

5G – An Opportunity or Threat for MVNOs?





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5G – An Opportunity or Threat for MVNOs?

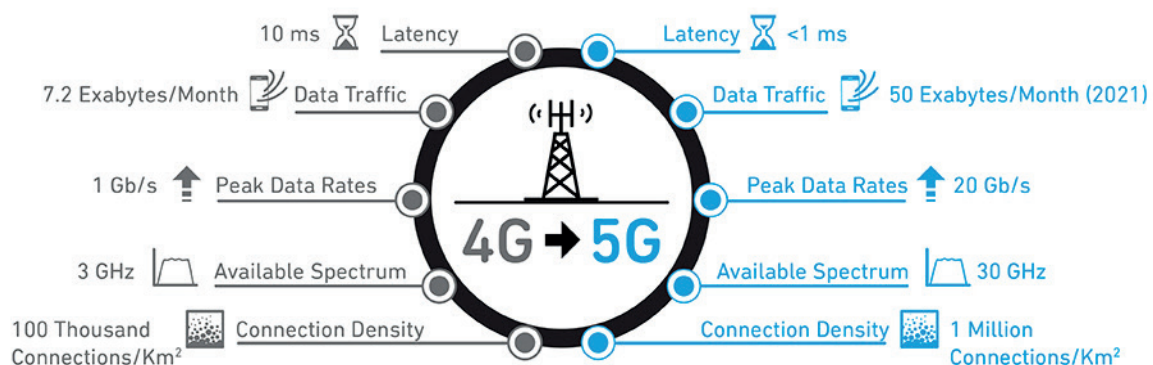
After years of hype, the UK's first 5G network has gone live and with announcements by all the major operators of their various 5G launches, we are taking this opportunity to reflect upon how this may affect the MVNO industry. This paper examines some of the questions the MVNO industry is beginning to ask both itself and their Host MNOs.

It is clear there is a genuine opportunity for 5G to drive the transformation of businesses in ways which have never been possible before. The telecom industry has all the technical capabilities to succeed and we will start to see this play out in the form of new service-enablement platforms providing bespoke 5G connectivity, virtualization, open APIs and other 'market led' developments that have the potential to lead the digital transformation of industry.

We position this paper in the form of "questions" because, like us, the industry is still searching for clear answers as to the use cases and benefits of 5G, particularly when analysing what is feasible within the radio network constraints of 5G technology. The subject is still evolving rapidly and there is little available in terms of concrete data upon which to base a firm conclusion. So in this paper we set out what we feel is an accurate distillation of the current state of play to help MVNOs begin preparing for or, at least, begin to think about how the advent of 5G will impact their businesses, both today and in the future.

To start with, let's remind ourselves of what 5G actually means in terms of delivery at a technology level:

Comparing 4G and 5G



Source: Qorvo Inc.

Deloitte Global predicts that 2019 will be the year in which fifth-generation (5G) wide-area wireless networks arrive in scale. Here in the UK, MNOs are implementing their 5G networks but cell site deployments are small in scale. EE, for example, has announced the launch of its 5G network in major cities across the UK including London, Edinburgh, Cardiff, Belfast, Birmingham, and Manchester. However, the number of cell sites in each city is limited, less than 10 in some cities, meaning consumer impact will be minimal until the rollout gains pace. Globally, there were 72 operators testing 5G in 2018, and by the end of 2019, we expect 25 operators to have launched

5G service in at least part of their territory (usually cities) with another 26 operators planning to launch in 2020, more than doubling the total. In the majority of cases, we see these 5G network rollouts as being mainly about getting to market first from a consumer acquisition and marketing standpoint. There is, however, no doubt that 5G is now top of the list for most MNOs' network strategy and many of these initial network deployments will provide valuable insights for how 5G will be efficiently rolled out en masse for the benefit of consumers and industry.

5G networks are obviously one enabler for 5G but the other is obviously 5G-enabled handsets. We expect about 20 handset vendors to launch 5G-ready handsets in 2019 (with the first available in Q2), and about 1 million 5G handsets (out of a projected 1.5 billion smartphone handsets sold in 2019) to be shipped by year's end. One million 5G modems (also known as pucks or hotspots) will be sold, and around a million 5G fixed wireless access devices will be installed.

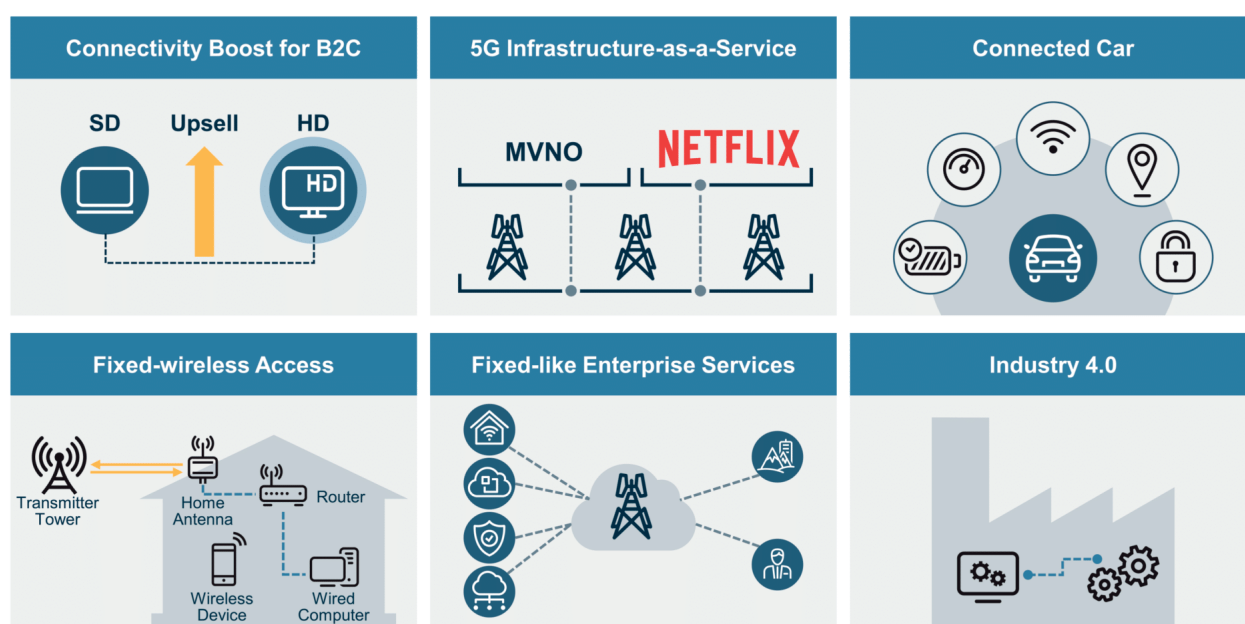
There has been a lot of industry buzz regarding how 5G technology will unlock a myriad of new segments / industry verticals for both MNOs and MVNOs, both consumer and industry. However, it is our opinion that in the short to medium term, i.e. 2-5 years, there will be no "new" target segments

or industry verticals enabled, rather potential for deeper penetration of existing segments with new services or better performance of existing services. Our opinion is rooted in the belief that 5G access technologies have not insignificant limitations that will restrict use cases until the technology matures and use cases are better tested.

In a recent GSMA paper, they put forward the argument that *"enhanced mobile broadband (eMBB) will be the key proposition in early 5G deployments and will drive increased performance, functionality and efficiency across society. This is the clearest, potential 5G use case and will support the delivery of high definition video (e.g. TV and gaming), immersive communication (e.g. video calling and augmented & virtual reality) and smart city services (e.g. video cameras for surveillance)."*

Effectively this suggests that the first wave of 5G use cases will be more of the same but with alternative delivery methods, i.e. delivering in home internet access via Fixed Wireless broadband over 5G versus wired connectivity. With IoT, especially industrial automation applications and automotive applications will come later.

We see this opinion repeated in the business space where it is forecast that the provision of services to



Source: Inform 2018

enterprises will use the same underlying platform as providing services to consumers. It is becoming clear that enterprises are not convinced that telecom operators can meet their needs, and as a result, are building out their own private networks. Equipment providers such as Nokia, Ericsson, Huawei and Samsung are already offering private LTE solutions for industrial applications. For example, in November 2018, car manufacturers VW, Daimler and BMW approached the German spectrum authority BNA to express their interest in private 5G networks.

This is indicating that an alternative market-driven approach, in which the needs and wishes of the customer are central to the design and delivery of products and services, is coming to the fore. This approach requires excellent products and services based on a deep understanding of client needs, combined with top-level customer-service which is

well aligned with the MVNO business model and their understanding of delivering to niche segments, and offers the opportunity to work with enterprises in providing dedicated, tailored, MVNO solutions.

This means in the 5G era, that operator platforms will need to support massive IoT, network slices using virtualised network functions, and common enablers and APIs. To fully address these business-oriented opportunities, operators will need to focus on business-to-business (B2B) and business-to-business-to-consumer (B2B2C) business models.

Whilst we do not see many “new” segments, we do find that operators see opportunity in many industry verticals. For example, the automotive sector and its progress towards driverless cars, is a much-discussed example of an industry that could benefit from 5G’s superior capabilities.

Consumers' perception of activities that simplify health management



Source: Ericsson ConsumerLab, From healthcare to homecare 2017

Base: 4,500 smartphone mobile broadband users, across Germany, Japan, South Korea, UK, US, aged 18-69

This presumes that the operators can overcome the ROI challenges of deploying the required network infrastructure.

Other existing segments and verticals that can benefit from 5G will be in manufacturing, healthcare, entertainment.

We have read and heard that the IoT will change everything and whilst we agree that IoT remains an attractive opportunity for 5G, operators will still need to rely on current cellular IoT standards such as NB-IoT in the early 5G era. It will be later in the 5G lifecycle that substantive IoT business case(s) will become viable in their own right.

So, to reiterate, if MVNO trends follow the MNOs then we expect the initial target segments will be the

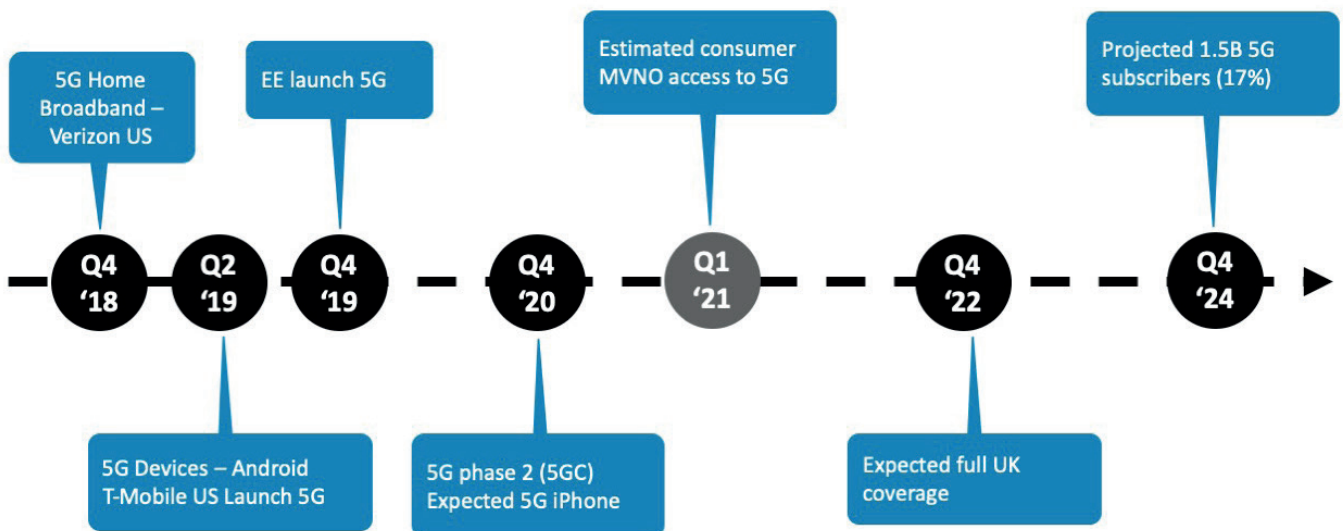
consumer market and ‘horizontal’ enterprise services (e.g. laptop connectivity). Whilst there is the potential to offer new services to industrial verticals – such as autonomous vehicles for the automotive sector, this is some way in the future and in fact might never materialise due to the significant infrastructure investment required. However we may see new innovations such as UAV (unmanned aerial vehicles, drones), developing into a potential new segment/application category.

This is a potential new segment, although most of the UAV applications have already been discussed and to some extent been served by existing communications technologies. However, the higher bandwidth and lower latency of 5G could enable drones to be deployed more widely in a variety of commercial and industrial applications.

What does this mean for operators' MVNO partners?

There will be an opportunity to develop IoT services whilst operators are focused on early-adopter price-insensitive consumer users, but it will be hard to get such services to work while operators are focused on other things. At the same time, 5G may prove a challenge to traditional MVNOs that simply want to offer their customers high bandwidth and low latency applications. This is due to the fact that mobile operators do not always make new technology available to MVNOs at the same time as to their own customers. Remember how long it took for MNOs to make 3G and 4G available to their wholesale channels? In the UK, there was a near 1 year delay for MVNOs to start launching 4G (Q3 2013) following the MNOs' launch. In extreme case, such as with MovilDia in Spain, a change of network provider was required. In November 2018 MovilDia moved from Orange to Vodafone Spain in order to offer 4G, a costly and disruptive undertaking to complete.

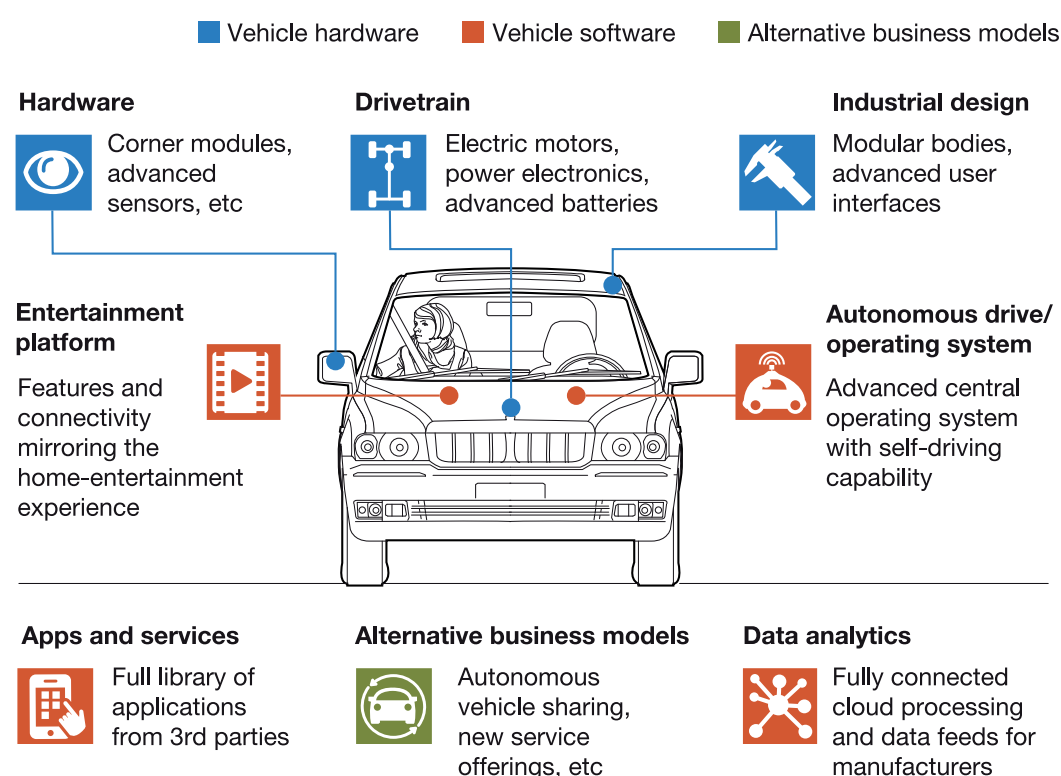
5G timeline and where does MVNO fits?



Automotive (especially autonomous driving and V2X) is one of the key mass market opportunities identified as being enabled by 5G. That's potentially another MVNO opportunity, especially if an MVNO can leverage the weight, and purchasing power, of the automotive OEMs or their partners. But it must be noted that device-to-device communications (required for some V2X use cases) has always been a tricky issue for the mobile industry; it's potentially in the LTE standard but not implemented by any vendor or deployed anywhere.

Also, there are other obstacles to automotive deployments such as competing technologies like DSRC, and also, the added layer of complication arising from regulatory issues with autonomous driving, etc.

In the future, cars will become computers on wheels as tech players move into the automotive sector to leverage their existing capabilities.



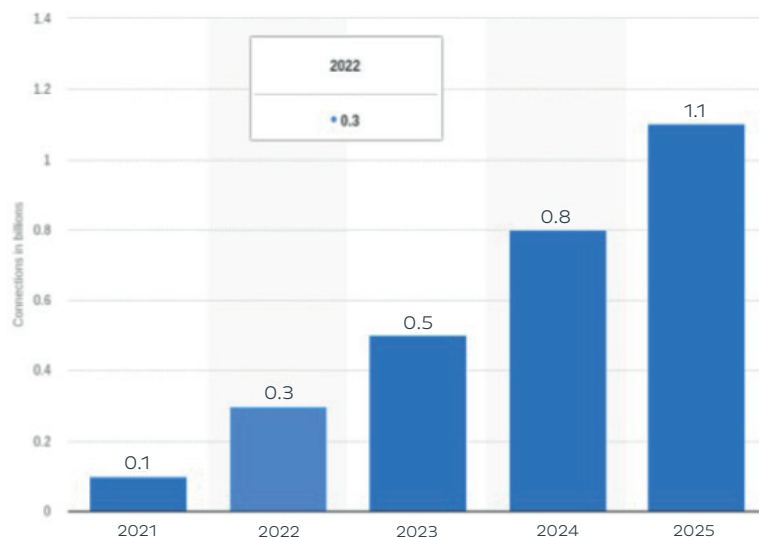
McKinsey&Company | Source: 35 expert interviews (across Asia, Europe, and United States)

Market Penetration

A further issue is that of dependency on the host MNOs, as that is directly linked to their deployment timeline of 5G MNO Network roll outs, which is discussed in more detail in the following section. We already know that 5G rollouts are underway and coverage density will increase over the next 2-3 years or even earlier in some markets. However, that is only half the story.

Market penetration is also driven by end user adoption and there are any number of forecasts by both suppliers and independent analyst firms, and inevitably at this early stage of 5G deployment, forecast of penetration and subscribers is more art than science, but here are some estimates by research companies:

Forecast number of mobile 5G connections worldwide from 2021 to 2025 (in billions)

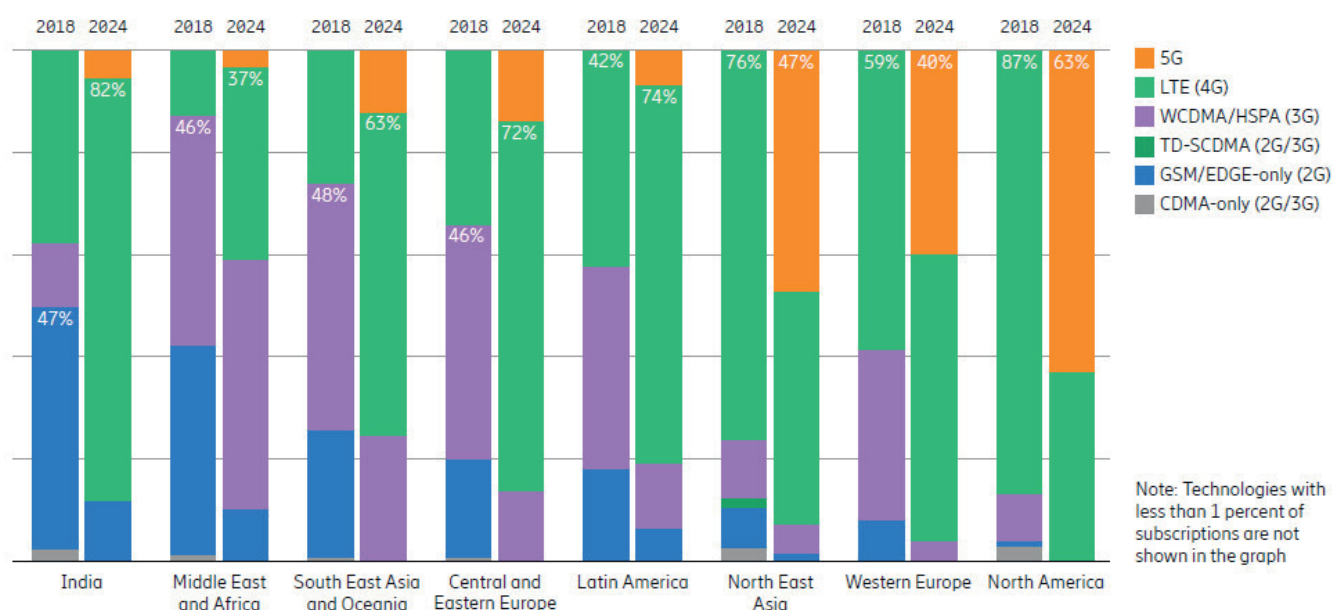


The statistic shows the forecast number of 5G connections worldwide from 2021 to 2025. the number of 5G connections is projected to grow to 1,1 billion by 2025.

Source: Statista 2019

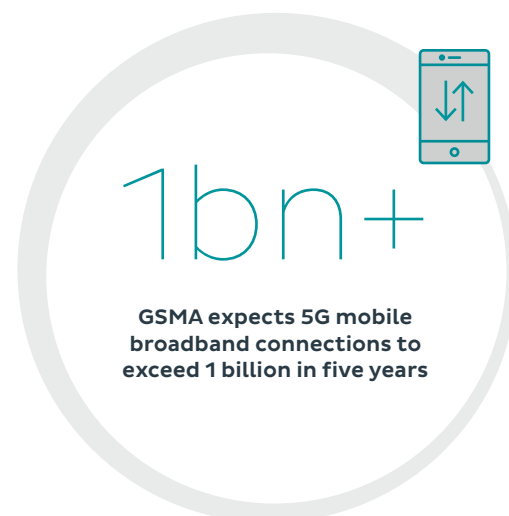
However, there is a more upbeat forecast from Ericsson with 5G accounting for 55% of connections in N. America and 29% in Western Europe by 2024.

Mobile subscriptions by region and technology (percent)



Source: Ericsson

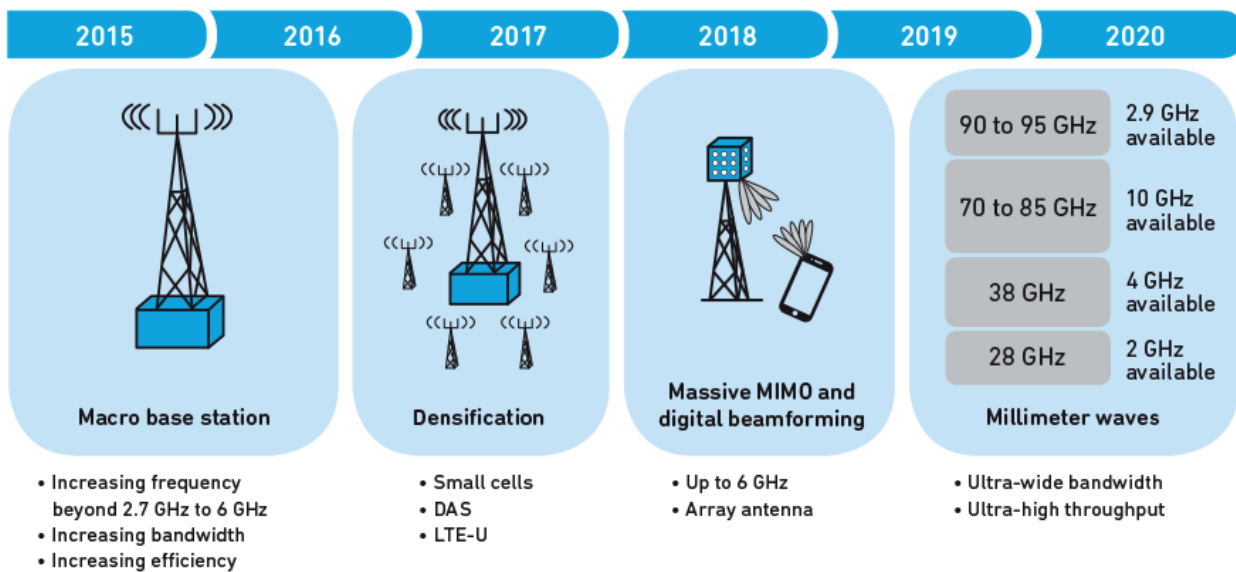
The GSMA expects 5G to scale rapidly after launch in 2020, with coverage reaching just over a third of the global population in five years, and 5G mobile broadband connections exceeding 1 billion, some 12% of total mobile connections, over the same timeframe. The same report indicates that if operators pursue new business models to improve data monetisation and unlock the enterprise opportunity then it is anticipated that they will be able to grow revenues globally at a CAGR of 2.5% during the 5G era, to \$1.3 trillion in 2025. The GSMA's aspiration is for "5G to drive annual revenue growth to 5%."



Infrastructure Challenges

Before we discuss in more detail the benefits to end users, and by extension to MVNOs, first there is a need to understand the huge challenge facing the MNOs in terms of rolling out 5G network infrastructure. Each successive rollout of “next generation” services has resulted in increasing technology challenges.

The evolution of 5G



Source: Qorvo Inc.

From a technology perspective, it is clear that 5G is beginning to crystallise. Early deployments will be largely evolutionary to LTE, supporting the ever-growing demand for high-bandwidth mobile data in dense urban and suburban areas, or used for specific use cases such as fixed wireless access (FWA) to extend the reach of fixed networks (e.g. Verizon’s proposals in the US).

However, this does suggest there is a parallel need for new business models to make the economics of 5G work as operators in the early stages selectively upgrade macro cell sites to 5G in key locations and where network capacity is under pressure. This will utilise the existing 4G infrastructure as a fall-back option. As a result, capex will remain relatively flat over this period, as operators seek to maximise cash flow.

If we look back at the deployment of 4G, and if we expect operators to roll out 5G at a similar rate, we can see 5G attaining a coverage of 34% of the global population – 2.6 billion people – by 2025. In the GSMA survey, 36% of operators plan for commercial deployment before 2020 (and 38% before 2025) but only 11% are talking about full geographical coverage – most are expecting either ‘hotspot’ coverage (32%) or ‘urban’ (45%).

But it is clear that there will not be a “big bang” roll-out of high-bandwidth low-latency service coverage and even where there is 5G radio coverage, it will be backhauled via 4G core networks. In such cases, 5G New Radio (NR) will be operating on top of 4G core network to start, until 5G core network launches – expected in 2021 or 2022. This means autonomous vehicles via 5G will be hard to support, and probably industrial automation too.

The Handset Challenge

Hand in hand with network roll out is the question of what the availability will be of 5G-enabled handsets and other non-phone devices like laptop dongles and mobile hotspot devices, and modules for integration into industrial devices.



Source: Teleinfotoday.com

We hear announcements almost every day of new devices coming to market as all the OEMs race to fulfil an as yet unproven demand.

At the end of 2020, it is expected that 5G handset sales (15–20 million units) will represent approximately 1 percent of all smartphone sales, with sales taking off in 2021, the first year in which retailers will sell more than 100 million 5G handsets. However, the issue will be whether there will actually be extensive or meaningful 5G network coverage available anywhere to enable users to take advantage of the benefits of 5G.

Whilst there may not be any ubiquitous 5G network coverage to use them, it is clear that the handset OEMs are making sure they are available. There are already a range of handsets currently/imminently available from a range of the major brand OEMs including Apple (not until 2020), Samsung, LG, Sony, Motorola, NOKIA as well as a host of Chinese OEMs including Huawei, Xiaomi, OnePlus, ZTE and others. These will ensure that the launch of 5G has much better device support than was the case for 4G, 3G, and even 2G. The GSMA have identified 23 vendors who have confirmed the availability of forthcoming 5G devices with 33 different devices including regional variants.

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Another factor to be considered is the cost of 5G phones. Making a 5G-ready handset is more complicated than one might think, due to differences in two critical components of a 5G versus a 4G phone: the radio modem and the antenna. The modem in a smartphone usually sits on the same chip as the processor. A bundled 4G chip for a high-end phone cost an estimated US\$70 in 2018; the 5G version with a much more complicated 5G antenna will almost certainly carry a higher price—possibly much higher.

Putting these factors together, a 5G-ready phone's component costs in 2019 will likely be US\$40–50 higher than for a comparable 4G phone. However, there's one good piece of news, battery life will likely be a smaller issue than it was when 4G was launched. Chipmakers have said that they expect battery life for the first 5G phones to be in line with that of current 4G handsets.

This cost is not insignificant in that it will contribute to drive up prices of new 5G handsets in a mobile phone market that is both challenging and saturated, operating against a backdrop of stagnant device sales, rising prices and falling consumer confidence in the traditional MNOs. At the same time the MNOs have been vying to move away from the subsidised-handset model for some time, primarily due to the cost.

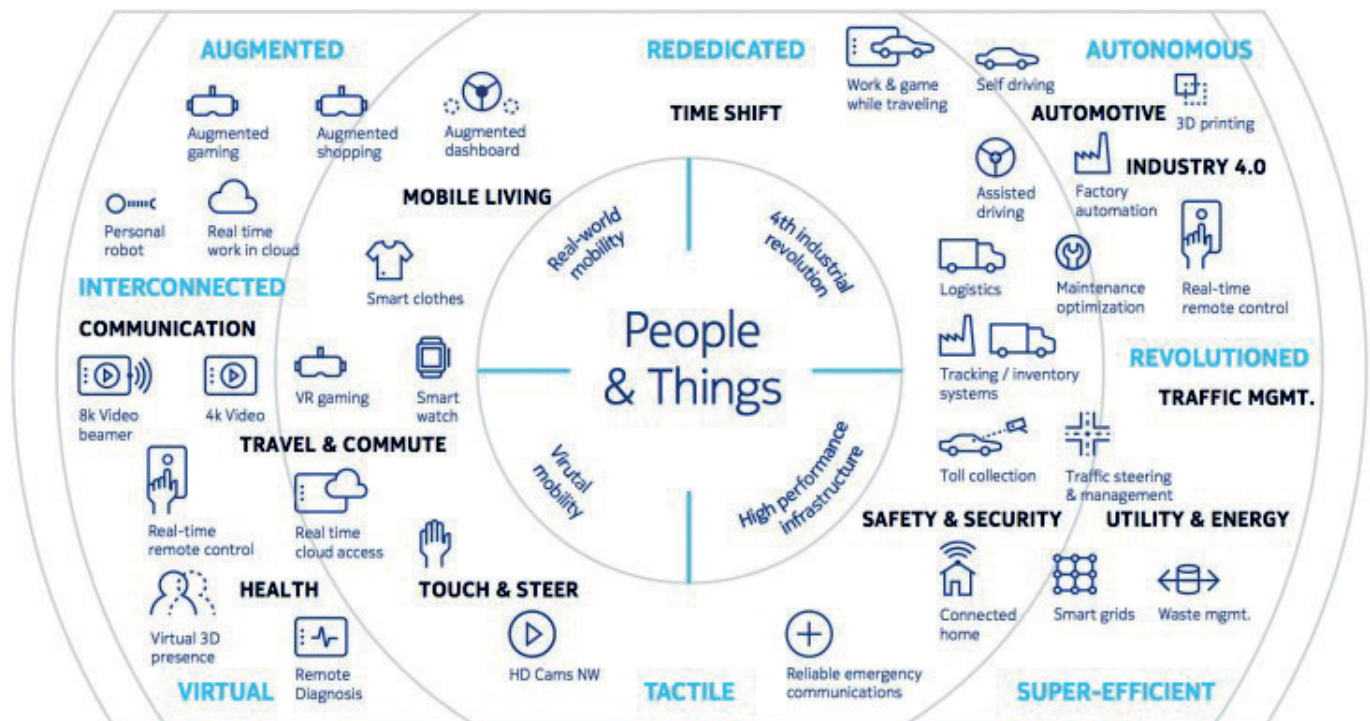
Against reports of falling sales of new handsets, it is becoming evident that where people are only seeing incremental improvements in their phone's functionality, it results in the situation where people are holding on to their phones for longer and running down their contracts. This extra cost will likely also impact upon uptake and corresponding 5G penetration.

For more a more detailed look at the state and relevance to MVNOs of the handset market, please refer to our White Paper entitled "Game of Phones" available from our website at <https://www.mobiliseglobal.com/category/white-paper/>

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Is there user demand for 5G devices and their services?

As we have indicated above, we do not feel there will be any “magic bullet” application that 5G will unlock and become a “must have” for consumers. There is not much data to support a proven demand for 5G devices and services per se, but 5G will enable features and performance enhancements that match user preferences and demands. 5G will enable connectivity for some new services for which demand is well established but where other dependencies are also involved.



Source: Teleinfotoday.com

Apart from some early adopter geeks, there is little evidence that users want to adopt a device or a service just because it is labelled ‘5G’ – again, not a new service but a better version of existing ones.

So how will this play out? Some users would undoubtedly like the benefits that 5G promises for consumer devices – higher-definition video, faster download speeds, more responsive games, less buffering, etc. Some of the actual performance will depend on the capabilities of the device and/or the application; for example, streaming videos buffer sometimes even when the user is on a high-speed fixed network because of the demands on the server. There will be a trade-off with battery life,

especially with early devices, and users might not like that or view the trade-off as acceptable.

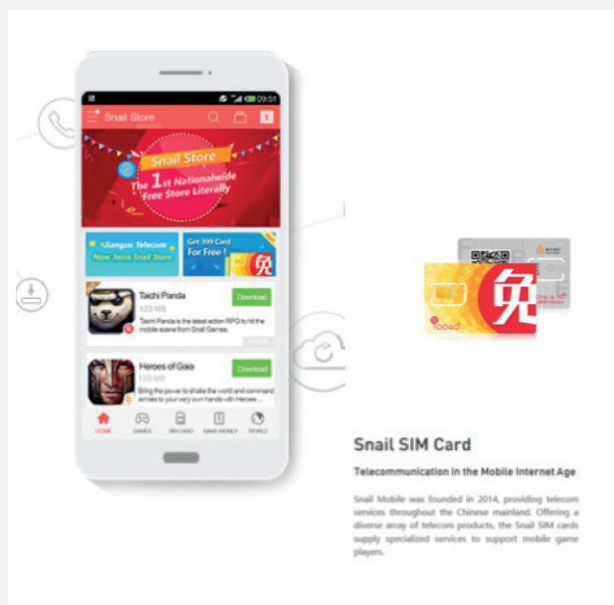
Another possible opportunity for MVNOs following the roll out of 5G is that of Gaming. While 5G network rollouts are still in their infancy, it is clear that the enhanced Augmented, Virtual and Mixed Reality capability that 5G offers, in combination with cloud gaming, will offer new opportunities for MVNO as well as other OTT players.

While still in its early stages, the potential for cloud gaming does seem huge. The recent emergence of cloud gaming platforms including Google Stadia, Apple Arcade, Microsoft xCloud and Snap Games has not escaped the operator community as they warily

watch the OTT players' ambitious plans to become the 'Netflix of Gaming'. They will host libraries of thousands of instantly accessible games that, ultimately, will consume three to four times the amount of bandwidth on 5G networks, compared to standard definition video traffic. This will impact mobile operator data strategies with some operators, believing cloud gaming could represent 25% to 50% of 5G data traffic by 2022. This

assumption was heavily influenced by observing the trajectory of the cloud gaming industry in general.

Being able to offload the processing of gaming to the cloud will open up a new generation of thin client devices, which will rely on the increased bandwidth and low latency capability of 5G but importantly for MVNOs, it is this kind of specialised, niche business model that lends itself to MVNO industry players.



Source: Snail Mobile

In this regard, it is worth looking at Snail Mobile for some indication of this trend. SNAIL DIGITAL (Suzhou Snail Digital Technology Co., Ltd.) was founded in 2000 and was China's first studio to create its own 3D online gaming title. Today, successfully forming an integrated industry chain with competencies in software and hardware. Snail is an Internet-based company with a comprehensive product portfolio comprised of technology development, content development, global distribution, platform operations, traffic data management, and terminal manufacturing and now has attracted over 100 million registered players globally and over 80 million registered users in China.

A dedicated Mobile division, SNAIL MOBILE was established in 2014 with a series of telecom products and has become the largest virtual network operator by revenue with over 10 million users.

They have already moved towards the provision of connectivity with the establishment of its MVNO business, Snail is working to convert its core user base of game players into MVNO subscribers.

There are some consumer services that have been demonstrated but don't really work with existing 4G connectivity; the obvious examples are virtual reality and augmented reality. We don't yet know how well these will work with 5G (at scale and in real life, rather than in demos) and it is also unclear what kind of user demand there will be for such services. In any case, and based on current industry dynamics, it is unlikely to be the mobile network operators who make money from this but the content providers. However, there may be opportunities for MVNOs who offer content related services and connectivity just as a facilitating service where this may work.

Some data services currently supported by 4G/LTE will continue to work on 5G; unlike the transition from 3G to 4G, 5G uses the same core network as LTE. The mobile industry has been emphasising the suitability of its already-available NB-IoT and LTE-M 4G technologies as connectivity for Internet of Things applications, and it's hard to see how 5G will make these any better for most applications. The discussions so far have emphasised low power and high penetration into buildings, and specific 5G versions of these will probably make this worse rather than better. More importantly for MVNOs with their differing and more targeted customer profiles and propositions, it is difficult to see how this story will have much effect on those customers' buying decisions.

It is also clear that 5G will enable more of these kinds of connections to be supported on the same radio network, thus improving the economics of the network for the operator. Again, whilst it's possible that some of the benefits of this will be passed on to the deploying customer, it is hard to see how this will translate into a strong selling point for MVNOs. On the IoT front it is also clear the price of connectivity is a relatively small component of the overall cost of deploying an IoT solution and again for a specialist existing IoT MVNOs, it is unclear if they will be able to enhance their proposition by offering price reduction in using 5G services.

However, there are some IoT solutions that can't be deployed – at least at scale – with currently available technologies. As mentioned already, the obvious candidates are autonomous vehicles, UAVs, and industrial robots, where both latency and bandwidth constraints are limiting factors on deployment. These are again potentially big markets but face other challenges apart from the network being ready to support them – see this article about the recent announcement by Microsoft and BMW as an illustration of the challenges involved.

As more MNOs conclude their 5G test programs and results from initial network deployments are becoming available, many of the potential use cases, such as autonomous driving, which were discussed with fervour in the early stages of the 5G hype curve, have been dampened by what are clear limitations with access technology and significant cost requirements to deliver 5G with broad population coverage.

Possible 5G enhancements

Realistic and seamless video streaming

High definition video downloads in a matter of seconds

Connected and autonomous driving vehicles

Connect all your devices and smart home equipment through the IoT ecosystem, enabled by 5G

Increase in internet-enabled tech – smart traffic lights, wireless sensors, mobile wearables, and car-to-car communication

Source: Ericsson

Will ARPUs increase with 5G?

MVNOs operate on thin margins and our key finding is that they cannot expect an increase in ARPU arising from 5G. The general trend is for ARPUs to decline, and part of the business case for 5G is to bring in new device and application categories that can't economically be served with 4G technology - especially machines. So, there will necessarily be lower ARPU. The hope is that the increase in connections will create economies of scale and this will more than compensate for the lower ARPUs.

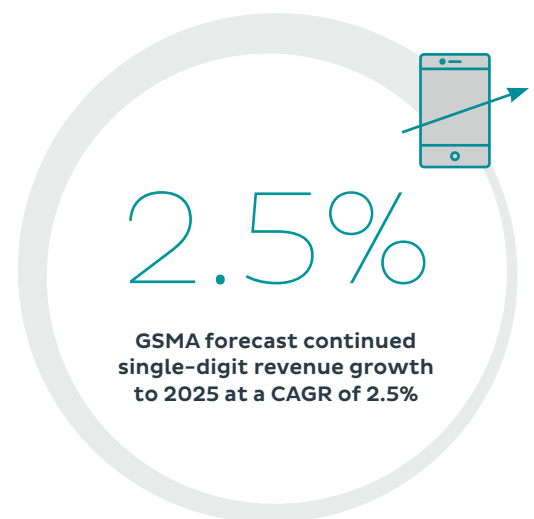
A recent Deloitte report makes it very clear that revenue per user and revenue per MB is declining (tabulated below), and it's unlikely that 5G will reverse this trend.

	Asia	Europe	US
2016 ARPU as % of 2012 ARPU	84.96	68.37	84.96
2016 Revenue per MB as % of 2012	4.37	18.26	10.94

ARPU and Revenue per MB, Indexed – Source: Deloitte

The GSMA has also noted that while revenue growth has slowed over the past five years, they forecast continued single-digit growth to 2025, at a CAGR of 2.5%. They also expect growth will be sustained through connecting more unique subscribers as populations grow and more unconnected demographics subscribe to mobile services. Furthermore, operators will actively pursue new business models to improve data monetisation and begin to unlock the enterprise opportunity.

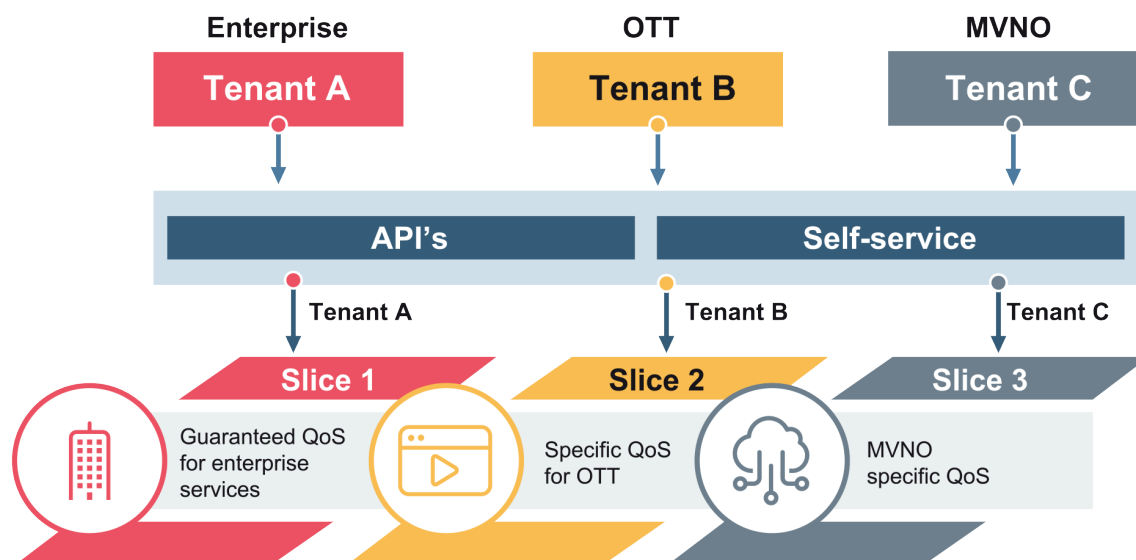
Whilst this suggests that there is a potential upside to these forecasts if operators can capture growth opportunities in areas such as digital identity and IoT, this does not offer an early opportunity for MVNOs as MNOs will be focused upon maximising their returns on 5G investment. Looking back over the launch of 4G, and 3G before, and if the same pattern emerges then the early adopters of 5G will tend to be higher ARPU customers. So, if these 5G customers have higher ARPUs than others, the MNOs will want to hold onto them rather than allow them to migrate to MVNOs in the early years.



Can MVNOs who currently offer 4G IOT services transition to 5G?

The simple answer is yes: the initial phase of 5G uses the same core network as LTE, and both NB-IoT and LTE-M are expected to transition easily to 5G. This is succinctly put in this report from Sierra Wireless, which is a major module supplier of IoT:

“The 3rd Generation Partnership Project (3GPP), the standards group specifying 5G and other wireless networking standards, has indicated LTE-M and NB-IoT will be part of 5G and are the only 5G technology to support 5G LPWA use cases in the foreseeable future.



5G Enables slice-based infrastructure sharing across tenants

Source: digital tmforum

The more complex answer is also a yes, but work will be needed; we don't know how the implementation of 5G will impact on the interoperability between MNOs' operational systems (activation, provisioning, billing, etc.) and those of their MVNO partners. It might be a trivial impact, because 5G will use the same core network as 4G, but it might not, because of new service classes and so on.

Another aspect of 5G technology – Network Slicing – holds out the prospect of more differentiated virtual networks for MVNOs; they won't all have to take the same wholesale offering from MNOs. This would allow for niche propositions, to targeted vertical segments (but perhaps also to specific consumer segments like gamers).

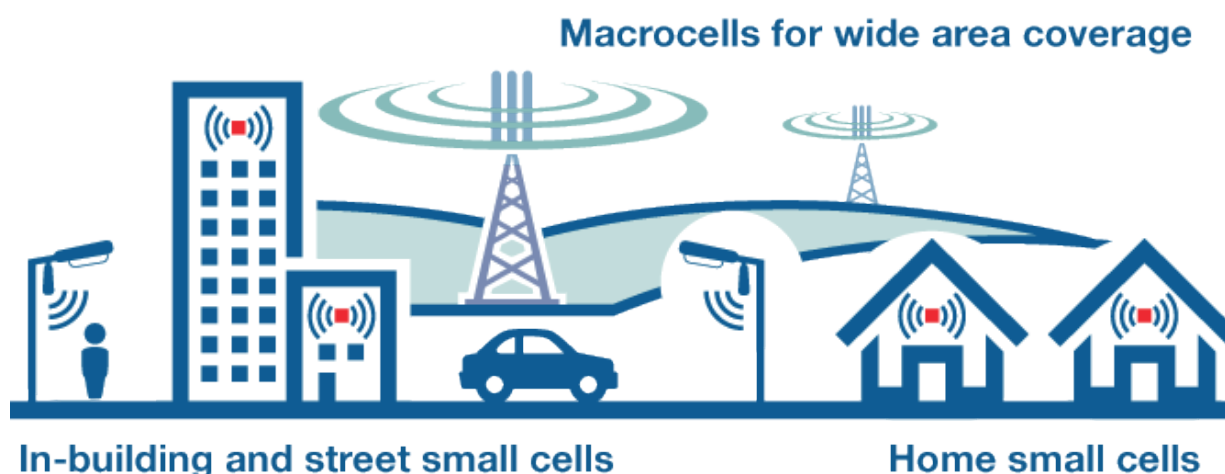
Potentially the most interesting aspect of this is yet to come. SKT in Korea is involved in a project with Ericsson for Software Defined Infrastructure that could also enable network

slicing and thereby newer and more radical business models. See <https://www.ericsson.com/en/press-releases/2016/6/ericsson-and-sk-telecom-demonstrate-5g-software-defined-telecommunications-infrastructure>

The potential is clear but taking advantage of 5G will also pose challenges for MVNOs. If MVNOs own a 5G network slice, deploying their own virtual network functions and providing new applications and services for consumers, they will need to need to establish an ecosystem of partners to be profitable. For example, a company like Netflix may want to boost the mobile element of its multiscreen IP video service capabilities. Under this model, the company could achieve this by itself in an MVNO model allowing more control over the data delivery whilst also providing more integrated telephony and messaging services. This type of play becomes possible under 5G, as the barriers to market entry are lowered and the RAN connectivity becomes hugely customizable to fit usage type.

Will the challenge of working with new infrastructure and the need for Small Cell technology to support 5G services, increase the dependency of MVNOs on their host networks?

The short answer is Yes! At the present time 5G vendors and consultants see this as an opportunity to propose new business models for infrastructure deployment, especially in building deployments where they propose 'neutral host' models. However, it seems that mobile operators are less optimistic in regard to such models and don't have strong expectations of them materialising.



Source: digital tmforum

However, the fact remains that 5G will require a much higher density of cell sites and a lot of infill technology and this is driving the boom in small cell deployment.

When 5G comes along, it will bring its own complications to the indoor coverage challenge. First of all, as 5G will make greater use of high-frequency spectrum than 4G did and as previously mentioned, high-frequency spectrum doesn't penetrate walls as well as low- or mid-frequency spectrum, which could increase the need for indoor networks like Distributed Antenna Systems (DAS). This brings another issue in that some DAS can't transmit over 5G's high frequencies, and most DAS lack the ability to add antenna arrays needed for 5G.

This lack of compatibility will put more pressure on distributed small-cell solutions to provide 5G. Yet, distributed small-cell solutions may not be as effective as DAS in supporting multiple operators



so indoor coverage will be an issue and early adoption might be machine-to-machine connections, adoption of which is likely to take time and will not help multi-operator consumer service coverage much.

Given all that, it is clear that whether 4G or 5G, operators will continue increasing the density of their networks to improve service but indoor coverage will be an issue and maybe an opportunity for MVNOs to deploy their own equipment. In any event, if nothing else, there's always WiFi which could be used in conjunction with 5G to overcome the indoor issue.

It is this requirement for hybrid network solutions that is pointing to the need for new business models to make the economics of 5G work. Whilst in the 5G era, operators would like to think they will remain the primary owners and managers of telecoms infrastructure and will continue to compete aggressively among themselves to deploy the best quality network, the sheer capital expenditure needed will drive them to consider alternative models, the recent experience of the emergence of Tower Companies buying the physical assets of the MNOs is a demonstration of this.

Whilst MNOs will continue to view other mobile network operators as their chief competitors for telecoms infrastructure and delivering connectivity, the need for a range of network solutions will mean alternative network providers will play an important role in expanding network coverage and capacity across society. Wi-Fi is already pervasive in many societies and its role and that of other alternative networks will continue to grow.

Similarly, the industry needs to engage with third-party connectivity providers on how to integrate alternative networks (e.g. drones, balloons, satellites) to provide ubiquitous and consistently high-quality connectivity. This means that operators will use connectivity solutions provided by other players or by customers to provide services. In some cases, operators might form direct partnerships, but in

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other cases the end user could have a relationship with a third party and reach the mobile services from there (as with Wi-Fi calling, for example).

So: this does give rise to the possibility that MNOs may agree to allow MVNOs to install their own Small Cells in specific locations i.e. football clubs or other localised communities thereby opening up opportunities for some physical asset owners to play a part in the deployment of 5G infrastructure, and to provide service to the end-customer too. In the GSMA survey 31% of operators expected non-operators to partner with operators via a shared/neutral host framework, and 26% expected non-operators to enter into exclusive deals with individual operators and/or industry-level partnership with selected alternative network providers such as MVNOs as "Neutral Host" partners.

How is 5G playing out in real life?

We have looked at a couple of examples of MNOs that have launched 5G services either as full commercial launches or as trials to see how the predictions are performing in real life:

Whilst the first commercial trials launched in mid-April with a number of MNOs across Europe offering limited services – it is far too early to comment much on these. The Technical ‘launches’ in December 2018 are again largely meaningless, as the 5G network was switched on but no devices or services offered.

The recent announcements by all the UK MNOs of their 5G rollout makes it clear this will follow the pattern of the 4G rollout with some high density (and footfall) areas such as shopping malls, railway stations, stadiums etc. targeted for what are effectively “beta” trials.

A more “real life” example is the City of London deployment by CTIL, the infrastructure joint venture between Telefónica UK and Vodafone. Whilst it could be considered a field test, the concentration of high value APRU users and early adopters justifies the relatively wide area coverage deployment.

In this case the business model was that of a “neutral host” combining Small cells and Wi-Fi access points installed on street furniture, with “de minimis” form factor nodes ensuring unobtrusive deployment throughout the City’s historic streets. It is one of the largest single investments in wireless infrastructure ever seen in London, and the project is a cornerstone of the City of London’s strategy to cement its leadership position in global finance.

Looking on a more global basis, April 2019 saw launches by all three networks in South Korea, and in the USA by Verizon and AT &T, albeit in limited areas.


The Verizon service was available via an add-on module to the Moto z3 handset. There are no new 5G data plans at the moment, just a device accessory charge – the 5G service is available via existing 4G data plans. The marketing pitch was very device oriented; “Customers simply snap the 5G moto mod to the back of a compatible Motorola z3 smartphone and experience the power of 5G for just \$199.99 (\$349.99 retail)”. This plan was only offered to Verizon post-paid customers with any Verizon unlimited plan and enabled customers to get unlimited 5G data for an additional \$10 per month (with the first three months of 5G data for

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free). This is reminiscent of the “unlimited” plans offered at the introduction of 3G and 4G but they did not last long as penetration increased and “unlimited” became unviable for MNOs. Therefore we must expect this offer to be more of a trial to gain real life data on usage etc., and unlikely to be maintained in the longer term.

AT&T also launched its 5G service in December 2018, however, not with a mobile handset but with a Netgear 5G enabled hotspot device. This was for invited customers only, the Nighthawk hotspot and 5G data usage were free for at least 90 days. Intentions to make the device more widely available for \$499 upfront, combined with a 15GB data plan costing \$70 per month, as well as the introduction of mobile handsets, in Spring 2019, seems to support the assertion that “unlimited” plans will not be widely available.

The first Korean launches were in December 2018 but again it was not until April 2019 that devices or services became commercially available.



The SKT service launch was a wider reaching network offering with 34,000 5G-enabled base stations with coverage concentrated in the busiest parts of 85 cities across the country, a 5G compatible handset (5G version of Samsung Galaxy S10), some dedicated applications and content (plans to offer as much as 7,000 pieces of content that harness the capabilities of these speeds, including 4K video, gaming and Augmented and Virtual Reality and specific tariffs (notably at the same amount of data for less than the equivalent cost on 4G – again reducing the prospect for higher ARPU from 5G).

LG Uplus launched 5 April 2019 with 18,000 5G base stations in Seoul and neighbouring areas as well as metropolitan cities of the country. It has set a goal to secure more than 50,000 base stations nationwide within the first half of 2019. Again with 3 monthly data plans for 5G services, ranging from 55,000 won (\$48.40) to 95,000 won (\$84). Also, subscribers to the firm's 5G services can share data plans with their second devices such as tablets or smart watches. Those who subscribe to the 75,000 won and 95,000 won plans will receive additional 10 gigabytes and 50 gigabytes respectively that can be used to share data with the second devices.

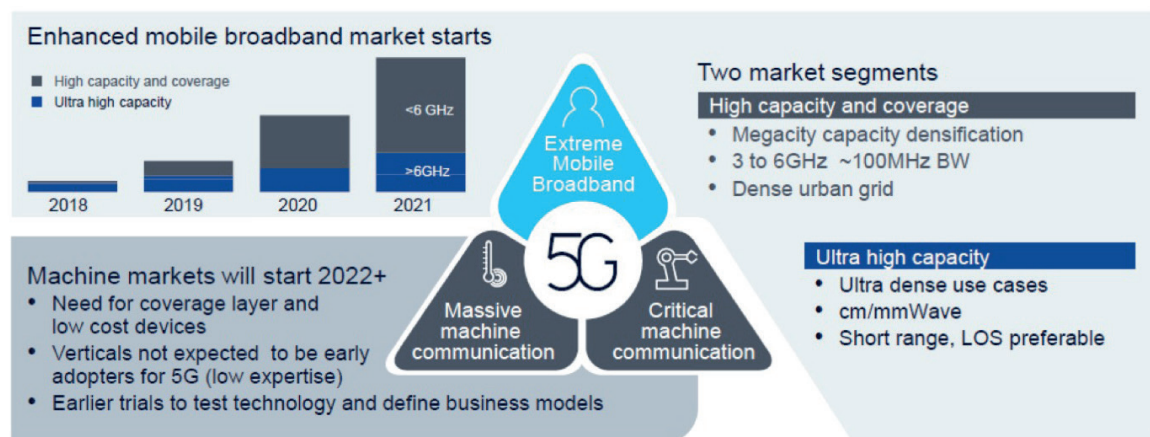
KT claimed a launch in January 2019 but the only 'user' was an AI-equipped robot. The full 5G service has begun in the greater Seoul metropolitan area, in the country's most populated, major metropolitan cities outside Seoul and KT plans to expand its nationwide 5G network to 24 major cities, key transport routes such as expressways, subways, high-speed railways, large universities and neighbourhood shopping areas. Again, a very targeted roll out rather than a ubiquitous national coverage plan.

In the Middle East region, there has been a lot of "noise" but to date only Etisalat and Du in the UAE have launched services and the Qatari firm Ooredoo said it offers 5G services in and around Doha but does not have devices available to use them. However, reports suggest that MNOs and MVNOs are looking towards FWA as a potential service in these areas.

In Conclusion

We started this paper by asking, 5G – Opportunity or Threat for MVNOs? The answer is still far from clear for MVNOs and the broader telecoms market. What we can see, however, is that 5G is pushing the boundaries for what we expect our telecommunications networks can do for society. What we have seen so far is a lot of marketing hype but little in the way of hard facts and actual deployments upon which to base a medium to long term strategy. The short term view? We think it is business as usual for MVNOs until the network infrastructure has matured enough to offer 5G to the masses.

5G market will start with enhanced mobile broadband Nokia market view and derived engagement



Why do we say this? We have seen that in 2019 and 2020, 5G wireless technology will have three major applications. First, 5G will be used for truly mobile connectivity, mainly by devices such as smartphones. Second, 5G will be used to connect “less mobile” devices, mainly 5G modems or hotspots: dedicated wireless access devices, small enough to be mobile, that will connect to the 5G network and then connect to other devices over Wi-Fi technology. Finally, there will be 5G fixed-wireless access (FWA) devices, with antennas permanently mounted on buildings or in windows, providing a home or business with broadband in place of a wired connection.

The model for the mobile virtual network operator (MVNO) has been relatively consistent since its conception in the 1990s when the liberalization of regulatory frameworks first made it possible for a third-party company to buy wholesale bulk access to 2G networks. Since then, the added data element has made mobile broadband a large cash cow for MVNOs, even though the connectivity proposition is still basically the same. However, after nearly a decade of this intense competitive pressure, average revenue per user (ARPU) has fallen significantly, forcing MVNOs to look for new revenue opportunities and it must be said that 4G did little for MVNOs in terms of offering a technology to innovate or create new revenue opportunities.

With the advent of 5G networks, the ability to provide network slices across virtualized network infrastructure does mean that the MVNO model will have the potential to change dramatically in the 2020s. Essentially, if unprecedented amounts of control can be given to the MVNO and the previously high barriers to market entry can be lowered, this will introduce a new wave of specialist, mini-MVNOs. For example, niche MVNOs that can provide network slices with pre-defined characteristics, such as high bandwidth and low latency, for target markets like mobile gaming or HD video conferencing.

Getting the orchestration hierarchy correct across the networks of two or more operators is absolutely critical to providing next-generation MVNO services in a sliced 5G model. If it can be done cost-effectively, it could expose a whole new revenue stream in the digital economy that was previously unreachable. The technological challenges are clearly surmountable if the regulatory and competitive landscapes (and the MNOs prove willing!) allow these powerful 5G features to be accessed by MVNOs.

However, at this early stage it has to be said that 5G has little immediate benefit for consumers. Yes, mobile data rates will gradually improve, but most people already take that as a given. The significant speed improvement from 5G will only come with the wider use of millimetre wave frequencies, but these have much shorter range and will require mass deployments of small cells which will have to be paid for. So, as operators are searching for viable 5G use cases, mostly focused on enterprise and IoT (Internet of Things), could this open up opportunities for MVNOs to move into the “Neutral Host” space?

At the service level, the next generation of MVNOs will be able to target specific verticals with bundled services that very closely match their needs for connectivity, cloud services, AI/big data solutions, self-service enterprise solutions, IoT or any other offerings. With access to full feature 5G connectivity services, it could mean that we will see interest from established media companies that currently have no business in the telecom space.

However, on the flip side, 5G could allow more network operators to launch their own MVNOs as they have done in the 4G world, like Vodafone, which has launched an in-house MVNO called Voxi, as well as O2's giffgaff and Three's Smarty.

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Operator MVNOs could be more prevalent with 5G, as the ‘network of networks’ will be able to support almost any access technology as well as introduce the disruptive concept of neutral hosting partnerships between local authorities and other private investors. This “neutral hosting” concept would allow the operators to connect their existing communications networks to shared infrastructure in an urban environment and then ‘lease’ the space on that infrastructure and access technologies, thereby becoming a 5G MVNO of sorts.

Many Mobile Virtual Network Operators, as well as industrial companies, are willing to develop 5G networks and services, particularly in the business space, where it may be that the value of the next generation communication technologies is not immediately apparent to certain industry sectors. It will be Telecom operators who can expose and illustrate the uses of these new technologies and demonstrate how those technologies can be tailored to the client industry's requirements.

It is also likely that they will tend to prioritise industries according to best fit. When selecting their lead industries, they will tend to focus on considerations such as; strength of existing relationships, willingness of the industry to partner with the operator, the growth capability of each sector, the ease with which the operator can meet that sector's growth and technology ambitions, and probably high on the list will be the overlap with the

industry's coverage and existing technology to reduce time to market and leverage existing wireless requirements.

This could open the opportunity for MVNOs to identify and exploit small(er) niche segments before the MNOs move beyond the big enterprise customers, but it has yet to be seen if mobile network operators will see 5G as a catalyst for more MVNO wholesale business, rather than a competitive threat. Only time will tell if the MNOs will recognize that deploying sliced mini-networks for non-telco service providers could open up a whole new line of business with new commercial and innovation potential and associated revenue streams.

On the other side, MVNOs must also recognise the capital investment the MNOs are making in deploying 5G and should be prepared to pay a fair price for wholesale access, in a manner that will not only allow MNOs to make a fast and reasonable return on 5G investment, but also enable innovative developments fully capitalising on new network technologies.

In conclusion, what should MVNOs do to prepare for the new 5G world?

- MVNOs should consider negotiating for 5G inclusion with MNOs now. New MVNOs should include it in contracts by default.
- Full MVNOs need to consider if they need to deploy any new tech to support 5G (i.e. Edge computing, 5G Core, NFV etc.)
- Is Network slicing an option to consider?
- Will MVNOs need to be concerned about MNO partners deprioritizing MVNO traffic?
- Are there regulatory aspects of 5G that need to be considered?
- How will the economics look for 5G data traffic? How do current wholesale access models and commercials work in the high data usage world of 5G?

What is clear is that 5G will accelerate the pace of change in wireless and we can expect to see many other companies from other industries enter wireless the same way Uber and Lyft did several years ago. They transformed the traditional taxicab and limousine industry and we expect this to continue with new companies in other industries including Telecoms, and by extension MVNOs, but maybe not quite yet!

About Mobilise

Mobilise was founded in 2011 by Hamish White, who noticed a gap in the market for a consulting company specialising in MVNOs and mobile technology. In response, he set up Mobilise Consulting, building upon his decades of experience in consulting for MVNOs and MNOs.

Mobilise Consulting now provides innovative mobile solutions to companies across the globe, enabling the realisation of corporate goals and new initiatives at low overhead. It offers consultancy services to MVNOs and others looking to enter the telecoms industry, including strategy, business casing, feasibility study, project management, solution architecture and service operations.

In 2015, Mobilise set up a new business unit, Mobilise Technology, which specialises in software development and providing connectivity and hybrid solutions to the telecoms industry. Mobilise rebranded the group to Mobilise Global in 2018.

About the Authors:

Paul Wade

Paul Wade is an experienced C-level Commercial and Business Development professional, well known in the MVNO industry, although now semi-retired, he maintains a close connection with Mobile Telco industry and his background, originating from his time at Vodafone leading the commercial teams for Cellular Licence Bids, through to the founding of Smarter Mobile, a specialist SME MVNO and wireless solution provider in the UK, has given him a deep insight to the MVNO scene. He led the acquisition of Family Mobile an MVNO originally set up for IKEA and put the company back on sound financial footing and then divested to a PLC.

A frequent speaker at MVNO conferences, he led the acquisition of Family Mobile MVNO (originally set up for IKEA in the UK) and managed other MVNO projects in Canada, USA, Oman, Palestine and most recently, he was Strategy consultant to the EcoRenew Group (Hong Kong) where he managed the acquisition of 3 UK companies, Mazuma Mobile (the UK largest mobile recycling company) ICT Reverse asset management (a leading UK data wiping and IT equipment disposal company) and iMend (a leading mobile device repair company) and where he also established EcoRenew Finance Limited, a specialist Mobile device finance company and obtained full FCA UK lending license for the group giving him unique insight to the wider mobile phone "eco system".

Hamish White

Hamish White is the founder and CEO of Mobilise and based in London. Hamish has day to day operational responsibility of Mobilise but also participates in Product Development, Consultancy and Sales.

Hamish is a hands-on telecoms entrepreneur with 19 years' experience supporting Tier 1 & Tier 2 International Telecommunications Operators. Before founding Mobilise, he worked as a consultant launching and growing start-up telecoms companies primarily in the MVNO domain. This included the launch of 8 MVNOs across 5 countries.

His background is in technology; however his management experience spans the end to end telecoms value chain, including in-depth knowledge of sales & marketing, commercial, finance, operations and technology functions.

Hamish specialises in helping companies with digital transformation and establishing mobile app strategies.



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