

SPECS SURVEY: Microphones and Antennas | WHAT'S NEW: Digital Radio

RadioResource

March 2016 | MCCmag.com

MissionCritical™

C O M M U N I C A T I O N S

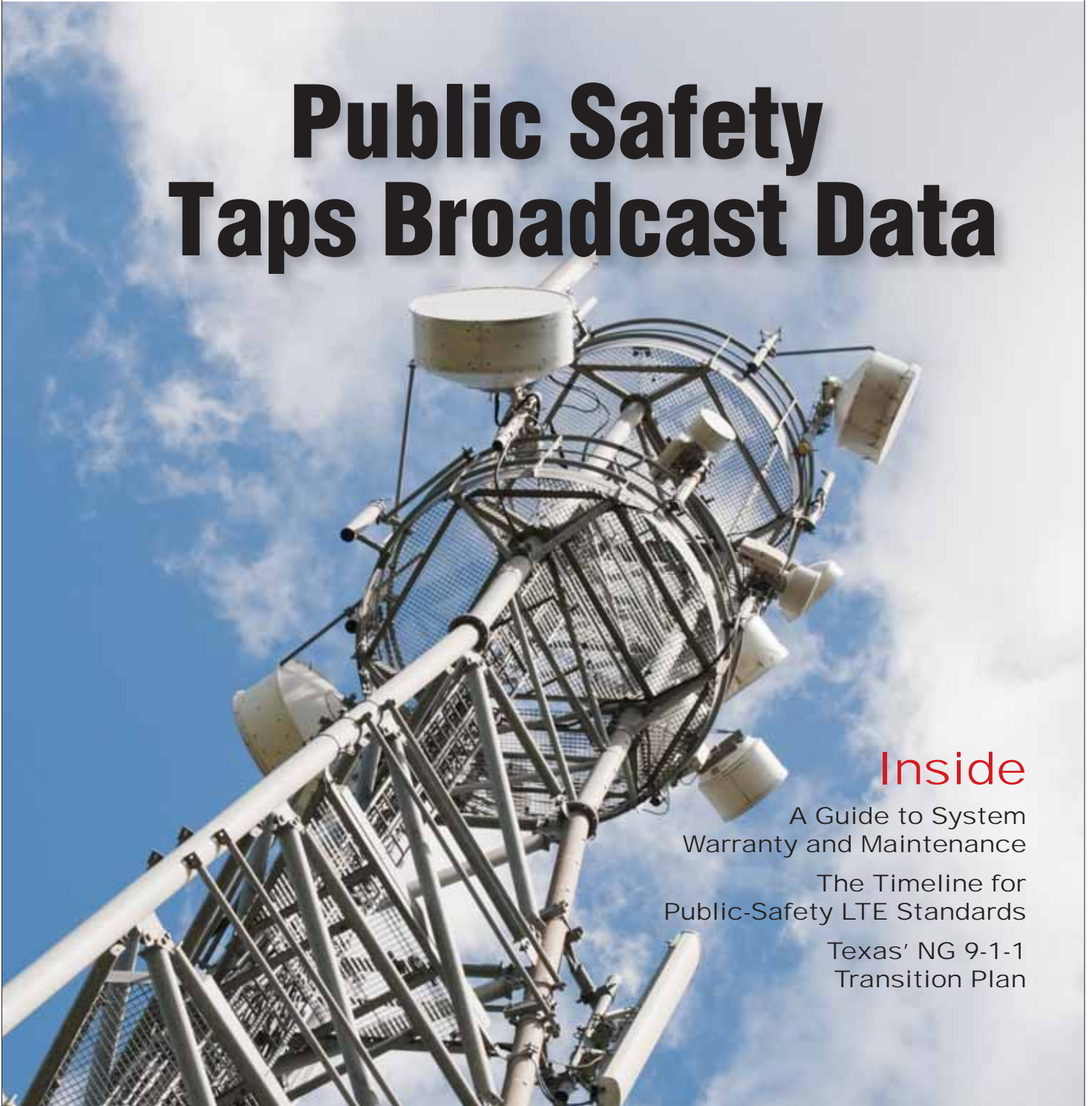
Public Safety Taps Broadcast Data

Inside

A Guide to System
Warranty and Maintenance

The Timeline for
Public-Safety LTE Standards

Texas' NG 9-1-1
Transition Plan





Broadcast Data for Public Safety

Public-safety agencies are testing the potential for datacasting technology to deliver real-time video and data over broadcast spectrum. **By Kristen Beckman**

The average citizen can stream videos on their smartphones, but most first responders are unable to access critical video and data on their communications devices, which could increase situational awareness and aid in incident response. The need to bridge this data gap and give responders access to critical data to perform their jobs is one of the major drivers in the effort to deploy the nationwide public-safety broadband network (NPSBN), led by the First Responder Network Authority (FirstNet).

But an operational FirstNet network is years away. Current LMR networks do not have the capacity to transmit large amounts of data, and the need to push video and data to responders is increasing. Many agencies have turned to commercial cellular networks to provide data access for responders, but during disasters and large-scale events, those networks are unreliable and susceptible to congestion and outages caused by high call volumes, leaving first responders

without access to multimedia data when they need it most.

A New Data Option

Enter datacasting, a familiar technology to the broadcast industry but a relatively new concept to the public-safety industry. Made possible by the transition from analog to digital television technology, datacasting allows public-safety agencies to piggyback on TV broadcasters' infrastructure and airwaves to send data files to an unlimited number of recipients in a given coverage area.

"Billions of dollars have been invested already in building out broadcast television networks nationwide," says Mark O'Brien, president and chief technology officer (CTO) at SpectraRep, which offers turnkey datacasting service to agencies, universities and other organizations. "They have backup generators, they monitor the network 24/7 with professional engineers, they have almost 100 percent uptime built in because their core

business is broadcasting live television programming, and they need it to be reliable.

"When we put datacasting technology into these television stations, we take this existing infrastructure — tall towers, million-watt transmitters, all the infrastructure that goes into making sure broadcast television works — and we ride on those coattails," says O'Brien.

While messages sent via datacasting technically reach everyone within a coverage area, encryption, encoding and registration are used to target messages so that only the intended recipient or group can view them. And because broadcast technology is inherently one to many, it is not hampered by the kind of congestion caused by sending video and data files individually to each recipient on cellular and Long Term Evolution (LTE) networks.

Deployment of a datacasting system is straightforward, says O'Brien. A communications link must be established between the operations center sending the video to the broadcast facility, and equipment must be installed at the transmitter. On the end-user side, a datacast receiver that can plug into a laptop in a responder vehicle or command center is required. Software, such as the product SpectraRep provides, allows agencies to remain in control of the data and who is allowed to receive it.

Public TV broadcasters serve as a natural partner for public safety because they cover 97 percent of the country's population, including territories and rural areas. The spectrum used for datacasting is primarily in the 500 – 600 MHz bands, which can penetrate rain, trees and buildings better than networks on higher frequencies, says O'Brien. In addition, public television broadcasters are willing and motivated partners with public safety.

"It's really mission consistent with what they are trying to do in serving their communities," says O'Brien. "They also are ultimately looking for some bandwidth revenue because they have bills to pay. They are still paying all of these operating costs for their broadcast infrastructure, but

most of the people watching their content are not watching it using their over-the-air infrastructure. So they are really excited about the opportunity to be broadcasters again.”

Broadcasters also bring technology know-how that can benefit public safety as it learns to incorporate video and data content into its operational processes. For example, one agency SpectraRep worked with wanted to transmit live video from helicopters to an operations center so it could then be pushed to responders using data-casting. Broadcasters are familiar with how to do that because they have been using helicopters for news gathering and broadcasting images for decades.

“Television has an 80-year history of figuring out how to move high-value, high-bit-rate content around the country for live distribution to TV stations,” says O’Brien. “If you drive past any station, you’ll see a dozen satellite dishes all pointed to different birds, tons of microwave, fiber hubs connected to all the local fiber switches.

“They are in the business of moving content around for live broadcast, and they have tall towers,” says O’Brien. “They own a lot of vertical real estate. There’s a lot of things here besides their spectrum that TV stations can bring into this discussion.”

Last month, America’s Public Television Stations (APTS) announced its member stations have committed in principle to an allocation of 1 Megabits per second (Mbps) of their public television spectrum bandwidth to participate in FirstNet.

“For years, public broadcasters have embraced their public safety mission and are focused on maximizing the broadcast spectrum for the public good,” says APTS President and CEO Patrick Butler. “Public television stations are already partnering with state and local public safety, law enforcement and first responder organizations — connecting these agencies with one another, with the public and with vital datacasting services that use the broadcast spectrum to help first responders securely send critical information and video during times of crisis.

“In addition, public broadcasters

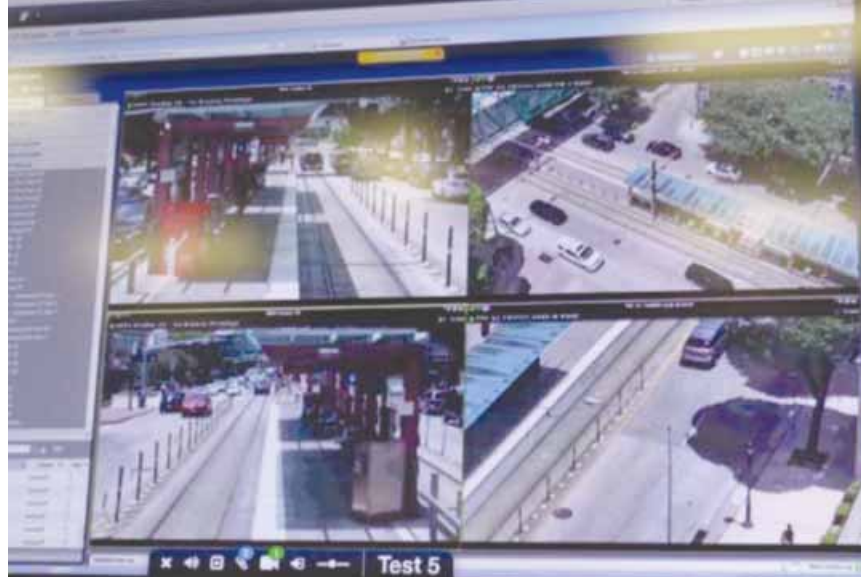


Photo courtesy JHU/APL and DHS

Live video can be aggregated from a variety of sources and sent to targeted recipients.

provide a backbone for emergency alerts and warnings to the public,” Butler says. “This commitment of a small portion of spectrum to FirstNet will allow public broadcasters to deepen and broaden this public-safety commitment at both the community and national levels.”

Datacasting Pilots

Datacasting caught the attention of the Department of Homeland Security (DHS) Science and Technology (S&T) Directorate. The S&T’s First Responder Group (FRG) worked with Johns Hopkins University’s Applied Physics Lab (JHU/APL), SpectraRep and several public broadcasting service television stations on two successful pilots in Houston and Chicago during 2015.

The first pilot took place in July 2015 in Houston using a prototype datacasting system installed at the offices of Houston Public Media public broadcasting station KUHT and operated by the University of Houston office of emergency management. Two potential operational scenarios were tested.

The first scenario tested the ability to track simulated suspects using the University of Houston’s closed-circuit

television (CCTV) surveillance system. Live video streams and other data files that included blueprints and a dorm roster were forwarded to officers arriving on the scene. The second scenario tracked simulated suspects leaving the scene of an incident at NRG Park and escaping via the Houston Metro light rail system (MetroRail). The test used NRG Park surveillance video and MetroRail cameras overlooking train platforms. An after-action report on the pilot says all transmissions were successfully received by targeted recipients, extensive coverage was noted, a strong signal was available even in moving vehicles, and installation and training were quick and simple.

“Law enforcement officers participating in the test reported that datacasting provided video and audio quality far exceeding current capability (which is frequently nonexistent),” says the report. “One officer referred to the ability of datacasting to support video streaming as potentially lifesaving, and end-user participants made clear their desire to retain the system after completion of the exercise.”

The Houston pilot was recognized among top innovators in the security industry as the Grand Platinum

Public television broadcasters serve as a natural partner for datacasting because they cover 97 percent of the country’s population, including territories and rural areas.

Reports about Datacasting Pilots

The after-action reports from two datacasting pilots list several potential benefits of the technology, including:

- Because broadcast TV signals are widely available geographically in urban, suburban and rural environments, datacasting coverage typically exceeds that of cellular systems and LMR. For example, digital TV broadcasts can cover 10,000 square miles or more, which is orders of magnitude greater than cellular coverage. TV broadcasts not only can reach remote areas, but also urban dead spots not covered by existing public-safety communications systems.

- Because datacasting uses infrastructure provided by a broadcast TV station, it is a highly reliable and available method of communication. In contrast, cellular coverage is often lost for significant periods of time following emergency events.

- Datacasting is not subject to congestion during emergencies. Unlike other public-safety communications systems, datacasting does not need to share infrastructure or capacity with commercial communications networks.

- Datacasting can be used to multicast data to a large number of users for the same cost as the transmission of data to a single user. Datacasting can make more efficient use of available bandwidth and possibly reduce the cost of commercial service to the agency by reducing the overall demand for bandwidth.

- Datacasting leverages a system designed primarily for the transmission of high-quality video and audio streams. Thus, it has the innate ability to address the public-safety community's desire for high-quality audio and video data transport.

- Datacasting is relatively inexpensive to implement and operate. Many public broadcasting TV stations are already configured to support datacasting. The existing digital TV transmission infrastructure is used, so datacasting does not add a significant cost to the broadcaster.

winner at the 2015 Secured Cities Exclusive Security Innovation Awards in November. The pilot was unanimously selected as the top overall security project of the year because of its unique scope and application.

The second pilot took place in Chicago in August 2015 using a prototype datacasting system installed at the offices of public TV broadcasting station WTTW using a transmitter located atop the Willis Tower. Three scenarios were tested.

In the first scenario, teams demonstrated a search-and-rescue (SAR) and

pursuit scenario in Lake Michigan using a receiver installed on a U.S. Coast Guard boat positioned 8 miles off the shore of Lake Michigan. The system was configured to continuously transmit video from on-shore Chicago Police Department (CPD) video surveillance feeds to the boat. In the second scenario, CPD surveillance cameras were used to track a simulated suspect fleeing south along the Lake Michigan shore. Members of the test team observed video transmissions from CPD and Chicago Fire Department (CFD) boats in DuSable

“One officer referred to the ability of datacasting to support video streaming as potentially lifesaving, and end-user participants made clear their desire to retain the system after completion of the exercise.”

— DHS report

Harbor. A third test simulated a SAR exercise using CPD video surveillance cameras located along the shore of Lake Michigan, and alerts and data files were transmitted to boats stationed at docks.

According to the after-action report, all transmissions were successfully received, initial poor reception was fixed by adjusting receiver antennas, video reception remained excellent even at 8 miles from shore on Lake Michigan where data on personal cellphones was unavailable, and reception while moving was better than expected but occasional disruptions were noted related to water chop. The system could not consistently receive high-quality data at speeds greater than 35 nautical miles per hour (knots).

“The participating CPD and CFD officers indicated datacasting capabilities would be a useful tool for their activities,” says the after-action report.

S&T is looking for additional markets in which to test datacasting technology this year.

Datacasting's Future

O'Brien says he views datacasting not only as an interim solution to bring data capabilities to public safety now, but also as a synergistic tool that can work with FirstNet down the road. In the future, O'Brien envisions a datacasting-capable receiver incorporated into FirstNet devices along with other receivers that would allow responders to seamlessly receive data from the LTE network, datacasting, Wi-Fi and other potential transmission sources.

“I don't think it's us or them; I think it's us and them,” says O'Brien. “When we are able to work with FirstNet, we can bring this type of coverage to the table on day one.

“Certainly we're not LTE so we're not voice, but certain capabilities to be able to get information out into rural areas and not worry about bandwidth congestion I think are very synergistic with the FirstNet mission, and that's what we're hoping will ultimately be the case.”

In February, SpectraRep participated in a trial in Houston that helped demonstrate the ability to share data among recipients and agencies by

transmitting live video via LTE to an operations center, which then broadcasted the video to an unlimited number of recipients using datacasting. In addition, O'Brien says the Houston Police Department will use datacasting technology during the NCAA Final Four basketball tournament in April.

Advances in video technology may further increase the usefulness of broadcasting spectrum for public-safety use.

"The Advanced Television Systems Committee (ATSC) is close to finalizing the new standard that will allow broadcasters to control the robustness of any program stream in

More Information

After-action reports along with a 100-second video about datacasting and other materials are available on the Department of Homeland Security (DHS) First Responder Group (FRG) website, www.firstresponder.gov.

their broadcast, including the stream allocated to public safety," says O'Brien. "This means that they can improve how deep into buildings a signal can go by increasing the robustness (at the expense of bits per hertz or total throughput)."

New video codecs that will hit the market in the next few years should further increase the efficiency of broadcast television spectrum and result in even more potential for sharing bandwidth, says O'Brien. Some public television stations have even expressed a willingness to dynamically offer more bandwidth during disasters to serve public safety by temporarily throttling their own programming, he says. ■

Kristen Beckman is managing editor of *MissionCritical Communications* magazine. Email comments to editor@RRMediaGroup.com.

RadioResource *MissionCritical Communications* delivers wireless voice and data solutions for mobile and remote mission-critical operations. Editorial content targets organizations in the United States and Canada with mobile and remote communications needs, including public safety, government, transportation, manufacturing, utility/energy, business, and industrial entities. The magazine covers industry news; case studies; innovative applications; product information; emerging technologies; industry reports and trends; and technical tips. In addition, each issue contains *Public Safety Technology*, a special section devoted solely to the needs of the public-safety community. RadioResource *MissionCritical Communications* is published by RadioResource Media Group. Pandata Corp., 7108 S. Alton Way, Building H, Centennial, CO 80112, Tel: 303-792-2390, Fax: 303-792-2391, www.RRMediaGroup.com. Copyright 2016 Pandata Corp. All rights reserved. Reprinted from the March 2016 issue of RadioResource *MissionCritical Communications*. For subscription or advertising information please call 303-792-2390 or visit www.RRMediaGroup.com.