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CNT 4703C

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Lab 10 – Designing a Network

The City of Hastings, KY, desires to set up a secure WAN that interconnects 10 government buildings. They also want to provide free and secure wireless access to residents within the downtown city limits. The WAN would also include 5 elementary schools, 2 middle schools, and 2 high schools, with a total population of approximately 9,600 students. The city presently relies on leased lines via the local phone company, with a monthly cost of $347 per connection. This report proposes a solution that provides redundancy and fault tolerance, cost savings, and is suitable for the city's needs.

Type of media:

Wired and wireless connections operate together in the advised network configuration. We suggest using fiber optic cables for the wired connections because they can transmit data at fast speeds across greater distances. A fiber optic connection would be placed in each of the ten government buildings to connect them to the main hub at City Hall, which will house the central server, switches, and routers. High-speed and dependable connectivity between the government buildings would be provided by fiber optic cables, saving the city about 50% of monthly leased line costs.

We suggest using wireless connectivity in the schools. A wireless access point (WAP) would be established at each school to give nearby residents, employees, and students free and secure wireless connectivity. We advise using IEEE 802.11ac wireless technology, which can transmit data at high speeds and give pupils access to online learning resources.

Hardware Upgrades:

The city would need to update its current hardware and software in order to implement the suggested network layout. We advise replacing the switches and routers on the local area network (LAN) with Cisco Catalyst 2960-X switches and Cisco ISR 4000 routers, respectively. These devices contain built-in security capabilities like firewalls and VPN tunnels to protect the network from attacks and offer high-speed and dependable connectivity.

We advise installing two ISP connections at the WAN level to offer redundancy and fault tolerance. To ensure redundancy in the event that one connection fails, the city would need to sign up for two different ISPs, such as Comcast and AT&T. The two CISCO ISR 4000 routers would be connected to the two ISPs, and the routers would be set up to offer load balancing and automated failover in the event that one connection fails.

Wireless WAN Access:

Mesh networks are advised for usage in wireless WAN access. The downtown area would have a number of wireless access points installed by the city that would be connected to one another to create a mesh network. In order to provide high-speed and dependable connectivity,

the network would use IEEE 802.11ac wireless technology, with each access point being linked to a fiber optic cable. No dead spots would exist thanks to the mesh network, which can also support a large number of users.

Equipment List and Configuration:

The following is a list of equipment that the city would require to implement the proposed solution:

- 10x CISCO Catalyst 2960-X series switches
- 12x CISCO ISR 4000 series routers
- 12x Dell PowerEdge Rack servers
- 10x WAPs for the government buildings
- 9x WAPs for the schools
- Fiber optic cables
- Mesh network wireless access points
- IEEE 802.11ac wireless technology

We propose setting up the network so that the city's main server serves as the DHCP server and assigns local addresses to the PCs using DHCP. To enhance security and guarantee compatibility with the most recent applications, we also advise upgrading the machines to Windows 10.

Configuration recommendations:

a) LAN level:

- Use Active Directory to set up a domain structure.

- To control computer settings, use Group Policy Objects (GPOs).
- Set up and customize a backup program like Veeam Backup & Replication

b) WAN level:

- Create a virtual private network (VPN) to safely connect City Hall to the remote sites.
- Use Quality of Service (QoS) to give network traffic priority
- Set the firewall to only permit necessary traffic.

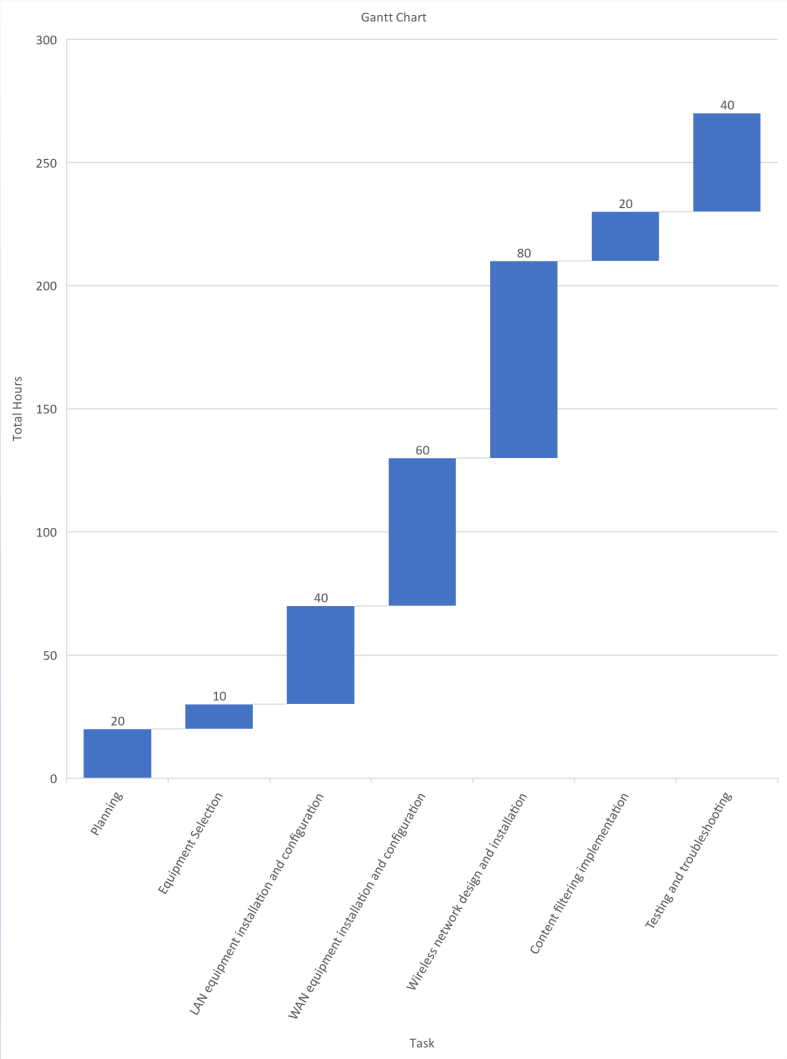
Price list:

- Consulting costs ($150/hour for 30 hours): $4,500
- Installation and configuration costs ($100/hour for 240 hours): $24,000
- Hardware costs: $120,000
- Software costs: $6,000

  Total estimated cost is $154,500.

Estimated hours for each task are as follows:

- Planning and requirements gathering: 20 hours
- Equipment selection and procurement: 10 hours
- LAN equipment installation and configuration: 40 hours
- WAN equipment installation and configuration: 60 hours
- Wireless network design and installation: 80 hours
- Content filtering implementation: 20 hours
- Testing and troubleshooting: 40 hours



Gantt Chart.xlsx

Total estimated cost is $154,500 with about 270 hours of work.

On this exciting project, we are looking forward to cooperating with the city of Hastings, Kentucky.

Thank you,

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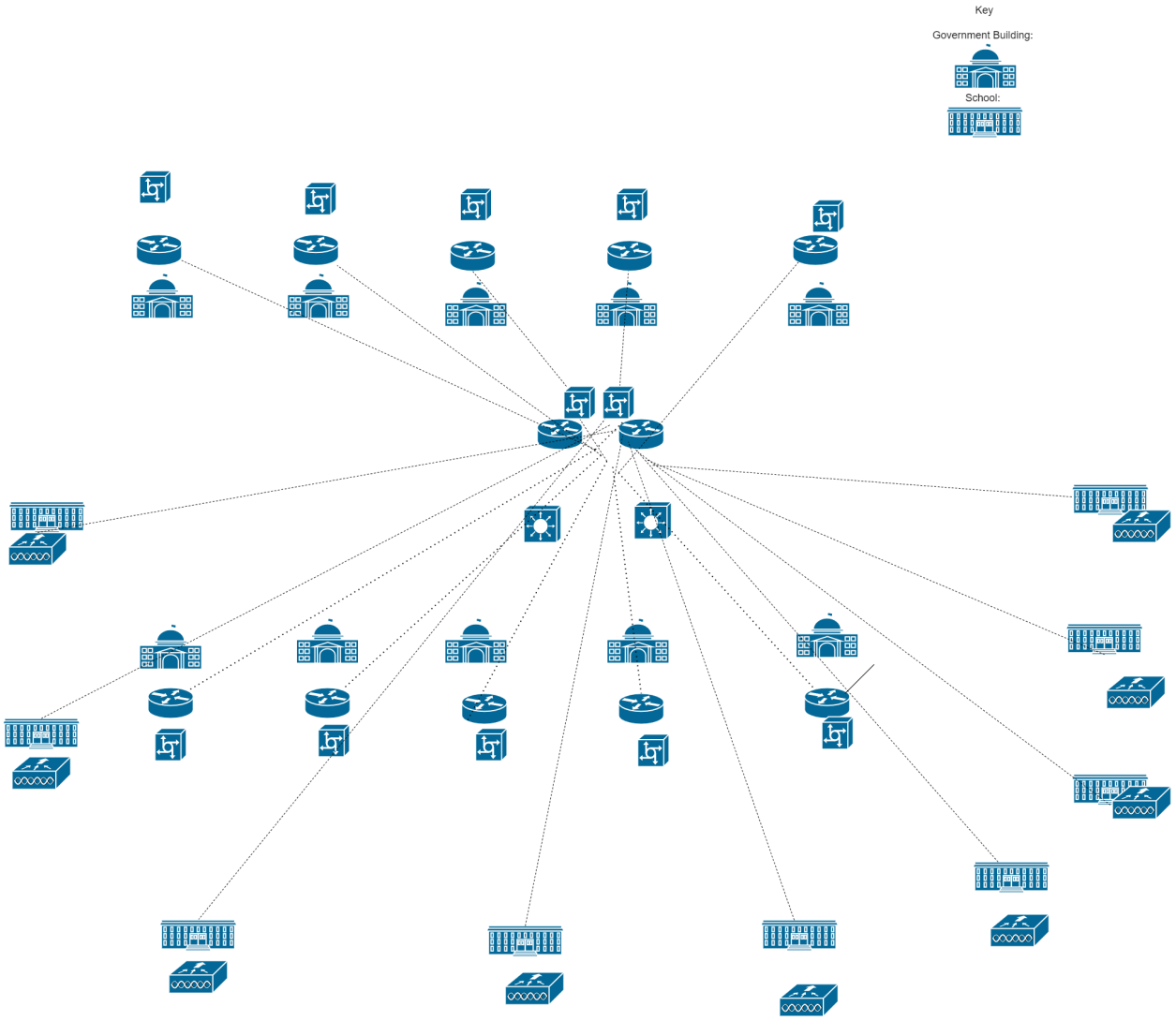
Key
Government Building:
School: