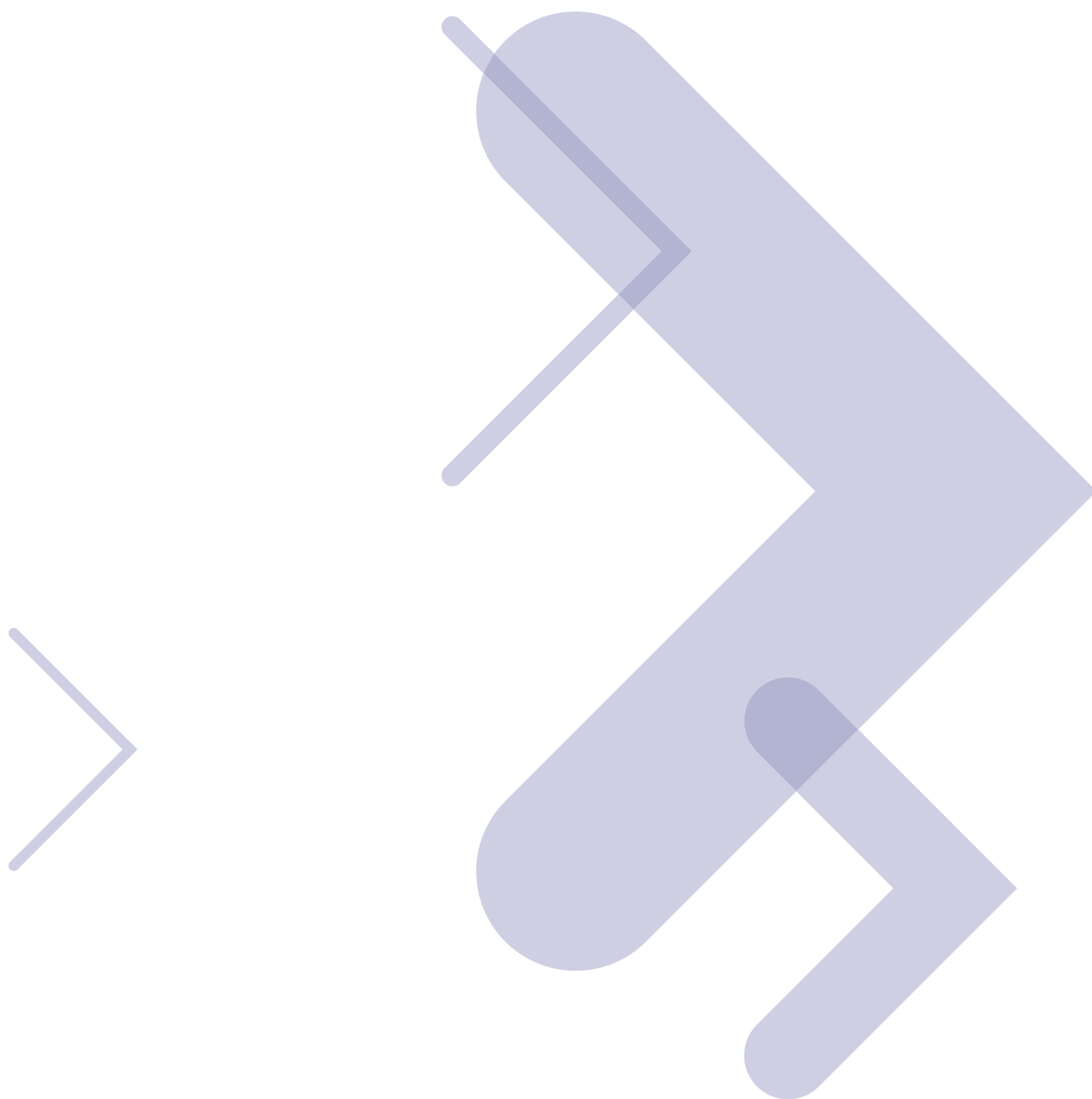




DOCSIS 3.0: Taking Advantage of Commercial Services to Increase Revenues





Contents

Executive Summary.....	3
Commercial Services in the SME Sector: The Opportunity	3
Enabling Ultra-Broadband Enterprise Services	3
Standards-Based DOCSIS 3.0 Solutions From Motorola	3
Delivering Increased Bandwidth to Commercial Customers	5
Delivering Carrier-Grade QoS	5
Increasing the Billability of Existing Bandwidth	6
Marketing Commercial Services to SMEs.....	6
Supporting Symmetrical Services.....	6
High Availability.....	7
Supporting Business Services Over DOCSIS	7
Enabling Ultra-Broadband Enterprise VPN Services	7
Providing an Evolution to Fiber	7
Conclusion	8



Executive Summary

This document provides analysis of the business opportunity presented by the delivery of cable services to businesses in the small and medium enterprise (SME) market. The discussions dovetail with insights into how service providers can capitalize on the demand from the SME sector by delivering carrier-class services through rapid deployments of Motorola's DOCSIS 3.0 solutions.

Commercial Services in the SME Sector: The Opportunity

The SME market represents one of the fastest-growing market opportunities for cable service providers. SNL Kagan estimates that revenues from commercial services for MSOs in the United States generated \$3 billion in 2008. This figure is forecast to increase to nearly \$10 billion by 2012 with the "engine-room" of this growth expected to be SMEs.

Such analysis tallies with Motorola's view that MSOs are experiencing upward of 20 percent annual revenue growth from the provision of high-speed data services to business customers. The majority of the increases are generated by companies based at home, or in residential districts, that are prime candidates to buy communications from their local HFC network owner. Indeed, taking advantage of the infrastructure deployed primarily for residential subscribers to fulfill the data, voice and IP video transport needs of enterprise customers is a fast, efficient way to accelerate free cash flow. And with new technologies based around DOCSIS 3.0 becoming available to enhance service provision (in return for relatively little additional capital), the business case is more compelling than ever to reach out to SME customers.

Enabling Ultra-Broadband Enterprise Services

DOCSIS 3.0 specifications include a number of major enhancements to improve the service platform and operating efficiency of networks, such as channel bonding, IPv6, and improved security. These advanced features are available now in DOCSIS 3.0 infrastructure from Motorola.

The decision as to whether to upgrade to DOCSIS 3.0 is, of course, driven by economics, with service providers increasingly concluding that the case to move to DOCSIS 3.0 is strong. This observation is based on a number of reasons:

- Higher speeds: By deploying DOCSIS 3.0 CMTS and cable modem solutions, service providers can swiftly deploy Ultra-Broadband commercial services at speeds of 25, 50, or even 100 Mbps. Such speeds are very attractive to commercial subscribers.
- Improved CAPEX and OPEX: DOCSIS 3.0 systems enable reduced costs to scale capacity and provide more efficient ways to manage networks, particularly with Integrated CMTS architectures. GPON
- Capacity management: DOCSIS 3.0 equipment more efficiently utilizes bandwidth to protect the most valuable commodity of service providers, RF spectrum.

As well as the technical advantages of the standard, the decision to migrate to DOCSIS 3.0 is eased by two key issues. The first is compatibility. Existing infrastructure investments can be protected as DOCSIS 3.0 systems can be integrated with predeployed DOCSIS 1.x and 2.0 customer premises equipment. Second, systems upgrades can be achieved through cost-effective, software-only enhancements to existing CMTS platforms that minimize disruption and optimize existing investments.

The bottom line is that, by upgrading to DOCSIS 3.0, MSOs can more successfully compete with incumbent carriers and deliver the reliability and scalability enterprises demand. Service providers are moving rapidly to take advantage of the technology: ABI Research forecasts that penetration of DOCSIS 3.0 systems will reach nearly 60 percent for cable modem termination system (CMTS) platforms by 2011. Furthermore, the company predicts that, within the same timeframe, approximately 40 percent of cable modems, eMTAs, and other customer premises equipment will support DOCSIS 3.0. Key elements of Motorola's DOCSIS 3.0 systems are reviewed in the following section of this paper.

Standards-Based DOCSIS 3.0 Solutions From Motorola

Motorola has contributed significantly to the development of DOCSIS 3.0 standards to support the delivery of Ultra-Broadband commercial services.

Cable operators can deploy DOCSIS 3.0-qualified BSR 64000 CMTS/edge routers and DOCSIS-certified Motorola SURFboard® cable modems and eMTAs to take advantage of the DOCSIS 3.0 specifications now, while continuing to leverage legacy DOCSIS CPE. For instance, the BSR 64000 has received CableLabs' Bronze qualification for DOCSIS 3.0, and the Motorola SB6120 cable modem and the Motorola SBV6220 eMTA have already received CableLabs' DOCSIS 3.0 certification.



Figure 1: Utilizing the power of DOCSIS 3.0, the SB6120 cable modem enables channel bonding of up to 4 downstream channels and 4 upstream channels: performance which enables operators to offer commercial customers advanced multimedia commercial services with data rates of well over 100 Mbps in each direction.

DOCSIS 3.0 upstream and downstream channel bonding provides a standard approach to bonding multiple physical channels into a single, virtual, high-bandwidth channel. For example, a DOCSIS 3.0 6 MHz downstream channel can provide peak bandwidth of 38.8 Mbps. Channel bonding solutions from Motorola allow cable operators to efficiently deliver increased bandwidth to/from a given cable modem by transmitting DOCSIS frames across multiple RF channels in parallel—while performing dynamic load balancing across all channels. This enables increased throughput between a cable modem and a CMTS by sending packets on multiple streams at the same time.

To gain a competitive edge, cable operators can bond up to four physical channels for Ultra-Broadband commercial services. Moreover, systems will soon be able to bond up to eight channels. By deploying the BSR 64000 in the headend or distribution hub and Motorola SURFboard DOCSIS 3.0 cable modems and eMTAs at the locations of commercial subscribers, operators can deploy DOCSIS 3.0 solutions immediately to deliver Ultra-Broadband commercial services.



Figure 2: The Motorola SBV6220 DOCSIS 3.0-certified digital voice modem introduces channel bonding into Motorola's digital voice product portfolio. It supports the full range of DOCSIS 3.0 features, including IPv6 and Advanced Encryption Services.

The BSR 64000 CMTS/edge router maintains a solid history of investment protection due to a software-focused approach to system upgrades. This software-based approach allows MSOs to economically migrate their existing BSR 64000 environment to the latest DOCSIS standards. The BSR 64000 supports DOCSIS 3.0 as well as legacy cable modems and eMTAs, allowing MSOs to implement a cost-effective migration path to DOCSIS 3.0 while protecting investments in deployed cable modems. Deployed BSR 64000s utilizing DOCSIS and EuroDOCSIS 2.0 hardware elements, can be upgraded to support DOCSIS 3.0 based, downstream channel bonding without the need for additional hardware investments. All existing BSR 64000 customers with 2:8 Modules can take advantage of standards-based DOCSIS 3.0 downstream channel bonding by simply upgrading the software and deploying DOCSIS 3.0 compatible cable modems. Motorola's BSR 64000 provides cable operators with the highest level of investment protection. It supports migration to DOCSIS 3.0 or EuroDOCSIS 3.0 to deliver high-throughput commercial services that optimize previously installed BSR 64000 hardware, and seamlessly works alongside existing populations of DOCSIS/

EuroDOCSIS 1.x and 2.0 modems. The 2:8 Modules also supports IPv6 and most DOCSIS 3.0 network management and security features.



Figure 3: The BSR 64000 CMTS/edge router allows cable operators to rapidly introduce standards-based DOCSIS 3.0 services to commercial subscribers. It offers superior flexibility and scalability that allows MSOs to reduce CAPEX and OPEX.

Delivering Increased Bandwidth to Commercial Customers

By migrating now to DOCSIS 3.0, cable operators can cost-efficiently increase capacity to swiftly deliver Ultra-Broadband services which attract commercial subscribers away from traditional carriers.

Specifications for DOCSIS 2.0 included no increase in downstream data rates, so increased bandwidth was a major driver for the DOCSIS 3.0 specifications. With DOCSIS 3.0, the need to significantly increase bandwidth and capacity can be achieved by channel bonding. Channel bonding multiplexes multiple RF channels to create a single virtual channel. It provides cable operators with a flexible way to increase upstream and downstream throughput to customers. Data rates can be in the hundreds of megabits and potentially gigabits per second. Channel bonding offers a standardized approach to bonding multiple physical channels into a single, virtual, high-bandwidth channel.

J:COM Implements DOCSIS 3.0 Nationwide

J:COM migrated to DOCSIS 3.0 primarily in response to competitive threats from carriers offering Ultra-Broadband services over VDSL or in fiber implementations to deliver over 100 Mbps. Japan's largest MSO has implemented DOCSIS 3.0 to offer new services, increase market share, and successfully compete with carriers. J:COM has completed a national deployment of DOCSIS 3.0, applying standards-based channel bonding solutions from Motorola to deliver 160 Mbps to premium customers. J:COM deployed BSR 64000 CMTS/edge routers in headends and Motorola SURFboard® SB6120 cable modems on customers' premises. It's the first cable operator in the world to deploy DOCSIS 3.0 nationwide.

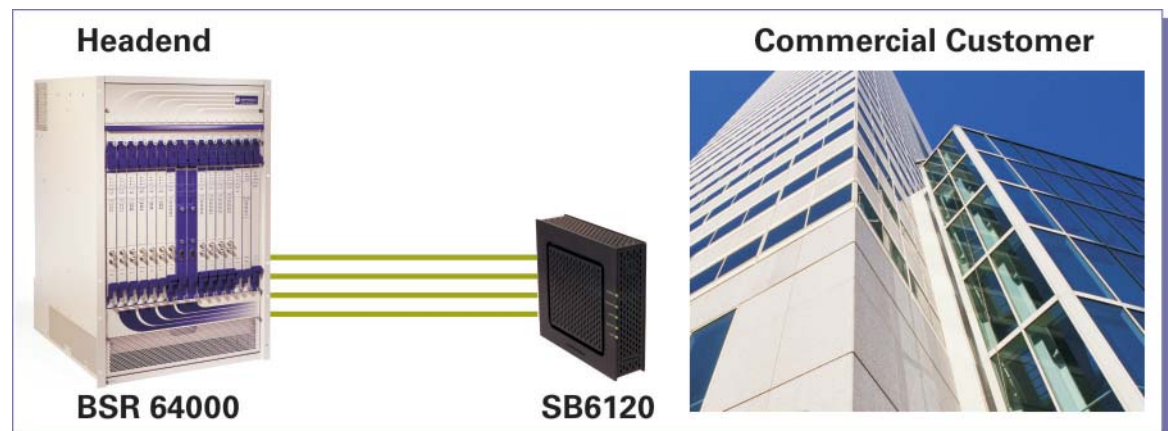


Figure 4: Cable operators can implement DOCSIS 3.0 channel bonding to logically bind four physical channels today (and eight channels in the near future) to deliver scalable Ultra-Broadband services to commercial customers.

Packet-based channel bonding allows flows to remain almost the same as they are with DOCSIS 2.0, with packets entering a similar architecture as they do today. It enables coexistence over the same DOCSIS infrastructure serving DOCSIS 1.x and 2.0 cable modems, and it doesn't impose a new infrastructure design on cable operators.

Delivering Carrier-Grade QoS

The BSR 64000 enables cable operators to deliver reliable voice and data commercial services with measurable SLAs to attract SMEs to commercial service offerings. The system manages handoffs to core networks using DiffServ and/or Multiprotocol Label Switching (MPLS) and delivers carrier-grade QoS levels for commercial data services with documented SLAs, and high-quality, business-class voice services that support Dynamic QoS (DQoS) and Common Open Policy Service (COPS, IPsec, and Communications Assistance for Law Enforcement Act [CALEA]).

Increasing the Billability of Existing Bandwidth

Network bandwidth primarily created for residential services is subject to the time-of-day peaks and valleys of subscriber utilization. Residential subscribers traditionally access services in the morning around breakfast time. As they leave for work, demand typically declines. Usage picks up as children come home from school, and peaks in the evenings as family members access broadband services.



Figure 5: Commercial services can capitalize on usage declines during business hours by allowing MSOs to offer new billable services that are largely consumed between 8 am and 6 pm.

Access networks are typically architected to support peak-time demands, leaving cable operators with unused capacity throughout the business day. But by offering Ultra-Broadband commercial services, cable operators can productively increase utilization of existing access network bandwidth and more efficiently balance subscriber demand.

Marketing Commercial Services to SMEs

The SME commercial services market is a largely untapped business opportunity for cable operators. Incumbent carriers traditionally dominate this market segment but cable operators can leverage DOCSIS 3.0 to create compelling services that address the opportunity. For example, SMEs that have the requirement to regularly transfer large files—such as advertising agencies, health-care organizations, and video production companies—can turn to cable operators for the bandwidth necessary to run online operations.

They can avoid the rigid digital hierarchy imposed by incumbent carriers (i.e. 1.544 Mbps for T1 lines in North America, 2.048 Mbps for E1 lines in Europe) and customize the upstream and downstream capacity to support the requirements of the SME. Cable operators can implement channel bonding to offer scalable bandwidth to SMEs, and they can offer an attractive value proposition that frees SMEs from the strict cost structure of T1/T3 and E1/E3 service offerings by carriers.

Supporting Symmetrical Services

With DOCSIS 3.0, cable operators have greater flexibility to support symmetrical services that require both higher upstream and downstream transmission to support bandwidth-intensive services. By deploying the BSR 64000 in an Integrated-CMTS (I-CMTS) architecture, upstream or downstream capacity can be flexibly expanded as needed to support commercial services.

Motorola offers a smooth migration path to Ultra-Broadband services by allowing cable operators to decouple upstream and downstream capacity investments in their BSR 64000: an I-CMTS solution that provides 32 upstream channels per single card – ideal for greenfield deployments or capacity upgrades. The new decoupled upstream modules will complement the industry's densest I-CMTS card, the TX32 Decoupled Downstream Module. With DOCSIS 3.0 upstream channel bonding capabilities, operators will have the optimum mix of increased average capacity as well as increased peak bandwidth for channel bonding.

With HFC access networks passing most of the commercial enterprises in North America, DOCSIS 3.0 opens up a new playing field for the MSO, and allows cable operators to break down many of the traditional barriers to attracting commercial accounts. The ability to decouple upstream and downstream capacity investments empowers cable operators to support more symmetrical services and economically build out the optimum capacity to support the needs of commercial customers.



High Availability

Commercial customers demand bulletproof network reliability, and accordingly, business services are typically sold with very stringent service level contracts. Therefore, cable networks originally built for best effort services need to demonstrate increased levels of redundancy to attract commercial subscribers. For cable operators to compete in this space, it's critical that service availability is protected. Full end-to-end infrastructure redundancy is necessary—including CMTS redundancy—since more high-throughput devices and higher-revenue services become dependent on the CMTS platform. The Motorola BSR 64000 supports full redundancy for DOCSIS 2.0 as well as the new DOCSIS 3.0 blades, such as the TX32, 1 GHz Decoupled 32 QAM and DOCSIS 3.0 Modules.

Supporting Business Services Over DOCSIS

The BSR 64000 supports the Business Services over DOCSIS-TDM Emulation service (BSoD-TE), a method for cable operators to deliver T1, E1 and NxDS0 emulation services that meet or exceed the quality requirement of applications that use such services. This allows MSOs to compete successfully against carriers for commercial voice services. The specification was developed by CableLabs for the benefit of the cable industry and includes contributions by operators and vendors worldwide.

The Business Services over DOCSIS specifications allow cable operators to cost-effectively deliver TDM-based commercial services over DOCSIS infrastructure. This is particularly appealing to SMEs accustomed to the digital hierarchy of the public switched telephone network and allows the cable operator to mirror service offerings provided by the Telcos.

Enabling Ultra-Broadband Enterprise VPN Services

Cable operators can deploy Ultra-Broadband Virtual Private Networks (VPNs) that allow them to logically segregate their network for enterprise customers to securely transmit information.

MSOs can create transparent, private and dedicated connections between cable modems at multiple business locations and offer Ultra-Broadband commercial services that do not require specialized VPN equipment or client software at customer locations. VPNs allow cable operators to more successfully compete with carriers by offering high-performance commercial services that can be easily scaled.

Operators can create long-term relationships with enterprise customers by offering VPN services that allow commercial services customers to depend on the broadband cable network for secure transport of mission critical enterprise applications. The broadband cable network offers far more flexibility for offering VPN services, including greater abilities to "turn up" bandwidth to support peak periods or additional applications. T1/E1 circuit emulation capabilities allow cable operators to gain larger shares of the enterprise market. T1/E1 traffic can be packetized for transport over the HFC access network, and cable operators can offer innovative bundles of voice and data services to further penetrate commercial accounts. The BSR 64000 also offers support for BGP/MPLS VPNs (RFC 2547), which allow MSOs to provide compelling VPN services for SMEs. Cable operators can offer enterprise services with the same parameters for QoS, security, and performance at a fraction of the cost of traditional leased-line services offered by carriers.

Providing an Evolution to Fiber

Cable operators can leverage DOCSIS 3.0 to deliver increased bandwidth for commercial services over HFC access networks as they plan a gradual evolution to fiber. Emerging as a viable solution for cable operators, radio frequency over glass (RfOG) solutions allow cable operators to deploy fiber connectivity directly to the premises while leveraging existing DOCSIS infrastructure. Providing a route to higher-bandwidth passive optical networking (PON) deployments in the future, RfOG is proving ready to aid operators initiating the journey to an all-fiber network.

Combining HFC technology with the DOCSIS infrastructure and newer fiber technologies such as RfOG and ultimately PON enables operators to cost-effectively deploy fiber directly to the premises of commercial customers. The primary benefit to any operator will be the ability to leverage existing CMTS and cable modem investments and back-office applications, all while maintaining service continuity with existing video, VoIP and Ultra-Broadband internet services. Motorola has a unique position to provide fiber solutions to cable operators. We offer proven expertise in HFC, DOCSIS and fiber access network solutions and a robust solution for implementing standards-based RfOG solutions that provide a path to PON deployments in the future.

"Most large and some small cable MSOs will start rolling out DOCSIS 3.0 by the end of 2009, and increased broadband competition from telco FTTP and faster DSL deployments will fuel MSO rollouts of DOCSIS 3.0." — Alan Breznick, Senior Analyst, Heavy Reading



Conclusion

The time is now for operators to leverage their DOCSIS 3.0 deployments to add a new mix of commercial services to their portfolios. While residential data and voice adds are slowing, the SME market is still relatively untapped. Recent commercial service success has come from the low hanging fruit provided by offering DOCSIS 2.0 based services to small enterprises. Now, DOCSIS 3.0 technology provides the tool set to broaden the target market and better compete with Telcos on speed, quality of service and price.

Motorola offers flexible, standards-based DOCSIS 3.0 solutions with a superior long term evolution path to an all-fiber platform. These solutions can be implemented now to develop powerful services that capture new commercial subscribers who have traditionally relied on carriers to deliver communications services.

For More Information

To find out more about deploying DOCSIS 3.0 and offering Ultra-Broadband commercial services, contact your Motorola account representative or visit www.motorola.com/ultrabroadbandsolutions.



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