TTOW0110 ADVANCED DATABASES

PHYSICAL DATABASE DESIGN

BASED ON THE BOOK HOVI, HUOTARI, LAHDENMÄKI:
TIETOKANTOJEN SUUNNITTELU & INDEKSOINTI,
DOCENDO (2003, 2005), CHAPTER 9

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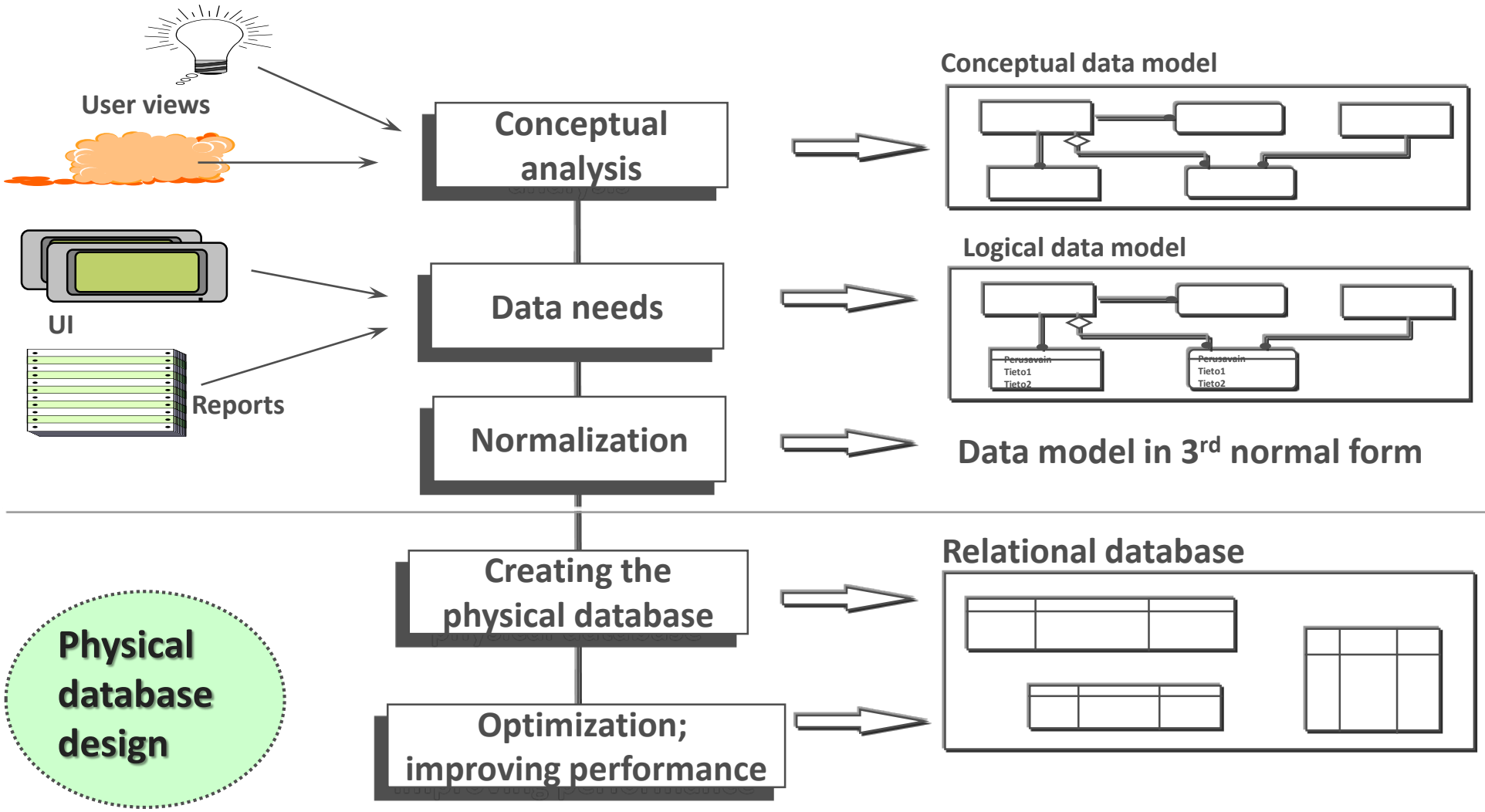
DATABASE DESIGN PROCESS



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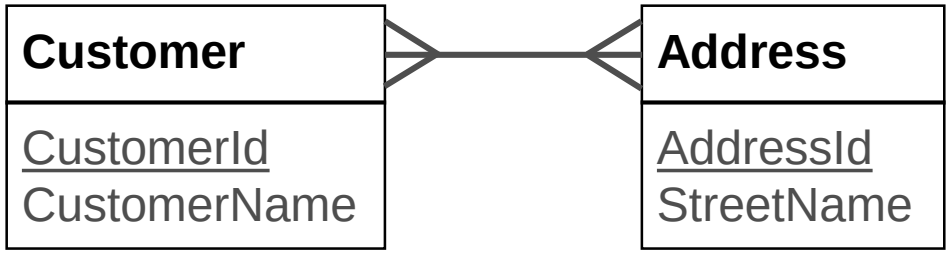
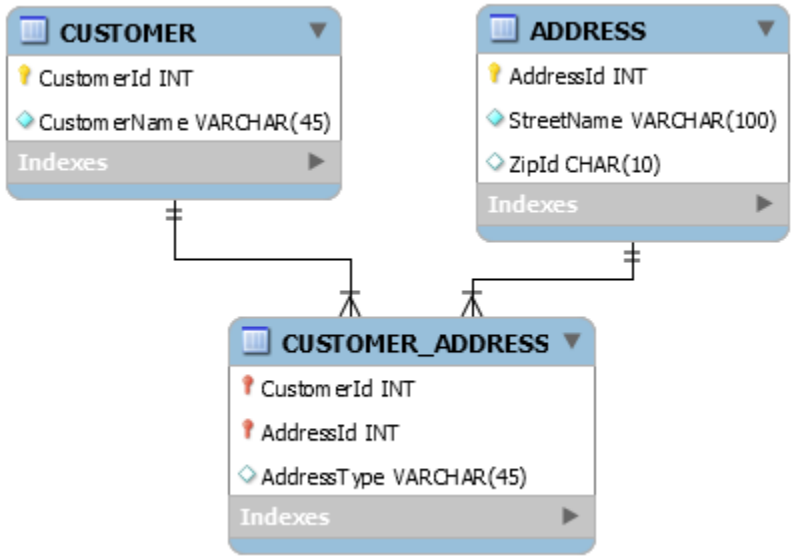
PHYSICAL DATA MODEL (PDM)

- Internal schema of the database
- Physical model depicts:
  - Data tables; their types (e.g. “engine” used)
  - Columns and their data types, are they required (not null) etc.
  - Relationships (primary and foreign keys; identifying/non-identifying)
- PDM should also reflect database naming standards

Example: from conceptual / logical model to physical data model





TYPICAL TASKS FOR DB PHYSICAL DESIGN

- Designing and implementing indexes
- Defining the page size (e.g. 4k, 8k, 32k)
- Planning extents and free space
- Partitioning of the tables and indexes
- Planning the use of disks (e.g. hot tables)
- Transaction analysis
- Optimizing the hardware use; how much RAM for data buffers etc.

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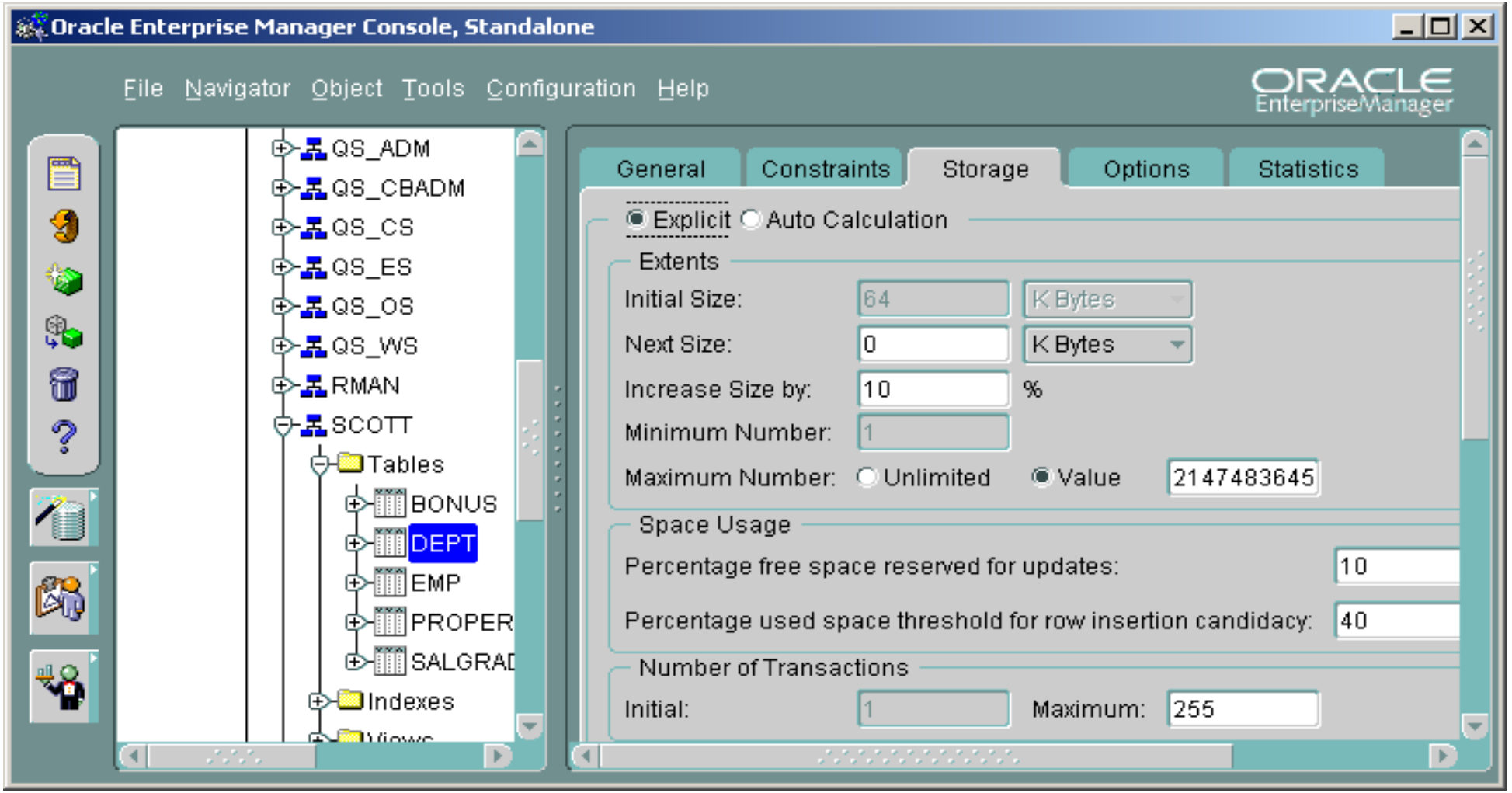
EXTENT AND FREE SPACE EXAMPLE: ORACLE



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DEFINING FREE SPACE

- How much space you need for inserts (PCTFREE, FILLFACTOR) and empty pages (FREEPAGE)
- Rough estimate for calculating disk space

  Space needed = net size of the big tables x 5

  (net size = nr of rows x average length of rows)

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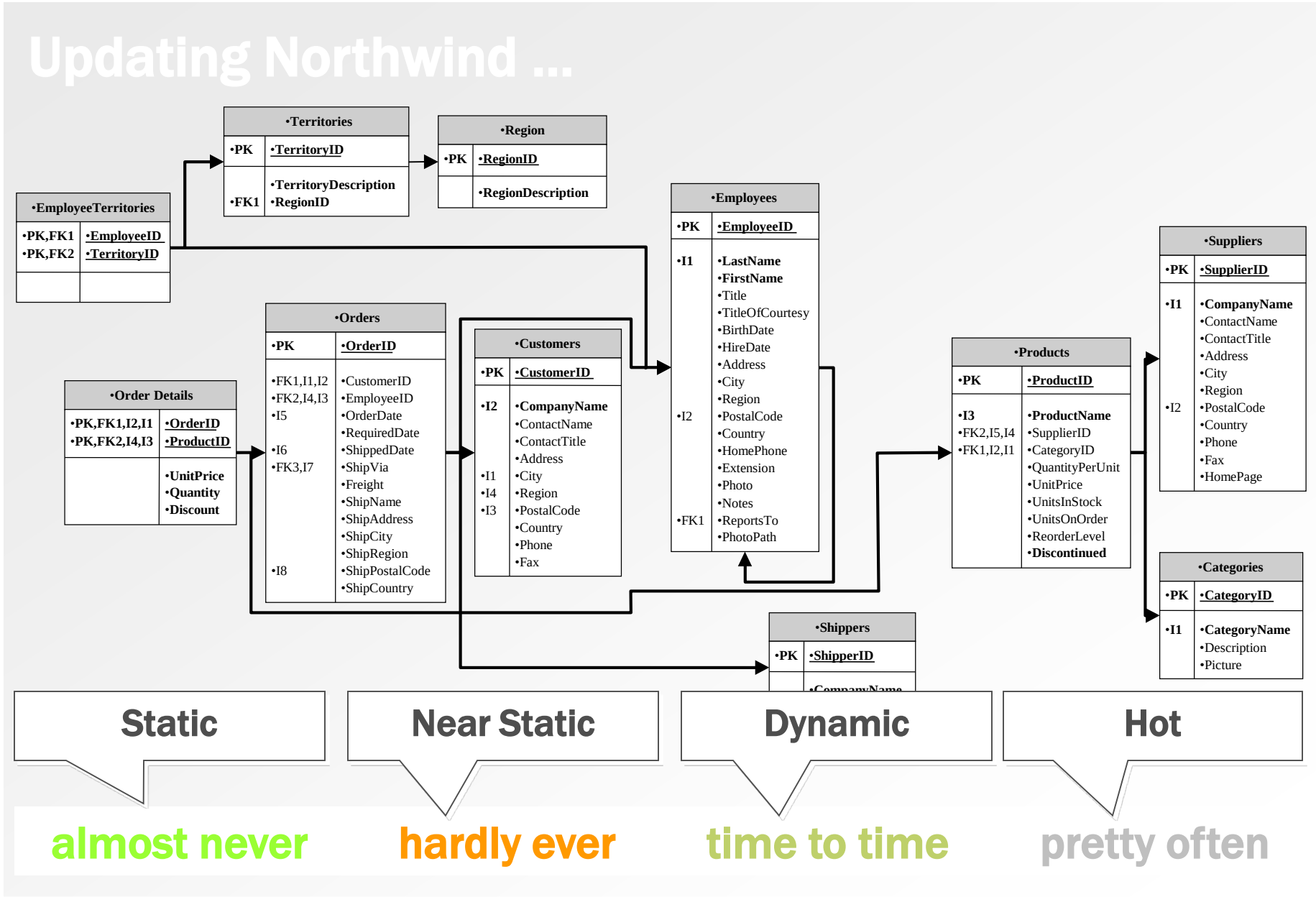
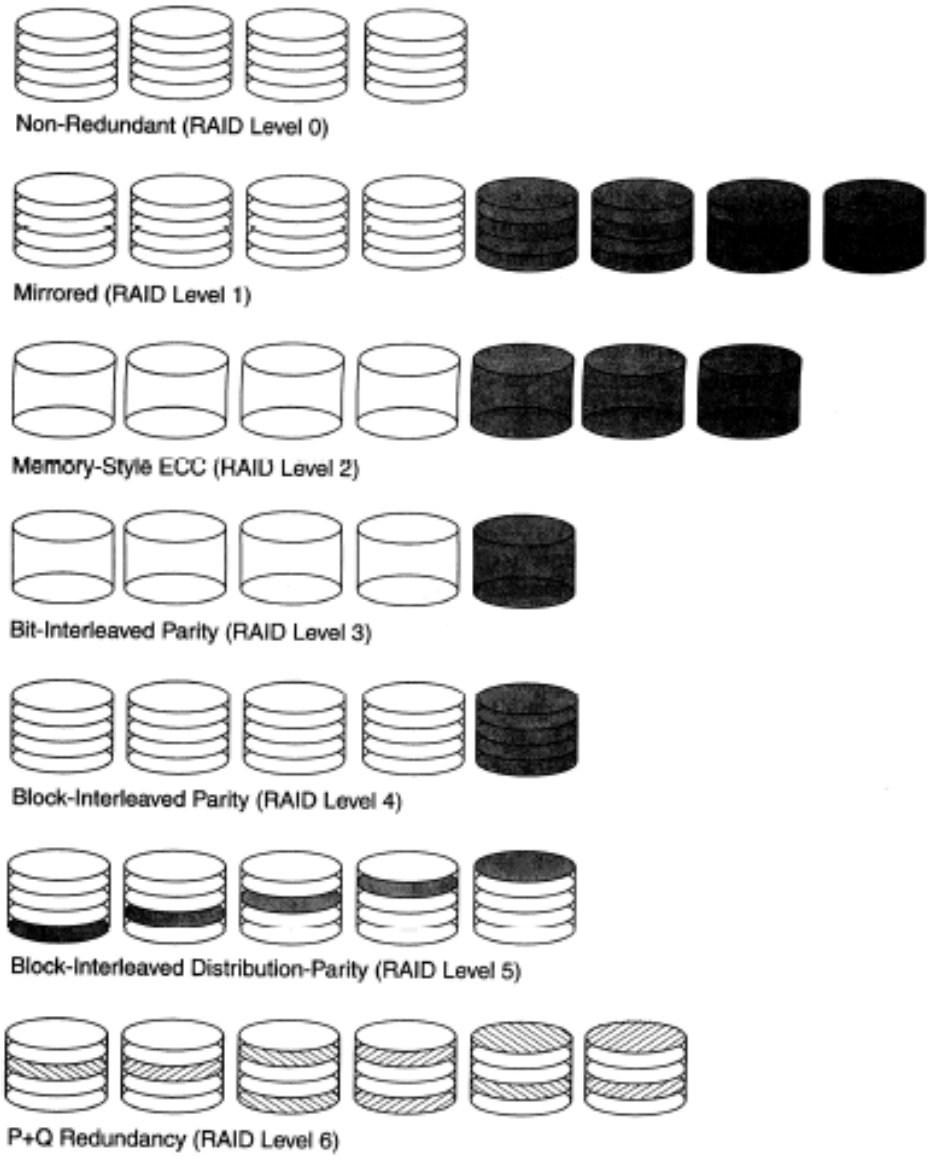
LAYOUT BASICS: ADDING SOME COLOR TO DATA



Lähde: TechEd2003, Clements Vasters

RAID

- Redundant Arrays of Inexpensive Disks
- RAID 1: mirroring
- RAID 5: at least 3 disks from which one for parity checking



- **Elmasri/Navathe, Fundamentals of Database Systems, Fourth Edition, chapter 13**

https://www.cloudwards.net/what-is-raid/

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PARTITIONING TABLES

- Rather than combining tables, could decompose a table into a smaller number of partitions.
- Horizontal partition: distribute records across a number of (smaller) tables.
- Vertical partition: distribute columns across a number of (smaller) tables. PK duplicated to allow reconstruction.
- Partitions useful for applications that store and analyse large amounts of data.

https://stackoverflow.com/questions/20771435/database-sharding-vs-partitioning

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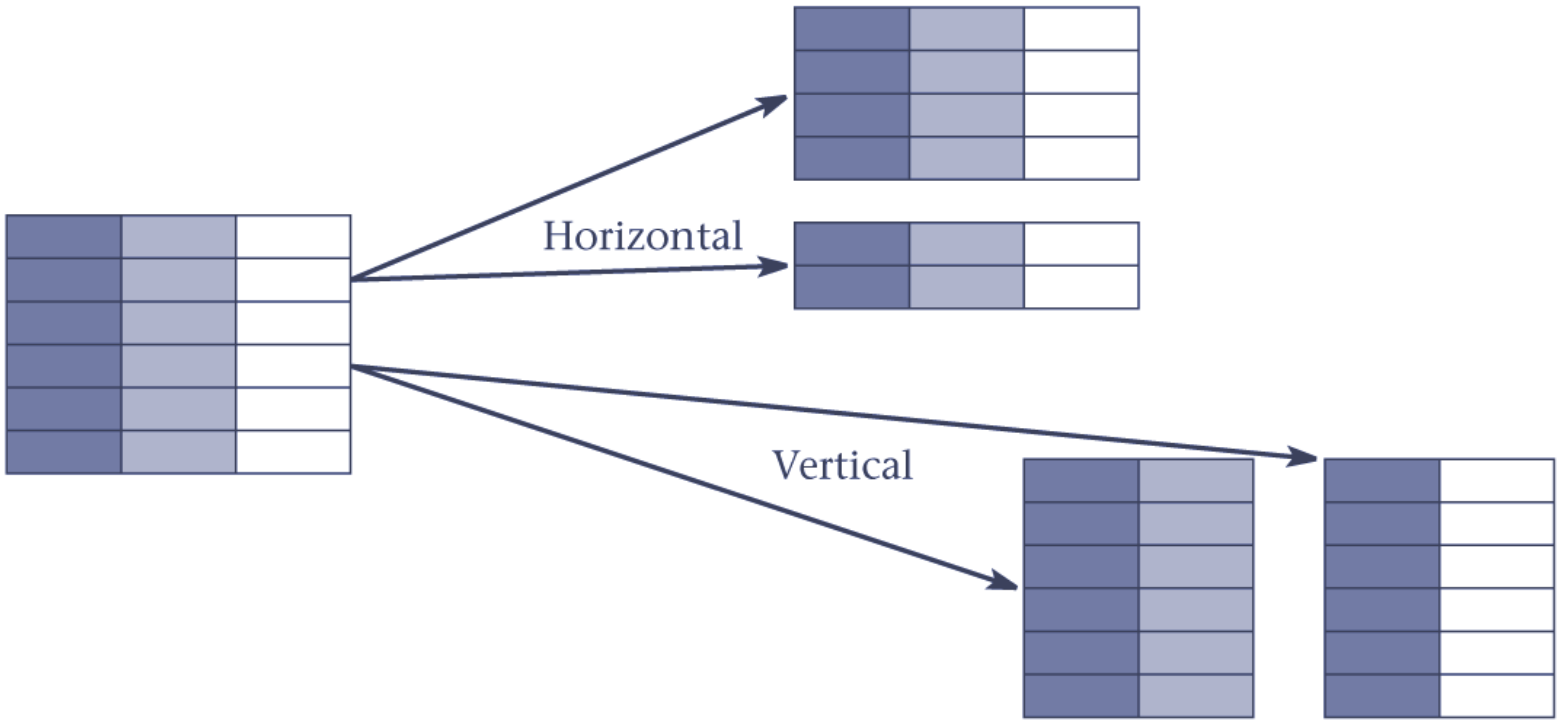
PARTITIONING TABLES



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ASSIGNMENT

Write a database management plan which includes physical design about (but not limited to):

- Creating backups (how, when, where, by whom)
- Partitioning, disk usage
- DB optimization (creating indexes etc.)
- Maintenance of database
- Users, user roles and their rights
- Other database administrator (DBA) tasks/duties

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