**Unit 10 Recommendations for Kyle**

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**Part A: Network Assessment Guidelines**

1. Connections between computers and the internet is a series of complicated transactions. Multiple different protocols and platforms combine to make sure a user is able to access a coherent readout of the information they need at any given time. These connections take place in different geographical styles in LAN’s, MAN’s, and WAN’s (Indiana University Information Technology Services, 2018). This all starts with a LAN, or Local Access Network. A LAN is comprised of the devices on your network, and the communications there within. For example, a home may have a LAN consisting of two desktop computers, an Amazon Fire TV stick, and a modem/router combo supplied by their Internet Service Provider (ISP). This increases in scale with a Metropolitan Area Network, which is something you may consider. This takes devices from multiple buildings and access points to combine them into a single network. This is useful for places such as large school campuses, or business centers. This increases in scale further with a Wide Area Network. This may be restricted to a corporate enterprise, or even publicly accessible. The most commonly used example of a WAN would be the worldwide Internet.

2. Digital noise may occur from a number of different areas. Firstly, you may get noise due to old styles of cabling (Floriday Center for Instructional Technology, 2013). When running in parallel, cables may create noise while signals are running through them called Cross-Talk. Many ways to mitigate this have been implemented such as Twisted Pair Cables, or even Fiber Optic connections. The latter would be relatively expensive to implement, but due to peer-to-peer file sharing, I would recommend looking into it in order to handle the immense bandwidth requirements of instantaneously sharing large files as your business grows in scale. Another common area that may produce is the system itself (Institute of Radio Frequency Engineering and Electronics, n.d.). Internal Noise is due to the equipment involved generating extraneous signals that become integrated into the transmission itself. A way to mitigate this effect is simply to put more thorough design into your communications array, as well as using high-quality equipment and cabling for your network.

3. There are many different kinds of networking devices. For starters, you may implement a Hub. This is a device that connects other devices via physical connections such as Ethernet to form a LAN (University of Houston Clear Lake, n.d.). This device enables computers on the same LAN to send information to one another. This can be a little complicated, however, as many problems exist with Hub-centric designs. For example, data collisions may occur when multiple devices are transmitting data at the same time. Additionally, data eavesdropping is possible, as all devices on the same Hub are able to listen in on transactions whether or not they are actually a part of it. An improvement of Hub infrastructure came with the introduction of Switches. A Network Switch allows also allows the formation of a LAN via ethernet ports, but comes with a lot more utility (University of Houston Clear Lake, n.d.). For instance, a switch has the capability to pace digital communications to improve reliability and reduce data collisions. Next, the main point of online communications would be the Wireless Access Point in a Modem, Router, and Gateway (Xfinity, n.d.). A Router works in connection with a Modem to provide a wireless connectivity to your network, and allow your devices to connect to your LAN without cabling. A Modem works with your ISP to provide access to the internet, and may be connected to a router to enable it to provide as a path for your device to connect and browse the internet. Gateways are devices that function as both a modem and router, and can be supplied by your Internet Service Provider for a fee without the need to buy and set up a Modem and Router separately.

4. Network devices being shared can vary wildly depending on the needs of your LAN (Wijuntunga, n.d.). Examples of these include the computer itself and data to be shared in a standard transaction which is shared by either wired or wireless connections that allow the computer to send data and files to other destinations within the LAN, the access points in your setup such as Modems; Routers; and Gateways which are shared by each device on your network connecting to them and providing a sort of anchor for your network to build off of, and network peripherals such as Smart devices, printers, and other network-activated devices which are usually shared based off of your Wi-Fi network for other devices to wirelessly connect to.

5. Connecting to the internet may not be as complicated as one may think. Simply enough, your computer will use your modem (possibly with the help of your router via a wireless communication) and communicated with your Internet Service Provider (ISP) to give you access to the destination you would like to go to. From there, a number of protocols and layers are put on top of one another to ensure your experience is as smooth and secure as we can currently make it (Shuler, 2002). Domain Names are used in combination with search engines such as Google Chrome to turn a human-readable URL into a machine-readable address. HTTPS:// ensures your connection to specific sites are secure, and that the websites you are accessing are resolving with the certificates and authentication required to prove they have not been hijacked by malicious actors trying to steal information. File Transfer Protocol is used to ensure a safe and effective method of transferring large chunks of data from a server to your machine useful in applications like downloading files or folders. Many more protocols like these are used to standardize your internet experience in pursuit of effective and safe workflows while connected to the Internet WAN.

6. Security is one of the factors at the forefront of digital communication. It sems malicious actors are ever-present just waiting to steal data where they can. Because of this, a number of elements have been introduced to help keep standard users as safe as they can. One technology in particular comes by the name of port triggering, or port forwarding. In order to provide a level of security, many modems and routers will block suspicious traffic on certain ports (Boston University, n.d.). This is meant to provide a layer of security for ports that may be targeted for stealing data, but may make things like server hosting relatively complicated, as ports will need to be opened in order to use them effectively. One utility comparable to such a practice would be your computer’s firewall (Boston University, n.d.). A firewall will monitor the connections on your computer or network to ensure that traffic remains standard and efficient. Should the firewall detect abnormal communications, it may block those and notify the user. This works in tandem with Malware Detection to uninstall those suspicious applications, and address the problem at its roots. This software is a great leap towards security, but it fails at one critical level; the OSI Physical layer (Systems, n.d.). Believe it or not, one great way to improve your business’ security is to simply lock access points behind a physical barrier. This will prevent any malicious actors from being able to physically connect to your network, and steal information from within.

**Part B: Problem/Solution Table**

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| **Problem** | **Solution** | **Future Consideration** |
| 4-hour print turn-around | Network Attached Printers | This will allow your business to instantaneously print important documents, and increase productivity and flexibility of all staff by adding printers that can be accessed from computers, tablets, and even smartphones. |
| Little to No Network Software Security | Implement encryption software such as PGP into messaging platforms and GPG into work-related emails while requiring Two-Factor authentication to log into employee sections. | This will add additional security into your store, and help the clients feel safer and more secure about spending their earned money with you. This will also lessen the chances of law suits due to a lack of care into security. |
| Little to No Network Hardware Security | Implement Employee Training and Ensure Access Points Require Authentication to Access. | Employee training will work to minimize risk that employees may download malware onto your businesses network, and risk your business’ information being leaked and held for ransom.  A hardware lock on access points will require only those applicable be allowed access to your routers, switches, and modems. This will increase the security of your business in the event of a hostile intrusion, and work to curb the likelihood of the intruder getting out with valuable information. |
| Business is using outdated hardware. | Ensure cabling and network configurations such as Modem/Router bandwidth is capable of the speeds your business requires. | Ensuring your business uses the internet speed required is an important step to having a functional and efficient business for your customers. Equally important is ensuring that your equipment is able to attain the speeds you request from your ISP. |

**Part C: Proposal Document**

**Project Justification:** This project is important for a number of reasons. Firstly, and most importantly, the security you describe in your Project Scenario description is relatively nonexistent. Having poor security implemented into your business strategy opens up a myriad of risks you must consider. With malicious actors around every corner, it is entirely possible you may run into attacks such as Ransomware, or data theft. Breaches like these in your business may also leave you liable for a lawsuit and cost you so much in monetary and infrastructural damages that you could go out of business from a single attack.

Near-equally important is the inadequate infrastructure you have set up for your business. Opening a website to serve as a primary sale front takes an immense amount of organizational and operational resources that currently is not available to Gifts of Fortune Enterprises. Fast internet speeds are required in order to keep up with the server demand of your storefront, and rigorous infrastructure is required to ensure your relational database may run at peak efficiency when paired with the data sharing needs of your employees.

**Project Goals:** One goal for implementation in your final design process is that of an efficient high-speed internet connection. In order to accomplish this, you must talk with your ISP to compare what you currently receive with the demands of an internet-focused storefront. You will also need to consider hardware requirements of this goal, as current cabling, routers, and modems may only serve a specific bandwidth. Due to this, you may need to upgrade your ethernet cables, consider fiber-optic connections, and upgrade your routers and modems. The company will know this goal has succeeded with the introduction of a new network capable of communicating with your clients while daily operations are unfolding.

Another goal would be enhanced file sharing. Similarly to upgrading your internet speed above, this requires a strong infrastructure. Because of this, you will need to consider obtaining quality network switches to connect the devices on your LAN to one another and aid in file transfers, should you not want this done remotely from a Network Attached Storage. An important consideration here is privacy, and reliability. For this reason, I would recommend the company look into network Switches rather than Hubs. The company will know this goal has been completed when the switches have been installed into your LAN, and communication between devices remain consistent during peak data transmission hours.

A third goal to consider would be implementation of data encryption software. I would recommend looking into a common encryption platform called Pretty Good Privacy (PGP). The current setup in the office allows for a malicious actor to get a hold of transmissions between employees in plain-text, which will allow the actor to use that information easily and without constraint. Encryption steps in to mitigate the risks in the event of a data breach by transforming your messages pre-transit. This will ensure that the malicious actor described above is only able to get a hold of the encrypted transmission, and thus must decode it before being able to use it for anything of value. With PGP, the decoding process is nearly impossible, as only the destination client has access to the decoder which is used to translate the message into plain-text, or file into something the destination may use. The company will know this goal has succeeded by the integration of encryption into messages, with penetration testing proving positive results.

**Solution Summary:** These solutions will work together to ensure more effective operations while the company expands further and further. All three of these solutions work to “future proof” your setup, and ensure you will not need to upgrade drastically in the future as your business adapts to consumer demands. By integrating faster and more reliable connections, enhanced file sharing between employees, and better security, your business will be more accessible to new customers that can feel safe about shopping with you, and thus better tailor to your expansion projects to adapt to newer markets to spread even further than previously available. Estimates for each of these solutions are important, as project management may define. Goal 1 will take the most care and resources to implement, as it must be highly scalable to your customer’s demands. Recommendations for a storefront may need Gigabit fiber connections, which may be available in your area from google fiber for just $70 per month (Google, 2023). This will require cabling, which could run $6-15 per 20ft cable (Amazon, 2023). This will finally require a $300 Modem (Best Buy, 2023) and $70 router (Amazon, 2023) capable of these speeds to connect your devices wirelessly; although you will need to check with your ISP to determine exactly what modems your plan will support. This goal should take no more than two weeks to complete. Goal 2 is less complicated upon the completion of goal 1. You will require a $70 gigabit network switch (Newegg, 2023) per LAN you need to assimilate into your MAN. With the cabling and internet upgrade in Goal 1, this should take just a day or two longer than the shipping time of your network switch. Goal 3 is an interesting case. PGP as described above is actually an open-source platform, and requires no additional costs to implement (Open PGP, n.d.). Due to this, the implementation cost is technically free; though this may change if you incur operation costs for implementation requiring resources and time above simple installations. The time required for this goal should be no longer than one week.

**Impact:** The infrastructure changes proposed have the potential to impact every aspect of your business. Customers will be more pleased with your business, as all technological aspects they interact with will now be much more usable and responsive. Employee satisfaction will be improved, as they are impowered to be more efficient with less waiting to hit higher production goals than they previously could. Your office assistant will have more time to focus on tasks that actually matter rather than being forced to simply print out different prints all day due to the process being streamlined to the individual employee. Overall production will be improved by the increased availability of file sharing, enabling workers to use the tools they prefer for their work, rather than antiquated tools they have been using. Peace of mind will be improved from the integrated security, and more opportunity for investment and higher profits will be hit from the operation being functional and organized enough to expand as management sees fit.

**IT Infrastructure Library (ITIL):** Although many of the different 34 ITIL 4 management practices are exceedingly helpful in such a project, I find in particular the Infrastructure and Platform Management to be the most relevant to this project (Universtiy, Metro State, 2023). Deployment and software are vital parts to this project, but Infrastructure is at the heart of everything we’re doing. The main problems that lie in technological capabilities revolve around an inadequate platform and infrastructure implemented due to a lack of care and education on risk factors and technological solutions. Due to this, many of the issues you face in upgrading your storefront are fixed by simply modernizing the infrastructure your store runs on.

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