LTE ECOSYSTEM REPORT:

Status Update October 2020

GSA

Introduction

GSA (Global mobile Suppliers Association) monitors and researches worldwide mobile broadband developments and publishes facts, statistics and trends. This report confirms 18,127 LTE user devices identified as launched (including 206 commercial 5G devices also supporting LTE) from 811 manufacturers and provides an analysis of the main developments and trends. The increase in manufacturers mostly reflects the addition to the database of a number of small specialist vendors for particular form factors including cameras, industrial CPE/routers, fixed wireless terminals/phones and smart-home devices.

This new total is 17.7% higher than the number of devices identified by GSA in September 2019. This report covers LTE FDD and TDD (TD-LTE) models and LTE-related cellular IoT devices standardised by 3GPP as UE Cat-M1/M2 and UE Cat-NB1/NB2.

LTE user devices

While 5G grabs the headlines, LTE still dominates global mobile telecoms. There are 798 operators with commercially launched mobile or broadband fixed wireless access networks (GSA: NTS Database September 2020). There were 5.55 billion LTE subscriptions globally by the end of Q2 2020 (source: Omdia, September 2020). LTE accounts for 60.4% of mobile subscriptions globally. Given this huge market, it is not surprising that there is a vibrant technology ecosystem supporting operators with LTE networks and within that, a large number of vendors selling a huge array of devices.

There are 18,127 LTE-capable user devices including frequency and operator variants from 811 suppliers verified in GSA's GAMBoD database, a 17.7% increase since September 2019. The number of devices has continued to grow rapidly, at an average growth rate of more than 3,000 devices per year for the past four years.

Figure 1: LTE user devices growth (count of devices in GAMBoD database, including commercial 5G devices supporting LTE)

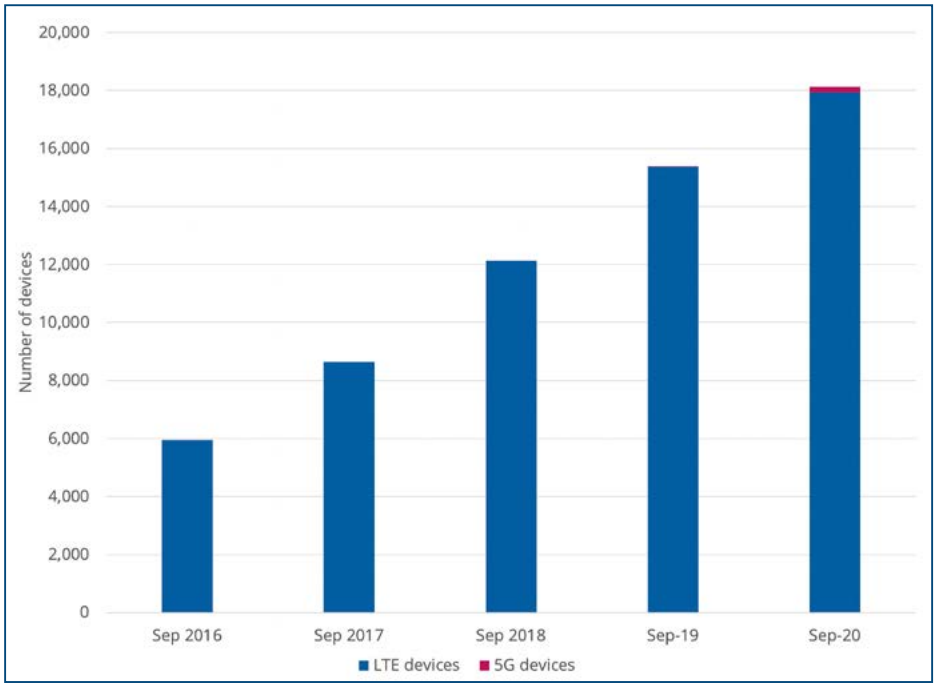
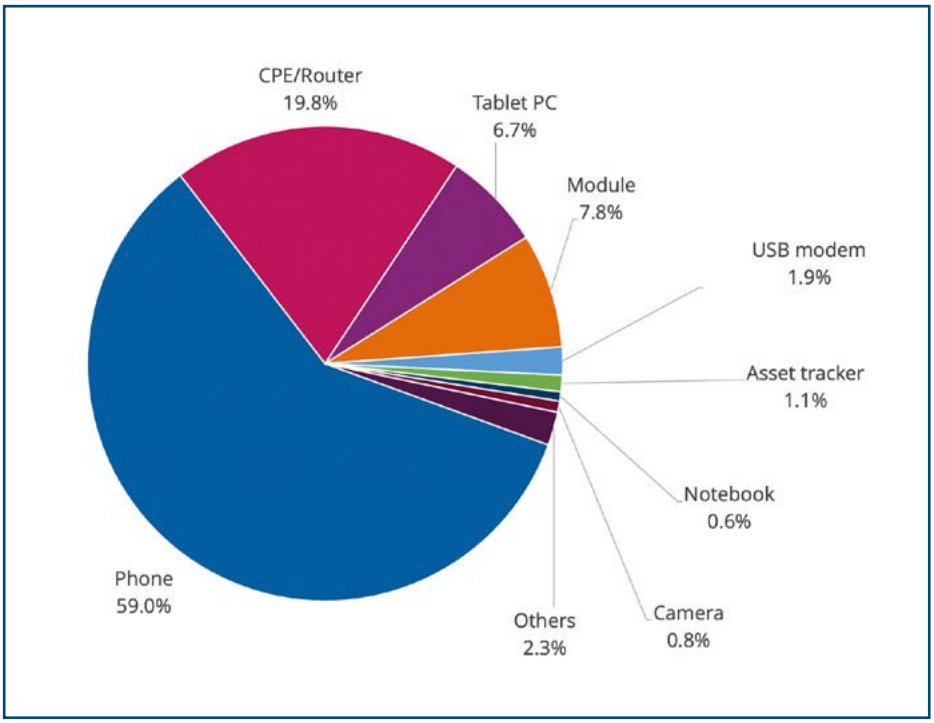


Figure 2: 18,127 LTE user devices by form factor, September 2020



Form factor

The phone form factor has the largest ecosystem with 10,697 phones announced, including operator and frequency variants, giving a 59% share of all LTE devices. The LTE-capable CPE/router, LTE module and LTE-connected tablet PC segments (3,585, 1,414 and 1,220 devices respectively) are also large. Other categories being tracked include USB modems (345 devices), asset trackers (203), cameras (138), notebooks (115), and smart watches (81), as well as car hotspots, vehicle on-board units (OBUs), femtocells, fixed wireless terminals/phones, data loggers/IoT sensors, drones, kiosk terminals, PC cards, POS machines, projectors, smart-home devices, vehicle accessories, intercoms and voice translators.

LTE device frequency bands

Most devices operate in the FDD mode (16,354 devices out of 18,127: 90.3%), while the number of terminals that support LTE TDD (TD-LTE) continues to grow: 8,102 (44.7%) LTE devices support the LTE TDD (TD-LTE) mode.

LTE networks are operating commercially in many bands. Table 1 (LTE-FDD) and Table 2 (LTE-TDD) confirm the frequency bands that are most supported by the device ecosystem.

Table 1: The main FDD frequency bands supported by LTE-capable devices

LTE FDD Band	Number of devices
1800 MHz Band 3	12,353
2600 MHz Band 7	10,687
2100 MHz Band 1	10,471
800 MHz Band 20	7,410
850 MHz Band 5	7,303
900 MHz Band 8	6,991
AWS Band 4	5,404
1900 MHz Band 2	5,150
700 MHz Band 17	3,120
APT700 Band 28	2,927
700 MHz Band 12	2,484
700 MHz Band 13	2,262
1900 MHz Band 25	1,280

Table 2: The main TDD frequency bands supported by LTE-capable devices

LTE TDD Band	Number of devices
2300 MHz Band 40	6,435
2600 MHz Band 41	5,164
2600 MHz Band 38	5,034
1900 MHz Band 39	3,509
2000 MHz Band 34	590
3500 MHz Band 42	452
3700 MHz Band 43	344

Note 1: Manufacturers have not declared operating frequencies for some products.

Note 2: Certain products are carrier- or country-specific and are therefore not available in all markets.

Note 3: A number of devices are currently listed as band 'other'.

FDD ecosystem

1800 MHz Band 3

The most popular spectrum for LTE deployments is 1800 MHz. Band 3 is being deployed or used in 382 commercial LTE networks globally (47.9% of the total).

Band 3 also has the largest LTE user devices ecosystem: 12,353 Band 3 user devices are announced in the market, i.e. 68.1% of LTE devices can operate using spectrum at 1800 MHz.

800 MHz Band 20

The second-most used spectrum band in networks worldwide is 800 MHz Band 20 (being deployed or launched in 202 networks). The ecosystem of devices is strong, with 7,410 known supporting LTE devices (40.9% of all devices).

2600 MHz Band 7

The third major FDD band in terms of global deployments is Band 7, launched in 190 commercial networks. Its ecosystem is strong: 2600 MHz FDD is supported by 10,687 LTE devices (59.0% of the total).

TDD ecosystem

3GPP decided from the beginning that LTE must support both FDD and TDD modes with the minimum possible difference between the two modes. The emphasis has been on leveraging synergies between the modes to the largest extent possible. The result is that almost all parts of the LTE specifications are the same for both FDD and TDD. By end-September 2020, GSA had identified 233 operators holding licences to use spectrum enabling provision of TD-LTE services, of which at least 165 were actively using the spectrum.

The LTE-TDD user devices ecosystem is well established with 8,102 devices, i.e. 44.7% of LTE devices in GAMBoD support the LTE-TDD (TD-LTE) mode and thus supporting the growing number of LTE operators using unpaired spectrum. The phone is the largest device category supporting TDD: 5,031 phones are included in GAMBoD.

Bands 40 (2.3 GHz) and 41 (2.6 GHz) and 38 (2.6 GHz) have the largest choice of TDD terminals with Band 39 also being well supported.

- Terminal support for Band 40 = 79.4% (of LTE-TDD devices announced)
- Terminal support for Band 41 = 63.7%
- Terminal support for Band 38 = 62.1%
- Terminal support for Band 39 = 43.3%

Figure 3: LTE-FDD user devices by form factor

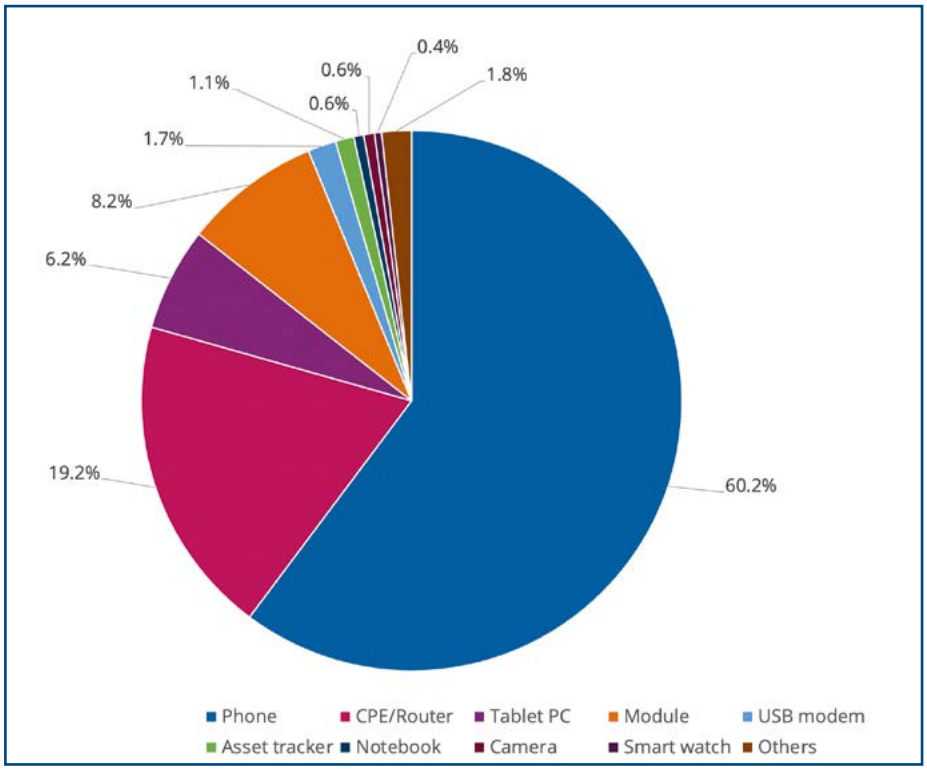
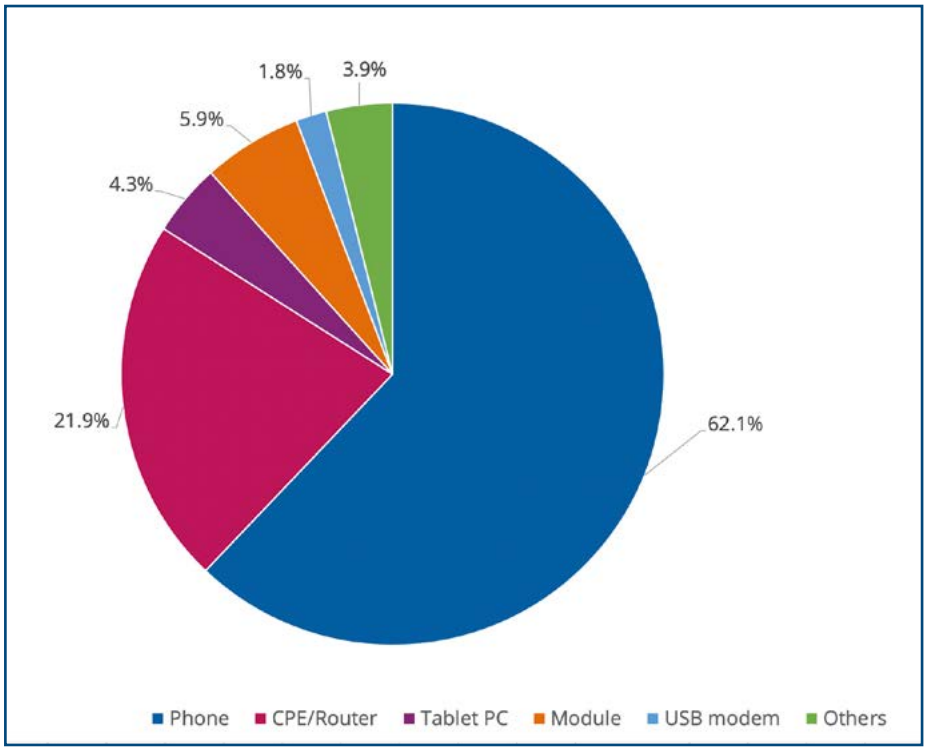


Figure 4: LTE-TDD user devices by form factor§



There is a good choice of multi-band and dual-mode FDD-TDD devices.

UE categories and feature support

Category 4, 6 and 7 UE devices

Many operators have launched or are deploying networks supporting UE Category 4 devices. UE device Category 4 offers a theoretical peak downlink rate of up to 150 Mbit/s with a peak uplink of up to 50 Mbit/s on compatible networks. LTE-Advanced deployment is now well established with wide-scale commercialisation of carrier aggregation to combine different spectrum bands for greater bandwidth. There are 9,522 devices (52.5% of LTE devices) that support Category 4 (excluding higher UE categories), an additional 1,877 devices that can support Category 6 (300/50 Mbit/s) and 602 that can support Category 7 (300/100 Mbit/s).

The numbers of devices capable of supporting higher UE categories is growing too, as Figure 5 shows.

A significant proportion of the high-end devices (Cat-20 to Cat-22) are also 5G devices (41.7% of them, up from 24.7% last quarter).

Note that not all vendors publish details of UE category or up/downlink speeds. GSA holds UE Cat data for 80.3% of the devices in the GAMBoD database.

For updates on global LTE-Advanced and Gigabit LTE network deployments, see the relevant reports at www.gsacom.com.

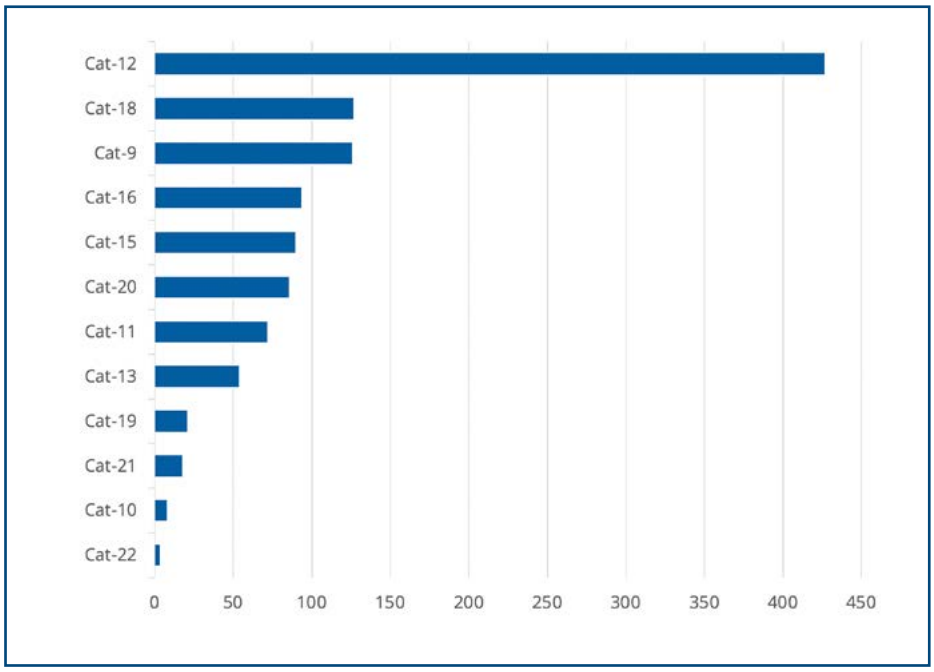
VoLTE, ViLTE and EVS user devices

Operators worldwide are investing in VoLTE, enabling an HD-voice experience for LTE users, with 274 operators identified as investing in VoLTE by September 2020 and 215 launched networks. In GAMBoD, GSA has recorded 2,941 VoLTE-capable devices (up from 2,730 in June 2020) including carrier and frequency variants. Of these devices, 2,449 are phones, which means 22.9% of LTE phones announced are known to support VoLTE.

The number of ViLTE-capable devices listed in the GSA database is 426 (up from 398 at the end of December 2019). While video calling over LTE does not have to make use of standards-based ViLTE, operators offering VoLTE-based HD-voice services sometimes also support ViLTE-based video calling, as much of the technology stack for VoLTE and ViLTE is the same.

GSA has identified 177 devices supporting EVS (Enhanced Voice Services).

Figure 5: Number of LTE devices by max UE Cat rating, UE Cat-9 and above



eMBMS (LTE Broadcast) and PTT (Push-to-Talk)

There are 47 devices capable of supporting LTE Broadcast services. Most of these devices are CPE devices and routers.

There are 181 devices (159 of them phones and many are from specialist vendors of ruggedised equipment) supporting the Push-to-Talk (PTT) or Mission Critical Push-to-Talk (MCPTT) features.

Cellular IoT LPWA devices

The majority of IoT LPWA devices are modules, though CPE/routers are a strong category of form factor for LTE-1 devices, and there are an increasing number of asset trackers and CPE/routers across these three categories.

Table 3: Cellular IoT LPWA devices counts by type

LTE technologies	Characteristics	Devices announced
LTE Cat-1	Up to 10 Mbit/s; 20 MHz	516 (220 modules, 196 CPE/routers, 56 asset trackers, 18 vehicle OBUs, 26 others)
LTE-M (Cat-M1)	Up to 1 Mbit/s; 1.4 MHz	333 (159 modules, 90 asset trackers, 66 CPE/routers, 18 others)
NB-IoT (Cat-NB1)	10s of kbit/s to 100s of kbit/s; 180 kHz narrowband	341 (167 modules, 83 asset trackers, 23 data loggers/IoT sensors, 55 CPE/routers, 13 others)

LTE devices for use in unlicensed spectrum

- 227 LAA devices announced.
- 46 LTE-U devices announced.
- •16 LWA devices announced.

There are also 254 devices in GAMBoD that support LTE in the CBRS spectrum band (Band 48).

For more details of the use of these technologies, see the GSA report LTE in Unlicensed Spectrum: Trials, Deployments and Devices on the GSA website.

The expanding devices ecosystem

4G/LTE and 5G headlines often focus on ever-rising performance milestones and successes of networks and device capabilities. It is equally important that there is a good choice of LTE user terminals to meet the needs of developing markets, where cost factors and flexibility are particularly important and can assist in opening new segments in developed markets.

GAMBoD includes an extensive list of types of LTE-connected terminals, including many produced by OEMs/ODMs, as well as the premium mobile phone and CPE brands. GSA regularly reaches out to low-cost OEM/ODM suppliers of phones, tablet PCs, routers etc. based in China, India and other locations and includes many of their products in GAMBoD. If you have details about products you would like included in this database, please contact us at research@gsacom.com

Devices analysis using GAMBoD

The GAMBoD devices database is now updated on a monthly basis. Searching by supplier, form factor, features, peak downlink and uplink speeds and operating frequency is enabled. Results are presented as lists, spreadsheets or charts. Charts may be used in documents or presentations, referencing GSA as the source. Visit gsacom.com/gambod. Search criteria are:

- manufacturer name
- product model number or name
- form factor
- FDD and TDD spectrum bands
- UE categories (including IoT device categories)
- support for VoLTE, ViLTE and EVS
- support for eMBMS (LTE Broadcast)
- support for 4x4 MIMO
- support for 256QAM (downlink)
- support for unlicensed bands LTE-U/LAA/LWA
- support for PTT and MCPTT over LTE
- ruggedised products
- 3G fallback technology: HSPA, HSPA+, DC-HSPA+, EV-DO, or TD-SCDMA.

5G devices have also been added to the database with details about new spectrum bands and 5G features.

Access to GAMBoD is available to GSA Members and Associates. Other companies can subscribe to GAMBoD. For more info email info@gsacom.com.

ABOUT GSA

GSA is the voice of the global mobile ecosystem and has been representing mobile suppliers since 1998.

GSA GAMBoD Database

Reports are based on data contained in the GSA GAMBoD databases which is a resource available to GSA Members and Associates. Companies and policy makers can subscribe as a GSA Associate to the database to gain insights into the source data behind reports for their own research purposes.

Discounted annual subscription are available to regulators, government agencies and mobile operators.

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