

# Broadband spectrum management

**S**pectrum management is taking on an increasingly important role around the world. Many developing countries are expected to grow their broadband markets through broadband wireless access (BWA) technologies. The *Trends* report looks at the challenges that regulators face in assigning spectrum, especially concerning frequencies below 6 GHz, which are considered ideal for many BWA applications.

## The challenge

The main challenge for spectrum managers is to provide for flexible, market-oriented spectrum licence rights, which can create a positive investment climate for BWA services. Another task is to discourage uneco-

nommic speculation and the hoarding of spectrum, which could delay the roll-out of services to consumers.

The report urges regulators to understand that technological advances are increasing spectrum capabilities, allowing licensees to do more with the same resources and enabling entirely new spectrum uses. Licensees can now offer new products by making trade-offs between power, bandwidth, throughput and bit error rate.

In addition, the report says that spectrum regulators need to look at the "best practices" that have fostered the widespread deployment of wireless services. It explores these good examples, including those specifically endorsed by ITU's Global Symposium for Regulators.

## Existing regulatory models

Are traditional approaches to spectrum management sufficient to deal with the new technological and market realities? Three models are examined in the *Trends* report, and the conclusion drawn is that none is sufficient in itself to deal with the evolving world of broadband. Their problem is that they focus on defining usage rights of spectrum licensees without articulating how to help achieve the underlying policy goals of the regulator.

## Command and control

In the command-and-control model, strict operating parameters and service rules define a licensee's spectrum rights. According to some experts,



there is tight government control over spectrum use — an approach that has its origin in the technological limitations of radio systems during the last century. Those called for four steps in regulation: allocation of spectrum, enactment of service rules, assignment (licensing), and enforcement of the rules and licence requirements.

Under the command-and-control regime, the task of regulators is never done, as they must continually revisit and referee the spectrum environment as new radio systems and devices are introduced into the marketplace. This process can lead to delays in the deployment of new BWA services.

### Exclusive rights

Under this model, a licensee is given rights (which may be transferable and flexible) to use a specified spectrum band within a defined geographic area and during a fixed period of time. Spectrum use rules are primarily technical (as opposed to service-based), because they are designed only to protect the spectrum licensee and adjacent spectrum users from generating or receiving harmful interference. There is no intention to influence the market or promote a particular service.

Although the exclusive use model can encourage new market entrants, it also creates perverse incentives for incumbent licensees to hoard spectrum, as a way to thwart possible competition. Critics of this model argue that it does not prevent incumbents from simply buying up spectrum rights, with no guarantee that they will use those resources to offer innovative and competitive wireless systems.

### Spectrum commons

The commons (or unlicensed) model allows unlimited numbers of users to share a block of frequencies, without giving priority to any individual

## Ireland: Balancing the use of licensed and licence-exempt spectrum

A number of regulators are using a mix of licensed and unlicensed spectrum to promote low-cost broadband services in under-served areas. Ireland, for example, allows small operators to launch services in rural areas using unlicensed spectrum, and at very low cost. These operators can migrate to licensed spectrum once they have established a successful business.



Since July 2002, wideband data transmission systems for the provision of fixed wireless access networks or metropolitan area networks in Ireland have been permitted in the 5.8 GHz (5725–5875 MHz) band on a licence-exempt basis, provided that the maximum radiated power does not exceed 2W eirp. This power level, which is above the European harmonized standard, has increased potential coverage and hence the utility of the 5.8 GHz band.

Irish regulator ComReg announced a new scheme in 2004 for the licensing of broadband fixed wireless access services in local areas, defined by a 15-km radius from a base station, with an interference zone extending to a 30-km radius. Since inception of the scheme, 110 licences have been granted across the country. Initial concerns that new services would only be offered in urban areas have proved to be unfounded.

In the past, Ireland has awarded national licences for broadband wireless access that incorporated roll-out and coverage obligations. But roll-out of services was not satisfactory. Ireland's experience indicates that regulators should, instead, minimize barriers to entry by allowing broadband suppliers to begin operations on a small scale, and by not imposing onerous roll-out and coverage conditions. ■

or group. Use of the spectrum is limited only by technical criteria that specify bandwidth and emitted power, but provide no enforceable rights to protect against interference. A well-known form of the commons

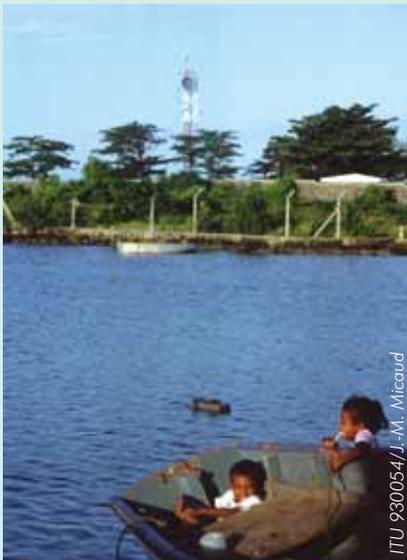
approach has been the deployment of wireless local-area networks using Wi-Fi technology.

The commons approach makes it relatively easy to enter a market, beginning services at lower costs and

## Mauritius

### Overcoming the pitfalls of the commons approach

In Mauritius, the Information and Communication Technologies Authority (ICTA) has a mandate that calls for it not just to manage spectrum, but also to increase the reach of ICT throughout the country. In 2005, ICTA began a development programme by exploring the demand for broadband wireless access. At the same time, it identified key factors that have had a negative impact on past attempts to develop BWA services in



Mauritius. It found that operators in the unlicensed 2.4 GHz band were exceeding designated power limits, using licence-exempt systems for long-range transmissions — contrary to their design and purpose. ICTA concluded that the previous “commons” model had led to overuse and overcrowding in the 2.4 GHz band.

ICTA then took note of other countries' decisions to define bands for BWA uses, and it took account of the potential of new standards, such as WiMAX. In the case of the 5.4–5.8 GHz band, for instance, ICTA determined that the presence of radar incumbents required postponing any allocation decision for broadband, even though this band had been harmonized globally for higher-powered unlicensed operations through negotiations at the World Radio-communication Conference in 2003. ■

then rapidly expanding them. The model could be attractive to regulators who want to promote BWA deployment, especially in rural and under-developed areas. But the *Trends* report points out that the spectrum commons model also has risks: the rapid proliferation of systems can lead to interference, crowding and an unstable spectrum environment.

### Tricky issues

In dealing with spectrum management, regulators are likely to face a number of challenging issues in future, such as how to deal with competing technologies, and the question of harmonization.

### Technology neutrality

The term “technology neutrality” describes a regulatory policy that does not favour one type of technology over another. This may be highly desirable, but the *Trends* report underlines that promoting a standard, or creating a harmonized spectrum band and associated service rules, enables economies of scale leading to cheaper equipment for operators and users. It says that “for the regulator as resource manager, full technological neutrality is an impossible goal, because the desire to achieve efficiency and rapid utilization of the spectrum

ultimately requires decisions that point to particular technology paths.”

The report urges regulators to take a pragmatic approach, balancing social and policy objectives, such as universal access, with the need to maximize the efficient use of scarce resources.

### WLAN versus 3G?

The report warns that the disparity between massive fees paid for 3G licences (for example in Europe) and the unlicensed use of WLAN could cause problems for regulators, especially if both technologies converge into a single broadband wireless market. But for now, it appears that licensing as a regulatory mechanism is being applied in limited ways to the realm of WLANs. In all regions of the world, around two-thirds of countries do not require spectrum licences for WLANs.

### Inconsistency

A lack of consistency among national spectrum policies — particularly on unlicensed “commons” models — is becoming an issue. Lack of coherence from country to country in the fees and costs associated with spectrum access may be manageable in the short-term, but it could become problematic in the long term, as innovations sweep through the market.



## Singapore: Using auctions to manage spectrum

One way to prevent licensees from hoarding spectrum is to use the transparent process of auctions. In Singapore, the Info-Communications Development Authority (IDA) successfully auctioned spectrum in the 2.3 GHz and 2.5 GHz frequency bands for broadband wireless access services in May 2005. The starting price for each of the spectrum blocks put up for auction was SGD 1 000, and the highest closing price bid was SGD 550 000. IDA decided to grant successful bidders a ten-year licence, in order to provide an acceptable level of security for their investment.



Singapore's distribution of spectrum for BWA services was conducted in a transparent fashion. IDA had earmarked the 2.3 GHz and 2.5 GHz bands for broadband wireless services in February 2004, and in April launched a public consultation on spectrum allocation and the licensing framework for these services. In February 2005, IDA released licensing details for broadband wireless services notifying interested parties that it would hold an auction if demand exceeded the supply of available spectrum. ■

## A flexible regulatory approach for new times

Today's spectrum regulator needs a practical, outcome-oriented policy framework, the *Trends* report says. A pragmatic approach that rewards economic risk-taking by spectrum holders will reduce the likelihood that they will hoard spectrum.

According to the report, regulators can start by offering to grant spectrum holders maximum flexibility for their spectrum rights on the condition they

meet two threshold obligations. First, even before gaining any new spectrum rights, they must demonstrate their commitment to increasing competition. Second, they must agree to licence conditions that enforce the opportunity cost of their newly allocated spectrum rights. Pricing policy can be used to show licensees the value of their spectrum holdings and discourage them from hoarding spectrum. Regulators can also combat this practice by simply recapturing spectrum, or by using such methods as open auctions.

In developing countries, and particularly in remote areas, where spectrum scarcity is a much smaller problem than in developed countries, spectrum management policies could include a less dense environment of spectrum use, allowing greater power and range for wireless systems.

## No longer just a dream

Broadband networks are no longer a dream for the future; they are at the centre of ICT development today. The growth of converged, "triple-play" offerings is coming to dominate business and regulatory developments. This is particularly true in developed countries, but it is also a powerful factor in developing ones. A full range of broadband technologies can, and are, being deployed in rural and underserved areas of developing countries. And increasingly, discussions about regulatory issues focus on the fundamental question of how all communities can participate in, and benefit from, the deployment of broadband capabilities. As the *Trends* report says:

"Broadband internet access (whether through fixed lines or wireless) is becoming increasingly relevant to the demands of subscribers in developed and developing countries alike. The essence of voice telephony is being transformed. Next-generation networks are being designed and developed, even as 3G services begin to gain widespread acceptance. Through all of these trends, one thing appears certain: the sector is tending towards a more open, competitive, and transparent model, in which governments, operators, development agencies, educational institutions, civil society groups, and end users all have equally important stakes." ■