NETWORK

DESIGN & ANALYSIS

02 REQUIREMENT ANALYSIS

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Contents

2.1 Background

- Network analysis process begin with requirement analysis. This consists of
  - identifying,
  - gathering,
  - deriving, and
  - understanding

  system requirements and their characteristics;

2.1 Background

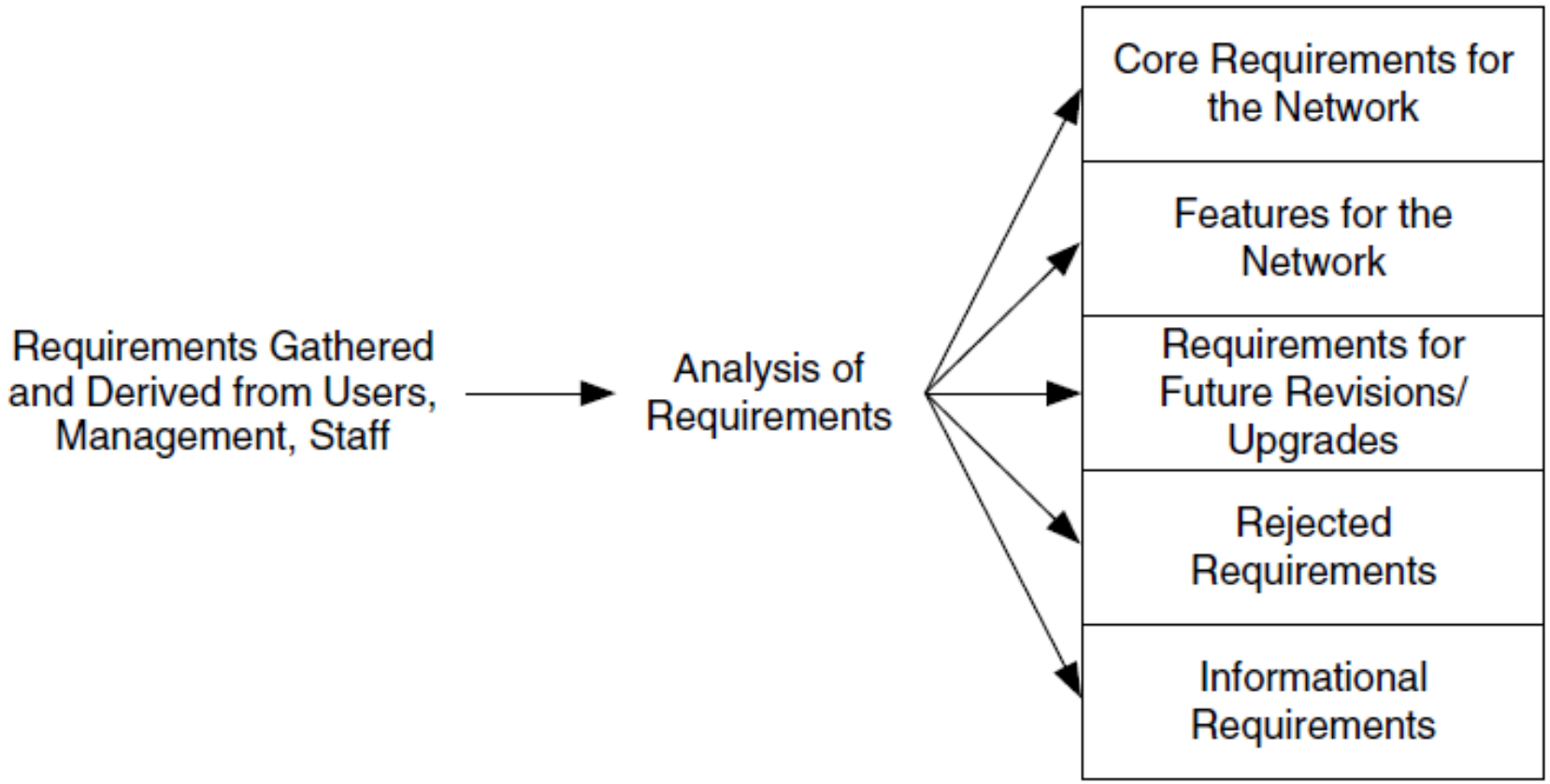
2.1.1 Requirements and Features

- *Requirements* are descriptions of the network functions and performance needed in order for the network to successfully support its users, applications, and devices (and thus the success of the network project)
- Requirements that are determined to be necessary for the success of the network project are termed *core* or *fundamental requirements*.

2.1 Background

- Thus, associated with each core/fundamental requirement is one or more *metrics*.
- Network functions and performance that are desired but not necessary for the success of the network project are called *features*.
- Each network should have, as a minimum, a set of core requirements.
- Requirements are categorized during the requirements analysis process.

2.1 Background



2.1 Background

- One method to categorize requirements is based on the current practice of the Internet Engineering Task Force (IETF).
- RFC 2119 identifies key words and phrases that can be used to describe the relative importance of a requirement.
- These key words and phrases are *Must/Shall/Required, Must Not/Shall Not, Should/Recommended, Should Not/Not Recommended*, and *May/Optional*.

2.1 Background

2.1.2 The Need for Requirement Analysis

- Requirements analysis means putting thought and time into preparing for the architecture and design.
- Failing to do proper requirements analysis may result a flawless network design.

2.1 Background

- Requirements analysis helps the designer to better understand the network being built. This results in several payoffs:
  - More objective, informed choices of network technologies and services
  - The ability to apply technology and topology candidates to networks
  - Networks and elements properly sized to users and applications
  - A better understanding of where and how to apply services in the network

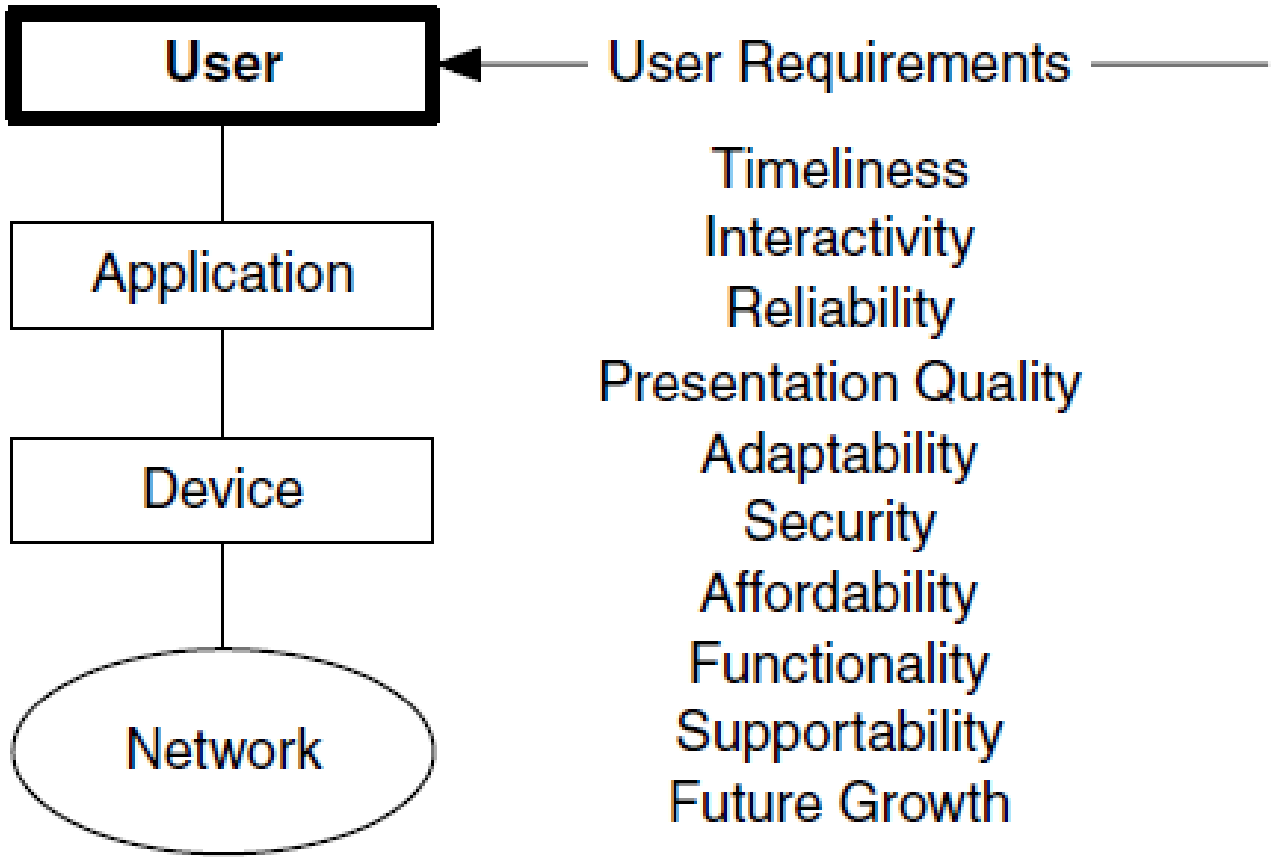
2.1 Background

- Requirements analysis results in a requirements specification and a requirements map.
  - A *requirements specification* is a document that lists and prioritizes the requirements gathered for your architecture and design.
  - The *requirements map* shows the location dependencies between applications and devices, which will be used for flow analysis.

2.2 User Requirements

- *User requirements* comprise the set of requirements that is gathered or derived from user input and represent what is needed by users.
- Typically, when gathering requirements, everyone involved with that network is considered a potential user.

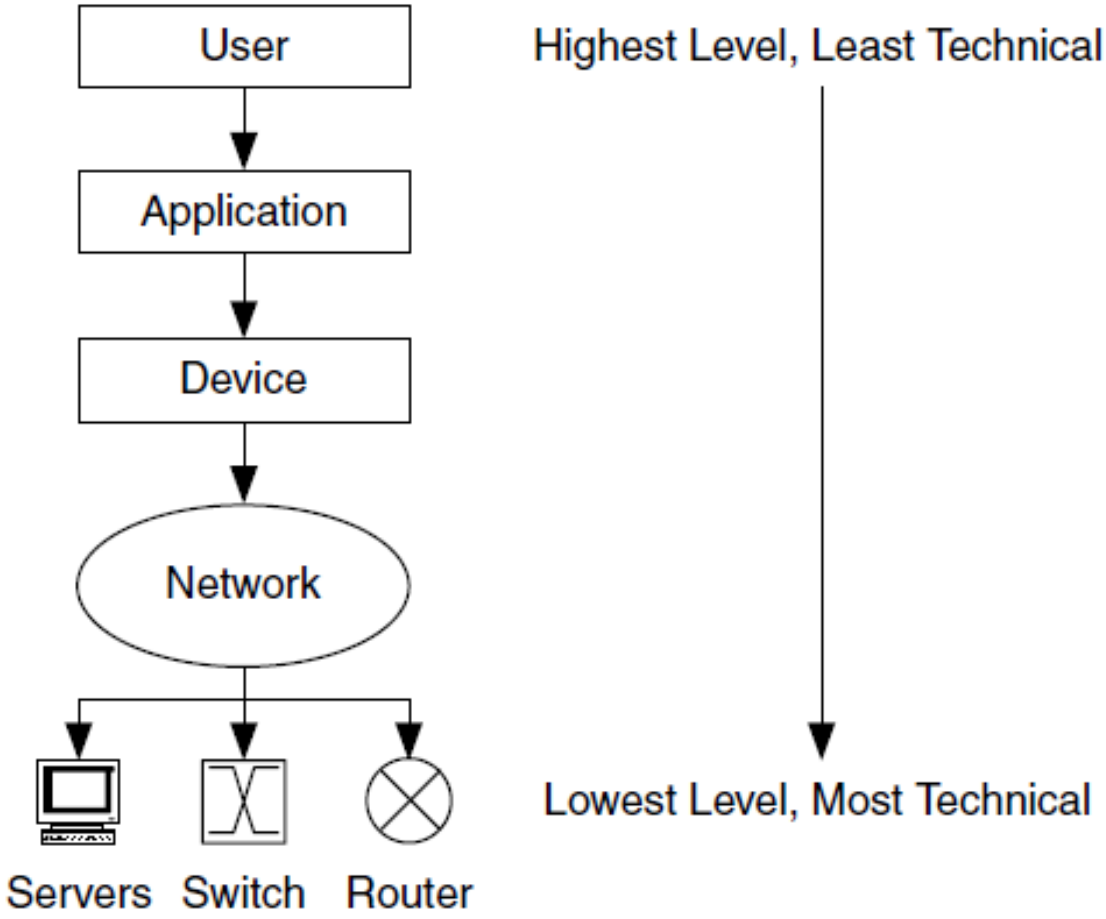
2.2 User Requirements



2.2 User Requirements

- In general, the system should adapt to users and their environments.
- User requirements are the least technical and are also the most subjective.
- Our intent is to use these basic requirements as a start toward developing more objective and technical requirements in the other components.

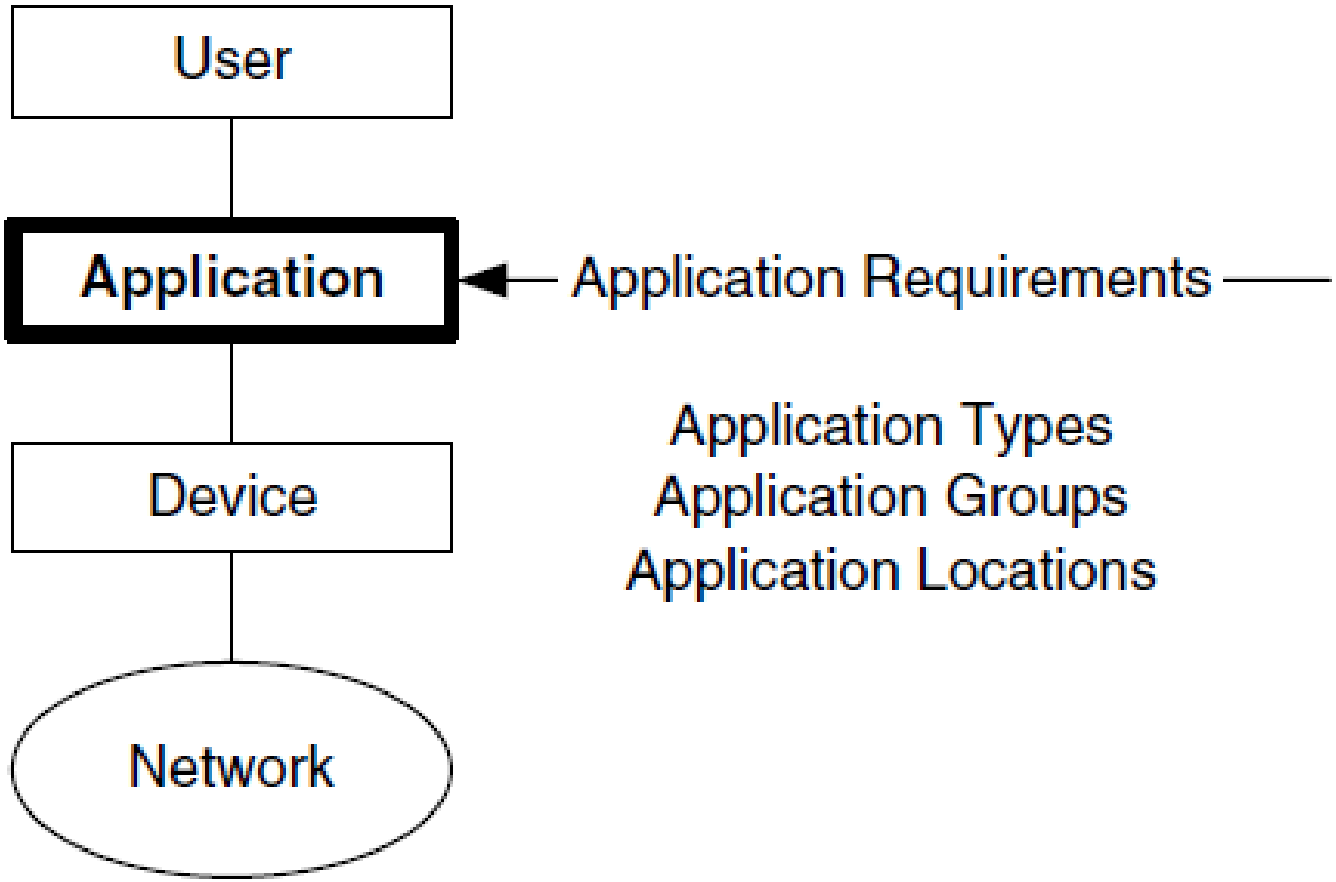
2.2 User Requirements



2.3 Application Requirements

- *Application requirements* are requirements that are determined from application information, experience, or testing, and represent what is needed by applications.
- Application requirements are more technical than user requirements but may still be subjective.

2.3 Application Requirements



2.3 Application Requirements

2.3.1 Application Types

- Based on service and performance requirements, applications were type as:
  - mission-critical → RMA
  - rate-critical → capacity, or
  - real-time/interactive → delay
- These application types are described by their requirements and service metrics.

2.3 Application Requirements

- A loss of any part of RMA in such applications may be serious or disastrous, such as:
  - Loss of revenue or customers
  - Unrecoverable information or situation
  - Loss of sensitive data
  - Loss of life
- In terms of capacity, there are some applications that require a predictable, bounded, or high degree of capacity include voice and non-buffered video.

2.3 Application Requirements

- From an application service perspective, optimizing the total, end-to-end, or round-trip delay is usually the most important things.

2.3 Application Requirements

2.3.2 Applications Groups

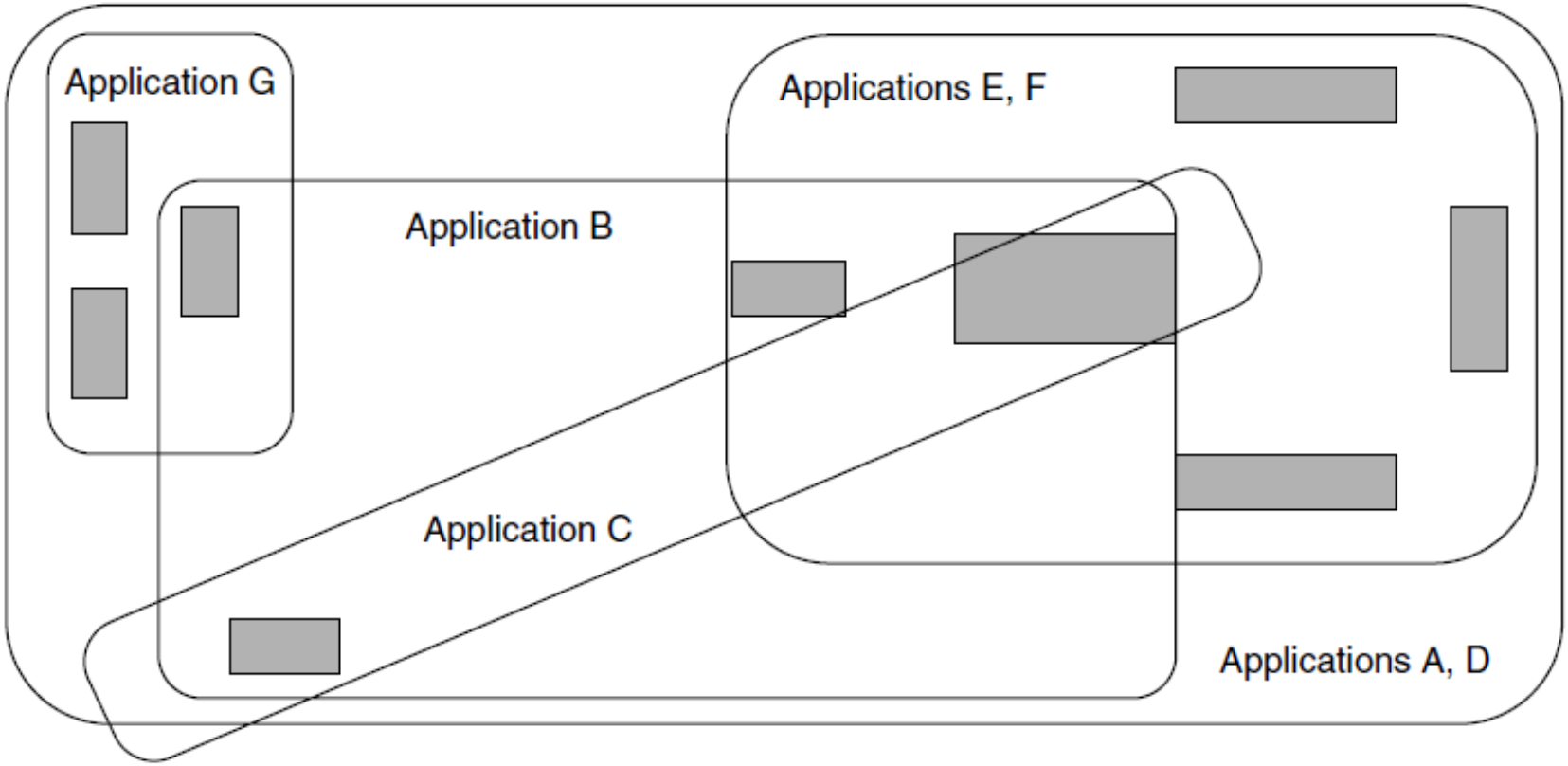
- It is often useful to group applications with similar performance characteristics.
- Application can be identified using the requirements analysis process.
  - Telemetry Applications
  - Visualization Applications
  - Distributed Applications
  - Web, Access and Use Applications
  - Operations, Administration and Maintenance

2.3 Application Requirements

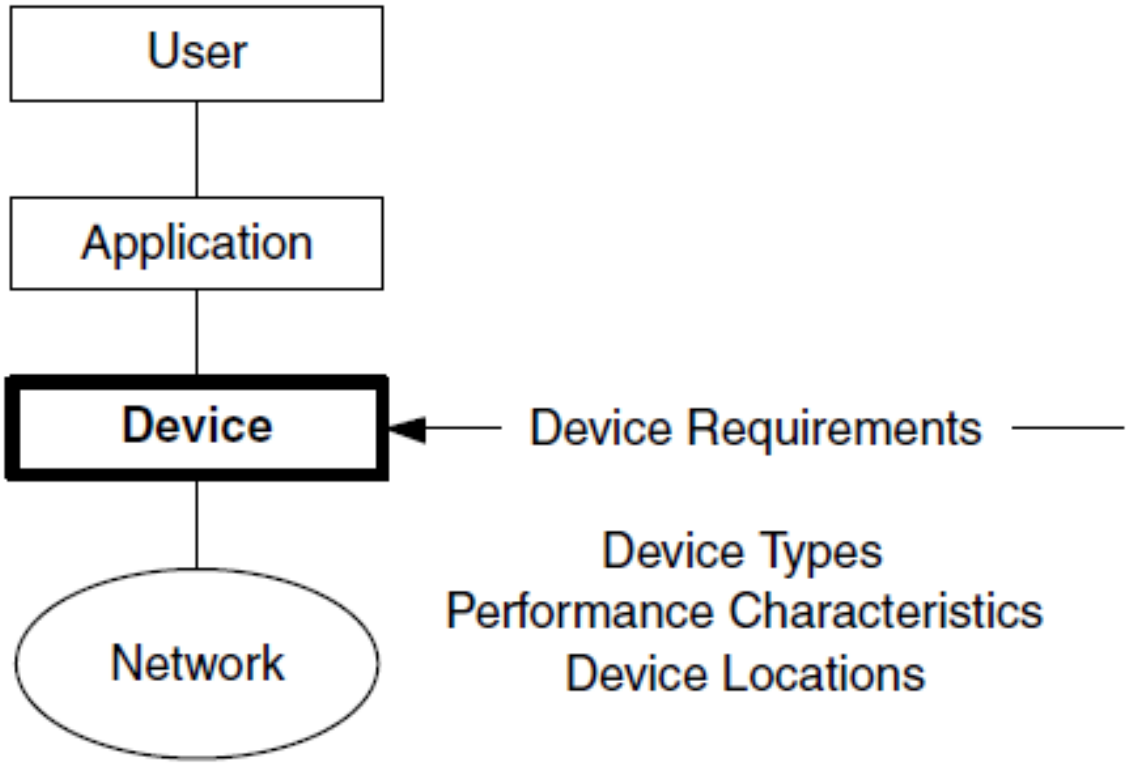
2.3.3 Application Locations

- It is often useful to determine where application applies in an environment.
- This will help in mapping traffic flows during the flow analysis process.
- Application types, their performance requirements, their locations, and application groups form the interface between the application component and the rest of the system.

2.3 Application Requirements



2.4 Device Requirements



2.4 Device Requirements

2.4.1 Device Type

- Devices can be grouped into three categories:
  - generic computing devices, their requirements are important from an end-to-end perspective, as they provide the interface between applications and the network.
  - servers, have an impact on the traffic flows within the system.
  - specialized devices are devices that provide specific functions to their users.

2.4 Device Requirements

2.4.2 Performance Characteristics

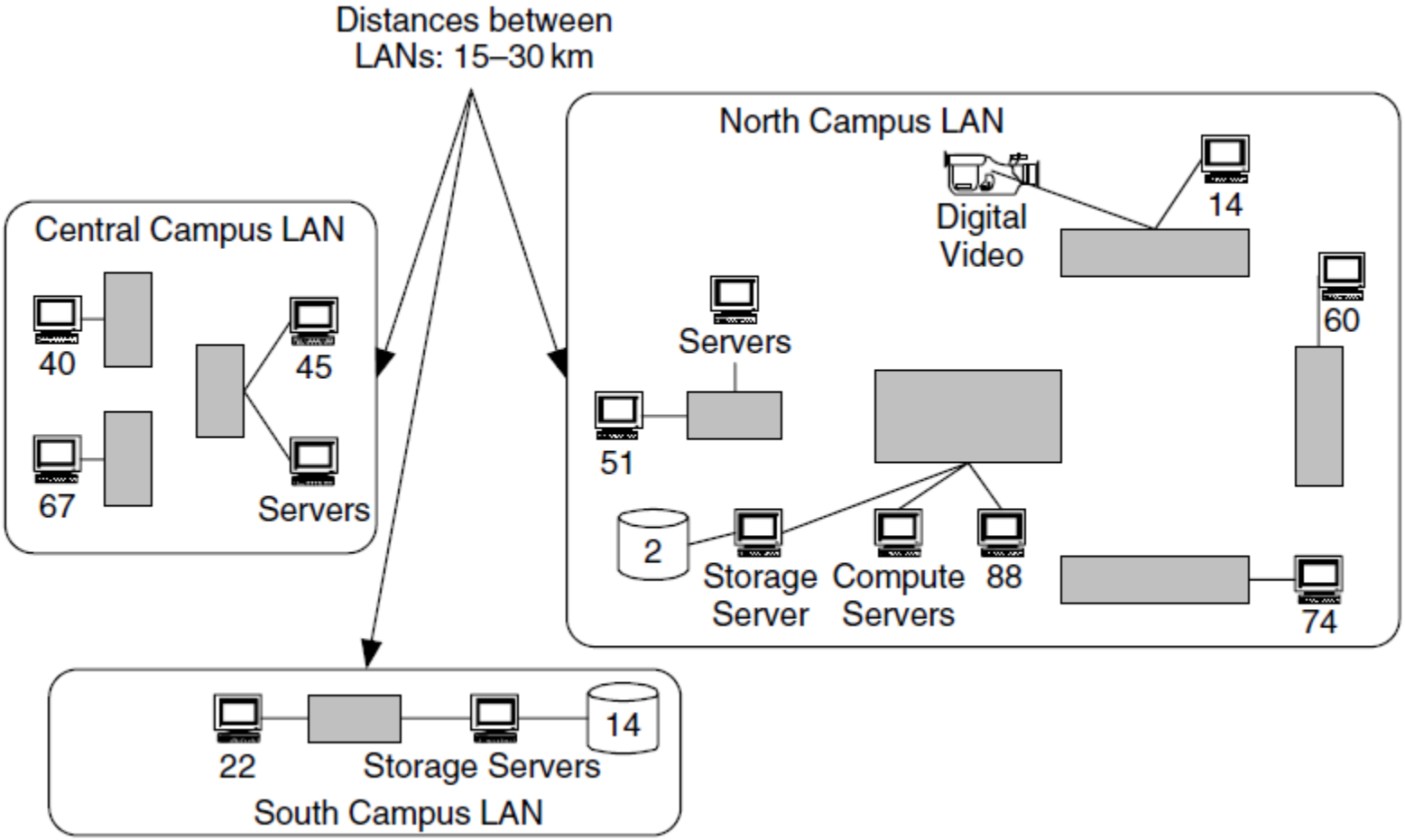
- For many environments, it may be difficult to determine or measure the performance characteristics of its devices.
- Note that device problems frequently are misinterpreted as network problems.
- Understanding at the device component level can help you recognize such bottlenecks early in the analysis process.

2.4 Device Requirements

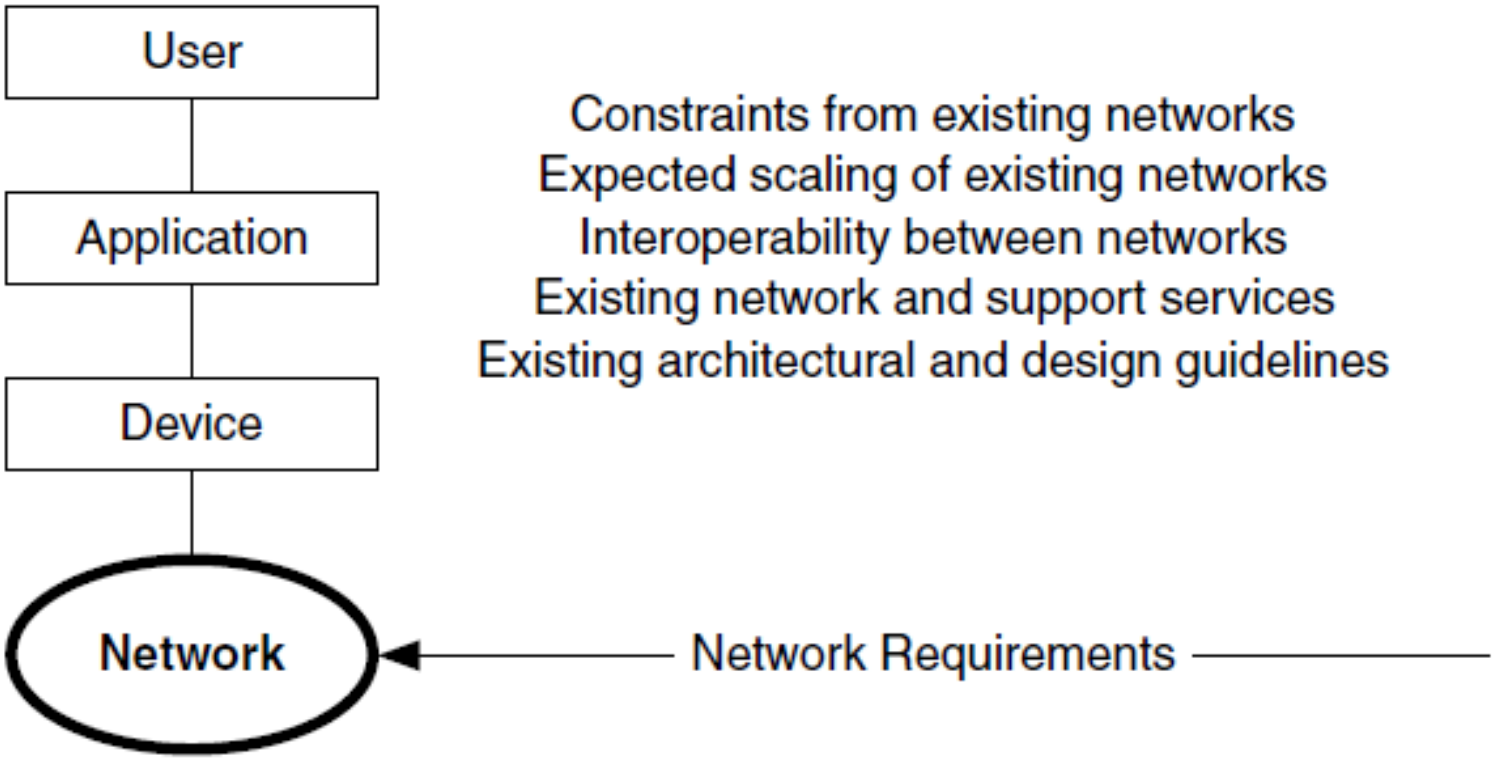
2.4.3 Device Locations

- Location information helps to determine the relationships among components of the system.
- Location information also helps to determine the traffic flow characteristics for the system.
- The interface between the device component and the rest of the system consists of the types of devices, their location dependencies, and their performance characteristics.

2.4 Device Requirements



2.5 Network Requirements



2.5 Network Requirements

2.5.1 Existing & Migration

- Most network architectures/designs today need to incorporate existing networks.
- This includes system upgrades, migrating to a new or different technology or protocol, or upgrading network infrastructure.

2.5 Network Requirements

- Sometimes the network architecture and design must accommodate any dependencies and constraints imposed by the existing network.
- Examples include the following:
  - *Scaling dependencies*. How will new network change the size and scope of the system? or will the change be within the LAN/MAN/WAN boundaries of the existing network?

2.5 Network Requirements

- *Location dependencies*.

- *Performance constraints*. Existing network performance characteristics should be integrated into the performance requirements of the planned network.

- *Network, system, and support service dependencies*. These include network addressing strategies, security, choices and configurations of routing protocols, and naming strategies.

2.5 Network Requirements

- *Interoperability dependencies*. The boundaries between existing and planned networks are points where service information and performance guarantees need to be translated.

- *Network obsolescence*. Whenever possible, it should be noted that parts of the network will need to be transitioned out of the planned network.

2.5 Network Requirements

2.5.2 Network Management & Security

- There are four categories of network management tasks:
  - Monitoring for event notification
  - Monitoring for metrics and planning
  - Network configuration
  - Troubleshooting

2.5 Network Requirements

- List of some potential network management requirements:
  - Monitoring methods
  - Instrumentation methods. These include the network management protocols (SNMPv3, CMIP, RMON), parameter lists (MIBs), monitoring tools, and access methods.
  - Sets of characteristics for monitoring.
  - Centralized versus distributed monitoring.
  - Performance requirements.

2.5 Network Requirements

- it is also need to be determined a security risks by performing a risk analysis for both the existing network and planned network.
- Security requirements and the results of the risk analysis are used to develop a security plan and define security policies for the network.

2.5 Network Requirements

Effect/ Probability	User Devices	Servers	Network Elements	Software	Services	Data
Unauthorized Access	B/A	B/B	C/B	A/B	B/C	A/B
Unauthorized Disclosure	B/C	B/B	C/C	A/B	B/C	A/B
Denial of Service	B/B	B/B	B/B	B/B	B/B	D/D
Theft	A/D	B/D	B/D	A/B	C/C	A/B
Corruption	A/C	B/C	C/C	A/B	D/D	A/B
Viruses	B/B	B/B	B/B	B/B	B/C	D/D
Physical Damage	A/D	B/C	C/C	D/D	D/D	D/D

Effect:

A: Destructive C: Disruptive
B: Disabling D: No Impact

Probability:

A: Certain C: Likely
B: Unlikely D: Impossible