Chapter 6
Essentials of Design and the Design Activities

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Topics

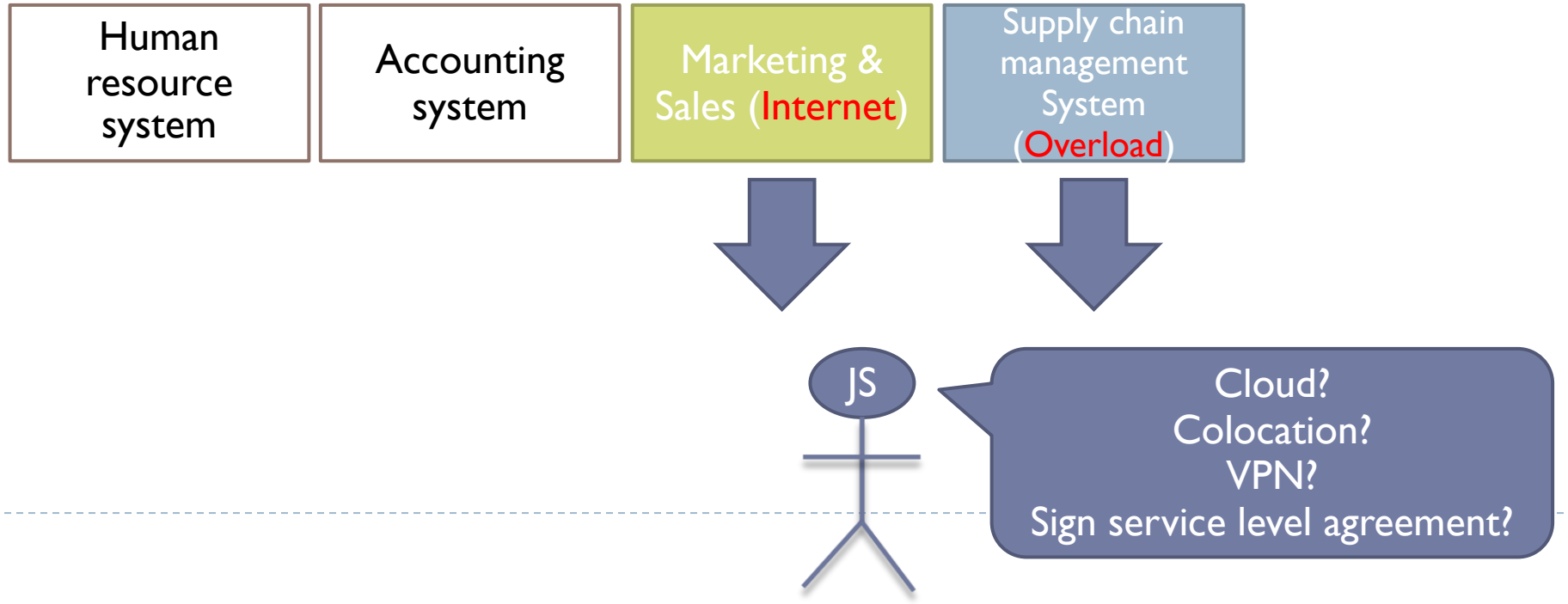
- The element of design
- Input and output for system design
- Design activities
- Design the environment

Objective

- Describe the difference between system analysis and system design.
- Explain each of major activity in design.
- Describe the major of hardware and network in system environment.
- Express each of the hosting services.

6.0 Company case study: Technology Decisions

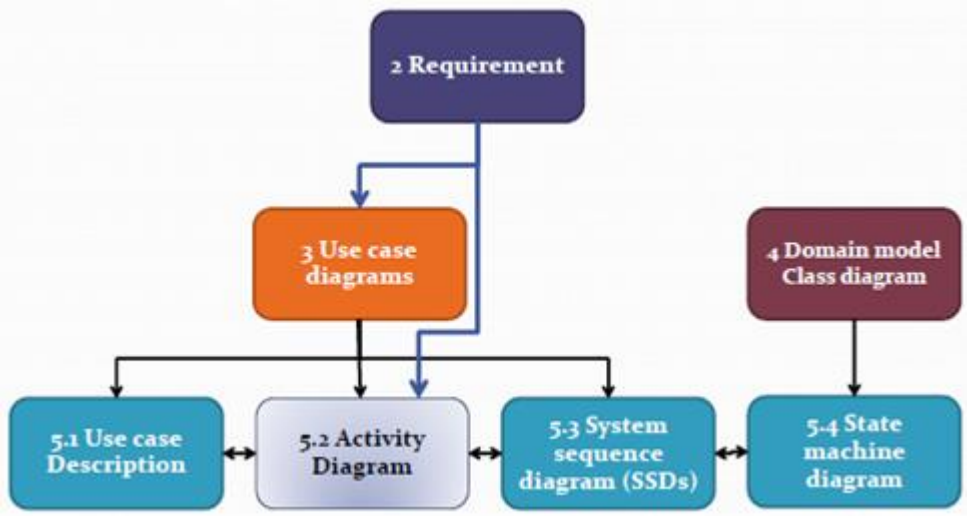
- Jame Schultz
  - Vice president and chief information officer
  - Supplier electronic components
  - The infrastructure was a hodgepodge of disjointed computer and networks



6.1 The element of design

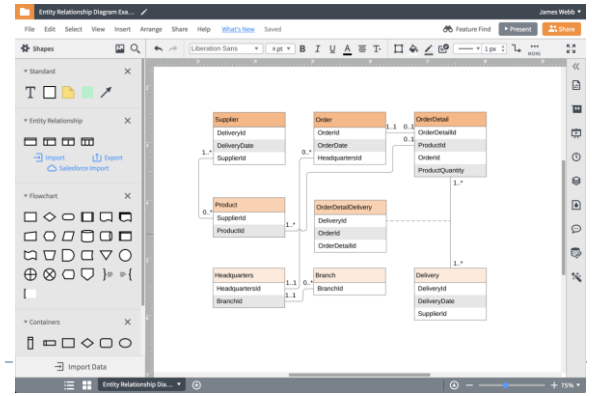
- The analysis activities is focus on

*"Understanding **what** the system should do"*



- The design is focus on

*"Solution **how** the system will be built"*



6.1 The element of design

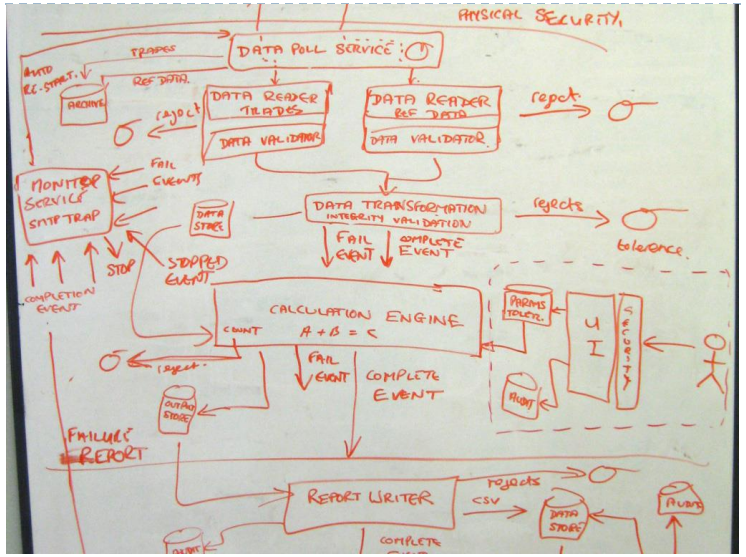
- Major components and Level of design
  - Information system today
    - Web-based system.
    - Connect to Internet or Intranet
    - Stand-alone, offline application
      - Registration via internet
      - Update via internet
    - Database
    - Web services

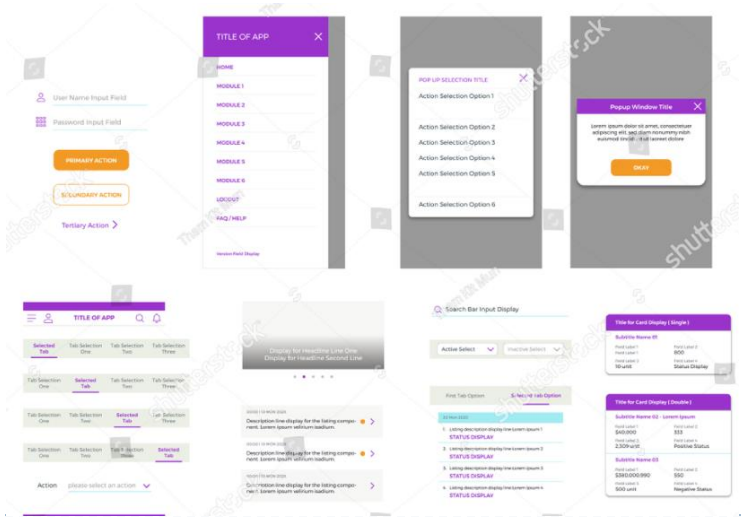
Difference levels of design

- **Architectural design =**

  General design =

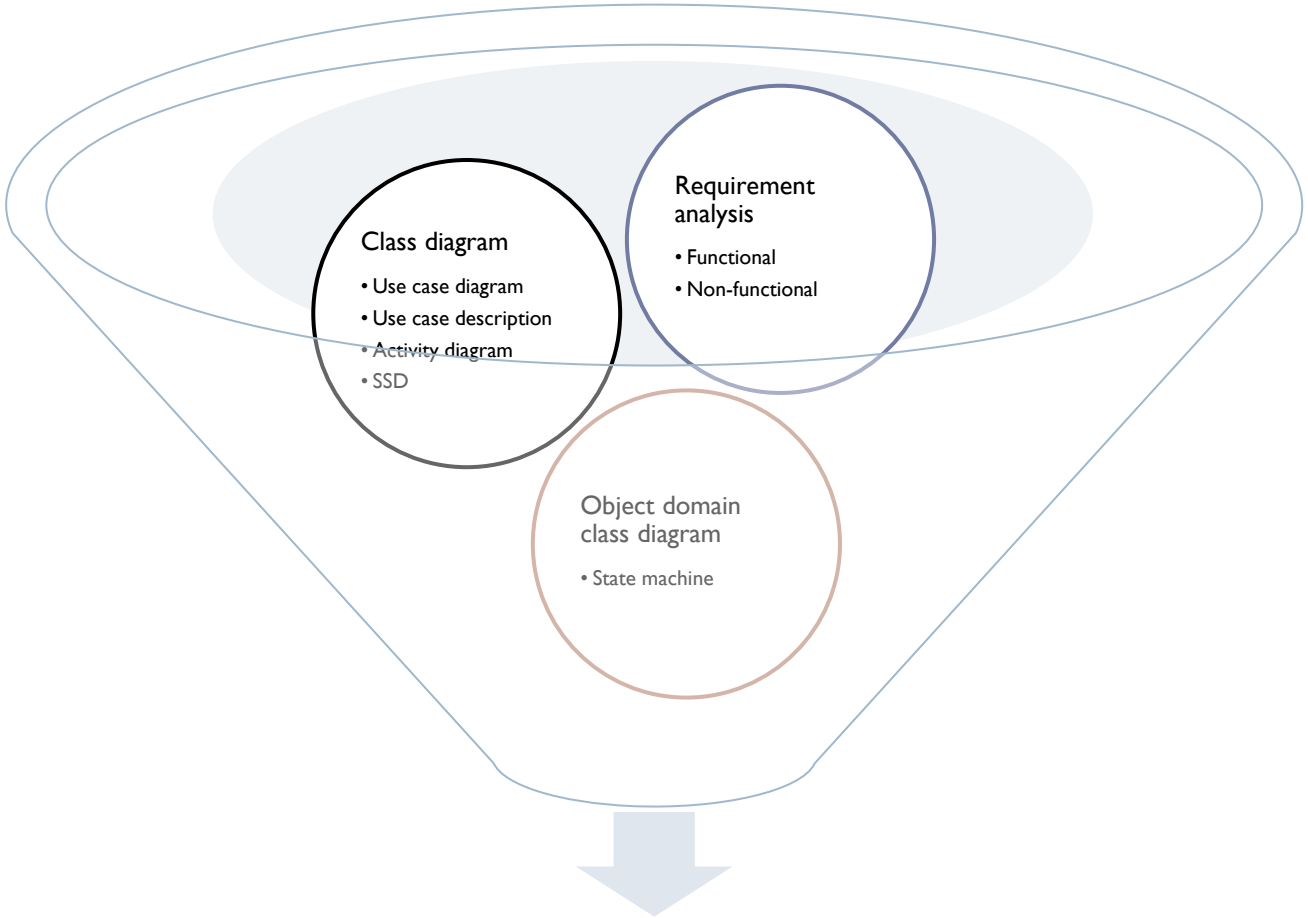
  Conceptual design are the overall system and sketch design before increasing the detail design.





- **Detail design** is low-level design that include the design of the specific program.

6.2 Input and Output for system design

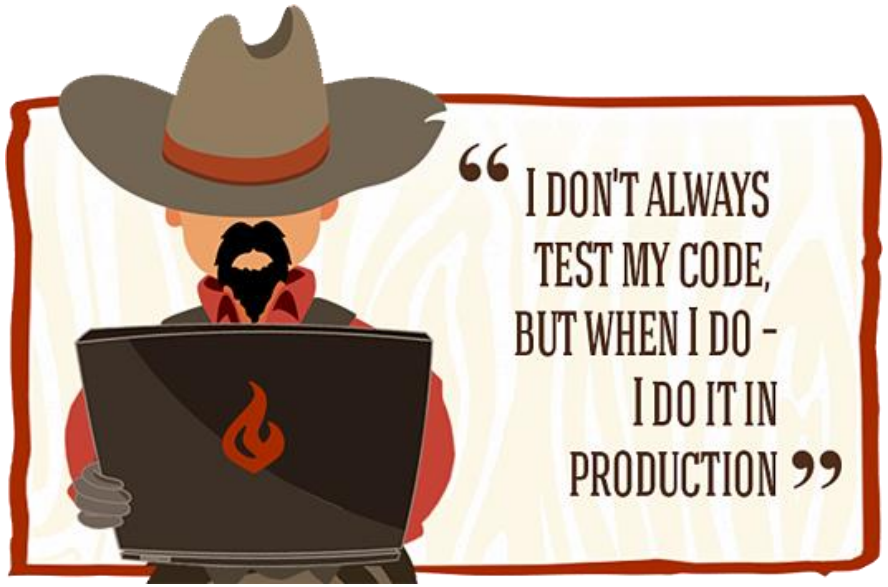


The input of the design

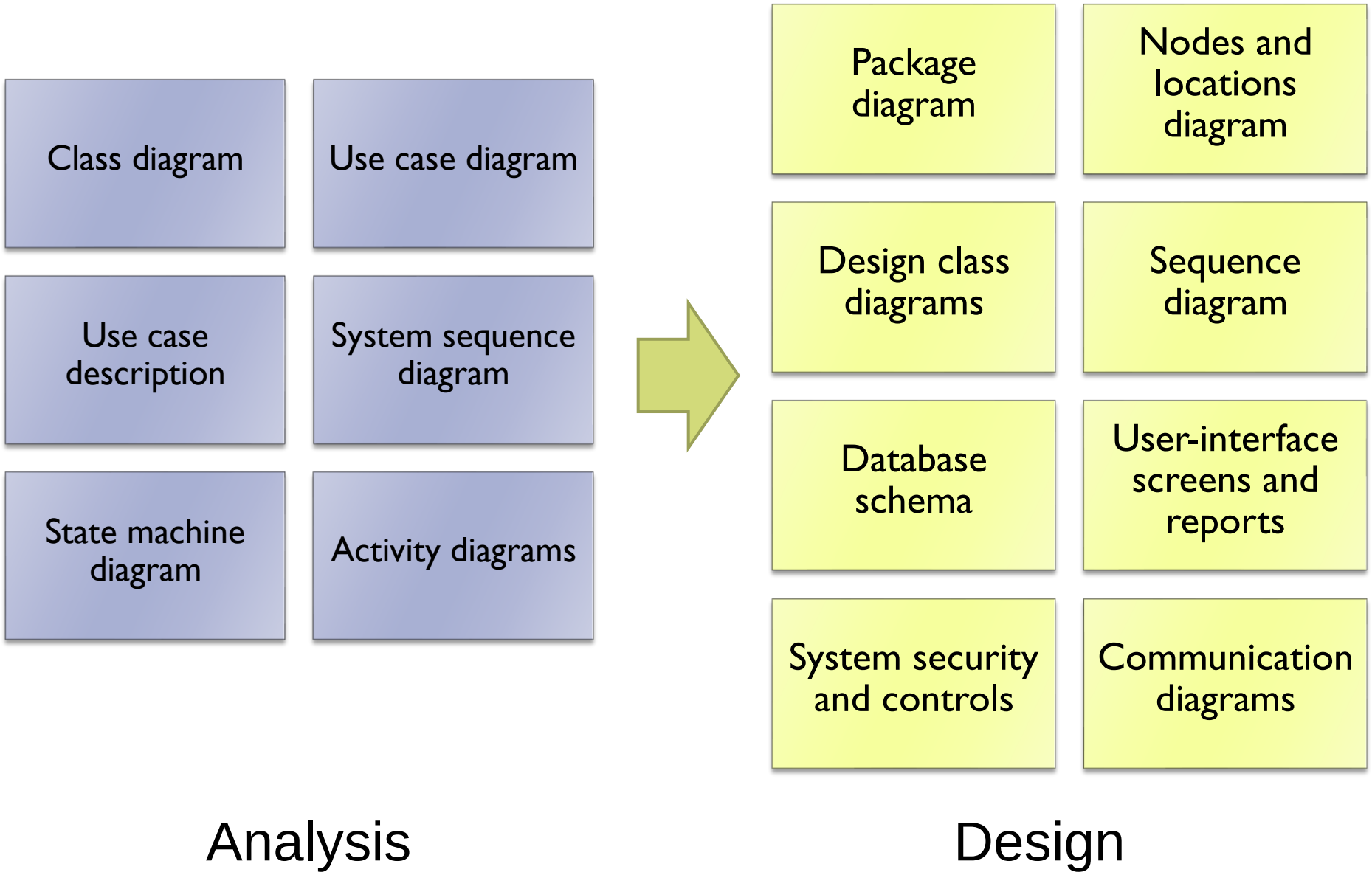
- To understand the business process
- To know the information in the system

6.2 Input and Output for system design

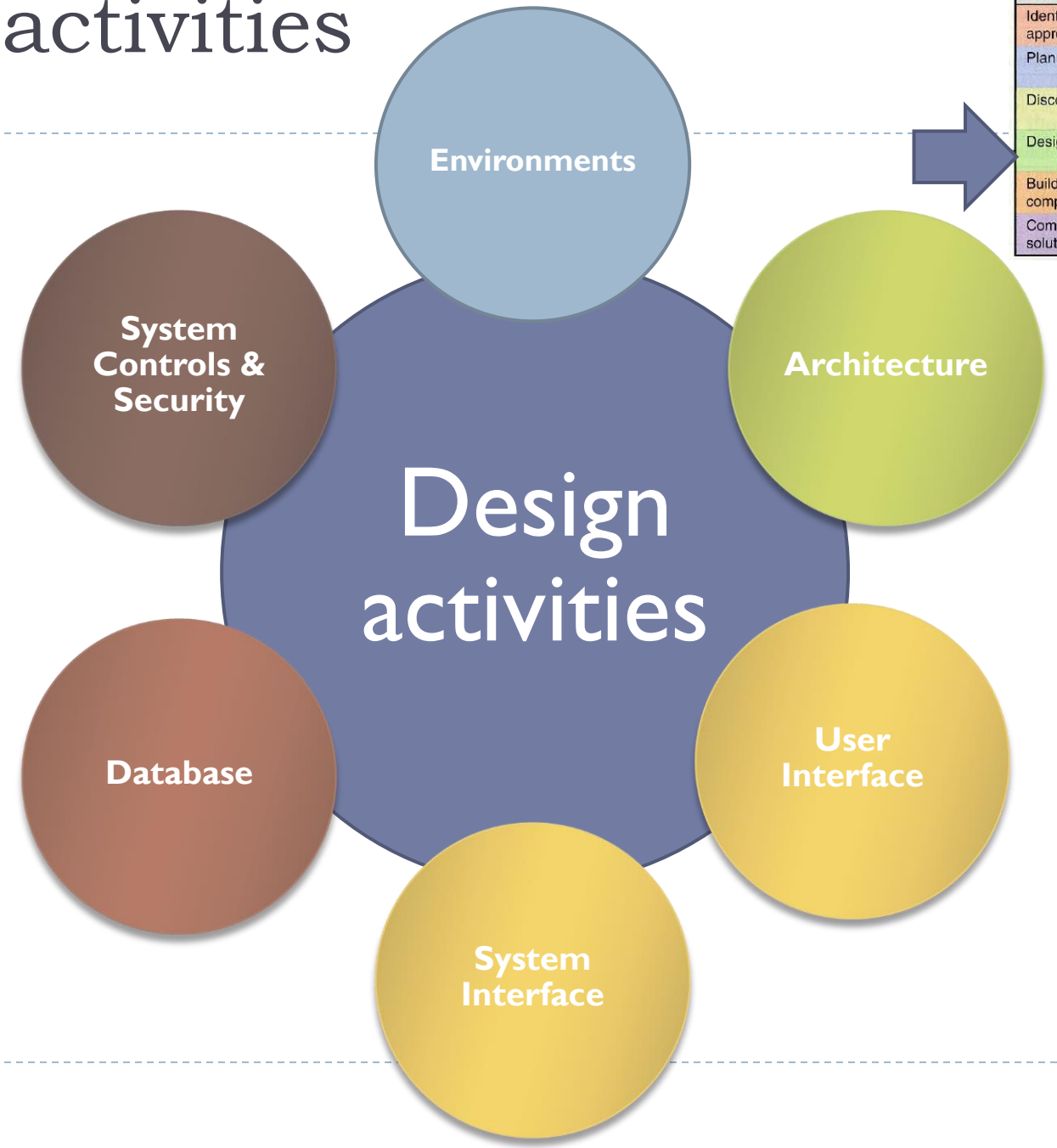
- The output of the design activities
  - Create the blueprint for construction
  - The diagram model
    - State sequence diagram
    - The database schema
  - The design document
    - Flow control
    - System security
  - Etc..

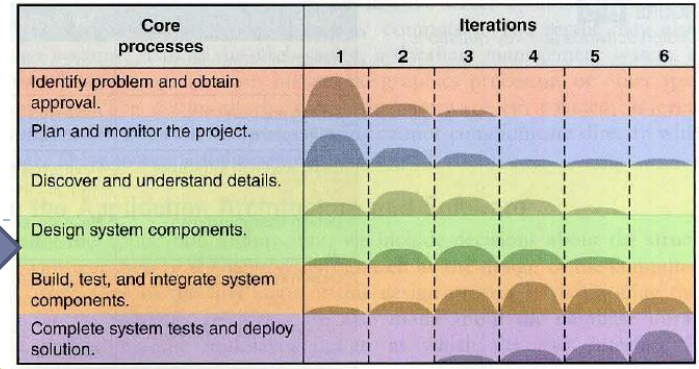


Cowboy coding
- Jumping right into writing code
- No standard way of coding
- ...


Class diagram
Use case diagram
Use case description
System sequence diagram
State machine diagram
Activity diagrams
Package diagram
Nodes and locations diagram
Design class diagrams
Sequence diagram
Database schema
User-interface screens and reports
System security and controls
Communication diagrams
Analysis
Design

6.3 Design activities



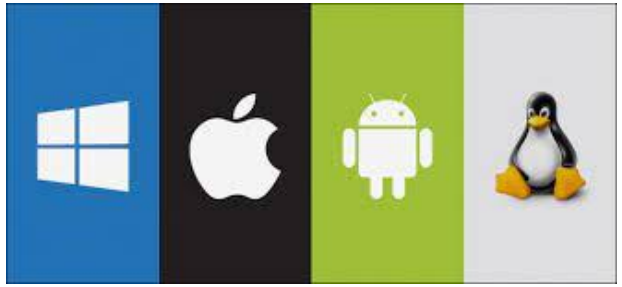


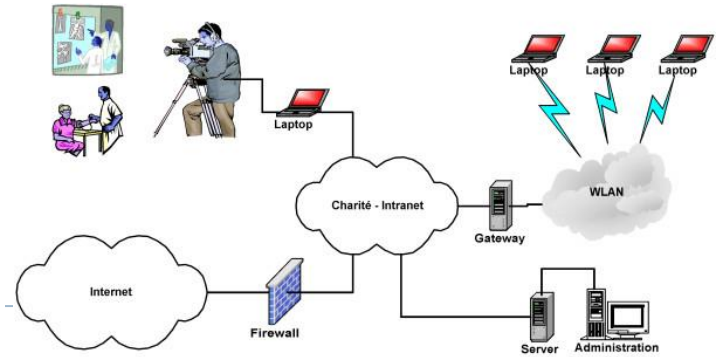
6.3.1 Design the environment

Have you specified in detail of the environment and an options in which the system will execute?

6.3.1 Design the environment

- The environment is all the technology required to support the software application that is being developed.
  - Computers: server, desktop, mobile, small devices
  - Operating systems: Windows, Linux, MacOS, ..
  - Communications: Internet, Intranet, Speed, …



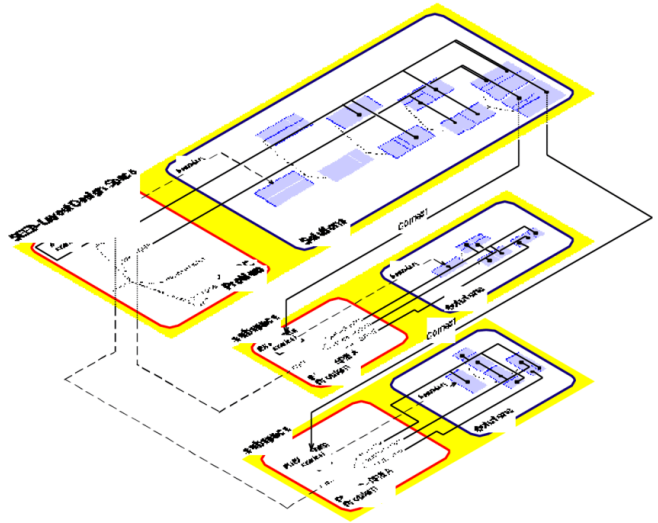


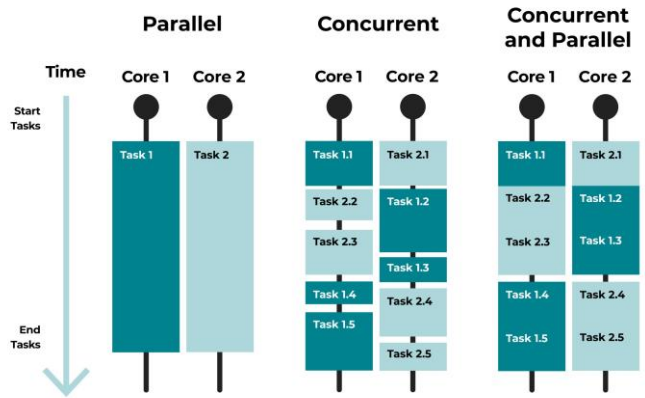
6.3.2 Design Architecture

Have you specified in detail of all software element and how each use case is executed?

6.3.2 Design Architecture

- The application architecture is decisions about the structure and configuration of the new system.
  - Use Top-down process
  - Divide the software into sub systems
    - Database processing
    - Business logic
    - Interface (Screen)
  - Check information size
    - Volume, size of data
    - Number of transaction in a second/minute/hour
    - Response time = Transport latency + Processing time
    - Concurrency





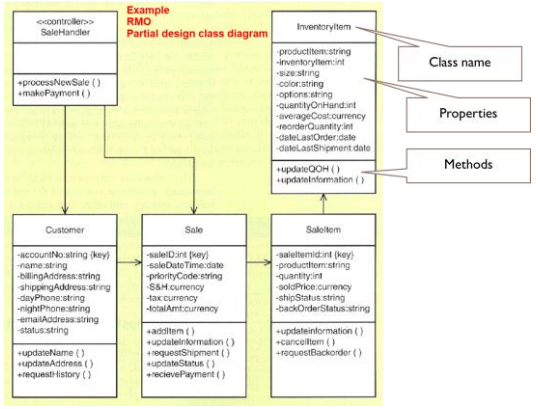
6.3.2 Design the application architecture and software

After complete divide into sub system

- The detailed level (Detail design)
  - Design from small and non-complex part (Partial design)
  - Uses information from the list below to design class diagram

- Activity diagram
- Sequence diagram
- Other physical models

design class diagram



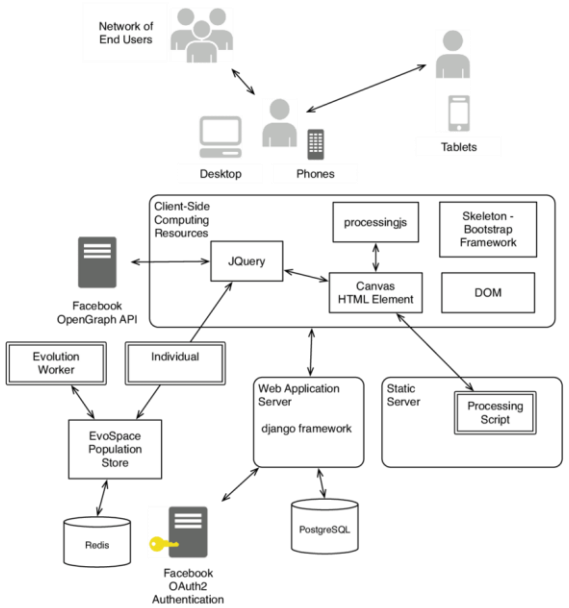
6.3.3 Design User Interface

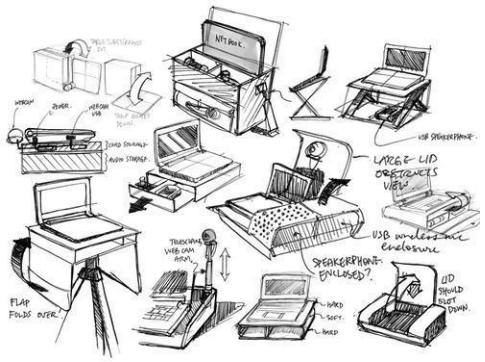
Have you specific in detail of system communicate with other system inside and outside the organization?

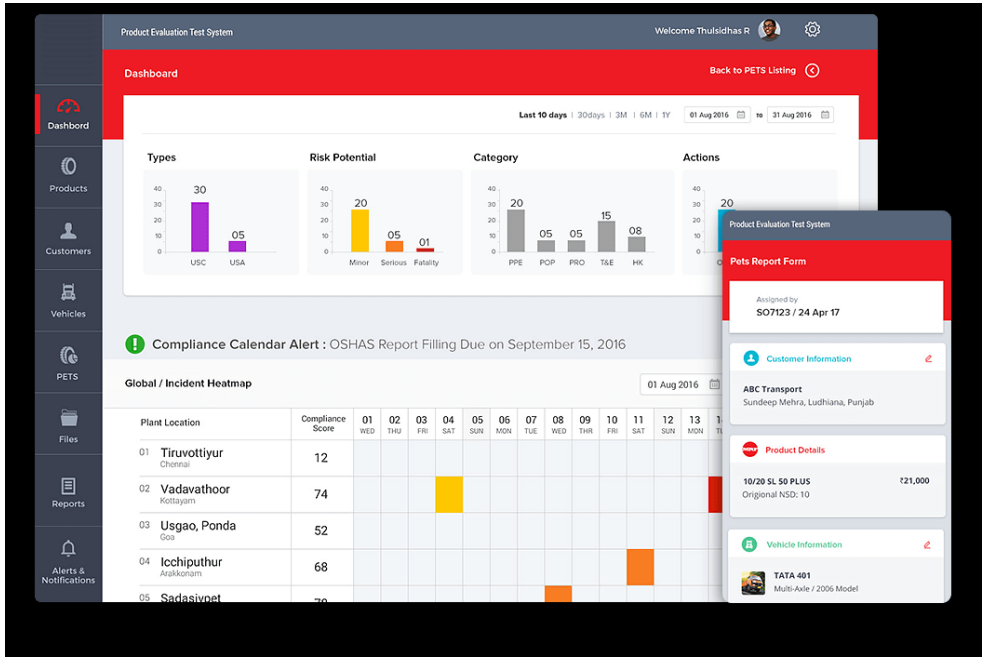
6.3.3 Design the user interfaces

The user interfaces is more than just the screen – it is

- Conceptual design แนวคิด
- Perceptual การรับรู้
- Physical



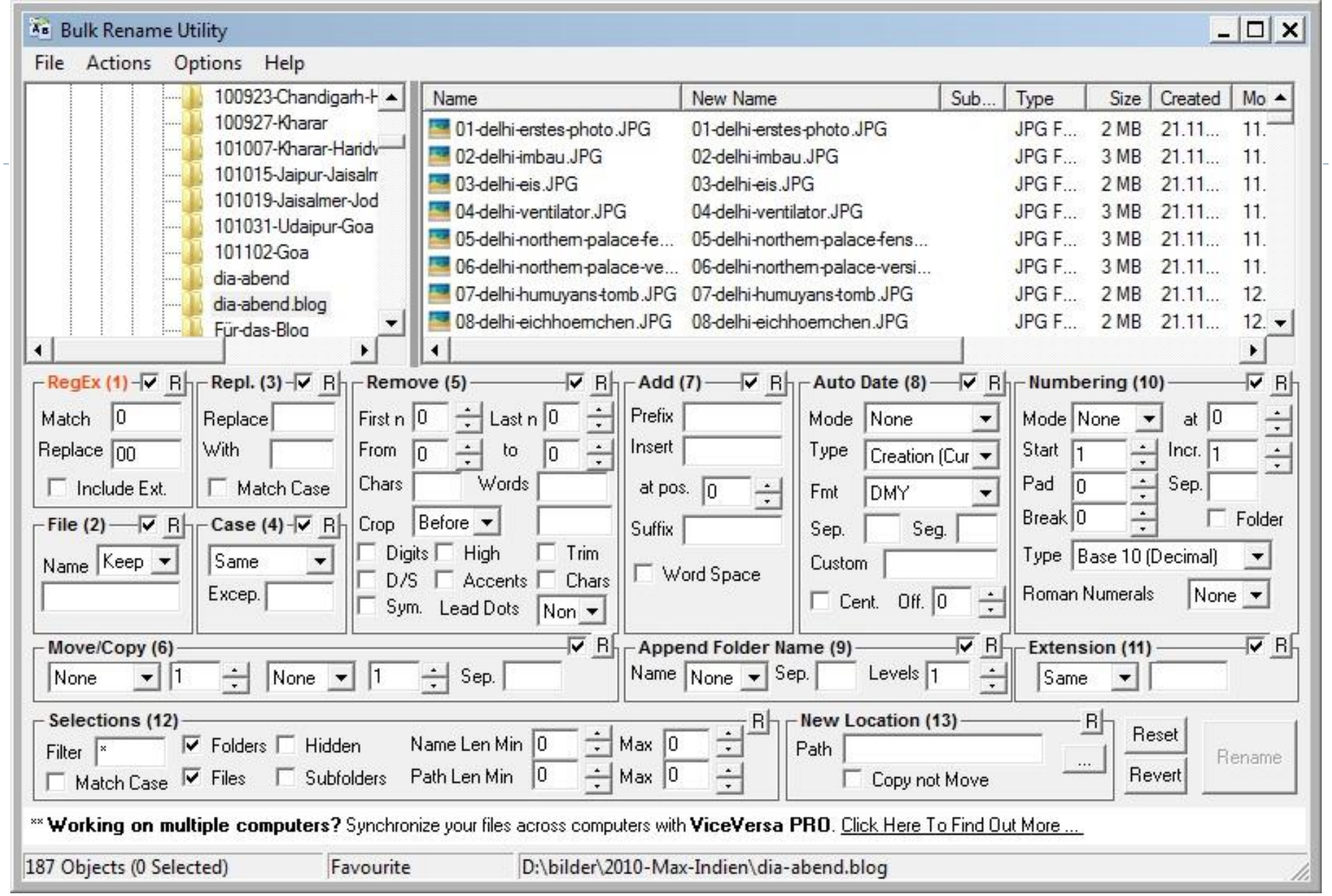





1:03: 14am
1 - SOUL MAN
3 - DAVID
3 - DAVID
4 - JOHN
5 - TOM
RED
BLUE

6.3.3 Design the user interfaces

- The user interface is consideration.
  - Screen (display)
  - Sound
  - Touch screen
  - Ergonomically efficient
  - Single / Multiple user interface
  - Etc..



Picture from: http://blog.ideaday.de/max/2010/11/example-for-a-bad-user-interface/

6.3.4 Design System Interface

Have we specified in detail of user interact with the system to carry out their tasks (use case) ?

6.3.4 Design the system interfaces

The system interface considers

- Exchange information / Sharing information
- Standard of information name
- Format of interchange
  - Binary data
  - Text base data
- Real time
- Services from other systems
- Data encryption
- Web service
  - Soap
  - Restful

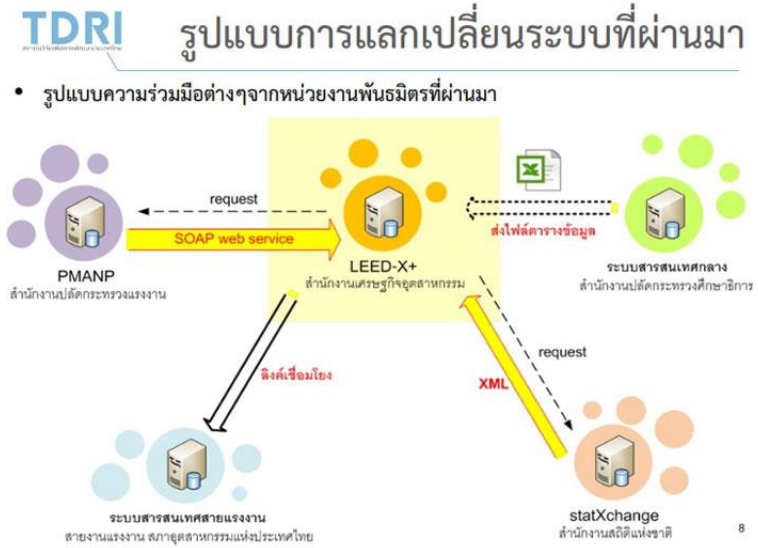


TABLE II. TEST RESULT OF VEHICLE SPEED VS READING

Tag ID	Speed (km/h)	Identified as	Result
:10008212 02	0 – 2	:10008212 02	Detected
:10008212 02	3 – 5	:10008212 02	Detected
:10008212 02	6 – 8	:10008212 02	Detected
:10008212 02	9 – 10	:10008212 02	Detected
:10008212 02	11 – 13	-	Undetected
:10008212 02	14 – 20	-	Undetected
:10008212 02	21 – 30	-	Undetected

Example of the eXtensible Makeup Language (XML)

```
<inventoryRecord>
            <productItem>WS39448-7</productItem>
            <inventoryItem>48763920</inventoryItem>
            <itemCharacteristics>
                <size>large</size>
                <color>blue</color>
                <options>withzippers</options>
            </itemCharacteristics>
            <orderRules>
                <quantityOnHand>54</quantityOnHand>
                <averageCost>38.27</averageCost>
                <reorderQuantity>25</reorderQuantity>
            </orderRules>
            <dates>
                <dateLastOrder>06042012</dateLaseOrder>
                <dateLastShipment>08072012</dateLastShipment>
            </dates>
</inventoryRecord>
```

6.3.5 Design Database

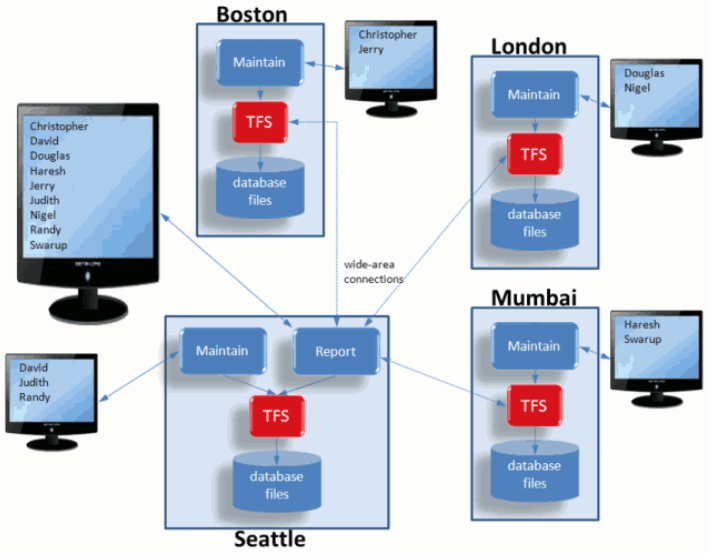
Have you specified in detail of data store?

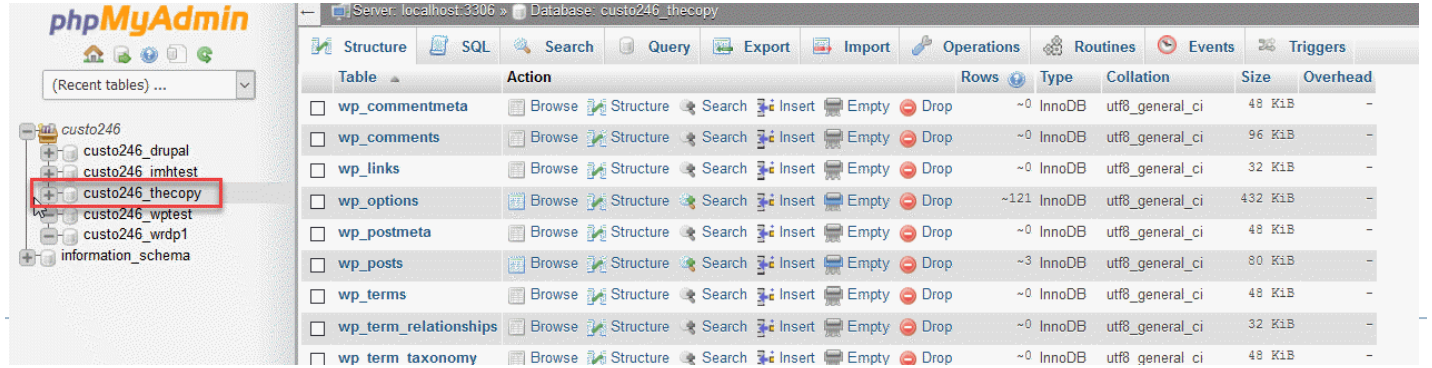
6.3.5 Design the database

The design database

- Uses the data model (the domain model) from system analysis to create the database diagram

- Many importance should be considered
  - Performance (Response time)
  - Security and encryption
  - The multiple database (installation on various location)





6.3.6 Design System Control & Security

Have you specified in detail of the secure and protected?

6.3.6 Design the security and system controls

- The final design is to ensure the system having safeguard protects organization assets.

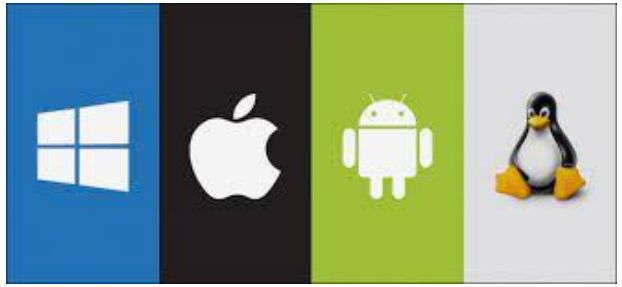
- The security design and system control should include the design
  - User interface
    - Limit access by show data only authorized user
  - System interface
    - Ensuring other system cause no harm to this system
  - Application architecture
    - Transaction control, log data keeping
  - Database
    - Password, encryption, and protect unauthorized access during software or hard failure.
  - Network design

6.4.1 Detail of Design environment

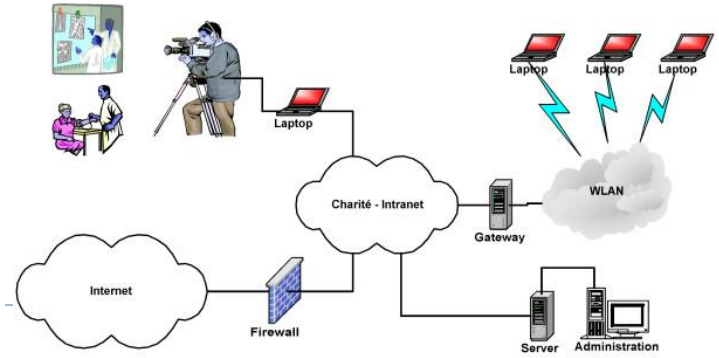
Have you specified in detail of the design environment and an options in which the system will execute?

6.3.1 Design the environment

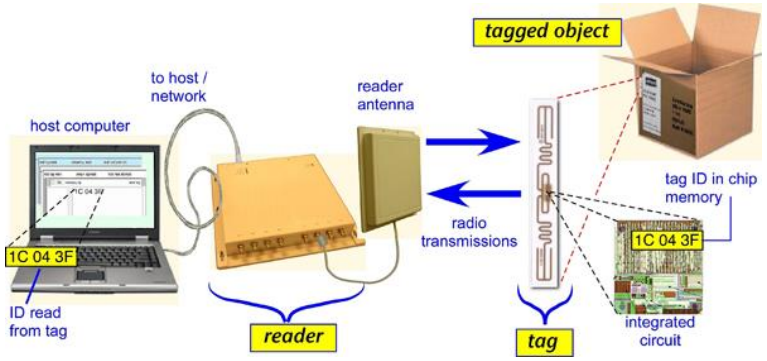
- The environment is all the technology required to support the software application that is being developed.
  - Computers: server, desktop, mobile, small devices
  - Operating systems: Windows, Linux, MacOS, ..
  - Communications: Internet, Intranet, Speed, …

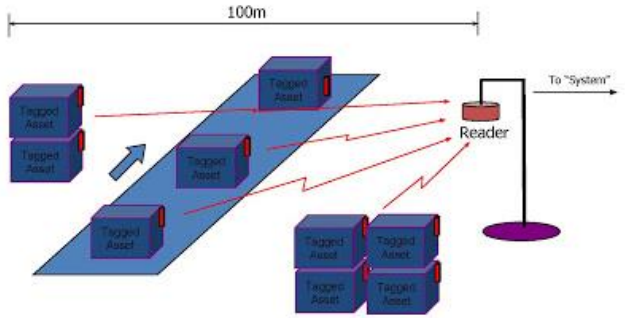


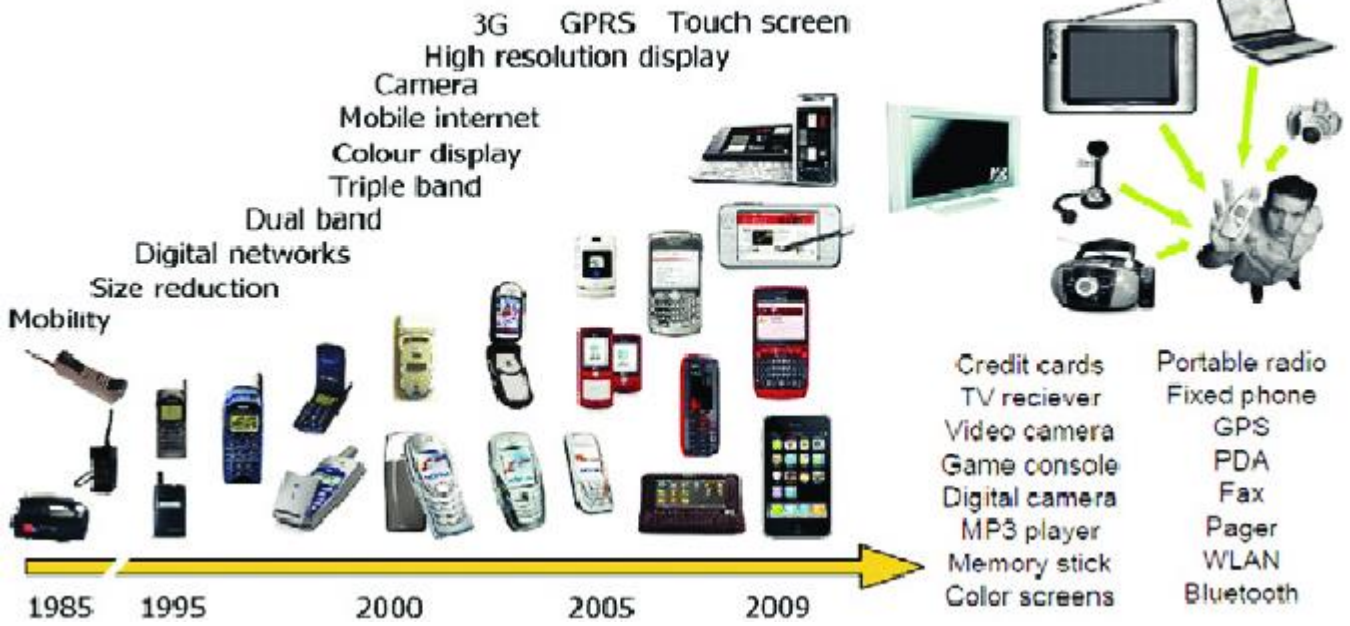
- Focus on deployment and location
  - Design for internal deployment
  - Design for external deployment
  - Design for remote, distributed environment



Hardware details

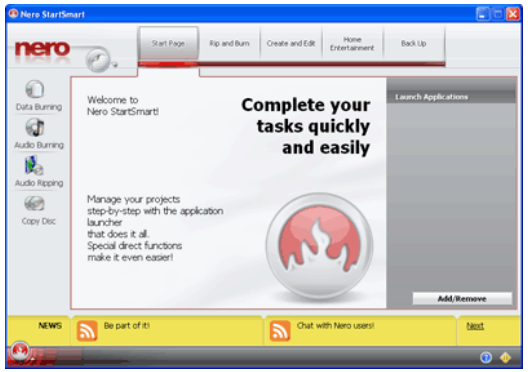


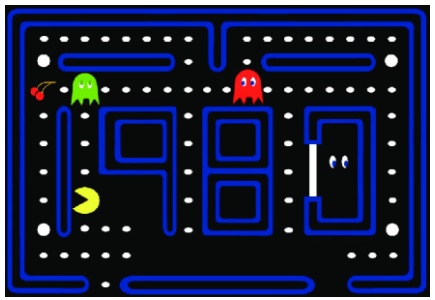




6.4.1 Design for internal deployment

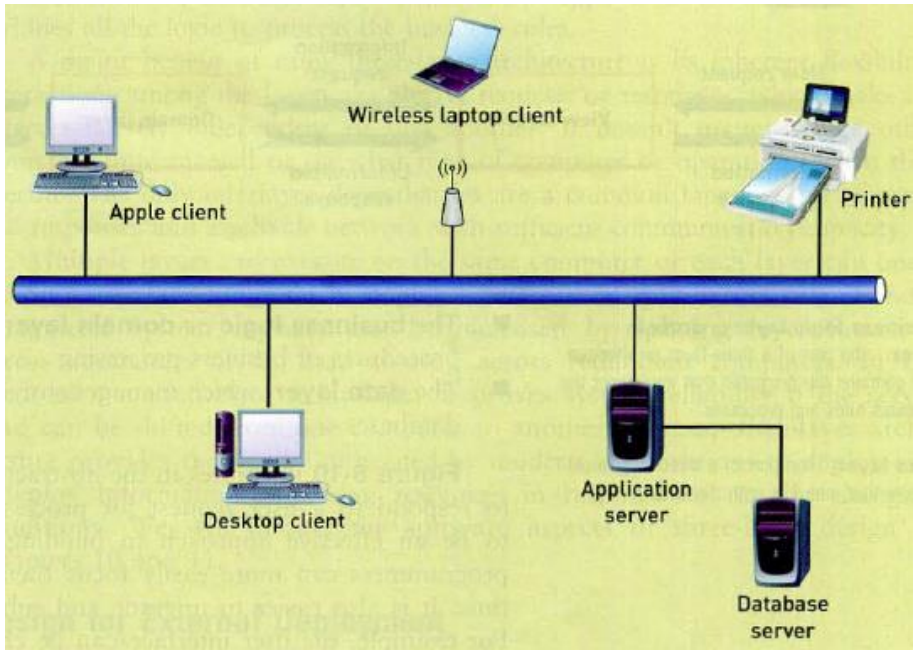
- Two types of internally deployed software system
  - a) Stand-alone software systems means
    - Software executes on a single computer
    - Software no need to connect Internet or network
    - Read and write data to files
    - Example applications (MS-office, Game, Utility software…)





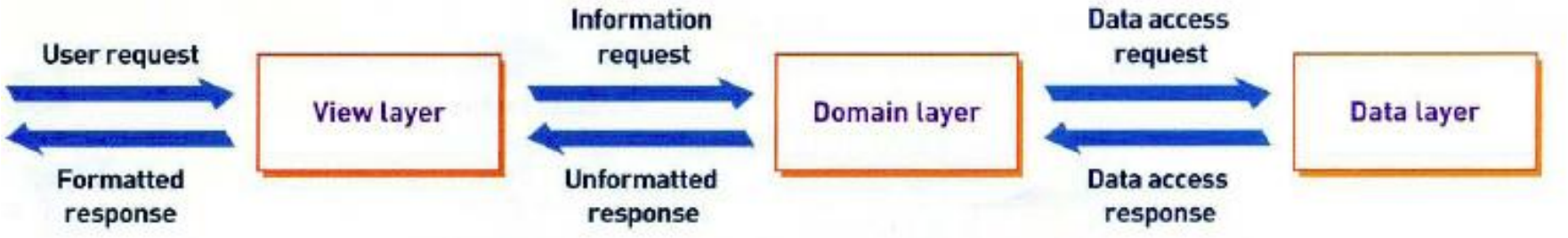
6.4.1 Design for internal deployment (2)

- b) Internal network-based systems means
  - Client-Server architecture
    - Server computer
    - Client computer
  - Local area network (LAN)
  - Software types
    - Desktop application system
    - Browser-based application (Web App) system

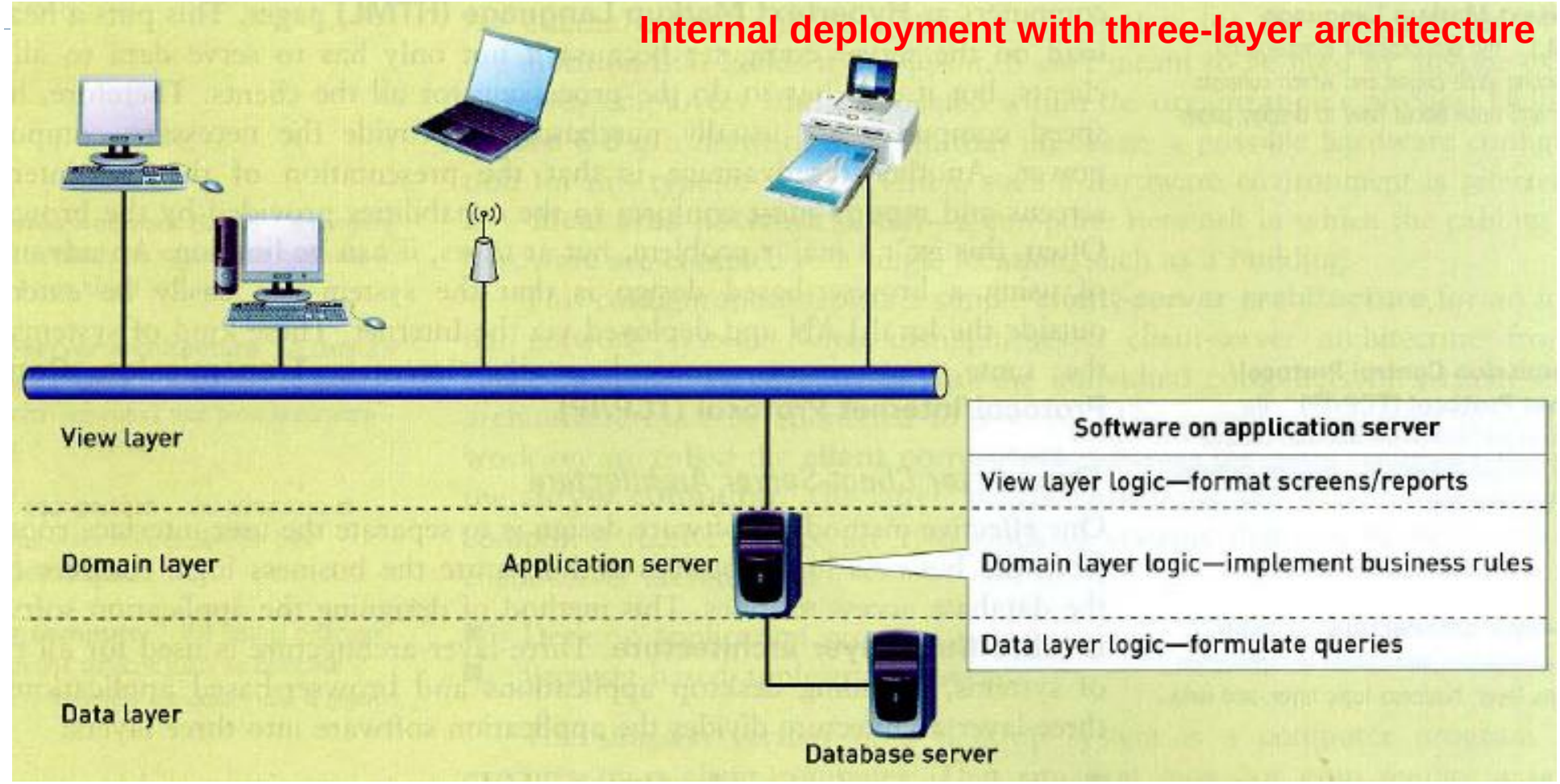


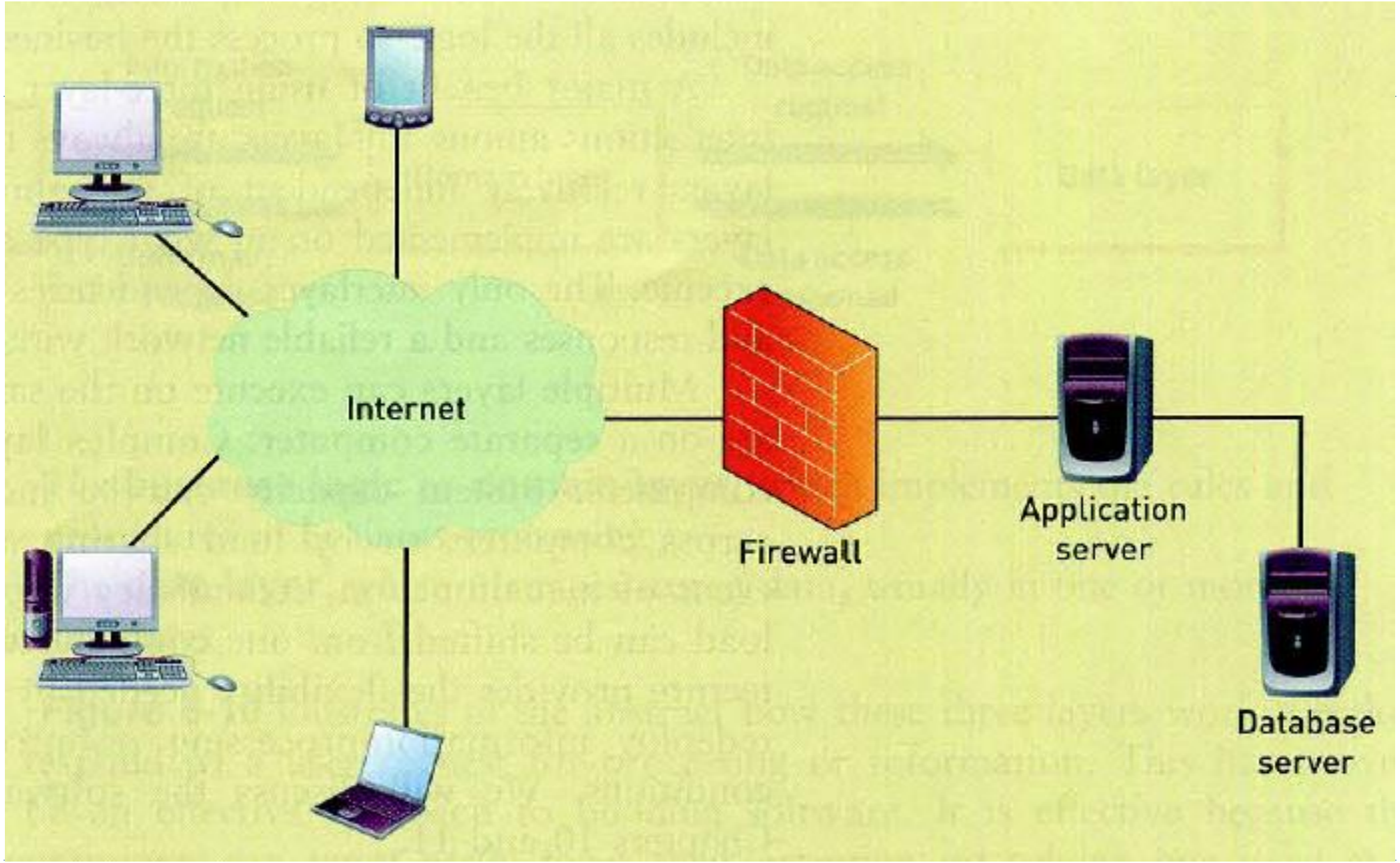
6.4.1 Design for internal deployment (3)

- c) Three-layer client-server architecture is design separately.
  - The user-interface (called view layer)
  - The business logic (called domain layer)
  - The database access (called data layer)



Internal deployment with three-layer architecture

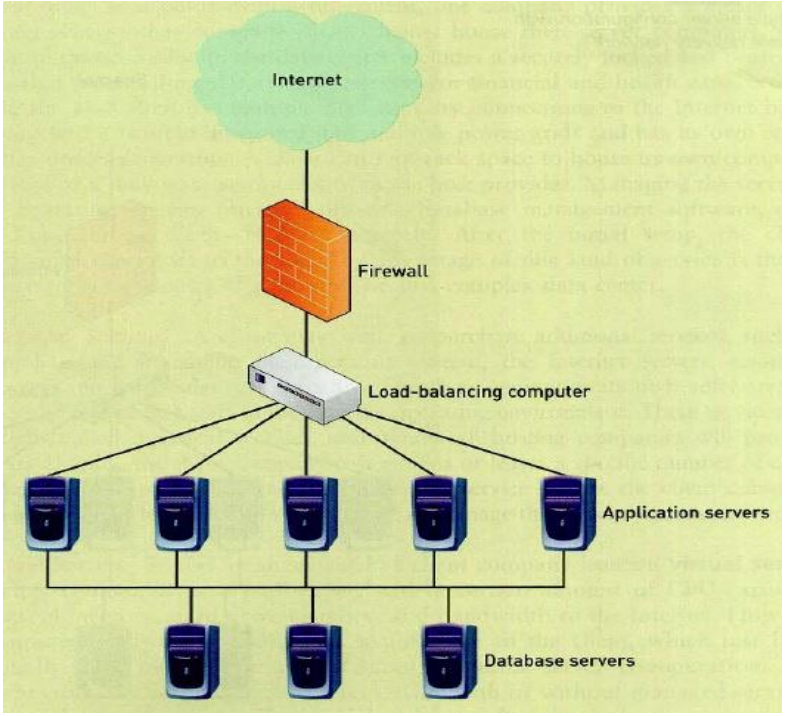



Internet
Firewall
Application server
Database server

6.4.2 Design for external deployment

- New software most rapidly growing area is the external system using on Internet.
  - Small to large business use Internet service

- Importance issue related for external deployment
  - **Configuration for Internet** deployment
    - Web technologies
    - Security on Web
    - Throughput
    - Changing Web standards

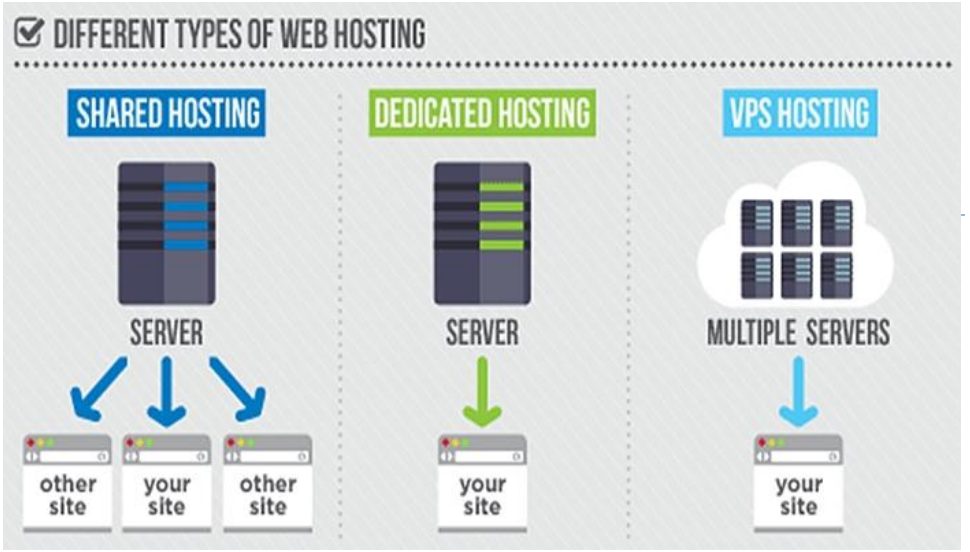


6.4.2 Design for external deployment

- **Hosting alternative** for Internet deployment must considers server computer
  - Reliability (backup, recover, redundancy)
  - Security (hardware encryption)
  - Physical facilities (security, special rooms, electrical power backup, air-conditioner)
  - Staff
  - Growth

The preservation data as value of data

HOSTING OPTIONS				
Service options	**Colocation**	**Managed services**	**Virtual servers**	**Cloud computing**
Hosting service provides building and infrastructure	Yes	Yes	Yes	Yes
Client owns computer	Yes	Perhaps	No	No
Client manages computer configuration	Yes	No	Possible	No
Scalability	Client adds more computers	Client adds more computers	Client buys larger or more virtual servers	Client adds small increments of computing power
Maintenance	Client provides	Host provides	Host provides	Host provides
Backup and recovery	Client provides	Host provides	Available	Available



- Shared CPU, Shared Hosting
  - Lesser cost
  - Low traffic web servers
  - Blogs
  - Content Management Systems (CMS)
  - Small databases
  - Dev/test servers
  - Microservices
- Dedicated CPU
  - Medium-to-high-traffic web servers
  - No-impact from other sites
  - Medium-sized databases
  - Enterprise Software as a Service (SaaS)
- Virtual Private Server (VPS) hosting
  - high-traffic
  - Zero downtime
  - Easy scale customization

Virtual servers

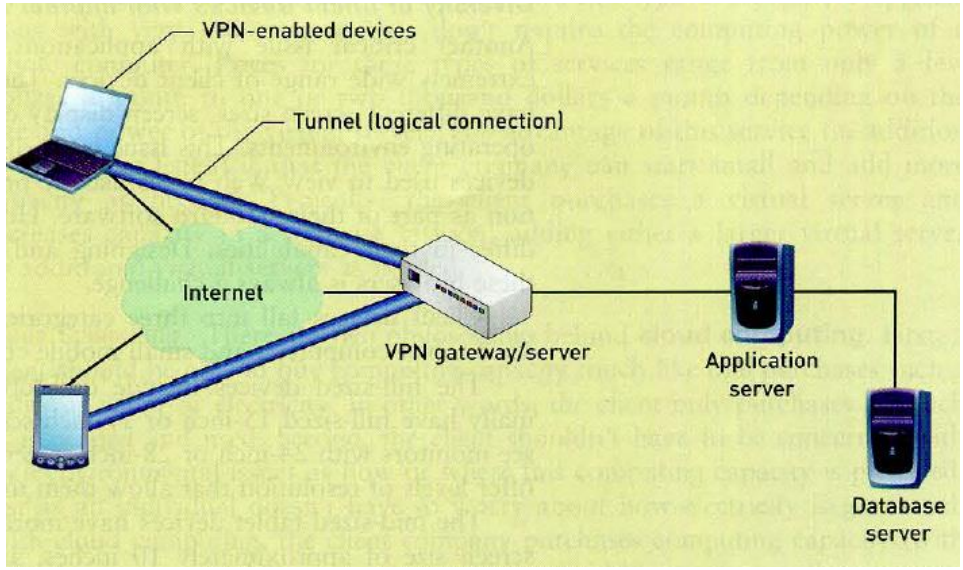
Linux/Unix Windows

$3.50 USD/mo	$5 USD/mo	$10 USD/mo	$20 USD/mo	$40 USD/mo	$80 USD/mo	$160 USD/mo
512 MB Memory	**1 GB** Memory	**2 GB** Memory	**4 GB** Memory	**8 GB** Memory	**16 GB** Memory	**32 GB** Memory
1 Core Processor	**1 Core** Processor	**1 Core** Processor	**2 Core** Processor	**2 Core** Processor	**4 Core** Processor	**8 Core** Processor
20 GB SSD Disk	**40 GB** SSD Disk	**60 GB** SSD Disk	**80 GB** SSD Disk	**160 GB** SSD Disk	**320 GB** SSD Disk	**640 GB** SSD Disk
1 TB Transfer*	**2 TB** Transfer*	**3 TB** Transfer*	**4 TB** Transfer*	**5 TB** Transfer*	**6 TB** Transfer*	**7 TB** Transfer*

6.4.2 Design for external deployment

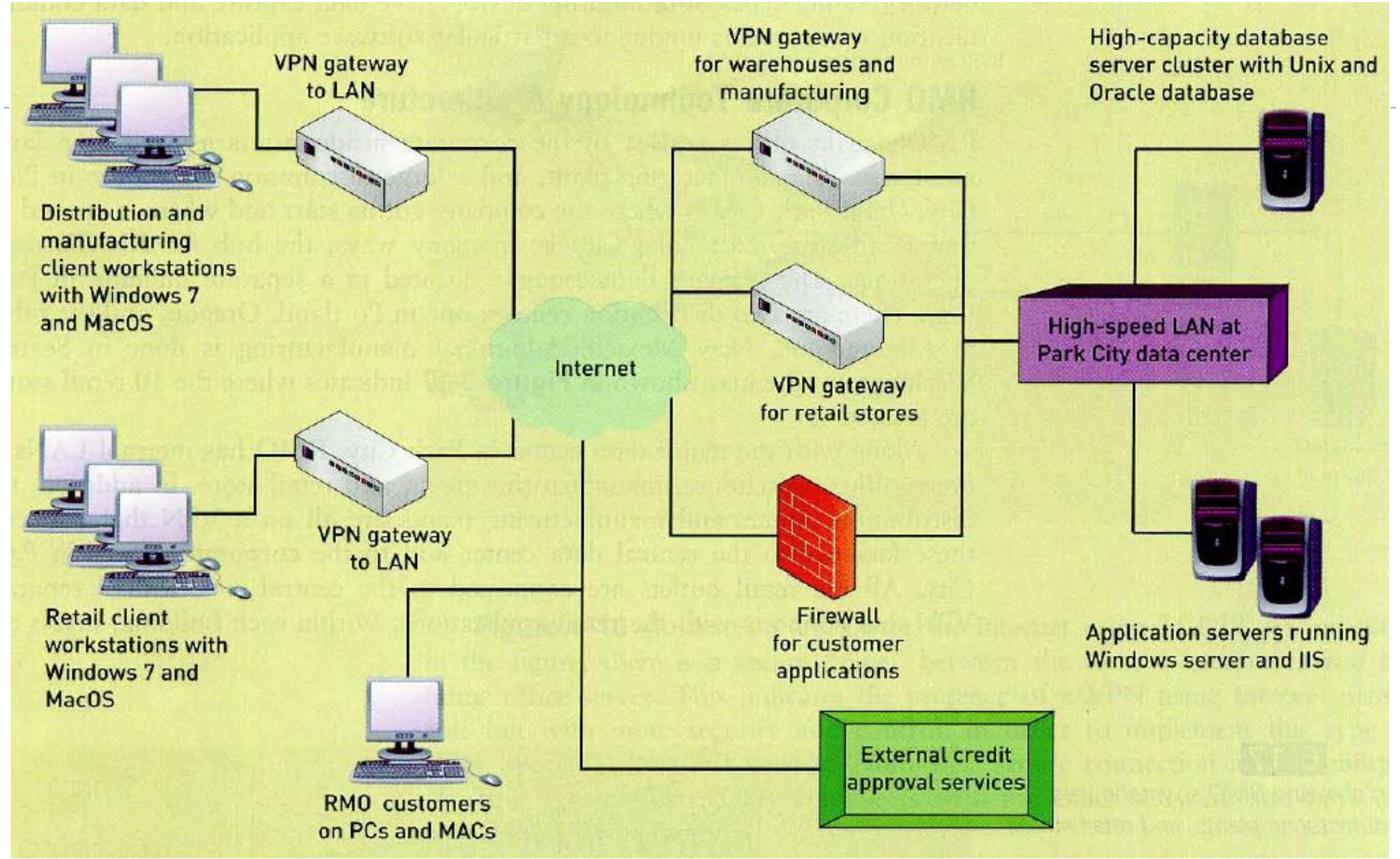
- **Diversity of client devices** with Internet deployment is the extremely wide range of client devices.
  - Desktop and laptop computer, screen size >12" inches
  - Tablet, iPad, screen size >7" inches
  - Mobile computer, smart phone.

- Design for remote, distributed environment
  - Remote via virtual private network
  - Peer-to-peer connection



Example RMO

- Pin on the retail store and the warehouse


VPN gateway to LAN
Distribution and manufacturing client workstations with Windows 7 and MacOS
VPN gateway for warehouses and manufacturing
High-capacity database server cluster with Unix and Oracle database
Internet
VPN gateway for retail stores
High-speed LAN at Park City data center
VPN gateway to LAN
Retail client workstations with Windows 7 and MacOS
Firewall for customer applications
Application servers running Windows server and IIS
RMO customers on PCs and MACs
External credit approval services

Summary

- The element of design
  - Network diagram
  - Architectural design
  - Detail design
- Input and Output for system design
  - SA: Understanding / SD: Solution
- Design activities
  - Design environment
  - Design application architecture and software
  - Design system interface
  - Design user interface
  - Design database
  - Design system control and security
- Design the environment
  - Internal deployment
  - External deployment
  - Remote access