

BMC Tools and Tactics
for Backup and Recovery

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IMPACT OF DOWNTIME

Your company has invested a lot of time and money to build mainframe applications that provide value to the business. Many times, these applications support customer-facing processes such as ordering goods and services, billing, shipping, and banking ATMS. If these applications are down due to a database outage, the business is down. In other cases, the applications support internal business processes such as inventory management and payroll. If these applications are down, the business may incur lost productivity or added cost.

You have implemented a successful disaster recovery process exploiting the latest technology in replicating or recovering your mainframe databases. You have tested the technology, worked out the kinks, and have met your corporate service level agreements for Recovery Time and Recovery Point Objectives. You have spent a lot of time and money to achieve this success and you deserve credit for it.

But ... what will you do if a disk system malfunctions due to bad maintenance or firmware? Will you declare a total site-wide disaster for that relatively small impact outage? And what if a program or utility process introduces data integrity issues in your databases?. If you have a mirrored disk, the data integrity issue exists at both sites.

You'll need to ensure that you have flexible recovery options for these smaller scale local recovery requirements. Using your mainframe database system's native utilities may not meet your recovery time objectives, and they may not offer the flexibility to perform complicated recoveries across database subsystems. Analyst studies indicate that 80% of all unplanned downtime is caused by user or program errors.

Here are several recent examples of outages and data integrity exposures that we've witnessed, which have caused unplanned downtime:

- » A network outage on a distributed system platform caused so much business disruption that the CIO mandated that all production applications be recoverable from any outage within two hours. The native mainframe database utilities could not meet that objective.
- » A disgruntled employee updated several DB2 databases with profane language.
- » An inadvertent update changed all the data in a customer database to indicate the customers were all male, irrespective of their actual gender.
- » An unload utility failed, but was not noticed. The subsequent load utility process resulted in data loss in production databases.
- » A mirrored file was inadvertently deleted. Since it was mirrored, the operators saw no reason to back it up. When it was deleted, the mirror was deleted as well. Over 18,000 batch jobs were impacted.

Most companies have established availability objectives like '5 9s' (99.999% available). That's less than 6 minutes a year of downtime! For planned outages, this may be achievable by exploiting mainframe technology like SYSPLEX logical partitions, which allow multiple processors to work against a common database. Individual processors can fail or be brought down for maintenance without affecting access to the database. For unplanned outages like the examples we've witnessed, a more realistic goal is complete recovery within hours. Many companies establish this recovery time objective at two hours of outage for any specific failure. That includes 'think time,' the time it takes to recognize a problem, diagnose it, and generate the recovery action. This means the actual recovery process target is much less than two hours.

To achieve that recovery time objective, you'll need to revisit both your backup strategy and your recovery processes. It may not be possible to take weekly or even nightly backups and expect to meet a two-hour recovery window if your DB2 log volume is high. BMC Software offers complementary backup, recovery, and log processing solutions to help you achieve the aggressive recovery time objective.

BACKUP

BMC Software provides many techniques for backup of DB2, IMS, and VSAM files with reduced or eliminated outage. We had a customer come to us with some stringent recovery requirements (less than two hours) after they discovered the native DBMS recovery took over six hours. To achieve that goal, we had to address their backup strategy. Their requirements for backup became:

- » Support recovery time objective of less than two hours
- » High speed copy process
- » Zero outage copy process
- » Cheap copy process (lower CPU)

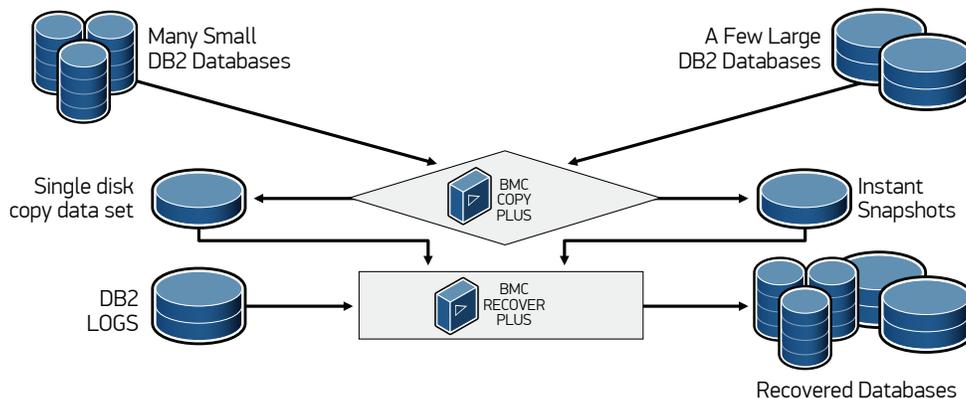
We were able to meet these needs with a new backup strategy that relies on a 'Hybrid Copy' process that exploits several advanced or unique BMC features:

- » Instant Snapshot of the largest objects – a rapid disk-based operation that exploits Intelligent Storage Device technology such as IBM Flashcopy 2 or EMC Snap. There is very little CPU associated with type of copy as most of the work is done by the DASD controller. The copies were done as 'SHRLEVEL CHANGE' so there was no outage to the application. The disk copies are done in seconds, even for very large objects.
- » DB2 Cabinet Copy for the many smaller objects – during the normal copy of an application, there may be 2,000 objects being copied. The copy has to allocate and open a data set for each of the 2,000 objects, many of which may be very small. Cabinet copy allocates and opens a single dataset, then copies all the objects into it, saving a lot of CPU and elapsed time. These copies were also done 'SHRLEVEL CHANGE' so there was no outage.
- » Wildcarding – the ability to code a pattern mask to sweep all the objects that meet the criteria into a single copy process.
- » Dynamic Group Definitions – the ability to define an application object group that is automatically updated as objects are created or dropped.

By coding the Hybrid Copy using these features, a single copy job with a single copy statement processed over 1,800 objects. 200 of the objects met a size threshold and were routed to an Instant Snapshot. The remaining 1,600 objects were small and copied into a single Cabinet Copy. Because the copy process causes no outage, it can be run several times a day to meet the two-hour recovery point objective. The copy process is cheap and fast, requiring minimal CPU overhead and clearing out of the processor initiators quickly.

Answer – **Hybrid Copy** - part Cabinet Copy, part Instant Snapshot Copy
One BMC Copy statement (DB2 Example follows) -
COPY TABLESPACE DB.* SHRLEVEL CHANGE STACK CABINET
OUTSIZE parm drives large objects to DSSNAP, small to cabinet copy

Generated copy for 1828 data sets (198 Instant Snapshot, 1630 regular copy)
17 Minutes elapsed time (**NO OUTAGE due to SHRLEVEL CHANGE**)
Very little CPU time
Forward Recovery time for entire application – **49 minutes**



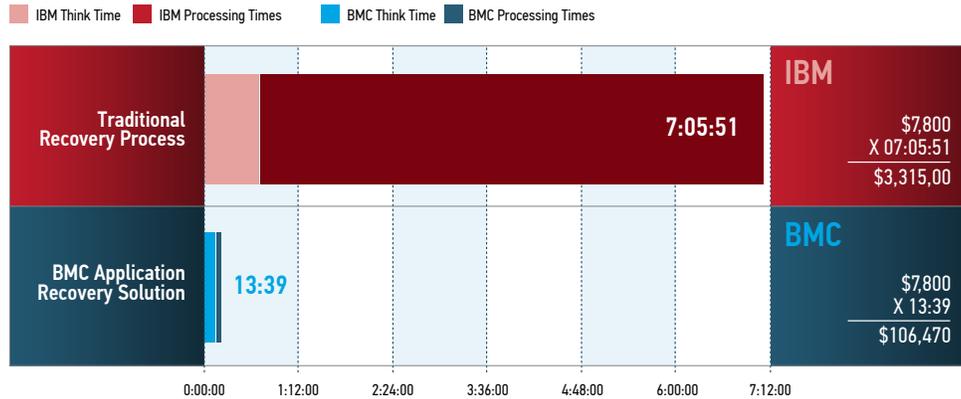
RECOVERY

For the disk-based failures described above, the underlying database datasets are destroyed or inaccessible, so a full forward recovery will be required. This type of recovery restores a recent backup and applies DBMS log data to rebuild the database to the point of the failure. Benchmarks show the BMC recovery utilities are several time faster and use less CPU than the native DB2, IMS, or VSAM utilities delivered with the DBMS.

For the data integrity issues generated by bad updates to particular objects, the BMC Log Master for DB2 UNDO function can be used to correct the data. Running the UNDO SQL through the unique High-Speed Apply Engine can dramatically reduce the time it takes to correct the data. The Log Master reports can also be used to identify who did the update and what program they used to do it. Many companies use these reports to monitor 'super users'— those users with authorization to change data outside of business processes and programs.

In the case of a bad program update or utility process failure, it may be required that you recover the affected objects to a point in time prior to the improper action. The underlying database dataset is intact; it just has incorrect data in it. All of the BMC recovery products support a type of recovery that can 'backout' the changes to any point in time. You can also use the BMC recovery products to identify objects that do not need recovery if they were unaffected by the bad program or utility. The combination of backout and recovery avoidance can reduce a seven-hour recovery to a 15-minute recovery.

Physical BACKOUT + Recovery Avoidance + Automation delivers REAL ROI!



The ability to recover DB2 and IMS database datasets to any point in time can be exploited to perform a coordinated recovery. Many applications have components from several DBMS databases, so a point-in-time recovery to any of the components may require a recovery to the same point in time for other DBMS components.

ADDITIONAL CAPABILITIES

Backup and recovery tools can be used in support of day-to-day operations as well. Many customers use the BMC DB2, IMS, and VSAM recovery tools in support of data replication, data migration, high availability object structure changes, audit reporting, and more. For additional information on these and other features of the BMC tools, please see the following web links:

- » [BMC Recovery Management for DB2](#)
- » [BMC Backup and Recovery Solutions for IMS](#)
- » [BMC Recovery Utility for VSAM](#)

If you already own BMC Software mainframe products and have a Support ID, you can watch some excellent demos of many of these features in the [BMC Documentation Center](#).

