



Department of Computing
COMP247 Data Communications
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Network Analysis and Design

Introduction

Soylent Co, a small consulting firm operated by 30 employees within four departments appealed to review their newly upgraded network since there has been a high amount of stability problems and recently had a data breach. Throughout this report, the issues with the network's stability will be evaluated and solved by proper improvements on design to Soylent Co's network. Due to a recent data breach, the solutions for security controls in the cross-department environment will be undertaken.

Identified Network issues

The issue connecting to the internet service provider (ISP) within Soylent Co's network is the use of the 'ring' topology. The ring topology loops around between each department's switches with just only the engineering's switch being connected to the router which leads directly to ISP, creating a daisy chain from the switch to switch in either using full or half-duplex. The only disadvantage when using the ring topology is that the transmission of messages can take a long time to travel from the ISP to the receiver, which cause a traffic delay or potential cause an overload. For example, a device in the administration department wants to download directly from the internet. All the packets will travel through the router, engineering's switch, Human Resources' switch and onto their switch. This mainly causes problems in the network's stability.

Another issue in Soylent Co's network that needs to be raised is that the lack of organisation with edge devices. It comes to question why the HR file server is connected to the administration's modem, and the Engineering File server is connected to HR's switch which causes a muddle of edge devices being located in the wrong areas of the network. This confuses every staff member from their departments about their own edge devices. Grouping each department's own edge devices can build the professionalism of management by showing how the network is valued when it comes to action in the workplace, creating a mutuality and sense of belonging to each department [1]. The placement of edge devices in Soylent Co's network is crucial to share common human understanding between employees.

Soylent Co's network design is illogical as there is just one ethernet port providing internet for all the departments between the router and the engineering's switch. The one ethernet is carrying the rest of the packets/messages that are coming in and out of the network, which causes a lot of traffic to Soylent Co's network. It is a considerable risk for the organisation as if the one connecting ethernet cable could potentially be cut, affecting all the connections from each department to access the internet. This can lead to a sizeable hypothetical problem for Soylent Co if they continue to operate their network through this manner.

Improving Network design

To enhance the majority of the network's design, it is recommended to use a physical star topology with the switches as it will be required to enable each department to have their own established connection directly to the router. By breaking up each department with a partial mesh between the switches as it provides each department to receive packets and messages smoothly without traffic or any collisions. In comparison to the previous design of Soylent Co's network, there was less cabling involved by altering the physical 'ring' into a tangible 'star' which makes the wiring the system throughout the office more accessible and straightforward instead of having cables being muddled. Overall, it is suggested that creating a physical star with the switches to allow the network to avoid stability problems for Soylent Co.

Another suggestion to improve Soylent Co's network is implementing two separate switches from the router, creating a system known as a switched backbone. A switch backbone allows one branch for servers who are combined by using server multi-racks as one centralised server and the other branch to cater all employees in the organisation. The switch will divide the internet transmission evenly between both branches, allowing the servers to operate at their full potential smoothly with employees during network operation. In contrast to the current network, all the servers were separated all over the place as each of them receiving different transmission speeds, especially when the HR and engineering servers are getting traffic. Therefore, a switch backbone network offers a direct link for the servers to operate at high-speed internet connections will improve how the network gets operated.

Another suggestion is assembling the edge devices to their own persevered departments that would making the network less confusing for clients. Printers and servers were placed incorrectly for some departments by linking their device to another department's switch. To improve the network's reliability to create a set of rules when building the network [2], grouping the edge devices per department is one of them, keeping the network organised and have possible room for expansion to avoid mishaps due to lack of systematising. Arranging the edge devices to their correct retrospective placements can improve the layout of Soylent Co's network.

Obtaining Security Controls

The basic controls to be added to the network is a packet filter firewall. On the diagram, there are two firewalls shown, one from the ISP and one going to the servers. The firewall from the ISP will prevent malicious packets or messages from coming to the network,

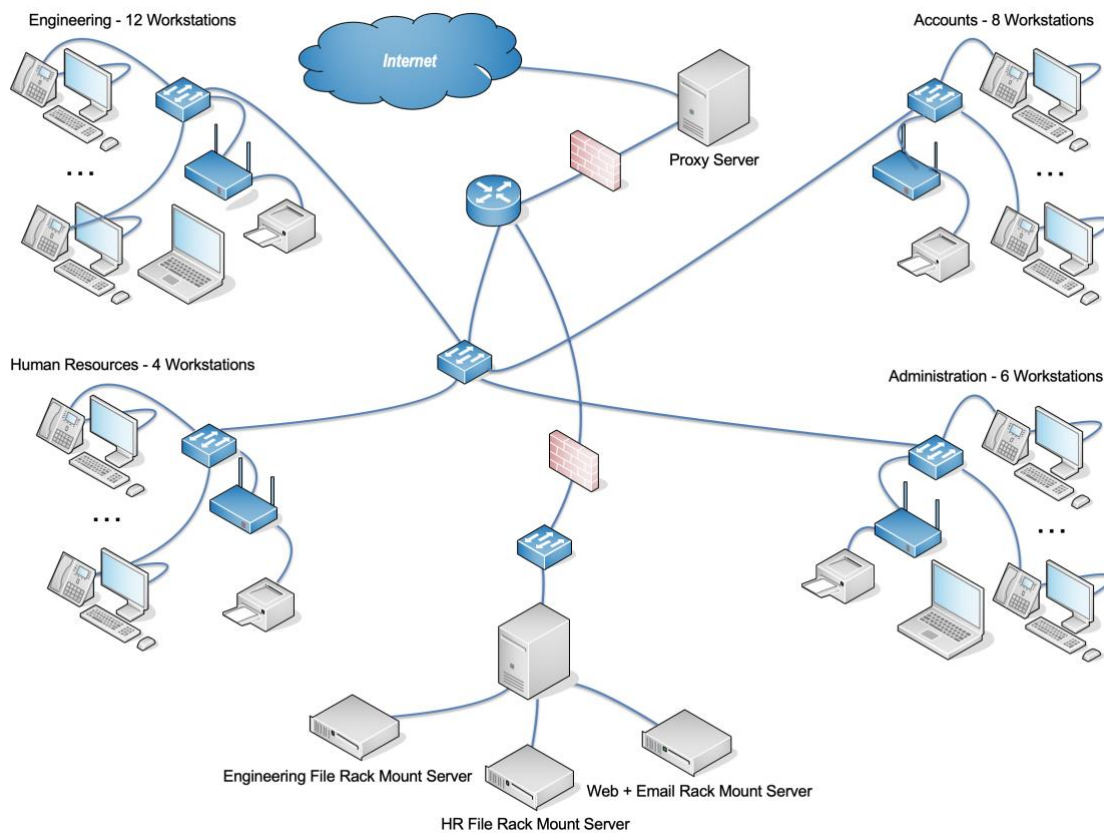
toughening up the security of public access to Soylent Co's network. The packet filter firewall will read the source address and destination address of the packet that's going through and allows packets with acceptable passes to transfer packets towards the server, preventing other departments from accessing or retrieving to non-assigned servers and accepting access to their servers. The firewalls can avoid possible denial of service (DDoS) or other cyber-attacks, which increases the safety measures of the network. When using a packet filter firewall, it can form control on the packets entering the network and accessing the servers increase the security for Soylent Co's network to prevent future DDoS attacks.

Additional control that is considered to use to improve network security is applying proxy server for Soylent Co's employees. An HTTP proxy server allows restricted access to websites on the internet that may cause harm to Soylent Co's business practices. By not having an HTTP proxy server can lead employees to have freelance access to unsafe or pornographic websites through the business's ISP. A proxy server can offer top-notch security for the organisation. However, since Soylent Co's budget for getting new equipment is limited, they will have buy-outright a dedicated proxy server on a month to month subscription basis to afford the security control that business requires to operate the network. It is accomplishing the security controls to maintain the activities of the employees' digital footprint with HTTP proxy limitations to prevent harm for Soylent Co's network procedures.

Conclusion

The consulting firm needs to have a refresh with changing the network design due to its current equipment use and security problems as identified throughout this report. The issues arise as the physically 'ring', lack of edge device placement and the reliance of one ethernet port can cause potential problems to the network by creating improves such as making a physical 'star' and backbone switch network with grouping devices together per department to build a single interface. For Soylent Co's security controls by applying two packet filter firewalls will prevent unauthorised access to the network and the servers and operating a proxy server will restrict employee access when using the IPS. Following these procedures will give Soylent a reliable and secured network which will enable to continue their business operations without stability problems.

Improved network design



References:

Academic Study:

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Journal:

[2] AHMAD, S. A simple technique for computing network reliability (Improving)