RTT TECHNOLOGY TOPIC
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LTE - S

In our June Technology Topic we explored the evolving role of sub orbit and satellite platforms in mobile broadband delivery including backhaul and satellite to device communication.

http://www.rttonline.com/tt/TT2014_006.pdf

The mobile broadband industry and satellite industry remain remarkably separate both in terms of standards making, spectral policy and network investment.

This is unsurprising considering that there over 600 cellular operators globally, a sharp contrast to the handful of satellite operators with mobile broadband support capability.

While cellular operators are finally coalescing around a more or less global terrestrial technology standard, a process that has taken 30 years, the satellite industry remains fragmented in terms of its use of proprietary air interfaces and network topology.

This is partly determined by the choice of orbit and target application.

Within the last month there have been new KA band satellites launched by O3B networks into Medium Earth Orbit and new KA band geostationary satellites from Inmarsat providing 50 mbps to user terminals. Thuraya has similarly ambitious plans.

http://www.o3bnetworks.com/

http://www.inmarsat.com/about-us/our-satellites/global-xpress/

http://www.thuraya.com/

Iridium will be launching the first of their new generation of low earth orbit satellites next year using their existing KA band allocation for inter satellite switching and their L band allocation for the uplink and downlink - expect improved link budgets and some interesting shared payload capabilities (and great higher latitude coverage).

http://www.iridium.com/about/iridiumnext.aspx

The mobile broadband community seems unaware of or unimpressed by the potential opportunities implied by this frenzy of satellite launch activity and associated space network and ground station investment.

Partly this is explained by the relative lack of success of hybrid terrestrial systems. Specifically the failure of Light Squared continues to dampen investor sentiment.

http://www.washingtonpost.com/business/economy/fcc-treading-lightly-after-lightsquared-debacle/2012/02/15/gIQAv60cGR_story.html

This is probably a mistake.

In the 16 years since the Iridium satellites first went commercial there has been radical progress in on board processing, smart antenna arrays, solar panel efficiency and launch vehicle efficiency.

Together these are transforming the delivery economics of the LEO, MEO and GEO satellite sector.

In this month's technology topic we look at the impact of this on the longer term mobile broadband service offer and the possible impact on LTE standards, spectral allocation and regulation.

Read on

The first obvious point to make is that there will be an increasing overlap between mobile broadband and satellite downlink and uplink spectrum.

Light Squared showed that an apparently trivial coexistence issue with in their case the GPS receive band in L band was sufficient to derail their proposed $8 billion dollar network investment.

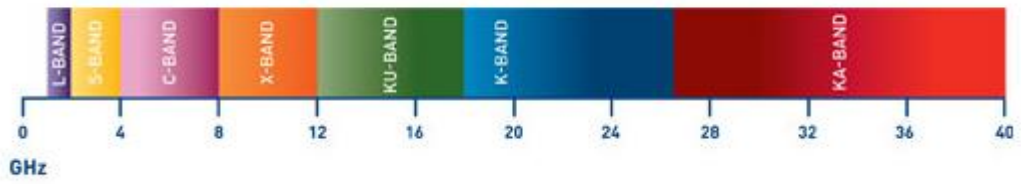
The future of the satellite spectrum either side of Band 1 at 1.9/2GHz also remains unresolved.

Those with relatively long memories will remember that the intention was to repurpose this band as UMTS S
http://www.comnets.rwth-aachen.de/DISS_Oh200.6009.0.html

This whole project ended up being more complicated both technically and politically than expected and provides an insecure base line for efforts to integrate LTE with satellite standards.

It could be argued that this does not matter for backhaul but it does matter if the intention remains to deliver LTE dual mode terrestrial/satellite user devices. The TV industry for example has been able to establish a basic commonality between cable (DVB-C), satellite (DVB-S) and terrestrial broadcasting (DVB T) which significantly simplifies TV receiver design.

The new satellites being deployed in KA band are presently focussed on providing backhaul or fixed connectivity though Inmarsat have a successful and rapidly evolving service for mobile devices.
http://www.ptc.org/ptc13/images/papers/upload/PTC13_Jones_Eric_PPS.pdf



While the MEO and GEO orbits are best at providing 48th parallel to 48th parallel coverage the link budgets are becoming sufficient to provide service on a wider basis (further north and south) and the LEO orbits are of course ideal for extreme north and south pole to pole connectivity.

It can however be simply stated that coexistence issues are likely to become more important over time both between space sector and terrestrial backhaul links and longer term proposed 5G deployments in the millimetric bands (above 30 GHz).

Present investment in local area connectivity using Wi Fi at 60 GHz is an early precursor of the mobile communities' potential appetite for higher band spectrum.

There are however many other users in these higher bands including military systems. Remote control of drones is presently topical and heavily reliant on integrating satellite and terrestrial high bandwidth low latency connectivity.

For both military and commercial systems the ability to mix and match platforms allows a range of latency metrics to be met. MEO and LEO orbits will inherently deliver lower latency.

Geostationary platforms have higher latency but have the advantage of being stationary (from an earth perspective!) which makes interference management and handover easier. The latency may be relatively long but at least it is consistent.

Equally having both ends of the link moving is not a major problem, and something that Iridium has managed effectively.

There are many positive aspects to the technology progress being made in the satellite sector.

Link budgets are improving which makes it easier to deliver decent data rates to hand held devices at least in outdoor environments.

But these devices at present will typically need to support proprietary air interfaces. This is not ideal for the mobile broadband community.

The satellite sector is also closely coupled to strategic defence interests.

This extends to the shared payloads being incorporated into present and future satellite systems including sensing, tracking and surveillance functionality.

While these can have a beneficial impact on delivery economics, it can sometimes be difficult to resolve defence and civilian access priorities.

This is not new.

80 years ago (July 1934) FD Roosevelt introduced the Communications Act

'Regulating interstate and foreign commerce in communication by wire and radio so as to make available, so far as possible, to all the people of the United States a rapid, efficient, nationwide, and worldwide wire and radio communication service with adequate facilities at reasonable charges, for the purpose of the national defence'

It was 25 years before the first satellite was launched but the act established the principle that national defence was a paramount consideration, initially in terrestrial and then satellite wireless regulatory policy.

The Communications Act was overhauled in 1996 with the purpose predominantly of broadening competition in telecommunications provision but then significantly amended in the post 9/11Homeland Security Act of 2002.

The 2002 act increased the political importance and therefore lobbying power of the US satellite industry. This in turn has increased the importance of the satellite industry in most other parts of the world including Russia, China, North and South Korea, the Middle East and Indonesia.

This may lead to surprises at the World Radio Congress in November next year. It certainly suggests that mobile broadband operators would be well advised to keep a closer eye on the rapidly evolving satellite market, a market benefiting from a positive regulatory environment and genuinely significant technology progress.

And it does not need to be necessarily a confrontation. A closer commercial and technical collaborative coupling between terrestrial and satellite systems could deliver substantial user experience value providing the inherent regulatory and competitive tension between these two traditionally separate communities can be resolved.

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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.

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