Tutorial of Course Project:

Distributed Database Systems

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Outline

- Requirements
- Benchmark
- System Overview
- Discussion of Design & Implementation
- Demo
- Summary
- Q&A

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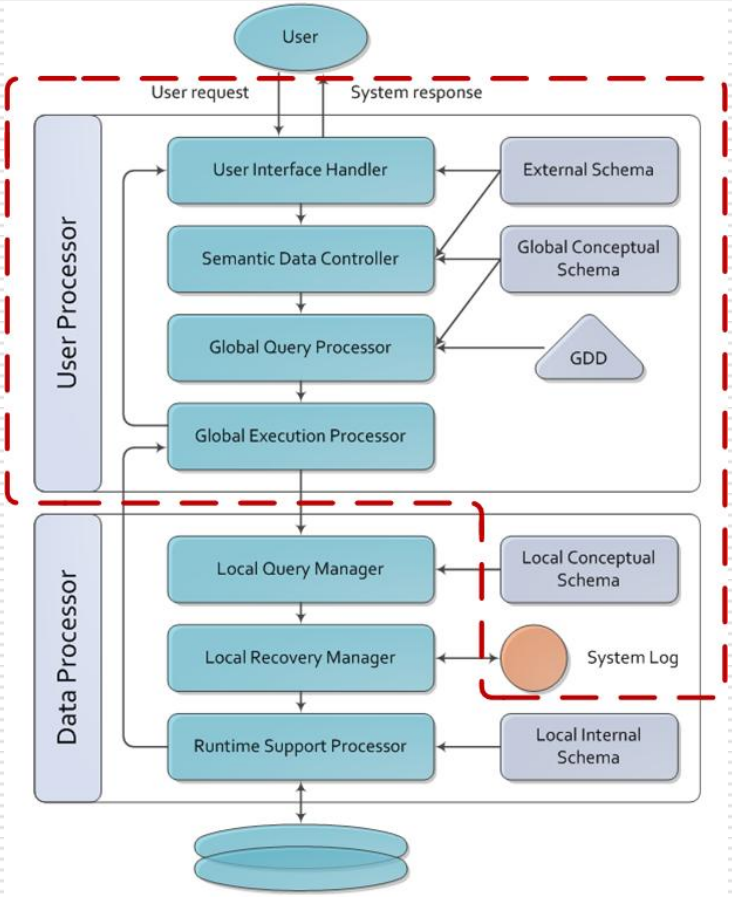
Overview of Requirements



- Distributed DBMS
- User Interface

Architecture

- P2P Architecture
  - The system should support multiple logic sites
  - Each site is identical to others
- Benchmark
  - 4 logic sites in 3 computers
  - The system can work even if some sites are off

Database Management

- Compulsory Commands
  - CREATE TABLE
  - FRAGMENT
  - ALLOCATE
  - INSERT & DELETE
  - IMPORT
  - SELECT
- Optional Commands
  - CREATE DATABASE & USE DATABASE
  - Other SQL statements

Fragmentation

- Compulsory Requirements
  - Horizontal Fragmentation
  - Vertical Fragmentation
- Optional Requirements
  - Hybrid Fragmentation
  - Derived Fragmentation

Fragmentation (cont.)

ID	A1	A2	A3	A4	A5
1					
2					
3					
4					
5					
6					
7					

R

ID	A1	A2
1		
2		
3		
4		
5		
6		
7		

R_1

ID	A3	A4	A5
1			
2			
3			
4			
5			
6			
7			

R_2

ID	A1	A2
1		
2		

R_{11}

ID	A3	A4	A5
1			
2			

R_{21}

ID	A1	A2
3		
4		
5		

R_{12}

ID	A3	A4	A5
3			
4			
5			

R_{22}

ID	A1	A2
6		
7		

R_{13}

ID	A3	A4	A5
6			
7			

R_{23}

Query Processing

- SELECT statement
  - One table & multi-tables (JOIN)
  - Type of operator in the predicate: >,>=,<,<=,=,<>
- Query Optimization
  - Query Tree Pruning
  - Optimized Query Tree Visualization or Print
- Query Execution
  - Execution Info of each Operator

User Interface

- The user should be able to use the interface to interact with your Distributed DBMS
- Any type of interface
  - Command Line Interface
  - Application-based Interface
  - Web-based Interface

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Example

- Benchmark Documentation of DDB Course 2007
- Link: ddb2007_test_student_beta3.pdf

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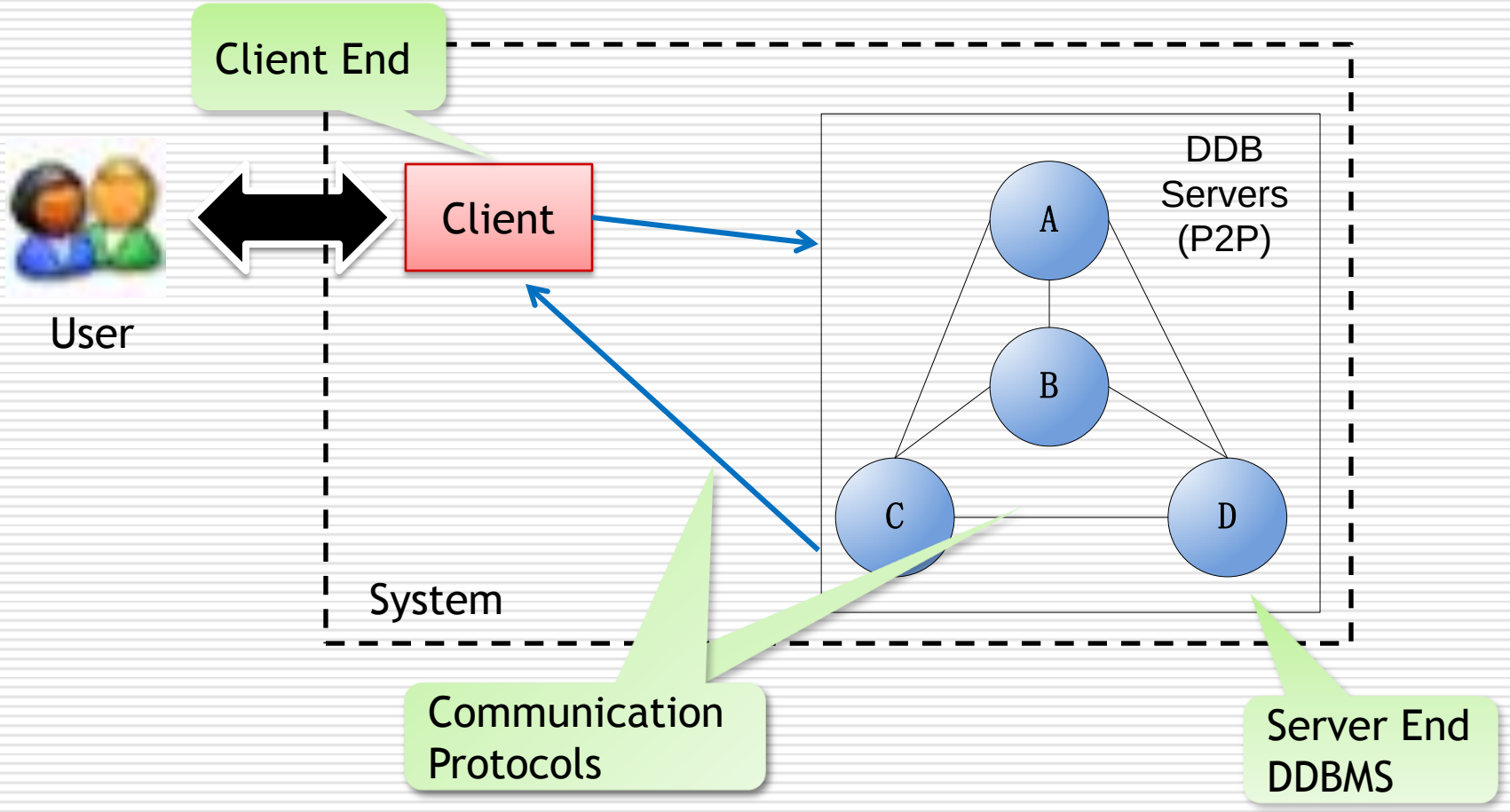
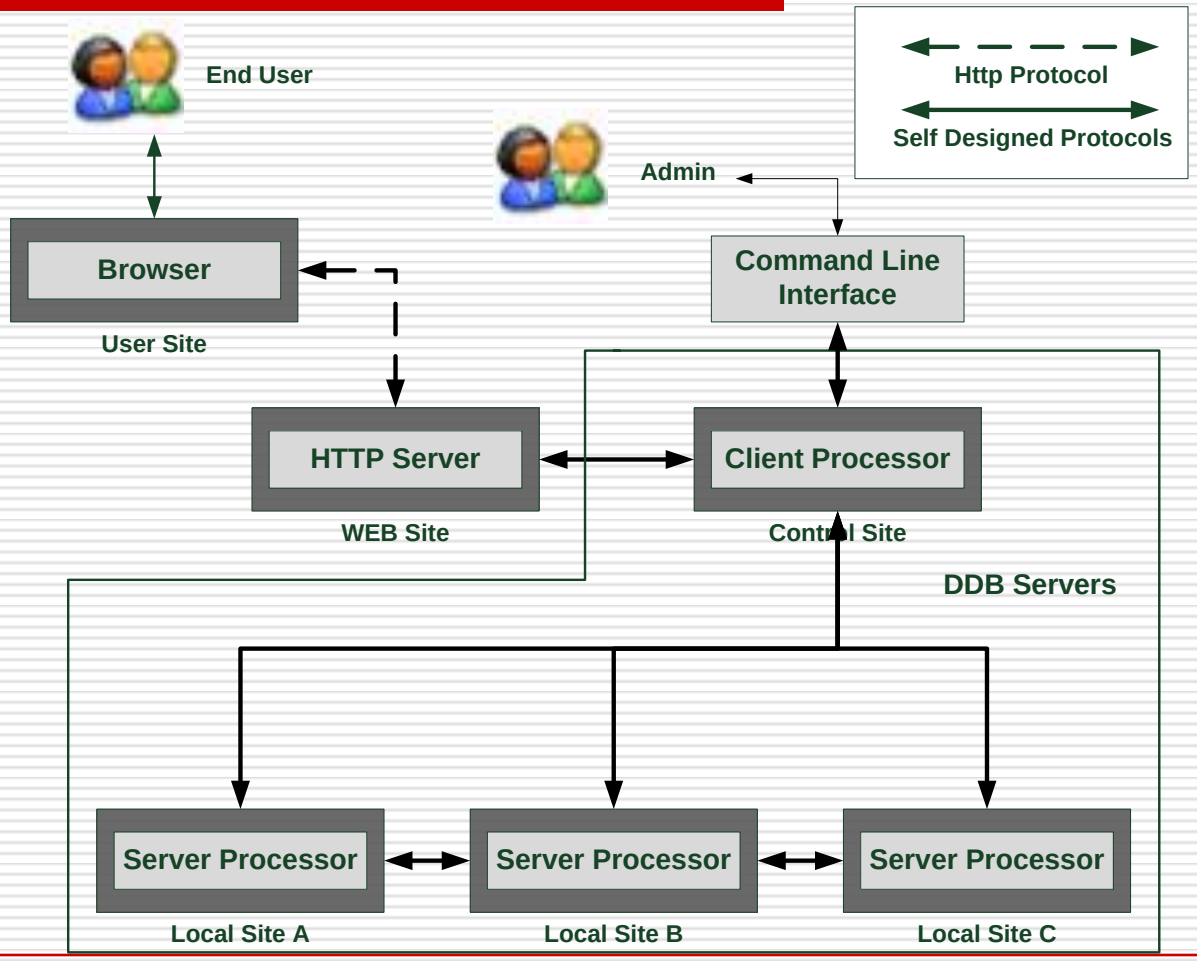
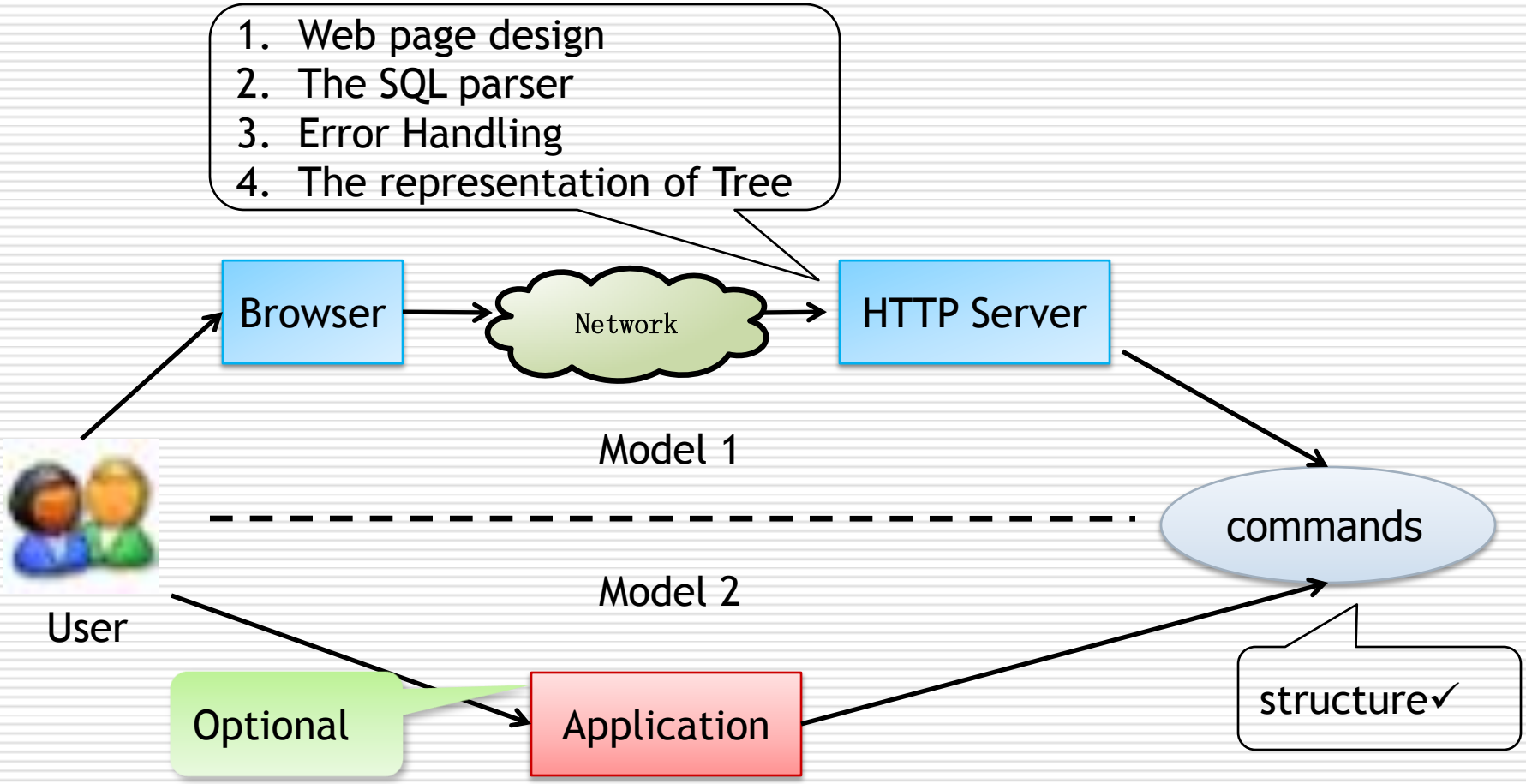
An Overview of the System



Example


End User
Admin
Http Protocol
Self Designed Protocols
Browser
User Site
Command Line Interface
HTTP Server
WEB Site
Client Processor
Control Site
DDB Servers
Server Processor
Local Site A
Server Processor
Local Site B
Server Processor
Local Site C

Example (cont.): Two Client models



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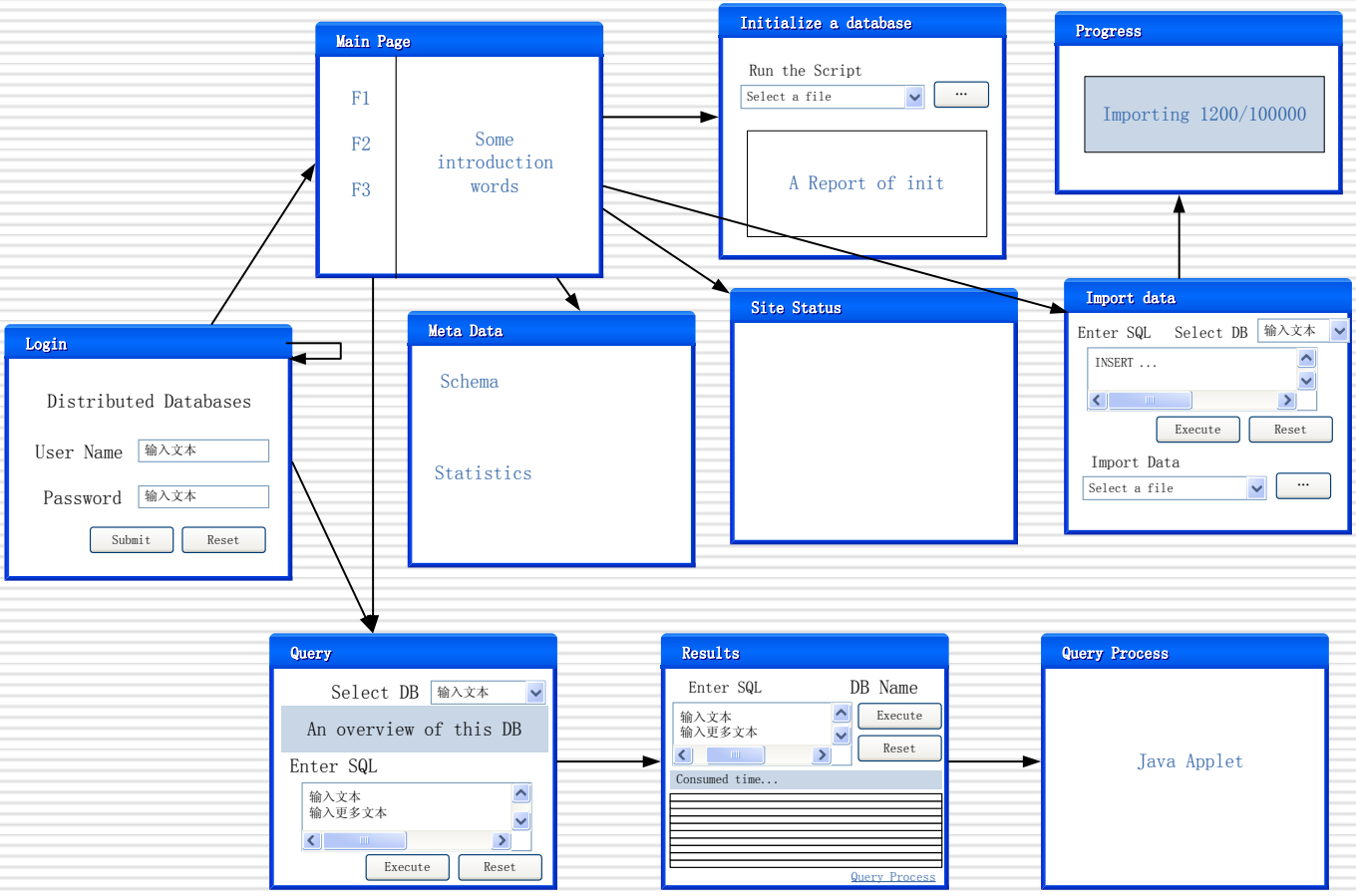
User Interface: Screen Flow

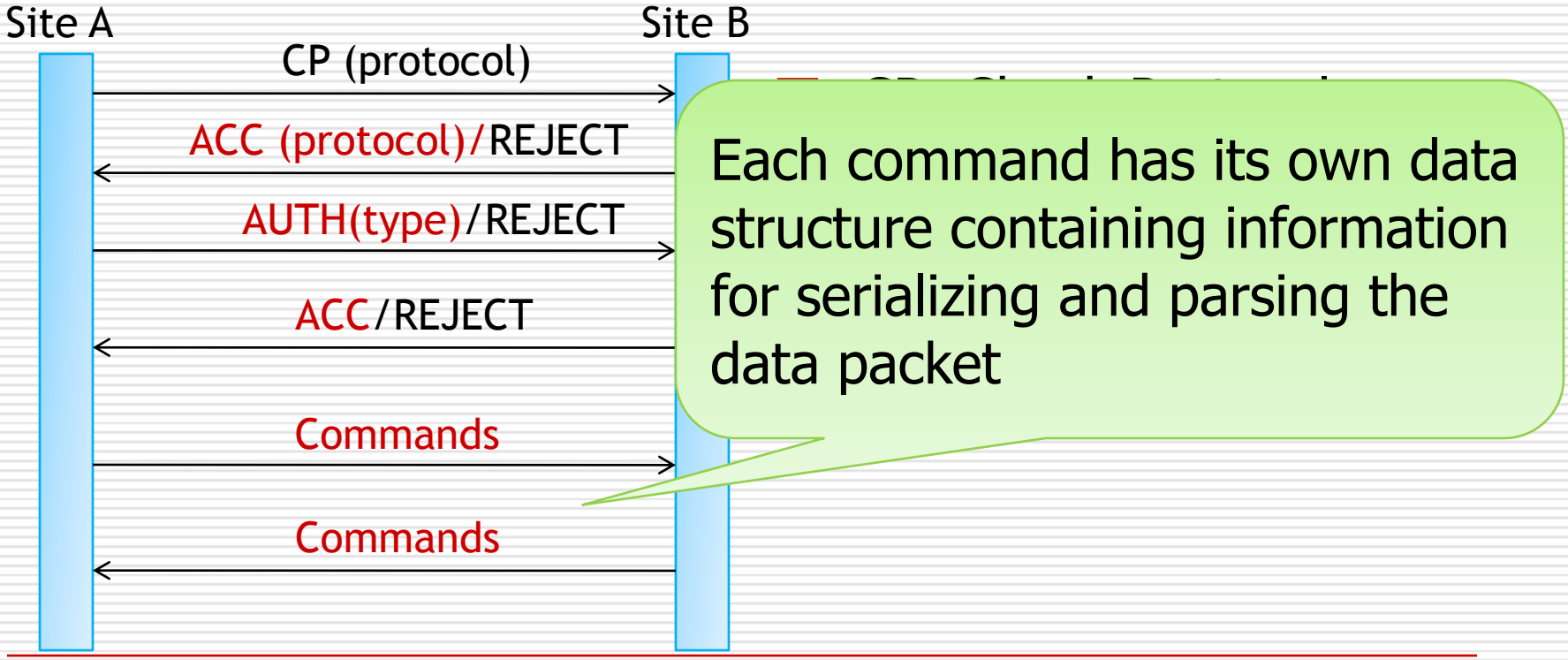


Communication Protocols

- Access Level
  - Client-Server Protocols
  - Server-Server Protocols
- How to Design Communication Protocols
  - Sync vs. Async
  - Design of commands and responses
  - Other issues introduced by Computer Network
- How to implement Communication Protocols
  - Strong vs. Economy
  - Techniques

Communication Protocols (cont.)

- Communication is done using own documented packet based binary protocol



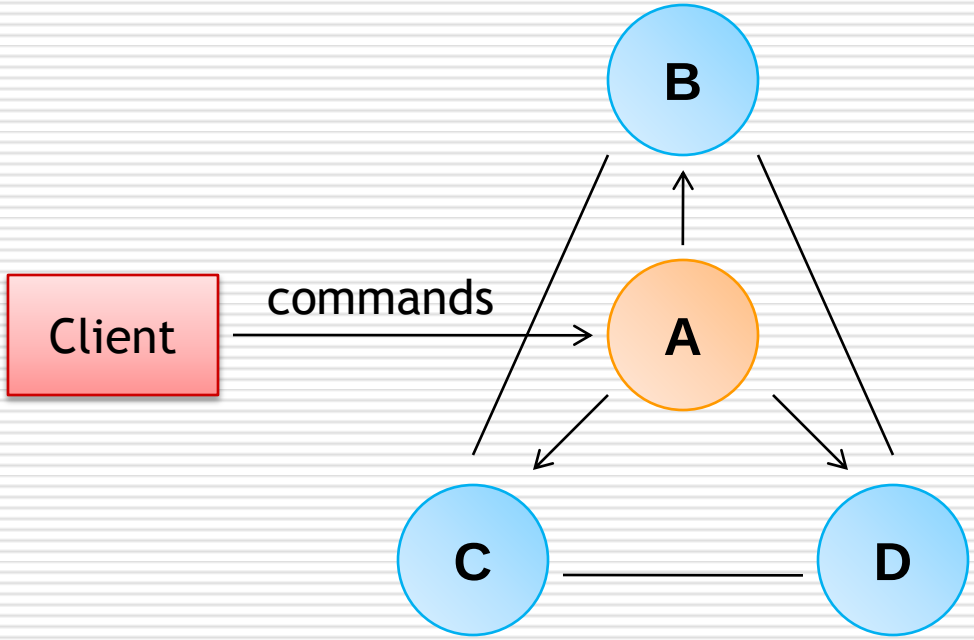
Notes

- The access level defines the set of commands available for each peer
- Clients-server and server-server communication differs only by different access level
- Programming language specific features not used (i.e. object streams in Java), focus on interoperability
- Both synchronous and asynchronous communication methods possible

Database Management

- Global vs. Local
  - Global Management
  - Local Management
- GDD
  - Global Information of DDB
  - Storage Issues
- Local DBMS Recommendation
  - MySQL

Query Processing



- Master site
  - Optimize the query
  - Formulate execution plan
  - Broadcast the plan
- All sites
  - Execute commands from Master site
  - Return results

- The Crucial Points
  - Global Optimization
  - Global Execution Formulation

Other Issues

- SQL Statement Parser
- Multi-Thread Mechanism
- Query Tree Layout and Visualization

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Demo

For References Only

- Author:
  - Ju Fan 范举 (leader)
  - Juho Vähä-Herttua 裕好 (Finland)
  - Xiaoming Song 宋晓明

Implementation Details

- Programming Language: Java
- Local DBMS: MySQL
- Dynamic Web Script: JSP (Apache Tomcat Server)
- Query Tree Visualization: Flash

Deployment

- Server1: 166.111.69.18:12345
- Server2: 166.111.69.18:23456
- Server3: 166.111.69.21:12345
- Server4: 166.111.69.21:23456
- Http Server: 166.111.69.18:8800

Summaries

- Requirement Driven
- Perfect vs. Good Enough
- Ideas are more important than techniques
- Comparative Advantage
- A central Management Scheme to a Distributed Project


Q & A
Thank You!