EXECUTIVE INSIGHTS WITH
Shirley Bloomfield
CEO, NTCA
THE RURAL BROADBAND ASSOCIATION

ALSO INSIDE
Fibering the Last Hundreds of Feet
Removing the “Gotcha” in FTTx Installation
DAS and Wi-Fi Gets Sporty
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FEATURES

10 Executive Insights With Shirley Bloomfield, CEO, NTCA—The Rural Broadband Association
By Sharon Vollman, ISE
Shirley Bloomfield talks about deep fiber for 5G, smart rural communities, and mentoring.

18 Fibering the Last Hundreds of Feet
Solutions Evolved to Meet Providers’ Needs
By Scot Bohaychyk
When it comes to telecom fiber solutions, it’s all about the last hundreds of feet and the best way to get it there.

22 Removing the “Gotcha” in FTTx Installation
Preparing for Workforce Challenges With Better FTTx Installation Training
By Dave Schuman
How can we evolve fiber fusion splicing training from boring and tedious to something that appeals to a changing workforce?

26 DAS and Wi-Fi Gets Sporty
University of Colorado (CU) and Colorado State University (CSU) Get Agile to Deploy DAS and Wi-Fi in Sport Stadiums
Learn how 2 Colorado universities are bringing DAS and Wi-Fi to their football and basketball arenas.

28 Fields of Gold?
Field Service Management Market $5.9 Billion by 2024
By Ritesh Chawrashe
Field service revenue growth of 16% CAGR means telecom providers could cash in on these fields of gold.

32 With Big Densification Comes Big Responsibility
Intelligent Fiber Management for Next-Gen Latency Challenges
By Michael Zammit
Today’s killer app (OTT bingeing) is a bandwidth eater, but next-gen killer apps like telepresence and remote surgery will shine a spotlight on the growing hunger for ultra-low latency. How are you managing your fiber networks to ensure that you can deliver?

36 AIM to Leverage Augmented Reality
Fiber Management for the Future
By Michael German and LeaAnn Carl
Learn how AR can assist AIM data by putting it where and when the technician needs it.

WEB-EXCLUSIVES

Are Your Clients Ready?
Globally, 51% of Organizations Are Unprepared for a Cyberattack or Breach
By Eric Ouellet
You can really help your customers only if you know what cybersecurity pains they feel.

People on the Move
Keep up-to-date about your peers’ career changes and promotions.

COLUMNIST
FIBER EXPERT | Larry Johnson
Troubleshooting Optical Splitters

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SD-WAN IS WINNING’

2019 was a year of significant growth for SD-WAN and VNF. Year-on-year vendor SD-WAN growth in 2019 was 80%, and 190% for VNFs.

Source: www.acgcc.com

IN EVERY ISSUE
41 Tools
41 Advertiser Index
41 Classified
42 Human Network

ISE magazine is published by Practical Communications, Inc., 1900 E. Golf Rd, Suite 950, Schaumburg, IL 60173, U.S.A. Frequency: Published monthly. ISE magazine print (ISSN 2470-0517) and online (ISSN 2470-0525). ISE MAGAZINE MARCH 2020 • Volume 38 • Issue 3. ISE magazine is free to professionals in the ICT industry and related contractors. Rates outside this audience are: $32.00 for one year, $56.00 for two years, $73.00 for three years. Shipping and handling is required for all international subscriptions: Canada $50.00 per year, all other international $115 per year. Single copies available; cost varies depending on shipping fees. All fees are payable in advance in U.S. funds. Executive, Editorial, Circulation and Advertising offices: 1900 E. Golf Rd, Suite 950, Schaumburg, IL 60173, U.S.A. Phone: 773.754.3250. Fax: 773.754.3259. No material may be reproduced in any form without publisher’s written permission. Periodicals postage paid at Schaumburg Post Office, Schaumburg, IL 60194 and additional mailing offices. POSTMASTER: Send address changes to ISE magazine, 1900 E. Golf Rd, Suite 950, Schaumburg, IL 60173, U.S.A. Phone: 773.754.3250. Fax: 773.754.3259. Practical Communications, Inc., also sponsors and manages the annual ISE EXPO.
Wi-Fi Entitled

The heat wasn’t working when we woke this morning. (It was 50 degrees in our house.) I rolled over, turned on my iPhone, and attempted to use our Nest app to regulate the Alaskan-like air surrounding me. Power was on. Wi-Fi was out.

It was cold. Played paper/rock/scissors with Hubby until I won and he got up to manually turn on the heat. When he brought heat back into our lives, it was like man found fire for the first time. We ooh-ed and ahh-ed while waiting for our world to defrost.

It did after 15 minutes. But, still no Wi-Fi. (Harrumph!)

I opted to stay under the warm quilt until it was at least 65 degrees. All the while, I pouted about my smart house denying me. I couldn’t indulge in my morning wake-up ritual of checking email, weather, news, calendar, and IG (that’s Instagram to us old folks who don’t know the right acronyms for anything).

Coffee maker wasn’t K-cupping caffeine because there was no Wi-Fi. Ring was offline so I couldn’t see if Amazon had delivered my paper towels yet. Home security camera, Canary, wasn’t chirping to show me our familiar dust-bunny trespassers. And, the new Roomba I received for the holidays was on strike.

Twenty minutes later, I flung back the quilt, put my fuzzy slippers on, stomped to my desk, and called my ISP. I explained to the CSR that I worked from home and this Wi-Fi-not-working-thing was unacceptable. They told me they were working to resolve an outage and it shouldn’t be long before the Internet/Wi-Fi was working again.

After I hung up, my imagination took me places I shouldn’t go.

Perhaps, a problem with the tower near the edge of our neighborhood caused the outage? (See Figure 1.) Perhaps squatter bird hosted a fowl party last evening, and one of its disruptive bird guests brought a hungry squirrel as a date. Cable was the appetizer.

Yes, I have a vivid imagination. Can you blame me? It’s been nearly an hour without a connection. Without Wi-Fi, how can I get ANYTHING done?!

Except count the problems this bird has caused! My Editor’s Note will be tardy due to bird and friends. My bills will post late since bird won’t allow me to access my bank’s online portal. Dinner will be non-existent because I can’t use Grub Hub without Wi-Fi. (No judging, people. Making food is so 1990s.)

You’ve read this correctly. Your Wi-Fi-entitled editor IS blaming a bird for everything that’s not right in the world this morning. You think that’s odd?

Fine. Judge me. Then, try to work without Wi-Fi for a good solid hour. I dare you.

Sharon Vollman, Editorial Director
SMALL CELLS, BIG OPPORTUNITY

The small cell 5G network market is expected to register a CAGR of 32%+ from 2020-2025. With mobile data traffic expected to grow at a CAGR of 46% from 2017 to 2022, that’s a very good thing. Cisco forecasts that by 2022, a 5G connection will generate 2.6 times more traffic than the average 4G connection. The trade group CTIA forecasts that small cells in the US will grow from around 86,000 in 2018 to over 800,000 by 2026.

THE ALL AND EVERYTHING?

According to Forrester, 57% of mobility decision-makers recently surveyed said they “…have edge computing on their roadmap for the next 12 months.” The research firm also forecasts that the edge cloud services market will grow by at least 50% in 2020, driven by the rollout of IaaS and PaaS solutions.
DID YOU WORK SAFELY TODAY, OR WERE YOU JUST LUCKY?

Staying safe begins when you load up and get in the truck and (I hope!) you hook up your safety belt.

I had the seat belt habit pounded into me by my old boomer line foreman, Ellis Nelson, while working for Northwestern Bell in Minneapolis. Ellis would catch me “sittin’ on the belt insteada usin’ em,” and if you’ve ever felt the wrath of a boomer line foreman in chew mode, you’ll know why wearing them became habit. Because of this safety lesson, I lived through a terrible car accident in 1991. Lesson learned!

Working line crew is your basic safety training ground. From day one, working as a grunt for a man aloft, safety glasses, gloves, hard hats, boots, and proper clothes, are a must. This apprentice job requires that you learn to properly and safely handle heavy equipment, strand stresses and strains, cables and drops. Cutting a wire without relieving the strain can mean a trip through the air or down a telephone pole in a second.

Trenchers, back hoes, boom trucks, and myriad other heavy equipment can, in a quick moment, remove or damage appendages, slice, scrape, and otherwise make a bad day for any lineman who drops his guard.

In most telephone companies all technicians received, and continue receiving, extensive safety training in all aspects of the job. And survival lies in following the rules.

Bottom line: safety is up to you. Companies require that you be taught safe processes and procedures -- but they can’t look over your shoulder every day.

Remember: working in a safe manner cannot only save you from serious injury but it can also save those who work with you or those who are nearby when you are working.

SAFETY TIPS

A bit of thought is required for each specific task performed on a daily basis, and it’s better to pre-plan each task with an eye to safety and avoid surprises.

Safety Headgear, or Hard Hats

Some safety precautions are obvious. Hard hats, for example, are designed to act both as a shield and a shock absorber to protect against head injuries. A hard hat also provides protection against electric shock in case of accidental contact with electricity. But the use of safety headgear in no way reduces the need for good job planning and observing the safety requirements the task demands.

Most companies require that your hat goes on when you open the truck door to begin working. If that isn’t a blanket requirement, safety headgear should be worn whenever engaged in outside plant or installation and repair work whenever you are subjected to conditions that could result in head injuries from moving or falling objects, striking against stationary objects, or when the possibility of electrical shock exists. In other words, pretty much all the time! Watch your head friend -- you’ll keep it longer.

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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.
Potential Electrical Hazards

Be sure to look for potential electrical hazards before climbing or working in joint use plant. It is imperative that you recognize, test, and eliminate, the possibility of electrical shock before exposing yourself to a potential electrical hazard.

Eye Protection

Eye protection is simple enough. Use eye protection whenever performing, observing, or supervising, a work operation where there is any possibility of injury to the eyes.

There are 2 types of eye protection: Regular Protection, and Special Protection.

Regular Protection consists of frontal eye protection against flying or moving objects.

Special Protection consists of side, as well as frontal, eye protection from flying or moving objects and irritating liquids dust and splashes. We do very good when it comes to Regular Protection, but seem to drop the ball when it comes to Special Protection. Perhaps it feels awkward to some but it's like seatbelts: once you become a regular user, you don’t want to work without them.

Back in my splicing days, my helper and I had a splice to wipe on a very cold Minnesota day. It had snowed the night before, and there were several inches of snow on the street.

Since it was very cold, I loaned my new, cutting-edge, ultra-lightweight White Stag snowmobile suit to my helper. After finding the cover with a frost bar, we set up the manhole, started the solder pot, and I went below to prepare the splice for wiping.

Seconds after I called for the solder pot, I heard a double explosion. When I reached the street, I found my helper, and my new snowmobile suit, covered with lead.

My helper had dropped the solder pot in the snow. The solder exploded, ricocheted against the manhole tent, and then washed over my helper. Solder hit his face. He was very lucky -- the solder cooled quickly enough so that he wasn’t badly burned, and he did have safety glasses on so he didn’t get solder in his eyes.

I spent the next few minutes peeling solder off my helper. That 4-pound snowmobile suit now weighed 13 pounds -- and 30 years later, it’s still shedding flecks of solder. This guy wasn’t safe -- he was lucky.

But Lady Luck is fickle.

Body Belts

Body belts are required when working more than 4 feet above the ground on poles, ladders, platforms, aerial lift buckets, cable cars, towers, and terminal balconies. These belts have improved dramatically from the old leather belts, but they require careful periodic inspection. It’s up to you to make sure they are in good condition.

Footwear

Climbers require care and maintenance, but this is directed more to the line crews than to the average ladder technician. It’s both highly dangerous, illegal, and difficult, to climb in tennis shoes, but we all know someone who ignores company policy and wears them on the job. That person won’t be lucky every day -- it’s just a matter of time.

Manhole Safety

Manhole safety is of the utmost importance. The process of testing and ventilation has come a long way from the wolf lamp and the sail cloth. New testing systems can indicate hazards ranging from combustible gas and petroleum products, to an unsatisfactory atmosphere.

Even the proper methods of removing and placing manhole covers are important safety procedures. They are very heavy and can result in broken or lost fingers and toes, scrapped shins, and other injuries. Make sure you have your heavy work gloves on, and take your time. Many, if not most, work accidents happen when performing routine tasks because we go about them automatically and don’t think carefully.

Well, back to where we started with me stuck in the side of a 1983 Chrysler, thinking hard about safety. I’m alive, thanks to the telephone industry’s emphasis on safety. Thanks, Ellis. You saved a life.

Signing Off

Stay safe whether in daily life at home or work or while enjoying sports. It’s not just a work issue. I saved my leg from a bad cut by wearing chaps when taking down some trees, and I now wear goggles and ear cover every time I work in the garage or in the yard. It’s a small concession -- and you and your family need you to be safe. Contact me for questions or comments at dmccarty@mccartyinc.com or 831.818.3930.
EXECUTIVE INSIGHTS WITH
Shirley Bloomfield
CEO, NTCA—The Rural Broadband Association

By Sharon Vollman, ISE

Topic: NTCA Priorities

ISE magazine: What are NTCA’s 2020 priorities for your rural members? What is going to “move the needle” for them, related to network transformation and the ability to deliver what end users demand in today’s hyper-connected society?

Bloomfield: We are really encouraged by the attention being paid to rural broadband in the last several months, including the announcement in spring 2019 about the FCC’s creation of the Rural Digital Opportunity Fund (RDOF). So, in 2020, our priority is to ensure that programs like RDOF are implemented in a way that promotes future-proof network deployment.

Accurate broadband mapping practices, of course, have a role to play too, and we have and will advocate for more granular mapping, standards for reporting, and competitive overlap challenge processes. Additionally, the federal support programs that enable broadband deployment in rural America are critical to its success. So, contributions reform will be key to ensure the future viability of these programs.

Last, but certainly not least, is trying to bring different business opportunities to the table for our member companies. What role can we play in connecting the dots between different opportunities, and getting the right players around the table to look at ways to generate new streams of income? I find that possibility exciting!

Topic: Network Testing

ISE: In late October 2019, NTCA met with staff from the offices of FCC Chairman Ajit Pai, Commissioner Jessica Rosenworcel, and Commissioner Geoffrey Starks, on Performance Testing. NTCA expressed appreciation for the pre-testing and testing schedule, and reiterated its support for the usefulness of network testing. NTCA also expressed to the Commission the need to ensure protocols be implemented in ways that are both administratively and economically equitable and efficient. Why are these measures important? What are specific recommendations NTCA has to do this?

Bloomfield: While we agree that performance testing is useful, it is equally important to implement it appropriately. Right now the requirement for providers to test from the customer premises to a remote test server reached by passing through a Commission-designated IXP is worrisome and a bit unfair.

That holds NTCA member companies to a standard for a part of the network they are not responsible for -- like someone getting a speeding ticket when the cab driver is the one with their foot on the gas pedal.
Topic: Being All Things to All Users

**ISE:** A significant challenge for service providers today is the need to simultaneously service customers on everything the “big guys” do. What is your advice to rural telecom providers to address this challenge?

**Bloomfield:** Be real about what you’re good at. We look at the increased importance of a mobility play. Rural operators just cannot compete with the “big guys” on spectrum and market share. Know the market and know your sweet spot. Use your time, energy and resources in areas where you can excel. Customer service, for instance. NTCA member companies serve their customers really well, and we hear about it. NTCA members take pride in their work, and care about their customers because they are their neighbors and friends.
Topic: 5G

**ISE:** What important things must rural providers do to help advance 5G?

**Bloomfield:** There will be no 5G without a fiber network because 5G is a fiber-fed product. Right now, over 60% of customers served by NTCA members have fiber-to-the-home and, even still, we are aiming higher.

Streaming video and other data demands enabled by 5G will test and strain spectrum resources and networks. Promised speeds therefore won’t be realized without significant underlying fiber capacity -- and in rural areas, the practical reality is that it’s going to take fiber to nearly every home and business to make 5G work as it does in urban areas.

Fortunately, NTCA members haven’t taken their eyes off the prize. While they use every possible technology to reach consumers in need of service now, they have stayed focused on the ultimate goal of building networks for the long haul: networks that will both respond directly to increasing consumer demand for high-speed broadband and enable evolving complementary 5G services. Meanwhile, we have some parts of rural America waiting for “Any Gs”, so expectations need to be realistic as well.

Topic: Women in Telecom

**ISE:** Despite many efforts, the Telecom/Information and Communication Technology (ICT) industry is still lacking when it comes to executive leadership by women. Why is that, and what can we do about it?

**Bloomfield:** Traditionally the path to leadership in telecom organizations progressed through the engineering side of the house, which was a male-dominated field. (Although that is changing!) The recent emphasis on STEM education for young girls will go a long way in re-setting gender diversity in the industry.

That being said, engineering is not the only field that produces great technology business leaders. Business acumen (making the case for deployment, understanding financial resources needed to do the job well, etc.) is key to success, especially for broadband deployment in rural areas. I find that women who work on the financial aspects of business have a very good gut for leading on critical business decisions.

I have personally found it very rewarding to create and participate in various networking opportunities with other women leaders. At NTCA we launched our Women in Telecom network to allow women leaders to share, support, and compare, career and management advice with one another. I have a similar group of women I work with at GlobalWin, a group I helped organize in D.C. with other female leaders in various tech industries, and we share those same opportunities from a national perspective.

As Eleanor Roosevelt famously said: *It is better to light a candle than curse the darkness.* We all have a role to play in putting out a helping hand to that next generation of leaders. I certainly owe that much to my 2 amazing daughters!

Topic: Rural Network Speeds

**ISE:** What are some answers to delivering higher-speed broadband to rural communities? What can the vendors supporting rural providers do to help this?

**Bloomfield:** Invest in future-proof technology. We cannot look to just “patch a hole” or “fill in
Since 1980, when cable networks were only beginning to emerge, Antronix has been there. Playing a central role in designing and manufacturing those early solutions that would carry the company, and cable, into their prominence. Along with other early cable pioneers, Antronix has helped carry the cable industry into its current age. Today, cable service operators are the backbone of data communications and content delivery across the globe. Antronix customers enable the most advanced communication services, empowering people, strengthening communities and leading innovation. We’d like to thank all of our partners now in our 40th year, as we look to forge ahead into the next 40. Let Us Show You.
the gap.” Go in and do it right the first time; it is far more cost-effective, and it matches what consumer demand is telling us. They want faster broadband on more devices, and the multiplier effect will not slow down.

As the government makes broadband buildout a priority and invests in deployment in terms of infrastructure, support programs have to incentivize the most future-proof technology for their long-term viability. The vendor community is terrific about lending their expertise, advice, and counsel, and we’re seeing the proof of that good work with the number of NTCA members receiving the inaugural USDA Re-Connect funding, announced as 2019 drew to a close.

**Topic: Overlooked Issues**

**ISE:** What should all of us in the ICT industry be talking about that we are not? What current topic is the most important that needs additional and different attention?

**Bloomfield:** Dispel the myth that rural America is disconnected. Yes, we need to connect rural America more than ever, but a significant portion of rural America is already connected, thanks to community-based providers. As community-based entities, their focus is always on serving the area where they themselves live, work, and play, as well as the economics will allow.

What you see is not simply a rural/urban divide, but a divide between rural areas themselves -- between those who have lightning-fast broadband speeds in their community of 3,000, and those who perhaps are served (or not served) by some of the larger companies out there who, quite frankly, have shareholder pressure to put their resources into more lucrative markets with larger returns on the investments.

We know where the problem is. Now we just need to incentivize companies, like NTCA members, to be part of the solution by edging out even further to bring service in collaborative ways to these underserved areas outside of their existing current markets.

**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 the smart cities’ and telecom providers’ interconnected relationship, and how it needs to change in the future.

**Bloomfield:** Smart cities -- or, as we call them, Smart Rural CommunitiesSM -- are not just connected streetlights and driverless cars; they are networks of local residents and organizations prioritizing connectivity for the students, patients, and business owners, in their communities. Broadband providers can educate their community members on all the ways that connectivity changes lives (from telemedicine to social media to operating a global business in a small, rural town).

This is also a terrific opportunity to further the adoption rate for broadband in rural communities when the lightbulb goes off that advanced communications is about more than just faster email delivery.

What I know about Smart Rural CommunitiesSM and the broadband providers that support them is that relationships matter. Taking the time to connect with communities and community members creates buy-in for these endeavors.

**Topic: Guidance**

**ISE:** What professional and leadership guidance would you offer a younger Shirley as she was forging her career path?

**Bloomfield:** The first is: don’t take things so personally. Learning early how to take constructive advice is very important, because I do think viewing that feedback as a gift helps you to reflect and grow.

The other: follow your passion. I do what I do working with rural broadband providers because I’m passionate about it -- passionate about the people I represent, and about the amazing work they do in their communities. The twists and turns in my career have nearly always been in the telecom arena, but I did not always feel like I was making a difference in people’s lives in larger corporations. I knew I wanted to make a difference, so I sought experiences and roles where that was possible.

Now, at NTCA, I see it each and every day through our incredible member stories. I think my entire team feels the pride and satisfaction of a job well done when we see those communities receiving broadband for the first time, or when a telehealth clinic is established in a member’s service territory. I recently shared with them the story from a
farmer in Iowa about how broadband monitoring and online marketing has changed his operation and his business model, and how he can now hand the farm down to his son.

**Topic: Agility**

**ISE:** A business needs to run 2 models simultaneously: one optimized for today, and one optimized for tomorrow. How do you do that well without neglecting one or the other?

**Bloomfield:** I have a great team. Our board leadership is heavily involved on all levels. They spend time focused on both the operational aspects of NTCA, but also always create time for big-picture thinking, and our terrific staff allows us to pursue both.

We have also always had an established group of great thinkers from our membership that we pull together at least a few times a year to be thinking about where the industry is heading and how we best help companies prepare. Their last product was called *A Practical Guide to Charting One’s Own Course.* It focused on various challenges and issues faced by rural operators, case studies of recent successes and failures, and the continuing evolution and cultural shifts of telcos as they transition from “order takers” in an environment where customers had only one place to go for their telecom services, to aggressive “order getters” that proactively plan new service offerings, market those offerings in creative ways, and look to differentiate themselves from would-be competitors.

**Topic: Failure**

**ISE:** How do you embrace failure, and encourage risk-taking across your organization?

**Bloomfield:** I do it in practice. I am a big believer in trying new things, and make it very clear to our team that I embrace that. And I don’t view things not working as a failure. What I think is a failure is to do the same thing over again without recognizing that it did not work.

For instance, right now we are in the middle of a digital transition, moving almost all of our operations and communications online in an effort to meet our members where they are and where they’re going. It’s a big step forward and a big change!

On that note, no one is punished for trying and failing. You cannot say enough to people: *Let’s give it a try.* I say *If it doesn’t work we’re going to pivot.* And *What did we learn from this?* And tweaking is not failing!

**Topic: Balance**

**ISE:** What do you do to help create work/life balance in your life?

**Bloomfield:** I try very consciously to find one thing a day that will give me a belly laugh. One thing a day that I can find humor in. It keeps me grounded. Also, because I’m on the road a fair amount I try not to deprive myself. If I smell great fries going through an airport I might grab them. But I also do try to squeeze exercise in when I can, and have even gone digital myself with The Mirror, a home fitness system that allows me to guilt myself into working up a sweat if I don’t make it to the gym. And now that my children are grown, there are the dogs.
**VIAVI Network & Service Companion**

The handheld Network & Service Companion combines multiple test interfaces (PON, Ethernet, WiFi) for network validation and high-speed (Gigabit) service testing for frontline techs and installers. The instrument equips techs for multiple network environments and applications enabling easy performance documentation with quick issue demarcation/segmentation in under a minute.

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Craftmark – The Snap On Marker Experts—have developed the Ultra Snap for longer term (7+ years) cable identification projects. The Ultra Snap has a crystal clear UV over-lamination that sheds harmful UV rays for years as well as providing abrasion resistance. These markers have been tested side by side with competitor products in accelerated weatherometer testing equipment. After the equivalent of 4 years outdoors, the competitor sample was completely faded while the Ultra Snap retained its brilliant color. See our website for test results. Available in your choice of wording, logo and colors.

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**DRONING ON AND ON**

Worldwide spending on robotics systems and drones will be $128.7 billion in 2020, an increase of 17.1% over 2019, according to the International Data Corporation (IDC) Worldwide Robotics and Drones Spending Guide. By 2023, IDC expects this spending will reach $241.4 billion with a compound annual growth rate (CAGR) of 19.8%.

Robotics systems will be the larger of the 2 categories throughout the 5-year forecast period, with worldwide robotics spending forecast to be $112.4 billion in 2020. Spending on drones will total $16.3 billion in 2020, but is forecast to grow at a faster rate (33.3% CAGR) than robotics systems (17.8% CAGR).

Source: www.idc.com
EXECUTIVE INSIGHTS

Topic: Mentoring

**ISE:** What hands-on things should good mentors do?

**Bloomfield:** To be a good mentor you have to be your best at listening. Sometimes when people say they want to mentor they want to share stories of *their* success and *their* path, but the better thing to do is check that at the door and simply listen.

You also have to be willing to share some constructive feedback. Too often mentors share the easy stuff but if you really do the listening you can more purposely give people the hard nugget. And that hard nugget is where the true value lies. Giving someone constructive advice and counsel means you care about that employee because you want them to grow and improve.

In that regard, I am really energized by our Women in Telecom initiative, which supports a mentoring program for women in the industry. We already have several women who volunteered to mentor, to be mentees, and also, something I think is great, women who want to do both.

Shirley Bloomfield is CEO of NTCA – The Rural Broadband Association. With 30 years of experience representing the country’s smallest independent telecom operators, Bloomfield is an expert on the role of federal communications policies in sustaining the vitality of rural and remote communities and the benefits rural broadband networks bring to the national economy. You can read Shirley’s blog, Broadband Beat, at https://ceoblog.ntca.org/. She can also be reached at sbloomfield@ntca.org. For more information, please visit https://www.ntca.org/.
For many years there really has been only one solution for FTTx connectivity in what is known as The Last Mile (well, actually it’s only the last hundreds of feet): the proverbial flat drop. The flat drop for fiber was really just a re-purpose of a popular copper drop wire used in telco for as long as most of us can remember. And while it is not a bad solution, in recent years there have been advancements in fiber drop and termination technology where significant savings can be realized, depending on where and when they are used.

The Old Standby
The flat drop for fiber, as mentioned earlier, is really just an adaptation of a standard copper drop. Its familiar form and low cost make it an attractive choice, especially in rural areas and aerial applications. This old standby is one of the least expensive when we look at capital expenditures in a fiber deployment. That said, it offers little in terms of restorability and upgradability. (See Figure 1.)

As networks evolve, the drawbacks associated with flat drop become much less attractive within a drop solution. Because
1 to install the microduct, and another to install and splice the fiber.

This is partially remedied by the advent of pushable, pre-terminated fiber drops. These factory terminated drop assemblies allow an entry-level technician to both place the fiber and easily terminate it without the need of a splicer.

**Pushing to the Next Step**

*Pushable fiber* is a relatively new term that means the fiber is stiff enough to be pushed into a microduct and to a terminal. Since they are pre-connectorized, they allow for the first true plug-and-play design solutions. This saves time and money in that there is no splicing; an entry-level tech can install and terminate at the same time, and it is fully restorable without removing the connectors.

Another significant leap in drop technology was the release of the Multi-fiber Push-On connectors or MPO. These give the designer and installer another tool in their toolbox for FTTx plug-and-play designs. Because these connectors can have up to 24 pre-terminated fibers, the designer can now have the advantages of plug-and-play, not just from the terminal to the end user, but from the distribution hub to terminal or multiple terminals, without the hassle (and cost) associated with splicing.

These MPO connectors are seeing use in everything from FTTH to MDU to business class and wireless deployments.

One drawback of these connectors is the larger footprint does not allow them to be installed in microducts.

That led to the Pushable MPO Connector. This connector is housed in a protective enclosure small enough to pass through a microduct and, once installed, a housing snaps onto the end and plugs in. This, combined with new MPO ready terminals, allows the plug-and-play approach to be used in virtually any environment from rural FTTH deployments, to dense urban FTTH, fiber to the wireless tower, MDU, and the multi-use building where both residential and commercial spaces.

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**Enter Microduct and Terminals**

With the advent of microducts, the drop world began to change. Because homes and businesses alike were developing a greater hunger for fiber, methods to deliver and terminate multiple fibers were needed. Microduct was an obvious solution because of its small size, durability, and ease of use.

This, coupled with microfibers, pushable fiber, and small form factor terminals helped to ease network planner’s pain (especially those in urban environments). Because microducts and the fiber drops used in them allow placement in almost any environment, they are a great solution for densely populated residential areas, business parks, MDUs, etc.

Additionally, because the network planner can choose from a variety of fiber counts, these ducted drops allow for greater flexibility in design. (See Figure 2.)

As fiber drops evolved, so have the terminals that accepted them. Because installers are now placing microducts from point to point, they need a way to “land” the ducts at both the street and the home or business. New terminal designs allow for the installer to simply plug the duct into the base of the terminal and have a neat, watertight seal in a very small footprint — something very appealing in dense urban environments.

The only real drawback of this approach is that it takes 2 passes (and 3 steps) to install the service:

- 1 to install the microduct, and another to install and splice the fiber.
- Another to install and splice the fiber.
are combined under one roof. New MPO-ready terminals allow network operators to deploy both residential and commercial services in a single terminal, allowing for greater flexibility and savings.

And Then Came…

The next evolution was really a remake of an older product. *Cable in Conduit (CIC)* has been around for many years, however, it was not widely used as a drop solution until recently. There seemed to be a fear of placing both duct and fiber during construction phases because of the risk of damage to the fiber.

An added negative: if you wanted the CIC assembly pre-connectorized, the microduct would have to be split longitudinally in order to adjust the length. Not a terrible thing to do if you were only cutting a foot or so off of the length. However, if you had to cut longer lengths, it became very cumbersome.

Some indoor versions of CIC have been used in MDU deployments, providing some real savings to an installer as well as providing a pathway that is considered restorable.

The caveat to the restorability of traditional CIC is that you still have to cut off the connector and re-spool both ends of the fiber because the connectors are simply too big to pass through the duct.

Pre-Terminated CIC

Decision time. In choosing which drop solution best fits your project, designers and installers alike can ask themselves a few questions that will help in the selection of their fiber drops:

1. Is the old standby (flat drop) sufficient for my needs?
2. Do I need or want a pathway for future expansion or repairs?
3. Would I prefer a one-pass CIC type product, or is a 2-pass product good enough?
4. Do I need or want a pre-connectorized solution?
5. Is there another evolution of fiber drop?

Once you have answered these questions, you can decide which type of product best suits your needs. For example:

- If restorability is not a concern and you don’t mind splicing, then perhaps the flat drop is fine for your situation.
- If you want to be able to restore or upgrade in the future, then the microduct solution may be best for your application.
- If you want what has been considered a one pass solution in the past, (pre-connectorized did not always exist) then the CIC path is a way for you to go.
- Clearfield’s FieldShield D-ROP product provides a pre-connectorized, one-pass, restorable CIC solution. The name *D-ROP* is an acronym for *Drop-Restorable One pass Pre-terminated*. It takes all of the benefits of the previous drop types and combines them into a single one-pass drop assembly. (See Figure 3.)

Equipped with these choices, you can ask yourself which type of drop solution works best and choose the product that best suits your particular network plan.
Looking at fiber deployments and taking into account factors such as different environments, how much time to deploy the network, construction costs, both initial capital outlay, downstream maintenance, and, as a whole, the total cost of ownership, we should evaluate all options.

The best answer is to review old and new solutions to see which one, or what combination of some, best serves the needs to get the network deployed, and then also considering how they will impact the ongoing maintenance and upgrading of the network. Only after you do that homework will you be able to choose how to effectively deploy a robust fiber network.

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REMOVING THE “GOTCHA” IN FTTX INSTALLATION

Preparing for Workforce Challenges With Better FTTx Installation Techniques and Training
In the late 1990s, fiber for the masses was still years away and fiber splicing technicians were akin to astronauts. There were few of them who worked with very environmentally sensitive and specialized devices; training came more by experience than by textbooks. Oftentimes, they forged their way through each unique installation one at a time. These optical technicians were proven copper/coax technicians who were tapped mid-career because they demonstrated the skill, tenacity, and methodology, to do what it took to get things perfect.

Flash forward ahead to today. These “Senior” technicians who led the way, as well as many of those they trained, are retiring in large numbers, leaving an ever-growing drain on the skilled optical technician workforce. Combine this with the exponential increase in fiber deployments by service providers of all types --Telcos, MSOs, Utilities, Municipalities, Contractors, and Private Carriers -- all of these network providers are finding themselves in competition to deploy a highly skilled fiber-savvy workforce. It’s no wonder the skilled fiber-tech resource pool is very shallow if not empty.

The current end game for all providers of high-speed services must include fiber, either for the delivery of their services to the end user or for the backhaul of wireless and 5G services from the end user. Up until recently the traditional training methods used for years were replicated until they couldn’t support the volume and quality of installations needed. This led the service providers to entertain many good, bad, and ugly, solutions from equipment manufacturers to use alternative methods of connectivity to avoid or replace fiber splicing.

Many solutions have come and gone, but one principal remains true and constant: the best possible way to connect fiber optic cable still remains melting the glass or fusing it by using a fusion splicer. Operation of a fusion splicer requires training and knowledge and it is a tool that needs to be purchased and cared for. Therefore, becoming a fusion splicer has always been a specialized skill. Which technicians can use fusion splicers varies from company to company, and can even be defined by union work agreements.

One of the current workforce dilemmas is that, until recently, the methods to train fiber technicians were the same as 20 years ago. The multiple step and nuanced skill set required to splice fiber is no longer appealing to the changing workforce.
As a result, newer, more efficient standards-based methodologies have been developed that enable shorter training to production level timelines, and enable cross training among platforms of fusion splicers, making the workforce more versatile.

A New Model Needed

Fiber splicing requires good close-up vision and dexterity, the ability to reason and think on your feet, and the patience to be methodical, AKA patience and repetitiveness. This is a “gotcha” as it is akin to boring and tedious — 2 qualities that are detrimental to the currently evolving workforce demographic as a whole for any employee in any industry today. The workforce of the 2020s and beyond wants a career that enables them to be challenged, engaged, and is evolving forward, and, most of all, provides job satisfaction.

As an industry we need to evolve the deployment training processes while adhering to industry standards. We need to replace the boring and tedious so we can attract the transitioning workforce to fusion splicing as a career.

3 Changes

Three of the most significant changes we, and others, have incorporated into our products can increase the quality and speed of the performed tasks — but also appeals to a broader, skilled workforce.

A brief description of these 3 methods follows.

1. Use of Fiber Holders

Traditional fusion splicers use fiber clamps, which requires very good dexterity and vision, as well as the added steps of measuring and paying more attention to lengths for stripping and cleaving.

With fiber holders, once the fiber is inserted, it remains there for each of stripping, cleaning, cleaving, and fusing, steps. This methodology eliminates any measuring as the proper cleave lengths are determined by the holders. Seeding the holders into each step of the process is quick, seamless, and the same each and every time, which creates consistent high-quality work with less variation over a diverse workforce.

2. Thermal Stripping

Thermal strippers remove the jacket from the fiber to be spliced by heating the jacket and pulling the fiber away from it. This is preferable to using a hand stripper, which is a nuanced skill that is difficult to learn, and can damage and scratch the fiber if not done correctly.

Thermal strippers are always currently used with Ribbon Splicers, which are very expensive. Some companies do offer thermal strippers for their single fiber splicers, which, again, speeds up the process and produces the highest quality measurable result each and every time.

3. Staying in the “Family”

This means utilizing a platform of machines that incorporate the same skill set for the different fusion splicer applications.

• Last Mile FTTx typically uses an active-clad 4-motor machine.
• Mid-Span and longer use core-aligned 6-motor machines.
• High-density mass fusion or ribbon splicing utilizes a 2-motor ribbon splicer to splice 12 fibers at once.
By selecting a family of machines, a tech that is trained on any one of the 3 different types of fusion splicers will rapidly train up on the others as the skills, methods, and metrics, are all very similar.

Training Models
The current model for training is usually centered around a project. Many times, training is delivered close to the project kick-off date, when the technicians need to learn too many disciplines at once in addition to learning how to fusion splice.

- An early fiber skills training is more effective.
- It should then be followed up by a pre-deployment training that is specific in nature to a well-defined project.
- The final phase is an interactive follow-up session that is based on actual field experience of the technicians. This gives all the technicians an opportunity to share their successes and struggles, and to get answers to their individual challenges.

Training technicians with fiber skills helps their individual career progression, which in turn directly benefits their company, which in turn supports the efforts of the industry as a whole.

Utilizing training and deployment methods with well-defined and measurable standardized processes enables quick and easy successes, and eliminates most all of the nuances and monotony. The results are a well-trained reliable field technician workforce that ramps up rapidly to deliver consistent high-quality fiber splicing.

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Visit our website, https://americailsintech.com/, to contact us, schedule a demo, or learn more about our precision equipment. Join our many followers on LinkedIn: America Ilsintech.
The recent football and basketball season saw University of Colorado (CU) fans passionately texting, tweeting, and streaming videos about their Buffalos via a new Wi-Fi and cellular networks that could finally handle their sports enthusiasm.

While its incredibly picturesque location at the edge of the Rocky Mountains has historically made Folsom Field a fan-favorite place to visit, the lack of any comprehensive wireless coverage of any sort produced some grumbling from Buffs fans in recent years.

Neutral Connect Networks (NCN) used Cisco gear for the Wi-Fi network and JMA Wireless gear for the University of Colorado Folsom Field. (Credit: University of Colorado)
cellular networks. The networks are served by a central head-end room located in an old telephone PBX space near the center of campus. Fiber connections run through some existing tunnels from the campus’ old steam-heating infrastructure.

The Wi-Fi network used 550 APs in a mostly under-seat deployment at Folsom Field, since there are no overhangs over any of the seating areas. In addition, the flagpole-type structures NCN used had to match Folsom Field’s architectural heritage.

The deployment team had a long list of deployment challenges, mainly having to navigate the construction particulars of a stadium that had been gradually expanded and added onto over the years. “Sometimes it’s hard to know what’s behind a brick,” said NCN director of program management Bryan Courtney, speaking of existing infrastructure that has been around for decades.

A Slam Dunk

The same deal is bringing Wi-Fi and a cellular DAS to the school’s basketball arena.

At the 11,064-seat CU Events Center, formerly known as the Coors Events Center, deployment of both Wi-Fi and DAS is somewhat easier, as all the gear servicing the seating area is suspended from the catwalks. With the main concourse at stadium entry level and all the seats in a single rectangular bowl flowing down from there, the ceiling is close enough for good top-down coverage for both Wi-Fi and cellular.

Though deployment of both networks in the Events Center is currently underway, neither will be active until after the 2020 college basketball season is completed. That’s because the Events Center stays somewhat busier than the football stadium, with events like local high school graduations, and other special events, making use of the space. Still, both networks should be fully up and running by the next basketball season.

The business model embraced by all parties involved allows the school’s Wi-Fi and DAS networks to be built under a revenue-sharing deal with the school. Carriers helped with some with upfront payments. They will also provide payments over a long-term lease to operate on the DAS.

Rivals Get Fair Treatment

The company negotiated a similar neutral-host deal with CU’s neighbor to the north, Colorado State University, for CSU’s football stadium which opened in 2017. Now known as Canvas Stadium, the 41,000-seat venue had 419 total Wi-Fi access points when it opened, with approximately 250 of those used in the bowl seating area.

This article contains excerpts from “New Wi-Fi and DAS at Colorado’s Folsom Field”, the Stadium Tech Report, Spring 2019. The case study report is found on Connectivity Wireless’s website, in the Content hub. For more information, please visit https://content-hub.connectivitywireless.com/case-studies/folsom-field and https://connectivitywireless.com/services/neutralconnect/.
The global field service management market is expected to double its worth in the next 5 years. At USD 2.8 billion as of 2019, the global field service management market is expected to grow to USD 5.9 billion by 2024, at a CAGR of 16.2% in the forecast period.

There are several reasons that are driving this expected growth. The growing demand for mobility-based solutions to improve field operations, the use of advanced technologies to scale field technicians’ needs, and the increasing adoption of cloud-based field service solutions, are some of them.

Telecom providers will be at the center of innovation of the FSM ecosystem in the coming years. Telecom service providers will provide the basic communication infrastructure required by FSM vendors to track their field employees in real time, which will be the critical factor on how successful the FSM solution is deployed.
3 Hot Segments

A recently published report, *Field Service Management Market*, identifies specific segments of field service management that are expected to grow based on demand and usage. The schedule, dispatch, and route optimization solution segments are expected to become the largest during the forecast period. Since scheduling and dispatching are crucial for the efficiency of any organization, it is necessary to find methods that account for unexpected situations that cause human error (for example, late service delivery).

According to the report, advancements in technology are expected to play a vital role in shaping the future dynamics of the global markets. The use of technology and automated systems to help businesses navigate scheduling, planning, and dispatching processes, will significantly increase efficiency in customer service, reduce operational costs, as well as maximize business output.

Service Over Solutions

The report further highlights that, in the forecast period, the services segment is likely to grow at a much faster CAGR than the solutions segment. The services segment of field service management has a diverse scope of usage: they can be used to assist clients better in providing them with solutions, strategy, and implementation, and they can also be used internally to cater to business-specific needs of organizations.

The biggest asset of field service management services is that they bridge the stability of using legacy systems and the ease of modern applications to allow organizations to prioritize and execute the tasks that increase their efficiency the most. For example, they take care of training and implementation work so that clients can focus on their core business.

The need for such a technology in business has opened up opportunities for vendors to provide services to help various industries deal with the complexities of delegation, administration, and other management-related tasks, while also configuring field service management solutions.

Drivers

A decade ago, it was next to impossible to run a field service business remotely. Currently, smartphones and tablets have made this a reality.

The real-time monitoring of the movement of field service technicians not only prompts the timely dispatch of the nearest technician to resolve an issue but also empowers these technicians with the information needed to fix the customer’s problem.
at the first visit. Technicians can remotely reboot a machine or upload new software without visiting the site with mobility powered field service management solutions.

At the customer end, real-time visibility into the technician’s movement offers the assurance of help coming at the assured time. According to a recent study, nearly 75% of businesses that use mobility tools have seen an increase in the productivity of workers, while the rest have witnessed an increase in customer satisfaction rates.

Hence, the implementation of mobility driven field service solutions helps service organizations make better business decisions, gain better control over field operations, and deliver prompt services to customers.

Who Will Dominate?

In addition to identifying potential growth in specific segments and industries, the report also examines the growth by region. North America, estimated to account for the largest share of field management services in 2019, is also likely to witness the maximum gains during the forecast period. Countries such as the US and Canada are home to several of the key industry players that offer field service management solutions and services.

In addition to being a region that is considered one of the most advanced in terms of adopting digital technologies, the North American market also has the financial stability to invest in leading tools and technologies for effective business operations.

Companies such as Oracle, Microsoft, ClickSoftware, ServiceMax, Astea, Salesforce, Trimble, ServicePower, FieldAware, and Zinier, are some of the key players in the North American market, particularly the US. Other companies from around the world, including IFS (Sweden), Comarch (Poland), SAP (Germany), GEOCONCEPT (France), and FieldEZ (India), are also considered strong contenders.

This article is adapted from the report Field Service Management Market by Component (Solutions, Services), Organization Size, Deployment Type, Industry Vertical (IT and Telecom, Energy and Utilities, Manufacturing, Transportation and Logistics), and Region - Global Forecast to 2024, published by MarketsandMarkets. For more information, please visit https://www.marketsandmarkets.com/Market-Reports/field-service-management-market-209977425.html.

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WITH **BIG** DENSIFICATION COMES **BIG** RESPONSIBILITY

By Michael Zammit
To implement growing connectivity needs for inside/outside plant and direct links to an expanding population of high capacity wireline end users, but also to accommodate the emergence of next-gen sources of connectivity demand: proliferating MEC facilities and the soon-to-be ubiquitous microcells required by 5G, particularly in its up-spectrum manifestations. Your phone might be wireless, but your neighborhood antenna won’t be; it will require backhaul to the Internet and also, in many, if not most, cases, fronthaul to a centralized base station.

Not as Easy as It Looks

Effective management of the vastly more complex architectures needed to support the hyper fast, symmetrical, and ultra-reliable low latency communication (URLLC) networks of the future will require development of innovative approaches to network operations control. From traditional service providers to cloud data centers, operators of densified next-gen optical networks will require versatile connectivity solutions oriented for fast, simple, cost-effective field deployment. These solutions must ensure low-cost, low-maintenance operation over the life of the network without compromising the highest standards for performance, quality and reliability.

Obviously, they must also be scalable. And because, as implied by Amara’s Law,
the future has a way of sneaking up on us rather than just abruptly showing up and announcing itself, going all-in at the outset is not necessarily a viable option for most operators. Instead these solutions must be compatible with today’s network while affording operators the flexibility to evolve legacy infrastructures toward fully next-gen-ready high-density connectivity.

Moreover, the intelligence of the network must be capable of scaling with the network. Optical surveillance, working-protection, and fast-provisioning processes have typically been supported in network element management systems but maintaining reliability while building out both the dependable high-data-rate bi-directional throughput and near-zero latencies demanded by tactile and presence applications will challenge the intelligence capabilities of today’s networks.

For the intelligent fiber management (IFM) of tomorrow, every component in the network, including the connections themselves, must be capable of being monitored, measured, and held accountable. The goal: always-on end-to-end visibility of ever-denser infrastructure, including precise physical layer (Layer 0) sensing at every fiber junction.

**Optical Options for IFM**

Let’s review 9 optical component technologies for their potential to meet the monitoring and scalability requirements for true IFM.

1. **Fused Biconical Taper Splitters (FBT)**

   Due to their optical performance limitations, FBT splitters can serve only at certain or specified wavelengths on single mode fiber.

   For multimode applications, this simple power splitter cannot be controlled very well, and may be subject to optical power fluctuations depending on the modes transmitted in the optical signal. As such, FBTs are not suitable for broadband applications, and may have only limited use in Wave Division Multiplexing (WDM) applications.

2. **Thin Film Filters (TFF)**

   Unlike FBT, TFF technology can be used in optical power splitters for broadband WDM and DWDM applications. TFFs can be designed for customer-specific requirements in power, wavelength separation, express optical channels, and channel-band reflectors, across a wide variety of wavelength plans.

   Per basic optical interference theory, multiple layers of optical coatings may be required; however, the resulting performance and reliability of the TFF optical devices are exceptionally high.

   TFF challenges include miniaturization, number of coatings needed, and cost control.

3. **Arrayed Wave Gratings (AWG) and Interleaver**

   These technologies are widely used in Wave Division Multiplexing (WDM) and Dense Wave Division Multiplexing (DWDM) products today. Mass production is now practical at the chip level, but challenges remain for temperature sensitivity and fine control of the optical path. Packaging of AWGs can be realized in the range of millimeters, enabling use in typical transceiver form factors (TO/RO/BO-SA: Transmitter Optical/Receiver Optical/Bi-directional Optical Sub-Assemblies).

   The optical performance of AWGs, however, is only average due to the difficulty of maintaining inter-channel crosstalk below 35dB.

**TRUE OR FALSE?** The greatest genius of the 20th Century received his Nobel Prize not for demonstrating special or general relativity, but for explaining the photoelectric effect.

**ANSWER:** True. And photodiodes, which work according to the principles first elucidated by Einstein in his award-winning 1905 paper, represent a very promising bridge between optical and electrical domains in 21st Century telecommunications networks.
When cascading AWG components together, optical insertion loss can also be an issue.

   Challenges include cost (despite mass production), stability, inertial characteristics (i.e., positional hysteresis), switching-speed (typically in the range of 30 ms), and control loops.

5. Piezoelectric Optical Components
   These are used mostly in fiber sensors and mechanical vibration loop controls.

6. Optical Gratings
   This is a mature technology, and the chip itself can be relatively small. But with the addition of free space optics, the overall dimensions can easily become quite challenging.

7. PLC Optical Power Splitters
   This is a mature product technology with high factory yields and broad current deployment.
   The challenge is that insertion loss limit of 3dB cannot be further reduced due to simple power splitter physics.
   Also it cannot be used to separate the wavelength.

8. RFID (Radio Frequency Identification)
   This technology operates solely in the electrical domain and is not directly integrated with optical signals.

9. Photodiodes (PD)
   Considered with the various component technologies reviewed earlier, PDs or PD-arrays can be joined with electronic subsystems and software monitoring to enable the necessary building blocks of broad IMF implementation while at the same time meeting target optical performance and cost requirements. PDs are thus capable of achieving an intelligence solution that may be widely deployed in an ever-more-complex fiber network.

   By leveraging the unique properties of each component technology, a portfolio of IMF modules with integrated PDs can be developed. Once these optimized IMF elements are built, they can be packaged in high-density fiber management and connectivity network products which enable scalable performance monitoring and data collection, and which can provide the application versatility to meet a broad variety of deployment needs. One solution, Go!Foton’s fiber management platform, can provide IMF flexibility for operators at virtually any stage of their fiber network evolution.

Fiber for the Future
With both 5G and next-gen wireline access protocols demanding greater fiber densification and complexity in emerging network topologies, it’s imperative for the industry to develop future-ready IMF with exceptionally versatile high-density packaging that can effectively monitor virtually every physical point of fiber connection throughout the network.

Resource
*Wireless Edge Computing with Latency and Reliability Guarantees by Mohammed S. Elbamby, Cristina Perfecto, Chen-Feng Liu, Student Member, IEEE; Jihong Park, Sumudu Samarakoon, Xianfu Chen, Member, IEEE; and Mehdi Bennis, Senior Member, IEEE.

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For more information, please visit https://www.gofoton.com/.

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Go!Foton’s spreadable PEACOC cassette provides operators with greatly enhanced tool-less accessibility to fiber connections, especially in high-density implementations.
Data centers are becoming more complex due to higher network speeds, spine leaf network architecture, and the use of parallel optics. This growing complexity can cause problems in managing network cabling infrastructure because the use of advanced technologies leads to a larger number of connections and connected devices. The recently published BICSI 009-2019 standard for Data Center Operations and Maintenance listed automated infrastructure management (AIM) systems as a recommended management tool for data center cabling infrastructure to help address these challenges.

Fiber Management for the Future

By Michael German and LeaAnn Carl
AIM systems can capture the details of optical fiber cabling characteristics (type, capacity, polarity, etc.), along with automated tracking and documentation of connectivity changes, and can present this information at a central console. Now, AIM developers can also integrate augmented reality (AR) technology into these systems. This can improve the efficiency of conducting maintenance and troubleshooting tasks, and add the ability to provide contextual information, either in the form of overlaid instructional images or an interactive interface, at the location where the work is done.

AR in the Real World

AR is already being used to provide on-the-spot information or supplement or replace traditional manuals and training techniques in many industries.

- **Porsche began testing AR in the factory in 2016.** Their internal AR initiative uses highly sophisticated lasers to scan finished parts, including full vehicles, and compare them against specifications stored in the cloud. Porsche’s QA technicians, positioned on the production floor, then use tablets to capture images of any questionable parts or obvious defects. The tablets use digital, AR-generated overlays to verify the technician’s work and to help determine which parts pass inspection and which ones need more work.

- **At a GE plant, workers use AR to inspect gas turbine nozzles.** The process requires more than 100 precise measurements and using AR has reduced the time it takes by 88%.

- **At an Airbus factory, workers wear smart glasses to precisely position cabin seats and furnishings on commercial jets --** resulting in a zero error rate and a 500% improvement in productivity.

- **According to a survey, “Atheer 2019 Enterprise AR Readiness Survey”, conducted by AR company, Atheer, in September 2018, 53% of respondents from companies with at least 1,000 employees said: “...they were testing or imple-menting AR with limited and/or local scope, while a further 13% were at the stage of having enterprise-wide AR solutions under deployment/in operation.” In the same survey, 70% of respondents said they expected AR adoption in their organizations within the next 3 years.

Now, let’s explore how AR and AIM systems may work together in the future to achieve similar results in the data center.

AIM Defined

According to TIA standard ISO/IEC 18598, an AIM solution is an “integrated hardware and software system that automatically detects the insertion or removal of cords, documents the cabling infrastructure including connected equipment enabling management of the infrastructure and data exchange with other systems.” AIM products like CommScope’s imVision® give IT managers the ability to monitor and assess every aspect of their network infrastructure -- from tracking down a stranded switch port to troubleshooting a connectivity issue -- in a fraction of the time it would take to do it manually. Located in a data center, AIM solutions can remotely show where ports are located and how and where they are connected.

IT professionals must handle network topology changes, scaling, outages, security, and other issues, all while trying to maintain or reduce operational costs and improving efficiency and performance. AIM systems address these challenges by reporting the state of the network along with any changes made over time. These systems “know” exactly what cables are live in the network, what speeds they support, which ports they connect, and where they are located.

In addition, AIM systems are unique in their ability to document and monitor one-to-many connectivity, which is critical with the advent of multi-fiber array connectors that are becoming a common practice in supporting 40G, 100G, and 400G, network speeds.

AIM systems also ensure proper fiber polarity rules, eliminating time-consuming troubleshooting tasks of polarity issues.
AR Will Soon Add Value

AR is a valuable addition to AIM systems because there is a gap between the wealth of digital information available to us and the physical world where we apply that information. In a data center, the AIM system knows how network equipment is connected, where network equipment is located, which connections are carrying live data, available rack space, and port capacity, as well as availability of ports with specific network services.

However, transferring that information to a tech tasked with implementing connectivity changes involves using either a computer or a mobile device to associate information on a screen with real equipment in the data center. This process is not ideal since it could easily lead to errors.

AR addresses this issue by providing contextual data, images, and even video, at exactly the place where the technician needs it. For example, by pointing an AR-enabled AIM device at a switch port, the tech can display connectivity information for that port, including connected end points. Then, by pointing at a switch, the tech can display relevant switch operational data, like the number of ports in use, maintenance records, and more.

There are quite a few practical use cases for combining AIM systems with AR to increase data center operational efficiencies, reduce the number of errors, and improve documentation quality.

AR Developments

In most studies, enterprise customers don’t believe that the hardware and software are yet ready for AR. AR devices can be heavy, battery life is too short in many cases, and image recognition isn’t accurate enough yet. For example, in a data center, an AR device needs depth perception capabilities to distinguish one cable from another -- which points to 3D imaging technology that hasn’t quite yet arrived.

Large players like Apple, Facebook, and Google, are accelerating efforts to develop AR engines and integrate AR capabilities into their hardware. And in March 2019, The Khronos Group announced the ratification and public release of the OpenXR 0.90 provisional specification for royalty-free standards related to AR and VR devices, collectively known as XR.

This means software makers will know how to make software that runs quickly and efficiently on various kinds of VR and AR hardware. AIM vendors are preparing for the future by extending their software’s application programming interfaces (APIs) so they can interact with AR systems, and vendors’ R&D departments are keeping up with the state-of-the-art so they can prepare their AIM systems to deliver the right information.

AR significantly increases the value of AIM data by putting it out in the network, where, and when, the technician needs it. AIM manufacturers are

“IT professionals must handle network topology changes, scaling, outages, security, and other issues, all while trying to maintain or reduce operational costs and improving efficiency and performance. AIM systems address these challenges by reporting the state of the network along with any changes made over time.”

AIM With AR Use Cases

Consider the possible options for telecom service providers to employ AIM and AR across the network. Just a few options to explore include:

- Indoor navigation to locate network equipment in the data center.
- Virtual circuit tracing, including tracking fiber cables through the conveyance system.
- Identifying equipment with alarms, displaying alarm details, and providing instructions for alarm resolution.
- Automated asset auditing to detect differences between installed equipment and documented equipment using AR devices, and automated documentation updates to reconcile the differences.
- Remote assistance to engage experts to assist with troubleshooting uncommon problems.
already incorporating AR into their products, and we can expect increasingly sophisticated systems in the future.

AR technology is changing rapidly, and it is just a matter of time before it is mainstream. For data center and network operators to be ready to take advantage of AR tools, they need to collect detailed data and information about the physical network and cabling locations. Investing in documentation and an AIM system now will pay off when the AR future arrives.

Michael German is the Global Technical Director with CommScope. During his 30-plus year career with AT&T Bell Labs, Lucent, Avaya, and CommScope, Michael was involved in the development of a broad range of products from fiber optic transmitters and repeaters to structured cabling systems. Michael’s contributions include the development of CommScope’s imVision, an AIM System. His innovative work produced more than 50 patents. He holds a Master of Mechanical Engineering degree from Columbia University and a Bachelor of Science degree from New York University Tandon School of Engineering. For more information, please visit https://www.commscope.com/.

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