DBMS Parallel Architecture
DBMS Parallel Architecture

PARSING ENGINE (PE)
- SQL Parser & Optimizer
- Query Step Dispatcher
- Session Manager
- Input Data Conversion

Message Subsystem

AMP
- R3 R8 R11
- R1 R6 R4
- R7 R2 R22
- R12 R9 R5
DBMS Parallel Architecture

Message Subsystem

- Software/Hardware Communications Network -- BYNET
- Enables Scalability
- Dual BYNETs for Fault Tolerance
DBMS Parallel Architecture

ACCESS MODULE PROCESS (AMP)
- Searching & Sorting
- Row Joins
- Aggregations
- Index Management
- Journaling & Rollback

Message Subsystem

- PE
- AMP
- R3 R8 R11
- AMP
- R1 R6 R4
- AMP
- R7 R2 R22
- AMP
- R12 R9 R5
Parallelization

- User request parallelized by optimizer
  - Single processing step sent to all vprocs simultaneously
    - Optimized to only affected vprocs as appropriate
  - Multiple steps launched concurrently for a single request
  - Multiple requests launched concurrently for multiple users
- Allows hundreds of in flight requests for thousands of concurrent users
Resolver

• Retrieve dictionary information
  • From dictionary cache if possible
  • Annotate skeleton tree (database, table, column)
• Derive new conditions using transitivity
• Handle views and macros
• Handle derived tables
• Identify access requirements
• Report semantic errors
Optimizer Input and Output

Resolver Tree

OPTIMIZER

Statement list that specifies “best” (join) plan
Optimizer -- Data Definition Language

- No corresponding steps for DDL
  - E.g., AMP cannot CREATE VIEW
- Build dictionary operations tree
  - Inserts, updates and deletes to dictionary tables
  - update table headers
  - spoil operations
- Remove original statement tree
Optimizer -- Data Manipulation Language

- Transform a statement (red, resolver) tree to an operation (white) tree
- A request can be turned into many operations
- Access planning -- single table
- Join planning -- multiple tables
  - join two tables at a time
- Aggregate planning
- OLAP statistical function planning
- Spool number allocation
- Locking
  - full file scan ==> table level lock
  - UPI access ==> row-hash lock
  - etc.
Query Optimizer
Query Optimization Input and Outputs

1. Set of relations
2. List of outer joins
3. List of predicates

OPTIMIZER
Join Planner

Join Plan with:
1. Join Order
2. Join Methods
3. Access Path