

CIO Think Tank Roadmap Report:

NE ERERESE

32 IT leaders Share Use Cases, Challenges, and Insights

TAT HILL





Last year, a sudden shift to remote work reinforced a vital concept that companies might have started taking for granted: **Connectivity is the lifeblood of** work. What role should 5G, the latest generation of wireless broadband, play in that connection?

That's the question explored in a series of virtual CIO Think Tank roundtables held in May and June 2021. Dozens of IT leaders took part in three panel discussions, identifying 5G's potential and hurdles for enterprise adoption, highlighting innovative possible use cases, and illuminating the kinds of partnerships needed for 5G technology and infrastructure.

The roundtables were facilitated by John Gallant, enterprise consulting director for IDG, and also included Carrie MacGillivray, group vice president and general manager for Worldwide Telecom, Mobility, and IoT Research at IDC; Eric Knorr, B2B editor-in-chief at IDG; and Mark McDiarmid, SVP, Radio Network Engineering and Development at T-Mobile.

The participants—IT leaders from a range of commercial industries, universities, and government agencies of all sizes—drew on their own experience and knowledge to describe strategic and tactical approaches to critical connectivity challenges. How will IT harness the potential and overcome the practical challenges facing 5G, the next generation of cellular technology? What new applications and transformative business changes will the lower latency and higher bandwidth of 5G make possible?



WHAT IS CIO THINK TANK?

CIO Think Tank is a unique collaboration showcasing the ideas and expertise of top IT executives, IDC analysts, IDG editors, and our exclusive vendor partners. Our goal is to explore and shape the future of the IT function and emerging technologies. T-Mobile is IDG's partner on this 5G CIO Think Tank. For more on this program, go to www.idg.com/product/cio-virtual-think-tank.

CIO T**H?NK**TÂNK

TABLE OF CONTENTS

2 Introduction

3 5G, Connectivity, and Innovation

4 Flavors of 5G

5 Use Cases: Doing Today Better

7 Use Cases: Transformative Opportunities

8 What About IoT?

9 Obstacles Facing 5G in the Enterprise

11 What to Do Now

13 Participants

5G, Connectivity, and Innovation

Broadband wireless connectivity, anywhere and everywhere: The idea opens up seemingly endless possibilities, far beyond just mobile devices with faster connections. CIO Think Tank panelists said they are looking at 5G to solve immediate tactical challenges, while also keeping an eye on transformative applications and ideas.

For example, when Covid-19 hit, much of Discount Tire's work and customer contact suddenly moved from the indoor bays to the parking lot, where the Wi-Fi couldn't provide a strong signal, said CIO Gary Desai. That's something 5G could help alleviate without requiring IT to provision a new network.

That's a today problem. 5G's higher speeds, bigger bandwidth, and lower latency than priorgeneration LTE technology will offer even more solutions tomorrow.

"Gaming, freight management, broadband to a home or possibly a small business, rural connectivity in the near term, 5G can address those types of use cases," said IDC's Carrie MacGillivray. "But in the longer term, we can start to think about remote surgical procedures, robotics in warehouses, and autonomous public transit."

Security is another potentially attractive benefit of 5G.

Talent company Aquent is taking the pandemic's work-from-anywhere wave as an opportunity to rethink its offices, and some have been closed. VP of IT Robert Stretz said the company is considering turning off its Wi-Fi network in those that remain open.

"[The chance to] not provide Wi-Fi, not provide all those infrastructure services, and just focus all of our energy on the endpoint ... really dovetails with our zero trust [security] initiative," he said. He is keeping a close eye on 5G infrastructure to see when this approach might be feasible for his business.

5G isn't necessarily faster than Wi-Fi, and MacGillivray said IDC expects 5G will work alongside it rather than replace it in most cases. Still, IT leaders in several contexts—campus settings, in particular—said it's tempting to let carriers provision the network.

The rollout of 5G is nowhere near complete, however. And there are multiple flavors of 5G, some of which do not offer much speed advantage over existing wireless broadband. In fact, many IT leaders said they've been put off by vendor and media hype that's outpaced the actual availability of 5G service.

"Finally, people just say, OK, we'll wait until it's really here, and then we'll start thinking about what we can do with it," said Michael Mayta, CIO of the City of Wichita.

It's on the way, but 5G requires a lot of infrastructure to offer its full potential for enterprise users.

Bringing 5G to the People

5G requires three factors to achieve adoption, said T-Mobile's Mark McDiarmid.

First is radio spectrum.

"That's not the hard part. That's kind of what we [carriers] do," he said.

Second is "access to massive volumes of real estate" to put connection points in place, particularly for high-end, ultra-low-latency applications of 5G that require line-of-sight connectivity (see "Flavors of 5G" sidebar, next page).

Third is fiber connectivity to the base stations.

CIO Th?nktänk



\$5.7B

Projected private 5G/ LTE infrastructure sales worldwide by 2024 Source: IDC

\$249.2B

Projected 5G services market worldwide by 2026 Source: <u>Markets and Markets</u> All that buildout takes time and money. In densely built areas like Manhattan, the real estate is hard to get and expensive. At the other end of the spectrum, sparsely populated places like Nevada's high desert and a Trona ore mining town in Wyoming don't offer an immediate payoff for carriers. A number of CIO and CTO panelists said they aren't ready to buy until carriers can demonstrate strong, predictable, reliable service in the right locations. And, according to IDC's research, many buyers perceive price and battery life for 5G devices as problems, at least in the near term.

Solving these challenges requires creativity. All three CIO Think Tank discussions eventually pointed to the need for collaboration and partnerships, potentially on a scale rarely seen in IT. Industry competitors, telecom carriers, IT, operating technology, cloud computing providers, legal and real estate leaders, cities, and states expect to sit at the table with any or all these individuals. For a lot of organizations, waiting for the carriers to deliver cheap, ultrafast 5G means sitting for a long time.

To seriously consider investing time and money in early 5G adoption, panelists said they wanted to see a broad range of use cases to fully understand the organizational capabilities 5G might create and the value it can provide.

"5G vendors often talk about really aspirational, long-term use cases," said MacGillivray. "I think there needs to be, I guess, a balance reached between the aspirational and the 'what can you do for me today' story."

This CIO Think Tank report explores the range of near- and long-term use cases IT leaders are considering and the hurdles that enterprise 5G still faces. Finally, it outlines steps to overcome those hurdles and deliver real business value.

FLAVORS OF 5G

Not all 5G coverage is equal. The 5G spectrum is divided into three frequency ranges:

- The low band, below 1 GHz, provides the wide area reach and reliability for 5G connections but not the highest throughput.
- The mid band, at 2.5GHz, delivers the gigabit speeds that 5G promises.
- The high band—the very short, millimeter wave spectrum—can provide multigigabit throughput capabilities but is limited to line-of-sight connectivity.

Not all providers are equally focused on building infrastructure to support all three ranges.

Not every application and device will use them all. According to McDiarmid, 5G devices that don't use the high band will remain comparable in price to 4G equipment.

Enterprise buyers also will want to know the difference between standalone architecture (SA) and non-standalone architecture (NSA) 5G.

- NSA is essentially 5G built on top of existing 4G infrastructure, which will still handle control signaling.
- SA connects directly to the 5G core network, with no reliance on 4G.

NSA provides a faster route for carriers to provide some 5G connectivity, particularly for consumer handsets. Ultimately, however, SA will be vital as the basis for robust enterprise services and applications, with no reliance on limited 4G elements.

SA isn't necessarily faster, however.

To reach SA's full potential performance, the carrier network and the handset or device must handle both low- and mid-band frequencies described above. That's part of the gradual infrastructure buildout in progress today but not complete in many areas.

CIO Th?nktänk



5G'S HIGHER SPEEDS, BIGGER BANDWIDTH, AND LOWER LATENCY THAN PRIOR-GENERATION LTE TECHNOLOGY WILL OFFER EVEN MORE SOLUTIONS TOMORROW.

5G Use Cases: Doing Today Better

The evolutionary path for 5G in the enterprise might be described as "walk first, then run," but panelists noted plenty of value in walking. CIOs are first looking at 5G for basic networking in locations where that's hard to supply, and there are a lot more of those locations than a layperson might expect.

Panelists then cited other applications in which improved bandwidth and mobility could help business run more smoothly. These are the not-always-sexy, everyday uses that will provide most organizations with a business case for 5G.

Basic Connectivity and Redundancy

Some companies are looking at 5G simply because they need multiple forms of connection to ensure continued operation.

The Hospital for Special Surgery operates ambulatory care centers and clinics in New York and adjacent states, typically connecting those sites back to enterprise systems via multiprotocol label switching (MPLS).

"I see 5G as a potential for either serving as a backup connectivity or as part of our SD-WAN infrastructure," said CTO Bashir Agboola.

"[5G] could be a tertiary connection, and with banks, that's how we are with just about anything. We back it up three times so there's three different ways to get to it," said Citigroup VP Keith Jefferson.

"For our distribution centers, if we've got to ship product, and at 4 p.m. Friday, somebody runs a bulldozer through fiber and cuts it, we're down for three days. So, for us, 5G is a backup to our backup. That would be a lifesaver for us," said David Kueffner, VP of IT infrastructure, Clover Imaging Group, LLC.

Errant backhoes aren't the only challenge. Many panelists in many different businesses need better connectivity in remote locations or, conversely, in dense cities or buildings.

"I still have a number of restaurants, 20 or so, that do not have easy access to basic broadband. People expect it to be ubiquitous. It is not, especially in mall locations," said Mark Urbis, CTO of California Pizza Kitchen. Urbis said he is looking at 5G as a potential first or second broadband connection. "We'd prefer diversity, so we'd rather have two [forms of connection], in active-active status for redundancy."

Similarly, Kirk Hay, CIO of logistics company Jack Cooper Investments, said he deals with shipping docks and railyards, some of which have limited bandwidth and only a single provider option. "Optimizing the shipping of several thousand vehicles several times a day is a pretty chatty app, whether it's a lot of data or a lot of back-and-forth. So, you can never be fast enough at those locations." Hay said the company doesn't view 5G as a complete solution, but it will provide incremental performance gains at some locations.

"We have poor cellular coverage typically in many high-rise buildings, particularly in cities like New York City. We've had to implement very expensive DAS antenna systems. I just wonder how 5G would help with that problem," said Agboola.

CIO Th?nktánk

We basically have two ISPs here not a very competitive environment. I would look at 5G as being able to drop prices for us.



– MICHAEL MAYTA IO, City of Wichita

Campus Networks

Daniel Araena, CIO, Teachers College, Columbia University, sees 5G as a possible replacement for campus Wi-Fi.

"We're continually having to manage and upgrade the environment," he said, a concern several panelists echoed. "Having availability of a 5G type of technology that'll provide an ease of transition between on-campus and off-campus for our students and faculty would be beneficial."

The security aspect of 5G particularly appealed to CIOs in this context.

"I don't want to be an ISP to our student body anymore," said Zach Gorman, CIO of Bradley University. "These students are bringing everything into our campus environment, and I'm having to balance [creating] a secure environment, as well as an extremely open environment. That can be a unique challenge, to put it lightly."

Temporary Locations, Pop-Ups, and Events

A range of panelists deal with places and people needing temporary connectivity, whether due to short-term contracts or natural events.

"We were able to stand up a full warehouse in about two and a half weeks and conduct our operations in a very effective way. 5G was a savior there," said Sanil Mooken, director of IT for Focal Point.

Jack Cooper Investments' Kirk Hay also said his business often wins short-term contracts that make it too costly to have cable laid in.

"Being able to pop up a bank anywhere that's needed, especially in response to a disaster, that's not dependent on any infrastructure—it could literally be a trailer representing the bank to serve the customers' needs," said Denys Diaz, CIO of TowneBank.

Events present a similar possible application for 5G, according to panelists.

"We hold events with thousands of people hopping onto our Wi-Fi and requiring certain levels of security, email access, validation, things like that. That introduces a level of complexity that we just can't administer. 5G availability for that purpose would definitely help those events prosper," said Araena.

Crowd-Sourcing Inventory Tasks

Lale Kof, CIO of Axalta Coating Systems, said a common industry practice in retail involves paying a service to count inventory in store displays. 5G could change that.

"You could basically ask the shop owner or, really, somebody who's just shopping, [to] just take the picture and upload it," she said. With the right analytic tools, this would allow better inventory visibility without requiring a service or a store visit. CIO Th?nktänk



Projected private campus network market worldwide by 2025 (roughly \$70B-\$82B) Source: AD Little

5G Use Cases: Transformative Ideas and Opportunities

Many CIO Think Tank panelists envisioned still bigger possibilities for 5G.

"I'm optimistic, and 4G really taught us a big lesson. Apple, Google and Facebook are 10 times larger today because of mobile," said McDiarmid. "Even though it's still immature, we're seeing that 5G can handle secure basic connectivity right now, while potentially laying some tracks for transformation that's going to come down the pike."

Here are some of the opportunities CIOs and CTOs noted.

Enabling New Products and Services Across the Supply Chain

The ability to transmit higher volumes of data opens the door to digital products.

"IDC estimates that, by 2025, there's going to be 181 billion zettabytes of data created, and we need to have the connectivity to support the movement of that data," said MacGillivray.

Axalta Coating Systems works with a lot of small auto body shops and retail companies. CIO Lale Kof said 5G data creates opportunities to connect directly with those organizations' enterprise resource planning, inventory, and other business systems.

"We could potentially bundle data together with our knowledge and provide training, optimize their labor, etc.," she said.

5G could make this connection a more reliable, real-time possibility than reliance on 4G's lower bandwidth or on less predictable shop Wi-Fi.

"Automotive and oil and gas are very fragmented industries. The supply chain in automotive is tremendously inefficient," said Koch CTO Sandesh Shetty. "If we can connect different segments together and provide a more reliable demand [view] to not only the Koch companies, but also to our suppliers and our partners, I think there are opportunities to create digital products for the marketplace there."

The just-in-time aspect of inventory management could benefit from 5G's bigger, faster pipes.

Access to New Talent Pools

Aquent is a professional services company, often providing their customers with contract employees for three-month engagements.

"Lighting up a fiber connection for three months? You don't even get it installed that fast," said Robert Stretz, VP of IT.

5G is a game-changer, said Stretz. "If we can deploy desktop-as-a-service and let them bring their own device, and all we do is light it up with a 5G connection, we can hire anybody anywhere essentially." 5G's inherent security advantage over public Wi-Fi is an important aspect of this plan. "People in metropolitan areas have great bandwidth, but [that is] expensive because of where they live."

Eventually, as 5G reaches more rural areas, Aquent will be able to draw on talent in those places.

CIO Th**?nk**tánk

If all our devices can phone home, it means better reporting, better analytics, better customer service, better everything.



— DAVID KUEFFNER VP, IT Infrastructure, Clover Imaging Group

Continuity and Life-Saving Safety Applications

Houston Public Works' Garcia said some applications help digging crews visualize nearby power and gas lines and buried pipes. Increased bandwidth for field workers means better access to this kind of information.

Wichita's Mayta described an even more dramatic use: Firefighters being able to call up 3D renderings of burning buildings.

"We have the data, but being able to be onsite and pull up that information and be able to see what they're walking into" would be a powerful use of 5G's higher bandwidth, he said.

Autonomous Public Transport

Autonomous vehicles get a lot of ink, but carmakers are having difficulty accounting for all the scenarios a driver might encounter. Public transportation that follows a limited number of set routes and low, predictable speeds might be a simpler puzzle, and connecting to predictable 5G infrastructure along the way could make this viable.

Bradley University is on "The Hill" in Peoria, Illinois, making movement between university, the town center downhill, and airport a challenge.

"Public transport is limited, and if you have 10,000 students flooding the downtown in their own vehicles, that's not really beneficial either," Gorman said. He is looking at 5G's potential to improve mass transportation options, which would have a big impact on the entire community, not just the University itself.

Augmented Reality for Training

"We have a very advanced training program on how to really apply paint in body shops," said Kof. "Today, we have to deploy people to do that, but we are looking at is 5G combined with other technologies, like Google Glass, because augmented reality can replicate that [in-person] experience and really help do the certification for these really skilled workers."



WHAT ABOUT IoT?

CIO T**H**¶NKTÄNK



Projected semiautonomous bus market worldwide, 2025 Source: Markets and Markets

The Internet of Things (IoT) is often cited as a natural pairing with 5G. Panelists did cite several enticing possibilities, from straightforward monitoring of environments and equipment to more distinct applications.

At Ciner Resources, "one of the key assets that we operate is a \$100,000 pump," noted Lakdawala. The pump can be out of sync with other equipment only for about 60 seconds before it results in a long outage. "If we are able to analyze the data in a timely manner, we can shut down the pump [to spot a problem] and avoid a longer outage. Because every time there is an outage, that is a \$15,000 cost minimum and at least three to four days outage of the pump, which we cannot really afford." he said.

Pavi Agrawal, global head of enterprise architecture at Mars, cited similar uses. "Machine downtime can also mean penalties from missing product guarantees from big customers like Walmart," he said.

However, 5G IoT has its own hurdles to jump.

"Battery life requirements, [ability to handle] the amount of data, and cost: A 5G module is very expensive. Our research finds IoT won't be a leading indicator for 5G. It's a very niche application," said IDC's MacGillivray.

Houston Public Works' Garcia agreed. "[Houston has] maybe 1,500 to 1,800 connected traffic signals, 400-plus connected lift stations for wastewater, and I think quite a few of our drinking water centers are also part of our IoT network," he said. Most data from those sensors and devices is backhauled to the main network over 4G connections. "There's a lot of opportunity, including some smart lighting applications. I think it's going to continue to evolve, [but] we don't really have a compelling business need for 5G."

Obstacles Facing 5G in the Enterprise

Lack of Reliable, Universal Coverage

As noted, this was a steady drumbeat throughout all three panel discussions.

From spotty geographical availability to perceived lower speeds than 4G in some areas to applications such as traffic lights that demand near-100% constant connection, CIOs said they are waiting for better availability before committing to 5G.

The connectivity challenge in newer metro areas might surprise some. T-Mobile's McDiarmid agreed that modern buildings often use windows and coatings with very low transmissivity, good for energy efficiency but bad for cellular connections.

"Radio signals simply don't go through the glass the way they used to, so newer buildings are a real problem," he said.

So, although a carrier might include an area like Manhattan in their coverage, levels of connectivity might vary from building to building and even within a single facility.

Rural areas present a more obvious challenge, as already noted. Low population and business density means carriers see less payoff on the infrastructure investment.

Whatever the cause, inconsistent coverage and unreliable connections are inconveniences for consumers but showstoppers for many enterprise applications.

"I've got a bunch of network guys who are going to say, 'No, give me a wired connection. Because when it rains, if we have strong winds, thunderstorms, all these things can glitch that connectivity'," said Mayta regarding Wichita city systems and devices such as traffic signals. "That connection can't drop."

No Killer App

Why is the 5G rollout proceeding more slowly than users would like? IDC's MacGillivray pointed out the lack of a single, horizontal killer app to drive 5G investment. When 4G cellular came on the scene, this wasn't a problem: The killer app was video.

"Media could be consumed by an enterprise, government, or individual. It was very horizontal," said MacGillivray. "It was an application that all of us could adopt quickly, and it changed how we interact with one another, how we consume information and how we entertain ourselves."

All these 5G use cases might provide vital value, but only for some organizations, in some industries. One could argue that using 5G for faster mobile broadband or greater reliability is a horizontal application. For a lot of companies, however, that's plumbing—certainly valuable, but not a creator of new, behavior-changing business opportunities.

Without that single compelling use driving demand for 5G, providers don't see payoff as quickly, which, in turn, delays the infrastructure buildout.

CIO Th?nktánk



INCONSISTENT COVERAGE AND UNRELIABLE CONNECTIONS ARE INCONVENIENCES FOR CONSUMERS BUT SHOWSTOP-PERS FOR MANY ENTERPRISE APPLICATIONS.

Cost, Real or Perceived

MacGillivray said that IDC research found buyers ranked the costs of both devices and services as top concerns hindering 5G adoption.

T-Mobile's McDiarmid said that devices using the lower two frequency ranges in 5G are already similar in price to 4G equipment. MacGillivray agreed and indicated that the cost of services is consistent with 4G plans.

"I think there was the ambition by the mobile operators to price 5G at a premium rate, but what we've seen in the U.S. market is there has not been a premium placed on it," she said. "The idea that 5G is more expensive than 4G is actually inaccurate."

However, some panelists aren't convinced they understand the full cost picture yet.

"Assuming we've defined the primary use case, the next thing holding us back would be [understanding] the cost of deployment. What does the deployment model look like ... and not just putting it out there, but maintaining it? And what's the management cost?" asked Edward Wustenhoff, head of infrastructure for IT, Juniper Networks.

"We have some 'unlimited' [4G] plans now, but once they use up their regular data plan, it's throttled down so low it's basically not usable. Will that happen in the 5G world?" asked Andy Flatt, CIO, National Healthcare Corp.

Battery Life

Another aspect uncovered in IDC's primary research was a perception that devices, particularly in IoT applications, need better batteries to really make use of what 5G offers. Improved battery life will mean less maintenance and better reliability for these devices. This is a limitation IDC's Jason Leigh described as having "a Maserati in a 25-mph speed limit zone," unable to fully harness the available power.

However, MacGillivray indicated that recent improvements in software and firmware have already helped improve power handling in many devices.

Hype vs. Reality

Media brands took the hit from panelists for overhyping 5G as much as vendors. As noted, fast headlines coupled with slow rollout have turned off many IT leaders.

"I just upgraded my phone to 5G, and the speed is lower than my 4G," said Alan Cunningham, CIO of the State of Nevada, citing the lack of full-fledged, robust local infrastructure.

When a service advertises blazing speeds but users don't have that experience immediately, again, potential buyers are reluctant to start building mission-critical apps on 5G.

Lingering Perceptions of Health Risks

"The public perception is that 5G antennas being popped up on campus can cause problems," said Leo Howell, chief information security officer, Virtual CTO, University of Oregon. "We are already anticipating parent calls that are going to come in: 'Hey, I don't want you putting this thing near my student's dorm room.'"

CIO T**H?NK**TÁNK

The reality is 5G is going to be part of a hybrid solution, and your prior investments in Wi-Fi and wired assets don't need to go away.

— JASON LEIGH, IDC

What to Do Now



eio Th**?nk**tánk

Press Your Vendors on What's Real, and Now

Panelists said that, although ignoring perceived hype is an easy reflex—one that IT departments have had lots of practice in over the past few decades—staying engaged when the potential payoff is high is more valuable.

"I think it's important for you to be pressuring your vendors and service providers to say, 'What is available, what's really capable today, and where should we be making investment in the next two to three years?'" said MacGillivray.

Demonstrated value from current users will go a long way toward making the aspirational real.

Educate

IT leaders should plan on significant educational efforts to get various stakeholders on board. Organizational leadership is the first stop, according to MacGillivray, because that's the only way to have the budget ready and available once the possibilities become realities.

Dispelling health concerns is another part of the educational lift. A <u>New York Times investigation</u> into a purported link between 5G and cancer traced many concerns back to a faulty research study written by a single individual.

"According to experts on the biological effects of electromagnetic radiation, radio waves become safer at higher frequencies, not more dangerous," the Times found.

And CIOs should remember that education can go two ways. Line-of-business employees might well have the best ideas about how 5G might pay off.

"Some of the companies that I'm working with on expanded 5G did not really have great use cases to share when they were trying to sell this idea to the university, to faculty. So, let's have some conversations where we can explain to faculty members what 5G is, what the capabilities are, and then let them go do what they do best, which is research and push the envelope," said University of Oregon's Leo Howell.

Let's have some conversations where we can explain to faculty members what 5G is, what the capabilities are, and then let them go do what they do best, which is research and push the envelope.

> — LEO HOWELL CISO and Virtual CTO University of Oregon

Plan on Partnerships

This is the big one.

For many companies, perfect 5G coverage isn't just going to land in their laps. Once they have identified real organizational goals that 5G can help address, CIOs also should figure out who can help pay for the infrastructure. Necessary collaborations might include:

Public/private partnerships ("P3")

This includes cooperation across levels of federal, state, and municipal governments.

"Broadband access drives economic development. So, where can the state step in, and where's that balance point that we need to invest to get that 5G high speed to the majority of our rural areas?" said Nevada's Cunningham.

The autonomous public transportation use case that Bradley University's Gorman envisioned is a great example. City departments, local businesses, and airlines serving an airport all might have necessary roles in this type of development, along with the university itself.

Shared investment with carriers

These partnerships can include the telecom companies offering 5G as well.

"One thing I want to start building with the providers is, 'Where can the state step in and where's that balance point that we need to invest to get that 5G high speed to the majority of our rural areas?'" said Cunningham.

Among carriers and cloud providers

Telecom providers are accustomed to working together, leasing access to towers, for example. 5G could take that cooperation to new heights, given the dense infrastructure requirements of high-end applications.

The ability of cell carriers to provide process on or near the tower itself creates an interesting wrinkle. Carriers have pretty much missed out on the computing aspect of the cloud, IDG's Knorr said, but low-latency, real-time applications can't afford extra hundreds of milliseconds for data to be back-hauled to a "hyperscaler" point of presence. Carriers could find themselves working more closely with the Googles and Microsofts of the world to build 5G solutions for enterprise applications.

More interdepartmental communication within companies

IT must talk to operating technology counterparts, both to identify the high-payoff use cases for 5G and to understand cost and implementation details. This conversation has been evolving along with trends such as edge computing and IoT.

Facilities, operations, and real estate are likely collaborators as well, whether a company is looking at a private campus 5G network or an infrastructure shared among neighbors, tenants, or other outside parties.



CIO ThinkTank Roadmap Report: 5G in the Enterprise

CIO Th**?nk**tánk

KEY COLLABORATIONS FOR IMPLEMENTING 5G

PUBLIC/PRIVATE PARTNERSHIPS ("P3")

SHARED INVESTMENT WITH CARRIERS

AMONG CARRIERS AND CLOUD PROVIDERS

MORE INTERDEPARTMENTAL COMMUNICATION WITHIN COMPANIES

CIO TH**?NK**TÄNK

IDG

Eric Knorr B2B Editor-in-Chief Eric_Knorr@IDG.com

Carrie MacGillivray Group Vice President and General Manager for Worldwide Telecom, Mobility and IoT research

Jason Leigh Manager, Research Manager, Mobility

T-MOBILE

Mark McDiarmid SVP Radio Network Engineering and Development

MODERATOR

John Gallant **IDG** Enterprise **Consulting Director** john_gallant@idg.com

Participants

Robert Stretz, VP of IT, Aquent Zachary (Zach) Gorman, CIO, Bradley University J. Mark Urbis, CTO, California Pizza Kitchen Lale Kof, CIO, Axalta Coating Systems Sandesh Shetty, CTO, Koch Michael Mayta, CIO, City of Wichita David Kueffner, VP of IT Infrastructure, Clover Imaging Group, LLC Keith Jefferson, VP, Citigroup Daniel Araena, CIO, Teachers College, Columbia University Kirk Hay, CIO, Jack Cooper Investments, Inc. Pavi Agrawal, Chief Enterprise Applications Architecture, Mars Troy Jarvis, Associate Director IT, UCF Tanvir Raihan, VP, Bank of China (USA) Stephen Brobst, CTO, Teradata Alan Cunningham, CIO, State of Nevada Al Garcia, CTO, Houston Public Works Bashir Agboola, CTO, Hospital for Special Surgery Frank Palermo, Global Head of Digital Solutions, Virtusa Chris Murphy, CTO, Black & Veatch Sunil Badlani, Cyber Security Officer, BNY Mellon Muzaffer Lakdawala, CIO, Ciner Resources Edward Wustenhoff, Head of Infrastructure for IT, Juniper Leo Howell, Chief Information Security Officer, Virtual CTO, University of Oregon James Lin, CTO, UC Riverside Sanil Mooken, Director of IT, Systems Infrastructure, Focal Point Vinit Kohli, VP of MIS, Sibcy Cline, Inc. Andy Flatt, CIO, National Healthcare Corp. Andrew Miller, Asst. VP Network Support, First Bank Gary Desai, CIO, Discount Tire Doug West, Asst. VP, Telecom/Media Support & User Services, University of Richmond Denys Diaz, CIO, TowneBank



