The Power of Rajant **InstaMesh®** **with LTE/5G**

RAJANT

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Introduction

Rajant InstaMesh networking software has been orchestrating Kinetic Mesh networks for twenty years in commercial and industrial settings to provide highly reliable broadband connectivity for mission-critical applications. Over the past ten years, 4G/LTE technology has transformed cellular networks and individuals' lives by bringing broadband access to handheld devices. These networks provide broad coverage in well-populated areas and are relied on by consumers for voice, video, and data. The 5G revolution has already started with worldwide deployments and promises to increase data speeds even more.

These connectivity technologies, along with reductions in compute cost and the rise of cloud computing and artificial intelligence, have spurred the advent of the Industrial IoT and Industry 4.0. An explosion of sensors, drones, robots, cameras, and other devices has entered every market from hospitals, factories, and warehouses to shipping ports, rail yards, and mines. These devices have a broad range of needs in terms of connectivity coverage, data rate, and reliability. With the advent of the Industrial IoT and Industry 4.0 applications, 4G and 5G networks are being stretched to provide highly reliable, low latency connectivity everywhere but are struggling to do so.

This white paper explores the synthesis of Rajant's Kinetic Mesh and 4G/5G networks, with InstaMesh operating simultaneously over both, to bring an unparalleled combination of coverage, reliability, high throughput, interoperability, connectivity, and low latency.

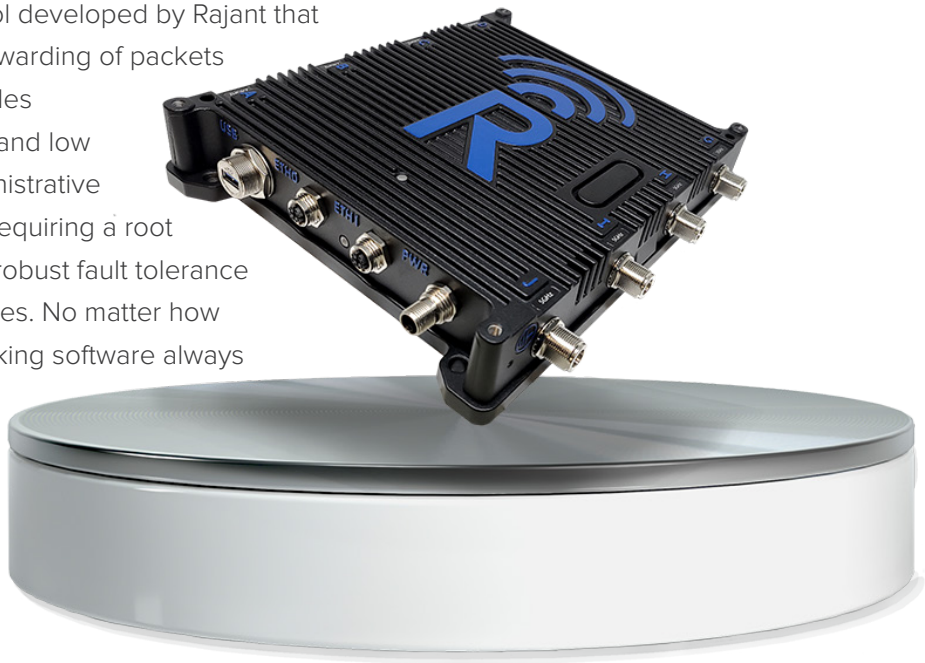
What is **Kinetic Mesh and InstaMesh?**

Rajant networking is not traditional. We call our networks Kinetic Mesh. They are uniquely designed for environments and applications where client devices and even the network itself are in a state of constant change and motion due to challenging, changing environments.

Rajant Kinetic Mesh networks are built around superior reliability and security. To achieve these goals, Rajant utilizes a multi-frequency, multi-peer mesh connection to give every node in the network the ability to talk directly to each other using multiple radios simultaneously.

Each node, or BreadCrumb®, such as the Peregrine pictured below, behaves as a smart wireless device, maintaining connections to every other BreadCrumb that can be connected wirelessly or wired. This web of connections gives Rajant unparalleled reliability, ensuring that packets always have a path home, even in the toughest environments. **Rajant BreadCrumbs also support Wi-Fi to connect to any Wi-Fi sensors, tablets, phones, PC's, augmented reality and more providing connectivity to billions of devices deployed today**.

InstaMesh is the advanced, patented protocol developed by Rajant that directs the continuous and instantaneous forwarding of packets from wireless and wired connections. It enables complete network mobility, high throughput, and low latency with very low maintenance and administrative requirements. Operating at Layer 2 and not requiring a root node or LAN Controller, InstaMesh provides robust fault tolerance in the face of lost connections or node outages. No matter how the network is configured, InstaMesh networking software always determines the most efficient pathway between any two points, even when those points are in motion.



Mobility **for Mission-Critical Application Performance**

With Rajant InstaMesh, the network is flexible and reliable in multiple ways. Rajant can equip mobile vehicles such as forklifts, drones, robots, or emergency vehicles with Rajant BreadCrumbs. By doing so, Rajant can provide a mobile infrastructure that is much more powerful than any client device trying to roam. These mobile infrastructure nodes act as mobile access points and communication bridges/repeaters in areas where communications may be weak or incomplete in coverage.

Rajant also utilizes machine-to-machine communications where each vehicle, mobile device, or infrastructure node can communicate locally. With InstaMesh's dynamic routing protocol, packets are not required to flow in and out of a wired network or go through a route bridge or central controller. This behavior improves coverage with mobile infrastructure and allows for fully ad-hoc networks to be deployed anywhere, anytime. With InstaMesh, field crews and drones are empowered in mission-critical situations such as rescuing people in inaccessible sites, coordinating disaster response services, and fire brigade missions.

- Fully mobile multi-frequency network with no single point of failure
- Deploys anywhere – rooftops, tanks, aircraft, convoys, drones
- Unsurpassed security & availability for mission-critical applications

Kinetic Mesh & LTE/5G: How They Complement Each Other

Rajant Kinetic Mesh and LTE/5G cellular networks have strengths and weaknesses that complement one another well. Cellular networks are fundamentally infrastructure-oriented with fixed-location base stations and a complex routing core. Cellular base stations benefit from high power transmissions over dedicated spectrum using high-gain antennas located on tall towers. These benefits translate to service coverage in urban and suburban areas where people are.

Additionally, LTE and 5G technology is integrated into smartphones and tablets, allowing them to connect and roam the network natively. However, when applying cellular connections to machine-to-machine, Industrial IoT, and Industry 4.0 applications and devices, coverage and data reliability are not always strong enough where the devices are. The infrastructure-oriented and fixed-location nature of cellular, which is sufficient for consumers, causes coverage and data reliability to be spotty when deep in a warehouse or hospital or for a drone operating at 100 meters above the ground.

InstaMesh over **LTE/5G Hybrid Networks**

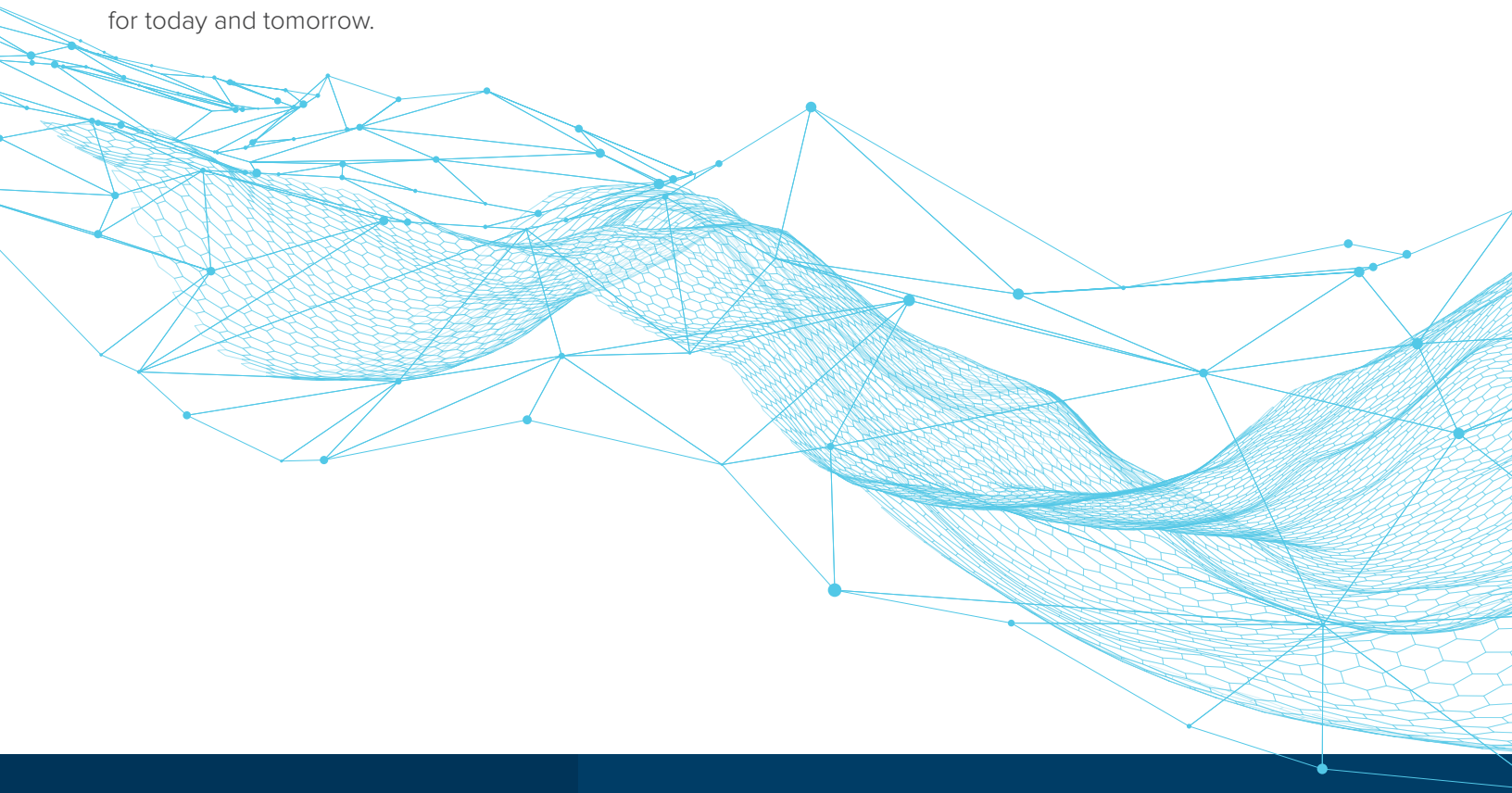
Rajant InstaMesh and cellular LTE/5G combined provide excellent coverage and throughput across broad regions in the face of obstacles and interference, supporting either private or public cellular networks. InstaMesh operates simultaneously over Kinetic Mesh and cellular networks, choosing the best path in real-time, to unite the technologies into a single network and provide unparalleled reliability.

A Rajant Peregrine BreadCrumb can be fitted with a standard 4G/5G SIM card allowing it to connect to the cellular network as a standard client (UE). A Rajant SlipStream network appliance on the cellular backend network acts as a protocol tunnel endpoint for all of the BreadCrumbs' cellular connections. As machines and IoT devices roam across Kinetic Mesh and cellular networks, InstaMesh will continuously evaluate all possible wireless paths and forward device data over optimal paths. When the optimal path is the cellular network, packets will flow through the SlipStream and on to their destination. Path selection is biased toward application performance and is designed to value connectivity over data rate.

For example, consider a piece of medical diagnostic equipment moving from place to place within a hospital. Hospitals are notoriously difficult for wireless coverage due to their structure, winding hallways, nested rooms, dungeon-like basement areas, as well as wireless interference from equipment. Cellular signals often struggle to penetrate each area with adequate signal quality. Combining Kinetic Mesh with cellular service can increase coverage substantially, allowing the mobile medical equipment to connect directly to the cellular network when it is available or meshing with other Kinetic Mesh devices until it reaches a wired connection or another BreadCrumb with sufficient cellular signal. This combination can improve coverage and reliability to near perfect.

Built **for the Future**

Every day, more and more commercial and industrial operations are moving toward smart and artificial intelligence (AI) solutions. These smart and AI solutions need continuous, reliable communication to function properly and provide a high level of safety for workers. Rajant's reliability-based mesh networking system, using the patented InstaMesh protocol, has been built to provide wireless service in the toughest areas on the planet. Combined with a cellular 4G/5G network, Rajant can achieve a flexible, robust, rapidly deployable, self-healing network for today and tomorrow.



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*If it's **moving,** it's Rajant.*
*Industrial Wireless Networks **Unleashed.***

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Learn why utilities, ports, mines, agriculture, and more industries rely on Rajant Kinetic Mesh networks for the continuous, fully mobile connectivity required to power today's data-driven operations. Visit www.rajant.com or contact a representative to learn more.