Architectural Design
What is architectural design?

• What is software architecture?
  • Organization, structure

• What is the output of architectural design?
  • Components
  • The interaction among components
Why should we do architectural design?

• We need it even in agile process
  • Refactoring does not help/change architectural design

• Non-functional requirements can be affected by architectural design
  • Maintainability
    • The less interaction among components, the better
  • Availability
    • Redundant component can be used to improve availability
  • Performance
How to design?

• Follow the requirement and modeling
  • Architectural design can be conducted right after use-case study

• Architecture styles/patterns
What is the architecture of ...
MVC pattern

- Model
- Controller
- View
- User
MVC pattern examples

• Angry birds

• Google search
Design concerns in MVC

• Where to put M, V, C, given multiple nodes?
  • M is most suitable for server machines
  • C is most suitable for client machines
  • V depends on network bandwidth between serve and client
Layered pattern
Examples

• Operating systems and user applications

• Strength
  • Easy testing
  • Modify one layer won’t affect the whole system

• Weakness
  • Performance
  • Strict layering may be difficult in practice
Data-flow pattern (pipeline-and-filter)
Examples

• Compiler

• Strengths
  • Filters can be re-used

• Weaknesses
  • Data format compatibility among filters is crucial; format violation will break down the system
Data-centered pattern
Examples

• Programming IDE

• Strengths
  • Little to no interaction among different data-processing components

• Weaknesses
  • Slow for different components to interact with each other
  • The data repository is the single-point-of-failure, performance bottleneck
Client-server

• Server machine(s)
• Client machines
• Client machines getting services provided by servers
Peer-to-peer

- Multiple machines work together to provide a service
  - No centralized management
  - Distributed management logic
Event driven pattern

- Processing loop
- Event queue
- Call-back
Architectural design assessment

• Cohesion (within component)
  • The more the better

• Coupling (across components)
  • The less the better