RAJANT

Communications Industry
2023 Trend Report

What is Mesh Networking?

It's the best kept secret in tech and here's why it matters

What is a Mesh Network?

A mesh network is one way to provide online connectivity to devices, just like Wi-Fi or LTE. Mesh networks are unique because instead of each device connecting to a single centralized access point, mesh networks feature nodes, or signal bridging devices, arranged in a mesh or web-like structure that serve as connectivity points.

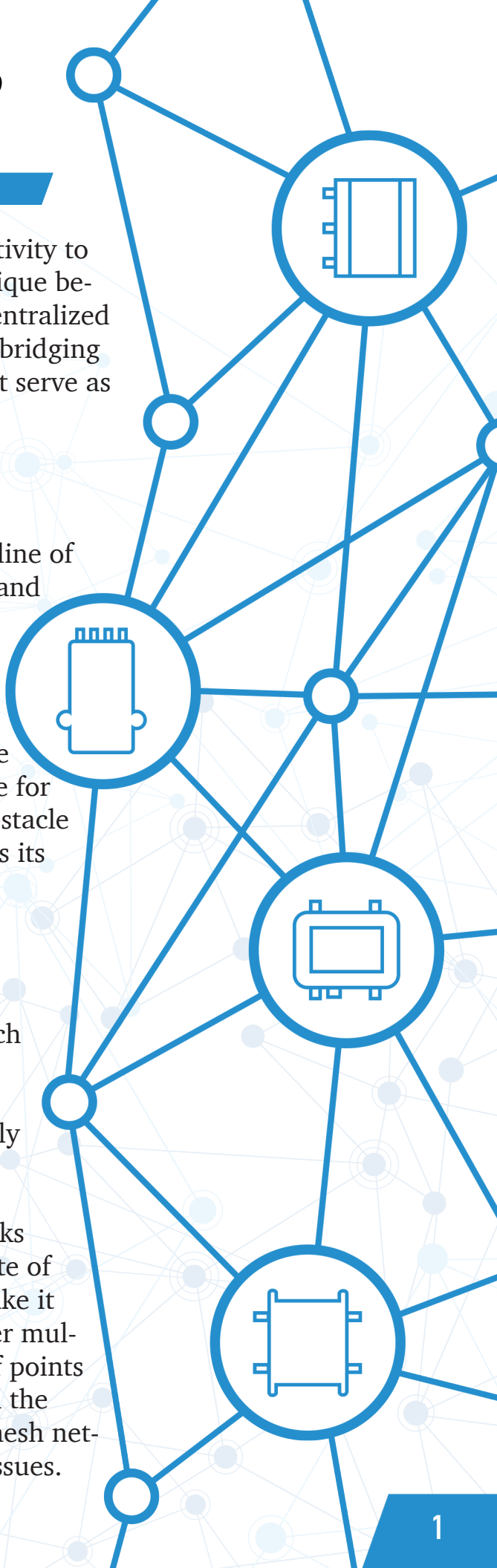
Mesh Networks Are More Reliable

Traditional high-risk networks must establish a clear line of sight to afford coverage. Bad weather, tall buildings, and even interference from nearby devices may challenge the integrity of other networks, while Kinetic Mesh networks will function properly despite those obstacles. The nodes that comprise mesh networks make signal transmission possible through multi-node connectivity. Even if a clear line of sight isn't available for one or two nodes, the signal will route around the obstacle through a series of other nearby nodes until it reaches its intended destination.

Mesh Networks Offer More Bandwidth

In traditional high-risk networks, there is only so much bandwidth to go around. That bandwidth is divided among all the clients paying for usage, and the bandwidth is often restricted and unreliable, especially during peak busy times.

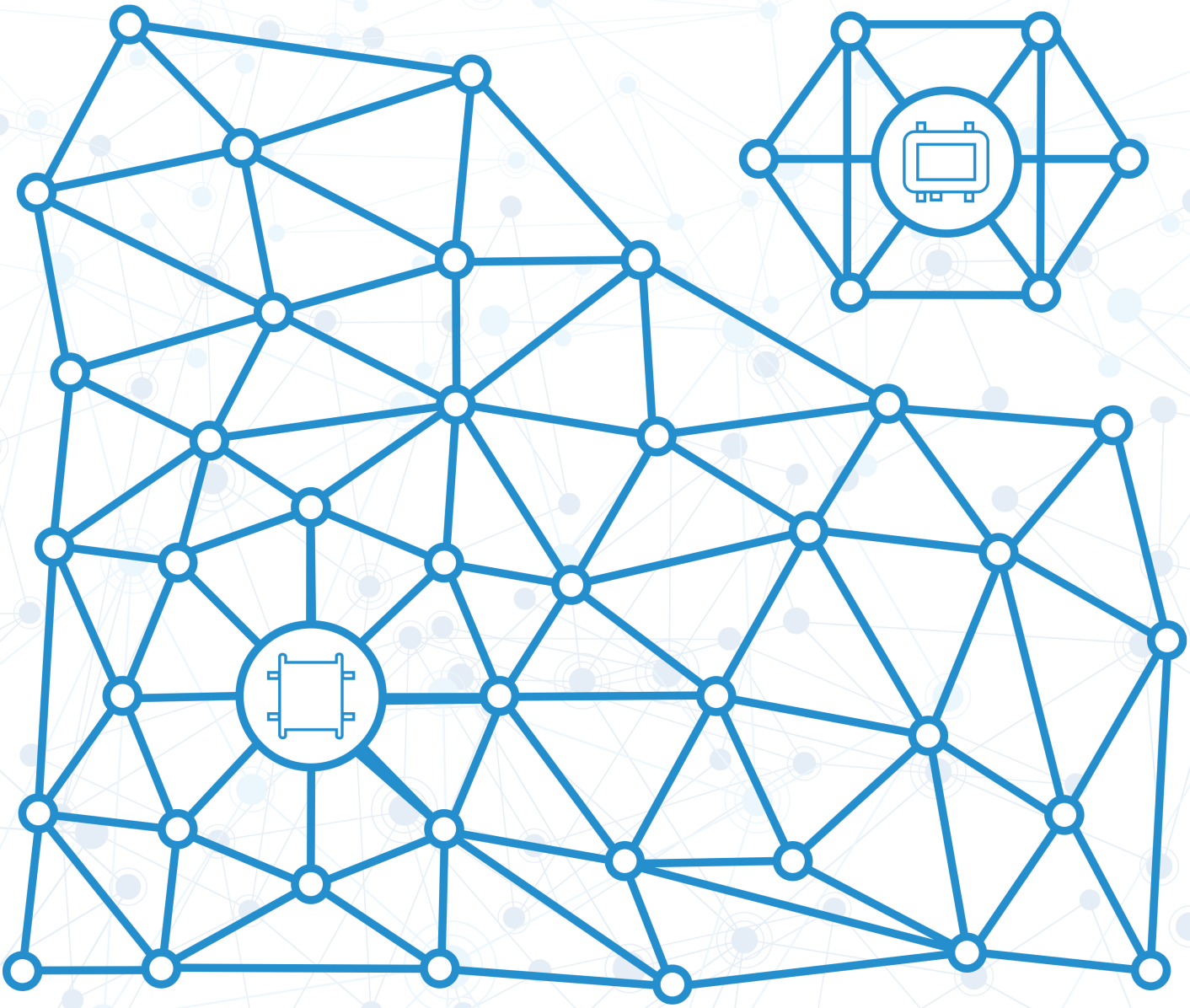
In contrast, mesh networks are closed-private networks built with high bandwidth and can produce a data rate of up to 450 Mbps. Further, nodes in mesh networks make it possible to have multiple devices sending packets over multiple paths simultaneously, as well as various drop-off points that allow consumers to quickly get information from the client device to the network infrastructure. In turn, mesh networks offer more bandwidth with fewer congestion issues.



Mesh Networks Are Easier To Scale

There are a few factors that come into play when it comes to scaling traditional high-risk networks. Base station and tower placement, frequency availability, and the number of access points within the network must all be considered. If scaling is necessary, base stations, towers, and access points must be added at fixed locations—and those get expensive, fast.

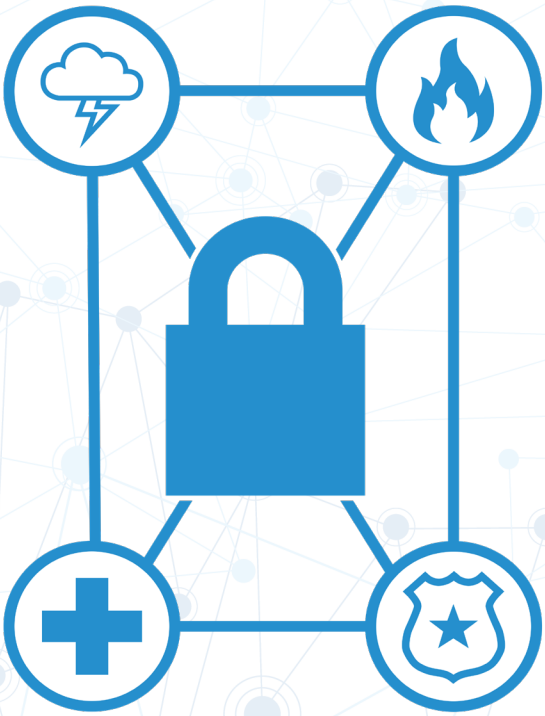
Mesh networks are much easier to scale. For example, Rajant Kinetic Mesh wireless networking uses unlicensed and lightly licensed frequencies that offer larger amounts of bandwidth and are more readily available around the globe to support various business applications. To expand the mesh network, users simply add additional nodes wherever or on whatever they're needed. Unlike competitive networks, Rajant's mesh nodes do not require a LAN connection to operate and expand coverage.



Real-Life Applications for Mesh Networks

First Responders

The 9/11 Commission released a report in 2004 detailing the communication failures at Ground Zero and throughout the New York City area. With so many public safety agencies responding simultaneously, radio frequencies and channels were inconsistent and communication between organizations was extremely limited. Some even attribute the death of more than 400 first responders to communication blunders.



That's where Rajant comes in. Rajant was established in October 2001 after founders Robert Schena and Paul Hellhake recognized the significant shortcomings in traditional wireless mesh technology, particularly when it came to mobile voice and data networks used by first responders.

Mesh networks can be deployed as emergency response networks to aid first responders. Private wireless network meets all the vital communications requirements to support the critical setup of emergency medical spaces, offering a rapidly deployable, self-healing, and highly secure solution to connect field hospitals, inflatable emergency shelters, and other temporary triage centers.

The technology could even be capable of bolstering early warning systems, such as earthquakes, tsunamis, hurricanes, tornadoes, wildfires, and floods. These systems can transmit data from sensors that detect changes in environmental conditions and alert authorities and the public to potential hazards, giving first responders and local public officials adequate time to take preventive measures. Also, mesh networks allow easier remote assistance to people in disaster-stricken areas.

Mining

In August 2021, disaster struck when a 100-year-old limestone mine in the Southeastern part of the United States collapsed unexpectedly. This resulted from subsidence, further causing a massive event underground where the pillar and roof collapsed. Violent air blasts up to 190 mph launched debris and dirt through portals and ventilation shafts. The failure of old pillars left an enormous subsidence measuring 800 ft. across and 100 ft. deep. The mine was evacuated beforehand by a veteran worker who noticed something was wrong that day. The Mining Safety and Health Administration (MSHA) deemed no one return working in the mine until an unmanned survey ensured safe conditions.

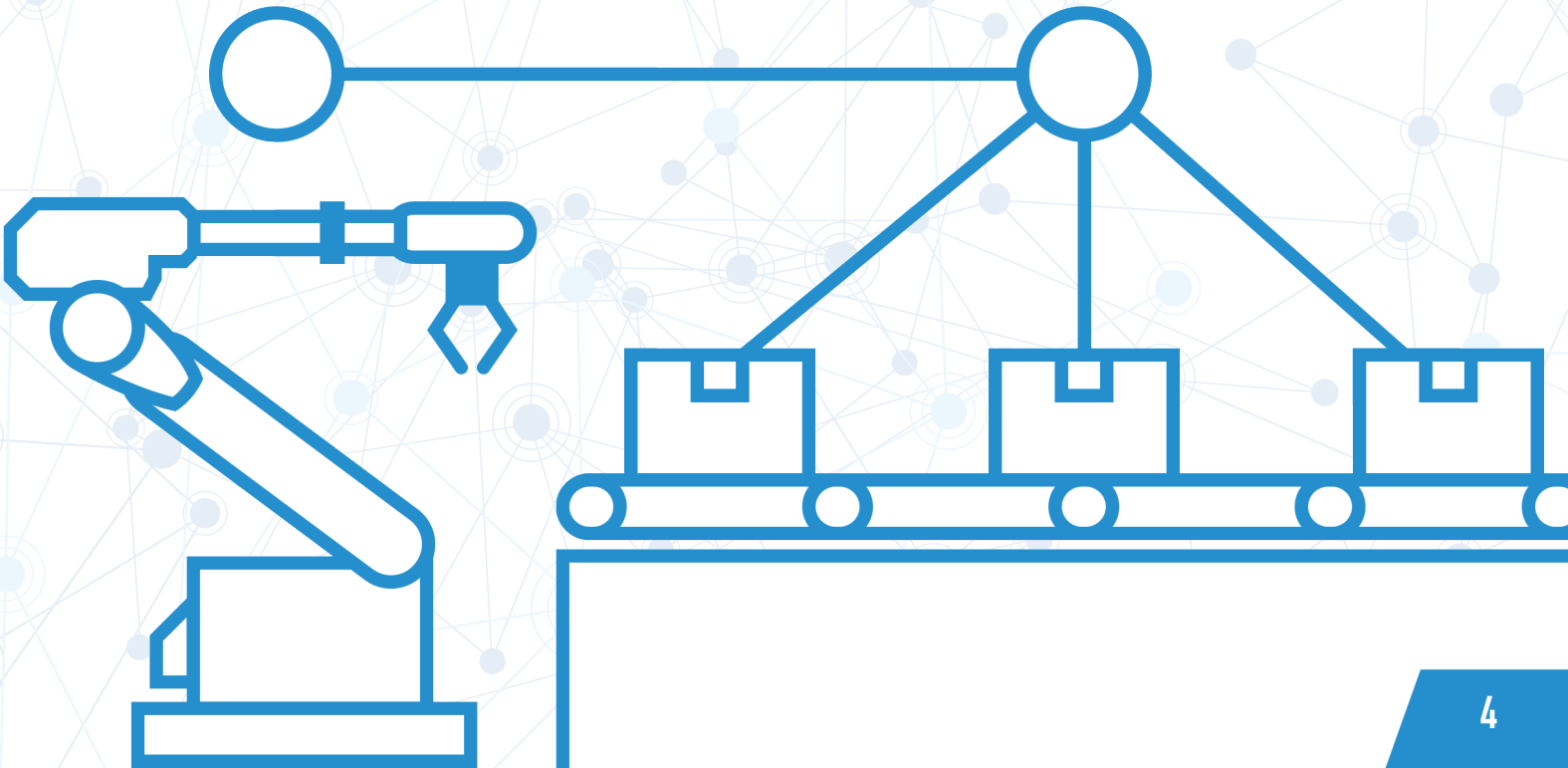
Rajant Kinetic Mesh provided a robust and reliable connectivity solution that was efficiently deployed for the project, enabling long-distance, low latency wireless networking without fixed infrastructure. The remote inspection robots, equipped with Rajant BreadCrumbs®, entered the underground area and relayed communication signals to each other through a daisy chain structure, high bandwidth mobile network. With no fixed infrastructure or supporting systems underground, the operation needed to handle data backhaul and power the robots. BreadCrumbs, Rajant's wireless radio nodes, were also installed at the surface site providing high bandwidth between the mine entry and the center of operations. The robots successfully streamed high definition video and LiDAR point cloud data in real time from the incident area deep in the mine, to the surface operations center. Enabling mine personnel to make a successful argument to re-enter the mine, which was granted by MSHA inspectors.

Industrial Space & Autonomous Robotics

Mesh networks are for all businesses. Gone are the days of static operations and fixed networking infrastructure. Mesh network technology has already demonstrated, beyond public broadband or centralized Wi-Fi alternatives, to be incredibly effective at ensuring operational security.

This includes enabling automated guided vehicles and autonomous robots; automated inventory identification, data capture and sortation, and remote operation of storage, retrieval, and material handling systems to keep workers off the floor themselves. The continuous mobile connectivity provided by the wireless Rajant Kinetic Mesh network can also be used for telemetry to monitor equipment health dynamically and for real-time video to monitor worker safety.

Today, remotely guided and autonomous indoor industrial machinery demands 'never-break' wireless communications, but metal shelving and equipment can block radio frequency (RF) signals and cause automated systems to grind to a halt. Rajant BreadCrumbs, which can hold many connections over multiple frequencies simultaneously, can be easily placed where needed to work around obstructions. These compact, lightweight nodes can even be deployed on mobile robots, equipment, and personnel working between the racks to readily extend
coverage to the hardest-to-reach areas.



1 in 5 Households are not connected to the internet

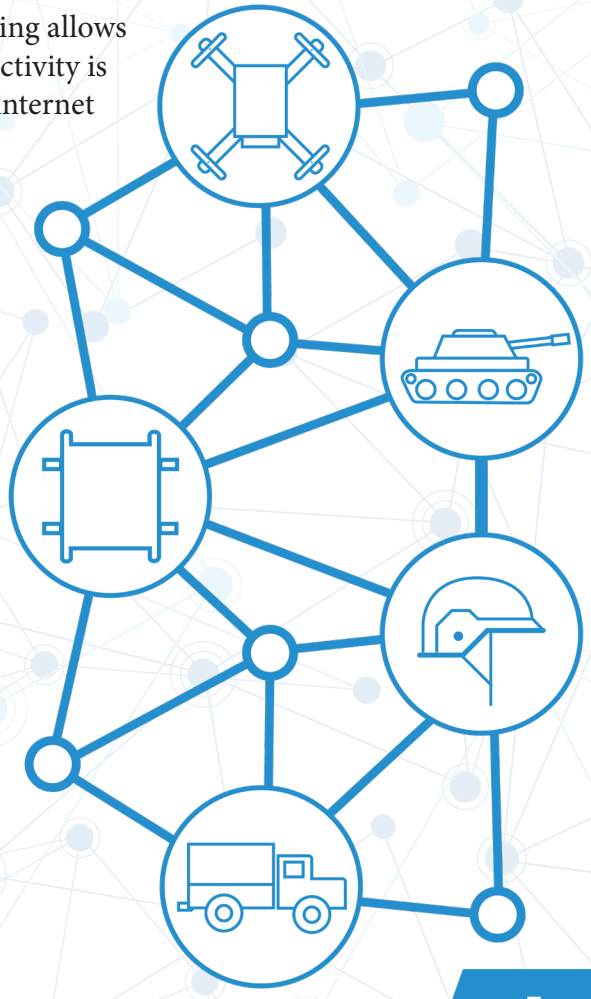
*According to data from the National Telecommunications and Information Association

Rural Communities and Broadband Connectivity

Depending on which agency you ask, the level of broadband connectivity in the United States varies. “19 million Americans—6 percent of the population—still lack access to fixed broadband service at threshold speeds. In rural areas, nearly one-fourth of the population —14.5 million people—lack access to this service,” according to the Federal Communications Commission’s (FCC) Eighth Broadband Report..

But, according to data from the National Telecommunications and Information Association, one in five U.S. households are not connected to the internet. While Broadband Now estimates that up to 42 million Americans lack access to broadband, which is defined as having download speeds of a minimum of 25 megabits per second (or Mbps) and upload speeds of at least 3 Mbps. Broadband technology can include everything from Wi-Fi and satellite to fiber-optic cables.

If it is one in five households, or 42 million people, Rajant mesh networking allows rural communities around the country to connect where last-mile connectivity is failing, and residents suffer from the digital divide. Having access to the internet and to higher connection speeds allows residents more access to education opportunities, remote work opportunities, and even virtual healthcare.



Military

Rajant has worked for 20 years providing the military with a “Combat Proven Solution” in support of Operation Iraqi Freedom (OIF), which later became “The Surge.” The intent of “The Surge” was to move soldiers from the large sprawling Forward Operating Bases (FOBs) into the neighborhoods to demonstrate the willingness to protect Iraqis
from violence. During the early months of 2007, “The Surge” coincided with the beginning of the largest counter-fire fight of the
war, combating the increased Indirect Fire (IDF) was the Counter Rocket Artillery Mortar (C-RAM) Program had been deployed since 2005 to defend servicemembers, government officials, and civilian contractors from IDF attacks by insurgent forces.

Rajant was selected to provide radios for the C-RAM architecture. The addition of the military band transceivers was done rapidly and with precision to meet the deadline set by the Army.

For the Army, the Rajant wireless radios provided a scalable and user-friendly solution (some FOBs had over 500 nodes). They could move real-time safety-critical C-RAM data to provide Warning and Intercept IDF attacks.

In Conclusion

After more than 20 years, the Rajant Corporation continues to bring unparalleled innovation and creativity to the mesh networking industry. To find out more, inquire about potential partnerships, or learn about the latest developments in Kinetic Mesh, visit www.rajant.com

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