Study Objectives

• Group Project 1
  – Group Presentation

• Architecture and Design Phase
  – Software Architecture
  – Client Server
  – Distributed
Group Project 1

Class Presentation and Discussion
Software Architecture and Design include, which ones of these?

What do they mean?

- Systems Architecture
- Application Architecture
- Integration Architecture
- High Level Design
- Entity Relationship Diagrams
- Detailed Designs
- Components Design
- Hardware Design
- Security Design
- Authentication/Authorization
- User Interface Design
- Service/Transaction Design
- Database Design
- ....
High-Level Design

• Systems Architecture covers high-level systems components and how they fit together
• ERD helps define database schema. Process Flow chart shows internal business logic or function
• Structured Design techniques start with top level context diagram and further decomposes the system using data flow diagrams (DFDs)
• (Relational) Database Design show tables and their relationship
• Service / Transaction Design show the input/output and the different functional logic they support
• UI Design show “wire-frame” and behavior of the “widgets” in response to the user interaction
• Data Conversion Design would show the current state of data and how the transformation would occur to the new repository
• Test Design show different test plans, and how they would support the requirements and high-level design
• Hardware design show how the hardware components (such as web servers, app servers, DB servers, routers, VIPs etc) fit together
Detailed Design

• Further decomposes the systems and interfaces
• Interaction is shown by more granular diagram such as sequence diagram, collaboration diagram, class diagram. These are low-level flow-charts
• Database Design schema would include such as DDL (Data Definition Language)
• Service / Transaction Design would show the input/output details such as XML schema, WSDL (web service description language)
• UI Design would show decomposition of the user interface (presentation) layer into presentation User Interface layer and User Process layer
• Module design would show how a component or sub-system is decomposed into different “procedures” and “functions” and their relationship
• Pseudo-code further decomposes the modules
• The focus is on detail that is comprehensive and supports business functions
E-R Diagram Example

ER Diagram decomposes problem domain based on Entity (nouns) and Relationships (Verb).
Client Server Architecture

Client-Server Computing Model had typically multiple clients connecting to the same server that processes the request.
Modern Component Based Distributed Architecture

Client-Server Computing Model had typically multiple clients connecting to the same server that processes the request.
Component Based Distributed Architecture
(including layered, SOA-based)

• SOA-based (service-oriented architecture based) integration layer allows distributed systems to be integrated well

• SOA uses XML-based Web-Service technology leveraging SOAP, WSDL, UDDI
  – XML (Extensible Markup Language) is an extension of HTML and
  – WSDL (Web Services Description Language): Allows data and procedure to be coded using XML type of syntax
  – SOAP (SOAP): Simple Object Access Protocol allows objects to be accessed on any platform
  – UDDI (Universal Description, Discovery, and Integration): is used for discovery of the web services

• Layered architecture allows replacement and modernization of individual components, without replacing majority of the system at the same time. Also, if the old and the new system provide the same interface, the clients or consumers don’t have to change

• Layered architecture when has many layers, are called n-tier architecture. Each sub-system typically has 3 (presentation, business-logic, and data-access) layers, and there are multiple sub-systems stacked to make a systems

• Not all component-based systems (old ones) have layered sub-components. In those cases the sub-systems integrate using variety of technologies including web-service, MQ, CORBA, COM, EDI, RPC, Database access, File Transfer, etc.
Application or Sub-system Components

Example of typical application components
Sequence Diagram is a widely use Design Tool for distributed systems.
Design Flow Diagrams

- There are a number of design diagrams designers use
- ER Diagram, Sequence Diagram (covered)
- DFDs (Data Flow Diagram) for structural decomposition of the system. Context diagram is highest level diagram of the system that can be further decomposed

http://www.smartdraw.com/resources/tutorials/entity-relationship-diagrams/#/resources/tutorials/Introduction-to-DFD

- UML Diagrams
  - Class Diagram: describes static structure of the system
  - Use Case diagram: models functions of the system using actor and use cases
  - Sequence Diagram: interaction amongst classes across time
  - Collaboration Diagram: interaction amongst objects as sequenced messages
  - State Chart Diagram: behavior of the systems as its state changed
  - Activity Diagram: flow of control from activity to activity
  - Component Diagram: organization of physical components
  - Deployment Diagram – for deployment; refers to physical resources

http://www.smartdraw.com/resources/tutorials/uml-sequence-diagram/#/resources/tutorials/Introduction-to-UML
E-Commerce Architecture

- E-Commerce involves selling and buying products and services electronically
- B-to-C, B-to-B, B-to-E, B-to-G (section 3.6.1 textbook)
- Architectural Consideration
  - Integration architecture with back-end (web services, MQ, MTS, Oracle Weblogic, etc.)
  - Product catalogue and the content management system (CMS)
  - Authentication and Authorization of Users
  - Security, encryption (PKI, SSL/HTTPS communication, digital signature)
  - Firewall between public (internet) and organization (private) network
  - Shopping cart, discount, promotions etc.
EDI (Electronic Data Interchange)
Architecture

• EDI involves exchanging electronic data between partners

• Traditional or Web-based EDI (section 3.6.2 textbook)

• Architectural Consideration
  – Application, EDI Interface, and Communication layers
  – Data format based on standards such as ANSI X.12
  – Authorization of Transactions
  – Encryption
Question

Which of the following design techniques deals with internal functions used for data and process changes?

A. Function point analysis
B. ER diagram
C. Flowchart
D. Database Schema
Upcoming Assignments/Tests

1. Group Project -1 (Business Case, RFP): Tues 10/7 before the class
2. Individual Case Study -2 (Requirements and Use Case): Mon 10/21 before the class
3. Quiz 2 (Week 5 – Week 8): Mon 10/28

Questions?
Summary of Today’s Class

- Architecture
- Design
- Focus of the Next Class and Reading
- Questions