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Managing Indexes

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Objectives

- Listing the different types of indexes and their uses
- Creating B-tree and Bitmap indexes
- Reorganizing indexes
- Dropping indexes
- Getting index information from the data dictionary

Classification of Indexes

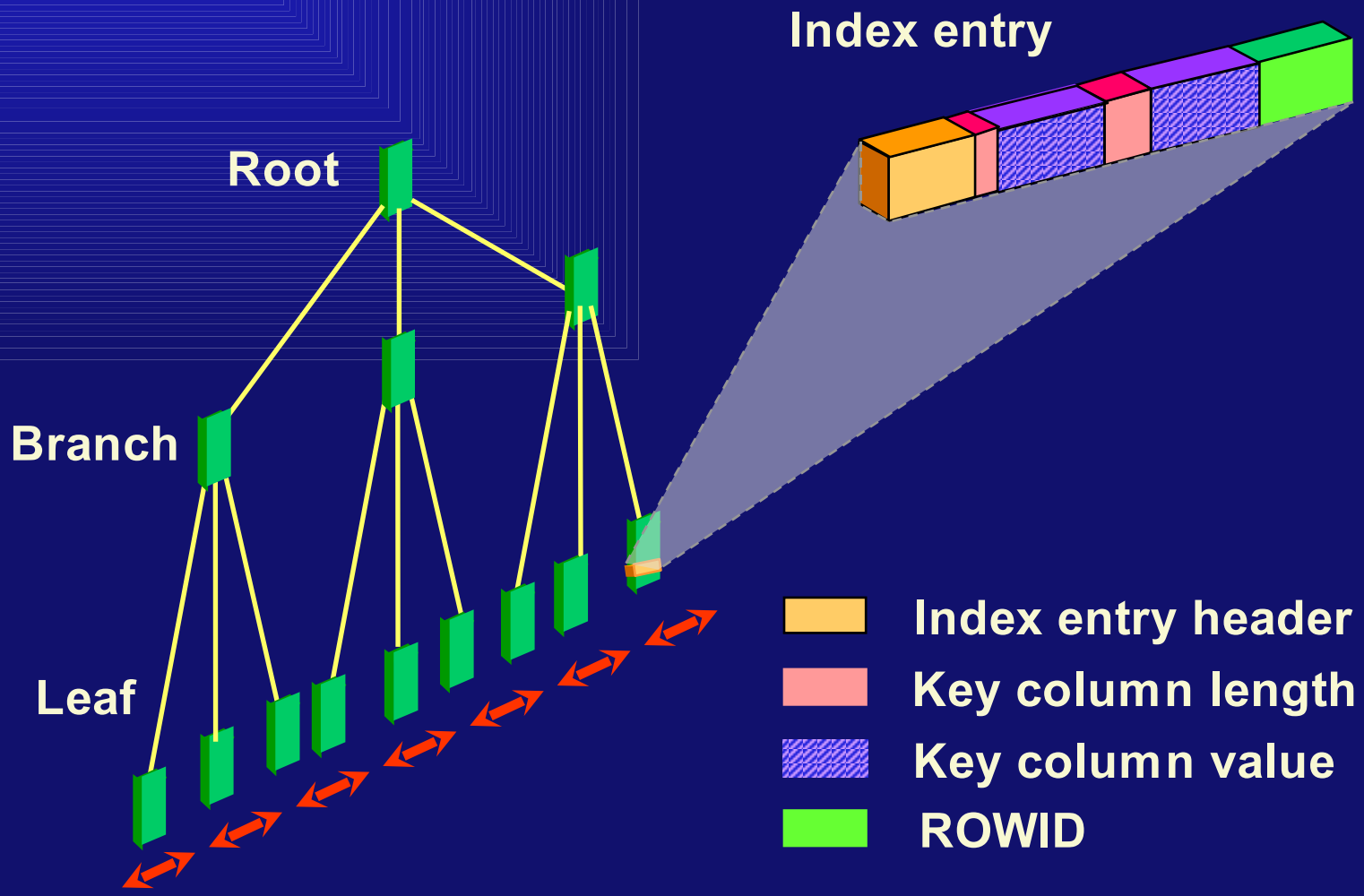
Logical

- Single column or concatenated
- Unique or nonunique

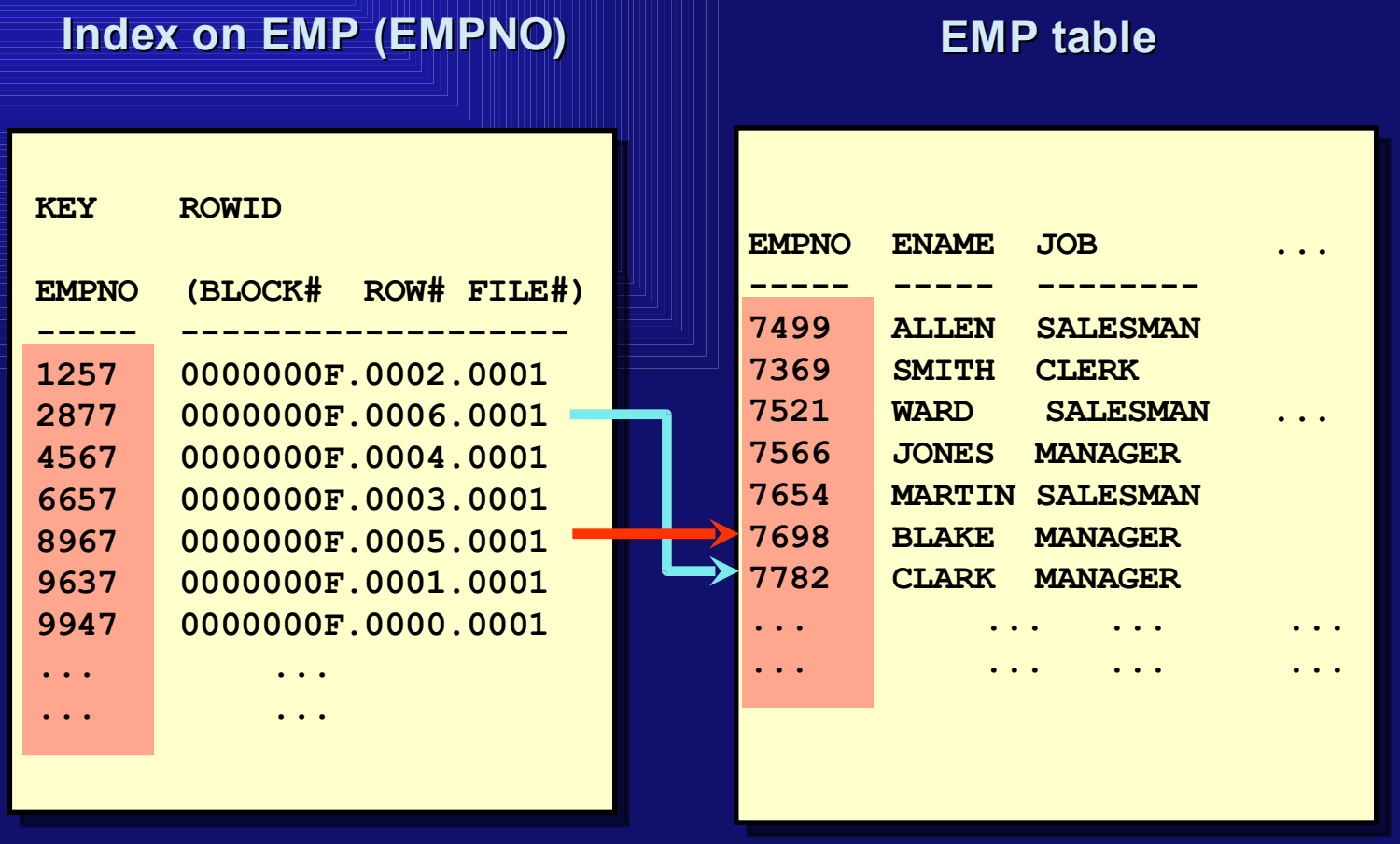
Physical

- Partitioned or nonpartitioned
- B-tree or bitmap
  - Normal or reverse key (B-tree only)

B-Tree Index

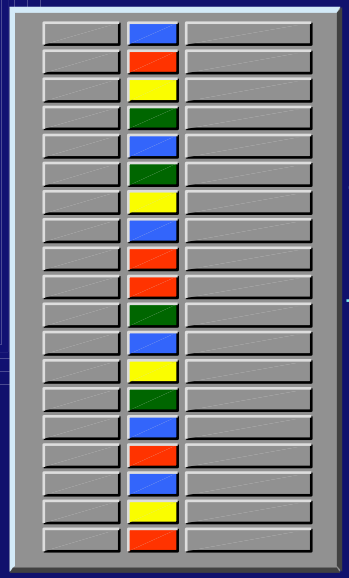


Reverse Key Index



Bitmap Index

Table

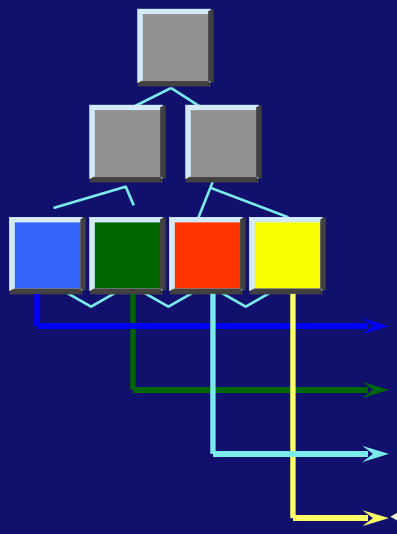


File 3
Block 10

Block 11

Block 12

Index



key	start ROWID	end ROWID	bitmap
<Blue,	10.0.3,	12.8.3,	1000100100010010100>
<Green,	10.0.3,	12.8.3,	0001010000100100000>
<Red,	10.0.3,	12.8.3,	0100000011000001001>
<Yellow,	10.0.3,	12.8.3,	0010001000001000010>

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Comparing B-Tree and Bitmap Indexes

B-tree	Bitmap
Suitable for high-cardinality columns	Suitable for low-cardinality columns
Updates on keys relatively inexpensive	Updates to key columns very expensive
Inefficient for queries using OR predicates	Efficient for queries using OR predicates
Useful for OLTP	Useful for DSS

Creating Normal B-Tree Indexes

```
CREATE INDEX scott.emp_lname_idx
ON scott.employees(last_name)
PCTFREE 30
STORAGE(INITIAL 200K NEXT 200K
PCTINCREASE 0 MAXEXTENTS 50)
TABLESPACE indx01;
```

Creating Indexes: Guidelines

- Balance query and DML needs
- Place in separate tablespace
- Use uniform extent sizes: multiples of five blocks or MINIMUM EXTENT size for tablespace
- Consider NOLOGGING for large indexes
- Set high PCTFREE if new key values are likely to be within the current range

Creating Reverse Key Indexes

```
CREATE UNIQUE INDEX scott.ord_ord_no_idx
ON scott.ord(ord_no) REVERSE
PCTFREE 30
STORAGE(INITIAL 200K NEXT 200K
PCTINCREASE 0 MAXEXTENTS 50)
TABLESPACE indx01;
```

Creating Bitmap Indexes

```
CREATE BITMAP INDEX scott.ord_region_id_idx
ON scott.ord(region_id)
PCTFREE 30
STORAGE(INITIAL 200K NEXT 200K
PCTINCREASE 0 MAXEXTENTS 50)
TABLESPACE indx01;
```

Changing Storage Parameters for Indexes

```
ALTER INDEX scott.emp_lname_idx
STORAGE(NEXT 400K
MAXEXTENTS 100);
```

Allocating and Deallocating Index Space

```
ALTER INDEX scott.ord_region_id_idx
ALLOCATE EXTENT (SIZE 200K
DATAFILE '/DISK6/indx01.dbf');
```

```
ALTER INDEX scott.ord_ord_no_idx
DEALLOCATE UNUSED;
```

Rebuilding Indexes

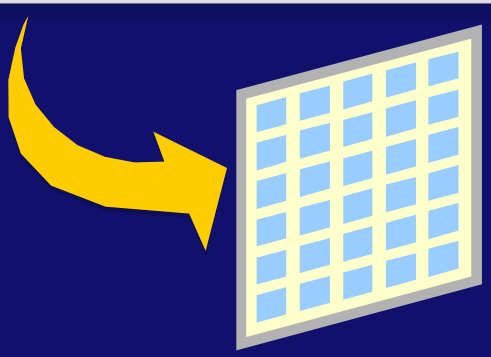
Use this command to:

- Move an index to a different tablespace
- Improve space utilization by removing deleted entries
- Change a reverse key index to a normal B-tree index and vice versa

```
ALTER INDEX scott.ord_region_id_idx
REBUILD
TABLESPACE indx02;
```

Checking Index Validity

```
ANALYZE INDEX scott.ord_region_id_idx
VALIDATE STRUCTURE;
```



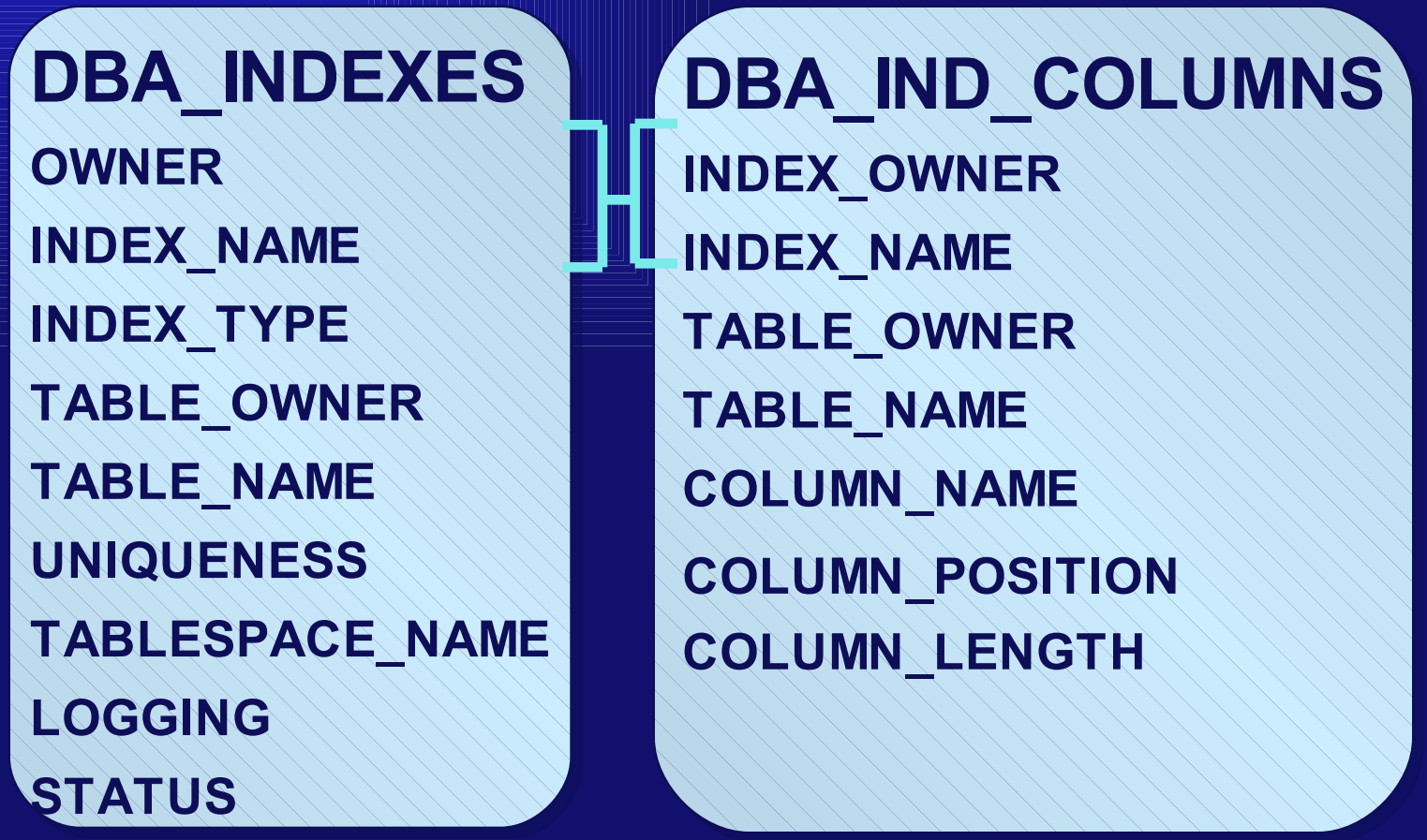
INDEX_STATS

Dropping Indexes

- Drop and re-create an index before bulk loads.
- Drop indexes that are infrequently needed and build them when necessary.
- Drop and recreate invalid indexes.

```
DROP INDEX scott.dept_dname_idx;
```

Obtaining Index Information



Summary

- Creating different types of indexes
- Reorganizing indexes