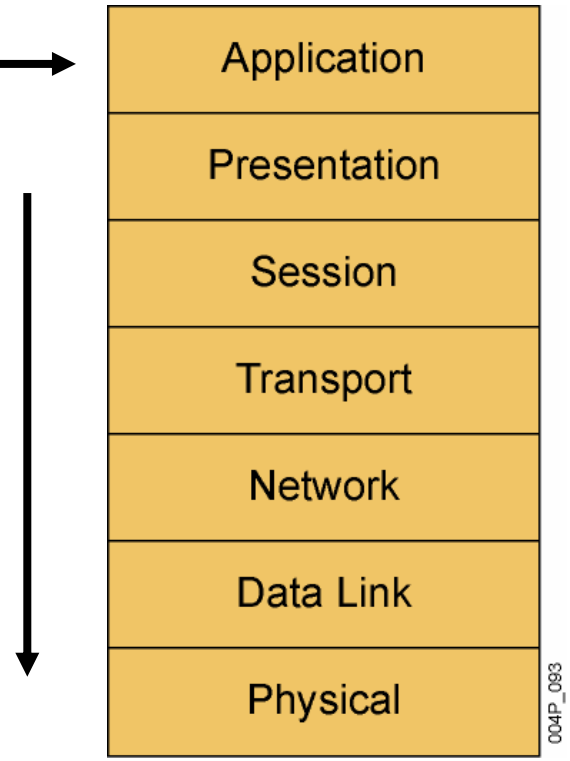
Using the Top-Down Approach to Network Design

Applying a Methodology to Network Design

Top-Down Design Practices

Start your design here.

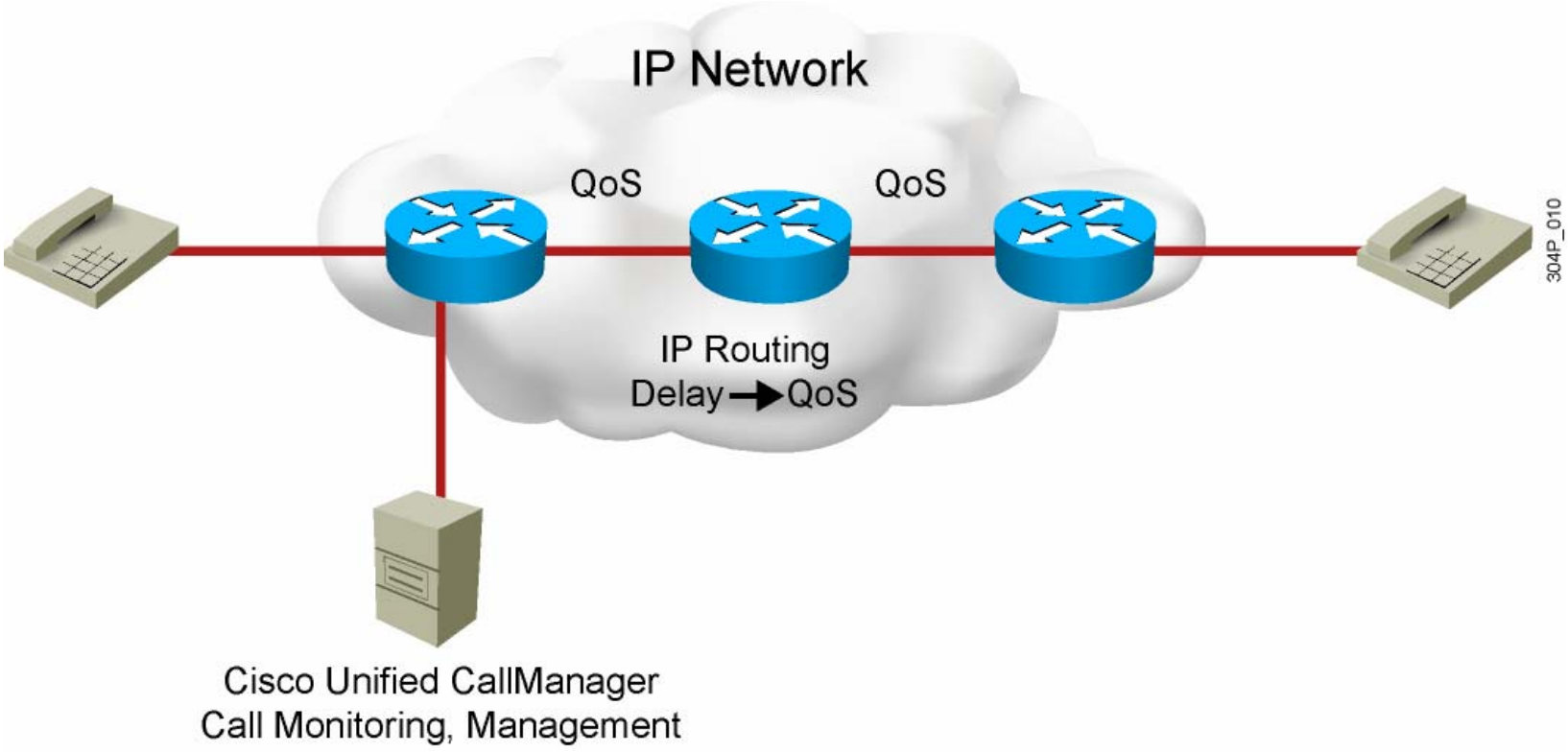
Design down the OSI model.



Top-Down and Bottom-Up Approach Comparison

	Top-Down Approach	Bottom-Up Approach
Benefits	▪ Incorporates organizational requirements ▪ Gives the big picture to organization and designer	▪ Allows a quick response to a design request ▪ Facilitates design based on previous experience
Disadvantages	▪ Incorporates organizational requirements	▪ Implements little or no notion of actual organizational requirements ▪ May result in inappropriate network design

Example: Top-Down Voice Design



Creating a Network Decision Table

- Decide which network layer requires decisions.
- Gather possible options for a given situation.
- Create a table that includes possible options and given requirements.
- Match given requirements with specific properties of given options.
- Select the option with the most matches as the most appropriate one.

Example: Selecting a Routing Protocol

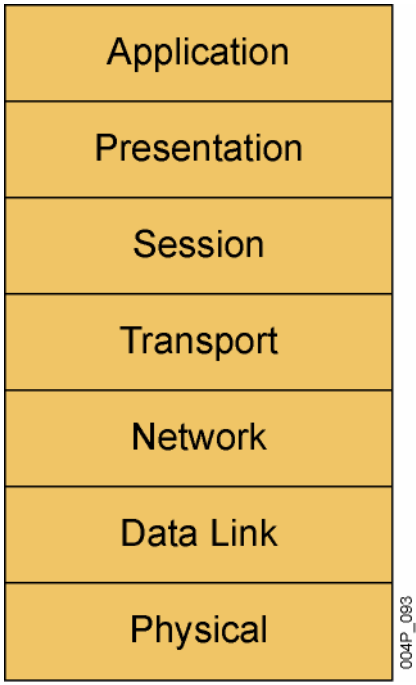
Parameters	Options: EIGRP	OSPF	BGP	Required Network Parameters
Size of Network (Small/Medium/Large/Very Large)	Large	Large	Very Large	Large
Enterprise-Focused (Yes/No)	Yes	Yes	No	Yes
Use of VLSM (Yes/No)	Yes	Yes	Yes	Yes
Supports Cisco Routers (Yes/No)	Yes	Yes	Yes	Yes
Network Support Staff Knowledge (Good/Fair/Poor)	Good	Fair	Poor	Good

Assessing the Scope of the Network Design Process

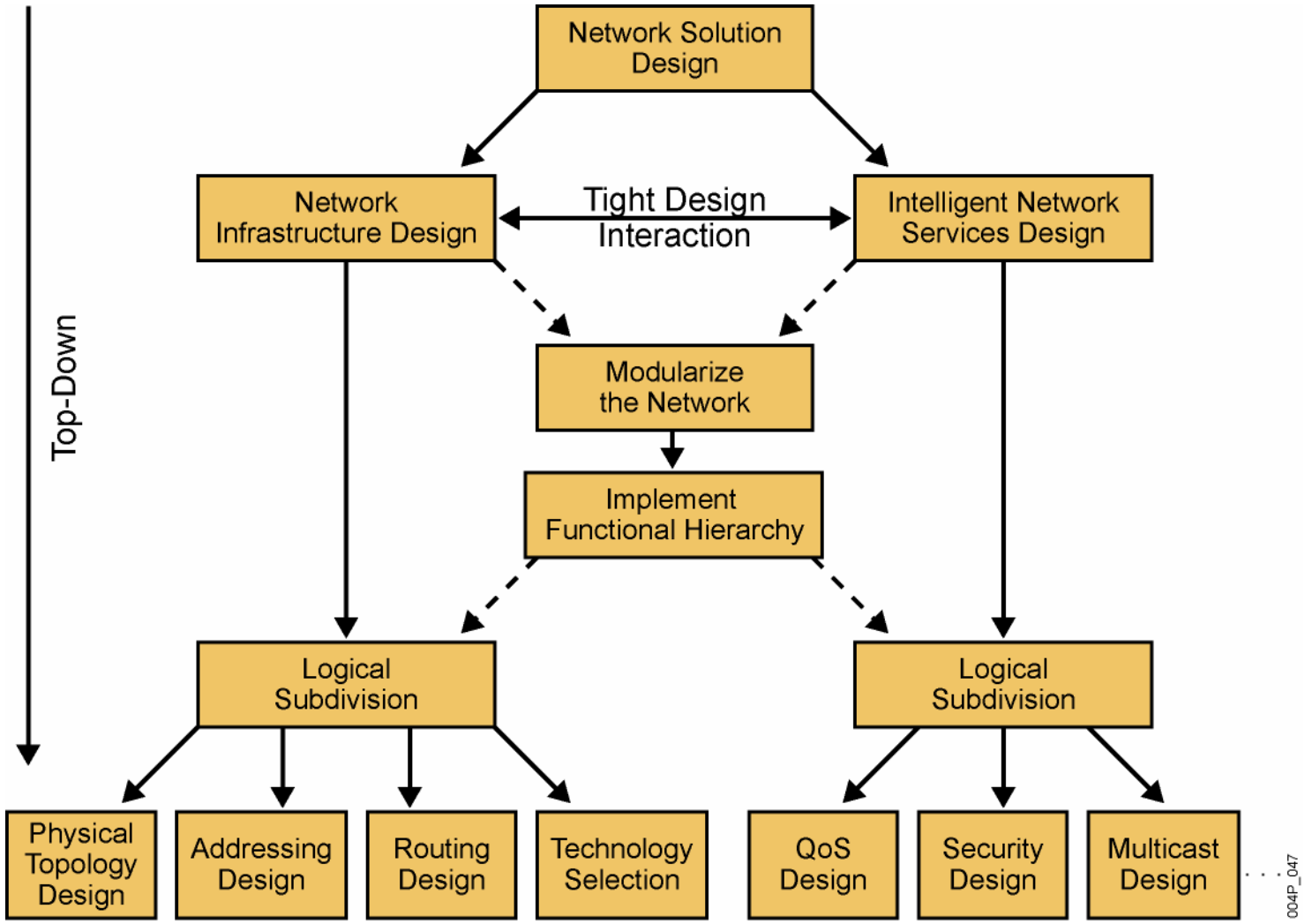
Scope of Design	Comments
Entire network	All branch office LANs upgraded to support Fast Ethernet technology
Campus	Redundant equipment and links Addition of wireless client mobility
WAN	Solutions to overcome bottlenecks

Example: Assessing the Scope of the Network Design Process

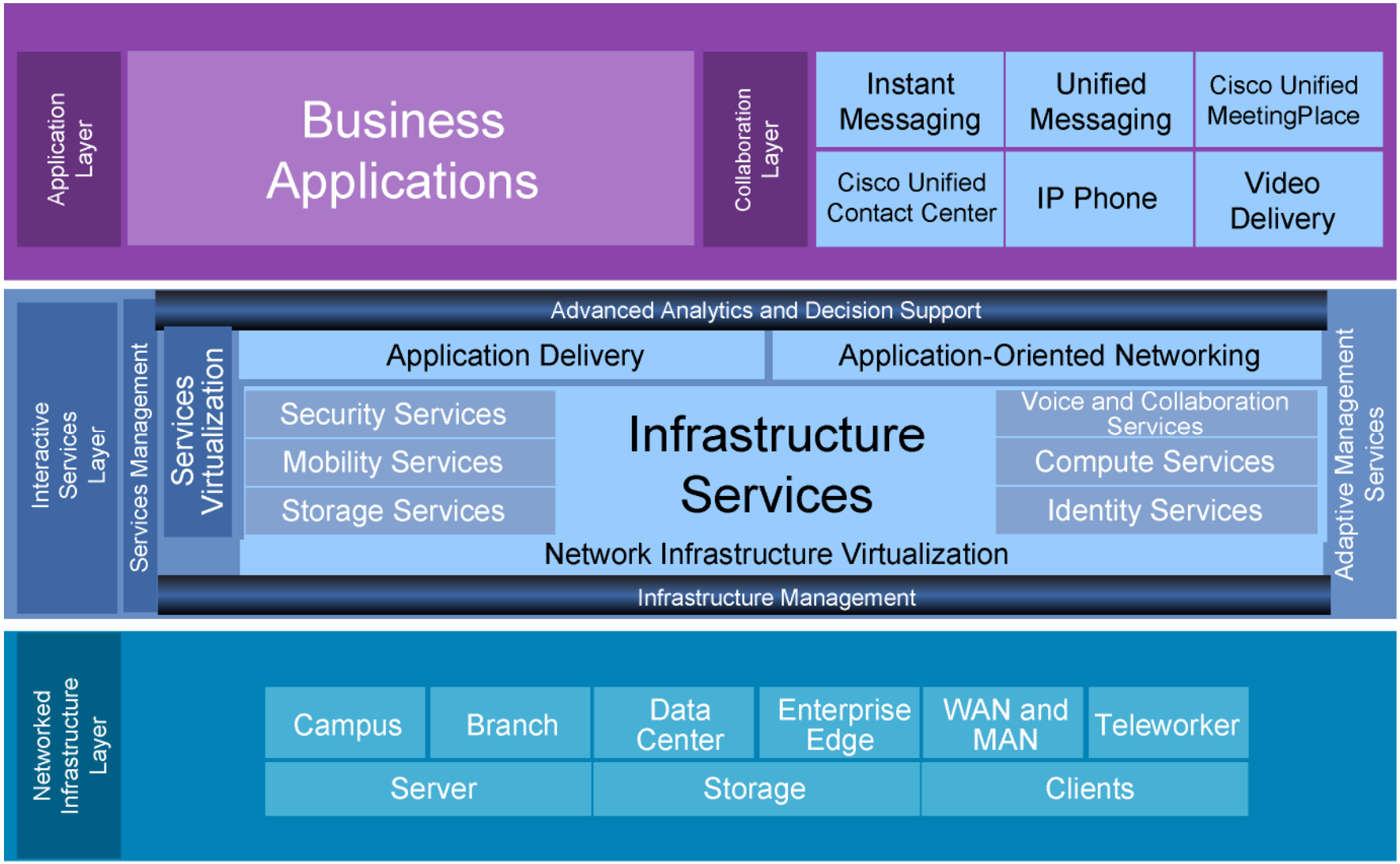
- Application—Designing voice transport
- Network—Designing routing, addressing
- Physical, data link—Choosing connection type



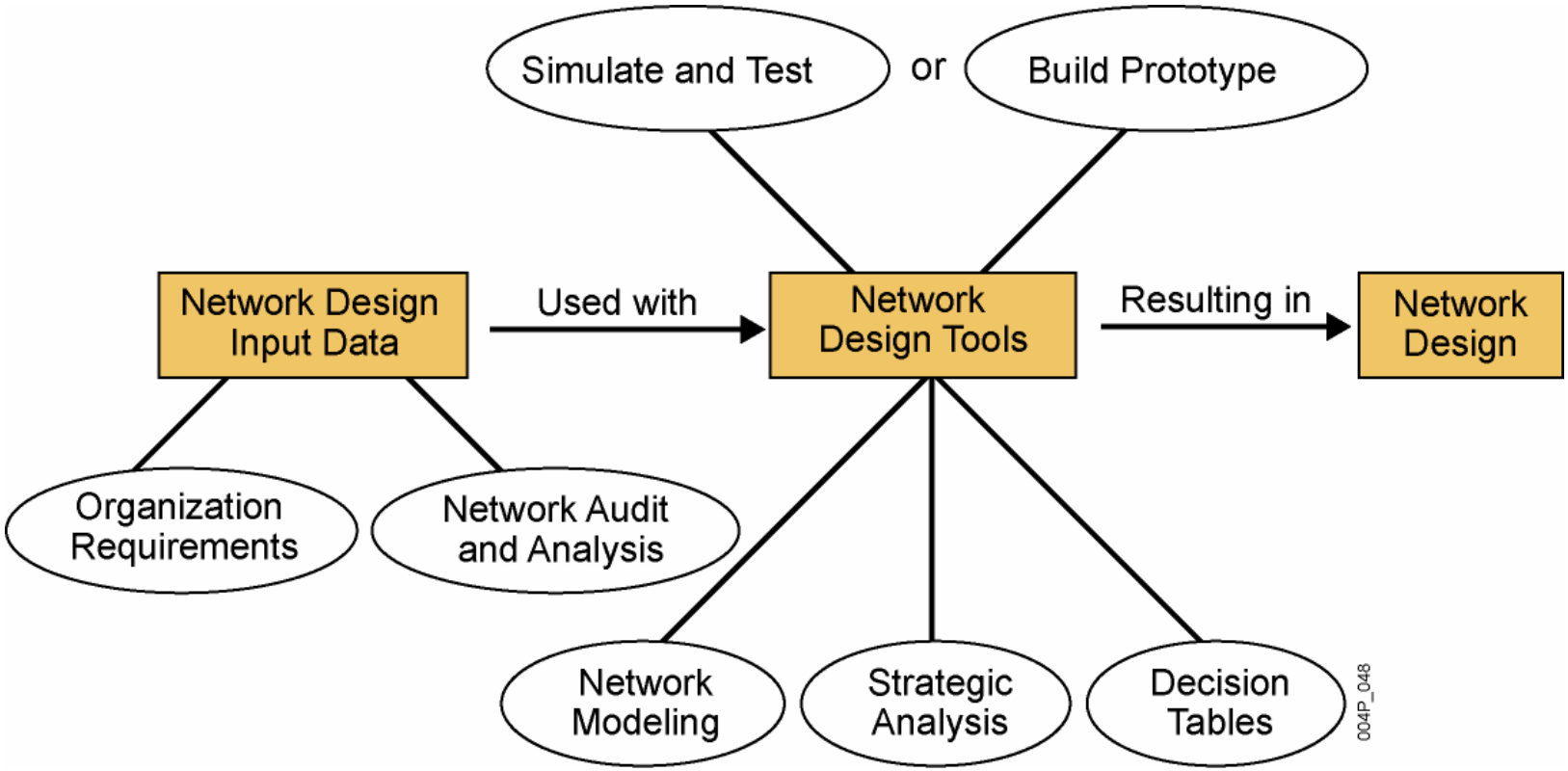
Structured Design Principles



Cisco SONA Offerings



Network Design Tools



Planning an Implementation

- If a design is composed of multiple complex components:
  - Implement each component separately; do not implement everything at once.
- Incremental implementation:
  - Reduces troubleshooting in case of failure
  - Reduces time needed to revert to previous state in case of failure

Major Implementation Components

Each step should contain the following information:

- Description
- Reference to design sections
- Detailed implementation guidelines
- Detailed roll-back guidelines in case of failure
- Estimated time for implementation

Example: Summary Implementation Plan

	Date, Time	Description	Implementation Details	Complete
Phase 3	04/02/2007	Install campus hardware	Section 6.2.3	✓
Step 1		Connect switches	Section 6.2.3.1	✓
Step 2		Install routers	Section 6.2.3.2	✓
Step 3		Complete cabling	Section 6.2.3.3	✓
Step 4		Verify data link layer	Section 6.2.3.4	✓
Phase 4	04/03/2007	Configure campus hardware	Section 6.2.4	
Step 1		Configure VLANs	Section 6.2.4.1	
Step 2		Configure IP addressing	Section 6.2.4.2	
Step 3		Configure routing	Section 6.2.4.3	
Step 4		Verify connectivity	Section 6.2.4.4	
Phase 5	04/05/2007	Launch campus updates into production	Section 6.2.5	
Step 1	…	Complete connections to existing network	Section 6.2.5.1	
Step 2		Verify connectivity	Section 6.2.5.2	

Example: Detailed Implementation Plan

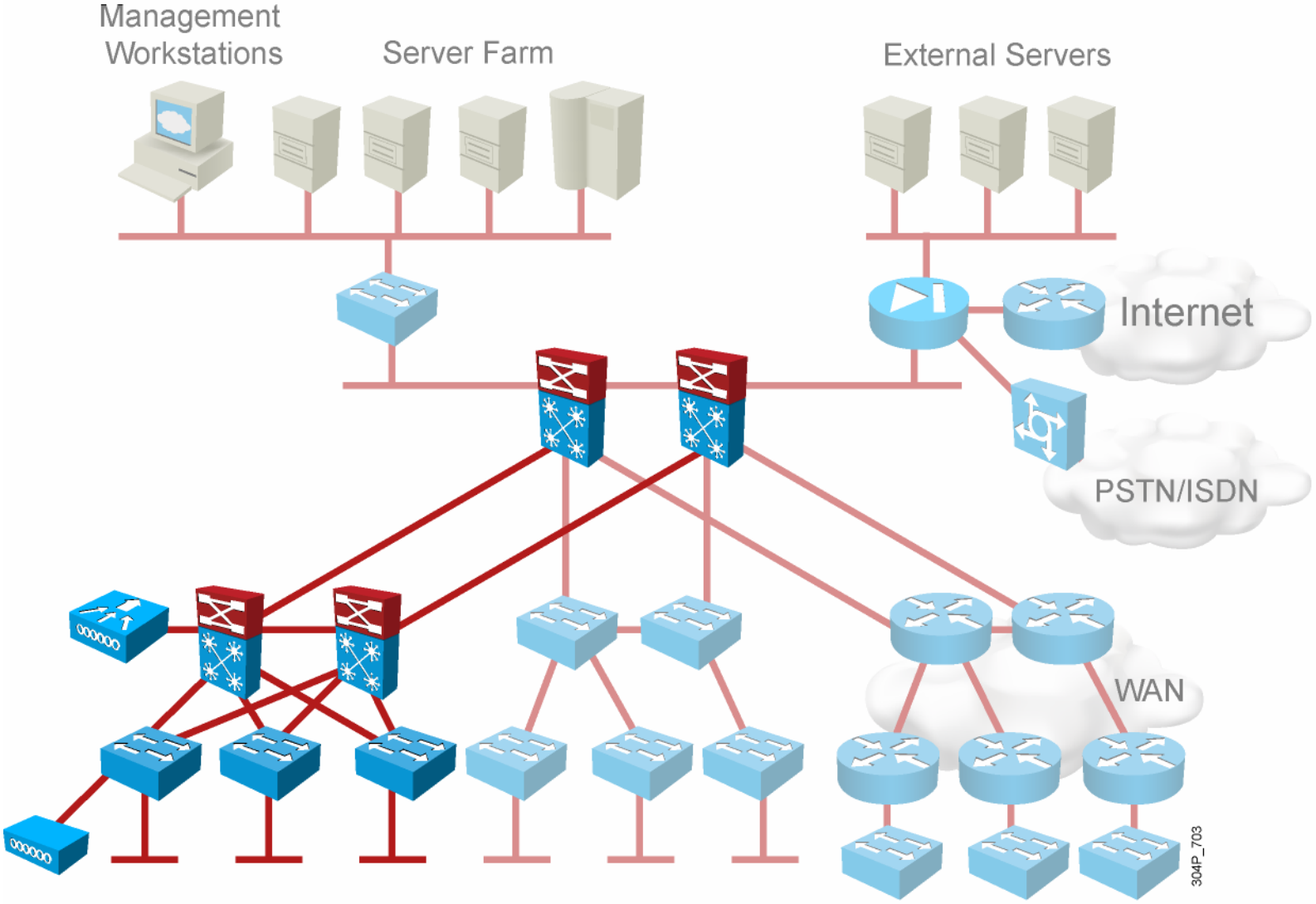
Section 6.2.7.3, “Configure routing protocols in the WAN network module”:

- Number of routers involved is 50.
- Use template from section 4.3.1, “EIGRP details.”
- Per router configuration:
  - Use passive-interface command on all nonbackbone LANs. (See section 4.2.3, “EIGRP details.”)
  - Use summarization according to the design. (See section 4.2.3, “EIGRP details,” and section 4.2.2, “Addressing details.”)
- Estimated time is 10 minutes per router.
- Roll-back procedure is not required.

Pilot vs. Prototype Networks

- The pilot or prototype network is used as proof of concept for the design:
  - A pilot network tests and verifies the design before the network is launched.
  - A prototype network tests and verifies a redesign in an isolated network before it is applied to the existing network.
- Results:
  - Success
  - Failure

Example: Prototype Network



Detailed Structure of a Design Document

Design Document Index
1. Introduction
2. Design requirements
3. Existing network infrastructure
   - 3.1. Network topology
   - 3.2. Network audit
   - 3.3. Applications used in the network
   - 3.4. Network health analysis
   - 3.5. Recommended changes to the existing network
4. Design
   - 4.1. Design summary
   - 4.2. Design details
     - 4.2.1. Topology design
     - 4.2.2. Addressing design
     - 4.2.3. EIGRP design
     - 4.2.4. Security design
     - . . .
   - 4.3. Implementation details
     - 4.3.1. Configuration templates for campus devices
     - 4.3.2. Configuration templates for WAN devices
     - . . .
5. Proof of concept
   - 5.1. Pilot or prototype network
   - 5.2. Test results
6. Implementation plan
   - 6.1. Summary
   - 6.2. Implementation steps

Appendix A—List of existing network devices
Appendix B —Configurations of existing network devices

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Summary

- Designing an enterprise network is a complex project. Top-down design facilitates the process by dividing it into smaller, more manageable steps.
- Decision tables facilitate the selection of the most appropriate option from many possibilities.
- In assessing the scope of a network design, determine whether the design is for a new network or is a modification of the entire network, a single segment or module, a set of LANs, a WAN, or a remote-access network.
- The output of the design should be a model of the complete system. To achieve this, the top-down approach is highly recommended.

Summary (Cont.)

- When the design is complete, you are ready to document the implementation and migration in as much detail as possible.
- After a design is complete, you should verify it. You can test the design in an existing or live network (pilot) or in a prototype network that will not affect the existing network.
- A design document lists the design requirements, documents the existing network, documents the network design, identifies the proof-of-concept strategy, and details an implementation plan.