

The *Mobile World Congress (MWC)* took place in Barcelona from Feb 26-Mar1, 2018. Creating a Better Future was the theme of the show to emphasize how the mobile tech is connecting everything and everyone to a better future. According to the organizers, GSMA, more than 107,000 people attended the show - which is a slight drop from last year's 108,000 - where 2,400 companies showcased their latest offerings.

On connecting everyone: According to GSMA intelligence, the number of unique mobile subscribers hit 5 billion in 2017 and is expected to reach 5.9 billion people by 2025. 71% of world's population will be connected on mobile by 2025. 4G+5G networks will serve two-thirds of mobile connections (excluding IoT) in 2025. 4G is growing from 29% of global connections in 2017 to 53% of global connections by 2025. By 2025, 5G will grow to 14% of global connections following its 2018 launch.

On connecting everything: The number of Internet of Things (IoT) connections both cellular and non-cellular will grow from 7.5 billion in 2017 to over 25 billion in 2025. Of that total, 12% or 3.1 billion devices will be on licensed cellular IoT connections.

5G Transition from Hype to Reality is Accelerating

Telco players are accelerating their move to 5G mobile networks as the bandwidth crunch is providing a strong tailwind. Every operator that we have talked to is experiencing over 100% year over year growth in mobile data. The standards bodies are moving faster to ratify various parts of 5G standards.

US and China, along with Japan and Korea, will be the early adopters of 5G. China Mobile plans to have commercial 5G deployment by 2020 with 5G field trials in Q2 of 2018 paving the way. China Mobile is committing to deploying standalone 5G (end to end 5G including new radio and new core network) with trials starting this year and the deployment starting in 2020. China Mobile wants to take advantage of all of 5G capabilities including network slicing and mobile edge computing. The operator also wants to take a big leap into industrial space, serving special vertical needs.

Verizon and AT&T each plan to be the first to market with 5G services, which creates exciting competition and a fun dole of anticipation for us all. Verizon plans to launch 5G fixed services as broadband to homes in up to five US cities, starting with Sacramento, California, by end of 2018. AT&T will deploy 5G service in twelve markets by the year end. AT&T will start with wireless hotspots, called pucks, that would take in 5G and provide WiFi in the house.

Neville Ray, CTO of T-Mobile, talked about plans to build 5G in 30 US cities this year, starting with New York City, Las Vegas and Dallas. Sprint CEO said the company plans to roll out 5G-ready in 6 cities and wants to build the first nationwide 5G network by early 2019.

While the 5G networks are getting deployed, the 5G phones will not be available until early next year. That is why the early adoption would start with hotspot devices.

Operators in Japan and Korea, including DOCOMO and KT are also among the early 5G adopters. KT with partners ran a public 5G (pre standard) test network in 28 GHz at the Winter Olympics in Pyeongchang showcasing a few use cases including broadcasting 360-degree views of certain events onto test devices enabling real-time replay and zooming. DOCOMO plans to run a commercial 5G network at the 2020 Summer Olympics.

AI and ML Serving Telecom Use Cases

Mobile device makers are sprinkling AI fairy dust onto their offerings to create compelling services for consumers, from virtual assistants to face and object recognition applications. Samsung will be launching the second version of its virtual assistant, Bixby 2.0, in its upcoming devices including Galaxy 9 and Notes 9, and later in its smart TVs.

For many applications, AI has to run at the edge of the network to provide low latency and reduce costs and security issues having to do with movement of lots of data. Qualcomm unveiled Snapdragon 700 series that would bring on-device AI in addition to other features to affordable phone category. In addition, Arm has announced Project Trillium, its new machine learning platform. The company says the platform can be scaled to low-end or high-end applications based on the number of cores that would be used.

As Artificial Intelligence and Machine Learning gets more useful and practical, more telecom operators are turning to AI solutions to optimize the operations of their current and next-generation networks, improve internal efficiencies, and better serve their customers.

Separately, US Defense Advanced Research Projects Agency, DARPA, is running a Spectrum Collaboration Challenge. This is a competition to use machine learning where radio networks would autonomously collaborate to decide how to use spectrum in real time. You may recall DARPA's Grand Challenge jumpstarted the self-driving cars.

Device Battleground: From phones to Cars, Smart Watches, Smart Speakers, and Robots

Mobile devices are transforming into many different types. While smartphones are still a big draw, the excitement is moving to cars and smart watches and speakers and robots.

Samsung launched its Galaxy S9 and S9 Plus smartphones at the show with better camera and incremental updates, while it is saving its firepower for Galaxy S10 for their own event later this year. LG announced its V30S ThinQ smartphone, a newer version of V30S, with AI features like AI Cam, QLens and Bright Mode to enhance the camera app. Sony's new Xperia XZ2 features a Dynamic Vibration System which makes your phone vibrate along with movies and games.

Cars are the new smartphones at mobile shows these days. More cars were connected to the wireless networks than phones in 2017 for the first time. This was not based on consumer demand but based on connected car applications like assisted driving.

The transition from activity trackers to smart watches in 2017 happened faster than even industry insiders like Fitbit had expected.

Samsung will launch Bixby smart speaker in the second half of this year, to compete in the premium smart speaker market competing with the likes of Apple's HomePod.

DOCOMO and NS Solutions showed the prototype of a 5G humanoid assistant robot that would mimic the movements of a human operator. The movement would be transmitted using signals on 5G network from sensors all over operator's body to the robot. Very cool!

Meanwhile, Amazon is expanding its smart home offerings by acquiring Ring, the digital doorbell maker.

Internet of Things Has Multiple Network Technology Options

Low Power Wide Area Networks, LPWANs, will be the fastest growing connectivity technology through 2025, supporting four billion IoT devices by that date, according to ABI research. LPWANs have several technology options including two licensed cellular options. MWC highlighted launching of narrowband IoT (NB-IoT) and LTE-M networks, along with supporting chips from various vendors, including Qorvo, Qualcomm, and Riot Micro. Forty one mobile IoT commercial networks have been launched by 23 operators in 26 countries: 32 NB-IoT and 9 LTE-M, according to GSMA. These two technologies serve different needs, with NB-IoT serving lower data rates with lower power requirements and LTE-M supporting voice calls.

Role of Regulatory Bodies

To roll out 5G and new mobile services, operators need huge amounts of spectrum. US Federal Communications Commission Chairman, Ajit Pai, said the FCC will be holding auctions for 28 GHz spectrum in November and soon after for 24 GHz. FCC has also been working on streamlining infrastructure siting laws to make it easier to deploy 5G. UK's Ofcom has approved six bidders in its March auction of 2.3 GHz for 4G services and 3.4 GHz for upcoming 5G services.

Data privacy has been a hot topic, as seen by the recent backlash at social media companies which have been playing fast and loose with consumer data. With EU's General Data Protection Regulation (GDPR) going into effect on May 25th, companies operating in EU must be able to protect the digital identity and data privacy of their customer base and ensure their partners are doing the same.

And One More Thing... (maybe four more!)

Softbank's Vision Fund has already spent one third of its \$100B capital by investing in 30 companies, with only two European companies in its portfolio. Sony's Xperia Ear Duo wireless headphones, which will allow the user to hear background sounds, will be available this May for \$280. MWC organizers, GSMA, partnered with PwC and MEXIA One to pilot face recognition technology to provide another access option to enter MWC at Fria Gran Via. Haier, Chinese tech company, unveiled Asu, a smart watch with a projector that can beam the images on your hand.

Disclosure: Azita Arvani runs Innovation Partnering and Ecosystem Ventures at Nokia. This report does not reflect Nokia's views.

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