



The independent global standard for measuring
real-world mobile network experience

The State of Wifi vs Mobile Network Experience as 5G Arrives

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VP Analysis

Report Facts



Report Location
Global



Sample Period
Aug 5 - Nov 3, 2018



Measurements
63,223,150,678



Unique Devices
7,788,215

Key Findings

Landscape

In 33 countries smartphone users now experience faster average download speeds using a mobile network than using Wifi according to OpenSignal mobile analytics.

The range of countries where mobile proves faster vary widely from richer countries such as Australia, where the benefit of using mobile was greatest where smartphone users experienced average download speeds 13 Mbps faster on mobile than Wifi, and France (+2.5 Mbps) to markets across every continent, for example: Qatar (+11.8 Mbps); Turkey (+7.3 Mbps); Mexico (+1.5 Mbps) and South Africa (+5.7 Mbps).

In three highly developed geographies – Hong Kong, Singapore and the USA – the mobile experience bucks the global trend and significantly underperforms compared with smartphone users' Wifi download experience with a slower mobile experience of -38.6 Mbps, -34 Mbps and -25 Mbps respectively.

The time smartphones spend connected to Wifi has no significant correlation with users experiencing faster Wifi speeds relative to those on mobile, because smartphones will automatically connect to known Wifi networks without including speed as a factor in their decision.

Outlook

Newer mobile network technology increases mobile's superiority: In 50 countries, 63% of those studied, 4G networks offer a faster smartphone download experience than Wifi, up from 41% of countries when compared with overall mobile download experience instead of 4G.

Just seven countries saw a faster experience on 3G, and even in those countries the speed advantage of a 3G mobile experience was modest, at best an increase of 3Mbps in Lebanon.

5G will accelerate the advantage of mobile technology because of the pace of mobile innovation and the dependency of Wifi network experiences on the quality of fixed network broadband deployments which are slow and expensive to upgrade with fiber to the premise (FTTP).

Implications

Mobile operators and smartphone makers must re-evaluate their Wifi strategies, especially around mobile offload, automatic network selection and indoor coverage, to ensure they do not accidentally push consumers' smartphones onto a Wifi network with a worse experience than the mobile network.

Background:

Why everyone has believed Wifi to be superior to cellular

There's long been an industry assumption that Wifi is better than mobile networks in almost every way. As a result, ever since the arrival of the earliest iPhone and Android smartphones around ten years ago, smartphones have routinely jumped on the nearest known Wifi connection and used it in preference to 2G, 3G or 4G mobile networks for data.

But now new OpenSignal mobile analytics indicates that mobile is no longer inferior to Wifi in every regard and the mobile industry must change a number of design decisions as a result.

The reason early modern smartphones made the choice to stop using cellular for data if a usable Wifi hotspot was nearby is simple to understand given the situation back then.

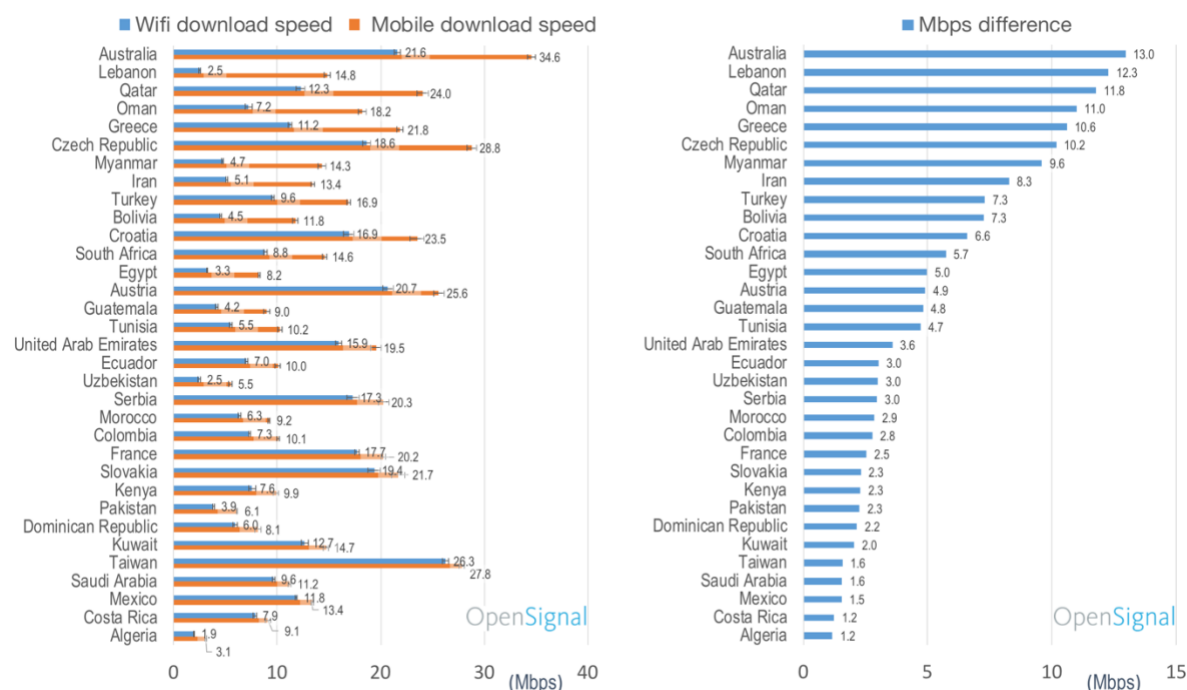
Ten years ago, Wifi:

- **Was faster than mobile almost all of the time.** The first iPhone only used slow 2G networks — so of course, Wifi backed by ADSL or cable modems running at many Mbps was faster. Even for later iPhones or Android smartphones, the mobile networks back in 2008/9 were only 3G, and were often overloaded by the sudden surge of smartphone sales.
- **Was cheaper, always.** Wifi in the home or office had no marginal cost for the users, but often mobile networks charged more for plans with more data volume or in some cases for the privilege of even having any mobile data.
- **Had much greater capacity.** With the exception of those on initial iPhone plans with unlimited data, smartphone users had to confront limited data volumes on mobile, but unlimited data when they connected to Wifi. And, many of the mobile operators that initially offered “unlimited” data with the iPhone soon backtracked.

Wifi was so important when the iPhone launched that some of the initial batch of exclusive iPhone mobile operators bundled a free public Wifi access plan with the iPhone mobile tariff, for example O2 in the UK and AT&T in the US.

Landscape:

In 33 countries, or 41% of those analyzed by OpenSignal, mobile delivers a faster download experience than Wifi



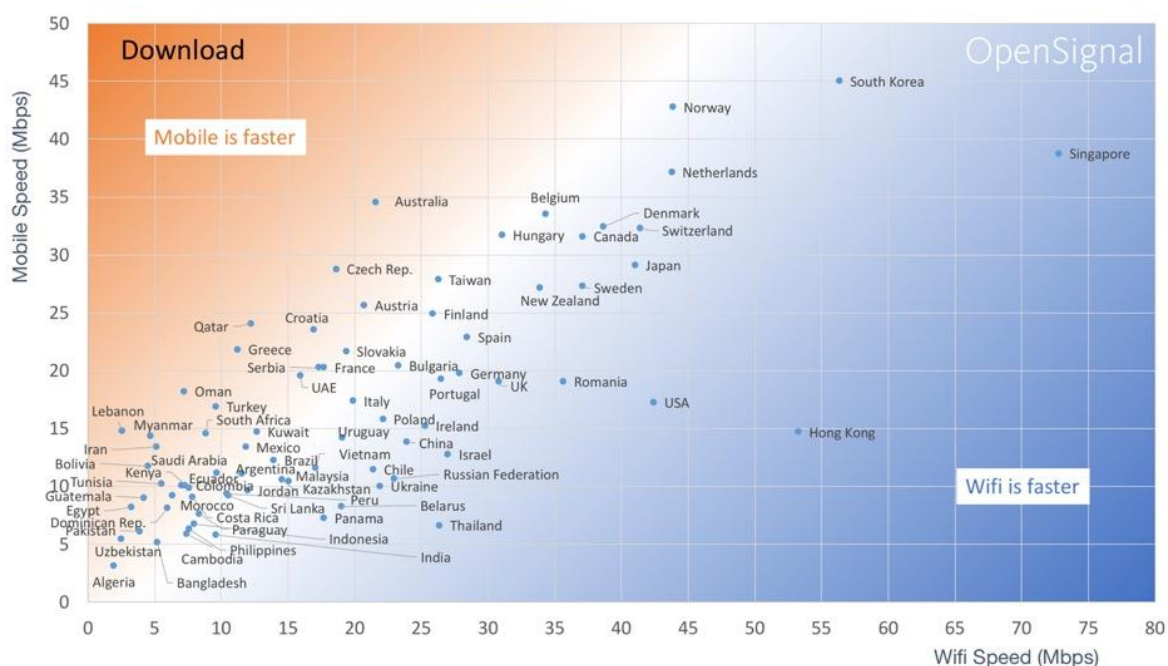
The world has changed dramatically since the dawn of the modern smartphone:

- **4G networks have launched.** This new network generation has dramatically boosted the quality of smartphone users' experience.
- **Almost everyone now owns a smartphone.** In mature smartphone markets, this is leading to concern of lower smartphone shipments affecting the revenues of smartphone makers.
- **Mobile video consumption has exploded.** Smartphones have become a mainstream way to watch TV, to such an extent that Netflix is even trialling mobile-only tariff plans and OpenSignal has pioneered new mobile video experience analytics.

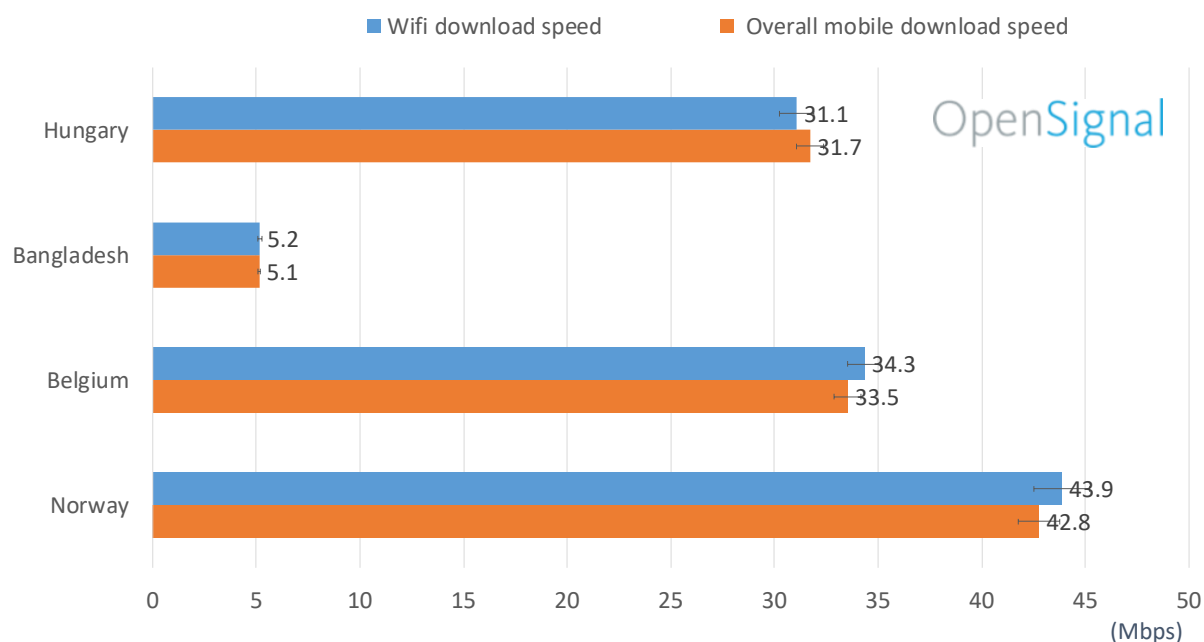
Yet, the perception that mobile networks are inferior to Wifi has persisted, wrongly.

OpenSignal's mobile analytics data demonstrates that in 41% of the 80 countries OpenSignal studied for this report – representing 33 countries – the average mobile download speed experienced by smartphone users is now faster on mobile networks than on Wifi.

Across countries there is an enormous range of download speeds experienced



The countries where mobile offers a faster download experience for smartphone users cover a wide range of categories of country. As a result, it appears to be hard to categorize this set of countries: They range from richer markets with industrialized economies such as Australia, the Czech Republic, Austria and France... to countries across every continent, and a wide range of demographics, income, state of development such as UAE, Turkey, Kenya, Myanmar and Mexico.



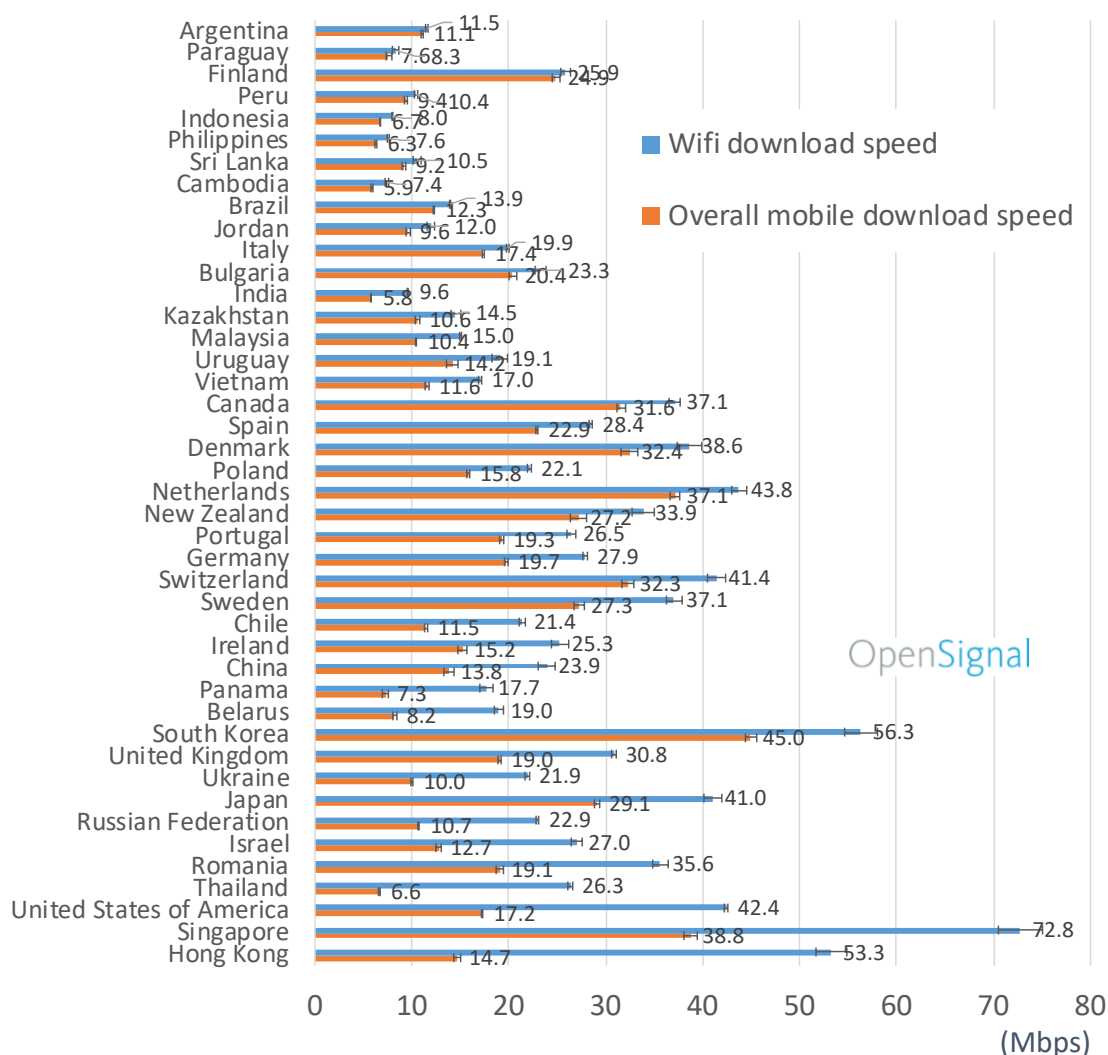
In four countries – Hungary, Bangladesh, Belgium and Norway – there is no significant difference between the Wifi and mobile download speeds that smartphone users experience. We consider these

countries to be “dead heats” because the difference between the experience of Wifi and cellular is within the statistical confidence intervals we have calculated.

Such an equivalent download experience means:

- **There is no “speed reason” for smartphone users to switch network type.** When one type of network is faster, then users may choose to manually switch to that network type for the greater speed. But when the performance is similar on both Wifi and cellular, consumers have no reason to override their smartphone’s automatic choice.
- **Wifi experience is not being held back by fixed broadband quality.** Most Wifi depends on the quality of a home or office broadband connection. Therefore, if that fixed network is slow, or otherwise performs poorly, then it will become a bottleneck which also affects the Wifi experience.
- **Mobile operators are using fixed networks effectively to support cellular networks.** Raising mobile network capacity, and hence usable speed, often involves deploying more fiber optic cable to each cell site to improve “backhaul” capacity. Or, in other words, fiber improves the ability of the site to support more simultaneous smartphone users. Deploying fiber to cell sites tends to be easier in locations where there is already a high-quality fixed network that has been widely deployed for other reasons, for example to connect homes or offices.

Wifi offers smartphone users a faster experience in countries where fixed networks are relatively strong



Today, there are still many countries where Wifi continues to offer a faster download experience for smartphone users, although this is likely to change as newer mobile network generations launch imminently.

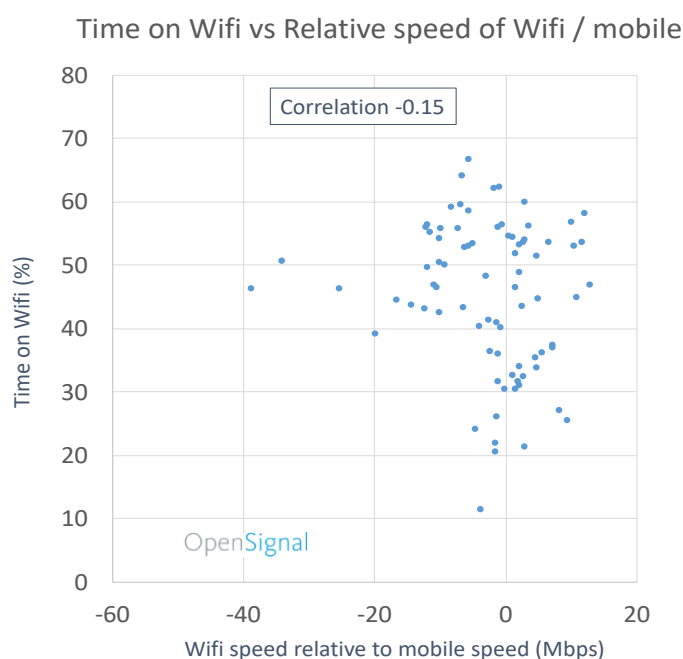
Smartphone users' Wifi experience depends not just on the quality of the Wifi but also on the fixed network which Wifi depends upon for Internet access. The quality of fixed networks varies greatly across countries. Typically, fixed connections will be provided by a telecom operator or cable TV provider using technologies such as ADSL; hybrid fiber solutions such as VDSL, or DOCSIS; and in relatively rare occasions in most countries a fully fiber option connection connects a home or office.

Wifi also has its own special challenges such as congestion of the unlicensed airwaves which Wifi uses, as anyone can operate a Wifi network in the same location at the same time, leading to unpredictable and often poor Wifi performance. Often, in busy urban locations there can be ten to twenty active Wifi networks all trying to use the same spectrum.

By comparison, mobile networks operate in spectrum where the operator pays a fee, or license, to have the exclusive use of a set of frequencies which should in theory make the network experience more predictable and consistent than Wifi.

However, these Wifi challenges due to unlicensed spectrum use apply in every country. As a result, they are not likely to have caused the wide differences in the relative download experience delivered by mobile networks and Wifi to smartphone users which OpenSignal's analytics demonstrates.

Smartphone users do not spend more time on Wifi where the Wifi experience is better

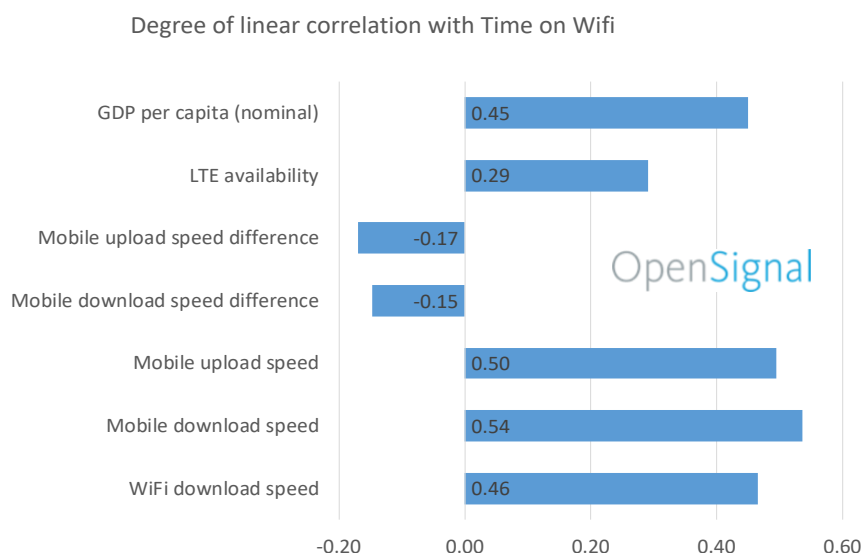


OpenSignal analyzed numerous factors to understand why smartphone users spent longer connected to Wifi. Intriguingly, we found no significant correlation between having a relatively faster download or upload experience on Wifi and smartphones spending longer connected to Wifi networks. On this measure, a strong correlation is represented by a value near to either +1 or -1, while a figure close to 0 indicates little or no correlation.

This lack of connection between having a better Wifi experience than mobile, and smartphones spending longer connected to Wifi, is most likely because modern smartphones automatically connect to known Wifi networks without asking the user. Smartphone designers made this decision long ago because they assumed that Wifi connectivity was superior to mobile networks.

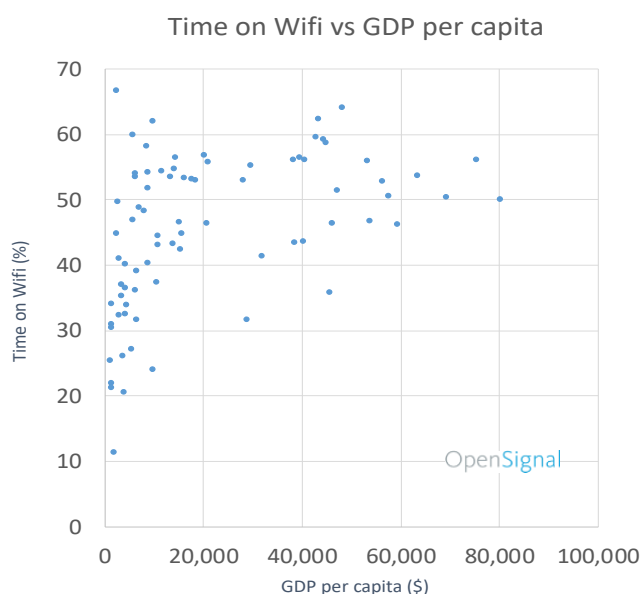
Per capita GDP is a better indicator of Time on Wifi than relative speeds

However, there is a correlation between higher per capita GDP and more time spent on Wifi. This is because the Time on Wifi metric is more affected by the presence of a suitable Wifi network than by consumers' decisions to connect each time to Wifi. And Wifi is more likely to be present in countries with more developed infrastructure overall because both mobile networks and individual consumers are more able to invest.



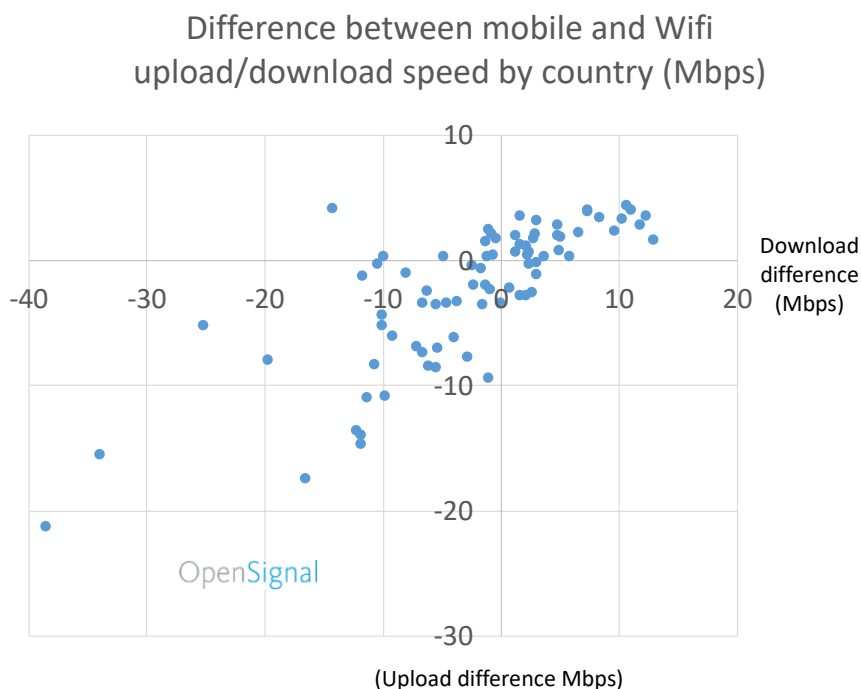
Source: OpenSignal (11/2018) & GDP data from World Bank.

There is also a correlation between other indicators of a more developed country infrastructure that is linked to higher GDP levels, such as: overall average mobile upload and download speeds; overall Wifi download speeds; and LTE availability which indicates the time smartphones spend connected to LTE rather than older mobile network technology generations.



Source: OpenSignal (11/2018) & GDP data from World Bank.

Upload speed experience trend mostly follows download



In most countries where smartphone users experienced faster download speeds on mobile networks, they also experienced faster upload speeds on mobile. In only four countries did smartphone users experience faster downloads, but not also faster upload speeds.

For consumers keen to share large video or many photos, in seven countries smartphone users enjoyed faster upload speeds on mobile even though they did not also have a superior download experience.

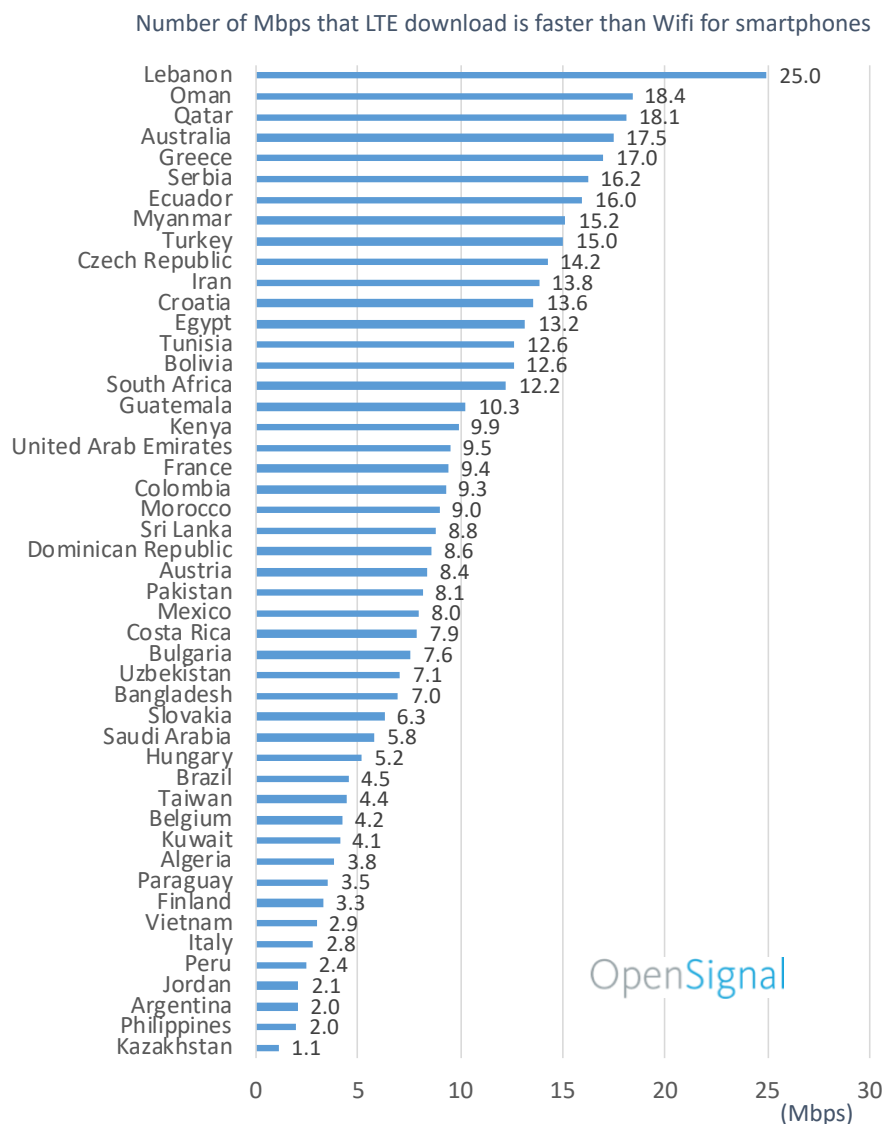
There is a strong relationship between the upload and download experience because both are covered by the same cellular or

Wifi standards. Usually, improving the download experience also leads to an improvement in upload, although upload speeds are normally slower than download on cellular networks.

Upload only faster on mobile	Upload & Download faster on mobile
Argentina Chile Indonesia Israel Paraguay Peru Sri Lanka	Algeria Australia Austria Bolivia Colombia Costa Rica Croatia Czech Rep Dominican Rep Egypt Greece Guatemala Iran Lebanon Mexico Morocco Myanmar Oman Pakistan Qatar Saudi Arabia Serbia Slovakia South Africa Tunisia Turkey UAE
Upload & download faster on Wifi	Download only faster on mobile
Belarus Brazil Bulgaria Cambodia Canada China Denmark Finland Germany Hong Kong India Ireland Italy Japan Jordan Kazakhstan Malaysia Netherlands New Zealand Philippines Poland Portugal Romania Russian Federation Singapore South Korea Spain Sweden Switzerland Thailand Ukraine USA Vietnam	Ecuador France Kuwait Taiwan

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With LTE, in 63% of countries smartphone users enjoy faster download speeds on mobile than on Wifi



With 4G, or LTE, there is a much longer list of countries where smartphone users have a faster download experience on mobile networks than on Wifi. In Australia, on average smartphone users receive 17.5 Mbps greater speed on LTE than on Wifi. There are similar increases across the board.

The countries where smartphone users have a faster mobile experience using 4G, but do not overall on mobile, include major mobile markets such as Bangladesh, Brazil, Finland, and Vietnam.

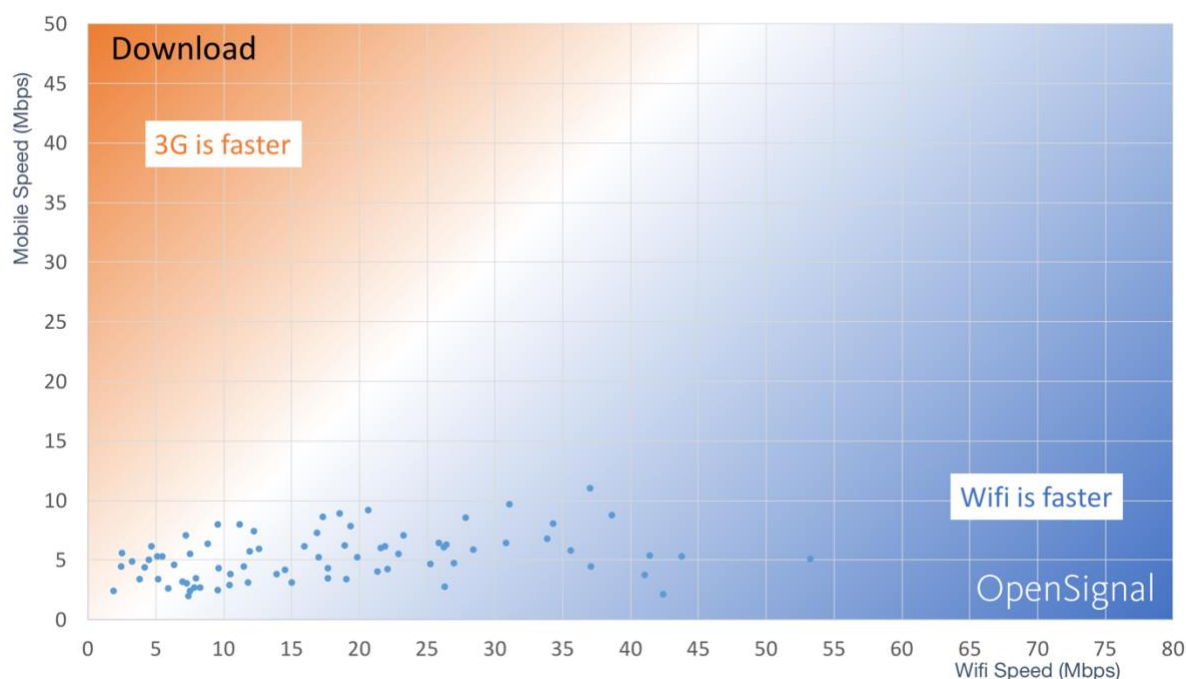
There are a number of reasons why the cellular experience is faster:

- **Relative ease of cellular deployments.** It's easier and usually cheaper to roll out new cellular standards fast and improve cell site backhaul than it is to run fiber to every premise to enable faster Wifi Internet access. Laying new fiber often requires special planning permission, and requires a significant amount of labour to lay in existing ducts or poles, and often requires new digging.

- **Smartphone design priorities do not focus on Wifi.** Smartphones are extremely complicated devices with enormous pressures to include almost every conceivable technology in a tiny volume, with a low weight, without using too much battery power, and without adding too much to the bill of materials cost. Smartphone makers must make trade-offs and decide where to focus. And smartphone Wifi antennas and other Wifi hardware has been a lower priority than almost all other parts of smartphone hardware designs such as cellular modems, cellular antennas, display, audio, etc.
- **5 Ghz effect.** Many smartphones do not work on 5 Ghz Wifi, so are limited by congestion on the extremely busy 2.4 Ghz unlicensed spectrum band also used for Wifi.

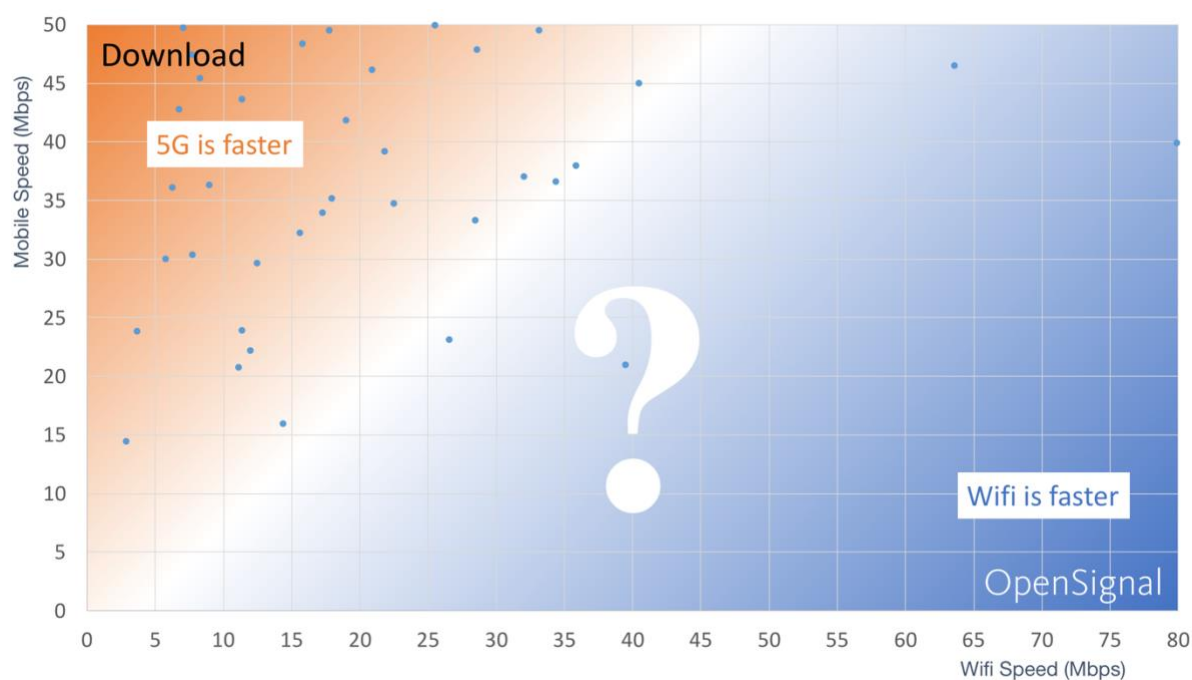
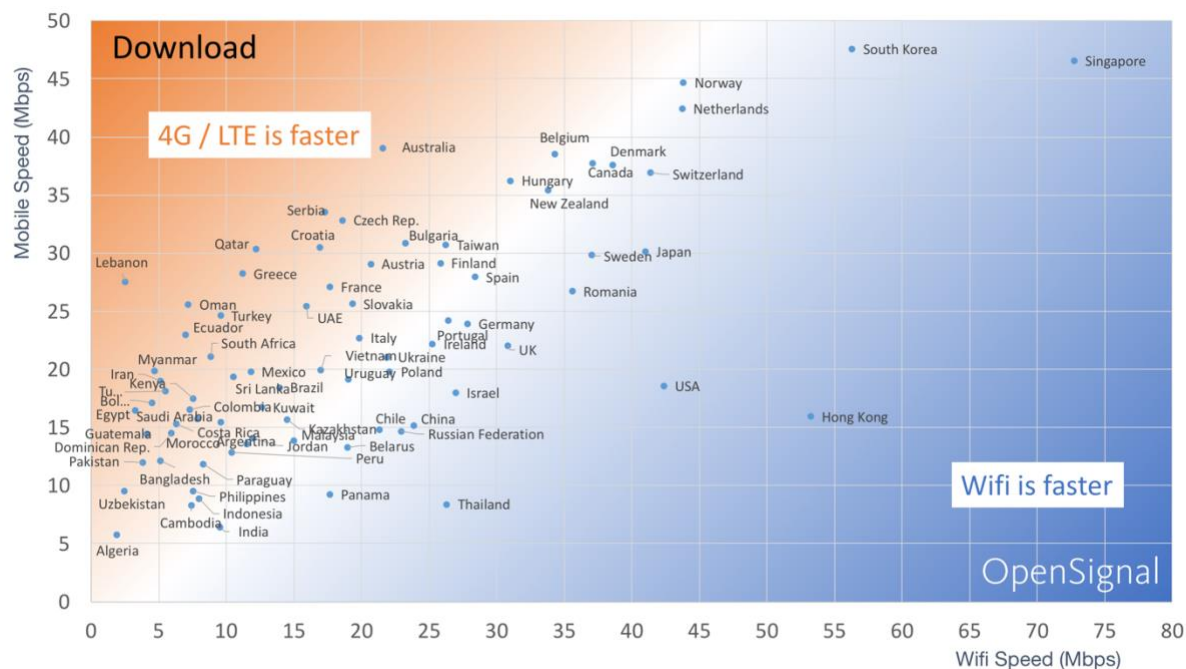
Outlook:

New mobile network generations will increase mobile's advantage



On third generation mobile networks there are very few countries where mobile delivers a faster download experience than Wifi for smartphone users. Older mobile network technology offers lower maximum throughput speeds, with a theoretical maximum download speed of just 0.042 Gbps – compared with 1.4 Gbps for current 4G LTE technology – despite numerous improvements from the original 3G standard, released in 1999. Smartphone users' average speeds are also considerably lower on 3G than on more modern mobile network generations.

5G will follow past 3G to 4G evolution trend and accelerate mobile experience



4G LTE networks enable smartphone users to experience much faster download speeds than do 3G networks. This is why there are now so many countries where on average mobile delivers a faster experience than does Wifi for smartphone users.

The pace of innovation is faster in the mobile industry than in almost any other industry. This will continue with 5G rollouts which help mobile to leapfrog the experience of Wifi in countries where

operators are slow to roll out full fiber to the premise connections because of capital cost concerns or logistical issues such as planning approvals.

New 5G networks offer many advantages for mobile broadband which smartphone users will benefit from, including:

- **Greater speeds, especially peak speed.** Operators are targeting usable speeds in the range of 1-3 Gbps with 5G technologies.
- **Tremendous capacity increase.** Many of the new frequency bands are high frequency, which offers a lot more capacity to support more smartphone users; or, in practice, because the number of smartphone users has plateaued, a lot more data consumption per smartphone user at higher speed.
- **More spectrum choices.** As new frequencies arrive, mobile operators look to utilize the most efficient technology, which is now 5G New Radio (5G NR). Some of the new bands such as those targeted by T-Mobile US – for example 600 Mhz – will deliver wide high quality mobile broadband coverage; others in the mmWave, which is the focus of other US operators such as Verizon and AT&T as well as many Asian operators, will deliver extremely high speed and capacity but as it requires almost line of sight, it will be poor for indoor use. In Europe, operators' focus is mostly on "midband" 3.4-3.6 Ghz which offers a compromise between above fairly high capacity and reasonably good coverage.

Implications:

Operators must re-evaluate how to position mobile and Wifi

Now mobile often offers a faster experience than Wifi, everyone must re-think when and how to use Wifi to complement the mobile experience. In countries where Wifi is slow, there will be one major less reason for consumers to choose Wifi over cellular for the best experience.

Operators must re-evaluate their Wifi assumptions:

- **Operators must become smarter with Wifi offload strategies.** If not, they risk worsening aspects of their users' experience, rather than improving it. There will be ongoing cost and capacity reasons for offload, but operators must take care on execution.
- **Relying only on Wifi for indoor experience will not be viable.** Consumers will increasingly override their smartphone's automatic Wifi choice, and instead select cellular, to find the fastest download speed. If when they switch off Wifi they find the mobile experience to be poor, it will reduce satisfaction levels. Operators need to deliver good in-building mobile network coverage to be successful.
- **Devices will connect to Wifi and mobile at once.** Assumptions that users will connect to one network type at a time should be shelved, because smartphone designs will increasingly allow the use of both Wifi and mobile network technologies simultaneously to deliver the fastest data experience. Samsung already offers this feature on its flagship smartphones, and it will become a more common option.

Wifi will continue to co-exist with mobile, but the relationship will change

Over the years, the position of Wifi and mobile technology has been presented by many vendors and industry experts as a struggle to the death. The reality is that both will survive because Wifi continues to have a few useful benefits over mobile technology.

Wifi's ongoing advantages will be:

- **Lower cost.** Wifi uses free unlicensed spectrum and Wifi hardware is cheap and widely adopted.
- **Wide support across categories.** Wifi is a ubiquitous feature across all mobile, smartphone and most smart wearable devices.
- **Capacity.** While Wifi is constrained by congestion on unlicensed spectrum and by the fixed networks which enable Wifi to connect onto the Internet, many Wifi networks have less limits on capacity than busy mobile base stations at high traffic locations.

Wifi no longer has a guaranteed advantage over mobile in the speed experience it offers smartphone users. With 5G, there will be many more countries where mobile delivers a faster experience than Wifi. But Wifi still has a role.

Operators, device makers and consumers need to alter the relationship they have with Wifi and mobile to reflect the improvements in the mobile experience now and in the immediate 5G future.

About OpenSignal

OpenSignal, a mobile analytics company, is the independent global standard for measuring real-world mobile network experience. Using billions of measurements collected from tens of millions of smartphones, we analyze real-world mobile network experience at the largest scale and frequency in the wireless industry: by operator and by country, regionally and worldwide. We believe measuring how the network performs directly through users' eyes is key to building better wireless networks. Our insights are used across the industry by mobile operators, telecoms regulators, equipment manufacturers and analysts.

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