RTT TECHNOLOGY TOPIC
February 2007

The Battle for Broadcast Bandwidth

Introducing this month's Technology Topic
Mobile TV seemed to be everywhere at this year's GSM World Congress.

Opinion is divided as to whether mobile TV is best delivered over cellular networks or broadcast networks or a mix of both options.

This depends on available bandwidth and the power needed by the devices to view the content. For example, broadcasters are allowed to transmit at higher powers than the cellular industry.

This confers economic advantage to broadcasters in terms of cost per bit delivered and advantage to users in terms of the DC power needed to receive digital TV on mobile devices.

In this month's Technology Topic we review some of the technology, engineering and spectral allocation issues that need to be addressed in order to make Mobile TV a useful and profitable service.

In the process, we highlight some of the inherent strengths that traditional broadcasters have both in terms of technology and engineering. We also highlight some of the inherent strengths that traditional broadcasters have in content production and content management expertise.

We argue that this makes it imperative for the cellular industry to collaborate with rather than compete against the broadcast community in order to ensure that mobile TV delivers future value.

This is a Eurocentric and Asia Centric view of the world. US Digital TV is different both in terms of the technology used and spectrum allocation. The absence of a mobile TV option in the US digital TV specification has provided an opportunity for proprietary solutions to be introduced, Qualcomm's Media FLO (forward link only) being a present example.

Media FLO could of course be successful in other markets other than the US but will need to co exist and compete with existing technology and market solutions and the local regulatory and business environment which we will now discuss.

Background - the battle for broadcast bandwidth
Over the next few months significant decisions will be made on spectral allocations for broadcast and cellular wide area wireless technologies.

These decisions are being made on a national, regional and international basis and will be ratified in October at the World Radio Congress, WRC07.

Examples include
The extension of Digital Radio Mondiale from long wave, medium wave and short wave to include the FM broadcast bands.

The extension of the present T-DAB/DMB multiplex in Band 111 to include160 k/bit enhanced audio transmissions and related European digital TV and DMB deployments.

Agreement on additional HDD broadcast DTT DVB UHF transmissions and additional DVB H multiplex options.

Finalised plans for allocating and auctioning 112 MHz of UHF between 470 and 862 MHz for cellular FDD transmission.

Agreement on L band allocations between 1452 and 1492 MHz including potential DAB extensions and cellular FDD or TDD opportunities.

The repurposing of S Band for DVB -SH and related hybrid satellite and terrestrial broadcast delivery options

International agreement on the 2.5 GHz cellular extension band from 2500 to 2690 MHz.

The emphasis is on producing harmonised band allocations that can deliver sufficient economies of scale to support new cost and performance competitive cellular transceivers with integrated broadcast receive capabilities.

Some of this spectrum is being made available at the expense of present users including broadcasting and Programme Making and Special Events (radio microphones and professional wireless cameras).

The repurposing of this spectrum therefore implies significant engineering challenges and related business transition management opportunities.

Engineering optimisation
Much of the proposed repurposing of present broadcast fixed and mobile TV and cellular spectrum implies that substantial engineering issues need to be resolved.

An example would be the potential interference from mobile cellular transmit in either low band or high band UHF into present and possible future DVB and DVB H receive channels and into existing or future PMSE bandwidth.

The broadcasting industry and cellular industry have been mast sharing and site sharing for over 30 years. The broadcasting and two way radio industry have been mast sharing and site sharing for over 50 years. There is therefore an extensive body of knowledge and experience that can be applied to ensure that cellular, two way radio and broadcast transmissions can co exist.

From a business perspective this is good news for manufacturers of RF conditioning

products.

Mast sharing and site sharing has historically been based on the two way radio and cellular industry being given, leased or sold space on broadcast transmitter masts.

Increasingly we may now see the broadcast industry being given, leased or sold space on cellular macro or micro sites for local digital TV and local digital radio transmission.

The broadcast and cellular industries have a strong engineering common interest. Generally when a strong engineering common interest exists there is also a strong commercial common interest though sometimes this is not immediately apparent to the parties involved.

Broadcast and Cellular handset device optimisation

The assumption has to be that there will be a much broader choice of digital broadcast transmissions from digital long wave to digital S band and that these transmissions will be from traditional broadcast sites and from smaller sites that have previously been exclusively cellular.

Some or all of these broadcast receive functions can be designed in to a cellular phone receiver but have to co exist with present and future cellular transmission frequencies.

For example, the cellular industry has a particular interest in the UHF spectrum being vacated by analogue TV. The spectrum provides economic rural coverage and improved in building penetration, particularly useful in urban areas and a potential alternative to other in building coverage solutions.

FDD cellular at UHF could either be deployed at 550/800, 550/625, 580/620 or 810/850 MHz. Any of these bands could be potentially economically attractive to operators, particularly operators without 900 MHz allocations or operators needing to compete with 450 MHz based systems.

This brings mobile transmit significantly closer to the DVB and DVB H receive bands and suggests some interesting challenges both in terms of network engineering (see RF conditioning above) and handset design.

From a handset perspective, companies with existing expertise in DAB and DVB device development and cellular phone transceiver design optimisation will be well placed to benefit from this design opportunity.

Related implications for LTE development including LTE and broadcast OFDM technology integration also need to be considered.

The notion by some vendors in the cellular industry that they have a potentially powerful position in OFDM patents is falsely based. Most of the fundamental work on OFDM was undertaken by the broadcasting industry twenty years ago and exists as prior art.

The broadcast industry also has the best part of 15 years experience implementing multi frequency and single frequency wide area OFDM radio networks.

From a timing perspective, the UHF band will become nationally available in the UK in 2012 to coincide with the London Olympics. Other countries around the world will either be earlier (the US) or similar or later. Thus although operators will be asked to bid for and pay for this spectrum next year or certainly within two to three years they will not to be able to deploy for at least five years.

This timing suggests that implementation of cellular into the UHF band will be based on LTE OFDM rather than UMTS technology. This will help resolve the cellular/broadcast co existence issues but also highlights the need for the cellular industry to work with the broadcasters not only on spectral sharing and site sharing issues but also standards, intellectual property issues and deployment optimisation.

The benefits of the UHF band for the cellular industry will only be realised if the broadcast industry can be reassured that the engineering and business challenges implicit in co sharing this spectrum can be resolved. The broadcasting industry will need to be motivated to work with the cellular industry. This in turn suggests that joint revenue opportunities will need to be actively developed.

Content as a joint revenue opportunity

The broadcast community is moving from standard to high definition content and enhanced audio with longer term plans for a transition to super high definition TV. Similar changes are proposed in terms of colour space extension. These changes will have a profound impact on user expectations.

The cellular industry tends to underestimate the inherent advantages that the broadcasters have in sourcing and managing content.

In 1960 the BBC opened the BBC Television Centre in Shepherds Bush. This was the world's first purpose built content manufacturing factory. Present plans are to increase rather than decrease output from the site. In particular, these plans include substantial studio hardware and software investment in high definition content production. It is wrong to think that traditional broadcasting is dead. It is alive and well and expanding.

Superficially there would seem to be little point in delivering high definition TV to mobile devices. However mobile phones are increasingly being used to drive other devices. Plugging audio I Pods into stereo systems and video I pods into video systems are present examples. By 2012, high definition large screen displays with integrated enhanced audio capabilities will be more or less ubiquitous. Many of these displays will have local wireless connectivity, NFC and/or wireless LAN or Bluetooth or UWB.

HD capable cellular phones will represent an important part of the overall handset product mix by value if not by volume.

Broadcasters and/or companies close to the broadcasting community therefore have significant leverage in terms of transmitter sites and existing spectrum from long wave

to S Band, leverage in technology ownership and engineering deployment experience and leverage in content production.

Broadcasters also have significant political leverage. For example in the UK, there are persuasive reasons for UHF spectrum being made available or rather, given back to the broadcasters for additional high definition multiplexes to support the Olympic Games.

Similar arguments are being used by the Programme Making and Special Events community to ensure adequate bandwidth is available for radio microphones and wireless broadband high definition cameras and related content capture platforms.

This implies an imperative need for the cellular community to work proactively with the broadcast community and other interest groups to meet future user needs including numerically small but politically important specialist users.

THE BATTLE FOR BROADBAND BANDWIDTH

In 1995, Nicholas Negroponte, writing in his book 'Being Digital' forecast that broadband would move from wireless to fibre and copper, a consequence of an assumed dollar per bit cost advantage when servicing fixed/non mobile users.

Twelve years later, most of us, particularly most of us in Europe, are still watching television received through aerials (analogue or digital terrestrial TV using DVB-T) or satellite dishes (DVB-C).

Partly this is due to the continuing cost per bit advantage that terrestrial wireless and to a lesser extent satellite systems can deliver when compared with present fibre or copper alternatives.

DWDM technologies over fibre and developed ADSL and VDSL technologies over copper may finally be moving us to a tipping point where standard, high definition and super high definition services finally migrate from wireless delivery to wire line delivery platforms. The present explosion of triple play offerings from cable vendors and fixed line service operators is an early sign of this shift taking place.

This will have a potentially profound impact on the broadcast and cellular industry and is a topic that merits substantial study.

THE BATTLE FOR BIDIRECTIONAL BROADBAND

In parallel, there is a transition from traditional advertising revenue based business models to participation revenue based business models.

The cellular industry has achieved a step function increase in capture bandwidth based on multi mega pixel camera phones. MEMS based solid state microphones promise a similar step function gain in audio capture bandwidth.

This implies that future revenue streams may be increasingly dependent on uplink bandwidth.

Bandwidth balancing both in the radio access network and core network and

bandwidth sharing between broadcast and cellular bearers is a topic that merits substantial study and has a potentially major impact on future business models.

POSITIONAL VALUE
These revenue streams can be enhanced by positional knowledge. The positional knowledge implicit in cellular network provisioning is a major competitive differentiator both for future cellular network service platforms and local TV delivery.

This is a topic that merits substantial study.

COMPLEMENTARY VERSUS COMPETITIVE CONVERGENCE
It is of course wrong to characterise competition for wireless spectrum as a battle. The common interest between the broadcast and cellular community and other interest groups, for example the PMSE community, outweighs any potential competitive consideration.

It is therefore advantageous for the broadcasting community and the cellular community to work together constructively on spectrum sharing and associated combined user value propositions.

CO OPERATIVE NETWORKS
Co operative networks have been championed for a number of years by the BBC and other parties with an interest in converged network propositions. We have highlighted the long tradition of mast sharing and site sharing but there are more fundamental network sharing opportunities that merit deeper exploration.

As with site sharing, if there is a strong engineering common interest, there will almost certainly be a potential commercial common interest.

SUMMARY
'The Battle for Broadcast Bandwidth' suggests that the broadcasting industry and cellular industry will be engaged in a destructive dash to acquire or re acquire spectrum for new broadcast services.

This would be ill advised.

All parties involved would potentially benefit from a collaborative rather than competitive approach to building common interests both in terms of sharing spectrum, technical knowledge, engineering resource, content production and content management capabilities.

The cellular industry is perhaps regarded as something of a predator in this space which suggests that it is time for a charm offensive. Collaboration not competition should be the chosen route to future revenue gain.

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RTT, the Shosteck Group and The Mobile World are presently working on a number of research and forecasting projects in the cellular, two way radio, satellite and broadcasting industry.

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