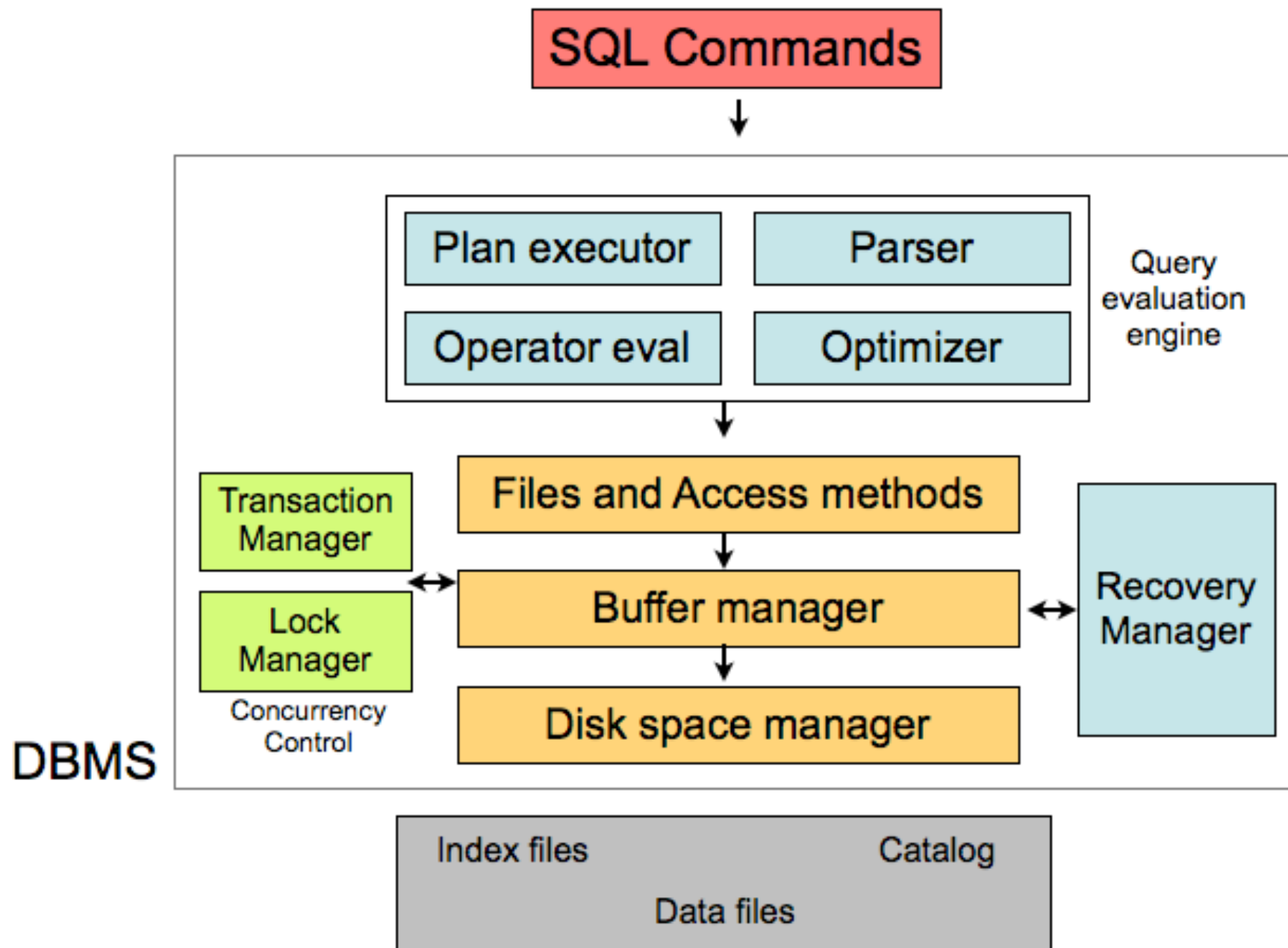# COSC 460 Lecture 1: Relational model

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Architecture of DBMS

Relational Database: Definitions

- *Relational database:* a set of *relations*
- *Relation:* made up of 2 parts:
  - *Schema* : name of relation, plus name and type/domain of each column.

  Students(*sid*: string, *name*: string, *login*: string, *age*: integer, *gpa*: real).

  - *Instance* : the actual data at a given time

Relational instance: a table

column, attribute, field

Students

sid	name	login	age	gpa
53666	Jones	jones@cs	18	3.4
53688	Smith	smith@eecs	18	3.2
53650	Smith	smith@math	19	3.8

row, tuple

Attribute *value*

- #rows = cardinality
- #fields = degree / arity

Is this a relation?

123,Jose Marquez,1996,4.3
456,William McCarthy,1996,2.9
789,Wilma Mayhew,1997,3.4
456,William McCarthy,1996,3.3
123,Omega Jones,2000,3.0
123,Jose Marquez,1996,4.3

data.csv

Codd Turing Aware Lecture (1981)

2. Motivation

The most important motivation for the research work that resulted in the relational model was the objective of providing a sharp and clear boundary between the logical and physical aspects of database management (including database design, data retrieval, and data manipulation). We call this the *data independence objective.*

A second objective was to make the model structurally simple, so that all kinds of users and programmers could have a common understanding of the data, and could therefore communicate with one another about the database. We call this the *communicability objective.*

A third objective was to introduce high level language concepts (but not specific syntax) to enable users to express operations upon large chunks of information at a time. This entailed providing a foundation for set-oriented processing (i.e., the ability to express in a single statement the processing of multiple sets of records at a time). We call this the *set-processing objective.*

There were other objectives, such as providing a sound theoretical foundation for database organization and management, but these objectives are less relevant to our present productivity theme.

Invention of relational model

- Invented by E.F. Codd in 1970

- Radical idea: describe data in a logical way that is *independent* of how it is actually stored on disk

- Invented in 1970 yet did not see widespread adoption for another 10 years... why?

A Relational Model of Data for Large Shared Data Banks

E. F. Codd
IBM Research Laboratory, San Jose, California

Future users of large data banks must be protected from having to know how the data is organized in the machine (the internal representation). A prompting service which supplies such information is not a satisfactory solution. Activities of users at terminals and most application programs should remain

1. **Relational Model and Normal Form**

1.1. INTRODUCTION

The relational view (or model) Section 1 appears to be superior in s graph or network model [3, 4] prese inferential systems. It provides a me with its natural structure only—tha posing any additional structure for m purposes. Accordingly, it provides a data language which will yield maxi tween programs on the one hand and tion and organization of data on the

A further advantage of the relat forms a sound basis for treating deri and consistency of relations—these a

"Future users of large data banks must be protected from having to know how the data is organized in the machine (the internal representation)… Activities of users at terminals and most application programs should remain unaffected when the internal representation of data is changed…"

toward the goal of data independenc facilitate changing certain characteri sentation stored in a data bank. Ho data representation characteristics *without logically impairing some a* still quite limited. Further, the mod users interact is still cluttered with erties, particularly in regard to the lections of data (as opposed to indiv the principal kinds of data depend to be removed are: ordering depend ence, and access path dependence. dependencies are not clearly separa