WHAT YOU NEED TO KNOW ABOUT VOIP: ITS NOT ALL THE SAME

Imagine a familiar, but dangerous scene: it's a dark and stormy night. A power line falls down across a street in a suburban neighborhood. The local power company is called, and they respond quickly to the scene. At the same time, the fire department is alerted and they are *en route* to the scene.

For communications, the power company uses 800 MHz two way radios operating on EDACS format; while the fire department uses 900 MHz SmartNet radios by Motorola. The two different radio systems are naturally not interoperable with each other. They operate on different spectrum bands and on different technology platforms: 800 MHz EDACS versus 900 MHz SmartNet.

Now imagine an unfamiliar, but easily achievable outcome: the fire truck arrives on the scene and instantly communicates over a predetermined interoperable channel with the utility crew up in the bucket truck above the power line. The utility crew radios back down from the bucket that the power has been cut at the transformer; they then request the fire department officials to help out by cordoning off the area from vehicular traffic and pedestrians. The fire department radios an ambulance service, using the same interoperable channel. The ambulance service has 450 MHz LTR radios.

The fire chief arrives and switches to a separate talk group on his radio where the local sheriff and utility manager are standing by. Both the sheriff and utility manager are off duty. The three of them talk together about the emergency, and the conversation is efficient and quick. The local sheriff, by the way, uses a Sprint Nextel iDEN to communicate to the 800 MHz radio of the power company and the 900 MHz radio of the fire department. The ambulance arrives and communicates over its radio with the police department, arranging for an escort to the hospital if anyone is injured.

In the Public Safety/Critical Infrastructure world, there is an immediate need for interoperable communications just like this example above. This need for interoperability was, of course, spotlighted during the Hurricane Katrina disaster, during which first responders could not talk with one another. We have all heard the stories about how FEMA officials in helicopters resorted to hand signals to communicate with fire department personnel on the rooftops of flooded houses below.

Thankfully, help is on the way in the form of interoperability solutions which are Voice over Internet Protocol (VoIP) based. These solutions stem from recent breakthroughs in VoIP technology in the two-way radio sector. *Not all VoIP solutions, however, are created equal. Important differences exist which could mean the difference between life and death in emergency situations.*

One popular solution, espoused by companies like JPS Raytheon and Cisco, depends upon centralized architecture for the VoIP solution. Thus, in the example above, one agency, like the police, would have a device, such as an ACU-1000, resident at the police dispatch location. In that ACU-1000 would be a radio from the police, an iDEN unit, a fire department radio, a utility company radio, and a radio from the ambulance service. Without those radios and the iDEN at the central location, those devices would not interoperate.

This centralized architecture is, however, less than ideal in situations where not all radios are capable of transmitting a strong signal to the location of the centrally based ACU-1000.

A better alternative is distributed architecture, such as the SafetyNet product from my employer, Critical RF, Inc. This SafetyNet device resides at the dispatch location, or a tower, of each radio system. In the example above, the police would have one SafetyNet at their location, and it would contain just the police radio. The power company, fire department and ambulance service would, in turn, have a SafetyNet at their central dispatch, or a tower location. No SafetyNet would be needed for the iDEN or other internet accessing devices like cell phones, PDA's or laptops.

The clear advantage of this distributed design is that for each radio system, the VoIP interface resides at the location where the signal for that radio system is the strongest: its own dispatch location or its own tower location.

This distributed architecture also has the added benefit that other internet devices, including laptops, cell phones, iDEN and PDA's, do not need to be plugged into any VoIP interface at all. Instead, these non-radio devices can access the internet and communicate with the two way radios from anywhere in the world. Thus, a FEMA official in Washington, DC with a PDA could talk with the local police, fire and ambulance service in southern Mississippi, for example. The utility manager can access the internet from his laptop, and use his microphone to speak and his space bar as the push-to-talk button. He can be anywhere in the world, and communicate with his team and with the other agency personnel. All that is needed is a SafetyNet at each of the radio dispatch or central tower locations.

By contrast, centralized architecture relies dangerously upon the survival of one central point of communication. When that central point floods, as in Hurricane Katrina, it becomes a central point of failure rather than connection. Similarly, the central point may not have every end user device that officials want to interoperate with.

Distributed architecture does a better job of bringing different parties to the same table: different devices, different jurisdictions and different spectrum bands are all tied together in a web of interoperability, rather than the old fashioned spoke-and-hub system of centralized VoIP design. And with distributed architecture, the risk that one point goes out does not endanger the interoperability of other systems. Distributed architecture is largely self-healing in that context.

When queried about the effectiveness of a centralized VoIP solution during Hurricane Katrina, one operator of an ambulance service in the Gulf Coast region stated that he owned but never deployed his centralized VoIP solution. "Imagine trying to tie together [County A] with [County B]: we had both radios in our central location in [County A], but the signal from [County B] was too weak for the solution to ever be deployed. As a result, we never used it. Instead, we ordered a few hundred additional radios from M/A COM."

First responders are increasingly aware that more radios are not the preferred answer, nor is it the cheapest solution. Thanks to VoIP, first responders with radios operating on one portion of the spectrum, such as UHF, can now talk to other emergency agencies operating on a different portion of the spectrum, such as 700 MHz. This means that agencies with one radio system, such as the local police, can now talk to local agencies on other systems, such as the firefighters.

However, as discussed above, not all VoIP is created equal. When determining what solution is best for your organization, ask questions like:

1) will you be able to hear all radio jurisdictions from one central point of operation?
2) Will you want to tie in other devices, such as PDA's and cell phones, without needing to plug one of each device into the central location?
3) Will you have a static IP address (centralized), or do you prefer flexibility (distributed)?
4) Will your budget support the traditional costs of centralized architecture?
5) Will you desire to expand your capabilities to other counties, or jurisdictions, in the future, or will you be forever limited with a centralized solution to the immediate geographic surroundings?
6) Are you willing to give command and control over to another agency operating from its central point?

Depending upon your answers to these questions, a distributed architecture may be the superior choice for your VoIP interoperability needs. Thanks to flexibility and scalability, distributed solutions are rapidly gaining in favor over the older solutions which depend upon a centralized location of operation.

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