White Paper

Converged Cable Access Platform (CCAP) to the Home

Creating more services for customers and lower costs for operators

CCAP is getting a lot of attention due to its ability to reduce costs for operators and better meet bandwidth needs for IP-based traffic. CCAP will align networks with the ways today's customers are using cable services.

In the network headend, the area between the plant and the customer, operators have begun to look at different ways to replace edge quadrature amplitude modulation (edge QAM) and cable modem termination system (CMTS) units. They are looking for ways to increase bandwidth and make networks more dynamic, all in an effort to handle data and unicast traffic that is growing exponentially.

How does CCAP extend to the home, adding capacity and flexibility to provide new and improved services? This paper discusses the benefits of CCAP in the home, including what this new environment will look like from the customer and operator perspectives. It will address implementation methods, showing the different stages of deployment in the home and what advantages are created for operators at each stage. Finally, it will cover testing, including what challenges CCAP creates for testing and how the industry is addressing these challenges.

Benefits

Customers are using more bandwidth than ever before. Most homes today have multiple devices trying to access cable networks using a variety of technologies. Where typical homes used to have one or two televisions as their main point of entertainment, they now have smart TVs, tablets, smartphones, and streaming video boxes such as Roku, Apple TV, or Chromecast. Many families are trying to use many, if not all, of these devices at the same time to access completely different applications.

Many houses also use cable, Ethernet, and/or WiFi to connect devices and access the Internet. This puts a tremendous strain on networks and creates a complicated technological environment inside each home. In addition, one of the biggest challenges for operators has not only been keeping up with bandwidth demands, but also finding a way to provide more services to customers as their appetite for applications and new technologies change.

CCAP has the ability to solve many of these issues. Once CCAP is fully implemented in the headend, the cable network becomes CCAP-enabled all the way to the home. This allows for a consolidated enablement of advanced services that will provide more of what customers want along with streamlined delivery for operators.

Current cable networks must manage analog and digital channels while keeping certain channels open for DOCSIS (data) traffic. However, in a CCAP network, all channels become digital; and all traffic becomes IP-based. This allows for a more simplified network that is able to change dynamically as customers change their usage.

Some of the first changes customers will see include channel guides accessed from the cloud. This will give customers more options within the guide and faster response times as they browse the guide's extensive library of information. Video on demand (VoD) will also become cloud-based to provide more real-time movie options.

Interactive sessions will also become more prevalent, allowing live Twitter chat feeds to display as an overlay on TV shows. This is becoming especially popular with customers watching reality TV shows. And, since all traffic entering the home will be IP in nature, it will be much easier for devices to communicate with each other and share data. For example, a customer can watch a TV show on a smart TV in the living room and transfer the show to his or her tablet to finish watching the program in the kitchen.

A CCAP-enabled home is also a benefit to operators. In the past, operators had to invest a lot of time and money to test a new service in a particular market. If the test was successful, the operator could make a profit from that service, but might have lost valuable time getting it to market. If the test was a failure, large amounts of money are usually lost.

With CCAP, operators can turn up and test new services in near real time, as soon as they become popular. Operators can also test the service in very small markets, or even down to a node-by-node basis depending on customer demographics and geographic demands. For example, operators can test services such as gigabit-to-the-home on a node-by-node basis in cities where the network can handle such capacity and specific customers that use large amounts of bandwidth can be targeted.

In this scenario, operators can seize an opportunity at the beginning of the customer demand curve in order to profit throughout the full life cycle of a service. demand for a new service is not what an operator had hoped, minimal money and time will have been spent on the test. In essence, CCAP will give operators the ability to test new services at the right time, with fewer installations of proprietary "heavy-iron" hardware dedicated to a single purpose.

Implementation

CCAP to the home will have many of the same benefits for operators as its counterpart in the headend, but the hardware requirements will not be the same. Since the network will be CCAP-enabled all the way to the home once CCAP is installed in the headend, no new hardware will be needed outside of a customer residence. What will change are the set top boxes located inside the home.

Many cable operators are already replacing old hardware with new, cloud-enabled boxes to meet the changing customer needs. By combining the modem, WiFi, DOCSIS, and video capabilities into one solution, the new boxes create multimedia gateways that let an array of devices share multiple types of media.

Operators using a distributed method for deployment with higher-density edge QAM units can turn up new cloud-based channel guides. VoD and DVR capabilities will also be cloud-enabled at this point, making it easier to send content to any device. For cable providers, the real change will happen when they replace CMTS with CCAP core chassis for the distributed model or the edge QAM and CMTS are replaced at the same time in the integrated deployment model. In this case, the network becomes simpler and more intelligent. Operators can turn up new services in near real time on a node-by-node basis—something that currently takes up to 18 months to do manually.

Testing

Although the network will become simpler, testing within the home will be more complicated. With multiple video sources, along with more devices connected to the network, technicians will have a more difficult time troubleshooting issues. Is the problem with the WiFi to the device? Is it a video issue to that device?

One of the biggest changes in testing will be dynamically adapting to the changing service delivery known as the channel line up. In the past, the channel line up was set manually and changed slowly over time to meet certain needs. The rate of change was usually slow enough so that the operator could label a channel to match the content. For example, labeling channel 2 as ESPN let a technician easily tell if a problem was with the content or the channel itself.

With the migration to all-IP networks, new problems arise. CCAP provides the ability to easily turn on more digital carriers as well as to change carriers automatically. For example, to accommodate 1 GB data service and video over DOCSIS, traditional video carriers may be converted to DOCSIS carriers. The adaption to more data carriers could also happen on a node-by-node basis to accommodate different bandwidth and targeted market rollouts of high-value services.

This means that technicians will no longer be able to rely on a single channel line up for testing. Each neighborhood or node may have a different line up and therefore need test equipment that has the ability to adapt to new line ups in a real-time fashion.

Another challenge will be isolating and identifying quality of service (QoS) issues. With analog TV, a technician checks the carrier quality and if the quality is good, then the customer's picture should be clear. But if the quality is bad, the technician needs to track back the issue to a demarcation point so the proper group, such as the network technicians, can fix the problem.

However, with CCAP to the home, new multimedia gateways are created. These gateways not only receive DOCSIS and QAM traffic, but also provide video services within the home as IP-based services over Multimedia over Coax Alliance (MoCA), WiFi, and Ethernet. This creates a new level of complexity when determining where the customer experience is breaking down. Was the content good getting to the home? Is the problem within the home? Is the problem the customer premise equipment?

For this new complex environment, technicians need new testing solutions that can simultaneously look at the physical layer, transport layer, and packet layer. A technician needs to move through the demarcation points and determine where the problem resides. Solutions must also let technicians look at multiple incoming services to ascertain if one of them is causing the problem.

For example, IPTV over WiFi as a primary service opens up a new set of problems for technicians since the wireless RF physical medium is an uncontrolled, dynamically-shared medium. Basic service level tests of signal strength are not enough to assure that the channel will be good. Testing of wireless can be complex since it can involve spectral analysis combined with transport and packet-layer analysis.

Under these conditions, new WiFi testing solutions need to provide sufficient, useful, and actionable information. This is where testing multiple layers simultaneously becomes a great benefit—testing the physical layer (RF), transport layer (802.11), and packet layer (L3+)—letting the tests guide a technician to the cause of a problem and suggest resolutions. A similar approach of multilayer testing will probably be applied to services over traditional wired Ethernet as well.

MoCA can also cause problems for the technician in the home. MoCA is the preferred transport layer for cable TV operators to distribute IP video and data over existing coax. Technicians need to be able to determine if the home network is causing MoCA problems, and if so, how to resolve those problems.

Key issues for MoCA include too much loss, too many reflections, interference, or faulty components within the system. Testing for loss, signal quality, and point-to-point connection quality can validate and fix the physical layer. Looking at MoCA rate tables between endpoints can test the transport layer, while running stress and capacity tests over MoCA connections to validate actual performance can test the service layer.

New testers are in development that will help in all of these situations by giving technicians one-stop tool kits for the home to quickly set up new services and troubleshoot issues. Where separate testers are currently used for each service, new testers will keep up with the automatic nature of the CCAP environment and troubleshoot and locate problems within the home— whether the issue is QAM video, DOCSIS, IPTV, or WiFi related.

This greatly reduces the amount of work a technician must do within the home, saving valuable time and reducing costs for operators. In this new environment, technicians must also become proficient with all four technologies since CCAP blends them into one solution.

The new testers should be available within the next year. Since CCAP itself isn't expected to reach full-scale deployment for another year or two, the timing should be ideal.

Conclusion

CCAP to the home will provide great benefits to customers and operators alike. For customers, CCAP will create faster, easier-to-use services that will let all of their devices work seamlessly with each other. For operators, a more automated network that dynamically changes to meet customer demands will greatly decrease QoS issues and provide the ability to economically offer services in a "just-in-time" manner.

As operators choose where to rollout CCAP on a headend-by-headend basis, CCAP to the home can be implemented with the same precision so that operators are only investing in markets that will have an immediate financial return. New testing solutions also help to streamline the deployment process and reduce costs for operators moving forward. The end result will be a simplified, intelligent network that meets the needs of customers and operators for years to come.