Using FlashCopy in the DB2 Utilities

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SHARE in Pittsburgh 2014

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Agenda

- FlashCopy Overview of Basic Concepts
- Using FlashCopy in the DB2 Utilities
  - COPY/LOAD/CHECK/REBUILD/REORG/RECOVER
- FlashCopy Overview of Advanced Concepts
- Using FlashCopy in system level backups
- Using FlashCopy in system and object level recoveries
- Using the object level recovery (from system level backup) enhancement

FlashCopy w/ Background Copy

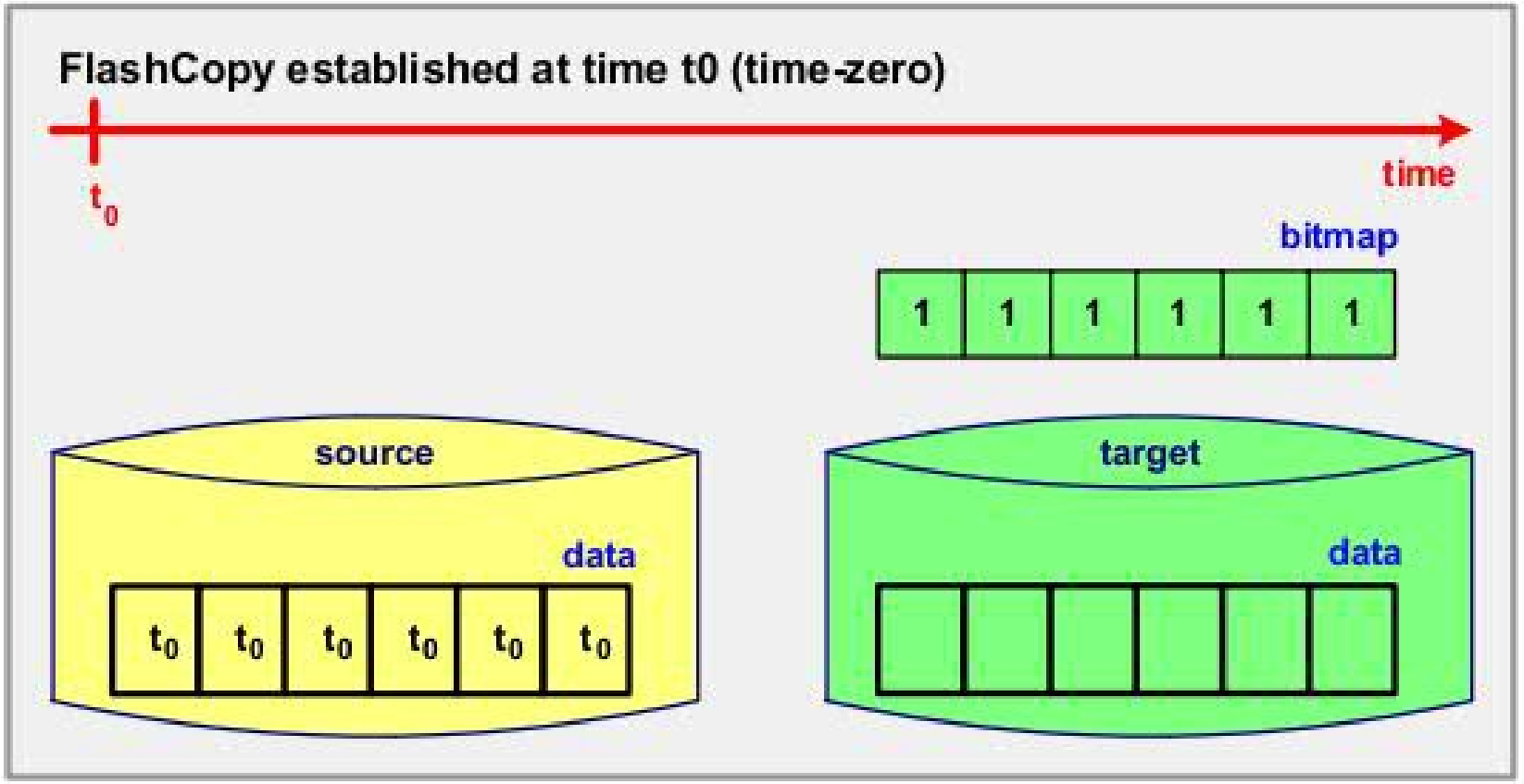

Figure 8-2 FlashCopy at time t0

Source: IBM System Storage DS8000 Copy Services for IBM System Z

Complete your session evaluations online at www.SHARE.org/Pittsburgh-Eval

FlashCopy w/ Background Copy

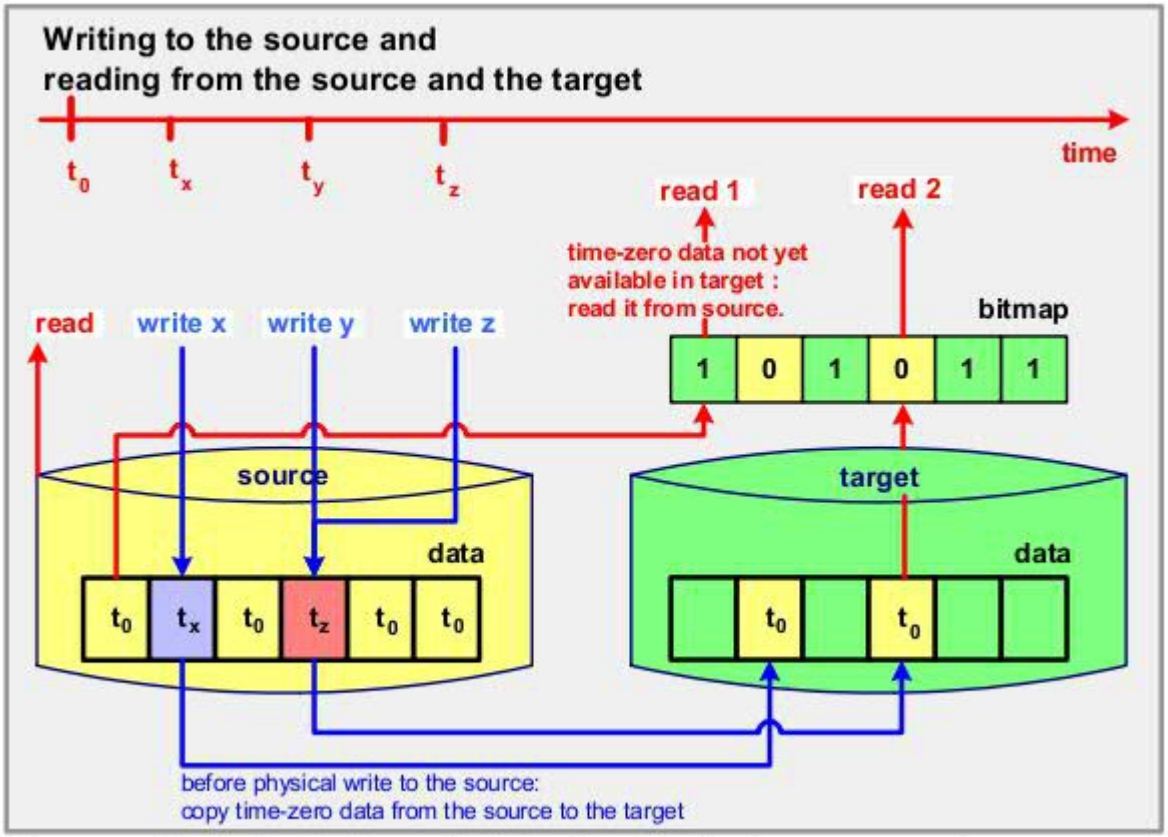

Figure 8-3 Reads from source and target volumes and writes to source volume

Source: IBM System Storage DS8000 Copy Services for IBM System Z

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FlashCopy w/out Background Copy (FCNOCOPY)

- Same pictures as the previous slides, however, the relationship lasts until one of the following occurs
  - it is explicitly withdrawn
  - until all data in the source relationship is modified
  - until all the data in the target relationship is modified

Source: IBM System Storage DS8000 Copy Services for IBM System Z

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FlashCopy in a Metro Mirror Environment

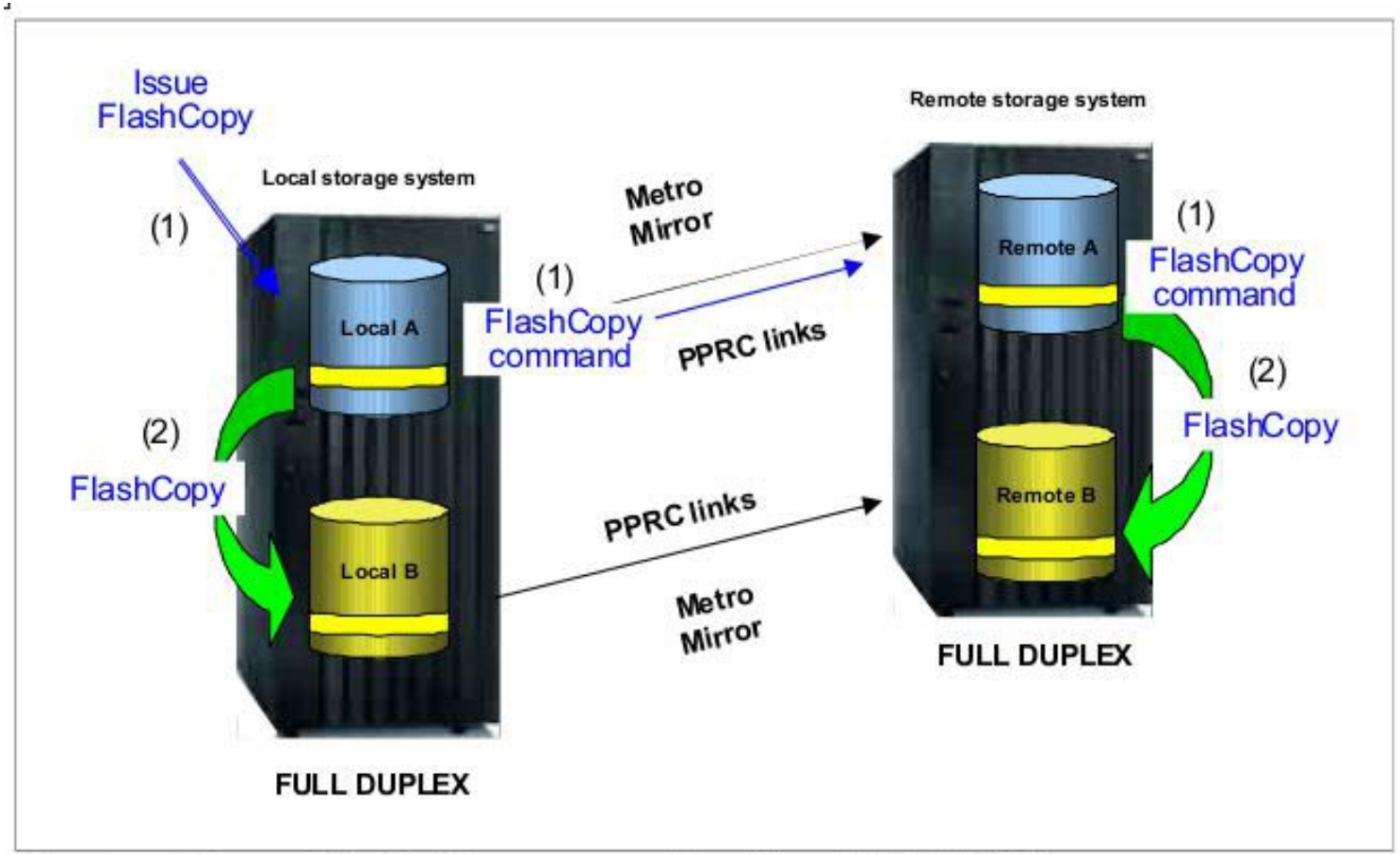

Figure 8-10 Remote Pair FlashCopy preserves Metro Mirror FULL DUPLEX state

Source: IBM System Storage DS8000 Copy Services for IBM System Z

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Using FlashCopy in the DB2 Utilities

- The utilities that invoke DFSMSdss COPY are:
  - DB2 for z/OS V8
    - *CHECK INDEX with SHRLEVEL CHANGE*
  - DB2 for z/OS V9
    - *CHECK DATA|LOB with SHRLEVEL CHANGE*
  - DB2 for z/OS V10
    - *COPY,LOAD,REBUILD INDEX,REORG TABLESPACE | INDEX with FLASHCOPY YES or FLASHCOPY CONSISTENT*

Source: DB2 10 for z/OS Utility Guide and Reference (Subsystem parameters for refining DFSMSdss COPY operation with utilities)

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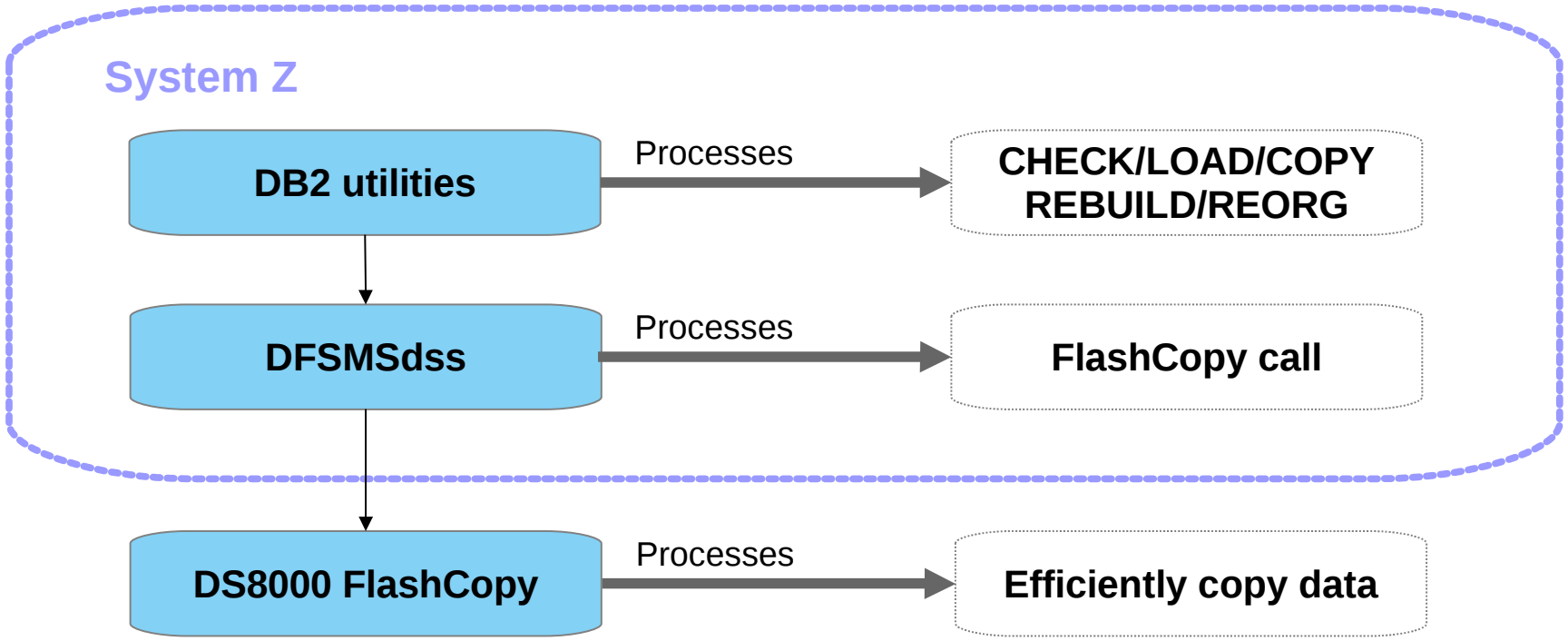
Understanding the stack



Source: Casebook: DB2 backup, recovery and cloning for SAP environments

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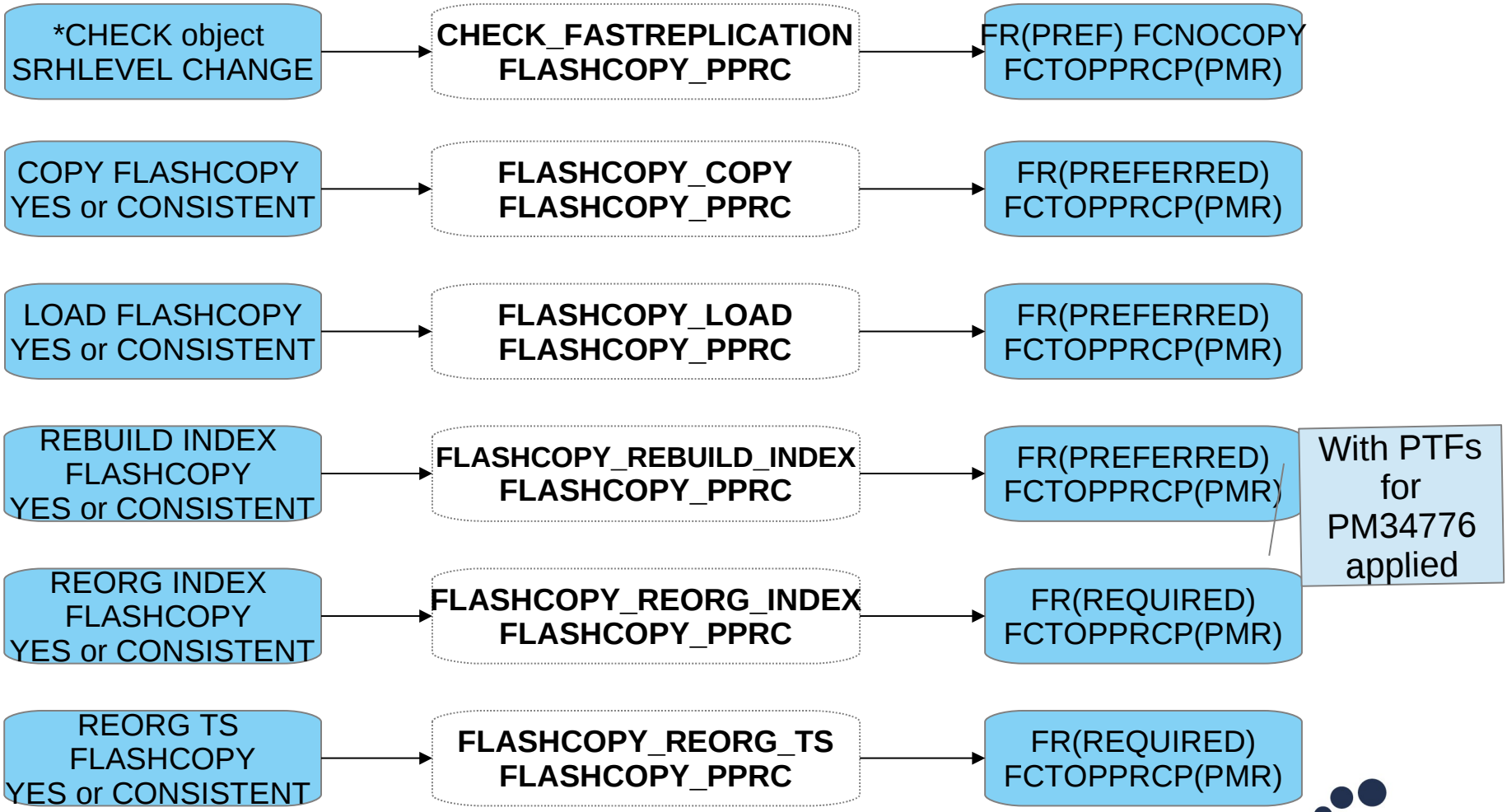
Invoking FlashCopy using the DB2 utilities



Asking the right questions to simplify choice of FlashCopy options

- Can I tolerate my metro mirror to get out of sync due to a FlashCopy
  - No – FCTOPPRCP(PreserveMirrorRequired)
  - Yes – FCTOPPRCP(PreserveMirrorPreferred)
- Can I tolerate extended unavailability in order to run my utility
  - No – FR(Required)
    - *Note that if FlashCopy cannot be used the utility will have to be run at a later time when it can be used*
  - Yes – FR(Preferred)

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Incremental FlashCopy relationships

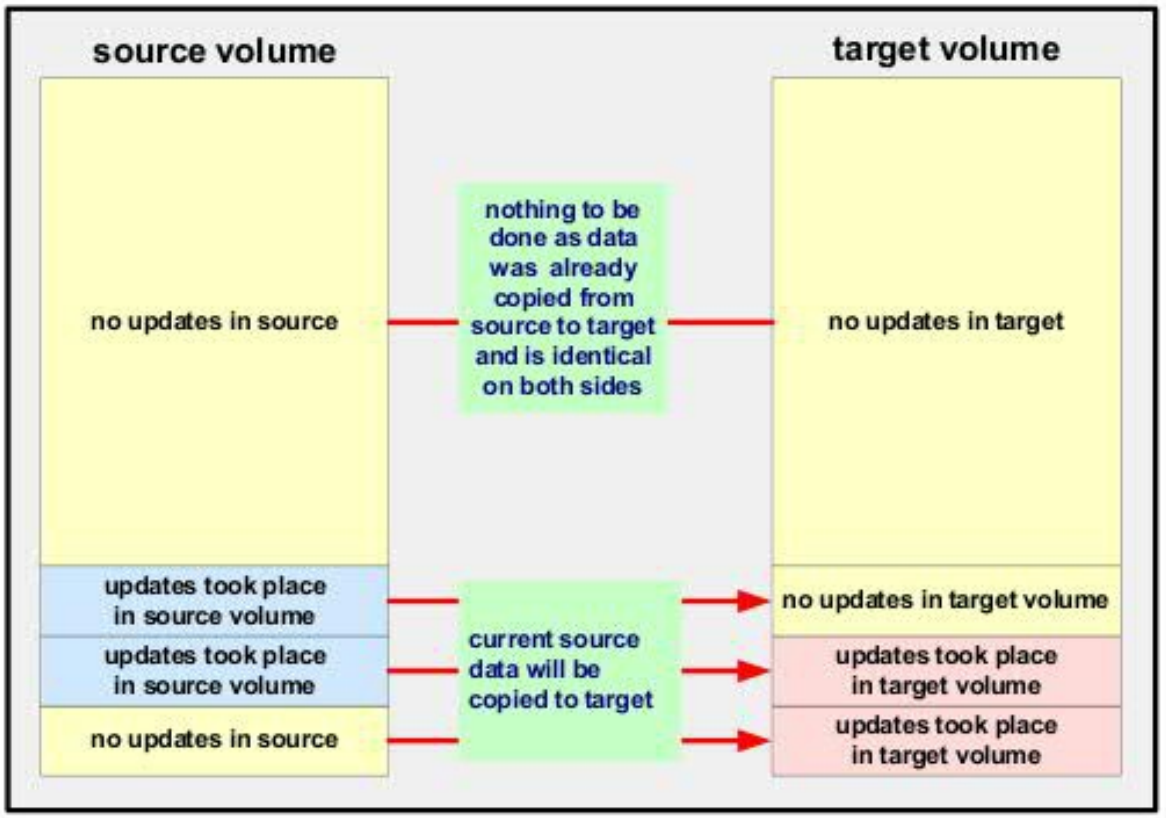


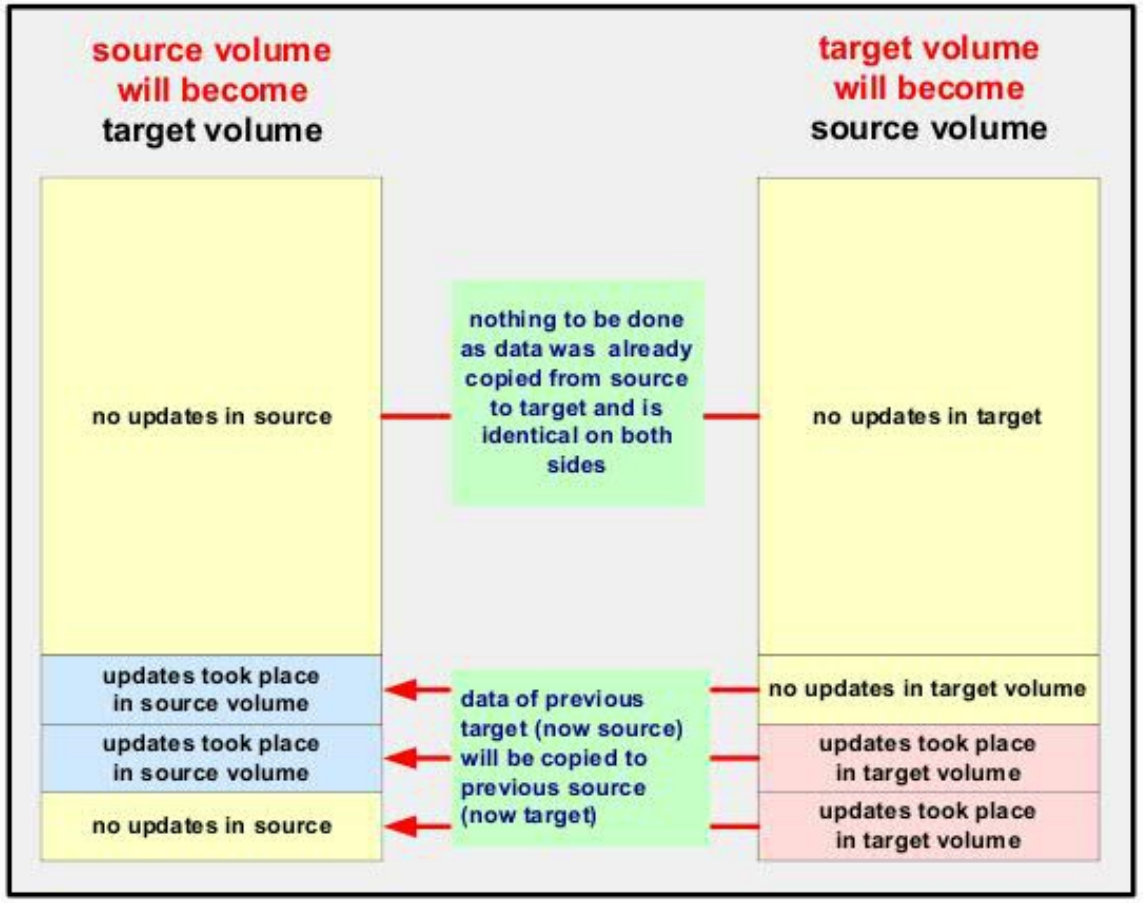
Figure 9-3 Updates to the target volume caused by a refresh target FlashCopy

Persistent relationship

Source: IBM System Storage DS8000 Copy Services for IBM System Z

Fast Reverse Restore

Requires Full Volume Relation



Source: IBM System Storage DS8000 Copy Services for IBM System Z

Consistency Groups

- For applications that have data spread over multiple volumes
  - Creates a consistent point in time copy across multiple volumes
- Maintains the order of dependent writes

1. Write to log volume: Data Record #2 is being updated.
2. Update Data Record #2 on data volume.
3. Write to log volume: Data Record #2 update complete.

If the copy of the data contains any of these combinations, then the data is *consistent*:

- Operation 1, 2, and 3
- Operation 1 and 2
- Operation 1

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Space Efficient FlashCopy

Incremental Not supported

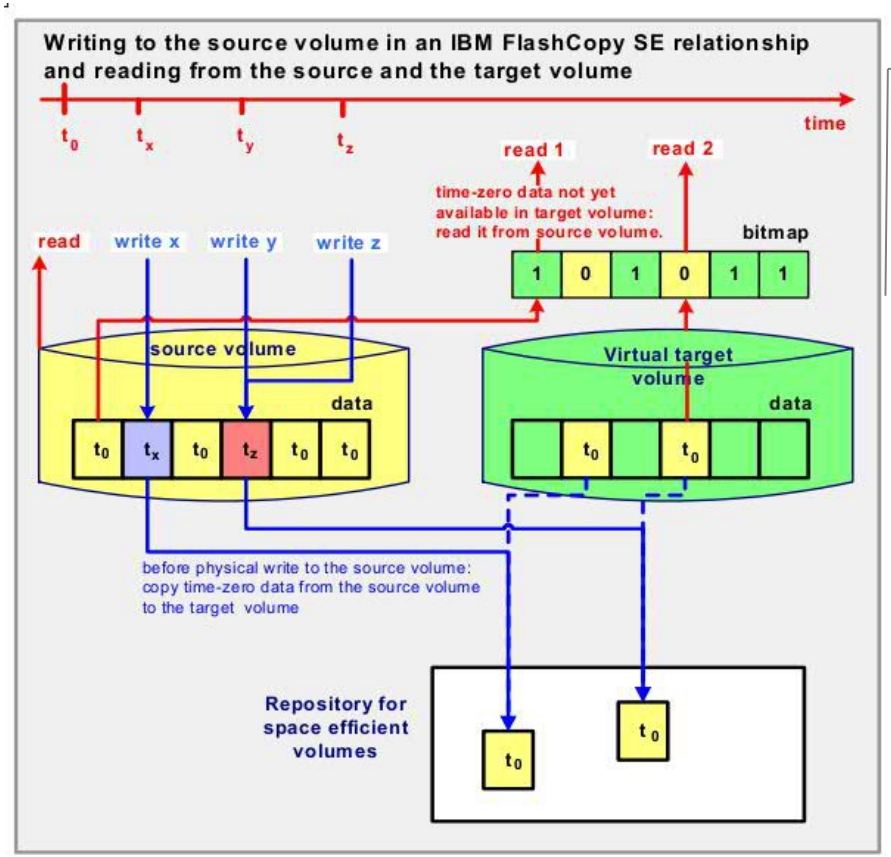
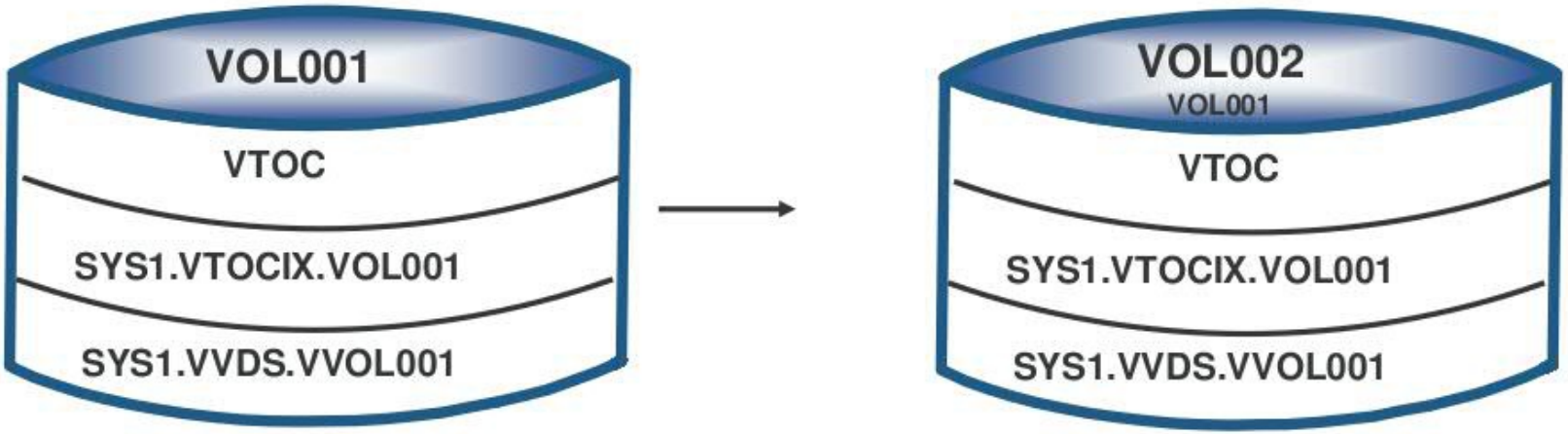


Figure 8-4 Reads from source and target volumes and writes to source volume for IBM FlashCopy SE relationships

NOCOPY only

Source: IBM System Storage DS8000 Copy Services for IBM System Z

Dump Conditioning for full volume FlashCopy



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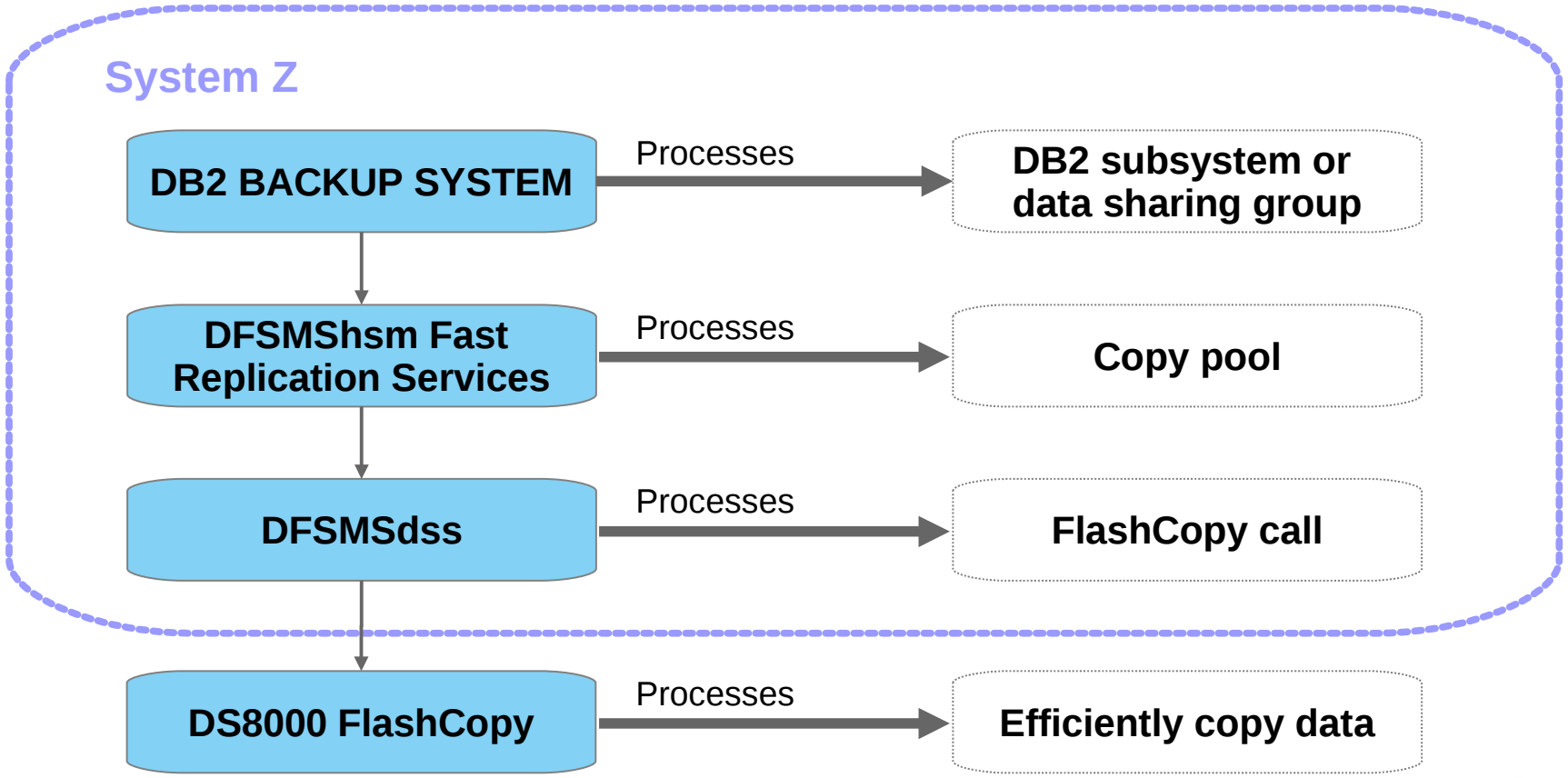
Understanding the system level backup stack



Source: Casebook: DB2 backup, recovery and cloning for SAP environments

Controlling FlashCopy in system level backups

- DB2 BACKUP SYSTEM
  - ESTABLISH FCINCRENEMTAL
  - END FCINCREMENTAL
- DFSMShsm FRBACKUP
  - FCINCREMENTAL
  - FCINCREMENTALLAST

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Controlling FlashCopy in system level backups

- DFSMShsm copy pool definition
  - Number of DASD Fast Replication Backup Versions with Background Copy
  - FRBACKUP to PPRC Primary Volumes allowed (NO, PN, PP, PR or blank)
  - FlashCopy Consistency Group
  - Allow Fast Reverse Restore (Y or N)
  - **Capture Catalog Information for Data Set Recovery (R, P or N)**

*FCINCREMENTAL cannot be used in combination with space efficient FlashCopy.

*The preserve mirror operation cannot be used in combination with space efficient FlashCopy.

Source: DFSMShsm Storage Administration

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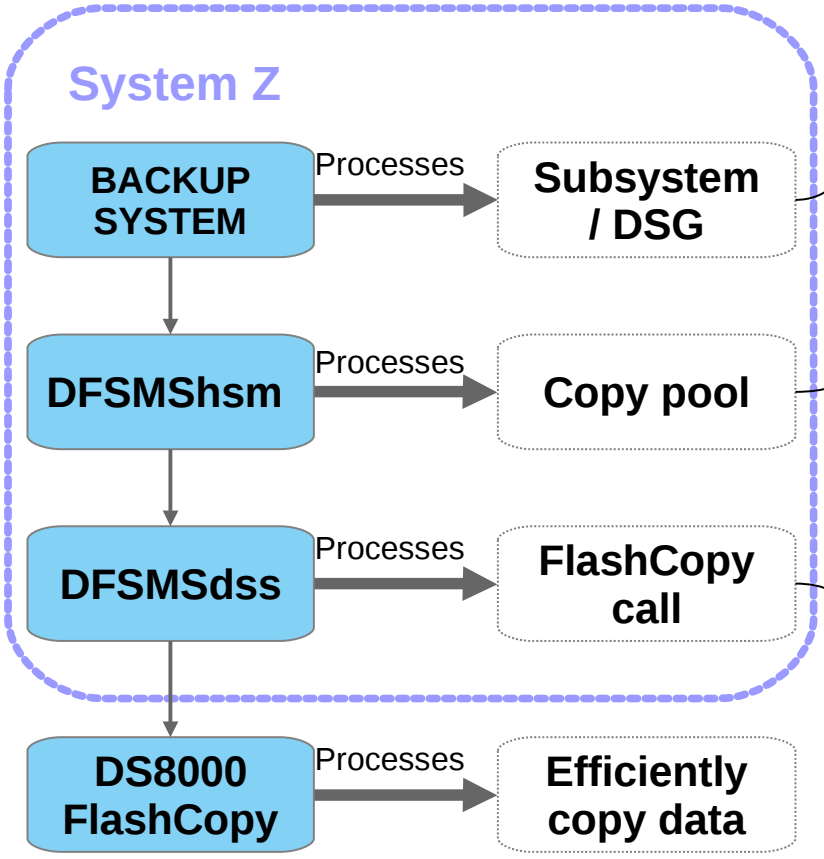
Using FlashCopy during system level backups



BACKUP SYSTEM
- ESTABLISH FCINCREMENTAL
- END FCINCREMENTAL

FRBACKUP CP(*cp*)
- FCINCREMENTAL
- FCINCREMENTALLAST

Copy Pool Definition
- Number of DASD FR Backup Versions
- FRBACKUP to PPRC Primary
- FlashCopy Consistency Group
- Allow Fast Reverse Restore

COPY FULL DC INDY(*volser*) FR(REQ)
- FCINCREMENTAL
- FCINCREMENTALLAST

Copy Pool Definition
- 0 – FCNOCOPY FCSETGTOK(FAIL)
- FCTOPPRCP(PMN|PMP|PMR)
- FCCGFREEZE
- FCFULLVOLUMERELATION

Source: Casebook: DB2 backup, recovery and cloning for SAP environments

Realizing FlashCopy combinations during system level backups without Metro Mirror

Allow Fast Reverse Restore would add FCFULLVOLUMERELATION

FRBACKUP to PPRC Primary	Number of Backup Versions	Consistency Group	ESTABLISH FCINCREMENTAL	Action
NO | PN | Blank	0	No	Not Specified	FR(REQ) FCNOCOPY FCSETGTOK(FAIL)
NO | PN | Blank	0	Yes	Not Specified	FR(REQ) FCNOCOPY FCSETGTOK(FAIL) FCFRZ

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Realizing FlashCopy combinations during system level backups without Metro Mirror

FRBACKUP to PPRC Primary	Number of Backup Versions	Consistency Group	ESTABLISH FCINCREMENTAL	Action
NO | PN | Blank	>0	No	Not Specified	FR(REQ)
NO | PN | Blank	>0	No	Specified	FR(REQ) FCINCREMENTAL
NO | PN | Blank	>0	Yes	Not Specified	FR(REQ) FCFRZ
NO | PN | Blank	>0	Yes	Specified	FR(REQ) FCFRZ FCINCREMENTAL

Realizing FlashCopy combinations during system level backups with Metro Mirror

FRBACKUP to PPRC Primary	Number of Backup Versions	Consistency Group	ESTABLISH FCINCREMENTAL	Action
PresMirPreferred PresMirRequired	0	No	Not Specified	FR(REQ) FCNOCOPY FCTOPRRCP(PMP|PMR)
PresMirPreferred PresMirRequired	0	Yes	Not Specified	FR(REQ) FCNOCOPY FCFRZ FCTOPPRCP(PMP| PMR)

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Realizing FlashCopy combinations during system level backups with Metro Mirror

FRBACKUP to PPRC Primary	Number of Backup Versions	Consistency Group	ESTABLISH FCINCREMENTAL	Action
PresMirPreferred PresMirRequired	>0	No	Not Specified	ER(REQ) FCTOPPRCP(PMP|PMR)
PresMirPreferred PresMirRequired	>0	No	Specified	ER(REQ) FCINCREMENTAL FCTOPPRCP(PMP|PMR)
PresMirPreferred PresMirRequired	>0	Yes	Not Specified	ER(REQ) FCFRZ FCTOPPRCP(PMP|PMR)
PresMirPreferred PresMirRequired	>0	Yes	Specified	ER(REQ) FCFRZ FCINCREMENTAL FCTOPPRCP(PMP|PMR)

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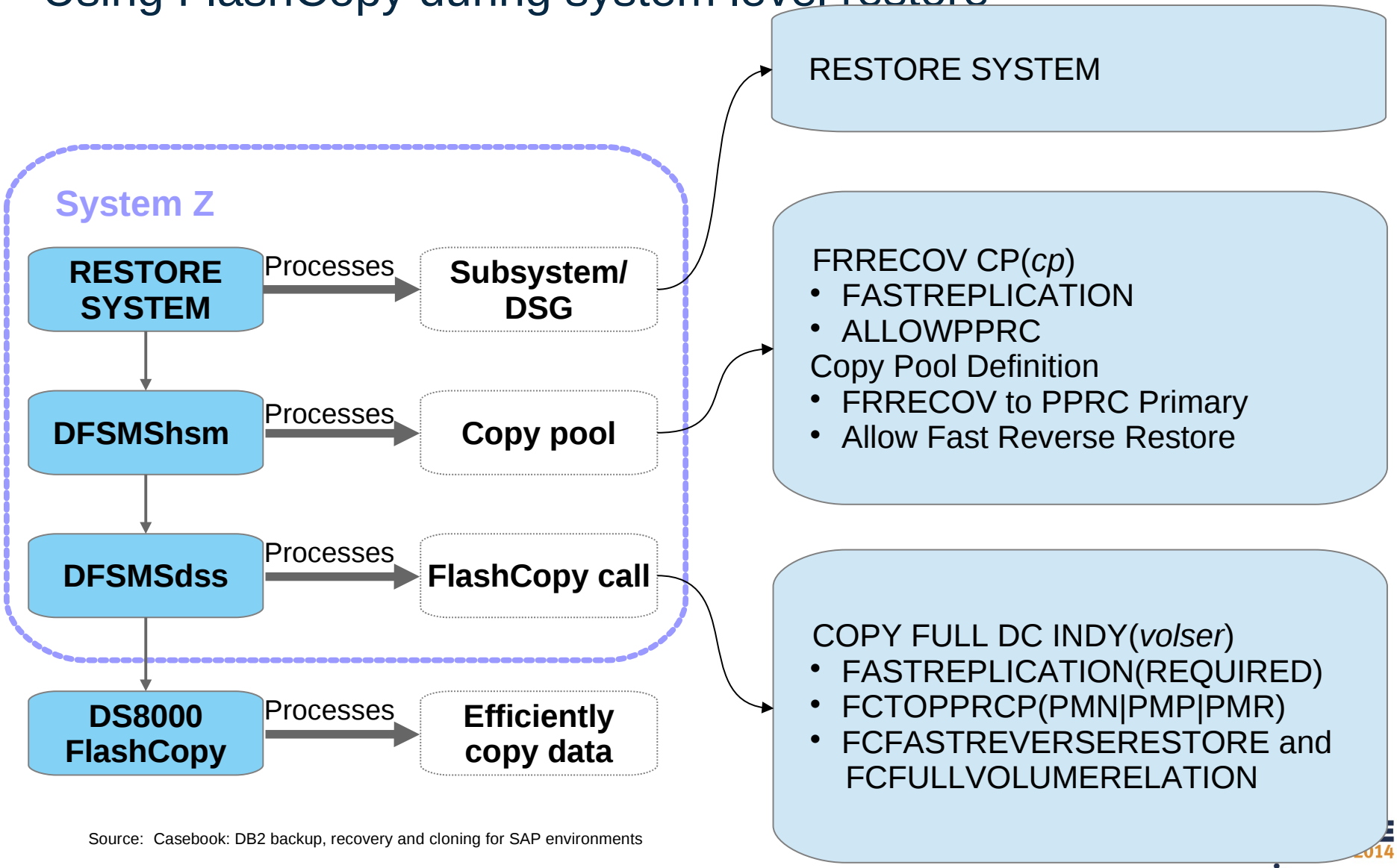
Controlling FlashCopy in system level recoveries

- DB2 RESTORE SYSTEM
- DFSMShsm Copy Pool Definition
  - FRRECOV to PPRC Primary Volumes allowed (NO, PN, PP, PR or blank)
    - *DFSMSdss FCTOPPRCPRIMARY(NONE|PMP|PMR)*

Using FlashCopy during system level restore



Source: Casebook: DB2 backup, recovery and cloning for SAP environments

Realizing FlashCopy combinations during system level recoveries without Metro Mirror

FBRECOV to PPRC Primary	Backup created with FCINCREMENTAL	Backup Created with Allow Fast Reverse Restore	Action
No | PN | Blank	No	No	FR(REQ)
No | PN | Blank	No	Yes	FR(REQ) FRR FCFVR
No | PN | Blank	Yes	No	ARC1806E RC=0004
No | PN | Blank	Yes	Yes	FR(REQ) FRR FCFVR

Realizing FlashCopy combinations during system level recoveries with Metro Mirror

ERRECOV to PPRC Primary	Backup created with FCINCREMENTAL	Backup created with Allow Fast Reverse Restore	Action
PMP | PMR	No	No	ER(REQ) FCTOPPRCP(PMP|PMR)
PMP | PMR	No	Yes	ARC1806E RC=0081
PMP | PMR	Yes	No	ARC1806E RC=0004
PMP | PMR	Yes	Yes	ARC1806E RC=0081

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Controlling FlashCopy when recovering objects

- RECOVER OBJECT
  - REC_FASTREPLICATION subsystem parameter can also control FASTREPLICATION specification FASTREPLICATION(REQUIRED|NONE)
  - FLASHCOPY_PPRC subsystem parameter can also control FCTOPPRCPRIMARY specification to FCTOPPRCPRIMARY(PRESERVEMIRRORPREFERRED|NONE)

Controlling FlashCopy when recovering objects

- DFSMShsm Copy Pool Definition
  - FRRECOV to PPRC Primary Volumes allowed (NO, PN, PP, PR or blank)
    - *DB2 parameters override copy pool definition settings*

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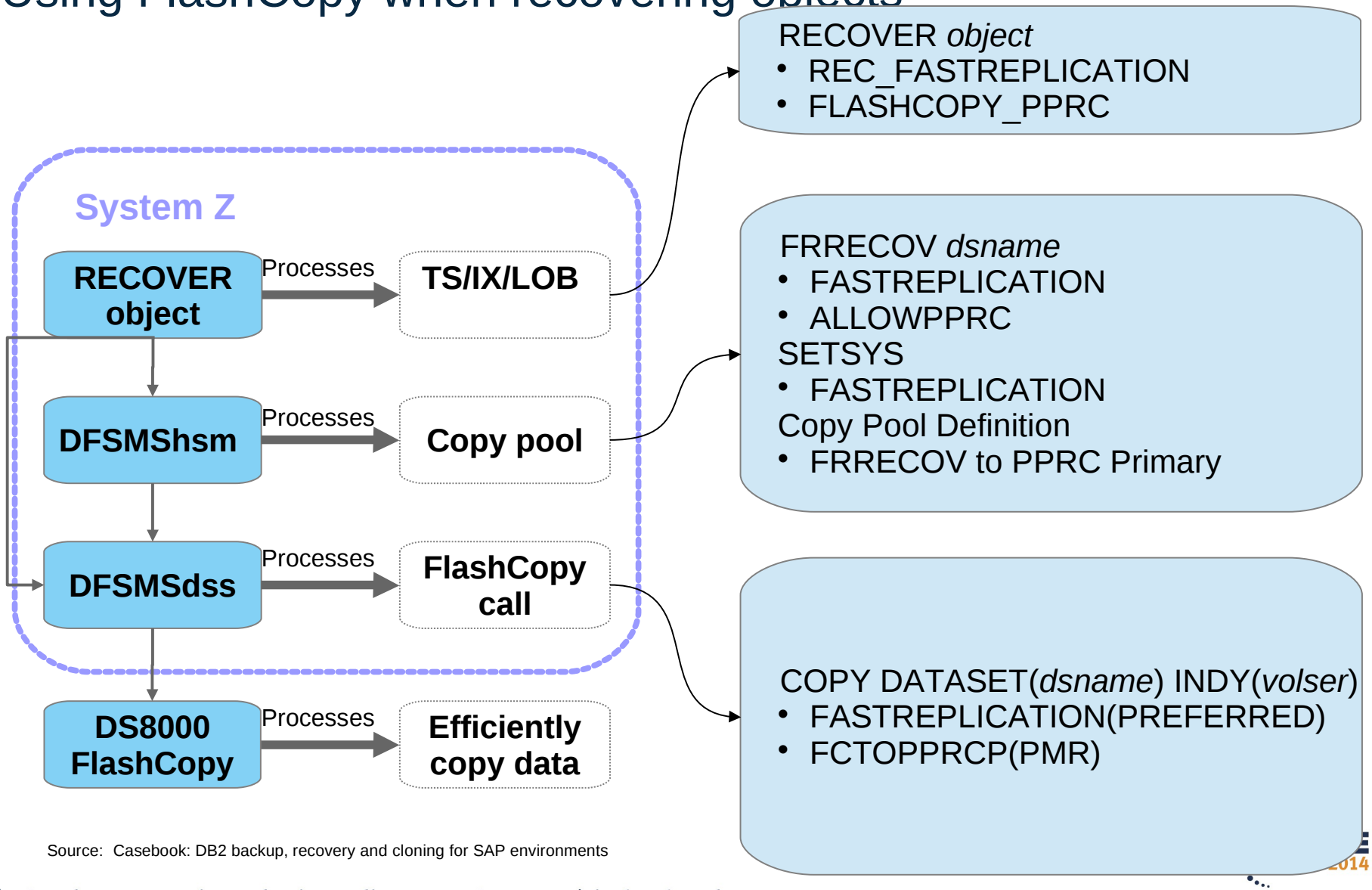
Using FlashCopy when recovering objects



Source: Casebook: DB2 backup, recovery and cloning for SAP environments

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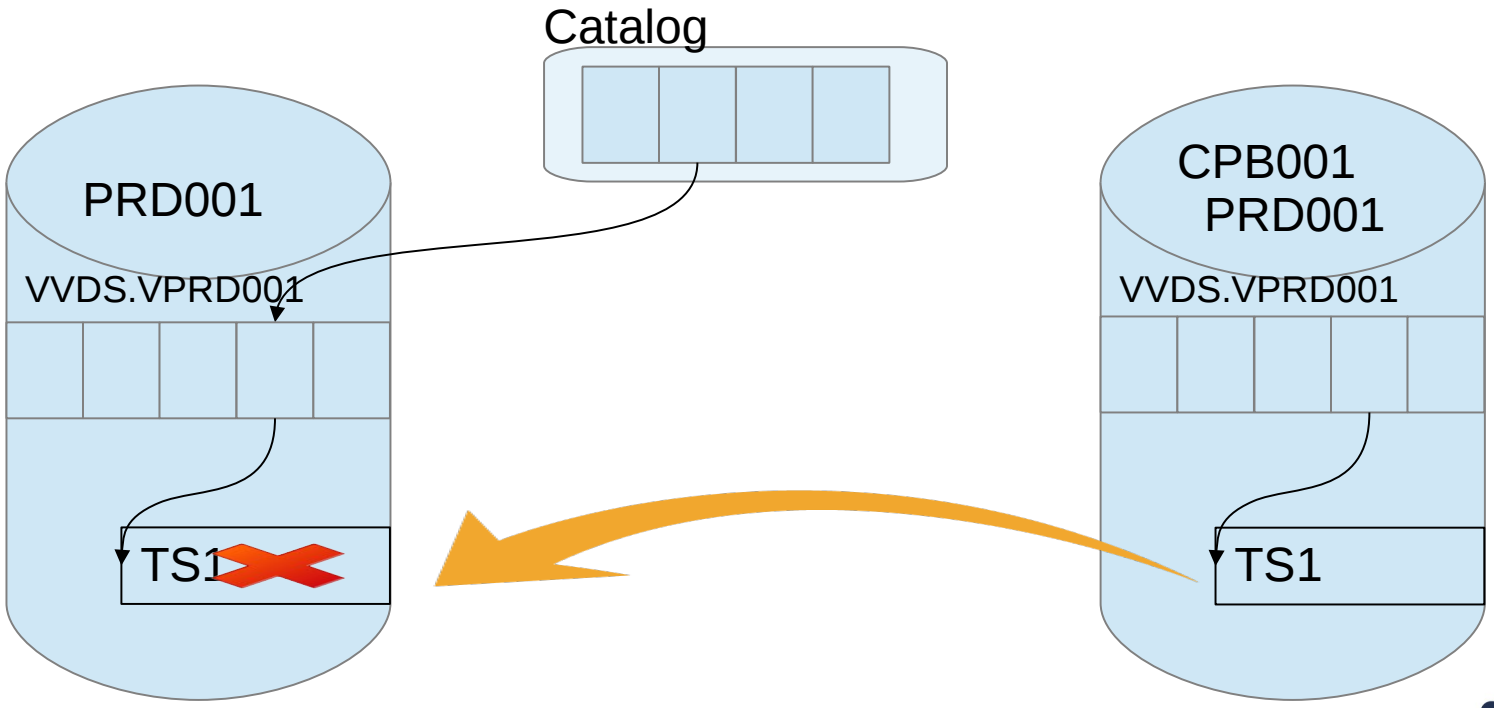
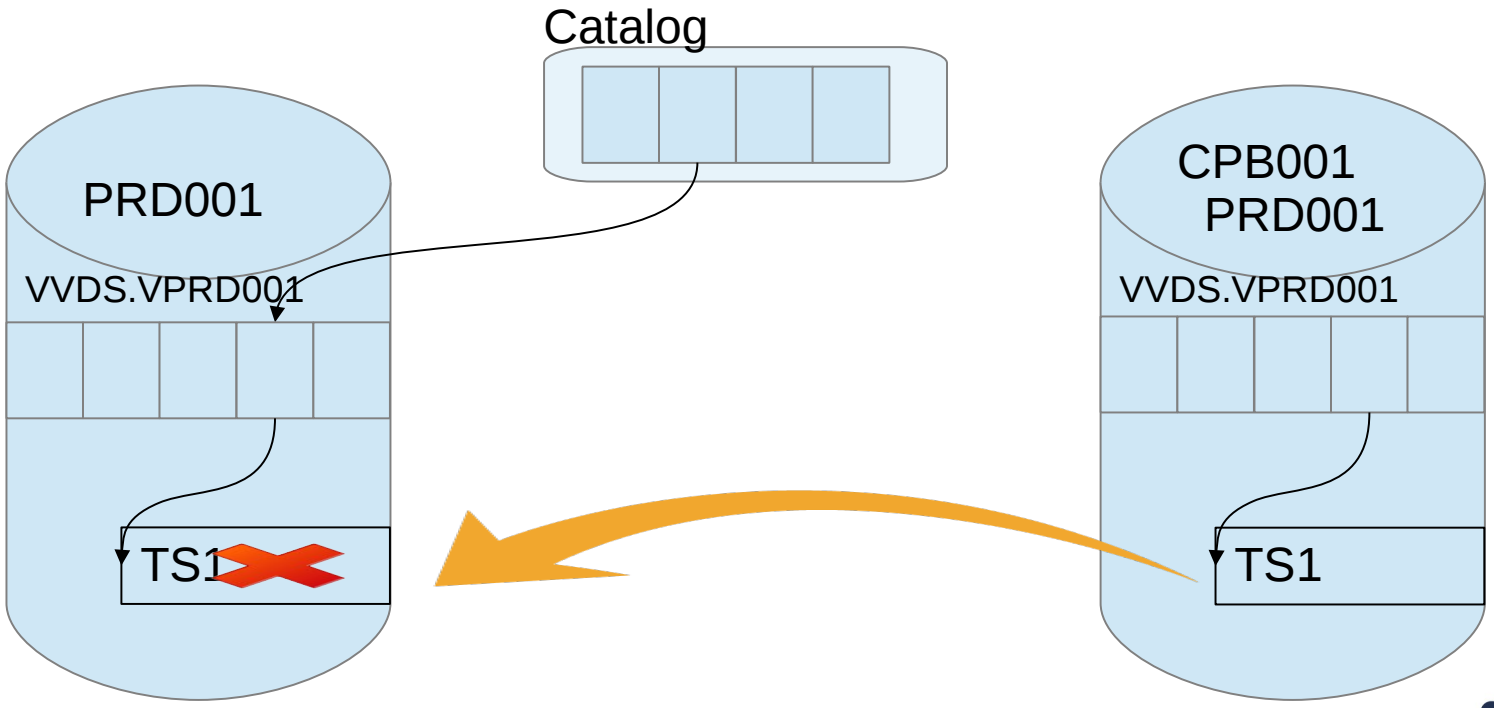
Object Level Recovery Today

- DB2 RECOVER object from a system level backup



Enhancement to Object Level Recovery

- DB2 RECOVER object from a system level backup



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Enhancement to the object level recovery

- Requires DFSMSdss and DFSMShsm PTFs
  - DFSMSdss
    - *V1R13 OA41275 PTF – UA73031*
  - DFSMShsm
    - *V1R13 OA41298 PTF – UA73035*
    - *V2R1 – OA42298 PTF - UA70295*

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When would an image copy recovery fail

- T0 - take a system level backup
- T1 - take an image copy backup
- T2 - image copy backup completes
- T3 - corruption to table space
- T4 – recover object from image copy backup
  - If system level backup has not completed from T0 then this will fail because the target of your recovery is the source of a FlashCopy relationship.
    - *Cannot have a cascaded FlashCopy relation*

Multiple Incremental FlashCopy

- DFSMShsm and DFSMSdss, in conjunction with the DS8000 will support Multiple Incremental FlashCopy relationships
  - Currently available by RPQ
  - Supports up to twelve incremental FlashCopy relationships
- Transparent to DB2

References

- DFSMSdss Storage Administration
- DFSMShsm Storage Administration
- DB2 for z/OS Utility Guide and Reference
- Casebook: DB2 backup, recovery and cloning for SAP environments
- IBM System Storage DS8000 Copy Services for IBM System Z

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System Z Social Media Channels

Top Facebook pages related to System z:
IBM System z
IBM Academic Initiative System z
IBM Master the Mainframe Contest
IBM Destination z
Millennial Mainframer
IBM Smarter Computing

Top LinkedIn groups related to System z:
System z Advocates
SAP on System z
IBM Mainframe- Unofficial Group
IBM System z Events
Mainframe Experts Network
System z Linux
Enterprise Systems
Mainframe Security Gurus

Twitter profiles related to System z:
IBM System z
IBM System z Events
IBM DB2 on System z
Millennial Mainframer
Destination z
IBM Smarter Computing

YouTube accounts related to System z:
IBM System z
Destination z
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- **Top System z blogs to check out:**
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  - Smarter Computing
  - Millennial Mainframer
  - Mainframe & Hybrid Computing
  - The Mainframe Blog
  - Mainframe Watch Belgium
  - Mainframe Update
  - Enterprise Systems Media Blog
  - Dancing Dinosaur
  - DB2 for z/OS
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