ISE

ICT SOLUTIONS & EDUCATION

MAY 2020

EXECUTIVE INSIGHTS WITH

Bob Udell

PRESIDENT AND CEO, CONSOLIDATED COMMUNICATIONS

ALSO INSIDE

ISE EXPO Attendee Guide
Enabling a 5G Future
Know Your Best Assets
Making Room for the Future
Fortify Each Other

VOLUME 38, ISSUE 5   **www.isemag.com**

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FEATURES

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AN FCC OOPS!!!

Telecompetitor recently shared that researchers at BroadbandNow believe the FCC vastly underestimated the number of people that are unserved.

Broadband Now researchers estimate that at least 20.7 million people considered to have broadband available to them can't get service. The total unserved population nationwide is at least 42 million -- about twice the FCC's estimate, BroadbandNow researchers estimate.

The data is based on information collected from service providers on FCC Form 477, which the providers are required to report. That data considers an entire census block to be served even if only a single location in the block actually has service available.

Source: www.telecompetitor.com

NETWORK COVERAGE

Cable · Ethernet

Access Network

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Network Slicing · SDN

Network Transformation

CORD · Data Centers

UHD · Voice

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Massive IoT · Mission Critical · IoT

Network Reliability

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IP · Open Source ·

CONTENTS

COLUMNISTS

IN EVERY ISSUE

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Follow Sharon on Twitter and LinkedIn
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Visit www.isemag.com/contribute
for more information on submitting
an article to ISE magazine in print, digital,
and online.

At the time of this writing, April 15, 2020, COVID-19 has infected more than 2M people across the world. By the time you read this note, the pandemic will impact more people than I can imagine.

Source: https://ncov2019.live

FORTIFY EACH OTHER

Last evening, my iPhone frenetically buzzed with a county emergency update. It read:
Be kind.
Use good hygiene.
Practice social distancing.
Stay home.

I smiled after reading the first sentence. I also liked how the text offered clear, concise, action-oriented guidance.

With so much we CAN'T control during this pandemic we CAN do something powerful: Be good to others -- at work and at home.

We need to remember that we have multiple opportunities to help or hurt others each and every day. Simply being kind may be some of the best preventive medicine we can offer in times of uncertainty.

On a corporate level, it's good to see telecom providers doing that by waiving late fees to accommodate consumers who might be struggling. AT&T, Comcast, CenturyLink, T-Mobile, TDS Telecom, Verizon, and regional providers, have committed to a "Keep Americans Connected Pledge" issued by FCC Chairman Ajit Pai to promote sustained connectivity during disruptions caused by the coronavirus. For the next 60 days (at the time of this writing, that's from mid-March into May) they will not terminate service or assess late fees on customers and businesses that fall behind on their bills. Many also agreed to open Wi-Fi hot spots to any American who needs them.

Let's follow suit and help others. Let's also spread some joy when we see those acts of kindness. Simply send us short stories and photos of those in your organization who are going above and beyond to help customers, team members, and others they may not even know. We'll post them on isemag.com so our 25K readers can see and feel the kindness our industry so often exhibits during challenging times.

Why? Because fortifying the confidence we have in each other is important during ordinary days. Right now, it is paramount.

Sharon

Sharon Vollman, Editorial Director

For more information about the Keep Americans Connected Pledge, please visit https://docs.fcc.gov/public/attachments/DOC-363033A1.pdf.

HELP!
I NEED SOMEBODY!

Parks Associates' whitepaper *Next-Generation Support: Building an Engagement Platform,* finds **over 33% of CE device owners report experiencing problems with their device over the past year.**

The whitepaper notes that even as these problems could extend to damage a brand's reputation, they present an opportunity for service providers and device manufacturers to launch new support strategies that can secure new business and loyal customers by delivering superior support and smart home experiences.

49%

Brand abandonment when consumers reported setup was very difficult

"Technical problems with devices can impact brand loyalty -- 29% of consumers who indicate their devices were difficult to set up ended up switching to a different brand" said Patrice Samuels, Senior Analyst, Parks Associates.

About 47% of US broadband households that received technical support services over the past 12 months are very satisfied with the speed at which their problem was resolved, and with the resources available to the agent to address their concern.

Source: www.parksassociates.com

PRICE DROP!

5G SMARTPHONE DECLINING PRICES

The 5G smartphone market across the globe is predicted to grow twofold in 2021, up from 29 million in 2019.

This surge will be driven by declining device costs that will reach the $700-$800 range in the next 2 years, making them more affordable.

The global 5G radio access market (RAN) will rise to $21bn in 2024. Moreover, brands would be using the technology to reduce privacy fears around AI, driving the revenue growth to $827bn in 2025 for edge devices and networks deployed for AI.

Source: www.telecomstechnews.com

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Don McCarty is the Copper Expert
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ucts company training field technicians,
cable maintenance,
installation repair, and Central
Office technicians and managers.

MANUFACTURED CABLE CHARACTERISTICS AND THEIR EFFECTS ON TEST SET ACCURACY

We constantly hear in the field that a test set is not performing its advertised tasks. *My resistance bridge missed that trouble by 75 feet* or *This open meter measured short or long* or *The TDR indicated the fault at the wrong footage.*

As technicians puzzle out why measurements aren't correct, their first step is to consider whether their input might be off. More knowledge is better!

Understanding the make-up of the cable and how different types of cable can throw off your measurements, help ensure that your test set has the best information available, and that it can provide you with accurate information.

When trouble is isolated to a section, and the technician decides to go after it, a conceptual model is created allowing us to analyze the situation and determine the problem(s) before the shovel is taken off the truck.

Test equipment available to the average cable repair technician consists of a multi-function test set, which has a multi-meter, a resistance bridge (RFL), an open meter, and a TDR, among other functions. When these test set functions look at a cable pair, they are looking at 3 characteristics of cable: **resistance**, **capacitance** and **dielectric constant**. That's all. The test set then compares the manufacturer's specifications against real-life cable status in the field. The test sets are calibrated to standardized manufactured characteristics of telephone cable.

For example, when a conductor is insulated in the factory, the insulation extruder is paired with a spark testing unit. The newly insulated conductor passes through electrodes which detect and resist any dielectric faults (pin holes) in the insulation. This factory testing monitors the insulation resistance of the new wire. The wire is charged with a voltage, and the spark tester provides the return side of any circuit formed by a defect. Any time a technician tests a cable pair with a digital multimeter he's performing the same test with all other conductors in the cable acting potentially as the other side of the circuit.

THE AWG STANDARD

After a wire is insulated and spark tested, its conductor resistance is measured against a given length to determine if it is manufactured exactly to the proper gauge. This assures the manufacturer that the die which cuts the wire to an exact diameter (gauge) is not worn, and that the wire has not been stretched during the manufacturing process.

A 50,000-foot length or 100,000-foot length spool of wire is placed in a temperature-controlled room for a 24-hour period and then attached to a precision resistance bridge. The resistance of the spool is measured and compared to a tolerance scale based on the American Wire Gauge (AWG) standard.

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These standards dictate that, at 68 degrees Fahrenheit:
- a 19-gauge copper conductor measures 124.24 feet per ohm,
- a 22-gauge copper conductor measures 61.75 feet per ohm,
- a 24-gauge copper conductor measures 38.54 feet per ohm, and
- a 26-gauge copper conductor measures 24 feet per ohm.

Therefore, a 100,000-foot spool of 24-gauge conductor at 68 degrees Fahrenheit should measure 2594.7067 ohms. Any resistance less than that (within a tolerance) would indicate a worn die, while a higher resistance indicates a stretched conductor.

RESISTANCE

In the field, a portable resistance bridge measures this same conductor resistance for a given length of conductor. All such bridges are calibrated to the same AWG standard as the manufacturer's tester.

When measuring to a fault, testing is based on the
- gauge
- temperature
- composition
- helical design (twist of the pairs, units, and cable, during manufacture).

Each of these parameters must be accurately entered into the set so an accurate sheath footage can be displayed. We'll discuss these in order.

GAUGE

Gauge is easily determined at the test site, and as long as the conductor remains in one-gauge, accurate measurements can be made. Your resistance bridge would be capable of measuring to an accuracy of 1 foot in 1,000 feet of unencumbered conductor. However, the chance of inaccuracy increases when this conductor is paired, twisted grouped and placed inside of a cable.

If a gauge change occurs within the resistance bridge measurement, this change must be accounted for, or the measurement is inaccurate. The measurement is no longer a sheath footage measurement, but the equivalent resistance of 2 different gauges measured in one-gauge. Using a gauge change formula, the exact sheath footage can be calculated.

TEMPERATURE

The cable manufacturing plant stabilizes the conductor to an exact temperature for testing. If a technician sets his resistance bridge to an incorrect temperature, measurements won't be accurate.

This error is .00218 feet per degree of error per foot of wire measured. For example, a 10-degree error on a distance measurement of 1,000 feet is 21.8 feet of error. We realize that most

buried section measurements are backed up with an earth frame, but if the problem is a wet module in a buried splice and you have the shovel in your hand, temperature is important.

Temperature changes also affect measurement. If a portion of a distance measurement is in an aerial cable that then goes down the pole and is buried, the wire temperature changes. A temperature change must be treated like a gauge change, using a temperature conversion formula to find the exact sheath footage to a fault.

COMPOSITION

Most wire in the field is copper, but not all of it. **We'll use 22-gauge for an example demonstrating how composition affects resistance.**

A 22-gauge copper conductor measures 61.75 feet per ohm at 68 degrees Fahrenheit. A 22-gauge aluminum conductor measures 37.08 feet per ohm at that temperature. Aluminum doesn't conduct electricity as well as copper, so there are less feet per ohm.

A real-world example of where a technician will run into the composition problem in the field is with "B" service wire. "B" service wire is a two-pair drop wire that is colored red, green, yellow, and black. The drop is air-core and has an aluminum shield. The wire is 20-gauge, but steel is added to the copper for strength, which changes the resistance. To measure "B" service wire accurately with a resistance bridge, set the gauge switch to 24-gauge, and set the temperature control 26 degrees lower than actual buried conductor temperature.

HELIX (TWIST)

Two individual conductors are tested for any resistance unbalance and then twisted into a cable pair. In PIC cables, each sub-unit has 25 different twists that range from 2 inches to 6 inches. For example, in all gauges, the white-blue pair has 2 inches per twist. The old split maker, the red-slate pair is 4.7 inches per twist in 24- and 26-gauge.
- The sub-units are twisted into units, tested, and the units are made into cables.
- Twisting the sub-units and units creates better transmission characteristics in a cable.
- The twist makes one unit invisible to another unit from a standpoint of capacitance or cross-talk.
- The lay or twist in the cable makes it flexible for placing purposes and temperature changes throughout its life.

The resistance bridge allows for this helical design.

For example, if 100 feet of cable sheath were opened, and the white-blue pair removed from a sub-unit and untwisted, it

would measure 103 feet in length. If the red-slate pair were untwisted, it would measure 101 feet.

As you can see, this would create a 1% to 3% error, depending upon which pair a technician is measuring in a cable. The resistance bridge subtracts approximately 2% for the helix or twist of the cable.

Even so, different pairs in a given length of cable measure a different footage, within a tolerance. So, you see, the best accuracy with any resistance bridge is 1 foot in 100 feet, unless each conductor is calibrated to the exact sheath footage for each measurement.

CAPACITANCE

Mutual capacitance is a requirement in every cable specification. The manufacturer tests all cables for their mutual capacitance.

The desired average for an exchange cable pair is .083 microfarads per mile. Open meters are calibrated to this capacitance to measure the distance to an open cable pair. Since this is an average, distance to opens are approximate but will allow the technician to find opens in accesses close to the measurement. If the problem is in a section, the technician must calibrate the open meter to the exact capacitance of that section for pinpoint accuracy.

Your open meter is designed to measure pairs in working cables. When the sub-unit or unit is twisted, all other pairs in all other units of the cable become invisible to pairs in that unit -- from a standpoint of capacitance. This means that capacitance from pairs in other units will not affect open meter measurements.

When measuring in non-working units of cable within the group the open is in, an electro-static or false shield is created by non-working units, the distance to the open pairs will measure shorter than the actual distance. **This phenomenon affects only the pairs under one binder tie.**

An example of this is measuring the distance to a cut cable from a terminal on the field side of the cut cable. A cut cable

400 feet from the terminal would measure 350 feet on any open meter. **This effect is easily eliminated: simply ground 12 pairs in the same group (under that binder tie) and the measurement will be accurate.**

However, measurements to ground (ring or tip) differ in filled cable and air-core. In filled cable, capacitance to ground increases about 28%. **To compensate for this, use the capacitance setting shown in your open meter's operation manual (normally .125 microfarads/mile).**

DIELECTRIC

The dielectric is any material used in a cable that will insulate one conductor from another or from the shield.

This dielectric constant affects a Time Domain Reflectometer (TDR), as it is different in pulp, air-core PIC, and filled PIC (both solid and foam skin) conductors.

TDRs are affected by the type of insulation on a cable pair, as the speed (propagation factor) of the input pulse varies with different kinds of insulation.

The propagation factor must be set for each type of cable dielectric or the distance measurements will be inaccurate.

SUMMARY

Test sets don't mis-locate cable faults -- technicians do, although not usually intentionally. Knowing how a cable is made, and to what standards, helps a technician program a test set to yield correct fault measurements.

The better informed you are, the more successful you'll be. What you don't know can hurt you -- in time, effort, and money. ∎

SIGNING OFF

Thank you, loyal readers. Please keep sending your comments and ideas I can explore for my next column: dmccarty@mccarty-inc.com; www.mccartyinc.com; 831.818.3930.

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As the Chief Technologist and Founder of Vernon May Solutions, Vernon, an expert in OSP and ISP Operations, is focused on new technology introduction, from Marketing and Sales to Design Enhancement to Training to Product Approval. Along with writing a quarterly column for ISE magazine, he also hosts seminars available throughout the country. For more information, please email vernon@vmaysolutions.com or visit http://vmaysolutions.com.

FORGET THE BAD APPLES

What's the Best Measurement of Field Technician Productivity?

We all have at least 1 boss, and we must be accountable for our work. That said, telecom field techs have unique struggles -- as do their managers.

I know this from firsthand experience, as I've gone from technician to manager and back to technician more than a few times. Just from experience, I can tell who is doing their job well, and who is not, by spending a little time with them. Ask me how to quantify that knowledge and scale it to a large service provider -- and I am at a loss for an answer.

Forty years ago, the first level supervisors had performed the jobs that they managed. They saw every technician every day. They showed up on the jobsite during the operation. AND, they had time to inspect at least 1 job a week and provide a full quality report for every technician. Sure, jobs-per-day were measured, but quality was king. After all, everything we did was supposed to last 30 years.

Fast forward to today, and one first level supervisor might have an entire state. I personally worked with a beleaguered first level manager who managed every CO technician in Iowa for a major provider. In a year, I saw the man only 2 times: when I interviewed for the job, and when I left the company. This, despite the guy working 16-hour days with outage responsibilities 24/7. How can anybody manage quality and productivity under those circumstances?

Again, being on both sides, I see this issue from both sides.

Technician Perspective

"I have 83 minutes to compete a task and I have 30 minutes travel time, not knowing what I will find when I get there." That is in good weather. I know 1 crew that works 2 towns in Colorado. When the pass over the mountain is open, the drive time from one to the other is only about 20 minutes. During the winter months, when the pass is closed, the drive time is 2 hours because they have to drive around the Rocky Mountains. The crew is 37 minutes in red before they reach the jobsite. (See photo on page 13.)

"The people measuring my performance have no clue what it takes to do the job," an unnamed technician shared with me a time ago. That is probably true. Most technicians will not take a management job anymore because they are paid better and have much less stress in their current tech role. That leaves people with Accounting degrees deciding how long it should take to find a fault problem the size of a dime in a 100-mile fiber run.

"My expected productivity prevents me from ever doing a stellar job," shared another. That resonates as well. If you see a pedestal open on your route, you don't stop to close it even though you know a family of rats will soon take residence and you'll end up back there when there is an outage. You just don't have time to be proactive.

Management Perspective

To be fair, we also have to look at the manager's perspective.

For example, sometimes a tech can be at the CO for 2 hours and never actually enter the building. Yes, this happens.

Because direct management is so sparse, the bad apples will take advantage of not being supervised. Too many people work harder at getting out of work than if they just did their jobs.

Managers also deal with something called the *Taillight Principle.* That means some techs who are hitting their productivity numbers are not really fixing the full scope of the problem. As long as the service is working when the subscriber sees the taillights of the technician leave the driveway, it's all good. Unfortunately, later their managers must send a second tech out to finish the job.

Managers also face the challenges of managing technicians they never see.

The last time I managed a crew, I was averaging 100 emails a day, and 50 of them had "very important" in the title. Conference calls, reports, and new practices that changed every week, made it nearly impossible to get out of the office. When I could untether from the office, I had to drive 6 hours to see a technician and show an ID badge just so the techs could know who I was. Just a quick chat after shaking hands did not develop mutual trust.

One manager I know asked *I have fewer technicians, lower budget and less control than I've ever had. How in the world can I make improvements?* In general, you can't. If performance is as good this year as it was last year, you are doing a great job.

The Latest Answer

GPS is supposed to be the answer. With it, managers can now track:

- Location
- Time at location
- Truck idle time
- Speed
- Lane changes
- Traffic lights ran
- Tech in the driver's seat or not

These massive systems do okay at measuring activity, but do poorly at measuring productivity. One tech might open 20 splices to fix a trouble and have proven high activity, while not fixing anything. Another tech might use the right problem-solving strategy, open 2 splices and fix the trouble, while being flagged for being in one location for too long. The truth is they were performing the required testing to efficiently fix the trouble the first time.

There are also times when activity is misrepresented. Techs are often flagged for truck idle time because they are in the air and their bucket truck must be running or the bucket won't work. One tech I knew was flagged because his hazard lights wouldn't come on unless the key was on. The guy was doing his job, but the GPS system algorithms showed he was not.

Abusing idle time is another example of how the bad apples are hurting everybody. Some techs have been guilty of leaving their trucks idling all day when there is no good reason for it.

Concerning truck idle time: a little bit of common sense will go a long way. If you are working in -0 degrees F temperatures, a warm truck can prevent frostbite and general hypothermia. When it is 107 degrees F outside, the air conditioning in the truck can prevent heat stroke.

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The Real Solution

The industry-expert columnists at *ISE* magazine are famous for offering solutions to problems. I always try to do the same, but I'm unable to on this subject.

Based on my experience, the techs that do a good job always have and always will. The bad apples will find a way around any system designed to make them good technicians. Again, they will work harder at getting out of work than doing their jobs.

I believe that management, the unions, and the technicians, must take a hard look at themselves. There is plenty of guilt to go around. If the bad apples are removed from the tree, average productivity will go up across the board. Then, management can, and will (I hope) set productivity expectations that are representative of the real world. This would include avoiding one-size-fits-all expectations. The technology in LA and in Dubois, WY, is generally the same. What it takes to make it work is completely different.

If you have any ideas on how to fix this problem, let me know, and I will share them in this column. If you have other subject matter suggestions, please send them in. ∎

EXECUTIVE INSIGHTS WITH

Bob Udell

PRESIDENT AND CEO, CONSOLIDATED COMMUNICATIONS

By Sharon Vollman, ISE

TOPIC: PRIORITIES

Sharon Vollman, ISE: What is Consolidated Communications' vision for what will move the needle in terms of network transformation that will help meet end user's demands in today's hyper-connected society?

BOB UDELL: Our mission is to turn technology into solutions, enriching how people work and live. We do this by providing broadband solutions to Consumer, Commercial, and Carrier, customers across the communities we serve.

Consolidated Communications is a Top 10 Fiber Provider in the US. We have a deep, fiber network that spans across 23 states with operations centered around 5 core regions in the west, north, south, east, and central.

What really moves the needle is when we can upgrade speeds for our customers, giving them more bandwidth to support typical growth and unforeseen events. In addition, our consultative approach helps businesses move their applications to the cloud by utilizing our Cloud Secure, Cloud

Wi-Fi or Unified Communications. Our Carrier customers also need solutions to support wireless densification, which results in more fiber routes deployed to support cell sites and more businesses and homes passed along the way.

Our investments in our fiber network benefit all 3 of our customer groups. For our **Consumer** customers, fiber technology that supports high-definition TV, uploading high-resolution photos, remote work and learning, video conferencing, and smart home devices is the sweet spot, not to mention being the catalyst for local economic development. In the **Commercial** space, we are evolving our already robust product portfolio and continue to build on our depth of experience serving vertical industries, such as banking, healthcare, government, and education. And, in the **Carrier** space, we are adding lit buildings and edging out our network for wireless densification projects and tower upgrades.

TOPIC: PAIN POINTS

ISE: Consolidated Communications serves 23 states and approximately 1.2 million connections in underserved and/or rural areas. What are your biggest challenges/obstacles to delivering higher speeds to those customers?

BOB UDELL: The biggest challenge is lack of subscriber density, and this isn't unique to us. It's a challenge that all service providers of rural America face. Consolidated has an extraordinarily robust fiber network, but in an environment where subscriber density could be much less than one home per square mile, economics can be challenging.

We have the resources to build these networks and, frankly, we are very good at it. We have expanded speeds to more than 750,000 locations across our footprint over the past 2 years. This includes fiber expansion in very rural and geographically challenging locations like Chesterfield, New Hampshire, and across a wide portion of upstate New York.

Despite this challenge, Consolidated remains focused on growing our fiber network and delivering on our promise to provide broadband solutions to rural America.

TOPIC: CORONAVIRUS (COVID-19)

ISE: How has the coronavirus (COVID-19) pandemic this year impacted Consolidated?

BOB UDELL: COVID-19 has had an extraordinary impact on all of our lives. Now, more than ever, as a nation we understand the critical importance of connecting consumers, businesses, and carriers, during this time. Our top priority is to protect and keep safe our employees and customers. We've implemented numerous preventive measures to ensure their health and safety. In many ways, we've changed how we do business, such as virtualizing our call centers, and transitioning our office employees to work from home.

I'm incredibly proud of how proactive our teams have been to anticipate the changes we needed to make and implement them. At this time, we've seen an increase in Interent network traffic utilization of approximately 30%, and an increase in voice traffic of approximately 10%, as an impact of the coronavirus (COVID-19). Overall, our network is performing very well and is designed with an architecture that prioritizes video and real time communications, allowing us to handle this increased utilization. We're here for our customers, and we are continuing to provide them with reliable solutions, including bandwidth upgrades and collaboration tools that are helping them stay connected during this time.

TOPIC: FIBER INVESTMENT

ISE: In a recent interview, you said that Consolidated is committed to extending its more than 37,500 route miles of fiber. The cities of Portland, Maine; Roseville, California; Conroe, Texas; Champaign, Illinois; Edina, Minnesota; and Fargo, North Dakota; are good examples of communities in which Consolidated has made significant fiber investments. Share a few concrete results from those investments.

BOB UDELL: We deploy fiber every day. In 2019, we added more than 600 route miles of fiber to serve all customer types. We serve thousands of cell towers, we help wire municipalities, and we are a leading provider for small and large business customers in all of our 23 states. There's a lot of synergies among our 3 customer groups. Our past network investments, made for Carrier services, are also benefiting our Commercial customers. We connected 1,800 new buildings onto our network in 2019, an increase of 18%.

We are committed to growing our fiber network and providing access to faster Internet speeds. We do this through our 3-customer strategy: leveraging our network assets to serve Consumer, Commercial, and Carrier customers. Our network is multi-use, meaning when we deploy fiber, we look for opportunities to connect as many customer types as we can. We also continue to pursue public-private partnerships like the one we have with Chesterfield, New Hampshire, with more northern New England municipalities to expand our fiber footprint and bring increased Internet speeds to our customers.

Our next-generation TV service, CCiTV, is available throughout Maine, New Hampshire, and Vermont, and we will expand into new markets this year, which is driving speed upgrades and additional broadband deployment.

TOPIC: COMMUNITY COLLABORATION

In the past, Google struggled to deploy fiber using a long-term, replicative model in their markets of choice. Consolidated works with communities across its 23 states.

ISE: In your opinion, what is the "secret sauce" to making and keeping strong relationships with municipalities as you work to expand your fiber footprint?

BOB UDELL: I'd say our approach with municipalities is one based on collaboration and education. We meet frequently with municipalities that want higher broadband speeds. And it's a different conversation now than it was 2 years ago. Two years ago, the question was *What are **you** going to do to expand broadband?* Today, the question is *What can **we** do together?* There's a greater understanding of the economics behind implementing a broadband network. As a result, we're enlisting the support of a wide range of constituents to help

grow the digital economy in rural towns. This includes local leaders, state and federal legislators, and the residents of the towns themselves.

This collaboration and increased level of understanding has helped us be especially successful in our northern New England service area where we have very deep, Middle Mile long-haul fiber networks that can help minimize deployment costs. We've seized the opportunity to use that network footprint in conjunction with laws that allow municipalities to fund broadband networks through bond offerings. These public-private partnerships can be transformational to some municipalities where an incumbent carrier may have declined to upgrade its infrastructure, forcing the towns to seek alternatives. We completed the fiber overbuild in Chesterfield, New Hampshire, last year and we have 5 additional overbuild projects targeted for the second half of 2020.

TOPIC: PUBLIC-PRIVATE PARTNERSHIP (P3) MODELS

ISE: Are P3 models the best way to connect rural America? Why or why not? What are alternative models that might be better?

BOB UDELL: We've had tremendous success with public-private partnerships, especially in our northern New England service area. State legislators in New Hampshire, for example, have provided the legal mechanism to fund broadband networks. This arrangement for building Last Mile fiber is an ideal fit for us to leverage our very deep Middle Mile, long-haul fiber networks. Used together, the bonding arrangement can help minimize deployment costs while delivering to our customers some of the fastest Internet speeds available.

Our primary focus is on expanding our fiber footprint. Fiber can increase bandwidth a hundredfold, giving customers technology that supports high-definition TV, uploading high-resolution photos, remote work and video conferencing, and smart home devices, not to mention being the catalyst for local economic development.

TOPIC: ARTIFICIAL INTELLIGENCE

ISE: Artifical Intelligence (AI) across the worldwide telecom market is expected to grow from $235.7 Million in 2016 to reach $2,497.8 Million by 2022, at a CAGR of 46.8% during the forecast period. The increasing adoption of AI for various applications in the telecommunication industry is expected to be driving the growth of the market. (Source: www.marketsandmarkets.com) Why is this critical, and in what areas across the network(s) do you see AI being used in the future (or already today)?

BOB UDELL: We have embraced AI as a tool to help us be more efficient, while at the same time making it easier for our customers to do business with us. We currently look at AI as a decision-support tool. We use it to make sure our customers' calls are routed appropriately to address their needs.

Also, we're implementing AI and process automation to handle some of the routine types of activities in our frontline, like seasonal line suspensions and restorals. Automation of processes allows us to spend more time developing custom solutions for our customers.

AI is beginning to play a role in network deployment. Looking into the future, I can see a time where AI does even more of the network engineering for our industry, especially on choosing site locations for fiber hubs and wireless antennas.

TOPIC: SMART SMALLER CITIES

ISE: How can rural providers work with their cities and towns to help them develop comprehensive smart city initiatives? Share your greatest learnings about smart cities and telecom providers' interconnected relationships and how they need to change in the future.

BOB UDELL: Collaboration is key between municipalities and service providers. I'm a big supporter of working with cities to identify innovative solutions that are a win for the town and its citizens. Some towns or municipalities have attempted to build their own broadband network and become their own provider. There are few -- if any -- examples where this approach has been successful and ends well for the taxpayer who funded it. Partnerships between the town and an experienced service provider allow each to leverage their mutual strengths. We have a number of examples where, in partnership with a town, we've built a network and began installing customers in less than 6 months.

TOPIC: GUIDANCE

ISE: What professional and leadership guidance would you offer a younger Bob as he was forging his career path?

BOB UDELL: I'm fortunate to be in a position where I currently mentor a few young professionals on an ongoing basis. The advice I give them is simple: *Make this world a better place than you found it.* That's my guiding principle. While simple to state, it can apply to everything.

One should follow their passion and use the energy they get from doing so to motivate those around them to achieve great things. Along the way, listen and learn from the best. Treat others as you like to be treated.

Build a network of trusted advisors. Especially in areas in which you feel weak or unskilled.

When it comes to tough conversations, have them. Do it with respect but with an appropriate tone. The worst feeling is knowing you should have had a conversation and didn't. Most people respect when they are held accountable, and they benefit from constructive feedback.

Finally, when it comes to making decisions: *Do the right thing.* Knowing the right thing to do or the right decision to make is a combination of knowledge, experience, and heart or intuition. More often than not, you'll know the "right thing" to do, and will regret if you don't do it.

TOPIC: YOUR ROLE

ISE: What is the most interesting thing about your role? What would you recommend to someone who wants to achieve a high-level position in their career?

BOB UDELL: The most meaningful aspect of my role is the opportunity to raise the economic prospects for a community by bringing them reliable broadband services which impact their businesses and daily lives. I love seeing our team, employees across 23 states, energized in their roles of delivering service to our customers and prospects.

TOPIC: SATISFACTION

**ISE:** Please fill in the blank:
Satisfaction is: _____.

BOB UDELL: Satisfaction is completing an install of a multi-site turn up and getting a positive acknowledgement from the customer contact that it went well from their perspective.

Satisfaction is also seeing someone you've mentored get promoted and celebrated by their colleagues because everyone knows they earned it. This goes for those who move on to other companies too. Sometimes people leave and you still helped them get their chance to impact the world around them. That's also a reason to celebrate. ■

Visit www.isemag.com to read even more insights from Bob Udell.

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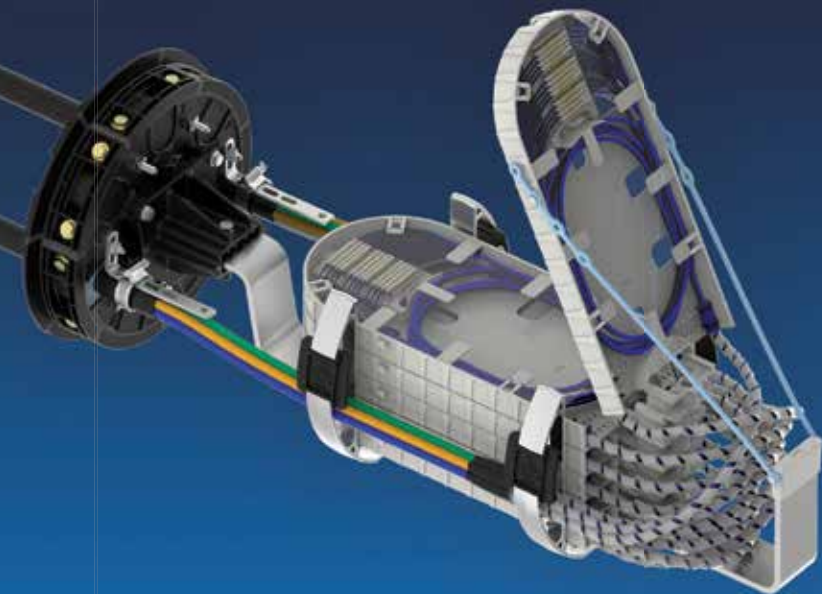
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ENABLING A 5G FUTURE

Fiber Fuels It All

By Kevin Morgan

The reality of a fully connected world is nearly upon us. People and companies are leveraging gigabit speeds to do more, accomplish more, and connect more fully with the world around them. Transforming the way businesses operate, kids learn, and how we entertain ourselves and our families. Quite simply, our lives are now shaped by the ability to connect.

From telemedicine to self-driving cars, 5G and the applications it enables will be transformative. It will deliver faster speeds, better performance, and more reliable services, redefining what we interpret as a seamless experience.

But in the midst of this wireless revolution, fiber networks running underground and along the poles are what will truly enable carriers to reliably and continuously support all the devices, and the increasingly complex and latency-sensitive types of data that will flow over the network to and from homes and businesses.

Currently, carriers are touting their plans for 5G rollouts at unprecedented rates. This will place a tremendous strain on existing wired infrastructure that will be crucial for supporting fronthaul, midhaul, and backhaul services. To fully maximize this opportunity and to ensure networks are equipped for the dramatic increase in wireless coverage 5G will demand, wireless operators need to leverage advances in Small Cell deployments and distributed antenna systems (DAS) as a critical component of their arsenal.

Small Cells and DAS Requirements

Small cells help boost an area of weak coverage within a macro cell network by offloading traffic normally handled by the macro cell. They also help the carrier get closer to the customer to ensure the optimal customer experience.

Since the goal is to move the wireless signal onto a fiber as quickly as possible, this requires fiber be deployed deeper into the network. Only then can

the carrier adhere to the strict latency and reliability requirements of 5G.

While fiber for backhaul is key in the 5G era, it will also play a critical role in fronthaul and midhaul as well. Fiber will be deployed to the top of the tower as a fronthaul connection in the radio area network (RAN).

As 5G networks advance, it is expected that carriers will look to move the location of the radio control closer to the core of the network (i.e., CRAN) instead of having it collocated at the base of the tower. When carriers look to make this type of transition, having fiber ready will be a necessity.

Overcoming the challenges of providing signal in large buildings, stadiums, and more, DAS will be vital for facilities looking to benefit from 5G. To facilitate this, single-mode fiber cabling will be required to replace traditional coax copper connections in DAS networks. This mirrors the same type of fiber management needed in the mass market PON environment.

Transport Trauma?

For both small cells and DAS, the hand-off from transport to antenna locations is the last, and often the most challenging, section of the deployment as it often requires a technician to work near road traffic and other hazards. Allowing for quick and easy access to these wireless sites is important to ensure that the carrier gets fiber where it's needed, including to cell towers, buildings, and wireless antenna sites. Ideally, carriers will look to deploy a solution that requires the least amount of technician time in the field so they can further reduce the time and money required for service turn up.

According to McKinsey & Company's report, *The Road to 5G: The Inevitable Growth of Infrastructure Cost*, "When network upgrades are no longer sufficient to support the increased traffic, operators will need to build new macro sites or small cells. That point in time will vary by location, but simulations show that most operators will need to embark on significant new build-out between 2020 and 2025. That shift will be the primary driver behind network cost increases."

The report states that without additional 5G spectrum and investment, some US carriers will

Small cell deployments create the need for more fiber -- further.

run out of capacity to meet increased demand in at least 50% of sites by 2020.

Of course, these deployments take time and planning.

- **In 2018, T-Mobile** announced a partnership to deploy additional small cells within their existing footprint and to light up small cells in new markets, helping it to enhance and prepare for 5G network deployments.

- **In the fall of 2019, Verizon** announced it was planning to use 5G to power automation and quality assurance in what they have called the "factory of the future." This test case looks at how the factory of the future can leverage "5G to dra-

the same geography compared to previous generations in order for carriers to realize the full revenue potential of 5G, which we see as the tipping point for fiber network densification.

Because small cells and DAS deployments should leverage single-mode fiber cabling, a sound fiber management strategy is needed for these applications. Clearfield and other manufacturers can offer network operators field-proven solutions designed to reduce the high labor costs associated with deploying, managing, protecting, and scaling, small cell and DAS deployments to support wide-spread 5G deployments. ∎

> ❞ It is estimated that 5G will require up to a tenfold increase in the density of cellular antennas within the same geography compared to previous generations, in order for carriers to realize the full revenue potential of 5G, which we see as the tipping point for fiber network densification. ❞

matically speed data collection, allow machines to communicate with each other in near real time, and wirelessly track and inspect inventory using 5G-connected cameras. They will also test how 5G can improve the function of autonomous guided vehicles (AGVs) by helping them move more efficiently around the factory floor." This use case will require fiber throughout the facility to connect all the devices for both fronthaul and backhaul of the data.

While these innovative services are delivered over the wireless network, they share a common need for fiber to support the bandwidth-intensive applications that these services will carry. A robust fiber infrastructure for backhaul, midhaul, and fronthaul, needs to be carefully planned and developed so that carriers can maximize the opportunity, minimize the risk, and realize the fastest possible return on investment as these services are launched.

Given that many of these services will initially target dense, urban environments, understanding the challenges with deploying smalls cells and DAS networks will greatly ease network rollouts. It is estimated that 5G will require up to a tenfold increase in the density of cellular antennas within

Resource

To read, and to download, McKinsey & Company's report, *The Road to 5G: The Inevitable Growth of Infrastructure Cost,* please visit https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-road-to-5g-the-inevitable-growth-of-infrastructure-cost.

Kevin Morgan leads the marketing efforts for Clearfield as Chief Marketing Officer. Prior to joining Clearfield in 2016, he spent 2 decades serving in various senior marketing positions at ADTRAN, Inc., where he gained extensive experience in advanced communications technology, fiber optic systems, and business product marketing. Before that, he spent a decade at telephone operating company BellSouth, now a part of AT&T. He received a B.S. in Electrical Engineering from Auburn University and an MBA from the University of Alabama. **For more information, please email kmorgan@clfd.net or visit www.SeeClearfield.com.**

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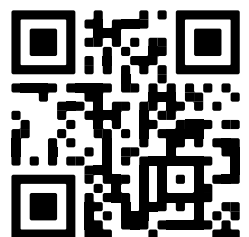
Can Data Sharing Help the Homelessness and Opioid Crisis?

A Roadmap for Sharing Data to Enable More Effective Collaboration

By Megan Atchley, Galen Bock, Nicole Geller, Grant Thornton, Paula Hildebrand, Bob Nevins, Ruthie Seale, Kim Shaver, and Rob Tai

CompTIA's latest report *Homelessness and Opioids: A Roadmap for Sharing Data to Enable More Effective Collaboration,* examines how access to better information and harvesting of existing data on homelessness and opioid abuse across multiple systems may help inform and evolve service delivery to those suffering from the growing epidemic. This article is adapted from the white paper.

More than one-half a million people in the United States were reported homeless in 2018 by the U.S. Department of Housing and Urban Development (HUD). For this same time frame, opioid deaths in this country exceeded rates of 115 per day.*

Given the staggering rates for both homelessness and opioid deaths, and the intersection between these 2 populations, it follows that finding effective solutions to address homelessness will have a positive effect on opioid abuse and death rates.

While arguments can be made on either side of the debate as to whether substance abuse is the cause or the effect of these individuals becoming homeless, it is nevertheless a societal challenge that must be addressed.

It is also noteworthy to mention that in 2019, homelessness in the US increased for the second consecutive year. This stresses both our medical and first responder community, as homeless people suffer from the same illnesses as other individuals but at rates 3 to 6 times higher.

Also, on average, people without homes are 3 to 4 times more likely to die, and on average die 30 years sooner.

management services are sometimes offered to residents, and it emphasizes a "low threshold" with personal choice about whether to address substance abuse and mental health problems.

We are advocating for widespread data sharing across the various agencies that bear responsibility for providing support and services to those impacted by homelessness and opioid abuse. Because of the sensitive nature of the issue, there are some real and/or perceived constraints on the ability to share information that would provide better insight on the severity of the problem and perhaps suggest which of the 2 models -- Linear or Housing First -- represents the most effective path towards ameliorating the homelessness issue while influencing the opioid abuse and death rate.

Data Sharing

Program administrators and data stewards have a critical role to play in addressing the homelessness and opioid epidemics. While not thought of as front-line workers in these issues, these individuals

According to the most recent annual survey by the U.S. Conference of Mayors, the top causes of homelessness are:

- Lack of affordable housing
- Unemployment
- Poverty
- Mental illness and the lack of needed services
- Substance abuse and the lack of needed services

While no clear solution to homelessness exists, there are 2 prominent models that have emerged in response to the need for housing for persons with co-occurring substance abuse and unstable housing.

1. The Linear model emphasizes abstinence from substances as an explicit goal. In this model, substance use treatment is an integral first step to obtaining permanent, stable housing.

2. The Housing First model takes the view that the provision of subsidized, and in some cases free housing, should occur first. In this model, case

are uniquely poised to shape strategy to bridge critical data that is currently dispersed across a myriad of agencies. Information that could inform a case worker of the likelihood that their client will suffer from homelessness or opioid use is buried across numerous agencies' servers, siloed and unharnessed to be used for broader insights.

Homelessness and opioid abuse affect people in a wide variety of individual ways, increasing the complexity of any appropriate response. The inherent difficulty in tackling these intertwined epidemics is due to countless individualized circumstances and

unique reasons that lead to an individual becoming homeless or addicted. Data stewards alone often lack the necessary information and governance authority to comprehensively identify challenges, to assess needs, and to apply appropriate services to meet individualized demands most effectively.

Critical information is dispersed among a variety of stakeholders at varying levels across multiple jurisdictions. The ability for stakeholders to cooperatively share siloed data, while applying advanced analytics to this aggregated information, can drastically improve the ability to address needs on an individualized level, shape policy and practice, and allow for targeted interventions which more effectively utilize scarce resources.

Data Sharing Constraints

Privacy concerns are a legitimate consideration that limits the sharing of data around opioids and homelessness. For instance, the legal guidance around the Health Insurance Portability and Accountability Act12 (HIPPA) ensures that entities "protect the privacy of individuals' health information while allowing covered entities to adopt new technologies to improve the quality and efficiency of patient care."

While HIPAA allows the creation of data aggregation systems, there must simultaneously be an extremely rigorous patient data protection scheme alongside.

Another consideration for this type of information is 42 CFR (Code of Federal Regulations) Part 2 which protects the privacy of substance use disorder (SUD) patient records by prohibiting unauthorized disclosures of patient records except in limited circumstances.* The confidentiality protections of Part 2 are vital for SUD patients to avoid discrimination and negative consequences.

For certain types of sensitive and personal data, consent and disclosure procedures must be considered if they are not already required by law. Regardless of how local groups decide to begin coordinating data for analytics, constituents will still expect reasonable disclosure about how that work is getting done. Implementing proactive user consent for cookie tracking on digital platforms, creating open comment periods for proposed integration work, hiring third party risk assessors, and more, are all ways to ensure constituents stay well-informed. Government must also consider the potential risks for misuse or abuse of data.

Further complicating things in this area is that since many opioids users are homeless or involved in the criminal justice system, consent over the use of the data is even more challenging.

In addition to legal and policy considerations, the technical mechanics of how patient data is siloed within each agency or stakeholder presents significant barriers. Data systems are often not interoperable. There is a lack of standard data collection, accessibility, and integration practices, for various types of data, including electronic medical records, social determinants of health data, behavioral data, and toxicology data. Real-time data collection also presents additional technological and accessibility challenges.

Whatever the reason, siloed data limits the ability of social services to have a holistic view of their patients and clients. With limitations in the availability and completeness of data coupled with the challenges of integrating multiple data sources across multiple stakeholders and jurisdictions, governments are inefficiently directing resources and, in many cases, ineffectively serving its citizens.

Conclusions and Recommendations

The rates of homelessness and opioid abuse in the country are staggering, and the resulting societal impact is enormous. With the incident rate so pervasive, the underlying causes so deep-seated, and effective solutions still quite elusive, continued and enhanced federal funding is undoubtedly a critical ingredient in solving these individual and intertwined public crises.

However, funding for programs to support the homeless or those battling opioid abuse will always face the same challenges as other social programs: there will never be enough.

As such, the critical path forward is not only identifying solutions that support those already impacted, but more importantly, it is identifying effective solutions to prevent homelessness and opioid abuse.

By stemming the tide of those becoming homeless or abusing opioids, this approach will offer the best opportunity to begin to eradicate these conditions. A key element of such a solution is using shared data to not only understand these conditions and contributing factors but how to predict and implement effective intervention to avoid homelessness and/or opioid abuse.

We must find a way to adequately mitigate this epidemic in order to prevent further deterioration within our communities. The impact on our communities is multi-faceted from the impact on child health and welfare to the burden placed on our country's medical and public first responder services.

The epidemic and intersection of both homelessness and opioid abuse is so incredibly detrimental to the overall well-being of our nation. While advocates, administrators, and policy makers alike are working hard to solve this issue, we implore those involved in seeking solutions to recognize and embrace the use of shared data as a key component to stabilization and prevention.

Sharing data and then analyzing the aggregated information available across the spectrum of involved agencies offers an opportunity to increase the toolkit availability for tackling the drivers for homelessness and opioid abuse, and to improve the detection of the relationship between them. Moreover, this additional insight could lead to identifying additional solutions and or funding that might be leveraged or redirected to more effective, long-lasting outcomes for treatment and stabilization, as well as early prevention and intervention. ■

IT TAKES TWO

Empowering Fixed Mobile Convergence and Transport for 5G

By Robin Mersh

While 2019 marked the year 5G deployments finally came to fruition, this year, we are witnessing a much wider rollout of this powerful technology as mass global rollout moves into high gear.

This realization of 5G deployments will bring yet another surge in network traffic -- which for years now has already been growing dramatically. As much more than the next generation of mobile technology, 5G technology promises to be a game-changer in terms of broadband reach and user experience, opening up new innovative use cases for consumers and businesses alike, and new applications from autonomous cars and smart communities to Industrial Internet of Things (IIoT), remote surgery, and immersive education.

However, to be successful, an entire ecosystem around 5G technology needs to be in place, from transport networks capable of handling increased network traffic and network slicing, to end devices that can seamlessly leverage the optimal technology available, to billing and management systems that seamlessly hand-off between these networks.

With 5G set to take off faster than either of its predecessors (CCS Insight predicts that there will be one billion users of 5G by 2023), operators are seeking ways to rapidly prepare for this powerful new

better user experiences and more efficient network utilization for these devices as they handoff, roam, tether, and attach to wireline locations. Therefore, for operators wishing to provide superior user experiences, interworking between fixed and mobile networks is becoming crucial.

If operators are to cost-effectively support the growing use of multimedia applications and related traffic growth in both fixed and mobile environments, they require solutions that can constrain capital and operational expenditures. While network traffic continues to grow annually, it is unlikely to produce a commensurate increase in revenue in a competitive and regulated marketplace. Therefore, operators who own both fixed and wireless access networks are best positioned to consider converged solutions which can provide optimization of their network infrastructure.

To make this a reality, operators must have the tools at their disposal to enable sharing components between both their fixed and wireless networks, enabling them to align their service offerings and enhance user experience across both types of access technologies.

ONE GOAL, ONE NETWORK

The success of 5G and its ability to enable these new use cases and applications is dependent on the speed and reliability of both fixed and mobile networks. This means operators must leverage both fixed and mobile networks to unlock the full potential of new innovative services and applications, and to deliver a seamless experience for end users across all their devices.

To achieve this, operators must look to do 2 things:

1. **Implement a converged and integrated core network.** This is key to a converged services approach, which will ultimately enable operators to deliver a uniform experience to their customers irrespective of the access media type, technology, or appliance, they are using.

2. **Enhance their transport network(s).** The transport networks that interconnect the 5G RAN and core networks need to be enhanced to support the evolving 5G mobile architectures as well as the capacity and QoS performance demands of the 5G mobile network and its applications. Upgrading

technology. However, if operators are to support the requirements and demands of 5G, the way they build, operate, and use both their fixed and mobile networks must fundamentally change.

MARRYING FIXED AND MOBILE

Since the introduction of mobile devices that include Wi-Fi, there has been an increasing interest in coordination and interworking among wireless and wireline networks across the industry -- which has been further fueled by the rise in the use of smartphones at public hotspots.

As a result, an emerging ecosystem is taking shape where applications are developed largely independently of access types. There is an increased desire to provide network capabilities that offer

the 5G mobile equipment without the corresponding transport enhancements will not provide the full promise of 5G that end users expect.

Convergence (FMC), the organization is also developing a specification for a 5G Access Gateway Function (AGF) which adapts fixed access onto the

> "While network traffic continues to grow annually, it is unlikely to produce a commensurate increase in revenue in a competitive and regulated marketplace. Therefore, operators who own both fixed and wireless access networks are best positioned to consider converged solutions which can provide optimization of their network infrastructure."

NOT A ONE-MAN MISSION

To address this challenge as 5G gathers pace, Broadband Forum is working to increase the synergy between wireless access technologies and wired access technologies, as well as that of wireless networking and wireline networking functions.

To ensure industry-wide collaboration, we are coordinating efforts with the 3rd Generation Partnership Project (3GPP) to provide an architectural framework for interworking between next-generation fixed and 3GPP wireless access. This work defines the business requirements, use cases, high-level functional architecture, and deployment options for interworking. It includes requirements on the regional access network and customer premises network to support interworking between Broadband Forum wireline access networks and 3GPP wireless networks, enabling the use of 3GPP User Equipment (UE) with wireline networks.

The organization contributed detailed recommendations to 3GPP as part of its Release 16 time frame, aligning their efforts in the development of a converged 5G core network. The suggestions addressed the common interfaces for access networks and 5G core networks to support the convergence of wireline and wireless networks. Detailed recommendations on a number of interfaces in the context of fixed 5G were also passed on to 3GPP, enabling its members to evaluate the interfaces that run between the 5G core and the fixed network. In addition to this, recommendations on signaling changes and enhancements were provided, addressing how fixed access can be fully integrated into the 5G core.

As part of its efforts to drive Fixed Mobile

5G core, specifications for 5G-capable Customer Premises Equipment (CPE), and specifications which address the interworking of existing fixed access subscribers, as well as deployed equipment into a 5G core that encompass a variety of deployment scenarios. This work is designed to empower operators to create powerful new converged service offerings, enabling them to gain additional revenues.

These initiatives leverage and integrate the newest technologies to ready the transport network for 5G while at the same time apply the transport network to the new 5G Radio Access Network (RAN) and mobile core architectures from 3GPP to fulfill the promises of 5G.

With 5G, 3GPP has split the traditional RAN and mobile core architecture exposing standard interfaces that were previously internal to the LTE equipment. The split allows a more dynamic and custom deployment of 5G equipment particularly for the RAN. The transport network, previously supporting only mobile backhaul, must support the volume of these new "fronthaul" interfaces.

However, these new interfaces are demanding not only in terms of the number that must be supported but also in terms of capacity and performance (e.g., latency, delay variation)

Focusing on capacity, performance, reliability, scalability and security, the scope of work on the transport network includes control, management, and data plane for the IP layer down to the physical layers.

A 5G FUTURE

That's why long-standing working relationships with organizations such as IEEE, IETF, and ITU-T are critical. We aim to leverage their work on timing and synchronization; OAM, routing,

resiliency, scalability, and security into a comprehensive 5G Transport architecture that addresses the challenges of 5G; along with virtualization of the mobile transport infrastructure and enablement of software-driven networking.

All industry stakeholders can shape the future of broadband. When we work together to create a collaborative ecosystem, we provide a globally supported framework for operators worldwide to develop next-generation services and launch new, innovative, combined subscriber offerings. ∎

Resource

For more information, please see *CCS Insight Predicts 1 Billion Users of 5G by 2023, with More Than Half in China* at https://www.ccsinsight.com/press/compa-ny-news/3240-ccs-insight-predicts-1-billion-users-of-5g-by-2023-with-more-than-half-in-china/.

Robin Mersh is CEO of the Broadband Forum. He joined the Broadband Forum as COO in July 2006, and was promoted to CEO in July 2010. He has authored multiple articles and has spoken at and chaired many broadband industry events. Robin has worked in the telecommunications industry for more than 18 years, and has worked in business development and alliance management for various OSS software companies in the US. For more information, please visit https://www.broadband-forum.org/.

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MAKING ROOM FOR THE FUTURE

Strategies to Combat Shrinking Underground Space

By Roger Fynan

With 5G being deployed in early markets, consumers are demanding more connectivity and lightning-fast speeds. Cybersecurity is a real concern, and manufacturers are connecting more machinery and devices to the Internet of Things (IoT).

To those of us in the telecommunications industry, all this advancement boils down to one primary need: increased bandwidth.

While adding more bandwidth sounds simple, it requires space. Higher bandwidth means more fiber optic cables underground. And cables are increasing in size as they increase in bandwidth. For example, some 3,456-count fibers are nearly 1.5 inches in diameter. Higher bandwidths can have a significant impact on underground real estate.

It used to be that underground space wasn't considered a commodity because it was so abundant. These days, however, it's becoming scarcer as it's quickly taken up with multiple utilities -- and, yes, bandwidth. How we address shrinking underground space will set us up for future success.

Urban Challenges

In urban areas, specifically, the availability of underground space is a growing concern. It's not uncommon, for example, to have underground space that's shared by both utilities and telecom providers. Even though underground lines may be buried at different depths, the crowding can be a serious concern. In city environments, underground space is often such a rare commodity that the same conduit may have several different owners. All this crowding leads to marginal space available for expansion.

Another issue that faces urban installers is the

need for minimal disruption. Installing new fiber or even performing maintenance on existing fiber can be a significant hassle within city confines. There's an added pressure on engineers in urban environments to ensure any projects are quick and hassle free, allowing the usual ebb and flow to remain undisturbed.

5G Integration

The arrival of 5G is another ground-consuming factor. With 5G, many antennas are closely arrayed to provide coverage, almost like a huge Wi-Fi network. This densification requires antennas to be closer to end users than 4G did, and many of those antennas are required in urban areas, where available space is already an issue. Even though antennas will be transmitting to connected devices, fiber with high bandwidth will have to run to those antennas.

The constant need for higher bandwidth combined with the fiber demand that 5G will bring makes the scarcity of underground space a growing concern for everyone in the telecommunications industry.

The Edge

5G isn't the only factor that's causing more fiber deployment to occur closer to urban areas. The rise of cloud computing requires even shorter latency periods, which means data centers are moving closer to end users. We have already seen data centers built in suburban areas of Atlanta, Dallas, Chicago, and Miami.

As data centers in urban areas continue to need to expand and evolve to meet current demands, they'll require significant amounts of underground space in order to maintain the necessary bandwidth. Data center growth is just one more reason our underground availability is rapidly shrinking.

Figure 1. In this example, segmented conduits provided multiple pathways for the University of Iowa to share space with Iowa City.

3 Ways to Future Proof

The solution to this growing problem of reduced underground availability is future proofing. Our mindset cannot be just catching up or meeting the current demand; we need to be several steps ahead in order to be successful.

Far too often, engineers and contractors alike are looking at the project that's right in front of them instead of considering how it could be impacted by future needs. We have to start anticipating how to leave physical space for expansions, upgrades, or changes, that need to occur -- and to factor in how to do so while avoiding or minimizing civil disruptions. As space becomes more limited, we have to design infrastructure with the future in mind, even if we aren't sure yet what the future holds.

When designing new construction, it's increasingly important that engineers not only meet present needs but also incorporate strategies for future changes. But these options do not have to be significant or even disrupt current processes to have a significant positive impact on future flexibility.

1. Install segmented conduits

One of the best ways to maximize underground real estate is to leverage the space inside the conduits that are installed. Often, there's plenty of unused space below the recommended fill ratio in the conduit. Installing a segmented conduit can help maximize that space. One solution is a rigid, segmented high-density polyethylene (HDPE) conduit with a fabric divider, like Vis™ Divide. This allows for multiple pathways within the same conduit so future cables can be installed without running the risk of cable-over-cable damage. (See Figure 1.)

It's a common future-proofing practice to install 2 conduits, creating an extra pathway for future upgrades. Installing 1 segmented conduit provides the same solution while taking up less real estate and less installation time.

Segmented conduits can also assist with providing a way for multiple providers to share space. Access conduits are specifically an area that quickly becomes crowded with demand from multiple providers, such as cable, security, and landlines. Segmented conduits provide a pathway for each provider and help keep cables organized efficiently.

These are a preferred option for future-proofing because they are installed in the same manner as standard HDPE conduits, requiring no additional training or proprietary equipment. Cables are placed into the pathways using traditional pulling methods. No learning curve for contractors makes segmented conduits a low risk solution for maximizing underground space. (See Figure 2.)

2. Utilize temporary seals

The need for future maintenance is an inevitable reality that can and should be recognized by using temporary seals on ductwork. Seals like reusable inflatable bags or mechanical plugs provide easy, quick access to conduits. While it's true that contractors can still access conduits with permanent, hardened compound seals, it adds an extra layer of complication that can be both time consuming and costly. It's far more efficient for contractors to seal ducts with something more temporary, acknowledging the need for future convenience to help minimize civil disruptions. (See Figure 3.)

3. Maximize existing ductwork

As upgrades are needed, making the most out of existing ductwork is often the best option for limited disruptions to everyday workflow. In order

Figure 2. Segmented conduits are installed in the same manner as standard HDPE conduits.

Figure 3. Foam makes a great temporary seal so segmented conduits can be easily accessed in the future.

to do that, engineers should consider how to best utilize space inside the ductwork.

Incorporating fabric innerduct into existing ducts allows for network expansion within the same conduit. Even if existing conduits have cables already inside, there may be room for more with a fabric innerduct in an overlay application. The innerduct helps to prevent both pulling friction and tension and is a good solution for data centers or other high-bandwidth areas.

A study performed at the Corning Green Acres Test Facility in Hickory, North Carolina, in November 2018 found that fabric innerduct can hold four 3,456-count fiber optic cables in a four-inch conduit -- over 13,000 fibers in an area that typically holds half that.

Future Lens

Even when underground space is at a premium, there are future-proofing options available that can make the most of existing infrastructure -- and help save both money and time in the process.

The onus is on the entire industry to look at underground construction with a future lens. Engineers should be specifying solutions that allow for future expansion and easy maintenance. Contractors should be evaluating their work with the mindset of simplifying future processes. Through future-proofing, we set ourselves up for success. ■

Roger Fynan has been in the telecommunication industry for nearly 20 years, and currently serves as the Sales Manager at Milliken Cable Management -- a business within Milliken & Company that's leading the data communication network industry with insightful problem-solving and future-proofed, cost-effective solutions. For more information, please visit www.cable.milliken.com.

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PHONE DATA RATCHETING MULTI-TOOL CRIMPER - 48-22-3075

DATA COMM Universal Twisted Pair Stripper - 48-22-3065   **UTILITY POUCH - 48-22-8119**

DATA COMM Punchdown Tool with Extended Blade - 48-22-2165

COMPACT UTILITY POUCH - 48-22-8118

KNOW YOUR BEST ASSETS

Fiber Network Documentation Planning

By Sean Dundon

Demand for bandwidth is doubling every 100 days. In fact, the Fiber Broadband Association estimates that 5G will require the deployment of about 1.4 million miles of fiber in just the top 25 urban areas in the United States. To effectively capitalize on this demand, Internet service providers (ISPs) need to deploy or expand their networks quickly and efficiently. The bottleneck? Asset documentation and management.

Accurate network documentation is crucial to going to market faster; it outlines current connections, maps existing infrastructure, and provides a clear view of available network capacity, which helps identify the best routes for expansion. This remote visibility improves operational efficiencies by reducing the need for expensive field maintenance tasks such as truck rolls, enabling ISPs to be more cost-competitive overall. Robust documentation also empowers ISPs to assign an accurate valuation to the network if they are considering an acquisition or sale, and makes it easy to package network data to meet funding, regulator or third party compliance requirements.

Historically, network asset inventory was managed in static CAD files that were difficult to update and share. As a result, the documentation was often incomplete or outdated, which required engineers to spend valuable time confirming true network connectivity information through field audits.
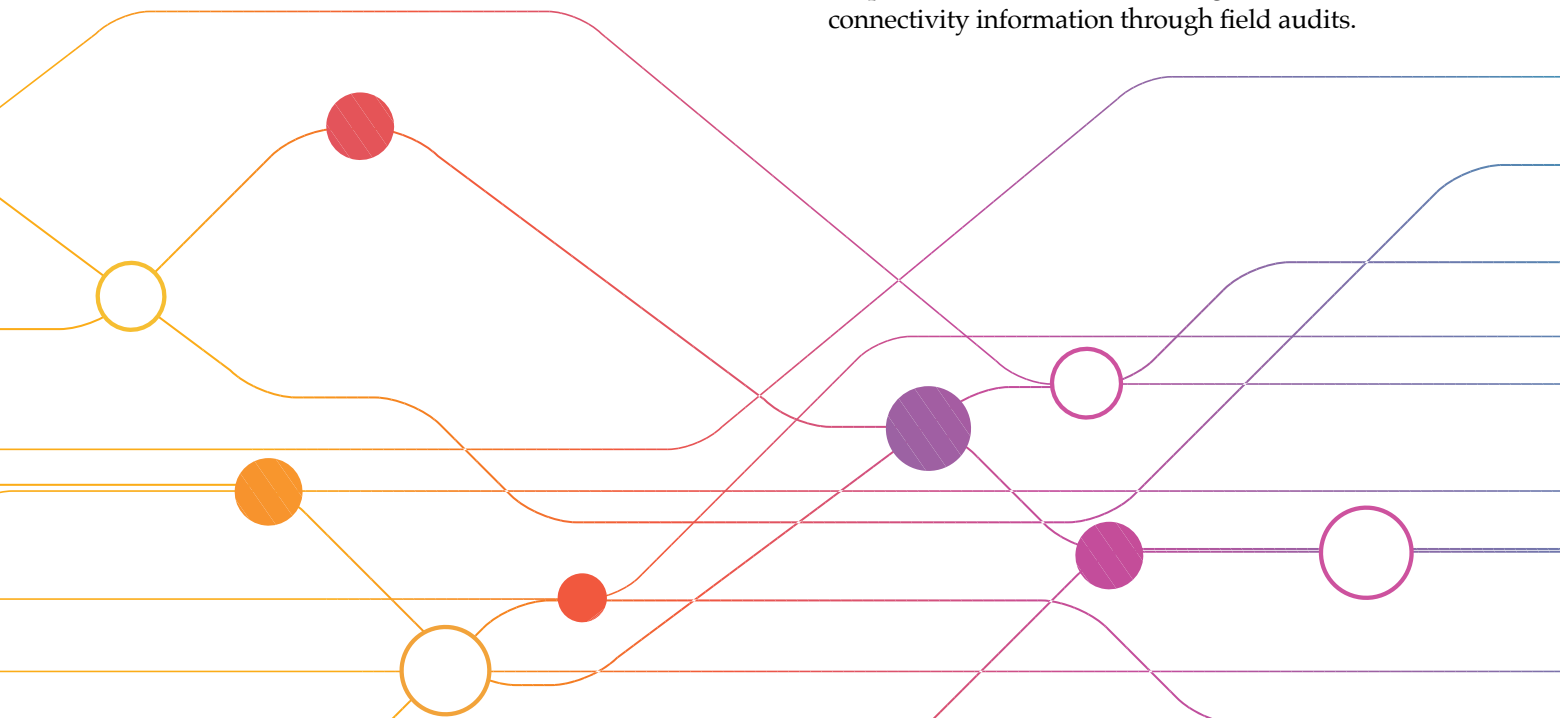
Today, there are several more dynamic geospatial environments that provide visibility across departments and enable data access and sharing. However, a few planning steps are necessary before choosing to migrate your data. These 5 guidelines will help get you started.

Guideline #1. Set Clear Goals

Before making any decisions, it's important to determine what's most integral to your network's success. For instance, are you

- Expanding, selling, or acquiring, a network?
- Trying to reduce operational costs?
- Working to improve customer support response rate?
- Reducing organizational risk or dependence on institutional knowledge?

Determining where you'd like to end up will help you figure out where to start.

Guideline #2. Get Organized

Take an inventory of your current assets. Collect all existing records of fiber paths, materials and equipment across your entire network, and try to digitize them to the best of your ability. For instance, any paper records should be converted to digital files for easier management.

When possible, it's preferable to convert data into a shapefile or .kmz format. CAD files tend to be more complicated to ingest into a new system because they're not necessarily GIS-friendly.

In addition, the network data in CAD files is often offset from the physical infrastructure, and must be corrected by manually aligning fiber routes with existing infrastructure to ensure spatial accuracy.

Guideline #3. Determine Functionality Requirements

There are several potential software solutions to compare when selecting your ideal geospatial environment for your network data, so it helps to narrow down your criteria. Here are a few things to consider.

- How many people will need access to your network map and data, and in what capacity?
- Will you hire specialists or contractors to manage the software, or will you train existing employees?
- Are you currently working on a fixed timeline for any new fiber deployment?
- Will you require integration with software such as OSS/BSS, CRM or field data collection tools?
- Are you considering demand aggregation tools to expedite customer acquisition?
- Are there existing processes you'd like to automate or simply improve?
- Do you need to include field images of your physical network assets in your inventory?
- Do you need to speed up deployment or network repairs with more intuitive field work orders and splicing diagrams?
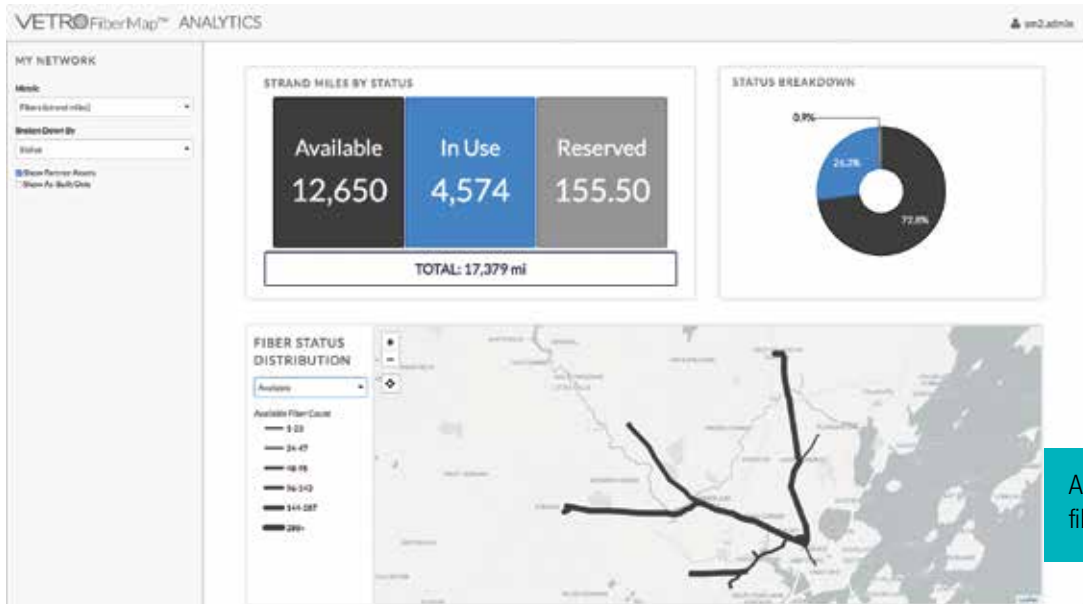
Analytics portal view of fiber network capacity.
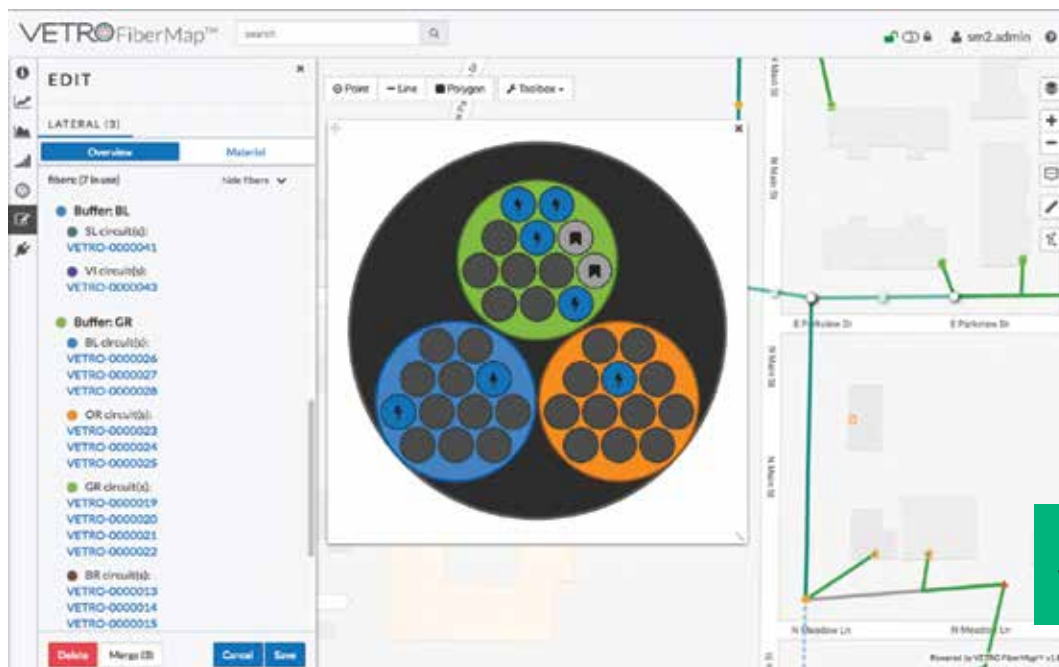
Fiber assignment within the buffer tube.

Guideline #4. Consider On-Premise vs. Cloud Hosting

As the popularity of open and connected cloud-based software grows, ISPs have an increasing number of questions about data security. While cloud-based hosting can seem less secure, it actually provides equal if not better data redundancy.

On-premise or single-stack solutions typically rely on the IT department to perform backups, which can be inconsistent or incredibly proactive, depending on your team. On the other hand, cloud-based hosting provides redundancy by performing automatic updates that store data on multiple servers.

Another added benefit: unlike static desktop single-stack software, cloud-based solutions never go out of date -- all new features and upgrades are automatically synced to your account.

Guideline #5. Get Started

You're now well on your way to having a complete representation of the physical network, from the switch to the customer, that allows you to evaluate or adjust your network at any level.

Now that you've **identified your goals, organized your existing inventory,** and **figured out what you need from an asset management solution,** it's time to **start evaluating specific software.**

While we are admittedly biased toward the VETRO FiberMap platform solution, our team is happy to act as a resource and to answer any questions that arise as you evaluate geospatial fiber management solutions. Good luck, and happy splicing! ∎

Sean Dundon is Director of Business Development, VETRO FiberMap®.

He is responsible for VETRO FiberMap's sales strategy and growth. His educational background includes an MBA from Bryant College, an M.S. in Nuclear Engineering from the University of New Mexico, and a B.S. in Public Health from the University of Massachusetts. For more information, please email sales@vetrofibermap.com or visit www.vetrofibermap.com.

@sean_dundon
@vetrofibermap

ISE Buyer's Guide

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ISE has already found it.

The ISE team has done the hard work!

We have collected the latest and best products for your wireline and wireless networks.

We categorize them based on YOUR needs for YOUR network.

Find what you need with the ISE Buyer's Guide.

www.isebuyersguide.com
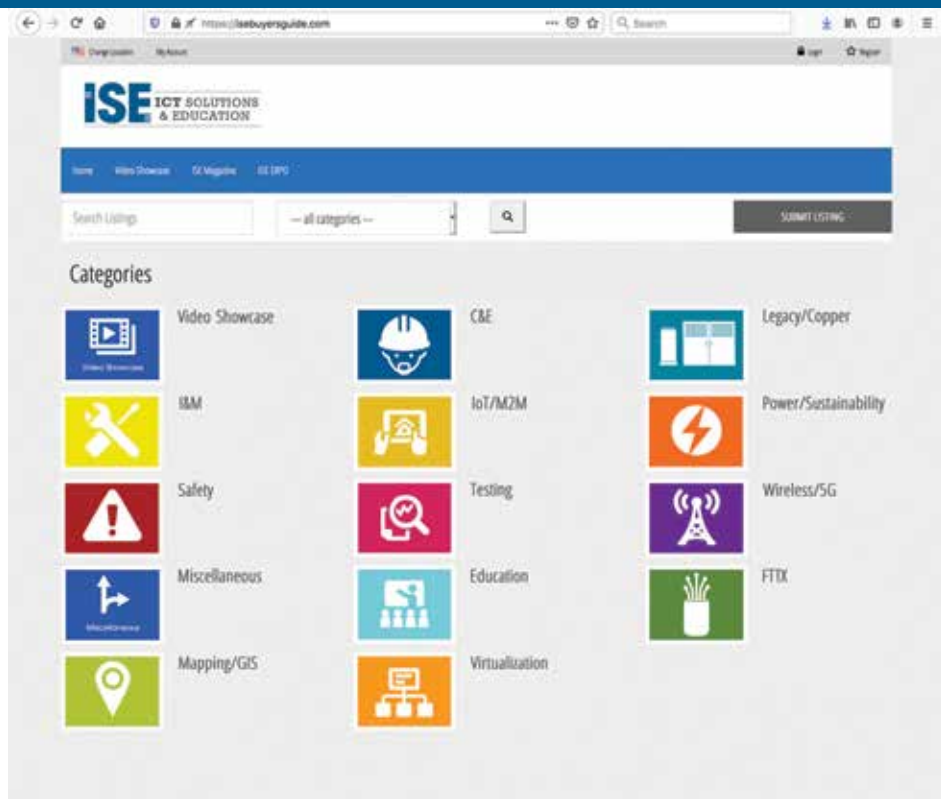
ISE EXPO

ICT SOLUTIONS & EDUCATION

ATTENDEE GUIDE

Education: August 18 – 20, 2020
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Be inspired by industry leaders presenting keynotes and seminars. Learn from 20+ seminars tailored just for you. Network with your colleagues during a show-floor happy hour and participate in hands-on demos with our newly developed Tech Zone.

Some wireline and wireless products/solutions showcased:

- C&E/Planning; Core/Legacy
- FTTx
- 5G Networks
- IoT
- Network Automation
- Power/Sustainability
- Safety/Network Security
- Testing
- GIS
- Municipal Broadband and More

Visit www.iseexpo.com for more information
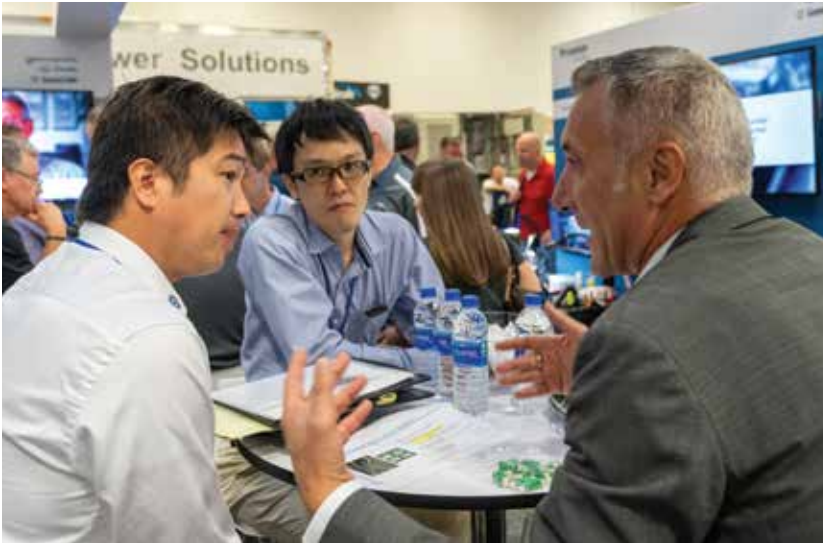
What Companies Should Attend?

Attendees come from all sectors of the Telecom/ICT industry including: Fixed and Mobile Network Service Providers, ISPs, Cable MSOs, EF&I contractors and sub-contractors, engineers, IT professionals from government, educational institutions, municipalities and utilities along with others aligned with these fields.

Who Should Attend?

All professionals who impact the telecom/ICT networks including: network procurement teams, buyers, NOC managers, R&D leads, planners, strategists, engineers, designers, inside and outside plant technicians, safety experts, maintenance and construction staff, system testers, contractors, IT personnel and educators.

General admission includes access to Opening Keynote Presentation, Tech Talks, 20+ Accredited Seminars, Exhibit Hall featuring 200+ Vendors, 2 Drink Tickets for Wednesday's Happy Hour, Attendee Vacation Giveaway opportunity and Scavenger Hunt contests.

ISE EXPO

ICT SOLUTIONS & EDUCATION

Tuesday | August 18

7:00 AM – 5:00 PM
Registration Open

8:00 AM – 4:30 PM
Advanced Workshops
(Requires Pre-Registration and Payment)

Wednesday | August 19

7:00 AM – 6:00 PM
Registration Open

8:00 AM – 10:15 AM
Seminars

10:30 AM – 11:30 AM
Opening Keynote

11:30 AM – 6:30 PM
Exhibit Floor Open

5:30 PM – 6:30 PM
Happy Hour on Exhibit Floor

Thursday | August 20

7:00 AM – 2:30 PM
Registration Open

8:00 AM – 9:00 AM
Tech Zone
(Requires Pre-Registration and Payment)

9:15 AM – 10:15 AM
Seminars

10:30 AM – 11:30 AM
Keynote Tech Talks

11:30 AM – 3:00 PM
Exhibit Floor Open

2:45 PM
Contests Giveaways

Keynotes

OPENING KEYNOTE August 19 | 10:30 AM

Andrew Dugan

Chief Technology Officer
CenturyLink

Join Andrew as he addresses topics that matter to network transformation today and tomorrow including:

- Leveraging Lifecycle Service Orchestration (LSO) APIs to improve automation for customers, carrier partners and employees.

- How CenturyLink's Black Lotus Lab is working with AI and ML to analyze and prevent malicious activity across their network.

- Fixed wireless technology evolution.

- Collaborative fiber expansion efforts for 5G.

- How CenturyLink will meet the FCC CAF fund objectives by using fixed wireless.

CenturyLink®

Andrew is responsible for the development, integration and deployment of CenturyLink's global network supporting Consumer, Wholesale, Government and Enterprise markets. He is a veteran technology executive with more than 30 years of experience in building telecommunications networks, switching platforms and services platforms. Prior to his CTO role, he served as CenturyLink senior vice president of technology planning, network architecture and security. He joined Level 3 in 1998 where he played an integral part in building its global network. He held various roles at Level 3 and was named its CTO in 2016.

Get involved in the content of our Opening Keynote and Tech Talks by making YOUR topic requests known NOW. Simply text us your wish list of topics or questions. We'll share these requests with our presenters so they can tailor their presentation to YOUR needs.

Text us at **240.ISE.EXPO** (240.473.3976).

TECH TALKS   August 20 | 10:30 AM

TECHTalks

Be Inspired by Network Visionaries' Tech Talks

Tech Talk presenters offer ISE EXPO attendees short and to the point network evolution insights that are engaging and topical. These 2 respected network visionaries will share their passion and problem-solving strategies for the pain points YOU face across the wireless and wireline networks. Plan to be in the front row to be inspired on Thursday, August 20, 2020.

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Lynn Cox
Senior Vice President –
Network Systems, Verizon

Since she was appointed to this role in November 2017, Cox's responsibilities include the planning, design and operation of Verizon's OSS and BSS portfolio. This includes supporting new technology deployment, like iEN, 1F, 5G and SDN, ensuring the field teams can design, install and maintain the infrastructure and provision services onto the network. Additionally, Cox is responsible for all ordering and provisioning systems across Verizon's LOBs, including VES, VCM, VPS and VzW. Cox holds an MBA degree from Rutgers University and a Bachelor's in Business Administration from James Madison University.

Catherine Moyer
General Manager and CEO,
Pioneer Communications

Moyer currently serves on the CoBank board of directors. She is the vice-chair of the Federal Communications Commission's Precision Ag Connectivity Task Force, the chairman of the Kansas Lottery Commission, and the chairman of Telcom Insurance Group. Catherine is active in the telecommunications industry at both the state and federal level. Catherine holds a bachelor's degree from Middlebury College in Vermont and a law degree from Washburn University. She resides in Ulysses, Kansas, with her husband Kevin and their two dogs, a Great Dane and a rescue Husky/Lab mix.

Education

Successful people know that professional learning is their link to future success. In fact, almost 70% of attendees attend trade shows in order to increase their own professional knowledge.*

ISE EXPO 2020 delivers targeted education you need to do your job better and grow your career. You can earn CECs, learn best practices, network with presenters, and connect with thought leaders on the topics that matter most to wireline and wireless network transformation.

Carve out time for your own professional development today. Remember, you become indispensable to your company when YOU have expertise that others value!

*Source: www.tradeshowexecutive.com

For the complete seminar lineup and descriptions, visit www.iseexpo.com/schedule-of-events.

Track 1: Construction & Engineering / Network Transformation
Attendees will learn new strategies to evolve and transform the network for better performance and cost-efficiencies.

Track 2: Access Network Advances
Attendees will learn advanced solutions to leverage the copper/fiber/hybrid networks. These new tools/techniques will help them increase rate and reach to their customers in a more cost-effective manner.

Track 3: 5G Infrastructure Preparedness
Attendees will learn best practices to prepare the network for 5G mass market rollout and cost-effective deployments.

Track 4: Network Reliability/Power/GIS/Cybersecurity
Attendees will explore new service assurance strategies, including: testing, network optimization, GIS, hybrid power, cybersecurity, and other solutions to optimize and secure the network.

Earn CECs Toward Your Professional Certification

Our top-quality seminars are approved to award CECs from BICSI and the Electronics Technicians Association Int'l (ETA). For more information, visit www.iseexpo.com/cecs/

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Advanced Workshops

ISE EXPO 2020 will offer you the chance to participate in advanced education workshops. These workshops will take your education experience at ISE EXPO 2020 even higher. **Don't wait to register**. These workshops will fill up fast!

5G Technician: An Introduction to 5G

August 18, 2020
8:00 AM – 3:30 PM   Workshop
3:45 PM – 5:45 PM   ETA Certification Exam – Optional
Presented by Patrick McNerney, Chief Operating Officer, 3D Design and Engineering
Cost – Workshop Only $350, includes lunch
ETA Exam $105

Prepare yourself for the next wave of work for the telecommunications industry with "5G Technician: An Introduction to 5G". Learn the differences between 1G through 5G, the history that got us to this point, and the key technology enablers of 5G. Also, unique to this course is the 5G Build-Out section covering the practical design applications of 5G Build-Outs of Ultra-Dense Networks.

Introduction to Project Management: A Firm Foundation

August 18, 2020 | 8:30 AM – 11:30 AM
Presented by Deb Schaffer, PMP, AdvantEdge Training and Consulting   Cost $150

In this session, you'll learn how to define a project and get an overview of how projects are planned, managed and executed. Learn about the life cycle of a project, the WBS, handling constraints and how to craft a project plan -- including a scope statement -- and a high level schedule. We'll do a case study, practicing the concepts that we're discussing. When you leave the session, you'll be able to assess the need for a project and have a high-level understanding about how to create the project charter and project plan, including defining the project, stakeholders, constraints, and creating a high-level schedule.

FTTx Outside Plant Design Short Course

August 18, 2020 | 9:00 AM – 12:00 PM
Presented by Danny Huffman, Instructor, Light Brigade
Cost $150

This session will focus on the proper design of FTTx point-to-point and point-to-multipoint passive optical networks (PON) with home run, centralized, and distributed topologies. Learn about the importance of customer take-rate and density and how they apply to your design. The session will review various network configurations, design benchmarks, and installation parameters for FTTx systems.

Keeping it Together: What Project Documents do I Really Need?

August 18, 2020 | 12:30 PM – 4:30 PM
Presented by Deb Schaffer, PMP, AdvantEdge Training and Consulting
Cost $200

In this session, you'll learn what documents and files are needed when creating and running a project. We'll talk about some of the most important documents like the Project Charter and Project Plan and what they contain, including statements like the problem statement and scope statement. Then we'll practice writing those words. We'll also talk about the need for communication plans, risk management plans, resource planning, status reporting and budgets. When you leave the session, you'll understand what types of documents you need to manage your projects, what is contained in those documents, and you'll have a few templates to get you started on your own project management documentation.

Thank you to the following industry and media partners for their support of ISE EXPO 2020.

Industry Partners   **Media Partner**

Wednesday, August 19

All regular seminars are **free** to registered attendees and exhibitors

8:00 AM – 9:00 AM

9:15 AM – 10:15 AM

TRACK 1

Mapping the Journey to the Network Management in the Cloud
Presented by 3-GIS
BASIC

Cloud Communications Platforms and the Future of Telco Voice
Panel Discussion Moderated by Alianza

Stop the Chaos! It's time for High-Density Fiber Management
Presented by Go!Foton Corporation
BASIC

Joint Fiber Backhaul and Wireless Access Network Planning for 5G Small Cell Deployments
Presented by Comsof
BASIC

Transform Your PON Construction, Activation and Management Process With Remote Test
Presented by VIAVI Solutions
BASIC

5G and Wi-Fi 6, the Next Generation of Wireless for Us All
Presented by Zyxel Communications
BASIC

TRACK 2

The Importance of Connecting Smart IT to the Smart Home Interface
Presented by Advanced AVS Solutions
d.b.a. Smarter Homes of Austin
BASIC

5G and Small Cells Made for Each Other
Presented by Cyient
ADVANCED

Emerging Multimedia Services Will Break Broadband and Home Wi-Fi Networks
Presented by Calix
BASIC

FTTX in the Gigabit Era
Presented by CommScope
INTERMEDIATE

TRACK 3

Lighting Up 5G – the Future-Ready Access Network
Presented by AFL
BASIC

Effectively Managing the 5G Utility Co-Locations Through Vertically Integrated Solutions
Presented by Black and Veatch
BASIC

Goals of 5G and Fiber Implications
Presented by EXFO, Inc.
INTERMEDIATE

Placing and Protecting Edge Compute Infrastructure Outdoors
Presented by Charles Industries
BASIC

In the End There's Only One Network – Implications of Wireline and Wireless Convergence
Presented by Corning
INTERMEDIATE

5G Pole Deployment and Fronthaul Fiber
Presented by Tilson Technology Management, Inc.
ADVANCED

TRACK 4

The Power of Dashboards in Construction Projects
Presented by Millennium Geospatial
INTERMEDIATE

Proven Method to Ensure DC Power Reliability
Panel Discussion Moderated by Servato

New Technology for Making Fiber Optic Facilities Locatable Without Using Tracer Wire
Presented by 3M
BASIC

Sustainability as a Business Case
Presented by Plug Power
BASIC

Thursday, August 20

8:00 AM – 9:00 AM

Tech Zone*

Register to attend the Tech Zone where you can see firsthand the latest and greatest innovations from these leading ICT companies: AFL, EXFO, Preformed Line Products, Render Networks, and Viavi Solutions.

*MUST REGISTER TO ATTEND. COST OF $50 INCLUDES CONTINENTAL BREAKFAST.

AFL

EXFO

PLP PREFORMED LINE PRODUCTS

Render

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9:15 AM – 10:15 AM

Permit Changes and Insights to Help Speed Up the Approval Process
Presented by ASG, Inc.
INTERMEDIATE

Looking Beyond Growth and Capacity to Build a Multi-Year Network Transformation Strategy
Presented by First Principles Innovations, LLC
INTERMEDIATE

Pragmatic AI in Field Operations
Presented by Verizon Communications, Inc.
BASIC

Making the Case for Fixed Wireless Access Broadband
Presented by ADTRAN, Inc.
BASIC

Enhancing Cellular Network Uptime Through Power Boost Conversion
Presented by Vertiv
INTERMEDIATE

Is the Market Prepared to go From Millions to Billions More Endpoints With Wireless-to-Wireline Convergence?
Presented by Clearfield, Inc.
BASIC

Powering Small Cells – Lessons Learned
Presented by EnerSys Energy Systems
BASIC

Power and Surge Protection for Reliable Remote Network Deployments
Presented by SETfuse and Ericsson,
Representing ATIS Protection Engineers Group
BASIC

Practical Lightning Mitigation
Presented by Solara Technical Sales
BASIC

Assuring 5G Security
Presented by Tempest Telecom Solutions
INTERMEDIATE

Face the Facts!

Networking stats show that investing time in face-to-face events is the most effective way to get ahead:

- 95% of professionals consider face-to-face communication vital for long term business.

- **Networking at trade shows can get you up to 20% of your new customers.**

- 41% of professionals believe that face-to-face marketing at business events is the most effective way of finding customers.

(Sources: Oxford Economics Study; Bizzabo; review42.com; greatbusinessschools.org)

72%

OF THOSE SURVEYED SAID THEY WERE **INFLUENCED** BY LOOKS AND HANDSHAKE

Is it worth a plane ticket?
Face to Face ROI

95% Survey respondents who say face-to-face meetings are essential for long-term business relationships
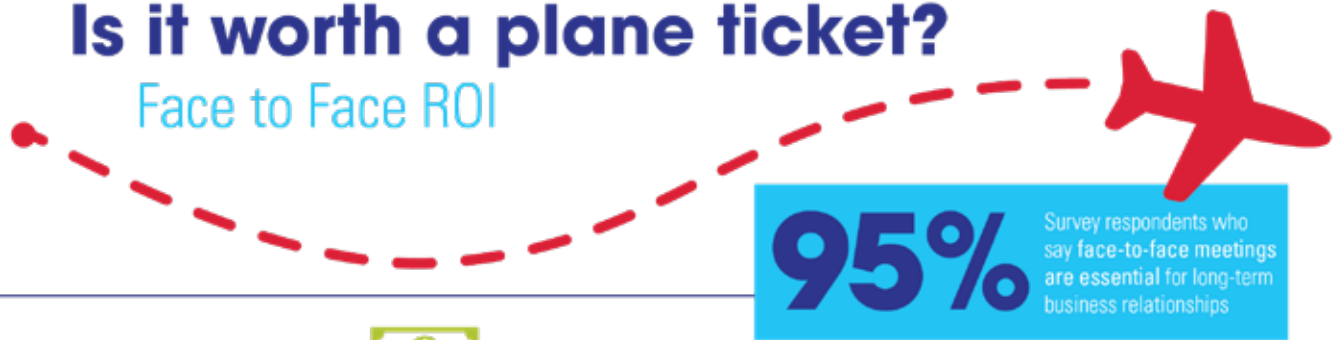
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ISE EXPO provides many opportunities for attendees, speakers and exhibitors to network in a collaborative, peer-to-peer environment. Explore the many ways you can connect with like-minded network professionals:

- Attend Wednesday night Happy Hour.

- Connect directly with speakers, vendors, and attendees via the Mobile App direct messaging.

- Text your questions to our keynote presenters via 240.ISE.EXPO (240.473.3976).

- Discuss your challenges in educational sessions with peers and presenters during Q&As.

- Connect with exclusive vendors during the Tech Zone breakfast (registration required).

Happy Hour

Wednesday, August 19 | 5:30 PM – 6:30 PM

Network With the Humans Behind the Networks

Catch up with your peers and share experiences from the day's events in a relaxed environment where you can join your colleagues and mingle with new friends, as well as meet exhibitors and ICT Visionaries. Enjoy local beverages and live entertainment while you sip and stroll through the exhibit hall to see new and exciting innovations and products.

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MOBILE APP

Download the official ISE EXPO Mobile app on your smartphone (iOS and Android), tablet or laptop to get the most out of your show experience at ISE EXPO 2020. Search exhibitors, sessions and speakers, get notifications and show highlights, watch product videos and more. Use In-App messaging to directly connect with attendees and exhibitors one-on-one.

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Attendee Vacation Giveaway

Win a Trip for Two to Grand Palladium Vallarta Resort & Spa

Our Vacation Giveaway will award one deserving ISE EXPO attendee an all-inclusive 4-night trip for 2 to the Grand Palladium Vallarta Resort & Spa nestled along the picturesque Bay of Banderas in Mexico's sublime Riviera Nayarit. The trip includes round-trip air* from your home city, transportation to/from the resort, as well as ALL meals, drinks, taxes and tips!

How to Win

Pickup an entry card at the registration counter when you check in at the convention center. Visit ALL of the sponsoring companies' booths on the exhibit floor and have them hole-punch your card. Drop your completed entry cards into the bin on the exhibit floor by 2 PM on Thursday, August 20 (late entries will not be accepted). The winner will be announced on August 20, at 2:45 PM on the exhibit floor. **Winner must be present to win. Arrive at the front of the exhibit floor at 2:40 PM for the drawing.**

*Additional charges may occur for any winners residing outside the continental USA.

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Hotels

ISE has secured the best rates possible for our attendees and exhibitors at our host hotels. We ask that you **always book your rooms with and under ISE EXPO room blocks to take advantage of these savings**. We take pride in securing housing blocks to ensure that our guests will be adequately accommodated in the downtown area.

Hilton Garden Inn Denver Downtown

1400 Welton St., Denver, CO 80202
Tel: 303.603.8000
Room rate: $243.00
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Cut-off date: 07/27/2020

Sheraton Denver Downtown Hotel

1550 Court Place, Denver, CO 80202
Tel: 303.893.3333
Room rate: $249.00
Block name: ISE EXPO
Cut-off date: 07/27/2020

Hampton Inn and Suites Denver Downtown Convention Center

550 15th St., Denver, CO 80202
Tel: 303.623.5900
Room rate: $239.00
Block name: ISE EXPO
Cut-off date: 7/26/2020
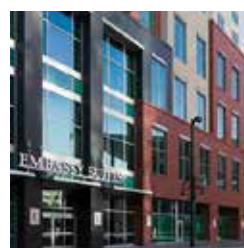
Embassy Suites by Hilton Denver Downtown Convention Center

1420 Stout St., Denver, CO 80202
Tel: 303.592.1000
Room rate: $228.00
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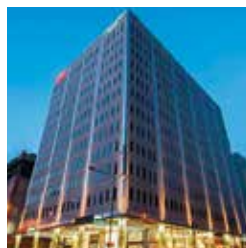
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Maximize Joint Use Audits Field Routines for Wireline & Small Cell

presented by:

Steve Colburn, Applications Training Specialist, Laser Technologies
Jim Cox, Senior Vice President, GCP Technologies
Mike George, GISP, sUAS, GIS Director, DDSI Global

For all Joint Use auditors there are new challenges with the deployment of small cells. Attachers also need to ensure the spacing of assets meets requirement guidelines of the NESC regulations. With the deployment of small cell 5G infrastructure there are Right-of-Way and height guidelines for mounting and placement of the cells.

ISE magazine and Laser Technology Inc. have developed this webinar to help you learn the best field measurement technology and practices for both the wired and small cell placement, what assets can easily be measured, and how to electronically collect accurate field data quicker and safer.

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THE KNOW HOW NETWORK BY MICHELLE LABROSSE

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If you aren't already a good negotiator, you better work on getting there because some type of negotiation is required of the project manager, and possibly even some of the project team members, on nearly every single project.

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By Allison Sakara

According to a landmark 2018 report from the WHO, the 3 mostly overlooked causes of serious health problems are having a detrimental impact on the health of your employees and customers.

EYE ROLLING
5 Ways to Keep the Conversation Rolling

By Marcia Reynolds, PsyD

Most people emotionally react when someone rolls their eyes -- and eye rollers generally deny they did anything disrespectful. Instead of reacting to eye-rolling, follow these 5 steps to engage in the conversation.

Identifying and Mitigating Unconscious Bias in Yourself and in Your Workplace

By Dr. Steve Yacovelli

Hidden biases can be pervasive throughout your business. If you don't identify and root them out, they can derail your efforts to succeed.

5G Strategies Accelerating in Global Rush to Revenue

This Spirent report goes behind the scenes to reveal what's gone right, wrong, and what's driving strategy shifts as 5G finally gets deployed.

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3 Ways to Minimize the Risk

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