Functional Requirements for the 802.16 standard

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These functional requirements define in a broad way the goals that the 802.16 working group has for standardized broadband wireless links that provide access from users to wide-area networks. The standard or standards generated by the working group will add details to these goals sufficient to achieve the performance goals specified here and maintain interoperability between units from different manufacturers.

PAR requirements

The standard will conform to the statements of the 802.16 PAR, with respect to goals of the standard.

Public network considerations

It is assumed that the 802.16 network will be operated on a commercial basis by a third party rather than by user organizations themselves as is normal with LANs. As a public network, a number of considerations apply:

Privacy

All transmissions must encrypt user data, with encryption strength TBD.

Integrity

All transmissions must provide for verifying the integrity of user data, i.e. assuring that no alterations of data have occurred by either deletion, addition, or modification of the data.

Authentication

Provision must be made for authentication of users so as to prevent unauthorized use of the service and to enable proper billing to subscribers.

Centralized control

Access to the air link must be under control of the base station at all times.

Contract enforceability

Provision must be made to permit service operators to enforce service level agreements with customers by restricting access to the air link, discarding data, or other appropriate means. The service operator must have means to shut down a customer unit if necessary.

Network topology

The standard will assume a cellular structure, with base stations each in communication with a multiplicity of user stations in the vicinity. Transmission to the user stations will be from the base station only, with data addressed to each user station by means of timing relative to reference marks or by means of data unit headers. Peer communication directly between user stations will not be supported.

Point-to-point operation will not be precluded when done as a special case of point-to-multipoint. In this case there will be only one user station and default scheduling parameters may be appropriate.

Sectorization of the base station antenna pattern is not an issue for interoperability between base station and user; however, recommendations in this area may be undertaken.

Frequency channels

Provision will be made to divide the appropriate bands and sub-bands such as LMDS A and B into frequency channels which can be operated independently. The channel width is TBD.

Multiple services

The MAC must be able to support multiple services simultaneously, based on multiple higher-layer protocol stacks. For example, TCP/IP, frame relay, ATM (and whatever may be on top of it) and STM as used in T1 and E1 lines will be supported, as shown in Figure 1. Both symmetric and asymmetric traffic models will be accommodated.

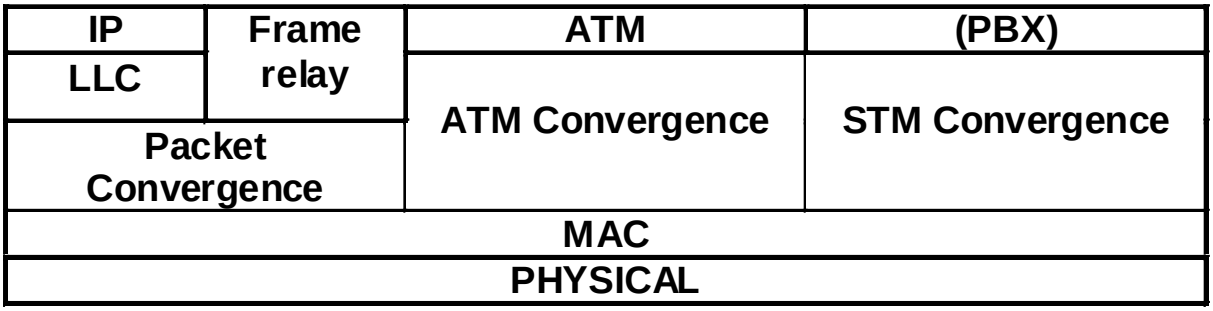

Figure 1. Layering showing multiple stacks supported by 802.16 MAC

Service types will include, at a minimum:

Dedicated bit rate

This service will support legacy applications such as connecting a PBX to the wide-area network. Bandwidth will be fixed (though it may be changed on request by the user, for example to change the number of DS0 channels provided). Guarantees will be possible in terms of jitter and delay, with the details TBD.

Variable rate, real time

This service is intended to support compressed voice and/or video. For voice, the access network should be compatible with compression standards such as G.723.1 operating at 5.3 kilobits per second. For video, rates typical of algorithms ranging from H.261 through MPEG 2, high profile (HDTV) should be accommodated.

Priority data

This service category is intended for high-priority data that will take precedence over normal (best efforts) data traffic; several service classes may be defined here.

Best-efforts data

This is the last category, with no guarantees as to rate or protection against discard should overload occur. It is equivalent to an available rate service in that transmission is always controlled by the base station and hence conforms to whatever rate is available after the higher-priority services have been scheduled.

Modulation

Modulation will be specified in terms of constellation and fallback strategies, should received signal strength vary due to atmospheric conditions.

Error rate

Error rates after correction by FEC will be specified; these will be consistent with the overall IEEE 802 functional requirement of a bit error rate of 10^{-9}. A Hamming distance of 4 (minimum number of errors per block to cause non-detection of errors) will be maintained, in conformance with the 802 requirements.