ZCorum™

The Benefits of PNM

Find and resolve issues in the cable plant before they impact subscribers

Introduction

DOCSIS Proactive Network Maintenance (PNM) is a relatively new tool for cable operators that allows them to find and resolve issues in the cable plant before they impact subscribers. For most of the history of cable plant maintenance the default methodology was a break-fix one, where most issues were addressed after reports were received from customers that their service was affected. PNM is a proactive methodology that uses data collected from the CMTS and connected cable modems to identify hidden impairments and their locations before they cause degraded service or an outage for one or more subscribers.

How PNM Applications Work

A PNM application analyzes cable modem data using simple network management protocol (SNMP). Using a number of algorithms, the application collects and analyzes several sample points from a cable modem's upstream frequency response to find impairments that are impacting the upstream cable plant, like group delay and micro-reflections. Through analysis of this data, it can also estimate the distance of the reflection that is causing the impairment.

Most PNM applications also plot all cable modems on a map, assuming address information is included and the application supports geo-location. Usually the application also color codes the devices on the map depending upon the severity of the impairment (such as red, yellow and green). This information significantly helps maintenance staff determine which subscribers or areas to address first. The automated analysis of frequency response data and the echo cavity length, along with the location of the devices that are impacted, also allows the operator to limit the area searched when looking for the source of the problem.

Benefits

A PNM application is a tool that gives a service provider a wealth of information that allows them to address issues in advance, rather than after service is impacted. However, like any tool, it needs to be effectively utilized to achieve any of the potential benefits of Proactive Network Maintenance. And, there are many benefits.

Reduced Operational Expenses

Taking preventative measures certainly costs less over time than dealing with problems after they develop. A PNM application allows you to plan when you will fix known issues so that you can minimize truck rolls and make the most efficient use of your technicians in the field. Over time, service providers have seen a 10 to 40% reduction in truck rolls depending on the features of the PNM application and how effectively it is utilized and incorporated into day-to-day operational processes. In addition to a reduction in truck rolls, proactive maintenance with a PNM tool leads to a similar reduction in the number of subscriber support calls to the Call Center. Obviously, the effective use of PNM can lead to significant OPEX savings.

Efficiently Target In-home and Near-home Issues

A PNM application will show you which customer devices are being impacted by an issue that is likely in the home or near the home. Color-coded map pins and signal quality data can quickly show you which are the worst performing devices. This allows you to methodically address the worst issues first, reducing the likelihood of customer downtime and complaints in the future.

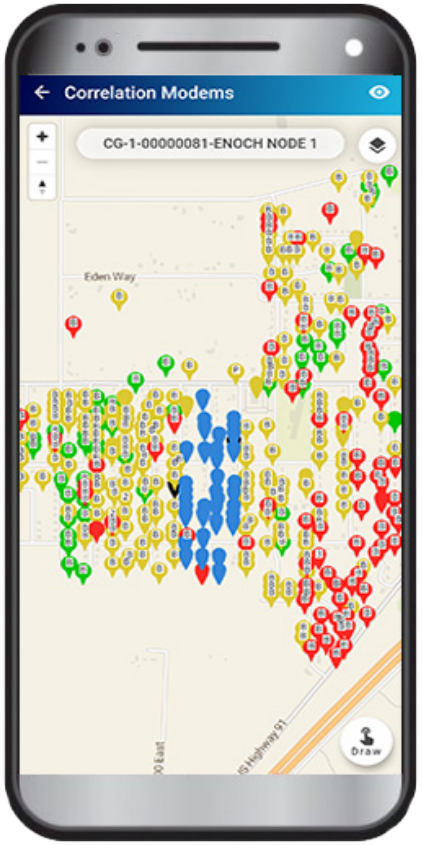
Locating Sources of Ingress

Cable operators are constantly fighting return-path noise and ingress. Some PNM applications are able to identify cable modems being impacted by nearby ingress points that are allowing noise to leak into the upstream cable plant.

Noise can leak into the return path from something as simple as a loose connector on the back of a customer's modem, or possibly a loose, corroded or damaged connector at the tap or DMARC. Another source could be compromised coax shielding inside the customer's home or at the drop. Ingress issues are often intermittent, so a good PNM application will show you over time which devices are being impacted by nearby, intermittent noise.

Quickly Address Outside Plant Issues

An outside plant issue can affect the quality of service for multiple subscribers. Some PNM applications can determine if a cluster of modems are being impacted by the same hidden impairment. For example, some will analyze nearby modems to see if any are adjusting their internal equalizers in the same way in order to overcome the same upstream impairment, like a micro-reflection or group delay. The application then identifies those affected devices on the map and gives an estimate of the length of the reflection caused by the impairment. The technician can then check the map to see which segment of the cable plant is affected. That information, along with the approximate length of the reflection further narrows down where to search on that segment. Some PNM applications even allow the operator to add their strand map as a map layer. This overlay on the PNM map would show the distance of cable runs, and the location of actives and passives on the segment, which makes it easier to identify potential reflection points and the source of the problem before ever leaving the office.



Some applications can leverage the Full Band Capture capabilities in cable modems to analyze the downstream spectrum response from nearby modems, and then plot on the map any modems experiencing common issues like standing waves, suck-outs, and roll-off. Finally, the most advanced PNM applications can show clusters of modems on an OFDM channel that have the same RxMER response. These features allow technicians to find and address common impairments that could potentially cause degraded service or a future outage for multiple subscribers.

Improved RF Signal Quality

Over time, the use of a PNM application will significantly improve the RF signal quality in a cable plant. This is especially the case if the application has features that allow you to locate ingress in or near the subscriber's home, which is where well over 80% of noise enters the return path. All noise that enters the return path heads towards the CMTS, and this can impact all customers on that upstream. By proactively and methodically targeting upstream impairments, especially in-home and near-home ingress sources, you will improve the RF signal quality and experience for all subscribers.

Reduction in Unplanned Outages

A PNM application lets you see developing issues before they impact subscribers, and we know those issues do not get better over time. By addressing impairments in your plant proactively, you will minimize the occurrence of unplanned outages that would otherwise occur. In addition to the reduction in operational costs this provides, this will mean a better experience for your subscribers and a higher level of satisfaction with your service, both of which can lead to a reduction in churn.

Monitor Upstream Spectrum

Some PNM applications include an upstream spectrum analyzer that allows you to view the live return-path spectrum passing through the CMTS on any channel. More advanced applications also provide historical snapshots of the upstream spectrum so you can monitor changes over time. This feature does not require any expensive equipment, special cabling or splitters in the headend. All you need is your CMTS. And, if the application has a mobile app, your headend staff or field technicians can view the spectrum charts anywhere they have internet access.

View Downstream Spectrum

Some applications support the ability to view the downstream spectrum passing through the cable modem using the full-band capture capabilities now supported in most CPE. You can view the full spectrum for all video and data channels right on your PC, laptop, tablet or smartphone. There are no expensive probes required in your network, and there is no need to send a technician into the field with a meter in a trial and error search for the problem. They can narrow down the search sitting in their truck, or before they ever leave the office. Some applications also provide a list of devices experiencing common issues like Suck-outs, Roll-off, Tilt, Standing Waves, Adjacency, Resonant peaking and FM Noise, allowing you to proactively address these downstream issues. Being able to remotely and proactively view downstream impairments impacting subscriber devices lowers equipment and operational costs and reduces mean-time-to-repair.

More Resources

Finding Ingress Video

Case Study: Sweetwater Cable TV Uses Pre-Equalization to Find Elusive Impairments

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