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Effective Spectrum Management:

Moving from Spectrum Scarcity to Spectrum Abundance

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Spectrum is a resource which is so critical to our daily lives but most of the time, we don't even realise how important or scarce it is. We regularly use our mobile phones and WiFi, and all of our connectivity is riding on spectrum. The simple reality is that as our needs to connect continue to grow, we need more spectrum to allow us to do so. This becomes abundantly clear in the case of 5G and the growth of the Internet of Things (IoT). To find the necessary spectrum for the connectivity needs of the future, we are finding that the old models of exclusive licensing of spectrum are not able to keep up with the demand. The industry and governments are, however, slowly making inroads to think about spectrum and regulatory policy differently and considering new dynamic sharing approaches; but there is still a long way to go.

Spectrum availability

Exclusive licensing to spectrum has been a successful and valuable tool to allocate spectrum for many years. Exclusive licensing gave one entity the right to both use the spectrum, as well as exclude others from using the spectrum, even if that use did not interfere. Governments auctioned these spectrum rights to generate revenue to support important government programs. Auction winners, typically mobile wireless carriers, used this spectrum – virtually all low-band spectrum to cover large geographic areas (entire cities or metro areas) with first voice and then later broadband services. However, as the demand for spectrum has grown, it has become harder to clear spectrum of its existing users to auction it on an exclusive basis. Further, newer spectrum has tended to be at higher frequency, which does not travel as far or penetrate obstructions as well, so often cannot be used in the same ways as lower frequency spectrum of the past. The challenges with clearing spectrum and the characteristics of higher frequency spectrum make spectrum sharing a much more valuable management approach that drives tremendous efficiency to help solve the spectrum scarcity challenges of the future. At the Dynamic Spectrum Alliance, we believe that a shared approach to spectrum is vital to enable continued wireless innovation and greater service levels. There is a huge demand for enabling this.

The excitement around 5G will require significantly more spectrum for broadband systems. 5G, or Next Generation Networks, promise to deliver high speed, low latency, and always available coverage. They will require significantly more spectrum to deliver on the promise of an always connected

future. Old methods of spectrum clearing and exclusive licensing will not free up the necessary spectrum, and will in fact drive the very scarcity that is essential to eliminate. Incumbent users of spectrum are no longer easy to remove, as their services are valuable and even critical to established user bases. Efforts to remove these incumbents have already taken years to achieve with only disappointing results.

A balanced approach to how spectrum is managed is needed because the reality is that most spectrum is not being used most of the time in most places. The DSA believes that there should be a balanced roll between licensed and unlicensed spectrum and that in many cases, both can co-exist together even in the same bands. Licensed regulatory structures can give licensees the right to use the spectrum without interference when they need to do so, without giving them the right to exclude others from using the spectrum when they are not operating. This change in approach can unlock vast amounts of spectrum in virtually all geographic areas to unleash a wireless innovation revolution. Governments are beginning to see exactly this.

Effective spectrum management

In the United States, the Federal Communications Commission (FCC) is currently implementing a new regulatory paradigm in the Citizens Broadband Radio Service (CBRS) band. This creates means for the primary user to share spectrum between multiple groups, while still protecting their primary incumbent services. In the CBRS band, the U.S. Navy is the incumbent and has embraced dynamic sharing as a way to drive more efficient use of spectrum. The FCC also created a second tier to take half of the spectrum and make it available for those who need certainty that they will have spectrum when they need it. This Priority Access License gives licensees the right to use spectrum when they need it, subject only to protecting the incumbent U.S. Navy users. The revolutionary step taken by the FCC was to also allow a General Authorized Access (GAA) (akin to an unlicensed user) to use the spectrum when the other two higher tier users were not. Essentially this allows an opportunity for unused spectrum to be utilized productively and efficiently. Instead of wasting spectrum by excluding unlicensed users even when licensed operations were non-existent, GAA creates spectrum access opportunities that were previously lost. The CBRS ruling was a huge step forward for the industry, enabling new users to use spectrum on an opportunistic basis so that when it is available, they can use it to deploy equipment and services. The first devices to use CBRS are expected to be rolled out later this year, and once its success and capability is realised, it will become irresistible to regulators around the world. There is already some discussion in Europe regarding the 3.8 – 4.2 GHz band.

Another means of dynamic spectrum management is using low band TV White Space (TVWS), the unused frequencies in the wireless spectrum between TV broadcasts. The adoption of TVWS as a broadband technology was initially hampered by a lack of permanent rules and regulatory structures in place to incentivise commercial investment. As rules are established in a growing number of countries, TVWS networks, often coupled with fibre, microwave, satellite, and/or Wi-Fi technology, are becoming more prevalent. The combination of technologies has enabled more cost-effective solutions for rural and low-density communities.

New tools for regulators

The DSA recently published its new model roles for TVWS, giving governments, policy makers and regulators the tools necessary to enable the quick and efficient deployment of TVWS networks. Based on the regulatory environments already in place by Ofcom in the UK and the FCC in the US, the model rules offer higher availability for dynamic spectrum devices and stronger protection for incumbent users.

The new rules are designed to facilitate and encourage international regulatory harmonisation for TVWS and help countries where creating a bespoke regulatory environment for TVWS from scratch is difficult and time intensive due to limited resources and the nature of the process of developing new regulations. Instead, regulators can use the new model rules as an out-of-the-box solution, that is customisable for local conditions where necessary, for a faster and more efficient way to enable TVWS networks to be launched in their markets.

In countries that adopt this approach to keep the unused TV spectrum free and unlicensed, the barriers to entry for operators to use that portion of broadcast spectrum are as low and affordable as possible. Therefore, we expect to see investment for new and existing projects in ever more regions around the world. We expect that TVWS technology will play a valuable role in narrowing the digital divide that keeps 4 Billion people unconnected.

An era of spectrum abundance

To achieve connectivity for all, and to continue discussions on next generation networks, license exempt and dynamically shared spectrum access models must be an integral part of the solution for regulators and governments everywhere. Enabling more shared and unlicensed spectrum in low band (TVWS), mid band (3 and 6 GHz) and high band (mmW, particularly 60 GHz) is a critical part of enabling the telecommunications networks of the future. Dynamic sharing of spectrum, using databases, location identification, and new innovative ways to manage potential interference, allows governments to unlock spectrum and helps us to move from spectrum scarcity to spectrum abundance.

Fortunately, dynamic sharing technology and regulatory models are readily available to move the industry towards an era of spectrum abundance to allow next generation networks to flourish. Dynamic sharing is the future of spectrum management and will change our lives through unleashing innovation and broadening access through the more efficient use of spectrum.

The topics mentioned above, and more, will be discussed during the Dynamic Spectrum Alliance's annual Global Summit, which will this year take place in London, UK (May 1-3, 2018).

To find out more, please visit:
http://dynamicspectrumalliance.org/global-summit/