

# Secure LAN Design Case Study

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## Secure Local Area Network (LAN) Design Case Study

### Background

Modern automobiles are increasingly often entrusted with safety-critical functionality, sold to the customer as “driver assistance systems.” Examples of such systems are adaptive cruise controls, driver attention systems, blind spot warning systems, front- and rear collision warning systems, etc. Moreover, modern automobiles increasingly often include cloud-based connectivity features such as GM’s OnStar, Hyundai BlueLink, Mercedes me Connect, or Tesla’s Connected Car. The integration of such cloud-based connectivity features with safety-critical systems offers new attack vectors for malicious users.

### Case Study Overview

The objective of this case study is to create a secure local area network (LAN) design for a fictional medical center made up of several units and departments. In particular, the medical center has four units (e.g., Information Services, Therapeutic Services, Diagnostic Services and Support Services) and each unit has three departments. The medical center wants to establish one computer lab for each department.

The final design should show the following for each computer lab :

- A Windows-based wired LAN
- WiFi-based Internet access for mobile users in areas close to labs
- A network printer
- A File Server that permits users to store their data

### Student Instructions

#### Tasks

1. Given the design requirements below, make a hierarchy diagram for organizational units (OUs) to represent the logical structure of the network
2. Determine the minimum number of hardware items required to create this network and host the required services, then provide justification for these values
3. Determine which server features must be installed to support network operations, then explain their use
4. Make a network diagram to show the physical structure of the proposed LAN representing all the elements of the network
5. Explain how you would secure this network

## Design requirements

1. The medical center router should have a 200 Mbps access link to their Internet Service Provider (ISP)
2. The medical center wants to establish a separate web server to run its website and web applications.
3. An additional server should be used to install Active Directory Domain Services
4. A tree topology should be used to interconnect the labs and the router
5. All computers within a lab should be connected in a star topology
6. Each lab should have 20 computers connected into UTP-based Ethernet LAN
7. The computers in the lab should have access to the Internet via wired links

## Solution Template

You may use the following template as the basis for your proposed design and analysis.

1. Make a hierarchy diagram for organizational units (OUs) to represent the logical structure of the network

<insert your diagram here >

2. Determine the minimum number of hardware items required to create this network and host the required services, then provide justification for these values

Hardware	# of items	Explain why this item is or is not needed
Server PCs for AD/DS and DNS		
Server PCs for DHCP		
Server PCs for IIS		
Miscellaneous Server PCs		
Client PCs for labs		
UTP cables		
100-port switches for labs with star topology		
10-port switches for linking labs in tree topology		
Routers		

Printers		
WiFi Access Points		
Any other equipment		

<you may choose to use more rows than this>

3. Determine which server features that must be installed to support network operations, then explain their use

<insert your general observations here >

Server Feature	Explain why this service is or is not needed
Active Directory Domain Services (AD DS)	
Domain Name System (DNS)	
Dynamic Host Configuration Protocol (DHCP)	
Internet Information Server (IIS)	
Remote Desktop (RD)	
File Server role	
Print and Document Services role	
Anything else?	

<you may choose to use more rows than this>

4. Make a network diagram to show the physical structure of the proposed LAN representing all the elements of the network

<insert your diagram here >

5. Explain how you would secure this network

<insert your explanation here >

#### Instructor Notes

This case study should be made available as an individual assignment with roughly one week given for its completion.

#### Example solution

The main learning outcome of this case study is knowledge discovery and application. Therefore, no example solution is applicable, as the solution is what students make of it.