

Averting a Spectrum Shortage in the GCC

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Demand for wireless spectrum capacity in GCC countries is predicted to continue to increase at a very high growth rate as more people use smartphones and other devices on wireless networks.

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But the supply of the wireless spectrum is relatively constrained. The result is a potential shortage of spectrum capacity.

GCC countries are well placed to avert a spectrum crisis as long as mobile network operators and the regulators continue to make efforts to improve spectrum availability and efficiency.

What exactly is wireless spectrum?

All wireless communication signals travel via the radio frequency spectrum. TV broadcasts, radio stations, GPS devices, mobile phones, smartphones and tablets all use invisible airwaves to transmit bits of data.

The easiest way to understand how spectrum is used is to look at a radio. When you tune your radio to a station at FM 103.8, you are tuning into the station that is broadcasting at 103.8 megahertz. If you want to listen to a different station, you tune the radio to another frequency like FM 104.4, where another radio station is transmitting over that particular frequency. Different stations cannot transmit over the same radio frequency spectrum at the same time in the same area – if they did, they would cause interference with each other.

As wireless signals only transmit over a certain distance, you probably will not be able to tune in a radio station you like that broadcasts out of, for example, Dubai when you are in Doha.

Mobile devices work in much the same way. Mobile telecommunications network operators cannot transmit wireless signals over the same frequencies in the same markets at the same time.

Each country has a government authority that controls who can use what spectrum in that country. That authority grants companies licenses to use the spectrum.

For mobile phones, spectrum has generally been allocated between 700 MHz and 2.6 GHz frequency range. Most of the spectrum in this range has already been allocated for use. This means if a mobile network operator wants to add more spectrum to boost the capacity for its services, it may well be disappointed. Currently there is not much more unlicensed spectrum that can be used.

The Predicted Shortage

Smartphones and tablets have been driving a huge increase in demand for spectrum capacity in recent years. We are now looking at our phones rather than talking on them and that consumes more bandwidth. The average smartphone is responsible for 35 times more traffic than an ordinary cellphone. The average tablet user takes up over 120 times more bandwidth.

The dwindling availability of a finite resource that cannot be seen or touched threatens to possibly disrupt the mobile lifestyle that the people in GCC countries have embraced.

Because the airwaves on which wireless data travels are nearing capacity around the world, industry analysts have predicted that users in major cities in other regions will be subject to wireless “rush hours” which will be characterized by two to three times as many failed attempts to connect, and three to four times as many instances of dropped or frozen calls or frozen web browsing.

In particular it was predicted that in 2014 the US alone would suffer a spectrum deficit of 275 MHz, about 50 percent of the currently allocated capacity of 574 MHz.

Mobile Data Traffic Growth Rate Decelerating

Despite predictions that some countries should have exhausted their wireless data capacity by now, this has not actually happened yet. Why not?

The reason appears to be that although the demand for wireless spectrum capacity globally is still growing very quickly, it is doing so at a decelerating rate.

The Middle East and Africa had the highest growth in mobile data traffic of 107 percent in 2013. Clearly continued growth at that rate would quickly lead to shortage of allocated spectrum resources.

However current predictions are that, while the Middle East and Africa will continue to have the strongest mobile data traffic growth of any region in the world over the next three years, the growth rate will slow to the rate of 70 per cent.

Although a growth rate of 70 percent is still exceptionally fast, the compounded effect of the deceleration in traffic growth means that there is significant reduction in the overall increase in consumption of data.

How to Meet Demand

Even if we recognize that past estimates for the growth in wireless data use have been overstated, the risk remains that the amount of spectrum currently allocated to wireless data in the GCC region could, at some point in the not too distant future, be inadequate to meet demand

To meet this demand, action needs to be taken by network operators and regulators to both find additional spectrum and find ways to use it more efficiently.

Fortunately, both can be done. Here are a number of possible actions that can be taken:

1. Reallocation of spectrum

This is the course favored by mobile network operators and, to a considerable extent, regulators.

The best example is the “Digital Dividend” reallocation from broadcasting to mobile. The digital dividend refers to the spectrum which will be released in the process of digital television transition. When television broadcasters switch from analog platforms to digital only platforms, the part of the radio frequency spectrum that had been used for broadcasting will be freed up because digital television needs less spectrum than analog television.

The UAE Telecommunications Regulatory Authority (“TRA”) was among the first regulators in the region to propose an allocation for mobile operators in the 700MHz band. In May 2012, the UAE TRA announced plans to vacate sub-1GHz (694–862MHz band) spectrum to allow some parts of it to be used by mobile operators by June 2015. This was covered in the TRA’s ‘Terrestrial Digital TV Switchover’ plan.

Oman, Kuwait and Saudi Arabia have similar plans to completely move to digital TV broadcasting, and consequently free up spectrum for mobile operators.

2. LTE deployment

The mobile network operators promote Long Tern Evolution (“LTE”) as being faster than existing technologies. In general it is, but its real importance is that it uses its spectrum far more efficiently than 3G technologies. LTE is almost 16 times better than 3G at moving a bit of data over a hertz of spectrum.

Every single carrier in the GCC now has at least one LTE network.

LTE subscriptions in the Middle East increased by 174% to 3 million for the year preceding the second quarter of 2014 according to an Ovum metrics report released in September 2014. With a 20% population penetration for LTE in the first quarter of 2014, Kuwait is one of the top 10 most penetrated markets globally.

Currently in the GCC, most LTE deployments are in the 1800 MHz bands and above. The sub-1 GHz frequencies (ideal for urban and rural LTE deployments) are still awaiting reallocation after Digital Dividend transition. The one exception is in Qatar, where Vodafone and Ooredoo, have launched LTE on the 800 MHz.

3. WiFi Offload

WiFi Offload is a technique used by mobile network operators to basically reduce usage of their cellular networks by having you use your home or free local WiFi hotspots for your smartphone’s data connection. An Infonetics Research global mobile spectrum report released in March 2014 said that some mobile operators reported that up to 75% of mobile device data traffic is actually on WiFi.

4. Spectrum sharing

It has been argued that there is plenty of wireless spectrum available to meet the demand for wireless services, but the problem may be that too much of it is in the wrong hands.

In a 2011 report from analysts at Citigroup, it was said that in the US the operators that controlled the greatest amount of unused spectrum were either under-capitalized or unwilling to build out networks to use that spectrum. By contrast, operators who were in the best position to build out these networks, were already using a significant amount of their spectrum holdings to offer existing wireless services. In total US operators had licenses for about 538 MHz of wireless spectrum in 2011. Only about 192 MHz of that spectrum was actually being used. Most of the unused spectrum at that time was owned by three companies that were only second tier carriers in the US. Since 2011 one of those companies has been taken over by Sprint and another has filed for bankruptcy.

The spectrum sharing concept is based on a lease model where licensees are encouraged to lease part their spectrum to competitors temporarily on commercial terms.

Regulators should be encouraging spectrum sharing to focus on usage of allocated spectrum. Licensees should be subject to build-out requirements, anti-hoarding mandates, technology mandates and increased use of spectrum sharing.

In the US the Federal government is trying to have the military share its unused spectrum allocations. This may be an option in the GCC region.

5. White spaces

'White space' is defined as the unused frequencies allocated to broadcasting services that are left unused in particular areas of a country. The white space frequencies vary by region but generally lie in chunks of useful spectrum between 470Mhz to 698Mhz. The size of the frequency gaps, and their precise frequency varies too – meaning that there is no single white space frequency that can be used around a country. Cognitive or agile mobile phones and tablets could use the free spectrum by knowing which frequencies are available, at what power levels, and at which time of day in a particular location. Unfortunately, white space is most available in rural areas and scarce in crowded cities where it is really needed.

6. Small cells

Wireless operators can add capacity without obtaining more spectrum by adding more cell sites. Additional cell sites in spectrum constrained areas allow the same spectrum to be used by even more consumers, subject to some well understood design considerations. By 2016, market research by Huawei (a leading ICT solutions provider to network operators in the GCC region) has predicted that small cells could serve up to 25% of all mobile traffic.

7. Smart antennas

One of the best ways to increase the capacity of a radio network is to focus on improving the ability of the radio to listen via its antenna. Although antennas play a key role in any radio communication, they have tended to receive very little engineering attention as a percentage of the overall work that goes into a piece of mobile network equipment. Building and deploying better antennas is one way to drastically increase the overall efficiency of a network.

Smart antennas send better targeted transmissions by pointing their beams towards individual devices when they are connected rather than simply broadcasting a response in all directions as is done with an omni-directional antenna.

Outlook

There is no single cure when facing a spectrum shortage. However the spectrum "crisis" is a challenge that the region can overcome with a combination of sound regulatory policy, effective network planning and good technology. Most or all of the above described actions are going to be needed in combination to meet the fast growing demand for the GCC region's finite spectrum resources.