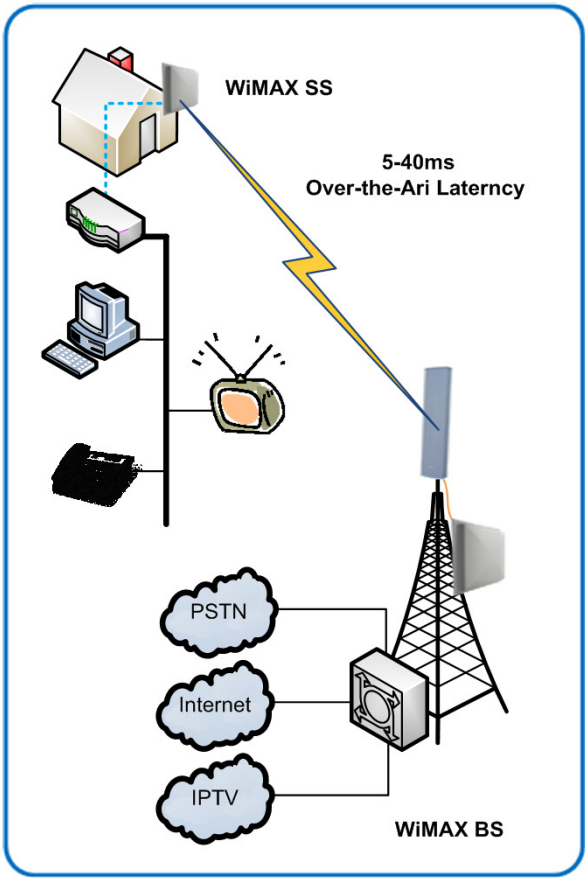
WiMAX QoS Classes

Using WiMAX QoS Classes to support Voice, Video, and Data Traffic

Whitepaper

Quality Of Service (QoS)

WiMAX gives network operators the opportunity to provide a wealth of services to differentiate their offerings and attract a tiered range of subscribers. It features a variety of flow types that can be used to optimize performance for voice, data, and video. Offering Voice/data/video convergence makes sense for enterprises and service providers alike. For example, effective voice over IP (VoIP) communications require QoS features that can quickly identify voice traffic and prioritize it to assure high-quality audio and service level adherence. Without a robust QoS implementation, it is not possible to ensure low latency and low jitter that are necessary to provide carrier grade services such as VoIP and IPTV.



The IEEE802.16d WiMAX standard offers four categories for the prioritization of traffic: (1) Unsolicited Grant Service (UGS), (2) Real-Time Polling Service (rtPS), (3) Non-Real Time Polling Service (nrtPS), and (4) Best Effort (BE). Each of these service class is intended for specific application(s). Tranzeo's WiMAX devices support all four types of fixed WiMAX QoS service classes.

With Best Effort service, voice packets may have to be buffered until a transmission burst slot becomes available and thus leading to degradation in service. This paper briefly explains how each type of service class can be used.

Unsolicited Grant Service (UGS)

UGS is primarily intended for Constant-Bit-Rate (CBR) services such as VoIP, which means that achieving low latency and low jitter is very important. At the same time, low percentage of packet drops is possible. UGS flows are configured to send fixed-size packets at recurring intervals with as little latency and jitter as possible.

UGS has the following set of features:

- UGS flows are buffered separately from each other and from flows in service classes such as nrtPS and BE.
- UGS service flows are given strictly higher priority versus nrtPS and BE service flows, which implies that the system serves nrtPS and BE packets only after it has finished transmitting all outstanding UGS packets.

In the upstream, the system uses UGS to bypass the normal request-grant mechanism for upstream traffic by allowing the BS to give automatic grants to a UGS flow. Also, over-the-air latency in a WiMAX network is small (5-40 ms) relative to the latency on an IP backbone (100ms), which inherently ensures minimal latency.

Real-Time Polling Service (rtPS)

The Real-Time Polling Service (rtPS) on the other hand is designed to support real-time service flows that generate variable size data packets on a periodic basis, such as MPEG video. The service offers real-time, periodic, unicast request opportunities, which meet the flow's real-time needs and allow the Subscriber Station (SS) to specify the size of the desired grant. A major drawback to using this QoS approach is the impact on the overall sector throughput. Polling overhead can reach up to 60% when using 3.5MHz channel.

This service requires more request overhead than UGS, but supports variable grant sizes for optimum data transport efficiency. Unlike UGS, the polling overhead exists even when the flows are idle, and for as long as they are active.

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Non-Real-Time Polling Service (nrtPS)

This service class is intended to support non-real-time service flows that require variable size data packets, and a minimum data rate, such as FTP. This is accomplished by offering unicast polls on a regular basis, which ensures that the service flow receives requests even during network congestion.

Best Effort (BE)

The BE service is intended to support data streams that don't require minimum guaranteed rate, and could be handled on best available basis. Unicast polling requests are not guaranteed in this case, requiring contention requests to be used. BE packets may therefore take a long time to transmit during network congestions.

Scheduling

A scheduler is present in both the Base Station and (BS) and Subscriber Station (SS). The BS schedule controls all system parameters. It is the role of the BS to determine the burst profile and transmission periods for each connection. The choice of the coding and modulation parameters are decisions that are taken by the BS scheduler based on the quality of the link and the network load and demand.

The BS scheduler continuously monitors the received CINR values of each link, and determines the bandwidth requirements for each station taking into consideration the service class for each connection and the quantity of traffic required.

The role of the SS scheduler is to classify all of the incoming packets into the SS different connections.

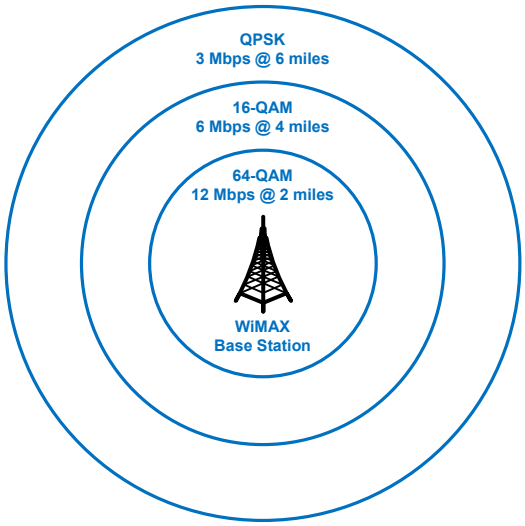
Table 1 lists the scheduling service types that can be used for some of the standard applications.

Application	Service Class
Tl/El (over IP)	UGS
VoIP	UGS
MPEG	rtPS
FTP	nrtPS
TFTP	nrtPS
HTTP	nrtPS
Email	BE

Adaptive Modulation & Dynamic Bandwidth Allocation

WiMAX coding and modulation schemes ensure steady signal strength over distance by decreasing throughput over distance to deliver the best QoS possible.

Adaptive modulation and dynamic bandwidth allocation are the 2 mechanisms that a WiMAX system uses to ensure good QoS. The BS monitors the network and allocates more bandwidth and power for affected connections.



Conclusion

Tranzeo offers a complete family of 802.16d WiMAX products that support all four service class types, and can operate in the licensed 3.5GHz spectrum, lightly-licensed 3.65GHz spectrum, and license-free 5.8GHz spectrum. Tranzeo's WiMAX product line-up includes indoor and outdoor Subscriber Stations, Pico base Stations, and Centralized Element Management System (EMS) with Autonomous Rules-based QoS for complete turn-key solutions.

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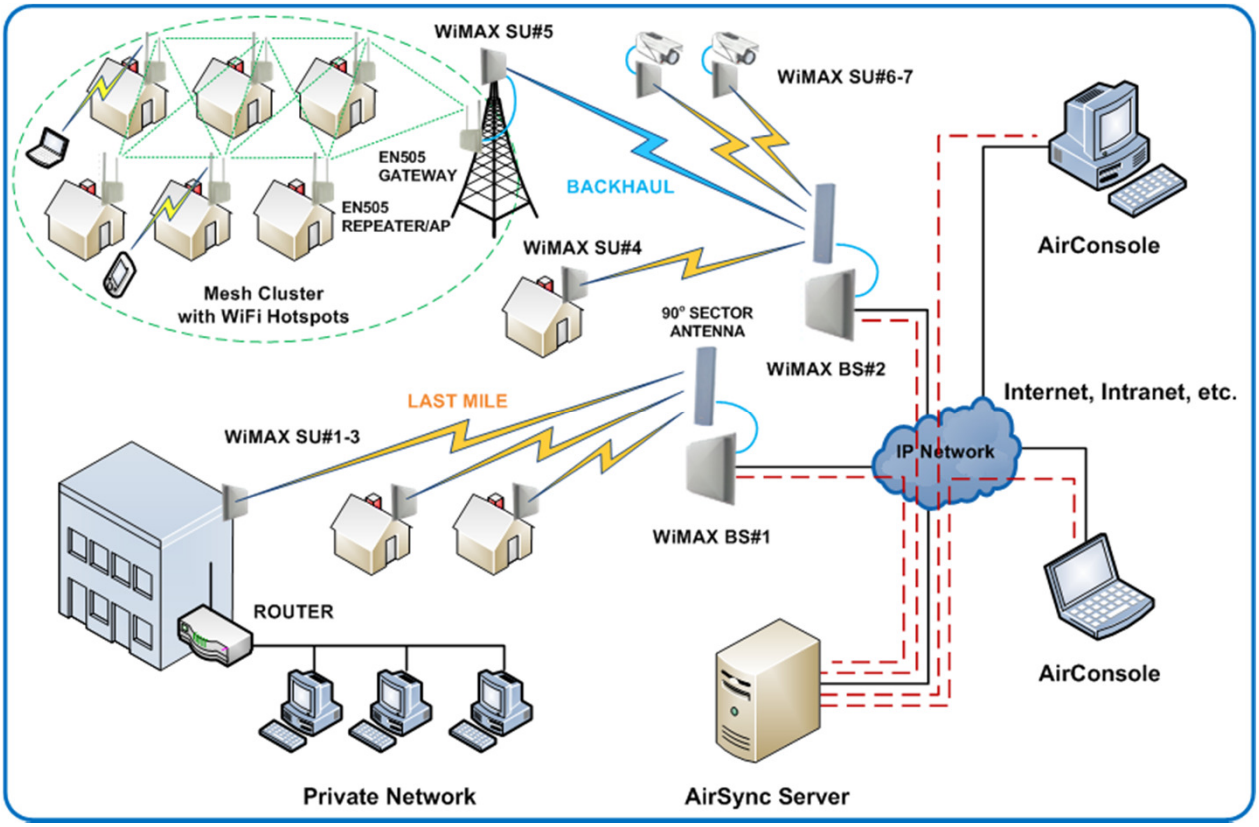

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About Tranzeo Wireless™

Tranzeo Wireless Technologies Inc. (TSX:TZT) leads the wireless broadband industry as a premier manufacturer of high-performance wireless network equipment that allows communities and businesses to communicate without boundaries. Tranzeo's optimum cost effectiveness, premium quality and responsive support have attracted a growing and devoted worldwide following of more than 2,465 dealers and 16 distributors. Tranzeo's full spectrum of point-to-point and point-to-multipoint radios, WiMAX equipment, and mesh network solutions are designed for wireless internet service providers, governments, campuses, military, carriers, enterprise customers, and systems integrators around the globe. Headquartered in British Columbia, Canada, Tranzeo also has offices in San Diego, California, San Jose, California, and Shannon, Ireland.

Aperto Networks operates as a wholly owned subsidiary of Tranzeo. Aperto is a leading supplier of wireless broadband, mobile WiMAX and Enterprise VPN solutions using highly versatile and cost-effective carrier-grade WiMAX Forum Certified infrastructure equipment.

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