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Z FILE SYSTEM-WHAT MAKES IT BETTER

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Abstract
ZFS is introduced by Sun Micro Systems. ZFS file system is a powerful file system which is better than traditional file system in managing large storage system. ZFS is designed to support more file systems, pooled storage, snapshots and to provide data integrity, reliability and security. It does not require separate volume manager to handle different file system and storage devices. It is easy to handle for the administrator using less number of commands.

I. Z FILE SYSTEM WHAT MAKES IT BETTER

The Z File System or ZFS is an advanced open source file system developed by Sun Micro Systems, announced in Sept. 2004. Z File System is a 128 bit file system for Solaris 10 Operating System which revolutionary changes the way of storing data. ZFS is a registered trade mark of the Oracle and licensed under the Common Development and Distribution License. Features provided by ZFS are not available in any other file system. It combines the features of Traditional File System and Volume Manager and provides greater space for storage. ZFS is preferred by the user who needs more space for storage, improved administration and higher data security.

The main feature provided by the ZFS is its Pooled Storage system to manage physical storage. ZFS Storage pool is a logical group of virtual storage devices. Pooled storage helps to easily increase or decrease the space by adding and removing any storage device according to the requirement. When new storage device is added, all file system within the pool can immediately use the additional disk space. Traditional file systems were limited to single disk. Different file systems were required for separate storage devices. If there were two disks, then two separate file system were needed to be created. ZFS automatically grows and rebuild itself when new devices are added to existing system. New file system becomes the part of existing pool and it combines all the devices into one storage pool. It is similar to adding new RAM when large memory is required. In the same way using ZFS new storage devices can be added without using extra tools or commands.

Second advantage of ZFS is end-to-end Data Integrity. To maintain Data integrity 256-bit checksum is used to verify data or metadata. When data is to be stored, a checksum is calculated and stored with indirect blocks, separately from corresponding data blocks. When this data is required to be read, again a checksum is calculated and compared with the value of checksum calculated at the time of storing. If checksum do not match an error is generated. As ZFS support data redundancy, it also tries to recover the data. RAID-Z is used to provide redundant copies of data. This helps ZFS to detect the bad blocks from the CRC stored and reconstruct form the other copies and restore the corrupted data. ZFS can automatically recognize and

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recover from bit rots, lost write, misdirect write, DMA parity write and Phantom writes. fsck is not required if the system is not shut down properly which saves a lot of time.

ZFS uses Transactional Object Model which provides copy-on-write method to save the file. This means file system is always in consistent state. ZFS never overwrites live data instead ZFS writes data to a new block before changing the pointers and committing the write operation. To save the data form any loss, operations performed on ZFS are committed totally or ignored totally. It saves the data from any loss due to power failure or process is failed.

Snapshot is very common and useful feature of ZFS. ZFS snapshots are read-only copies of volumes. Snapshots backup through copy-on-write so they do not consume more space in pool. Snapshots cannot be mounted as file system. In the beginning ZFS snapshots consume no space on the disk. Snapshots consume space when data in the active data set is changed and these snapshots keep referencing to old data. ZFS can have any number of snapshots. When data is lost or corrupted can be recovered from snapshots.
Clones can also play a useful role in ZFS. A clone is similar to snapshot but with one difference, clones are writable copies of the valumes. Like snapshots cloes are dynamic they do not consume additional space in the beginning. Even a snapshot can be cloned.
Next considerable feature of JFS is its performance and unparalleled scalability. ZFS is a 128-bit File System and the maximum file system size can be 256 Quadrillion Zettabytes (1 Zettabyte = 2^{70}).ZFS uses 128-bit block address so each storage pool can address up to 256 Quadrillion blocks. The maximum size of volume can be up to 16 EB.
It provides 255 bytes long file name. Directory name allow any Unicode character except NULL. There is no limit on the length of pathname. It supports maximum file size upto16 EB. There are multiple caching mechanisms provided by the ZFS which increase the performance. All the metadata in ZFS is dynamic so the number of files and size of file system is not predetermined..

At administrator level ZFS is easy to maintain and has been designed with simplicity. One of the design goals was to reduce the number of commands needed to manage file system. An administrator needs not to learn extra commands to manage different file systems, set quotas, turn compression on or off or manage various mount points for different file systems. There is no need to mount or unmount file systems. He can easily maintain quotas and mount points and he can turn on or off compression. ZFS manages file systems hierarchically in which similar file system are grouped together. Whole the file system is controlled centrally by the administrator. A ZFS administrator does not need to manage each volume separately.

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