

Mission-critical mesh

Mesh networking sparks the solution for first responders in unfolding emergencies, by Don Gilbreath, Rajant Vice President of Systems



In emergency situations, unfailing connectivity is needed to not only keep communications flowing but keep people alive. A network that is robust enough to bounce back from network coverage interference and safely deliver communications in the face of extreme and hazardous situations is critical.

Those tasked with protecting the public must adopt predictive and preventative measures to avert, solve and respond to changing and constantly evolving safety and security conditions. But one key challenge that must be systematically overcome is having access to fast and real-time communications. A connectivity network that can be deployed swiftly, is self-healing and resilient, will keep mission-critical operations moving.

Disjointed connectivity – a blazing concern

For first responders, such as firefighters, incompatible equipment can prevent access to vital information, applications and real-time data. This in conjunction with limited bandwidth or sporadic connectivity can create serious issues and threaten the effectiveness of crucial tasks.

Increased bandwidth is key for supplying the reliable stream of live and on-scene video and aerial imagery, especially when emergency personnel and vehicles are on the move. Any network outage experienced can be catastrophic for situational awareness, as certain conditions may be unforgiving.

While all public safety organisations wish that their networks are cutting-edge and include the latest technology advancements, budgetary constraints can pose a notable sticking point. But it is vital that they act swiftly to harness the potential of the Industrial Internet of Things (IIoT) and the many benefits it brings.

Latest tech advances powering a public safety change

Thanks to the latest technological innovations, real-time data has placed first responders one step ahead as they are provided with a clearer view and more insight into the crisis that is unfolding before them. Receiving the latest information and having access to real-time situational awareness, means that resources can be allocated accordingly in coordination with those changing conditions.

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For those attending developing situations, liaison with offsite commanders is key. First responders and security personnel may need to broadcast telemetry and videos directly from the scene to those away from the site. From the central command centre, network operators can assess the demands and, in turn, deploy personnel and assets to particular locations or areas that demand more attention or focus. Crucially, when time is of the utmost importance, lag times will not unduly impact response times.

A crucial comms link

Fully mobile coverage is a necessity, even if the infrastructure or backhaul does not exist. For the likes of mobile robotic systems, surveillance drones, robust sensors and cameras, a high-capacity network can help notify personnel of activities. A network that can adapt and be deployed seamlessly and swiftly is desirable.

When wildfires rage, cellular service can go down and it can be days, or even weeks before the networks are operational again. Compared to other natural disasters, such as hurricanes, wildfires pose a much more superior risk as they can burn and destroy vital equipment and can even attenuate wireless signals. In some cases, cell towers can collapse and if they do, it is a single point of failure. Whereas satellite and mesh connectivity can be rapidly deployed and withstand adversity in the harshest of conditions.

In a mesh network, wireless nodes can be deployed on any asset, anywhere, to extend or improve operational coverage. These nodes can integrate seamlessly with satellite, and extend the capabilities and range of Long-Term Evolution (LTE) technologies.

The right mesh network can multiply and create networks that were not available before, without sacrificing connectivity. The performance of bandwidth-intensive applications can be guaranteed, thanks to multiple

paths and frequencies. This includes the likes of CCTV and Machine-To-Machine communications between robots, drones and other autonomous systems.

For firefighters to provide a timely and effective response in a disaster, vital voice, data, and video communications must remain available in the face of a disaster. This 24/7/365 anywhere



FOR FIRST RESPONDERS, INCOMPATIBLE EQUIPMENT CAN PREVENT ACCESS TO VITAL INFORMATION.

connectivity provides much-needed visibility crucial in public safety operations, and provide first responders, such as firefighters with complete situational awareness. This can include an array of challenging events that they typically encounter, including vehicles accidents, water rescues or wildfires.

Communications are not only vital between fire crews and their control rooms, but they are necessary for the seamless coordination with other teams and emergency services providers at the scene.

Containing the Californian blaze

In October 2019, a bush fire raged in El Capitán Canyon, California, due to the heat of the sun combining with winds of up to 40 miles per hour in the dry desert hills. It spread at a dangerous and rapid speed through the foothills on the north side of Highway 101 near El Capitán State Beach.

Emergency service crews from the Santa Barbara County Fire Department, California Fire, and the US Forest Service were dispatched to contain ▶

the wildfire. Incidentally, Rajant Corporation and its technology partner Dejero were also delivering a live safety demo to the Santa Barbara County Fire Department and the Department of Homeland Security on the same day. This demo was going to showcase the combination of Rajant's Kinetic Mesh® technology and Dejero's Smart Blending Technology (SBT) and how it could prevent any drops in mission-critical connectivity.

By utilising mesh radio communications, bonded cellular and satellite technologies, the communication gap could be addressed. LTE may provide the high bandwidth, low latency and greater spectrum efficiency, but signals can still be dropped in remote locations due to potential interference and evolving situations. Relocating or adding a tower to achieve everywhere coverage is a complex, costly, and time-consuming feat. The joint solution however, blended any available LTE with satellite communications to guarantee connectivity, which typically becomes patchy in valleys.

From live demo to real-time response

While the wildfire blazed and the 101 freeway had been shutdown in both directions, Rajant and Dejero were tasked with pivoting from a live demo situation to deploying the network in a real-life emergency situation. As part of the precautions, evacuations were carried out of nearby campgrounds, beaches and resorts, and warnings shared to residents living in the nearby canyons.

At the scene, 200 firefighters were tasked with reinforcing containment lines both from the sky and the ground, using drones, helicopters and bulldozers. When fighting a fire, bulldozers play an important role in cutting the fire line, but significantly, they also collect vital information while on the ground. In an ever-changing and unpredictable situation, typical of a wildfire, being one step ahead is key to proactively prevent the disaster developing further. Bulldozers can transmit data with the command control centre



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where the fire operation is being remotely managed, to ensure that the firefighters and each dozer is combating the fire collectively. The ability to track each bulldozer and their driver, and relay messages in real-time cannot be overstated. Offering crucial support, Rajant's BreadCrumbs® and camera systems were mounted to the bulldozers, crucially allowing local data to be transmitted to the central control



centre and situational data shared with those on the ground.

Dejero SBT powered the Microsoft Tactical Truck and provided the bridge from the field to the command centre over cellular and satellite networks. The truck was in a safe proximity to the bulldozers and provided the LTE connectivity needed. Similarly, the satellite communications in the truck was powered by Kymeta's flat-panel dish technology and leveraged Rajant's Kinetic Mesh. In turn, the command control centre received live real-time video from the location.

Mesh technology can extinguish the fire

Two days after the fire began, thanks to the efforts of Rajant and Dejero, it had been fully contained. 420 acres of land burned, but no structures were damaged, and no one was injured. Access to real-time data and ubiquitous mission-critical connectivity proved the catalyst for enabling a rapid and effective emergency service response and ensuring no communication drop outs were experienced.

The right wireless industrial network can offer the intelligent, and secure connectivity that can thrive in evolving and mobility-driven environments. It can form a "living" mesh network that can adapt in coordination with ever-changing communication requirements of public safety organisations. It is vital that video data can be transmitted with high throughput and low latency across a network, arming public safety personnel, such as firefighters, with the much-needed visibility necessary to carry out their life-saving duties. ■

