Network Management System Advantages and Implementation

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The emerging technologies that place greater and greater demands on our present day CATV Networks must also provide easier and more cost-effective ways to manage and control them. As CATV companies derive more of their income from PPV and other transactional services, network reliability grows from merely important to imperative. Historically, Network Management Systems (NMS) were not cost effective and provided no control of the CATV system. Fortunately as fiber moves closer to the home newer architecture's and Network Management Strategies become much more viable. In the new networks based on new architectures, Network Management Strategies become an integral part of the overall system design. By using sophisticated Network Management software and hardware in these new system architectures, network down-time can be virtually eliminated and system maintenance costs dramatically reduced. This paper will discuss the implementations and advantages of state of the art CATV Network Management Systems.

Network Management System Advantages

NMS systems are cost effective ways for allowing CATV systems to reach high performance goals and achieve optimization of valuable resources. As the revenue stream generated by transactional services becomes an increasingly larger portion of a systems revenue generation reliability becomes extremely important. People will not tolerate outages is services such as pay per view, alternative access, and telephony. Since the system operator systems will be unable to bill the customer during network down time, revenue becomes significantly effected if the network is unreliable. Additionally, data and telephony customers will not utilize the CATV network if it is unavailable due to repeated system failures, thus further affecting revenues. It must achieve the same level of accessibility as today's telephone network.

The other key advantage of NMS systems is resource optimization. By doing predictive analysis and using redundant equipment in the correct architectures network down time can be virtually eliminated. In addition by utilizing the above mentioned strategies system maintenance costs can be greatly reduced. The NMS system provides the user with non intrusive visibility into the network, thus providing the user with the ability to predict when a network element is going to fail. The NMS systems enables the user to allocate the correct resource when a failure does occur. By

knowing which element failed, the user can either re-route the flow of information through the network or dispatch the correct resources to deal with the fault. This allows the system operator to maximize the effectiveness of system resources.

Determining A Network Management Strategy

In order to achieve the above mentioned gains, it is imperative that the user plan, design and implement a NMS strategy correctly. The hardest part of implementing a cohesive cost effective NMS system is deciding on the NMS strategy. The NMS strategy can be cut into two distinct sections.

The first section is the network elements that the user wants to monitor. The user must decide what are the important network elements that need to be monitored and how much effort to allocate to the task. There are several key parameters that can be used to determine the importance of a element with respect to what effect it has on the network as a whole. If the element under consideration effects a large portion of the network it is important to manage it. For example a fiber optic transmitter that feeds up to 5000-10000 homes node is probably a good candidate for network management. A receiver that feeds a 500 home node is also a good candidate. Equipment with controllable functions are obvious candidates especially those which provide system operators redundancy is a good candidate, because it can provide the system operator with a means of preventing system outages. Power supplies are another good example of what to monitor because they can have a large effect on the network. There are two more key parameters that are not so obvious. The first is Mean Time Between Failure of the element. If an element under consideration is prone to severe environmental conditions, it might justify the extra cost to be network managed. The final parameter that should be considered is the typical failure mode of the element. If the element fails gracefully over time then the element might warrant being considered so that the system operator can predictavely remove the unit from use before a hard failure, thus causing a service interruption.

In addition to managing network equipment there is additional network elements that should be considered in the NMS strategy. This is equipment that was designed specifically to help monitor the network. For example equipment that allows the user to monitor discrete digital and analog points that can examine air conditioning systems, temperatures, open doors , etc. Another useful NMS system related piece of equipment is an end of line monitor. This piece of equipment allows the user to examine the RF signal almost at the customer premise. These two pieces of equipment must also be examined while forming the NMS strategy . A typical example of how to judge whether a network element warrants monitoring is illustrated below. Let's look at an amplifier. Typically amplifiers do not have the ability to reroute the network

flow. Amplifiers don't tend to fail gracefully. Amplifiers are being removed as fiber is being moved closer to the home, so the amplifier may not be the most optimal piece of equipment to monitor. An alternative strategy that would be more cost effective might be to have a backup link and an end of line monitoring trasnsponder that tells the user the condition of the service after the cascade. This optimization has two distinct advantages. The biggest is that the customer realized no service interruption because the system operator is providing him service through another route. The second big advantage is that regardless of how many amplifiers fail the end of line monitor will tell the user the status of the service. So, in a sense the system operator is monitoring all the amplifiers in this cascade with one piece of equipment. In addition as the user removes amplifiers the investment made doesn't become obsolete, also the user may be able to use this equipment to compile FCC proof of performance data. Once the user has determined which elements to monitor they must then choose the right equipment to enable them to implement their NMS strategy. This task is not as easy as it sounds. Most major CATV manufactures equipment claim to be status monitoring compatible, but what does that mean. The important criteria is does the network element provide enough monitoring and control points to be useful. For example a fiber optic transmitter that doesn't tell me the optical output on the NMS system is of little use. The fact that a unit failed will be instantly identifiable by the number of telephone calls from the subscribers. What's more important is the fact that the optical transmitters power is dropping and it can be determined in advance of a hard failure. In order for a network element to be truly network manageable it must be designed to be network managed from it's conception. Trying to network manage an element that wasn't designed to be managed provides minimal rewards at best. If a unit was not designed with all of it's essential parameters and controls to be microprocessor controlled, then the network management system will be unable to look into the internals of the element to effectively manage it.

The second section that must be examined is the application element. This is the software portion of the NMS system. It is as important as choosing the right elements for fulfilling the NMS strategy. It must be flexible enough to provide the user with all the functions that are necessary. But it shouldn't be overly flexible so that its to difficult to use. The ability to monitor and control the parameters that the network elements provide is the highest concern. The next parameter that the user should examine is ease of use. If the system is not plug and play people will not use it. This is where a point and click user interface becomes extremely important. The user should examine the NMS application element with respect to a typical customer service representative not a systems engineer. It should allow the systems engineer the flexibility to view all the important parameters of each element, while still providing a system overview at all times. Data logging of the network is an extremely important feature to be considered.

There are two type of logging that must be provided. The first type of logging is based on change of state. This would include open housing alarms, A/B switch information, and hard digital alarms. The second type of logging would include analog performance that should be used to perform analysis on element history and performance. Ideally the user would have the ability to set the interval of data acquisition. For example he may decide to log the performance of his elements at 12:00 noon because that's when his equipment runs the hottest or at 5:00am when it's at it's coldest. The ability to remotely monitor the network using readily available dial-up modems is a large consideration. Rather than mimicking the screen and keyboard of the system's computer, the remote software should be able to run independently and not effect the main terminal directly. The ability of the manufacturer to examine the system via the PSTN is another important consideration in determining the NMS strategy. This allows for multiple people to be examining the network and look at different elements simultaneously. Security is especially important if the user is planning to use the remote function. Multiple levels of passwords should be considered to fulfill this requirement.

While the application software is the part of the NMS system the user interacts with everyday. It's the network elements that will dictate how successful the NMS strategy becomes. The NMS system will be a constantly changing system that requires a good base in order to grow with the future. If the above NMS strategies are implemented the user will able to realize great gains in the networks reliability and management.