Long term evolution (LTE) technology is a global success, connecting around 44 per cent of mobile users worldwide. It is specified by 3GPP as a single global standard for paired and unpaired spectrum users. In recent years, LTE has evolved through various 3GPP technology releases covering the introduction of LTE-Advanced and then LTE-Advanced Pro versions that have significantly improved the capabilities of LTE networks. From 3GPP Release 15 onwards, the community has also been defining 5G networks, starting with non-stand-alone 5G systems that will integrate with existing LTE networks, and then moving on to stand-alone 5G systems with substantially different network configurations.

In a report, “Evolution from LTE to 5G”, Global Mobile Suppliers Association (GSA) provides an in-depth status view and analysis of the global 4G/LTE, LTE-Advanced and 5G markets. A summary of the report:

LTE global status

The past one year saw the continued introduction of LTE in more markets and regions around the world. By the end of 2018, GSA had identified 712 operators running LTE networks for providing mobile and/or fixed wireless broadband services in 213 countries. Further, another 117 companies are trialling, investing or planning to invest in LTE. The GSA forecasts that by the end of 2019, over 760 operators will be operating on LTE networks.

During 2018, launches of LTE networks were announced in various countries including Bangladesh, Libya, Mali, Mozambique, St Lucia and Syria. There were also awards of licences or conversions of licences to enable LTE launches. In Burkina Faso, for instance, the licences of Onatel and Orange were converted to technology-neutral status to enable an LTE launch in December 2018. In Cuba, Etecsa is trialling LTE and LTE networks are also planned in Niger.

There are relatively few LTE not-spots (that is, countries with no launched LTE network of any kind – mobile or broadband fixed wireless) left in the world. Most of these are remote island territories, states or countries in Africa. Other notable LTE not-spots are Bosnia and Herzegovina, Cuba, North Korea and Yemen.

Spectrum for LTE deployments

Pressure for spectrum is high and operators need to deploy the most efficient technologies available. LTE, LTE-Advanced and LTE-Advanced Pro services can be deployed in dozens of spectrum bands starting at 450 MHz and rising to nearly 6 GHz. The most used bands in commercial LTE networks are 1800 MHz (Band 3), which is a mainstream choice for LTE in most regions; 800 MHz (Band 20 and regional variations) for extending coverage and improving in-building services; 2.6 GHz (FDD Band 7) as a major capacity band; and 700 MHz (with variations in spectrum allocated around the world), again for coverage improvement. The new LTE standards enable the possibility to extend the benefits of LTE-Advanced to unlicensed and shared spectrum as well.

Many recent allocations/auctions of spectrum have focused on licensing the unused spectrum – especially in pockets of spectrum in the 2 GHz to 4 GHz range – for LTE and future 5G services. This spectrum is sometimes dedicated to LTE, sometimes to 5G and sometimes allocated on a technology-neutral basis.

- Band 3 (1800 MHz): LTE network deployment in the 1800 MHz (Band 3) is now common throughout Europe, the Asia-Pacific, the Middle East and Africa, and regions of South America. Currently, there are 327 live networks in 137 countries/territories that either use it as a single band or as part of a multiband deployment. Band 3 is used globally by 46 per cent of all operators with launched LTE networks and it has greatly assisted international roaming for mobile broadband services. The GSA has identified 31 operators that have acquired licences, are conducting trials or have plans for launching service in Band 3.
- Band 20 (800 MHz): The 800 MHz band (Band 20) is firmly established as a mainstream band for LTE. It is used in 184 commercial networks in 84 countries. Additionally, 23 operators have announced investments in the band in the form of acquiring licences, piloting or announcing plans to launch services.
- Band 7 (2.6 GHz): The 2.6 GHz band (Band 7) is the third most used band, with 164 deployed/launched networks in 78 countries and is more extensively used in the Americas than Bands 3 and 20. Mexico is among the latest countries to have auctioned spectrum in Band 7 in a tender that took place in the late summer of 2018, but more are planned.

VoLTE global status

In total, the GSA has identified 248 operators investing in voice over LTE (VoLTE) in 112 countries, including 180 operators that have launched VoLTE services in 87 countries, an increase from 134 in 65 countries in January 2018. Another 51 operators either plan to deploy or are deploying VoLTE services. Additionally, 17 operators that are involved in tests/trials have been identified. While the number of networks running VoLTE has been growing rapidly, the number offering enhanced voice services has been rising at a more measured pace. By January 2019, the GSA had identified 21 networks that had launched services, the most recently identified being Play in Poland and Orange in Romania.

LTE-Advanced global status

Investment in LTE-Advanced networks continues to grow. By January 2019, there were 274 commercially launched LTE-Advanced networks in 122 countries. Overall, 317 operators are investing in LTE-Advanced (in the form of tests, trials, deployments or commercial service provision) in 130 countries. Many operators with LTE-Advanced networks are looking to extend their capabilities by adding 3GPP Release 13 or Release 14 LTE-Advanced Pro features.

Carrier aggregation has been the dominant feature of LTE-Advanced networks. Varying numbers of carriers and varying amounts of the total bandwidth have been aggregated in trials and demos. While some trials and demos have aggregated up to 10 carriers, for instance, SK Telecom’s trial in South Korea, the highest number of carriers aggregated in commercial networks is just five.

IoT global status

The year 2018 saw a strong growth in the number of cellular internet of things (IoT) networks based on narrowband IoT (NB-IoT) and LTE machine (LTE-M). By mid-January 2019, there were 133 operators investing in NB-IoT in 64 countries. The number of deployed/launched NB-IoT networks has doubled in the past 12 months. About 78 operators have deployed/launched NB-IoT networks in 45 countries, up from 39 operators in 28 countries a year ago. Further, there are 57 operators investing in LTE-M networks in 34 countries. About 30 operators have deployed/ launched LTE-M networks in 21 countries. Altogether, 47 countries now have at least either a launched NB-IoT network or a launched LTE-M network and 19 of these countries have both network types.

5G global status

The GSA has identified 201 operators in 83 countries that have launched (limited availability or non-3GPP networks), demonstrated, are testing or trialling, or have been licensed to conduct field trials of 5G-enabling and candidate technologies.

Operators continue to provide clarity about their intentions in terms of launch timetables for 5G or pre-standards 5G. Now, 11 operators have announced limited 5G service launches. These include AT&T (USA), Elisa (Finland and Estonia), Etisalat (UAE), Fastweb and TIM (Italy – joint Matera and Bari “5G city” for project partners only), LG Uplus (South Korea), KT (South Korea), Ooredoo (Qatar), SK Telecom (South Korea), Verizon (USA) and Vodacom (Lesotho). All their services are initially restricted in terms of geographic availability, device availability, or the types and numbers of customers being provided with services. Verizon’s service uses non-3GPP-compliant equipment that will be upgraded in the future. Seven other operators have said that they have turned on 5G base stations but have not yet launched commercial services.