



Executive Insights

5G Unlocks Opportunity for Carriers — But Will They Take Advantage?

If you build it, they will come. What was true for the baseball players in that “field of dreams” is equally true for carriers contemplating the coming 5G revolution.

5G brings with it many impacts — including one that seems to have escaped widespread attention: network function virtualization (NFV). NFV shifts network infrastructure from a siloed hardware-centric architecture to a virtual one. This change promises to be as transformational as cloud computing has been for IT. What the cloud did for the internet — unlocking its commercial potential and shattering the established order — NFV will do for networks.

NFV will bring about a fundamental shift in infrastructure players. It will alter the industry’s cost structure, create new business models, and establish novel ways of structuring and delivering products and services.

Yet carriers seem hesitant about seizing the opportunity that 5G represents. Many of them are holding back their investments, citing the lack of a compelling business case that would justify the required expenditure.

The question carriers need to answer is, should they wait for a business case to emerge? Or should they seize the moment, building out their infrastructure and creating new kinds of services — some of them unanticipated — that will drive future revenue?

As with the advent of cloud computing (which was driven by server virtualization), the smartphone explosion during the mid-to-late 2000s and the arrival of the commercial internet, there’s a strong case to be made for acting swiftly to create the platform for future offerings, even though it is difficult to predict the full scope of those offerings. Though such a course of action might seem rash, it could well be the better choice. Past experience suggests that in this instance, as with previous technology revolutions, if you build it, they — the customers — will indeed come.

The coming 5G revolution: Transforming the industry and unlocking a number of new service offerings

There’s no question about it — the arrival of 5G will be transformative (see Figure 1). While debate continues about what forms the transformation will take, there is broad consensus that the industry landscape will change dramatically.

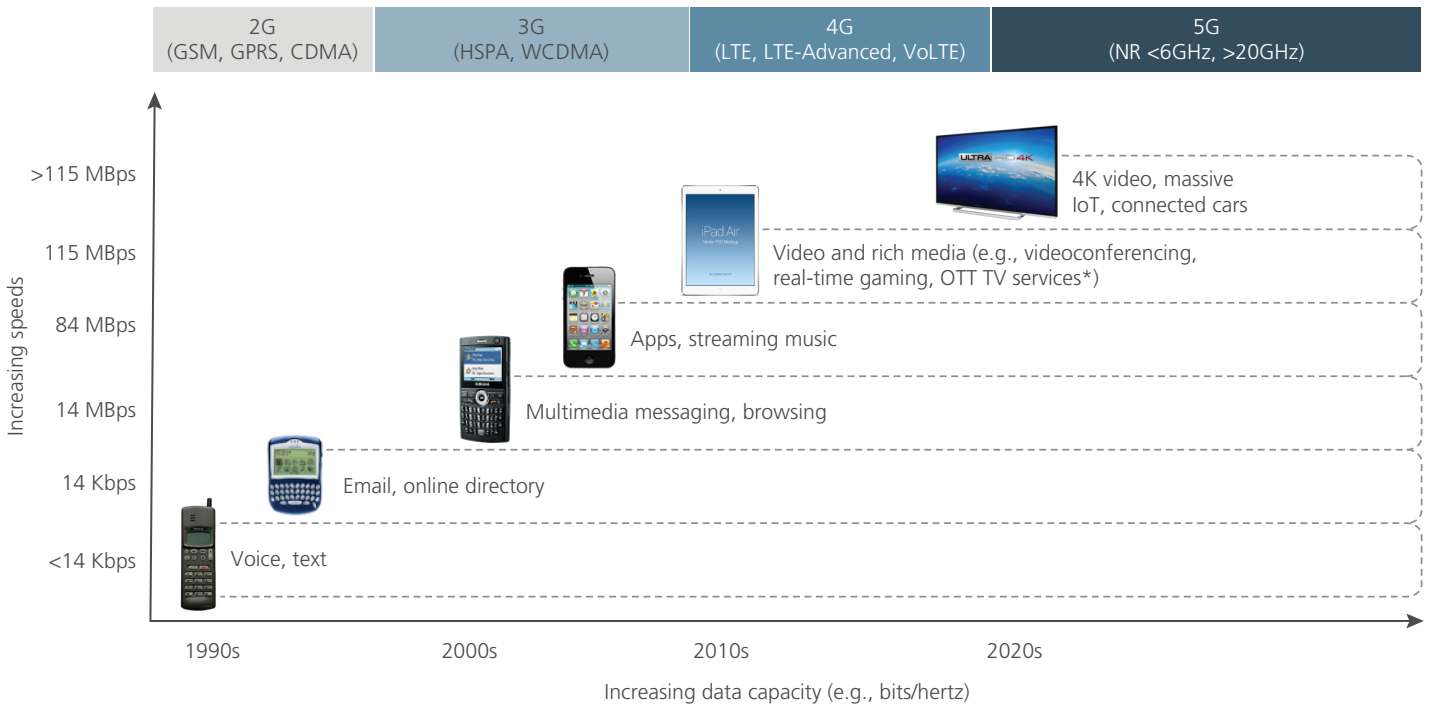
5G will have multiple impacts:

- **Consumer demand** — for low latency, extreme bandwidth and highly customized services — can finally be met
- **New entrants** will challenge established players as competition heats up
- **Unique service offerings** — narrowly sliced and individualized — will translate into new revenue opportunities for service providers

5G Unlocks Opportunity for Carriers — But Will They Take Advantage? was written by **Harsha Madannavar**, Managing Director at L.E.K. Consulting. Harsha is based in San Francisco.

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Figure 1
The evolution of 5G represents a potential 'revolution' of the telecommunications industry



*Over-the-top video services
Source: L.E.K. interviews and analysis

All of these bear watching. But the last one — the potential for new service offerings — is the focus of our attention. It defines the new field of opportunity for carriers — their “field of dreams.”

NFV: An undocumented feature with far-reaching implications

Network function virtualization, the source of the opportunity, is one of the less-recognized features of 5G, despite being part of its backbone. While 5G is based on a series of new technologies, NFV is at the heart of its potential for highly customized and even individualized services.

NFV is complex but can be simply defined. As the name suggests, NFV means that network functions — which were previously dependent on proprietary hardware — are now “virtualized.” That is, they are transferred from proprietary hardware centrality to software running on standardized hardware (see Figure 2).

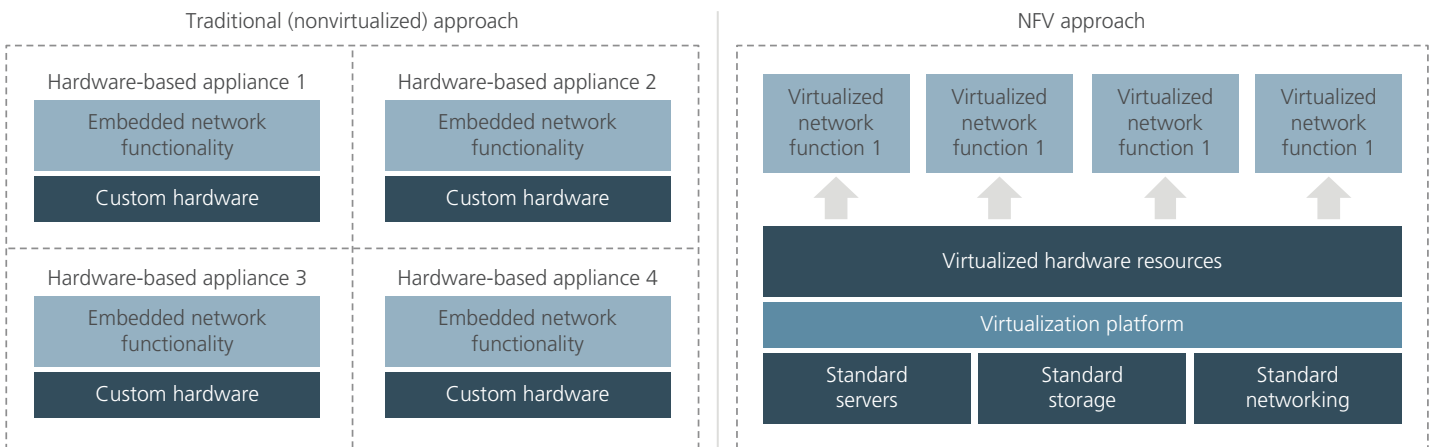
The advent of NFV threatens to break the power of incumbent vendors — such as Nokia and Ericsson — that currently dominate the wireless marketplace and, because of its outsize role, the industry’s cost structure. That cost structure will be shattered — and costs will plummet — as functions such as encryption,

security and bandwidth allocation, which currently require expensive, proprietary boxes, are shifted to software running on generic hardware.

We have seen this movie before — 10 to 15 years ago, when server virtualization transformed the IT industry and provided a central element of cloud computing. Before the advent of server virtualization, enterprise IT consisted of large, proprietary hardware installations that the enterprise had to fully own and maintain — usually at significant cost. The companies that provided the infrastructure were able to control their own destinies and those of other players as well. Hardware vendors like IBM, HP and EMC held dominant positions.

Cloud computing, made possible in large measure by server virtualization, transformed this landscape — to the extent that IT today does not look anything like it did before the early 2000s. With its transfer of computing power from on-site to off-site infrastructure, which was accessed via networks, cloud computing changed the fundamental cost structure of IT and lowered barriers to entry, making it possible for large and small companies alike to rent IT infrastructure rather than buy or build it. Computing power shifted to data centers run by the likes of Amazon, Microsoft and

Figure 2
Traditional vs. NFV approach



Source: L.E.K. interviews and analysis

Google. In 2018, Amazon Web Services alone generated \$25.7 billion — divisional results that amount to roughly one-third of the revenue earned that year by IBM.

Thanks to the rise of cloud computing, IT hardware players are less dominant — because hardware alone is not such a critical factor. Functionality is defined in software, and applications can run on generic, inexpensive hardware hosted remotely (e.g., white boxes).

What happened in IT will soon happen to networks, thanks to NFV. Once again, all the functionality that used to be in proprietary hardware will be realized in software. That means it will be vastly easier and less expensive to deploy technology and deliver services.

Identifying opportunities for services

It's easy to foresee near-term opportunities for services. But what will those services be?

In a 5G environment that provides for NFV, network operators can take advantage of lower costs to offer their customers a full array of 5G features — for example, high-capacity bandwidth and low latency with no loss of quality; secure conferencing protected by passwords and with encryption for as few as five users in a single, unique instance; and unbundled video content that individual consumers can take advantage of to customize and personalize their entertainment offerings.

Thanks to NFV, a customer can ask, say, AT&T to encrypt a small-scale conference call — and can name the five individuals

approved for access. That wasn't possible under the old regime — a proprietary hardware-based infrastructure can't be customized finely enough to deliver a level of service that meets those requirements. But a service based on NFV can do it easily and economically.

In the near term, NFV drives both network features, such as high-bandwidth streaming without compromising quality and extreme customization provisioned via software, and network cost structure. The offerings are provided at a much lower overall cost — and at much higher levels of profitability — because they avoid the cost of maintaining an on-premises, proprietary hardware installation. Software running on generic hardware — which, cloudlike, is located at a third-party site — reduces costs, increases margins and allows entirely new levels of personalized service to be profitable.

Furthermore, as the global telecom infrastructure harmonizes toward a common 5G standard, infrastructure suppliers will be building products for a larger, global addressable market, eliminating the higher-cost structures associated with lower-volume fragmented architectures.

Only virtualization makes these things possible.

Looking for the 'killer app'

All of this is well and good, but is it enough to justify the investment in 5G?

Carriers don't seem to think so. Other than an interest in the fairly basic service offerings described here, they're showing little enthusiasm for the next-generation network. They seem to be

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scratching their heads and saying, in effect, “We understand how 5G works as an alternative to broadband cable, and we can justify the investment. But beyond that — what’s the killer app? Who will buy the service, and what will we sell?”

The problem is that the answer isn’t easy to discern right now — no easier than it was to predict the advent of ecommerce when the internet became a business and consumer platform in the early 1990s, or the future of smartphone-based services when the iPhone first launched in 2007. The “killer app” has yet to emerge — but smartphone killer apps didn’t arrive overnight either.

These analogies are worth exploring. When the World Wide Web made the internet viable for ecommerce, and when the modern smartphone first arrived, consumption patterns and types of applications had yet to emerge. It was years before Amazon became an internet powerhouse and smartphone-based services — for example, Uber and Lyft — arrived in force.

In 2007, no one involved in telecommunications, either as an industry player or an investor, looked at the first iPhone and said, “Ride-sharing services will emerge in three years, and usage will explode, so we’d better invest.” They invested on the prospect of new opportunities, not on the basis of a specific business case.

The same scenario is currently playing out for carriers, and it is equally challenging — to make an investment in the absence of a compelling business case. To invest in 5G today is a matter not of funding a business plan, but rather of betting on the future (see Figure 3).

That future is nebulous — as nebulous as the smartphone ecosystem was in 2006. That was roughly the year, by the way, that 3G was meaningfully introduced, at a time when the iPhone itself was still a year away. 4G came onto the scene in 2009, a full decade ago. For both 3G and 4G, it took years before the business opportunities gelled.

What will emerge as a result of 5G? It’s not yet possible to say. But there is the potential for advanced business models —

The broad impact of NFV

Network function virtualization will have a transformative impact — not just on the industry, but on society as well. That said, the full impact of NFV is probably 15 years away. Nevertheless, it’s possible to imagine a 5G world in the 2030s, where highly customizable, high-capacity broadband becomes the platform for such services as individualized education. In this new 5G, NFV-driven world, people will be able, at low cost, to access information, master new skills, create a trajectory and move up the societal ladder.

The ability to acquire and synthesize information will be available for anyone with the desire and energy to take advantage of it — just as you can now go to YouTube to learn about any subject — but with much greater sophistication and quality, and at much larger scale. Today there is well-founded concern about growing inequality, including digital inequality — but the economics of 5G and NFV could serve to counter the trend.

The same is true globally. Fast-emerging powers and regions like Africa, India and

China — historically left out of the power structure in a modern world dominated by Europe and America — will rapidly achieve a more level digital playing field. Or they could perhaps achieve a superior one, since they have less need to accommodate legacy infrastructure and can build their new platforms with few restrictions. We have seen this dynamic play out in the global buildout of wireless networks. The impact of 5G and NFV could be similar.

In the arrival of 5G, there is more than just a technology story — there are significant implications for global competitiveness and wealth creation. Some U.S. operators will try to maintain the status quo — “milking the cow” before they lose dominance. But others will seize the opportunity represented by 5 billion people trying to get into the digital side of the equation.

In all these respects, and perhaps in other ways not yet foreseen, 5G and NFV can be the pathway to an entirely different world.

involving the industrial “internet of things” (IoT), remote surgery and other telemedicine applications, gaming, new forms of media consumption, and perhaps business platforms that are as unexpected as Uber and Lyft would have seemed 10 years ago. If history is any guide, the killer app will emerge. The risk is in waiting to lay the foundation until that app arrives.

There is additional reason for urgency, because carriers in international markets are moving fast to seize the opportunity. In Australia and New Zealand, carriers have started migrating their customers to 5G — while U.S. carriers are just beginning to roll them over. In other overseas markets, monopoly carriers can shift all their subscribers — and they are doing just that. In other words, the rest of the world is moving forward. Among the risks U.S. carriers need to consider is the risk of being left behind. But there is also upside opportunity: The rapid global uptake of 5G means a U.S. carrier could easily serve the global market, with ongoing cost reduction as the user base expands.

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Envisioning the 5G future

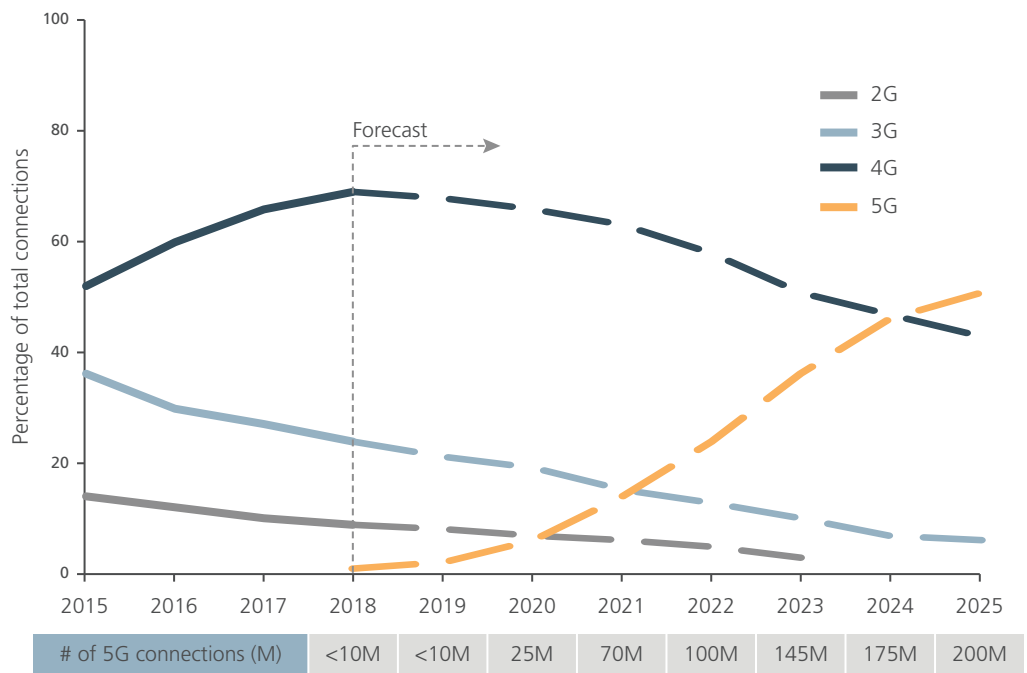
Is there any way to predict what apps might eventually emerge? With all the caveats we've outlined — because, again, this is an emerging marketplace and not yet fully formed — there are some intriguing possibilities. Not only are there consumer applications, but a range of professional and industrial applications are also possible. 5G will have the capacity to power virtual reality and augmented reality projects that could change the face of retailing, medical robotics and remote surgery applications, and programs that coordinate the movement of large numbers of robots in the tight space of a factory floor. These opportunities, in addition to the business use cases (e.g., customized conference calling) and broad-based consumer services that experience suggests, will take shape over time.

Carriers likely will be able to exploit the potential of 5G to create highly specific vertical solutions for healthcare, manufacturing, general business clients and consumers as well.

Build the foundation now, and let the marketplace follow

In evaluating 5G, the main point to remember is that we are in the early innings. 3G took seven years to fully realize its potential, and 4G took a decade. In neither of those cases was it clear at the beginning what the final state of the marketplace would be and what opportunities would emerge. But if carriers in either of those scenarios had held back their investments, they would have

Figure 3
US mobile connections by technology (2015-2025F)*



*Excludes cellular IoT connections
Source: GSMA Intelligence, L.E.K. interviews

missed out on the 3G smartphone revolution and on the array of services that were built on the foundation of 4G.

It's true that right now, thanks to NFV and the resulting end of the high-cost incumbency vendor, the only certainty is a reduction in the cost curve, which in turn will enable carriers to create new services. What those services will be is up to the marketplace to determine. For carriers, the immediate opportunity is to put aside the obsessive hunt for the next killer app and make the investment in 5G. The task of the moment is to build the foundation. As they say — if you build it, they will come.

About the Author



Harsha Madannavar is a Managing Director and Partner in L.E.K. Consulting's San Francisco office. He is focused in the firm's Technology, Telecom, Industrial Tech, Digital Health and Private Equity practices. He advises clients on a range of shareholder value issues, including corporate growth strategy, business model transformation, technology disruptions, product development, corporate finance, and mergers and acquisitions.

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