Mobility for Enterprise
Why Wi-Fi is the right choice

White Paper
Mobility for the Enterprise – why Wi-Fi is the right choice

Alcatel·Lucent
Enterprise

Wi-Fi or 5G for the Enterprise?

With the hype surrounding 5G LTE technology and Wi-Fi 6 launches, the question is will one technology win over the other, or can they coexist and in fact even complement each other? The debate centers around whether each technology will merge into one or maintain their separate course as they have for many years.

One of the main reasons that both technologies could co-exist is the fact that there are millions of connected Wi-Fi only devices already deployed. These will not be replaced overnight and many of these devices will remain Wi-Fi only for the foreseeable future. Wi-Fi technology brings the enterprise many advantages over cellular technology as resource access can be controlled centrally and single policies applied across the campus. Bandwidth restrictions can also be applied to non-essential services, and IT departments can monitor and control users and devices accessing the network.

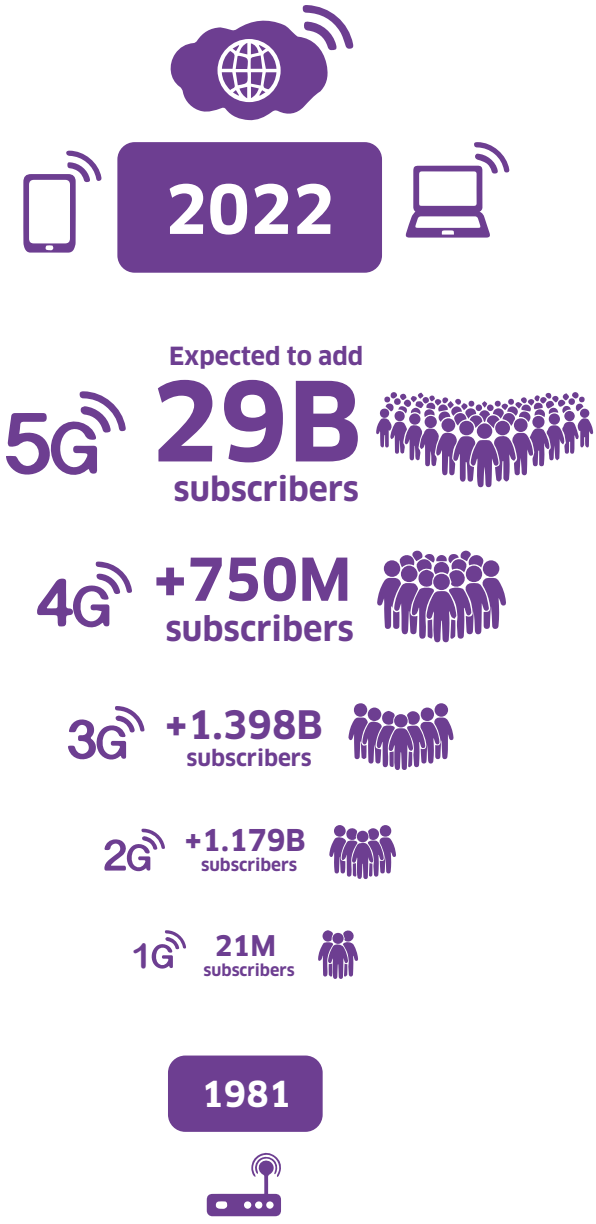
What is 5G?

5G is the next generation of mobile network technology and is not necessarily viewed as a replacement for 4G, but as an extra layer to provide a faster, smoother and better mobile experience. 5G operates at higher frequencies than the existing 4G networks and since these higher frequencies are faster, they allow the network to carry more information. 5G also allows the network to be segmented, or "sliced", meaning the operators can dedicate parts of the network to specific tasks. For example, one part of the network could be used for phones or other mobile handheld devices connecting to the internet while another part can be used for autonomous vehicles. For carriers to provide the reach and throughput that 5G promises, a denser transmitter tower deployment is required because 5G frequencies do not travel easily through obstacles and inside buildings.

However, a word of caution – most mobile devices do not support 5G. It's true that many Android phones with 5G radios can now be ordered from Samsung, LG and others, as well as many domestic or small office routers and hotspot devices. However, Apple currently does not support 5G on any phones. Therefore, if you want to get the benefits of 5G on your iPhone you will need to wait for the next upgrade.

The opposite is true of Wi-Fi connected devices. While many mobile devices do not yet support the Wi-Fi 6 standard, the Wi-Fi alliance has been very clear in making sure that all iterations of the Wi-Fi standards are backwardly compatible, thus allowing Enterprises to upgrade devices as required because 5G frequencies do not travel easily through obstacles and inside buildings.

Figure 1. Evolution of mobile networks and subscribers[1]



1 Source: IoT and 5G history evolution and its architecture their compatibility and future, Jahangir Saqlain - IoT and 5G Thesis, Metropolia University of Applied Sciences, March 2018.)

5G is designed to deliver higher bandwidth and low latency, which is the key to connected driving. When we think of autonomous vehicles, data must be transmitted and a reaction triggered in real time, as decisions must be made in fractions of a second so that the vehicle stops or avoids an obstacle in time. Theoretically, this will stop a vehicle much quicker than a human operated vehicle, as the reaction time of the vehicle will be 1000 times faster than the average human.

Advantages and disadvantages of a 5G network

It is true that 5G will bring increased bandwidth for all users and more bandwidth means faster speeds. Conversely increased bandwidth also means less coverage, thus requiring carriers to install more masts/transmitter towers. It is also thought that with the expected increases in 5G connected devices the radio frequency spectrum may become congested.

5G promises to deliver uniform, uninterrupted and consistent connectivity, however old devices are incompatible. There is a high cost for operators to deploy infrastructure, security and privacy issues have yet to be solved. Plus 3G - 4G networks are not yet ubiquitous.

Wi-Fi

Wi-Fi was first released to consumers in 1997 and has continuously evolved ever since.

The original 802.11 standard was renamed in 2018 by the Wi-Fi Alliance to make the Wi-Fi standards easier to name and understand. The upcoming 802.11 ax standard, being the official sixth generation of Wi-Fi technology, will be known as Wi-Fi 6. The two previous standards were also renamed Wi-Fi 4 and 5.

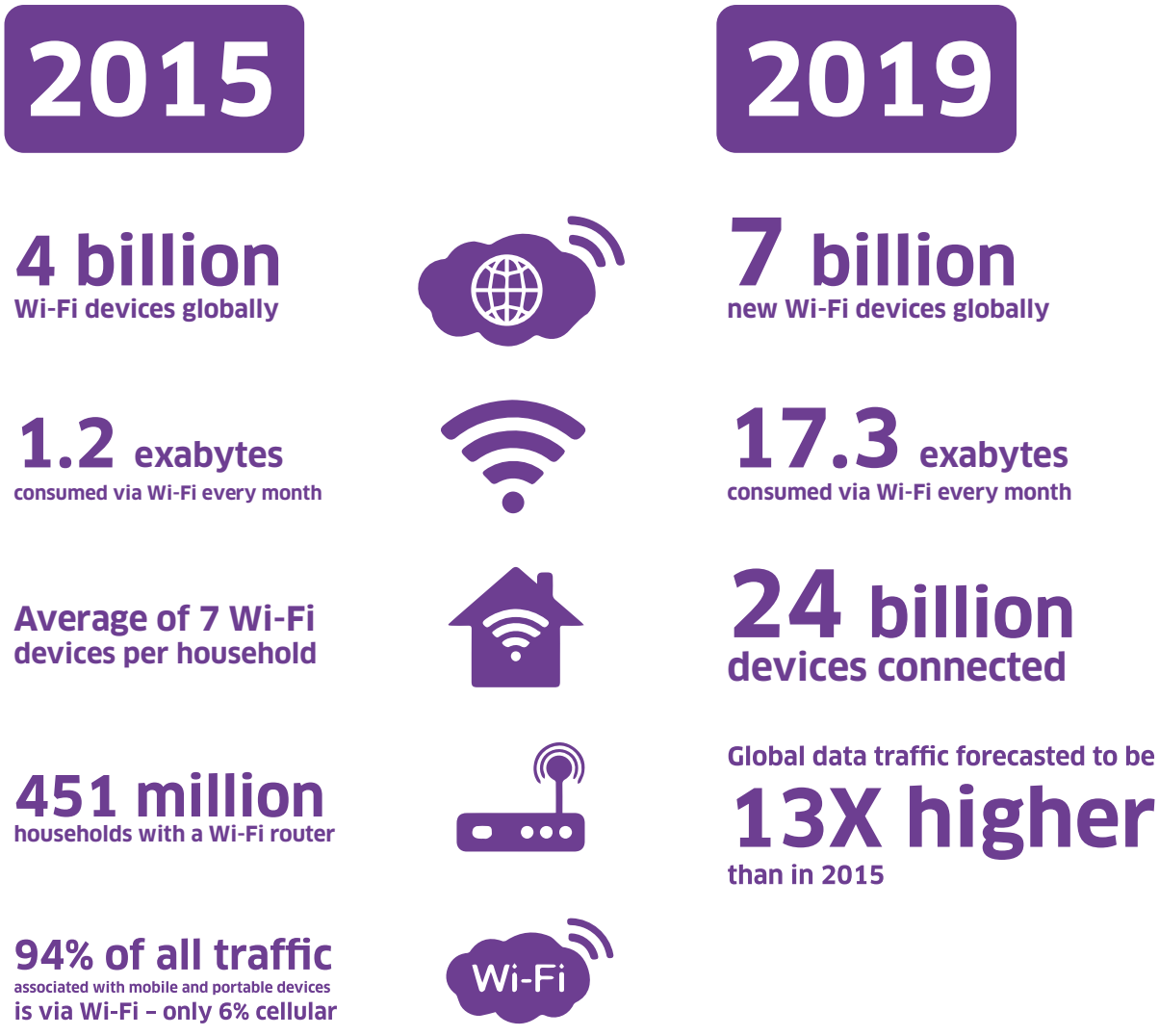
Table 1. Wi-Fi standards

Year	802.11 Standard	Speed	Frequency	Wi-Fi Alliance Name
1997 / 1999	802.11 b	11 Mb/s	2.4 GHz	
1999	802.11 a	54 Mb/s	5 GHz	
2003	802.11 g	54 Mb/s	2.4 GHz	
2009	802.11 n	600 Mb/s	2.4/5 GHz	Wi-Fi 4
2014	802.11 ac	3.46 Gb/s	5 GHz	Wi-Fi 5
2019	802.11 ax	10 Gb/s	2.4/5 GHz	Wi-Fi 6

The Wi-Fi market exploded with the introduction of smart devices that includes smart phones, tablets and appliances. The first devices that used only Wi-Fi to connect appeared in the market around 2004. In 2007, smartphones arrived and pushed up demand for Wi-Fi in homes and enterprises.

In 2009, Wi-Fi only device sales hit 600 million globally and by 2011 this had doubled to 1.2 billion (Source: https://fon.com/fon-wifi-infographic/).

Figure 2. Wi-Fi growth from 2015 to 2019



The Wi-Fi market is growing according to a MarketsandMarkets™ report, the Wi-Fi market is expected to grow from USD 5.96 billion in 2017 to USD 15.60 billion by 2022. Wi-Fi traffic, from both mobile and Wi-Fi-only devices, will account for more than 50 percent of total IP traffic by that time.

A new report by ABI Research says more than 1 billion Wi-Fi 6 chipsets will be shipped annually by 2022 – only three years after the first client devices are expected to be released. In comparison, yearly shipments of 5G devices are expected to reach 1 billion six years after first commercial 5G launch.

If you have been following the worlds of cellular and Wi-Fi for decades it has always been Wi-Fi that moves a lot faster than its 3GPP based brethren (ie. 4G / 5G).

The report says that 'Wi-Fi will retain its connectivity crown in the 5G era', even though significant adoption of Wi-Fi 6 is not expected to happen until 2020 once the standard becomes fully ratified.

ABI Research's senior analyst Andrew Zignani cites 'enormous growth in Wi-Fi-enabled devices' and 'Wi-Fi 6's ability to enhance performance in dense environments' as key drivers for Wi-Fi 6 adoption.

Zignani also applauded the Wi-Fi Alliance's recent adoption of the new naming convention for Wi-Fi generations as Wi-Fi 5, Wi-Fi 6, etc. "The greater awareness of Wi-Fi devices strengths and limitations could also drive competition and greater incentivization in the market," Zignani said.

5G use cases

There are many use cases for 5G – from vehicle-to-vehicle or vehicle-to-road communication, to massive machine communications – all while on the move. Some Wi-Fi deployments aren't possible due to range or broad coverage requirements, for example ship to shore communication, even when the ship is within the boundaries of the port. In this case, whether private LTE or general public LTE coverage is used depends on the requirements of the enterprise.

It is expected that smart motorways and autonomous vehicles will drive the adoption of 5G as always on, super-fast and robust, mobile technology is required.

5G allows a user to run parallel services with no loss of quality. In isolated villages, medical treatment becomes possible as the doctor can treat the patient remotely. Education, away from the classroom, is shareable around the world. This is true even in areas not supported by an enterprise-class network with super-fast broadband access.

5G will support communication in ultra-dense deployments, such as city networks, and mission-critical related communications, such as energy or utility monitoring and control.

Wi-Fi use cases

Enterprise networks

Wi-Fi is now the de-facto standard for radio communications for most enterprises. Most enterprises have moved from hotspot Wi-Fi to ubiquitous Wi-Fi across the enterprise, providing seamless connectivity and access to resources. This dependence on Wi-Fi is increasing the demand placed on enterprise networks. Networks need to provision faster speeds and more capacity for the challenges created by delivering BYOD access and support of bandwidth intensive applications such as video, which are impacting all businesses.

IoT requirements

With the internet of things (IoT) mega trend, the connected device explosion will put an even greater strain on the Wi-Fi network. Many of these devices might be low bandwidth, but they still require a certain quality of service level and infrastructure reliability. With Wi-Fi 6, the increased bandwidth provides simultaneous connectivity for more devices per access point than previously possible.

Education

As early technology adopters, university students with their multiple devices are the most likely first users of Wi-Fi 6 capable devices. Many of these devices are Wi-Fi only (for example, tablets), yet the students expect to be connected at all times.

Connected learning is now the standard for all education establishments. Most larger university facilities now must provide connectivity to thousands of staff and tens of thousands of students, each of them using multiple devices. The number of connected devices is expected to grow as students invest in more wireless technology, and more devices and objects become Wi-Fi-only enabled (IoTs). To attract students to a university, one of the top requirements is access to high speed quality Wi-Fi, and students can be either persuaded or dissuaded from joining a university based on this element alone.

Healthcare

Healthcare organizations have moved from Wi-Fi for computers on wheels (CoWs), to supporting mobile connectivity for heart monitors, oxygen monitors and smart beds, while providing real-time access to x-rays, MRI scans, tablets, and electronic medical records (EMRs), and of course internet connectivity for patients.

This has moved the Wi-Fi deployments for healthcare from a static environment with Wi-Fi in wards only to completely pervasive Wi-Fi across the hospital campus. Furthermore, new developments in location-based services, wayfinding and most importantly asset tracking, will continue to drive the deployment and expansion of enterprise Wi-Fi in these types of healthcare organizations.

Government

Government authorities have taken a conservative approach when deploying Wi-Fi networks with security being of highest importance and Wi-Fi always considered unsecured. Security standards have changed over the years with the most recent standard being WPA3. Government bodies now deploy the highest security level using multi-factor authentication for access and certificate-based security following the 802.11ax standard. In many cases, the wireless infrastructure is more secure than the wired. While government bodies were traditionally a very static environment, the move to unified communications and collaborative working has changed the dynamic and now there is a need for an always on, secure and controlled mobile Wi-Fi architecture.

Smart cities

The move to smart cities will require both 5G and Wi-Fi to coexist and complement each other. Smart cities incorporate IoTs, building management systems, security cameras, traffic sensors, pollution monitors and citizen Wi-Fi. In this scenario, Wi-Fi connected devices would tend to be more fixed than mobile, include building management, CCTV, sensors and monitors. The connected vehicles, will use 5G technology, and the citizens themselves will use a mixture of Wi-Fi when in the home or building and 5G when travelling around the city.

Hospitality

In an increasingly competitive hospitality landscape, the guest experience has become one of the top differentiators. Most guests bring several devices with them, and they just want to connect, relax and feel at home. To make this happen, Wi-Fi Is required.

Hotels need to go beyond guests and staff devices. With the explosion of IoT, hotels need to be hyper-connected, mobile and secure. They need to securely support IoT protocols, such as Zigbee for door locking systems, over the existing wireless LAN infrastructure.

Transportation

Transportation enterprises vary greatly, from ports, road and rail to airports and airlines. Each have their own defined needs for Wi-Fi, and most likely will use both 5G technology and Wi-Fi going forward.

For example, airports use Wi-Fi to enhance the passenger experience by offering free Wi-Fi - and pushing advertising to the passenger with offers, etc. Wi-Fi, however, is used for more than passenger convenience. It is used by airport operations, baggage handling and security.

Airports are also embracing IoT to increase safety, security and operational efficiencies, which is also driving the demand for Wi-Fi. Add to this the push to use location-based services to increase passenger satisfaction with wayfinding, geo-notifications of offers, and to track assets to support passengers with reduced mobility (PRM) will cause an exponential growth of Wi-Fi and complementary technologies.

Private LTE adoption in airports is gaining traction since an airport is vast in size and public LTE does not necessarily cover the whole area. Private LTE allows the airport operator to secure and guarantee the quality of signal and service across the airport apron, extending the digital services to the ground crew, air crew, operations, logistics and security.

Summary

Alcatel-Lucent Enterprise believes that most enterprise wireless connectivity use cases will continue to be addressed by Wi-Fi technology due to:

1) Availability of 5G technology
2) Dedicated bandwidth for Wi-Fi
3) Unified LAN and WLAN infrastructure brings more control and security of company assets
4) Cost of Wi-Fi technology is dropping
5) Wi-Fi is greener
6) Proliferation of Wi-Fi devices in enterprises
7) Unlicensed spectrum

With the introduction of Wi-Fi 6, which will be commercially available before major rollouts of 5G – the WLAN is here to stay. A huge advantage over 5G is the fact that Wi-Fi has always been backwards compatible, meaning enterprises do not need to replace all their assets when moving to Wi-Fi 6, whereas with 5G a new device will be required.

There is no compelling technological reason to replace Wi-Fi if you already have invested in Wi-Fi 5. However, enterprises need to start planning. The expected exponential growth of devices and objects that will connect via Wi-Fi will mean that you will need to deploy Wi-Fi 6 in the next two to three years to remain competitive and meet user expectations. Wi-Fi 6 is faster, more robust, and can support an increasing number of Wi-Fi devices simultaneously, with repeaters becoming more common and mesh networking on the way in the forthcoming IEEE 802.11ax generation of Wi-Fi technology, which is being branded as Max Wi-Fi.

Like 3G or 4G, 5G signals are a shared resource. Whereas Wi-Fi MIMO technology ensures dedicated bandwidth over Wi-Fi. If you have a hundred homes served by a single 5G base station, that 1 Gb/s gets distributed, averaging out to 10 Mb/s to each home. If we then expand this to a university case, we have tens of thousands of connected devices potentially connecting to 10 base stations, therefore, the need for robust, fast, and secure Wi-Fi is self-evident. If enterprises ask for gigabit connectivity they expect gigabit speeds. The only way to ensure that you provide the bandwidth needed is to own your own infrastructure, with Wi-Fi 6 being at the heart of the solution.

5G remains an infrastructure that is owned by carriers, therefore directly connecting enterprise devices or IoTs to such an infrastructure raises a security conversation. Wi-Fi benefits from the single unified LAN and WLAN infrastructure, owned by enterprises. Network access control (NAC), Deep Packet Inspection (DPI) and IoT containerization technology are existing assets that protect enterprise intellectual property.

If a company is seeking an equivalent security infrastructure with 5G, they should look at purchasing their own private 5G infrastructure. In that case, the CAPEX cost of 5G base stations is much higher than Wi-Fi access points. The cost to install new 5G towers/base stations is high and includes civil engineering, digging of trenches, laying of new cables, concrete and the actual installation of the tower itself. This is one of the main reasons that a full 5G rollout will take many years.

Last and not least, the Wi-Fi 6 standard, implemented in Alcatel-Lucent Enterprise access points, delivers some green benefits. First, reduced client polling compared to 5G, enables less power consumption by the APs. Second, automated power adaptation reduces power consumption of APs and battery usage for devices. A new target wake time (TWT) feature means your smartphone, laptop, and other Wi-Fi-enabled devices should have longer battery life too.

5G technology will no doubt become the defacto cellular technology of choice in the coming years, but it will be many years before it provides the coverage that users and enterprises will need.

Wi-Fi 6 is the technology that enterprises must consider for supporting the explosion of IoT devices, user mobility, security and control. Enterprises can deploy Wi-Fi 6 now while protecting the investment they have made in Wi-Fi connected devices. Upgrading to Wi-Fi 6 is seamless and will protect the investment made for many years to come.

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