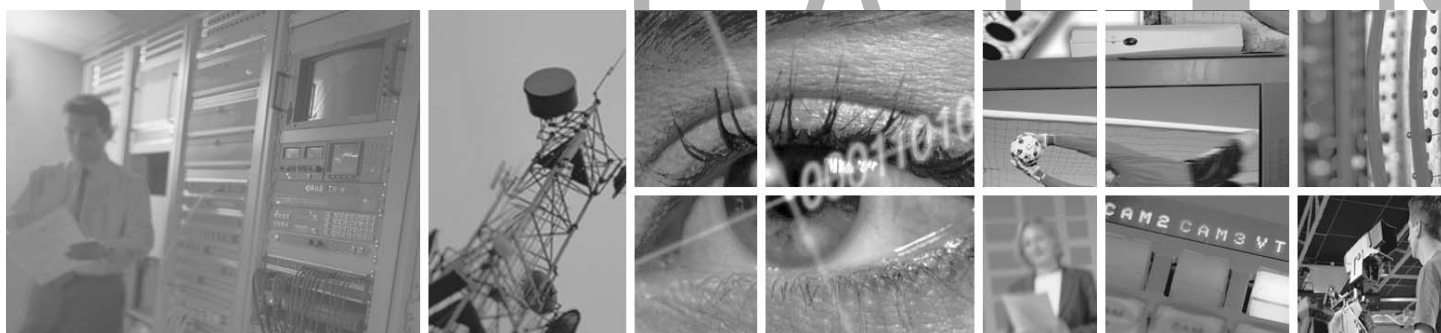




FULL OBJECT-ORIENTED MPEG-4 WEBCASTING SOLUTION USING CISCO ACNS 5.1 AND ENVIVIO 4FORUM™ 2.0

WHITE PAPER



For Large-Scale Deployments of Enterprise Communication and Training

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1. Introduction

The team focused on creating a solution to produce and deliver live and on-demand enterprise communications in MPEG-4 using the 4Forum™ 2.0 product from Envivio and the ACNS 5.1 (Application and Content Networking System) product from Cisco Systems.

In the solution, Envivio 4Forum focuses on easily producing live and on-demand interactive MPEG-4 presentations and streaming them from the origin server, while Cisco ACNS focuses on distributing the content across an enterprise Wide Area Network. The solution brings high-quality live and on-demand content to every desktop in the Enterprise, over large and heterogeneous networks.

This solution makes innovative use of the MPEG-4 Systems specification to deliver presentations as a single MPEG-4 stream that contains multiple objects that make up the presentation (video of the presenter, audio, presentation material, graphics, animations, and text). This new technological approach makes it possible to overcome limitations found in traditional webcasting that is based on hybrid technologies. It achieves better synchronization between video, audio, and collaborative material. When used with ACNS, the solution scales the content delivery to any number of simultaneous viewers and remote offices.

Both companies implemented support for the Advanced2D profile described in the *MPEG-4 Systems* specification to handle multi-object MPEG-4 streams and to ensure interoperability between the two products in their respective labs.

This solution was optimized for applications such as a "Morning Call" where financial analysts present data from a New York office to all branch offices in real time. The achieved sub-second latency across the WAN (end-to-end propagation delay of the signal from presenter to viewers) makes the simultaneous use of the telephone possible, for viewers to interact with the presenter during the live presentation.

The solution reduces travel costs while improving productivity with more efficient corporate communications. It meets enterprise needs for delivering a broad range of corporate communications, including morning calls, executive messages or HR announcements, corporate sales and partners' training, marketing messages, academic training and e-learning in corporate, financial, insurance, pharmaceutical, law, military, government, or academic environments.

This document provides a description of the global architecture and components of the 4Forum/ACNS enterprise webcasting solution, the value proposition supporting their deployment, and the key products that can be used in implementing the solution.

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2. Technology: Object-Based MPEG-4 Webcasting vs Traditional Webcasting

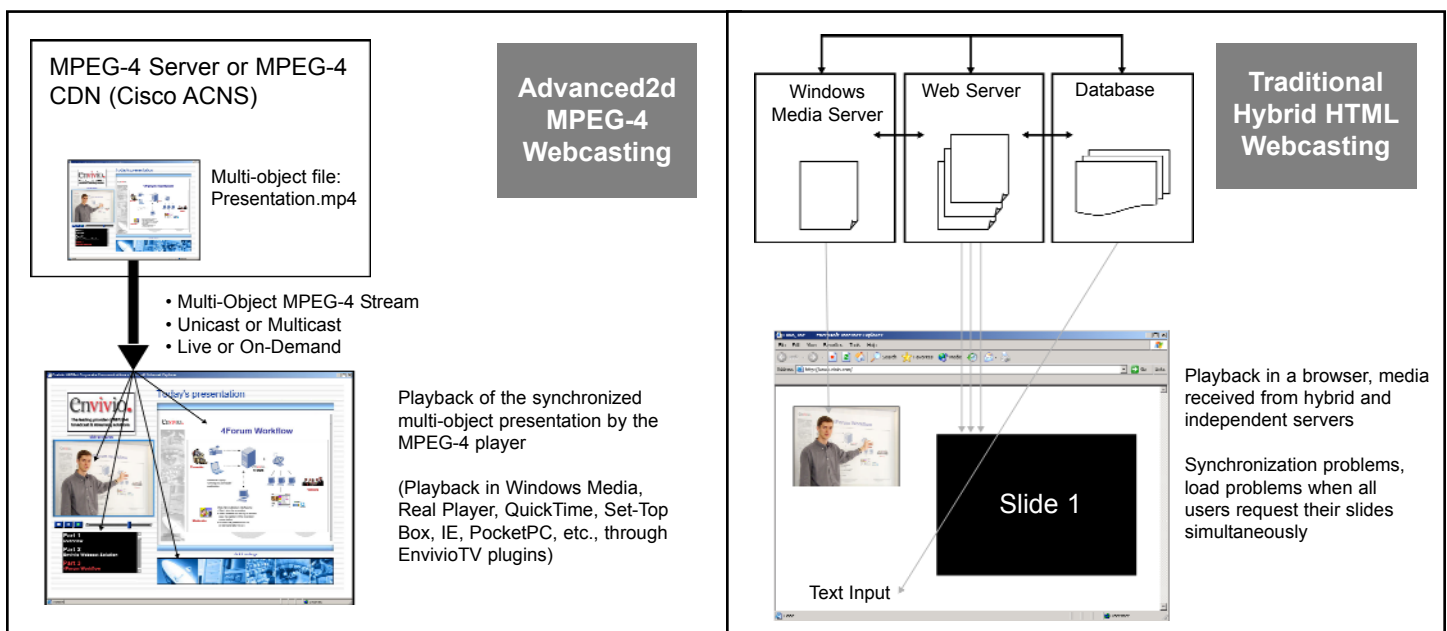
The Cisco ACNS/Envivio 4Forum solution makes the exclusive use of the *MPEG-4 System* portion of the standard (also known as BIFS: Binary Format for Scenes) to deliver multi-object and interactive presentations. These presentations are produced as self-contained files (with the mp4 extension) containing all the elements of the presentation as 'MPEG-4 Elementary Streams,' such as the video of the presenter, the video capture of his desktop, audio objects, text objects, animations, and interactive features for the viewer to interact with the MPEG-4 scene. These self-contained mp4 presentation files can be streamed by any server compliant to the MPEG-4 Advanced2D profile defined in MPEG-4 Systems.

In particular, 4Forum produces MPEG-4 Advanced2D files and live streams, and the ACNS 5.1 is able to handle them and efficiently bring them to the edge of an enterprise WAN for a reliable playback on every desktop.

This approach is different from commonly found HTML-based webcasting systems where elements of the presen-

tation are artificially put together using hybrid technology such as HTML, JavaScript, an embedded proprietary player for the presenter's video, a web server delivering slides previously converted to JPEG images, and a database to link contents together. Because these systems rely on disparate technologies not meant to work together, they usually lead to synchronization problems or fail when attempting to scale to a large number of simultaneous viewers, the connections load making one of the pieces of the system break. Also the distribution is more difficult since many files, servers, and databases are necessary to playback a presentation, while a single mp4 file can easily be distributed or streamed by MPEG-4 compliant products such as the Cisco ACNS or Envivio 4Sight™ streaming server, or played back locally with an MPEG-4 client.

The following diagram shows the differences between a traditional proprietary webcasting system and MPEG-4 webcasting:



3. Producing and Viewing the MPEG-4 Webcast: The 4Forum System

The **Envivio 4Forum system** is a plug and play hardware/software bundle that allows easy authoring, production and distribution of live and on-demand interactive MPEG-4 presentations over IP networks. It consists of several hardware components (see the *4Forum and ACNS Solution Global Architecture* diagram, paragraph 5).

Envivio 4Forum Producer is the main piece of the 4Forum system. It runs the two MPEG-4 live encoders and the 4Forum web-based application server to remotely control encoders, record and edit presentations, add chapter marks, package presentations into self-contained mp4 files, manage the library of presentations, and deliver files for streaming to the Envivio 4Sight streaming server.

Envivio 4Sight™ is an MPEG-4 streaming server supporting the Advanced2D profile, and is used as the origin server to the Cisco ACNS in charge of bringing the content to the edges of the WAN.

Envivio 4Mation™ (optional) is an MPEG-4 authoring tool to create and customize interactive MPEG-4 templates. 4Mation can import multiple file formats, including images, videos, audios, flash animations, texts, etc. The author also easily creates actions and defines interactions between the MPEG-4 objects of the scene or between the viewer and the MPEG-4 objects, through mouse or keyboard events. Once created with 4Mation, the 4Forum design template can be uploaded to the 4Forum producer via the web interface. Default templates are provided with the system and users can acquire 4Mation to create different user experiences and brand presentations.

EnvivioTV is an MPEG-4 player with support for the Advanced2D graphics profile. The same MPEG-4 content

can be played on many platforms because EnvivioTV is available as plugins to Windows Media Player, QuickTime Player, Real Player, Internet Explorer, and on Windows, Mac, Pocket PC, and Linux platforms. MPEG-4 Advanced2D set-top boxes also make the content playable on a TV set. The cross-platform playback reduces costs by removing the need for useless transcodings.

More Details About 4Forum Producer

The 4Forum Producer is fully automated and can be operated by non-technical users through an intuitive web-based administrator interface. The moderator can remotely prepare a live event, control the encoders, insert chapters on the fly for later navigation, edit, and archive the saved presentation for on-demand access.

An event using 4Forum typically involves several actors: the presenter, the moderator (or administrator), and a large number of viewers across the WAN.

Available in rack-mount or tower form factors, the 4Forum Producer appliance has two inputs:

- The first input receives an A/V signal from a video camera through S-Video or composite connections.
- The second input receives a VGA signal from the presenter's laptop through a VGA cable connected to the system.

3. Producing and Viewing the MPEG-4 Webcast: The 4Forum System (Continued)

Both signals are then encoded in real time, broadcasted by the live encoder components of the 4Forum Producer, and re-composed with the rest of the MPEG-4 scene by the player on the client side.

The output of the system is an Ethernet connection to deliver the live and on-demand presentations over the IP network.

The presenter only has to plug his laptop to the 4Forum Producer with a VGA cable to share his desktop with support for capture resolutions up to 1600 x 1200. Any application running on his computer will be viewed, including the mouse pointer.

By encoding the collaborative material as a high-resolution video with a low frame rate, it is possible to maintain very good quality even at low bit rates, keeping small text fonts intact. In addition, because the collaborative material is also sent in multicast, the number of users doesn't have any impact on the system performances (this is not true with traditional webcasting systems where users simultaneously send many requests to a web server to retrieve the slides as JPEG images, causing the web server to be overloaded).

At the end of the event, a single mp4 presentation file is produced from the two saved videos, the interactive template, custom text, and image elements input from the web interface. The produced presentation file can then be distributed for local playback, served by a streaming server or ingested by Cisco ACNS for delivery to the edges of the WAN.

4. Distributing the MPEG-4 Webcast to the Edges of the WAN, the ACNS Solution

Cisco ACNS solution enables intelligent delivery of content-rich media from a corporate headquarters to low-bandwidth branch offices. Cisco ACNS components include a Cisco CDM for centralized distribution of media and Cisco CEs, which poll the Cisco CDM for new content and ultimately fulfill the client browser requests.

Benefits of the Cisco ACNS include:

- Reduced bandwidth costs by distributing rich, on-demand media during off hours.
- Higher quality-switched LANs offer 10 to 100 times more bandwidth than T1 Internet connections, enabling enterprises to offer TV-quality media to tens or hundreds of users without having to make major WAN upgrades.

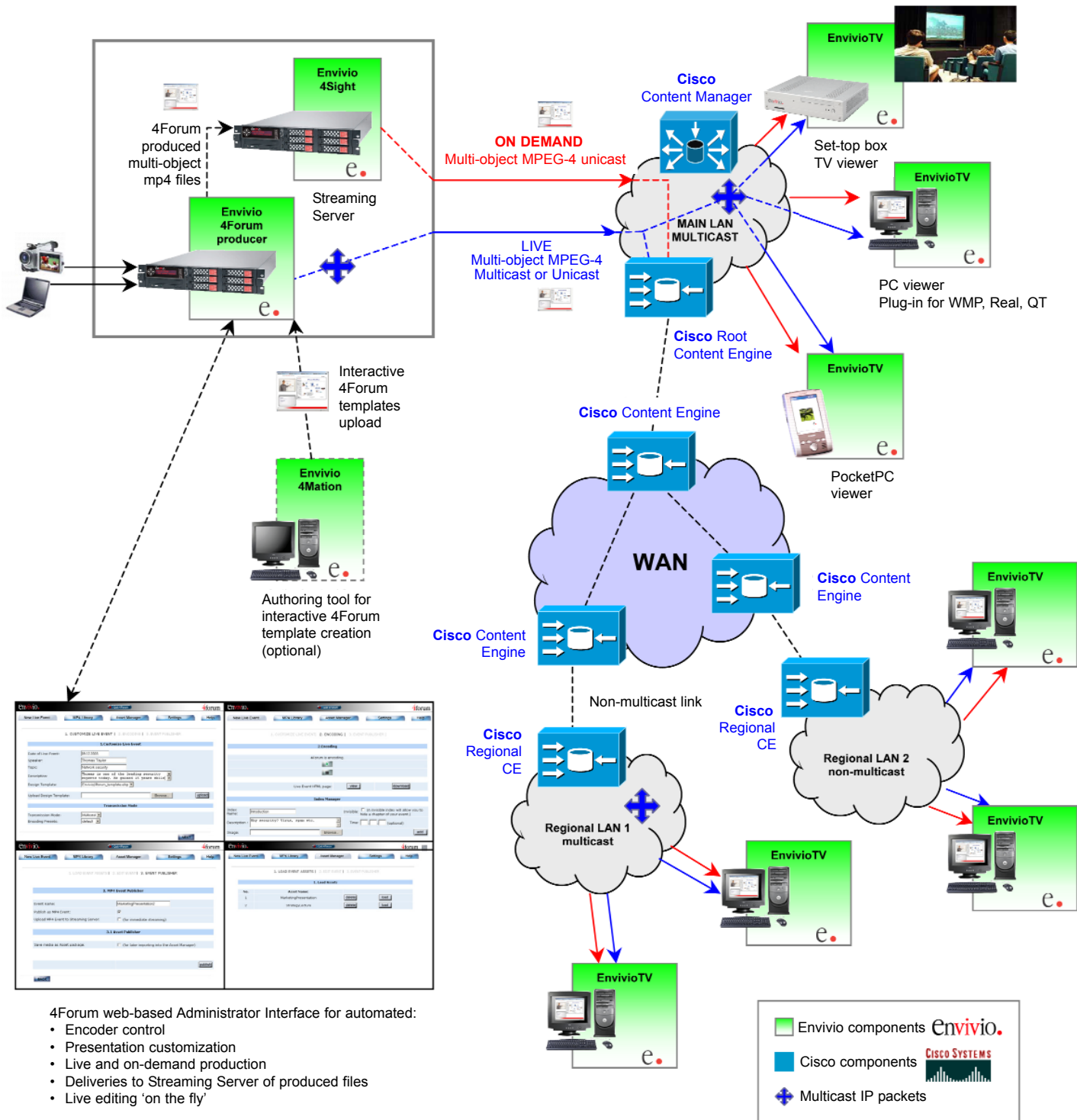
ACNS consists of Content Engines (CEs) running in branch offices and a Content Distribution Manager (CDM) in the data center. These devices work together as a system to ensure that high-quality video is available in all parts of the organization. ACNS ensures quality video delivery, even over small WAN links.

The network components are deployed and configured in a manner that minimizes the number of service interruptions of an e-business solution.

ACNS components are managed like Cisco routers with an IOS style Command Line Interface, SNMP MIBs and Traps, syslog output, and other standard Network Management interfaces. This makes ACNS CEs less expensive to own and operate and improves the reliability of video streaming solution.

While 4Forum produces and encodes the video presentations, ACNS distributes it to the edge of the network. The two products work together to ensure that the highest quality video is available in all branch offices and remote locations within an enterprise.

5. The 4Forum and ACNS Solution Global Architecture



- 4Forum web-based Administrator Interface for automated:
- Encoder control
 - Presentation customization
 - Live and on-demand production
 - Deliveries to Streaming Server of produced files
 - Live editing 'on the fly'

6. Enterprise Market Drivers and Requirements

There are many reasons why global organizations require an MPEG-4 enterprise webcasting system such as the ACNS/4Forum solution. At the technology level, MPEG-4 offers benefits not found in hybrid HTML-based webcasting systems.

Enterprise Market Drivers

The 4Forum/ACNS webcast system helps enterprises improve internal communication and training, hence productivity, while reducing infrastructure costs and training travel expenses. The system also helps communicating a denser flow of information than traditional ways of communication (such as the telephone) and reaching a dispersed audience to give equal access to knowledge and information.

Enterprise Requirements

Ultra-Low Latency, From 500 ms

An important requirement for an efficient corporate communications system is the ability to interact with the presenter. This requires a low latency, which is the delay for the stream to arrive at viewers' desktops. With the 4Forum system, streams arrive at viewers' desktops via private multicast networks in less than one second, where other proprietary solutions take anywhere from 20 seconds to 2 minutes or more.

The low latency makes it possible for viewers to interact with the presenter via chat or even by telephone and enable an effective two-way communication.

Leverage Legacy Desktops and Comply to Internal SOE (Standard Operating Environment) Policies

Enterprises cannot afford major upgrades of employees' desktop computers. EnvivioTV has been optimized to enable playback even on low-end employees' desktops in the enterprise without a need to upgrade hardware.

The use of an open standard such as MPEG-4 makes the same content playable on most platforms of a heterogeneous enterprise environment. In particular, EnvivioTV makes the same MPEG-4 content play on PC, Mac, Linux platforms, in Windows Media, Real, and QuickTime players, in Internet Explorer, and even on set-top boxes for TV playback.

The rollout of EnvivioTV is easy with its "automatic installer" transparently downloaded and installed on the first user's attempt to play MPEG-4 content. It is also possible to deploy EnvivioTV through standard internal SOE processes.

The versatility of the MPEG-4 open standard makes 4Forum/ACNS a cost-effective solution to deliver high-quality and reliable interactive webcasts over a large enterprise network.

Leverage Existing Network Infrastructures

Enterprises who want to deliver quality video on their networks can't necessarily afford major upgrade of their networks. ACNS components work together to ensure that high quality video is available in all parts of the organization, even over small WAN links.

6. Enterprise Market Drivers and Requirements (Continued)

The network components are deployed and configured in a manner that minimizes the number of service interruptions of an e-business solution.

Cost Effectiveness: Highly Automated and Easy-to-Produce Live and On-Demand Contents

Because enterprises need to focus on their own business, they can't spend large amounts of time and resources on maintaining and operating a webcast system, pre-authoring live events or performing advanced video post-production.

With 4Forum, there is no need for converting slideshows prior to the event: the presenter can complete his presentation at the last minute and simply plug his laptop to the 4Forum Producer to share his desktop immediately.

Simple editing and indexing capabilities are offered to the administrator through the wizard-like html interface while Envivio 4Mation can be used if more advanced MPEG-4 editing is needed before producing the final presentation.

Because of its high level of automation, the 4Forum/ACNS solution simplifies the workflow at the user level to make the webcast system an easy and convenient tool without compromising the capabilities.

Engaging User Experience

For the system to be a valuable alternative to traditional ways of communicating in the Enterprise, the user experience must be engaging and reliable, which ensures a high attendance. 4Forum produces MPEG-4 files with interactive features making the user experience much more immersive. Envivio 4Mation makes it possible to create

interactive templates for 4Forum to customize or brand the presentation and add more MPEG-4 interactive features.

The high quality of the video and the high resolution of the presentation material are also key in keeping the audience's attention.

In addition, the simpler workflow MPEG-4 offers for delivering rich media, combined with the intelligent management of video traffic that ACNS provides, makes the 4Forum/ACNS combination a reliable solution.

Scalability and Interruption-Free

4Forum/ACNS answers the enterprise needs for a system that can scale to thousands of users for both live and on-demand delivery.

By using MPEG-4 – a single technology that was designed for streaming multi-object presentations – with the use of multicast and a smart distribution through the CDN, the solution is much more robust, especially when scaling to a large number of simultaneous viewers, and prevents service interruptions.

7. Conclusion

Envivio and Cisco have combined several innovative technologies into a robust, standards-based solution that allows enterprises to distribute time-critical presentations around the globe with subsecond latency.

Together, Cisco's ACNS and Envivio's 4Forum system offer enhanced communication to meet an enterprise's short-term goals for increased productivity and reduced travel, staffing, and production costs. Without the need for infrastructure changes, enterprises can accomplish their enterprise webcasting goals.

The solution is the only industry-standard, all-in-one corporate communications solution in the enterprise marketplace that uses MPEG-4 as a single technology for synchronized video, audio, and collaborative material. It is an integrated plug-and-play and easy-to-operate system with optimized hardware, streaming software, and rich media authoring tools. The system works on existing IP infrastructures, and content can be delivered over terrestrial, satellite, or wireless networks in multicast and unicast modes. Recipients can view the presentations on all major media players and devices, including PCs, TVs, and PDAs.

The Envivio and Cisco Strategic Alliance

While selecting the right set of prioritized strategies for your business is difficult, the need for experience partners is paramount. Envivio and Cisco Systems are working together to provide end-to-end solutions for various industry sectors with the financial services market. This relationship combines Envivio's global leadership in MPEG-4 broadcast and streaming solutions with Cisco's leadership in networking products and Content Networking.

The joint effort between Envivio and Cisco provides the rich, integrated solutions that solve some of the most pressing enterprise issues currently affecting both Envivio and Cisco customers today. Not only do Envivio and Cisco advise customers on video streaming strategy, they implement the solutions internally as well.

Additional Information

Additional information can be found on the Envivio website at <http://www.envivio.com>. For specific 4Forum information, link to <http://www.envivio.com/products/4forum.html>.

Envivio representatives can be reached via an information request form at <http://www.envivio.com/company/inforequestform.html>, or via the phone, fax, or mail listed at <http://www.envivio.com/company/contacts.html>.

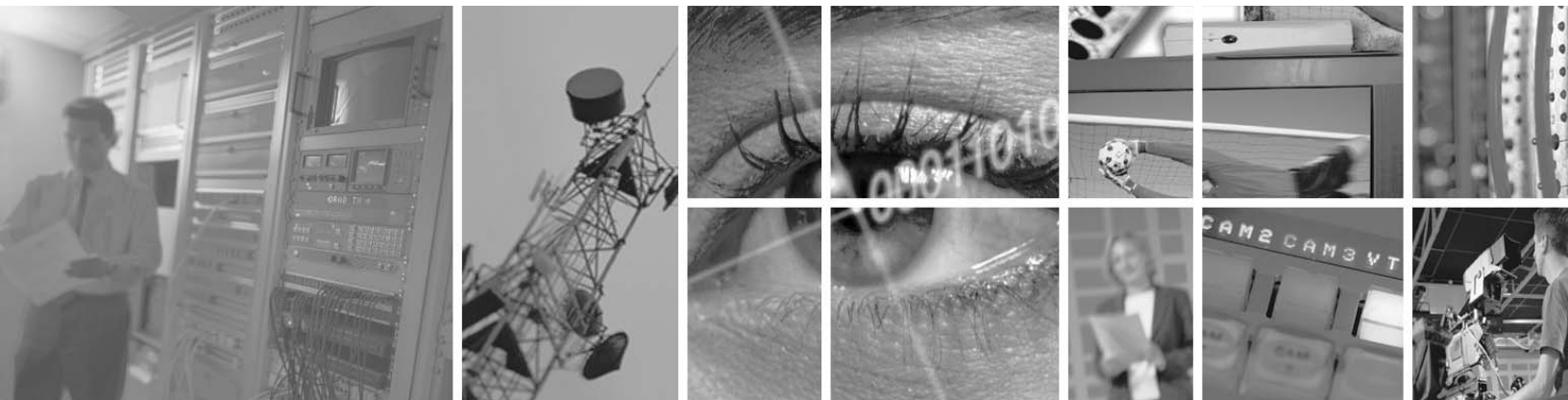
Additional information on Cisco Systems, Inc. ACNS product can be found at: <http://www.cisco.com/en/US/products/sw/conntsw/ps491/index.html>

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