

Web Technologies and Programming Lecture 05

Web application architecture

Summary of the previous lecture

- System modeling
- Requirement Modeling
 - use-case diagram, activity diagram
- Content modeling
 - class diagram, state machine diagram
- Navigation modeling
- Presentation modeling

Summary of the previous lecture

Technologies for web development

Protocol

- client-side technologies
- server-side technologies
- Testing web applications
 - Objectives
 - Levels
 - Web application specifics
 - challenges

Outline

- Software system architecture
- Specifics of web application architecture
- Layered web architecture
 - 2-layered architecture
 - 3-layered architecture
 - N-layered architecture

1. Software system architecture

- The architecture of a computer system is the high-level (most general) design on which the system is based
- Architectural features include:
 - Components (a Component is a part of a program)
 - It contains one or several routines
 - Connectors (how components communicate)
 - Collaborations (how components interact)

1. Software system architecture...

- Key attributes of an architecture
 - architecture describes structure
 - architecture forms the transition from analysis to implementation
 - different viewpoints (conceptual, runtime, process and implementation)
 - makes a system understandable

1. Software system architecture...

• Factors influence the system architecture

Functional Requirements

- Clients
- Users
- Other Stakeholders

Quality considerations with

PerformanceScalabilityReusability



1. Software system architecture...

• Factors influence the system architecture



Experience with

- Existing Architecture
- Patterns
- Project Management
- •Other?

Technical Aspects

- Operating System
- Middleware
- Legacy Systems
- •Other?

2. Specifics in web application architecture

- A number of architectures for specific requirement in several application domain have been developed
- For web application architecture, usually we consider
 - layering aspect: to implement the principle of 'separation of concerns'
 - data aspects: to support processing of structured and non-structured data

2. Specifics in web application architecture...

- For web applications quality requirements are more demanding as compared to desktop applications
 - performance, security, scalability, and availability etc.
- Need specific technical infrastructures both for the development and the operation of web applications

2. Specifics in web application architecture

- we have to consider
 - web infrastructure architecture (WPA)
 - web application architecture (WAA)
- Web application architecture (WAA) depends on the problem domain of the application, therefore we focus on web platform architecture (WPA)

• Client:

- generally a browser (user agent) is controlled by a user to operate the web application
- the client's functionality can be expanded by installing plug-ins
- Firewall:
 - a piece of software regulating the communication between insecure networks(e.g., the Internet) and secure networks (e.g., corporate LANs)
 - this communication is filtered by access rules

• Proxy:

 A proxy is typically used to temporarily store web pages in a cache

• Web server:

 A Web server is a piece of software that supports various Web protocols like HTTP, and HTTPS, etc., to process client requests

- Database server:
 - this server normally supplies data in structured form, e.g., in tables
- Legacy application:
 - A legacy application is an older system that should be integrated as an internal or external component

- Media server:
 - This component is primarily used for content streaming of non-structured bulk data (e.g., audio or video)
- Application server:
 - An application server holds the functionality required by several applications



3. Layered architecture for web applications

- Presentation tier:
 - Every web application needs to communicate with external entities, human users or other computers
 - allows these entities to interact with the system
 - implemented as a GUI interface
 - How the data should appear to the user

3. Layered architecture for web applications

- Application tier:
 - Web applications do more than information delivery, they perform data processing (Business Logic & calculation) behind the results being delivered
 - This tier is often referred to as
 - Services
 - Business logic

3. Layered architecture for web applications

- Data tier:
 - Web applications needs data to work with
 - Data can reside in databases or other information repositories
 - Deals with and implements different data sources of Information Systems

3.1 two-layer web architecture

- Presents architecture in two layers:
 - Layer 1: Client platform, hosting a web browser
 - Layer 2: server platform, hosting all server software components
- Also called client/server architecture
- Client directly send request to the server
 - Server respond to the client request
 - Static or dynamic requests

3.1 two-layer web architecture



3.1 two-layer web architecture

- Advantage:
 - Inexpensive (single platform)
- Disadvantages:
 - Interdependency (coupling) of components
 - No redundancy
 - Limited scalability
- Typical application:
 - 10-100 users
 - Small company or organization

3.2 three-layer web architecture

- Usually implemented in 3 layers
 - Layer 1: Data
 - Layer 2: Application
 - Layer 3: presentation
- Additionally, security mechanism (Firewall) and caching mechanism (Proxies) can be added

3.1 three-layer web architecture



3.2 three-layer web architecture

- Advantages:
 - Improved performance
 - Decreased coupling of software components
 - Improved scalability
- Disadvantages:
 - No redundancy
- Typical Application:
 - 100-1000 users
 - Small business or regional organization, e.g., specialty retailer, small college

- A multitier (N-layer) architecture is an expansion of the 3-layer architecture, in one of several different possible ways
 - Replication of the function of a layer
 - Specialization of function within a layer

- Replication:
- Application and data servers are replicated
- Servers share the total workload



- Specialization:
- Servers are specialized
- Each server handles a designated part of the workload, by function



• Advantages:

- Decoupling of software components
- Flexibility to add/remove platforms in response to load
- Scalability
- Redundancy
- Disadvantages:
 - Higher costs (maintenance, design, electrical load, cooling)
- Typical Application:
 - 1000+ users
 - Large business or organization

3.4 Comparison of layered architecture



cost

•large e-commerce, business, or organization

•small e-commerce, regional business or organization

local business or organization

3.5 example



Summary

- Software system architecture
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THANK YOU