

# QualNet<sup>®</sup>

## Advanced Wireless Library (WiMAX\*)

The IEEE 802.16 standard (popularly known as WiMAX<sup>®</sup>) specifies high range and high bandwidth wireless access for fixed and mobile users.

QualNet enables the test and evaluation of fixed and mobile WiMAX devices, applications, and networks. QualNet's WiMAX channel model incorporates co-channel interference, urban pathloss, fading, shadowing and mobility effects. Through detailed models, unrivaled speed and scalability, QualNet provides an environment for controlled and repeatable experimentation that leads to improved network performance and a better end-user experience.

Examples of the types of projects QualNet Advanced Wireless Library can support include:

- Network planning
- Capacity versus coverage tradeoff analysis
- Business case analysis
- Investigations of performance bottlenecks
- Optimization of network performance and resource configurations
- User experience analysis
- Application tuning using cross-layer optimization
- Improved proprietary algorithms for scheduling and admission control and other non-interface features

Network architects, R & D engineers and deployment engineers at service providers can perform capacity planning, capacity/coverage tradeoff analysis, network stack tuning, and Quality of Service analysis. They can also do application testing, optimization, and end user experience analysis using the hardware-in-the-loop capability of QualNet (Network Emulation Library).

System engineers, R & D engineers and implementation teams at equipment manufacturers can optimize their protocol stacks and perform cross-layer optimization for best performance in an end-to-end simulated network environment. They can also improve proprietary algorithms for QoS scheduling, admission control and other features that are required by standards but whose implementation details are not specified. QualNet includes generic implementations for these features that can be customized or completely replaced.

### Key Features of QualNet WiMAX

Support for 802.16d (Fixed Wireless) and 802.16e (Mobile Wireless)

Adheres to IEEE 802.16-2004 and IEEE 802.16-2005 specifications

Full source code (in C/C++) for fixed & mobile WiMAX simulation models

Detailed OFDMA model

ARQ, Admission Control

Sleep/Idle mode, Paging & Power Control

CDMA-based ranging & bandwidth request of OFDMA

UGS, rtPS, nrtPS, ertPS and BE QoS

Dynamic burst profiles and data rates (AMC – Automatic Modulation and Coding)

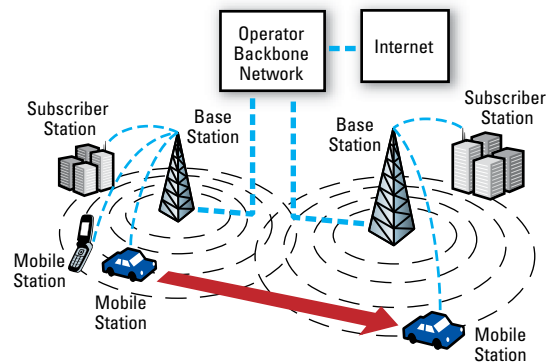


Diagram of Base Stations and Mobile Stations in the Advanced Wireless Library of QualNet.

\* "WiMAX", "Mobile WiMAX", "Fixed WiMAX" and "WiMAX Forum" are trademarks of the WiMAX Forum. Scalable Network Technologies is a member of the WiMAX Forum. For more details on WiMAX visit the WiMAX Forum website at <http://www.wimaxforum.org>

Customers who can benefit from QualNet WiMAX models include:

- Service Providers
- Equipment Manufacturers
- Network Integrators and Consultants
- Research groups and universities

## Model Variables

QualNet simulates 802.16 and 802.16e networks using detailed MAC and PHY models. The following table summarizes model parameters in WiMAX.

### WiMAX Sample Model Parameters

MAC Protocol

Station Type (BS / SS)

BS Frame Duration

BS TDD DL Duration

BS Transmit / Receive Transition Gap

BS Receive / Transmit Transition Gap

Transition gap for SS to switch from transmit to receive or vice versa

BS DCD Broadcast Interval

BS UCD Broadcast Interval

BS Ranging Backoff Min / Max

BS Bandwidth Request Backoff Min / Max

SS Wait DCD Timeout Interval

SS Wait UCD Timeout Interval

Service Flow Timeout Interval

IP Queue Number of Priorities

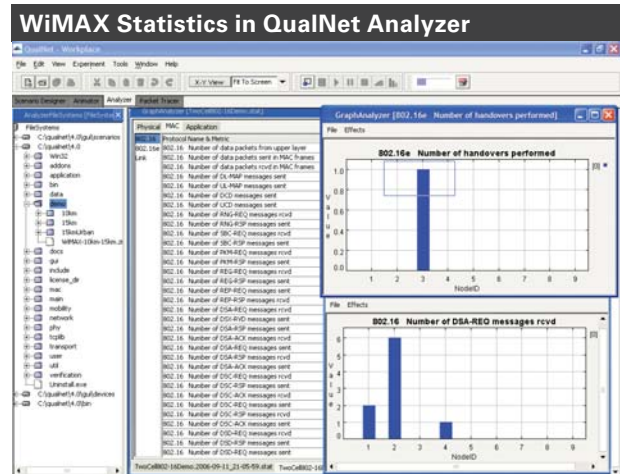
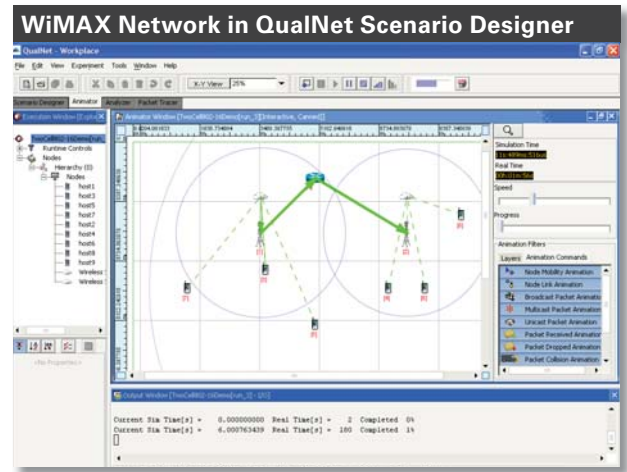
Propagation Channel Frequency

PHY Listening / Listenable Channel Mask

PHY Reception Model

Handover trigger based on receiving signal strength threshold

Signal strength based parameter for selecting target BS during handover



## How to Buy

The **Advanced Wireless Library** is available for QualNet Developer 4.5 as a free-standing model library. Other model libraries that complement the Advanced Wireless Library include:

- Developer, Wireless, and Multimedia and Enterprise Libraries (included with QualNet Developer)
- Urban Propagation Library for COST231 Walfish-Ikegami and Street Microcell models
- IPNE for connecting QualNet 802.16 models to live IP networks