XVII. System Design

What is System Design?
The Outputs of System Design
The (Global) System Architecture
Classification of Applications
State of the Market

Major Tasks of System Design

- *Identify major hardware and software **subsystems** and **components**.*
- *Identify (usage, control or data) **dependencies** among subsystems.*
- *Decide on a hardware and software **platform** for the new system.*
- *Design the information system **software**, **database**, and **user interfaces**.*

Other Elements of System Design

(...Not discussed in this course….)

- *Plan control aspects of the application.*
- *Test plans.*
- *Code development standards.*
- *Priorities for design trade-offs.*
- *Implementation requirements (e.g., data conversion)*

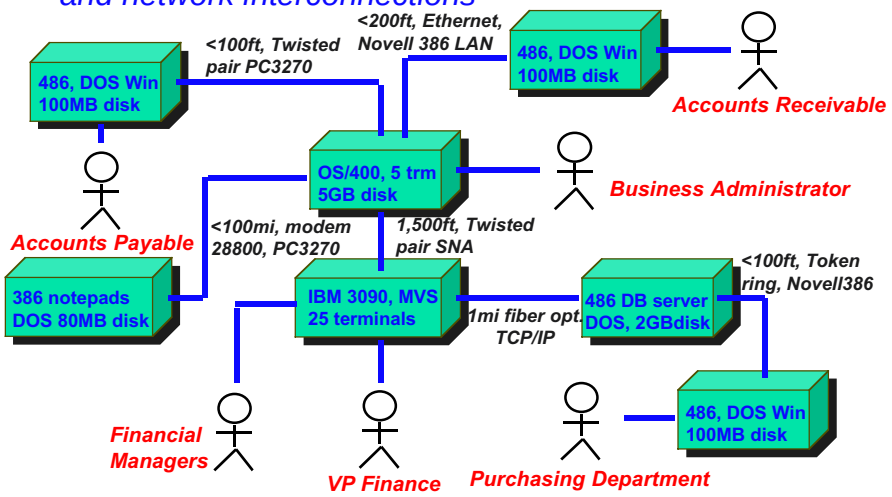
System Architecture

- ***System*** *refers to both hardware and software.*
- *The system architecture describes the collection of inter-connected hardware nodes on which the software will eventually run.*
- *A* ***system architecture*** *consists of:*
  - ✓ *Hardware nodes, e.g., 486, 2MB RAM, 100MB disk OS: DOS Windows.*
  - ✓ *The connectivity among nodes, e.g., length: <100ft, type: fiber optic, product: Novell 386 LAN, PC3270*
  - ✓ *The location of users, inputs and outputs;*

Key concern: Minimize data communication

Example

- To each hardware node, associate users (actors) and network interconnections



Distribution Issues: How Are Data Processed?

- ***Batch mode*** -- e.g., incoming/outgoing surface mail (purchase orders, invoices, cheques…
- ***On-line mode*** -- can save data entry time, particularly if end user can do the input, clearly the way of the future.
- ***Remote batch*** -- data are input on-line on remote machines, then fed in batch to centralized database.

New Technologies for I/O and New Standards for Data Interchange

- ***Keyless data entry*** -- bar coding, optical character recognition, special keyboards.
- ***Pen input*** -- several products in the market.
- ***Electronic data interchange (EDI)*** -- data are transferred through telephone lines from one location to another; e.g., credit card charging
- ***Image and Document Interchange*** -- like electronic data interchange, e.g., law enforcement, banking.
- ***HTML/XML/SGML*** -- markup languages for documents; SGML is a general markup languages for documents.

Choosing a System Architecture

Here is a series of issues that need to be addressed:

- *Establish batch and on-line computer processes; e.g., on-site conference registration.*
- *Determine process cycles, i.e., when does each process need to run, e.g., end-of-month, end-of-project.*
- *Establish processing locations -- identify user locations (and numbers).*
- *Distribute data to locations.*
- *Distribute software subsystems to locations.*
- *Assign technology -- what hardware, software is going to run where?*

Classification of Applications

Span / Type	Operational Support	*Decision Support* *(browsing+analysis)*	*Real Time*
Group/Dept	E.g., regional inventory control	E.g., regional marketing info system	E.g., video conferencing within group
Enterprise	E.g., enterprise-wide cash mgt	E.g., corporate data warehouse	E.g., enterpr-wide video-conference
Inter-Enterprise	E.g., B2B Ecommerce	E.g., DBs for communities of interest	E.g., distributed multimedia over the internet

State of the Market

Span / Type	Operational Support	*Decision Support* *(browsing+analysis)*	*Real Time*
Group/Dept	PC, Windows, OLTP, OO products	COTS (mainly SQL-based	Multimedia technology maturing
Enterprise	ERPs, OLTP over private intranets	ERPs, Web-based products	ERPs, Web-based technologies
Inter-Enterprise	Ecommerce technologies	Web-based technologies	Web-based technologies

- ***OLTP** -- On-Line Transaction Processing*
- ***ERPs** -- Enterprise Resource Planning systems*
- ***COTS** -- Components Off-The Shelf*

Data Management Issues

- Identify amount and type of data persistence needed:
  - ✓ Is simple file I/O sufficient?
  - ✓ Is a Database Management System (DBMS) required?
- A DBMS is typically needed when:
  - ✓ Data is accessed at a fine level of detail,
  - ✓ Sophisticated indexing is required,
  - ✓ There is a need to port data across multiple platforms,
  - ✓ Data needs to be accessible from multiple platforms.

Isolate persistence mechanisms from application!