

Storage and File Structure – Practice Questions Solution

1. Consider a relational database table which is stored in a database file using fixed length records and a free list. The file appears initially as follows:

				free list
header				
record 0	Alexei Yashin	Senators	19	
record 1				
record 2	Matts Sundin	Maple Leafs	13	
record 3	Mark Messier	Canucks	11	
record 4				
record 5	Jeff Hackett	Canadiens	31	
record 6				
record 7	Paul Kariya	Mighty Ducks	9	
record 8	Garth Snow	Canucks	30	

Show the structure of the file after the following actions:

- a) Insert (Sergei Fedorov, Red Wings, 91)

				free list
header				
record 0	Alexei Yashin	Senators	19	
record 1	Sergei Fedorov	Red Wings	91	
record 2	Matts Sundin	Maple Leafs	13	
record 3	Mark Messier	Canucks	11	
record 4				
record 5	Jeff Hackett	Canadiens	31	
record 6				
record 7	Paul Kariya	Mighty Ducks	9	
record 8	Garth Snow	Canucks	30	

- b) Delete the record containing 'Matts Sundin'. Assume that this is done before part a) is carried out.

				free list
header				
record 0	Alexei Yashin	Senators	19	
record 1				
record 2				
record 3	Mark Messier	Canucks	11	
record 4				
record 5	Jeff Hackett	Canadiens	31	
record 6				
record 7	Paul Kariya	Mighty Ducks	9	
record 8	Garth Snow	Canucks	30	

c) Insert (Patrick Roy, Avalanche, 33). This should be done on the file structure after part b) has been applied.

				free list
header				
record 0	Alexei Yashin	Senators	19	
record 1				
record 2	Patrick Roy	Avalanche	33	
record 3	Mark Messier	Canucks	11	
record 4				
record 5	Jeff Hackett	Canadiens	31	
record 6				
record 7	Paul Kariya	Mighty Ducks	9	
record 8	Garth Snow	Canucks	30	

2. List an advantage and a disadvantage of each of the following strategies for storing a relational database:

- i) store each table in a separate file,
- ii) store multiple tables (or even the entire database) in a single file.

Advantages of storing each relation in a separate file:

- uses the file system provided by the operating system, thus simplifying the DBMS for backups, etc.

Disadvantages of storing each relation in a separate file:

- restricts the ability of the DBMS to increase performance by using more sophisticated storage structures

Advantages of storing multiple relations in a single file:

- complex structures can be implemented through the DBMS, thus increasing performance

Disadvantages of storing multiple relations in a single file:

- increases the size and complexity of the DBMS.

3. Define the term *pinned record*.

A *pinned record* is a record which cannot be moved to another location in disk without the creation of dangling pointers, since some other record or structure contains a pointer to it. This is different from a *pinned page*, which is a data page currently residing in the memory buffer, and which cannot be written back to the disk for various kinds of reasons.

4. Explain why the allocation of records to blocks can affect database-system performance significantly.

If records are related to blocks, we can often retrieve most or all of the requested records in a query with a single disk access (*i.e.* if the table is indexed). Disk accesses tend to be the bottlenecks in databases; since this allocation strategy reduces the number of disk accesses for a given operation, it significantly improves performance.