# Saving Bandwidth by Truncation of Scalable Streams in A Wireless Active Gateway

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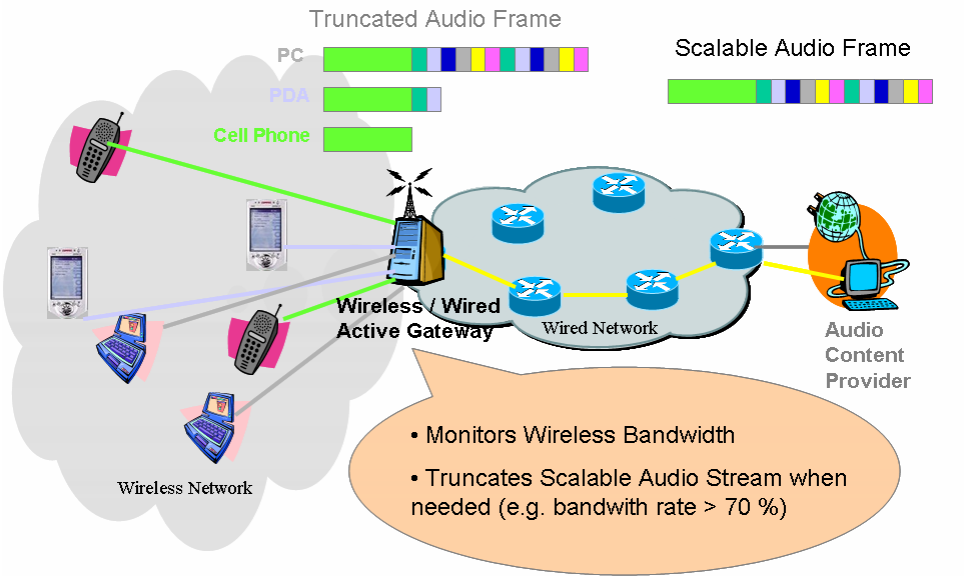
Wireless networks such as Wifi (802.11) enable new kinds of applications when users are in a mobility situation (hotspot, hotel, airport….). Those applications include internet browsing, e-mails, file sharing, VoIP, audio/video streaming….
However, the total bandwidth available may vary greatly because of physical interferences in the 2.4GHz band. Moreover the bandwidth usage rate may change very quickly depending on the numbers of connected users and/or the nature of the application traffic. This may lead to a point where the bandwidth is overused, thus a lot of packets are lost and finally the quality of service is bad. Taking the example of audio/video streams, end-users may be very disappointed by the poor quality if this loss rate is too high.
Scalable coding is a media coding technique that enables to send a large data stream with an uncompressible core and refinements bytes for better quality. The more data are decoded by the receiver, the better the quality will be. The receiver that only decodes the core will have a lower quality but still an acceptable perceived quality. This technique allows decoding only part of a total stream but does not prevent the bandwidth overuse since the total packets are emitted over the transmission network. Furthermore, the sending rate may not be reduced on the sender's side since some users may be able to receive all the data (those who are not located in an overused network).
The idea is then to design an element, located between end-users and servers, that integrates to the network in order to intercept in real-time all the packets of same flows transparently for applying a special processing: in the case of scalable coding, truncating packets when needed (overused network) to reduce the used bandwidth. A programmable node is a network element that is able to modify transparently (without splitting the client-server connection, there is only one connection) packets passing through it and that enables dynamic code deployment on it. We decided to extend the functionality of a wireless gateway (a wifi access point) and to make it “active”. This is done by one module that monitors the wireless network and by a module that may truncate packets (remove some refinements bytes in the scalable stream).



Furthermore, since the active gateway is based on the concept of programmable nodes, the "applicative" modules (e.g. the truncating module or a transcoding module…) may be dynamically (when needed) deployed and removed, avoiding to have a lot of useless modules deployed on the gateway.

The previous picture presents the demonstrator, where a scalable audio stream (scalable NB-AMR) is sent by an audio content provider, and truncated when needed by the wireless/wired active gateway before being forwarded to the wireless receivers. The demonstration shows clearly the quality of service gain allowed by such an architecture. In our case, when 60 wireless clients are receiving the audio stream, the wireless network is overused and the received data cannot be decoded properly by some receivers because of the high packet loss rate. Indeed, 293 kB/s are emitted and only 265 kB/s are received, thus an average packet loss of about 10% (knowing that some receivers lost more than 25%). Truncating the audio stream from 32 kbit/s (packet size = 294 bytes : 252 bytes of data) to about 15 kbit/s (packet size = 162 bytes : 120 bytes of data) for 25 flows (the others 35 remains unchanged), the quality is becoming acceptable for all the flows (even if the quality is decreased for 25 of them) and no more packets are lost. In this case, about 230 kB/s are received, which is under the maximum throughput of the wireless network.