

NAPA VALLEY UNIFIED SCHOOL DISTRICT COMMUNICATIONS PROJECT

Summary

The goal of this project was to research, review and provide options for consideration to adopt a quality and cost effective communication solution to meet the growing communication needs of the Napa Valley Unified School District (NVUSD). Both District-owned and commercially managed communication platforms were researched in order to provide NVUSD with an all-encompassing interoperable communications solution.

In reviewing the numerous communication vendors and products that are available, one organization that stands out based on price point, capabilities and customer service is Crystal Communications. Crystal Communications is based in San Leandro, CA and has been in business since 1962. See Attachment A, "Crystal Communications Business Summary."

Crystal Communications services the Greater Bay Area and its customer base includes small, medium and large scale organizations that rely on an uninterrupted communications platform as part of their business model. One of Crystal Communications specialties is developing and supporting communication systems for school districts.

The information that follows addresses specific information about NVUSD that was considered in developing a viable option for implementing a communications platform that is reliable, sustainable and meets the needs of NVUSD.

Overview

Public safety communication problems are not limited to one city. It is a nation-wide problem that impacts preparedness and safety on the federal, state and local levels. Fire and police chiefs, mayors, governors, county executives, school districts and emergency management officials are worried about the level of preparedness for their jurisdictions and respective agencies, especially when it comes to the basic need of communicating. No matter how well prepared and coordinated a response may be, the lack of rapid, instant communications hinders response efforts.

Interoperable communications mean different things to different agencies, districts, cities or states, depending on their current communication capabilities and needs. One definition that everyone seems to agree on, however, is that interoperable communications is the ability for local, state and federal organizations to talk with each other, share data and send information when they need to.

It is managed communications, determined and deployed by organizations before a crisis occurs. It is day-to-day communications that easily shift to emergency communications for everyone at the scene of an incident. Communications link critical components together in an emergency.

As you are aware, the tools to create interoperability are more available today than ever before. State and local governments have considered many immediate, short and long-term solutions to create interoperable communications among their first responders, as well as other key entities that are a critical part of maintaining their continuity of government. Each jurisdiction has different needs, requirements or geography that may dictate certain solutions. Some have used console patches that link different trunked systems. Others have designated certain radio channels as their interoperable channels. Some communities have used microwave links for data interoperability and have installed switches to allow different agencies to talk to each other.

The information below identifies several suggested interoperable solutions that will achieve the desired level of interoperable communications sought by the NVUSD.

Current Status

Napa Valley Unified School District (NVUSD) currently uses a commercially available cellular system to provide mobile communications throughout the District. This system is limited in scope, as well as, its capabilities. In reviewing this system, it was determined that coverage is very limited and often times staff experience “dead spots” where they have no communication capability. This poses a significant safety issue to staff who may be in need of assistance. Outside of the current cellular system in use, NVUSD relies on land line and Internet based communication mediums.

Campus/Facility Sites

NVUSD is comprised of 30 campuses and 6 non-instructional facilities, for a total of 36 locations that are in need of communications. It is my understanding that 2 of the campuses (Mt. George and Yountville) are pending closure, bringing the total location number to 34. Below is a listing of campuses and non-instructional facilities within NVUSD.

Campuses		
1. Alta Heights	Elementary	15 Monticito Blvd., Napa 94558
2. Bel Aire	Elementary	3580 Beckworth Blvd., Napa 94558
3. Browns Valley	Elementary	1001 Buhman Ave., Napa 94558
4. Canyon Oaks	Elementary	475 Silver Oak Trl., American Canyon 94503

5. Donaldson Way	Elementary	430 Donaldson Way, American Canyon 94503
6. McPherson	Elementary	2670 Yajome St., Napa 94558
7. MT. George (Pending Closure)	Elementary	1019 Second Ave., Napa 94559
8. Napa Junction (Relocated)	Elementary	300 Napa Junction Rd., American Canyon 94503
9. Northwood	Elementary	2214 Berks St., Napa 94558
10. Phillips	Elementary	1210 Shetler Ave., Napa 94559
11. Pueblo Vista	Elementary	1600 Barbara Rd., Napa 94558
12. Shearer	Elementary	1590 Elm St., Napa 94559
13. Snow	Elementary	1130 Foster Rd., Napa 94558
14. Vichy	Elementary	3261 Vichy Ave., Napa 94558
15. West Park	Elementary	2315 West Park Ave., Napa 94558
16. Willow	Elementary	1480 El Centro Ave., Napa
17. Yountville (Pending Closure)	Elementary	6554 Yount St., Yountville 94599
18. American Canyon MS	Middle	300 Benton Way, American Canyon 94503
19. Harvest	Middle	2449 Old Sonoma Rd., Napa 94559
20. Redwood	Middle	3600 Oxford St., Napa 94558
21. River	Middle	1850 Salvador Ave, Napa 94558
22. Silverado	Middle	1133 Coombsville Rd., Napa 94559
23. NVLA	Charter	2700 Kilburn Ave., Napa 94559
24. American Canyon HS	High	3000 Newell Dr., American Canyon 94503
25. Napa High	High	2475 Jefferson St., Napa 94558
26. New Tech	High	920 Yount St., Napa 94559
27. Valley Oak	High	1600 Myrtle Ave., Napa 94558
28. Vintage	High	1375 Trower Ave., Napa 94558
29. Napa Valley Adult Ed	Ad Ed	1600 Lincoln Ave., Napa 94558
30. Napa Valley Independent Study	Independent Study	1400 Menlo Ave., Napa / 3000 Newell Dr., AC
Facilities		
1. District Office	Non-Instruction	2425 Jefferson Street, Napa 94558
2. Food Service	Non-Instruction	1360 Menlo Ave., Napa 94558
3. Maintenance & Operations	Non-Instruction	1616 Lincoln Ave., Napa 94558
4. Transportation	Non-Instruction	1340 Menlo Ave., Napa 94558

5. Technology	Non-Instruction	1610 Lincoln Ave., Napa 94558
6. Vocational Serv. / Transition – SpEd	Post-Secondary	1680 Myrtle Ave., Napa 94558

Topography

Regional Setting: Napa County is located in the Coast Ranges Geomorphic Province. This province is bounded on the west by the Pacific Ocean and on the east by the Great Valley geomorphic province. A dominant characteristic of the Coast Ranges Province is the general northwest/southeast orientation of its valleys and ridgelines. In Napa County, located in the eastern, central section of the province, the topography consists of a series of long, linear, major and lesser valleys, separated by steep, rugged ridge and hill systems.

Local Setting: Napa County’s highest topographic feature is Mount St. Helena, which is located in the northwest corner of the County and whose peak elevation is 4,343 feet. Principal ridgelines have maximum elevations that roughly vary between 1,800 and 2,500 feet to sea level. These elevations decrease in the southern part of the County. Napa Valley is the main valley in the County. It extends southeast along the west side of the County to near the edge of San Pablo Bay. Valley floor elevations are up to approximately 400 feet near the north end of the valley and approach sea level on the south. Pope Valley is a similar but smaller valley in the upper watershed flowing into Lake Berryessa Reservoir (formerly Berryessa Valley) along the east central part of the County. In the west and east, the County line coincides with the crest of major northwest-trending ridge systems that border on Sonoma and Yolo Counties. Lake and Solano County boundaries are located to the north and southeast, respectfully. The County covers approximately 507,438 acres that provide for a very diverse landscape.

NVUSD Setting: NVUSD’s footprint is spread throughout Napa Valley and encompasses the City of American Canyon to the south and the City of Napa to the north. Within this footprint, American Canyon High School is the furthest south, River Middle School (new location) is the furthest north, Vichy Elementary School is the furthest east and Browns Valley Elementary School is the furthest west. Within the center of NVUSD’s footprint resides numerous campuses and non-instructional facilities and are situated in the city of Napa.

Site visits were conducted at each campus and non-instructional facility to determine their relative location, distance between campuses/facilities, surrounding topography and physical characteristics of individual buildings/structures. Hillsides, low lying valleys and distances between campuses/facilities (American Canyon Middle School to Snow Elementary School-approximately 10 miles) pose significant challenges in building out a comprehensive communication platform that integrates all NVUSD locations.

District-Owned Digital Repeater System

One of the systems reviewed to provide digital radio communications coverage to NVUSD is a stand-alone District-owned digital radio repeater system. With this system, there are no monthly recurring fees.

This system entails placing individual low power digital radio repeaters at selected campuses/facilities to broadcast radio signals throughout NVUSD. This system has the option of being IP connected that enhances radio signal strength by using the internet.

Because of the numerous sites involved, coupled with the topography and distances that radio signals would have to travel from site to site, it is estimated that 10 repeaters would be needed to connect all sites at NVUSD. See Attachment B, "Digital Repeater Site Map." Being that District-owned repeaters are low power, additional repeaters may have to be installed to boost in-building connectivity due to construction materials used at campuses/facilities (concrete, stucco, steel or wood) to alleviate potential dead spots in the system.

A District-owned repeater system, based on its low power output, would not be conducive with mobile operations such as a Transportation Section. With the vast area covered by NVUSD school buses, the signal strength simply would not be enough to support an operation of this type.

One of the challenges with a District-owned repeater system of this size is obtaining the requisite number of sole sourced radio frequencies that would be required to broadcast radio signals throughout NVUSD. To avoid radio signal "bleed over" and interference from other campus/facilities that are broadcasting, a separate radio frequency would be needed for each repeater. Obtaining this number of sole sourced frequencies from the Federal Communications Commission (FCC) would be challenging unto itself, if not impossible. I reviewed the current list of 9 radio frequencies owned by NVUSD to see if they would work on a digital communication network. I found that these frequencies are VHF instead of UHF frequencies and are not conducive to support a digital radio system.

There may be an option to obtain shared frequencies from the FCC, but I would not recommend this option as these types of frequencies lend itself to competing for air time with other entities on your system which result in busy signals, interruptions in communications and others listening to your radio traffic.

Wide Area Network (WAN) System

In looking at a District the size of NVUSD, with all of its topographic challenges, an option to consider that would maximize coverage with both stationary (campuses/facilities) and mobile operations (Transportation Section) would be the implementation of a system that utilizes a Wide Area Network (WAN) system.

A WAN system incorporates a series of high power repeaters that are strategically placed throughout a geographic area to create a “mesh network” that maximizes radio signal strength. WAN systems utilize geographic locations such as tops of hills, mountains or other tall structures in order to broadcast radio signals over large areas without any physical barriers or impediments that could potentially interrupt the radio signal.

Because of the 24/7 operational needs of organizations that rely on WAN systems for their communication needs, these systems are very robust, have power back-up capabilities and are networked in such a fashion to provide redundancies to ensure communications are maintained during emergency situations.

Additionally, unlike low power repeater systems, large numbers of radio frequencies are not necessary due to the high power repeaters that WAN systems have. WAN systems usually are owned by private or public entities and come with monthly recurring fees. These fees are usually based on a sliding scale due to the amount of usage on the WAN system. WAN systems are optimal for entities that have significant geographical challenges, need to cover large distances or are supporting mobile operations. See Attachment C, Kenwood Nexedge Digital System used by Crystal Communications.”

Recommendation

Based on the research conducted and taking into account the short term and long term needs of NVUSD, I recommend implementing a hybrid system that combines both District-owned repeaters, as well as, a WAN system. This option would provide the following: connectivity between each campus/facility, as well as, District Administration during emergency situations; a site specific communication platform where day to day communications can occur; and a robust communication platform for NVUSD’s Transportation Section that is capable of providing uninterrupted communications throughout the transportation footprint.

The proposed hybrid system would provide an increased level of safety for students and staff by having the ability to broadcast and receive emergency communications instantaneously throughout the District over a District-specific emergency communications network. It also addresses the necessity to upgrade an outdated communications system in a cost effective manner with a platform that increases coverage and provides vital communication links throughout NVUSD.

Hybrid System Implementation and Equipment Needs

To provide NVUSD with a robust communications system that optimizes not only day to day communications but also addresses the needs during emergency situations, the following system implementation and equipment is being proposed.

The below information incorporates certain assumptions based on information provided by NVUSD personnel as to the number of radios required for each location. This number could expand or contract based on actual need.

Absent from the list below are the actual number of digital repeaters that would be needed. Because this is a hybrid system that incorporates a WAN system overlay, the actual number of repeaters previously identified as being needed may be less. Testing is currently being conducted at NVUSD sites to determine the quality of in-building reception. At the conclusion of this testing process a determination will be made on the number of digital repeaters needed.

Emergency Communication Base Station Radios: This is a fixed mounted base station radio (Kenwood Model #NX3820HG) that is installed in the front office area of every campus/facility. This radio uses Crystal Communications Wide Area Network (WAN) and connects all campuses and facilities together for emergency radio communications over a dedicated emergency channel specific to NVUSD. See Attachment D, "Kenwood Model #NX3820HG Specification Sheet." These radios will be assigned as follows:

Emergency Communication Radios (one for each campus/facility)-34

Mobile Mounted Radios: This is a fixed mounted radio (Kenwood Model #NX3820HG) that will be installed in all buses within NVUSD's Transportation Section. This radio provides high quality expanding communication capabilities to meet the current and future needs of the user. It is a powerful communication device that is connected to Crystal Communications Wide Area Network (WAN) and will provide coverage throughout the geographical area traversed by NVUSD's Transportation Section. Through specific programming functions, these radios will have the ability to use a direct dial/call-up feature to the Transportation Dispatch Center that will allow for confidential communications between the driver and dispatcher. This radio supports both day to day and emergency communication. In order for the Dispatch Center to communicate with all drivers, a base station will be required. See Attachment D, "Kenwood Model #NX3820HG Specification Sheet." These radios will be assigned as follows:

Buses (Mobile Mounted Radios)-63
Base Station (Dispatch Center)-1

Number of Radios Needed-64

Command Radios: This is a hand held portable radio (Kenwood Model #NX-3320) that provides high quality expanding communication capabilities to meet the current and future needs of the user. This radio features a digital display screen that allows for ease of viewing selected channels. Through specific programming functions, these radios will have the ability to use a direct dial/call-up feature to contact any campus or facility over the Emergency Communication Base Station

Radio. These radios will be issued to select individuals (Department Heads/District Administration/Key Facility Personnel) that have a need to directly contact a campus/facility during normal and/or emergency situations. See Attachment E, "Kenwood Model #NX-3320 Specification Sheet." Command Radios will be assigned to the following sections of NVUSD:

District Headquarters-10
 Food Service-1
 Maintenance and Operations-10
 Transportation-6
 Technology-1
 Special Education-1

Number of Command Radios Needed: 29

Site Administration Radios: This hand held portable radio (Kenwood Model #NX-1300) is similar in functionality to the Command Radio but does not have the Wide Area Network (WAN) Channel capabilities. This radio features a digital display screen that allows for ease of viewing selected channels. It does not allow for the end user to receive direct dial/call-up communications. These radios will be issued to all Campus Principals/Site Administrators, as well as other facility support personnel that have duties that take them to multiple District locations throughout the course of their work day. These radios will provide the end user with communication capabilities to both outside and within their campus/facility footprint by simply switching to the appropriate channel at the location they are working at. See Attachment F, "Kenwood Model #NX-1300 Specification Sheet." Site Administration Radios will be assigned to the following sections of NVUSD:

Principals/Site Administration-28
 Food Service-4
 Technology-4
 Vocational Services/Special Education-4

Number of Site Administration Radios Needed-40

Staff Radios: This hand held portable radio (Kenwood Model #NX-1300) is the same type as the Site Administration radio. It provides high quality communication capabilities to meet the current and future needs of the user. This radio features a digital display screen for ease of viewing selected channels. This radio will be programmed to be site specific and will only have those channels programmed that allow for communication within the footprint of the campus/facility. These radios will be issued to those individuals that are required to have a line of communications with Site Administration or other functions (Custodial, Food Service, Etc.) that are specific to the campus/facility where they are assigned. See

Attachment F, "Kenwood Model #NX-1300 Specification Sheet." These radios will be assigned to locations as follows:

Elementary Schools-10 per campus
 Middle Schools-15 per campus
 High Schools-20 per campus
 Number of Staff Radios Needed-330

Additional Equipment: To ensure continuous functionality of NVUSD's Communication System, additional equipment will be needed to meet daily operational needs. This equipment includes: spare radios and extra batteries. The quantities of each are recommended as follows:

NX-3320 (Command) Radios-10
 NX-1300 (Site Admin/Staff) Radios-50
 NX-3320 (Command) Batteries-39
 NX-1300 (Site Admin/Staff) Batteries-136

In summation, the following numbers of radios and equipment will be needed to implement NVUSD's Communication System:

Radio Type	Location	Quantity
Emergency Comms*	All Campuses/Facilities	34
Mobile Mounted*	Buses	63
Base Station*	Dispatch Center	1
Command Radios*	Dept. Heads/Admin/Transportation	29
Site Admin Radios	Principals/Site Admin	40
Staff Radios	Site Staff	330
Rack Chargers (6 Unit)	All Campuses	68
Additional Command Radios	Dept. Heads/Admin/Transportation	10
Additional Admin/Staff Radios	Principals/Site Admin/Site Staff	50
Additional Command Batteries	Dept. Heads/Admin/Transportation	39
Additional Admin/Staff Batteries	Principals/Site Admin/Site Staff	136
Total Number of Radios on WAN		127
Total Number of Radios on NVUSD Internal System		430
Grand Total Number of Radios		557

*Denotes radios on Crystal Communications WAN System

**Testing is in process to determine the number of District-owned repeaters needed

Crystal Communications has submitted a quote for the recommended Hybrid Communication System described in this document. See Attachment G, "Crystal Communications Quote."

The quote is based on NASPO (National Association of State Procurement Officials) pricing which is a competitively bid contract that allows for design-build projects and negates the need to go out to bid. Discounts have been included in the quote if a 3 year option is selected. Additionally, Kenwood is offering a rebate on all radios purchased if procurement is started before March 31, 2020. Crystal Communications staff is always available to discuss pricing, as well as, project design.