

Satellites and the Next-Generation Networks race

by Grant Seiffert, President, Telecommunications Industry Association (TIA)

Competition among mobile operators to provide broadband mobile service is hot. Each operator is planning 3G and 4G strategies to outflank their competition. Converged networks for voice, data multi-media, and video over IP are high on their priority lists as are QoS, mobile commerce, gaming, location services, video, mapping services, quick information searches, security and technical issues such as backhaul. Satellite services have been little discussed, but emerging, advanced systems, will undoubtedly become increasingly important in difficult to reach areas.



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In a normal world one might expect second-generation mobile technology, or 2G, to be followed by 2.5G and then by 3G (or 3.xG) and then by 4G. Operators are expected to follow a pre-defined evolutionary sequence. However we live in a competitive world with rapid changes in technology and the economics of delivering new, innovative services.

Companies continually announce their planned evolution for existing networks; we hear rumours of mergers; we see divestitures of large portions of networks due to differing technologies of the installed bases; operators switch technologies or standards for the next generation of their networks. What can we make of all the chatter and confusion; what would be a sure bet?

The truth is that there is no crystal ball, but we can see trends. While some may choose technologies that have a) an installed base of vendors; b) many existing networks; and

c) logical technology evolution paths, other operators or new entrants may bet on long shots - technologies that seem to work in the lab and in some trials, but have yet to prove themselves in real commercial applications.

Most of the mobile technologies currently being deployed over the last decade are 3G, allowing for voice, video and data applications. But 4G is the next generation, and everyone is talking about its evolution and new capabilities; some claim that they are bringing it to the market now.

As the group representing the entire information and communications technology (ICT) industry, the Telecommunications Industry Association (TIA) supports all the technologies that new markets demand, both with new products and with new standards.

What directions are markets and new technologies actually taking? With the input and expertise of TIA members and TIA's

annually produced Market Review and Forecast as a backdrop, several themes are emerging:

- Converged networks carrying voice, data and multi-media, including video, over Internet Protocol (IP)-based technologies;
- Demands for improved quality of service (QoS) and performance;
- Interfacing to legacy networks that use non-IP and proprietary protocols and software;
- Desire for more bandwidth, higher data speeds, lower deployment and operating costs;
- Flexibility to support new services and applications;
- Demand for greater coverage areas;
- Capabilities to handle emerging applications such as mobile commerce, gaming, location services, video, mapping services and quick searches for needed information;
- A greater emphasis on security and

identity management in face of increased attacks on networks and their users;

- Timely alerts and warnings of imminent perils; and
- Open standards-based networks to ensure operability and interoperability.

Overall, we are seeing an explosion of consumer demand for more digital video and consumer control over how much, how often and where they want to have their content delivered or consumed. At the same time, video is transitioning to high-definition (HD) video, new cell phones are capable of large-volume video recording and all video-capable devices feature greater storage capacity. The world has shifted from prime time, to my time or anytime. Users want 'broadband on the go', greater levels of choice, control and customization for their video-on-demand experiences. Mobile TV technology lets service providers offer time-shifted and place-shifted video experiences.

As operators and technology firms jockey for position in this highly competitive market, they claim to know what the market wants and needs; it is their technology or standard or product that is bound to be the winner in the next-generation race!

In the U.S. we have seen Verizon Wireless announce its evolution plans and acquire large amounts of new spectrum. Sprint Nextel has announced a multi-billion dollar network and new partners; rumours abound of Sprint's divestiture of large portions of its existing network and of a Sprint takeover by another company, a move that could also impact future technology choices. T-Mobile has begun to deploy its 3G network, and AT&T is currently the largest mobile provider in the U.S.

Today the technology choices seem to be a UMTS/Wideband Code Division Multiple Access (WCDMA)/HSPA evolution to LTE, or a cdma2000® evolution to UMB or WiMAX technology. But some say HSPA+ may delay LTE implementation, and the International Telecommunication Union (ITU) is just beginning the process to define IMT-ADVANCED. Will we see some new technology entrants in this race to 4G?

In much of the discussion on next-generation networks one segment of the market or a technology choice you often do not see much about is satellite communications. How many people do you know who own - or have even used - a satellite phone? Yet TIA is developing standards prepared to meet the needs of this segment of the industry and its subscribers, and the topic deserves some discussion.

TIA committees are working on various aspects of satellite developments. The TIA Satellite Communications Division works closely with the TIA's Engineering Committee TR-34 - Satellite Equipment and Systems, to assure that the committee's work is consistent with regulatory and other policy issues addressed by the division for this segment of our industry. Engineering Committee TR-34 is responsible for standards and studies related to satellite communications systems, including both the space and earth segments. The committee focuses on standards for space-borne and terrestrial hardware; it interfaces with standards bodies for satellite and terrestrial systems and the efficient use of spectrum and orbital resources, including sharing between satellite and terrestrial services. Active projects range from studies on how best to accomplish inter-service spectrum sharing to developing standards for achieving interoperability between satellite systems, as well as among satellite and terrestrial systems, networks, and services.

Thus, the challenges for next-generation networks are also being addressed within the satellite segment of the industry. Progress includes standards developed by TIA for IP-over-Satellite (IPoS) which were also used as the basis for standards development at the ITU and the European Telecommunications Standards Institute. TR-34 works to promote the deployment of satellite-based solutions that can compete with access systems based on Digital Subscriber Line and cable access systems, (e.g., Data over Cable Service Interface Specification, DOCSIS).

TIA has issued standards for satellite network modem systems (SNMS) encryption requirements using time division multiplexing and multi-frequency time division multiple access signalling. The standards also define the requirements for hub-spoke as well as mesh satellite network topologies operating over transponded/transparent satellite systems. The TIA standards specify how to achieve security for hub-spoke and mesh network topologies.

Hybrid integrated satellite/terrestrial networks are emerging, providing ubiquitous wireless

broadband services, including Internet access, voice and video services. The newer or upgraded networks will improve flexibility and quality of service through priority mechanisms, enabling easier access between real-time and non-real time applications.

TIA knows there are satellite operators that plan to cover large land masses - for example, North and South America - with hundreds of spot beams. These networks will be made up of a collection of land-based cell sites, and will deliver services to wireless devices that are virtually identical to cell phone handsets in terms of aesthetics, cost and functionality. Communication via these satellites will facilitate direct access to small, fixed antennas on rural homes as well as to similar antennas providing highly economical data connections to all forms of cellular systems.

Networks using even 'a little bit of satellite' must address the technical challenges of using the Internet Protocol, which was not designed to handle the signal delays of a satellite link with a 45,000 mile hop from transmitter to receiver. Next-generation satellite networks are handling these and other challenges. Satellite-based broadband multimedia systems are also progressing as applications and service scenarios improve, along with interoperability and interworking with terrestrial next-generation network protocols.

For quality of service on next-generation IP networks, whether satellite, fixed or mobile, TIA TR-34 developed a standard that can ensure QoS (quality of service) signalling for use within both IP version 4 (IPv4) and IP version 6 (IPv6) network-layer protocols. This standardized mechanism allows the necessary resources to be allocated to a flow of packets or group of flows as they traverse the networks. This signalling scheme can be used to set the rate, burst tolerance, pre-emption priority, delay priority and changing the direction of a flow. This will help to differentiate congestion problems from channel errors, permitting senders to optimize their packet error control without confusing it with congestion. For premium services like voice and video, maximum rate service sets up a low-delay, low-loss path with minimal effort.

Who will win the race remains to be seen, but without a doubt, consumers never seem to get enough of broadband or speed. While speeds continue to rise, prices continue to fall. As broadband has become more widespread, new content, services and applications have emerged to drive even more demand. In the end, it is the consumer who rules and will determine the winner of the race. ●

