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EXECUTIVE INSIGHTS WITH

JENS LAIPENIEKS

CEO/GENERAL MANAGER ASTAC

(Arctic Slope Telephone
Association Cooperative, Inc.)

FEATURES

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COVID-19 IMPACT ON TELECOM

COVID-19 will have only short-term impacts on telecoms software and services vendors, according to a recent report by Analysys Mason.

Telecoms industry vendors will suffer short-term setbacks from COVID-19 as general shutdowns impede work and decision-making in 2Q 2020. However, the longer-term outlook for investment in the telecoms industry is positive, particularly in areas such as automation, virtualization and cloud enablement.

3.6%
IN 2020

Communications service provider (CSP) spending **INCREASE** on telecoms software and related services will grow as compared with our **prior expectation of 6.7%.**

7.9%
IN 2021

Expected CSP software and services spending **GROWTH** rebound. The telecoms industry **will be more robust** than almost any other industry during this crisis.

Source: https://www.analysysmason.com/Research/Content/Comments/covid-19-impacts-vendors/

NETWORK COVERAGE

Cable · Ethernet

Access Network

Network Slicing · SDN

FTTx · Hybrid · Legacy/Copper · RAN/NR

Network Transformation

CORD · Data Centers

UHD · Voice

End User

Massive IoT · Mission Critical · IoT

· xWDM · Ethernet · IMS

Network Reliability

IP · Open Source ·

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PROACTIVE CITIZENSHIP

It's Time for More Than Just Lip Service

I choose to be a glass-half-full person. I believe in sharing good news that has merit and is being ACTED on. But, don't confuse my positive nature with complacency. When companies or individuals make promises and don't act on them, my respect is lost in a nanosecond.

That's why my interest is piqued about Verizon's new initiative: **Citizen Verizon**. It focuses on taking action in 3 key areas:

1. **Digital Inclusion.** The company will provide 10 million youths with the digital skills training necessary to thrive in a modern economy, and will provide 1 million small businesses with resources to help them thrive in the digital economy by 2030. This includes creating an education platform geared towards grades K-12 that will address the new hybrid learning models emerging from COVID-19. The platform will support district leaders, teachers, parents, and students; enhance teacher resources with a focus on remote learning and expert tech guidance for districts; provide parents with digital literacy training; and offer engaging content for under-resourced youth.

2. **Climate Protection.** Verizon's pledge is to become carbon neutral in its operations by 2035 by reducing emissions, investing in renewable energy, and purchasing carbon offsets.

3. **Human Prosperity.** The company will prepare 500,000 individuals for the jobs for the future through skills training and job advancement tools. They plan to equip vulnerable populations with the skills and mentorship they need to enter the future economy; and collaborative partnerships to advance the conversation around skills-based hiring.

It's helpful to see large service providers investing in economic, environmental, and social issues. It's also important to recognize that small- to medium-sized providers, vendors, distributors, and their partners, are doing significant work as well.

That's why we want to spread the word about the concrete good works YOUR organization is doing. Send along a short description with a picture or two to svollman@isemag.com. We'll share it on www.isemag.com.

Right now, we could all benefit from seeing examples of proactive citizenship in action.

Sharon

Sharon Vollman, Editorial Director

DOING GOOD THROUGH CODING

In response to growing unemployment numbers, **Codecademy** announced a new initiative that aims to grant

100,000

unemployed or furloughed workers access to its premium online coding education resources.

Amidst the current environment of economic uncertainty, Codecademy believes that learning technology skills can not only provide a welcome distraction -- it can also empower people to gain control over their circumstances.

Source: https://www.codecademy.com/

Chiplets Could Reinstate Moore's Law

Moore's Law may not be dead, but at 55 years old, it's certainly feeling its age, with the pace of semiconductor manufacturing advancement decelerating in recent years. However, a new approach to semiconductor design and integration has arrived: **the chiplet**, which promises to help restore the microchip industry to its historic rate of advancement.

GLOBAL MARKET

GREAT GROWTH!

Chiplets

Promises to Restore the Microchip Industry

The global market for processor microchips that utilize chiplets in their manufacturing process is set to expand to **$5.8 billion in 2024**, rising by a factor of 9 from **$645 million in 2018**, according to Omdia.

Source: www.omdia.com

dmccarty@mccartyinc.com
For more information, email or visit www.mccartyinc.com.

Don McCarty is the Copper Expert columnist for ISE magazine, discussing the issues around provisioning, testing, and maintaining copper for all services from POTs to IPTV. Don is also President of and the Lead Trainer for McCarty Products, a technical training and products company training field technicians, cable maintenance, installation repair, and Central Office technicians and managers.

A SAD SHIFT FROM QUALITY TO QUANTITY

By guest writer Daniel Burch

The column this month was penned by Dan Burch with Tescom, a company respected for a 35-year history manufacturing quality test equipment targeting the telecom and CATV industry. Dan also has a long history in the industry as a technician and eventually in engineering management. This is a topic dear to my heart. Here's Dan.

> "... TWO ROADS DIVERGED IN A WOOD, AND I --
> I TOOK THE ONE LESS TRAVELED BY,
> AND THAT HAS MADE ALL THE DIFFERENCE."
>
> (Robert Frost, *The Road Not Taken*)

There was once a time in the telephone business (what do we call it now?) that quality ruled supreme and everyone strived for 99.999% reliability. If something broke, it was repaired in a way that would provide years of additional quality service. At some point, the bean counters jumped into the driver's seat, and productivity became an equal or superior goal. Now the thrust was x number of job tickets per day, with little or no emphasis on quality. Proud, seasoned technicians bucked this new order, with valiant dedication to quality workmanship engrained in them over decades of service to their customers.

First-level supervisors were trapped in a vice, squeezed between a 2nd Liner who demanded results and a seasoned work force who defended the age-old standard of Quality First. To compensate, many managers developed a hit squad of workers who would do whatever it took to sign off 10 or more job tickets each day. This hit squad was needed to offset the lower productivity of those who actually dug up the wet splices, went into the tree line to repair the sheath, and dropped into the manhole to correct the problem. Conversely, the hit squad was a team of cutters, slashers, and rollers, who took every shortcut just to code off a trouble ticket.

During the course of a normal day, technicians encounter a myriad of fault conditions, some of which can be quickly corrected (broken jumper wire, failed drop wire, pair pinched in pedestal lid, etc.). However, many days the remedy involves digging a pit to clean up a wet splice case, opening a sleeve in a manhole to replace a bad connector, or other time-consuming tasks. If a technician is repairing actual faults, their daily productivity should vary every day. Conversely, productivity for the hit squad will be rock solid at a high daily number.

Viewing the activity based on repeated reports is when this practice falls apart. Fast, temporary (dare we say illegal) fixes always lead to other employees returning to fix the actual problem. Within a work group, this causes friction and resentment when good workers have to follow-up on and make right the dastardly mess created by the cheaters. Adding salt to the wound, managers praised the "fast turnover" teams, admonishing the rest to follow their excellent example.

So, two roads diverged in the woods; one to cheat and repair nothing, and the other, less traveled, that repairs every fault the first trip. I took the one less traveled by.

However, there is no short-term glory in doing it right. In many shops (though not all, I'm told), you may be ridiculed by your peers and chastised by your boss.

However, I took the one less traveled by, and that made all the difference. My productivity was up and down any given day, depending on the fault encountered, but with a single splice pit we avoided 100 more trouble tickets. In the end, I entered Engineering & Management, and they all worked for me. The hit squad fled.

Lee Iacocca said *Quality and quantity are on the same side of the coin,* and that still holds true today. For all those who took the road less traveled by, you have the satisfaction that you performed your duties at the best of your ability, and the customer is the winner. At the end of our journey you have the satisfaction of having done it right. And that makes all the difference.

In the years since I originally penned this note, we have achieved a partial level of transition to fiber in the Last Mile. However, we still meet managers who say their hands are tied on properly maintaining the remaining copper plant. The premise was that all copper would have been replaced by fiber by now. However, until the last customer on the last piece of copper is migrated to fiber or wireless, the plant must provide some acceptable level of service. Due to years of deferred maintenance, much copper plant today is in high-maintenance mode, and companies lack the funds to transition all customers to fiber and wireless. This transition is perhaps still a decade away if it is ever achieved entirely. Until then, companies still need some of their employees to "take the road less traveled by…." ∎

About the Author

Daniel Burch, TesCom USA, can be reached by email danb@tescomusa.com, or for more information, please visit https://tescomusa.com/.

Signing off

Thank you, Dan. Sometimes I feel like the strict dad who keeps enforcing old-time values and rules. It's nice to hear this story come from other highly qualified and talented folks like you. I realize that dealing with budgets, with the focus on fiber makes it difficult to give time and attention to copper cable, but copper is still going to be around for a long time. Moving out of copper is complex, and fraught with political and budget issues, so meanwhile, treat it well -- and your customers will thank you. You can reach me at dmccarty@mccartyinc.com or text or call me at 831.818.3930.

EXECUTIVE INSIGHTS WITH

JENS LAIPENIEKS

CEO/GENERAL MANAGER

ASTAC

(Arctic Slope Telephone
 Association Cooperative, Inc.)

By Sharon Vollman, *ISE*

TOPIC: COVID-19

Vollman, ISE: How has the coronavirus (COVID-19) pandemic impacted your company, customers, AND team members?

LAIPENIEKS: The pandemic has significantly impacted all aspects of our Cooperative. Fortunately, we were well prepared to make the shift to work from home even before the rollout of the official hunker-down orders hit Alaska. Our corporate strategy over the past few years has included investments to modernize and automate wherever feasible. A few years ago, we transitioned entirely to Office365 and fully adopted Microsoft Teams and SharePoint as our

ASTAC Executive Team, August 2019. *(L to R)* Stacy Marshall, Director of Customer Experience; Charlie Carpenter, COO; Luke Middle, Chief Network Officer; Megan Clapper, HR/Office Manager; Brian DeMarco, Chief Network Officer; Jens Laipenieks, CEO/GM; Thomas Lochner, Director of Business Development/Sales; Clover McNeil, CFO.

internal comms platform. We had also updated our VPN platform and phone system to enable a fully decentralized call center and workforce. These investments allowed us to quickly adapt to COVID-19 and to continue to evolve as our needs change.

The entire ASTAC team, from leadership to field technicians, has stepped up to every challenge COVID-19 has thrown at us. In many ways, the pandemic has proven ASTAC's ability to be nimble, creative, and remain customer-focused, all while protecting the health and wellbeing of our employees. (See Figure 1.)

ASTAC's members are our top priority, which is

the most special part of working for a Cooperative. ASTAC joined the FCC's *Keep America Connected Pledge* almost immediately, and quickly launched an Internet service credit for those working and learning/teaching from home. Like all ISPs, we saw our network usage jump; the peak hour traffic graph spread from 5-6 hours to about 20 hours per day. We were fortunate to benefit from the generosity of our underlying Middle Mile provider who gifted us increased capacity during the surge.

Leading the Cooperative through this pandemic has been one of the most challenging tests of my career. Although we had a Disaster Recovery (DR) plan and numerous contingencies in place, a pandemic playbook simply did not exist. My greatest concern was wedging myself at the tip of the decision-making funnel. In the first few weeks, there was so much different information and guidance coming in that it became unmanageable.

The solution I crafted and launched was a COVID-19 Response Team, with a Response Leadership Team and various Action Teams. The individual action teams (External Communications, Regulatory Support, Supply Chain, Financial Modeling, Technology and Network) were all given the power to assess and react as needed and immediately. Over-communication became the expectation, decisions were shared, and our regular Response Team meetings continue today.

TOPIC: CO-OPS AND NETWORK TRANSFORMATION

ISE: What is the most challenging thing about working to transform ASTAC's network as a co-op? What is the greatest benefit to being a co-op?

LAIPENIEKS: To understand the challenges ASTAC faces, you must first understand the landscape of the North Slope. Our serving area is immense, over 90,000 square miles, with

A SNAPSHOT OF ASTAC

Arctic Slope Telephone Association Cooperative, Inc. (ASTAC) is a member-owned telephone utility Cooperative, providing telecommunications services to the residents of the North Slope region of Alaska. The Cooperative's designated service area is a roadless, remote arctic area of more than 90,000 square miles -- which is larger than 40 of the 50 states. Prior to having local phone service, each village was served by only 1 pay phone. Residents stood in line, sometimes for hours, in inclement weather, waiting their turn to use the pay phone.

The Cooperative utility consists of more than 3,500 access lines served by 9 central offices located in 8 of the region's traditional villages and at the petroleum industry exploration and production complex at Deadhorse-Prudhoe Bay. ASTAC currently employs approximately 77 employees.

The Cooperative was brought into existence in 1977 when Arctic Slope residents determined that the continued development of their traditional communities, the business success of the Alaska Native Claims Settlement Act (ANCSA) corporations, the Arctic Slope Regional Corporation (ASRC) and the 8 Village Corporations, and the delivery of public services by the North Slope Borough (NSB) home-rule municipality, were all dependent on the availability of, at least, basic telephone service.

Construction started in 1979, and by 1981, ASTAC was providing digital switching in 7 Inupiat communities and the oil fields of Prudhoe Bay. With the purchase of GTE in 2000, Utqiaġvik was added to the network, and ASTAC has since invested millions of dollars to upgrade facilities there.

ASTAC services include:

- Broadband Ethernet and Internet; 4G wireless (UMTS HSPA+ and LTE); LAN/WAN, local and long-distance service.

- Private 700 MHz LTE network in the oil field; available for nomadic data applications and extended WAN coverage off the wired network.

- Fixed and mobile voice and data solutions, including equipment sales and service to the North Slope region of Alaska.

a population of ~9,500. That is about 10 sq. miles per person. Imagine the landmass of Minnesota, with one dirt road to access a tiny part of it, the rest unreachable by road. The only access to most of the ASTAC communities is by small plane or once-per-year barge service.

Aerial view of Kaktovik, Alaska, pop. 256.
(Photo Credit: Department of Commerce, Community and Economic Development; Division of Community and Regional Affairs' Community Photo Library)

Unlike much of rural America, the homes in the villages of the North Slope of Alaska are not spread out, but the villages themselves are. (See Figure 2.) The difference between remote vs. rural is a conversation I have frequently when visiting Washington, DC, and at industry events. (See Figure 3.) The remoteness and frozen tundra

L to R: Jens Laipenieks, CEO/GM, ASTAC; Jeff Smith, VP–Regulatory Affairs, GVNW Consulting ; Bob Dunn, Director of Regulatory Affairs, TelAlaska; Juliana Wayman, Senior Director of Regulatory Affairs, GCI; U.S. Senator Dan Sullivan (R-Alaska); Christine O'Connor, Executive Director, Alaska Telecom Association; Ryan Ponder, Director of Legal & Regulatory Affairs, Matanuska Telephone Association; James Dunn, CEO, Copper Valley Telecom.

make building extensive roads cost-prohibitive -- and roads are what enable affordable broadband expansion across the rest of Alaska.

ASTAC has spent the last 5 years upgrading our Last Mile networks to fiber. Today, we reach almost 90% of our population with a fiber connection, and by 2020 year-end, nearly 100% with 4G LTE wireless service. This, in and of itself, is a huge accomplishment.

But the greatest challenge we face as a Co-op is not owning the Middle Mile connectivity to the Internet. The ability for us to deliver truly transformational bandwidth to our membership depends on the affordability of this critical link. We may have the most state-of-the-art Fiber-to-the-Home (FTTH) networks capable of Gbps speeds, but the economics of our Middle Mile force us to limit our broadband offerings to a mere 10 Mbps with metered service, which by comparison to any road-connected markets, are very, very expensive.

The greatest benefit of being a Co-op is that we can manage our margins to keep our products affordable. We can also extend our ROI thresholds as we consider the high CapEx cost of expanding our networks and connecting our markets. We remain accountable to our membership, with a mantra of equality for all markets, and not to investors who seek higher and shorter-term returns.

TOPIC: PAIN POINTS

ISE: ASTAC offers about 4K access lines across a roadless, remote arctic area of more than 90,000 square miles -- this area is larger than 40 of the 50 states. What are your biggest challenges/obstacles to delivering higher speeds to those customers?

LAIPENIEKS: Delivering higher speeds is not the right question. The real question should be how to deliver *affordable* high-speed services to our customers. The majority of the North Slope population is not wealthy, with an average income of $47,000-$58,000. The largest businesses are native corporations and the different divisions of the North Slope Borough government.

Everything in the Arctic costs more. Gas, $5.50/gallon; milk, $10/gallon; travel from Anchorage to the North Slope, $750; intervillage airfare, $400. ASTAC's cost of operation is greater than anywhere else in the US.

We also have a large number of transient staff. All our field techs work 3-weeks-on/3-weeks-off shifts, 21 ten-hour days with OT built in. ASTAC also provides transportation from Anchorage and room and board. All these factors drive up our cost of service, which are compounded by the very high cost of monopolistic Middle Mile transport (discussed earlier). These are the greatest challenges to delivering truly transformational and affordable broadband speeds to our membership.

TOPIC: CULTURAL TRANSFORMATION

ISE: Explain why cultural transformation is as important as technical transformation to ensure that Communications Service Providers like ASTAC succeed in the new normal.

LAIPENIEKS: This is a sensitive question for me. About 70% of the population of the North Slope are Alaska Native. Maintaining the strength and respect of the Inupiat culture is critical for ASTAC. Technology and cultural values do not have to be at odds. Sit in any room with a group of teenagers and it is easy to see how technology is impact-

Jens unveiling Point Hope Alaska Community Activities Center computer kiosks.

ing and evolving many facets of their lives. It's no different on the North Slope. Providers like ASTAC have a responsibility to promote and encourage the benefits of broadband, and I'm not talking about just gaming and better streaming service. We are making investments and developing partnerships to enable new opportunities for the Inupiat culture to grow and remain strong. (See Figure 4.)

ASTAC's scholarship program awards four $2,000 scholarships to 2 senior high school students and 2 students currently enrolled in post-secondary education from our serving territory.

As the sole supporter of the North Slope Borough School District's Battle of the Books program since 2015, ASTAC has helped grow the program each year, increasing the number of students taking part. We believe in the goals of this nationwide program which include encouraging and recognizing students who enjoy reading, broadening their reading interests, increasing their reading comprehension, and promoting academic excellence.

In addition, ASTAC believes in inspiring science and technology leaders of tomorrow. Our support of the NSBSD's FIRST Lego League (FLL) has helped expand the robotics program from middle school to also include K-4 and high school students. FLL's objective is to make children and youngsters enthusiastic about science and technology; equip them with the idea of team spirit, and to encourage them to solve complex tasks in a creative way.

During robotics tournaments, participants must solve a tricky "mission" with the help of a robot. They research a given topic within a team, and develop a plan for programming and testing an autonomous robot to solve the mission. The FLL Teams have the opportunity to experience all steps of a real product development process: solving a problem under time pressure with insufficient resources and unknown competitors.

In 2021, ASTAC will host its first annual Alaska Business Week in Utqiaġvik for high school students. The week-long program teaches students the basics of business, leadership, and entrepreneurship. Participants compete as teams in a dynamic business simulation with the guidance of adult mentors from the business community. After completing the program, students have a competitive edge on workplace readiness, college preparation and overall life success.

TOPIC: PRIORITIES

ISE: What are ASTAC's 2020-2021 priorities? What will move-the-needle in terms of network transformation for your company: Network simplification/automation/virtualization? Fiber investments? AI/AR?

LAIPENIEKS: Our priorities are simple: to connect everyone on the North Slope to terrestrial, high-quality broadband networks. We have completed FTTH builds in 5 of our 9 markets, with Utqiaġvik being the largest and most complex build. We were in the final stages of customer conversions when the COVID-19 pandemic hit, so we still have some work left to do there. Our FTTH cookie cutter is sharp, and we intend to convert all 9 of our markets. We are also finishing up a few LTE carrier additions to get our wireless network 100% LTE. A handful of these sites are along the northern half of

Point Hope Alaska Community Activities Center kiosk unveiling with *(L to R):* Jens Laipenieks, CEO/GM, ASTAC; Board member Ella Kowunna; Mayor Daisy Sage.

the Dalton Highway, which will bring new 4G coverage to the most remote road in America.

Beginning in 2021, we will focus on projects extending fiber or microwave connectivity to two of our "final four" markets. One of those projects

"Leading the Cooperative through this pandemic has been one of the most challenging tests of my career. Although we had a Disaster Recovery plan and numerous contingencies in place, a pandemic playbook simply did not exist. My greatest concern was wedging myself at the tip of the decision-making funnel."

connects the village of Atqasuk, about 65 miles due south of Utqiaġvik. Our connectivity plan includes a combination of aerial and ground-layed armored fiber, a novel and more cost-effective alternative to traditional buried fiber. In early 2020, we were awarded a USDA Community Connect grant which helped make this project a reality. (See Figure 5.) We are also finalizing plans for a microwave expansion to connect the village of Kaktovik, about 70 miles west of the Canadian border on the coast of the Beaufort Sea.

We have been pushing system integration and automation as a company-wide goal since I took over the GM position in 2016. Every keystroke we can eliminate is a win from an efficiency and accuracy standpoint. We are also driving to get 100% of the copper plant removed in our fiber-fed markets by YE 2021 to ensure we have little to no variation in our systems and procedures.

TOPIC: PUBLIC-PRIVATE PARTNERSHIP (P3) MODELS

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

LAIPENIEKS: Yes! P3 programs like the USDA's *Community Connect* and the *Re-Connect* programs are instrumental in making the business case for the Middle Mile expansions required to connect all Americans. Both programs require the applying carrier to have a significant amount of skin in the game and plenty of checks and balances to receive distributions. Both programs require specific service targets (25/3 Mbps) and free access to community centers and anchor institutions.

The Alaska Plan, which replaced the traditional USF support model for most carriers in Alaska requires specific performance obligations for the expansion of broadband in underserved markets. I believe in the concept of Universal Support, -- without it, ASTAC would likely not exist. To be most effective, all recipients should show progress and be accountable for responsible stewardship of the funding.

One way to improve the USDA's *Community Connect* and the *Re-Connect* programs would be to mandate a cost-based rate structure with a fixed maximum return that would eliminate the opportu-

Jens splicing fiber.

nity for the supported carrier to gouge the market and deter competition. I would also like to see federal and state mandates for expedited land use and ROW permits for publicly funded broadband expansion projects. The compounding costs and delays related to the excessive bureaucratic permitting process are a waste of scarce resources, and should be reduced as much as possible.

TOPIC: NUTS AND BOLTS

ISE: Given the terrain you cover, share your favorite story about this challenging situation in which your team members went above and beyond to serve customers' needs.

LAIPENIEKS: We began our first FTTH project in the village of Point Hope in 2015, and we have grown more efficient and cost-effective with each village we've converted since. Two events come to mind that exemplify the creativity and adaptability of the ASTAC team. (See Figure 6.)

The first was related to the fiber cable needed for our Point Hope and Wainwright builds. The logistics of these remote builds were incredibly challenging. Keep in mind there are no industrial supply stores or even hardware stores in these markets, so you must bring EVERYTHING, including supplies for contingencies.

Transporting job materials to midway job site, west of Nuiqsut via Rolligon.

"All our field techs work 3-weeks-on/3-weeks-off shifts, 21 ten-hour days with OT built in. ASTAC also provides transportation from Anchorage and room and board. All these factors drive up our cost of service, which are compounded by the very high cost of monopolistic middle-mile transport (discussed earlier). These are the greatest challenges to delivering truly transformational and affordable broadband speeds to our membership."

In this particular case, we had a hard deadline for the barge leaving Tacoma, Washington, and at the last minute, we were notified that our spools of fiber cable had been delayed because of the excessive demand for fiber optic cable in the lower 48 (Thanks, Google Fiber!). With only 1 barge and the very limited building season in the Arctic, we were faced with an entire year delay.

With some ingenuity, we were able to finally get the cable weeks later and have it trucked to Anchorage. We then loaded it into a C-130 Hercules cargo plane from Lynden Air Cargo which is capable of landing on the gravel airstrips in the villages. I don't like to think about the added cost of that charter, but the fiber arrived in the market with the barge about 8 weeks later, and the projects stayed on track and were completed before winter set in.

The other instance was just straight up ingenuity. In our first few FTTH builds, we utilized aerial fiber terminals, and soon realized that in the harsh winter with the large snow piles, it became a challenge to get a bucket truck into proper position to pull the cases down for splice work. Our Project Manager, Nate Yaskell, did some research with another Alaskan Co-op, and applied a twist to their practice of pole-mounting the fiber terminal with a slack loop so a single tech with a ladder could easily pull the case year-round. The Utqiaġvik project included over 400 of these O&M-friendly pole-mounted terminals. ∎

This interview is condensed from the original interview. To read the original complete interview, please visit www.isemag.com.

Jens Laipenieks is CEO/General Manager at Arctic Slope Telephone Association Cooperative, Inc. (ASTAC). For more information, please email info@astac.net or visit https://www.astac.net/.

🐦 @ASTACforAK

SUPPLY CHAIN CHALLENGES FOR THE NEW NORMAL

By Chris Bornstein

How Telecoms Can Evolve Their Processes Post COVID-19

Before COVID-19, one might say consumers had the blissful privilege of reaping the benefits of remote technology and applications. Today, in the "new normal" of working from home, consumers have higher demands for their wireline and wireless networks. When the Internet is latent or down, very few consumers stop and think *I wonder if this is due to the supply chain challenges of increased network access from home.*

Let's be clear. Latency is a more than bad word in a world where we expect instant gratification and transparent communication.

As a result, telecoms need to adapt to the higher demands of consumers -- including adjustments to its supply chain. The telecom supply chain for labor and equipment has been heavily disrupted, making it harder to keep up with the growing demand. Supply chain constraints from manufacturing locations that were previously heavily relied on (such as China) have resulted in extended lead times to customers, ultimately impacting serviceability, and, therefore, revenue.

A virus has no prejudice to the location of its effect, and as an equal opportunity destroyer of global economies, it has impacted businesses

Challenges

One article, as published in *Forbes*,[1] describes some of the challenges (both familiar and new) telecoms are facing amid COVID-19, including:

• Keeping up with the increased demands in bandwidth.

• Making adjustments due to shifts in the methods and locations people access their platforms.

• Finding sourcing elsewhere.

• Trying to meet the needs and challenges faced by customers whose businesses struggle to manage from home because of the amount of computing power and bandwidth required.

• Balancing the need to provide entertainment while securing and prioritizing bandwidth for essential things like healthcare, e-learning, and collaboration.

Communication Service Providers (CSPs) have stepped up during this pandemic: equipping essential workers with connectivity and devices, increasing network capacity for the increase in remote work, providing support to remote and virtual customer care, and even working with customers on billing during financially challenging times.

The challenges can be summarized into 2 groups: short-term and long-term.

Short-Term Challenges include an increase in operating expenses, prioritizing capital expenditures, revenue, cash management amid down economies, and optimizing the supply chain.

Long-Term Challenges include the acceleration of digital transformation, ramping up the automation of operations, acceleration of new services, and securing digital access.

In terms of the challenges faced specifically by supply chain demands, telecom providers -- whether prepared or not -- have to face the reality of their vulnerabilities to global market shocks. Pre-COVID-19, market turmoil in one region could easily have been mitigated by sourcing elsewhere. However, global market shocks, equipment, and labor instability, have forced providers to seek out new supply chain technologies to mitigate these risks.

The demand on telecoms to supply and meet expectations, reduction in business development opportunities, and the need to conduct business only via mobile communications -- all have an impact.

COVID-19 and Telecom[4]

everywhere. Despite improvements to manufacturing capacity, the remainder of 2020 still presents challenges as operations attempt to restart under controlled and limited working conditions.

Reflecting now, it seems only a few months ago that words such as *machine learning, artificial intelligence, cloud,* and *digital supply networks (DSNs),* seemed to be buzz phrases to most. As many countries continue the directive to maintain social distancing, the world has changed.

Telecoms are meeting challenges head-on by turning those previously stated marketing buzz phrases into reality -- and as fast as possible.

Staying Connected[5]

Operations and supply chain challenges per PwC current disruption could result in future dips in equipment revenues, slow down, or delay the delivery of network equipment.[2]

There can also be a decrease in service quality as more demand is placed on mobile and communication networks, and tests in adjustment to scale to the spike in call center volume.

The Harsh Realities

Early on in the pandemic, the telecom supply chain was heavily impacted as the initial surge originated in China, where a large number of people were struck by the disease and among the first forced into quarantine. This region was heavily relied on for manufacturing. COVID-19 led to partial and full shutdowns of plants and factories, therefore impacting production.

In any other market crisis, companies could initiate contingency plans, such as ramping up production in a different region.

However, COVID-19 made it difficult for companies to find alternatives as it spread globally. It became a matter of finding which areas had not been hit yet or had minimal exposure. Even then, the ability at which these alternatives could replicate the resources and output of China was not an easy task.

Technology companies whose imports relied heavily upon the exports from China and other countries hit hard by COVID-19 suffered severe setbacks. Although COVID-19 has left some feeling uncertain, and it is still too early to know exactly what this means for the latter half of 2020, there is some optimism wherever companies can find areas of momentum within their businesses.

It is imperative, if not already underway, that CSPs transition their supply chain models to one that provides end-to-end visibility to mitigate the risks associated with COVID-19 or other global market impact events.

So, how can telecoms strengthen and prepare their supply chain?

Here are some recommendations:

- Focus on the wins; keeping people safe, healthy, and connected, is a big win in terms of customer perception.

- Source elsewhere.

- Be proactive and data-driven.

- Speed to action is critical. Continuously review your system capabilities for remote workers.

- Take steps to fulfill customer priorities around maintenance and confidence.

- Reassess supply chain to uncover weak links.

- Ensure open and frequent communications with suppliers.

- Have contingency plans in place to meet demand.

- Be transparent with stakeholders, customers, and suppliers.

- Use analytics to reduce stress from call center volume.

- Identify customers most likely to be affected and develop proactive communication plans to keep them informed of policy changes and service disruptions.

- Adjust support models as necessary.

Now that service providers and businesses know that employees can work from home, how many companies will ask their employees to come back to the office once the coronavirus restrictions

relax? Many sources reveal that a hybrid working environment will likely be the new normal, which means the steps taken by the telecom industry to adapt the supply chain will not be in vain.[3]

There is still much to be done to keep up with the "new normal," but it seems as though the telecom industry is passed the survival phase and moving on to making improvements. The good news is that COVID-19's impact will help progress the telecoms industry into the beginning of a new era.

Benjamin Franklin said *by failing to prepare, you are preparing to fail.* Telecoms have never faced COVID-19 before now, and although some structures helped prepare them to meet the supply chain challenges initially, it is those that continually prepare for the future that will best weather the "global storm". ∎

Resources and Notes
1. Wilson, Craig. "IBM BrandVoice: The Telecom Industry Is Proving Essential In The COVID-19 Response." *Forbes, Forbes Magazine,* 15 Apr. 2020, www.forbes.com/sites/ibm/2020/04/15/the-telecom-industry-is-proving-essential-in-the-covid-19-response/.

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4. https://telecoms.com/503804/ofcom-fails-to-clear-up-the-myths-around-5g-and-the-coronavirus/

5. https://www.bizjournals.com/portland/news/2020/03/16/how-to-stay-productive-and-sane-while-working.html

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ROLL WITH IT, BABY!

By Mark Boxer

A rollable ribbon is a fiber optic ribbon that can be rolled into a tight cylinder, in contrast to a classic flat ribbon, which is designed to stay flat while in the cable and during splicing.

Where a flat ribbon is connected by matrix material between fibers down the entire length, the fibers in a rollable ribbon are connected only at regularly spaced points down the length of the fiber, which makes it more flexible and "rollable". (See Figure 1.) This design allows the fibers to be spliced using ribbon splicing techniques and equipment.

Rollable ribbon cables can double the fiber density for a typical duct compared to flat ribbons, enabling thousands of fibers to go into spaces that were previously too small, while enabling mass fusion splicing.

3 Applications That Beg Providers to Roll Their Fiber

Service providers are facing unprecedented demand due to increased bandwidth requirements, both from the launch of 5G cellular service as well as the response to COVID-19.[1]

In addition, duct space is at a premium, especially in dense metro areas, so enabling more fibers in less space is even more important in those scenarios.

Much more attention is now being paid to the rural/urban digital divide, and fiber density may even help in some rural and underserved areas. Many of these areas have older poles with potential sag and tension limitations. Although this case is not quite as clear as the metro case, there still can be value to having more fibers in less space.

3 Applications = One Size Doesn't Fit All

Telecom providers face a myriad of challenges as they install fiber closer to the end user. Thus, fiber cables must be deployed across a wide variety of environments.

As with flat ribbon cables, rollable ribbons come in different designs for different applications and network types. Three of these different situations are described below.

SITUATION 1.
Datacenter Interconnect Networks That Require Very-High Fiber Counts and Frequent Access.

With the explosion of demand for a wide variety of cloud-based applications, hundreds of new hyperscale datacenters have been built over the past few years, with more planned for the future.[2]

Many of these networks are in urban or metro areas, and/or in areas where access to duct space is at a premium, so fiber density poses a major challenge. More fibers in less space is very important for these networks. These networks often start with fiber counts as high as 864, and 1,728 or 3,456 fiber counts are not unusual. These often need to fit in existing 1 ¼" or 2" ducts.
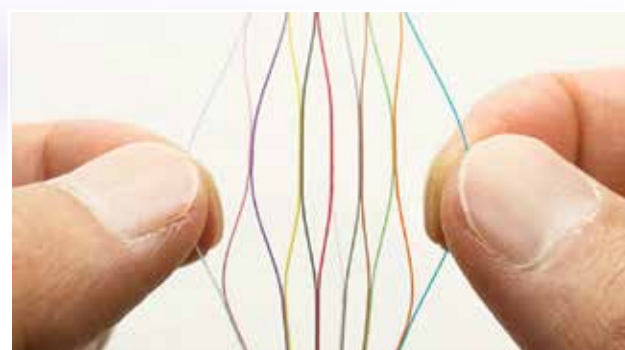
Figure 1. Rollable ribbon enables higher density cables.

Precisely because these networks are in crowded areas, another challenge is to provide proper protection for the fibers in these environments. Many of these cables are co-located in areas with many other cables from different service providers, and may be handled very roughly over their lifetimes.

Adding more fibers in a cable and materials for robustness typically make cables larger. However, rollable ribbons and bend insensitive fibers are tools that enable cables to be both ultra-high fiber count, and very robust.

The advantage for rollable ribbons over flat ribbons comes down simply to geometry. In a circular cable, circular rollable ribbons are more space-efficient. This means, for a given diameter, thicker buffer tubes and jackets can be used to better protect fibers in rollable ribbons versus cables with flat ribbons.

Another challenge is that although some of these networks may be point-to-point networks, other networks may require substantial numbers of fibers to be

accessed and dropped off. Accessing fibers in a central tube configuration is possible, but accessing ribbons in a ribbon in loose tube design can be easier for networks with ultra-high fiber counts, 864 and above.

For these types of applications, a rollable-ribbon in loose tube (RILT) design can be an effective choice. (See Figure 2.) It can significantly improve density, versus a flat ribbon design, but also can enable easier access to fibers along the way.

Some other specifics about the RILT design:

- It's inherently very strong, since the robust central member can enable 1,000 lbs. pulling tension.

- It facilitates good blowing performance, and offers crush resistance.

- The design enables easier handling, versus cable designs with outboard strength members.

- It has extra layers of fiber protection during mid-span access applications.

SITUATION 2.
Longer Distance Network Builds

For more traditional network high fiber count builds, challenges don't just disappear. These networks can be longer than metro networks, and reducing splice points can be a significant driver for both cost reduction and lower optical loss. These requirements can drive the need for longer length cables.

The installation method for these networks is often cable blowing. Cable blowing performance is typically helped by a stiffer cable. Cables with outboard strength members have been field-proven for

decades to have excellent blowing performance.

For these networks, a central core LXE-type design featuring outboard strength rods is an industry staple. (See Figure 3.) While these networks may not require quite as many points where individual fibers or ribbons need to be accessed, a workhorse such as this is needed for providers looking for high-density and good handling capabilities.

Some other notes about this design:

- Strong blowing performance.

- High fiber density, especially for armored cables.

- As a central tube design, it delivers low latency and lower excess fiber length than other designs.

- The outboard strength rods means that the cable has a preferred bending plane.

- Often available in longer lengths than ribbon in loose tube designs.

SITUATION 3.
Tight Bends

Finally, some high fiber count networks need to operate within the constraints of previously installed network hardware, including small handholes and or pedestals. These networks require a high fiber count cable that is both very small and can be coiled into these tight spaces. These networks may also frequent access.

For this type of network, a very flexible cable may be needed. These cables may have flat but very flexible strength elements surrounding a central tube, enabling very tight coiling and also the
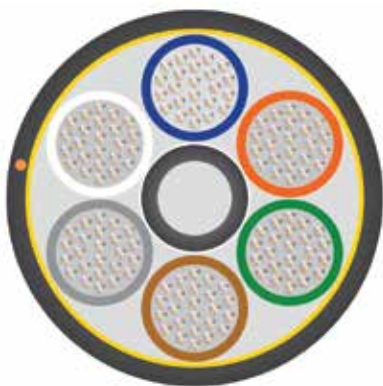
Figure 2. Ribbon in loose tube (RILT) cable design.
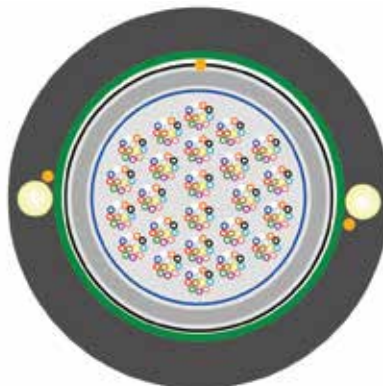
Figure 3. LXE-type cable design with outboard strength rods.
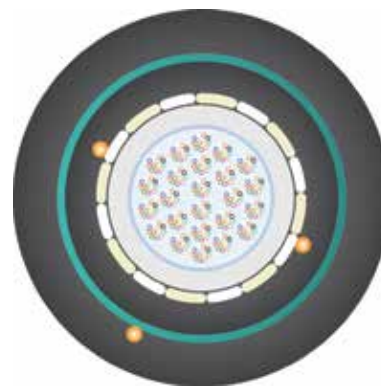
Figure 4. Highly flexible rollable ribbon cable.

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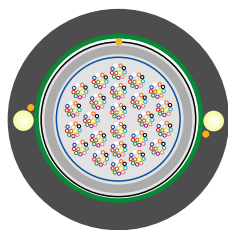
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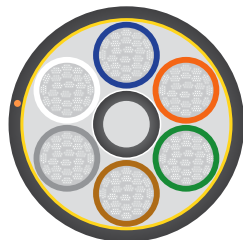
AccuTube®+ Rollable Ribbon Cable
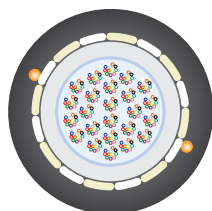
DuctSaver™ Rollable Ribbon Cable
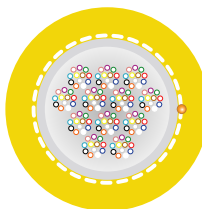
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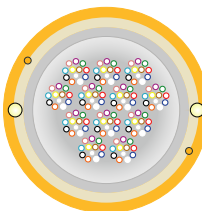
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The Correct Way to Use a Clamp-On Ground Tester

**Tuesday
September 8, 2020
1:00 PM (CT)**

Megger

This webinar will discuss two basic methods of ground testing and provide comprehensive coverage of proper clamp-around ground testing to avoid common mistakes and perform tests confidently.

Presented by Ed Rousselot, Sr. Consulting Application Engineer CATV/Communications, Megger

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Case Studies in Troubleshooting Your Fiber Networks

**Wednesday
September 9, 2020
1:00 PM (CT)**

OSPINSIGHT

Attendees will learn more effective ways to troubleshoot their fiber optic network as well as understand the return of investment through cost efficiencies, by studying case studies of networks doing it well.

Presented by Seth Straayer, Senior Solutions Engineer, OSPInsight

---

A Geospatial Approach to Network Design & Buildout

**Wednesday
September 16, 2020
1:00 PM (CT)**

esri
THE SCIENCE OF WHERE

This webinar will showcase how GIS manages network buildouts and improves design efficiencies, with time-saving techniques and creative ideas to monitor and analyze the process in near real time.

*Presented by
Stacia Canaday, Sales Manager/Telecommunications & Cable, Esri
Patrick Huls, Sr. Solutions Engineer/Telecommunications & Cable, Esri*

Trends in Fiber Optics

**Monday
September 21, 2020
1:00 PM (CT)**

LIGHT BRIGADE

Attendees will learn the latest trends in fiber optics and the potential impact on design and/or installation practices; appropriate for anyone in fiber optic manufacturing, design or field installation work.

Presented by Mark Kazes, Instructor, Light Brigade

smallest diameter for smaller fiber counts. (See Figure 4.)

Other features of this design include:

- Durable, highly crush-resistant central core with helically applied strength members for no preferred bending plane.

- Tighter cable coiling for simplified handling and installation compared to LXE designs.

- Added protection of central core tube for increased robustness.

- Easier mid-span access, especially with lower fiber counts. The core tube allows for a safe ring cut and longitudinal split, and strength elements can then be cut with scissors.

Rolling Into the Future

Although rollable ribbon technology is very promising, there are a few considerations that should be mentioned:

- At this point in time, rollable ribbon cables are sometimes more expensive than comparable options. That being said, the right design can result in savings when compared to either standard loose tube or flat ribbon cables.

- There are some subtle operational differences between splicing rollable ribbons and flat ribbons. This fact means that there is a small learning curve involved as splicers work with it for the first time. However, these differences are not significant.

- Finally, cable and ribbon designs are not as standardized as more traditional designs. There are significant differences between ribbon and cable designs from manufacturer to manufacturer.

Even though rollable ribbons are relatively new on the scene, there are different cable designs available that are purpose-built for various applications.

Also, there is a tremendous amount of innovation in this space, so it's a good idea to keep up to date on new product developments as they occur.

Like most things in life, remember that one size truly does not fit all. Choosing the most appropriate design for the specific application can help reduce installation hassles, potentially save significant amounts of money, and help keep the network humming for decades to come. ∎

Resources and Notes

1. https://www.fiberbroadband.org/p/do/sd/sid=3116
2. https://www.datacenterknowledge.com/cloud/analysts-there-are-now-more-500-hyperscale-data-centers-world

Mark Boxer is Technical Manager, Applications and Solutions Engineering, OFS. He has more than 30 years of experience in fiber network design and deployment in a wide variety of scenarios.

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COVID-19 TEMPORARILY DAMPENS 5G MARKET

Global Re-Forecast 2020-2030

By Oliver Guirdham

The 5G infrastructure equipment market comprises revenue generated by the sales of 5G network hardware or network communication devices supporting 5G technology.
It includes establishments that design, build, or develop, the 5G network infrastructure. This includes spectrum, macro-networks, small cells, and other network domains.

The global 5G infrastructure equipment market is expected to decline from $2.03 billion in 2019 to $1.90 billion in 2020 at a compound annual growth rate (CAGR) of -6.41%. The decline is mainly due to economic slowdown across countries owing to the COVID-19 outbreak and the measures to contain it. The market is then expected to recover and reach $9.37 billion in 2023 at a CAGR of 70.16%.

North America was the largest region in the 5G infrastructure equipment market in 2019. Asia Pacific is expected to be the fastest growing region in the forecast period. Africa was the slowest growing region in the forecast period.

Market Drivers

The adoption of 5G for smart city networks is the primary factor contributing to the growth of the global 5G infrastructure market. The enhanced features of 5G networks such as high speed, reduced or zero latency, wider bandwidth, uniform platform, larger number of connected devices, and extended battery life, are powering smart cities, thereby causing an urban revolution.

Zero latency enables the sensors and devices that power the city's transportation and traffic system to automatically redirect traffic, and also alert self-driving vehicle systems about the situations on the road.

Advanced 5G capabilities such as enhanced security (instantaneous transfer of videos from the security cameras), instant response to emergency situations, and personalized healthcare, are expected to bring increased digital inclusion to urban residents.

From automated grocery purchases and delivery to complex management of a building's infrastructure, 5G will enable people to adopt new standards of living.

Due to all these enhanced features, the demand for 5G network is growing, and therefore, adoption of 5G for smart city networks is driving the market.

Market Restraints

The timely deployment of 5G is essential for achieving the objectives of telecom service providers, especially in emerging markets. However, there is a delay in spectrum auction and standardization across many countries. (5G can be in low-band spectrum below 1 GHz; mid-band frequencies from 1 GHz to 6 GHz; or high-band spectrum above 6 GHz.)

While large quantities of new radio spectrum have been allocated to 5G, they come at a high price. A key reason for the delay is the financial health of service providers, who have been struggling to pay licensing fees and other penalties. Also, because the unit pricing of the spectrum is high, few countries, such as India, are taking time to raise money for the spectrum auction.

Clearly, long-term investment in 5G will further dent operators' finances. Unfortunately, delays in standardization of spectrum allocations also come at a significant cost.

IoT Impact

The Internet of Things (IoT) has been transforming businesses and peoples' lives, and is continuing to ignite new innovations. IoT represents one of the key growth opportunities for 5G telecommunication service providers. A number of factors, including increased demand from consumers and enterprises, and the availability of more affordable devices, is driving the adoption of the Internet of Things (IoT), which in turn is expected to drive 5G infrastructure. 5G will be driven largely by IoT applications including remote healthcare, traffic safety and control, smart grid automation, industrial application and control, and remote manufacturing, training, surgery. and education. Growth in IoT technology will drive significant operator investment in 5G technology, spectrum and infrastructure.

Additional reports of interest include:

- *Telecoms Market By Product Type (Wireless Telecommunication Carriers, Wired Telecommunication Carriers, Communications Hardware And Satellite And Telecommunication Resellers), And By Regions – Global Growth, Trends And Forecast To 2022,* https://www.thebusinessresearchcompany.com/report/telecoms-market

- *4G Infrastructure Equipment Market Global Report 2020-30: Covid 19 Growth And Change,* https://www.thebusinessresearchcompany.com/report/4g-infrastructure-equipment-global-market-report

- *Business Processes Outsourcing Market By Type (CRM BPO, HRO BPO, F&A BPO, And Other BPO Services), Drivers And Restraints – Global Forecast To 2022,* https://www.thebusinessresearchcompany.com/report/business-processes-outsourcing-market* ∎

This article is adapted from portions of the report *5G Infrastructure Equipment Market Global Report 2020-30: COVID-19 Growth And Change* by The Business Research Company.

Oliver Guirdham is Managing Director, The Business Research Company. He has more than 15 years of experience in market research and intelligence. For more information, please email info@tbrc.info or visit https://www.thebusinessresearchcompany.com.

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Rural Telecom Funding Model Must Change

By Jeff Johnston

COVID-19 has wreaked havoc on all Americans but has clearly exposed the vulnerability of the underserved and unserved. For those who lack broadband access, the sense of urgency to bridge The Digital Divide is palpable.

COVID-19 and the associated stay-at-home orders exposed the vulnerability of those without broadband access. While rural operators went to great lengths to connect the underserved and unserved

through the crisis, more must be done -- especially as leading infectious disease experts say we could be dealing with COVID-19 impacts for a while.

Rural telecommunication operators are taking on business and financial risks to ensure their communities remain connected during the COVID-19 pandemic. Many are providing free service and setting up free Wi-Fi hot spots, exposing them to cash flow risks.

Universal Service Fund (USF) contribution reform may have a material impact in preparing rural America for any similar occurrence. Given current circumstances, this may be an opportune time to implement long-term structural changes

1

$115B Needed to Bridge the Digital Divide

$37 Billion	$41 Billion	$37 Billion
Current federal broadband support programs	Additional projected USF receipts if applied to broadband services	Remaining funding gap to bridge the digital divide

$0 $20 $40 $60 $80 $100 $115

Source: CoBank estimates

2

USF Rates

Percent

30

25

20

15

10

5

0

Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2 Q3 Q4	Q1 Q2
2015	2016	2017	2018	2019	2020

Source: AT Conference
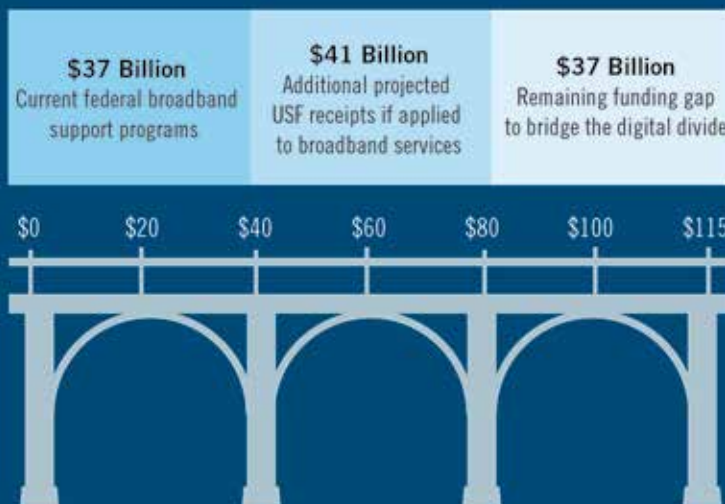
that will help ensure operators in rural America have the support required to bridge The Digital Divide for the long-term.

At the federal level, a number of government programs help build and maintain rural broadband networks. These programs total approximately $37 billion that will be distributed over the next 10 years. The FCC has estimated it would cost $80 billion to bridge The Digital Divide. Land O' Lakes CEO Beth Ford, who is championing efforts to bridge The Digital Divide, believes the number is closer to $150 billion.

The FCC's estimate is arguably too low given its flawed methodology for estimating the number of unserved and underserved Americans. For example, in May 2019, the FCC said that 93.7% of Americans had broadband access, leaving only 21.3 million Americans without it. But when researchers at Broadband Now manually checked broadband availability, they found that almost twice that number of Americans lacked broadband access. In reality, the actual number is probably somewhere in between.

Also, the FCC's $80 billion estimate likely includes a mix of fiber and fixed wireless as they have taken a technology-agnostic approach to bridging The Digital Divide.

The Land O'Lakes estimate might be on the high end of what it would cost as it appears to suggest an all-fiber, or a fiber-heavy, approach. Fiber is more costly to deploy in sparsely populated areas versus fixed wireless. So, if we take the midpoint of the range, it would peg the cost at $115 billion.

With just $37 billion coming from current federal programs, the real funding gap is $78 billion (See Figure 1.)

Projected Additional USF Revenue from Fees on Broadband

Source: S&P Market Intelligence; CoBank estimates
Based on broadband annual revenue forecasts of $75.60B in 2020; $79.79B in 2021; $83.60B in 2022; $87.44B in 2023; and $91.41B in 2024
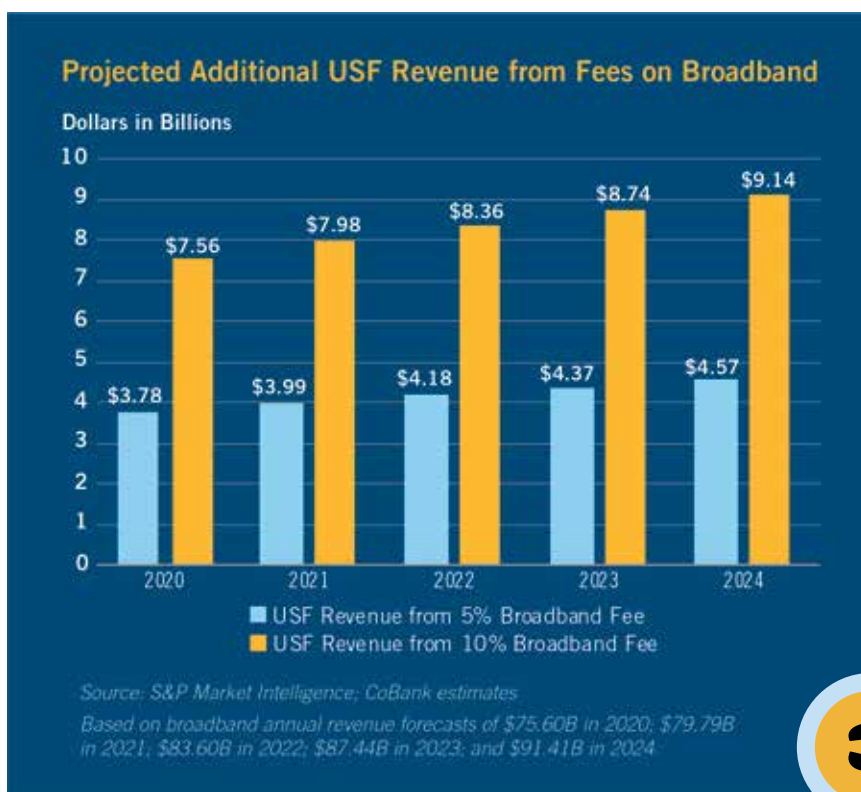
Contribution Reform Option

One of the ways to bridge this funding gap is via contribution reform. Today the $37 billion in federal programs is partially funded by the USF. The USF gets its money from fees applied to telecom services, which is problematic. Given the decrease in landline subscriptions, the pool of money the USF fees are charged against is shrinking. To compensate, USF fee rates have been increasing. (See Figure 2.) Over time, this appears to be an unsustainable model.

One solution is to apply USF fees against broadband bills as well as voice service. For example, a 5% USF charge applied to broadband bills would increase USF receipts by over 44%. A 10% USF charge on broadband would almost double USF receipts, bringing in an additional $41 billion over the next 5 years (See Figure 3.) This additional revenue from broadband fees would cover over one-third of the $115 billion needed to bring high-speed broadband to most of rural America and to bridge The Digital Divide.

Rural operators are supporting their fellow rural Americans in innovative ways during the COVID-19 pandemic. But the sacrifices being made by these companies come at a cost and have a finite lifetime. COVID-19 has demonstrated that reliable broadband is critical and exposed the vulnerability of those living in rural America without broadband access.

Setting up hot spots for school children to use while in the parking lot of a fairground is admirable, but this is not a sustainable model for rural operators or the community. Neither is the USF funding mechanism that only levies fees against telecom bills. Contribution reform that includes applying fees to broadband bills could stabilize the USF program and ensure that more money is available to help bridge The Digital Divide. ■

Jeff Johnston is Lead Communications Economist in CoBank's Knowledge Exchange research division, where he focuses on the communications industry. For more information, please email KED@CoBank.com or visit https://www.cobank.com/.

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THE PERFECT UNION: 5G AND SMALL CELLS

Don't Break Up Their Bliss by Ignoring Small Cell Challenges

By Prasad Bhandaru and Sarma Vellanki

5G promises to support diverse industry use cases with varying demands of service agility, Quality of Service (QoS), and latency requirements. By enabling a fully mobile and connected society, 5G could be the game-changer -- not just for personal communication or content delivery, but also for our way of life.

To realize the vast potential of 5G, however, devices need several things:

- **an edge data rate of 100 Mbps to each**

- **latency of less than 10 ms**

- **seamless handoff between the licensed and unlicensed spectrum**

These goals can be collectively achieved using ultra-densification of Radio Access Networks (RAN) with small cells, large unused bandwidth of millimeter-Wave (mmWave), Citizens Broadband Radio Services (CBRS), and advanced technologies such as beamforming. This article provides a further understanding of these requirements by deep-diving into mmWave small cell deployments, and why they are so critical for a 5G network.

RAN Ultra-Densification

From the Shannon Capacity theorem, it can be derived that throughput per square mile is directly proportional to the third order of the frequency (f^3), implying that mmWave frequencies are better suited for 5G capacity demands. However, it also means that site density will increase to the second order of frequency (f^2), resulting in higher CapEx per square mile. However, everything else being equal, CapEx per bit decreases by a factor of 10 as network migrates from AWS to mmWave.

In this type of RAN deployment, today's macro-based cell networks will evolve into dense and ultra-dense heterogeneous networks comprised of thousands of small cells. The potential deployment sites will include streetlights, traffic lights, utility poles, and even dustbins.

In mmWave, the typical path length is 500 feet, and the width of the Fresnel zone at its midpoint is around 62 centimeters. Any slight infringement into the Fresnel zones would add an extra 8-10dBm diffraction loss, which is substantial. Sites that are off by a couple of hundred feet (2 to 3 GIS bins in the planning tool) could alter the propagation map significantly. During 2.5GHz deployments, 1dBm or 2dBm error

margin was within the standard deviation of the model. That is no longer the case: 1dBm difference can cause a variation of 30 meters in coverage and approximately 2 small cells per square mile.

Light Detection and Ranging (LiDAR) is emerging as the technology of choice to include the most accurate features for site selection. Precise details are crucial to determine the most relevant sites for small cell deployments. (See Figure 1.)

LiDAR-based 3D digital surveys can be used to generate extremely accurate terrain and obstacle models for use in RF planning. From LiDAR data, features and 3D derivative objects, including poles, trees, terrain models, and buildings, can be extracted with a new level of precision.

Accurate network planning takes the guesswork out of transmitter selection and placement. It also enables CSPs to cut costs by significantly reducing the number and length of physical site-surveys. In many instances it can help CSPs perform upgrades, install new equipment, add capacity, or respond to environmental changes, in a more efficient manner.

Tapping Unused Bandwidth

A relatively unused mmWave spectrum offers excellent opportunities to increase mobile capacity. mmWave (28/39 GHz) has 100-400 MHz, while CBRS (3.5 GHz) has between 10 MHz to 40 MHz free spectrum available. While this spectrum offers an excellent opportunity to increase capaci-

Examples of feature types that can be extracted from LiDAR Data:
* Landbase Details
  * Road dimensions/centreline measurements
  * Drainage ditch depths, locations
  * Location and dimensions of any visible asset
  * Signage
  * Topology
- Utility Pole Details
  * Height AGL, Attachment heights, Clearances over objects/roadway
  * Span measurements, Crossarm widths/angles
  * Anchor leads/heights
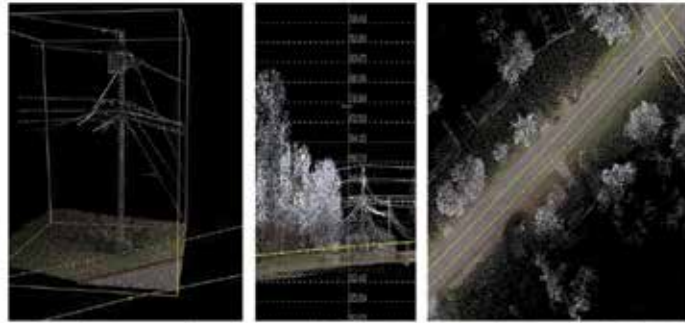 *If you can see it, you can measure it!*

Figure 1. LiDAR-based 3D digital survey for site selection.

ty, little is known about the channel propagation characteristics for mobile access networks in dense urban environments.

Thus, it's important to be aware of 3 mmwave small cell deployment challenges:

FACTOR 1:
PROPAGATION LOSSES

Penetration loss is a real enemy for millimeter waves, and penetration loss through trees is especially damaging. At very high frequency (VHF) and ultra-high frequency (UHF), 50 meters of tree canopy causes 15dBm to 20dBm penetration loss; whereas in 28 GHz, just 8 meters of tree canopy can lead to a similar loss.

UHF and VHF also take advantage of antenna height gain. Higher mounting heights help reduce the first Fresnel zone blockage by Earth and ground clutter. Whereas at mmWave, the first Fresnel zones width at its center is so narrow that it is never blocked by the Earth's surface. With propagation distance shorter than 500m, antenna heights of 30 ft. to 40 ft. are enough to support mmWave deployments.

In dense urban areas such as Manhattan, diffraction loss is a more significant challenge. Diffraction losses decrease with proper path clearance. However, even a slight infringement in the transmission path results in an exponential increase in loss. Consider how mmWave cannot penetrate through windows treated with transparent metallic film. This can result in diffraction losses ranging from 40dBm to 60dBm.

Although reflections and diffractions reduce the range of mmWave, they also facilitate non-line-of-sight (NLOS) communication. With a wavelength being so small, all the city obstructions look huge, causing friendly reflections, which increases signal strength. Smooth glass and metal can also result in significant reflection at 28/39 GHz. Accurate planning with 3D terrain and building models can alleviate some of these issues, and can provide better prediction of propagation losses, coverage, and user density, for each small cell site.

FACTOR 2:
MODELING MISSES

Accurate geographic rasters/grids are critical to proper modeling. Planning tools need precise information about tree locations, buildings, rivers, roads, low-density housing, high-density housing, downtown areas with tall buildings, etc. Other inputs include outlines of buildings from aerial photography, as well as 3D street views from LiDAR, including building shape and vegetation details.

Challenges arise when the grids don't line up. If the grids are off by even a few meters, then your information is useless -- garbage in, garbage out!

For example, for 500 small cells planning, using a clutter class map with incorrect assignments is a significant problem. It's crucial to keep this information up-to-date, especially in urban areas where building clutter height changes overnight. By using LiDAR measurements, clutter height can be accurately determined.

FACTOR 3:
SITE SELECTION DATA

Small cells have their own challenges and limited capabilities due to their coverage range of 500 feet or less. However, in favorable use cases, where there is enough channel bandwidth, small cells can have a major impact.

Finding the right small cell site quickly with minimal cost can expedite network planning and reduce the need for field visits, especially given the current situation of communities still impacted by COVID-19.

By harvesting the latest and updated information such as aerial imagery, call logs, etc., a 5G inventory planning platform can significantly reduce turnaround times. Leveraging analytics within a site selection process allows engineers to focus on solutions that maximize CapEx and OpEx investments while improving the user-experience.

Analytics-based solutions also accelerate time-to-service not only for CSPs but also for enterprises looking to build-out 5G in factories, ports, and other sites. (See Figure 2.) Consider how equipment (UE) traffic demand maps with highly accurate GIS details can help calculate accurate site offload potential. This is especially important in dense urban environments where a significant portion of traffic is generated at hotspots. User-demand information and call traces provided by the network can offer the actual level of UE traffic. That information, supplemented with data from accurate geo-locations, can help create a demand map that provides detailed location and volume accuracy.

A Marriage Made in 5G Heaven

When CSPs use proven deployment approaches, sound technology, and large bandwidth opportunities from mmWave, small cells are the key to a faster and seamless 5G network.

At Cyient, we have been modernizing CSPs networks for over 2 decades. Collaborating with a partner that offers customized solutions, proven processes, and extensive equipment knowledge, can help combat the mmWave small cell deployment challenges CSPs must address for future 5G success. ∎

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Data Gathering

Collection of Network Data
- OM- based network data collection
- Information on UE call traces and measurements
- Information on existing cells within deployment area

Small Cell Candidate Sites
- Desktop-based candidate survey
- Identification of potential RAD centers and landlord information
- Field verification of sites

Preparing Inputs

Creation of User Demand maps
- Call traces
- Minimization of drive test server
- Sniffer-based measurements
- Social network data

Creation of Radio propagation maps
- LiDAR-based propagation models
- UE traffic demand and coverage maps

Evaluation of backhaul options
- Fiber cost or MW backhaul cost

Calculation of site costs
- Site cost includes leasing, fiber deployment, etc.

Site Selection Optimization Process

Selection of Small Cell Site Locations
- Main driving factors: Interference, offload, backhaul, costs
- Site selection using different algorithms such as greedy, genetic, steepest ascent
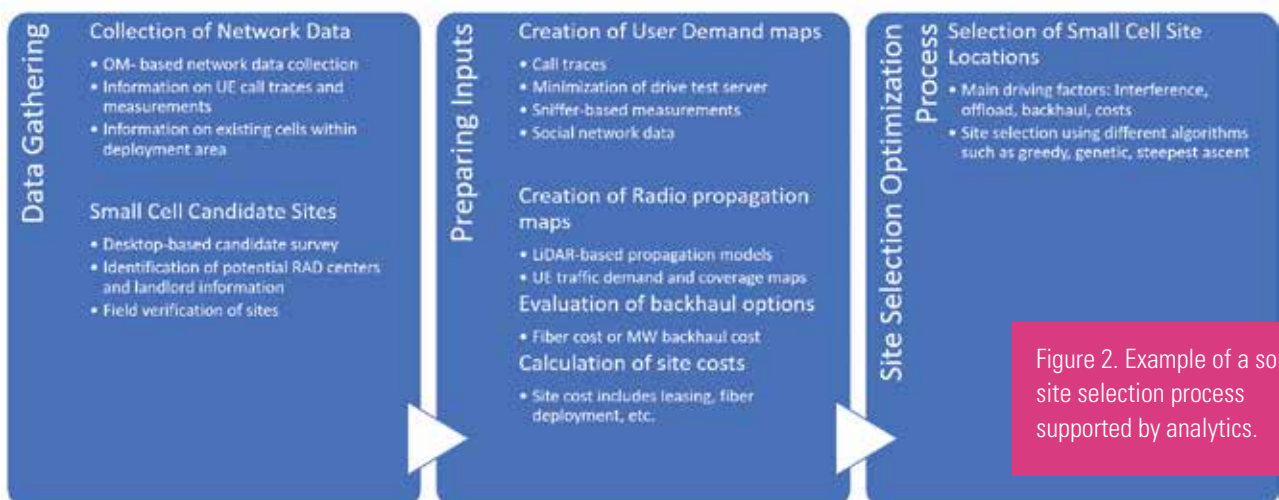
Figure 2. Example of a sound site selection process supported by analytics.

Tech Support 2.0 for the Post-COVID-19 Future

By Jason Moore

Taking Tech Support to the Next Level

At the time of this publication, we're about 7 months into the COVID pandemic in North America. Understandably, one of the big questions everyone asks is *When can we get back to normal?* Normal, of course, is defined as everything we knew until the second week of March 2020, before terms such as *lockdown, quarantine, shelter in place,* and *social distancing* became part of our vocabulary.

As we eagerly await to do things we've taken for granted, like eating in restaurants or going on vacation, there are many things that we've accepted as being "normal" that should never again be part of our daily reality. One of those things is how telecom providers/ICT companies deliver support to customers who experience broadband connectivity issues.

Until March 10, 2020, customer service was a fairly predictable affair. Customers would call a support desk to report a problem, and support personnel would walk them through a troubleshooting checklist to help diagnose and fix it. If issues couldn't be resolved remotely, a crew would be dispatched to the customer's home to do a deeper analysis and (in a perfect world) repair whatever wasn't working.

As we move into the next phase of the COVID-19 pandemic, telcos, like all large organizations, are

were never built to support commercial-grade usage, even though many areas have fast connections. Thanks to COVID-19, a record number of people are now working from home and using high-bandwidth applications such as Zoom and WebEx to collaborate with coworkers and customers.

Because of this, a problem with a home Internet connection isn't just inconvenient: it can have serious implications for people's livelihoods. That's why customers need their telecom providers to fix problems in a matter of minutes or hours, not days and weeks. The traditional approach to tech support was never designed for this kind of workload or user demand. And it's not like this is a temporary situation. In the "new normal," millions more Americans will work from home, either by choice or necessity.

> "After decades of following the same basic playbook, they are at a point where change isn't an afterthought but a necessity. And while the transition might be challenging, the reality is that the new normal could be orders of magnitude better than what they had before."

reevaluating their operational capacities to meet social distancing guidelines, provide better service, and reduce overhead.

While it's easy to get nostalgic for pre-pandemic life, COVID-19 is actually giving the ICT/Telecom industry an opportunity to reimagine what customer support can look like. After decades of following the same basic playbook, they are at a point where change isn't an afterthought but a necessity. And while the transition might be challenging, the reality is that the new normal could be orders of magnitude better than what they had before.

Today's Needs Are Different

The North American economy was built around the concept of "going to work"-- that is to say, people leaving their homes to work in a factory, office, farm, or other centralized location. Not surprisingly, our IT infrastructure was designed to support locations where hundreds or thousands of people gathered every day. Home Internet connections

The Fortress

One of the major issues with the current mode of providing support is the house visit. Because of coronavirus, no one wants strangers coming into their homes. And even though most areas are relaxing their restrictions on social distancing, including allowing people to form pods with close friends and family, there is still a high level of apprehension when it comes to interacting with technicians or other workers coming into customers' homes.

Unfortunately, people with inconsistent Internet connections are faced with an unpleasant choice: either deal with continued connectivity problems or burst the safety "bubble" they've created for themselves and their families. Even if service professionals take every precaution, it's still an issue for people who are avoiding unnecessary contact with the outside world.

This is an opportunity for telecom providers who can figure out how to deliver a hands-free experience for people who need home Internet troubleshooting. Those forward-thinking providers will

reap the benefits of being able to deliver a positive troubleshooting experience, including increased loyalty and customer retention.

All of which brings us to the bottom line. Even those who think the reaction to COVID-19 has been overblown and unnecessarily restrictive will acknowledge that one of the most expensive services provided by telcos is on-site troubleshooting and service in customers' homes. Dispatching a technician is as time-consuming as it is expensive and disruptive.

The Future

No one knows what the next year or two will look like. We don't know when a vaccine will be available. We don't know when a second wave of COVID-19 will come, or how bad it will be. Even further out, we don't know whether masses of people will go to offices in 5 years. But we *do* know telecom providers need to reimagine how they handle service requests. The pandemic may be the kick in the pants that we all need to do away with the outmoded approach we've been living with for more than a century.

So, what does this look like? How can we even plan for a future that is so unknown and difficult to predict? The answer is fairly encouraging, because most of the tools that telcos will need already exist, such as personal devices, mobile phones, and apps.

Most speed-related customer technician visits consist of lengthy back-and-forth conversations with clients who aren't tech savvy, or simply don't know the technical aspects of their home Internet. Even the savviest customers can give incorrect or inaccurate data, leading to improper diagnosis of the problem.

By giving customers the ability to run a diagnostic test from their mobile device using a mobile app, telcos can quickly gain access to important information on the configuration and health of the customer's network. They can collect data about router usage, speed, and device information. With all of this data available instantly, problems can be solved quickly and accurately, reducing the number of call-backs or home visits.

Video calls can also be part of the foundation for new tech support systems that allow people to do their own troubleshooting. However, in

order for telecom providers to take the next step in customer support, they must go beyond video-enabled solutions.

The Ideal Solution

The ideal solution is a collection of tools they can use while NOT being in the customer's home. The solution would check the wireless spectrum and coverage, run hardwired speed tests, and even evaluate the ability of customers' end devices to keep up with the speed being delivered to their home. Such a platform would incorporate advanced diagnostics and combine video chat capabilities to help solve many of the issues virtually that traditionally required a technician going on-site.

This paradigm shift, in which home technician visits are replaced by support staff in call centers who have the tools to fix issues remotely, is ultimately what comes next in providing quality customer service in this new, post-COVID-19 world.

There is no single fix to the incredibly complicated problem of providing world-class support to home Internet customers. It's not like there's a magic app that can eliminate all technical issues. But by adopting a new mindset around technical support, ISPs and telcos can pave the way for a new normal that is far better than the normal we left behind. ∎

Resources and Notes

Desilver, Drew; Senior Writer, Pew Research Center. "Working from home was a luxury for the relatively affluent before coronavirus -- not any more". World Economic Forum, weforum.org. This article is published with permission from Pew Research Center March 21, 2020. https://www.weforum.org/agenda/2020/03/working-from-home-coro-navirus-workers-future-of-work/

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COVID-19 Impact Updates
Recent updates include notices from ACG, Analysys Mason, Parks Associates, ABI Research, GlobalData, Tech Republic, and DigitalBridgeK-12. Visit https://www.isemag.com/category/safety/telecom-covid-19-network-impact-wireless-wireline/ often to find more COVID-19 Impact Updates.

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