**Physical Network Devices**

The company will use switches, routers, and firewalls to connect to physical network devices. This gives the company the ability to reach other offices in different states to share important information between one another. The router will analyze, receive, and move data traffic between networks. The switch will help with the LAN topology as this will help route traffic locally to different departments. The firewall will help provide security as this will set up rules for what is accepted into the network.

**Critical Traffic Patterns**

The real-time transport protocol is currently being used for audio and voice data. RTP is not secure though for the network according to (What Is RTP? Understanding Network Protocols by Wirex Systems, 2023) there are vulnerabilities such as eavesdropping, hijacking, voice injection, and denial of service. This is due to RTP being a connectionless protocol meaning it doesn't need a connection between endpoints before data is transmitted (What Is RTP? Understanding Network Protocols by Wirex Systems, 2023). To make the data secure for the network we would want to upgrade it to Secure real-time transport protocol (SRTP). SRTP according to (RTP (Real-Time Transport Protocol) and SRTP (Secure RTP) - MDN Web Docs Glossary: Definitions of Web-Related Terms | MDN, 2024) “uses encryption and authentication to minimize the risk of denial-of-service attacks and security breaches.”

The structured query language or MySQL protocol is secure for the network's security. However, upon further research it seems that PostgreSQL offers more flexibility in data types, scalability, concurrency, and data integrity (MySQL vs. PostgreSQL - Comparing Relational Database Management Systems (RDBMS) - AWS, 2024). The reason we should consider PostgreSQL over MySQL is due to the added security and extra capabilities such as define data types, index types, and functional languages (Smallcombe, 2023). PostgreSQL has become the go-to solution for complicated, high-volume data operations that MySQL wouldn’t be able to handle (Smallcombe, 2023).

TCP is a much better protocol for security than user datagram protocol or UDP because TCP is a connection-oriented protocol that prioritizes reliability, while UDP is a connectionless protocol that prioritizes speed (Gorman, 2023). If we are using TCP, we should see protocol Internet Control Message Protocol (ICMP) being used too, for checking to see if a host is available as ICMP can according to (Fulin, 2021) “transmit control messages between hosts and routers to report whether hosts are reachable, and routes are available.” This would benefit the traffic of data between offices like Dallas and Memphis so that if one is not available the network would know and report back to the IT department. ICMP would help the network with network management and should be considered if the company is going to grow and have more offices around the United States. PostgreSQL should also be considered for the same reason as the database will better support a high volume of data operations than MySQL.

**Patterns Across the Infrastructure**

RTP is being used for audio and voice data for VoIP phones across the infrastructure. MySQL is being used for email as you can use automation from an application called Boomi to send emails directly from your MySQL database according to (How to Automate Email Sending from MySQL Databases, 2024). TCP is being used for the Human Resources department by sending data to other offices, like the Dallas office sending important data to the Memphis office. Secure Shell or SSH is being used to authenticate devices like computers being used by employees with credentials to log into the network.

**Performance Issues**

If no changes are made to MySQL swapping out for PostgreSQL, then the network will continue to slow down due to MySQL limitations. Also, in some cases it will not work due to account limitations for customer’s email. Example would be customer goes to use email application but can no longer use it due to the data cap the customer has reached within the time limit, which will take an hour until the customer can use the email application. This also would mean the service the customer is paying for is unavailable for an hour to that customer due to data limitations. This is bad for a company trying to grow and support more and more customers and may very well leave customers looking for a new company provider, so that they have one hundred percent availability. According to (MySQL :: MySQL Restrictions and Limitations :: 12.5 Limits on Table Column Count and Row Size, 2019) MySQL has data limit of 4096 columns per table, but the effective maximum may be less for a given table. PostgreSQL according to (PostgreSQL Maximum Table Size, 2018) has a data limit of about 32 terabytes. Next is using ICMP as this would help with troubleshooting performance issues in the network. An example would be the Dallas office trying to send data from the human resources department over to the Memphis office to their human resources department. However, every time they try to Dallas never receives them. We don't know where the issue is due to not knowing what the error message is saying, and we don't know which office to start looking at because it could be the firewall for Memphis is blocking it or misconfigured router for Dallas office or Memphis office. If we have ICMP on the network, we can troubleshoot this issue by sending ICMP ping command to each router to see if they receive the packets. When one does not work, we can enter the configuration commands on the router to fix the routing for the packets to pass through so that the human resources departments can continue to operate and complete daily tasks. Without ICMP on the network these mistakes could take longer leading to longer downtimes for an office to complete daily tasks and communicate with the other departments.

**Security Issues**

For security we must get rid of RTP because this is not a secure protocol. An example of this going bad for a growing organization would be data breaches constantly as there is no encryption method being used and outsider threats could easily use snooping to get the credentials or other valuable information because of the RTP. This would also lead to fines for data breaches, customers leaving for better security at another company that offers the same service, and a loss of revenue. If we use SRTP this would encrypt data of valuable information and help keep customers with the company, as well as save the company money from fines because we are trygin to protect customers' data. We could also lose less customers leading to a higher number of customers because they could trust us more. Using SRTP helps according to (Sinch - TLS/SRTP: Secure Real-Time Transport Protocol Explained, 2024) by improving in the areas RTP was vulnerable in such as eavesdropping, tampering, and replay attacks.

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