

Interoperable applications for a national wireless network: A case study of mobile video applications



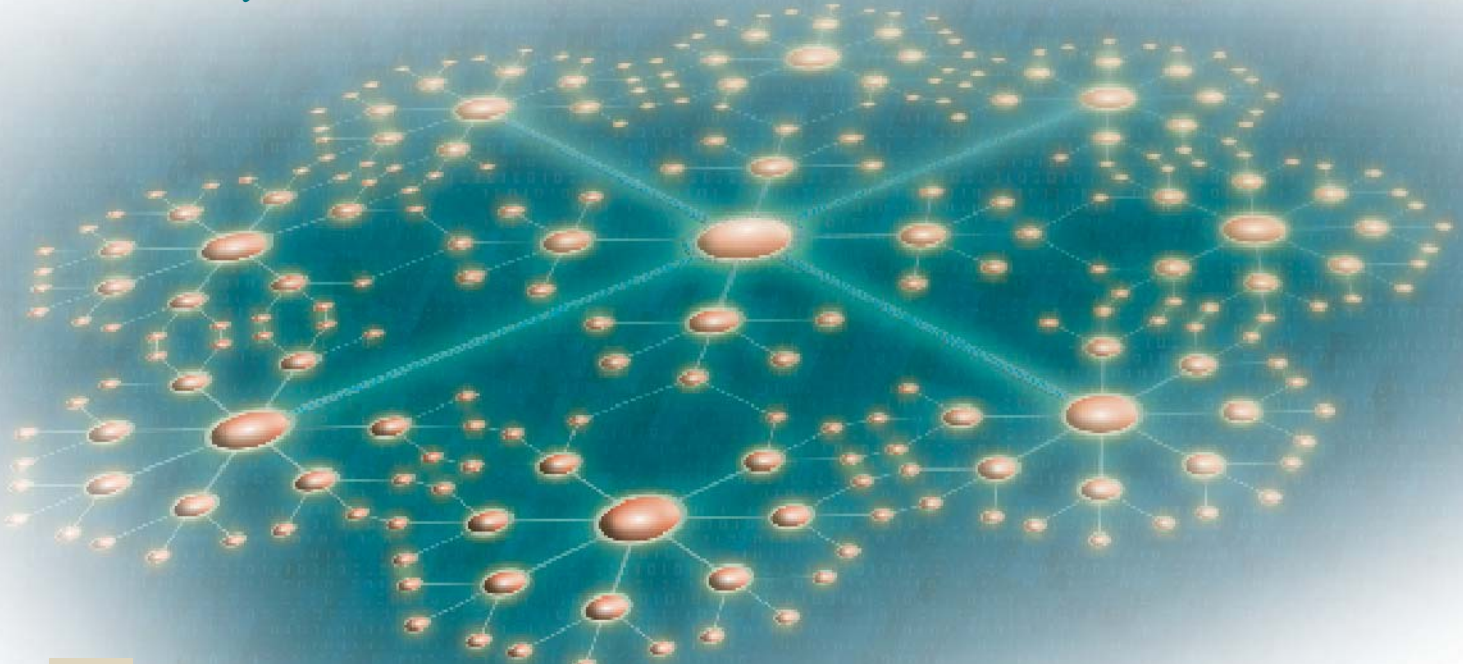
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Does a requirement for public safety video interoperability exist? According to first responders, the answer is 'yes.'

After devoting years of work to best define use of the 700-MHz spectrum for public safety, the Federal Communications Commission (FCC) has decided that a nationwide public safety dedicated wireless broadband network will be licensed to a commercial operator. In partnership with the Public Safety Spectrum Trust, the oversight manager for the public spectrum, the network will be auctioned and operated in partnership by commercial and public safety organizations. The exact terms and conditions of this novel relationship will be detailed in an operating agreement between the parties.

A congratulatory standing ovation to all those involved in this significant achievement is warranted. The deployment of this private-public broadband network

will result in a huge leap in capability and funding management in the public safety communications interoperability paradigm. This new network drives its evolution from both a requirement for a next generation broadband wireless data network to provide desktop extension, multi-media (video, messaging, e-mail, Internet, LAN access) to the field and a direct effort to deploy a fully interoperable wireless network, correcting the current state of the land mobile radio environment for public safety. Besides the Wireless Accelerated Response Network (WARN) and the Regional Wireless Broadband Network (RWBN) networks deployed by the District of Columbia and the National Capital Region, the national network will be the first nationwide public safety dedicated wireless broadband network, as well



as the first nationwide interoperable wireless infrastructure, accessible to local and state first responders.

We would like to believe that such an interoperable wireless broadband network will enable interoperable broadband applications to traverse the network. However, it is not clear which of the currently deployed public safety wireless broadband applications are truly interoperable.

As an example, one application that requires a bandwidth only a wireless broadband network can support is in-vehicle mobile video. However the network robustness and capability to support such a demanding application is not sufficient to facilitate public safety mobile video sharing in the field.

The TV show *COPS* has familiarized the American public with the importance and content of such video solutions by demonstrating how useful recorded material could be in court, if allowable evidence. Typically these solutions include features like the authentication of the officer in charge, various commands and controls of the system such as the pan-tilt-zoom of the camera, the local recording of the video and audio and other critical "metadata," including the time, location, and speed of the vehicle (GPS-based), and various fields describing the recorded event. After capturing the event, the video can then be uploaded and achieved to an access-controlled central server. It can later be retrieved and analyzed as necessary using metadata filters.

Streaming real-time video to control centers, or other mobile units, is also a critical tool to support remote suspect or vehicle identifica-

tions, and virtual back-up during chases or traffic stops. Another use is sharing situation awareness with officers en-route to the scene; this unquestionably requires access to a wireless broadband network.

Proprietary solutions

In recent years, improvements in digital technology have greatly enhanced mobile video solutions as they eliminate archaic, voluminous video tapes, facilitate the automation of uploading recorded files, automate the detection of

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events through sophisticated real-time image processing and enable real time streaming of video feeds through the use of state-of-the-art video codecs. Why should those solutions not be interoperable?

An example: suppose a neighboring officer arrives on-scene in a camera-equipped vehicle to support the local police force during a crisis. Can the captured video be shared with the local command center? Routing and firewall hurdles set aside, sharing the video will be limited unless he uses the same applications as the local jurisdiction, or a gateway that converts his video and

associated metadata to the local jurisdiction's format (a bit like a radio-gateway patches two different LMR systems to allow those two same guys to talk).

Although one might think the in-car mobile video solutions are rather complex, they are built around commercially available components such as cameras, DVR, computers, GPS units and routers that are standards-based, and can interoperate smoothly together in a variety of different environments.

Most in-car video mobile product vendors integrate the basic components in a unique architecture to provide their customers with what they believe is an optimal solution. Consequently, the product you are buying is proprietary. Although one vendor's components might be standardized, it does not mean you can swap these components for another vendor's brand without compromising the proper performance of the whole system.

True, most solutions are based on standard IP routing protocols. However, the way one vendor integrated a GPS unit to its router and the format used to communicate this information to the DVR, may impede the use of any other standard GPS-equipped router within that solution architecture.

These products propose standard video-codecs such as MPEG-4. However, another vendor may have enhanced the standard codec to optimize its performance in a mobile environment, and only its proprietary client software can read the streamed video. As a result, only visiting officers with the same software or an additional transcoder will be able to visualize the video in

the field.

In some cases, you might be able to swap a specific camera with another one, but flexibility is limited. You're basically locked into using one vendor should you want to extend your fleet without "ripping and replacing" the entire video system infrastructure.

In all cases, the format of the metadata associated with the video, i.e. crucial information such as officer ID, time, location vehicle speed, which can make or break a case in court, are proprietary.

Most vendors argue that the use of proprietary data formats and proprietary video and data viewing software enhances the security level of their products, and therefore, advocate the status quo.

This added security might make it more difficult for "the bad guys" to access and tamper evidence information. However, besides being locked to a specific vendor for potential fleet expansions or replacement, interoperability with other agencies is not guaranteed, even if those other agencies are sharing the same access-controlled, public safety-dedicated interoperable network. Sharing video feeds would actually require them to use the same vendor for their mobile video solutions, and to invest the time configuring them so that they interact according to requirements. Should the agencies operate applications from different vendors, they would need to develop and implement an interoperable interface between the applications, which would be more or less difficult to undertake, depending on the specific applications and interoperability requirements.

In both cases, an easy integration of additional video transmitters or viewers required in a crisis situation is not expected. On the other hand, it is probable that further developments — and additional costs — will occur each time there is a need to integrate a new agency's specific video solution within a local or regional public safety interoperable video sharing community.

A case study

Does a requirement for public safety video interoperability actually exist? According to the first responders who participated in the District of Columbia's wireless broadband pilot network for more than two years, the answer is yes.

Under an experimental license in the 700-MHz band from the FCC (call sign WD2XHO), the District of Columbia deployed and operated WARN for two years as a pilot, the first public safety dedicated wireless broadband network. In its experimental license filing reports titled "Progress Report on the Construction and Operation of the Experimental Wireless Accelerated Responders' Network," sharing video streams for situation awareness is clearly identified as a key requirement by the users. During the Fourth of July events in both 2006 and 2007, real-time video streams from the DC-Homeland Security Emergency Management Agency, the DC Fire and Emergency Medical Services, the U.S. Park Police command buses and the U.S. Park Police helicopter were shared among those agencies, and within the multi-agency communications center deployed for the occasion. Sharing this information

was instrumental in controlling the temporary evacuation of the mall due to potentially violent weather conditions during the 2007 event.

In this specific case, interoperability was achieved by deploying a common application across the participating agencies. It is easily conceivable that a Katrina or a 9/11 type of scenario, where first responders are likely to come from the four corners of the country, would require a more flexible and spontaneous solution in order to enable true video interoperability among accredited first responders.

However, duplicating this exact model at a national level is not reasonable. Requesting all public safety agencies across the country to deploy a unique in-car mobile video technical solution provided by a unique vendor is neither realistic nor desirable.

The implementation of technology standards in the wireless public safety communications world will eventually facilitate voice

interoperability between agencies. It seems the development of public safety mobile application standards would solve the specific video sharing problems.

The International Association of Chiefs of Police has dedicated a tremendous effort in developing a digital video system minimum performance specifications document, "In-Car Video Camera Systems Performance Specifications: Digital Video Systems Module." Standardizing such a solution, including its ancillary modules interfaces and data formats, would present multiple advantages besides enabling fully functional video interoperability among agencies. Specifically, it will provide law enforcement agencies with the ability to procure the various pieces of their mobile video solutions from different vendors, therefore providing the flexibility to enable that solution to evolve along with the development of specific requirements, or the availability in the

marketplace of more effective and less costly components. As it stands true, open standards will spur competition and eventually drive costs down to the benefit of the end-users: the first responders.

Better and affordable tools for our public safety, isn't this what we all want? ■

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