NEXT GENERATION FIRST RESPONDER CASE STUDY

Video Services

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Homeland Security
Science and Technology

EXECUTIVE SUMMARY

The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) launched the Next Generation First Responder (NGFR) Apex program in January 2015 as a strategic initiative to develop and integrate next-generation technologies with the goal of expanding first responder mission effectiveness and safety. The NGFR Apex program seeks to help tomorrow's first responders be better protected, connected and fully aware.

NGFR has conducted three integration demonstrations to assess how prototype technologies integrate to support the NGFR Apex program. The first demonstration in January 2016 was primarily a tabletop demonstration, and the second in May 2016 was a combined tabletop and field demonstration in a large urban area. For the third NGFR integration demonstration, the NGFR Apex program wanted to collaborate with a more rural community where cutting-edge technologies face a unique set of deployment challenges.

NGFR partnered with first responders in Grant County, Washington, to assess the capabilities of numerous NGFR technologies to support their public safety operations. This effort, known as the *Grant County – DHS Science and Technology Directorate Next Generation First Responder Apex Program Technology Experiment* (TechEx), involved deploying a suite of technologies. This case study identifies and explains the technologies that were used in the TechEx, and public safety agencies can use this case study as an example of how agencies can capture and share video across their jurisdictions.

Initial discussions with Grant County identified the following five areas as priority needs:

- Geo-location of first responder vehicles and personnel on map displays at the Grant County Multi-Agency Communications Center (MACC), command posts and on smartphones.
- Wireless data service at the Gorge Amphitheatre concert venue, campgrounds and along the Columbia River valley using various broadband technologies, including cellular broadband [Long Term Evolution (LTE)], Wi-Fi and digital television datacasting.
- Ability to view real-time video at the MACC, command posts, emergency management centers and other destinations when captured and streamed from small Unmanned Aircraft Systems (sUAS) or first responder smartphones.
- Capability to monitor first responders' physiological conditions and send the data wirelessly to the MACC and command post(s) for viewing using a visual "dashboard" on a monitor.
- Support for communications and information dissemination using a combination of county-owned land mobile radios (800 MHz P25), commercial mobile networks and a deployable government-band public safety broadband network (Band 14 LTE) for data communications.

After further discussions, extensive planning, site visits, an integration and testing event and a dry run of the experiment, NGFR and Grant County conducted the TechEx on June 6 and 7, 2017. The TechEx involved the deployment of more than 50 first responders from multiple Grant County first responder agencies, as well as 15 S&T NGFR staff and support contractors.

The scenario-based event used three operational scenario vignettes, illustrated in Figure 1:

- **Vignette A** functioned as a systems check of the new technologies. Each technology was tested for the corresponding responders and vehicles (as applicable).
- **Vignette B** involved tracking down two notional lost hikers who wandered down into the Columbia River gorge. One hiker fell off a cliff and broke a leg. Sheriff's deputies were sent down into the gorge to find the victims with an sUAS used to assist in finding the hikers. Once the hikers were located, the fire district responders were dispatched to perform a ropes rescue to transport the victim up the cliff to be treated by responders.
- **Vignette C** involved the report of a notional brush fire, which was located by the sUAS. Fire Districts 3 and 5 personnel were dispatched to fight the fire. Soon after, a notional altercation occurred at the nearby campground and deputies pursued the perpetrator.

Figure 1: Grant County Responders during the NGFR TechEx

The TechEx scenario provided sufficient realistic opportunities to assess the various technologies' utility and integration with existing systems (technical and human). The scenario also provided opportunities for participating first responders to identify gaps and required enhancements for future NGFR events. The evaluation team was able to verify the NGFR system architecture implemented and configured in Grant County was easy to install, easy to use and provided capabilities that were valued by the first responders.

The NGFR Apex program and their partners provided video capture/sharing and datacasting solutions to support the TechEx incorporating video input from both first responders and the Sheriff's Office drone, using a variety of software and hardware solutions. The video from the NGFR solutions was passed to the SpectraRep dashboard, viewed by first responders on multiple platforms, and broadcast via datacasting to deputies in their vehicles. This provided video information to responders, incident commanders and county leadership, enabling better-informed resourcing decisions.

INTRODUCTION

Next Generation First Responder Apex Program

The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) launched the Next Generation First Responder (NGFR) Apex program in January 2015 as a strategic initiative to develop and integrate next-generation technologies with the goal of expanding first responder mission effectiveness and safety. The NGFR Apex program seeks to help tomorrow's first responders be better protected, connected and fully aware. When firefighters, law enforcement officers and emergency medical services have enhanced protection, resilient communications and advanced situational awareness, they are better able to protect communities and make it home safely. The NGFR Apex program develops, adapts and integrates cutting-edge technologies using open standards, increasing competition in the first responder technology marketplace and giving responders more options to build the systems they need for their mission and budget.

NGFR Integration Demonstrations

NGFR has conducted three integration demonstrations to assess how prototype technologies integrate to support the NGFR Apex program. The first demonstration in January 2016 was primarily a tabletop demonstration, and the second in May 2016 was a combined tabletop and field demonstration in a large urban area. For the third NGFR integration demonstration, the NGFR Apex program reached out to a more rural community where cutting-edge technologies face a unique set of deployment challenges.

The NGFR Apex program is both modular—meaning responders can select different components that will easily integrate via open standards and interfaces—and scalable—meaning responders can build a large and complex system or a small and streamlined system, depending on their mission needs and budget. Throughout the course of the NGFR Apex program, it is essential to test both the modularity and scalability of the system with first responders, so that by the end of the program, responders will be able to build their own NGFR system from tested, integrated and demonstrated components that have already been proven in real-world environments.

NGFR Technology Experiment in Grant County

The DHS S&T NGFR Apex program partnered with the Grant County, Washington, Sheriff's Office to assess how NGFR technologies could improve the mission capabilities of Grant County public safety. The county, comprised of more than 2,700 square miles of river valleys, rolling hills and agricultural farmland, is decidedly rural, and Grant County responders have frequently struggled with poor communications coverage when supporting major events, managing wildland fires and coordinating multi-agency responses to large incidents.

The overarching objective for the event was to conduct a Technology Experiment (TechEx) in Grant County, Washington, in collaboration with Grant County public safety officials and first responders. The TechEx integrated several NGFR technologies to support an operationally-relevant, mission-based scenario centered on law enforcement and emergency response operations. The TechEx goals were to demonstrate the various technologies, assist Grant County in incorporating them into their daily operations and to gather responder feedback to help improve both individual NGFR technologies and the program as a whole.

Purpose of This Case Study

This case study describes NGFR's recent efforts to provide a method of capturing, sharing and datacasting video from first responder smartphones and the Sheriff's Office drone. This study identifies and explains the technologies used in the TechEx and presents a case study for public safety agencies as an example of how to implement video sharing systems in rural areas to improve officer safety and resource management.

TECHEX OVERVIEW

Background

The NGFR Apex program and Grant County partnership resulted in the *Grant County – DHS S&T NGFR Technology Experiment*. The two-day experiment was held in and around Grant County's Gorge Amphitheatre, a popular music venue and campsite surrounded by open farmland and canyons. The venue draws crowds that increase the county's population by 30,000—a 30 percent increase from Grant County's regular 93,000 residents—on weekends during summer events, and poses a strain on existing responder communications capabilities. This particular venue provided the optimal environment to test various NGFR technologies during the TechEx.

Objectives

The overarching objective for the event was to conduct a TechEx in Grant County, Washington, in collaboration with Grant County public safety officials and first responders. The TechEx was based upon the integration of identified NGFR technologies to support an operationally-relevant mission-based scenario centered on law enforcement and emergency response operations. The goal of this TechEx was to demonstrate the various technologies and assist Grant County in incorporating them into their daily operations and existing systems. By gathering feedback from first responders on the technologies and how they did or did not augment Grant County emergency response capabilities, the NGFR Apex program sought to improve the program's alignment with rural and urban responder needs.

Figure 2: Grant County Command Center Monitors TechEx Activities

Requirements

Initial discussions with Grant County in December 2016 resulted in the identification of the following technology TechEx requirements:

- **Extended and Increased Communications:** Provide a broadband ([Long Term Evolution (LTE)] communications infrastructure that works with both existing commercial LTE providers and with a temporary public safety Band 14 LTE system to provide connectivity for the various technologies being demonstrated.

- **Video Capture, Storage and Distribution:** Capture video from responders' smartphones, small unmanned aerial systems (sUAS) also known as drones and other devices to forward to a centralized video storage service; and distribute captured video from the centralized service to responders, incident commanders (IC) and the Grant County Multi-Agency Communications Center (MACC).

- **Location Tracking:** Track the locations of first responder vehicles and smartphone-equipped first responders on map displays at the MACC, command posts and on smartphones.

- **Responder Physiological Monitoring:** Monitor first responders' heart rate and respiration rate data to send to the MACC and/or command post.

- **Situational Awareness:** Share first responder location, physiological data and captured video to the MACC, command posts, emergency management and other destinations for display on dashboards and maps.

TechEx Activities

Site Survey

NGFR and their primary support partners, Johns Hopkins University Applied Physics Lab (JHU APL) and the U.S. Department of Commerce National Institute of Standards and Technology's (NIST) Public Safety Communications Research (PSCR) division, performed a site survey of Grant County in February 2017, which specifically focused on the technology currently in use by the Sheriff's Office, the fire districts and at the Gorge concert venue. This survey enabled the NGFR TechEx team to identify the types of technologies that would fulfill the requirements and objectives of the TechEx. As part of the survey, the NGFR TechEx team developed an "as-is" configuration of Grant County's communications infrastructure and capabilities for use as a baseline.

Integration Testing

Once the technologies were identified and preliminary development and integration was complete, NGFR and their partners met at PSCR in Boulder, Colorado, in April 2017 to perform further integration testing. This three-day session enabled technical participants to connect all technologies in both laboratory and radio transmitter test-range field locations to test the integration of the components as a system of systems.

Dry Run

Soon after the Boulder integration testing, the team reassembled at the Gorge concert venue in Grant County to install antennas, test coverage and perform a dry run of the scenario vignettes. This testing assisted the participants in finalizing the systems, testing the new capabilities in the actual event setting and preparing for the actual TechEx.

Technical Experiment

The TechEx was conducted June 6-7, 2017. It was conducted using an operational scenario with three vignettes:

- **Vignette A** functioned as a systems check of the new technologies. Each technology was tested for each of the corresponding responders and vehicles (as applicable).
- **Vignette B** involved tracking down two notional lost hikers who wandered down into the Columbia River gorge. One hiker fell off a cliff and broke a leg. Sheriff's deputies were sent down into the gorge to find the victims with an sUAS used to assist in finding the hikers. Once the hikers were located, the Fire District responders were dispatched to perform a ropes rescue to transport the victim up the cliff to be treated by responders.
- **Vignette C** involved the report of a notional brush fire, which was located by the sUAS. Fire Districts 3 and 5 personnel were dispatched to fight the fire. Soon after, a notional altercation occurred at the nearby campground, and deputies pursued the perpetrator.

The TechEx scenario provided sufficient realistic opportunities to assess the various technologies' utility and integration with existing systems (technical and human). The scenario also provided opportunities for the first responder to identify gaps and required enhancements to be addressed in future NGFR events and technical development. The evaluation team was able to verify the architecture implemented and configured in Grant County was easy to install, easy to use and provided capabilities that were valued by the first responders.
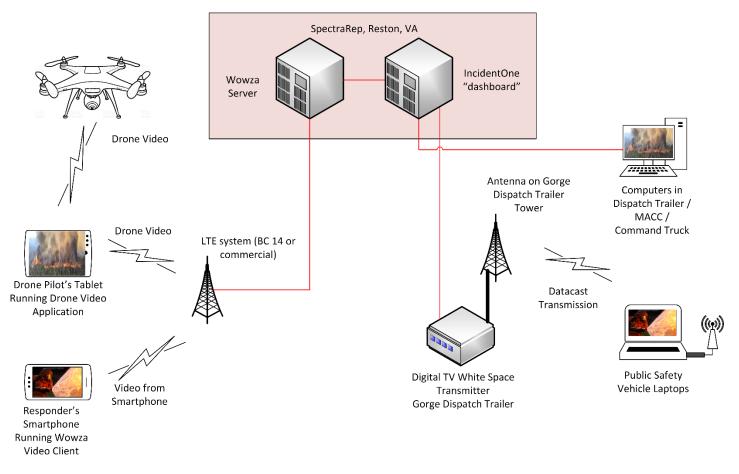
Video Capture, Sharing and Datacasting Architecture

Based upon the site visits, baseline assessments and ongoing collaboration with Grant County, the Spiral 2 TechEx team developed an architecture for the TechEx that aligned with Grant County first responders' expectations and needs. The architecture is shown in Figure 4.

Figure 3: Grant County Video Architecture

Grant County Constraints and Issues

There were several constraints and issues influencing the video solutions for Grant County.

- To expedite delivering the video storage and datacasting transmission capabilities to Grant County, SpectraRep provided use of/access to their Wowza server and SpectraRep IncidentOne servers for the TechEx.
- There was no Public Broadcasting System coverage for Grant County.To enable datacasting, SpectraRep provided a digital TV white space transmitter to broadcast the signal in the area around the Gorge venue.
- For Grant County's ability to view the Washington State Department of Transportation (DOT) traffic camera video in real time, they would have to pay for access to the DOT server – to which they declined.
- Due to time and technical constraints, Grant County chose not to include video feeds from their fixed security camera system as part of the video capture solution for the event.

Video Capture and Sharing Solution Implemented

It is crucial for public safety agencies to maintain effective real-time situational awareness in the execution of various law enforcement, emergency care and fire safety missions. One major component of situational awareness is that the incident commanders, dispatchers and agency leadership have the ability to see what is happening at the scene of an event. Viewing the conditions, environment and activities of first responders is essential for first responder safety and efficient deployment of resources. For example, capturing video at a large structure fire from multiple angles and transmitting it to the IC allows

the IC to deploy resources more effectively and fight the fire safely, reducing loss of life and property and protecting first responders.
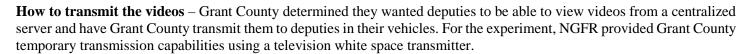
Grant County Video Capture Requirements

In order to develop and implement a real-time video capture and transmission system effectively, the NGFR team and Grant County assessed Grant County's requirements for capturing and transmitting video, to determine the existing capabilities of their internal and commercial infrastructure to support collection, transmission and display of the video. The analysis involved determining the following:

How to capture the video – Grant County determined they wanted to capture video from cameras on both smartphones and their sUAS drone.

How to collect and store the videos – Grant County determined they wanted to capture the video and store it on a central server for access by other first responders.

How to transmit the videos – Grant County determined they wanted deputies to be able to view videos from a centralized server and have Grant County transmit them to deputies in their vehicles. For the experiment, NGFR provided Grant County temporary transmission capabilities using a television white space transmitter.

Baseline Grant County Video Capture Environment

Body Cameras – Grant County deputies had body cameras; however, the cameras only recorded video for later downloading and viewing. There was no way to stream real-time video from the body cameras.

iPhone Cameras – The deputies had been issued iPhones, but there was no central way for them to share videos. The only way Grant County deputies could pass videos from one deputy to another was to send to each other as either an e-mail or text message attachment.

sUAS Cameras – In the past, the only way Grant County shared their sUAS video was to post it to YouTube, but this was determined to be an unsecure and uncontrolled way to distribute the video.

Security Cameras – Grant County has a security camera system that uses fixed cameras at critical locations (e.g., courthouse, jail, etc.), but there was no interface available to export the video from the security camera recording system to a central video server for remote viewing.

Washington Department of Transportation Traffic Cameras – There are six traffic cameras operated by the Washington State DOT within Grant County. These are published to the Web and accessible to the public, but are only updated every two minutes. Grant County does not have a direct link to or control of the cameras to provide a real-time video feed from the cameras.

Video Capture and Sharing Solution Tested During the TechEx

Small Unmanned Aerial System (sUAS)

The sUAS used was a DJI Phantom 4 quad-copter drone with an attached camera. The video was transmitted from the drone to the operator's tablet computer via Wi-Fi, displayed on the tablet and could be sent on via a Wi-Fi connection to the Internet. The SpectraRep enabled their server in Reston, Virginia, to receive the video instead of the typical YouTube destination after a reconfiguration of the destination URL in the tablet.

Smartphones

TechEx participants downloaded the Wowza client application (from iTunes or the Google Play Store, depending upon the type of smartphone) onto their smartphones and configured them to forward captured video to the SpectraRep servers in Reston, Virginia.

Video Server

SpectraRep provided an environment running the Wowza Server application as a destination for the videos captured by the drone and the responders' smartphones. This environment was located at SpectraRep's offices in Reston, Virginia.

Datacasting

Datacasting Concept

Datacasting uses the unused digital television transmission signal bandwidth (also known as white space, usually filled with random data) at Public Broadcasting System (PBS) stations to transmit digital data, including files, video and messages. The benefits of datacasting include:

- One-to-many distribution – a single PBS station can transmit a video to multiple users due to the broadcast nature of digital television.
- Encryption – the data transmitted is encrypted, so unauthorized personnel are unable to view the data.
- Authorized users only – only authorized, registered and designated users can receive the signal and decrypt the information.
- Low user cost – the technology requires minimal outlay for the agency – each user needs only the application, a receiver "dongle" and an antenna attached to a laptop or workstation in order to receive and display the transmitted data.
- Reduced use of LTE and LMR bandwidth – datacasting relieves the need to transmit the data files over commercial LTE or agency LMR networks.

SpectraRep Dashboard

SpectraRep provided their own datacasting "dashboard" application, which allowed users accessing the site to view streaming video, and also allowed the SpectraRep Operator, using the IncidentOne application, to select which of the video streams to send to the PBS TV transmitter for broadcasting. This environment was located in Reston, Virginia, and accessed from Grant County via the Internet. The video transmitted from the SpectraRep server and dashboard via the Internet, back to the transmitter at the Gorge, and then broadcasted to the campground and Gorge amphitheater.

Note: Datacasting and SpectraRep implementation is capable of transmitting data in the form of files to destination laptops; however, this capability was not tested in Grant County.

Digital TV White Space Transmitter

Because there was no PBS TV broadcast coverage in the area of the Gorge amphitheater, SpectraRep installed a suitcase-sized digital TV white space transmitter and a directional antenna at the Sheriff's Gorge Dispatch Trailer. This provided broadcast TV coverage for the Gorge amphitheater venue and the southern half of the large campground.

Datacasting Receiver Dongles and Software

SpectraRep provided digital TV receivers (dongles), which they attached to laptops in Sheriff's vehicles, and external antennas to receive the broadcast signals. SpectraRep also installed an application on the laptops that decrypted the broadcast signal, enabling the deputies to view the videos in real time.

Figure 5 depicts the location of the datacasting antenna and the notional datacasting coverage on an aerial photograph of the Gorge amphitheater.
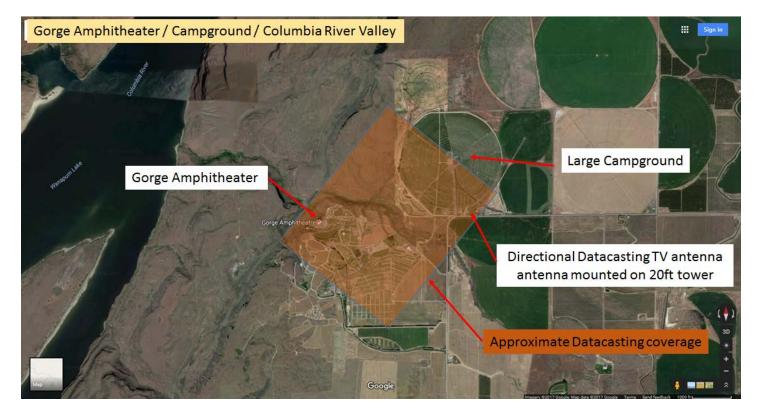
Figure 4: Gorge Amphitheater, Datacasting Antenna Location and Coverage

RESULTS

The TechEx proved to be successful in demonstrating both the advantages of the systems and their shortfalls as currently implemented. All of the requirements were fulfilled with the delivered capabilities, but with varying degrees of success. The input from Grant County first responders was overwhelmingly favorable. The first responders were very pleased to be able to view video from the drone and other first responders on their smartphones. The IC and MACC staff greatly appreciated the capability to have "eyes on" the activities of the Ropes Team via both the drone and on-scene first responders. A complete TechEx After Action Report is available online.

Additional sources are provided in the References and Recommended Reading section.

CASE STUDY SCENARIO

This scenario provides an example of how an agency can implement and use video capture/storage/transmission services to share video across their jurisdiction. The setting is a moderate-sized agency in a suburban/rural area, without a centralized method of capturing and sharing video. The agency understands the value of capturing and sharing video and wants to implement a solution.

Determine Video Capture and Sharing Requirements

The first step for the agency is to assess their video capture/sharing requirements. These would include:

1. Video Sources – From what sources does the agency want to capture video?
    a. Drone cameras?
    b. Body cameras?
    c. Dash/vehicle-mounted cameras?
    d. Smartphone cameras?
    e. Other handheld cameras?
    f. Fixed traffic cameras?
    g. Fixed security cameras?
    h. Other fixed cameras?
2. Video Destinations – To whom does the agency want to send and share the video:
    a. Command center?
    b. Incident commander?
    c. First responder vehicles?
    d. First responders?
    e. Other agencies/jurisdictions?
    f. General public?
3. Purpose – What is the agency's purpose for capturing/sharing video:
    a. Command and control?
    b. Situational awareness?
    c. Investigations?
    d. Historical record?
    e. Communications and outreach?
4. Content – What video content does the agency want to share:
    a. Full-motion video?
    b. Still pictures?
    c. Video and data?

Identify current video capture and sharing capabilities

The second step is for the agency is to determine their current video capture/sharing capabilities. These would include:

1. Sources – What video sources does the agency currently have:
    a. Drone cameras?
    b. Body cameras?
    c. Dash/vehicle-mounted cameras?
    d. Smartphone cameras?
    e. Other handheld cameras?
    f. Fixed traffic cameras?
    g. Fixed security cameras?
    h. Other fixed cameras?

2. Agency Infrastructure – What infrastructure does the agency have to support video capture/sharing:
   a. Centralized server capacity?
   b. Cloud server capacity?
   c. Adequate LTE coverage?
   d. Internet access?
3. PBS Datacasting Infrastructure – Does the jurisdiction have PBS broadcasting coverage?
   a. Coverage of the entire jurisdiction?
   b. Coverage by one station or multiple stations?

Identify solutions

Once the agency has determined their video capture/sharing requirements and current capabilities, they need to identify the solutions to fulfill those requirements. The agency would have to evaluate the costs of and functionality provided by each solution to determine which one(s) to select. Alternatives could include one or a combination of the following:

Video Capture and Sharing Only

The elements of a stand-alone video capture/sharing solution involve:

1. Installing video capture management software on a server.
2. Installing video capture software on smartphones and pointing their video to the video capture management server.
3. Directing drone video to the video capture management server.
4. Directing other video sources (e.g., fixed cameras, as applicable) to the video capture management server.

Combined Video Capture, Sharing and Datacasting

The elements of a combined video capture, sharing and datacasting involve:

1. Enter into a contract with a datacasting management provider for their support and services to host the video capture management server, the datacasting management dashboard and provide the datacasting management software for controlling the datacasting feed.
2. Enter into an agreement with the appropriate PBS station(s) for them to host the datacasting server and allow the agency to datacast video and data over their whitespace.
3. Procure the necessary datacasting server and associated software for installation at the PBS station(s).
4. Install video capture software on smartphones and point their video to the datacasting management system.
5. Direct drone video to the datacasting management system.
6. Direct other video sources (e.g., fixed cameras, as applicable) to the datacasting management system.

Implement solutions

Once the agency has selected the solution(s), they develop an implementation plan for the system(s). The plan would include guidance and processes to:

1. Negotiate the appropriate contracts.
2. Identify the necessary hardware and software.
3. Procure the software and hardware.
4. Install the components.
5. Configure the devices and associated applications.
6. Train support personnel on the maintenance of the devices and applications.
7. Train the first responders in the use of the systems.

Technical Implementation Issues to Consider

Video Capture and Storage Solution

Grant County cannot incorporate datacasting into their video capture and transmission solution at this time, due to the lack of PBS coverage for the county. As a result, they plan to install a Wowza server within their enterprise IT system to use in collecting videos and, using the Wowza Server's control application, allow authorized users to view the captured video. This is a workable solution for agencies who do not have access to a datacasting system at a PBS station covering their area or do not have PBS coverage.

Video Quality

The video quality from the smartphones and the drone is directly related to the bandwidth provided in the pathway between the camera and the Wowza server. In Grant County, the video quality from smartphones deteriorated when multiple users sent video over the same available bandwidth. For the drone, the video deteriorated as the video passed from the drone operator's tablet computer on to the infrastructure. The video data path from the drone to the IC or MACC had numerous links, as indicated below:

Drone camera > Wi-Fi link > Operator's iPad > Wi-Fi link > Wi-Fi Hotspot > Verizon LTE > Internet > SpectraRep/Wowza Server (Reston, Virginia) > Internet > Grant County WAN > Incident Commander

Datacasting Cooperative Effort

For jurisdictions with adequate PBS station coverage, agencies can initiate a cooperative effort with the applicable PBS TV station(s) to identify funding for the datacasting equipment needed at the station(s). This cooperative effort can build upon the concept that datacasting provides a valuable public safety service to first responders with only an initial outlay and minimal maintenance and operating costs, does not interfere with existing broadcasts, and uses excess transmission bandwidth. Datacasting also reduces the load on existing LTE and LMR networks, thereby reducing the need to expand those networks.

Datacasting Limitations

The current digital TV standard used for datacasting does not account for the Doppler shift that acts upon moving vehicles. As a result, datacasting to moving vehicles results in poor or no video reception. There are efforts underway to revise the transmission standards in order to account for Doppler shifts and facilitate reception of datacasts by moving vehicles.

Datacasting on Smartphones

Currently, smartphones cannot receive datacasting transmissions; as result, users must access the Wowza server directly to view videos. There are, however, several technical initiatives underway to allow smartphones to receive datacasting broadcasts. One solution involves changes within the smartphone itself; another involves adding an external receiver/antenna to the charging/data port on the smartphone. Either solution will, once developed, enable first responders to view datacasting broadcasts on their smartphones.

IMPLEMENTATION FOR YOUR AGENCY

The NGFR TechEx deployed video capture, sharing and datacasting to provide augmented capabilities at the incident site. How can your agency apply this case study and best practices to improve your capabilities? The NGFR Apex program has developed the following checklists to assist your agency with planning how to implement video capture, sharing and datacasting.

Video Capture, Sharing and Datacasting Implementation Checklist

- ☐ Identify Agency Video Capture and Sharing Needs
  - ☐ Video Sources:
    - ☐ Drone cameras?
    - ☐ Body cameras?
    - ☐ Dash orvehicle-mounted cameras?
    - ☐ Smartphone cameras?
    - ☐ Other handheld cameras?
    - ☐ Fixed traffic cameras?
    - ☐ Fixed security cameras?
    - ☐ Other fixed cameras?
  - ☐ Video Destinations:
    - ☐ Command center?
    - ☐ Incident commander?
    - ☐ First responder vehicles?
    - ☐ First responders?
    - ☐ Other agencies or jurisdictions?
    - ☐ General public?
  - ☐ Purpose:
    - ☐ Command and control?
    - ☐ Situational awareness?
    - ☐ Investigations?
    - ☐ Historical record?
    - ☐ Communications and outreach?
- ☐ Identify Current Agency Video Capture/Sharing Capabilities
  - ☐ Sources:
    - ☐ Drone cameras?
    - ☐ Body cameras?
    - ☐ Dash or vehicle-mounted cameras?
    - ☐ Smartphone cameras?
    - ☐ Other handheld cameras?
    - ☐ Fixed traffic cameras?
    - ☐ Fixed security cameras?
    - ☐ Other fixed cameras?
  - ☐ Agency Infrastructure:
    - ☐ Centralized server capacity?
    - ☐ Cloud server capacity?
    - ☐ Adequate LTE coverage?
    - ☐ Internet access?

- PBS Datacasting Infrastructure:
  - PBS broadcast coverage of the entire jurisdiction?
  - PBS broadcast coverage by one station or multiple stations?
- Identify Solutions
  - Video Server Only
    - Install video capture management software on a server.
    - Install video capture software on smartphones and point their video to the video capture management server.
    - Direct drone video to the video capture management server.
    - Direct other video sources (e.g., fixed cameras, as applicable) to the video capture management server.
  - Video Server and Datacasting
    - Enter into a contract with a datacasting provider for their support and services to host the video capture management server, the datacasting management dashboard and provide the datacasting management software for controlling the datacasting feed.
    - Enter into an agreement with the appropriate PBS station(s) for them to host the datacasting server and allow the agency to datacast video and data over their whitespace.
    - Procure the necessary datacasting server and associated software for installation at the PBS station(s).
    - Install video capture software on smartphones and point their video to the datacasting management system.
    - Direct drone video to the datacasting management system.
    - Direct other video sources (e.g., fixed cameras, as applicable) to the datacasting management system.
- Determine Necessary Changes and Execute
  - Negotiate the appropriate contracts.
  - Identify the necessary hardware and software.
  - Procure the software and hardware.
  - Install the components.
  - Configure the devices and associated applications.
  - Train support personnel on the maintenance of the devices and applications.
  - Train the first responders in the use of the systems.

SUMMARY

This NGFR case study provided an overview of the NGFR TechEx in Grant County, with a focus on the implementation of video capture, sharing and datacasting capabilities to improve situational awareness and officer safety. In addition, this case study reviewed best practices for planning and implementing video capture/sharing and datacasting services for public safety agencies.

If your agency finds this NGFR case study useful for improving your video sharing capabilities, the NGFR Apex program would greatly appreciate your feedback. Please contact the NGFR team with stories from the field, questions or comments by emailing NGFR@hq.dhs.gov.

Figure 5: Grant County Emergency Medical Services during the TechEx

REFERENCES & RECOMMENDED READING

DHS Science & Technology Directorate

Next Generation First Responder Apex Program (https://dhs.gov/ngfr)
This website provides NGFR Apex program descriptions, updates and knowledge products.

NGFR TechEx After Action Report, October 2017 (https://www.dhs.gov/publication/st-frg-grant-county-dhs-st-ngfr-apex-program-techex-after-action-report)
This document thoroughly describes the planning, execution and results of the NGFR TechEx.

NGFR TechEx Playbook, June 2017 (available upon request from NGFR@hq.dhs.gov)
This document is the guide used to execute the NGFR TechEx in Grant County.

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