Rajant Kinetic Mesh® Networks Help Public Safety Agencies Build Smarter, Safer Communities

Today's public safety agencies are tasked with building safer communities while addressing the requests of Homeland Security, law enforcement, first responders, and citizens. Forward-thinking officials know that having always-connected, high-capacity communications between personnel, vehicles, and command centers can mean the difference between life and death.

With so much at stake, many government agencies are expanding their networks to more efficiently deliver voice, video, and data across their coverage areas – with video and mobility being major drivers for these initiatives.

Communication Challenges in Public Safety

To provide public safety professionals with anytime, anywhere connectivity, your communication network has to overcome the complex challenges you face.

- **Incompatible and Aging Equipment:** Disparate, often incompatible networks can restrict access to vital information and applications.

- **Inadequate Mobile Infrastructure:** Without the right wireless solution, your agency can experience limited or fragmented connectivity between mobile personnel and vehicles, creating serious and possibly life-threatening gaps in situational awareness.

- **Insufficient Bandwidth:** If your network has insufficient bandwidth capacity, real-time access to large files such as on-scene video, aerial imagery, maps, and missing-person images may not be possible.

- **Budgetary Constraints:** Budgetary limitations are always a consideration when planning and implementing network enhancements, and there are always more needs than dollars. Leveraging existing fiber and wired infrastructure with a wireless solution that will support current and future needs and multi-departmental requirements can help you significantly offset budgetary restrictions.

Global wireless broadband in the public safety market is projected to grow from **USD 15.5 Billion in 2014** to **USD 22.9 Billion by 2020,** at a **CAGR of 6.8%** during the forecast period, 2015 to 2020.[1]

Public Safety Market Growth

$22.9B

$15.5B

2014   2020

[1] "Wireless Broadband in Public Safety Market," MarketsandMarkets

The Connected, Mobilized Public Safety Organization

Many agencies have a disparate collection of devices and systems delivering varying types of information such as street maps, medical records, and incident details to dispatchers, police officers, firefighters, emergency medical teams (EMTs), and other public safety officials. The goal going forward is to pull existing systems together to establish an integrated, high-capacity communication network that will help to achieve multiple objectives, including:

- **Improve public safety effectiveness and responsiveness**

- **Enable anywhere, anytime access to applications and data**

- **Increase inter-departmental and inter-agency collaboration**

- **Enhance emergency preparedness**

- **Plan and manage traffic flow**

- **Leverage legacy investments**

Rajant Kinetic Mesh® networks have been providing any-node to any-node connectivity across hundreds of high-bandwidth nodes with years of unattended, high-quality service. As a result, you can rely on a Rajant wireless mesh network to provide the ongoing communications needed to achieve your objectives reliably and cost-effectively. While there are several competing vendors that supply wireless solutions today, the majority of their deployments have fallen short of meeting municipal and public safety requirements.

Video Surveillance: On-the-Move Visibility

Arming first responders with more inclusive situational awareness is essential to protecting citizens, personnel, and property. Video surveillance is certainly the linch-pin in any effective situational awareness strategy and has been proven an indispensable tool to reduce crime, gather and analyze evidence, monitor events, and control traffic. Today IP cameras can be installed virtually anywhere and link to a central office, dispatch center, or moving vehicle via a wireless communication network. Regrettably, many existing public safety networks lack adequate bandwidth for streaming video from remote cameras to first responders – especially while response teams are racing to an incident.

> The global video surveillance market is projected to **grow steadily at a CAGR of over 22%** during the forecast period 2016-2020.[2]

Unparalleled Wireless Capabilities and Advantages

Rajant's private Kinetic Mesh® networks offer reliable, intelligent, and secure wireless broadband connectivity that survives and thrives in evolving and mobility-driven environments - a "living" mesh network that moves with and adapts to your evolving communication requirements. Using Rajant BreadCrumb® wireless nodes powered by our patented[3] InstaMesh® networking software, our wireless mesh networks deliver highly-available, mobile connectivity that is unmatched by other wireless offerings. With up to 300 Mbps physical layer data rate, each high-bandwidth BreadCrumb can connect with multiple neighboring nodes. In fact, the more nodes you add, the more communication pathways you establish, and the more resilient your network becomes. In a network with hundreds of nodes, the network can provide thousands of possible data delivery paths to make sure that your voice, video, and data reach the intended destination.

Rajant mesh networks are self-healing, peer-to-peer networks that can seamlessly integrate with non-Rajant devices and technologies. Whether you have satellite, fiber, copper, cellular, point-to-point (PTP) or point-to-multipoint (PMP) wireless, LTE, or 3G/4G communications, you can leverage your existing investment while taking advantage of the mobility, reliability, and performance offered by meshing technology. Even if you have no communications infrastructure, you still can quickly deploy a BreadCrumb-based network.

[2] "Global Video Surveillance Market 2016-2020," TechNavio
[3] "U.S. Patent 8341289B2

- **BreadCrumb® Wireless Nodes:** Our industrial-strength BreadCrumbs are proven to withstand challenging environments and severe weather conditions. The small-footprint, light-weight nodes can be readily deployed on vehicles, towers, lampposts, command centers, and personnel such as police officers and firefighters. BreadCrumbs can be configured with multiple radio transceivers and radio frequencies, including 900 MHz, 2.4 GHz, 4.9 GHz and 5 GHz. Multi-transceiver, multi-frequency capabilities mitigate interference and allow multiple applications to run simultaneously.

  A BreadCrumb-based network can support Wi-Fi and integrate easily with Ethernet-connected devices to deliver low-latency, high-throughput connectivity across the mesh. Anywhere an ingress/egress point is needed, our Automatic Protocol Tunneling (APT) feature can enable reliable and fast off-loading to a wired Ethernet network.

- **InstaMesh®:** InstaMesh networking software orchestrates all network traffic and continuously discovers and updates BreadCrumb information with each packet. Because each BreadCrumb can have multiple connections to neighboring nodes, you have fully redundant connectivity throughout the network. Consequently, there will always be a viable pathway to deliver your information. As nodes are added, moved, or removed, InstaMesh automatically adapts to the changes and establishes new links in real time while keeping the network available, intact, and secure. The software automatically redirects each data packet over the best available path to mitigate the negative effects of interference or obstructions. For example, if a four-frequency node encounters interference on one or two frequencies, InstaMesh will redirect packets over frequencies that are not experiencing interference.

Security Is Paramount

Rajant networks support military-grade security options to meet your stringent security requirements, including:

- Multiple cryptographic options
- Configurable data and MAC address encryption
- Configurable per-hop, per-packet authentication
- Layer-2 and Layer-3 client/server and peer-to-peer security solutions compatibility
- Harris SecNet 54® encryption compatibility

Rajant Active Security Certifications
- **FIPS 140-2 Level 2**
- **Suite A Classified**
- **AES Suite B - Secret and Below**[4]

No Single Point of Failure

Competitive mesh networks that rely on a controller node can experience communication bottlenecks or outages. Groups of mobile devices connect to only one access point. If the access point fails, the mobile nodes connected to that access point will be disconnected from the network, making access points potential points of failure.

Rajant networks do not use a controller node and have no single point of failure. BreadCrumbs can connect to multiple network nodes, providing several potential pathways for each transmission. Multi-transceiver and multi-frequency capabilities greatly increase network availability. And, our Automatic Protocol Tunneling (APT) feature provides reliable, fast data off-loading to a wired Ethernet network which increases usable bandwidth and speeds data delivery.

Make, Make, Make Connectivity

Kinetic Mesh® networks never break connections to form new ones. As personnel and vehicles move from one location to another, InstaMesh automatically connects to approaching nodes while maintaining connectivity with previous nodes. We call this make-make-make, never break connectivity. As a result, you have continuous communications for first responders, command centers, dispatchers, and other public safety professionals.

Typically, competitive networks that utilize access points break connectivity as people and assets move from one place to another, connecting to the next access point only after terminating connectivity from the previous access point. This can result in a loss of communications as personnel and vehicles move across the coverage area.

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[4] NSA Suite B implementation is not certified on our commercially available models. Contact Rajant or your authorized Rajant Kinetic Mesh Partner if you require an NSA-certified Suite B system.

Interoperability and Scalability

Many public safety networks are or will be integrated into a larger municipal, state, or federal network. Therefore, it is important that your wireless mesh network integrate easily into the central network. Rajant wireless networks support Wi-Fi and integrate easily with Ethernet-connected devices. Because communication requirements typically evolve over time, Rajant networks can also scale to hundreds of high-bandwidth nodes. This helps protect your network investment, while allowing you to support added applications, devices, and capacity as needed.

Reduce Backhaul Costs

Our mesh clustering feature allows you to designate per-BreadCrumb® sub-meshes that will only mesh with a specified series of nodes. You can isolate groups of BreadCrumbs to mesh with each other and no other nodes outside a defined cluster. This capability also allows you to operate two BreadCrumbs in a point-to-point (PTP) capacity, eliminating the need to purchase a third-party PTP backhaul link. As an example, you could have two separate municipal mesh networks and connect them with two LX5 nodes – one at each network location. Because each LX5 can have four radio transceivers, you could designate one radio transceiver in each LX5 as a PTP radio. Then those two radios would communicate with each other as a PTP link while the other three radios in each LX5 would communicate over the mesh network.

Easy Deployment, Time-Saving Network Management

Self-configuring BreadCrumbs are easy to deploy, offering virtually one-button set-up. After deployment, they require minimal maintenance and administration and can run unattended for years. As an alternative, you can choose to take a more hands-on approach to administering a BreadCrumb-based network using our feature-rich, intuitive BC|Commander® software. Available for both Microsoft® Windows® and Linux®, the application provides a secure, encrypted link to each BreadCrumb and helps you configure, monitor, and manage nodes through the easy-to-use graphical interface. For example, you can update firmware remotely, configure multiple BreadCrumbs simultaneously, analyze and report network performance, configure wireless encryption and authentication, and view your network in real time.

BC|Enterprise, our always-on mesh network monitoring software, provides historical network performance data with live updates to complement the real-time tactical network views available from BC|Commander. The system allows you to view information for chosen time periods - now, a few minutes ago, last week, or a few months ago. To notify you of anomalous conditions within your Kinetic Mesh® network, you also can receive automatic alerts via email, text messaging, or an API to a chat network. With fast access to performance and traffic data, you can proactively identify and diagnose potential problems and obtain the insights needed to optimize network performance. Together BC|Enterprise and BC|Commander offer a comprehensive monitoring and management solution for your mesh network.

4.9 GHz
5.8 GHz
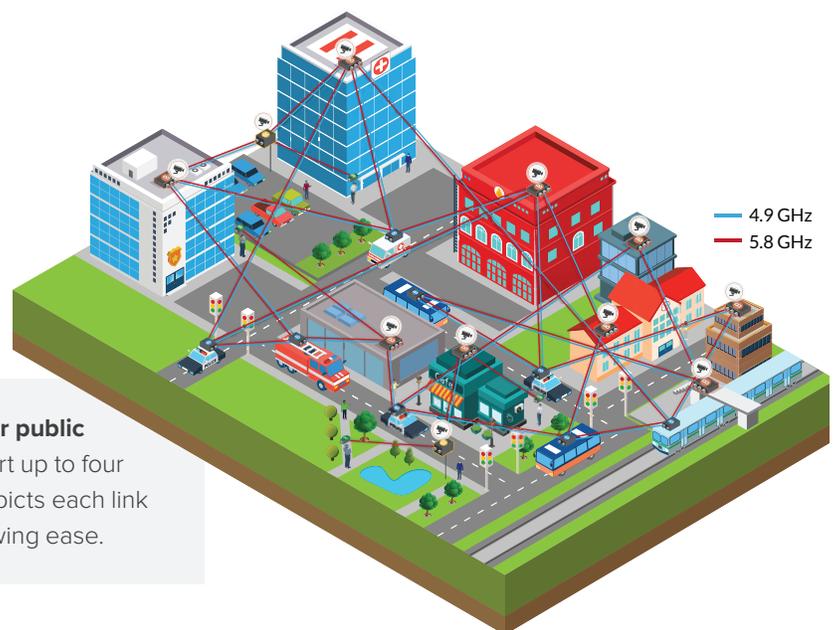
Typical Rajant wireless mesh network deployed for public safety applications. While BreadCrumbs can support up to four radio transceivers and frequencies, this example depicts each link with two radio frequencies (4.9 and 5.8 GHz) for viewing ease.

Connecting and Mobilizing Public Safety Applications

Rajant networks can support a variety of public safety applications, including:

- **Remote Information and Application Access:** First responders can instantly retrieve critical information such as arrest records, fingerprints, medical records, building blueprints, hazardous materials records, traffic reports, and Amber Alerts. Using smart phones, notebook computers, tablets, and in-vehicle information systems, police officers, firefighters, EMTs, and other personnel can prepare and submit reports, access email, and conduct Internet searches.

- **Improved Situational Awareness:** Police cars, fire trucks, ambulances, and officers fitted with cameras and BreadCrumbs® can stream on-scene video in-route. A dispatcher can view accident details, determine the extent of damage, coordinate emergency services, and get responders on-scene fast. EMTs can transmit live video in transit, allowing medical personnel to view a patient's condition prior to arrival. Monitoring of parking lots, garages, parks, buildings, crime-prone neighborhoods, events, and traffic flow can alert personnel to potential problems. These are just a few examples of how video improves situational awareness and helps officials respond quickly and safely to situations.

- **Enhanced Evidence Gathering:** Video, and especially high-definition video, can be an effective tool for building court-accepted forensic evidence. Whether from stationary or moving personnel and assets, IP-based video systems connected to a Rajant wireless network can help gather and disseminate evidence for investigation and prosecution.

- **Traffic Control and Enforcement:** A Rajant wireless mesh network can help monitor and manage traffic flow, even in harsh weather conditions. With traffic-signal and on-vehicle cameras connected to the network, police departments can issue red-light and parking violations automatically and have video records of violations. Just by their presence, video-based traffic enforcement systems are proving to deter red-light running and improve traffic safety.

- **Connectivity for UGVs and UAVs:** Today, many public safety agencies are evaluating and deploying unmanned ground and aerial vehicles such as drones, robots, and autonomous security vehicles for advanced monitoring and surveillance operations. A Kinetic Mesh network can support UGVs and UAVs with the continuous communications they require.

- **Mass Transit Safety:** To improve safety, monitor buses and trains, increase productivity, and enhance the passenger experience, many municipalities are extending their communication networks into mass transit operations. A Rajant wireless network can support applications such as train-to-trackside connectivity, vehicle-to-vehicle communications, passenger information systems, on-scene incident video, and fleet maintenance.

- **Event Monitoring:** From sports and political events to carnivals and outdoor concerts, wireless communications are helping officers monitor events, control crowds, manage traffic, and supply more "event eyes" for greater safety. You can utilize a permanent Rajant network to provide real-time communications or quickly and easily deploy an ad-hoc network for a short-term event. In stadiums where thousands of spectators are using their smart phones, a Rajant Kinetic Mesh® network can provide continuous operational, administrative, and public safety communications. With the enormous demand for available spectrum during events, you may not be able to totally rely on the public bands for stadium-wide communications. In such cases, custom licensed frequencies from 350 MHz to 6 GHz are available for development upon request to supplement the 4.9 public safety band and public bands.

ROI: Improve Productivity and Safety, Mitigate Risks, Cut Costs

Typically, municipal and public safety agencies have tight budgets and need innovative solutions that offer solid ROI. Rajant Kinetic Mesh® networks can help you realize strong ROI through benefits such as:

- **Increased Productivity:** Rajant's always-connected technology lets you better utilize personnel and resources to improve efficiency. Typical examples of productivity-increasing activities include: fast access to vital data, better informed incident response, more video-based "eyes on-the-street," and mobile access to applications that let personnel perform tasks from the field.

- **Improved Safety:** With mobile access to voice, video, and data, first responders can get real-time information in route to an incident, allowing them to plan and coordinate on-scene actions. Armed with good intelligence, personnel are more efficient, and only needed personnel and resources are dispatched to the scene, further improving efficiency.

- **Mitigated Risks:** Fully redundant, reliable connectivity can help gather and disseminate evidence quickly and reduce pay-outs from fraudulent claims.

- **Reduced Costs:** Rajant wireless networks can be deployed quickly and cost effectively since no cables have to be run, and BreadCrumbs® are self-configuring. A complete network can be installed in days rather than weeks or months, requires minimal maintenance, and enjoys low management costs. Because the networks support Wi-Fi, integrate easily with Ethernet devices, and scale to hundreds of high-bandwidth nodes, you can protect your infrastructure investment while having the flexibility to add applications, devices, and capacity as needed.

- **Increased Revenue:** While cutting costs is definitely important, municipalities can leverage their network investment to help generate added revenues with innovative applications such as automated red-light and parking violation systems.

Summary

The ability to supply essential communications between public safety personnel and assets — whether stationary or in motion — is crucial for efficient crime prevention, law enforcement, and emergency preparedness. The right wireless mesh network can help the agencies within your public safety community collaborate more effectively to protect citizens, personnel, and property. For more than a dozen years, Rajant customers have depended on our wireless networks to deliver the timely information they need to make good decisions and perform their duties efficiently and safely.

When choosing a wireless mesh solution to meet your public safety requirements, choose the wireless mesh network that can support your community with always-connected, secure, real-time information anytime and anywhere. Choose a Rajant Kinetic Mesh solution.

20+ Years OF GAME-CHANGING WIRELESS

RAJANT