Software Product Description

PRODUCT NAME: VAX RMS Journaling, Version 5.4 **SPD 27.58.05**

DESCRIPTION

VAX RMS Journaling helps maintain the data integrity of RMS files in the event of a number of failure scenarios. Journaling helps to protect RMS file data from becoming lost or inconsistent.

VAX RMS Journaling provides the following three methods of journaling:

- After-image (AI) journaling provides the ability to redo a series of modifications to a data file. This type of journaling helps recover lost or corrupted files. After-image recovery restores the contents of the file from the point of the latest backup copy of that file.
- Before-image (BI) journaling provides the ability to undo a series of modifications to a data file. This type of journaling allows a file to be returned to a previous known state. This is useful in the event that a file is updated with erroneous data.
- Recovery unit journaling helps maintain transaction integrity, where a transaction consists of a group of related operations that must be "atomic". That is, either all of the operations complete in their entirety or none of the operations complete. This type of journaling helps prevent data from becoming inconsistent due to the incomplete execution of a transaction.

Journaling is applied on a file-by-file basis. A file can be marked for after-image, before-image, recovery unit journaling, or any combination of these methods. Within a given application, any combination of journaling methods can be used.

VAX RMS Journaling stores the information necessary for data recovery in files known as journals. Multiple data files may use the same journal.

RMS Recovery Unit Journaling and DECdtm Transactions

Transactions are defined and managed using the DECdtm transaction services available in VMS. An RMS recovery unit is a set of RMS record operations, performed in the context of a single process, that are part of transactions coordinated by DECdtm services. RMS recovery units are started automatically by RMS and RMS recovery units are committed or aborted along with the transaction of which they are a part.

VAX RMS Journaling functions as a participating resource manager through the utilization of DECdtm services. DECdtm services are implemented using a two phase commit protocol as described in the VMS Operating System Software Product Description (SPD 25.01.xx). Recovery unit journaling supports both a one-phase and a two-phase commit protocol.

Remote RMS files (files accessed by means of the DAP/FAL protocol) that are marked for recovery unit journaling can be modified within a transaction, and will be included in the "atomic unit of work" defined by the transaction. Also, the modifications made to RMS files marked for recovery unit journaling can be combined with modifications made using any resource manager that supports DECdtm services into a single "atomic" transaction.

The Recovery Unit Facility (RUF) services have been superseded by DECdtm services. However, the RUF services are still supported and are transparently emulated using the DECdtm services. Existing applications written using the RUF services continue to work without recompilation or relinking.

Supported File Organizations

All RMS file organizations are supported by VAX RMS Journaling. Any sequential, relative, or Prolog 3 indexed file can use journaling. However, the following restrictions apply:

- Prolog 1 and Prolog 2 indexed files are not supported by VAX RMS Journaling.
- Sequential files are limited to a record size of 32667 bytes.
- Files marked for recovery unit journaling cannot be written with the DCL WRITE command.
- Stream files cannot be modified in shared mode in a recovery unit.
- Sequential files having VFC record format do not allow shared access for recovery unit journaling.

When using recovery unit journaling with shared fixed-length sequential files, any abort processing overwrites records added to the recovery unit with zero bytes (null characters). This occurs because the record cannot be deleted from the file.

All files that are marked for journaling must reside on Files-11 Structure Level 2 disks. All journals must also reside on a Files-11 Structure Level 2 disks. It is recommended that journals used for after-image journaling reside on a disk volume that is different from the disk volume where the data file that uses the journal resides. Journaling across a network or to a tape device is not supported.

Marking Files for Journaling

VAX RMS Journaling is enabled on a file-by-file basis. Files marked for after-image, before-image, and recovery unit journaling are enabled by using qualifiers to the DCL command SET FILE. Any combination of qualifiers may be used with a particular SET FILE command or series of SET FILE commands. Files are unmarked for journaling using the SET NOFILE command.

The most recent SET FILE command for a given file overrides all previous SET FILE commands for that file.

Successful marking of an RMS file for journaling requires exclusive access to the file specified in the SET FILE command. Exclusive access means the RMS file being marked for journaling must be closed; that is, application programs accessing that file must be shut down before the file can be successfully marked for journaling.

No modifications to application programs are required for long-term (after-image or before-image) journaling. Once a file has been marked for long-term journaling, journal information will be written to the journal each time the file is modified. The file must have been opened subsequent to the issuance of the SET FILE command that marked the file for VAX RMS Journaling. All modifications to the file are recorded in the journal until the file is unmarked for journaling.

Modifications to application programs are required for recovery unit journaling. At a minimum, the program must specify the start and end of a recovery unit, using the recovery unit system services. When a file is marked for recovery unit journaling, all modifications to that file within an application must be within a recovery unit.

Journal File Maintenance

After-image and before-image journals require periodic maintenance. Because journal files can expand indefinitely and a journal must reside on a single volume set, occasional remarking of a file for journaling and all of the associated operations is required. This implies that applications accessing RMS data files marked for after-image or before-image, or both, journaling must be stopped periodically for journal maintenance operations.

Recovering Data - Long-Term Journaling

In the case of long-term (either after-image or before-image) journaling, data recovery is done using the RMS Recovery Utility. Recovery is on a file-by-file basis and must be explicitly requested; it is not done automatically. The RMS Recovery Utility is invoked at DCL level to either roll forward or roll back changes to the file. The Recovery Utility requires exclusive access to the file being recovered. Changes may be rolled forward or rolled backward until a time specified by the user.

To roll forward a file and redo changes, a VMS backup copy of the file must be on disk. This backup copy must have been made after the file was marked for after-image journaling.

Recovering Data - Recovery Unit Journaling

No user intervention is required to roll back a recovery unit that is incomplete. The rollback of an incomplete transaction is started and completed automatically the next time the user accesses the file.

Interaction with Backup

To recover data using after-image journaling, a backup copy of the file must be available. This copy must be made with the Backup Utility (BACKUP); a copy of the file made with the COPY or CONVERT command cannot be used. A backup copy of the file must be made after the the SET FILE/AI_JOURNAL command is issued but before the file is opened for update. BACKUP requires exclusive access to files being backed up. No user or application program may access the file until BACKUP is finished.

The use of BACKUP/RECORD is recommended. If the file is then rolled forward, the modifications that have been made since the most recent backup are applied.

If a backup copy of a file is rolled forward with the RMS Recovery Utility, you must remark the file for after-image journaling with the SET FILE/AI_JOURNAL command. A backup copy of that file must be made after it has been marked for after-image journaling and before application updates are allowed.

A backup copy of the file must be remarked for journaling if it is to be used in place of the original file.

Interaction with VAX Volume Shadowing

VAX Volume Shadowing may be used in conjunction with after-image journaling. After-image journaling helps recover data in the following cases not addressed by VAX Volume Shadowing:

- Mistaken deletion of a file by a system user or operator
- Corruption of the file system pointers
- RMS file corruption due to a software error or incomplete bucket write operations to to an indexed file

Failures Not Addressed by RMS Recovery Unit Journaling

Recovery unit journaling alone does not provide recovery in cases when a multi-block bucket write operation to an indexed file is in progress, leaving the bucket in the indexed file in a corrupt state. Use after-image journaling in conjunction with recovery-unit journaling to recover from the following failed multi-block bucket write operations:

- Failure of the VAX host during a multi-block write operation, such as a VMS crash, halt, power failure, or system shutdown.
- Permanent loss of path to the disk during a multi-block write operation.
- Cancellation of a multi-block write operation in progress. This occurs only in disks using DUDRIVER. Other disk drivers ignore the cancellation of I/O and are not affected.

HARDWARE REQUIREMENTS

Refer to the VMS Operating System Software Product Description (SPD 25.01.xx) for hardware requirements and supported processors.

OPTIONAL HARDWARE

None

CLUSTER ENVIRONMENT

This layered product is fully supported without restrictions when installed on any valid and licensed VAXcluster* configuration. The *HARDWARE REQUIREMENTS* sections of this product's Software Product Description and the VMS Operating System Software Product Description (SPD 25.01.xx) list any special hardware required by this product.

* VAXcluster configurations are fully described in the VAXcluster Software Product Description (SPD 29.78.xx) and include CI, Ethernet, and Mixed Interconnect configurations.

SOFTWARE REQUIREMENTS

VMS Operating System

VMS Tailoring

For VMS V5.x, the following VMS classes are required for full functionality of this system integrated product:

- VMS Required Saveset

For more information about VMS classes and tailoring, refer to the VMS Operating System Software Product Description (SPD 25.01.xx).

OPTIONAL SOFTWARE

None

GROWTH CONSIDERATIONS

The minimum hardware/software requirements for any future version of this product may be different from the requirements for the current version.

ORDERING INFORMATION

Software Licenses: QL-VDVA*-**
Software Documentation: QA-VDVAA-GZ
Software Product Services: QT-VDVA*-**

* Denotes variant fields. For additional information on available licenses, services and media, refer to the appropriate price book.

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