

DOCSIS SET-TOP GATEWAY

Q. What is the DOCSIS[®] Set-Top Gateway (DSG)?

A. DSG is a CableLabs[®] specification for transporting set-top box (STB) command and control information over Data Over Cable Service Interface Specifications (DOCSIS[®]). DSG defines interface requirements for transport of a class of service known as out-of-band (OOB) between a set-top network controller and digital STBs. Traditionally, physical transport of OOB messaging is carried over dedicated channels as defined by the Society of Cable Telecommunication Engineers Digital Video Subcommittee (SCTE DVS) 167 and SCTE DVS 178. Conditional access (CA), system information (SI), electronic program guide (EPG), emergency alert system (EAS), and other generic messages are sent from a headend controller to each STB via an RF carrier that is separate from the channels being watched—hence the term out of band.

DSG moves away from traditional OOB transport, instead incorporating it into DOCSIS digitally modulated carriers now used for cable modem service. DSG provides transparent uni-directional and bi-directional transport of OOB messaging over Internet Protocol (IP) between a cable modem termination system (CMTS) and STBs via a hybrid fiber coaxial network (HFC). DSG allows cable operators to combine cable modem and STB operations over one open, vendor-independent DOCSIS network, with no changes to the existing DOCSIS infrastructure. The DSG specification can be found at <http://www.opencable.com/downloads/specs/SP-DSG-I01-020228.pdf>. A follow-up advanced mode specification is also in the works.

Q. Why should I deploy DSG? How do operators benefit from DSG?

A. Cable operators have deployed millions of STBs and cable modems. Most current STBs are based on proprietary technology, essentially locking a cable operator into using one vendor's product once it is chosen for deployment. Current OOB solutions are limited, because they're proprietary. DSG provides a way to migrate from proprietary to open standards-based set-top technology. DSG allows a DOCSIS CMTS to deliver OOB messages with just a software upgrade. Cable operators can use existing CMTS and RF signals to transport OOB messaging. Consolidating cable modem and STB traffic over a common DOCSIS network enables cable operators to support new features and technology with minimal hardware change and offers a smarter and lasting network infrastructure that increases return-on-investment and reduces operating expenses. DSG can be thought of as the first step toward a converged IP network that uses what amounts to next-generation OOB messaging. DSG adds the power of DOCSIS technology for new services—accelerating rollout of bandwidth-intensive, interactive services such as Web surfing, T-commerce, on-line gaming, and targeted advertising—and supports monitoring and network management. DOCSIS technology offers higher capacity than traditional OOB solutions. Migration of OOB messaging traffic to an operationally superior and higher bandwidth DOCSIS channel is critical to adoption of interactive services. For these services, the traditional OOB mechanism (DVS 167 and DVS 178) is inefficient and provides insufficient bandwidth at a higher cost point. DSG STBs boost the signaling return path of a STB and better support interactive

programming and other advanced video services. It is expected to give STBs a raw upstream improvement throughput of roughly 10-to-1. Cable operators benefit from technical advantages and continued innovation of DOCSIS technology. Multi-vendor interoperability and potential lowered STB costs result.

Q. Which Cisco® CMTSs support DSG?

A. Beginning with Cisco IOS® Software Release 12.2(15)BC2, the Cisco uBR7246VXR and Cisco uBR7100 Series universal broadband routers support DSG. The Cisco uBR10012 universal broadband router will also support DSG in subsequent Cisco IOS Software releases. These products evolve the CMTS into an intelligent broadband edge platform that delivers highly competitive service bundles and allows cable operators to capture the full potential of their cable spectrum and DOCSIS HFC networks. Cable operators can evolve their architectures and services, reducing overall network complexity and operational costs by building versatility and intelligence into their networks.

Q. What is a compatible DSG set-top box?

A. It is a DOCSIS cable modem embedded in a digital STB with DSG client software to handle OOB video control signaling. DSG builds upon DOCSIS technology to provide Layer 2 services necessary to send command and control information to STBs. DSG standardizes digital STBs and helps reduce costs. Using DOCSIS as the main conduit for data and video command and control data offers many advantages: interactivity, an attractive price point, and a platform open to a variety of vendors. DSG technology can either replace traditional STBs or operate side by side with them. Cable operators can migrate to DSG on a timeframe that fits their schedule.

Q. Does Cisco Systems® have marketing agreements with vendors supporting DSG?

A. Cisco has demonstrated the Cisco uBR7246VXR as a DSG gateway that interoperates with Samsung, Humax, and JooHong STBs, as well as NDS, NagraVision, and Aircode SI conditional access systems (CASs). Cisco is researching developing a formal program with vendors that support DSG and setting up marketing agreements. A marketing agreement with Cisco indicates that the products interoperate with the appropriate level of testing. In addition, Cisco will work with select vendors to jointly develop technologies and solutions that improve the value of DSG for shared customers.

Q. What are the configuration requirements for Cisco CMTS platforms?

A. To support DSG, the Cisco uBR7246VXR or Cisco uBR7100 Series require Cisco IOS Software Release 12.2(15)BC2 or later. IP multicast routing must be enabled. Before enabling and configuring the DSG feature, Protocol Independent Multicast (PIM) must be enabled on the cable interface and all outgoing WAN interfaces. DSG supports the following PIM modes: sparse mode, sparse-dense-mode, and dense mode. For best performance, fast switching of IP multicast should be enabled on incoming and outgoing interfaces. To ensure security on the network, IGMP multicast access group addresses should be used to make certain only valid users access DSG-related messages. DSG layers on the DOCSIS architecture and is compatible with existing DOCSIS 1.0, 1.1 or 2.0 implementations. DSG is transparent to application data. It allows one-way broadcast and multicast traffic to all compliant STBs.

Q. What is expected to influence growth for DSG?

A. Cable operators, worldwide, are looking into DSG as a way to use DOCSIS technology to carry STB OOB signaling. DSG has been shown to be a commercially feasible data-transport standard for digital cable TV. A Korean company—Broadband Solutions, Inc. (BSI)—will be the first to deploy DSG in early 2004 using the Cisco uBR7246VXR. Because Korea has adopted DSG as part of its move to an all-digital delivery of video, most Korean cable operators are watching BSI closely and are expected to follow BSI's decision and adopt DSG.

Operators in the United States have an embedded base of STBs and cable modems. Numerous multiple system operators (MSOs) are looking into DSG for deployment this year. DSG allows traditional STBs and DSG STBs to share the DOCSIS network, alongside cable-modem traffic. Using DOCSIS technology to transport OOB signaling makes the video infrastructure less complicated. Instead of one silo for IP data and voice and another for video, the so-called “triple play” comes under a single umbrella, a packet-based network. DSG protects capital expenditures (CapEx) and operating expenses (OpEx) as cable operators migrate from proprietary set-top technology and converge IP services.

Q. Cisco recently announced the Cisco uMG9800 Series and its vision for the next generational digital video network. How does DSG fit into this vision?

A. DSG is an element of the next generation digital video network strategy. DSG is a strategic technology. It is another move for cable operators to migrate to an end-to-end IP standards-based infrastructure. DSG introduces DOCSIS-based open systems into the digital video infrastructure. It is a step to get to an “all digital” video network. The Cisco uBR7246VXR and Cisco uBR7100 Series with DSG software serve as STB gateways. The Cisco uMG9800 Series serves as a quadrature-amplitude-modulation (QAM) gateway, enabling cable operators to more efficiently deliver video-on-demand (VoD) services using Gigabit Ethernet. The products complement each other. DSG can transport the same VoD session setup and stream control that today is carried over an OOB channel. Cisco CMTs with DSG and Cisco uMG9800 Series products help cable operators more fully utilize the power in their networks, minimize expenses, and offer greater platform flexibility and choice when deploying video services. Cisco is committed to offering next-generation digital video networking products, solutions, and services to cable operators that will enable them to easily and cost-effectively deliver new, profitable, and scalable digital video services.

Q. How does Cisco believe the video network will continue to evolve?

A. Cable video networks will evolve to integrate multiple video services over a common, intelligent, open-standards-based digital video network infrastructure. In the case of DSG, Cisco believes offering video through IP standards-based STBs is the way to go. Because operators probably will not migrate everything to all digital in one step, they will have to forge a migration plan. DSG offers a step to converge STB and cable modem traffic. CableLabs PacketCable Multimedia specification, with its array of policy servers and underlying DOCSIS-based quality of service (QoS) capabilities, will play a key role in the migration to all-digital and give operators the control they want to retain. In the case of VoD services, the Cisco uMG9800 Series will allow cable operators to capture the benefits of having an intelligent switched network infrastructure between the headend and distribution hub—and move away from the point-to-point direct connection in a legacy network. Benefits include a lower total cost of ownership across multiple video services, lower CapEx, and the ability to economically make large amounts of content available. Cisco believes that an open network will encourage cable operators to integrate multiple video and potentially other services on a single network.

Q. What is the Cisco competitive advantage and value proposition in the video market?

A. The strong Cisco heritage of open systems allows the company to bring its essentially unmatched networking expertise and industry leadership to solve infrastructure challenges faced by cable operators. Recognizable benefits include:

- Lower capital expenditures
- Greater flexibility
- Integrated transport solutions

- Market-leading, proven products
- Industry networking expertise and technology leadership
- Support for excellence—now and in the future

Q. How does DSG work?

A. DSG maps conditional-access, system-information, EPG, EAS, and other generic messages into one or separate DSG tunnels. Addressing of an individual STB is done at the application level and is based upon serial numbers, smartcard addresses, or similar addresses. OOB data is sent to the STB through the same DOCSIS digitally modulated carrier used for cable-modem service. The CMTS is configured to be a STB gateway, passing OOB messaging to compatible STBs. Cable operators can choose to have DSG OOB messaging transmitted in existing DOCSIS cable-modem data streams or can dedicate a separate CMTS downstream for DSG STBs.

DSG supports one- and two-way STBs. In one-way systems, DSG operates with no return path. In two-way systems, an upstream DOCSIS channel is used for interactive messaging. Downstream control continues to work in case of return-path impairments. Unlike modems, DSG STBs do not go through the standard DOCSIS ranging and registration sequence. The STBs, however, must be able to find the downstream digitally modulated carrier that contains DSG data and receive MAC messages such as upstream channel descriptors (UCDs) and time stamps. The set-top hardware address does not need to be resolved to an IP address because the CMTS does not have access to that address on a one-way plant. This preserves IP addresses. For advanced two-way services, an IP address for the STB can be provisioned just like any cable modem.

Q. What are the network requirements for deploying DSG?

A. DSG defines the addressing convention between the CMTS and STBs. The CMTS and STB must support DSG. In the initial DSG release, up to four separate conditional access (CA) vendors are supported per CMTS. The system supports a maximum of eight DSG tunnels per CA vendor, for a maximum possible total of 32 DSG tunnels per CMTS. Each CA vendor can have one or more DSG tunnels on each cable interface, up to the maximum of eight tunnels per vendor. Vendor names must be unique and limited to a maximum of seven characters. DSG traffic should be less than 2.048 Mbps per vendor, so as to conform to DSG specifications. DSG does not support BPI-encrypted IP multicast stream.

Q. What are operator deployment plans for DSG?

A. Current market dynamics are accelerating the demand for advanced STBs and tipping the market towards mass-market adoption. Introduction of OpenCable standards-based products, favorable regulations, and increased competition are driving costs of advanced STBs down.

Mainstream adoption in the U.S is progressing fast as solutions are being defined for migrating legacy headend and STB equipment to DOCSIS-based DSG. Major cable operators, overseas and in the U.S., are evaluating DSG-based equipment, thereby taking a major step toward migrating their networks to an all digital converged network. Manufacturers that succeed in these new, highly competitive markets will be the ones that can quickly deliver advanced STBs that cost about the same as basic DOCSIS cable modems.

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