

# Holden R-III School District

## Data Network Assessment Recommendations Report for Holden R-III School District

Prepared by Yellow Dog Networks, Inc.  
March 10<sup>th</sup>, 2016

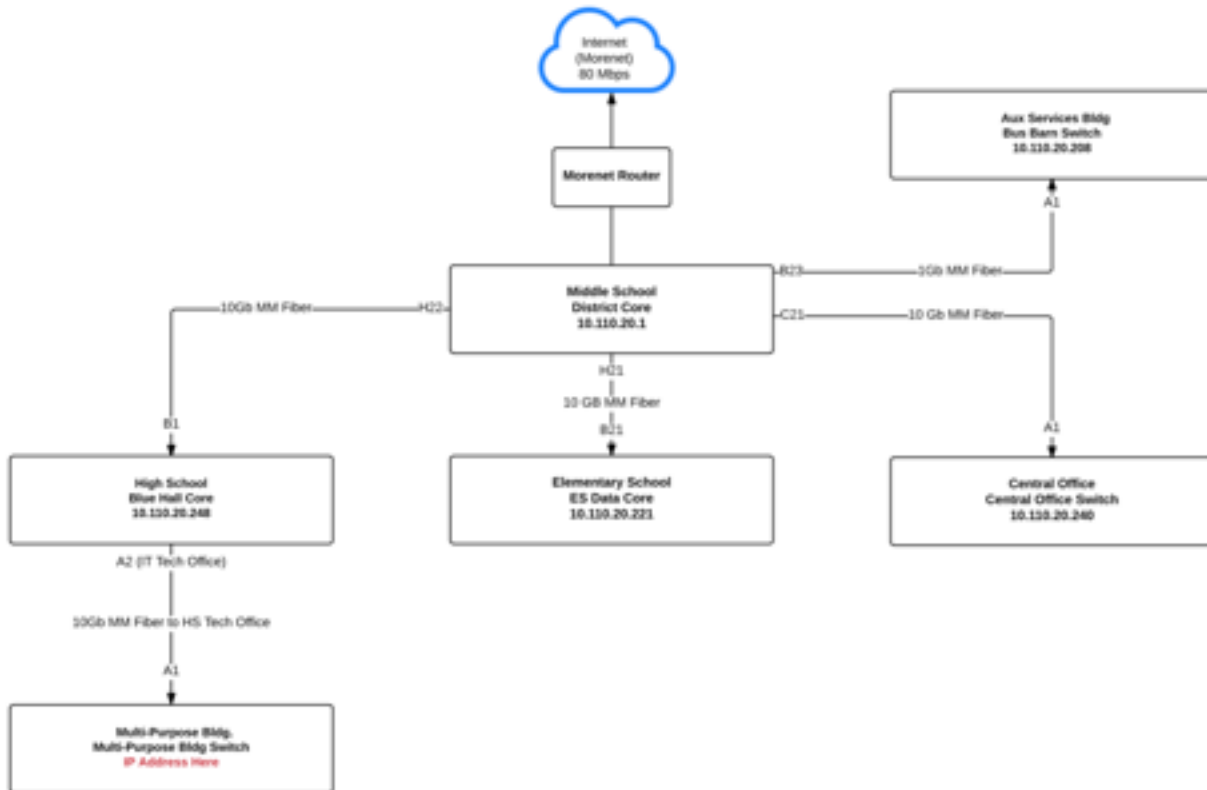


Overview:

On March 7<sup>th</sup> 2016, Yellow Dog Networks, INC. (YDN) had a network engineer on-site at the District to gather information regarding the data network infrastructure, access the state of the network, and provide recommendations where necessary.

**Current Data Network Architecture/Design/Inventory:**

The Holden School District data network is comprised of HP wired network switches and Aerohive wireless access point (APs) with a cloud based controller. The wired network architecture is a star topology with the Middle school being hub. Below is a high-level diagram of District’s Wide Area Network (WAN):



As stated earlier, the District utilizes HP switches for its data network; the following is a list of this equipment by location:

**HS Tech Closet - High School**

- 1x HP2920 24 Port, PoE+
- 1x APC Smart UPS SC 450
- Fiber Uplinks: To HS Core, To Multi-Purpose Building

**Multi-Purpose Building**

- 1x HP2920 24 Port, PoE+
- No UPS, switch goes direct to wall

Fiber uplink: To HS Tech Closet switch

### **Ag Closet - High School**

1x HP2920 24 Port, PoE+  
1x APC Smart UPS SC 450  
Fiber Uplink: To HS Core

### **Whitehall Closet - High School**

1x HP E5412 Chassis Switch  
8x24 port slots are used, 4 free  
3x APC 3000 UPS  
Fiber Uplinks: To HS Core

### **HS Office Closet**

1x HP2920 24 Port, PoE+  
1x APC Smart UPS SC 450  
Fiber Uplink: To HS Core

### **HS Elevator Closet**

\*Contains uplink to outside wireless AP  
1x HP 2910a1, 48 port, PoE+  
Fiber Uplink: To HS Core  
1x APC Smart UPS SC 450

### **Bluehall Closet - HS Core**

1x HP E5412 Chassis Switch  
5x24 port slots used, 1x SFP/+ module(8-ports), 6 used  
1x APC 3000 UPS  
Fiber Uplinks: MS Core, Elevator closet, Ag closet, Whitehall, Tech Office, HS Office

### **MS-SPED Closet**

1x HP 2910a1, 48 port, PoE+  
1x APC Smart UPS SC 450  
Copper Uplink: To MS Core

### **MS Tech**

1x HP 3500yl 48G, PoE+ switch  
1x APC Smart UPS SC 450  
Copper Uplink: To MS Core

### **MS Core Closet**

\*Phone system, firewall, Morenet Connection are in this closet  
1x HP E5412 Chassis Switch  
10x24G slots populated, 2 free  
Symmetra LX XR APC UPS, 4 slots free for expansion  
Fiber Uplinks: To Central Office, Elementary school, High School, Bus Barn (Aux services), and Tech room/Lab

### **Bus Barn/Aux Services Building**

1x HP 2910a1, 24 port, PoE+  
1x APC Smart UPS SC 450  
Fiber Uplink: To MS Core

### **Early Childhood Building**

1x HP 2910a1, 24 port, PoE+  
No UPS present, direct to wall outlet  
Fiber Uplink: To Elem Core

### **Elementary K-2 Closet**

1x HP 5406, PoE+, 5x24 port slots used, 1G  
3x APC Smart UPS 3000  
Fiber Uplink: To Early Childhood and 3-5 Closet

### **Elementary 3-5 Closet**

1xHP5412 Chassis Switch, 7x24 port slots used, 1G, 5 free  
2x APC 3000 UPS  
Fiber Uplinks: To Middle School and K-2 Closet

### **Central Office**

1x HP 2910a1, 48 port, PoE+  
1x APC Smart UPS SC 450  
Fiber Uplink: To MS Core

### **MS Tech Lab**

1x HP 2910a1, 48 port, PoE+  
No UPS present  
Fiber Uplink: To MS Core

### **Wireless:**

The District currently utilizes Aerohive for its wireless data network infrastructure. Specifically, the District uses Aerohive AP121s for indoor use and AP 170s for outdoor use. Both of these APs are 802.11n compliant, have dual radios, and with 2x2 MIMO support. Access Points with these characteristics are typically intended for low to medium user density environments.

### **Switch Configurations:**

While on-site, the YDN engineer gathered the switch configuration files that were accessible. Most of the files were not available due to the inability to access the switch via Telnet or SSH. YDN is still waiting for receipt of the majority of the configurations. Building to building connections are mostly using 10G multi-mode fiber with most MDF to IDF connections using 10G as well.

### **Recommendations Wired and Wireless Network:**

The District's production HP switches are adequate for the devices currently in use on the Holden SD network. However, the District's Aerohive based wireless network is questionable concerning the amount of bandwidth available per wireless device. There have been advancements in both wired and wireless Ethernet technology that the District can advantage of concerning one-to-one initiatives and instruction delivered over the wired and wireless data network infrastructure.

The District is currently utilizing 802.11n (2x2 MIMO) technology that delivers a theoretical throughput of up to 300 Mb/s. Current wireless technology (802.11ac) can deliver 1.3 Gb/s of wireless throughput. Obviously, this is faster than the port speed of the wired switch where it is connected.

The Holden R-III School District should consider upgrading the edge HP switches to a platform that supports multiple gigabit Ethernet speeds (1/2.5/5/10BaseT). This will eliminate bottlenecks at the edge of the network where 802.11ac APs are deployed and operating at 1.3 Gb/s speeds. This will then allow for much faster throughput on the wireless instructional network. Additionally, the District should consider replacing the current access points with ones that support 802.11ac. Yellow Dog Networks has extensive experience in designing and implementing wireless solutions in the K-12 space and would recommend placing a wireless access point in every classroom.

### **Recommendations Switch Configurations:**

As stated earlier, YDN has not received all of the switch configurations for a full and thorough evaluation. However, it appears as though the wired and wireless networks may occupy the same IP address space. If this in fact the configuration, it should be changed so the wireless network(s) are in a different subnet(s) than the wired subnet(s). In the case of one the switch configurations we did obtain, the switch has an IP address on several of the VLANs. If the switch is not routing for a particular subnet, then it should not "own" an IP address on that subnet. We can provide more analysis later when we receive the remainder of the switch configurations.