Police Communications: Tuning up for Interoperability

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The focus of this article is the latest "buzz word" associated with public safety radio systems - interoperability. One of the leading authorities on public safety interoperability is the Public Safety Wireless Network (PSWN), an organization co-sponsored by the Department of Justice and the Department of Treasury. The mission of PSWN is to improve communication between federal, state and local authorities. PSWN defines interoperability as "Communications links that permit people from two or more public safety agencies to interact with one another and to exchange information according to a prescribed method in order to achieve predictable results."**(1)**

In order to understand interoperability it is important to understand the history of public safety radio communication. This brief lesson of history will illustrate how public safety came to its current state of inoperability.

HISTORY

The invention of the radio has, with the exception of the automobile, had the greatest impact on how public safety does business. Public safety began using the radio when only one way communication was possible. Police stations dispatched calls for service one way and expected the officers to "call in" from call boxes on street corners to confirm receipt of their jobs. The use of the radio and telephone in public safety work grew between the 1930s and 1950s. With this evolution of technology the public came to expect an immediate response when the police were called. Thus the phrase "calling the cops" was coined.**(2)**

As more and more organizations (both public and private) began using radio, the more technology was driven. One area in which technology drove the market was the use of different parts of the frequency spectrum. Public safety started in the high frequency band (HF). The use of HF was not without its drawbacks. One drawback was "skip" which is predominantly seen at night and causes a radio signal to "skip" across great distances and interfere with other users miles away. **(3)**

"Skip" was reduced when public safety began the transition to the VHF band (Very High Frequency). While not completely eliminated, "skip" was greatly reduced in VHF. However, other problems tended to linger. Today many rural agencies continue to use VHF because of its ability to carry a radio signal for long distances.**(3)**

As the number of radios grew so did the need for additional frequencies. Public safety found very quickly that there were an inadequate number of frequencies in the VHF spectrum. This, along with lingering

problems associated with VHF, made it inevitable that public safety expand to the UHF (Ultra High Frequency) band. The expansion in to UHF made available a multitude of new frequencies and increased reliability in urban areas.

In many areas of the country VHF remains popular. This is very true in rural areas where there is a need to communicate over an extended distance. At the same time UHF remains very popular in many urban areas where there is a need for reliable communication in a smaller geographic area.

The drawback to this duel system (UHF/VHF) is a lack of interoperability. It is not possible to tune the same radio to both VHF and UHF. As a result, agencies who elected to use UHF frequencies could not communicate with agencies using VHF frequencies and visa versa. Thus a lack of interoperability was created.

As the number of UHF radio users continued to grow so did the use of the UHF spectrum. The next expansion took place in what is commonly called 800 MHz. Manufacturers began breaking into the 800 MHz spectrum with "trunked systems." Trunked systems provide a more efficient use of available frequencies and "bells and whistles" not found in conventional radio systems.

The "trunked systems," while they do provide better use of available frequencies, are not without their drawbacks. First, the radio signal in 800 MHz does not carry as far as UHF or VHF and second, the equipment is proprietary. In lay terms this means that an 800 MHz "trunked system" manufactured by vendor x will not interoperate with an 800 MHz "trunked system" manufactured by vendor y. Again, a lack of interoperability was created.

CREATING INOPERABILITY

As public safety agencies moved into a variety of different frequency bands to better meet their individual needs they moved away from interoperability. This was, and still is, most commonly found in larger metropolitan agencies. Larger agencies were willing to give up their ability to interoperate in exchange for radio equipment (and frequencies) which better met their organizational needs. Many of these agencies believed they were self-sufficient and did not need to communicate outside their own organization. On the other side of the coin smaller agencies have always seen the need to interoperate with agencies in their geographic area. In many areas the only backup a local officer may have is a trooper from the state patrol, or a sheriff's deputy.

Public safety as a whole has come full circle and realized the importance of interoperability. The efforts to achieve interoperability were accelerated by the events of September 11th. This tragedy showed both public safety officials and political leaders the necessity of working closely with other area public safety organizations. A close working relationship cannot be obtained without the ability to communicate in a time of need.

SOLVING THE PROBLEM

The first step in achieving interoperability is to get "buy in" from other agencies. One agency can strive for interoperability but if there is not willingness on the part of other agencies it will never come to fruition. This "buy in" has to occur at the highest levels of government as money will have to be allocated and policies and procedures changed or adopted.

Three options are generally available to solve the interoperability issue. A new radio system which provides adequate coverage and frequencies for multiple agencies can be implemented. An existing

system can be expanded to provide service for all agencies in the partnership. The final option is to deploy "links" to connect disparate systems together.

NEW VS. OLD

Whether a group of agencies choose to upgrade an existing system or implement a new system it will lead to the same end result. At project conclusion a single system that meets the needs of all agencies on the system will emerge. The new or upgraded system will handle all radio traffic generated by the agencies on the system. When designing the new system or determining what upgrade is needed the following should be considered:

• There should be no single point of system failure to prevent an interruption in service to the public.

• If multiple sites are used they should provide for overlapping site coverage in event of tower site failure. In the event only one tower is needed to achieve the desired level of coverage a backup site should be considered.

• Any existing equipment which is reused should have a good life expectancy.

• Current technology and standards should be used to ensure a clear upgrade path. Most agencies cannot afford to make large subsequent expenditures for upgrades in a short period of time.

• The system should be sized (adequate frequencies) to allow for expansion as the service population or users grow.

• The use of non-public safety equipment or resources should be kept to a minimum. In the event non-public safety resources (such as tower space) are used there should be a long term written commitment from both sides.

• Coverage provided by the new or upgraded system should be as good as or better than provided by the previous system. Officers and firefighters cannot understand how new is better when they cannot communicate as well as with their "old" radios.

• Considerations should be made to ensure adequate coverage is provided in key locations, e.g. hospitals, shopping malls, jails, and courthouses.

• Consideration must be given to interoperability with other public safety agencies in the region that remain on dissimilar systems, e.g. VHF, UHF or 800MHz, Nextel or Southern Linc.

• It is also important to have the availability of local service personnel to support any solution implemented.

• If a proprietary radio system is selected it is important to ensure the vendor has end user radio equipment (handhelds, mobiles and consoles) that meet the requirements of each agency. Typically officers complain most about the functionality of handheld radio equipment.

INTEROPERABILITY LINKS

The interoperability "link" is a solution that ties or patches radios operating in different bands (i.e. UHF and VHF) together. For example, when a transmission is made on a UHF frequency the same

transmission is rebroadcast on a designated VHF frequency and visa versa. This provides direct communication between two (or more) users operating in different bands.

The advantage of establishing interoperability links is that existing equipment, regardless of the band, is used. It is also typically the less expensive method of achieving interoperability.

Interoperability links are not without their disadvantages. The first, and often hardest to overcome, is the availability of frequencies in the needed bands. There are shortages of frequencies in the commonly used bands, thus making it impossible to secure the necessary FCC licensing.**(4)** The link causes the radio transmission to be rebroadcast over a second frequency in another band. Generally, two additional frequencies (one in each band) are required for each link to be established.

A number of vendors offer equipment and services needed to complete this interoperability interface. Each vendor typically has a slightly different methodology for achieving the same end result. Each individual situation is different, thus requiring a slightly different solution to best bridge two systems together for interoperability. When selecting a solution it is highly advisable to visit another jurisdiction which uses the same type interface to bring similar equipment (and bands) together. By seeing, and using, the equipment first hand an agency can make an informed decision if the solution will meet expectations.

SELECTING A SOLUTION

The best solution for interoperability is the one that is right for the individual agencies desiring the ability to intercommunicate. There is no one right solution which can be adopted for all situations. The following factors typically "drive" these type decisions:

- The availability of funding can play a determining role in deciding to use existing equipment and technology or implement a new system.

- Political issues, typically regarding control of systems, can restrict the options available. Some administrators and political officials are reluctant to give up any degree of control.

- The lack of available frequencies, especially in metropolitan areas, can prohibit the licensing of additional frequencies in certain bands.

- Frequency availability must be considered when expanding existing system(s) to accommodate other agencies.

- When considering expansion of an existing system the age and condition of existing equipment should be considered. The upgrade or expansion of legacy equipment is usually not the best long term solution.

- When migrating users to a new or different system it is a must to consider any possible changes to the coverage area. The idea is to move forward and not backwards. Existing system(s) should be used as a baseline to establish coverage as well as other project objectives.

WHERE IS THE HELP?

Achieving interoperability is not as easy as it appears. It takes a strong commitment at all levels and across multiple organizations. There are operational, political, organizational and technical hurdles to overcome. Each decision made when modifying, expanding or transitioning to a new radio system could

impact public safety for years to come. This is a heavy burden to place on an individual or group who does not have the needed level of experience or expertise.

There are a number of sources to turn for help. First, a vendor experienced in radio communications can lend technical guidance and direction to a project of this nature. The downside is the risk of becoming too dependant on a single vendor. Their solution to any problem is most assuredly going to be a product they market. This may or may not be the best for the success of the project. There is nothing wrong with tapping into a vendor's knowledge and resources but it must be done carefully. Independent judgment, knowledge and common sense must not be thrown out the window.

Another avenue to explore is free help available through organizations such as PSWN or local colleges willing to perform a community service. While they may not be able to oversee the entire project they can certainly be a resource which should not be overlooked.

CONSULTANTS

A final option to be considered is the paid professional consultant. The key to using a consultant for an interoperability project, or any project for that matter, is identifying a firm which will be a "good fit" for the project. A consultant can make or break any project. The selection process should be extensive and include a review of the company's complete client list for the past five years. Clients selected from the list should be interviewed, face to face if possible. A more accurate picture of a consultant's true ability will be gathered by interviewing a wide range of clients verses just the few provided as standard references.

The old adage, "you get what you pay for" definitely holds true in selecting the professional services of a consultant. Alabama law excludes consultants and other professional services from the competitive bid process.**(5)** This allows flexibility in selecting a consultant based on ability verses cost. While cost is always a factor it should not be the prevailing factor in such a selection process.

Another issue to consider in the selection process is any potential conflicts of interest that may exist. A consultant should make unbiased and objective recommendations. This is not possible if the consultant is closely aligned with any one vendor. The best way to identify these relationships (if any) is through client interviews or client profiles obtained from the consultants. If there is a tendency to recommend one vendor over another it will be obvious through the prior work of the consulting firm.

Once a consultant has been selected the next step should be to clearly define, in writing, what is expected of the consultant. This document is usually referred to as a Statement of Work or Scope of Work (SOW). The SOW should be broken down by task with goals and deliverables defined. Some consultants may provide a SOW with their initial proposal. In such cases it should be refined before a contract is executed.

The level of services required will tend to vary from project to project. A good starting point may be to utilize a consultant to make written recommendations on how to best achieve the desired level of interoperability. Based upon these recommendations a decision can be made to expand the consultant's services to include implementing the recommendations.

The services available from a consulting firm are quite wide ranging. Below are a few of the more common services utilized in projects of this nature:

- Identify user needs such as interoperability requirements, number of system users and mutual aid needs.

- Develop specifications to meet the previously defined needs statement. These specifications are then presented to vendors through Request for Proposals (RFP), Request for Information (RFI) or specification documents.

- Review vendor submissions to determine compliance with specifications and requirements.

- Correspond with vendors to address any technical issues not properly addressed.

- Conduct research to determine the availability of needed frequencies and assist with FCC licensing issues.

- Assist in contract negotiation.

- Oversee vendor's work and provide acceptance testing to ensure the contracted goods and services are delivered.

SUMMARY

There will be many difficult decisions and many barriers to overcome along the way to interoperability; therefore it is important to define project goals, expectations and priorities early. When making these key decisions project staff must constantly keep the defined goals and objectives in mind. Reaching interoperability can be a painstaking process but will pay for itself with the improved service offered to the public.

ENDNOTES

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1. .*How to Guide for System Planning, Design, Procurement, Implementation and Operation and Maintenance,* (Fairfax, VA: PSWN Program 2000) p. 2.

2. .Samuel Walker, The Police in America - An Introduction (New York, NY: McGraw Hill 1983) pp. 13-14.

3. .Eric Perry, Managing the 9-1-1 Center (Coshocton, OH: National Emergency Number Association 1998) pp. 127-129.

4. .*A Progress Report on Public Safety Spectrum,* (Fairfax, VA: PSWN Program 2001) pp. 6-8

5. .Ala. Code § 41-16-51 (1975).