Constraints in Broadband Networks

Broadband networks in dense housing should be designed and operated to avoid imposing constraints on users.

By David Daugherty and Marty Wold / *Korcett Holdings Inc.*

In the July 2015 issue of this magazine, the authors explored the network performance limitations, or constraints, eventually imposed by legacy infrastructure – that is, static infrastructure not designed to anticipate future use cases.

Most networks do not exhibit constraint-related limitations when first installed. Over time, as technology, bandwidth-consuming applications and subscriber expectations mature, constraints are eventually discovered. This is perhaps the most elegant explanation for the growing popularity of and demand for managed Internet services. Managed services typically include a proactive element of post-deployment support designed to maintain network health throughout its life cycle.

For any recent MBA, this will sound very similar to a management philosophy that Eliyahu M. Goldratt introduced in his 1984 book, "The Goal," which was essentially a manufacturing textbook in novel form. The book's success grew well beyond the factory floor to the C-suite and universities alike, as the principles contained therein transcended manufacturing and changed the way the world did business. Goldratt's theory of constraints (TOC) elaborates on the common saying, "A chain is no stronger than its weakest link." As applied to the design of broadband infrastructure, TOC-based design anticipates the weakest network or support components throughout the service term.

PRACTICAL APPLICATION

As it turns out, TOC-based design is a useful framework for the discussion of next-generation managed services. A network, like any complex system, is made up of a collection of components, each with the potential to become a system constraint. These constraints establish the limits of performance for the system. At the heart of TOC-based design is identifying these constraints and working to alleviate the subsequent bottlenecks in the system.

Goldratt's theory became associated with another catchy acronym, POOGI, or the process of ongoing improvement. A successful managed service provider (MSP) employs this approach in the care and feeding of a broadband network by always striving to mitigate constraints and improve performance.

Performance-limiting constraints typically found in legacy infrastructure include the following:

- Financial
- Business/legal
- Political
- Technology
- Social networking
- Customer expectations and customer support

Financial: Network performance limitations are often due to financial constraints imposed on network design. Multifamily builders, for example, often attempt to value engineer their infrastructure construction budgets to meet project capital and operating expense objectives. This means that project managers recommend budget cuts to communications infrastructure with the aim of increasing the ratio of function to cost. However, if they cut costs without fully understanding the growing importance of reliable Internet access, they can create

adverse impacts on long-term property operations. Thus the net effect of uninformed value engineering over time may include missing occupancy goals.

Business/legal: Business-related performance problems can sometimes be introduced when an ISP chooses or is forced to comply with performance-limiting constraints. One stark example is the procedure required for ISPs to curtail their contingent liability associated with Digital Millennium Copyright Act (DMCA) violations. To qualify for DMCA safe-harbor provisions, an ISP must restrict a subscriber's Internet access and provide and document notification of copyright infringement.

Political: Other performance-limiting constraints are introduced for internal political reasons. One example of a politically based constraint is ISP interdivisional competition for customers. This sometimes occurs when one division of an ISP sells services to commercial customers that simply want large data pipes while another division is trying to sell bundled services to residential subscribers. The residential salesforce may be restricted from selling high-performance services to residential customers at price points that could jeopardize commercial business or margins on commercial sales.

Technology: One common performance-limiting constraint has to do with the evolution of technology. Active network components installed at the beginning of a service term must be state-of-the-art to ensure that acceptable service levels are delivered throughout the life of the service agreement.

As new, higher-capacity computer devices are introduced and new, improved, bandwidth-consuming applications are developed, subscriber demands for bandwidth accelerate. If a network cannot keep pace with expectations, customer satisfaction will drop.

The good news is that modern managed service agreements may offer an option to include network equipment as part of the operational expense. These types of agreements amortize up-front equipment and installation costs into monthly service fees and allow the MSP to deal with any equipment failures in a totally transparent manner.

Social networking: Although not part of network infrastructure, social networking is an important element of customer satisfaction. The net effect of social networking is the reduction of acceptable time to resolve problems. If network problems are not resolved in an acceptable amount of time, subscribers will take to social networking to publicly voice consternation. Deleterious effects on the reputation of property owners and the service providers are typically more expensive than solving the problem or deploying a sufficiently future-proofed network in the first place – again, an argument for reliable managed services.

Customer expectations and customer support: Managing customer expectation is another important factor in the design, deployment and management of infrastructure. A network designed to meet the current needs of subscribers will ultimately fail as the network ages. Even when a network is designed to accommodate demands 60 months in the future, the support organization must understand how the network is being used in real time to provide appropriate levels of service. A very large part of this understanding is based on prompt, courteous, knowledgeable communication between the support organization and subscribers.

What makes providing superior customer support so challenging is that most subscribers don't look much further than the reliability of the network. As with other utilities, such as water and electricity, reliable access to the Internet has become an essential element of everyday life in the United States.
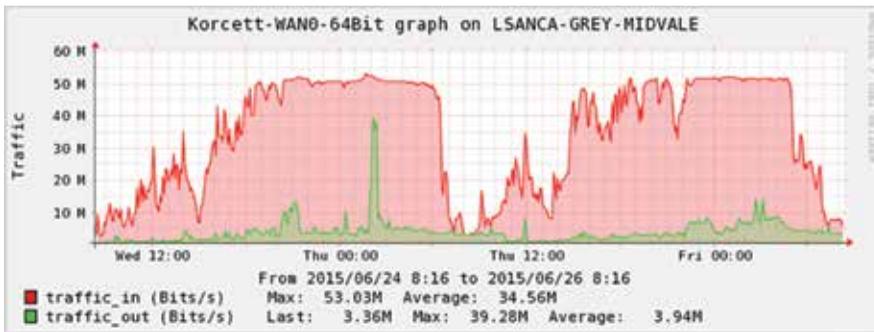
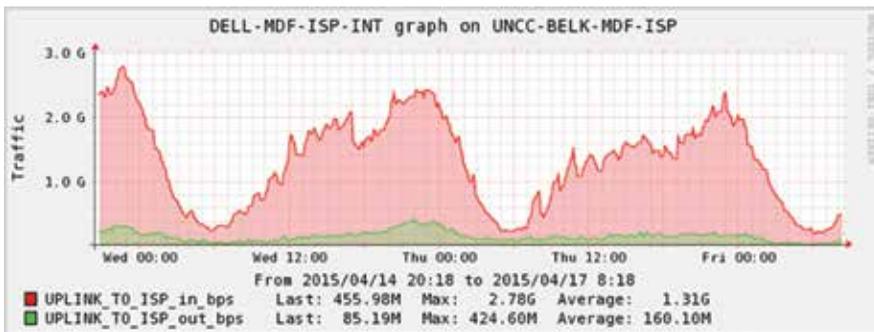Figure 1 – Limitations imposed by capping bandwidth

Figure 2: Unrestricted or uncapped service.

The design and operation of a well-oiled customer support organization, however, is not simple or inexpensive. A property owner should take the time to explore an MSP's customer support philosophy. Ask to see its run books and support metrics. This will show a lot about the kinds of problems encountered and how quickly they are resolved. A property owner unfamiliar with customer support should retain a consultant who has that expertise. This will tell you more about the MSP than any other line of inquiry.

INTERNET HEALTH

Figures 1 and 2, reproduced from the July 2015 article, clearly demonstrate the impact of a technological constraint (bandwidth availability) on the health and performance of a network. Users of the network depicted in Figure 1 are hitting a ceiling during peak utilization periods, and the residents on the network depicted in Figure 2 are provided with unfettered bandwidth access.

An important aspect of next-generation managed services is the ability of the MSP to anticipate and eliminate any constraints that may occur during the service term. Because the end customer may or may not be technically proficient enough to anticipate constraints, this task must be a required element of managed service. It is also important that customers understand that they are purchasing a premium, managed service and adjust financial expectations accordingly.

CONCLUSION

TOC-based design and operations will go only so far. The rapidly changing landscape of broadband services represents a very dynamic and challenging service environment. Translation: Something will eventually break. The real test for any service provider is how quickly it can assess and correct problems. If resolution is not promptly and professionally addressed, the resultant social noise

tends to quickly drown any other kind of feedback. When assessing the quality of any MSP's post-installation support, consider these key factors:

Design standardization: Does the MSP employ design and support standards? Those who sell managed services should understand the importance of design and support standardization. They should be able to tell you how many subscribers are being served, how long standards have been in place and the resulting economies of scale. They should be more than willing to share a wide range of subscriber references.

Network maturity: How long has the MSP been deploying and supporting services within your market segment?

Proactive support services: Perhaps one of the most important aspects of post-deployment support has to do with proactive communication. If an MSP waits to resolve problems retroactively, social networking has evolved to the point where damage to the MSP's and the property owner's reputation is unavoidable.

Proactive support is a relatively new concept and an essential element of long-term customer satisfaction (and ultimately customer retention). It includes a series of proactive events designed to improve communication with subscribers and resolve potential problems before they occur. Proactive support includes periodic reviews of changing technology, periodic reviews of recent trouble tickets and network outages and the tuning or replacement of active network components during the term of the service agreement. ❖

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