



# CCNA Discovery 4.0 Designing and Supporting Computer Networks



## Gathering Network Requirements— Chapter 2

Cisco | Networking Academy®  
Mind Wide Open™

# Objectives

- Explain what occurs during each of the six phases of the PPDIOO model: Prepare, Plan, Design, Implement, Operate, and Optimize.
- Explain how to respond to a customer RFP or RFQ.
- Describe the roles of each member of the network partner team: Account Manager, Pre-sales Systems Engineer, Network Designer, and Post-sales Field Engineer.
- Use prioritized business goals to determine technical requirements for a network upgrade project.
- Identify how constraints imposed by the customer affect the design of the network.

# The life cycle of a Network

- The world of networking is evolving. Networking is no longer just about connecting computers. Networking has become intelligent and plays a vital role in helping to improve business performance. Businesses are eager to expand their networks. Taking advantage of advances in technology, companies can add new services and increase productivity.

# The life cycle of a Network

- Cisco Lifecycle Services is designed to support evolving networks. Cisco Lifecycle Services is a six-phase approach. Each phase defines the activities required to successfully deploy and operate Cisco technologies. It also details how to optimize performance throughout the lifecycle of a network.
- The six phases of the Cisco Lifecycle Services are:
  - The Prepare Phase
  - The Plan Phase
  - The Design Phase
  - The Implement Phase
  - The Operate Phase
  - The Optimize Phase

# The life cycle of a Network



Prepare Phase

Plan Phase

Design Phase

Implement Phase

Operate Phase

Optimize Phase

Click the buttons to learn more about each phase of the lifecycle.

# The life cycle of a Network

- Case Study: Sports Stadium Network
- The management organization of a stadium is working with the NetworkingCompany to renovate and update the stadium network. Over the years, the stadium network has grown. However, little thought was given to overall business goals and infrastructure design. Some new projects went ahead. But the network administrators did not have a realistic understanding of the bandwidth, traffic prioritization, and other requirements needed to support such an advanced and business-critical network. The stadium management now wants to add new high-tech features, but the existing network is not capable of supporting them.

# The life cycle of a Network

- Phases of the Network Lifecycle
- NetworkingCompany representatives meet with the stadium management to discuss the process they intend to use to design the new network. Although the Design Phase is only one of the phases in the network lifecycle, all of the PPDIOO phases impact the design decisions.
- In the Prepare and Plan phases, the network designer and stadium staff identify the business goals and technical requirements of the stadium organization as well as any design constraints.
- The Implement Phase begins after the approval of the design. It includes the initial integration of the new design into the existing network.
- During the Operate and Optimize phases, the stadium personnel analyze and monitor the network performance.



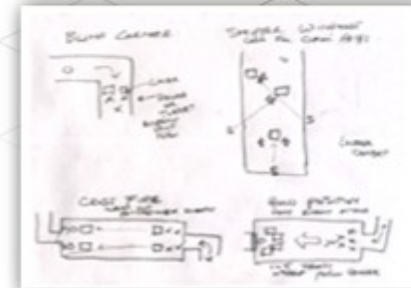
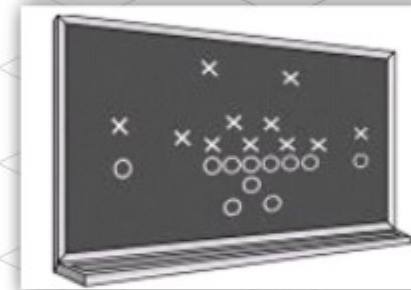
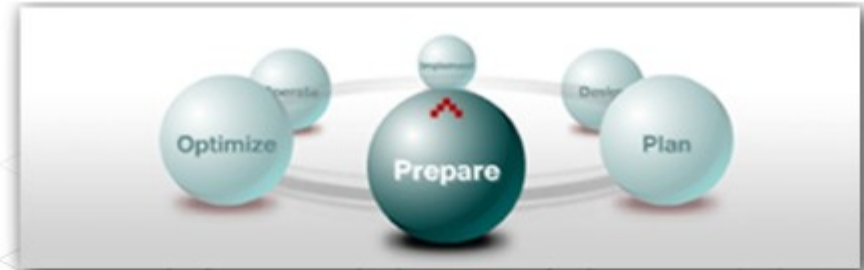
# The network life cycle prepare phase

- The Prepare Phase
- During the Prepare Phase, the stadium management and NetworkingCompany staff define the following business goals:
  - Improve customer experience
  - Reduce costs
  - Add additional services
  - Support company expansion



# The network life cycle prepare phase

These goals provide a foundation for a business case. The business case is used to justify the financial investment required to implement the technology change. The company considers possible business constraints, including budget, personnel, company policies, and schedule limitations.



Click any picture to view the elements of a business case.

# The network life cycle prepare phase

- After the business case is accepted, the NetworkingCompany staff assists in the development of the high-level technology strategy and solution.
- This strategy identifies:
  - Advanced technologies that support the new network solution
  - Current and planned network applications and services, and their priorities based on business goals
  - People, processes, and tools required to support the operations and management of the technology solution

# The network life cycle prepare phase

- The Prepare Phase is typically done before a company issues a Request For Proposal (RFP) or Request For Quotation (RFQ). RFPs and RFQs describe the requirements for the new network. They include information about the process that the company uses to purchase and install networking technologies.

# The network life cycle Plan phase

- The Plan Phase
- During the Plan Phase, the network designer performs a comprehensive site and operations assessment. This assessment evaluates the current network, operations, and network management infrastructure.
- The NetworkingCompany staff identifies all physical, environmental, and electrical modifications. They assess the ability of the current operations and network management infrastructure to support the new technology solution.

# The network life cycle Plan phase

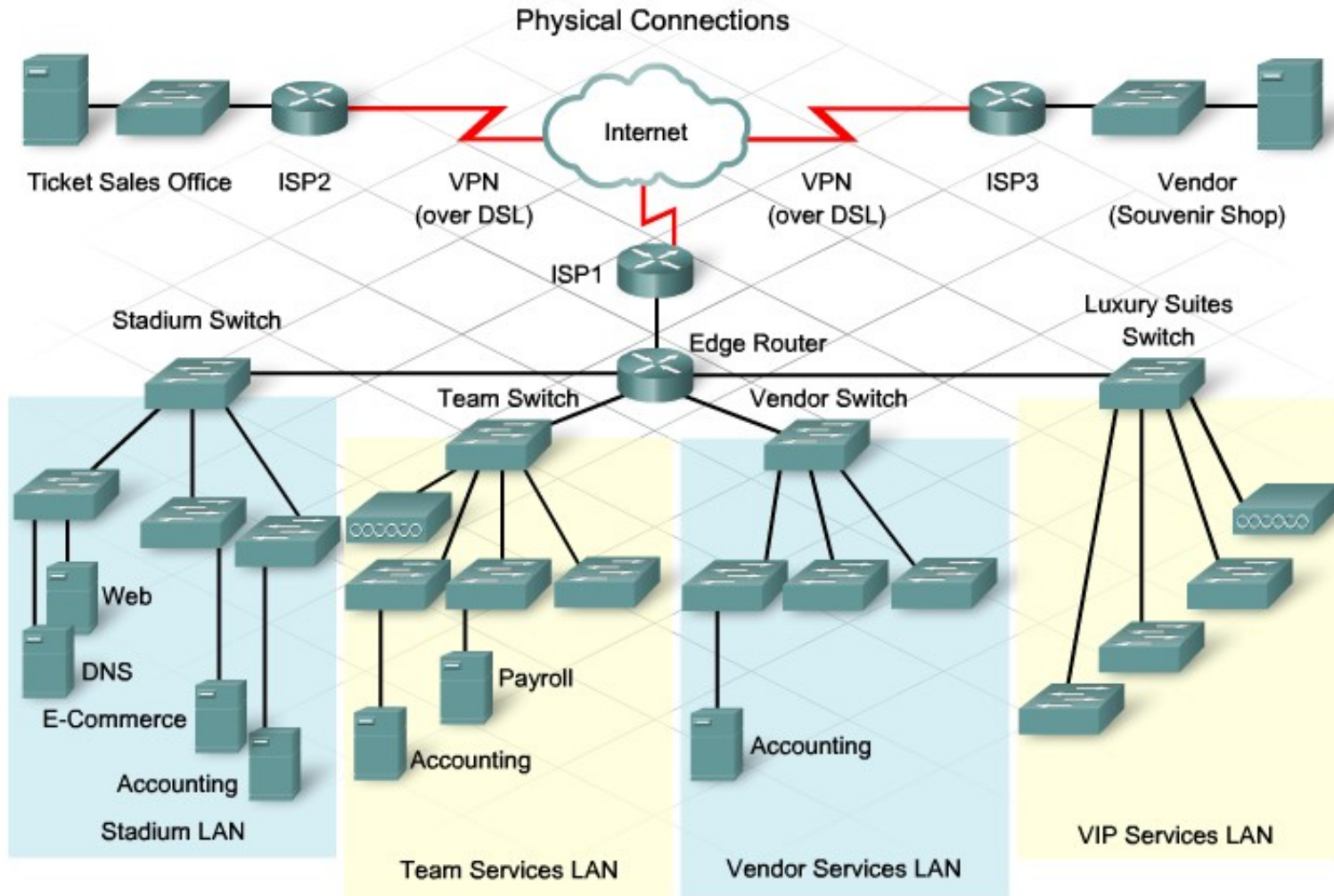
- The Project Plan
- In this phase, the NetworkingCompany staff and stadium management create a plan to help manage the project. The project plan includes:
  - Tasks
  - Timelines and critical milestones
  - Risks and constraints
  - Responsibilities
  - Resources required
  - The plan needs to be within the scope, cost, and resource limits established in the original business goals.

# The network life cycle Design phase

- The Design Phase
- In the Design Phase, the NetworkingCompany staff uses the initial requirements determined during the Plan Phase to direct its work.
- The design requirements document supports the specifications identified in the Prepare and Plan phases for:
  - Availability
  - Scalability
  - Security
  - Manageability
- The design must be flexible enough to allow for changes or additions as new goals or needs emerge



# The network life cycle Design phase





# The network life cycle Design phase

- Planning the Installation
- At the end of the Design Phase, the network designer creates plans that guide the installation and ensure that the end result is what the customer requested. Plans include:
  - Configuring and testing connectivity
  - Implementing the proposed system
  - Demonstrating the functionality of the network
  - Migrating network applications
  - Validating network operation
  - Training end users and support personnel

# The network life cycle Implement phase

- The Implement Phase
- The Implement Phase begins after the NetworkingCompany completes the design and the customer approves it. The network is built according to the approved design specification. The Implement Phase verifies the success or failure of the network design.
- Testing the New Network
- Testing all or part of a new network solution in a controlled environment helps to identify and resolve any implementation issues before the actual installation.

# The network life cycle Implement phase

System-level acceptance testing checks that the new network meets the business goals and design requirements. The results of this test are recorded and become part of the documentation provided to the customer. Any training required for the stadium staff needs to be completed during this phase.



# The network life cycle Operate phase

- The Operate Phase
- The Operate and Optimize phases are ongoing. They represent the day-to-day operations of a network. The stadium staff monitors the network and establishes a network baseline. This monitoring helps the company achieve maximum scalability, availability, security and manageability.
- After the new network is installed, stadium personnel manage the network to ensure that it is performing to the design specifications outlined in the Prepare and Plan phases.

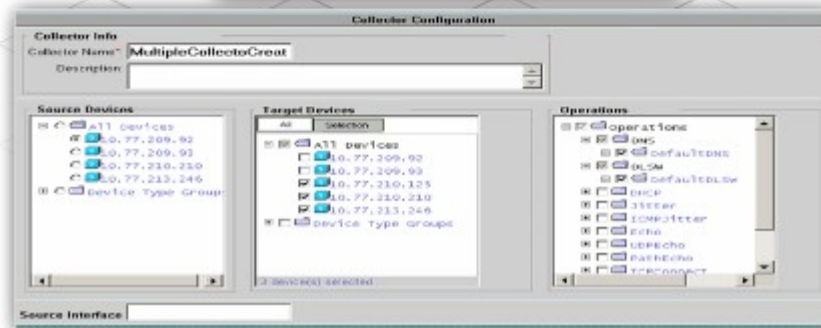
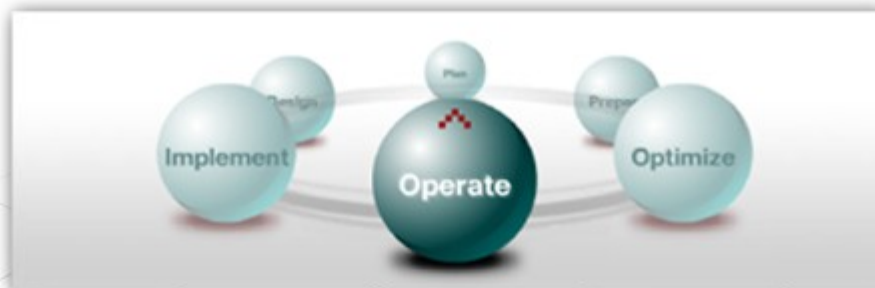
# The network life cycle Optimize phase

## Defining Policies and Procedures

Policies and procedures are needed to handle network issues, such as:

- Security incidents
- Configuration changes
- Equipment purchases

Updating these policies and procedures after an upgrade reduces downtime, operating costs, and change-related issues. If there are no policies and procedures in place, it is important to create them.



# The network life cycle Optimize phase

- The Optimize Phase
- Optimizing the network is a continuous process. Its purpose is to improve network performance and reliability by identifying and resolving potential network problems before they happen. Doing this ensures that the business goals and requirements of the company are maintained. Common network problems that could be discovered in the Optimize Phase include:
  - Feature incompatibilities
  - Insufficient link capacity
  - Device performance problems when multiple features are enabled
  - Scalability of protocols



# The network life cycle Optimize phase



The screenshot shows the Cisco Router and Security Device Manager (SDM) interface. The title bar reads 'Cisco Router and Security Device Manager (SDM): 172.18.7.179'. The main window displays the 'Interface Status' page for a specific interface. A table lists interface details:

Interface	Slot	Description
FastEthernet0/0	0	
FastEthernet0/1	1	

Below the table, there are monitoring options and a 'Packets Output' field showing 21,662. The 'Bandwidth Usage' is shown as 0%. Three line graphs are displayed:

- FastEthernet0/0, Packets Input:** A line graph showing an increasing trend of packets over time.
- FastEthernet0/0, Packets Output:** A line graph showing an increasing trend of packets over time.
- FastEthernet0/0, Bandwidth Usage:** A line graph showing bandwidth usage percentage over time, which remains at 0%.

The interface also includes a 'Show Table' button and a 'Reset' button. The bottom status bar indicates 'Interface Status' and the date '01:56:12 UTC Mon Mar 01 1993'.





# The network lifecycle

	Prepare	Plan	Design	Implement	Operate	Optimize
Identify devices, potential difficulties, and critical tasks.		✓				
Resolve issues discovered during testing.				✓		
Determine network requirements.	✓					
Compare user experience and deployment with the project goals.						✓
Bring network into service.					✓	
Create network plans and prototypes.			✓			

# Respond to a customer request for proposal or quote

- When a business or organization decides to upgrade or replace their existing network, they usually generate a Request for Proposal (RFP) or a Request for Quote (RFQ). In the PPDIOO model, this occurs at the end of the Prepare phase. RFPs and RFQs include specifications that define the format and content of the expected responses from the potential contractors. It is critical for contractors to follow the instructions contained within the document as accurately as possible.

# Respond to a customer request for proposal or quote



Cover Letter

Executive Summary

Proposed Solution

Proposed Cost

Signature Page

Appendices

# Respond to a customer request for proposal or quote

## Cover Letter

Document prepared on the company letterhead that includes:

- All relevant contact information for the company
  - Name of main contact person for the project and other appropriate staff
  - Phone numbers and fax numbers for company and personnel listed
- A brief, concise summary of the proposed project

## Executive Summary

Section that includes:

- Definition of the problem or requirements of the customer
- Recommended solution and its value or benefit to the customer
- Reason why your company is the right one to do the job

# Respond to a customer request for proposal or quote

## Proposed Solution

Section that includes but is not limited to:

- Detailed descriptions of solution
- Project management team and timeline (with explicit tasks and dates if possible)
- Cutover or Turn-over schedule
- On-site or remote support details relating to type of support and time period available
- Warranty information identifying:
  - What items are covered
  - The length of coverage
  - The procedure for repair or replacement
  - Timeline for response
  - Repair commitment for problems identified
- Description of what is considered a major or minor problem
- Emergency installations or responses if a disaster happens
- Responsibilities of company regarding interaction relating to ISP or service level agreement with the

# Respond to a customer request for proposal or quote

## Proposed Cost

Section with budget details that may include but is not limited to:

- Software and application components
- Hardware components and interfaces
- Licensing required
- Fees or permit costs
- Training charges
- Warranty, maintenance, and support costs
- Labor cost per hour or flat fees related to staff working on project
- Travel expenses if applicable
- Telecommunication service provider charges for changes and upgrades
- Specific tools or equipment required to complete the job
- Removal or disposal costs if applicable
- Costs related to equipment rental such as forklifts needed for implementation
- Electrician charges
- Methods of payments including leasing options if appropriate



# Respond to a customer request for proposal or quote

## Signature Page

Section of proposal that is signed by customer representative with authority to accept the project.

## Appendices

Section with additional information supporting proposal that may include:

- Detailed lists of equipment and services
- Diagrams and forms related to equipment and services list
- Background company information which may include items such as:
  - Size of company as it relates to total number of employees and revenues earned
  - Services and products the company provides
  - Reference list of previous customers for projects similar to the current RFP
  - Brief biographies of employees who will be working on the project including their education and certifications
  - The insurance and liability coverage of the company relating to projects
  - Identification of outside vendors, if the company plans to use subcontractors, as part of the service and product structure



# Attend a Pre-bid meeting

- Pre-bid Meeting
- Prior to the deadline for submitting RFP responses, the customer may schedule an informational meeting. This meeting may be referred to as a pre-bid meeting or pre-submittal conference. The purpose of the meeting is to provide:
  - An opportunity to review the project scope with the customer
  - Additional information and documentation identified, but not included in the original RFP
  - Clarification of formatting and project timeline details not included in the original RFP

# Explain the Request for Proposal (RFP)

- The RFP
- Businesses usually send a copy of the RFP to contractors. Occasionally the RFPs may be posted on the business web site. Responses to an RFP help the customer compare services, products, pricing, and support offered by the different contractors.
- Typically an RFP for a network project includes:
  - Business goals for the project
  - Anticipated project scope
  - Information on the existing network and applications
  - Requirements for the new network.
  - Business, technical, or environmental constraints
  - Preliminary schedule with milestones and deliverables
  - Legal contractual terms and conditions

# Explain the Request for Quote (RFQ)

- The RFQ
- Businesses use an RFQ instead of an RFP when the technical specifications of the project are already known. If a business has a skilled networking support staff, the staff can write an RFQ to obtain the costs for the necessary services and equipment. An RFQ is usually much simpler to respond to than an RFP, because the costs associated with an RFQ can easily be obtained or estimated.
- An RFQ can vary in content but will generally have three main parts. Like an RFP, the RFQ response may have formatting requirements. Proposal deadlines may be strictly enforced.

# Explain the Request for Quote (RFQ)



Organizational Overview

Required Deliverables

Assumptions/Agreements

# Explain the Request for Quote (RFQ)

## Organizational Overview

This section of an RFQ contains background information on the company issuing the RFQ. It provides some insight into what type of business the RFQ is for.

## Required Deliverables ✕

This section of an RFQ describes what the end product of the project must be. For example, the company issuing the RFQ is looking for a company to install an 1841 router or similar device. The deliverables section would include the device type and the scripting that may be required (VLANs, etc.).

## Assumptions/Agreements ✕

This section describes the terms of the project, such as project budget, submission date, the types of support the company will provide to the contractor, the process used to approve services and materials, etc. By submitting a response to an RFQ, the contractor or designer agrees to the terms in this section.

# Explain the role of the Account Manager

- When the NetworkingCompany receives the RFP from the StadiumCompany, the task of responding to it is assigned to an account manager. NetworkingCompany account managers are responsible for maintaining a continuing relationship between the company and its customers. This relationship begins when an account manager first contacts a potential customer. It continues throughout all phases of the PPDIOO network lifecycle. Business customers rely on the knowledge and expertise of their account manager to help them determine network requirements. Gaining and keeping a customer's trust is critical to an account manager's success.

# Explain the role of the Account Manager

- **Account Manager Responsibilities**
- While specific duties may vary from position to position, most account managers are responsible for:
  - Meeting their assigned sales and revenue goals
  - Communicating information about new products or technologies to customers and potential customers.
  - Directing local sales, service and support teams
  - Planning and budgeting for sales and support projects.
  - Responding to customer requests for proposals, demonstrations, quotations and information.
  - Negotiating and maintaining sales or service contracts



# Explain the role of pre-sales Systems Engineer

- Pre-Sales Systems Engineer
- Pre-sales systems engineers (sometimes called pre-sale technical support engineer) help the account manager and the customer to determine the need for upgrades or additions to the customer's network. Account managers rely on the technical expertise of the pre-sales systems engineers to ensure that any new equipment and services are appropriate for the customer's network needs. In the Plan and Design phases of the PPDIOO lifecycle, pre-sales systems engineers provide assistance to determine the technical requirements and feasibility of proposed network changes.

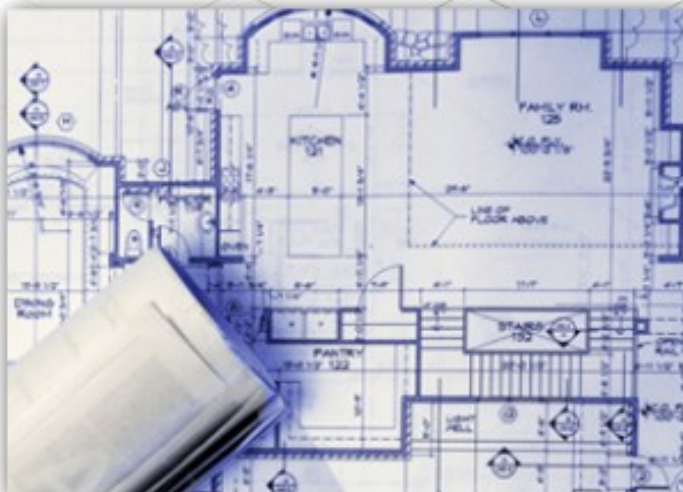
# Explain the role of pre-sales Systems Engineer

- These engineers, as well as network technicians who work with them, are responsible for:
  - Evaluating the customer's current network
  - Determining if a network upgrade or addition can meet the technical requirements
  - Ensuring that the proposed changes can be integrated into the existing customer network
  - Testing and evaluating proposed solutions
- The pre-sales systems engineer assists the network designer in identifying problems with the existing network or possible problems that changes to the network may cause.

# Explain the role of the Network Designer

- A network designer needs a thorough understanding of the capabilities of all types of networking technologies and equipment. These skills enable the designer to provide customers with a network design that meets the customer requirements for scalability, availability, security and manageability. The designer is involved in the Plan and Design phases of the PPDIOO network lifecycle.

# Explain the role of the Network Designer



# Explain the role of the Network Designer

- A designer is responsible for:
  - Analyzing customer goals and constraints in order to determine the technical requirements for the new design
  - Evaluating the current installed network
  - Selecting the technologies and equipment capabilities to meet the defined network requirements
  - Diagramming the placement and interconnection of various network devices and services
  - Designing and supervising proof-of-concept testing
  - Assisting the account manager in preparing presentations to the customer

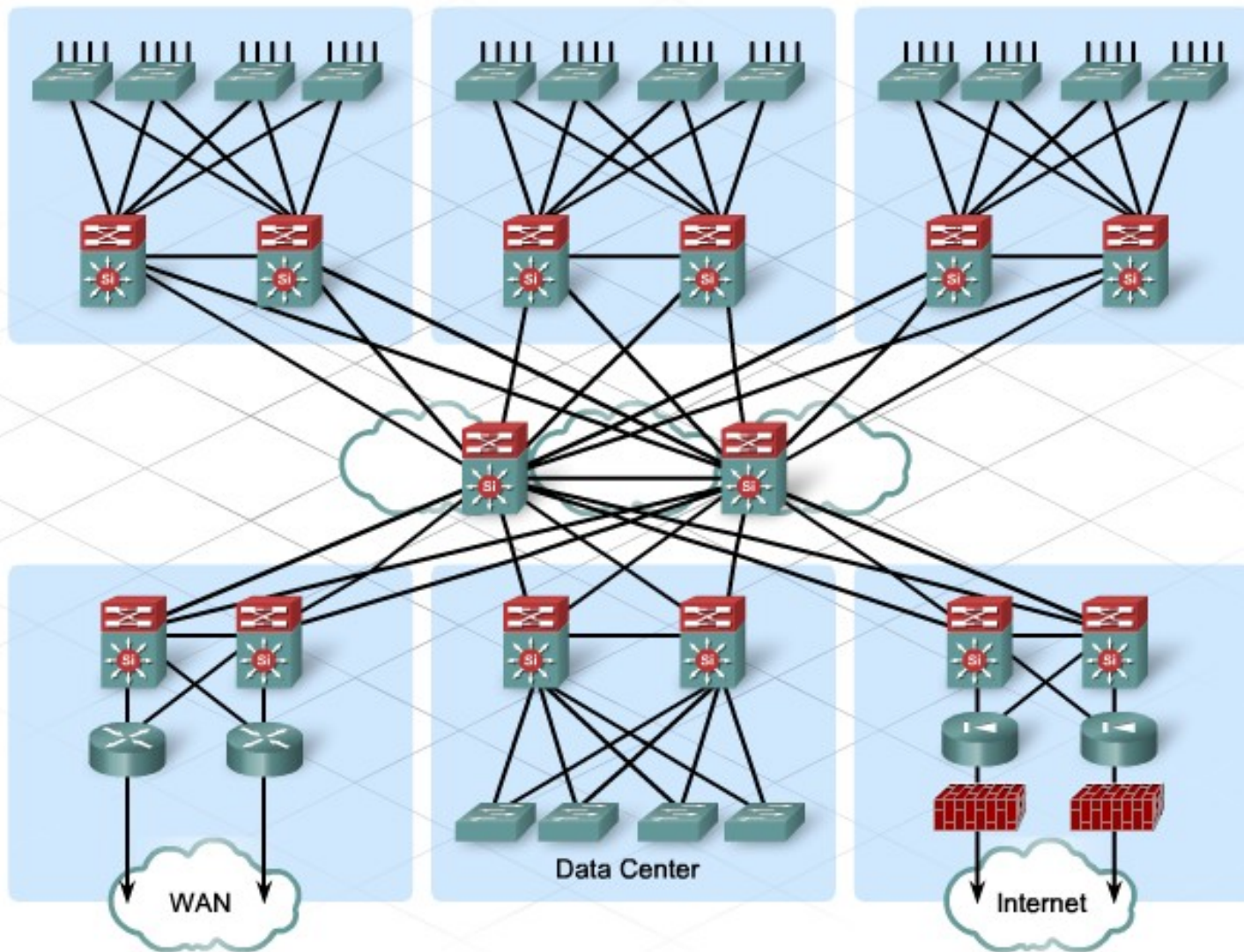


# Explain the role of the Network Designer

- At the NetworkingCompany, the design staff is made up of highly skilled network professionals. The network designer must stay up to date about technologies, as well as new design recommended practices.
- The designer is required to obtain network design certifications, in addition to technical networking professional certifications.
- The designer assigned to the stadium upgrade is a Cisco Certified Design Professional (CCDP).



# Explain the role of the Network Designer



# Explain the roles of post-sales Field Engineer

- During the Implementation, Operation, and Optimize phases of the PPDIOO network lifecycle, the post-sales field engineer (sometimes called the post-sales technical support engineer) takes over the technical support responsibility from the pre-sales staff. It is usually a post-sales field engineer who is responsible for the smooth installation of new network equipment. Post-sales field engineers work with the customers to ensure that the network upgrade functions as designed.

# Explain the roles of post-sales Field Engineer

- **Responsibilities of the Post-Sales Field Engineer include:**
- Provide installation assistance and acceptance testing.
- Support and organize troubleshooting of components or systems.
- Resolve technical problems the customer may encounter.
- Provide customer training and assistance with managing and configuring devices.
- The post-sales field engineer helps develop recommended changes to the network design throughout the PPDIOO life cycle.

# Explain the roles of post-sales Field Engineer





# Working with the Customer

- The Importance of Interpersonal Skills
- Good interpersonal skills are critical when interacting with customers. A calm and courteous manner instills confidence in customers. The customer believes that the NetworkingCompany designer and staff can perform the necessary tasks.
- The following skills are essential when working with clients:
  - Listening and accurately summarizing information
  - Corresponding with clients in a style, format, and level of detail appropriate for the intended audience
  - Presenting well-organized technical material in a logical fashion

# Working with the Customer

The ability to develop a good rapport with a client is crucial. Establishing a trusted business relationship eliminates many potential problems and contributes enormously to the success of the project for both companies.

Courteous





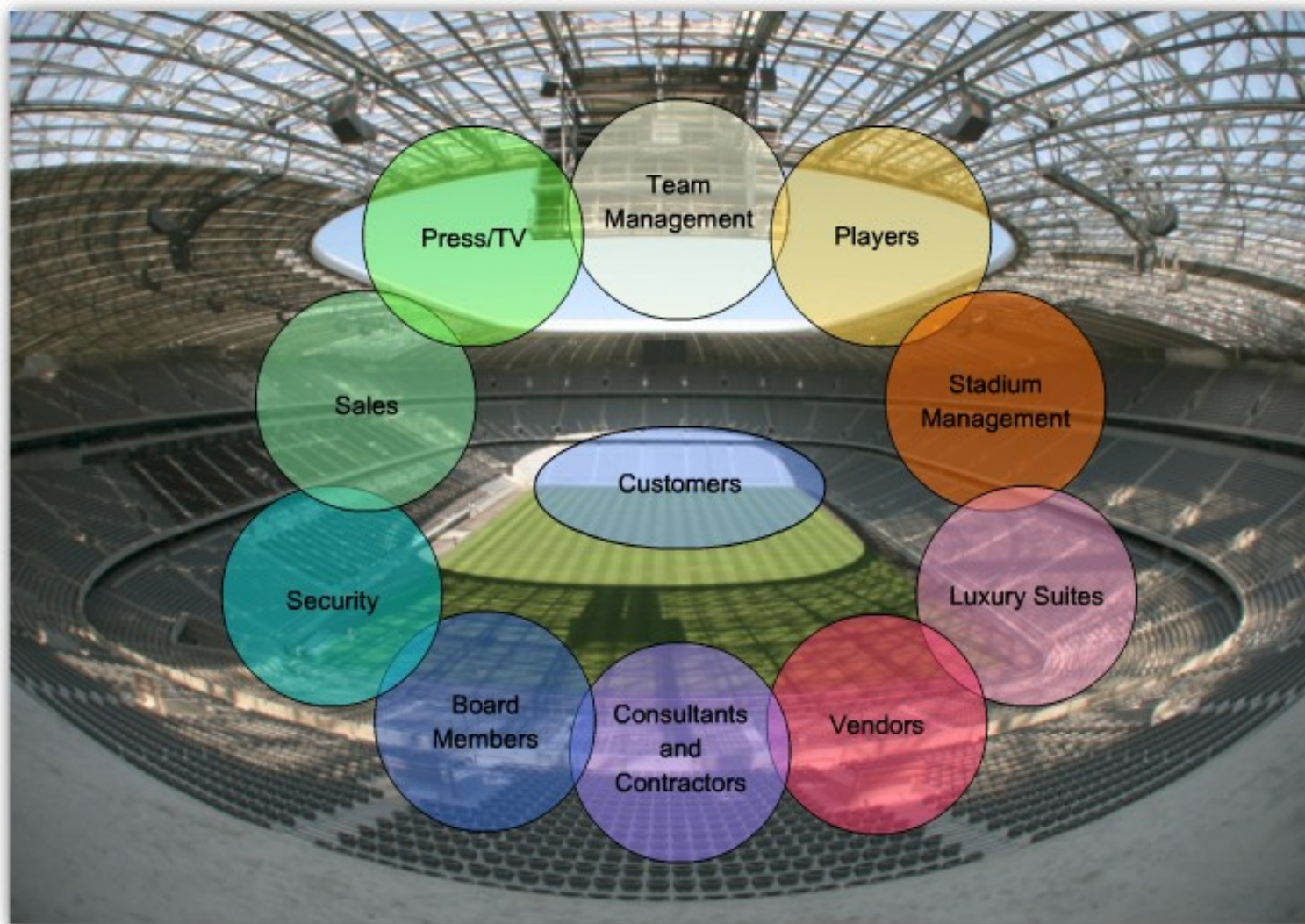
# Defining the Customer

- To create a comprehensive plan, the network designer needs to understand how the network users interact with the network resources and services. The designer gathers information about all internal and external access to the existing network infrastructure. Without full knowledge of who has access to the network, the designer may overlook some user requirements. As a result, the designer may present a design that is incomplete. Failure to submit an adequate design generates delays and increased costs.

# Defining the Customer

- The stadium management identifies the following potential end users:
  - Branch and field office staff
  - Remote workers
  - Sales and support personnel working off site
  - Vendors, suppliers, and partners
  - Board members
  - Consultants and contractors
  - Customers

# Defining the Customer



# Identifying Business goals and priorities

- The goal of every business is to be successful. Before beginning any network project, business managers analyze the feasibility of the project based on how it contributes to business success. They must consider:
  - Profitability - Can the project reduce costs or help the business avoid costs in the future?
  - Business growth and market share - Can the project help the business grow more efficiently or create competitive advantages?
  - Customer satisfaction - Can the project improve the customer experience and increase customer loyalty?

# Identifying Business goals and priorities

- **Prioritizing Goals**
- In consultation with the stadium management, the designer prioritizes the business goals. The priorities are based on which goals present the best opportunities to contribute to the success of the business. For example, the relative importance of each goal can be rated as a percentage of the overall total of 100.
- After the NetworkingCompany obtains the list of the prioritized business goals, the Plan Phase begins.



# Identifying Business goals and priorities

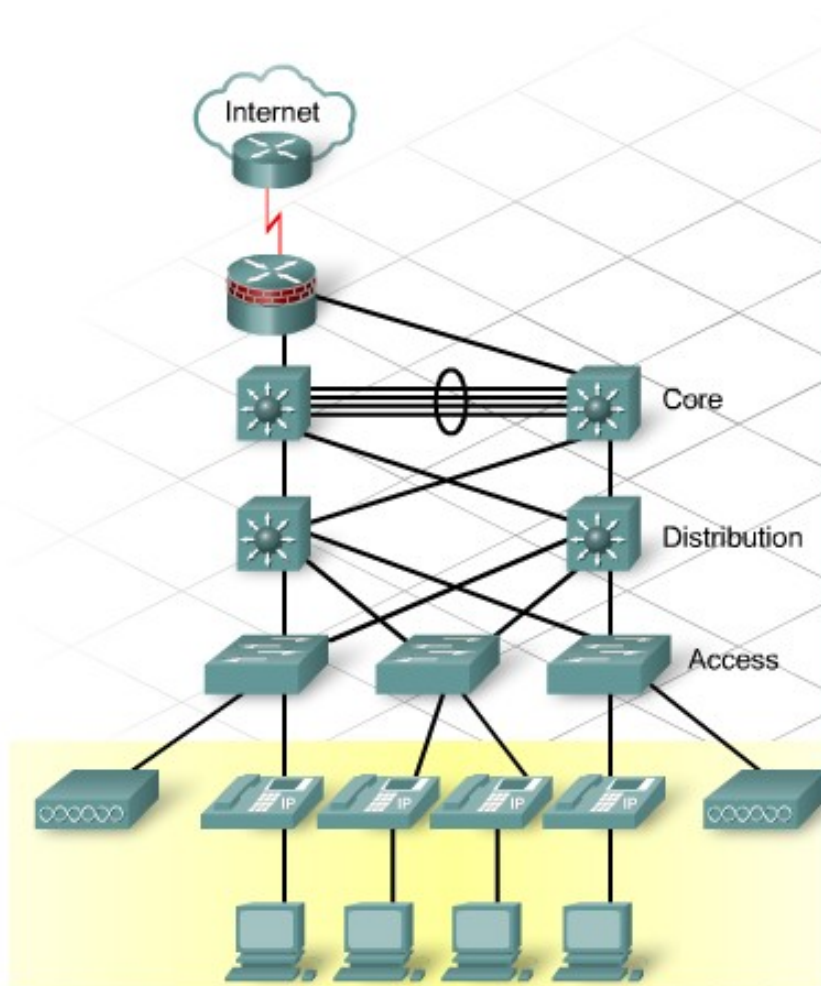




# Defining Technical Requirements

- Determining the technical requirements enables the designer to establish the scope of the project. These requirements drive the selection of technologies, equipment, and management software.
- Technical requirements include, but are not limited to:
  - Improving network scalability
  - Increasing network availability and performance
  - Enhancing network security
  - Simplifying network management and support

# Defining Technical Requirements



A business goal that must be met by the new design:

Reduce costs by consolidating the separate voice, video and data networks.

Changes in network functionality that are necessary for the business to meet the goal:

- Improve scalability
- Provide high availability and Quality of Service
- Increase security
- Simplify management

Technical requirements to implement each change:

- Create hierarchical network for scalability and reliability.
- Mark and classify traffic to provide QoS.
- Create redundant paths to ensure availability.
- Add stateful firewalls and intrusion prevention.
- Filter traffic at appropriate locations.
- Create a management network and install management software.

# Defining Technical Requirements

- The network designer works with the customer to create a prioritized list of technical requirements. This list provides direction for the following decisions:
- Selecting network equipment
- Choosing protocols
- Designing network services
- This project list defines the project scope.
- When discussing technical requirements with the customer, the designer considers the technical level of the audience.

# Defining Technical Requirements



# Identifying Constraints

- Every company wants to have the most advanced and efficient network available. In reality, various business constraints affect network design. Common constraints include:
  - Budget - Limited resources may require some compromises in design due to the costs of equipment, software, or other components.
  - Company policies - The design must take into account the customer's existing policies regarding protocols, standards, vendors, and applications.
  - Scheduling - The project time frame should be aligned with the customer schedules.
  - Personnel - The availability of trained personnel at the implementation and operation phases might be a design consideration.

# Using Top Down or Bottom Up Design Approach

- There are two common approaches for network design: top-down and bottom-up.
- **Top-Down**
- The top-down approach adapts the network infrastructure to the needs of the organization. Top-down design clarifies the design goals and initiates the design from the perspective of the required applications and network solutions, such as IP telephony, content networking, and video conferencing. The PPDIOO methodology uses the top-down approach.



# Using Top Down or Bottom Up Design Approach

- **Bottom-Up**

- A common approach - but one that is not recommended - is the bottom-up design. In this approach, the network designer selects network devices and technologies based on previous experience rather than from an understanding of the organization. Because this approach does not include information on the business goals, the proposed network design may not be able to support the required applications.

# Using Top Down or Bottom Up Design Approach

## Comparison of Two Design Approaches

	Top-Down Approach	Bottom-Up Approach
Benefits	<ul style="list-style-type: none"> <li>• Incorporates organizational requirements</li> <li>• Gives the big picture to organization and designer</li> </ul>	<ul style="list-style-type: none"> <li>• Allows a quick response to a design request</li> <li>• Facilitates design based on previous experience</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>• Requires more time up front before creating network design</li> <li>• Is not an approach that is familiar to many network designers</li> </ul>	<ul style="list-style-type: none"> <li>• Implements solution with little or no notion of actual organizational requirements</li> <li>• May result in inappropriate network design</li> </ul>

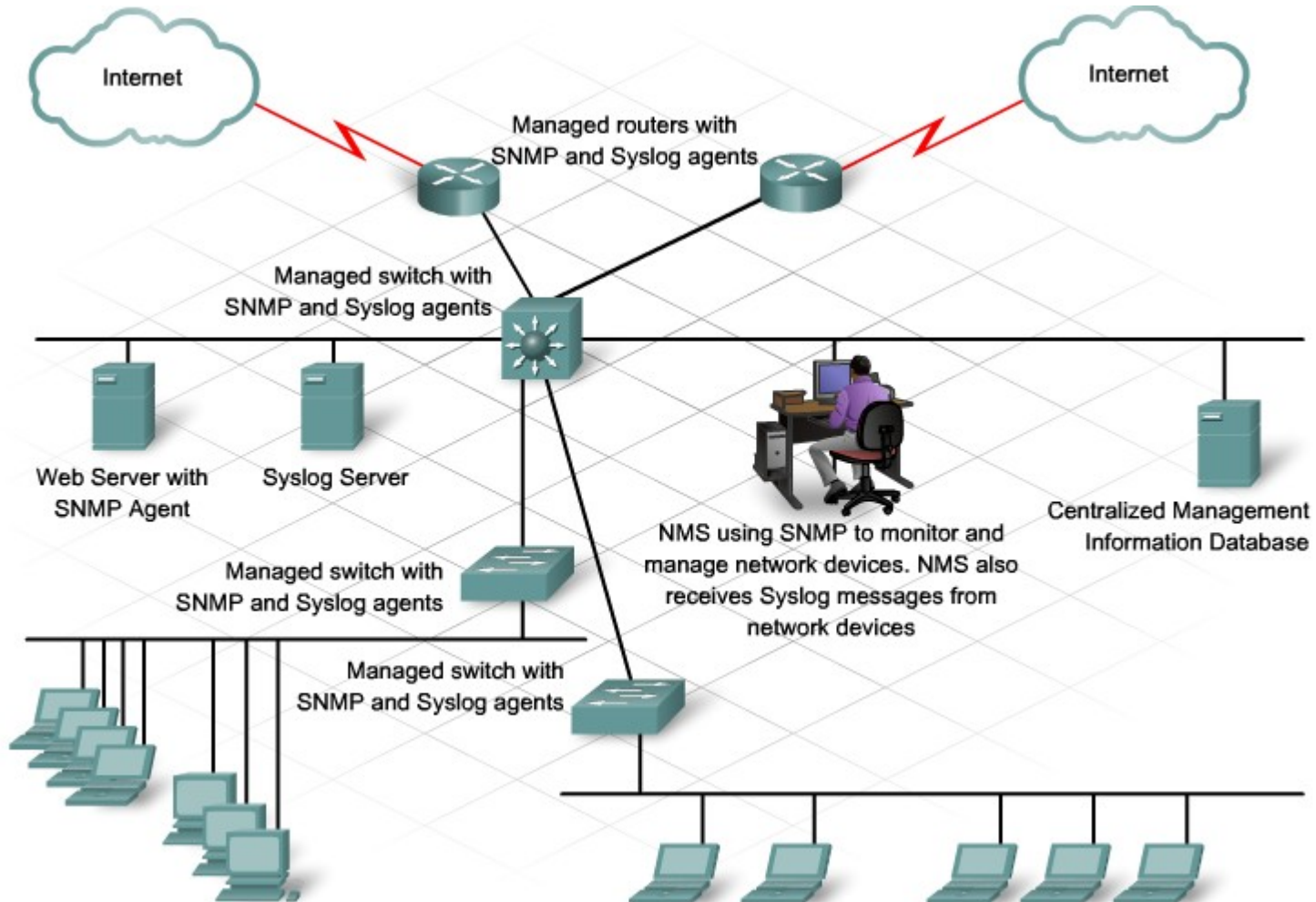
# Monitoring Network Operations

- After implementation, it is important to ensure that the network design specifications are met. The stadium network personnel monitor and manage the performance of the network. Network management includes the following functions:
  - Managing configuration changes to the network
  - Identifying network faults
  - Monitoring performance levels
  - Providing security and accounting management for individual and group usage of the network

# Monitoring Network Operations

- A typical network management architecture consists of the following elements:
- Network Management System (NMS) - A system that uses an application to monitor and control managed network devices, such as CiscoWorks
- Network Management Protocol - A protocol that facilitates the exchange of information between network devices and the NMS, such as the Simple Network Management Protocol version 3 (SNMPv3)
- Managed Devices - Network devices that are managed by an NMS, such as a router or switch
- Management Agents - Software on managed devices that collect and store network management information
- Management Information - Data collected by the NMS

# Monitoring Network Operations



# Monitoring Network Operations

- CiscoWorks LAN Management Solution (LMS) is a suite of powerful management tools that simplify the configuration, administration, monitoring, and troubleshooting of Cisco networks. It integrates these capabilities into a best-in-class solution that provides the following benefits:
  - Improves the accuracy and efficiency of the network operations staff
  - Increases the overall availability of the network by simplifying configuration and quickly identifying and fixing network problems
  - Maximizes network security through integration with access control services and audit of network-level changes



# Tools for Network Monitoring

- SNMP is the most common network management protocol to use. The protocol enables network administrators to gather data about the network and corresponding devices. SNMP management system software is available in tools such as CiscoWorks. SNMP management agent software is often embedded in operating systems on servers, routers, and switches.
- SNMP has four main components:
  - Management station
  - Management agents
  - Management Information Base (MIB)
  - Network management protocol

# Tools for Network Monitoring

- As part of a network management system, SNMP tools can respond to network errors or failures in several ways. Generally, when a network fault occurs, or when predefined thresholds are met, the SNMP tools can react by:
  - Sending an alert on the network
  - Sending a message to a pager
  - Sending an email to an administrator
- Because stadium management may want to offer service level agreements to their vendors, they need to purchase network management software.

# Tools for Network Monitoring

