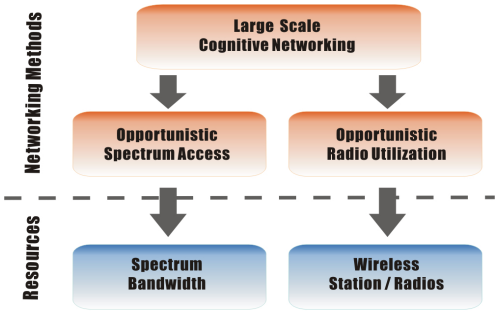
Technology Overview

OMESH Networks Incorporation
www.omeshnet.com
3 Kilkenny Drive
Toronto ON, Canada M1W1J3
Tel: 1-416-837-8980
Fax: 1-416-977-2796
Email: info@omeshnet.com

OMESH networking radios redefine how wireless devices can be organized in a multi-hop wireless structure to transfer information. By merging the wireless link layer and the packet routing layer, the packet forwarding protocol is able to respond instantly to volatile spectrum availability and network traffic congestion selecting the optimal path for each packet. This "opportunistic" selection of the optimal path and spectrum at each instant in time, maximizes spectrum utilization, and therefore increases throughput and reduces network cost. This is particularly important for devices using unlicensed spectrum such as that used by WiFi and Zigbee where interference prevails. The simplicity of the implementation combined with the reduction in latency over traditional implementations allows wireless networks to scale beyond current limitation.

Core Technology

Our unique wireless networking radios (U.S. Patent 7,760,694 B2 and a few others pending) are based upon the OPM (Opportunistic Mesh) technology and the large-scale cognitive networking concept. It is largely differentiated from traditional wireless networking, by the opportunistic network resource utilization of both spectrum bandwidth and mesh station/radio availability. On the contrary, traditional wireless networking assumes that those resources can be predetermined.



Dynamic Wireless Environment

In large-scale wireless networks, the problem of volatile spectrum availability is typical in unlicensed bands where interference prevails. Similarly, the problem of random radio availability is also often encountered due to the dynamic traffic load and other factors such as radio failure.

In dynamic wireless environment, traditional wireless networking seldom functions properly, given its assumption of predetermined "virtual-wired" links and network topology for (ad-hoc) network routing protocols. As a result, despite research and development efforts, almost every today's real-world wireless network is based on single-hop wireless (e.g., cellular networks, WLAN – wireless local area networks).

By taking cross-layer architecture, OMESH technology creates a dynamic (fluid) wireless network without predetermined topology and spectrum allocation. In multi-hop wireless communications, every packet can take opportunistically available paths in the wireless network, and with opportunistically available spectrum on each hop. The network-resource utilization can thereby reach its instantaneous maximum, disregarding volatile changes and the demand placed on the network.

Therefore, our radio technology provides the most reliable and cost-effective bandwidth in large-scale wireless systems. Compared to state-of-the-art competing technologies, it has been proved to achieve 5-10 times higher throughput (bandwidth) in wireless networks, with a fraction of the cost in terms of materials, installation, and maintenance. The full commercialization will be a game-changer that can bring the most ubiquitous wireless connectivity to "everybody" and "everything". "Everybody" can cover and address the pain of insufficient bandwidth and coverage of wireless Internet used by smart phones; and "everything" can bring smart wireless connectivity to sensor-devices in many traditional industries, including smart utility networks, indoor location/tracking (context computing) networks, broadband access and mobile social networking, mining, healthcare, surveillance and emergency communications, agriculture, home/building automation, and retailers.

Our radio technology platform is having great potentials in numerous vertical applications. Once it becomes ubiquitous, the full impact can be comparable to how packet switched technology (Internet) has differentiated from circuit switched technology (telephone networks) in wire-line networks. It creates a new world where high-bandwidth and low-cost communications become possible, for wireless and mobile devices.

Networking	Medium	Traffic
Circuit Switched	Reliable	Predetermined
Packet Switched	Reliable	Random
OMESH Technology	Unreliable	Random

Comparative Advantages

A set of comparative advantages of OMESH's radio technology are further explained as follows:

▪ Dynamic network planning and deployment model

No deterministic network topology has to be maintained, since the radio resource is opportunistically utilized. The mesh stations/radios, when implemented with OMESH's radio technology, become "drop-and-play" in the network deployment. Inserting more radios/stations can improve the radio resource to be opportunistically exploited, and therefore increase the network capacity. Likewise removing any individual radio/station does not create bottlenecks in the network. This fluid "drop-and-play" nature offers the potential of vast cost-saving in mesh infrastructure planning and deployments. The setup of mesh stations/radios does not need expensive planning and calibration, as multi-tier new deployments (for example introduced by service providers or subscribers) guarantee improved network capacity. High mobility of the mesh stations/radios can be supported.

▪ Better network resource utilization

The network resource in large scale wireless networks includes: the amount of spectrum bandwidth and the number of mesh radios. Theoretical network capacity is decided by the network resources, and the multiplication of these two factors. Traditional wireless networking depends on a deterministic mesh-network topology. It is therefore difficult to efficiently utilize the network resources, subject to a dynamic wireless networking environment where both spectrum bandwidth and mesh radio availability cannot be predetermined. Our technology offers a means of better network-resource utilization, approaching the information-theoretical limit on wireless-network capacity.

▪ Supporting high-quality and real-time services

Due to the opportunistic network-resource utilization, reliable wireless communications with specified dataflow throughput, end-to-end delay, and delay variance can be supported over multiple wireless hops. Therefore, real-time services, including high-quality multimedia, can be set up over multiple wireless hops. In overall, the opportunistic exploitation of local random networking environment can result in reliable end-to-end communications. Dataflow throughput is independent of the number of wireless hops; end-to-end delay and delay variance only increase linearly with the number of wireless hops; and delay variance can also diminish to zero with higher network density. Network operators only need to have sufficient network resources deployed to support their applications, where the resources, e.g., gateway capacity and mesh radios, can be conveniently deployed.

▪ Robust to wireless interferences

Due to the opportunistic network-resource utilization of spectrum bandwidth, the network can be very robust to interferences that are substantial in unlicensed spectrum bands (e.g., ISM bands). For example, viable operation within unlicensed bands brings large free bandwidth to wireless infrastructures, which results in large network capacity with virtually zero cost.

▪ Compatibility with current industrial standards

The technology can be compatible with all established wireless radio standards, so that the implementation can be independent of physical radios. Therefore, the radio modules can also use off-the-shelf RF technology. The implementation can also be seamlessly integrated with all network-layer protocols, including for example Internet Protocols.

▪ Supporting scalable radio complexity (low power)

The complexity of individual radio modules (with cognitive-networking capabilities) is low and independent of network scale. The low radio complexity results in low power consumption, lower cost, and long battery life. When needed, it also makes it possible to power the mesh radio by cost-effective solar panel, which would further reduce installation cost by removing any cable attachment.

▪ Better economics and business case (low cost)

As explained above, OMESH's radio technology can offer excellent economics in large-scale wireless systems, by which 1) the costs of deploying network resources could be vastly reduced by the utilization of unlicensed spectrum bands and drop-and-play (mobile) mesh radios; 2) much higher efficiency in network-resource utilization results in excellent performance with all the available resources being used to their instantaneous maximum.