**March 2020**

## Rolling Study Halls - A Simple Guide to Setting Up Wi-Fi Networks on School Buses in Rural Communities

### Background Information

**Location**: Caldwell County, North Carolina
**Student Population (K-12)**: Approximately 11,000
**Caldwell County Population**: 82,000 (Mostly Rural)
**Terrain**: Foothills/Mountainous

Spring of 2016, the Education Foundation Inc. of Caldwell County partnered with Google to implement Rolling Study Halls. Concentrating on long rural bus routes with little or no internet access in homes, technicians installed wireless internet routers on school buses. Students received technology to use on buses; teachers boarded to provide instruction, and students took advantage of the hour plus rides to complete assignments.

Spring of 2020, the global pandemic made Rolling Study Halls even more relevant. Schools closed, and online education became the norm. Life was difficult for students and teachers who did not have access at home. Google and the Education Foundation teamed up again to upgrade and expand the Wi-Fi bus fleet. Google provided new and updated equipment to boost the signal beyond the school bus. The idea was to use the buses as stationary Wi-Fi hotspots that could be strategically parked throughout the community for students to access safely by sitting in a car or on a nearby park bench.

Bus routers also needed electricity. Caldwell County Schools and community sites provided outlets and extension cords that connected buses to outlets. In addition, mesh network kits were built to enhance and extend bus networks to help boost the signal over a larger area. The costs to outfit each bus cost approximately $2,800 and the mesh network kits cost $1,400. A breakdown of equipment used along with the cost of each item is outlined below.

## Tips and Recommendations

### Make sure the superintendent and IT Department are on board!

**As a nonprofit organization that supports students and teachers, it is imperative that the superintendent and IT Department are a part of the conversation. IT will need to implement all federal guideline filters and other safety softwares necessary to protect students and networks. If IT department employees install and maintain the equipment, initial costs are reduced.**

## Make sure the bus garage is on board!

**The main job of the good people who work at the bus garage is to make sure buses are operating safely and effectively. Questions may include:**

- **Placement of routers: The devices are small and typically are housed in the storage compartment near the driver's seat. Each bus is a little different so it is important to work closely with the bus garage team.**
- **Placement of buses: Where will the buses be parked? Will vandalism be an issue?**
- **Will day-to-day operations be affected?**

## Install units on newer buses if possible.

**Hopefully the Wi-Fi units will provide service for several years. Installing Wi-Fi on newer buses will decrease downtime and installation cost if older buses are taken out of service.**

## Think about power.

**A simple 110 watt outlet (simple wall outlet) is all that is required. Converters were installed on the units. Buses could then be parked and the routers powered with extension cords. That being said, technicians must consider parking the bus near an accessible electrical outlet. When the buses are not parked and are back in service to transport students, the router will be powered through the bus battery. Keep in mind that the bus will have to be powered on for the Wi-Fi router to work. When the router is plugged in using the extension cord, the router runs 24/7.**

## Mesh network kits are cool but not necessary.

**Mesh kits allow signals to extend to a larger area. Mesh kits do not have to be used strictly on buses. They can be used anywhere to extend any signal! As long as technicians can run an internet connection to the main antenna, an extended area is beneficial. For example, with mesh kits, Caldwell County Schools has the option to extend signals within the school buildings to cover outside areas for larger usage.**

## Mesh Kits Need More Outlets

**Mesh kit units operate using small antennas. There is a main magnetic antenna that mounts to the bus that blasts the signal to other smaller antennas in the area. Each antenna needs to have its own outlet. Most big parking areas have large street lights that can be used but may require some additional wiring, adding to your costs.**

## No Cell Service = No Internet.

**Routers connect to the Internet using cellular service, just like smartphones. If there is a weak signal, a weak internet connection occurs. Mesh kits do not require additional provider costs. They act as extenders. Investigate what service provider in your area has the strongest signal and negotiate the price of each unit.**

## Parking the bus on public or private property.

**Written agreements should be made with all property owners before parking a bus. Some businesses will want to "host" a bus. However, liability may be an issue if damage occurs. Public spaces such as parks, libraries, and recreation centers are easier for the school system to work with and are typically well lit and have a safe environment. Religious properties are also possible safe areas where community members would take advantage of the hotspots. Work closely with the bus garage staff to ensure they are comfortable with each identified location.**

## Unwanted Guests

**Buses may attract area homeless populations. One municipality discovered someone sleeping in the bus. No damage was done, but hosts and the school system need to be aware that this could be an issue.**

## Market the buses for your community.

**The target audience for the buses are public school students. That being said, bus hot spots can benefit others as well. Consider offering locations to all citizens who may need access. Working closely with the school system's public information officer and local news outlets may be beneficial ways to market the availability and locations of service.**

## Partner with other institutions.

**The Education Foundation and Caldwell County Schools partnered with the local community college who also strategically marketed the use of the hotspots to their student body. The college also converted all of their seated classes to online classes due to Covid-19. Even though college students do not necessarily have the same logistical issues as a K-12 system population, there are still many students who cannot afford or don't have access to the internet because of rural topography. Wi-Fi on buses serves as a safe and easy alternative. Other potential partners may include your local workforce development boards, universities, preschools, and other nonprofits.**

## Closing Remarks

**The Education Foundation Inc. hopes the Rolling Study Hall guide will help your organization get started. There are several moving parts that go along with a project like Rolling Study Hall, and there will be other issues that the Foundation may not have covered or experienced. Each school system is unique. There is not a one-size-fits-all solution, but the fundamental elements remain the same. Success in implementing Rolling Study Halls will primarily depend on one key characteristic, communication. Communication is by far the most important aspect needed to get the project off the ground. Be sure to have everyone at the table to discuss a plan for your school district before you make a single purchase and remember that the Education Foundation Inc. of Caldwell County is here to help. Good luck!**

**April 2020**
**Hotspot/Wi-Fi System for School Bus Itemized List of Equipment**

**The Education Foundation Inc of Caldwell County**
**Caldwell County Schools Rolling Study Halls**

| Item | Amount |
|---|---|
| CradlePoint MA3-0900120B-NNA includes CradlePoint NetCloud Manager / CradleCare Support Bundle | $1,148.00 |
| Great White MiMo 2G/3G/4G, Optional MiMo WiFi + Optional GPS Vehicle Antenna with 17' cables | $269.00 |
| Installation | $399.00 |
| Aerolina Project management | $250.00 |
| Aerolina System Management and Support ($15/month for 12 months) | $180.00 |
| T-Mobile unlimited government data plan ($39/month for 12 months) | $468.00 |

**SUBTOTAL 2,714.00**
**TAX 185.85**
**TOTAL $2,899.85 per bus**

**April 2020**
**Portable Mesh Network Kits Itemized List of Equipment**

**The Education Foundation Inc of Caldwell County**
**Caldwell County Schools**

| | |
|---|---|
| Ubiquiti Unifi Cloud Key - Remote Control Device | $175.00 |
| 8 Port PoE Network Switch | $80.00 |
| Ubiquiti UAP-AC-M-PRO-US Unifi Access Point | $200.00 |
| Ubiquiti UAP-AC-US Unifi Mesh Access Point ($125 per unit x 4 units) | $500.00 |
| Equipment Case | $40.00 |
| Magnetic roof mount antenna mast | $85.00 |
| Cat6 Cables | $25.00 |
| Assembly/Programming/Testing | $150.00 |

**SUBTOTAL 1255.00**
**TAX 99.45**
**TOTAL $1354.45 per kit**