# HPE Shadowbase Data Recovery Software

## Restore Corrupted Databases to a Known-working State

Database corruption can occur for a variety of reasons such as programming errors, user or administrative staff mistakes or malfeasance, and other reasons. This corruption could cause an application outage, database inconsistencies, data unavailability, or the application to return erroneous results, any of which could have serious financial, regulatory, and other consequences. Fortunately, HPE Shadowbase UNDO and REDO can restore a corrupted database to a known-working state.


## HPE Shadowbase UNDO

The HPE Shadowbase UNDO solution works with any existing data replication engine in a modified configuration to correct data corruption while the application optionally stays online and continues normal operation. The approach uses the Database Management System (DBMS) change data log to reverse or roll-back the database to a known-correct state (Figure 1C). On an HPE NonStop, the change data log is the TMF Audit Trail.

More specifically, when database corruption is known or suspected, Shadowbase UNDO reads the DBMS change log to access the events that caused the corruption. It reads from either the start point of corruption to the end point, or in reverse, from the end point to the start point. These points usually are supplied by the administrator as date/time values in a timestamp or as change queue location values; although in some situations, a list of known-corrupted transaction or event identifiers can be used to access the events that need to be undone.

Although not required, database changes can be saved by Shadowbase UNDO into an intermediate UNDO Queue, which may be reviewed by the user to identify the events needing to be undone. If incorrect, the UNDO Queue can be purged, the start/end points adjusted or other filtering logic edited, and the UNDO Queue rebuilt from the change data log. This process can be repeated until the user is satisfied that the UNDO Queue properly captures all corrupting events. The events in the UNDO Queue are then read and converted by Shadowbase UNDO software, and applied to the original occurrence in reverse order to *back out, rollback,* or undo the original changes.

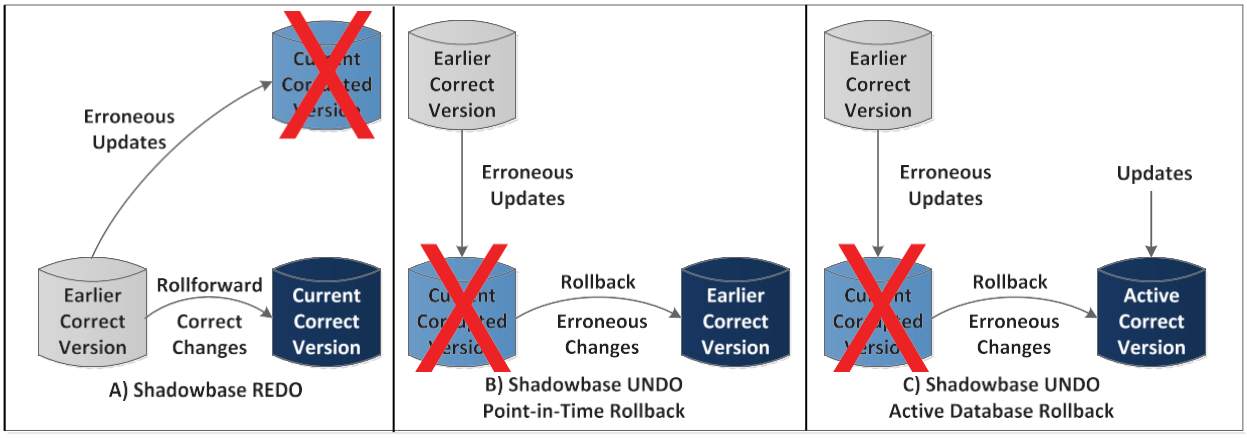
More specifically, the original events are converted from their original type as follows:

- COMMIT(s) -> BEGIN(s)
- BEGIN(s) -> COMMIT(s)
- INSERT(s) -> DELETE(s)
- DELETE(s) -> INSERT(s)
- UPDATE(s) after image -> UPDATE(s) before image

The original order of the events is then reversed and applied by Shadowbase UNDO, effectively rolling back the transaction's changes.

Aborted transactions are skipped, and dangling transactions (those without a COMMIT or ABORT event) are optionally skipped or applied. The UNDO operation changes are typically reapplied against the source database to selectively "roll back" the changes that were originally made erroneously. If replication to a target environment is in use, then these changes could be replicated to the target database to fix the corresponding corruption in that database. If desired, correct database changes that were applied subsequently to the corruption could be preserved so that the application can continue to run while the UNDO operation is taking place.

Shadowbase UNDO is a powerful and flexible tool which can be used to quickly restore a corrupted database to a known correct state, without taking the application or database offline, thereby mitigating the potential costs and issues arising from incorrect data or application downtime. It is also useful for reversing database changes to reset a database to an earlier point-in-time state (for example, to reset a database prior to executing a series of regression test cases, or to reset a database to its original state after a series of test cases are run; see Figure 1B).




**Figures 1A, B, C – Repairing Database Corruption with HPE Shadowbase REDO and Shadowbase UNDO**

## HPE Shadowbase REDO

The architecture for HPE Shadowbase UNDO can be leveraged to provide another database restoration product, Shadowbase REDO. Whereas Shadowbase UNDO "rolls back" selected database changes, Shadowbase REDO "rolls forward" selected database changes onto an earlier (typically saved) copy of the database (Figure 1A). It creates an up-to-date database that excludes certain operations that are deemed inappropriate or undesirable. The procedure involves saving a copy of the original database (for example the disk mirrors), making changes, capturing them in a REDO change queue, and then reverting back to the original copy with re-apply of the REDO change queue to the desired point.

For both Shadowbase UNDO and Shadowbase REDO, helpful reports can be generated from the UNDO or REDO Queues to aid in determining the period of corruption and the contributing sources. The scope of corrective activity is specified by a user or system administrator and includes a time or transaction range, a list of affected files and tables, and a list of sources of corrupted transactions, such as users, programs, etc. Shadowbase UNDO and Shadowbase REDO filter database changes and undo or redo only those specified by the administrator, giving the user total control over which events should be kept or removed.

## Summary

HPE Shadowbase Data Recovery Software is part of the Shadowbase Essentials bundle and can safely restore corrupted databases with a minimum of downtime and a maximum of confidence, quickly and reliably eliminating the potential costs and risks associated with corrupted data. Shadowbase UNDO and REDO are flexible, fully configurable, and able to meet specific needs, including customization via powerful user exit facilities. Depending on the nature of the corruption, Shadowbase UNDO and REDO may be used when significant data corruption has occurred, affecting a large part of the database, or if the amount of data corruption is smaller, localized, or service availability must be maintained while recovery is in process. In either case, HPE Shadowbase Data Recovery Software products enable the rapid recovery of business services from the effects of corrupted data.

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