Safety in Focus

New Tools, Process and Technologies during the Pandemic

by Jim Walsh, Solutions Marketing Manager, VIAVI Solutions

COVID-19 impacted all aspects of a service provider's business, but using new processes, tools and technologies to keep customers and technicians safe during the pandemic became the dominant #1 focus, replacing the relentless drive to reduce costs.

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Jim has been a frequent panelist at SCTE Cable-Tech Expo and other international cable events. Prior to VIAVI, Jim held various engineering and quality management positions at Intel and Delphi Automotive Systems. Jim holds both undergraduate and MBA degrees from Purdue University, is a Six-Sigma black belt and the holder of six US Patents.

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Introduction

It goes without saying that service providers are facing unprecedented challenges as they struggle to turn up an influx of new broadband subscribers, along with meeting surging network demands, while keeping everyone safe during this global pandemic. There is no established playbook to follow for these types of once-in-a-lifetime events, but operators have done very well at adapting 'on the fly' to keep us all connected with their services when we needed them most. The adaptations that made this heroic achievement possible are the focus of this article.

There has been plenty of material covering how broadband services changed during the various stages of the pandemic. Almost overnight, demand spiked by 100% or more as schools and places of employment emptied out replaced by eLearning and working from home.

Networks were generally well-prepared to handle the 30-80% spikes in downstream traffic, but they were challenged by the up to 150% increase in peak demand in the upstream. On top of the increased demand, the criticality of service quality also spiked. Where upstream congestion previously caused slow uploads of YouTube videos, it was now causing videoconferencing disruptions. Brief outages changed from minor annoyances to full-blown crises as critical meetings were missed by home-workers. These changes in demand, combined

with the restrictive new work practices required to minimise technician risk, created an environment where operators were forced to quickly adapt and adopt new tools and processes.

"Stay safe" is the new "save money"

While nearly all aspects of service providers' businesses were impacted by this event, the Technical Operations (Tech Ops) staff faced perhaps the greatest challenges. Safety has always been important but figuring out how to keep customers and technicians safe became the dominant #1 focus, replacing the relentless drive to reduce costs. Technicians were immediately barred from entering customer homes and businesses, disrupting most installation and repair processes.

Even those not on the front line were impacted as normally staffed facilities were emptied out as service providers' employees began working from home. Despite the restrictive work practices and challenges that they faced, services still needed to be installed and maintained.

How operators are safely keeping customers connected

While approaches taken by operators differed somewhat, there have been four pillars commonly observed:

1. Don't dispatch to a home unless absolutely needed.
2. Don't enter a home unless absolutely needed.
3. If entering – get in, fix it right, get out fast.
4. Stay safe in the outside plant.

Don't dispatch to homes or businesses unless absolutely necessary

When a customer calls in with a complaint, there are three discrete situations which may be in play:

a) There is no issue with service to the customer CPE.

b) The is a problem at the CPE, but others similarly impacted (root cause is NOT in customer's home).

c) There is a problem at the CPE and is unique to that home.

Far too often, the default action to a customer complaint is to assume the third scenario above and dispatch a tech to the home to investigate. While the root cause of many customer complaints resides at the customer premises, many do not. Dispatching to the home creates unnecessary risk when the problem falls into the first two scenarios above and also annoys the customer.

Driven by the need to avoid home visits, many operators are placing increased emphasis on remote analysis to first confirm a problem at the customer's CPE and then rule out scenario (b)

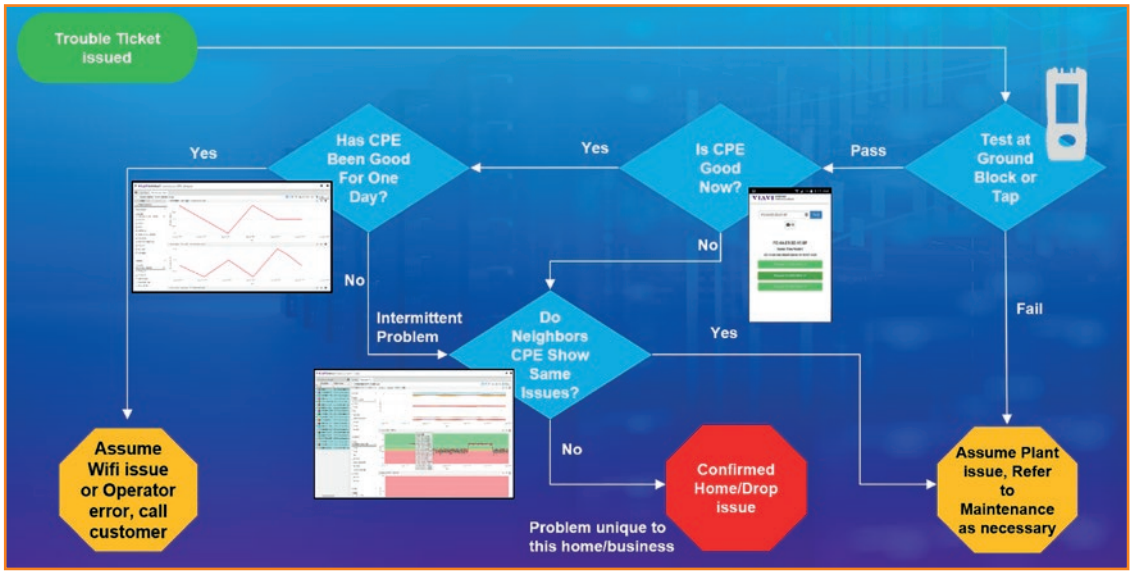

Figure 1A: Typical process

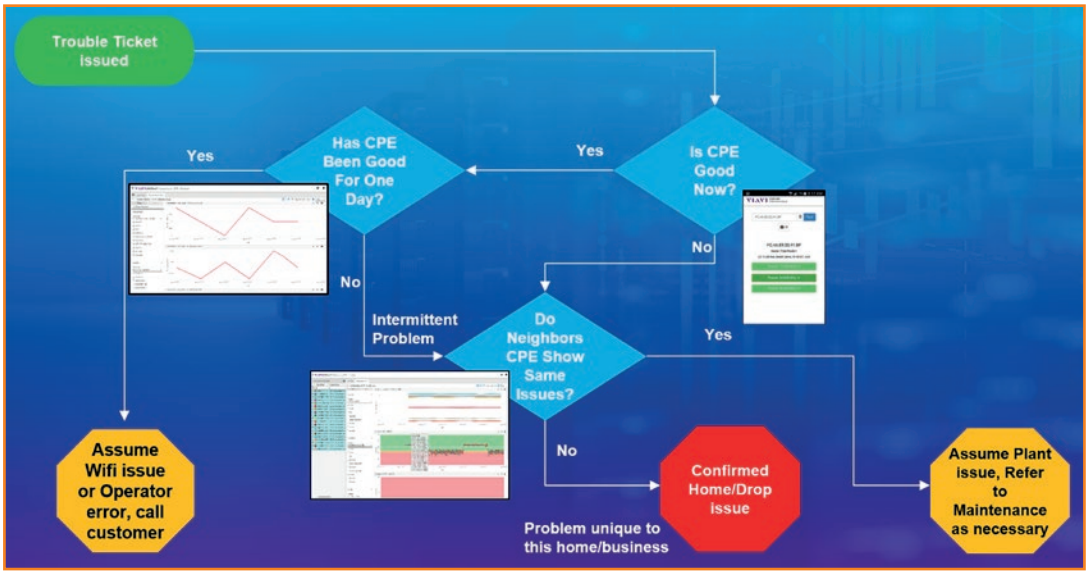

Figure 1B: New process

before dispatching techs. Commercial tools are available which simplify this analysis and can provide high-confidence triage between home and plant issues. In cases where the existing tools/processes needed to make this pre-dispatch analysis are too manual/complicated for a typical customer service rep, select service techs are being pulled in from the field to do this work. While it is painful to lose a couple of your star techs from the field, the time that they save by avoiding unnecessary dispatches makes it well worth the compromise.

Some service providers have taken this a step further to help separate service issues and application problems. According to NordVPN, there has been a 165% increase in business VPN usage since the start of the pandemic. Despite the fact that VPN services are most often provided by a customer's employer, broadband providers are generally guilty until proved innocent when subscribers experience VPN issues.

To combat this, operators are enabling customers to employ temporary virtual agents to their CPE, allowing the operators to perform extensive testing on the entire service delivery pipe up to and including the CPE to definitively separate service from application problems.

Don't enter home unless absolutely needed

There are times when a technician must be dispatched to a customer home or business, but that doesn't mean that they have to go inside to resolve the issue.

One tool that is frequently used outside a home is pressure testing. With this technique, a transmitter is connected at the drop or ground block transmitting a 40 or 60dBmV signal into the home. A field meter with an antenna is then used to walk the drop and/or home perimeter to determine if there are weaknesses in the RF shielding and, if so,where.

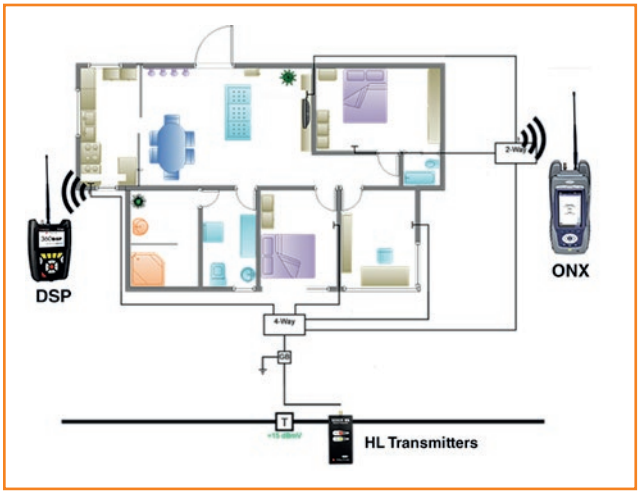

Figure 2: HL diagram

Even modest leaks inside a home can be detected from outdoors, so this test can be valuable to determine if home entry is needed to fix large leaks. Failure to fix these weaknesses can result in the home being an ingress source that can take down services for the entire node. Pressure testing drops have been found to reduce unnecessary drop replacements by 95% and escalations by 10%.

Service installations have traditionally required a home visit, but this too is changing. Service providers are generally using a combination of these options for service installations to reduce risk:

- **Self-Install "Ship and Hope"** – Operator ships needed CPE/cables/etc. to the customer with instructions on how to install. If they encounter problems, they are instructed to call the help line.
- **Assisted Self-Install** – Technician drives to customer home, pressure tests the drop and home from outside, and checks to ensure that services are good to the customer home demarcation point. They then drop all needed CPE/cables/etc. on the customer doorstep and remotely walk them through the installation from outside, often with the assistance of augmented reality apps like TechSee.
- **Business as Usual** – Where local health regulations allow, some operators are sending technicians into customer homes to perform installations. Various levels of health screenings are required on the technicians' part and, in some cases, on the customers' part before these occur.

If entering – 'get in, fix it right, get out fast'

There are times when entry into the home cannot be avoided, but the risk can be reduced significantly. The key in this case is to minimise the amount of time spent inside a home while ensuring that a second visit won't be required. Pressure testing and remote access are two key tools to accomplish this goal.

- **Pressure Testing:** If a significant in-home leak or other issue drives home entry, pressure testing is recommended to quickly find faults, minimising time spent inside. Studies have shown pressure testing to reduce time to fix by 5x on average. Pressure testing can also ensure that there are no other hidden issues which could drive a repeat visit.
- **Remote Access:** Installers are often among the new technicians within a service provider or contractor company and may not have extensive experience in interpreting test results. Rather than escalating and requiring a second visit, newer techs can be remotely coached by more experienced techs who remotely access their instrument. Remote instrument access is perhaps the most widely adopted technique for reducing technician risk. Many of the leading meters enable users to remotely access and control the instruments from afar over wireline, wifi or Bluetooth connections. Expert guidance from afar is often enough to help new techs through common questions - customers will be happier if services are running when the tech leaves and everyone wins if a second visit is not required.

Stay safe in the outside plant

Maintenance techs generally have fewer direct interactions with customers, but that doesn't mean that they are insulated from the same risks. Particularly in dense urban areas, maintenance techs come into close contact with others as they walk between their truck and network components. Service providers are taking steps to minimise the number of times that these techs must go into the field, and when they do to ensure that the trip will be productive.

Proactive Network Maintenance (PNM) tools, based on the CableLabs standard, are an excellent example of this. With PNM tools, operators can remotely direct technicians to a location very near the root cause of issues which manifest as:

- Upstream impedance mismatches.
- Downstream LTE/FM ingress.
- Downstream ripple, notches etc.

Similarly, systems which look at service impacts and degradation based on network topology can remotely pinpoint root cause issues, minimising the time that technicians spend finding issues instead of fixing them.

Interest in signal leakage technologies is also surging during the pandemic, as these tools allow touchless detection of shielding weaknesses as techs drive between jobs. Only after the central server has quadrangulated the various detections captured from routine driving to the precise location of the fault does the tech have to leave their truck. Time in the field is minimal as highly directional antennas can quickly point them to the exact source.

Typical Remote Instrument Access Use Models

- Experienced users remotely assisting new technicians to understand test results and not require a second visit later to retest or properly repair an issue.
- User enters home and connects instrument, exits and drives all testing from outside the home, minimising time spent indoors. This is especially common when repairs are required on the home exterior wiring, including the drop.
- Leave behind instrument – If measurements are frequently needed from inside a previously-staffed service provider's facility, an instrument can be wall-powered and accessed remotely (removing the need for a person to enter the facility).

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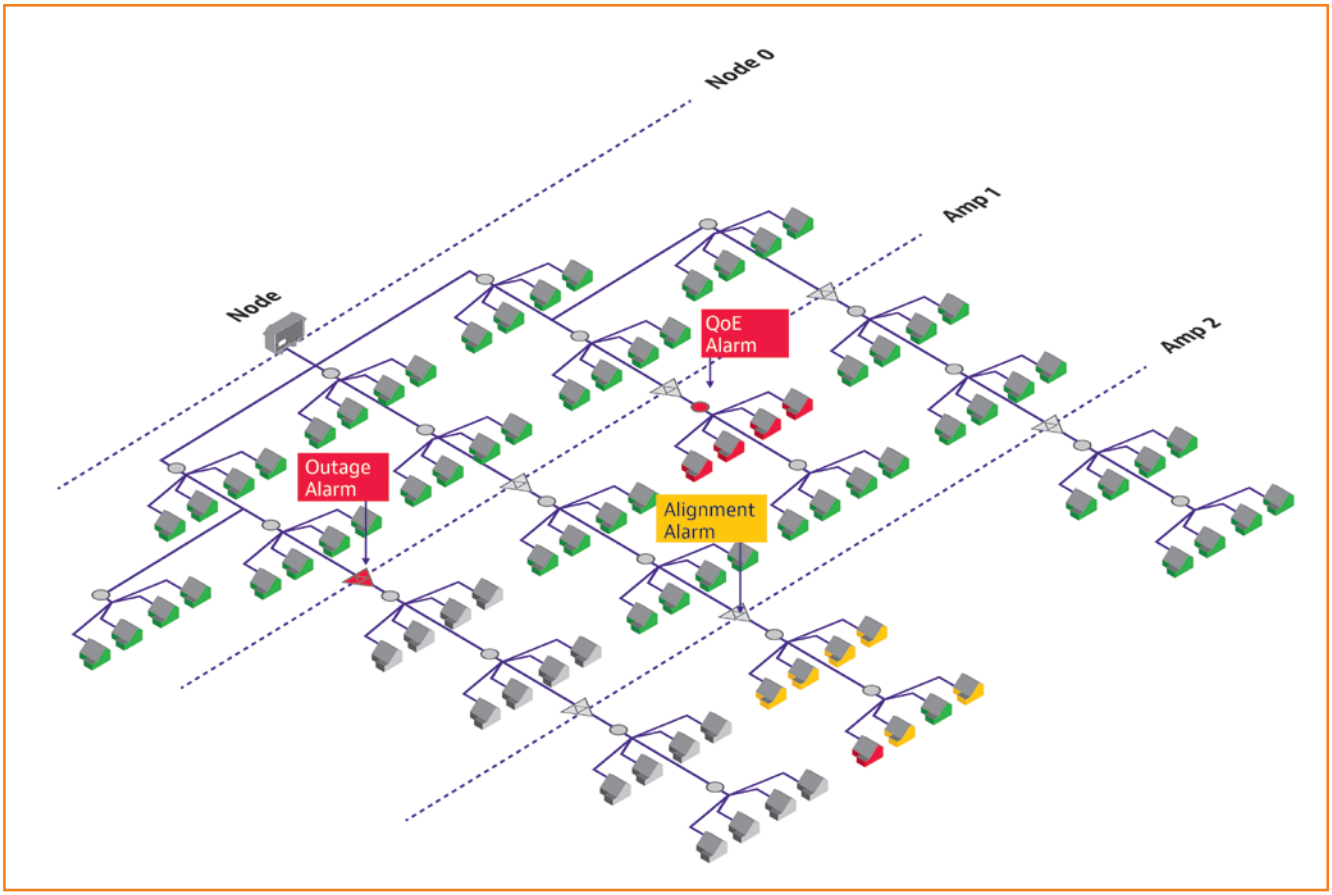

Figure 3: Topology-based network analysis

Operators using signal leakage technologies typically spend far fewer maintenance tech resources on ingress remediation and typically have higher-performing networks. Service providers implementing leakage technologies have seen upstream codeword errors drop by over 75% while also seeing 50% reductions in low SNR nodes, all while reducing risk for maintenance technicians.

What's next?

Once the smoke clears from this global pandemic, we will all settle into the "new normal". Some of the initial consequences of the situation that we were all facing will not completely go away when the urgency of the current situation fades. Many major corporations have seen benefits from the 'work from home' model for certain functions and plan to continue it indefinitely. Adoption of online learning as an acceptable alternative to in-person classes has also increased.

Service providers who adopted remote test tools and processes out of necessity have found some of them to be worth continuing for both risk reduction and cost reduction reasons, even when the original drivers are largely gone.

While necessity has driven even the most risk-averse operators to rapidly investigate and implement radical changes to their processes to maintain critical broadband connectivity for their customers, the lessons that have been learned will continue to benefit them well after this current threat has gone away.