TELE302 Lecture 15

Requirements Analysis I

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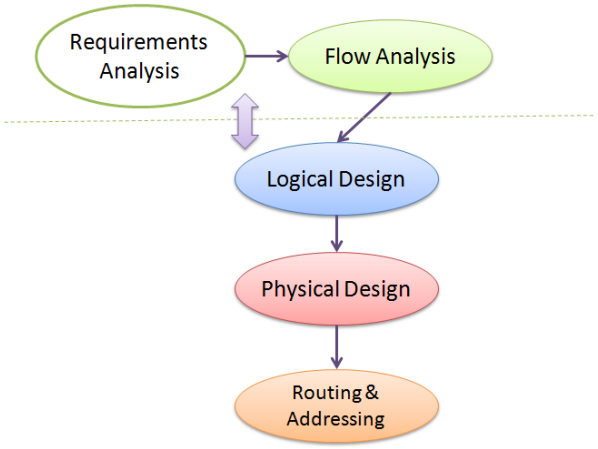
Lecture Outline

Network Design: A Systems Approach



Defining Requirements Analysis

- Requirements analysis consists of identifying, gathering, and understanding system requirements and their characteristics, and developing thresholds for performance to distinguish services (low-, high-performance, specified services etc.)
- Fundamental to network design.

Payoffs of R.A.

- More objective, informed **choices** of network technologies and services.
- The ability to match **interconnection** strategy to networks.
- Networks and components properly **sized** to users and applications.
- A better understanding of **where and how** to apply services in the network.

Sources of Requirements

- Users
- Applications
- Hosts
- Networks
- Functional (security, management ...)
- Finance
- Enterprise (regulations, policies etc.)

Requirements Categorization

Requirements gathered or derived from users, management and staff need to be analysed and separated into the following categories:

- **Core** requirements for the network
- **Desirable** features for the network
- Requirements for **future** revisions / upgrades
- *Rejected* requirements
- *Informational* requirements

Analyzing Business Goals

- Working with clients
- Identifying the scope of the Network Design Project
  - Build a network from scratch?
  - A test bed only?
  - Upgrade of an existing network?
- Identifying network applications
  - Any Mission-Critical ones?
  - Necessary System Applications

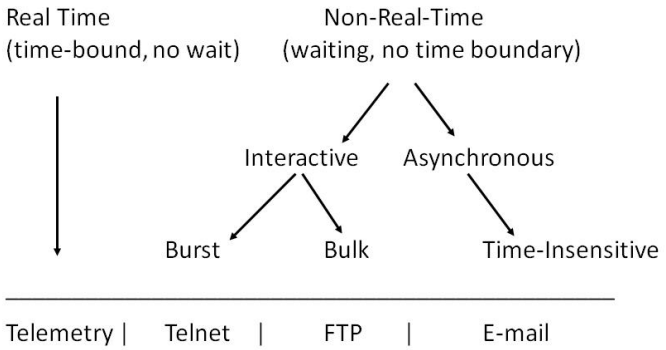
Analyzing Business Constraints

- Politics and policies
  - Personnel issues
  - Survive the partners and testers
  - Designation of vendors?
  - Standardization of desktops, OS, and protocols?
- Budgetary and staffing
- Use a Business Goals Checklist

Application Types

- *Mission-critical* applications have specified (deterministic and/or guaranteed) reliability.
- *Controlled-rate* applications have specified capacity.
- *Real-time* (and possibly interactive) applications have specified delay requirements.

Application Delay Types



User Service Req. → Performance Req.

- Timeliness
- Interactivity
- Reliability
- Quality
- Adaptability
- Security
- User Numbers
- User Locations
- User Growth
- Affordability
- Management
- Supportability

→ Capacity
→ Delay
→ Reliability
→ Functionality

Reliability

- System's ability to provide deterministic and accurate delivery of information.
- Connectivity, performance, security ...
- Consequences of poor reliability
  - Loss of revenue or customers: banking, airline reservation
  - Loss of information: telemetry, teleconferencing
  - Loss of sensitive data: customer ID/billing
  - Loss of life: transportation, health-care monitoring
- Applications requiring predictable, high degree of reliability, are mission-critical.

Capacity

- Applications that require an amount of capacity are termed controlled-rate applications.
- They require thresholds, bounds, or guarantee on minimum capacity, peak capacity, or sustained capacity.
- They have control in network resource to guarantee a certain (minimum) level of capacity, which is often tied to end-to-end delay of the network.

Delay

- Delay: a measure of time differences in the transfer and processing of information.
- Sources: propagation, transmission, queueing, routing, processing, ...
- Applications tend to focus on optimizing the total round-trip or end-to-end delay rather than on individual sources (lower-layer optimization).
- Applications with delay requirements are migrating to the Internet esp. using VPNs.

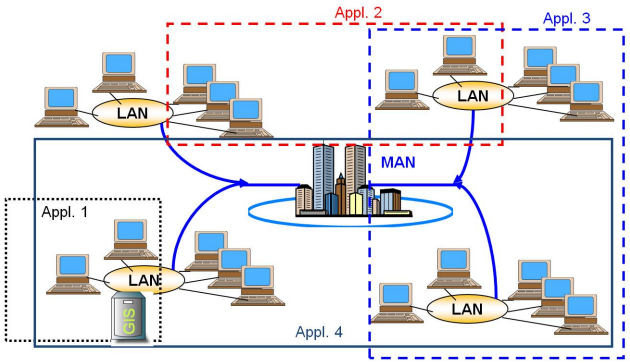
Host Requirements

- Desktop computers
- Workstations
- Servers
  - File / print
  - Web / e-mail
  - DNS
  - Computing
- Specialized equipments
  - Process-specific: high-end display, supercomputer, sensors
  - Location-dependent: e.g. Wind tunnels, ATMs

More Host Requirements

- Maintenance
- Special conditioning
  - Cooling
  - Power
  - Floor loading
- Security
- Disaster Recovery
- Network performance requirements
- Software compatibility
- Fault tolerance

Location Dependence



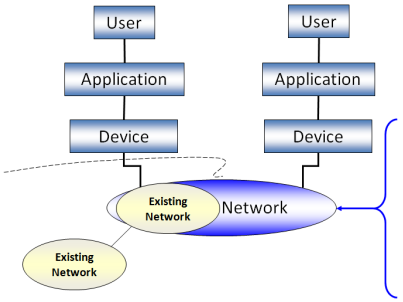
Use of Location Information

- Location of applications, servers, users, devices, ...
- Helps to determine flow characteristics
- Outsourcing / relocating computing resources
  - Outsourcing agents may relocate resources according to their OAM need
  - E.g. Moving resources from Giga-Ethernet LAN to WAN may run down applications
- Location change → Reevaluate system requirements

Network Requirements

- Existing networks
- Network migration
- Functional requirements
- Financial requirements
- Enterprise requirements

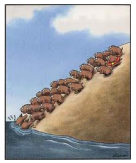
Dealing with Existing Networks



- Scaling
- Network Services
- Interoperability
- Performance
- Location dependencies
- Migration path

Network Migration

- Shall we migrate to another networking technology?
- Avoid the Lemming's tragedy



"The lemming has been known to migrate en-masse across vast bodies of water. Sometimes they underestimate the distance and drown in large numbers."

- "5P": Prior Planning Prevents Poor Performance
  - Requirements analysis (current, future)
  - Network infrastructure analysis and preparation
  - Pre-deployment and pilot testing
  - Deployment and Monitoring

Management Requirements

- Categories for network management:
  - Monitoring for event notification
  - Monitoring for metrics, capacity/reliability/delay engineering
  - Network configuration
  - Troubleshooting
- Requirements
  - Monitoring methods
  - Management protocols
  - Characteristic sets
  - Centralized/Distributed, in-band / out-of-band

Recap

- Requirements analysis – what it is, why important
- Categorization of requirements
- Be aware of business goals and constraints.
- Application requirements
  - Categorization of applications
  - Important application characteristics
- Network requirements
- Functional requirements
- Next Lecture: R.A. Practice