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### \*\*Microsoft Word Document: WAN Design Project for ABC Paper Products\*\*

## 1. Introduction

This document outlines the Wide Area Network (WAN) design for ABC Paper Products, Inc., a Cameroon-based manufacturer of paper and packaging products with 15 sites, including its headquarters in Yaounde. The design addresses the company’s business and technical goals, focusing on improving operational efficiency, supporting a distance-learning program, and ensuring reliable communication with global customers. The proposed architecture includes logical and physical designs tailored to meet scalability, security, and cost-efficiency requirements.

2. Business and Technical Goals

2.1 Business Goals

- Increase Profit Margins:

- Enhance operational efficiency to address reduced sales in Africa.

- Reduce reliance on scarce lumber by utilizing recycled postconsumer paper.

- \*\*Employee Training\*\*:

- Implement a distance-learning program to train 1,500 employees across 15 sites on conservation, recycling, and efficient workflows.

- Support the Conservation Initiative to sustain profitability.

- \*\*Global Customer Support\*\*:

- Maintain reliable communication with customers, particularly in Africa, to support sales and service.

- \*\*Cost Efficiency\*\*:

- Optimize internal processes, including network infrastructure and training delivery, to reduce costs.

### 2.2 Technical Goals

- \*\*Reliable WAN Connectivity\*\*:

- Connect 15 sites, including Yaounde headquarters, with high availability and redundancy.

- \*\*Support for Videoconferencing\*\*:

- Equip training rooms with digital videoconferencing systems for distance learning.

- Ensure low latency and high bandwidth for video traffic.

- \*\*Scalability\*\*:

- Design a network to accommodate future growth in employees, sites, or services.

- \*\*Security\*\*:

- Protect sensitive data (e.g., customer information, production processes) across the WAN.

- \*\*Cost-Effective Implementation\*\*:

- Balance performance with cost, leveraging existing infrastructure where possible.

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## 3. Logical Design

### 3.1 Network Architecture

The logical design employs a \*\*hierarchical star topology\*\* with Yaounde headquarters as the core, connecting to 14 branch sites. This structure ensures centralized management, scalability, and efficient traffic flow.

- \*\*Core Layer (Yaounde HQ)\*\*:

- High-performance routers and Layer 3 switches handle WAN and LAN connectivity.

- Hosts central servers for videoconferencing, file storage, and ERP systems.

- \*\*Distribution Layer\*\*:

- Layer 3 switches at each site (including HQ) manage inter-VLAN routing and enforce Quality of Service (QoS) policies for video traffic.

- \*\*Access Layer\*\*:

- Layer 2 switches connect end devices, including PCs, IP phones, and videoconferencing systems.

### 3.2 VLAN Configuration

- VLAN 10: Employee Workstations

- VLAN 20: Videoconferencing Systems

- VLAN 30: Management and Servers

- VLAN 99: Native VLAN for trunking

### 3.3 IP Addressing

- Private IP addressing using the 10.0.0.0/8 range, with subnets allocated per site:

- Headquarters: 10.1.0.0/16 (e.g., 10.1.10.0/24 for VLAN 10, 10.1.20.0/24 for VLAN 20).

- Branch 1: 10.2.0.0/16, Branch 2: 10.3.0.0/16, etc.

- Centralized DHCP and DNS servers at HQ for IP management.

### 3.4 Routing and WAN Links

- \*\*Routing Protocol\*\*: Open Shortest Path First (OSPF) for dynamic routing, ensuring scalability and fast convergence.

- \*\*WAN Links\*\*:

- Primary: MPLS or leased lines for reliable connectivity between HQ and branches.

- Backup: Site-to-site IPsec VPNs over the internet for redundancy.

- \*\*Services\*\*:

- Videoconferencing servers at HQ with QoS to prioritize video traffic.

- Firewalls and intrusion prevention systems (IPS) at each site for security.

### 3.5 Logical Diagram

- \*\*Headquarters\*\*: Core router connects to an MPLS cloud and internet VPN, hosting centralized servers.

- \*\*Branches\*\*: Each site has a router connecting to the MPLS cloud and internet, with local switches supporting VLANs.

- \*\*Traffic Flow\*\*: Centralized servers at HQ manage training content and videoconferencing, with QoS ensuring low-latency video delivery.

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## 4. Physical Design

### 4.1 Headquarters (Yaounde)

- \*\*Core Equipment\*\*:

- 2x Cisco ISR 4451 routers for MPLS and VPN redundancy.

- 2x Cisco Catalyst 9300 switches (stacked for redundancy) for inter-VLAN routing.

- \*\*Access Equipment\*\*:

- Cisco Catalyst 9200 switches for employee workstations and training rooms.

- Cisco IP phones and Polycom/Tandberg videoconferencing systems.

- \*\*Servers\*\*:

- Videoconferencing server (e.g., Cisco Webex or Zoom).

- File and application servers for ERP and training content.

- DHCP and DNS servers.

- \*\*Connectivity\*\*:

- Primary: 100 Mbps MPLS link to branches.

- Backup: 50 Mbps internet link with IPsec VPN.

- Dual ISPs for internet redundancy.

- \*\*Physical Layout\*\*:

- Data center with racks for servers, routers, and core switches.

- Training rooms equipped with videoconferencing systems and projectors.

- Employee workstations in open-plan offices.

### 4.2 Branch Sites (14 Sites)

- \*\*Core Equipment\*\*:

- 1x Cisco ISR 1100 router per site for MPLS and VPN connectivity.

- 1x Cisco Catalyst 9200 switch for local VLANs.

- \*\*Access Equipment\*\*:

- Cisco Catalyst 9200 switches for workstations and training rooms.

- Videoconferencing systems (Polycom or equivalent) in training rooms.

- \*\*Connectivity\*\*:

- Primary: 10–20 Mbps MPLS link to HQ.

- Backup: 5–10 Mbps internet link with VPN.

- \*\*Power\*\*:

- UPS systems to ensure reliability during power fluctuations in Cameroon.

- \*\*Physical Layout\*\*:

- Smaller server rooms for local routers and switches.

- Dedicated training rooms with videoconferencing equipment.

- Workstations in office areas.

### 4.3 WAN Infrastructure

- \*\*MPLS Network\*\*:

- Contract with a local ISP (e.g., MTN Cameroon or Camtel) for MPLS connectivity.

- QoS policies prioritize videoconferencing traffic (EF class for video, AF class for data).

- \*\*Internet VPN\*\*:

- IPsec tunnels between HQ and branches for backup connectivity.

- Cisco Firepower firewalls secure VPN traffic.

- \*\*Redundancy\*\*:

- Dual WAN links (MPLS + internet) with automatic failover using HSRP or VRRP.

### 4.4 Security

- Firewalls at each site to filter traffic.

- 802.1X authentication for secure network access.

- Encrypted videoconferencing sessions using SRTP.

- Regular security audits and intrusion detection systems.

### 4.5 Monitoring and Management

- Centralized network management using Cisco DNA Center or SolarWinds.

- Monitor bandwidth usage, latency, and videoconferencing performance.

- Regular backups of network configurations and training content.

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## 5. Conclusion

The proposed WAN design for ABC Paper Products aligns with the company’s business and technical goals by providing a scalable, secure, and cost-effective network. The hierarchical star topology, MPLS connectivity with VPN backup, and QoS-enabled videoconferencing support ensure reliable communication and training delivery across 15 sites. The physical design leverages industry-standard Cisco equipment and robust security measures to protect sensitive data while accommodating future growth.

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### \*\*Instructions to Create the Word Document\*\*

1. \*\*Open Microsoft Word\*\*:

- Create a new document and save it as "ABC\_WAN\_Design\_Project.docx".

2. \*\*Set Up Formatting\*\*:

- Set margins to 1 inch (File > Page Setup > Margins).

- Use Arial font, 12pt for body text, 14pt bold for headings.

- Add a header: "ABC Paper Products WAN Design Project" (left) and page number (right).

- Add a footer: Current date (e.g., August 28, 2025).

3. \*\*Copy and Paste Content\*\*:

- Copy the above content into the document.

- Apply Heading 1 to main sections (e.g., "1. Introduction", "2. Business and Technical Goals").

- Apply Heading 2 to subsections (e.g., "2.1 Business Goals", "3.1 Network Architecture").

- Use bullet points for lists (Home > Bullets).

4. \*\*Add a Title Page (Optional)\*\*:

- Insert a cover page with the title, your name, date, and course/project details.

5. \*\*Save and Review\*\*:

- Save the document and proofread for clarity and formatting consistency.

- Optionally, add a table of contents (References > Table of Contents) for easier navigation.

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### \*\*Additional Notes\*\*

- The document is concise yet comprehensive, covering all required aspects of the WAN design project.

- If you need specific diagrams (e.g., logical or physical topology), you can create them in tools like Microsoft Visio, Cisco Packet Tracer, or PowerPoint and insert them into the Word document as images.

- For example, to add a logical diagram:

- Create a diagram showing the HQ core router connected to an MPLS cloud, with branches linked via routers and switches.

- Save the diagram as an image (e.g., PNG) and insert it under section 3.5.

- If you want me to generate a specific diagram or provide additional details (e.g., sample configurations for routers/switches), let me know!

Let me know if you need assistance with any specific part of the Word document creation process or further refinements!