



# Optimization Algorithm for Wireless Mesh Networks

*To increase network performance and reduce data losses*

This advanced algorithm significantly enhances the efficiency and performance of wireless mesh networks (WMNs), an emerging broadband technology. The algorithm is able to determine where interference bottlenecks are present or developing in multi-hop wireless networks and then route the data to overcome these bottlenecks, minimizing or eliminating potential performance issues of the network. This prevents heavy streaming applications, such as video and large file sharing, from dragging down an entire network's performance. The technology integrates easily with others systems and is compatible with standard networking protocols, including transmission control protocol/Internet protocol (TCP/IP) and voice over Internet protocol (VoIP), as well as existing wireless standards such as 802.11a/b/g/n. It also offers a more reliable user experience for time-critical applications, such as VoIP.

## TECHNOLOGY OPPORTUNITY



## Benefits

- ▲ **Reduces disruptions for users:** Losses due to poor wireless links, media access contention, traffic congestion, and user mobility are greatly reduced
- ▲ **Enhances network performance:** When users view streaming video or transfer large files, service to other users on the network is unaffected
- ▲ **Lowers costs for network operators:** Memory requirements for network nodes are decreased, lowering overall costs

## Applications

The technology can be used for wireless communications in a wide variety of environments, including:

- ▲ Colleges, universities, high schools
- ▲ Hotels and resorts
- ▲ Hospitals
- ▲ Developing countries
- ▲ Remote locations
- ▲ Sporting events

## Opportunity

This technology is part of KAUST's technology commercialization program that seeks to stimulate development and commercial use of KAUST-developed technologies.

Opportunities exist for joint development, patent licensing, or other mutually beneficial relationships.

## For More Information

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## Technology Details

Users often report dissatisfaction with the performance of their wireless network service when user mobility or heavy streaming audio/video applications disrupt the network's performance. This innovation optimizes memory buffers across an entire wireless mesh network (WMN) to significantly improve the performance of devices connected to the network and reduce rates of corrupted or lost data packets, thereby enhancing the user experience.

### How It Works

This optimization algorithm sizes the collective buffer for the nodes experiencing network congestion in a WMN. Using knowledge of the neighborhood buffer size for all routers on the mesh, the algorithm determines where interference bottlenecks are present or developing. Data then can be routed in a manner that overcomes these bottlenecks and minimizes or eliminates potential performance issues of the network.

By dynamically right-sizing the buffers in the bottleneck, this technology achieves close to full network utilization with a significant drop in network latency. Mathematical modeling and extensive test bed deployments have achieved an order-of-magnitude reduction in round-trip time (RTT) of a TCP flow with less than 5% drop in network throughput. This significant increase in performance for traffic flows is unmatched by current WMN congestion-management algorithms.



### Why It Is Better

This technology improves the speed and performance of devices connected to the network and reduces the rate of corrupted or lost data packets. In addition, the algorithm decreases the memory requirements for the nodes in the network, which can reduce the network's overall cost and complexity. Integration of this algorithm into a WMN also offers significant scalability benefits. For example, adding more devices to the network enables greater flexibility to optimize network performance. Most importantly, the technology enhances the user experience by offering faster, more reliable access on wireless mesh networks.

### IP Protection

KAUST has issued patents 8,638,686 and 9,276,832 for this technology.



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