The Satellite Edge

By: Engr. Siva Priya a/p Thiagarajah, Grad. IEM

In May 1945, Arthur C. Clarke described a world communication and broadcasting system based on geosynchronous space stations. Clarke envisioned that three satellites positioned at 35787 km above mean sea level, and positioned 120 degrees apart from each other will serve as relays that can link all the countries in the country in communication. At 35,787 km above mean sea level the rotation of the satellite around the earth has a period equal to the Earth's rotation on its axis and would remain geostationary over the same point on the Earth's equator. Clarke's vision became a reality when INTELSAT-1, the first commercial geostationary communications satellite was launched in April 1965, providing line of sight communications between Europe and North America , communications at that time that were representative of all types of common carrier network traffic, including telephone, television, telegraph, and facsimile transmissions.

APPLICATIONS OF SATELLITE COMMUNICATIONS

There are many applications of satellite communications. These applications are either standalone or are merged with other technologies to provide an end- to-end user solution. The human factor of increased awareness for global events has also boosted satellite usages globally.

Video Distribution

DTH pay-TV platforms like ASTRO in Malaysia broadcast hundreds of TV channels directly to households and residential equipped with satellite antennas. Proprietary and third-party TV channels are packaged under a single brand and marketed as various content packages to viewers.

Multiplexes are gatherings of independent TV channels uplinked by one single satellite service provider who provides signal backhaul, encryption, compression and uplink services. Free-To-Air (FTA) TV channels aim to be distributed globally, and rely on advertisements to generate revenue. Satellites are used to distribute FTA channels to areas that suffer from lack of proper terrestrial broadcasting networks.

Individual TV channels targeting sparse communities (ethic, linguistic, thematic) dispersed over large territories choose satellite broadcasting for a wider coverage at a lower cost.

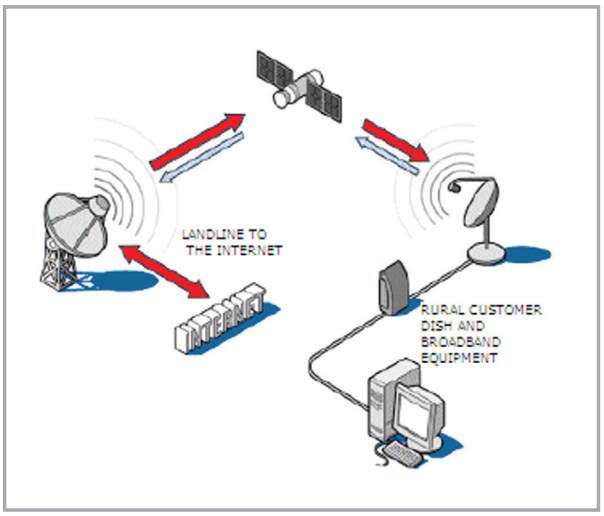

Figure 1 shows how satellite ubiquity links a rural broadband user to the Internet

In-flight satellite TV, in use since 2000 on selected airlines, uses satellites to provide real-time and live audio/ video programming fed directly to the aircraft via satellite. Passengers may independently access channels of digital-quality audio/video which are similar to, or identical to, the programming they receive via home satellite dishes. Live television has also been made available on international flights via an in-flight broadband connection wirelessly to passengers' notebook computers.

Digital cinema is a new form of satellite contribution service to feed cinemas and theatres with digital movies at a better quality and lower cost than with physical copies of films.

Satellite News Gathering (SNG)

Permanent distribution feeds are permanent links between companies to exchange traffic on a regular basis. Occasional distribution feeds are used when scheduled and non-scheduled events lead to multiple video content exchanges between several players of the TV value chain. Occasional broadcasting may use fixed facilities or SNG vans to capture live events in places where satellite transmission is the only transmission solution possible. Video contribution services are required during world tragedy, world political events, natural disasters and sports- related events.

IP Voice, Non IP Voice and Data Trunk Traffic

Satellite links provide remote connectivity, IP backhaul services and roaming connectivity where terrestrial networks are non- existent or unpredictable.

Satellite remains a cost effective solution where no terrestrial alternatives are available or when the cable alternative has too many drawbacks like multiple hops, causing significant delay, a dominant carrier or no cable backup.

Satellite operators are now offering more value added services that might interest Internet Service Providers with limited capabilities in a certain region. Satellite operators are mixing cable and satellite infrastructures to pack a desirable network solution to their customers.

Direct-to-Users Satcom Services

Corporate service providers use Very Small Aperture Terminals (VSAT) which are installed at customer premises for IP access and digital TV broadcasting. VSAT networks are cost-effective, reliable and flexible for voice, data and video transmission in areas of the world where terrestrial alternatives are unreliable or unavailable.

VSAT is increasingly offered as a backup for critical circuits in remote areas and also as gap-filler that can be setup quickly when a cable service is not yet available.

THE SATELLITE ROLE IN BROADBAND

Gaps in terrestrial coverage can be connected through satellite. This is true both in developed countries and even more so in developing nations where the cost of terrestrial infrastructures could otherwise be prohibitive.

Satellite broadband is available anywhere, can be deployed in a matter of days, it is easily scalable to meet demands, and it offers high availability and quality of service.

Satellite integrates perfectly with all wireless technologies, thus effectively enabling broadband anywhere in the most cost-efficient way. Satellite connectivity, in conjunction with W-LAN, brings broadband access to rural communities. Businesses can be set up in rural areas with no terrestrial network and broadband can be brought to these businesses via satellite.

THE SATELLITE EDGE OVER TERRESTRIAL BROADBAND

The main advantage of satellites is the ubiquity it can offer to broadband operators. In certain broadband systems, data signals travel from a computer to a satellite and are then beamed to the ISP where the request is processed. The main advantage of satellite broadband is that it is available to nearly anyone who has an unobstructed view of the southern sky, since satellites orbit the Earth near the Equator. Rural customers who may not have access to other broadband technology can usually receive service via satellite.

Other Advantages of Satellite Communications

Satellite systems are simple. Their uplink and downlink ground circuits consist of a Low Noise Amplifier, a frequency up or down converter and an antenna. The same circuits exists on the receive and transmit circuits on the satellite itself.

Satellites are able to provide bandwidth on demand. Satellites can easily be configured to provide capacity on demand to users within their coverage area. In the era of multimedia communications, this capability will allow users to "pay-as-they-use," which will be an attractive option to many private line terrestrial alternatives, which are virtually incapable of providing asymmetrical access.

Satellite systems can also be deployed rapidly, trans-Atlantic and over continents. In order to offer truly global services, satellites can be deployed much more rapidly than fiber optic cable and other terrestrial solutions.

SECURITY AND RELIABILITY

Signal retransmission by the satellite has one major advantage, which is the signal is retransmitted transparently. Thus, the signal structure can be arbitrarily modified on Earth, provided that the bandwidth occupied by the signal will not undergo changes. In this way it is possible to implement new types of transmission protocols. The development of processing and switching methods has made it possible to perform the two operations onboard the satellite. Thus, we can construct in outer space a channel- switched or packet-switched transmission network through satellites equipped with steerable–beam antennas. Terminal antennas and the emitted power can then be smaller because the signal is regenerated onboard the satellite. This is of particular importance to nomadic use and mobile terminals.

The digital DVB-S platform is able to provide broadcast transmission of a large volume of data at a very high rate and with an excellent protection against a variety of transmission errors. The distributed data may represent sound and video signals, data files, or other basic information structures. ■

REFERENCES

[1] Gunter's Space Page; www.space.skyrocket.de

[2] Daniel J. Bem, Tadeusz W. Wieckowski, Ryszard J. Zielinski; Broadband Satellite Systems Wroclaw University of Technology

[3] Airline Inflight Entertainment and Communications (IFE) Industry Fact Sheet; World Airline Entertainment Association

[4] World Satellite Communications and Broadcasting: Euroconsult