Wireless Network for Mountain West Credit Union

Western Governors University

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Summary

Mountain West Credit Union (MWCU) had an increase in member accounts being created and it spurred the need to for more member facing resources to help streamline document procurement and finalization. The IT Staff had recently upgraded the switches and installed Cat6 Ethernet cabling to provide 10 Gb network connections to future proof the infrastructure. However, this resulted in the funds not being available to upgrade the wireless network. Although, the IT staff knew that the hardware they had wouldn't suffice for a wireless network they saw a need and made a small wireless network of four, outdated, consumer grade, Linksys WRT54GL Wireless-G capable router. These routers were installed at two of the branch locations and two in operations center. When these devices were configured the IT team informed the staff that only 3-5 wireless devices would be able to connect and it was possible that connections would probably not be the best. Not only were these wireless routers slow, they were not very secure as the IT staff connected them directly to the branch switches and did not section off the network traffic with a secure VLANs to direct and block unwanted traffic.

More employees were wanting to use mobile, wireless devices to help members sign documents and some employees were starting to have members use their own wireless devices to connect to get documents downloaded and signed or to just have Wi-Fi while waiting to be helped by staff. This posed even more of a strain on the connection as the wireless routers were not made to have more than five connections and didn't have the bandwidth and speed capabilities needed. After multiple complaints from employees, the IT staff decided it was necessary to upgraded the wireless network.

With the updated infrastructure already in place and more funds allotted to the IT department, they were able to look into upgrading the network. They wanted to have wireless

access in all the branch locations and to cover the 3-level operations center with sufficient wireless signal. Also, with having the need for more than 4 access points, it sparked the desire of having a centralized management console for the access points. They wanted to get this project proposed and completed as quickly as possible, so they reached out to TechRight Networking for a consultation.

MWCU contracted TechRight Networking to asses and upgrade the wireless network for the branches and operations center. The proposed solution involved configuring and installing a Cisco Catalyst 9800-L Wireless Controller which allows for the IT staff to administer and maintain the wireless network from a centralized location. TechRight also configure and installed 16 – Cisco Aironet 4800 Wireless access points at the branch locations and operation center which now provides a wireless network capable of 400 clients running on 802.11ac wireless signal, a much-improved network than was currently being used. The new access points are able to provide separate Service Set Identifier (SSID's) for secure connections, one for employees to connect to and the other for visitors. As part of the security for the credit union information and data across the network, TechRight assisted the IT staff in creating VLAN's to separate the employee wireless network traffic from the visitors' traffic. These VLAN's also aid in making sure that employee traffic is prioritized to have quick response for the internal intranet and external internet connection over the visitors' external internet only connection.

TechRight began the upgrade process by first meeting with the IT Manager, Operations Manager and a couple of the branch managers to determine what the true need and wants of the wireless network were and to get a project scope. They visited the operations center and branch locations to gain an understanding and to map out the current networking equipment and cabling.

At the time of the physical visits, TechRight was able to generate heatmaps to determine signal strengths and weakness to find the best locations to install the wireless access points.

Once TechRight had the scope, infrastructure, and heatmap information, they were able to proceed with ordering the hardware for the project. When the equipment was delivered TechRight was onsite at MWCU and configured, installed and tested the equipment. After all the equipment was installed, they trained the IT staff on how to use the wireless controller to view and manage the wireless access points. As part of the training, they provided basic wireless network troubleshooting steps to aid the IT Staff in quickly resolving issues. TechRight also provided documentation that will help employees and visitors to be able to connect to the wireless network.

Review of Other Work

Creating multiple Service Set Identifiers (SSID) was part of the new wireless network configurations for MWCU. The IT staff and management wanted to know why it was so important to have different SSIDs configured. TechRight was able to provide reference from documentation on Cisco's site, *Configure Multiple SSIDs on a Network* (Cisco, 2018) that states the following:

> In environments where people come and go such as coffee shops or co-working spaces, it is best practice to segment networks. Create a shared network for the employees where sensitive, corporate data can be exchanged (private network) and another one for the transient workers or customers (guest network).

The document continues to give advantages that MWCU was looking for such as being able to secure traffic to keep the internal communications private and help the network maintain connectivity.

Connectivity to the digital world is a want that is becoming more of a needed expectation. People want to be able to keep their mobile devices connected to the internet easily and efficiently. Having a Wi-Fi connection that works flawlessly for a corporation's employees as well as for its guest can present challenges, especially when it comes to multiple devices connecting at the same time and keeping the connection up. Generally, being able to provide this working wireless network requires the use of two separate networks. The network infrastructure provider, CommScope has a study of the Adina Apartment Hotels group network upgrade. It was especially import to the hotel group that the new Wi-Fi solution would perform powerfully and flawlessly, even when a large number of devices were dialed into it simultaneously (CommScope, 2020). This a great example of why two separate networks for operations and guest is important. Although, Mountain West Credit Union doesn't have large branch buildings and hundreds of guests like the Adina Ap Hotels, it was important to them to have a flawless and powerful wireless network. TechRight was able to configure a network for Mountain West Credit Union that is capable of handling the workload of the employees and the temporary connections of guest, but it was also setup to expand for future implementation and growth.

A couple of the major components of a wireless network are the wireless access points and the configurations to make the system work. When there are just a few AP's it is a simple task to manage them, but when that number grows to 10, 20 plus it can be overwhelming for a small IT team to maintain. Wireless LAN controllers can make managing a wireless network much more effective and efficient. Aruba Networks, a wireless networking subsidiary of Hewlett

Packard reported a study of the wireless upgrade of Mount Waverley Secondary College where

they implemented the use of two wireless controllers. The college only has a four-man team, so

being able to manage the wireless access points from one location makes it much easier for them.

The new controllers have helped them to gain enhanced flexibility and full control over their

entire wireless infrastructure (Aruba, 2015). Mountain West Credit Union has an IT team of only

five persons and they were concerned about being able to manage each access point and

troubleshoot wireless network issues. TechRight ensured them that with the new wireless

controller they had installed they would be able to maintain full control of the wireless access

points and the network and it would aid them to more easily diagnose Wi-Fi problems.

Changes to the Project Environment

MWCU was using out-of-date, Linksys WRT54GL wireless routers as Wi-Fi access

points. As a result of these devices being residential grade, they did not sufficiently support the

need that the credit union had with wanting to use a wireless network at their branches and

operations center. Another downside to these wireless routers, is that they were not able to be

managed by a central management console and the IT staff have to spend time logging into each

device separately to make changes or troubleshoot. There were some benefits in the MWCU

environment that helped with the wireless upgrade is that the credit union had finished an

upgrade of the network infrastructure. One of those was benefits was the installation of new

Cisco 9248-48P switches, which provided the capability power over ethernet connections.

Another benefit is that when the new switches were installed, Cat6e ethernet cable was also run

throughout the operation center and in the branches.

When the project was completed the wireless routers that were being used were removed

and the new Cisco Aironet 4800 wireless access points were installed. There is a total of 16

access points, one at each branch location installed in a central location to provide the best signal

and two on each level of the operations center positioned to provide the greatest signal strength

for the employees without creating signal interference. The configurations of the new access

point allowed it to be mounted above the ceiling tiles to be out of site. The new switch at each

location and cabling that was installed was great for the wireless access points, as it provided

power, eliminating the need for a separate power adapter and utility power outlet at the

installation point. It also, is a major factor in providing the needed bandwidth and speed for the

increased network traffic. A new Cisco Catalyst 9800-L wireless LAN controller was installed in

the main network closet at the operation center and logical network routes created to allow for

the controller to communicate with each of the access points. The wireless network as eliminated

the complaints from the employees and the new controller has helped the IT staff to better

manage the wireless network by being able to more quickly resolve any outages or other Wi-Fi

network issues.

Methodology

The methodology model used for this project was the ADDIE model. The ADDIE model

has five different phase which are: Analysis, Design, Development, Implementation, and

Evaluation. When properly applied, ADDIE is a functional and fluid method that helps a project

move through different life cycles in an efficient manner.

As part of the analysis phase, TechRight met with the MWCU IT manager, Operations

manager and a few of the branch managers to determine the number of wireless devices that may

be connected at any given time and what the employee tasks will be while connected to the

network wirelessly. Also, noted during this time was the need for what traffic is needing to be

secure, verses what traffic can be allowed to freely traverse the network. TechRight made site visits to get building and room dimensions and heatmaps to determine what the strength of the wireless signal would need to be.

The scope formulated during the analysis phase played a vital part in the design phase for TechRight. They worked with the IT Staff to determine the best locations within the branches and the operation center to install the wireless access points. Once the access point location was determined, TechRight verified that the access point they suggested would provide the right signal strength and allow for enough clients to connect. TechRight helped the IT staff to create employee and visitor SSID's for the access points and VLAN's on the switches for the network for it to be properly secured.

After the design phase was completed, TechRight moved to the development phase where the necessary hardware was ordered and it was delivered to the credit union. While waiting for the hardware, TechRight assisted the IT staff in configuring VLAN's on the switches to separate visitor traffic to be routed externally to the internet, and configured a VLAN to route the employee traffic to stay within the MWCU network. They also created and documented the new employee and visitor SSID's.

During the implementation phase, TechRight went on site at the MWCU operations center and remove the old routers from the ops center. They installed the wireless controller and verified that the staff could manage it via the network. They configured the 6 access points and installed them in the operations center. At the operations center, they configured the other 10 access points and then went out to the branches and installed them and remove the other two remaining routers.

Finally, the project reached the evaluation phase where TechRight met again with the IT staff to verify that the installations and configurations of the access points were correct. They trained the IT staff on how to test network connections, troubleshoot connection issues and use the wireless controller to manage the wireless network. They provided the documentation for the employees and visitors to reference when connecting to the wireless network.

Project Goals and Objectives

	Goal	Supporting objectives	Deliverables enabling the project objectives	Met/Unmet
1	Upgrade wireless network at MWCU	1.a. Obtain the requirements that the MWCU management and employees want the wireless network to be for	1.a.i. List of different job functions that the employees will use the wireless for	Met
			1.a. ii. Obtain the approximate number of wireless devices that will connect to the network	Met
		1.b. Gain an understanding of the operation center and branch buildings' physical layout	1.b.i. Have a blueprint of the operation center for building dimensions; all 3 floors and blueprints of the branch locations for building dimensions	Met
			1.b. ii. Generate heatmaps for each location of where access points will be installed	Met

			1.b.iii. Obtain a logical and physical map of the network infrastructure and cabling for access point connection	Met
		1.c. Procure and configure the network hardware	1.c.i. Get Approved order for network hardware and order the hardware	Met
			1.c. ii. Switches configured with VLAN's to separate network traffic	Met
			1.c.iii. Configured access points with SSID's	Met
			1.c. iv. Configured wireless controller used to manage all access points	Met
		1.d. Remove old and install new network equipment	1.d.i. Old wireless routers removed	Met
			1.d. ii. 10 -Wireless access points installed at branches; one at each	Met
			1.d.iii. 6 -Wireless access points installed on the 3 floors of the operations center	Met
			1.d. iv. 1-Wireless controller installed at the operations center to manage all access points	Met
		1.e. IT staff that is trained to manage the	1.e.i. Documentation provided on how to use the wireless console	Met

		wireless network	1.e.ii IT Staff able to use the wireless controller successfully to manage the wireless network	Met
			1.e.iii. Troubleshooting steps to determine network issues	Met
			1.e. iv. Documentation provided to help instruct employees and visitors on how to connect to the wireless network	Met

Goals, Objectives, and Deliverables Descriptions

This project's main goal was to establish a secure, and reliable wireless network for employees to connect to using mobile devices and for visitors to use when on site. This has helped the employees in efficiently create and finalize documentation for the credit union members. It has also helped vendors and members to be able to use Wi-Fi when at the branches or visiting the operation center. This goal was met by the successful completion of the following five objectives:

- Objective 1a: Gained understanding of the need the credit union management and employees had for the wireless network. As part of this assessment, TechRight was able to learn some of the key job functions that could be done from a wireless device. This objective was successful when the assessment was completed and the client provided a document of the listed job requirements and an approximate number of devices that would be connecting to the wireless network.

- Objective 1.b: Gained an understanding of the physical layout of each floor of the operations center and branch locations. Learned the logical and physical topology of

the network infrastructure. This objective was completed when TechRight had

finished the onsite visits and obtained blueprints and heatmaps.

- Objective 1.c: One of the critical objectives was to procure the necessary hardware

    which took most of the time and helped the project to become more "real" in that a

    physical hardware was obtained. The VLAN's and SSID's were created before the

    hardware was received, which helped to be able to more quickly configure the

    hardware. This objective was successful when all the hardware was received and the

    VLAN's had been configured on the current switches and the SSID's had been

    configured on the access points.

- Objective 1.d: The objective that brought the project together was the installation of

    all the new hardware. This objective was successful when all access points had been

    installed at the ops center and branches and the wireless controller had been installed.

- Objective 1.e: TechRight wrapped up the project by training the IT staff and provided

    documentation to help in troubleshooting and setting up the network connections.

    This objective was successful when the IT staff had the necessary documentation in

    hand and they signed off on being able to effectively use the wireless controller to

    manage the wireless network.

Project Timeline

Milestone or deliverable	Planned Duration (Hours or Days)	Actual Duration (Hours or Days)	Actual Start Date	Actual End Date
Project kick off with MWCU management teams	4 Hours	5 Hours	9/14/2020	9/14/2020

Create a list of job functions done on wireless network	2 Hours	1 Hours	9/14/2020	9/14/2020
Obtain approximate number of wireless devices connecting to network	1 hour	1Hour	9/14/2020	9/14/2020
Obtain blueprints of the ops center and branch locations	3 hours	3 Hours	9/15/2020	9/15/2020
Obtain a logical and physical map of the network infrastructure and cabling	1 Hour	1 Hour	9/15/2020	9/15/2020
Generate Heatmaps for the 3 floors of the ops center and each branch location	1.5 Days	1.5 Days	9/15/2020	9/16/2020
Get hardware order approved	2 Hours	2 Hours	9/17/2020	9/17/2020
Order hardware from vendors and wait for delivery	6 Days	8 Days	9/17/2020	9/28/2020
Configure current switches with a VLAN for employee traffic and one for visitor traffic	1 Day	1 Day	9/29/2020	9/29/2020
Create and document each SSID configuration	3 hours	3 hours	9/30/2020	9/30/2020
Hardware delivered to MWCU	1 Day	1 Day	9/28/2020	9/28/2020
Configure the access points with the SSID's	6 Hours	6 Hours	10/1/2020	10/1/2020
Configure the wireless controller to be managed by IT Staff and verify all access points listed in the console	3 Hours	3 Hours	10/1/2020	10/1/2020
Install wireless controller at the operation center	1 hour	1 Hour	10/1/2020	10/1/2020
Install wireless access points at the operations center	1 Day	1 Day	10/1/2020	10/2/2020
Remove old wireless routers from branches	2 Hours	2 Hours	10/2/2020	10/2/2020

Install wireless access points at the branches	2 Days	2 Days	10/2/2020	10/5/2020
Provide documentation on how to use wireless controller	2 Hours	2 Hours	10/1/2020	10/1/2020
Train IT staff on how to use the wireless controller	2 Days	2 Days	10/5/2020	10/7/2020
Provide documentation of troubleshooting steps to help with determining network issues	2 hours	2 Hours	10/5/2020	10/5/2020
Provide documentation to help instruct employees and visitors on how to connect to the wireless network	3 Hours	3 Hours	10/5/2020	10/5/2020
Follow up with MWCU management team and IT Staff to verify the wireless network is performing as requested	3 Days	3 Days	10/6/2020	10/9/2020

TechRight remained focus and intent on keeping the timeline that was set. As part of the project there was a delay in the delivery of the hardware by two days. This set the completion date back by two days to October, 9th 2020. However, even with this minor setback there were other parts of the project while waiting for the hardware to arrive.

Unanticipated Requirements

Although there was new cabling installed in the operations center and in the branch locations, there were 3 branches that did not have cable run far enough for the access points to be connected. This was a minor setback as TechRight has techs that specialize in cabling. They were able to schedule their tech to be on site at the 3 branches that needed longer cables. The

new cable was run and the wireless access points were connected without any delay to the

project.

Conclusions

The wireless network upgrade for Mountain West Credit Union improved the working

environment for employees as it has increased the satisfaction of members and other visitors.

The new wireless network has allowed for employees to connect and maintain a connection

without the constant disconnecting because the circuits are overloaded. It has helped them to

create and finalize documentation without having to print hard copies for the members to sign. It

has also helped for the staff that have poor cell coverage to be connected via Wi-Fi to continue

email and other messaging correspondence on their phones or other mobile devices. As for

members and visitors, the wireless network has allowed for them to connect while waiting in the

lobbies and has helped vendors to be able to connect their devices to access resources they may

need over the. This project has been considered a success as the wireless network has maintained

90% uptime a week in the past month and they have seen 85% of new member and loan

documentations processed over wireless devices which is 10% more than was expected.

Project Deliverables

Appendix A shows the logical network diagram after TechRight had completed the

project. The diagram shows the logical connection flow from the Cisco 9800-L wireless LAN

Controller to the connected Cisco Aironet 4800 Access Points. It is also depicted how wireless

devices are connected to access points.

Appendix B shows the configuration commands used to configure the VLANs on the switches. With the two separate VLANs, 'Employee' and 'Guest', the guest traffic will not be broadcasted across the internal employee connection creating a more secure network environment.

Appendix C has 3 different charts that show the Wi-Fi usage, the Up time for the wireless network and the percentage that the network has been up for the past 3 months. The first chart is the Wi-Fi Usage in days, which shows there has been a large increase in the day used in October compared to the days of August and September. The chart, "Up-Time of the Wireless Network" show that MWCU had a desired time of 20 days for a 4-week work day period and were not quite making that before the upgrade. After the upgrade, they had a 23-day uptime for a 4-week work day period. The pie chart complements the Up-Time chart and shows the wireless network upgrade was a success with 90% uptime in October compared to lower times reported in September and August.

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Appendix A

Logical network map after network completion.
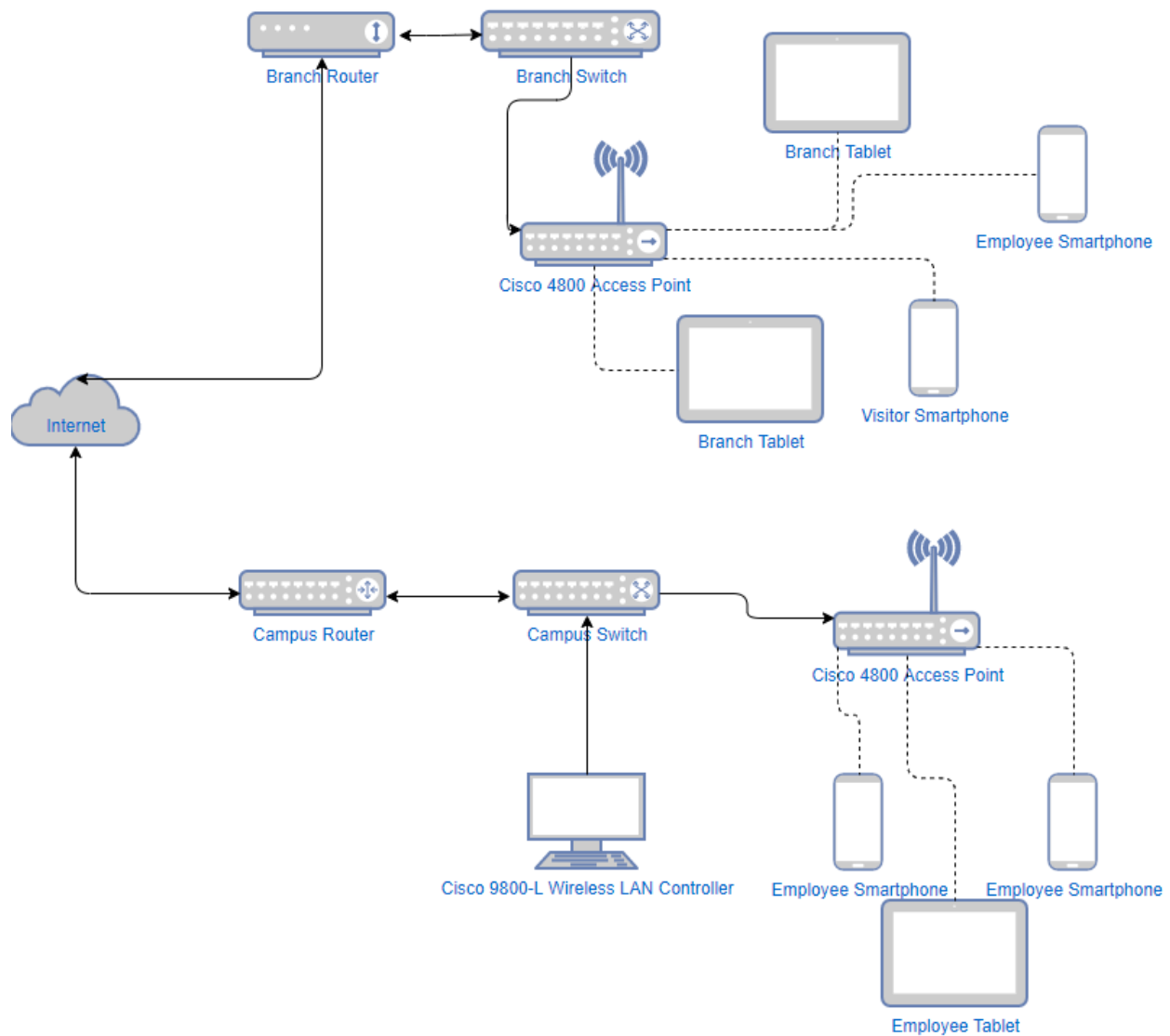
Appendix B

VLAN configuration commands

```
City_Branch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
City_Branch(config)#vlan 10
City_Branch(config-vlan)#name Employee
City_Branch(config-vlan)#end
VLAN 10 added:
    Name:Employee
City_Branch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
City_Branch(config)#interface fa1/0/10
City_Branch(config-if)#switchport mode access
City_Branch(config-if)#switchport access vlan 10
City_Branch(config-if)#end
City_Branch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
City_Branch(config)#vlan 24
City_Branch(config-vlan)#name Guest
City_Branch(config-vlan)#^Z
00:18:30: %SYS-5-CONFIG_I: Configured from console by console
City_Branch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
City_Branch(config)#interface fa1/0/24
City_Branch(config-if)#switchport mode acc
City_Branch(config-if)#switchport access vlan 24
City_Branch(config-if)#end
City_Branch#write
Building configuration...
[OK]

City_Branch#show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- ----------------
1    default                          active    Fa1/0/1, Fa1/0/
                                                Fa1/0/5, Fa1/0/
                                                Fa1/0/9, Fa1/0/
                                                Fa1/0/14, Fa1/0
                                                Fa1/0/18, Fa1/0
                                                Fa1/0/22, Fa1/0
2    test30                           active
10   Employee                         active    Fa1/0/10
24   Guest                            active    Fa1/0/24
```

Appendix C

Wi-Fi Usage and Uptime Charts and Graphs