



# Market Forecast 5G Connections, Worldwide 2018-2025

August 2018 Update

# Scope, Definitions and Confidence

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- **Scope of the forecast**

- 5G mobile connections in 2018 to 2025, split by main categories.
- The forecast is built bottom-up for the following regions: North America, Western Europe, Asia–Pacific developed markets, China, and the rest of the world.

- **Definitions**

- 5G, defined as 5G NR by 3GPP, is the next-generation wireless air interface that follows LTE.
- It is designed for flexibility, providing high-throughput, low-latency, high-availability, low-power communications to meet several needs from mobile broadband to "mission-critical" services.
- 5G significantly increases capacity through the introduction of new millimetre wavebands beyond 24 GHz and the broad use of unlicensed spectrum.
- The standardization of 5G begins with 3GPP Release 15. This is being split into two tracks: a non-standalone variant, which uses LTE as an anchor, and a standalone variant.
  - The standalone variant was conceived to accelerate time to market given early moves by US and South Korean operators.

- **Level of uncertainty**

- In producing this forecast, we have had extensive discussions with operators, manufacturers and chipset makers. Many of these companies are still working out their 5G strategies, therefore leaving a high level of uncertainty in areas such as geographic roll-out and pricing. This means that significant changes could apply to the forecast in the next few revisions.

# Areas of 5G Adoption

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- **CCS Insight has identified four main areas of 5G adoption:**

1. **Mobile broadband:** smartphones, MiFi devices, tablets, data dongles and cards
2. **Fixed wireless access:** household or business high-speed Internet access that competes with or complements fixed-line broadband
3. **Machine-to-machine and Internet of things (M2M and IoT):** industrial or consumer connected devices and end points for M2M communication
4. **Mission-critical:** emergency services, autonomous cars and other applications in which high-availability low-latency connectivity is essential

# Key Assumptions

- **Competitive forces will push operators to deploy 5G, even in the absence of a clear business case**
  - This scenario mirrors the roll-out of 4G networks.
  - The US, Japan, South Korea and China will be the first markets to launch commercial 5G services.
  - China wants to be a leader in 5G and will deploy networks quickly, unlike the delays with 4G; the growing influence of Huawei, which was less prominent during the early 4G networks, will support growth.
  - Operators in Western Europe are more cautious, but the first 5G networks in the region will still appear in 2019. Overall, Western Europe will lag the leading regions by about a year.
  - Emerging markets will be slow to adopt 5G technologies, as they remain focused on deploying LTE. Still, the first 5G networks will appear in isolated markets as early as 2019, for example in the Middle East.
- **Mobile broadband**
  - Adoption of 5G technology in smartphones will be driven by the growing need for capacity and bandwidth that results from steeply rising video consumption on mobile devices.
  - Operators will push adoption to aid network capacity and justify their investments in infrastructure.
  - The first 5G-enabled mobile phones will appear in the first half of 2019. 5G will become an important area of competition for high-end smartphone makers, and many of them will rush to deploy 5G in their flagship products in late 2019.
  - We assume that Apple will launch its first 5G-ready device in the second half of 2020.
  - Adoption of 5G technology in mobile phones will drive 5G connection growth as operators push users with enabled handsets to 5G tariffs.

# Key Assumptions

## ▪ Fixed wireless access

- US operators will be among the first to deploy 5G technology in fixed wireless broadband access. We expect them to initially focus on a few densely populated areas.
- Fixed wireless access could see deployment in some Asian markets (for example, South Korea) in the forecast period.
- We assume that fixed wireless access will not be a priority in Western Europe, although small-scale implementations will exist.
- Although fixed wireless access could be a good solution for emerging markets such as those in Africa and Latin America, the cost of 5G will be prohibitive for mass deployment during the forecast period.

## ▪ M2M and IoT

- Narrowband connectivity within 5G is likely to only become commercially available in 2023 or later.
- 5G connectivity should enable a lower cost per bit than 3G or 4G, but the full benefit of this will only lead to rapid adoption as 5G IoT modules achieve economies of scale and 5G networks reach full coverage.
- The replacement cycle of IoT devices could be 10 years or more. Operators will have to commit to supporting 4G networks for a long time, making it hard for those implementing IoT projects to forgo 4G connectivity.
- Millimetre-wave 5G could see solid adoption in industrial operations through private 5G networks. However, there is considerable uncertainty about the timing and size of this opportunity. We therefore remain cautious in this forecast and within the forecasting period.
- As a result, penetration of 5G within cellular connected IoT devices will grow slowly. Even in 2025, 5G connectivity will account for a small share of new devices sold in this area.

# Key Assumptions

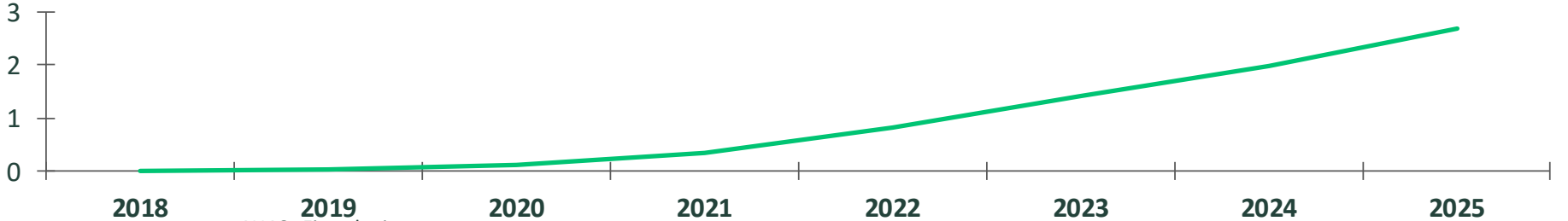
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- **Mission-critical**

- Mission-critical applications will need high availability and thus a mature, well-established network with both millimetre wave and sub-6 GHz coverage. Depending on the application, LTE-Advanced coverage will function as a fallback.
- Mass deployment of 5G in mission-critical applications will happen well beyond the forecasting period.
- An initial use is likely to be automotive (cellular V2X). This should begin emerging in 2019 and 2020, albeit not fully dependent on 5G.

# 5G Evolution

5G connections, worldwide (B)



**Mobile broadband**

**2019:** First devices launch; Autumn flagships on Android include 5G

**2020:** First iPhone enabled with 5G

**2021-2025:** Fast deployment in North America, Japan, South Korea, China, Western Europe and rest of developed markets in Asia-Pacific

**2021:** Deployment starts in emerging markets with small numbers

**Fixed wireless access**

**2018:** First commercial launches in US

**2019-2020:** Slow roll-out in US and some developed markets of Asia-Pacific

**2021:** Growth starts

**2025:** Still niche compared with fibre broadband

**M2M and IoT**

**2020:** Slow start; narrowband still not standardized in 5G NR

**2024:** Early commercial launches of narrowband 5G

**2025:** Scale starts to build

**Mission-critical**

**2025:** Isolated commercial implementations, led by automotive

# Key Messages

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- **Operators are competing to be first to launch 5G services and reap benefits of PR exposure**
  - In the past six months, several operators have committed to deployment in 2018 and 2019, and a number of countries have completed their 5G spectrum auctions.
- **The business case for deployment of 5G remains mobile broadband. Demand for video content continues to build, increasing data usage and the need for greater network capacity**
  - The first 5G-enabled mobile phones are set to arrive in early 2019. Major flagships, launched in autumn 2019 are expected to support 5G, with the exception of the iPhone, which is not expected to be 5G-enabled before 2020.
- **Fixed wireless access is a showpiece for 5G in the US, but adoption will be limited in the near and mid-term**
- **5G remains hugely important for the long-term development of IoT. However, at least until the mid-2020s, IoT development will depend on earlier generations of network technologies**
- **Different markets will see different rates of adoption**
  - Some US carriers will launch in late 2018, as will a small number of operators in the Middle East and Europe. South Korea, China, Japan will all see first launches in 2019.
  - China will become the largest market for 5G in 2020.
  - There will be some launches in Western Europe in 2019, but most major operators are expected to roll-out 5G in 2020.

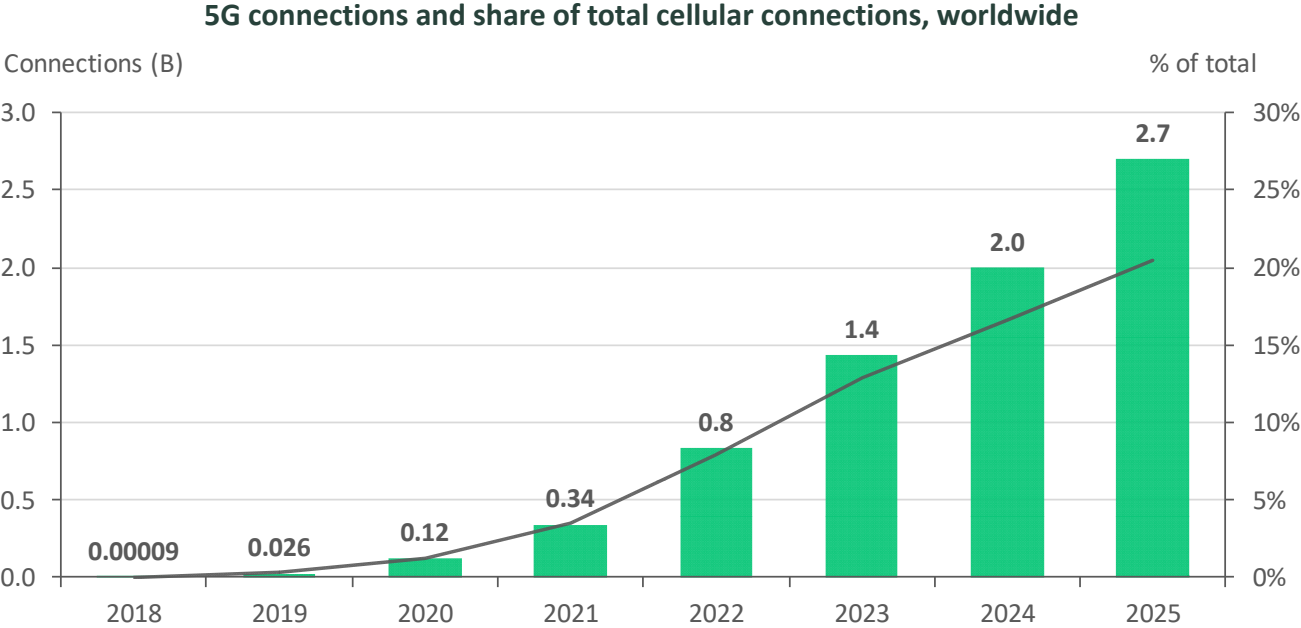


# Key Messages

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- **There will be 340 million 5G connections in 2021, and 2.7 billion in 2025**
  - 5G connections worldwide will surpass 1 billion in 2023.
  - Of the 2.7 billion 5G connections in 2025, 98% will be on mobile phones or other mobile data devices.
  - Fixed wireless access and M2M and IoT will account for about 1% of the 5G connections in 2025.
  - Developed markets, including China, will account for 94% of the 5G connections in 2021 and for 76% in 2025.

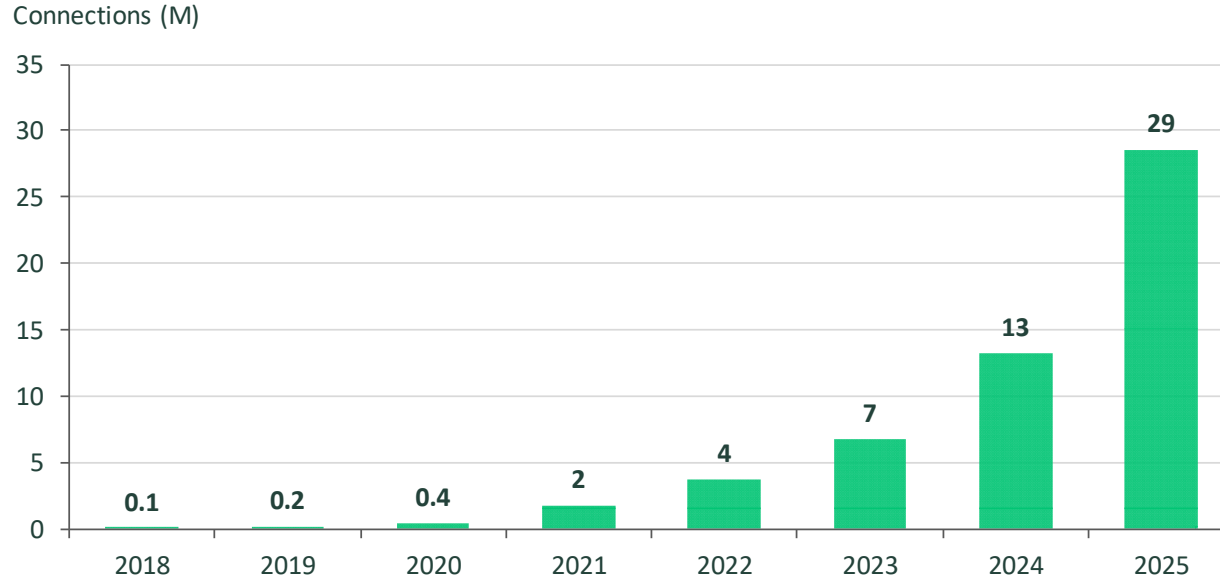
# 5G Connections to Reach 2.7 Billion in 2025



- The number of 5G connections will be limited until 2019, but will start building quickly from 2020 onward, as networks are rolled out and smartphones that support 5G proliferate
- 5G connections will reach 1 billion in 2023 and will double to 2 billion by the end of 2024
- In 2025, 21% of all worldwide cellular connections, including M2M, will be 5G

# Fixed Wireless Access Limited to Certain Markets

5G fixed wireless access connections, worldwide



- **5G fixed wireless access products are expected to debut first in the US by the end of 2018**
- **Some volume of fixed wireless access products will appear in certain markets in Eastern and Western Europe, such as Romania and the UK**
- **Adoption is forecast to remain slow, based on our expectations of limited availability, as well as potential price premium and restrictions compared with terrestrial high-speed broadband**

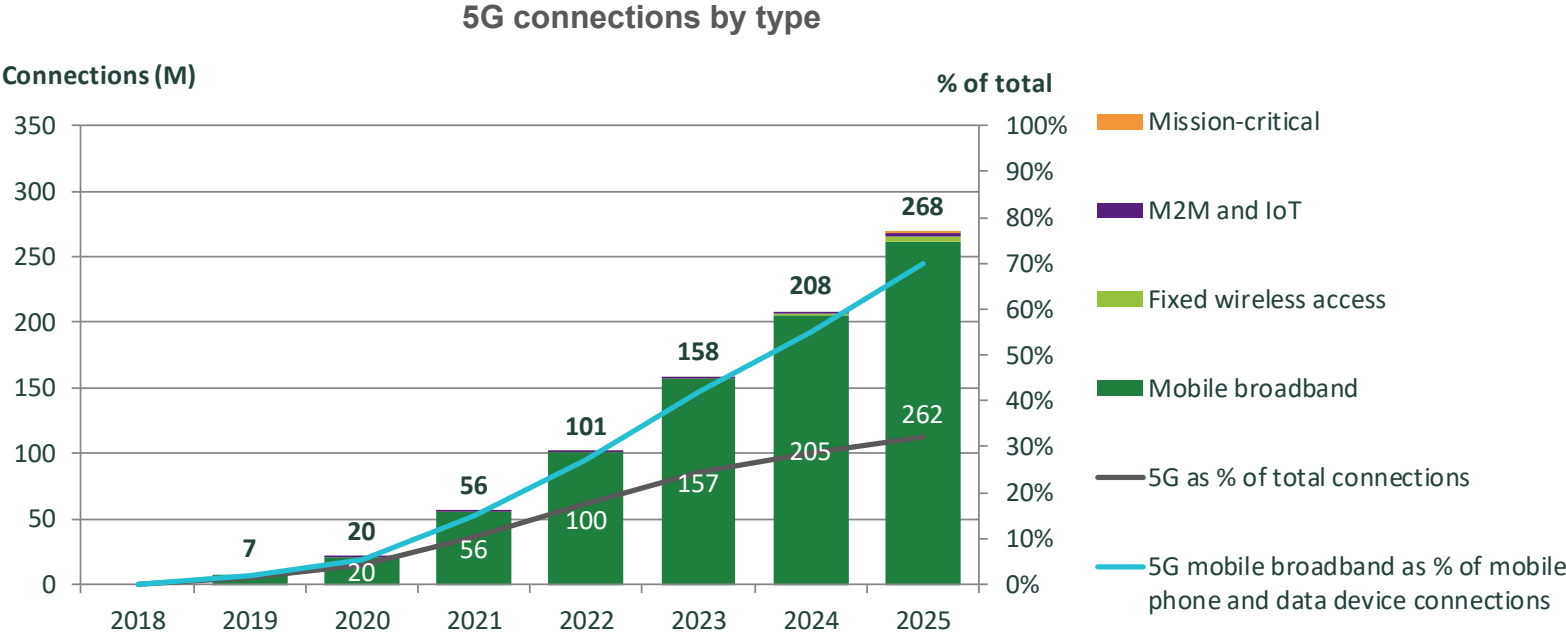
## Potential Upsides and Risks to the Forecast

- **There is a potential upside for the forecast thanks to adoption of millimetre-wave 5G in industrial operations through private 5G networks**
  - Please refer to [page 17](#).
- **C-V2X could also positively affect the forecast**
  - C-V2X is a 3GPP-based technology that can also work independently of 4G and 5G networks.
  - It competes against 802.11p, also known as dedicated short-range communications.
  - It enables vehicles to communicate with infrastructure such as road signs, traffic management systems, parking systems, mapping systems and so on, as well as other vehicles.
  - CCS Insight believes that momentum in the automotive industry is steadily gathering behind C-V2X.
  - We expect to include C-V2X in future reviews of the forecast.
- **Some scenarios that could lead to slower adoption of 5G than shown in this forecast:**
  - In IoT, operators might choose to keep M2M connections to 4G and leave their 5G capacity to devices requiring more bandwidth like mobile phones and data devices.
  - In fixed wireless access, retail prices might prove a deterrent for adoption of 5G as an alternative to fixed-line broadband. Broader deployment using fixed wireless access will be heavily dependent on coverage and capacity.
- **However, as M2M, IoT and fixed wireless access represent a tiny part of the 5G connections in our core forecast, these scenarios will have little impact on the total numbers within the forecast period**

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# Regional Forecasts

# Asia-Pacific Developed Markets: South Korea Leads the Region With 5G Roll-Out Plans



- **South Korean operators have agreed to launch 5G on the same day in March 2019, on "Korea 5G Day"**
  - The 5G spectrum auction in South Korea has recently been completed, with SK Telecom, KT and LG U+ all acquiring spectrum.
- **Japan will also introduce 5G early, with the Olympic Games in 2020 as a likely catalyst**
- **Other countries that we expect to lead 5G deployment in the region include Singapore, Hong Kong and Australia**
- **Adoption will be fast, as 5G devices will proliferate quickly**



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