

# CHAPTER 12



## Physical Storage Systems

In preceding chapters, we have emphasized the higher-level models of a database. For example, at the *conceptual* or *logical* level, we viewed the database, in the relational model, as a collection of tables. Indeed, the logical model of the database is the correct level for database *users* to focus on. This is because the goal of a database system is to simplify and facilitate access to data; users of the system should not be burdened unnecessarily with the physical details of the implementation of the system.

In this chapter, however, as well as in Chapter 13, Chapter 14, Chapter 15, and Chapter 16, we probe below the higher levels as we describe various methods for implementing the data models and languages presented in preceding chapters. We start with characteristics of the underlying storage media, with a particular focus on magnetic disks and flash-based solid-state disks, and then discuss how to create highly reliable storage structures by using multiple storage devices.

### Bibliographical Notes

[Hennessy et al. (2017)] is a popular textbook on computer architecture, which includes coverage of cache and memory organization.

The specifications of current-generation magnetic disk drives can be obtained from the web sites of their manufacturers, such as Hitachi, Seagate, Maxtor, and Western Digital. The specifications of current-generation SSDs can be obtained from the web sites of their manufacturers, such as Crucial, Intel, Micron, Samsung, SanDisk, Toshiba and Western Digital.

[Patterson et al. (1988)] provided early coverage of RAID levels and helped standardize the terminology. [Chen et al. (1994)] presents a survey of RAID principles and implementation.

A comprehensive coverage of RAID levels supported by most modern RAID systems, including the nested RAID levels, 10, 50 and 60, which combine RAID levels 1, 5 and 6 with striping as in RAID level 0, can be found in the “Introduction to RAID” chapter of [Cisco (2018)]. Reed-Solomon codes are covered in [Pless (1998)].

## Bibliography

- [Chen et al. (1994)] P. M. Chen, E. K. Lee, G. A. Gibson, R. H. Katz, and D. A. Patterson, “RAID: High-Performance, Reliable Secondary Storage”, *ACM Computing Surveys*, Volume 26, Number 2 (1994), pages 145–185.
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