CMPUT301 – Substitution 3-Tier Architecture

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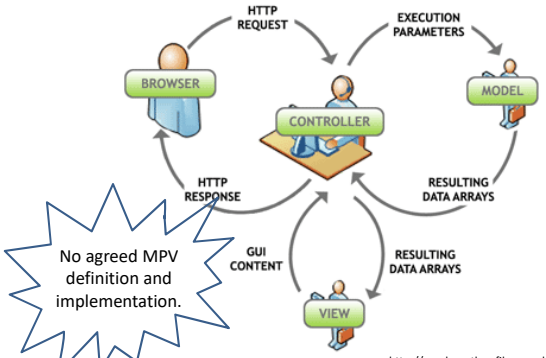
Small Applications

- Personal apps
- Phone and tablet apps
- Media players
- Mobile device games
- Single purpose websites
  - Run on single server
  - With moderate budget

Small Application – MVC



http://psychopathya.files.wordpress.com/2010/02/mvc.jpg

Large Applications

Insurance companies have various policies and claims.

Health care systems have complex permission and privacy restriction.

Government systems have complicated workflow.

Financial systems must follow strict regulation.

Law enforcement systems have to deal with fake and non-standard data.

Airline systems must handle inter-airline data and resource sharing.

Large Application Example

Healthcare.gov
Obama Care

"I spent $174 million on a website and all I got was this bad press."

— Someone, somewhere in the U.S. Department of Health and Human Services (HHS)

Large Application

- In analyzing the collective responses of some 150 participants in the 2011 Gartner five-country survey, the failure rate of IT projects with budgets exceeding $1 million was found to be almost 50% higher than for projects with budgets below $350,000.

L. Mieritz, "Gartner Survey Shows Why Projects Fail," Gartner, 01 06 2012. [Online]. Available: http://thisiswhatgoodlookslike.com/2012/06/10/gartner-survey-shows-why-projects-fail/

Large Application

- Involve complicated business requirements
  - Business requirements: professional, legal, accounting, unarticulated, etc.
  - Non-functional requirements: security, risk tolerance, service level agreements, etc.
  - Additional values: business intelligence, deep learning, etc.

Large Application

- Large Application Teams
  - Chief information officer (CIO)
  - Project managers
  - Business analysts
  - Architects
  - Developers
  - Testers
  - Database admins
  - Network admins
  - Technical writers
  - Operational analysts
  - Support analysts
  - Security analysts
  - etc.

Large Application

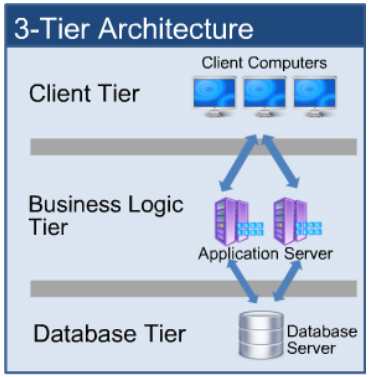
- Further division in the architect team
  - Enterprise architect
  - Infrastructure architect
  - System architect
  - Technical architect
  - Cloud architect
  - Virtualization architect
  - etc.

Professional subdivisions of the computing field.

Computing-Core Disciplines	Computing-Intensive Disciplines	Computing-Infrastructure Occupations
Artificial intelligence	Aerospace engineering	Computer technician
Cloud computing	Bioinformatics	Cyber operator
Computer science	Cognitive science	Database administrator
Computer engineering	Computational science	Help desk technician
Computational science	Digital library science	Network operator
Database engineering	E-commerce	Network technician
Computer graphics	Genetic engineering	Professional IT trainer
Cyber security	Information science	Security specialist
Human-computer interaction	Information systems	System administrator
Network engineering	Public policy and privacy	Web identity designer
Operating systems	Instructional design	Web programmer
Performance engineering	Knowledge engineering	Web services designer
Robotics	Management information systems	
Scientific computing	Network science	
Software architecture	Multimedia design	
Software engineering	Telecommunications	

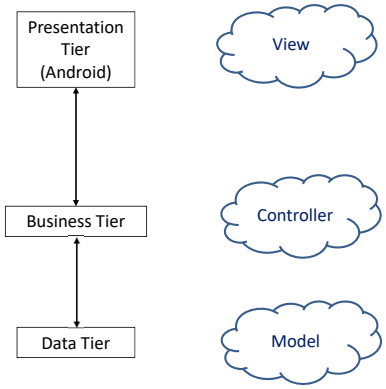
ViewPoints, The Profession of IT, A Technician Shortage,
by Peter J. Denning and Edward E. Gordon
Communications of the ACM March 2015, Vol. 58, No. 3, pp 28-30

Large Application – 3-Tier

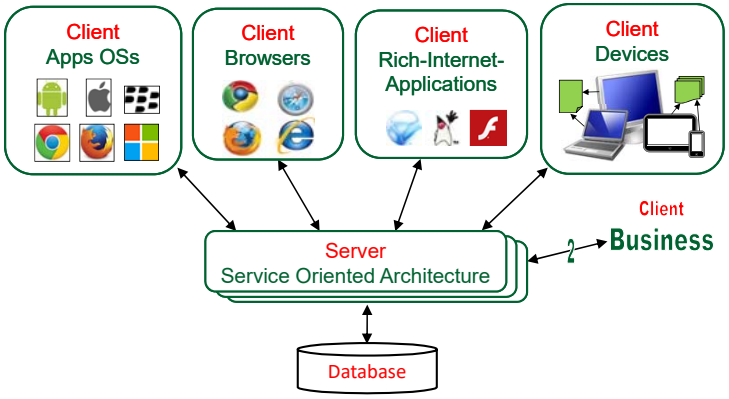


http://blog.simcrest.com/images/3tier.jpg

3-Tier Architecture



3-Tier Architecture



3-Tier Architecture

Segregated presentation-tier

- Supports non-compatible technologies and development tools.
- Supports multiple development teams with different skills to work concurrently.
- Allows separated repositories and deployment processes.
- Scales according usages.

3-Tier Architecture

Segregated business-tier

- Guarantees all presentation-tier options get the same treatment.
- Ensures business rules are implemented and updated in the designated location.
- Contains only computational processes and enables scalability.

3-Tier Architecture

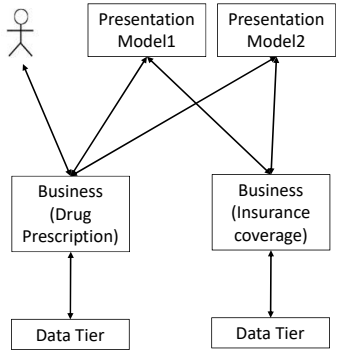
- For example, CRA is the single organization that accept personal tax return submission.
- Numerous applications as presentation tier. https://www.canada.ca/en/revenue-agency/services/e-services/e-services-businesses/efile-electronic-filers/efile-certified-software-efile-program.html
- One and only one business tier that offer the service.
- No matter which application the tax payers use, they get the exact same result.
- Called: Service Orient Architecture

3-Tier Architecture

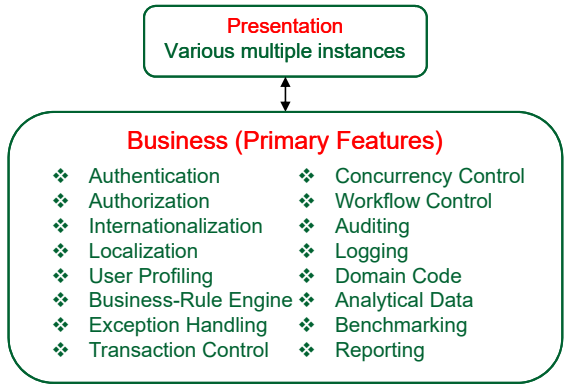
- **Service Oriented Architecture (SOA)**

  SOA is a flexible set of design principles used during the phases of systems development and integration in computing. A system based on a SOA will package functionality as a suite of interoperable services that can be used within multiple separate systems from several business domains.
  (Wikipedia)

3-Tier Architecture



Enterprise Framework



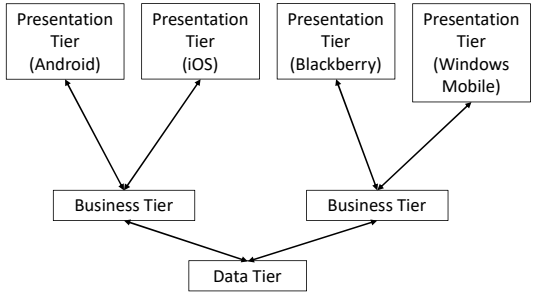
Enterprise Framework

Business Tier Additional Supporting Features:

- Authentication integration
- Version control
- Automated testing
- Build and deployment mgmt
- Release mgmt
- Software library mgmt
- Configuration mgmt
- Data mgmt
- Database config mgmt
- Network mgmt
- Storage mgmt
- Virtualization mgmt
- Performance mgmt
- Backup and archive
- Security standards
- Helpdesk category

3-Tier Architecture Benefits

- Scalability



3-Tier Architecture Benefits

- Large application is big and cumbersome, but expected to be adaptive and flexible.
- It is like expecting an elephant to run as fast as a panther.
- 3-Tier architecture allows components to adapt changes one at a time, without affecting the overall functionality.
- Provide better security protection.
- Good for full/partial cloud deployment.

3-Tier Application Developers

- Multiple groups of developers working on different business requirements in parallel need to look out for conflicts.
- Developers with different specialities:
  - Graphical designers
  - Desktop / Laptop platforms (Windows, Apple, UNIX, Linux, OS2, etc.)
  - Mobile platforms (Android, iOS, Blackberry, Windows Mobile, etc.)

3-Tier Application Developers

- Developers use different technologies:
  - Languages and standards (CSC, JavaScript, Java, Objective C, C, C++, C#, Python, PHP, etc.)
  - Databases (Oracle, SQL Server, DB2, Sybase, MySQL, etc.)
  - Tools (Flash, SilverLight, Vmware, Cytrix, SharePoint, Eclipse, Visual Studio, etc.)

3-Tier Application Developers

- IT workers rarely stay at one place for long. When IT workers move, they take with them their technical, operational and business knowledge about the system.
- Since no one single person can understand the complication of the whole system, the healthiness of the system rely on documentation and testing.

DevOps

- DevOps represents combination of Development (Dev) and Operations (Ops). DevOps is about the culture, collaborative practices, and automation that aligns development and operations teams so they have a single mindset on improving customer experiences, responding to faster business needs, and ensuring that innovation is balanced with security and operational needs.

I. Sacolick, "What is devops? Transforming software development," DZone, 18 08 2017. [Online]. Available: http://www.infoworld.com/article/3215275/devops/what-is-devops-transforming-software-development.html.

Conclusion