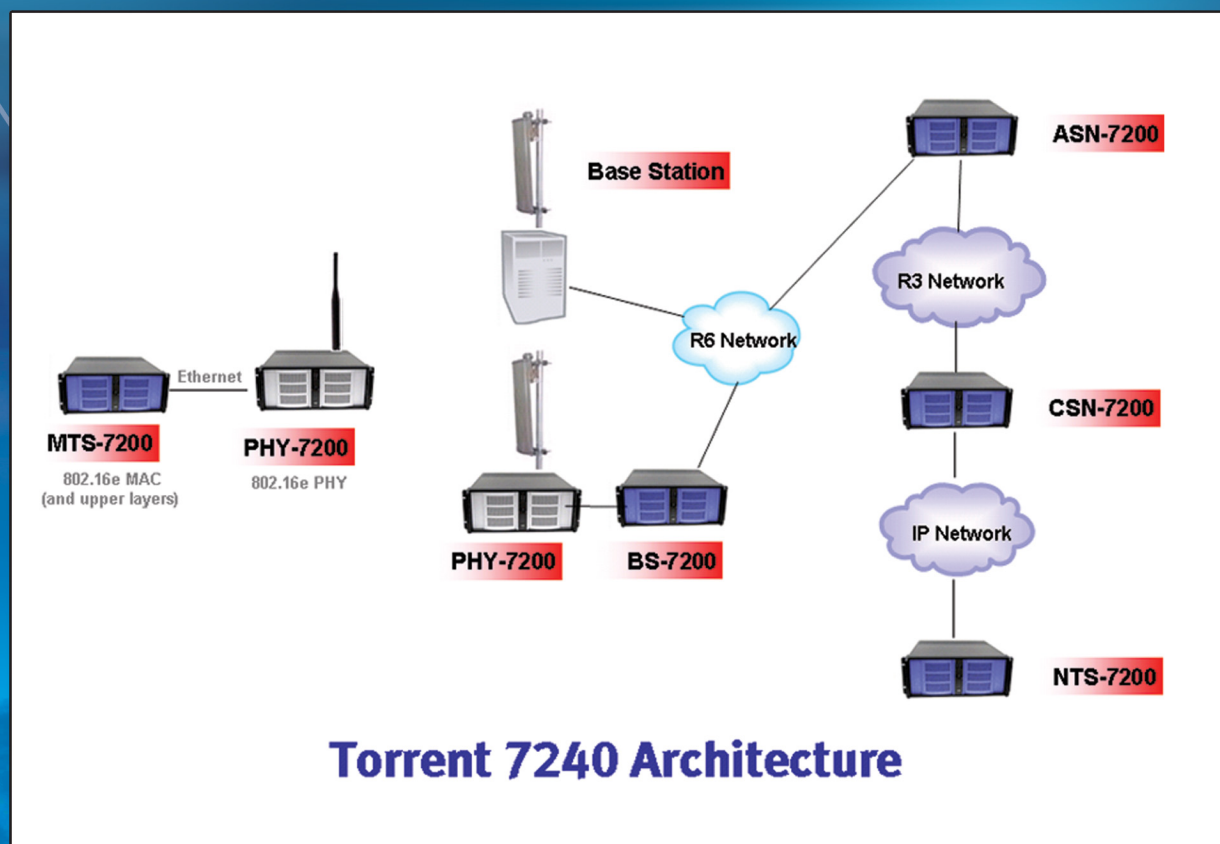


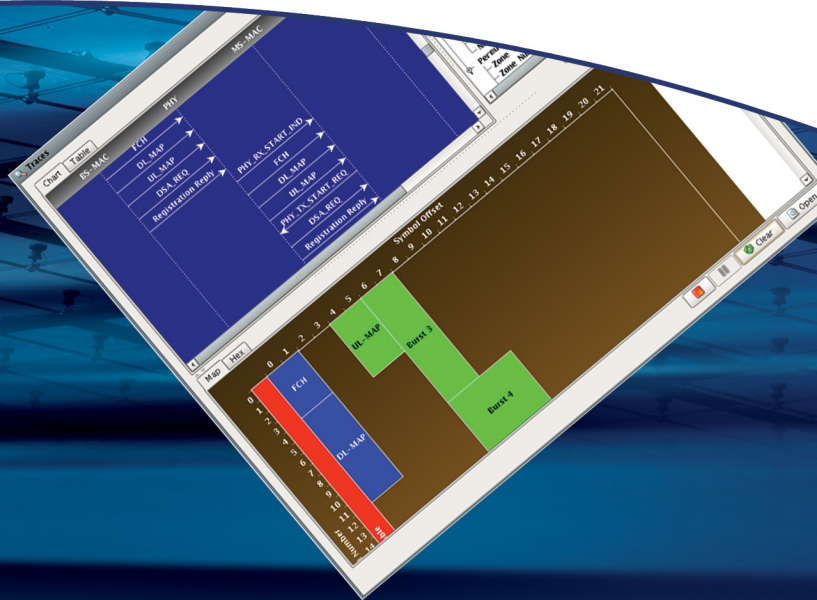
# The Torrent 7240 WiMAX Test System

The Torrent 7240 WTS is designed to comprehensively test 802.16e WiMAX networks over the air in an end to end fashion and builds on the foundation established by the Torrent 7100 which was the world's first WiMAX test system for ASN Gateways and CSN nodes. Although its primary focus is testing base stations, it can be used to test any node in the WiMAX ecosystem from mobile terminals to authentication and billing servers. With its unprecedented support for thousands of mobiles per channel, its flexibility, its realism, and its end subscriber QoE characterization we believe the 7240 sets a new standard in its feild.

The Torrent 7240 architecture consists of a suite of emulators which run in a Linux based distributed computing environment as illustrated below. Each emulator acts in a very precise manner as would the corresponding node in a WiMAX ecosystem. For example, the MTS-7200 emulates thousands of mobiles and these mobiles are able to communicate with base stations over live air or coax using one or more PHY-7200s (one for each channel). Also illustrated below are the BS-7200, ASN-7200, and CSN-7200. These emulate in real time the WiMAX base station (or base stations), ASN gateway, and CSN (HA/AAA) respectively; but they can be selectively replaced with system-under-test nodes as desired. Finally the optional NTS-7200 provides a convenient aggregation of network servers (MMS, PoC, WAP, HTTP, FTP, SMTP, POP3, etc).







### Key WiMAX Features

- 802.16e MAC Testing
- 802.16e PHY Testing
- Live Airlink Testing
- Drive Testing
- Client Mobile IP (CMIP) Support
- Proxy Mobile IP (PMIP) Support
- Network Entry (multiple SFs/mobile)
- Network Exit (MS & ASN Init)
- Full Dataplane Support (IP CS)
- R6 Handover (Controlled/Uncontrolled)
- R3 Relocation
- Multi-Target Handover
- Idle Mode
- Paging
- Location Update
- Reauthentication
- EAP Methods: TLS, TTLS (with MSCHAPv2), AKA, SIM, PEAP, MD5

### Mobile Protocols Supported

TCP/IP, UDP, SIP, RTP, RTCP, ICMP, HTTP, FTP, MMS, PoC, MIP, DNS, DHCP, SMTP, POP3, WAP

### System Supported Protocols

IEEE 802.16e, WiMAX ASN Control Protocol, MIP, GRE, IPIP, DHCP, DHCP Relay, Radius Auth, Radius Accounting, VLAN Tagging, DSCP Marking, Proxy ARP

### PHY Specifications

- Air Interface:  
IEEE 802.16e-2005 / S-OFDMA
- Frequency Bands:  
2.3GHz, 2.5GHz, 3.3GHz, 3.5GHz, 3.8GHz
- Channel Bandwidth:  
5MHz, 7MHz, and 10MHz
- Duplex Mode:  
TDD
- FFT Sizes  
512, 1024
- Modulation Types:  
BPSK, QPSK, 16-QAM, and 64-QAM
- FEC Types:  
CC (1/2), CTC (1/2, 2/3, 3/4, 5/6)
- QoS:  
UGS, RT, ERT, nRT, and BE
- Data Encryption:  
AES
- Ranging:  
Over one or two symbols
- Security:  
AES and PKMv2
- Capacity:  
4,000+ mobiles/channel



# Key System Features

- **Realistic Mobile Simulation**

A central feature of the system is that it is realistic, and simulates mobiles and the application data traffic that they generate as precisely as possible. In particular, mobiles are stateful and have their own network stacks built-in.

- **Built-in Mobile Browser**

Each mobile can be hand driven if desired using our built-in browser & terminal interface:



- **Realistic Network Simulation**

Because the entire network around the system under test is authentically simulated, complex tests such as inter-ASN gateway handover with ensuing R3 relocation and authenticator relocation can be performed -- all with concurrent data path continuity testing.

- **Programable Mobiles**

Another important aspect of the system is that the behavior of mobiles can be programmatically controlled using a high performance scripting language; though built-in programs may be used unaltered in most cases.

- **Full Automation Support**

Test cases may be fully automated and allow the end user to interact with the system under test via ssh, telnet, ftp, etc. through an Expect style interface.

- **Highly Parallel Simulation**

Parallelism is supported on numerous levels. Typically, it is accomplished by running multiple traffic profiles in parallel, but it can be extended right down to the individual mobile level as shown below:

```
File Edit Search View Tools Window Help
attach bs <asn1>
parallel:
  http_get url http://test.mobilemetrics.net
  handover bs <asn2>
parend
deactivate
```

- **Linear Scalability**

Any traffic profile can be scaled linearly by simply adding more computing hardware, and this can be accomplished without having to rewrite or otherwise modify test cases.

- **Ease of Use**

The Torrent 7100 features a simple installation process and intuitive multi-user GUI and does not require programming knowledge to operate.

- **Off-the-shelf Hardware**

The Torrent 7000 series runs on standard PC hardware so existing in-house servers may be used if desired.

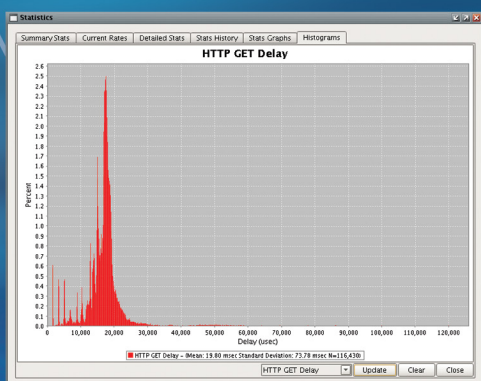




# Key System Features

### • QoE Characterization

A key aspect of the system is that it allows the end subscriber's experience to be characterized through a number of key performance indicators (KPIs). For each KPI, the system tracks not only the mean and standard deviation, but a complete high resolution histogram as shown below for HTTP GET:



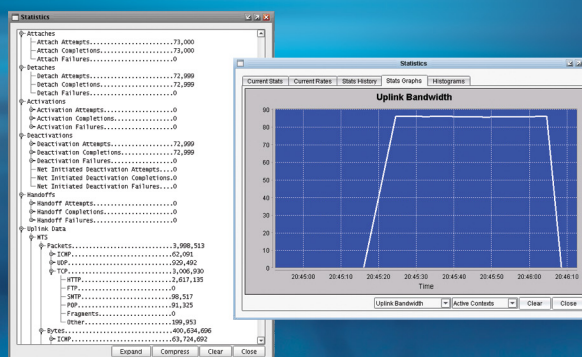
Histograms are particularly useful for studying the effect of background traffic on interactive traffic, especially under heavy loads.

### • Graphical Message Tracing

One of our favorite features is the system's ability to capture messages on multiple interfaces in real time and render them graphically in a unified, easily readable manner (sample output on preceding page).

### • Detailed Hierarchical Statistics

Hundreds of statistics are captured by the system on both MTS and NTS and they are organized in a hierarchical manner to allow both the big picture and the finer details to be seen more clearly. These statistics may be examined in real time by test cases, or they may be exported in bulk via CSV file to Excel. Additionally KPIs may be graphed dynamically.



### • Full Messaging Control

All control and data messages and their associated message flows may easily be modified by the end user using our patent-pending filtering layer. This allows a virtually limitless number of error scenarios or unusual message flows to be tested.

### • Network Service Assurance

While the Torrent system was originally designed for lab use, it may also be used to perform in-service network monitoring. For example, network entry, handover and data path functionality can be spot-checked periodically and an alarm raised if failures are detected.



# About Mobile Metrics

*Mobile Metrics is a specialized company focused exclusively on wireless test systems, with a specific focus on functional and load testing for broadband wireless technologies such as WiMAX and soon LTE.*

*At Mobile Metrics, our mission is to help make you successful by providing the most advanced and innovative test systems possible. Beyond our focus on technology is our focus on you and your goals. From the first consultation to the latest contact for support, you'll see how a specialized partner can make a difference in your development and test endeavors.*

## Contact Information

Mobile Metrics  
5050 Quorum Drive, Suite 700  
Dallas, Texas 75254

(877) 404-2600  
(214) 319-2600  
(214) 594-2700

Toll Free  
Phone  
Fax



*Our company grew out of decades of experience in wireless equipment design and test fields. So we understand your challenges because we've been there ourselves. With that knowledge we've build systems to help you address those challenges faster, more effectively, and with greater ease than previously possible; but you be the judge - ask us for a free demo today.*