RTT TECHNOLOGY TOPIC
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GSO/MEO/LEO LTE
The Heineken Network

In our December 2012 technology topic **(How Far Does it Go Mate?)** we reviewed the pros and cons of deploying LTE to provide rural broadband connectivity and talked briefly about the evolving role of geostationary (GSO), medium earth (MEO) and low earth orbit (LEO) satellites**.**
http://www.rttonline.com/tt/TT2012_012.pdf

This month we study in more detail how satellite technologies and satellite business models are changing and the impact that the **l**ong **t**erm **e**volution of satellite terminals and space hardware (GSO/MEO/LEO LTE) could have on terrestrial LTE rural broadband connectivity.

The topic has been covered by us three times in the last five years. Over this time scale it is useful to look at what was expected to happen, what actually happened and why.

July 2007 Satellite and terrestrial hybrid networks
http://www.rttonline.com/tt/TT2007_007.pdf

In July 2007 we studied the potential impact of hybrid satellite terrestrial systems also known as **A**uxiliary **T**errestrial **C**omponent (ATC) networks in L band and S band and suggested that the business models proposed were only viable if closely coupled with already established terrestrial service providers.

Thuraya, in the United Arab Emirates and Aces in Asia were referenced as example of operators providing dual mode networks. Aces went into administration in 2011.

Reborn Iridium was referenced as an example of a technically and commercially successful low earth orbit network and Inmarsat was referenced as an example of a technically and commercially successful GSO network providing broadband maritime and deep rural connectivity.

February 2008 Satellites for Emergency Service Provision
http://www.rttonline.com/tt/TT2008_002.pdf

In February 2008 we reviewed the evolving role of satellites in emergency service provision and public protection and disaster relief.

November 2010 L Band LTE ATC
http://www.rttonline.com/tt/TT2010_011.pdf

In November 2010 we examined the potential role of L Band ATC networks as a complement to 700 and 800 MHz LTE rural broadband networks. Terrestar had at that point gone into Chapter 11 administration with $1.6 billion dollars of debt. Harbinger, a US based private investment firm sold half its stake in Inmarsat raising $649 million to help finance the Light Squared LTE L Band ATC network. NSN announced a $7 billion dollar agreement to build 40,000 Light Squared base stations in the US to cover 92% of the US population by 2015.

We suggested that the economics of an L band ATC network would only make sense if user equipment R and D and manufacturing investment could be amortised over multiple geographic and demographic markets. We highlighted the risk of litigation from existing L band incumbents though failed to spot that it would be the GPS community that would deliver the death blow to the Light Squared L band adventure.

The experience with Light Squared understandably dampened enthusiasm for investing in hybrid

terrestrial satellite networks but it would be a mistake to discount the potential of closely coupled satellite and terrestrial service offers.

Partly this is due to the continuing improvement in satellite space hardware. More efficient solar arrays mean that more RF power can be made available. In parallel, advances in smart antennas have improved downlink and uplink efficiency. This means that hand held device performance has improved and will continue to improve over time.

Adding Wi Fi to a hand held and portable satellite terminals also potentially transforms the user experience.

As an example a product from Hughes enables users to create a Wi Fi Hot spot for outdoor or indoor use. Putting the device by a window allows for indoor broadband coverage.

The device accesses Inmarsat's BGAN GSO satellites with a receive band (satellite downlink) at 1525 to 1559 MHz and transmit (satellite uplink) at 1626.5 to 1660.5 MHz with GPS at 1575.42 MHz

http://www.groundcontrol.com/Hughes_9202_BGAN.htm

The headline data rate of 500 kbps might be considered slow but there many rural areas where this will be competitive to terrestrial cellular and many deep rural areas where there will be no cellular coverage at all.

Thuraya has a similar though lower data rate (60 kbps) option.

http://www.thuraya.com/about/profile/media-releases/thuraya-launches-mobile-satellite-industry-fastest-handheld-hotspot

Thuraya have made a success out of selling satellite and GSM and GPRS access as an integrated service in an integrated device optimised to meet the requirements of their core market in the Middle East but this is not a business model that would necessarily translate into other more price sensitive markets and 60 kbps cannot really be described as broad band.

Theoretically at least a similar offer and potentially higher data rate service could be delivered in the two by 15 MHz S band allocation adjacent to Band 1. This is presently being promoted by Solaris Mobile with the S band transponder hosted on Eutelsat's 10 A satellite located in geostationary orbit over Europe. The license allows services to be offered to all 27 member states.

The logic is that the spectral adjacency to Band 1 would facilitate the development of integrated LTE terrestrial/satellite user equipment. In practice adding two by 15 MHz to the existing two by 60 MHz Band 1 allocation would require a substantial change to existing filter bandwidths and would be unlikely to make commercial or technical sense to the RF component and RFIC supply chain given the relatively limited addressable market.

The alternative is to have two separate devices with a shared SIM.

This might seem awkward but in practice it is just another device to throw in the suitcase.

The question then is whether it would make sense for mobile broadband operators to include satellite handsets and terminals and satellite services as part of their mainstream product mix – an ATC service without an ATC network.

Satellite phones are presently distributed via specialist distributors servicing specific vertical markets such as maritime or deep rural terrestrial.

While this is unlikely to change it is conceivable that a more generic rural terrestrial broadband market is emerging. The general assumption might be that the delivery cost would be too high for this to be viable.

This fails to take into account a number of factors.

Terrestrial broadband delivery costs particularly for deep rural areas are likely to increase rather than decrease over time. This is partly a function of spectral cost and the spectral auction process but also includes the cost of meeting rural service obligations based on geography rather than population density.

Satellite broadband delivery costs for deep rural areas are likely to decrease rather than increase over time. This is partly a function of the spectrum having been acquired at a lower cost but also a function of lower launch costs and longer service life.

The latency of GSO's might limit some applications but the end to end latency of heavily loaded terrestrial networks could mean even this difference is less than might be expected.

And you don't have to deal with landlords or pay rent or deal with rural protection issues.

Summary – The Heineken Network

With the exception of companies such as Thuraya servicing specific geographic and demographic markets at relatively low data rates there has been to date no generically successful global service offer integrating LTE with satellite based broadband access.

In 2002 Teledesic conceded that their constellation of 288 low orbit satellites – the internet in the sky - was technically possible but commercially non-viable.

http://www.spaceandtech.com/spacedata/constellations/teledesic_sum.shtml

Ten years on the technology economics of the space sector have substantially changed and continue to change over time and it would be wrong to dismiss the potential of integrating terrestrial LTE with some combination of GSO/MEO/LEO service offer.

Groundwork (literally) has already been done as a result of the long and painful S-UMTS standards process and useful lessons could be learnt from the successful implementation of DVB-T and DVB-S. It would not be impossible to combine this work experience into an effective and efficient LTE-S standard and related network offer.

The net result would be over 60 MHz of additional low cost bandwidth supporting a rural broadband network proposition which to misquote the Heineken advertisement campaign would 'Reach the Parts That Other Networks Cannot Reach'

http://www.slideshare.net/kevinam/hit-or-myth-the-real-story-behind-heinekens-famous-refreshes-the-parts-ad-campaign

Cheers!

Relevant resources
Present and future generation Low Earth Orbit (LEO) satellite constellations
Iridium
http://www.iridium.com/
Globalstar
http://www.globalstar.com

Present and future Geostationary satellite constellations
Inmarsat BGAN
http://www.inmarsat.com/services/BGAN
Inmarsat hand held devices
http://www.satphone.co.uk/hardware/isatphone-pro?gclid=CNHL3dmI77MCFczHtAodejQAaw

S band/Band 1 LTE satellite and terrestrial networks
http://www.solarismobile.com

Dual mode terrestrial/satellite terminals
http://www.satphone.co.uk/networks/thuraya?gclid=CPOahqiJ77MCFW_KtAodyVoAAw

Ends

Rural fixed and mobile broad band is one of the topics addressed in RTT's fourth book '**Making Telecoms Work- from technical innovation to commercial success'** available from the **RTT book shop.**

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Contact RTT

RTT, the Jane Zweig Group and **The Mobile World** are presently working on a number of research and forecasting projects in the mobile broadband, two way radio, satellite and broadcasting industry. If you would like more information on this work then please contact
geoff@rttonline.com

00 44 208 744 3163