

The background image shows three white security cameras mounted on a light-colored, textured wall. The cameras are angled downwards, overlooking a city street with cars and buildings in the distance. A semi-transparent blue rectangle is overlaid on the left side of the image, containing the title text.

Security and Surveillance **Application Notes**

The logo for RAJANT, featuring a stylized blue antenna icon above the word "RAJANT" in a bold, blue, sans-serif font.

RAJANT



Introduction

The need for wirelessly transporting multimedia data over wide area networks has been the call of our age and the industry is using its creativity to find practical solutions and address associated problems.

There can be various solutions depending on the type of application, the nature of data, installation and cost. Very few organizations have found feasible solutions to transmit multimedia data over a wireless network due to the inherent nature of wireless networks – data loss randomness and multimedia traffic which is bulky, bursty, mission critical and time bound. These characteristics demand that the network be extremely reliable, stable and provides the necessary performance to guarantee desired results. Multimedia traffic is a composite of video, audio and raw data. It has distinct requirements and needs to be maintained at a certain acceptable level of performance.

At the same time, the network needs to provide the right foundation to ensure that the application works as expected. Rajant's BreadCrumb® family of products is designed to handle the growing demands of the industry to provide essential “good-put” so that high bandwidth applications can work seamlessly as they work on wired networks. A key part of the solution is on relaying “real-time” video over wireless networks. There is some ambiguity about the definition of “real-time”. In a general sense it means as if viewing directly from the camera or other video source. Rajant lives up to the expectations of its customers and the industry by providing fixed as well as mobile networks in urban and tactical environments. The intelligence required to perform this complex task resides in the BreadCrumb product which adapt flawlessly to dynamic situations and assures that the application requirements are satisfied from source to destination.

This white paper explores the need for wirelessly transporting multimedia data over wide area networks has been the call of our age. We discuss the unique advantages of using Rajant Kinetic Mesh® networks for security, video and surveillance applications.

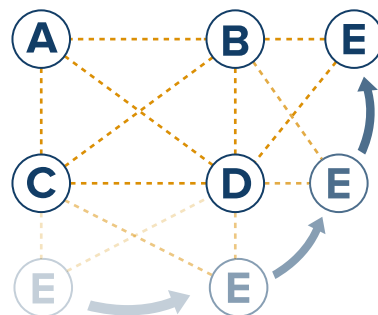
Breadcrumb Multimedia Solution

More Benefits, More Risks

The Rajant BreadCrumb is a rugged wireless transmitter-receiver that forms a mesh network (using InstaMesh®, Rajant's proprietary software application) when used in conjunction with other BreadCrumbs. This portable wireless mesh network node contains two radios and supports open standard IEEE 802.11 a/b/g protocols to enable data, voice and video applications.

These meshing, auto-configuring and self-adaptable devices offer great flexibility to operate in diverse environments by providing secure and steady connectivity with remotely located resources. The network automatically adapts to changes in radio interference, network traffic, mobile nodes and other environmental factors so that the application is not affected by these types of external factors. The InstaMesh software protocol handles all these dynamic variables without user intervention. The network operates at layer-2, which means that it can handle all IP-based traffic without modifications to clients, applications or other network interfacing devices and independent of the type of video compression. Also, any security solution that is end-to-end can be achieved without any difficulty.

Rajant has developed state-of-the-art Linux based software over the last 6 years for mission critical applications. InstaMesh resides on each BreadCrumb, allowing for hundreds of re-silient mesh connections to other BreadCrumb devices, even while they are moving.



The Rajant mesh network quickly adapts to the changes caused by the movement of Node E. New resilient links are **established in real-time** keeping the network available, intact and secure.

Rajant's BreadCrumb Wireless Network Nodes

High functionality, easy-to-install BreadCrumb nodes work in concert with InstaMesh to enable voice, video and data communications that operate over a common wireless infrastructure. Hundreds can be quickly linked, self-configuring as part of a fully mobile, high bandwidth network.

BreadCrumb Benefits:

- **Self-healing** for resilient connections and high availability
- **Rugged and portable** for applications in extreme situations, with permanent install capabilities
- **Open system IEEE 802.11 a/b/g standards for compatibility** with millions of commercial off-the-shelf (COTS) client devices such as laptops, PDAs, IP cameras, sensors, VoIP phones and other IP devices. Additional frequency ranges such as 900MHz and 4.9Ghz are in development.
- **Runs InstaMesh** so that the network quickly adapts to moving network elements
- **802.11a provides high bandwidth** 54Mbps connections in the 5GHz band for backhaul applications
- **High bandwidth availability** for data, voice & video applications
- **Self-configuring operation** for fast & easy deployments
- **Security encryption** to ensure privacy of data



Applications



PERIMETER SECURITY

Secure and sensitive installations such as military bases, oil refineries, energy production houses, ports, corporate campuses, warehouses and private properties have video cameras and other sensors installed for surveillance. By installing a BreadCrumb network, this information can be viewed at a central location or multiple locations allowing for decreased response times in case of a security breach. This information can also be stored and used for post-situation analysis using network DVRs and sophisticated software.



BORDER SECURITY

A mobile surveillance network with mobile nodes can be utilized by the border patrol. Ground sensors, radars and cameras connected to the BreadCrumb network can prove cost effective and crucial if the action is time bound. This can be a stealth installation which can be moved to a different location depending on the trend of cross-border movement.



FIRST RESPONDERS

Emergency services and law enforcement officials can have a BreadCrumb network deployed around a crisis zone, with cameras mounted on helmets or shoulders and this information can be sent back to an EOC or command center to get an understanding of the situation and deploy necessary strategies to respond to the field conditions.



COMMUNICATIONS ON THE MOVE (COTM)

Site-survey in rugged and inaccessible terrain, moving convoys and Unmanned Aerial Vehicles (UAV) applications can stream video traffic to a central point which can capture necessary data as well as get situational awareness. This can be connected to a gateway interface which can be satellite or other reach-back functionality to transmit the data over the Internet.





Performance and Improvement

The overall performance of applications and the network can be improved in a variety of ways. It is important to understand that multimedia traffic causes considerable stress on protocols and network equipment. Hence strategic and careful placement of clients and BreadCrums can significantly improve the aggregate network behavior.

Directional or sector antennae, clean power supply, well distributed traffic generators and good quality cables can bring about noticeable system performance. Each BreadCrumb is able to handle 20–25 Mbps (receive and transmit) under optimum conditions. Hence when connecting to clients, it is essential to know the sending and receiving rates to and from a BreadCrumb. This will help to calculate the estimated total network traffic and the necessary components needed to handle this.

WHY WIRELESS MESH NETWORKS?

Wireless mesh networks are multi-hop systems in which wireless devices assist each other in transmitting packets through the network, especially in adverse conditions such as in military or mining applications. A node can send and receive messages as well as function as a router and can relay messages on behalf of its neighbors. Through the relaying process, a packet of wireless data will find its way to its destination, passing through intermediate nodes with reliable communication links. There is minimal loss of throughput with multiple hops as there might be with other wireless mesh providers.

Similar to the Internet and other peer-to-peer routerbased networks, the Rajant wireless mesh network offers multiple redundant

communications paths throughout the network. If one link fails for any reason (including the introduction of strong RF interference), the network automatically routes messages through alternate paths.

A network shouldn't need a system administrator to tell it how to get a message to its destination. The Rajant wireless mesh network is self-organizing and doesn't require manual configuration. Because of this, adding new BreadCrums or relocating existing ones is as simple as plugging in the unit and turning it on. The BreadCrumb network discovers the new node and automatically incorporates it into the existing system. It is not necessary to restart, and thus disrupt, the entire network as some other network providers require.

Rajant Breadcrumb® Network:

Simple, scalable, adaptable, mobile

A Rajant mesh network is not only inherently reliable, it is also highly adaptable. On the Internet, if one router goes down, messages are sent through an alternate path by other routers. Similarly, if a device or its link in a Rajant mesh network fails, messages are sent around it via other devices. Loss of one or more nodes does not necessarily affect the network's operation. A Rajant mesh network is self-healing because human intervention is not necessary for re-routing of messages. This allows the optimum platform for video and security applications.

Why Rajant Portable Wireless Mesh?

- **Scale—from small networks** to hundreds of wireless nodes that are connected and passing traffic
- **True Mobility** with continuous network availability
- **Simplicity—single switch** operation, auto configuration and self-healing
- **Experience in large deployments** and mission critical applications with military, mining and first responders.



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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.