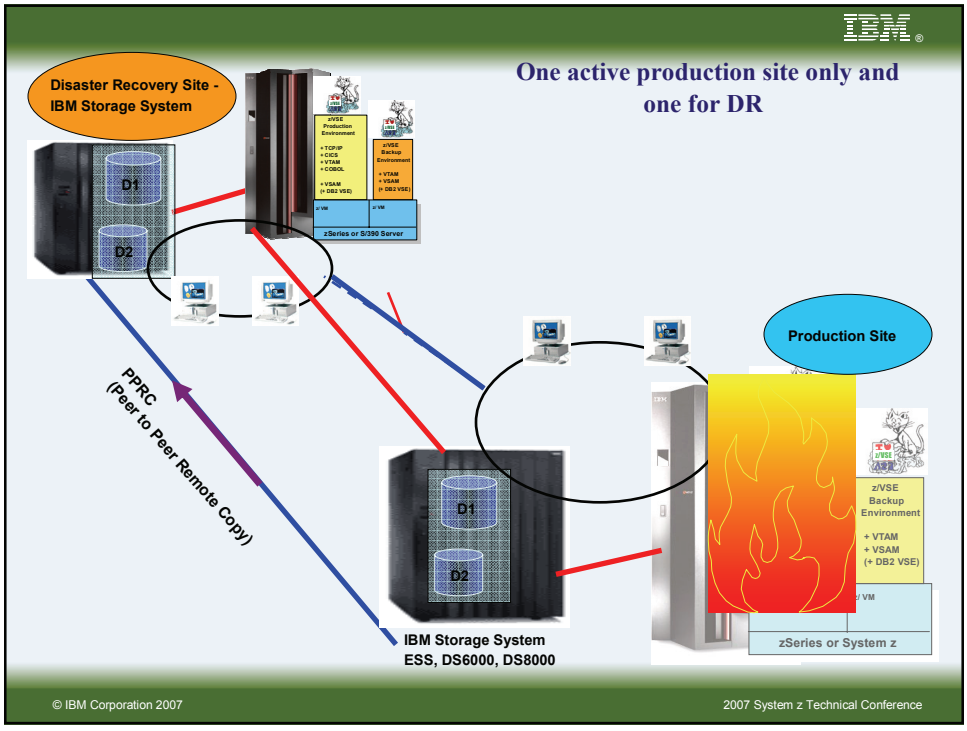
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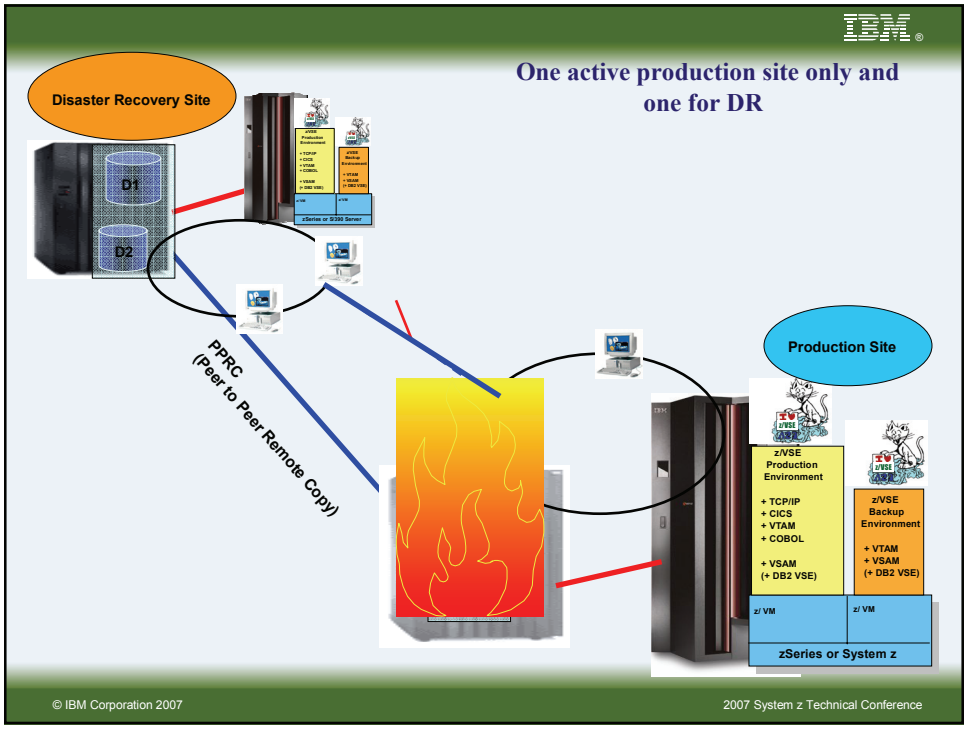
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PPRC (Peer to Peer Remote Copy)
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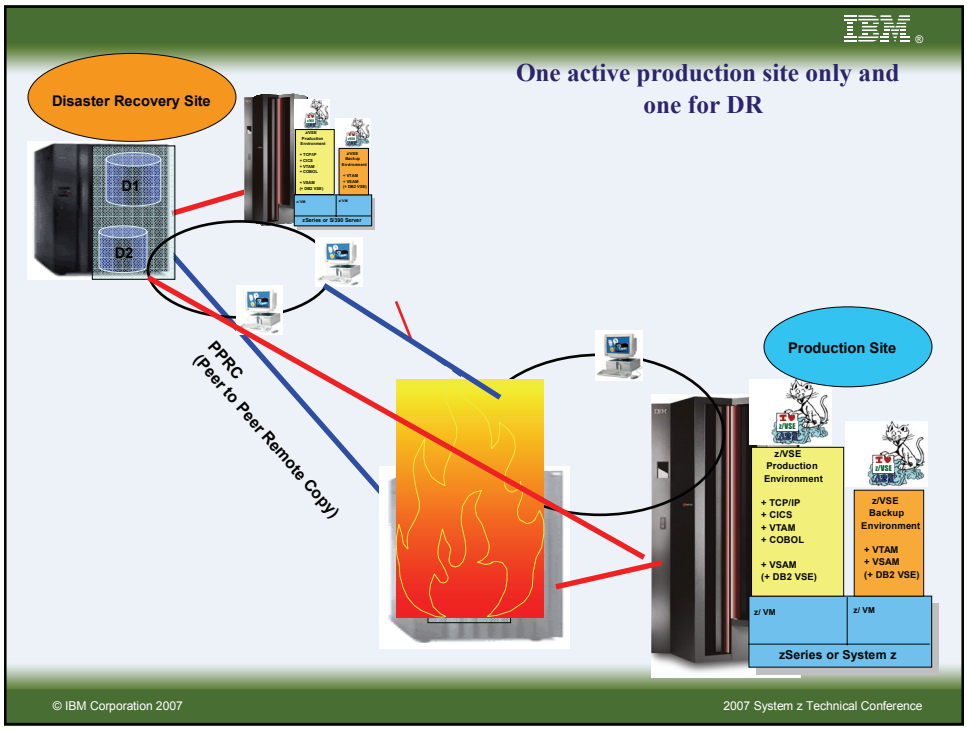
IBM
One active production site only and one for DR
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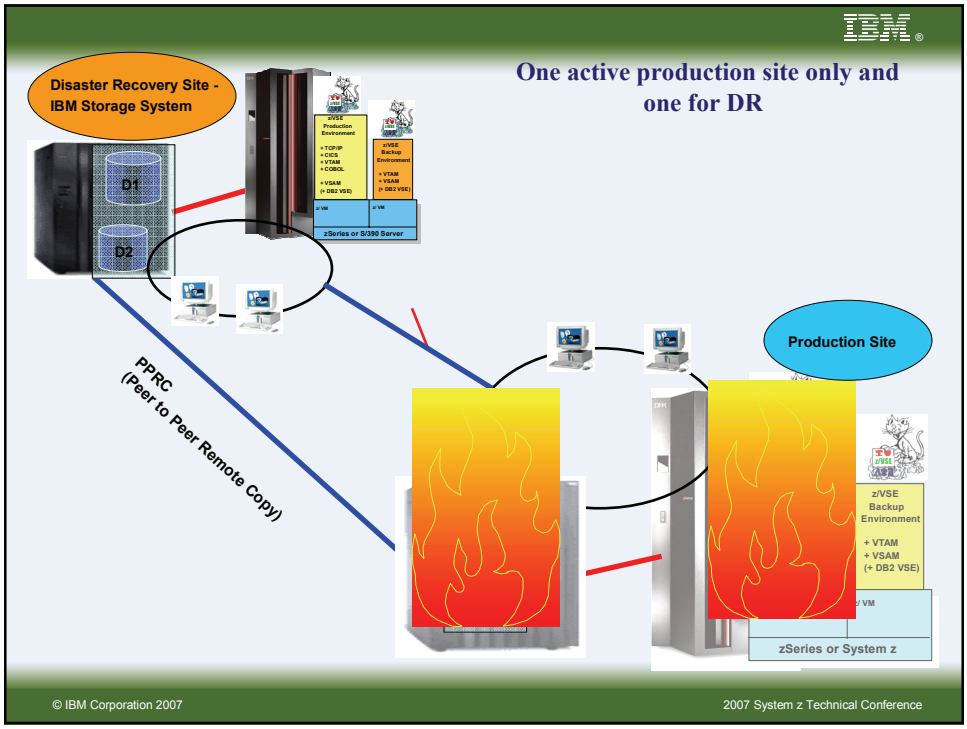


Steps in case of a disaster Recovery

1. Emergency phones and messaging methods have to be enabled
2. Start z/VM on the Recovery Site (on a COLD environment)
   1. Start the CBU (Capacity Backup Upgrade) if defined – to accelerate start of VSE systems
3. Switch the OSA Adapter Network Connectivity
4. Start Online VSE machines (all CICS partitions should start automatically)
5. After all productional machines are running – the capacity can be reduced to the normal productional capacity

Note: These Steps must be tested and trained periodically to have a well functioning process in case of a disaster Recovery failure.

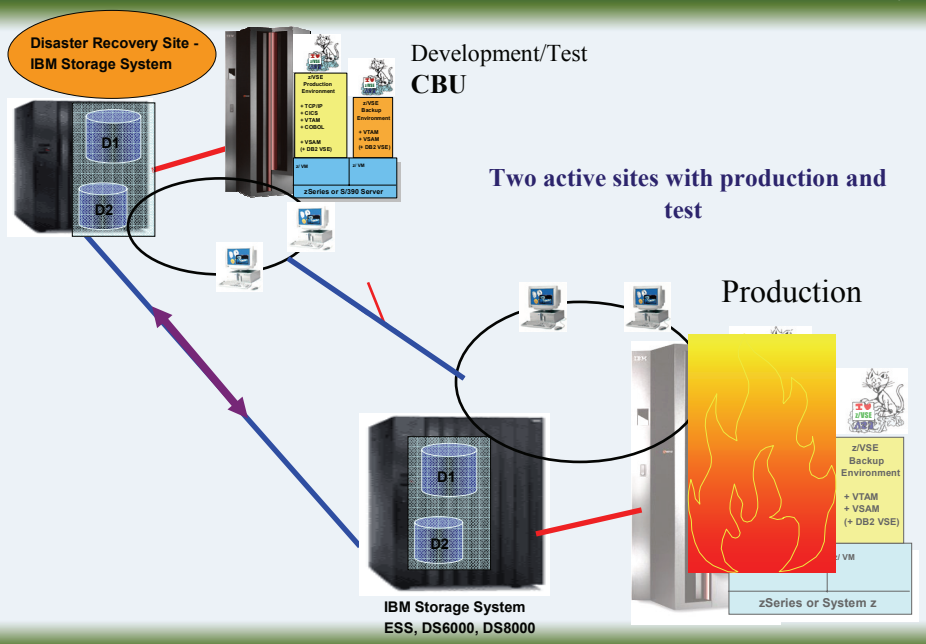
Scenarios for Disaster Recovery with VSE

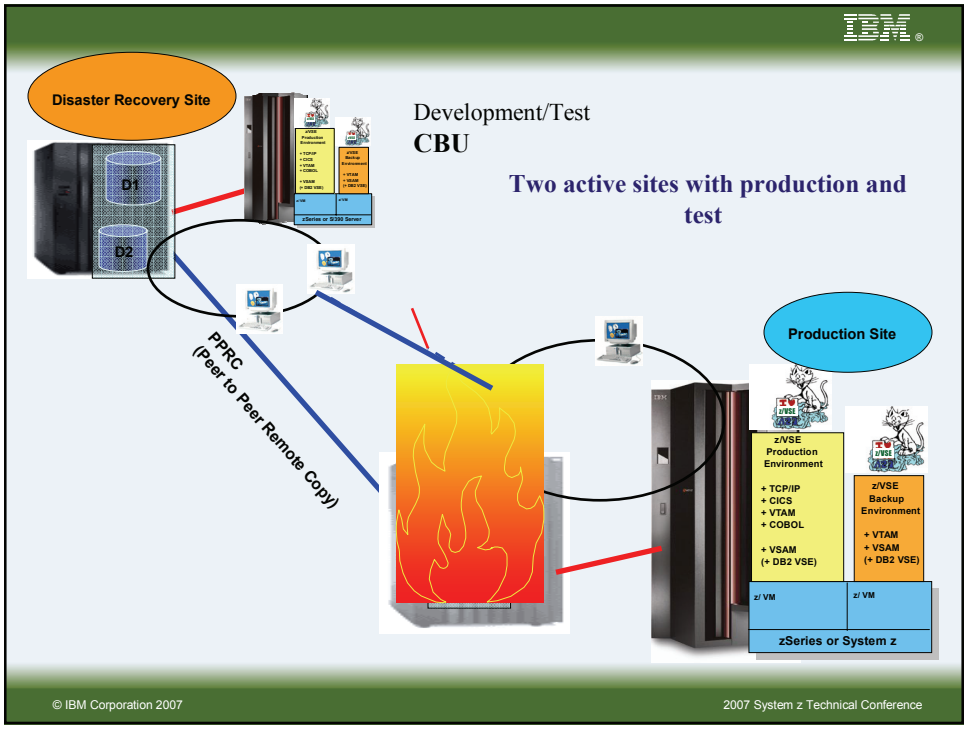
(1) Concepts of Disaster Recovery (DR)

(2) One active production site and one for DR

(3) Two active sites with production and test

(4) Borrowed Resources for Disaster Recovery





(1) Two active sites with production and test

Environment setup for disaster Recovery

- DR System
  - An IBM agreement is done to increase the machine for DR capacity with the power of the production site, using CBU (Capacity Backup Upgrade)
  - In a WARM environment setup - the System is idling
  - In a HOT Environment setup – the system is very fast ready to take over the production workload
  - Both Systems are able to connect to both Storage subsystems
    - (on the production and DR site)
- Storage Systems
  - The Production Storage system is connected to the one for DR
  - The DR Storage system is connected to the production Storage
  - Data is mirrored via PPRC (real time or asynchronous)
    - Enablement to switch the PPRC direction
- Network
  - Possibility to switch between the productional and DR network

Steps in case of a disaster Recovery

1. **Emergency phones and messaging methods have to be enabled**
2. **Start the CBU (Capacity Backup Upgrade)**
3. **Switch the OSA Adapter Network Connectivity**
4. **Start the Online VSE machines if not already started (all CICS partitions should start automatically)**
5. **After all productional machines are running – the capacity can be reduced to the normal productional capacity**

Note: These Steps must be tested and trained periodically to have a well functioning process in case of a disaster Recovery failure.

Scenarios for Disaster Recovery with VSE

(1) Concepts of Disaster Recovery (DR)

(2) One active production site and one for DR

(3) Two active sites with production and test

(4) Borrowed resources for Disaster Recovery

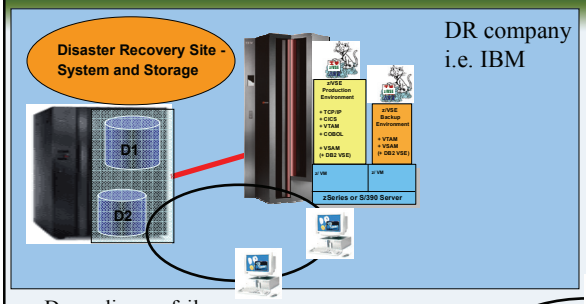
Borrowed resources for Disaster Recovery

A Disaster Recovery Site can be made offsite on other customers with IBM equipment.

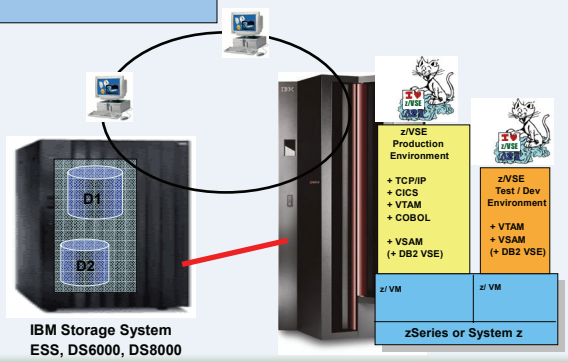
Necessary Agreements are required:

- An contract with HW details
- The DR procedure must be well defined and described
- Data for the DR case are provided periodically to the DR Center
- Training is done periodically and the DR procedure is verified

Borrowed resources for Disaster Recovery

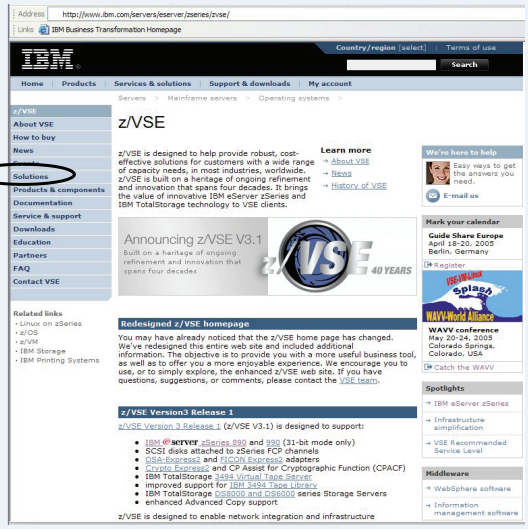


Depending on failure, not all actual running processes can be redone entirely.



z/VSE on the web

z/VSE Solutions



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  http://www.ibm.com/servers/eserver/zseries/zvse/

- z/VSE Solutions and Utilities
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Redbooks

- e-business Solutions for VSE/ESA SG24-5662
- e-business Connectivity for VSE/ESA SG24-5950
- CICS Transaction Server for VSE/ESA
  CICS Web Support *SG24-5997-00*
- ***WebSphere Handbook (Connectors to z/OS and VSE) SG24-7042***

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