DATABASE COMPONENTS

Typical DB Components

• The stored database
• The catalog (a DB about the DB)
  – identifies tables, fields, keys, etc., in the stored DB
  – statistics: size of tables, how stored
  – mappings.
• Data Manager: performs accesses to disk at request of ...
• Runtime DB Processor
  – Carries out access plans of higher level components
More Typical DB Components

• DDL Compiler
  – Checks for Correctness & permissions
  – Translates into Catalog Entries
  – Uses RT processor

• Query Processor
  – Checks for Correctness & permissions
  – Translates into Stored DB access and manipulation plans
  – Uses RT processor

Processing Command includes Checking Correctness

• correct syntax
• correct references:
  – if a query refers to a table’s column,
  – the table and column better exist!
Compile Data Definition Stmt

- DDL Statement like "Create Table' sent to **DDL Compiler**
- Compiler Creates **Catalog Manipulation Plan** for **Runtime Processor**.
- R/T processor gives **page by page instructions** to **Stored Data Manager**.
- But first has to Check Correctness.

DDL: 1 – Check Syntax

- DDL Compiler can check syntax of statement all by itself
- No need to consult catalog to know
  ```
  creat table xyz (integer idnum; string name)
  ```
  has mistakes.
DDL: Check Syntax

- Syntax is correct
- But
  - `dno integer foreign key references dept(dnumber)`
  may be a mistake (no such table)
- Can only be discovered by checking the catalog.
DDL: 2 – Check References

- Other errors discovered from catalog
  - Table already exists
  - User does not have right to create table
- While in catalog gather information
  - For use in compiling DDL statement
  - About referenced tables
  - About existing indexes
DDL: 3 – Compile DDL

- Compiler now has info about referenced tables and indexes
- Makes plan to create table
- Plan means to make entries in Catalog
  - USER_TABLES, USER_TAB_COLUMNS, ALL_CONSTRAINTS, etc.
- Builds plan to make entries

No DATA stored in Stored Database, only Metadata in catalog.
Interactive DML

- Query Processor processes DML similarly to DDL Compiler
  - Validates Syntax
  - Checks references in Catalog
  - Checks statistics to decide best plan for implementing the query
- R/T Processor takes the plan and parcels it out to the Data Manager.

DML: 1 - Syntax

- Query Processor checks syntax with no help from catalog.
- `select fname, lname
  where dno=5`
  is syntactically incorrect on its face.
DML: 2 – Refs and Info

• Consult Catalog to check validity of references, etc.
  – Do tables, columns exist?
  – Does user have proper privileges?
• Get info used to construct plan
  – How is data stored?
  – How many tuples?
  – What indexes exist?
DML: Refs and Info (2)

- But let’s assume the references are all ok
- And the user has all required privileges
“Prepare” statements

• When we get to PL/SQL and PHP you will learn about “preparing” SQL statements.
• Building these implementation plans is the main part of preparation.