

Establishing the Foundation for 5G

A 2018 Retrospective Report

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Introduction

2018 saw new advances in technology, new mergers & acquisitions activity, and new pilots in 5G deployment. Though this past year saw a lot of progress, there's much more to come in 2019. In order to make 5G a reality in 2019 and beyond, 2018 laid the groundwork in fiber, small cells, and determined the standards for other 5G technologies. This past year has provided the foundation for 5G.

As the preeminent providers of telecom project and asset management, we have a distinct window into the industry. **Sitetracker customers completed 3,000 projects weekly across major carriers and their supply chain in 2018, which totaled nearly 25,000 more annually than in 2017.** The number of updates, tasks, milestones, and projects are increasing in volume, variety, and velocity. Based on Sitetracker proprietary insight, we project that this will increase by at least 15% in 2019, and continue to increase thereafter. In contrast, capex spending at major carriers is forecast to increase at 2-3%. This reflects the growing volume of smaller, but no less complicated, projects. Over this past year, we've seen an increase in the number of small cell deployments and an increase in projects that can be categorized as base layer infrastructure for 5G, including 4G small cells and fiber.

We see the past, present, and future of telecom as a recurring cycle of project planning, macro and small cell deployment, asset maintenance, and ultimately, business and network growth. For an industry that generates upwards of US \$1.4 trillion in service revenues each year¹, getting these steps right is crucial. And that's just the beginning. Entire new business models and markets will be created by 5G, including ones not yet imagined.

We see the past, present, and future of telecom as a recurring cycle of project planning, macro and small cell deployment, asset maintenance, and ultimately, business and network growth. For an industry that generates upwards of US\$1.4 trillion in service revenues each year, getting these steps right is crucial. And that's just the beginning. Entire new business models and markets will be created by 5G, including ones not yet imagined.

Overall, 2018 was the year of building the groundwork for 5G and preparing for the impending tidal wave of growth. Specifically, stakeholders across the industry and government have been working hard to make three key components of 5G a reality: the regulatory foundation, the operational foundation, and the physical infrastructure foundation.

Regulatory foundation

As 2018 unfolded, United States regulatory bodies made sweeping decisions enabling large and small carriers alike to deploy small cells more quickly and easily than ever before. The FCC rolled out a new declaratory ruling that streamlined the small cell deployment process for carriers and service providers. The ruling removes regulatory barriers to infrastructure investment by ensuring that application processing fees do not unreasonably exceed the necessary costs to process the application, thus reducing the fee amount. Likewise, the ruling limits the maximum amount of time the application approval process can take².

These changes reduce the cost and time necessary for permit approval, greatly streamlining processes, and make it easier for companies to deploy the infrastructure needed for 5G.

4G LTE small cell sites are necessary for the migration to 5G

In essence, the site selection and permitting processes were largely completed for 4G LTE sites in 2018 and will continue into 2019, laying the groundwork for an upsurge in future modification projects, migrating these sites from 4G LTE to 5G technology over the course of the coming years. In 2018, Sitetracker customers completed 192.4 million project updates, reflecting the scale of telecom infrastructure projects. Tim May, Sitetracker CTO, predicts that this number will grow rapidly next year based on the types of projects we're seeing coming into the platform.

Across the United States, major carriers are investing in 4G infrastructure and improving download speeds to address growing demand. These improvements also serve to lay the foundation for 5G. Each 4G small cell can be modified to fit 5G technology standards. Essentially, every 4G small cell will eventually be converted to a 5G small cell as 5G adoption rises.

From new build to modification, the stages of asset lifecycle are blending together so it's important to integrate all of these processes into one platform in order to face these complex challenges. Sitetracker is seeing customers drive to standardize their internal operations and laying the groundwork for 2019 5G projects.

Operational foundation

Building the processes needed to enable 5G technologies

As the race to non-standalone and, eventually, standalone 5G coverage continues to heat up, MNOs need to make sure that they are aligned internally and with their service providers on the processes necessary to build out telecom infrastructure. Wireless carriers must adopt processes that enable them to move fast and provide customers with the best possible and most reliable mobile connectivity.

To deploy telecom infrastructure effectively, carriers must align their processes with their technology. They need to involve their entire ecosystem — from CEO to field worker — to provide customers with the connectivity that, if they don't get from one provider, they will look for in the next.

Telecom carriers, service providers, and their supply chains are facing unprecedented challenges as they vie to provide 5G coverage, including the dramatic growth in project volume without the budget for additional headcount. Whereas a project manager twenty years ago (or even ten years ago) could manage a low volume of projects, such as new tower builds, today's project managers must often manage hundreds of projects or more. Rapidly evolving technology and new entrants into the market are creating even more challenges. While the industry is making progress, to outplan and outperform the competition, companies of all sizes will need to improve their processes and become more efficient.

In 2018, Sitetracker customers completed **192.4 million project updates**, reflecting the scale of telecom infrastructure projects.

Sources:

1. Gordon, K. (n.d.). Topic: 5G. Retrieved from <https://www.statista.com/topics/3447/5g/>
2. FCC Facilitates Wireless Infrastructure Deployment for 5G. (2018, November 29). Retrieved from <https://www.fcc.gov/document/fcc-facilitates-wireless-infrastructure-deployment-5g>

Hurdles and challenges on the way to 5G

So, what's actually necessary to make 5G possible and successful? Fiber is a large component, but what will it take for companies to build enough backhaul to support the number of connections needed for a connected future?

Network densification requires operational excellence to succeed

Project and technology complexity is increasing, which means more moving parts and variables to turn even the best plans on their heads. With the stakes getting ever higher, the difference between winners and losers in the next year will be how well they embrace and adapt to change.

You can't legislate or lobby for changes in project and asset management. Carriers, service providers, and their partners are responsible for the future of 5G in 2019. They must either choose modern project and asset lifecycle management solutions or face extinction — innovate or die.

This dichotomy exists not only because of the demand that new projects and the subsequent explosion in project volume will place on carriers and service providers, but because without these solutions, organizations will not be able to meet opportunities and execute successfully — they will simply be left behind. Twenty years ago, you could deploy 10 towers using a spreadsheet. Today, a project manager is often responsible for hundreds of projects at once. To even keep up, let alone seize new market opportunities, project managers must innovate to become more efficient.

Operational excellence requires both the right processes and tools. Request a live consultation with our industry experts and learn how the Sitetracker Platform empowers industry leaders to seize opportunities and thrive in the 5G era.

Laying the foundation for 5G organizational and industry standardization

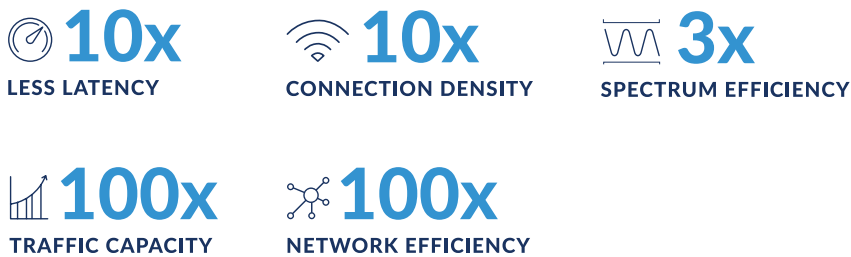
2018 was an inflection point for telecom with big 5G promises from major carriers and a fierce race to be the first carrier to deliver on them. We don't see this competition simmering down anytime soon. In order for carriers to deliver on their 5G promises, they have been heads down densifying their networks with small cell, DAS, and new tower builds.

This played a huge role in the past year in telecom: **data usage is on the rise and constant connection is expected by the consumer.** In this escalating and competitive environment, carriers and service providers must produce or lose market share. And as we mentioned above, there's more at stake than meets the eye. Whether or not organizations can take advantage of new markets and opportunities depends entirely on their ability to innovate and adapt. It's one thing to preserve existing market share, but it's another entirely to wholly own new markets.

Physical infrastructure foundation

What is 5G and what telecom infrastructure is necessary to support it?

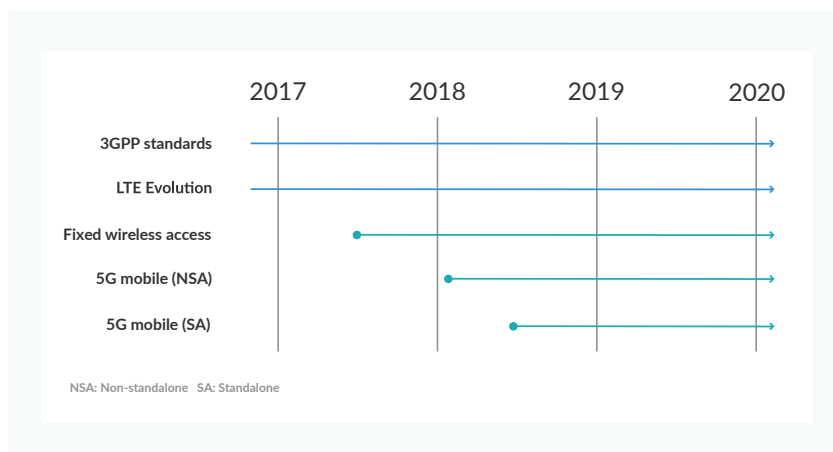
5G will deliver:³



T-Mobile's John Legere says about their 5G deployment: "It enables brand new IoT experiences, massive connectivity, smart cities, decade-long battery life, ultra-responsive networks, and increased speed, but it's more than that – to fully unleash 5G requires a nationwide network."⁴

With staggering improvements such as these waiting to be tapped, it's no wonder the race to 5G is heating up. 5G technology will enable a new age in the internet of things (IoT), Industrial Internet of Things (IIoT), and mobile device usage. From 1G to the development of 5G, we've gone from basic voice communication over wireless telecom infrastructure to virtually unlimited connectivity at previously unimaginable speeds. Each evolution of 3rd Generation Partnership Project (3GPP) standards has brought new capabilities. At this juncture, there are two steps ahead of carriers.

Achieving 5G standalone coverage⁵



So what do each of these mean and what telecom infrastructure is needed to get there?

5G Non-Standalone

The work to achieve a non-standalone 5G network starts with working to densify 4G LTE networks – this process is known in the telecom industry as network densification. Basing the first iteration of 5G on existing 4G technology will enable faster time to deployment.

Sources:

3. 5G & Beyond. (n.d.). Retrieved from <https://cradlepoint.com/sites/default/files/5g-info-graphic-082018.pdf>
4. T-Mobile. (2018, August 02). T-Mobile Building Out 5G in 30 Cities This Year ...and That's Just the Start. Retrieved from <https://www.t-mobile.com/news/mwc-2018-5g>
5. 5G & Beyond. (n.d.). Retrieved from <https://cradlepoint.com/sites/default/files/5g-info-graphic-082018.pdf>

This first phase of 5G deployment will be based on fixed wireless access, built on millimeter wavelength. There are two frequency ranges that non-standalone 5G will use:

- 450 MHz to 6,000 MHz, New Radio (NR), or sub-6GHz
- 24,250 MHz (~24GHz) to 52,600 MHz (~52GHz) or millimeter wave (mmWave)

This means that though speeds and efficiency will increase, connectivity may not be able to penetrate walls and other hard structures. This line of sight transmission will be a jumping point for 5G standalone technology.

5G Standalone

Standalone 5G will not be based on existing infrastructure but requires new infrastructure deployment, including hardware, chips, modems, and antennas. The 5G standards set out by 3GPP require that new infrastructure is built to support a new kind of connectivity.

So, the difference between standalone and non-standalone 5G technology is that non-standalone builds off 4G's existing infrastructure and standalone 5G requires completely new infrastructure with a new set of hardware standards.

What telecom infrastructure do carriers need to utilize and build to make 5G a reality?

To make 5G a reality, wireless carriers and their service providers will need to deploy small cells as quickly and strategically as possible, as well as make strides towards standalone networks. This means that the volume, variety, and velocity of projects is and will be increasing exponentially, whether that's modifying existing infrastructure or building out new sites. The volume of projects necessary for 5G simply cannot be managed in a spreadsheet. Carriers with existing 5G spectrum are undoubtedly at an advantage, but there's a wide range of spectrum that can be used for 5G, so there are a wide variety of hardware deployments needed.

So, the answer to the question, "What telecom infrastructure do carriers need to utilize and build to make 5G a reality?" is really:

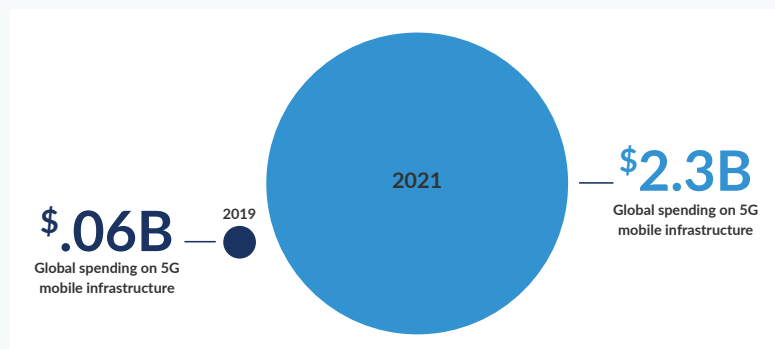
It depends on the spectrum. There will be a wide variety of antennas needed to utilize the spectrum available for 5G. This means that getting to 5G will require more standardization than ever before because the types of projects will vary so greatly.

Fiber providers are the unsung heroes of wireless infrastructure and our connected future

Across the telecom and wireless industry, the news is all about 5G. The cellular world is racing toward 5G and telecom infrastructure, such as small cells, are making headlines. 5G is important for our connected future and, certainly, small cells are a big part of it. We are seeing greater demand for throughput and connectivity. Consumers on their cell phones and other connected devices want high speeds and low latency from their wireless network.

Wired infrastructure backhaul, including fiber optic cable, will support future connectivity. Wireless networks depend on fiber backhaul connections to cell sites. Nearly all wireless traffic is traveling over a backbone of fixed fiber networks. 5G services won't be successful without an expansive fiber network to handle the traffic generated through 5G connections.

Global Spend on 5G: 2019 vs. 2021⁶



Fiber is integral to 5G and small cell success

Most of the data we demand from our wireless devices is actually traveling on wired fiber networks. The part of the journey that is wireless is only the last part of the connection — most of the journey is not wireless. Data travels from your mobile device to the cell tower, small cell, or wifi router, and fiber takes it the rest of the way. For example, if you are sending an email from your phone in San Francisco to a colleague in London, your message is traveling only, at the most, a couple of miles wirelessly. The rest of that journey is across five thousand miles of fiber. Without a strong and expansive fiber network that email would not make it far.

Fiber's irreplaceable role in making 5G a reality cannot be overstated. According to a survey conducted by the Telecommunications Industry Association (TIA), 5G operators consider fiber important for 5G backhaul, with 83 percent of respondents saying fiber is "very important."

This is due to the fact that initial small cell deployments often use high-density millimeter wave spectrum (mmWave) and rely heavily upon a high-speed fiber optic cabling for backhaul.

Deploy and maintain fiber networks successfully

Fiber is the backbone to the wireless infrastructure of the future. Fiber networks are going to continue to grow and expand their reach. It is one of the largest ongoing and high volume projects for the telecom industry and it will need to cover hundreds of thousands, if not millions, of miles.

Sources:

6. IHS; Statista estimates

Sitetracker customers completed **12,000 fiber projects in 2018 alone** and projected to increase exponentially to service demand in 2019.

Expansive fiber networks are going to need to span the globe, traveling under oceans, and connecting billions of mobile devices.

Fiber network providers are not going to be able to meet deployment and maintenance demands using spreadsheets and legacy software. Geographically dispersed teams need a project management solution that provides standardization and automation across processes. Sitetracker is the project management solution that provides organizations with real-time updates on high volume fiber and telecom projects. Demo the Sitetracker platform to learn how to effectively manage teams and workflows for high volume project management.

Sitracker customers, like ZenFi and Xiber, are paving the way for 5G connectivity by building out the infrastructure the industry needs.

Have Mobile Network Operators standardized their processes to dominate the market with 5G coverage?

MNOs will need to get their deployment teams on the same page, including their service providers, to take advantage of the race to 5G, because this race is being run on many different tracks and requires hundreds, if not thousands, of different types of repeatable project processes. Carriers must choose a project management platform that will enable entire project teams to work together seamlessly.

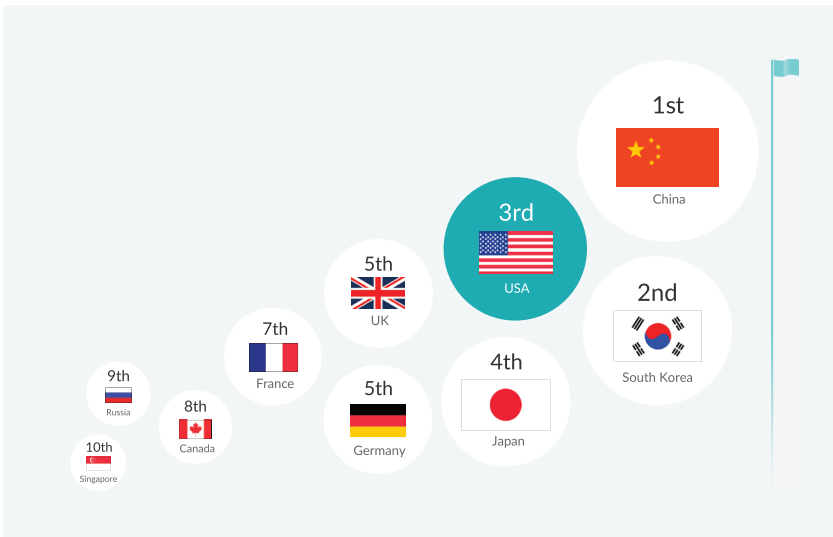
5G is projected to scale more quickly than 3G, LTE, and previous generations of wireless standards. 5G will reach 1.5 billion subscribers, 40% of the global population, by 2024.⁶

Much of the infrastructure needed to make this projection a reality is already in place in countries leading the way to 5G, but there's much work to be done in the coming years. 2019 will be the year of laying the groundwork, solidifying standards for building 5G small cells and modifying existing sites to accommodate 5G.

With the stakes getting ever higher, the difference between winners and losers in the next few years will be how well they embrace and adapt to change. Companies like Verizon, a Sitetracker customer, are already deploying 5G services to households as an alternative to wired in-home services. In the short time that this service has been available to a handful of locations, Verizon has reduced the amount of time it takes per in-home installation by 25%. Some of this time savings can be attributed to halving the time it takes to find the location for optimal signal in the home.⁷ Honing processes and operations can have a drastic impact on a company's revenues and customer service ratings.

The telecom industry has some work to do

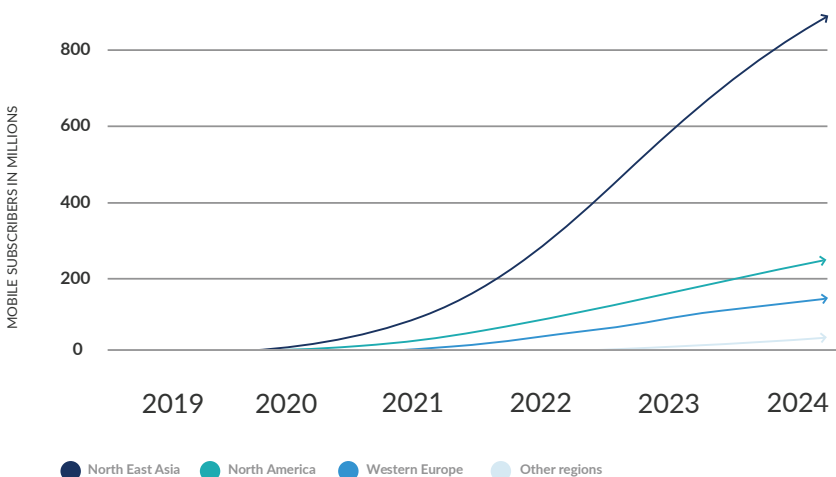
Which countries are pulling ahead in the race to 5G?⁸



Some countries are pulling ahead because they're already investing or have invested in the infrastructure necessary for 5G. China, South Korea, the US, and Japan are frontrunners in terms of infrastructure readiness, with European countries trailing.

Europe and others are falling behind because they lack fiber infrastructure necessary.⁹ Much of the disparity between the fiber infrastructure availability between the frontrunners and lagging countries is due to regulatory differences. The US, for example, has streamlined the permitting application process for small cells, and taken other measures to make it easier for carriers to create the new infrastructure needed for 5G deployment.

Forecast Number of Mobile 5G Subscriptions worldwide by Region¹⁰



In order to change course, Europe, Latin America, the Middle East, and Africa will need to build the infrastructure needed to support 5G, including 4G LTE small cells and fiber backhaul.

Sources:

6. Tomás, J. P. (2018, November 27). 1.5 billion 5G subscribers by 2024: Ericsson Mobility Report. Retrieved from <https://www.rcrwireless.com/20181127/5g/ericsson-mobility-report-5g>
7. Verizon gives some hints about how 5G Home is selling and performing. (2018, November 20). Retrieved from <https://www.fiercewireless.com/5g/verizon-gives-some-hints-about-how-5g-home-selling-and-performing>
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9. Tomás, J. P. (2018, November 21). US and China lead, regulation and competition policy impede Europe 5G. Retrieved from <https://www.rcrwireless.com/20181121/analyst-angle/us-china-lead-regulation-competition-policy-impede-europe-5g>
10. Ericsson Mobility Report. <https://www.ericsson.com/assets/local/mobility-report/documents/2018/ericsson-mobility-report-november-2018.pdf>

The carriers race to 5G

Large carriers are racing to 5G with regular announcements about their progress:

- In October 2018, Verizon announced the first commercially available 5G network.
- AT&T announced that its 5G network is launching in the next few weeks.
- T-Mobile announced that it would build out 5G in 30 new cities in 2018.

Conclusion

Standards are emerging, and mobile network operators (MNOs) should be capitalizing on this moment to own to the 5G space, shape the standards, and outsmart the competition. In order to do this, carriers must adopt processes that enable them to move quickly while providing a higher level of service and reliability to customers. This means aligning their processes with the technology they use to track projects and manage existing assets. This doesn't just apply to projects the carrier manages directly, but that of their service providers, as well. The entire ecosystem a carrier creates and works with should be using the same processes and standards, managed on the same platform to ensure that the end result is a faster time to 5G coverage and reliable service for customers.

A message from our CEO: Innovate or be left behind

It is clear that there are many challenges that lay ahead. It is equally clear they're not insurmountable. The telecom industry continues to evolve and the pace of innovation required to compete is only increasing.

The question now stands: will your organization be able to capitalize on our industry's inflection point? Will you be able to rise to the challenges ahead?

At Sitetracker, we've seen that with a focus on innovation and the right tools, you can. Not only will you overcome challenges, you will be able to use this turning point in the industry to your advantage. Being innovative at this inflection point will empower your organization to increase market share, enter new markets, and provide better products and services to your customers.

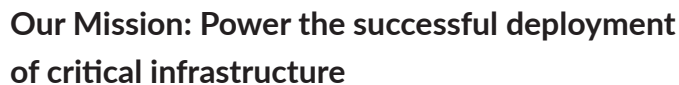
We are partnered with the leading telecom carriers and their service providers. We see that successful companies are those that innovate to achieve operational excellence. They realize that complacency is not an option, and they are not afraid to adapt to change.

Join telecom industry leaders, achieve operational excellence and deliver the connectivity that your customers demand. Free your organization from inefficiency, maximize the ROI of your capital investments, and prepare for the opportunities coming in the era of 5G.

Are you ready?

A handwritten signature in blue ink, consisting of a large, stylized 'G' followed by a series of loops and a final horizontal stroke.

Giuseppe Incitti
Sitetracker CEO



For more information, visit www.sitetracker.com.

