
High Performance Wireless Networks:

Delivering Seamless, Everywhere Connectivity with Firetide's AutoMesh[™]



Wireless Mesh Networking Solutions for Today's Challenging Market

Evolving Network Demands

Network administrators, and those responsible for building the infrastructures required to support today's demanding communications needs, are under increasing pressure to maintain and scale their networks. Many trends are impacting this requirement. However, none are more evident than the fact that people and businesses want to access human assets, data and intelligence wherever they may be—inside or outside—regardless of their physical proximity to the network. Seamless connectivity is no longer a matter of ensuring reliable connectivity for the local area network. The network must extend communications outside and reach coverage areas that are often many miles away.

In addition to network mobility requirements, support for the growing number of video applications has IT administrators scrambling to re-assess how they will meet the bandwidth and capacity demands these applications command. The increase in bandwidth to support a broad range of video applications such as video surveillance and monitoring, video offload, and content downloads to smart phones, tablets, and other devices is out-pacing the network operator's ability to deliver the needed bandwidth. This bandwidth crunch is especially evident in transportation, government, and industrial organizations where public safety, crime deterrence, and monitoring of capital assets are gaining widespread attention.

Today's True Communications Environment—Limitations and Opportunities

Today's communications operators have the difficult task of building new networks and expanding existing networks that support true mobility and can also deliver real-time video applications whether those applications reside indoors or outdoors. Perhaps a more detailed explanation of such a network may be warranted. As examples, one mobile network might supply smart-phone usage to metro-train passengers and another network might allow a fireman to download a building floor-plan from a device on a speeding fire truck en-route to a three-alarm fire. The delivery of high-definition video streaming is another area where requirements may vary considerably from one network to another. Passenger buses may want to display video messages on a static viewing screen for their riders while other networks want to provide transportation dispatchers with analytics such as bus speeds and individual fleet locations. Lastly, a network that allows its users to access its data, video, and voice assets regardless of their locations represents a true indoor-to-outdoor communications network. These examples illustrate the underlying demands being placed upon networks today. Not only are operators contending with increased range, throughput and capacity needs, they are also faced with the requirements to reduce costs and increase service revenues while enhancing productivity and efficiencies for the organizations they serve. The majority of today's networks are currently not fully able to support mobility, real-time video and a seamless indoor-to-outdoor experience.

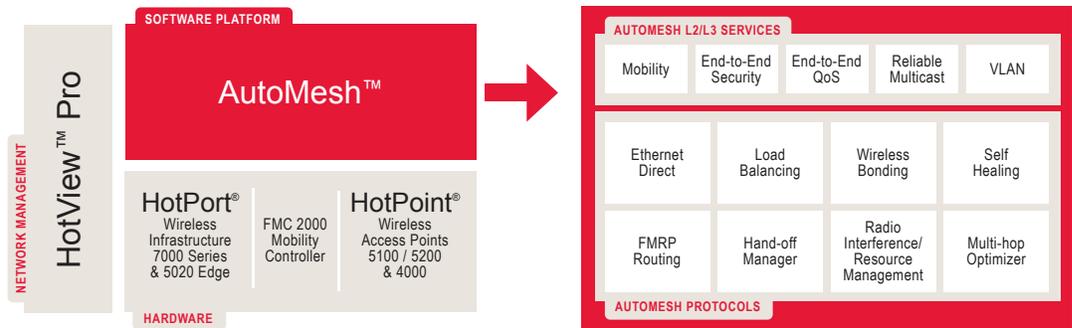
As a result, converged networks are larger and far more complex than ever before and represent a mixed bag of fiber and wireless infrastructures. Although the industry offers network infrastructure options from which administrators can choose, the task of evaluating each to fully understand the technical differentiations can be daunting.

The hard reality is that as pervasive and reliable as they are, wired fiber networks represent many challenges and, by themselves, fall short to support the network demands described above. They inherently have high CAPEX, long build-out times, and are not able to support applications that demand mobility. IT management must be able to implement network solutions that leverage their existing wired infrastructure investments yet meet the new indoor-to-outdoor and mobile-network requirements.

A quick look at Point-to-Point (PTP) and Point-to-Multipoint (PMP) wireless solutions in the market will demonstrate that, although these products may provide sufficient connectivity between fixed locations, they almost always lack the scalability, reliability, end-to-end security, and network management features critical for today's converged data, voice and video traffic. Fundamentally, PTP and PMP are products that see networks as links not as a network. Therein lies a major point of difference between these solutions and Firetide's mesh infrastructure technology. There is a real need for a wireless technology that offers the reliability, scalability, and security of fiber, yet has the flexibility and mobility offered by wireless.

Introducing Firetide's AutoMesh, True Market Differentiation

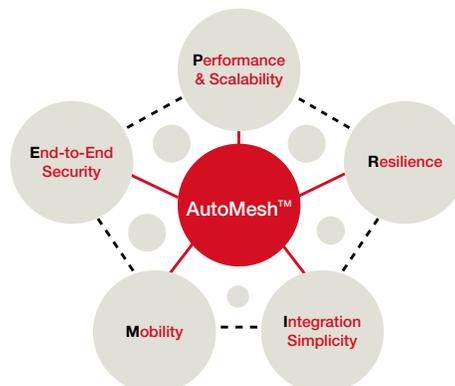
Firetide is a market leader in the delivery of high-performance, private wireless broadband solutions that are both reliable and secure. At the heart of all of Firetide products and solutions is their industry-leading technology—AutoMesh—which was built from the ground up specifically for video and mobility, the key cornerstones for today's converged networks. Backed by more than 10 years of innovation and 19 patents to date, the technological advancements in AutoMesh coupled with Firetide's deep understanding of customer requirements and application enablement has lead to the implementation of over 10,000 field deployments across the globe. Early on, Firetide understood that they had to have an innate understanding and an in-depth knowledge of the applications they would be supporting if they were going to develop a mesh technology that would deliver carrier-grade performance across the entire network.



Patented mesh software protocols and services that form the foundation for Firetide wireless infrastructure solutions.

The AutoMesh software platform resides in every product Firetide brings to market including its Wireless Infrastructure Series and Access Points, as well as its Mobility Controller and Network Management system.

Mesh technology is less costly, more convenient, and easier to deploy than your wired or fixed wireless network. Wireless mesh technology can be a substitute for wired systems, but can also complement wired systems by providing the optimal wireless solution for augmenting and expanding to new locations that are not well suited for wired systems. High CAPEX, poor mobility support and the inability to access tough-to-reach environments and challenging terrain are the primary reasons administrators seek alternative connectivity systems. In comparison to other wireless systems, AutoMesh uniquely brings these five distinct technological advantages referred to as **PRIME**.

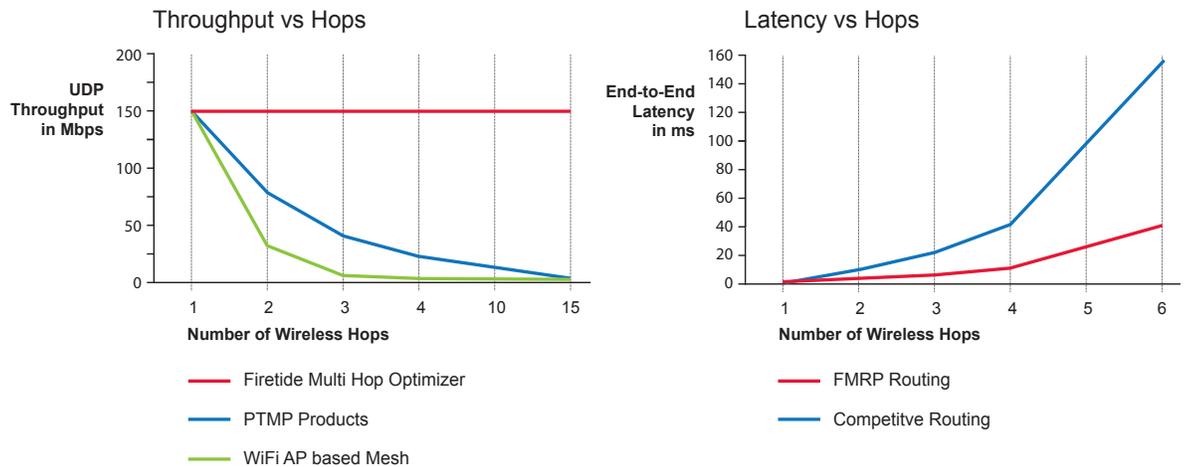


Performance and Scalability – In a mobile network, performance and scalability are defined by the ease at which nodes can be added or removed and the assurance that, as more nodes are added, network throughput and quality of service will not degrade. Self-managing capabilities include self-healing, self-configuring/reconfiguring, and self-tuning, all of which play a role in keeping traffic moving dynamically along an optimal path. Firetide’s Mesh Routing Protocol (FMRP), multi-hop optimization and ground-up modifications made to the wireless Mobility Access Controller (MAC) collectively ensure that the loss of a single end-point will never disrupt the network. As a result, Firetide can deliver up to 150 Mbps throughput with their single-radio, and up to 300 Mbps with their dual-radio platform while maintaining less than 1 ms latency per hop.

Firetide AutoMesh’s patented flow-based routing streamlines packet processing and transmission, eliminating the need for deep packet inspection between hops. Consequently, there is no need to inspect the IP address and route it at every hop. This unique feature allows up to 15 hops to be introduced to the mesh network effortlessly without any packet drop or throughput degradation. This capability gives administrators confidence that bandwidth intensive applications like high-definition video can be easily transmitted without any latency over large scalable networks.

The two illustrations below show the positive impact that Firetide’s Mesh Routing Protocol has on achievable data rates and latency minimization as hop numbers scale.

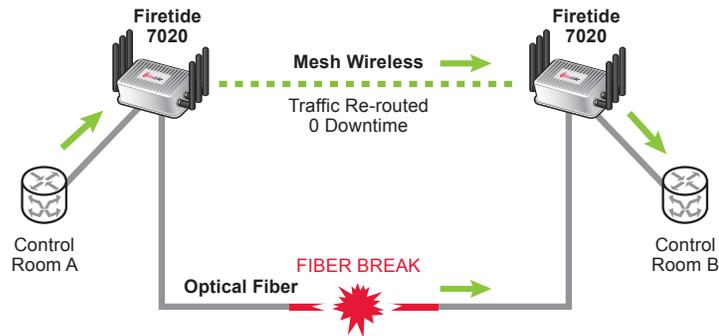
Scaling Your Network With 5x Less Fiber



Resiliency – Firetide’s Mesh Routing Protocol (FMRP) is the force behind AutoMesh’s self-healing technology. It provides a dynamic “on-demand” routing of the packets based on the network paths available. This results in an enhanced “learn-as-you-go” mode of route discovery for the packets being transmitted. The moment a link or path is not available for any reason, the packets are immediately re-routed through the next best available path, effectively healing the network from any down-time. AutoMesh is programmed to observe parameters that effect network performance. The ideal mix of these observed statistics and “on-demand” routing maintains the optimum level of traffic through the radio links, therefore keeping a smooth and fast traffic flow. This results in zero network down-time and peace of mind.

Redundancy is essentially built into the fabric with a mesh design. The network can lose one or more nodes without losing the ability to send traffic. In outdoor wireless networks, where conditions are often changing, this inherent redundancy is essential.

Zero Downtime Carrier-Grade Reliability



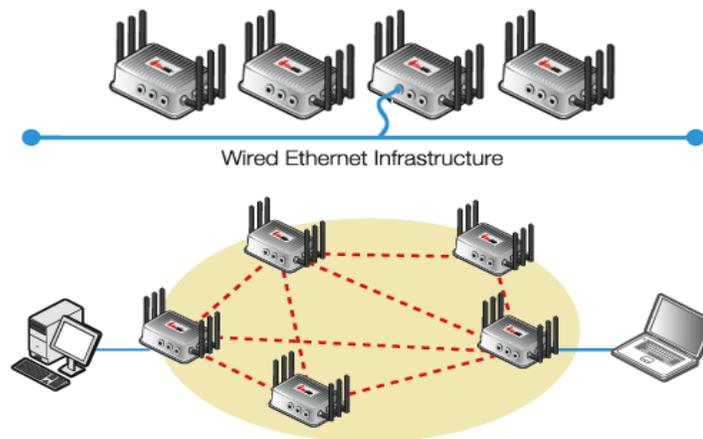
Self-healing via redundant links for critical applications.

In addition, using the Ethernet Direct feature you can use fiber for some of the links within the mesh, combining fiber and wireless in a single mesh network. This design delivers a higher level of resilience and availability, with redundancy across transmission methods.

The strength and resiliency of the Firetide mesh is consistent regardless of the topology, architecture, and the environmental conditions that exist. Its seamless failover capabilities are immediately apparent even when deployed in challenging terrain, non line-of-sight locations, and territories typically associated with higher levels of RF interference. Operators can confidently run all of their critical applications over the Firetide mesh network, knowing they will maintain five-nines availability.

Integration Simplicity – Firetide recognizes that customers need investment protection and depend on manufacturers to ensure smooth integration and performance continuity with existing wired and wireless infrastructures. By design, the AutoMesh network is architected to behave like a Layer 2 Ethernet switch. This means the entire mesh network can be visualized as a collection of Ethernet ports, and the entire mesh can be managed by one IP versus one IP per node. This offers real simplicity when integrating a seamless indoor/outdoor operation. FMRP encapsulation provides the additional benefit of enabling VLAN, end-to-end policy management, and QoS transparency which equates to a more consistent user experience and increased productivity. Streamlined network deployments and centralized network management help to lower network maintenance costs too.

No Hassle, IT Management



Simplicity of wired Ethernet carried over to wireless mesh.

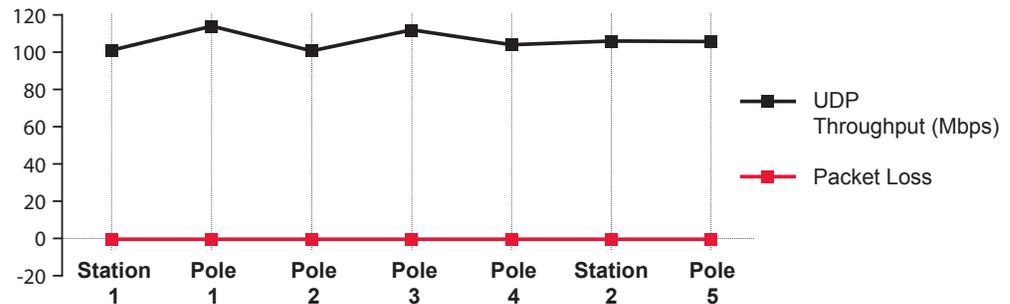
Mobility – There is a common misconception that infrastructure mobility concerns only the client/access side, when in reality there is a significant difference between mobile devices and a mobile network. Firetide’s Mobile Mesh solution delivers the infrastructure to allow an entire network to be mobile, not just the devices.

A mobile node travels across a network infrastructure of static mesh nodes which essentially form the mobile mesh. It associates with the static nodes in these meshes to communicate with clients connected to any part of the static meshes. This is linear mobility.

Linear mobility is a patented Firetide solution. It is applicable whenever a mobile unit moves along a fixed path which may span large distances. Firetide’s patented linear mobility has two parts—a dual-radio mobile node which allows you to scan for a better signal while you are attached without any throughput degradation, and a “make-before-break” connection model to allow for seamless hand over with zero packet loss even when data traffic flows at speeds of 100 Mbps. This capability is paramount when you consider the latency-prone traffic that traverses a mobile network infrastructure.

As examples, Firetide’s 3rd Generation mobility solution supports real-time, streaming HD-video at speeds up to 100 mph and can also offload several gigabits of data in less than a minute in depot. The benefits and advantages of enabling a mobility-based network infrastructure are huge and have collectively proven to reduce operating expenses, increase productivity, improve efficiencies, and generate new sources of revenue.

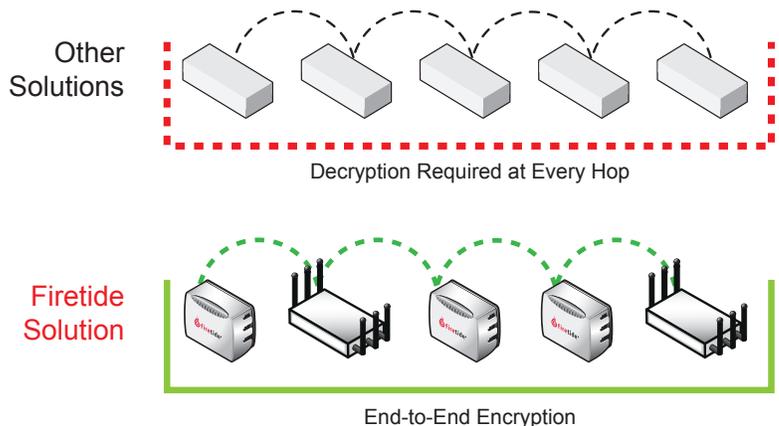
100 Mbps Network Connectivity @100 mph



Packet loss can have major safety implications for train operators in today’s modern rail environment.

End-to-End Security – To ensure transmission confidentiality and privacy of all data, voice, and video traffic across the entire network, Firetide’s AutoMesh platform extends enterprise security in many ways. First and foremost, Firetide utilizes the highest available, 256-bit key size AES encryption coupled with end-to-end packet transmission. Because Firetide mesh eliminates the need to open up packets in Layer 3 between hops, the potential for sniffing data packets over a hop is eliminated, and transmissions are faster and more secure. Many comparable mesh solutions decrypt data packets at every hop which creates a point of vulnerability and slows down the process.

Optimizing Secure Data Transmission



Firetide's security provides operators with efficiency enhancements and vulnerability management which only increase in significance as networks scale in size and complexity.

To communicate between mesh nodes, Firetide uses proprietary FMRP protocols which are not susceptible to other Wi-Fi-enabled devices. As a result, any device such as a laptop, smart phone, or tablet—other than a Firetide mesh node—cannot connect or communicate directly to the mesh network. Additionally, Firetide provides digitally-signed firmware files to stop any unauthorized firmware installation on nodes and VLAN-based access control lists to provide access control for all packets that are routed into or out of a VLAN.

Firetide takes security seriously employing a MAC-based access control list and an option to block the ports completely on a need-basis. Although no unauthorized device can access the mesh network directly, this “high security” feature can be enabled to detect any rogue node that is attempting to access the mesh network. In addition, the Firetide network management system communicates and shares network configuration information only with nodes having authorized Firetide-issued certificates. This blocks any rogue node that is attempting to spoof as a mesh node and join the network.

Lastly, Firetide is FIPS 140-2 compliant which validates its high level of security required by the U.S. Department of Defense.

Summary

Wireless mesh technology is quickly becoming the new communications standard as businesses and organizations look to expand the reach and functionality of their network. Network administrators want to deploy high-performance technology that is scalable, resilient, mobile, secure and easy to integrate. They also want a technology partner with deep expertise in supporting video and mobility and who can assist them to navigate the complexities of the ever-changing regulatory, safety and economic trends that impact the planning, delivery and implementation of their networks.

Today, Firetide is leading the way for the transformation of private wireless broadband networks. Customers around the globe are confidently deploying AutoMesh-based solutions to extend their reach and do more with their network. Contact Firetide and schedule your free Get PRIME'd Consultation. This comprehensive analysis will assess your current network infrastructure and demonstrate the advantages AutoMesh PRIME can bring to your network communications. Email us at sales@firetide.com, visit us on our website at www.firetide.com, or call us at 408-399-7771 for more details.

White Paper

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