Introduction to Web Application Architecture

Well begun is ½ done

Architecture

- **Architecture** is an abstract plan that can include design patterns, modules, and their interactions.

In this course we will focus on

- Architecture **Implementation or Realization**

which incorporates

- **Frameworks** - *architected* "physical" structures on which you build your application.

specifically we will use

- The **Spring Framework**, an **Enterprise Application** Development environment for building large scale enterprise applications.

Web Application Architecture

This course is concerned with the realization of **scalable web applications** as defined by a **Web Application Architecture.**

A **Web Application Architecture**

is a **part** of an **Enterprise Architecture**

A Scalable Web Application is an Enterprise Application…

An application - that is large & complex –

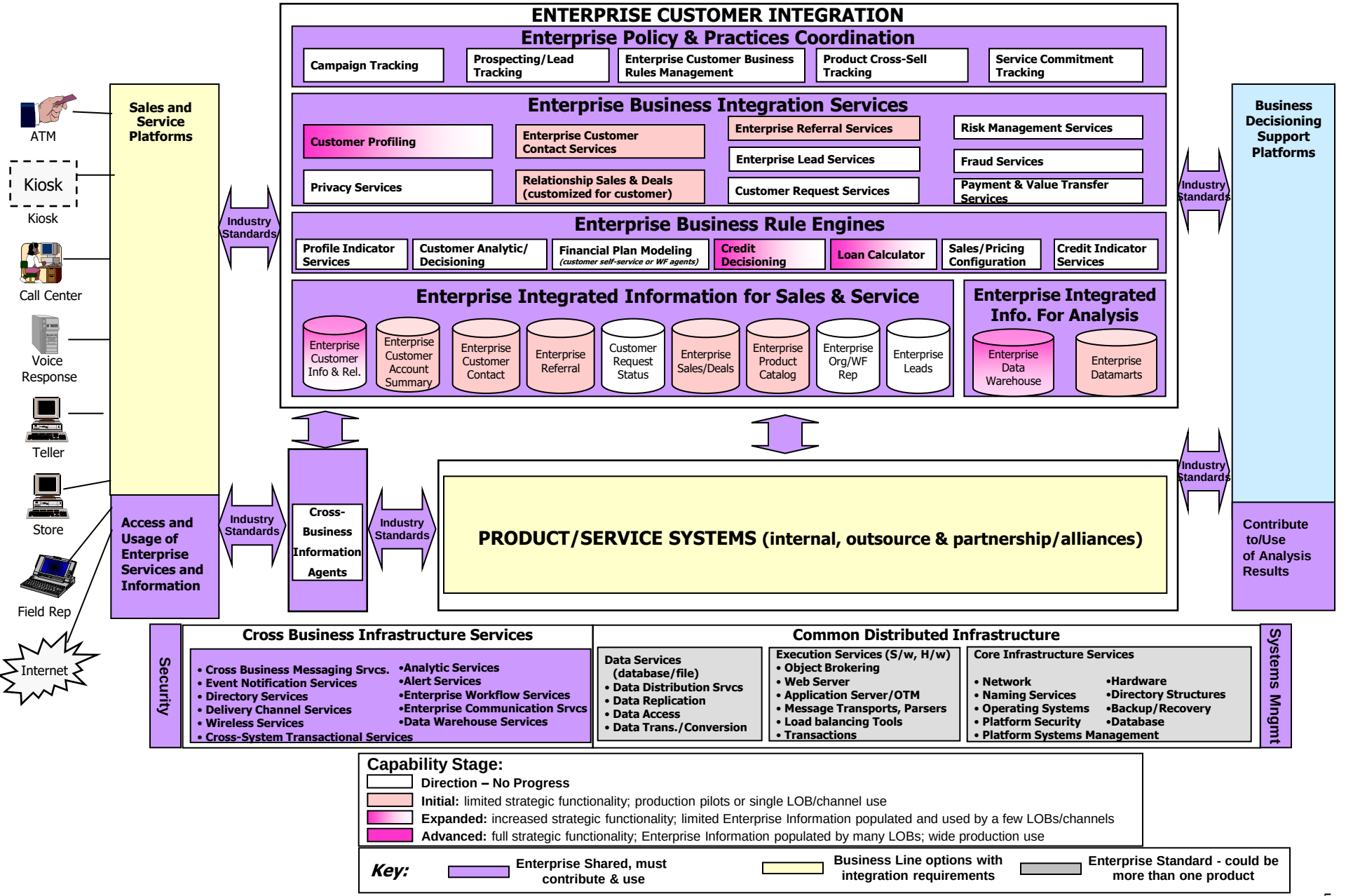
well beyond the individual or small business use case.

- "…for creating large-scale business applications, you need …[to understand] the design and architecture of enterprise applications…"
- Enterprise Design & Architecture - Microsoft

Enterprise Application

- **Large**
  - Large-scale, multi-tiered, scalable, reliable, and secure network applications. Designed to solve the problems encountered by large enterprises.
- **Business Oriented**
  - Meets specific business requirements; business policies, processes, rules, and entities
- **Mission Critical**
  - Sustain continuous operation, scalable and deployment, provide for maintenance, monitoring, and administration.

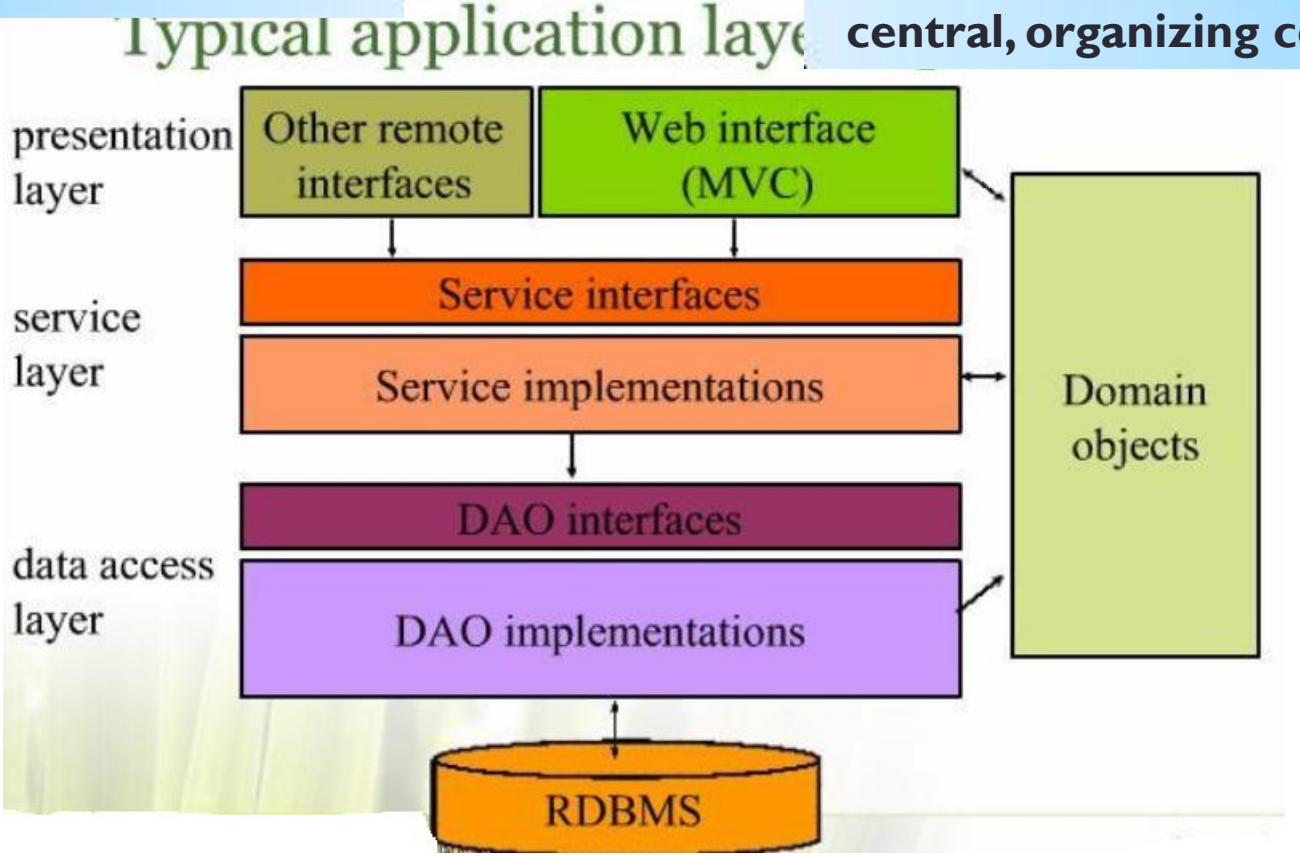
Enterprise Architecture



Underlying N-Tier Software Architecture

Separation of Concerns

Domain Model
central, organizing component

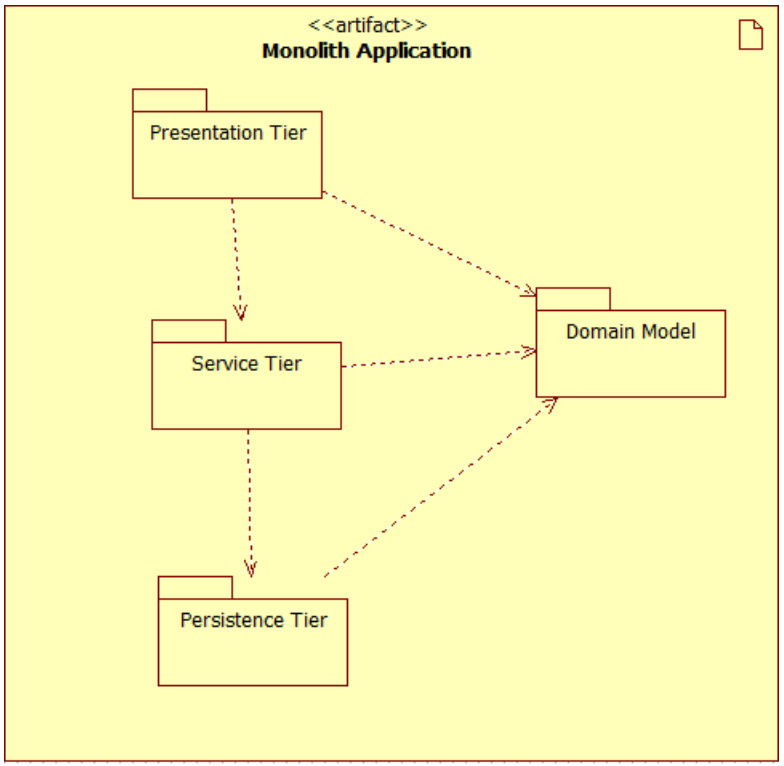


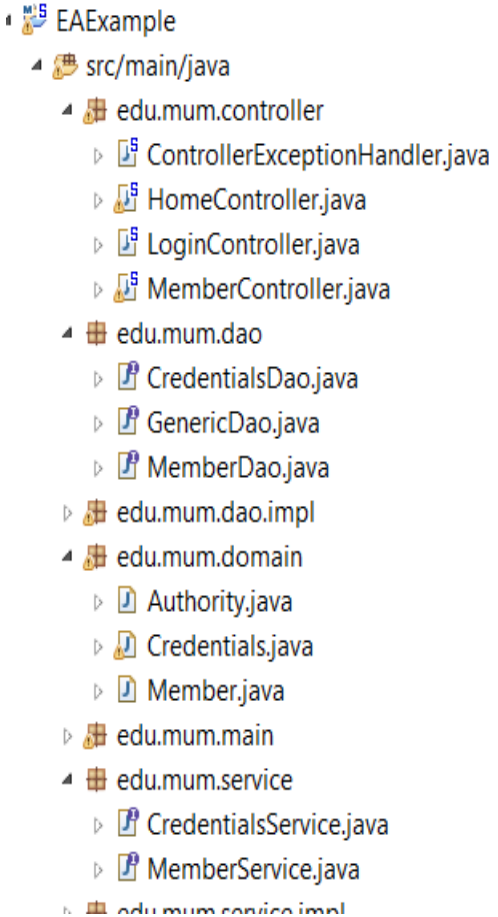
Design to Interfaces

“Types” of N-Tier architectures

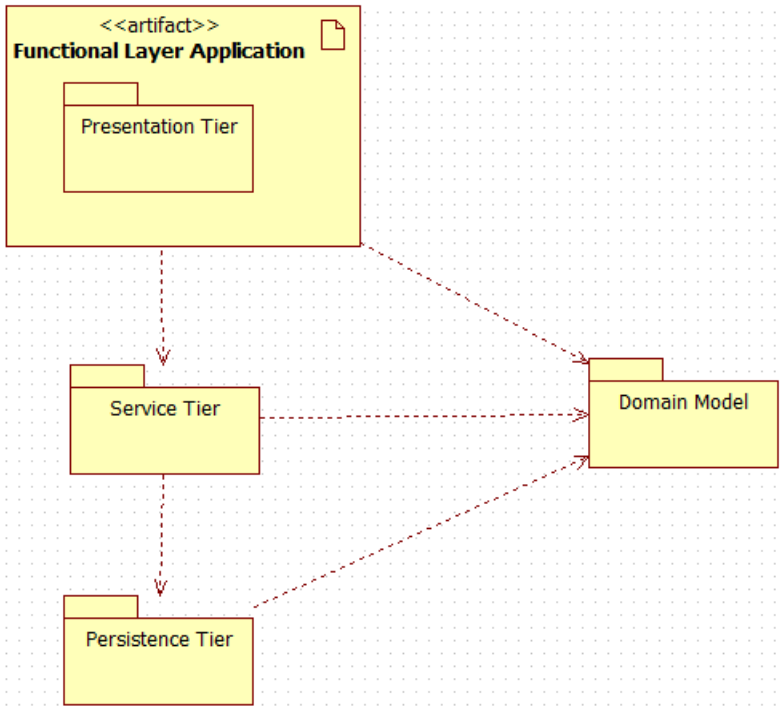
- **Monolith**
  - Single Project
  - Single Presentation layer
  - Boundaries between tiers “blur” over time
- **Technical Functional Layering**
  - Project per functional layer [Presentation, Service, Persistence, Domain]
  - Increase re-use
  - Clean layer separation
  - more flexible….scalable
- **Component Services Business**
  - Project per business domain
  - “Services” oriented

Monolith N-Tier





Functional N-Tier



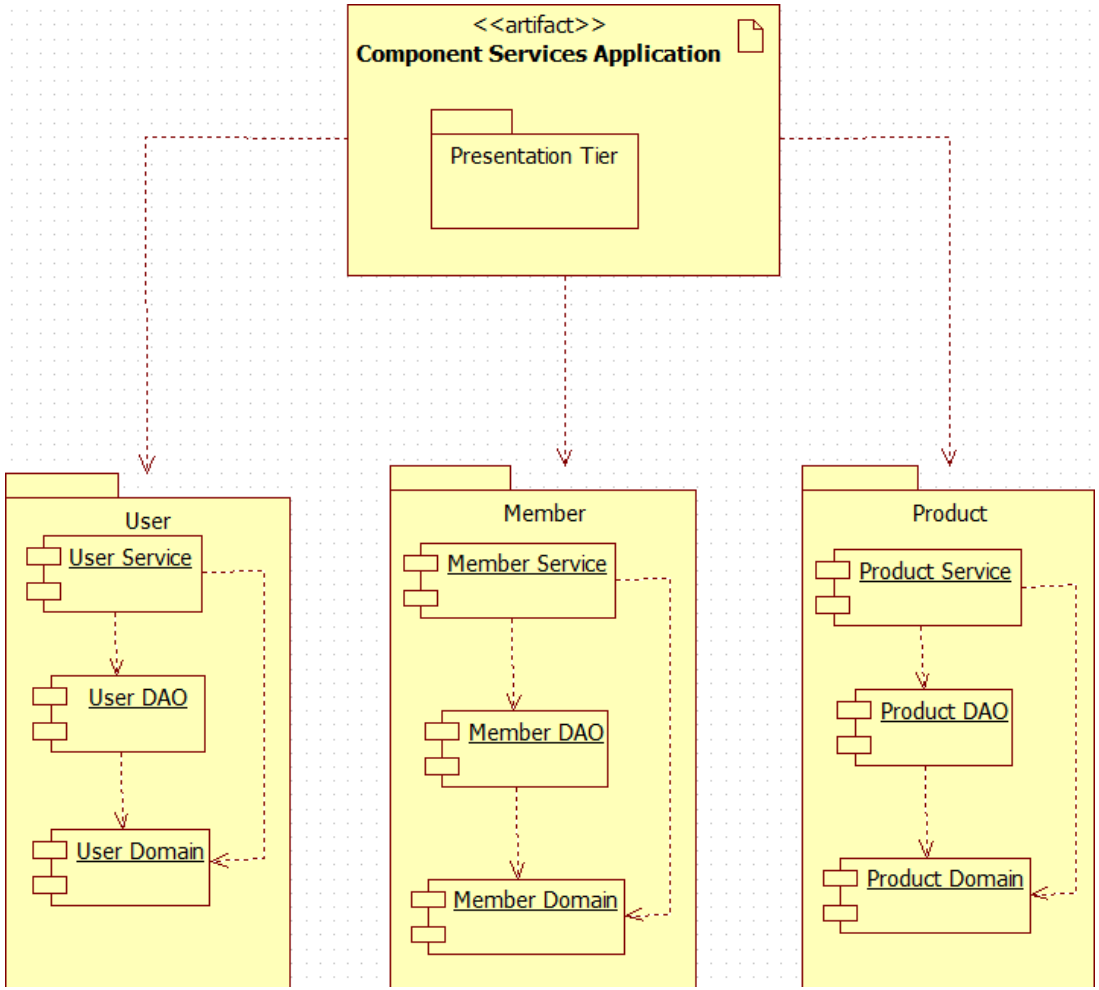
- FunctionalExample
  - src/main/java
    - mum.edu.controller
      - ControllerExceptionHandler.java
      - HomeController.java
      - LoginController.java
      - MemberController.java
    - mum.edu.interceptor
  - src/main/resources

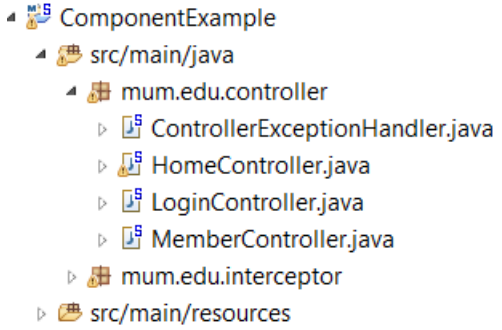
- EAExampleService
  - src/main/java
    - edu.mum.service
      - CredentialsService.java
      - MemberService.java
    - edu.mum.service.impl
  - src/main/resources

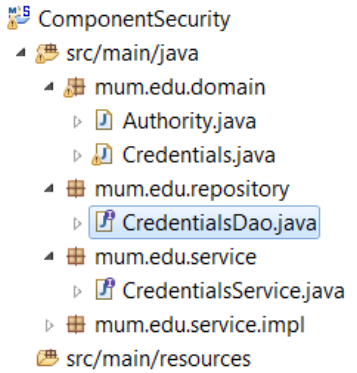
- EAExampleDomain
  - src/main/java
    - edu.mum.domain
      - Authority.java
      - Credentials.java
      - Member.java
  - src/main/resources

- EAExampleRepository
  - src/main/java
    - edu.mum.dao
      - CredentialsDao.java
      - GenericDao.java
      - MemberDao.java
    - edu.mum.dao.impl
  - src/main/resources

Component N-Tier







MVC & the N-tier architecture

MVC is the primary "pattern" associated with the presentation tier

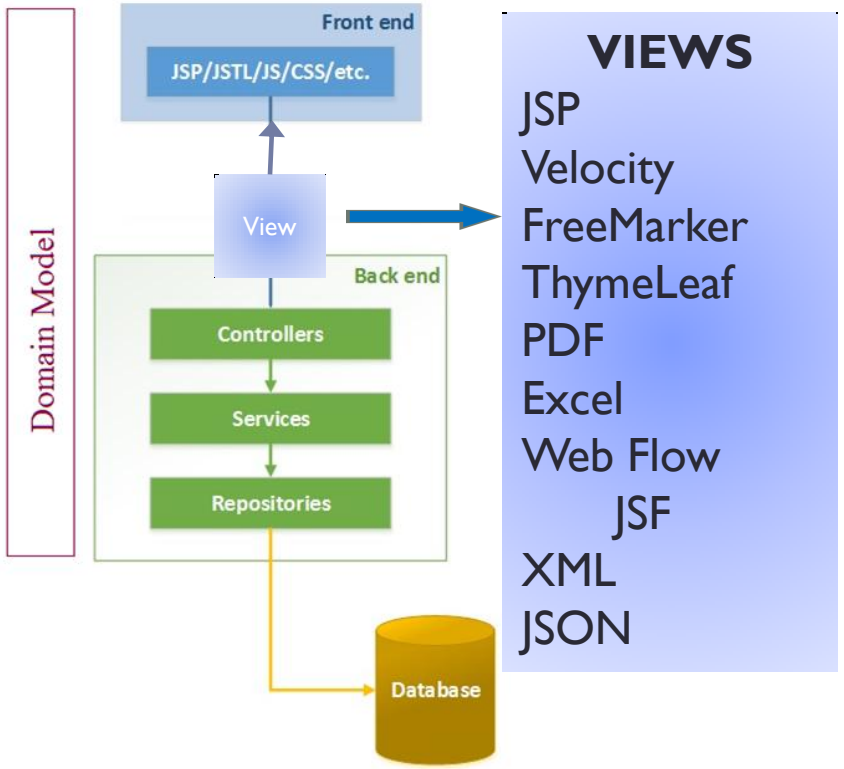
It is commonly identified as page rendering on the server

The growth of the **Consumer Web[2.0]** has emphasized alternative solutions

Specifically:

SPA & **microservices** Technologies

"Classic" Spring MVC



SPA & Microservices Definitions

- A SPA is a web application or web site that interacts with the user by dynamically rewriting the current page rather than loading entire new pages from a server. This approach avoids interruption of the user experience between successive pages, making the application behave more like a desktop application.

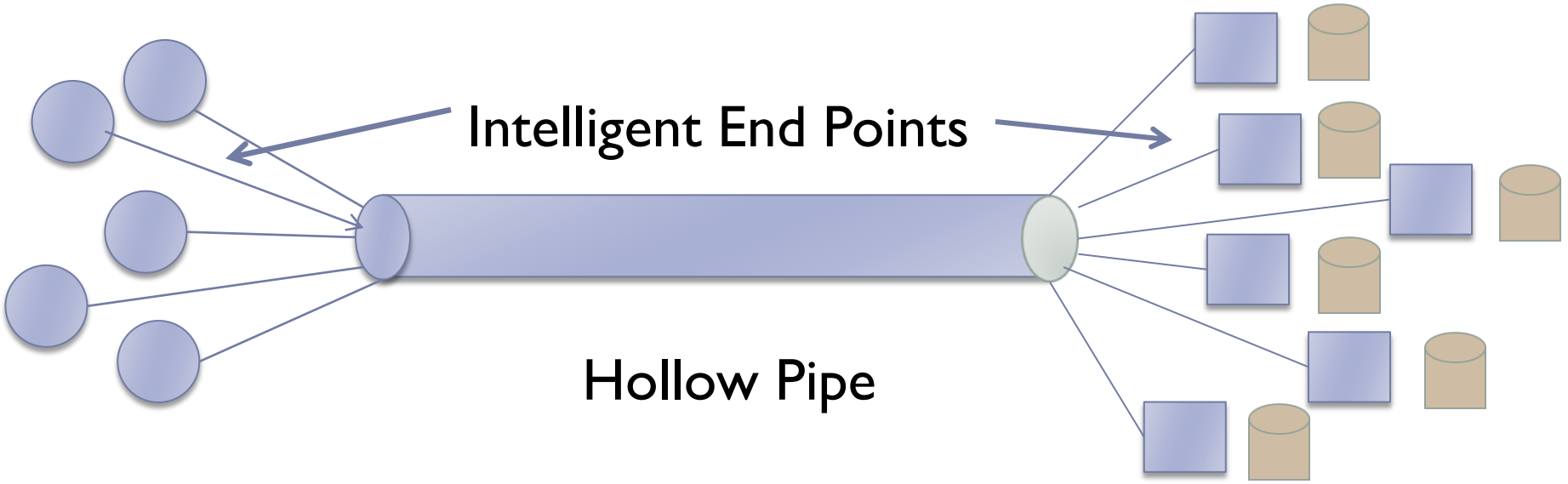
- Microservices is a variant of the service-oriented architecture (SOA) architectural style that structures an application as a collection of loosely coupled services. In a microservices architecture, services should be fine-grained and the protocols should be lightweight.
  - single business goal
  - simple, well-defined communication interface
  - runs a unique process
  - manages[usually] its **own database.**

SPA technologies[JavaScript MVC]
AngularJS, Backbone.js,
Ember.js,CanJS, React

rn" High End Consumer Web [2.0]

SPAs

Micro-Services



High Page Volume Ultra Many Users

***"Primary"* Candidates**

Internet companies – web page IS product

Facebook, Instagram, Twitter, AccuWeather

Internet Companies – with "products to sell"

Netflix, Amazon

Hollow Pipe/Services
Node.js, Play2.0/Scala
Spring Framework/Microservices

Microservices and the Enterprise Monolith

Re-work the Monolith

- ***Refactor, make it modular – Understand your Design/Implementation/Dependencies***

Significant benefit from just moving to Cloud

If and When Microservices are introduced:

- Split monolith into Microservices where[& when] the monolith is a bottleneck..
- Add new features by building Microservices that use the monolith's API.

Spring & Spring MVC, Consumer Web [2.0] Technologies

- Spring MVC – view agnostic
  - REST service support –
  - easily integrates with SPA.
- Mobile device support
- Integrated Web security
- Spring Data
  - Supports RDMS
  - Supports NOSQL
- WebSocket support
- Spring Boot - fast prototype/microservices delivery
- Cloud delivery

CS 545 WAA Focus

Spring N-tier Architecture