



Future-Proofing Cable Networks: DOCSIS 3.0 and Provisioning

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DOCSIS 3.0: The Need for Speed

As subscriber thirst for greater Internet speed and volume remain unquenched, cable operators are under increased pressure to offer higher bandwidth as well as a wider array of services. Increasing threats from telecom service providers, who are in some cases touting up to 100 Mbps service, further amplifies this pressure. With DOCSIS 2.0 offering only a maximum of 37 Mbps downstream and 27 Mbps upstream, this technology simply cannot handle the demands of today's competitive marketplace. It has become apparent that DOCSIS 3.0, with a maximum bandwidth of 160 Mbps downstream and 120 Mbps upstream and its support for future technologies, is the key to overcoming these hurdles.

What is DOCSIS 3.0?

First created in 2006, **Data Over Cable Service Interface Specification** or **DOCSIS** is an international standard developed by [CableLabs](#) that defines the communications and operation support interface requirements for transmitting data over a cable system. It permits high-speed data transfer over an existing [Cable TV](#) (CATV) system and is deployed by many cable operators to provide internet access over existing infrastructures.

DOCSIS 3.0 significantly increases transmission speeds both upstream and downstream and introduces support for IPv6. This is achieved with channel bonding technology, which allows multiple lines to be bonded, thus allowing greater bandwidth.

DOCSIS 3.0 increases maximum transfer rates from 37 Mbps to 160 Mbps downstream and from 27 Mbps to 120 Mbps upstream. It also permits a return path frequency response of 5 MHz to 85 MHz, a vast improvement over the current North American return path spectrum of 5 MHz to 42 MHz. DOCSIS 3.0 is widely recognized as a key building block of the cable industry's future success.

Leveraging DOCSIS 3.0 Through Services

In addition to its unprecedented speed advantages, DOCSIS 3.0 will enable operators to offer truly differentiated services such as IPTV and switched digital video along with IP content to the subscriber home. Its channel bonding capabilities will allow cable operators to compete against telecom service providers for important enterprise accounts by providing dedicated bandwidth to support services such as video conferencing and online training.

Other benefits include support for:

- User-defined interactive programming
- Time-shifted and place-shifted video, such as video-on-demand services
- Interactive online gaming

- Convergent media services, for example, allowing data to be viewed on a TV and video content to be viewed on a computer monitor
- 128-bit AES encryption
- IPv6

The table below provides a comparison of the features, benefits and services offered by the various DOCSIS versions.

Table 1: Comparison of DOCSIS Versions

Version	Features	Benefits	Services
DOCSIS 1.0	Basic broadband connectivity for one more or devices in the home	Made interoperability of cable technology a reality and made standardization of cable modems possible	High-speed data on cable modems
DOCSIS 1.1	Improved operational flexibility, security and quality-of-service (QoS) features	Enabled cable operators to guarantee data rates and latency of the service	High-quality digital voice, interactive gaming, and commercial service level agreements
DOCSIS 2.0	Increased upstream reliability and throughput for symmetric services	Increased upstream throughput to 30 Mbps	Increased capacity for delivering high-speed data
DOCSIS 3.0	Channel bonding capabilities, support for IPv6 and IPTV	Allow cable operators to provide data rates in the hundreds of megabits per second	IPTV

Future Challenges and Current Capabilities

With its many capabilities, DOCSIS 3.0 provides a more cost-effective option for future-proofing a network compared to system-wide network upgrades. However, in order to take advantage of the additional upstream channel capacity, operators will need to address all active and passive equipment in the high-performance computing (HPC) networks. So, while DOCSIS 3.0 has the potential for tremendous impact on the cable industry, significant preparation will be required in order to realize its full set of advantages.

For residential subscribers on shared bandwidth, the key to success with DOCSIS is not brute force with speeds, but providing them with the speed they need, when they need it and throttling back when it is not needed.

DOCSIS 3.0 can immediately address this demand for more bandwidth.

Subscriber Demand and Package Pricing: The Disparity

Because of the gap between subscribers’ demand for speed and the price they are willing to pay, a shift in how bandwidth is offered is required. To illustrate this, an example of a tier-1 cable operator’s residential services pricing is shown in the following diagrams.

Diagram 1 – Residential Packages and Pricing Per Megabit

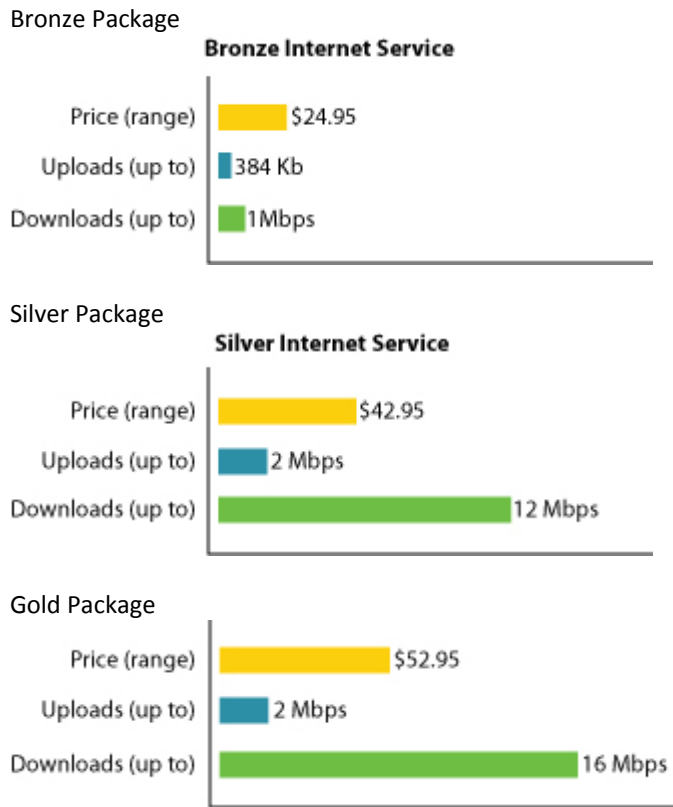
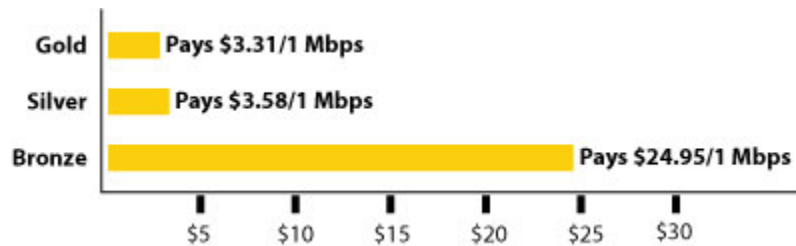


Diagram 1 represents the difference in pricing between three residential packages. Note that the pricing increases at a much slower rate than the throughput offered.

Diagram 2 - Revenue per Megabit



In this example, the cable operator offers three service levels at different price points. The revenue per megabit is calculated by dividing the price of each service package by the number of megabits per second offered in each package.


From a downstream perspective, customers are paying \$24.95 per Mbps in the Bronze package, \$3.58 per Mbps in the Silver and \$3.31 per Mbps in the Gold package. Due to economies of scale, it is not surprising that the cable operator makes the highest return per megabit on the lowest speed product. What is surprising, however, is the vast difference between the prices per megabit offered between the different service levels. Based on this pricing model, if a cable operator wanted to offer a 100 Mbps service level, the price difference would be calculated as follows:

$$100\text{MB} - \underset{\text{A}}{16 \text{ Mbps}} \times \underset{\text{B}}{(\$3.58 - \$3.31)} = \underset{\text{C}}{\$22.68}$$

- A. Gold package
- B. Difference between Silver and Gold package in price per Mbps
- C. Difference in price between 16 Mbps and 100 Mbps offering

$$\$22.68 + \underset{\text{A}}{\$52.95} = \underset{\text{B}}{\$72.63}$$

- A. Price of 16 Mbps gold package
- B. Price for 100 Mbps package based on this pricing model

$$\$75.63 / 100 \text{ Mbps} = \$0.76 \text{ Per Megabit}$$


Based on these calculations, the final price per megabit in a 100 Mbps package would be \$0.76.

Quench the Thirst for Speed with Bandwidth on Demand

Clearly, it is more profitable for cable operators to attract subscribers to the lowest priced package and save cost on bandwidth upgrades. However, subscribers usually want more than 1 Mbps. Due to the pricing offered by telecom service providers and the disparity between the speed subscribers demand and the price they are willing to pay, simply increasing pricing for the Bronze and Gold packages is not the solution to this problem.

Residential subscribers may demand packages of over 16Mbps during peak hours. Considering the current pricing expectations, it does not make financial sense to a cable operator to dedicate this bandwidth to all users. For now, it is more beneficial to attract subscribers to 'bandwidth on demand' products for extending bandwidth when it is needed. By providing bandwidth when it is needed instead of raw bandwidth that is available to every customer, DOCSIS 3.0 technologies enable cable operators to fulfill the current needs of their subscribers.

Laying the Foundation: Provisioning Requirements

None of these advantages can be realized without the proper modems. By deploying DOCSIS 3.0 modems today, cable operators will ensure that subscribers are equipped to receive increased capacity when it is needed and at a price they are willing to pay.

To take advantage of these new DOCSIS 3.0 modem capabilities, cable operators must implement a device-provisioning solution that can create dynamic configuration files for DOCSIS 3.0 modems and one that has full support for DOCSIS 3.0 parameters. The solution should also have a full feature set that will allow cable operators to future-proof their investment and deploy future multimedia services enabled by DOCSIS 3.0 and other

standards. Cable operators need to be aware of the pitfalls of relying on solutions that do not deliver on these essentials. Problems with open-source device provisioning software include a questionable support model and lack of security. This type of software may have recurring support costs due to errors, lack of support for type-length value parameters (TLVs) and improper packet handling. Over long term, these costs will outpace the cost of a commercial provisioning solution. Take, for example, the inconsistent support of PacketCable provisioning flows. Not all provisioning solutions support all three flows for MTA devices (Basic, Hybrid and Secure), thus leaving cable operators with limited choices when deciding the level of security needed.

Legacy provisioning systems also provide only incomplete support for new standards such as DOCSIS 3.0, PacketCable 2.0, and dynamic file generation. These systems fail to deliver the required throughput speeds. Furthermore, the lack of modern APIs causes problems in managing subscribers as the provisioning solution is not able to effectively communicate with back office systems and databases.

With these points in mind, cable operators looking to future-proof their investments and deploy new technologies should seek a solution that has a full feature set and development roadmap and one that supports the latest standards.

Conclusion

DOCSIS 3.0 is the key to future-proofing a cable operator's network. Though it may not be possible to deploy all of DOCSIS 3.0 capabilities today, there are immediate demands that can be satisfied with this new technology. However, this must be supplemented with a device provisioning solution that offers full standards support and upgrades for future technologies. Not only will this help cable operators avoid unexpected hidden costs and offer future services, but also it will help them satisfy immediate needs for bandwidth by demand.

About Incognito Software

Incognito Software is an industry leader in empowering broadband providers to increase revenue through rapid and easy deployment of its provisioning software. With support for the latest DOCSIS and PacketCable standards, Incognito's Broadband Command Center helps service providers worldwide deploy cost-effective and reliable data, voice, and video networks. Address Commander, Incognito's IP address management solution, allows the management and administration of both IPv4 and IPv6 address blocks simultaneously, simplifying and maximizing the use of the IP address space. Name Commander, Incognito's domain management system (DMS), provides a centralized system that manages DNS servers. All these products may be integrated to provide complete solutions.

Incognito's clients include world-class service providers like NET Brazil, Telmax, BT, Starhub and Cox and its products are deployed world-wide.

About the Author

Chris Busch is the Vice President of Broadband Technologies at Incognito Software and is responsible for the vision and management of Incognito's technologies for IP and multimedia convergence. He brings over 12 years

experience in broadband markets including cable, wireline, wireless, and satellite.

Previously with Nortel Networks as Senior Technology Advisor to the CTO of Cable MSO Global Solutions, Chris has also led teams in terabit IP core routing, BRAS IP services, wireless IP access, wireline and cable MSO access, video on demand, and triple-play IP video solutions. Chris draws on a wealth of knowledge in cable MSO video and IP data networking that are key to emerging PacketCable 2.0 standards for subscriber service and device management related to 3G IMS and SIP-based technologies and has written numerous articles for Communications Technology Magazine.

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