Execution of a SELECT statement

• SELECT col1 FROM Tab1 WHERE col2 = …

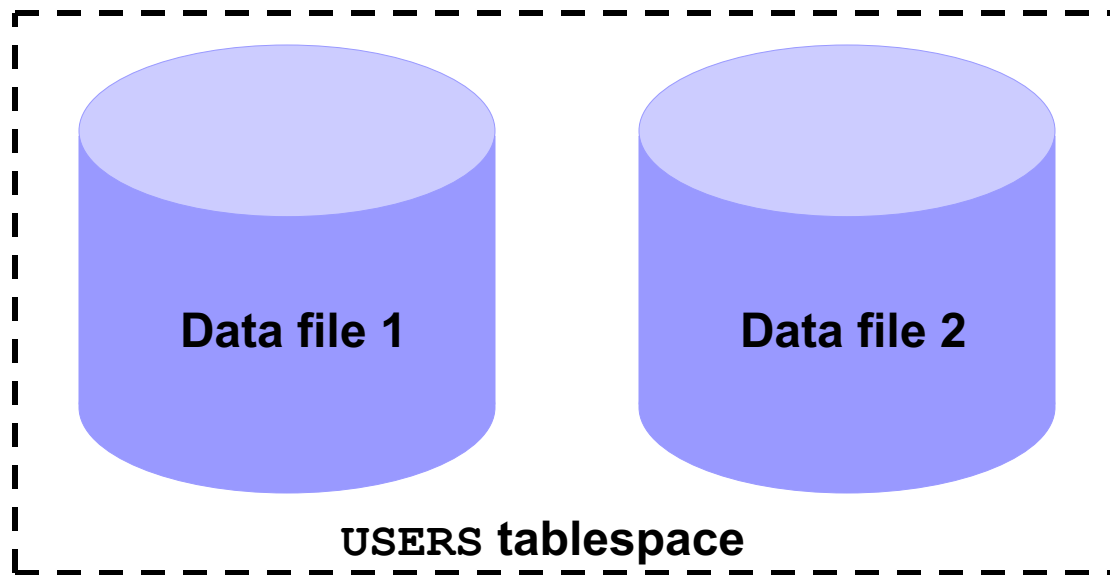How does the DBMS find the pieces of Data on disk?

Data blocks

Records

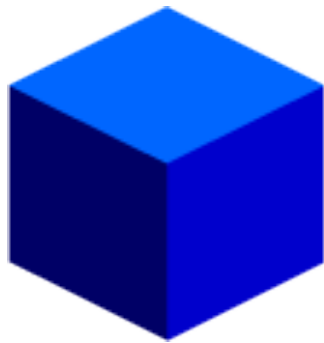Fields

Tablespaces and Data Files

– Tablespaces consist of one or more data files.

– Data files belong to only one tablespace.

USERS **tablespace**

Segments, Extents, and Blocks

- Segments exist within a tablespace.
- Segments are made up of a collection of extents.
- Extents are a collection of data blocks.

- Data blocks are mapped to disk blocks.
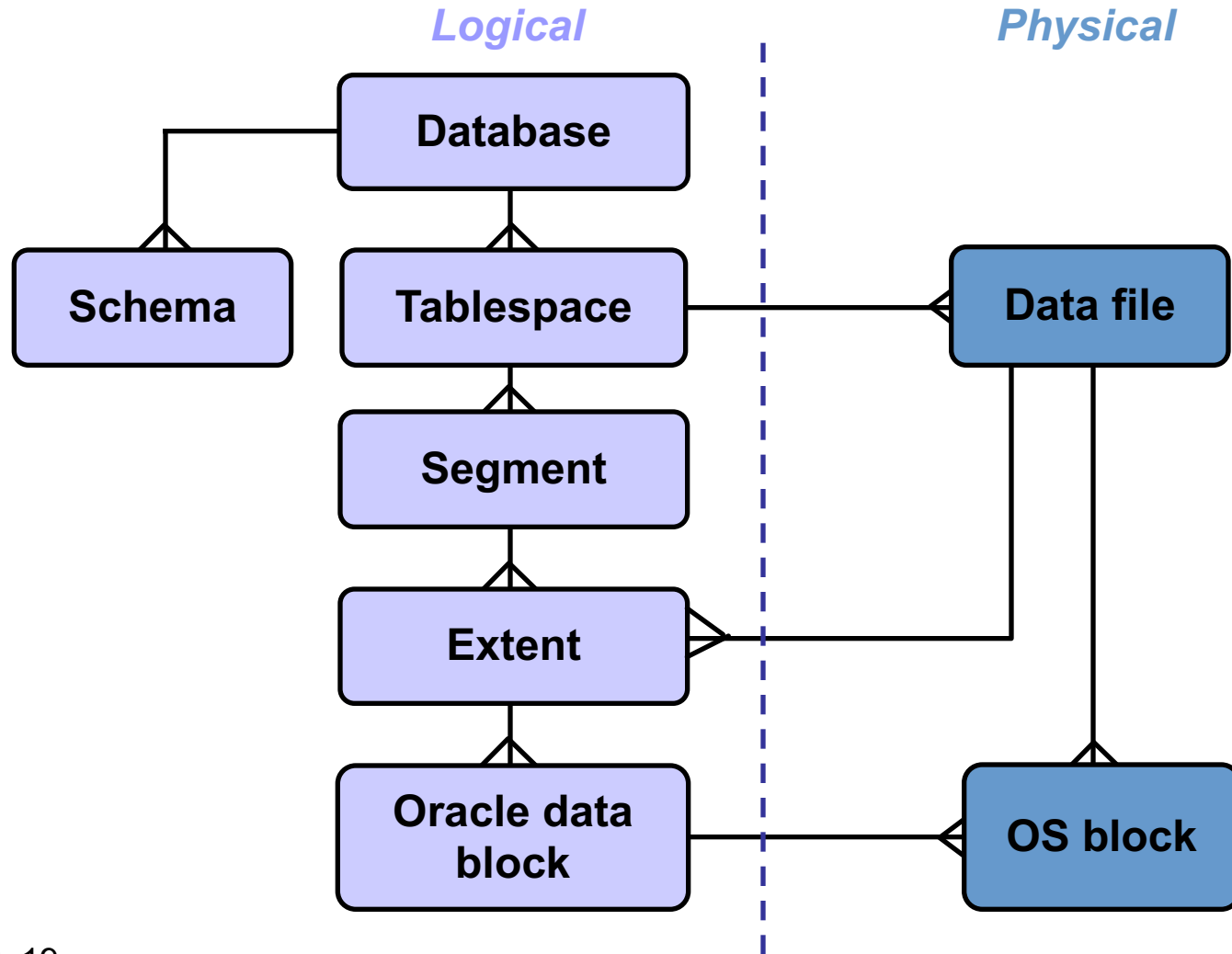
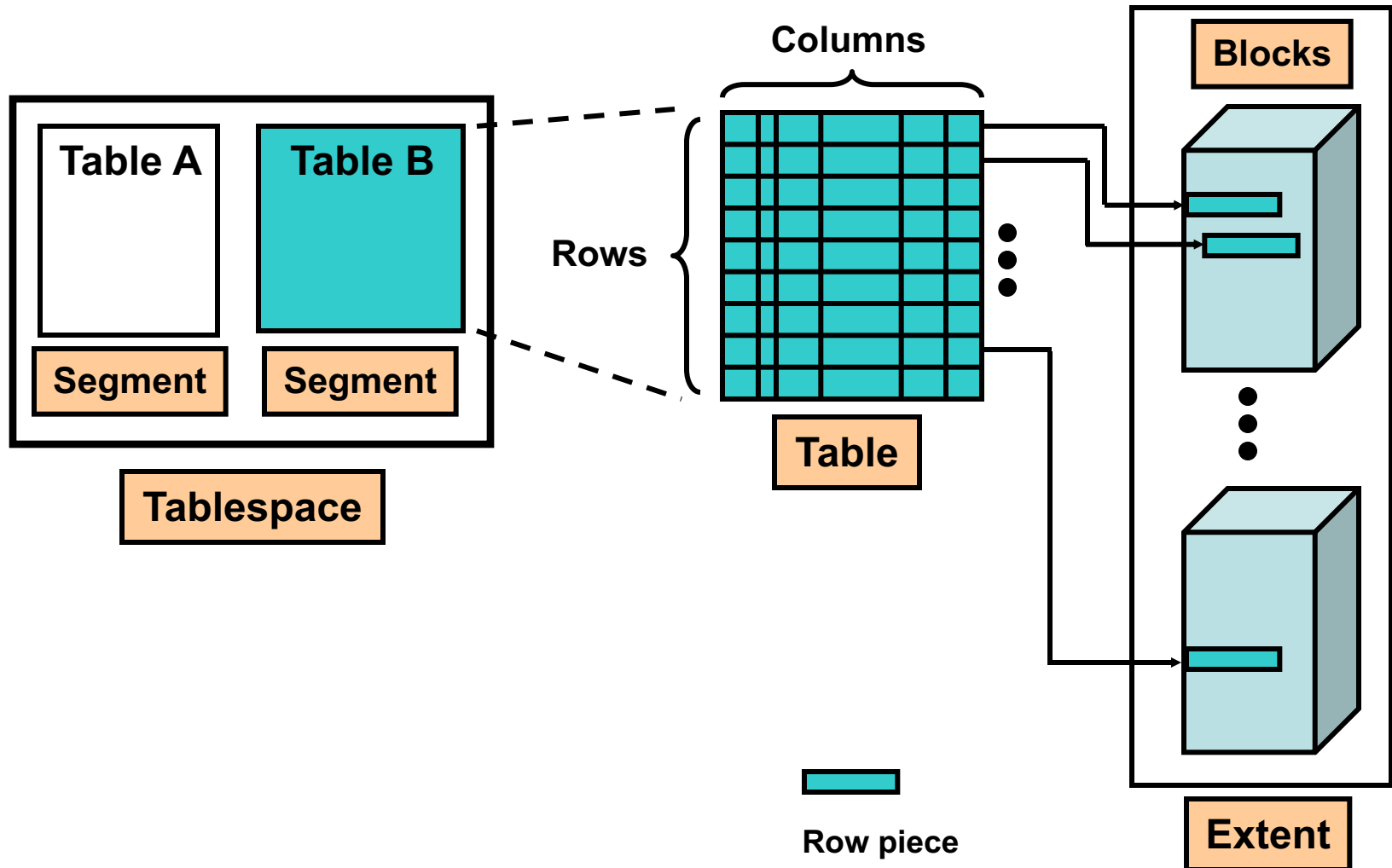**Segment**   **Extents**   **Data blocks**   **Disk blocks**

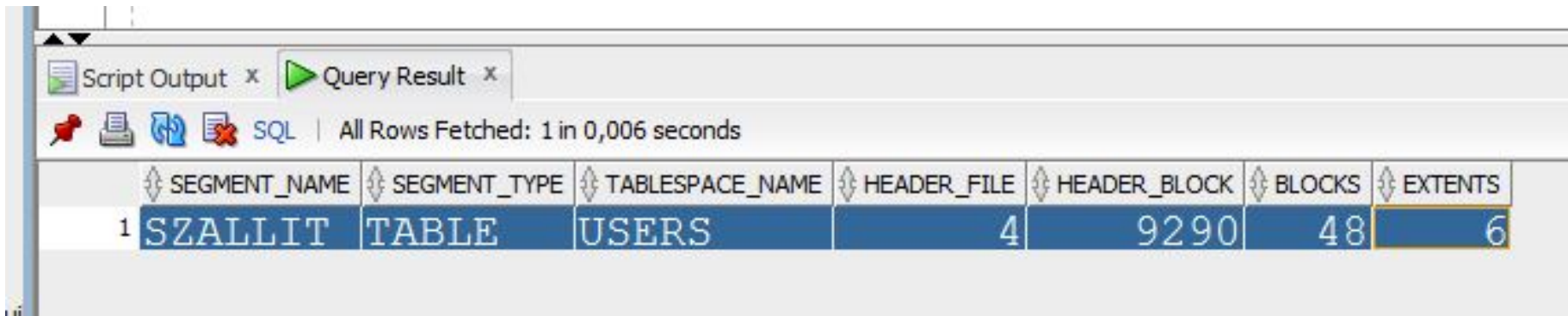# Logical and Physical Database Structures

How Table Data Is Stored

Columns

Blocks

Table A

Table B

Rows

Segment

Segment

Table

Tablespace

Row piece

Extent

Where Table Data is Stored?

SELECT segment_name, segment_type, tablespace_name,

    header_file, header_block, blocks, extents

FROM dba_segments where owner='NIKOVITS'
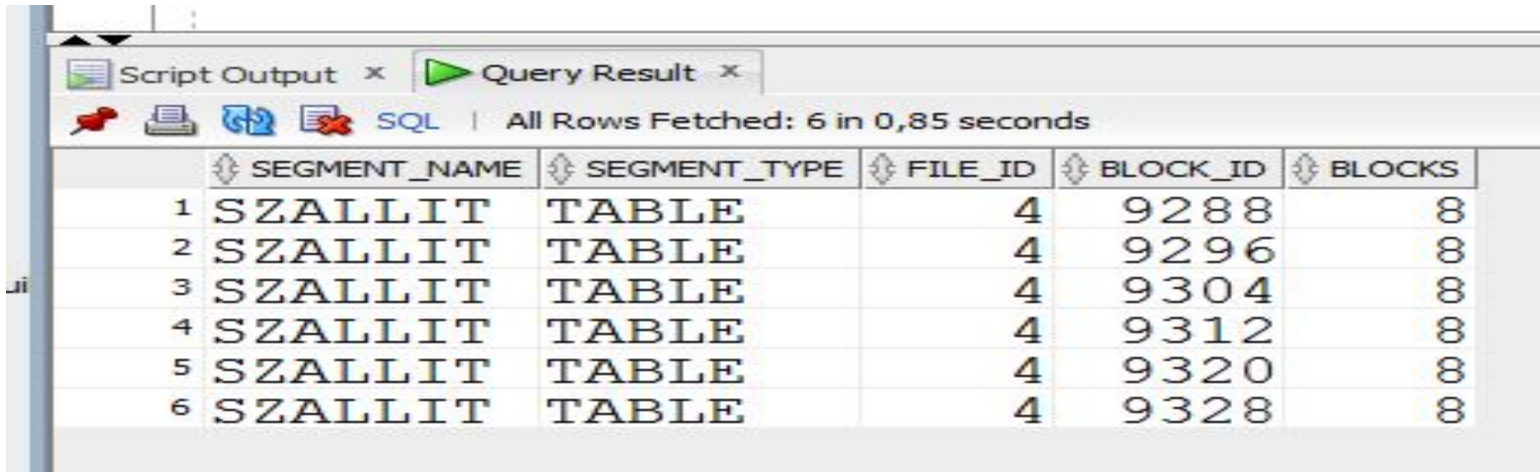
AND segment_name='SZALLIT' AND
segment_type='TABLE';

Script Output × ▶ Query Result ×

📌 🖨 🔁 ▣ SQL | All Rows Fetched: 1 in 0,006 seconds

SEGMENT_NAME	SEGMENT_TYPE	TABLESPACE_NAME	HEADER_FILE	HEADER_BLOCK	BLOCKS	EXTENTS
1 SZALLIT	TABLE	USERS	4	9290	48	6

Where Table Data is Stored?

SELECT segment_name, segment_type,

    file_id, block_id, blocks

FROM dba_extents where owner='NIKOVITS'
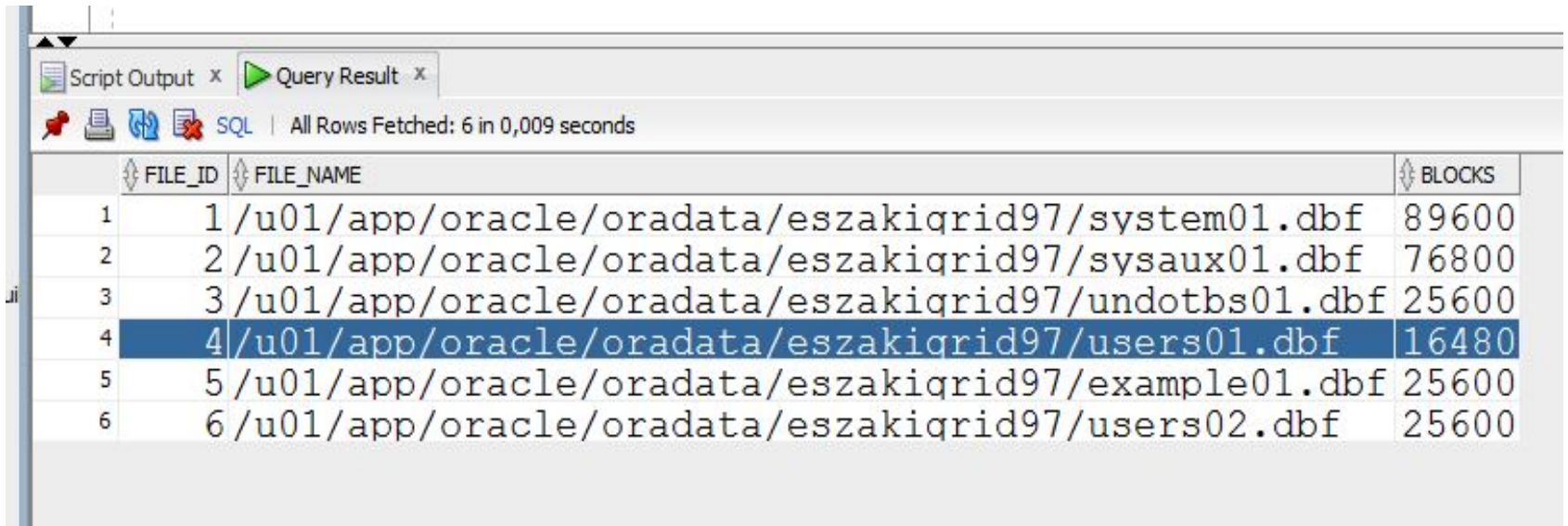
AND segment_name='SZALLIT' AND segment_type='TABLE';

Script Output ✕ | ▶ Query Result ✕

📌 🖨 🔁 ❌ SQL | All Rows Fetched: 6 in 0,85 seconds

	SEGMENT_NAME	SEGMENT_TYPE	FILE_ID	BLOCK_ID	BLOCKS
1	SZALLIT	TABLE	4	9288	8
2	SZALLIT	TABLE	4	9296	8
3	SZALLIT	TABLE	4	9304	8
4	SZALLIT	TABLE	4	9312	8
5	SZALLIT	TABLE	4	9320	8
6	SZALLIT	TABLE	4	9328	8

Where Table Data is Stored?

SELECT file_id, file_name, blocks

FROM dba_data_files;
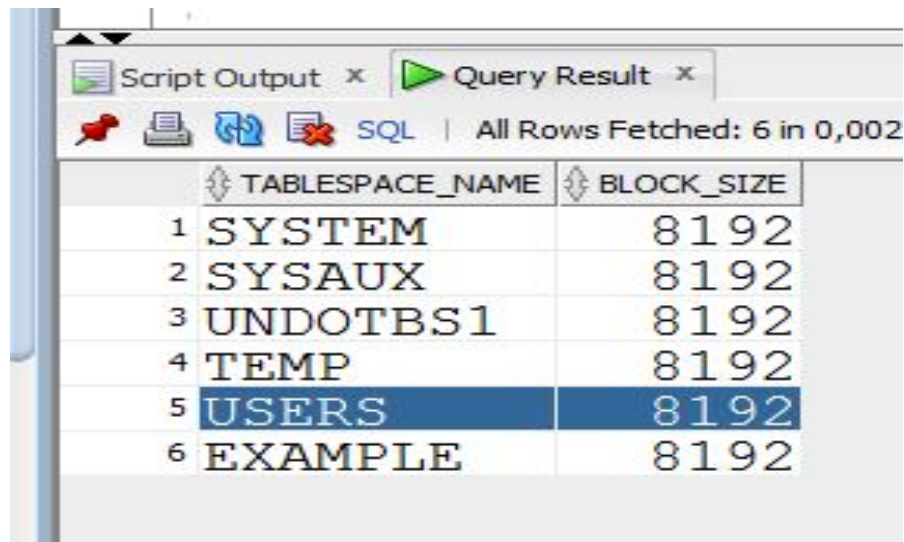
Which part of the Datafile?
(What is the block size?)

SELECT tablespace_name, block_size

FROM dba_tablespaces;

Anatomy of a Database Block

Growth

Block header

Free space

Row data
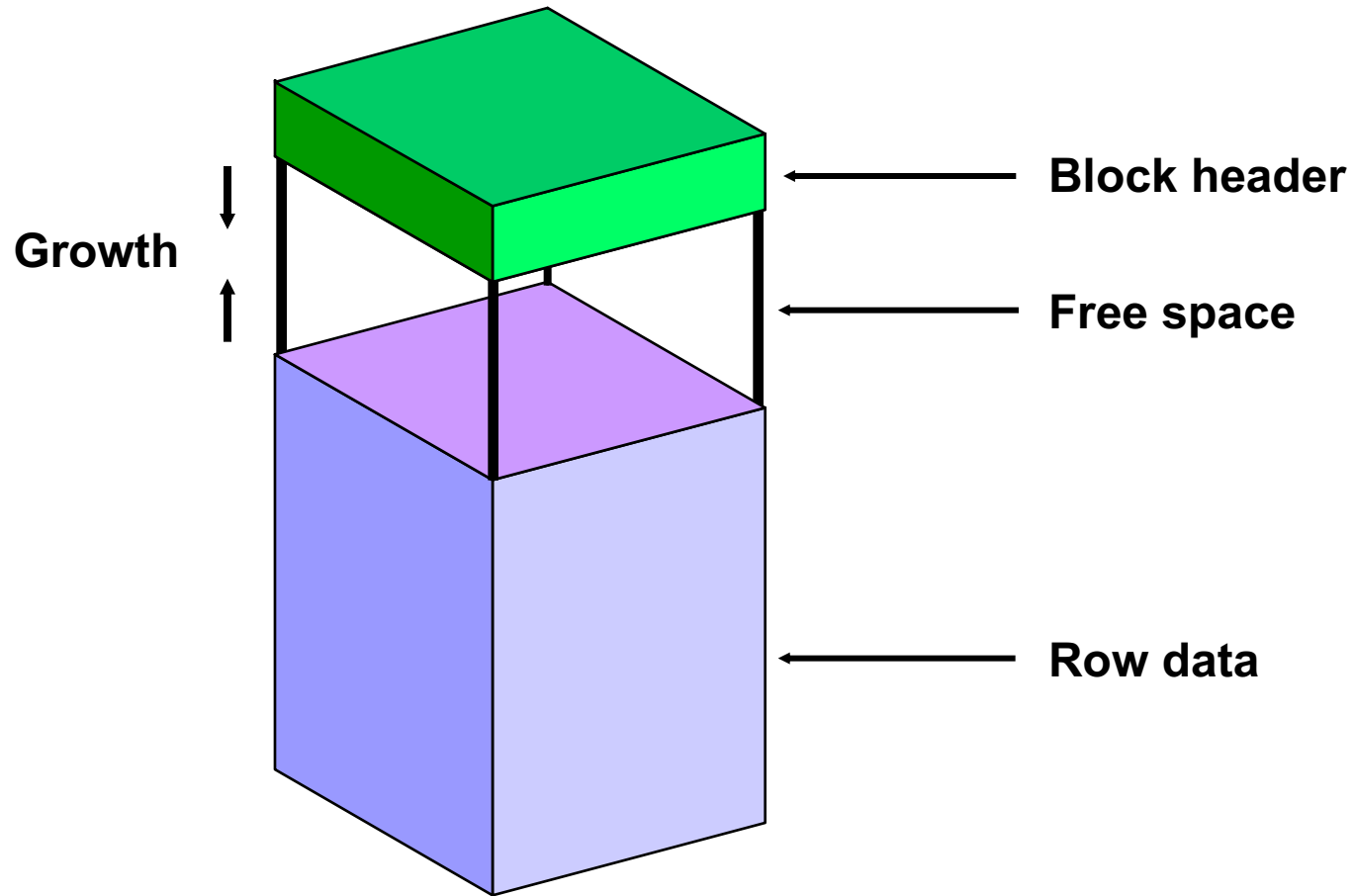
Variable-length records
(finding records within blocks)

- When do we have a file with variable-length records?
  - file contains records of multiple tables
  - create table t (field1 int, field2 varchar2(n))
- Problems:
  - Holes created upon deletion have variable size
  - Find large enough free space for new record
- Could use previous approaches: maximum record size
  - a lot of space wasted
- Use slotted page structure
  - Slot directory
  - Each slot storing offset, size of record
  - Record IDs: page number, slot number
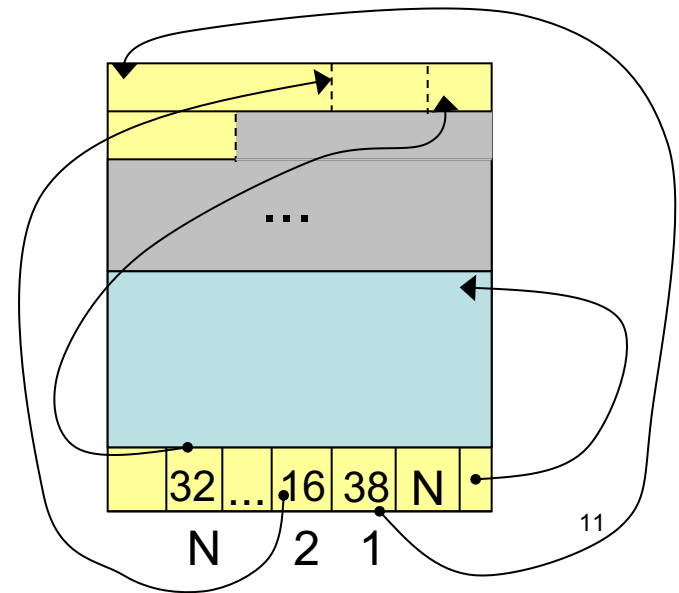
Record Organization
(finding fields within records)

- Fixed-length record formats
  - Fields stored consecutively
- Variable-length record formats
  - Array of offsets
  - NULL values when start offset = end offset

f3 Address = B+L1+L2