Introduction to DB2 Database

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Agenda

- Database Basics
- SQL
- DB2 Environment
- Constraints
- Functions
- Operators
- Views
- Index
- Generating Automated Values

The Importance of a Database

- Organisations must track information about people including employees, clients, potential donors, current donors, event attendees.
- Managing this information is crucial.
- A database allows you to manage and use an incredible variety of information easily.

Introduction to Database Systems

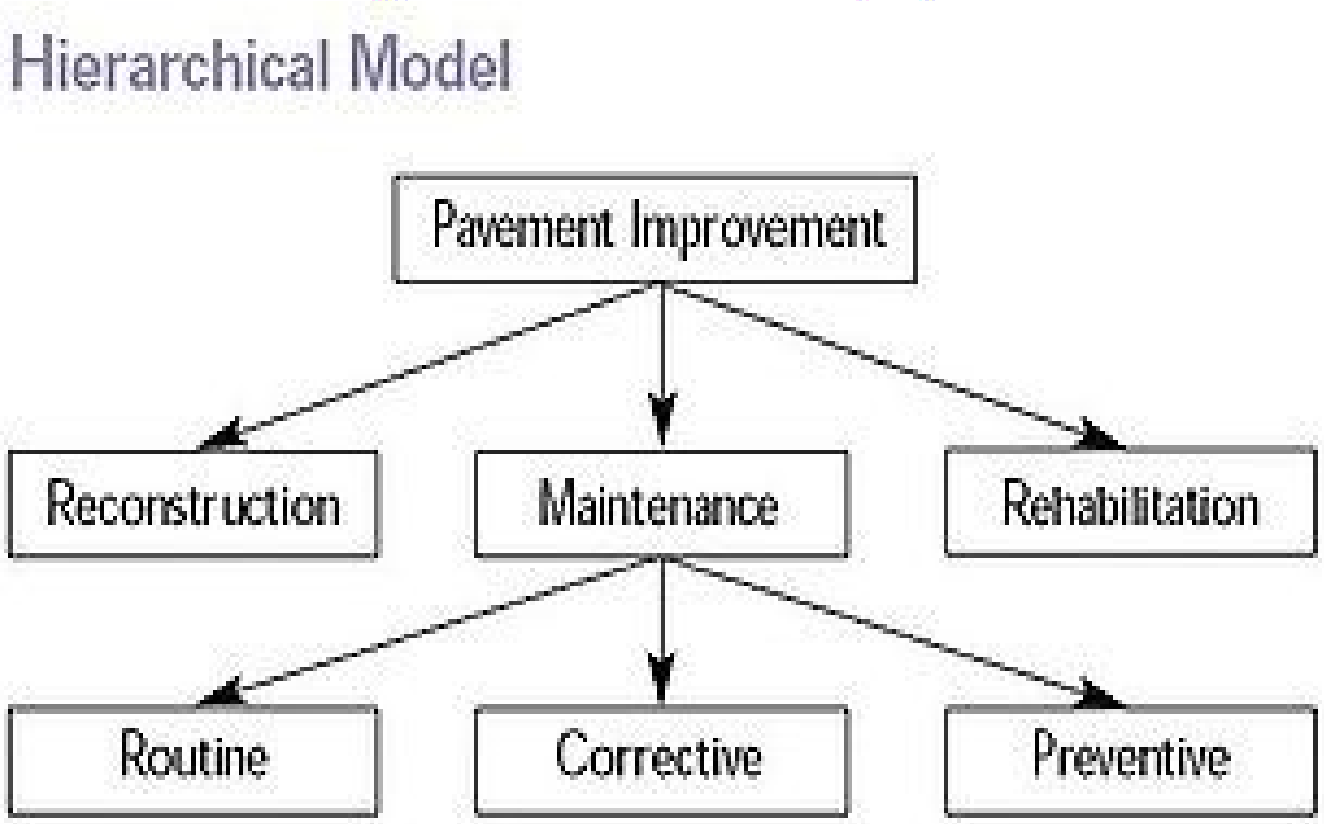
- Data: Activities that are need to be recorded is known as Data.
- Database: A database is a collection of information organized into interrelated objects like table spaces, tables, and indexes. It must provide proper storage for large amounts of data, easy and fast access and facilitate the processing of data.
- DBMS (Database Management System): DBMS is a set of software that is used to define, store, manipulate and control the data in a database.

Evolution of Database Modeling - Flat File Model

Flat File Model

	Route No.	Miles	Activity
Record 1	I-95	12	Overlay
Record 2	I-495	05	Patching
Record 3	SR-301	33	Crack seal

Evolution of Database Modeling - Hierarchical Data Model



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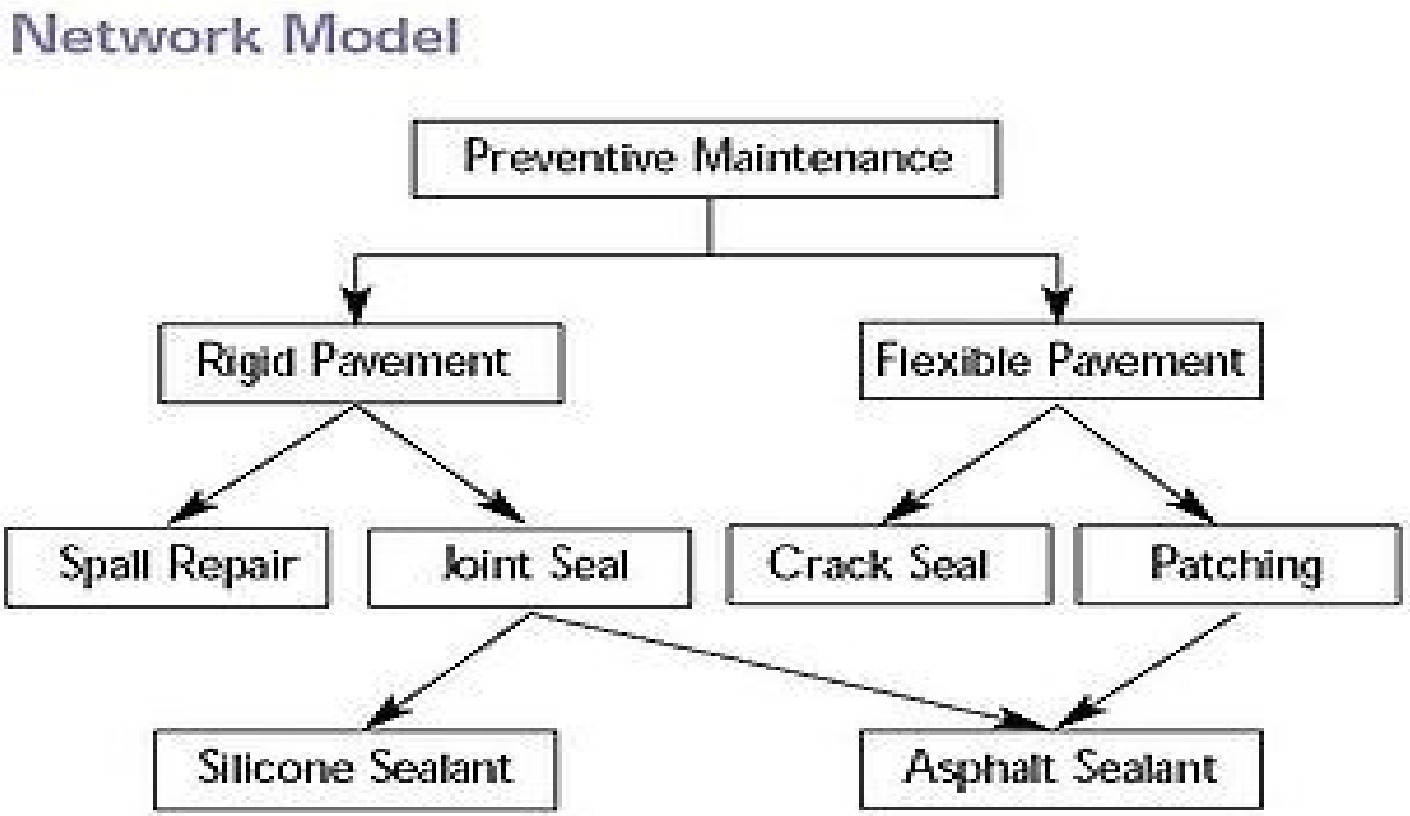
Evolution of Database Modeling - Network Model



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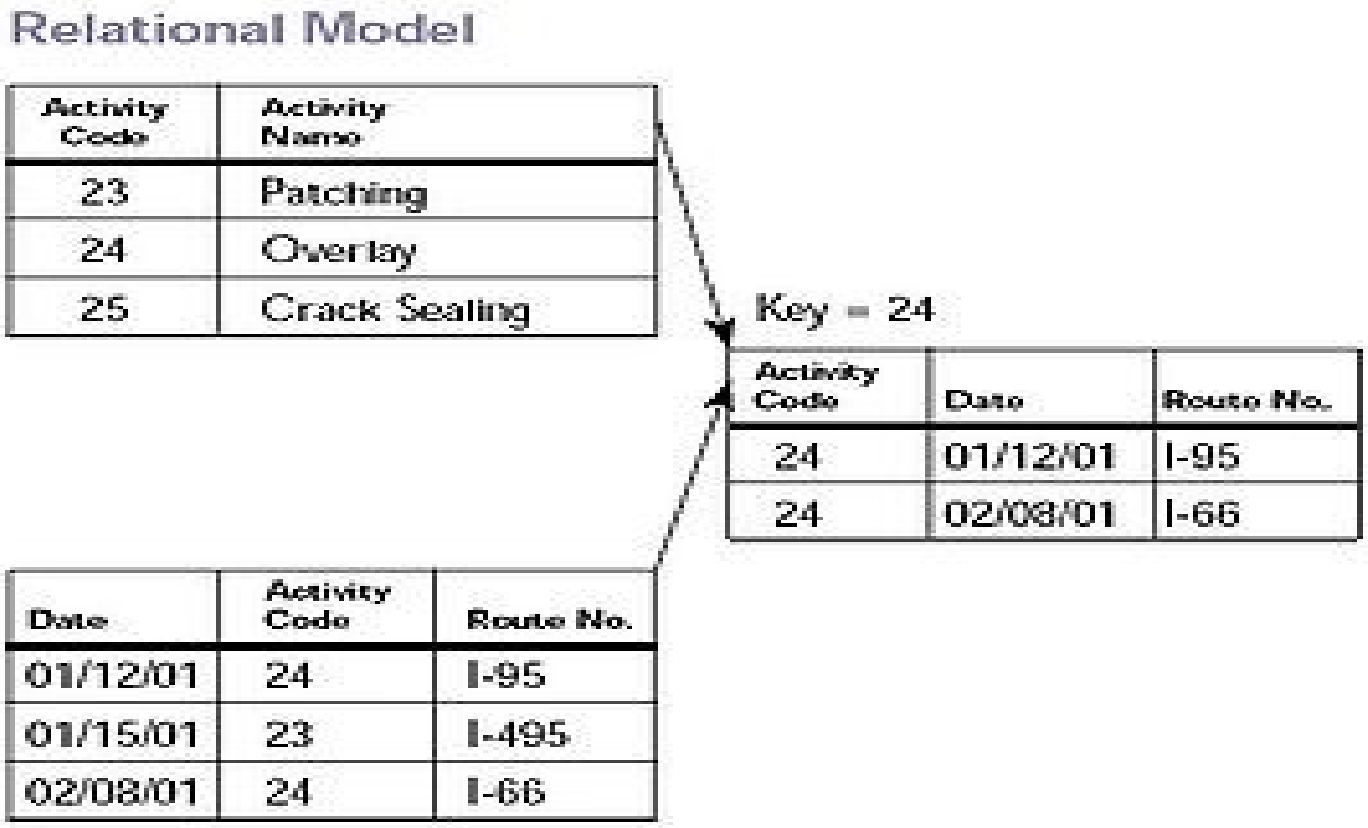
Evolution of Database Modeling - Relational Model



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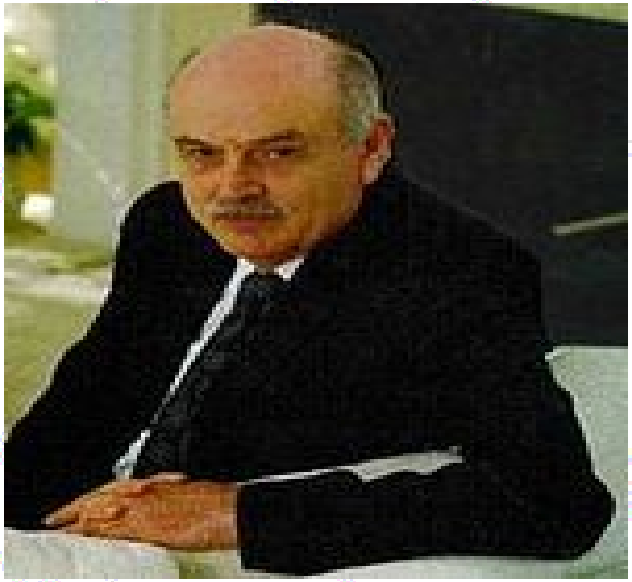
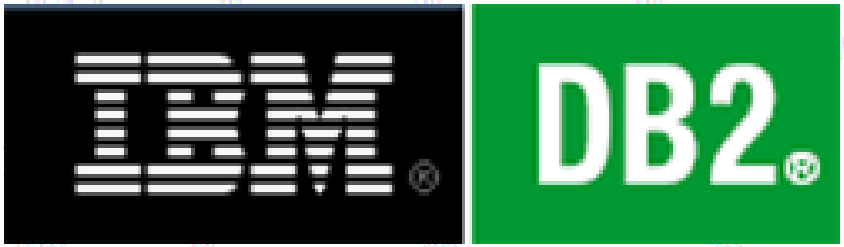
Relational Model cont ...

- Edgar Frank "Ted" Codd (August 23, 1923 – April 18, 2003) was a British computer scientist who, while working for IBM, invented the relational model for database management.



Popular RDBMS Vendors



Latest Versions of RDBMS Vendors

Sno	RDBMS Name	Vendor	Release Date	Latest Version
1	MySQL	Oracle Corpotration	2016-09	V5.7.15
2	Oracle	Oracle Corpotration	2016-08	Oracle 12c
3	DB2	IBM	2016-04	DB2 LUW 11
4	Teradata	Teradata	2015-12	V15.10
5	SQL Server	Microsoft	2016-06	Microsoft SQL Server 2016

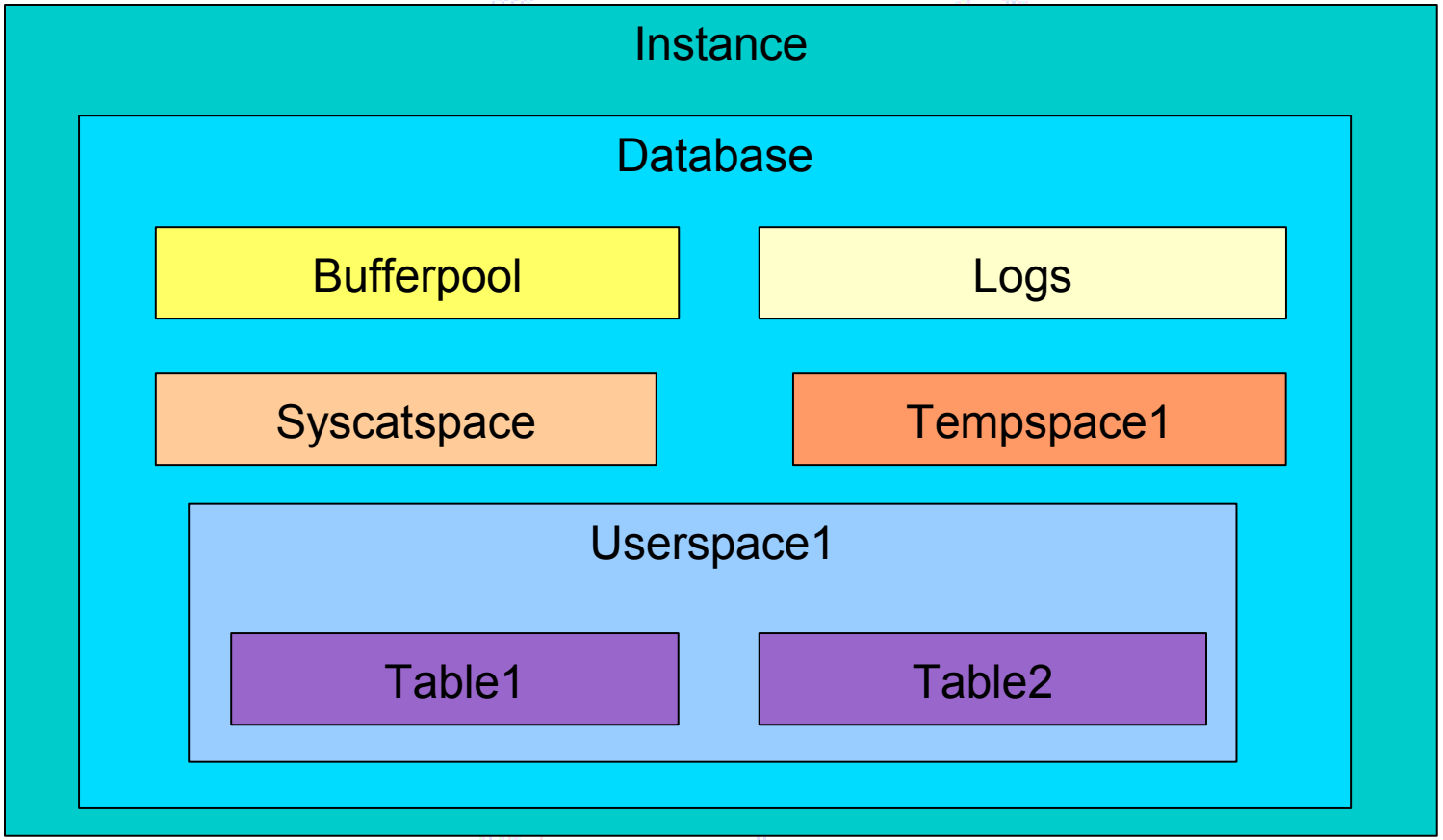
DB2 Versions

- "DB2" was used to indicate a shift from hierarchical databases - such as the Information Management System (IMS) popular at the time - to the new relational databases.
- IBM recognized early on the importance of XML and it released of the first hybrid data server in the market: DB2 9.
- DB2 9.1, available since July 2006, is a hybrid (also known as multi-structured) data server because it allows for storing relational data, as well as hierarchical data, natively.
- In 2007, IBM released DB2 9.5.
- Note as well that there is no DB2 9.2, DB2 9.3 or DB2 9.4. The version was changed from DB2 9 directly to DB2 9.5 to signify major changes and new features in the product.

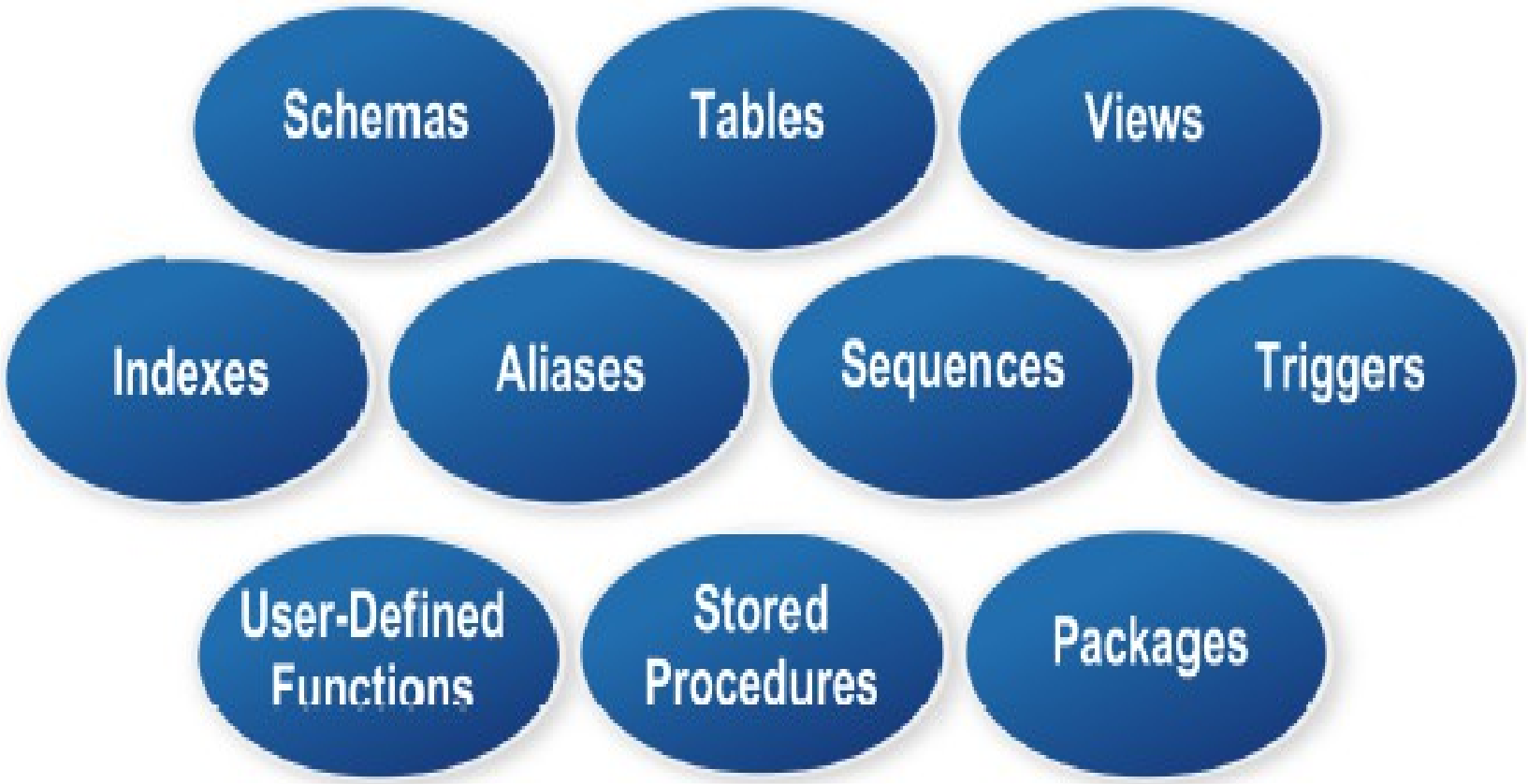
Code Names

- Before a new version of DB2 is publicly available, a code name is used to identify the product.
- Once the product is publicly available, the code name is not used.
- DB2 9 had a code name of "Viper", DB2 9.5 had a code name of "Viper 2", DB2 9.7 had a code name of "Cobra", DB2 10 had a code name “Galileo” and DB2 LUW 11 has a code name “Kepler” .
- Some references in published articles may still use these code names.

DB2 Environment



Database Objects



Data Types in DB2

SMALLINT

INT

BIGINT

CHAR

VARCHAR

BLOB

CLOB

DATE

TIME

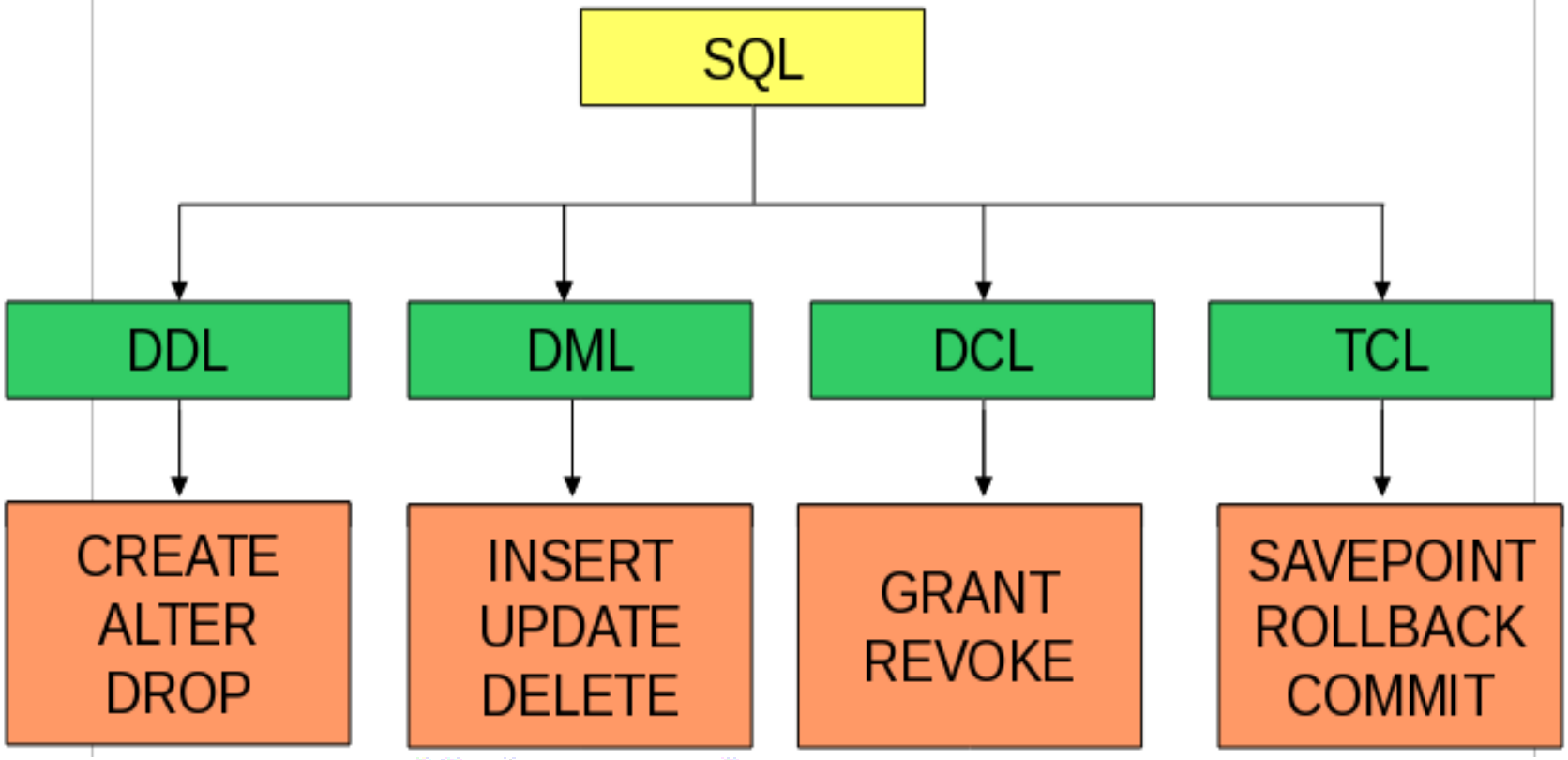
TIMESTAMP

DECIMAL

Structured Query Language (SQL)

- The word SQL came from Structured English QUEry Language or SEQUEL.
- DB2 is considered first database product to use SQL (also developed by IBM in 1970s) although Oracle released a commercial SQL database product somewhat earlier than IBM.
- SQL is a standard language for accessing and manipulating databases.
- According to ANSI (American National Standards Institute), it is the standard language for relational database management systems.
- SQL statements are used to perform tasks such as update data on a database, or retrieve data from a database. Some common relational database management systems

Structured Query Language cont ...



Database Constraints

- The data can be restricted before inserting into the table.
- Types of Constraints
  - Not Null
  - Unique
  - Primary Key
  - Foreign Key
  - Check
  - Default

DB2 Basics

- Version : DB2/Linux Client V9.1
- Connection : Open A terminal and type
- Syntax:

db2 connect to <db name> user <user name> using <pass word>

- Example:

  db2 connect to mcadb user miracle using miracle

- The key word db2 should add for each and every statement and it should be in lower case only.
- Except db2 remaining all the SQL statements should be in Double quotes.

db2 “select * from miracle.emp”

Creating DB Objects

- Create all the object with a sql file.
- The file name should contain extension of .sql.
- With in the file every statement should be end with a semicolon(;).
- After creation run that file by the below command

db2 -tvf staff_table.sql

Sample Script

```
DROP TABLE EDIDB2A.T_LKP_COMM_PAYER;

CREATE TABLE EDIDB2A.T_LKP_COMM_PAYER (
     IN_PAYER_ID VARCHAR(5) NOT NULL,
     IN_CLM_OFF_NO VARCHAR(5) NOT NULL,
     OUT_PAYER_ID VARCHAR(5),
     OUT_CLM_OFF_NO VARCHAR(6)
)IN TBSP_LKP INDEX IN TBSP_INDEX ;

ALTER TABLE EDIDB2A.T_LKP_COMM_PAYER ADD
CONSTRAINT  X_T_LKP_COMM_PAYER PRIMARY KEY
(IN_PAYER_ID,IN_CLM_OFF_NO);
```

The SELECT Statement

- The most commonly used SQL command is SELECT statement.
- The SQL SELECT statement is used to query or retrieve data from a table in the database.
- A query may retrieve information from specified columns or from all of the columns in the table.
- To create a simple SQL SELECT Statement, you must specify the column(s) name and the table name.
- The whole query is called SQL SELECT Statement.

Example:

```
db2 “select name from emp”
db2 “select * from emp where name='satish'”
```

The SELECT Statement cont …

- The statement begins with the SELECT keyword. The basic SELECT statement has 3 clauses:

* SELECT
* FROM
* WHERE

- The SELECT clause specifies the table columns that are retrieved.
- The FROM clause specifies the tables accessed.
- The WHERE clause specifies which table rows are used. The WHERE clause is optional; if missing, all table rows are used.

OPERATORS

MATHEMATICAL OPERATORS | COMPARISION OPERATORS | LOGICAL OPERATORS | SPECIAL OPERATORS

MATHEMATICAL OPERATORS

	OPERATOR	OPERATOR NAME
1.	+	Addition
2.	-	Subtraction
3.	/	Division
4.	*	Multiplication

COMPARISION OPERATORS

	OPERATOR	OPERATOR NAME
1.	=	Equal to
2.	>	Greater than
3.	<	Less than
4.	>=	Greater than or equal to
5.	<=	Lesser than or equal to
6.	<>	Not equal to

Database Scripts

- **LOGICAL OPERATORS:**
  - AND – OR – NOT
- **SPECIAL OPERATORS / Predicates:**
  - IN – LIKE – BETWEEN – NULL – EXISTS
- **SELECT * FROM DEPT WHERE DEPTNO IN (10,20,30);**
- **SELECT DEPTNO,EMPNO,ENAME FROM EMP WHERE DEPTNO LIKE 'SC%'**
- **SELECT EMPNO,SAL FROM EMP WHERE SAL BETWEEN 2000 AND 3000**
- **SELECT EMPNO,SAL,COMM FROM EMP WHERE COMM IS NULL;**
- **SELECT id, job FROM staff a WHERE EXISTS (SELECT * FROM staff b WHERE b.id = a.id 20 AND b.id < 50);**

BUILT IN FUNCTIONS

1) CHARACTER FUNCTIONS

2) NUMERIC FUNCTIONS

3) DATE FUNCTIONS

CHARACTER FUNCTIONS

1) ASCII ('A') – 65

2) CHR(65) – A

3) CONCAT('MIRACLE ','SOFTWARE') – MIRACLE SOFTWARE

4) 'MIRACLE ' || 'SOFTWARE' || ' SYSTEMS'
– MIRACLE SOFTWARE SYSTEMS

5) LENGTH('MIRACLE') – 8

6) LOWER('MIRACLE') miracle

7) UPPER('miracle')– MIRACLE

8) REPLACE('MIRACLEHARD','HARD','SOFT') – MIRACLESOFT

9) SUBSTR('MIRACLE SOFTWARE SYSTEMS',9,8) – SOFTWARE

CHARACTER FUNCTIONS

10) LOCATE('E','MIRACLE') – 7

11) LTRIM(' MIRACLE') – MIRACLE

12) RTRIM('MIRACLE ') – MIRACLE

13) REPEAT('MIRACLE',3)

– MIRACLEMIRACLEMIRACLE

14) LEFT('MIRACLE',5) – MIRAC

15) RIGHT('MIRACLE',5) – RACLE

NUMERIC FUNCTIONS

1) ABS(52) - 52 , ABS(-52) - 52
2) MOD(14,5) - 4
3) POWER(5,3) - 125
4) CEIL(9.2) - 10 , CEIL(-9.2) - -9
5) FLOOR(9.2) - 9, FLOOR(-9.2) - -10
6) ROUND(1234.5666,3) - 1234.56670,
ROUND(1234.5664,3) - 1234.56660
7) TRUNC(1234.5666,2) - 1234.5600 ,
TRUNC(1234.5665,3) - 1234.5660
8) SQRT(25) - +5.0000000000000E+000

DATE FUNCTIONS

1) CURRENT DATE

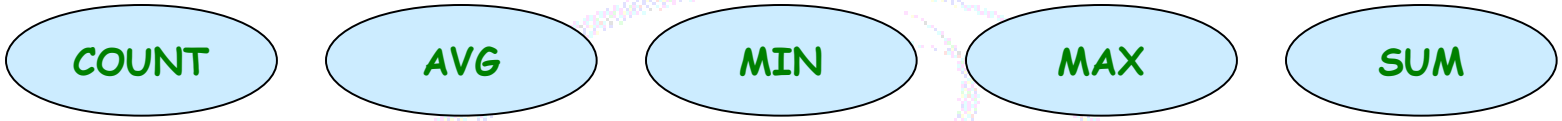
2) CURRENT TIMESTAMP

3) DAY(CURRENT DATE) , MONTH(CURRENT DATE) ,
YEAR(CURRENT DATE).

4) HOUR(CURRENT TIMESTAMP) ,
MINUTE(CURRENT TIMESTAMP)
SECOND(CURRENT TIMESTAMP).

5) DAYNAME(CURRENT DATE) ,
MONTHNAME(CURRENTDATE)
DAYNAME(CURRENT TIMESTAMP) ,
MONTHNAME(CURRENT TIMESTAMP).

GROUP FUNCTION




```
SELECT    COUNT(SAL),
          COUNT(DISTINCT SAL),
          AVG(SAL),
          AVG(DISTINCT SAL),
          MIN(SAL),
          MAX(SAL),
          SUM(SAL)
      FROM EMP

SELECT DEPTNO, AVG(SAL) FROM EMP
          GROUP BY DEPTNO
          HAVING AVG(SAL) > 1600
```

The GROUP BY Statement:
The GROUP BY statement is used in conjunction with the aggregate functions to group the result-set by one or more columns.

The HAVING Clause:
The HAVING clause was added to SQL because the WHERE keyword could not be used with aggregate functions.

Function Execution

db2 “select current date from sysibm.sysdummy1”

db2 “select sum(salary) from staff”

Views

- A view is another way to look at the data in one or more tables.
- A view is a logical or virtual table, which does not, exists physically in the database.
- Advantages:
  - Security – The confidential columns can be suppressed from viewing and manipulation.
  - Readability - Application design becomes easier.
- **CREATE VIEW EMP_VIEW AS SELECT EMPNO,ENAME FROM EMP;**

Index

- An index can be created in a table to find data more quickly and efficiently.
- The CREATE INDEX statement is used to create indexes in tables.
- Indexes allow the database application to find data fast without reading the whole table.
- The users cannot see the indexes, they are just used to speed up searches/queries.
- **CREATE INDEX index_name ON table_name (column_name)**

Generation Automated Values in DB2

- **The Identity Column & The Sequence Object**

- **The Identity Column:**
  - Introduced in DB2 UDB Version 7.1.
  - Automatically generate a unique value for every row in a table.
  - The identity column is tied to the table.
  - To create an identity column, include the IDENTITY clause in your CREATE TABLE statement.
  - The column is declared with a numeric data type.
  - Can increment by sequential integers.
  - In a table you can use only one identity column.

The Identity Column – Example

```
CREATE TABLE WIDGET_INVENT
( ROW_ID INT NOT NULL
GENERATED ALWAYS AS IDENTITY
(START WITH 1, INCREMENT BY 1, NO MAXVALUE, NO
  MINVALUE, NO CYCLE,
NO CACHE),
WIDGET_NO CHAR(6),
INV_COUNT INT WITH DEFAULT 0 );
```

Inserting Values:

```
INSERT INTO WIDGET_INVENT (WIDGET_NO, INV_COUNT)
   VALUES ('000005', 600), ('000006', 200);
INSERT INTO WIDGET_INVENT
   VALUES (DEFAULT,'000005', 600),
        (DEFAULT,'000006', 200);
```

The Sequence Object

- **The Sequence Object**
  - Introduced in DB2 UDB Version 7.2.
  - Automatically generate a unique value for every row in a table.
  - The identity column is not tied to the table.
  - It is separate database object.
  - The column is declared with a numeric data type.
  - Can increment by sequential integers.
  - In a table you can use N number of sequences.

The Sequence Object - Example

- **CREATE SEQUENCE *myseq***

AS INTEGER

START WITH 1

INCREMENT BY 1

NO MINVALUE

NO MAXVALUE

NO CYCLE

CACHE 10

- **Inserting Values**
- **INSERT INTO WIDGET_INVENT (NEXT VAL FOR *myseq*, '000005', 600);**

Any Queries ...

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Thank

Q

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