DATABASE LANGUAGES and LEVELS
Database Language Levels

• Each Level has a Definition Language
• Internal
  – Storage Definition Language
• Conceptual
  – Data Definition Language
• External (User)
  – View Definition Language
• Define data’s structure
Data Definition Language

Logical Structure of Conceptual Level Data
- Record Types
- Attributes

Rules governing DB
- Rules for each table
- Rules about connections between tables
Conceptual: DDL

- create table employee (fname varchar(15) not null, lname varchar(15) not null, ssn char(9) primary key, dno number(3) foreign key references department);
Conceptual: DDL

• create table employee ( 
  fname varchar(15) not null,
  lname varchar(15) not null,
• ssn char(9) primary key,
• dno number(3) foreign key references department);
create table employee (fname varchar(15) not null, lname varchar(15) not null, ssn char(9) primary key, dno number(3) foreign key references department);
Conceptual: DDL

- create table employee (
  fname varchar(15) not null,
  lname varchar(15) not null,
- ssn char(9) primary key,
- dno number(3) foreign key references department);
Storage Definition Language

- Physical Structure
- Bytes per field
- Order of fields
- Sorting
- Access (hash, B-tree)
- File Structure
- Mixed Records, etc.
SDL Example

- `create table employee ( ...,
- `initrans 3, /* simul updates */
- `pctfree 30, /* use new block */
- `initial 7,
  `next 7); /* space allocated */
- Beyond scope of this course
View Definition Language

- Define Subsets of records available to classes of user.
- Create "virtual tables" from base tables.
- View appears to user like conceptual level.
VDL Examples

• `create view emp5 as`  
  `select * from employee`  
  `where dno = 5;`  
  – See only dept 5 employees

• `create view empdept as`  
  `select fname,lname,dno,dname`  
  `from employee,department`  
  `where dno=dnrnumber;`  
  – Make both dept number and name available.
VDL Examples

• create view emp5 as
  select * from employee
  where dno = 5;
  – See only dept 5 employees

• create view empdept as
  select fname, lname, dno, dname
  from employee, department
  where dno=dnumber;
  – Make both dept number and name available.

Based in two tables
View Examples, cont.

- Create view stats as
  
  ```sql
  select dname, count(*), avg(salary),
  from employee, department
  where dno = dnumber
  group by dname;
  ```

  - This count and average do not exist in any DB table.
• Create view stats as
  select dname, count(*), avg(salary),
  from employee, department
  where dno = dnumber
  group by dname;
  – This count and average do not exist in any DB table.

Calculated from existing data in database
Data Manipulation Language

- Used at conceptual level
- and at External Level.
- query (request info)
- delete
- update
- insert
DML examples

- select * from stats
  where dname = 'Research';

- insert into works_on
  values('123456789',7,15);

- update works_on
  set hours = 10
  where essn = '123456789'
  and pno = 7;
DML examples

- select * from stats
  where dname = 'Research';
- insert into works_on
  values(‘123456789’,7,15);
- update works_on
  set hours = 10
  where essn = ‘123456789’
  and pno = 7;
Standard SQL Defines

- Conceptual Level DDL (Data Definition Lang)
- Conceptual Level DML (Data Manipulation)
- External Level DDL
  - Views are defined as Queries with names
- External Level DML (same as Conceptual)
- NO Storage Definition Language
Oracle DB Definition

- Adds SDL constructs to Standard SQL DDL.
- Also structures database with Configuration Files
- This is province of DB Administration.
- Beyond the Scope of this Course