Making broadband truly universal

Freeing up old TV frequencies for new purposes presents a historic opportunity to reduce the digital divide, both in developed and developing countries. Let's use this spectrum wisely and not waste it doing more of the same.

IT IS TODAY widely accepted that there is a digital divide that must be closed or at least greatly reduced. This divide shows itself both in a wide difference in access to communications services and in the capability to afford the use of them when they are available. The divide exists between developing and developed countries. It also exists within countries – between well-served and underserved areas, mostly corresponding to rural and urban areas.

Although voice calls are becoming available and affordable to most people, it is widely recognized that societal and economic development, cohesion, and participation in society will require more than voice communications, messaging, and low-rate data services.

For a modern sustainable society to prosper, broadband communications will need to be available to the entire population and in all geographical areas. Broadband is quickly entering the realm of a must-have communications "universal service." While the technology is available, the cost effectiveness and business viability of that delivery is hampered by spectrum allocation decisions taken half a century ago.

The released spectrum

The Ultra-High Frequency (UHF) bands currently reserved in most countries for broadcasting services were "ultra-high" when originally allocated; now they are "lower frequency bands" and coveted for their excellent radio propagation characteristics. Compared to spectrum bands at higher frequencies, such as those used for third generation (3G) mobile services around 2 GHz, UHF bands reach significantly farther and penetrate buildings much better.

The ongoing digitization of terrestrial TV broadcasting now offers the historic opportunity, already seized by some countries, to put to new use the radio spectrum resource that is freed by the higher efficiency of the digital transmission mode. This resource is often referred to as "the digital dividend," since it releases "new" spectrum into the hands of authorities regulating the use of spectrum, without the need to constrain any existing usage.

The size of this new resource is significant. As defined by the European Commission, the digital dividend is "the spectrum over and above the frequencies which are required to support existing [analog] broadcasting services in a fully digital environment, including current public service obligations." This amounts to more than 300 MHz of spectrum in Europe, slightly less in the Americas region. It is about the same amount as the sum of all spectrum licensed to all 2G and 3G mobile service operators today.

Administrations and regulators must support the public interest to manage the spectrum efficiently, putting it to the best social and economic use rather than simply using it for more of the same. In many countries it comes down to a choice between a new national spectrum resource to facilitate commercially viable broadband coverage for most of the population, or more television channels in the terrestrial network – channels which may already be available in alternative distribution channels.

Reaching farther, more, for less

This unprecedented amount of attractive spectrum is sufficient to allow public service broadcasters to significantly develop and expand their services in the terrestrial delivery mode. At the same time other valuable social and economic uses, such as broadband applications to overcome the "digital divide," can be provided with access to new spectrum.

The spectrum targeted for new communications services, at around 700 MHz, has superior propagation characteristics and can provide vastly improved wireless broadband coverage under commercially viable conditions. This means that the political goal of providing all households with access to affordable broadband comes at a much lower cost – commercial forces will cover a larger area because it is profitable. As an example, the cost of building broadband wireless coverage to a given area utilizing the same amount of spectrum in the 700 MHz range is only about 30 percent of providing the same coverage using spectrum at 2000 MHz, and only about 15 percent of similar coverage built in the 3500 MHz range, which is currently licensed in some countries for wireless broadband deployment.

Putting it to better use

Many different uses have been proposed for this newly available national spectrum resource. The proposal voiced by

Using new spectrum for broadband offers a chance to lower costs and make it available to the whole population and in all geographical areas.

the incumbent broadcasting industry is to simply allow more television channels to be transmitted via the terrestrial broadcasting distribution system and to improve picture in existing content. Most European countries have already licensed additional, mostly commercial, TV channels to transmit in the digital dividend spectrum. As a result, the majority of the digital dividend already has been allocated to "more of the same," that is, more broadcast TV.

Alternative uses proposed for the remaining digital dividend fall into two main categories: wireless broadband communications, and mobile multimedia in the form of broadcast mobile-TV (not to be confused with the broadcast mode enabled by 3G mobile networks). The proportion of households actually depending on the terrestrial distribution mode varies greatly between European countries: from as low as a few percent in Germany, the Netherlands and Belgium to as high as 95 percent in Greece.

Some countries, however, early recognized the greater economic and social value that can be realized from this spectrum by putting it to other uses. A prime example is the United States, where a digital dividend of about 100 MHz is being made available for various communications uses, dedicated mobile TV, and Public Safety, starting early 2009 when analog TV is switched off. The commercial value of the spectrum is significant and auction receipts are expected to total tens of billions of dollars.

The UK is another country that has expressed the ambition to open the digital dividend to non-broadcasting use. Already in transition to digital TV, the UK left some frequency channels free in order to ease the use of the dividend. A recent initiative started the process of rearranging the broadcasting channels and introducing cutting-edge broadcast technologies. The goal is to collect contiguous free bands and maximize the dividend while also maximizing the number of broadcasting channels.

Studies by the Swedish telecom regulator have concluded that there are alternative uses for the digital dividend spectrum, and that wireless communications will most benefit economic growth. The regulator also concluded that after the analog TV switch-off that took place in October 2007 there was a total of 112 MHz left of the digital dividend for use. Subsequently in December 2007 the Swedish government decided on a re-planning of broadcasting to free up 72 MHz of that spectrum for communications use.

The digital dividend leftovers

With most of the digital dividend already consumed, at least for the time being, by additional terrestrial broadcasting, the next question is what the actual remaining dividend will be. The ITU World Radio Conference, at its meeting in October–November 2007, agreed on a new allocation to the "Mobile Service" in parts of the UHF band. Unfortunately, the allocation is different in the three ITU regions of the world, varying between 698–806 MHz, 698–862 MHz, and 790–862 MHz.

The European Commission expressed its intentions for the digital divide in a Communication outlining the benefits to society of uses other than broadcasting. The Commission concluded that for the digital dividend benefits to be fully available to European consumers and societies, it needs to be harmonized with respect to which usage goes where. It proposes to subdivide the whole band of 470–862 MHz into three sub-bands. The lowest band will be used for existing radio and television services, and for more advanced television services such as high-definition transmission. This part will be under full national control.

The middle band is proposed to be used for unidirectional high-power services, for example, narrow-band broadcast mobile TV. This band is proposed to be under national management with optional EU coordination. The final, upper band is proposed for bidirectional medium- to low-power networks such as wireless broadband access and high-speed mobile data access. This part is proposed to be harmonized in the EU on a flexible basis, with a gradual implementation to cope with national constraints.

In offering better coverage and better building penetration, the digital dividend also could provide capacity (within or in cooperation with commercial networks) to enable EU-wide interoperability of essential public safety applications such as public protection and disaster recovery.

There is now an opportunity for the three ITU Regions to arrive at solutions that create the largest possible global harmonization. The biggest challenge comes in Europe, where an agreement needs to be made on a bidirectional subband covering the 698–862 MHz band. This would create synergies and scale economies with both the Americas and with Asia.

A look at the future

In a longer-range perspective it could be considered whether the majority of the digital dividend should be re-used for interactive services. If a societal obligation remains to offer public service TV channels via terrestrial broadcasting, this will be possible in a single multiplex of 56 MHz in a multi frequency network and in one 8 MHz slot for a future single-frequency network.

With the remaining 350 MHz of spectrum capacity, radio technologies widely available within five years offer enough network capacity for highly interactive advanced services, including broadcasting services. The smaller cells of communications systems compared to large high-power broadcasting cells provide total network capacities that are orders of magnitude higher and allow a wide variety of content to be delivered to different cultural, ethnic, and language groups.

Trends affecting broadcasting

Better picture quality, larger screens, and user-generated content, together with an increasing degree of interactivity, point to the need for bidirectional broadband capabilities or at least a very capable "return-channel" in any broadcasting system. Another strong trend is the appreciation of personalization; for example,

quote

» While the technology is available, the cost effectiveness and business viability of that delivery is hampered by spectrum allocation decisions taken half a century ago «

the ability to decide what content to consume and when to consume it.

The delivery channels capable of offering interactivity, a wide selection of on-demand content, and many parallel channels are clearly better positioned to move into the future. With a large proportion of the financing for commercial media coming from advertising, those delivery channels that have greater knowledge of the preferences of their audience or participants will receive more attention and more investment. Over time, one-way mass-market broadcasting will likely become less attractive as the delivery channel. The winner will be high-capacity broadband systems that have all the characteristics needed to fulfill consumer preferences.

FOOTNOTE

1. UHF bands IV/V at 470–862 MHz in International Telecommunication Union (ITU) Region 1 (EMEA) and Region 3 (Asia-Pacific) and 470–806 MHz in ITU Region 2 (the Americas)

What the World Radio Congress decided on the digital dividend

The International Telecommunications Union (ITU), the intergovernmental treaty organization responsible for international radio regulatory agreements, holds its four-week World Radio Conference once every three to four years. This year's conference included an agreement on a so-called "allocation" in the international spectrum table for the "Mobile Service" in parts of the digital dividend band discussed in this article.

The spectrum table differs between the three world regions defined by the ITU: Europe–Middle-East–Africa, The Americas, and Asia-Pacific. Both going into the Conference and coming out of it the regions had different allocations to the Mobile Service. In the end, all regions agreed on an increase in the allocation of spectrum to the Mobile Service and an increase in their "identification" to the IMT family of technologies. IMT, International Mobile Telecommunications is the family of radio access technology standards that includes WCDMA.

the author

Tom Lindström (tom.lindstrom@ericsson.com) is director in the Government & Industry Relations unit of the Ericsson Group Function Sales & Marketing. He is actively engaged globally in regulatory and industry policy affairs with governments, regulators, and industry organizations. He also advises Ericsson's Market Units on regulatory issues.