Planning for Information Network

Lecture 2:

The network design methodology

Contents

- The PPDIOO network lifecycle.
- Benefits of the lifecycle approach to network design.
- Design methodology.
- The Top-Down approach to network design.

The PPDIOO network lifecycle

- PPDIO is methodology that derived from the Cisco **P**repare, **P**lan, **D**esign, **I**mplement, **O**perate, and **O**ptimize (PPDIOO) methodology.

- It reflects a network's lifecycle.

The PPDIOO Phases

Prepare Phase:

The Prepare phase involves establishing the organizational (business) requirements, developing a network strategy, and proposing a high-level conceptual architecture, identifying technologies that can best support the architecture.

The PPDIOO Phases

Plan Phase:

This phase involves identifying the network requirements, which are based on the goals for the network, where the network will be installed, who will require which network services.

The Plan phase also involves assessing the sites where the network will be installed and any existing networks, and performing a gap analysis to determine if the existing system infrastructure, sites, and operational environment can support the proposed system.

A project plan helps manage the tasks, responsibilities, critical milestones, and resources required to implement the changes to the network.

The output of this phase is a set of network requirements.

The PPDIOO Phases

Design Phase:

This phase involves designing the network according to the initial requirements determined in the Plan phase, incorporating any additional data gathered during network analysis and through discussion with managers and network users.

The network design specification that is produced is a comprehensive detailed design that meets current business and technical requirements and incorporates specifications to support availability, reliability, security, scalability, and performance.

This design specification provides the basis for the implementation activities.

The PPDIOO Phases

Implementation Phase:

Implementation and verification begins after the design has been approved.

The network and any additional components are built according to the design specifications, with the goal of integrating devices without disrupting the existing network or creating points of vulnerability.

The PPDIOO Phases

Operate Phase:

Operation is the final test of the design's appropriateness.

The Operate phase involves maintaining network health through day-to-day operations.

The fault detection and correction, and performance monitoring that occur in daily operations provide initial data for the network lifecycle's Optimize phase.

The PPDIOO Phases

Optimize Phase:

The Optimize phase is based on proactive network management, the goal of which is to identify and resolve issues before real problems arise and the organization is affected.

Reactive fault detection and correction (troubleshooting) are necessary when proactive management cannot predict the failures.

Optimize phase might lead to network redesign if too many network problems or errors arise, if performance does not meet expectations, or if new applications are identified to support organizational and technical requirements.

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Network lifecycle Benefits

****Lowering the total cost of network ownership**:

- Identifying and validating technology requirements.
- Planning for infrastructure changes and resource requirements.
- Accelerating successful implementation.
- Improving the efficiency of the network and of the staff supporting it.
- Reducing operating expenses by improving the efficiency of operation processes and tools.

Network lifecycle Benefits

**** Increasing network availability:**

- Specifying the correct set of hardware and software releases and keeping them operational and current.
- Staging and testing the proposed system before deployment.
- Improving staff skills.
- Proactively monitoring the system and assessing availability trends and alerts.
- Proactively identifying security breaches and defining remediation plans.

Network lifecycle Benefits

**** Improving business agility**:

- Establishing business requirements and technology strategies.
- Integrating technical requirements and business goals into a detailed design and demonstrating that the network is functioning as specified.
- Expertly installing, configuring, and integrating system components.
- Continually enhancing performance.

Network lifecycle Benefits

****Accelerating access to applications and services**:

- Assessing and improving operational preparedness to support current and planned network technologies and services.
- Improving service-delivery efficiency and effectiveness by increasing availability, resource capacity, and performance.
- Improving the availability, reliability, and stability of the network and the applications running on it.
- Managing and resolving problems affecting the system and keeping software applications current.

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Network Design Methodology

- Network design methodology is a documented, systematic way of designing an internetwork.

Network Design Methodology - Advantages

Following a design methodology can have many **advantages:**

- It ensures that no step is missed when the process is followed.
- It provides a framework for the design process deliverables.
- It encourages consistency in the creative process, enabling network designers to set appropriate deadlines and maintain customer and manager satisfaction.
- It allows customers and managers to validate that the designers know about how to meet their requirements.

Network Design Methodology - Steps

Network design methodology has **three steps**:

Step 1 : Identify customer requirements:

This step, is typically completed during the PPDIOO Prepare phase, key decision makers identify the initial requirements.

Based on these requirements, a high-level conceptual architecture is proposed.

Network Design Methodology - Steps

Step 2 : Characterize the existing network and sites:

The Plan phase involves characterizing sites and assessing any existing networks, and performing a gap analysis to determine whether the existing system infrastructure, sites, and operational environment can support the proposed system.

Characterization of the existing network and sites includes site and network audit and network analysis.

During the network audit, the existing network is thoroughly checked for integrity and quality.

During the network analysis, network behavior (traffic, congestion, and so forth) is analyzed.

Network Design Methodology - Steps

Step 3 : Design the network topology and solutions:

In this step, the detailed design of the network is created. Decisions are made about networked infrastructure, infrastructure services, and applications.

The data for making these decisions is gathered during the first two steps.

A prototype network might be constructed to verify the correctness of the design and to identify and correct any problems as a proof of concept before implementing the entire network.

A detailed design document is also written during this step; it includes information that has been documented in the previous steps.

Network Design Implementation

When the design is complete, the design implementation process is executed, this process includes the following steps:

Step 1: Plan the implementation:

During this step, the implementation procedures are prepared in advance to clarify the actual implementation. Cost assessment is also undertaken at this time.

This step is performed during the PPDIOO Design phase.

Network Design Implementation

Step 2: Implement and verify the design:

The actual implementation and verification of the design take place during this step by building a network.

This step maps directly to the Implement phase of the PPDIOO methodology.

Network Design Implementation

Step 3: Monitor and optionally redesign:

The network is put into operation after it is built. During operation, the network is constantly monitored and checked for errors.

If troubleshooting problems become too frequent or even impossible to manage, a network redesign might be required; this can be avoided if all previous steps have been completed properly.

This step is a part of the Operate and Optimize phases of the PPDIOO methodology.

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Top-Down Approach to Network Design

A top-down design allows the designer to “see the big picture” before getting to the details.

Top-down design clarifies the design goals and initiates the design from the perspective of the required applications.

The top-down approach adapts the physical infrastructure to the needs of the applications. Network devices are chosen only after a thorough requirements analysis.

Structured design practices should be integrated with the top-down approach, especially in very complex networks.

Top-Down Approach to Network Design

In contrast to top-down design, the network design approach in which network devices and technologies are selected first is called bottom-up, or connect-the-dots.

This approach often results in an inappropriate network for the required services and is primarily used when a very quick response to the design request is needed.

With a bottom-up approach, the risk of having to redesign the network is high.

Top-Down Approach to Network Design

Guidelines for producing a top-down design include the following:

- Thoroughly analyze the customer's requirements.
- Initiate the design from the top of the OSI model. Define the upper OSI layers (application, presentation, and session) first, and then define the lower OSI layers (transport, network, data link, and physical)—the infrastructure (routers, switches, and media) that is required.
- Gather additional data about the network (protocol behavior, scalability requirements, additional requirements from the customer) that might influence the logical and physical design.

Top-Down Approach to Network Design

The disadvantage of the top-down approach is that it is more time-consuming than the bottom-up approach.

True & False

- The requirements derived from the Prepare and Plan phases are the basis for network **Implementation** phase.

Question

- The requirements derived from the Prepare and Plan phases are the basis for network design.
- There are two types of requirements, which requirement relates to each phase?
  - Organizational requirements..
  - Network requirements..

True & False

- The **Implement phase** includes the initial verification of the design on the actual network.

Thank you