

Introduction

About IP/TV

IP/TV is a client/server application that delivers live or prerecorded, on-demand or scheduled programs to an unlimited number of users over any IP-based local or wide-area network.

IP/TV brings movie-quality video to the user's computer, eliminating the need for dedicated video cabling, monitors, or special viewing rooms. IP/TV Version 3.0 supports a wide variety of audio/video formats including MPEG1, MPEG2, MPEG4, and H.261.

IP/TV is used in applications such as broadcast TV to the desktop, video on demand, computer-based training, distance learning, corporate communications, manufacturing process monitoring, and surveillance systems.

To view a seven-minute video that describes IP/TV's capabilities, click **Introduction Video** on the Cisco IP/TV Installer CD.

IP/TV Components

IP/TV consists of three separate components:

- IP/TV Viewer I
- P/TV Content Manager
- IP/TV Server

IP/TV Viewer

IP/TV Viewer lets you view programs. A program is an audio, video, or text transmission over the network. The Viewer has a customizable user interface that displays a list of scheduled and on-demand programs. IP/TV Viewer allows you to subscribe to any of the listed programs, and plays the program at the scheduled or requested time. You can also browse among all currently running programs.

IP/TV Viewer gets program information from the IP/TV Content Manager, and displays programs served by IP/TV Server or other servers. It can also display programs multicast from the Internet's Multicast Backbone (MBone) or from other servers that transmit in MBone-compatible format.

IP/TV Viewer can run as a standalone application, a helper application activated by a Web browser, or a browser plugin. It runs on Windows 95, Windows 98, and Windows NT 4.0.

Refer to the *IP/TV Viewer User Guide* for information on how to install and use the IP/TV Viewer.

IP/TV Content Manager

IP/TV Content Manager is used by the system administrator or broadcast administrator to set up and manage IP/TV scheduled or on-demand programs, channels, recordings, and file transfers among IP/TV servers.

IP/TV Content Manager runs on Windows NT 4.0, and can be accessed from Netscape 4.05 or 4.5x, or Microsoft Internet Explorer 4.x or 5.0. The browser must have support for Java and JavaScript enabled.

This manual provides information on how to install, configure, and administer the IP/TV Content Manager. The *IP/TV Content Manager User Guide* provides information on how to create scheduled and on-demand programs.

IP/TV Server

IP/TV Server, which is controlled by the IP/TV Content Manager, multicasts and records scheduled programs, unicasts on-demand programs, and transfers files according to the schedules defined in the IP/TV Content Manager. IP/TV Server runs on Windows NT 4.0.

The same server can be used for live encoding with a video capture card and for serving prerecorded files.

This manual provides information on how to install, configure, and administer IP/TV Server.

How IP/TV Components Interact

You can use IP/TV for the broadcast of scheduled live or prerecorded programs, on-demand programs, or some combination of the two.

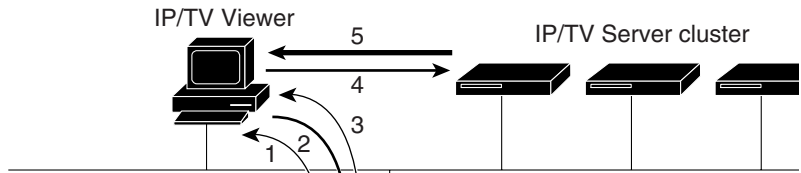
You can use a given server to broadcast both scheduled and on-demand programs. However, you may want to dedicate a server to scheduled programming so that the quality of scheduled programs does not degrade due to the unpredictable overhead of on-demand program requests.

Figure 1-1 shows the interactions between IP/TV components in the case of scheduled programs. Note that although the IP/TV Viewer receives program descriptions only from the IP/TV Content Manager, the programs are sent to the Viewers from the various media servers. The media servers may be IP/TV Servers, Mbone servers, or other servers that run IP/TV-compatible Mbone tools.

Figure 1-1 **IP/TV Components—Scheduled Programs**

Figure 1-2 shows the interactions between these components in the case of on-demand programs. The Content Manager manages a group (cluster) of servers that together form a virtual machine, with an integrated database to keep track of program information. This allows the Content Manager to balance the server load by routing a user's program request to the least busy server.

Figure 1-2 IP/TV Components—On-Demand Programs



New Features in IP/TV Release 3.0

IP/TV Release 3.0 introduces the following new features:

- Video enhancements

Quality for low-end and high-end video for live and prerecorded has been improved. IP/TV extends high-quality video by including MPEG2 at full D1 resolutions (720 x 480). Additionally, IP/TV enhances low-end quality by supporting MPEG4 for low and mid-bit rate streams.

- Management enhancements

Management of IP/TV video services has been extended to support multiple IP/TV Server clusters and IP/TV Viewer sets. IP/TV Server groups allow the user to group servers based upon video content, geographical locations, or any combination thereof. IP/TV Viewer sets allow the administrator of an IP/TV system to create group user machines to pull video on-demand content from specific IP/TV Server groups. The enhanced management features allow for flexible video service management schemes.

- Data integration enhancements

Data Integration has been greatly enhanced for easier delivery of nonvideo and audio data types. Web Presenter provides the ability to send information via web pages along with audio and video.

IP/TV has incorporated the ability to support Advanced Streaming Format (ASF) content, which supports many features such as content markers. Content markers are used to “mark” specific places within a stream for quick location indexing.

- Windows Media Technology (WMT) integration

IP/TV has integrated WMT with IP/TV to provide the best of both intranet and Internet streaming video.

- Client enhancements

IP/TV client enhancements include easier to use video controls and enhanced plugin capabilities.

Unicast, Broadcast, and Multicast Traffic

Understanding the differences between unicast, broadcast, and multicast network traffic is central to understanding the benefits of IP/TV and the use of scheduled and on-demand programs. Each of these types of transmission uses a different type of destination IP address to accomplish its task, and can have a very different level of impact on network bandwidth consumption.

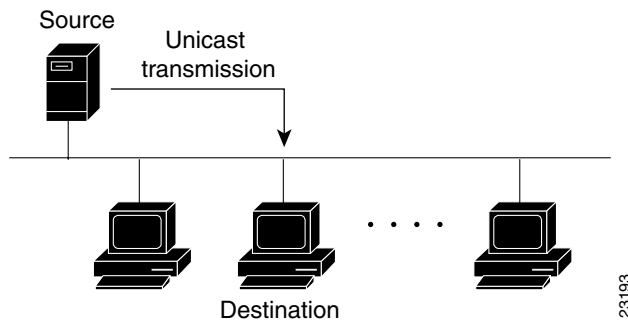
Unicast Traffic

IP/TV OnDemand and SmallCast programs use unicast traffic. Each user can request the program at a different time, with the number of simultaneous users limited by the available bandwidth from the video streams.

Unicast traffic is sent from a single source to a single destination IP address. The address belongs to one (and only one) machine in the network.

Figure 1-3 shows a simple example of unicast traffic, with one data stream being transmitted from a single source to a single destination.

Figure 1-3 Example of Single Unicast Traffic



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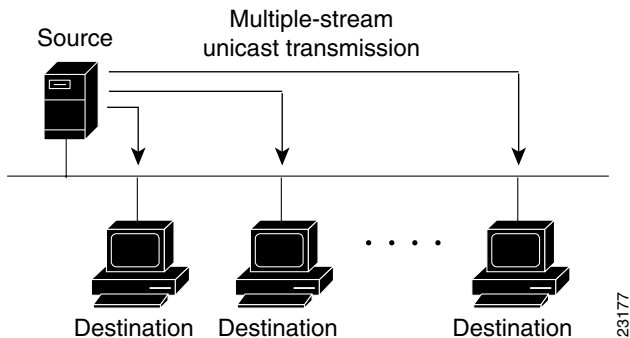
Unicast traffic is appropriate for many client/server applications, such as database applications, in which all the data resides on the server and the client runs an application to retrieve, modify, add, or delete data. For each transaction, there can be many bursts of unicast traffic traveling back and forth between the client and the server.

However, in the case of an application such as multimedia presentations, there might be a single source and several destinations. When a source machine wants to send the same data to two destination addresses using the unicast address scheme, it must send two separate data streams, thus doubling the amount of network bandwidth that is used.

Figure 1-4 shows an example of multiple-stream unicast traffic, with a single source sending separate data streams to multiple destinations.

Because the source must replicate the entire data stream for each intended destination, this can be a very inefficient use of network bandwidth.

Figure 1-4 Example of Multiple-Stream Unicast Traffic



Multicast Traffic

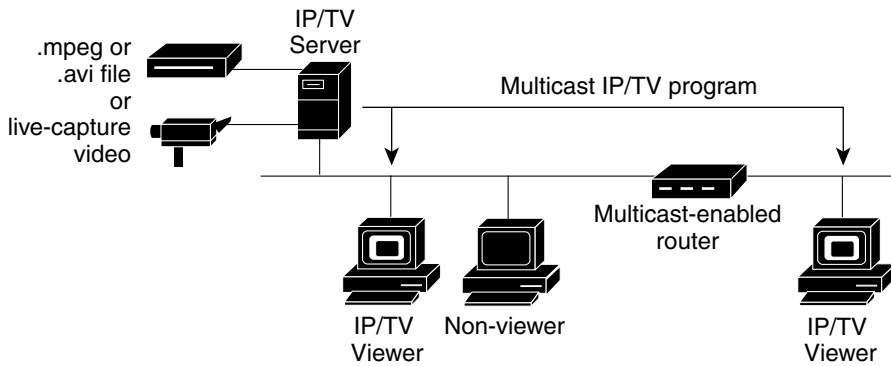
IP/TV scheduled programs use multicast transmissions which can reach unlimited numbers of viewers simultaneously without overloading the network.

Multicast transmissions uses a special class of destination IP addresses (the addresses in the range 224.0.0.0 through 239.255.255.255). Multicast addresses are Class D addresses. Unlike unicast addresses, these multicast addresses are not assigned to individual machines on the network. Instead, when a data stream is sent to one of these addresses, potential recipients of the data can decide whether or not to receive the data. If the user wants the data, the user's machine receives the data stream; if not, the user's machine ignores it.

For an application such as IP/TV, this means that a source server can transmit a single data stream that is received by many destinations without overloading the network by replicating the data stream for each destination. Unlike the broadcast case, the user can choose whether to receive the data.

Figure 1-6 shows an example of multicast traffic.

Figure 1-6 Example of Multicast Traffic



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IP/TV uses multicast addressing to deliver multimedia content to the user without overburdening the network with unnecessary data streams.

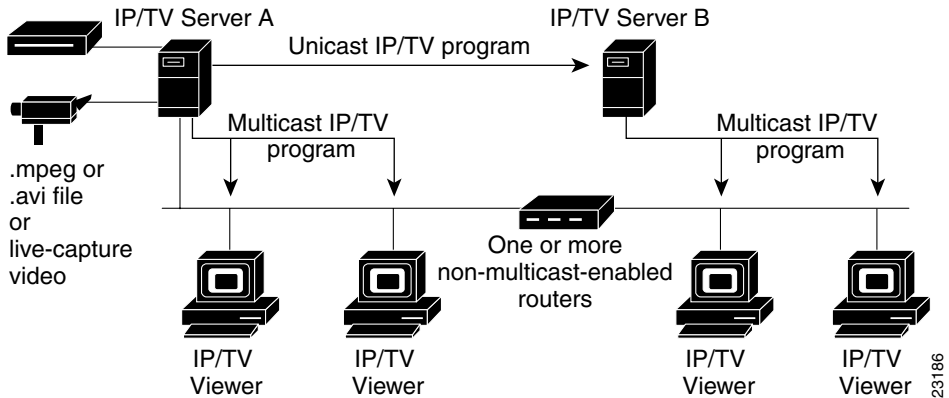
Note, however, that multicast transmissions require the routers in the network to be multicast-enabled.

Combining Unicast and Multicast Traffic

If the routers in a network are not capable of handling multicast traffic, IP/TV can use unicast transmissions to send the multimedia content across the nonmulticast-enabled router. A server on the other side of the router can then use multicast transmission to deliver the content to its local users.

Figure 1-7 shows an example in which both multicast and unicast transmissions are used to deliver IP/TV multimedia content. Note that the nonmulticast-enabled router in the illustration could represent the whole Internet itself.

Figure 1-7 Example of Combined Multicast and Unicast Traffic



Note, however, that each time a data stream is replicated, it adds to network traffic loads. Assume that a single data stream requires 1.15 Mbps per second of network bandwidth (which is typical for MPEG video), and the server sends one multicast data stream and seven unicast data streams (the maximum number permitted by IP/TV). In this case, the total network bandwidth consumed would be 9.2 Mbps, which is enough to severely overload the average 10BaseT Ethernet network.

The use of combined multicast and unicast transmissions to deliver IP/TV content is called SmallCasting. See the “SmallCasting Scheduled Programs” chapter for more information about SmallCast.

Scheduled and OnDemand Programs

The Content Manager can manage both scheduled and on-demand programs. The uses, advantages, and limitations of scheduled and on-demand programs are discussed in the sections that follow.

Scheduled Programs

Scheduled programs are available to viewers at times defined by the Content Manager. Scheduled programs are delivered by one multicast data stream per media type (video, audio, SlideCast, or Web Presenter), scheduled programs can reach unlimited numbers of viewers simultaneously without overloading the network. See the “Multicast Traffic” section earlier in this chapter.

Scheduled programs can be live content sent to viewers in real time and prerecorded content, that can be played repeatedly at scheduled times. Typical uses of scheduled programs include employee communications, group training, and distance learning.

How Scheduled Programs Work

In the Content Manager, you define a list of scheduled programs, and assign them to one or more specified servers. The list of programs is also sent to IP/TV Viewer, and viewers can watch the programs at their scheduled time.

When defining scheduled programs, it is important to understand the difference between programs and channels. In the IP/TV context, channels and programs are nearly identical to their network television equivalents, but there are a few differences. Understanding these differences will help you create the best model for your organization, and manage IP/TV scheduled programming most effectively.

On network television, a channel carries either a single, continuous program (such as a 24-hour news channel) or a series of noncontinuous, back-to-back programs. Programs cannot exist without channels. All programs must be carried by a channel in order to be viewable. To view a program, the user tunes to its channel, either by selecting the channel explicitly or surfing to it. The channel itself constitutes the address of all programs on that channel.

However, on IP/TV, a channel can carry either a single, continuous program, a series of noncontinuous, back-to-back programs, or both. A noncontinuous program can overlap a continuous program. They are defined as two separate programs that can be tuned in by the user.

An example of a continuous program that has a noncontinuous program overlapping it is a 24-hour news service. The news program is always on, and users can tune in whenever they want to get a news update. Suppose, though, that the financial news is always discussed for half an hour starting at 3:00 p.m., and some users want to subscribe to the financial news so that IP/TV automatically launches the program for them. You can define a noncontinuous program that begins at 3:00 p.m. and runs for 30 minutes. This noncontinuous program is a subset of the 24-hour news program, and overlaps it for that 30-minute interval.

A channel constitutes a template for programs. The programs on that channel share the channel's address and a variety of common characteristics such as passwords.

Unlike network television, an IP/TV program need not be assigned to a channel. It can exist independently. The program simply has its own address. Thus, if you prefer, you can omit the channel mechanism altogether. However, a channel is useful if you want to replicate programs with similar characteristics.

Note Channels are invisible to users of IP/TV Viewer. To view a program, the user can either subscribe to the program explicitly, or surf to the program spontaneously. The address the user ends up at belongs either to a channel or to an independent program. Either way, the actual IP address is invisible to the user.

OnDemand Programs

IP/TV OnDemand programs are available to individual users to watch at the time and pace of their choosing. Because multiple requests for an on-demand program require more network bandwidth than for a scheduled program (see the "Unicast Traffic" section earlier in this chapter), we recommend that you use OnDemand for programs that are accessed less frequently, such as individualized corporate training and video archives.

How OnDemand Works

The Content Manager manages a group (cluster) of servers that together form one larger server, with an integrated database to keep track of server and program information. The Content Manager automatically collects a list of available media files from the cluster, and, using Cisco's FTP Server (included with IP/TV), can also schedule distribution of files from one server to another or from an outside source to one or more of the servers.

The system administrator then defines these files as programs in the Content Manager, using a hierarchical tree of program categories. A top level category can contain subcategories, which you navigate to by clicking links. This hierarchical tree allows you to manage and make available a large library of programs.

The Content Manager distributes a list of available on-demand programs to IP/TV Viewers. When a user requests to watch a program, the Content Manager uses information from the database to assign the least busy server in the cluster to meet the request, then directs the IP/TV Viewer to that server. If one of the servers fails, or needs to be taken out of service, the Content Manager balances the request load among the remaining servers.

The Content Manager and on-demand programs can also be used with the IP/TV Viewer plugin.