



Database Backup and Recovery for DB2 on z/OS

Effortlessly manage DB2 backup, recovery, and disaster recovery while minimizing DB2 down time. Provide instant backup, parallel recovery, and disaster restart while using less CPU and I/O resources.

Database Backup and Recover for DB2 (DBR for DB2) is a DB2 for z/OS backup and recovery solution that simplifies and speeds up DB2 for z/OS backup, recover and disaster recover operations. DBR for DB2 is a “storage-aware” backup and recovery manager that is tightly integrated with storage processors to speed up DB2 backup and recovery processing and save CPU and I/O resources by using storage-based fast-replication facilities. DBR for DB2 automates the storage management functions for DBAs so they can leverage storage-based fast-replication without having to create or use storage specific commands, scripts, or JCL.

DBR for DB2 provides a fast and easy-to-use implementation of a DB2 system level backup methodology where backups can be used for system, application, object, or disaster recovery purposes. It reduces backup windows by leveraging storage-based fast-replication such that backups of multi-terabyte databases can be performed in seconds or less. It simplifies backup and recovery methodologies by allowing full-system, application, and object-level recoveries to be performed from a common system level backup. It provides DB2 system level backup and recovery support for complex applications like SAP and PeopleSoft where all of the application's data must be backed up, restored, and recovered as a unit.

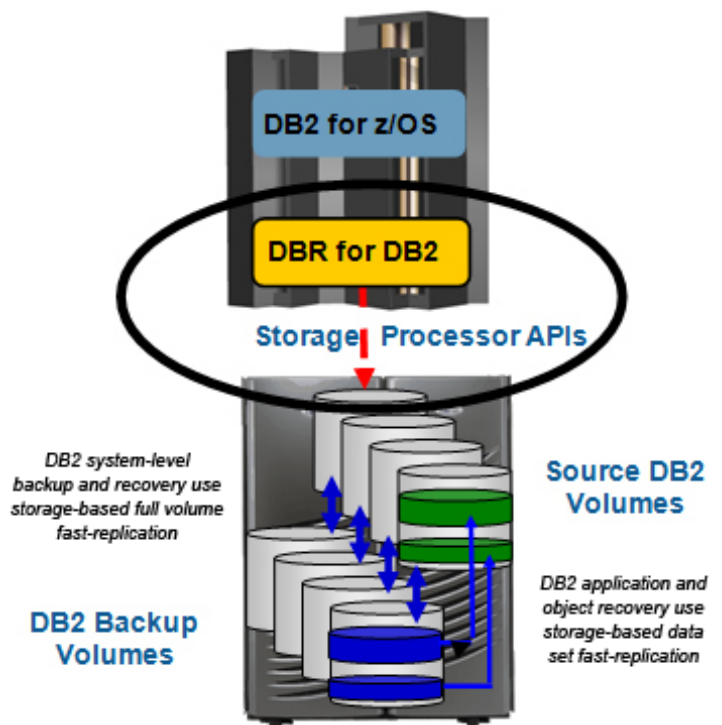


Figure 1 DBR for DB2 is storage-aware and uses storage processor APIs to create DB2 system level backups.

DBR for DB2 uses an intuitive and sophisticated ISPF interface to navigate through its features and use. The following figure represents DBR for DB2 main ISPF menu.

```
MAINSTAR V2R2 ----- Database Backup and Recovery for DB2 -----
Option ==>
                                     2009/06/03 16:04:47
                                     User: PDBOB   - DBR
-----
0. User Settings
1. System Backup Profiles
2. System Restore and Offload
3. Object Recovery Profiles
4. Disaster Recovery Profiles
5. DB2 Subsystem Analysis and Configuration
6. Exit
```

Figure 2 DBR for DB2 ISPF main menu.

- ▶ User Settings - Establishes configuration and usage defaults.
- ▶ Systems Backup Profiles - Defines system backup profile characteristics including; number of online backups, backup type, consistency method, fast replication usage, etc.
- ▶ System Restore and Offload - Provides facilities to select a system backup for recovery and specify recovery type and scope. Defines backup archival characteristics including data mover specifications, tape naming schemes, number of maintained offline backups, etc.
- ▶ Object Recovery Profiles - Specifies object groupings and recovery options for object and application recovery coordination.
- ▶ Disaster Recovery Profiles - Specifies source and recovery site structures that are used to automate remote recovery processes, reduce recovery time objectives (RTO), and minimize recovery point objectives or data loss (RPO).
- ▶ DB2 Subsystem Analysis and Configuration - Discovers DB2 systems, identifies database layout issues and optionally adjusts DB2 layouts to support a system level backup methodology that accommodate recovery requirements. DBR for DB2 analysis provides comprehensive backup and recovery reporting capabilities and has robust database and storage validity checking to ensure successful creation and usage of DB2 system level backups.

DB2 System Level Backup

DBR for DB2 is a storage-aware backup and recovery solution that backs up DB2 systems instantaneously with no impact to business applications. Backups can be made for an entire DB2 system or for a partial DB2 system. All backups are created consistently using “full” or “data only” system level backup options. DBR for DB2 performs system level backup and restore operations by invoking appropriate fast-replication facilities in the storage system through appropriate storage processor APIs. Leveraging storage-based fast-replication to perform backup operations in the storage processor significantly reduces host CPU and I/O Utilization costs and allows CPU upgrades to be deferred.

Storage blades provide storage processor integration and extensibility to support heterogeneous storage platforms and fast-replication features. DBR for DB2 supports IBM, EMC, and HDS storage systems and fast-replication facilities using integrated storage blades. DBR for DB2 storage blades include:

- ▶ IBM FlashCopy Storage Blade - Provides IBM native FlashCopy support
- ▶ EMC TimeFinder Storage Blade - Provides TimeFinder/Mirror, TimeFinder/Clone, TimeFinder/Snap Virtual Device, and EMC Enginuity Consistency Assist support
- ▶ HDS ShadowImage Storage Blade - Provides HDS ShadowImage support
- ▶ DFSMSdss Storage Blade - Allows backups to be performed using DFSMSdss. DFSMSdss can optionally be used to invoke FlashCopy or SnapShot fast-replication methods.
- ▶ IBM Backup System Storage Blade - Provides DB2 BACKUP SYSTEM support to invoke FlashCopy fast-replication methods.

A DB2 system level backup is a “restartable” copy. A restartable DB2 copy is one that has a dependent-write consistent data state from an I/O perspective. This data state is identical to the data state that is created by a power failure. A restartable DB2 copy is created by suspending I/O while a backup operation is performed. A restartable DB2 copy can be created using a DB2 Set Log Suspend function, or a DB2 BACKUP SYSTEM function, or by using storage-based consistency functions.

Meta-data Repository

DBR for DB2 has a meta-data repository to record DB2 source and backup volume relationships along with correlated DB2 recovery information. The repository keeps track of backup volumes, backup time, and pertinent DB2 log RBA values to aid recovery. It also records data set and volume mapping to allow object recovery from a system backup. The meta-data repository is maintained by DBR for DB2 and can be backed up when a DB2 system level backup is performed.

Multi-purpose System Level Backup

DBR for DB2 generated system level backups can be used for multiple purposes and saves storage and processing resources. A DB2 system level backup can be used for DB2 system recovery, application recovery, table and index space recovery, and for disaster restart. Thus, saving the CPU, I/O and storage resources required to make multiple backups for different purposes.

DB2 Discovery, Analysis, and Configuration

DBR for DB2 discovers DB2 systems and provides configuration advice for adjusting data set layouts to accommodate a system backup methodology. It provides guidance and assistance in isolating DB2 recovery structures from DB2 catalog and data structures if required. Reports show DB2 data set and volume mappings and highlight volumes where non-DB2 data sets are collocated with DB2 data sets. It provides alerts when identifying data set layout issues that may affect backup or recovery operations. DBR for DB2 will optionally move data sets appropriately to accommodate a system backup methodology that can be used to support recovery objectives.

Backup Profiles

Backup profiles make it easy to define and manage your backup processes. Backup profiles define the type of fast replication to use, source DB2 volume and backup volume relationships, the number of online backups to maintain, backup consistency mechanisms, and tape archival characteristics. Backup profiles contain information and options needed to perform a system level backup and provide validity checking to ensure backups are complete. DBR for DB2 generates JCL that is used to execute the backup using the characteristics defined in the backup profile. The generated JCL is used to perform the DB2 system level backup at predetermined times.

Backup Validation

DBR for DB2 automatically performs DB2 discovery during the backup process to validate that backups are complete. The validation ensures the integrity of the restoration process which provides the basis for successful recovery. It validates ICF catalog information, source and target volume information, recovery structures and object data separation, and it ensures the DBR for DB2 meta-data repository resides on a separate device from volumes being backed up. DBR for DB2 can ensure that system backups are valid for a recovery to a specific point in time.

Create Image Copies from a System Level Backup

DBR for DB2 can create image copies from a system level backup. These image copies can be registered in SYSCOPY and used by any utility that uses image copies as input. DBR for DB2 can also generate image copies from archived backup copies when backups are archived with DFSMSdss. Performing image copies from a system level backup allows the image copies to be done at exactly the same time; thus, minimizing log apply processing and reducing recovery time when they are used for recovery. Generating image copies from a system level backup directs image copy I/O to backup volumes and removes I/O contention from production DB2 volumes.

Backup and Recovery Health Check Reports

DBR for DB2 produces detailed reports on each backup showing the volumes involved and the type of DB2 data they contain. A recovery health check report performed on a system level backup will indicate whether recovery will be successful given a recovery point-in-time (PIT). If image copies have been moved or a utility has been run on an object that makes recovery impossible such as a LOG NO event, DBR will indicate which objects cannot be recovered and why. It can automatically generate JCL to restore objects that were left in recover or rebuild pending after a system restore operation.

Partial DB2 System Backup

DBR for DB2 can perform partial system backups to minimize storage resource utilization and accommodate backup methodologies where application objects are backed up more or less frequently. A partial system backup is one where select volumes that support specific application objects are backed up using volume based fast-replication. DBR for DB2 partial system backups are faster than using image copy processes, all related objects are backed up at the same time, and backups are performed without using host CPU and I/O resources. Partial DB2 system backups cannot be used for DB2 system recovery but can be used for application or object level recovery. Partial DB2 system backups reduce application and object recovery time as backups are restored using data set fast-replication and DB2 log apply processing is minimized.

Backup Archiving and Tape Offload

DBR for DB2 manages the archival of disk based backups by offloading them to tape or copying them to disk. DBR for DB2 supports DFSMSdss, DFSMSHsm, and Innovation Data Processing's FDR for performing the tape, disk, or remote disk offload process. Archive tuning options allow specification of the number of subtasks and the number of disk volume backups to stack on single output tape. Data encryption offload options support DFSMSdss and FDR encryption mechanisms.

Enhance DB2 BACKUP SYSTEM

DBR for DB2 provides support for DB2 BACKUP SYSTEM by using the DBR Backup System storage blade. This storage blade drives DB2 BACKUP SYSTEM and extends its functionality.

Extended DB2 BACKUP SYSTEM functionality includes:

- ▶ Provides an easy to use ISPF interface to setup and perform all aspects of DB2 system level backup and restore processes.
- ▶ Discovers and sets up DB2 systems to allow DB2 BACKUP SYSTEM to be implemented effectively.
- ▶ Validates the DB2 BACKUP SYSTEM process to ensure the DB2 system is configured properly and all associated storage volumes are backed up. Validation helps determine if the backup is valid before it is needed for restoration.
- ▶ Maintains a data set to volume mapping repository showing where data set existed at the time of the backup so objects can be restored from the DB2 BACKUP SYSTEM system level backup. Without the data set and volume mapping inventory, data sets cannot be restored if DB2 data sets are moved or deleted.
- ▶ Provides an ISPF interface to perform application and object recovery from a system level backup. See DB2 Application and Object Profiles below.
- ▶ Produces reports showing backed up DB2 tablespace and indexspace data sets and volumes they reside on. These reports eliminate the need to print and merge BSDS and HSM reports.
- ▶ Provides disaster recovery support using a system level backup on tape or using image copies. See DB2 Disaster Recovery and Restart below.
- ▶ Provides the ability to create image copies from the system level backup.
- ▶ Provides backup and recovery health check reporting and can automatically generate JCL to restore objects that were left in recover or rebuild pending after the system restore.

DB2 Recovery Performed Efficiently

DBR for DB2 reduces recovery time by parallelizing restore and recover operations. DBR for DB2 uses storage-based fast-replication facilities to restore backups quickly while invoking DB2 recovery processes in parallel to reduce overall recovery time and minimize DB2 and application down time. DB2 systems are restored using volume-based fast replication and DB2 applications or objects are restored using data set-based fast replication facilities.

DB2 System Recovery

DB2 system recovery is performed by restoring a system level-backup and invoking DB2 recover processes to recover the system with one pass of the log. A DB2 system level backup is a “restartable” copy that has a dependent-write consistent data state preserved during the backup process. The backup data state is identical to that created by a power failure. DB2 system recovery is accomplished by restoring a system level backup and DB2 recovery is performed implicitly during normal DB2 initialization. DB2 initialization performs recovery functions that transform the dependent-write consistent data state to a transactionally consistent data state. Recovery can be performed to the point-in-time of the backup or to any point on the log using an RBA, an LRSN, or a log-correlated-time point to control the recovery scope.

DBR for DB2 generated system level backups can be restored from disk or tape. Tape restart options are available to reduce the impact of job failures while restoring a DB2 system level backup from tape. DBR for DB2 keeps track of volumes in the meta-data repository as they are restored and will restart from the failure point when the RESTART parameter is used. This parameter allows DBR for DB2 to bypass restoring volumes from tape that were successfully restored in the previous job.

DB2 Application and Object Recovery Profiles

Application and object recovery is performed by creating object recovery profiles that predefine groups of objects that are recovered together. Object groupings can be related to an application. When the need to recover arises, the ISPF interface is used to select the appropriate object profile. DBR for DB2 executes the profile by analyzing the recovery resources available and automatically generates recovery JCL for all objects in the profile. The JCL generated is used to restore objects in the most effective manner using a system level backup or using image copies.

Object Recovery

DB2 applications and objects can be recovered using a system level backup. Recovery is performed quickly using storage-based data set fast-replication facilities to restore DB2 object data sets while invoking DB2 recovery processes in parallel to reduce overall recovery time and minimize application down time. Application and object recovery is done by creating object recovery profiles that predefine groups of objects that are recovered together. In addition, all objects related through DB2 defined referential integrity constraints can automatically be included in the objects profile. DBR for DB2 supports recovering objects to the last quiesce point, the last image copy, to current, or to a specified RBA or LRSN. DBR for DB2 also supports restoring objects that have moved since backup and data sets that do not exist at time of restore.

DB2 Disaster Recovery and Restart

DB2 system level backups simplify DB2 disaster recovery operations by transforming disaster recovery procedures into a DB2 disaster restart process that reduce DB2 recovery time objectives. A DB2 system level backup can be used to restart the DB2 system at a point in time when the backup was performed. DB2 system level backups can be automatically rolled forward using other DB2 recovery assets like offsite image copies and archive logs created since the system level backup.

DBR for DB2 restores the DB2 system from the last offsite system level backup and DB2 performs log apply system recovery implicitly during its normal initialization with one pass of the log. DB2 initialization performs recovery functions that transform the dependent-write consistent data state created during a system level backup operation to a transactionally consistent data state. Disaster recovery operations become as simple as restarting the DB2 system from a power failure.

Offloading storage-based DB2 system level backups to tape and then transporting the tapes to a disaster recovery site provides an effective tape-based disaster restart solution. A tape-based disaster restart solution transforms tedious DB2 disaster recovery procedures into an efficient tape based disaster restart process. Tape-based disaster restart solutions provide similar business continuity solution advantages as those that are based on remote storage replication like IBM PPRC and EMC SRDF.

Integration with Other Database Management Tools

DB2 systems can be cloned using a DBR for DB2 generated system level backup as input. Cloning DB2 systems allows production data to be used for testing, reporting, data warehouse loading, database utility processing, or other production offload tasks. Offloading these types of activities to a cloned DB2 copy reduces production I/O contention and allows processing activities on a static copy of the data. Mainstar: Volume Clone and Rename (VCR) can use a DBR for DB2 generated system level backup as input to create a DB2 clone at the point in time the system level backup was created.

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