Chapter 08: The Memory System

Lesson 19:

Secondary storage － RAID

Objective

- Understand how a RAID (redundant array of independent disks) used for the databases on multiple disks

- Seven levels of RAID memory storage schemes

RAID

An array of disks

- Can function independently

- Enables faster handling of IO requests for database read and write

- The requests are made and responded in parallel

Characteristics of RAID

- Use of redundant array of independent disks

- Redundant disks store parity information such that each database record is recoverable in case a disk fails

- Data distribution over multiple disks with parallel access from them

- Operating system considers multiple disks as single logical storage

Seven levels of RAID storage schemes

Level 0 use in RAID database storage

- Distribution over multiple disks with parallel access from them

- None of these— (i) Parallel write operations data strips (ii) Parallel read operations data strips (iii) Independent Access (iv) Database recovery methods in case of disk failure (v) Duplication of each at a mirror disk (vi) Redundant disk (vii) Redundant disks storing parity information for recovering (viii) Error detection bits only

Level 1 used in RAID database storage

- Distribution over multiple disks with parallel access from them, Parallel write operations data strips , Parallel read operations from two data strips, (iv) Mirror disk as Database recovery methods in case of disk failure, Duplication of each at a mirror disk, operating system consider multiple disks as single logical storage

- No Independent access, no redundant disk and no error detection bits

Level 2 used in RAID database storage

- Distribution over multiple disks with parallel access from them, Parallel write operations data strips , Parallel read operations from several data strips, (iv) parity storage disk as Database recovery methods in case of disk failure, operating system consider multiple disks as single logical storage, error detection bits

- No Independent access, no mirror disk, no redundant disk

Level 3 used in RAID database storage

- Distribution over multiple disks with parallel access from them, Parallel write operations data strips, Parallel read operations from two data strips, (iv) parity storage disk as Database recovery methods in case of disk failure, single redundant disk and

- operating system consider multiple disks as single logical storage, error detection and errror correction bits

- No Independent access, no mirror disk

Level 4 used in RAID database storage

- Distribution over multiple disks with parallel access from them, Parallel write operations data strips, parity storage disk as Database recovery methods in case of disk failure, single redundant disk and

- operating system consider multiple disks as single logical storage, error detection and error correction bits, independent access from several

- No duplication at mirror disk

11

Level 5 used in RAID database storage

- Distribution over multiple disks with parallel access from them, Parallel write operations data strips, parity storage disk as Database recovery methods in case of disk failure, single redundant disk and

- operating system consider multiple disks as single logical storage, error detection and error correction bits, independent access from several

- No duplication at mirror disk

Level 6 used in RAID database storage

- Distribution over multiple disks with parallel access from them, Parallel write operations data strips, parity storage disk as Database recovery methods in case of disk failure, single redundant disk and

- operating system consider multiple disks as single logical storage, error detection and error correction bits, independent access from several

- No duplication at mirror disk

Comparison of Seven levels of RAID storage schemes

Seven different levels (schemes) used in RAID database storage

- RAID level 0 does not follow the feature of operating system considers multiple disks as single logical storage and provides for data distribution over multiple disks with parallel access from them

Seven different levels (schemes) used in RAID database storage

- RAID level 1 does not provide the feature of store parity information such that each database record is recoverable in case a disk fails but it simply uses duplicating data and every disk in the array is provided with a mirror disk

- Level 1 enables data recoverability from the second disk in case the first fails

Seven different levels (schemes) used in RAID database storage

- RAID levels 2 to 6 provide the feature of store parity information such that each database record is recoverable in case a disk fails in place of uses of abut it simply uses duplicating data mirror disks

Seven different levels (schemes) used in RAID database storage

- Level 2─ the feature of parallel access using Hamming codes

- Level 3─ the feature of parallel access using bit interleaved parity schemes

Seven different levels (schemes) used in RAID database storage

- RAID levels 4 to 6 provide the feature of store parity information such that each database record is recoverable in case a disk fails in place of uses of abut it simply uses duplicating data mirror disks

- Further each disk is accessed independently

Seven different levels (schemes) used in RAID database storage

- Level 4─ use the block interleaved scheme.

- Level 5─ use the block interleaved distributed parity scheme

- Level 6─ use block interleaved dual distributed parity coding schemes

Summary

We learnt

- Redundant array of independent disks
- Seven levels of RAID memory storage schemes

End of Lesson 19 on
Secondary storage – **RAID**