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Introducing the Database File System

This chapter describes the Database File System in details.

- Why a Database File System?
  Conceptually, a database file system is a file system interface placed on top of files and directories that are stored in database tables.
- What Is Database File System (DBFS)?
  Database File System (DBFS) creates a standard file system interface using a server and clients.

17.1 Why a Database File System?

Conceptually, a database file system is a file system interface placed on top of files and directories that are stored in database tables.

Applications commonly use the standard SQL data types, `BLOB`s and `CLOB`s, to store and retrieve files in the Oracle Database, files such as medical images, invoice images, documents, videos, and other files. Oracle Database provides much better security, availability, robustness, transactional capability, and scalability than traditional file systems. Files stored in the database along with relational data are automatically backed up, synchronized to the disaster recovery site using Data Guard, and recovered together.

Database File System (DBFS) is a feature of Oracle Database that makes it easier for users to access and manage files stored in the database. With this interface, access to files in the database is no longer limited to programs specifically written to use `BLOB` and `CLOB` programmatic interfaces. Files in the database can now be transparently accessed using any operating system (OS) program that acts on files. For example, ETL (extraction, transformation, and loading) tools can transparently store staging files in the database and file-based applications can benefit from database features such as Maximum Availability Architecture (MAA) without any changes to the applications.

17.2 What Is Database File System (DBFS)?

Database File System (DBFS) creates a standard file system interface using a server and clients.

- About DBFS
  DBFS is similar to NFS in that it provides a shared network file system that looks like a local file system and has both a server component and a client component.
- DBFS Server
  An implementation of a file system in the database is called a DBFS content store, for example, the DBFS SecureFiles Store. A DBFS content store allows each database user to create one or more file systems that can be mounted by clients. Each file system has its own dedicated tables that hold the file system content. In DBFS, the file server is the Oracle Database.
- DBFS Client Access Methods
  Learn about various methods to access DBFS in this section.

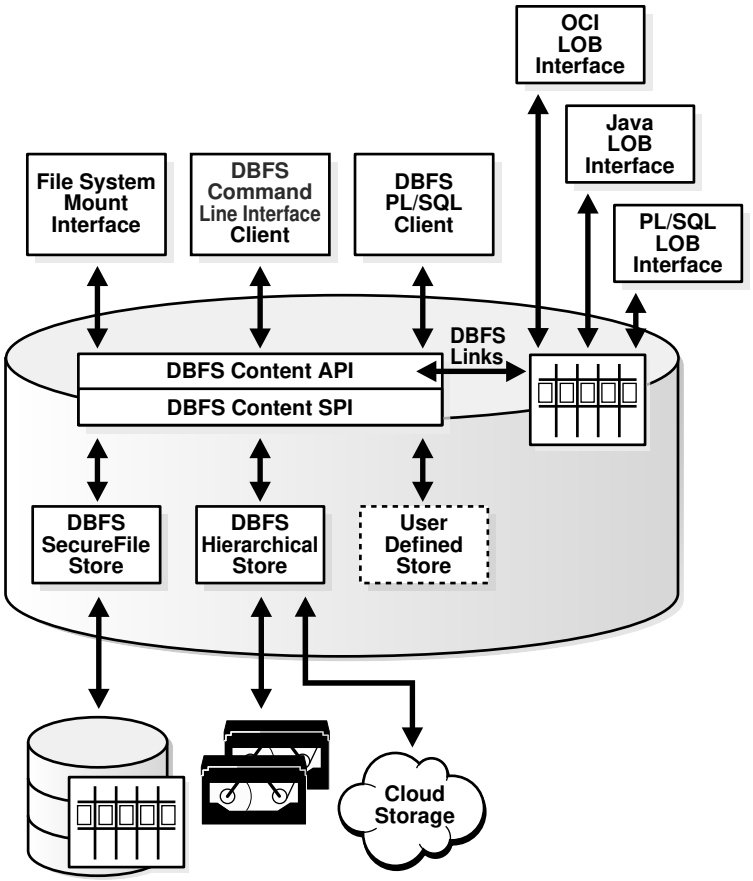
17.2.1 About DBFS

DBFS is similar to NFS in that it provides a shared network file system that looks like a local file system and has both a server component and a client component.

At the core of DBFS is the DBFS Content API, a PL/SQL interface in the Oracle Database. It connects to the DBFS Content SPI, a programmatic interface which allows for the support of different types of storage.

At the programming level, the client calls the DBFS Content API to perform a specific function, such as delete a file. The DBFS Content API `deletefile` function then calls the DBFS Content SPI to perform that function.

Figure 17-1 Database File System (DBFS)



17.2.2 DBFS Server

An implementation of a file system in the database is called a DBFS content store, for example, the DBFS SecureFiles Store. A DBFS content store allows each database user to create one or more file systems that can be mounted by clients. Each file system has its own dedicated tables that hold the file system content. In DBFS, the file server is the Oracle Database.

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Following are the different types of stores supported by the DBFS Content SPI:

- DBFS SecureFiles Store: A DBFS content store that uses a table with a SecureFiles LOB column to store the file system data. It implements POSIX-like file system capabilities.
- DBFS Hierarchical Store: A DBFS content store that allows files to be written to any tape storage units supported by Oracle Recovery Manager (RMAN) or to a cloud storage system.
- User-defined Store: A content store defined by the user. This allows users to program their own filesystems inside Oracle Database without writing any OS code.

See Also:

- Creating Your Own DBFS Store
- DBFS Content API
- DBFS Hierarchical Store

17.2.3 DBFS Client Access Methods

Learn about various methods to access DBFS in this section.

The Database File System offers several access methods.

- PL/SQL Client Interface

  Database applications can access files in the DBFS store directly, through the DBFS Content API PL/SQL interface. The PL/SQL interface allows database transactions and read consistency to span relational and file data.

- DBFS Client Command-Line Interface

  A client command-line interface named `dbfs_client` runs on each file system client computer. `dbfs_client` allows users to copy files in and out of the database from any host on the network. It implements simple file system commands such as list and copy in a manner that is similar to shell utilities `ls` and `cp`. The command interface creates a direct connection to the database without requiring an OS mount of DBFS.

- File System Mount Interface

  On Linux and Solaris, the `dbfs_client` also includes a mount interface that uses the Filesystem in User Space (`FUSE`) kernel module to implement a file-system mount point with transparent access to the files stored in the database. This does not require any changes to the Linux or Solaris kernels. It receives standard file system calls from the `FUSE` kernel module and translates them into OCI calls to the PL/SQL procedures in the DBFS content store.

- DBFS Links

  DBFS Links, Database File System Links, are references from SecureFiles LOB locators to files stored outside the database.

  DBFS Links can be used to migrate SecureFiles from existing tables to other storage.

See Also:

- Using DBFS
- DBFS Mounting Interface (Linux and Solaris Only)
- Database File System Links for information about using DBFS Links
- PL/SQL Packages for LOBs and DBFS for lists of useful `DBMS_LOB` constants and methods