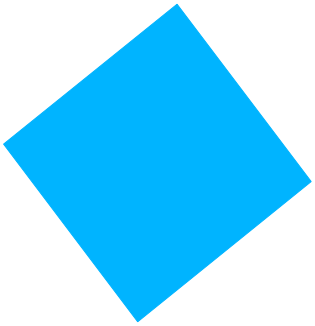
UDB Training

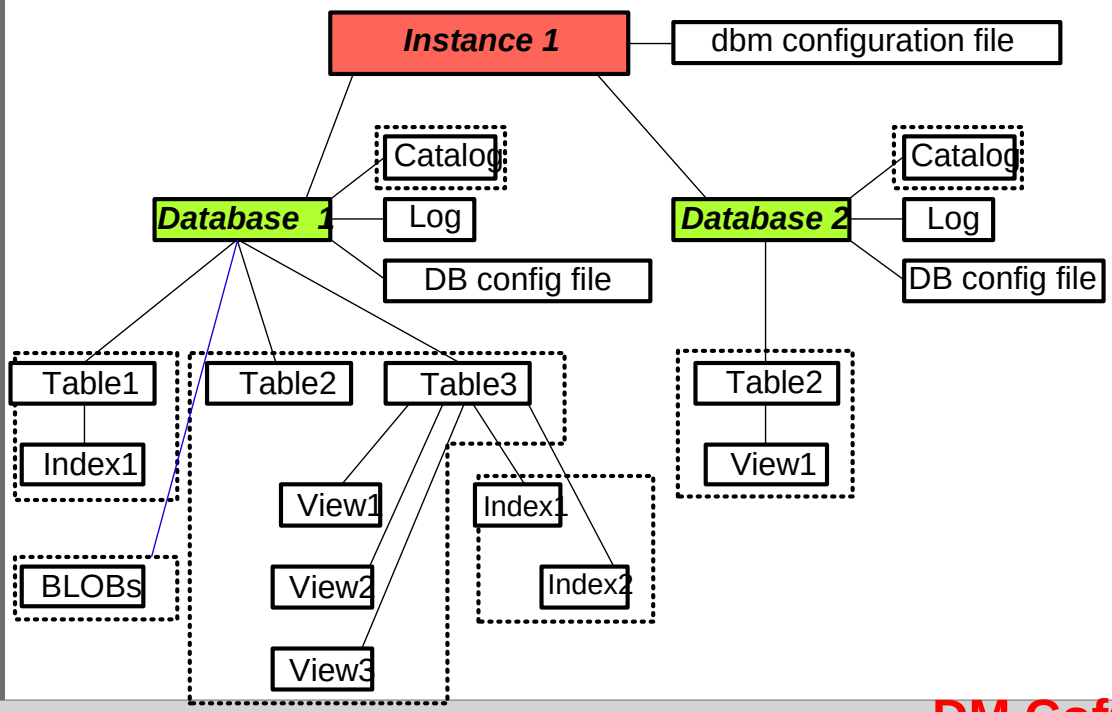
Data Object



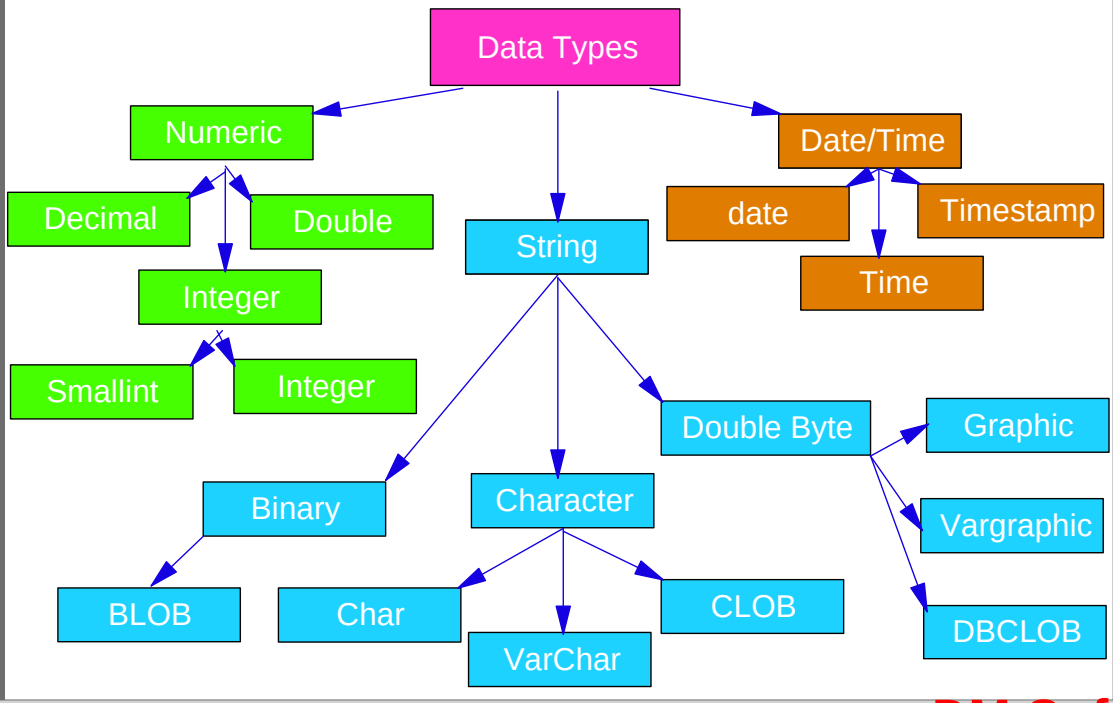
Objectives

- After completing this unit, you should be able to:
  - To describe database objects
  - To examine the DB2 implementation of SQL
    - Data Definition Language(DDL)
  - Data Manipulation Language(DML)

DB2 Object Hierarchy



DB2 Data Types



Multiple Page Size Support

Page Size (in Kilobytes)	Number of Columns	Maximum Row Length (in bytes)	Maximum Table Size** (in Gigabytes)
*4	500	4005	64
*8	1012	8101	128
16	1012	16293	256
32	1012	32677	512

A table space must be mapped to a buffer pool of the same page size.

* available in DB2 UDB V5R2

** Maximum Table Size per Database Pertition (EEE)

Notes:

Database Manager Limits

Description	4K	8K	16K	32K
Columns per table	500	1012	1012	1012
Row length (bytes)	4005	8101	16293	32677
Table Size per partition (Gigabytes)	64	128	256	512
Index Size per partition (Gigabytes)	64	128	256	512
Elements in a SELECT	500	1012	1012	1012
Columns in a GROUP BY	500	1012	1012	1012
Length of columns in a GROUP BY (bytes)	4005	8101	16293	32677
Columns in a ORDER BY	500	1012	1012	1012
Length of columns in a ORDER BY(bytes)	4005	8101	16293	32677
Columns in an INSERT	500	1012	1012	1012
SET clauses per UPDATE statement	500	1012	1012	1012
Size of a DMS table space (Gigabytes)	64	128	256	512

Table & Column Name Length

Product	Table Names	Column Names
DB2 UDB for OS/2, Windows and UNIX V6	128	30
DB2 for VSE & VM V6	18	18
DB2 UDB for OS/390 V6	18	18
DB2 for OS/400 V4R2	128	30
SQL Server V7.0	128	128
Sybase 11	30	30
Oracle 8	30	30
ANSI SQL3 Standard	128	128

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Increased Index Size

Product	Index Key Length (bytes)	Number of Columns
DB2 UDB for OS/2, Windows and UNIX	1024	16
DB2 UDB for OS/390	254	64
DB2 Server for VSE&VM	255	16
DB2 for OS/400	2000	120
Oracle (up to V7.3)	255	16
Oracle V8	**	32
SQL Server V7	900	16
Sybase 10	256	16
Informix 7.2	120	8

** note Oracle 8 index size will depend on the page size

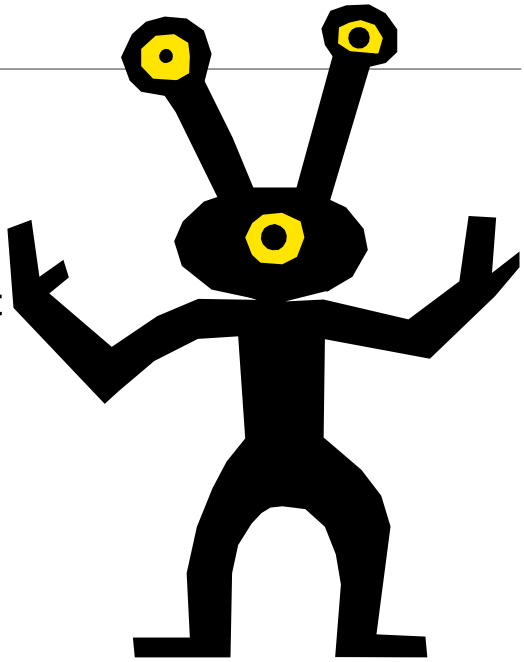
DM CofC

Increased Statement Size

Maximum SQL statement size increased from current limit of 32767 (32 KB) to 65535 (64 KB).

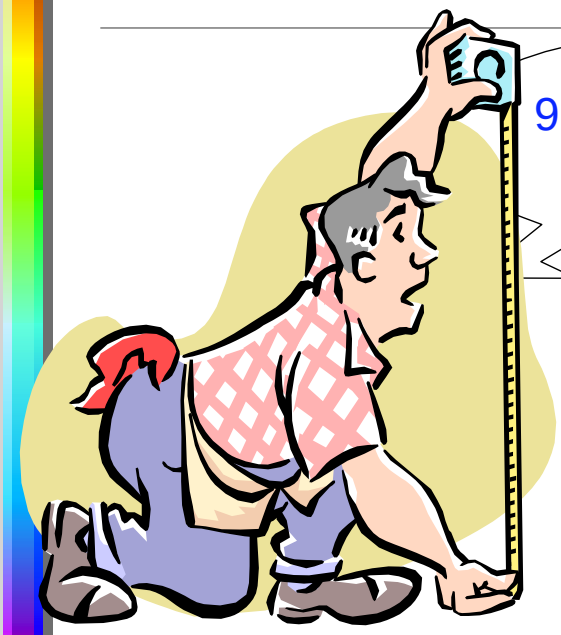
Size limit is enforced for all SQL statements submitted to the database manager, including (but not limited to):

- end user input
- JDBC/ODBC/CLI applications
- embedded SQL applications
- and many UDB tools



64 KB statement - that's big!

BIGINT Datatype



9,223,372,036,854,775,807
Now that is big!

8-byte integer
19-digit
precision

UNICODE Enhancements

Unicode is the standard codepage that includes characters from almost all the living languages of the world.

DB2 UDB supports UCS-2/UTF-8.

- UCS-2 (code page 1200) for DBCS (GRAPHIC data)
- UTF-8 (code page 1208) for MBCS (CHAR data)

All data types and functions supported.

Considerations for IMPORT/EXPORT/LOAD:

- WSF is not supported
- Codepage conversion is done when importing/exporting
- Loading ASC or DEL - Use modified by codepage=xxx option to perform codepage converstion

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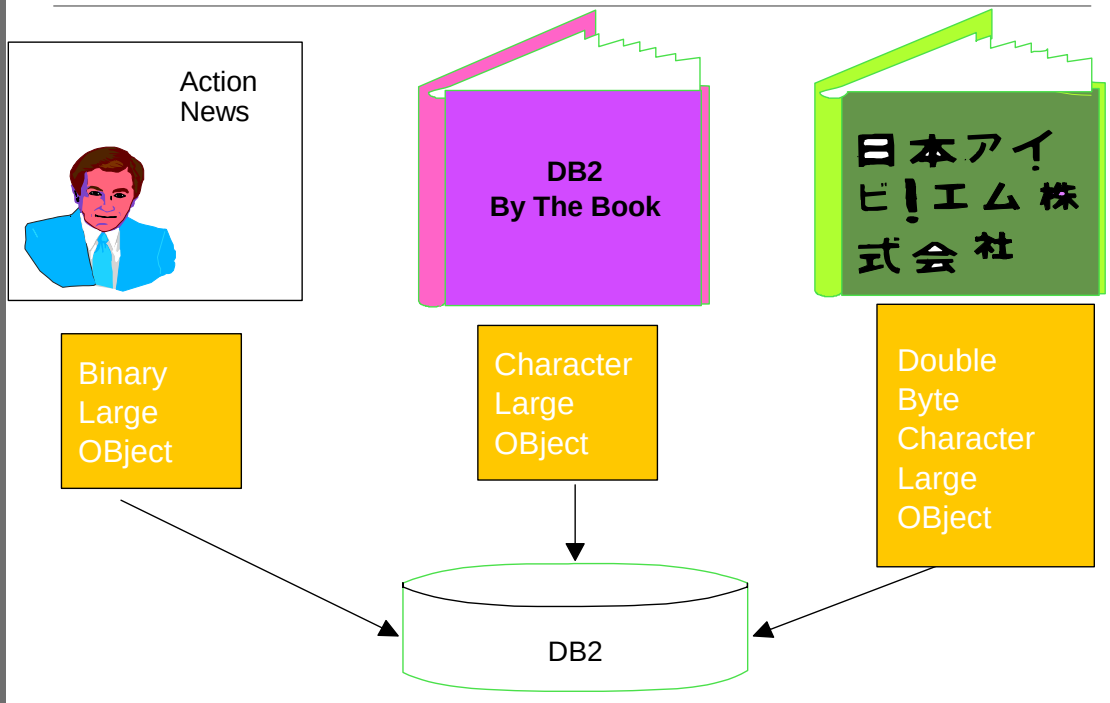
Large Objects - The Need



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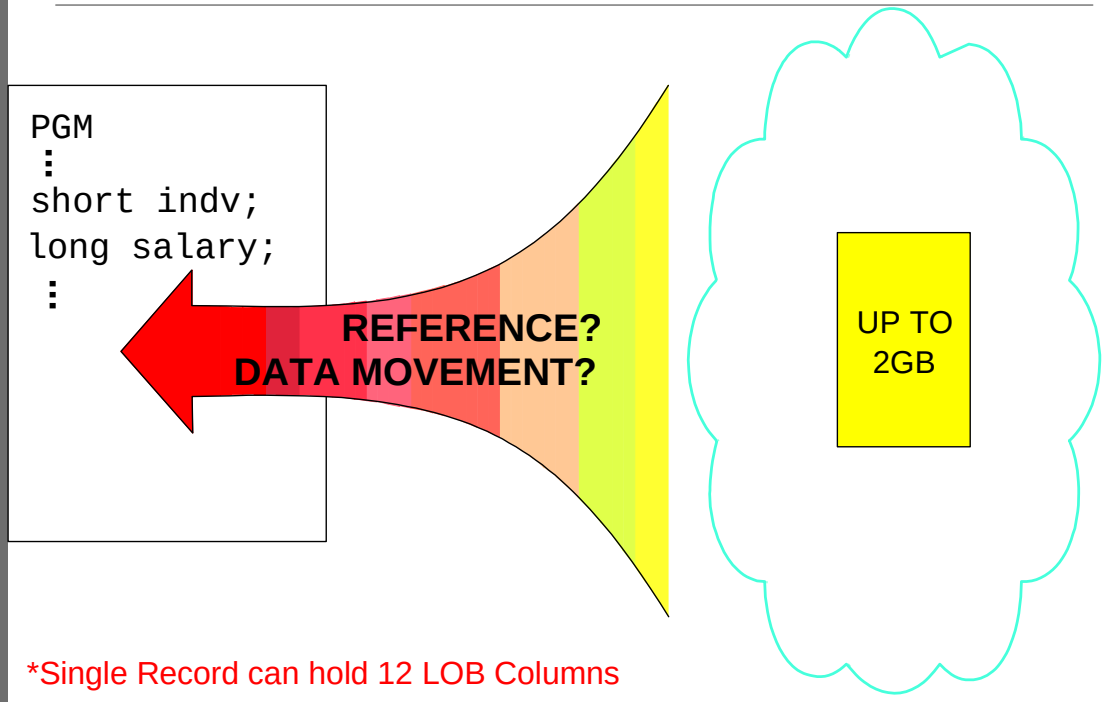
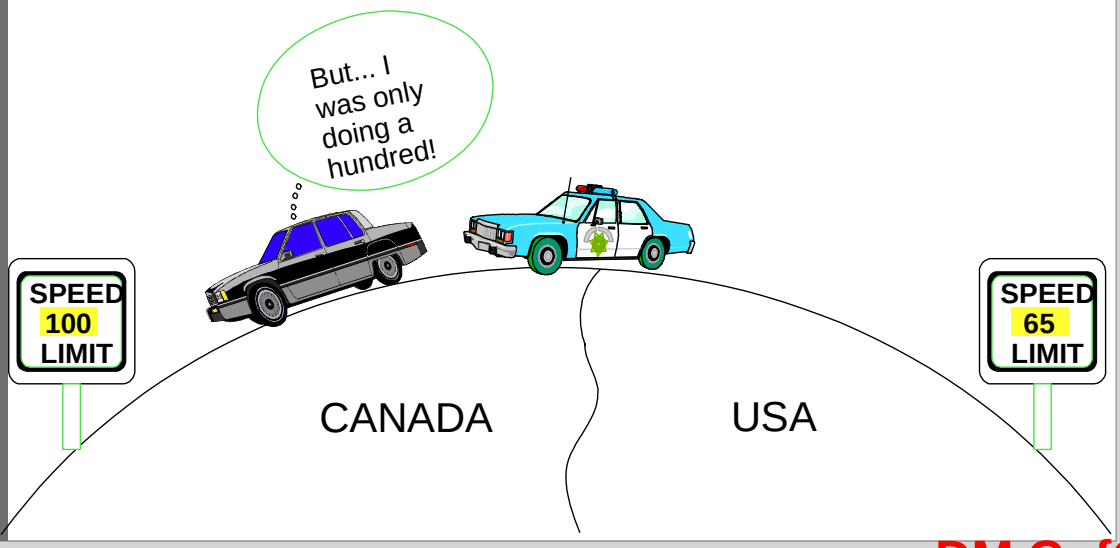
Large Objects - Memory Consideration



*Single Record can hold 12 LOB Columns

User-Defined Types - The Need

- Need to establish context for values
- DB2 enforced typing



User-Defined Types - Definition

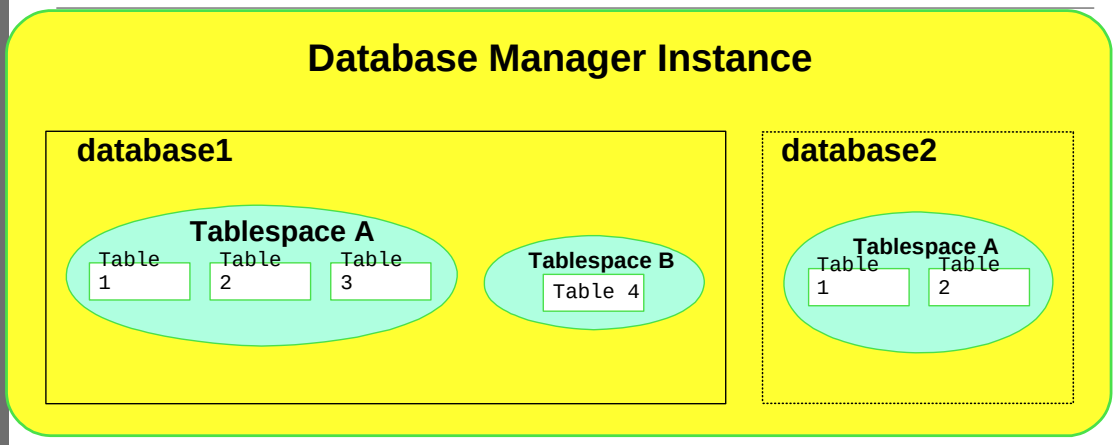
```
CREATE DISTINCT TYPE POUND AS INTEGER
WITH COMPARISONS
CREATE DISTINCT TYPE KILOGRAM AS
INTEGER
WITH COMPARISONS
CREATE TABLE person
   (f_name  varchar(30),
    weight_p  POUND NOT NULL,
    weight_k  KILOGRAM NOT NULL )
SELECT F_NAME FROM PERSON
  WHERE weight_p > POUND(30)
SELECT F_NAME FROM PERSON
  WHERE weight_p > weight_k
```

FAILS

Selecting the Correct Data Type

Question	DataType
Is the data fixed in length?	CHAR
Is the data variable in length?	VARCHAR
Do you need to sort(order) the data?	CHAR, VARCHAR, CLOB, DBCLOB
Is the data to be used in arithmetic operations?	DECIMAL, DOUBLE, INTEGER, SMALLINT
Does it contain decimal?	DECIMAL, DOUBLE
Does the data have a specific meaning (beyond DB2 base datatype)?	UDT

Physical Database Layout



- Table spaces are a logical layer created within catabase
- Tables are created within table spaces
- Two types of table spaces: SMS and DMS

Object Definition

- You can CREATE or DROP the following objects:-

Table	**View**	**Alias**
UDF	**Trigger**	**Event Monitor**
Index	**UDT**	**Table Space**

- But you can only ALTER :-

Table **Table Space**

Schema and Catalog

- What is a Schema name?
  - Fully-qualified table name
  - "schemaname.tablename"
- Following schema names reserved
  - SYSCAT, SYSIBM, SYSSTAT
  - Avoid schema names beginning with SYS
    - Enforced with triggers, UDFs, and UDTs
- If Database object does not specify a schema name
  - Table qualified with current authorization ID

SYS Schemas

- SYSIBM
  - Base catalogs
- SYSCAT - SELECT GRANT to PUBLIC
  - Catalog Read-Only Views
- SYSSTAT
  - Updateable Catalog Views - Influence the Optimizer
- SYSFUN
  - User-Defined Functions

Create Table

- Connect to database first
- You must have SYSADM, DBADM or CREATETAB privilege

```
connect to eddb
create table artists
(artno           smallint not null,
 name            varchar(50) with default 'abc',
 classification  char(1) not null,
 bio             clob(100K) logged,
 picture         blob(  2M) not logged compact)

 in dms01

 index in dms02

 long  in dms03
```


Creating Views

- Must have SYSADM, DBADM, CONTROL or SELECT on each base table
- Data for view not stored separately
- SYSCAT.VIEWS, SYSCAT.VIEWDEP, SYSCAT.TABLES

```
CONNECT TO TESTDB
CREATE VIEW DEPTSALARY
  AS SELECT DEPTNO, DEPTNAME, SUM(SALARY) AS TOTSAL
  FROM PAYROLL GROUP BY DEPTNO,DEPTNAME
```

```
CREATE VIEW EMPSALARY
    AS SELECT EMPNO, EMPNAME, SALARY
  FROM PAYROLL, PERSONNEL
  WHERE EMPNO=EMPNUMB AND SALARY > 30000.00
```

```
SELECT * FROM DEPTSALARY
```

```
DEPTNO         DEPTNAME                 TOTSAL
------         ----------------      ----------
  10           MANUFACTURING          1000000.00
  20           ADMINISTRATION          300000.00
  30           MARKETING               250000.00
  ...
```

Creating Indexes

- Must have SYSADM, DBADM, CONTROL or INDEX privilege on table

```
create unique index itemno on albums (itemno)

create index item on stock (itemno)
```

- SYSCAT.INDEXES and SYSCAT.INDEXAUTH

Referential Integrity

- Referential Constraints are established with the:-
  - Primary Key clause
  - Unique constraint clause
  - Foreign Key clause
  - References clause
- in the CREATE/ALTER TABLE statements

```
create table artists (artno          .....
   primary key (artno)
    foreign key dept (workdept)
    references department on delete no action)
in DMS01
```