



# The Coming of 5G


Checking in with mid-market IT  
leaders about their 5G awareness  
and adoption plans

## Tech

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It's going to have an impact on everybody under the sun. If you're connected to the internet, if you're connected to anything, 5G is going to impact you.





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# Project Background

# Research Background

Timing, method, participants

In July 2019, LinkedIn conducted research with IT leaders from mid-market (500 – 3500 employee companies) to understand their thoughts and actions around the future of 5G technology in the United States.

20 45-60 minute qualitative style telephone interviews occurred and covered such topics as current awareness, perceived benefits and challenges of adoption, and the overall impact on the business.

## Participants represented six verticals



Healthcare



Financial services



Transportation/ logistics



Technology



Retail



Local government

# Key Topics covered

## Current awareness

What do IT leaders know about 5G presently?

Where are they getting information from?

## Adoption plans

What are adoption plans for 5G?

What preparations are they making now, if any?

## Overall / vertical specific benefits

What are the overall benefits of 5G?

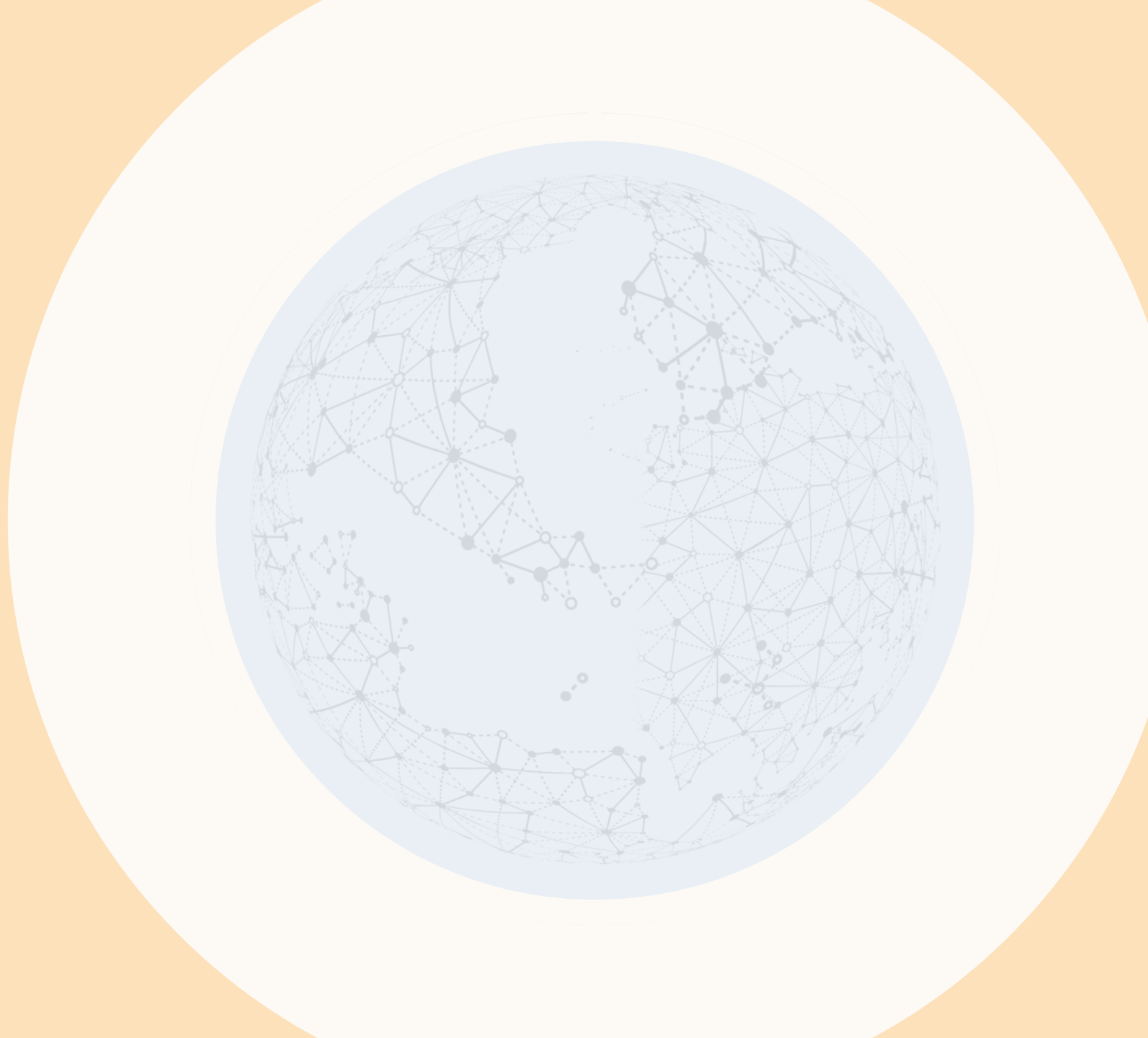
What are potential use cases in each vertical?

## Vendor landscape

What do companies need from current network vendors / carriers?

Do they anticipate a shift or disruption to the landscape?

The  
24-7-365  
on demand  
world



# Always on demand

## Retail

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Your storage, your shared documents, your data. You are so heavily cloud reliant now.

You never want to hear, 'Oh this is not working because we can't get connected.'



- Today's businesses operate in an always-on, on-demand world.
- To be competitive, they must not just be connected – they must be well-connected.
- Although the casual worker might not notice it regularly, IT leaders understand the technological limits that their businesses increasingly bump into.
- Although not without its own set of concerns, 5G has the potential to solve many problems.





# Big Data = Big Bandwidth Needs

## Tech

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You're dealing with big data, and big data requires big bandwidth. That's why we need to get ahead of the game or we need to be in the game, at least, because we're touting that you can do this, it's now in the cloud, you can access it mobile, but realistically how efficient and effective is that going to be?

Not very until we can get a better performance, better bandwidth, certainly better reliability, it's probably going to be a problem.

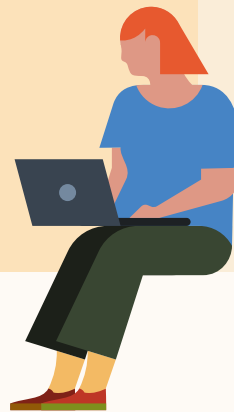


# Current infrastructure is often a limiting factor

## Retail

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In Aberdeen, North Carolina, there was **no fiber feed** to my building for roughly like a five mile spread. We had to invest pitch in for laying the fiber. We're talking tens of thousands of dollars.



- Current infrastructure is being taxed – whether it's running out of IP addresses, not having enough bandwidth on current lines, or not having lines altogether, companies are feeling the pinch.
- In many cases, they must dig into their own coffers to lay cable and make necessary infrastructure improvements.



# Today's network challenges are divers



Several levels of redundancy



Limits to what can be transmitted



Difficult access in rural areas



More wireless access but still not pervasive



Simplified interfaces for mobile



Bills from multiple providers



Slowdowns, capacity issues during peak times



More user owned mobile devices doing more tasks



Contracts

## Tech

“I have a lot of my services under Access One including some of my Comcast services. But I also I have XO Communication which provides other services and it's a separate bill. I also have separate bills for all the local municipalities, the last mile hookups. I have bills from AT&T, Frontier, Windstream.”



## Retail

“In some of my buildings, the cabling is getting very, very old. We're always updating cables and wires that are either old or that have been damaged by excessive light and heat. This can cost \$20,000 for a normal size building and take a good week to complete. We're always looking for ways to solve that.”



5G is expected  
to solve many  
current issues



**For the IT professional, 5G can be a solution to a host of headaches from network traffic to opening new office space.**

- Even if they do not know a great deal about 5G, they know they need to think about it.
- Managing a network in 2019 means dealing with strategic initiatives (ex: deploying SDWAN) and mundane problems (ex: worn out cabling in a building, too many Skype video chats occurring while shipping and receiving is coping with a spike in orders).
- Fiber is helping alleviate the load on copper lines but getting it can be expensive and time-consuming in many areas. 4G is the only backup network in some instances but still has limitations.

**5G can solve many of these issues**

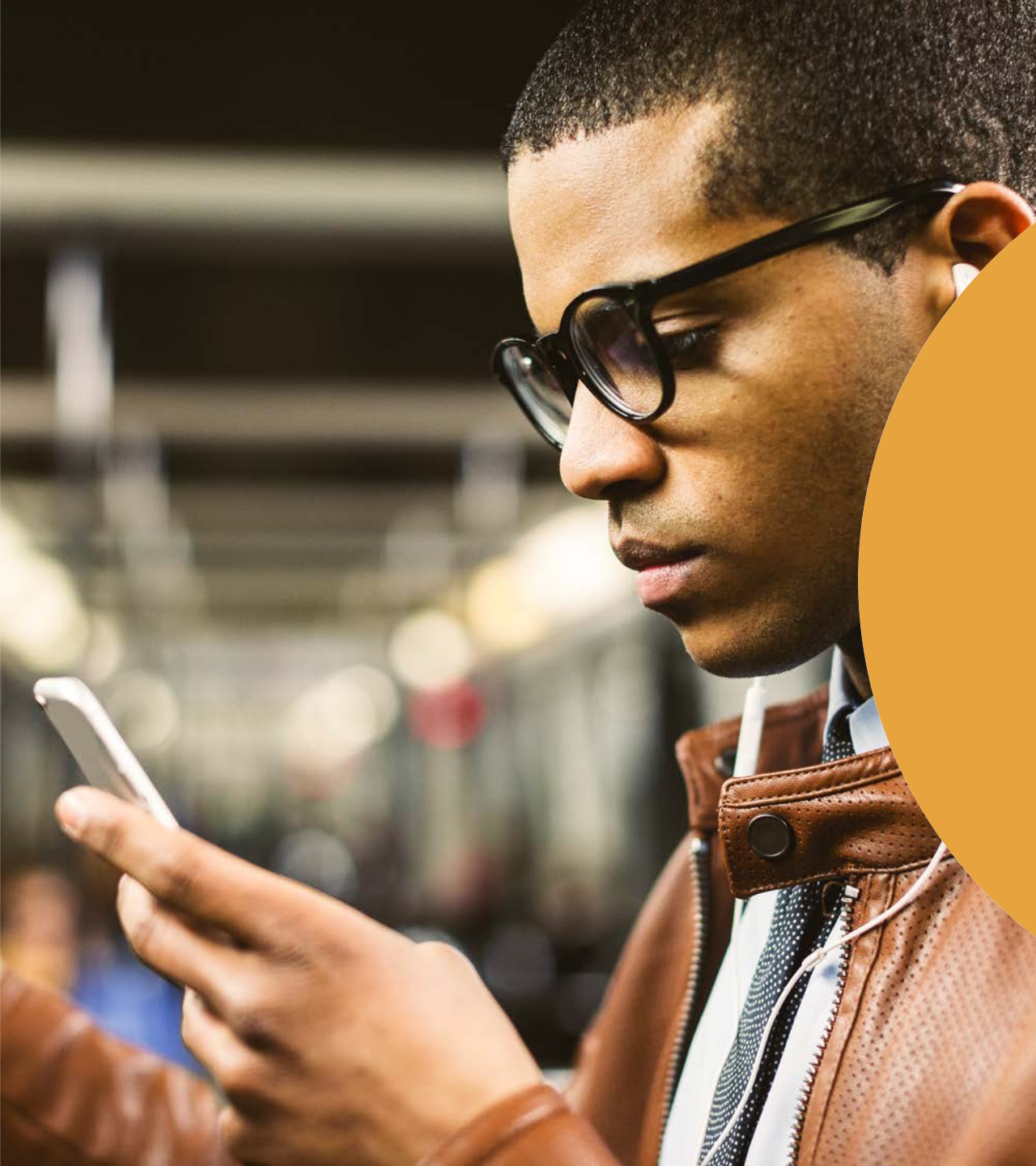
## For IT leaders, 5G's biggest impact will be on infrastructure and employee productivity

### Infrastructure

- More technology in smaller packages. Especially important for B2B.
- Better integration in a BYOD (Bring Your Own Device) environment – regardless of platform or application, workers do not sacrifice anything using their own devices. Delivering more information in apps versus dumbing them down to create a faster user experience.
- In some cases, companies may be able to make existing networks smaller and utilize more VPN solutions for IOT devices and remote users.
- Less dependence on a variety of ILECs and CLACs for office connectivity and greater negotiating capability. Less time spent dealing with multiple vendors.

### Productivity

- Workers can work anywhere and be just as productive.
- More multi-dimensional training and simulation opportunities.



# Awareness of 5G



Surprisingly, little  
is known among  
IT leaders

**Separating 5G hype from reality is a challenge.  
Everything is in flux.**

- Even among the most astute IT leaders, the lack of and inconsistency of solid knowledge about 5G was surprising.
- Aside from it being faster than current 4G technology and a few specifics over wavelengths, there are no universally accepted / known principles of 5G.
- Some mention that it is already available in China while others think it is beginning to arrive in the US. Although some understand that 5G will not rely on traditional cell towers, they do not necessarily understand how dense new 5G transmitters must be.
- Leaders freely admit that information varies from source to source and in line with the way previous network technology has rolled out, much of it is hype anyway.

# Expectation: Lots of hype, little transparency



## Retail

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“The cellular companies, and providers, and ISPs just take too long to get stuff to the market. I think they just finished LTE, which was supposed to be the fastest, the baddest, the nicest thing that you could get.”



## Tech

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“I personally am not too concerned about the marketing speak. I do my best to discount it and get through to the underlying technologies. They did a terrible job in the early days of defining what 4G meant. We just sort of got there over time.”



## Tech

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“When we were going from 3G to 4G, it's all hyped. Typically, one carrier tries to get an advantage over the other by coming up with, ‘Oh, we've got 5G, now.’ What does that really mean, 5G?”





IT leaders are  
not ‘holding  
their breath’

**IT leaders have excited skepticism about 5G. They believe it will come but will believe it when they actually see it.**

- How much better 5G will be versus current technology remains to be seen. Comments range from 100mb up/down speeds to the experience of going from a four to 100 lane highway.
- All companies agree that technically, 5G means faster data transfer speeds and practically no latency (network lags or drops). And theoretically, it should mean more people and devices accessing data simultaneously enabling more realistic and richer online experiences.
- Through today’s lens, however, 5G takes on a more practical look. As one participant puts it, “5G looks like ten to twelve workers using a MiFi type device in a remote office without any issues or limitations”.

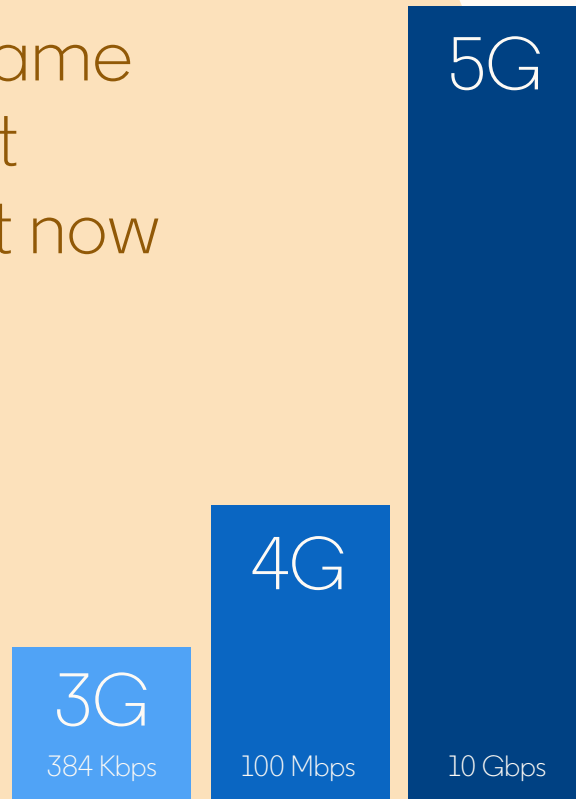
## Finance

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A small farmer is in a village that has some type of fertilization equipment and a sensor says that he needs more nitrogen and he's on a metered nitrogen plan. He could use that device to purchase nitrogen and some entity could process that transaction. Is that a crazy scenario or is that entirely realistic with 5G?



While 5G is a game changer, it is just another 'G' right now



- For some companies, 5G is just another evolution of network technology a la 3G and 4G.
- It is hard to get too excited about 5G until they can experience it first hand. They have become blasé to carrier “hype” which often comes along with roll out delays, technological hiccups, and increased costs.
- Compounding matters is carriers’ historic reticence to adhere to any naming standards.
- What is 5G for AT&T may not be so for Verizon. Their experience with 4G and 4G LTE suggests new networks can be all about branding and less about the underlying technology.



# Technology benefits

# Transport

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We tend to be asset light. And that means the land, too. In the past, we might have had a 20 year lease. Now we might have no lease. We might have a space availability contract where a ship comes in or something. We work it and we rent out five or six acres from the port while we're working. Then, as soon as all the cargo has been delivered, we're out of there.

What that means is that we can't install physical infrastructure. But there is potential opportunity for flexible or mobile infrastructure and 5G could be a way to allow for wireless cameras and other devices to help improve our operations. That's where you see technology complimenting business. And it's not technology at the speed of business, it's business at the speed of technology. **Technology is no longer a limiting factor. It's a key enabler.**



# Ultimately, 5G enables companies to be more nimble in a world where success depends upon it



## Flexible operations

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- Rapidly establish fully enabled physical presences without dependence on ILECs and CLECs.
- Ex: Temporary office spaces, pop-up shops, remote shipping / receiving facilities.

## Fit for the on-demand world

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- Bandwidth needs rapidly change and often do. Companies need technology that gives ample headroom for data.
- Ex: Enabling shipping to keep pace when product orders spike due to a social media call-out.

## Better consumer experiences

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- Use new tools to more easily connect with customers and keep them engaged no matter where they are.
- Ex: Remotely diagnosing and fixing an equipment problem.

# More flexibility – open and close offices on demand



## Finance

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“When we start moving people around the office, when we start adding additional floor space, the infrastructure and cabling capability necessary to make it happen can take months. Working strictly through a **wireless connection**, the setup of the new office space could **happen in days.**”



## Finance

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“Anytime we have a new store or office opening, we have to first find out when the opening is, because we work backwards to make sure we can get an **internet connection** to it.”



## Retail

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“If I were to, say, let’s open up a new store, the first question is, ‘**How soon can I get an internet connection?**’ Because before 4G came, 3G wasn’t an option. When 4G came, it’s a valid option, but we run into issues with bandwidth.”

# Lighter technology footprint



Tech

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“Instead of people bringing goods to you for analysis, you can process them at their offices premises. You can sort of do that now but with all sorts of equipment. With 5G you might be able **to test everything on site with just some small devices** that transmit the information somewhere else.”



Tech

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“Our manufacturing customers are saying, ‘**We get everything through the cloud.** We want to do the same thing with your tool. We do not want to invest in all this CAPEX just to house computers to run your software. And **we want it done now.**’”





# More mobile / productive salesforce

## Tech

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It will improve communication – whether via phone calls or emails to customers or just working with employees in the field. If you're working virtually, you'll have instantaneous connections. Presentations will download faster. With virtual rooms, it will allow our salespeople to ultimately spend less time on the road.



# Some cost savings, but not always in the areas expected



## Tech

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“For our enterprise applications to perform we do a lot of caching. We use a lot of file collaboration servers. We do location-based file upload and download so anytime our CAD designers are working and they need to check on files, we check their current location and take them to the nearest servers. **If 5G is available, we can probably get rid of all those layers** that have been built just for performance.”



## Retail

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“I can now use a customized app that someone downloads on the phone. Most of our store managers are part of our BYOD policy, so we add the inventory map to their phone. I push it out to the devices where it's already programmed and **then I don't even have to spend \$900 on the inventory guns** that they have sitting there. **They use their phones to do it.**”

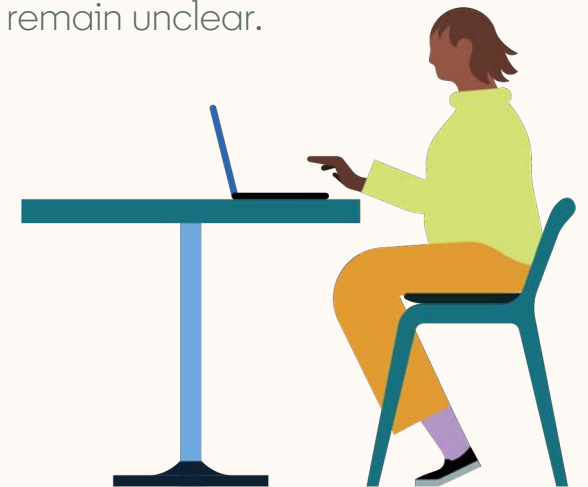


# Adoption Plans

IT leaders  
anticipate 1 to 2  
years for rollout

**IT leaders have experienced 3G and 4G roll outs.  
They know it takes time.**

- General consensus is that 5G will move from testing to the first phases of significant roll-out in 12-18 months.
- Critical to the roll-out will be availability of 5G phones (and thereby mass production of 5G chipsets). While Samsung has its S105G for sale, there was no awareness of it or any other available 5G devices.
- Apple's plans for a 5G iPhone remain unclear.



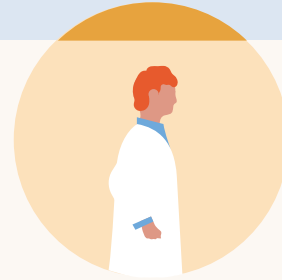
# Timeline - verbatims



## Finance

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“It's very, very early days. There hasn't been a large rollout and it's not yet clear what devices can support 5G. There isn't a 5G iPhone. A 5G iPhone will be the tipping point for people picking this up and let's hope that carriers are ready.”



## Healthcare

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“I'm thinking probably end of 2020 is when we will truly have a direction on whether this is available as a mainstream technology or just small pockets of the world or. We'll know if it's ready for primetime or not.”



## Tech

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“The arrival of the autonomous car will mean 5G a reality. That technology would require every device on every vehicle to be available to other vehicles. Extreme network connectivity and very low latency.”

# Key concerns

Arising mainly from lack of details about 5G and the rollout plan

| Coverage  | Cost  | Hardware   | Network Management  |
|---|---|--|---|
| <p>For 5G to be a truly reliable solution, leaders need assurance that system assets will work anywhere and everywhere.</p>                   | <p>5G will inevitably mean more data consumption overall.</p> <p>How will carriers charge? By the bandwidth used? Will there be data caps?</p>    | <p>Greater data usage will place new demands on servers, switches, and end user devices.</p> <p>Until details about roll-out timelines and actual speeds become available, it is impossible to forecast necessary new equipment.</p> | <p>5G will inevitably mean more devices accessing wirelessly.</p> <p>Consequently, there will be more devices operating outside the confines of traditional networks.</p> <p>Managing devices on the edge will present new security concerns.</p> |
| <p>“The density of the transmitters has to be pretty high for this to work. How long will it take to get there?”<br/>-Anthony (Logistics)</p> | <p>“If it is more expensive and it’s the same as getting a hard line connection, then I am inclined to get the hard line.”<br/>-Abbi (Retail)</p> | <p>“I am sure there will be greater volumes of transactions which will at some point mean upgrading hardware.”<br/>-Gary (Finance)</p>   | <p>“I try to get as many things off of my network as possible. If I can offload more of that, great.”<br/>- Jon (Retail)</p>  |

# Concerns - verbatims

## Finance

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### Cost

“How is this going to impact the financials? **Obviously we have to pay for 5G**, the R&D. Are the telcos really going to up our pricing plans to cover it?”



## Healthcare

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### Coverage

“The drawbacks will draw a parallel from the 4G world. If I'm in Boulder I have great coverage, but the moment I go to Denver it's a problem. You have to be able to reliably do things. **So coverage would be one.**”

## Finance

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### Network Management

“**My concern always is the uptime guarantee, and the speed guarantee.** Even when I talked to our counterparts in Germany two years back, when we were discussing this, I'm like, ‘So, do you really ... are they stable enough?’. And they were like, ‘No, it's still running through your cell phone towers, so depending on the daytime congestion on the network, **you never know if you'll be able to get the bandwidth you're looking for,** because it's not dedicated to you.’ ”

# Keep calm

Some matters are not even worth thinking about as they tend to work themselves out or be more hype than reality

| Safety  | Security   | Compliance  |
|---|--|---|
| <p>Unfamiliarity with 5G and contested claims against current wireless technology fuel confusion.</p> <p>Companies are unsure whether to worry or not. However, they generally feel it will be safe if the government and industry is pursuing it in such a visible manner.</p> | <p>Security is always a concern. There is nothing to suggest 5G will be inherently more or less secure than any other technology.</p> <p>Hackers will continue to hack and companies will continue to spend money safeguarding networks.</p> | <p>Compliance is more internal and network agnostic.</p> <p>Companies do not know enough to anticipate needing to make any changes.</p> |
| <p>“I’ve heard some birds will not be able to survive because of the radiation.”<br/>- <b>Abbi (Retail)</b></p>   | <p>“We’re going to employ the same principles we do now with any wireless connection.”<br/>- <b>Bill (Retail)</b></p>  | <p>“There may be issues for certain providers but I don’t know what they would be for us.”<br/>- <b>Jeff (Tech)</b></p>                 |



# Safety / Security / Compliance - verbatims

## Finance



“It’s not going to change from how 4G now. The vulnerabilities are still there and I assume they’ll remain the same and we have to work hard to be cognizant of that. But moving from 4G to 5G doesn’t increase the risk at all.”

## Healthcare



“I’m thinking probably end of 2020 is when we will truly have a direction on whether this is available as a mainstream technology or just small pockets of the world or. We’ll know if it’s ready for primetime or not.”

## Tech



“The arrival of the autonomous car will mean 5G a reality. That technology would require every device on every vehicle to be available to other vehicles. Extreme network connectivity and very low latency.”

## Transport



“Because we work with the Department of Defense, we have to be NIST-800 compliant. My thinking is that there’s no way 5G’s not going to be able to be secure to a standard where the military and the government can use it.”



# Key concerns

While they are unsure how, 5G will likely disrupt the network vendor landscape

| Wireless Carriers   | ILECs / CLECs   | Tier 2 Providers   | Tech Players   |
|---|---|--|--|
| <p>Companies mostly think of Verizon, AT&amp;T, and T-Mobile when they think of 5G.</p> <p>There is no clear leader in the space as of yet.</p> | <p>Assuming 5G makes it beyond the confines of urban areas, it could allow companies to bypass ILECs.</p> <p>5G may also be a viable backup alternative at an office versus the CLEC.</p> | <p>Tier 2 providers are valuable in that they provide seamless access across multiple locations.</p> <p>As 5G coverage becomes more pervasive, companies be able to satisfy more needs with one larger provider.</p> | <p>New technology always means the possibility of new players.</p> <p>Google and Amazon are undoubtedly flexing their muscles in 5G in some fashion.</p> |
| <p>“I assume AT&amp;T, Verizon will be leading the charge.”<br/>- Gary (Tech)</p>   | <p>“To run lines for a new office can take 90 days and you have no choice. 5G is a way around that.”<br/>- Dennis (Finance)</p>   | <p>“I can’t imagine we would suddenly just stop working with our provider. It will take time.”<br/>- Nicke (Tech)</p>  | <p>“Didn’t Amazon want to buy its own network? You never know what they are up to.”<br/>- Ameya (Healthcare)</p>   |

# Competition

## Healthcare

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“I think Verizon's at the top of the list. But some networks are having trouble with offering widespread 5G in a city. Having trouble with penetrating certain walls, tall buildings, trees. It sounds funny but that's so true about the pains that they've been having with 5G.”



# Opportunities for leadership

There is no pressure to  
consume 5G information

## Everything still feels very beta.

- There is no leading voice – person, company, government, or otherwise for 5G. There is so much noise that nothing is getting through.
- Information sources are the usual suspects – leading CIO publications and conferences and general Google searches.
- For some, the wireless carriers might lead the charge. For others, leadership will come from the chip or hardware makers.
- Companies are willing to listen to providers but as of yet have not been approached with detailed plans for 5G roll out.

# Timeline verbatims

## Finance

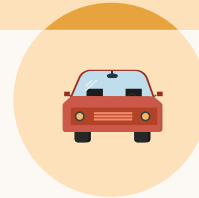
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“I thought that the companies like Qualcomm and the Nokias, the hardware manufacturers, I thought they were the ones that were going to take lead on saying, this is the 5G standard.”

## Transport

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“The Ubers and Amazons will be adopting it first. Once the rest of the market sees that, it will think, ‘Oh well, all right, now it’s real.’ ”

## Tech

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“The other thing that I think is going to become much more relevant for me is I expect that certain carriers are going to have much better footprints in certain areas, and I therefore am going to need to establish and maintain relationships with multiple carriers for that reason.”



# Vertical specific use cases



## Retail

“ With 5G, retailers can have greater flexibility with leases and trendy pop-up shops.

They can also better use online assets and provide consumers with better experiences in store.

”

### Opening stores

- Rapidly deploy “IT in a box” to enable new store openings.

### Inventory management

- More reliable inventory management without needing to use specialized equipment such as scanners.

### Customer experience

- Seamless ability for customers to get online and share with others what they see and may buy.
- Ability to integrate online catalog assets with physical items to make the sale.



## Case Study Retail

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We are very **focused on pop-up shops**. We never like to sign contracts for services to that real-estate because we never know what the lifespan will be on them.

We want to put our store tech in a refrigerator sized box. It would include our point of sale server, the firewall, our Wi-Fi equipment, our switches. If we have a good 5G wireless router in it we can tell them to just plug it in a go. Even if it guarantees only 50 MB up and down, it's a game changer because the business no longer needs to give me 4 to 6 months lead time to make it happen.

Being in the boutique business, we have Wi-Fi for guests. That experience should be seamless. Guests should get that high-res video when they're doing FaceTime with someone to show them the clothes, et cetera, so.

We're adding what we call a digital content catalog, which will be talking with the virtual app in the store, which is talking real time to our online catalog, which is high-res images. We want as much bandwidth we can get, because there will be 5 to 10 associates at any given point trying to browse through our online catalog with clients.





## Healthcare

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“ If we can have vehicles out and about providing real medical procedures, imagine what that will do for our brand. ”

### Embedded devices

- Embedded devices in patients seamlessly transmit data and integrate with voice assistants in home – “Alexa – what’s my sugar level?”

### Virtual doctors

- While with patients virtually, doctors can instantly access large images / files rather than staff having to assemble them in advance.
- Zero latency will enable doctors to preform virtual surgeries or at the very least, participate in more realistic training.

### Mobile medicine

- Not just giving shots but performing more complicated procedures on site.

# Healthcare verbatims



## Patient care

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“Let’s say your sugar level was very high in the morning? So, maybe in the afternoon, your Echo will ask you a question. “I see your blood sugar level was high this morning. Is everything okay? Are you taking your medication? Yes, no, maybe.” And then, they say yes or they click no. If they say no, then we can take preventive actions based upon it.”

## Patient care

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“There are so many studies that patients recover faster, healthier when they are recovering in their own home, compared to a hospital. So again, I think that it will answer the communities need that the patient heals in their own home, but the clinical care team can take care of the patient through the IoT devices as long as they are now reliably send the data back to the mothership.”

## Doctors on demand

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“Before a doctor comes to the office, we have to start accumulating data and a device. And then, keep it scaled for about four hours or six hours until the doctor connects to the network and views it. And so, what we're planning to do is try to be as real time as possible. To get the data, scan it immediately to the system, generate a report.”

## Need for devices

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“We have 3G and 4G devices out there that we don’t want back and we are waiting to upgrade. But we do not know if the new 5G devices are going to be more expensive? Less expensive? Will the speed offset the cost?”



## Transportation

“ So much of this business is based on personal interactions which take a lot of time and cause delays. The more we can automate and have freight seamlessly handoff between different parties, the better. ”

### Office space

- Fully connected but temporary intake stations such as floating docks and warehouses.

### Goods management

- Even the smallest of goods are tagged and connected to digital manifests which monitor location and condition.
- More cameras to monitor inventory and definitively settle theft and damage claims.

### Autonomous equipment

- Operatorless cranes and fork lifts lower costs and allow uninterrupted workstreams.

# Transportation verbatims



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“How would you drive down reactive time in your operation? And we've talked about video and photographs, right? We could probably put a lot more cameras in and we could reduce our cargo claims significantly and better manage how we're actually executing the operation than we do today. We're highly reliant on humans and physical aspects and hearsay, if you will, for sort of how things work.”

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“I've been on terminals where we've had truck drivers and longshoreman get hit and die. Let's say you gave every one of your people vests with sensors that are alerting them fast enough that “there's something coming.” Sensors could give a warning that you're about to enter into an aisle where there is something that's moving in that aisle.”

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We have 3,000 chassis in Hawaii that don't just stay on one island. They actually go on barges to the other islands. And then those have to be serviced once a year by the Hawaii Department of Transportation. Well, we lose chassis. We can't even find the chassis or we have the wrong chassis on the wrong islands to get serviced. And then they get red tagged and must taken out of service.

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Being smarter about our maintenance on equipment. Maintenance is preventing you from losing revenue. It's such a waste. And how do we take out the places where things slow down and then how do we automate some of the pieces where we have to hire checkers and inventory specialists?



## Technology

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“ It takes a rack full of equipment to run our software and customers are always clamoring for us to get it into a smaller package. If we can have a “dumber” and smaller device on site that transmits everything back to HQ, that would be great. ”

### Hardware

- With less reliance on local processing of data, companies can use dumber devices locally that send signal back to HQ for more intense processing.

### I.OT.

- Multiple sensors that not only communicate with a central server but also one another making devices truly smart.

### Application experiences

- Applications that include all data and information which normally may only be able to be received on a workstation.

# Case Study **Internet Company**

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It will allow us to move data much, much quicker. It will also allow us to move data off an aircraft much more efficiently. Right now we use terrestrial modems when the plane is on the ground over either a 4G or 3G connection which is really slow. We're hoping to really leverage 5G for those types of applications. And we're talking about aircraft data - engine data, flight data which can create quite a large digital footprint over the course of a flight.

We also are moving media files around. We offer in-flight entertainment solutions, so we need to move movies and TV shows and magazines from our central hub out to the individual aircraft themselves. And then once the aircraft is airborne, and we're hoping to leverage 5G to improve bandwidth and speed on board the aircraft.



## Financial services

“ We sometimes need to set up offices in foreign countries during peak times. I need advanced notice of that so I can get the comms set up and it doesn't always come. ”

### Office space

- Deal teams can quickly establish local offices. Service teams can be more flexible when establishing operations in foreign countries and / or where people are needed for regulatory purposes.

### User verification

- More bandwidth means more ability to authenticate users with multiple data points providing greater transaction security.

### Metered billing

- Users of all kinds will be able to more easily pay for things as needed and on the go.

# Financial Services verbatims



## Impact to the business

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“People will be consuming more media because they can download and watch more videos no matter where they are. Which means people will be paying for more things.”



## Will it require a hardware upgrade

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“We obviously have a number of transactions per second that we process now and we know our peaks, averages, and growth rates. We have a monthly prediction and know how much our systems can handle and how much head room we have. Carriers need to give thought to their back office APIs when they roll out 5G.”





## Local government

“ 5G will create many new things for us to consider. Are we going to allow people to stream anything on city buses? What are the limits of what we will enable? ”

### Public transit

- Less lag and greater coverage / reliability mean that transit vehicles and trains can continuously post location data. “Two minutes away” will truly mean two minutes away to the person waiting for the bus.

### Natural disasters

- Bandwidth is always a concern during natural disasters. Emergency personnel will be able to claim the entire spectrum and / or not compete as much with the general public.

### Social services

- Case workers can do more in the field and spend less time in the office.

# Government verbatims



## Tracking

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“The biggest thing for us I think is tracking the buses. If you're at a bus stop, you should be able to go on the app and see exactly how far away that bus is. Our system is so slow that it can mean a 5 minute estimate is more like 15 minutes or maybe that the bus has already come.”

## No standards

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“In government, different entities may use different services. We're not standardized which can cause a lot of headaches.”

## Limits to discuss

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“5G will create many new things for us to consider. Are we going to allow people to stream anything on city buses? What are the limits of what we will enable?”

## Legal issues

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“We had one vendor say they could take care of everything with cameras and videos. They need to know this opens up a lot of legal issues for us. Bus drivers cannot be photographed. All that video could be subpoenaed for legal cases where they need evidence that something happened even if the bus had nothing to do with it.”



Thank you