

# Understanding the Effects of RAID Levels on SQL Server Workloads

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# Module Summary



How RAID levels are affected by SQL Server workload type

How availability requirements affect desired RAID level

How performance and redundancy are affected by RAID level



# Common RAID Levels

RAID 1

RAID 5

RAID 10

RAID 6



# RAID 1 (Mirroring)

## RAID 1

- Data is written to two different disks in parallel
- No parity information is used, so no parity write performance overhead
- Usable capacity is 50% of raw capacity



# RAID 5 (Striping with Parity)

## RAID 5

Data is striped across all disks in array

Parity information is calculated and striped across all disks in array in a separate write

Writing parity information decreases overall write performance

Capacity overhead is  $1/N$  of raw capacity, where  $N$  is number of disks in array

Can only lose one disk in array



# RAID 10 (Mirroring + Striping)

## RAID 10

Data is striped across all disk sets in array, with each disk set being a two-disk RAID 1 mirror

No parity information is used, so no parity write performance overhead

Usable capacity is 50% of raw capacity

Can usually lose more than one disk in array



# RAID 6 (Striping with Double Parity)

## RAID 6

Data is striped across all disks in array

Parity information is calculated and striped across all disks in array in two separate writes

Writing more parity information decreases overall write performance even more

Capacity overhead is  $2/N$  of raw capacity

Can lose up to two disks in array



# RAID Does Not Replace Backup/Restore Plans

RAID is not a substitute for a good backup/restore strategy

RAID is not a substitute for an effective HA/DR strategy

Appropriate RAID level reduces the chances of unplanned downtime

RAID 10 and RAID 6 are most robust common RAID levels





# Primary SQL Server Workload Types

**Online Transaction Processing  
(OLTP)**

**Reporting against OLTP  
database(s)**

**Relational Data Warehouse  
(DW)**

**Online Analytical Processing  
(OLAP)**



# OLTP Workload I/O Access Patterns

Frequent writes  
to data files and  
log file

Frequent reads  
from data files  
if active part of  
database does not  
fit in buffer pool

Writes to a single  
database log file  
are sequential



# DW and Reporting I/O Access Patterns

**Frequent  
sequential reads  
from data file(s) if  
database does not  
fit in buffer pool**

**Very little use of  
log file (except  
during data loads)**

**Sequential read  
I/O performance  
is very important**



# OLAP Workload I/O Access Patterns

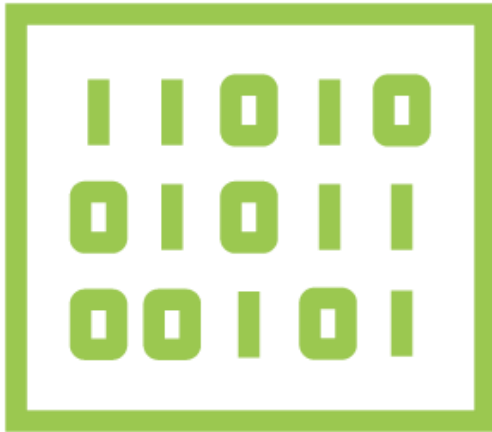
Frequent random  
reads from  
cube files

Random read I/O  
performance is  
very important

Sequential write  
performance to  
cube files is  
important during  
cube generation



# SQL Server File Types



Different file types have different I/O patterns, which also vary based on activity

Use Performance Monitor, Resource Monitor, and DMV queries to measure

Don't just guess



# SQL Server Workloads and RAID Level Choice

Understand  
workload  
characteristics!

**Read/write ratio for different file types and workloads can be different, as various activities occur**

**Also important to understand workload's sequential vs. random reads and writes**

**These characteristics influence desired RAID level and storage type**

- E.g., parity-based RAID levels have a write performance penalty, so avoid using for write-intensive workloads



# What We Covered



How RAID levels are affected by SQL Server workload type

How availability requirements affect desired RAID level

How performance and redundancy are affected by RAID level

