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Software Architectures: Layered Systems
FTP / TCP / IP on Ethernet

FTP

TCP

IP

Ethernet

Hardware

FTP protocol

TCP protocol

IP protocol

Ethernet protocol

physical connexion
Relational Database Management System Reference Architecture

- Query Evaluation Engine
- Files and Access Methods
- Buffer Management
- Disk Space Management

DB
Application on JFC on Java Platform on Mac OS X

Your Application

Swing

AWT Components
Button
Frame
ScrollBar
...

Accessibility
Java 2D
Drag and Drop

AWT

JFC

Java Runtime Environment (JRE)
Java API classes
Java Virtual Machine

Examples
Patterns
Responsibilities
Communication

Software Design and Architectures
Layered Systems
Generic Layered Architecture

- **Layer N**: Provide services to client
  - Handle requests from Layer N, delegate subtasks to layer N-2
  - Handle requests from Layer 3, delegate subtasks to layer 1
  - Directly handle requests from Layer 2.
  - ...
OSI 7-Layer Network Reference Architecture

- Application
- Presentation
- Session
- Transport
- Network
- Data Link
- Physical

**Miscellaneous protocols for common activities**

- Structure information and attach semantics
- Provide dialogue control and synchronization facilities
- Packetize messages and guarantee delivery
- Select route from sender to receiver
- Detect and correct bit sequence errors
- Transmit bits (velocity, bit-code, connexion, etc.)
Information System Reference Architecture [Larman]

**Presentation**
(Interface, UI, View)

**Application**
(Workflow, Process, Mediation, Controller)

**Domain**
(Business, Services, Model)

**Business Infrastructure**
(Low-Level Business Services)

**Technical Services**
(Technical Infrastructure, High-level Technical Services)

**Foundation**
(Core Services, Base Services, Low-level Technical Services)

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GUI windows, reports, speech interface, HTML, XML, php, JSP, Javascript, etc.

handle presentation requests, workflow, session state, window and page transition, data consolidation for display

handle application layer requests, domain rules, domain services, possibly across several applications

business middleware, general low-level business services: currency conversion, rate calculation,

technical frameworks: testing, object persistence, security, high-level text services, object middleware

technical libraries, utilities, data structures, containers, threads, math, file, database, network I/O.

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dependency
application specificity

range of applicability