



# Release Notes for Cisco Gigabit-Ethernet Optimized VoD Solution, Release 2.0

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September 10, 2004

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Tip

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Use this document online. This document provides hyperlinks to related documents and websites, including release notes for solution components and Cisco IOS images.

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## Document History

Document Version	Date	Notes
1	07/30/2003	This document was first published as <i>Release Notes for Cisco Gigabit-Ethernet Optimized VoD Solution, Release 1.0</i>
1.1	03/15/2004	Revised to include additions for Release 1.1
2.0	09/10/2004	New release.



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# Solution Description

The Cisco Gigabit-Ethernet (GE) Optimized VoD Solution enables multiple system operators (MSOs) to offer Video on Demand (VoD) services to consumer customers over their existing hybrid fiber-coaxial (HFC) plant, with existing next-generation digital set-top boxes (STBs).

Figure 1 illustrates the generic switch-in-distribution hub (Dhub) plus optical transport architecture used by Releases 1.2, 1.1, and 2.0 of the solution. All solution components are located in either a video headend or a Dhub site. The basic solution topology is an Ethernet hub and spoke between the headend site and multiple Dhub sites.

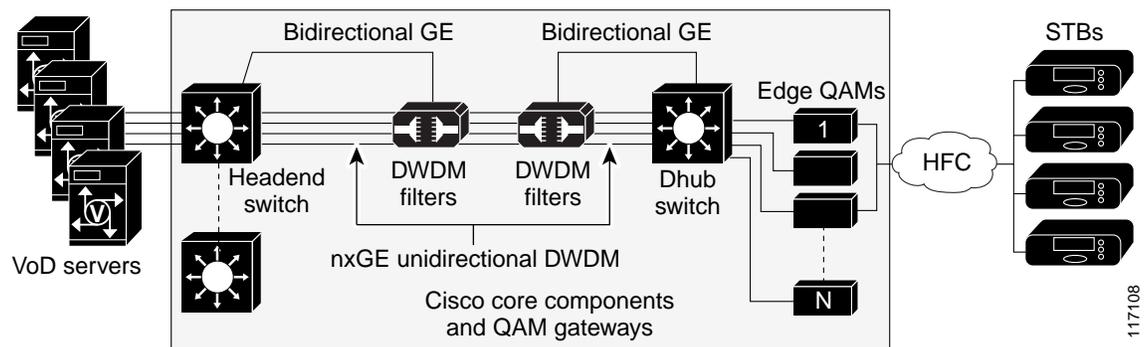


## Note

Release 2.0 supports a 10-GE transport topology. For information on supported 1-GE transport topologies, see Release 1.1 documentation at the following URL:

[http://www.cisco.com/univercd/cc/td/doc/solution/vodsols/geopt1\\_1/index.htm](http://www.cisco.com/univercd/cc/td/doc/solution/vodsols/geopt1_1/index.htm)

Figure 1 Cisco Gigabit-Ethernet Optimized VoD Solution Architecture



## New and Changed Information

With respect to Release 1.1, the Cisco Gigabit-Ethernet Optimized VoD Solution, Release 2.0 adds major enhancements in the areas of Ethernet switching, optical transport, and Cisco video edge QAM devices, including support for the following:

- Cisco Catalyst 6507 switch and the Cisco 7609 router in the headend and Dhub, with 10-Gigabit Ethernet
- 10-GE external transponders and intelligent optical filters in conjunction with the Cisco ONS 15454 MSTP (Multi-Service Transport Platform)
- Cisco uMG9850 QAM Module
- Cisco uMG9820 QAM Gateway
- The video architecture of Release 2.0 leverages transport and routing designs for fully converged networks that support not only video, but also high-speed data (HSD), voice over IP (VoIP), and other applications

The solution builds on the switch-in-Dhub architecture established for previous releases, and introduces support for additional switching and transport components. Release 2.0 does not include any additional functionality for the no-switch-in-Dhub architecture described in previous releases.

Release 2.0 includes topologies where unidirectional 10-GE links are routed directly between the headend and a target Dhub, as well as topologies where 10-GE links are routed through one or more intermediate Dhubs on the way to the target Dhub.

The point-to-point 10-GE topology is implemented by using one or more unidirectional 10-GE ports between the headend and a Dhub. Bidirectional connectivity for each IP interface associated with the physical ports is provided by unidirectional link routing (UDLR).

In the multihop video topology, each intermediate Dhub switch terminates one or more upstream 10-GE unidirectional links, and generates one or more downstream 10-GE unidirectional links. IP forwarding in the switch determines which packets are forwarded to the QAM devices attached to the switch and which packets are sent out 10-GE unidirectional links to downstream Dhubs. To save on ports on the intermediate Dhub switches, a single physical port is split into two logical transmit and receive unidirectional interfaces. As with point-to-point 10 GE, bidirectional connectivity on the 10-GE interfaces is provided by UDLR.

The Ethernet hub-and-spoke topology can be realized in either physical hub-and-spoke or physical fiber-ring environments. When the solution is deployed in networks that use physical ring topologies, the physical ring networks must be converted to an Ethernet hub-and-spoke network at the optical layer. Both 10-GE optical topologies in Release 2.0 are based on physical ring designs.

## Solution Components

Release 2.0 of the Cisco Gigabit-Ethernet Optimized VoD Solution features both Cisco and third-party components. Cisco components are listed in the following sections:

- [Cisco Hardware Components](#)
- [Cisco Software Matrix](#)

Third-Party Components are listed in [Important Notes, page 6](#).



### Note

This solution is primarily for Cisco products. To establish and maintain the third-party products and applications that may be a part of the Cisco Gigabit-Ethernet Optimized VoD Solution, refer to the documentation provided by the vendors of those products.

## Cisco Hardware Components

Release 2.0 uses 10-GE connectivity between the headend and the Dhub. However, the use of 10-GE interfaces limits the choice of platforms that can be used as the headend switch, requiring the Cisco Catalyst 6507 switch or Cisco 7609 router, as opposed to the Cisco Catalyst 4507 switch, in the headend. Since edge QAM devices do not support 10-GE interfaces, the use of 10 GE makes it necessary to use a Dhub switch as well. Release 2.0 uses the Cisco 7609 router and Cisco Catalyst 6507 switch with 10-GE interfaces as Dhub switches. Also in the Dhub, the Cisco Catalyst 4507 is used as a QAM switch, to host Cisco uMG9850 QAM modules, when used.

The use of 10 GE also results in changes in the optical components used for the solution. The Cisco Catalyst 6507 switch and Cisco 7609 router with WS-X6704-10GE 10-GE line cards transport channelized or unchannelized optical signaling using 10-GE long-range Ethernet or 10-GE dense wavelength division multiplexing (DWDM) XENPAK modules.

When using the 10-GE long-range Ethernet XENPAK modules in the headend and Dhub, Cisco ONS 15454 MTSP optical transport components are used to convert the long-range Ethernet optical signal to a DWDM signal and route the signal to the appropriate Dhub. The Cisco ONS 15454 integrated optical components have the additional benefit of supporting optical monitoring.

When using the 10-GE DWDM XENPAK module, Cisco ONS 15216 optical components are used to route the signal to the appropriate Dhub. Using receive-only DWDM optics in the Dhub for one-way transmissions offsets overall network costs.



**Note** 10-GE DWDM XENPAK modules are pending release.

[Table 1](#) describes the Cisco hardware components tested for Release 2.0 of the Cisco Gigabit-Ethernet Optimized VoD Solution. Software releases that were tested for the solution are listed in [Table 2 on page 5](#).



**Tip** When viewing this document online, the components in the Hardware columns of [Table 1](#) serve as links to the platform-specific user documentation. Refer to the release notes for each platform and software image that you use in this solution.



**Note** Different applications of this solution may use different subsets of the following components.

*Table 1 Cisco Components for the Cisco Gigabit-Ethernet Optimized VoD Solution, Release 2.0*

Hardware	Purpose
<b>Switches</b>	
<a href="#">Cisco Catalyst 6507 switch, with Supervisor Engine 720</a>	Headend and distribution hub switching
<a href="#">Cisco 7609 router, with Supervisor Engine 720</a>	
<a href="#">Cisco Catalyst 4507 switch, with Supervisor Engine IV</a>	Distribution hub switch
<b>Video Edge QAM Devices</b>	
<a href="#">Cisco uMG9850 QAM Module</a>	Video edge QAM gateway designed for use in Cisco Catalyst 4507 switch slots
<a href="#">Cisco uMG9820 QAM Gateway</a>	Standalone video edge QAM gateway
<b>Optical Components</b>	
<a href="#">Cisco ONS 15216 FlexLayer DWDM filters</a>	Optical transport network
<a href="#">Cisco ONS 15454 10-GE transponder</a>	
<a href="#">Cisco ONS 15454 4-channel mux/demux</a>	
<a href="#">Cisco ONS 15454 4-channel OADM</a>	

See also [Related Documentation, page 8](#).

## Cisco Software Matrix

[Table 2 on page 5](#) is a matrix that describes the tested Cisco IOS and other software releases for Release 2.0 of the Cisco Gigabit-Ethernet Optimized VoD Solution. If you are implementing this solution for the first time, we recommend that you use the most recent software releases in [Table 2](#). If you have already implemented the solution in your network, use the entries in [Table 2](#) as options for upgrading your solution components.

[Table 2](#) also provides hyperlinks to release notes and the Cisco IOS Upgrade Planner from which you can download Cisco IOS images for Cisco components of the solution. See [How to Use the Cisco Upgrade Planner, page 5](#).

Before you select a Cisco IOS image, do the following:

- Select a feature set. Consult with your Cisco account representative to determine the Cisco IOS features that are required for your installation.
- Check the release notes for the platform and software release for flash and DRAM memory requirements.



### Tip

If you view this document online, some of the components in the first column of [Table 2](#) serve as links to the platform-specific release notes. The software release names in the rest of the table serve as links to the Cisco IOS Upgrade Planner from which you can download the Cisco IOS images.

**Table 2** *Cisco Gigabit-Ethernet Optimized VoD Solution Software Matrix*

Component	Cisco Release Tested for This Solution
<a href="#">Cisco Catalyst 6500 series switches</a>	<a href="#">Cisco IOS Release 12.2(17d)SXB1</a>
<a href="#">Cisco 7609 router</a>	<a href="#">Cisco IOS Release 12.2(17d)SXB1</a>
<a href="#">Cisco Catalyst 4507 switch with Cisco uMG9850 QAM Module</a>	<a href="#">Cisco IOS Release 12.1(20)EU</a>
<a href="#">Cisco uMG9820 QAM Gateway</a>	<a href="#">Release 1.0, Software Version 1.3</a>
<a href="#">Cisco ONS 15216 FlexLayer DWDM filters</a>	N/A
<a href="#">Cisco ONS 15454</a>	<a href="#">Cisco ONS System Software Release 4.6</a>

## How to Use the Cisco Upgrade Planner



### Note

You need a Cisco.com password and user ID to access the Cisco IOS Upgrade Planner.

- Step 1** To access the Cisco IOS Upgrade Planner, complete one of the following steps:
- Within the online version of these release notes, click the release version in [Table 2](#), and launch the Cisco IOS Upgrade Planner.
  - Go to <http://www.cisco.com/cgi-bin/Software/Iosplanner/Planner-tool/iosplanner.cgi?>, and launch the Cisco IOS Upgrade Planner.
- Step 2** Select the platform name from the Select Platform column in the Choose Options window.
- Step 3** Go to the Select Release column and find the heading Early Development Updates.

- Step 4 Search for the release name that corresponds with the name in the Cisco Releases Tested for This Solution column in [Table 2](#).
- Step 5 Click the link for that release. The Cisco IOS Upgrade Planner is refreshed.
- Step 6 Read all instructions on the page, then click the appropriate software feature in the Select Software Feature column. The Cisco IOS Upgrade Planner is refreshed.
- Step 7 Read the information on that page. If you agree with the requirements, click **I Agree**. The Cisco IOS Upgrade Planner is refreshed.



**Caution** Make sure that you have enough memory on your system for the file. Note the values in the Minimum Memory and Minimum Flash columns in the File Download Information table.

- Step 8 Read all instructions on that page, then click the filename of the binary image in the Download: line.
- Step 9 Continue as prompted.

## Important Notes

### Third-Party Components



**Note** While third-party servers and QAM devices are tested for interoperability in this solution, they are not supported as part of this solution. Configurations relevant to the transport network are documented in the *Cisco Gigabit-Ethernet Optimized VoD Solution Design and Implementation Guide*. Refer to third-party documentation for configuration of third-party equipment.

[Table 3](#) lists third-party components of the solution.



**Note** For the most current information, contact your Cisco account representative, visit the manufacturer’s website, or contact the manufacturer’s representative.

*Table 3 Third-Party Components*

Component	Manufacturer	Product and Version	Website
VoD Server	Concurrent Computer Corporation	MediaHawk	<a href="http://www.ccur.com">www.ccur.com</a>
	nCUBE	n4x On-Demand Server	<a href="http://www.ncube.com">www.ncube.com</a>
	SeaChange International	ITV Media Cluster	<a href="http://www.schange.com">www.schange.com</a>
QAM Device	Harmonic Inc.	NSG	<a href="http://www.harmonicinc.com">www.harmonicinc.com</a>

## SeaChange VoD Server Hardware and Software

For this solution, the SeaChange VoD server requires the following hardware and software components:

- Hardware:

- EVL-0068-02

Software:

- Vstream version 3.51
- Mylex firmware version AMI 79P
- NT advanced server 4.0 OEM service pack 114

## Asymmetric EtherChannel

The load balancing behavior of an EtherChannel with both bidirectional and send-only links is as follows:

- If a bidirectional link is lost, the flows on that link are rebalanced to the other links. If this link is the only bidirectional link in the EtherChannel, then it is possible that OSPF will lose this route and force the traffic to a new route.
- If a send-only link is lost, the flows on that link are not rebalanced to the other links.

## Adding Send-Only Gigabit-Ethernet Links to Operational EtherChannels

When adding send-only GE links to EtherChannels that are carrying video traffic, be sure to configure the receive-side switch and all physical connections before configuring the send-side switch. If the send-side switch is configured first, then the send-only link is forced up (even though the receive side is not ready to receive) and traffic is load-balanced onto that link—subsequently causing that traffic to be lost.

## Limitations and Restrictions

### ARP and MAC Address Table Timeouts

Because the data flow in VoD is unidirectional, the MAC address table for each Gigabit-Ethernet port connected to an edge QAM device eventually times out and causes data bound for that device to get flooded to all ports. To get around this, set the ARP timeout for that port (or VLAN) to a value less than the value for **mac-address-table aging-time**. Because the default value of **aging-time** is 300 (seconds), the ARP timeout can be set to 150, as follows: **arp timeout 150**.

### Layer 3 versus Layer 2 Interfaces

Cisco recommends using only Layer 3, not Layer 2, VLANs between the headend and Dhub switches and between the Dhub switches and the edge QAMs. Layer 2 VLANs can be used between the video server and the headend switch.

## Harmonic NSG Issues

Versions of Harmonic NSG earlier than V2.1 do not support GE link redundancy and ARP responses are unreliable.

## Caveats

Following are the key caveats for the components in this solution. Workarounds are provided where applicable.



### Note

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For additional caveats that may affect this solution, refer to the release notes for each platform and software release that you use as a solution component. If you view this document online, the software release numbers in [Table 2](#) serve as links to the platform-specific release notes.

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If you have an account with Cisco.com, you can use the Bug Toolkit to find to find caveats of any severity for any release. To find the open caveats for Cisco components used in this solution, you must query the system for each of the component and software releases used or being planned for your network. To reach the Bug Toolkit, go to [http://www.cisco.com/cgi-bin/Support/Bugtool/launch\\_bugtool.pl](http://www.cisco.com/cgi-bin/Support/Bugtool/launch_bugtool.pl).

## Open Caveats—Release 2.0

- CSCef68531

The Cisco IOS version tested in the Cisco Catalyst 6507 switch and the Cisco 7609 router does not optimally load-balance VoD server traffic across multiple equal-cost Layer 3 links. This is because the user is unable to modify the parameters appropriately in the CEF load-balancing algorithm. For VoD traffic, the source and destination Layer 2 and Layer 3 parameters, in addition to the destination Layer 4 port, should be included. The Cisco IOS version tested for this solution allows inclusion of both the source and destination Layer 4 ports only, not the destination only.

If multiple equal-cost paths are used and load balancing is required, the paths should be configured as an EtherChannel. EtherChannel load balancing allows the user to select just the destination Layer 4 port and therefore has acceptable load balancing when the number of links in the EtherChannel is 2, 4, or 8. No other number of links should be used in the EtherChannel.

## Related Documentation

### Solution Documentation

This document, and *Cisco Gigabit-Ethernet Optimized VoD Solution Design and Implementation Guide* are available under Cisco Gigabit-Ethernet Optimized VoD Solution, Release 2.0, at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/solution/vodsols/geopt2/index.htm>

## Cisco Catalyst 6500 Series Switches

Documentation resources for the Cisco 6500 series switches are available at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/lan/cat6000/index.htm>

## Cisco Catalyst 4500 Series Switches

Documentation resources for the Cisco Catalyst 4500 series switches are available at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/lan/cat4000/index.htm>

## Cisco 7609 Router

Documentation resources for the Cisco 7609 router are available at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/core/cis7600/index.htm>

## Cisco uMG9820 QAM Gateway

Documentation resources for the Cisco uMG9820 QAM Gateway are available at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/cable/vod/umg9820/index.htm>

## Cisco uMG9850 QAM Module

Documentation resources for the Cisco uMG9850 QAM Module are available at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/cable/vod/umg9850/index.htm>

## Cisco ONS 15454

Documentation resources for the Cisco ONS 15454 are available at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/ong/15400/index.htm>

## Cisco ONS 15216 DWDM Filters

Documentation resources for Cisco ONS 15216 DWDM filters are available at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/ong/15216/flx1yr10/index.htm>

## Cisco DWDM GBICs

Documentation resources for Cisco DWDM GBICs are available at the following URLs:

- *Cisco DWDM Gigabit Interface Converter Installation Note*  
[http://www.cisco.com/univercd/cc/td/doc/product/gbic\\_sfp/gbic\\_doc/78\\_15574.htm](http://www.cisco.com/univercd/cc/td/doc/product/gbic_sfp/gbic_doc/78_15574.htm)
- *Cisco Dense Wavelength Division Multiplexing GBICs Compatibility Matrix*  
[http://www.cisco.com/univercd/cc/td/doc/product/gbic\\_sfp/gbic\\_doc/ol\\_4604.htm](http://www.cisco.com/univercd/cc/td/doc/product/gbic_sfp/gbic_doc/ol_4604.htm)

# Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

## Cisco.com

You can access the most current Cisco documentation at this URL:

<http://www.cisco.com/univercd/home/home.htm>

You can access the Cisco website at this URL:

<http://www.cisco.com>

You can access international Cisco websites at this URL:

[http://www.cisco.com/public/countries\\_languages.shtml](http://www.cisco.com/public/countries_languages.shtml)

## Ordering Documentation

You can find instructions for ordering documentation at this URL:

[http://www.cisco.com/univercd/cc/td/doc/es\\_inpk/pdi.htm](http://www.cisco.com/univercd/cc/td/doc/es_inpk/pdi.htm)

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Ordering tool:  
<http://www.cisco.com/en/US/partner/ordering/index.shtml>
- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

## Documentation Feedback

You can send comments about technical documentation to [bug-doc@cisco.com](mailto:bug-doc@cisco.com).

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems  
Attn: Customer Document Ordering  
170 West Tasman Drive  
San Jose, CA 95134-9883

We appreciate your comments.

# Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, Cisco Technical Support provides 24-hour-a-day, award-winning technical assistance. The Cisco Technical Support Website on Cisco.com features extensive online support resources. In addition, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not hold a valid Cisco service contract, contact your reseller.

## Cisco Technical Support Website

The Cisco Technical Support Website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, 365 days a year at this URL:

<http://www.cisco.com/techsupport>

Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

<http://tools.cisco.com/RPF/register/register.do>

## Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool automatically provides recommended solutions. If your issue is not resolved using the recommended resources, your service request will be assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

<http://www.cisco.com/techsupport/servicerequest>

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)

EMEA: +32 2 704 55 55

USA: 1 800 553 2447

For a complete list of Cisco TAC contacts, go to this URL:

<http://www.cisco.com/techsupport/contacts>

## Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—Your network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

## Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:  
<http://www.cisco.com/go/marketplace/>
- The *Cisco Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the Cisco Product Catalog at this URL:  
<http://cisco.com/univercd/cc/td/doc/pcat/>
- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:  
<http://www.ciscopress.com>
- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:  
<http://www.cisco.com/packet>
- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:  
<http://www.cisco.com/go/iqmagazine>
- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:  
<http://www.cisco.com/ipj>
- World-class networking training is available from Cisco. You can view current offerings at this URL:  
<http://www.cisco.com/en/US/learning/index.html>



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