Cisco Digital Media Systems—Solution Overview

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Executive Overview

The Cisco Digital Media System (DMS) consists of a comprehensive suite of applications that allow companies to use digital media to increase sales, enhance customer experience, and facilitate learning.

Cisco DMS is split into three functional subsystems (Figure 1). These three sub-systems are *Digital Signage*, *Enterprise TV*, and *Desktop Video*. The Desktop Video subsystem is sometimes referred to as *Video Portal*, but is generally referred to as Desktop Video in this document.

Cisco DMS is a key element of the overall Cisco Enterprise Video Solution—which also consists of Video Collaboration, IP Video Surveillance, and Telepresence technologies (Figure 2).

Figure 1 DMS Functional Subsystems

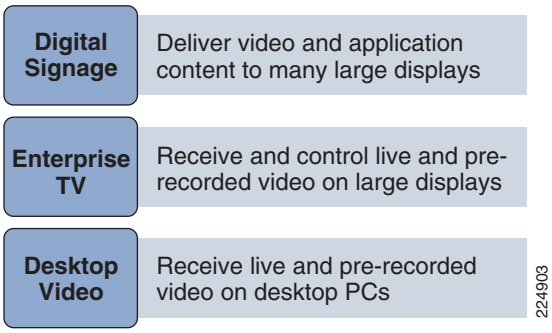

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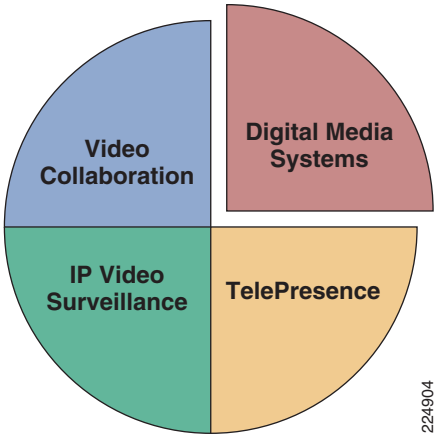
Figure 2 Cisco Enterprise Video Solution Components



Product Overview

More detailed information about specific Cisco DMS products can be found at the following URL:

http://www.cisco.com/web/solutions/dms

Cisco DMS Benefits

Today, digital media is the single most compelling platform for effectively communicating information about news, training, and events to customers, employees, partners, and students. The sections that follow summarize the key benefits of the Cisco DMS subsystems.

Digital Signage

Cisco Digital Signage provides scalable, centralized management and publishing of high-quality content to networked, on-premise digital signage displays.

Built on the power of the Cisco Digital Media System, Cisco Digital Signage leverages the same hardware and management platform as—and can interoperate with—Cisco Enterprise TV, or can operate as a standalone application.

More and more financial services organizations, retail stores, and educational institutions are using Cisco DMS for Digital Signage. Additional examples of industry applications include:

- *Sports and Entertainment*—Deliver high-definition event broadcasts, live streaming statistics, sales and marketing of products and services, and directional informational on digital signs and video walls throughout the even venue and in fan lounges and suites
- *Government*—Use digital signs to provide useful information for people waiting in line in government offices to help speed transactions
- *Healthcare*—Share relevant healthcare information and wayfinding through digital signs around the hospital; offer cost-effective training options for hospital personnel

In addition to Digital Signage, Cisco DMS is a single solution for delivering content for Enterprise TV across digital displays and through the web for desktop video.

Cisco Digital Signage with Cisco Application and Content Networking System (ACNS) provides optimized live streaming content in IP Multicast, unicast, store-and-forward, and mixed environments. For Cisco Digital Signage content, Cisco ACNS provides intelligent prepositioning and distribution technologies to efficiently deliver high-quality digital media content to the edge of the network without adversely affecting the network connection.

Enterprise TV

Enterprise TV allows organizations to deliver live and prerecorded content, controlled by the end user. Content can include news, financial information, sales and marketing, learning/training, corporate communications, and entertainment video.

On-screen menus and program guides give users access to Enterprise TV content and organizations can customize lineups, as well as create their own content libraries. Users navigate through channel menus, selecting from live or on-demand content with a remote control or other remote devices.

Built on the power of the Cisco Digital Media System, Cisco Enterprise TV leverages the same hardware and management platform as Digital Signage and Desktop Video. Enterprise TV can interoperate with Cisco Digital Signage, or can operate as a standalone application.

Financial services organizations, retail stores, and educational institutions are using Cisco DMS for Enterprise TV. Typical use cases include:

- *In an Executive's Office*—For delivery of live-broadcast business channels over IP such as CNBC, MSNBC, and Bloomberg.
- *In Employee Gathering Areas*—For delivery of executive broadcasts or employee communications videos, and infotainment such as the Weather Channel, CNN, ESPN, or internal TV channels.
- *In Customer-Facing Lobbies or Waiting Areas*—For delivery of sales and marketing videos and infotainment such as the Weather Channel, CNN, and ESPN.

Desktop Video

The Cisco Desktop Video offers customers, employees, partners, and students access to high-quality and compelling video-on-demand (VoD) and live webcasts at their desktops. Digital media can be browsed, searched, and viewed over the network through a unique, easy-to-use Cisco Video Portal experience-anywhere, anytime.

Industries using Cisco Desktop Video include:

- *Government*—To enable live and on-demand web-based access to city council meetings or events; to provide access to digital media-based information about relevant regulations and laws.
- *Healthcare*—To alleviate staff and resource shortages by providing patients, families, and friends with digital media-based what-to-expect patient materials.

When implemented with Cisco Digital Signage or Cisco Enterprise TV, organizations can expand their reach beyond the desktop to internal and external audiences.

The Cisco Desktop Video with Cisco ACNS provides optimized live streaming content in IP multicast, unicast, store-and-forward and mixed environments. Further, for VoD content, Cisco ACNS provides intelligent prepositioning and distribution technologies to efficiently deliver digital media content to the edge of the network for a high-quality LAN-viewer experience, while maintaining centralized control and reporting.

DMS 5 New Features

Moving from DMS Release 4.x to 5.x includes numerous new features as well as the introduction of an entirely new DMS subsystem, Enterprise TV. The features discussed below are inclusive of the added features between Release 4.x and 5.1.

Digital Signage and Enterprise TV New Features

- Digital Signage and Enterprise TV in the DMS Release 5.1 includethe following new features:
- Support for Flash 10 applications with DMP 4400G
- Support for H.264 Video with DMP 4400G
- Support for USB external storage devices attached to the DMP
- Support of IP phone and Smart phone-based remote control for Enterprise TV
- Support of scheduled content distribution to DMPs

Enterprise TV New Features

DMS will see a significant addition of an entirely new capability: Enterprise TV. Enterprise TV allows the remote user to control what is displayed through an IR remote control, IP phone, or SmartPhone through the DMP. Using a program guide, users can select prerecorded or live content.

Adding the Enterprise TV capability gives the user the ability to initiate unique streams of content on multiple screens in one location. Due to the user, and not the administrator, controlling what content is sent where and when, additional requirements are placed on the network to ensure availability at all times. The *ad-hoc* nature of Enterprise TV can be significantly more demanding on the network than the scheduled distribution of the traditional Digital Signage usage model.

Desktop Video New Features

New features in Desktop Video (Video Portal) for 5.0 are primarily focused on organization of content and user rights within the DMM/Video Portal server.

Network Requirements

Table 1 summarizes the network requirements associated with Cisco DMS. These requirements are briefly described in the sections that follow.

Table 1 Summary of DMS Network Requirement Guidelines

		Bandwidth	Latency	Jitter	Loss
Desktop Video	VoDs	200Kbps – 1.5Mbps	<400ms	<100ms	< 0.5%
	Live	200Kbps – 1.5Mbps	<2000ms	<500ms	< 0.5%
Digital Signage/Enterprise TV	VoDs SD	1.5Mbps – 5Mbps	<100ms	<30ms	< 0.5%
	VoDs HD	8Mbps– 15Mbps	<60ms	<30ms	< 0.5%
	Live SD	1.5Mbps – 5Mbps	<2000ms	<1000ms	0%
	Live HD	8Mbps – 15Mbps	<2000ms	<1000ms	0%

Bandwidth

Bandwidth requirements vary greatly with Cisco DMS, generally falling anywhere between 200 Kbps to 15 Mbps—depending on the applications and content involved.

Digital Signage and Enterprise TV

Digital Signage and Enterprise TV use the same hardware and therefore have the same bandwidth requirements for individual video streams. Overall bandwidth usage differs due to different usage models for Digital Signage and Enterprise TV.

Digital Signage and Enterprise TV use the Digital Media Player to deliver live and prerecorded streaming content to displays. Bandwidth used per stream will be 1.5-to-5 Mbps for standard definition streaming video content and 8-to-15 Mbps for high definition streaming video content.

With Digital Signage, streaming video content might be placed on a portion of the screen with the remaining screen being consumed by Flash content such as information tickers, advertisements, or any other nonstreaming content. Video resolution might be reduced for partial coverage of the screen. Reduction of displayed video resolution allows reduction of encoded stream resolution, lowering the bandwidth requirements.

With Enterprise TV, one consideration to take into account that might influence bandwidth requirements is the multicast delivery of live content or TV channels to the Digital Media Player. The end user controls the delivery of these channels through the remote control. Switching between channels causes the DMP to start and stop, or join and leave, multicast streams. Rapid switching of channels might cause multiple streams to be started, or joined, at the same time. This increases bandwidth requirements to the endpoint significantly and may impact other parts of the network as well.

Non-live VoD content has similar bandwidth requirements when streamed across the network. Remote locations may take advantage of a Content Delivery Network (CDN) for content prepositioning to reduce network requirements for VoD.

Desktop Video

Desktop Video generally requires 200Kbps to 1.5Mbps for live streaming video content. Requirements in the future will increase with the introduction of high definition content.

Non-live content, known as VoD, will have similar bandwidth requirements when streamed across the network. Remote locations may take advantage of a CDN for content prepositioning to reduce bandwidth requirements for VoDs.

Latency and Jitter

Digital Signage and Enterprise TV

Digital Signage and Enterprise TV use the same hardware and therefore have the same latency and jitter requirements. For live streaming content, moderate latency will not have a significant impact with one exception. The user experience with Enterprise TV may be slightly impacted with significant latency due to the delay when changing channels of live content.

Extreme jitter may have an impact if the jitter exceeds the buffer on the Digital Media Player. The DMP 4400G has a 1500ms jitter buffer, which should account for all but the most extreme jitter scenarios.

Prerecorded content is delivered through HTTP and will have significant latency and jitter requirements due to having a TCP-based transport. These requirements are as strict as 60ms to 100ms of latency.

Desktop Video

For live and prerecorded content delivered through RTSP-U or multicast, moderate latency and jitter should not impact Desktop Video due to significant buffering on the endpoint. Content delivered through RTSP-T or HTTP will be impacted by latency above 400ms round trip.

Packet Loss

Digital Signage and Enterprise TV

For live streaming content, lost packets are not re-transmitted and with the amount of compression utilized by the video codecs, even a single packet lost will result in degradation of the video quality. Avoiding any packet loss is the highest priority for live streaming video. Packet loss above 0.001% will be noticeable and considered unacceptable over an extended period of time.

For prerecorded content, packet loss requirements are still very stringent due to minimal buffering. Packet loss of less than 0.1% is necessary for good quality video.

Desktop Video

Desktop Video does not have as stringent packet loss requirements. Loss requirements are detailed in Table 1.

Application Network Services

Implementation of Application Network Services in a Cisco DMS environment is another consideration for network designers and managers. The discussions that follow summarize some relevant Application Network Services.

Cisco ACNS

Cisco ACNS may be used to preposition VoD content for all three DMS subsystems. Benefits provided by Cisco ACNS include:

- Reduces demand on the WAN during peak hours
- Allows multiple branch clients to access content only transferred across the WAN once
- Ensures quality of content by accessing locally

Cisco ACNS may be used with Desktop Video live streaming content to perform stream transport and splitting. This reduces bandwidth requirements on the WAN by sending a single stream to a remote location, regardless of the number of clients at that location. ACNS may also be used to convert unicast to multicast for Desktop Video, delivering multicast to remote location.

Cisco ACNS may use one of these three methods for providing content to remote users: proxy, Web Cache Communications Protocol (WCCP) v2, or content routing. These are briefly described in the following sections.

Proxy

In this mode, end user web browsers must be explicitly configured to use the IP address or host name of the Cisco Content Engine and there is no need for additional hardware—such as Layer-4 switches, Content Routers, or WCCP-enabled routers to intercept user requests. If the Content Engine has the requested content, the request is serviced from this cached storage. If the content is not in the Content Engine's storage, the content is requested from the origin web server and served to the requesting client by way of the Content Engine.

WCCPv2

When configured for WCCP routing, the Content Engine receives requests from its assigned router and compares the content request against the content currently stored in its cache. If the Content Engine has the requested content (cache hit), the request is served from this cached storage. If the Content Engine does not have the content (cache miss), the content is requested from the origin web server and served to the requesting client through the Content Engine. No proxy configuration is required at the end user's browser.

Content Routing

Content Router routing uses Hypertext Transfer Protocol (HTTP) or Real Time Streaming Protocol (RTSP) redirection through a Content Router. The Content Router determines which Content Engine is best suited to deliver the desired content to the client by comparing the source IP address of the client end system against a table of address ranges assigned to Content Engines, known as the coverage zone.

The coverage zone provides information on the proximity of client end systems to Content Engines based on each client's IP address. The Content Router can then choose the closest, best-suited Content Engine to serve the website request to the client.

Cisco WAAS

Cisco Wide Area Application Services (WAAS) may be implemented to increase bandwidth available to video applications by optimizing non-video traffic. With the introduction of WAAS 4.1, Desktop Video implementations now benefit from additional stream splitting and content optimization capabilities in WAAS.

All three subsystems of DMS support the use of CIFS for content access allowing additional content prepositioning and caching using CIFS shares in Cisco WAAS.

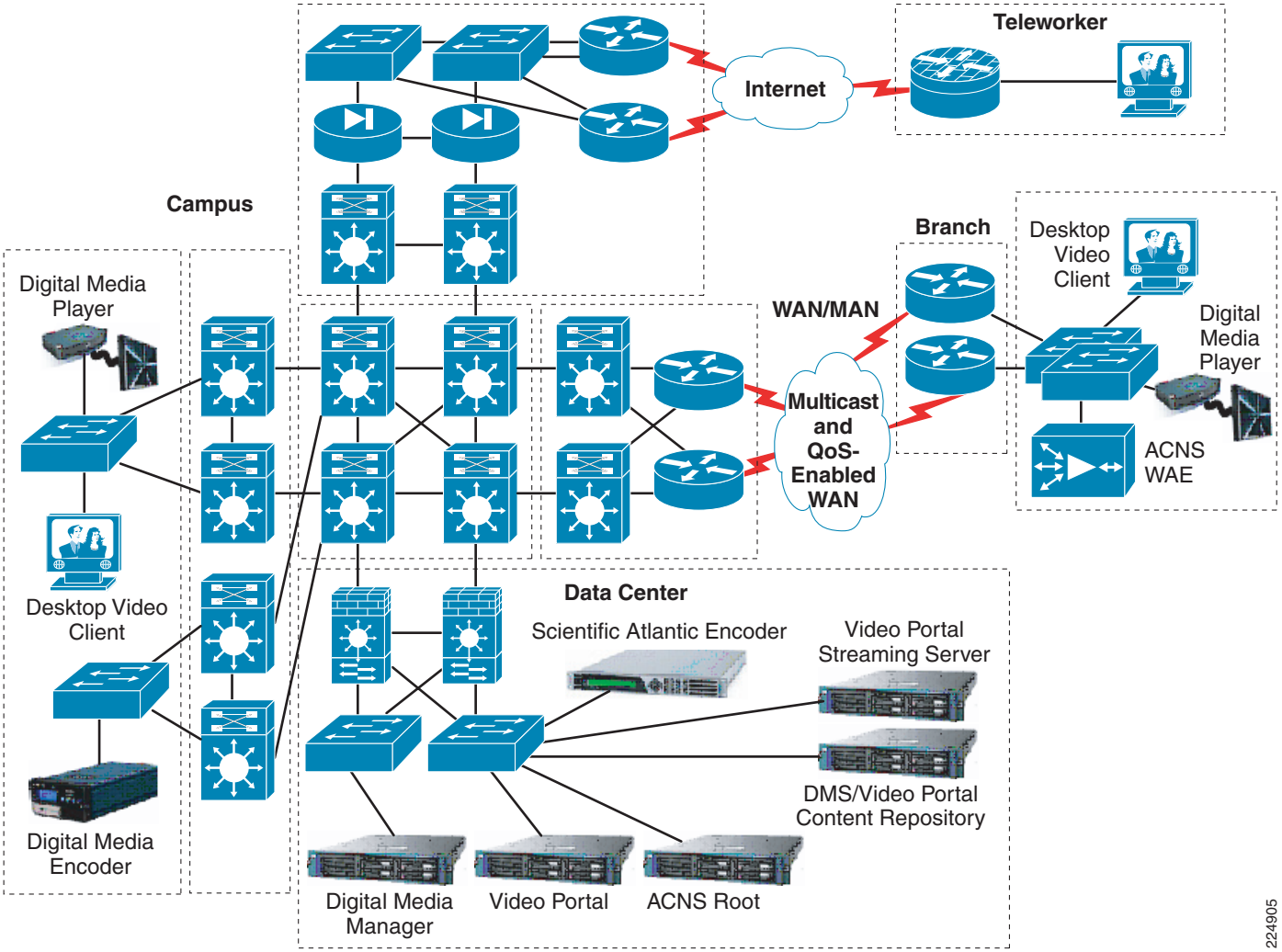
Performance Routing

Performance Routing (PfR) is an optimization technology that can be used to ensure Cisco DMS video content takes the optimal path through the WAN. With dual-tier branch deployments, PfR will help ensure video quality, picking the less congested path for video streams.

PIN Architecture Design Considerations

Figure 3 illustrates a high-level view of the overall Cisco Places-in-the-Network (PIN) architecture. The sections that follow briefly address campus, branch, and WAN PIN considerations associated with Cisco DMS.

Figure 3 High-Level PIN Architectural Summary



Campus PIN Design Considerations

Within the campus, one of the primary design considerations is multicast enablement. Live video content delivery with Digital Signage and Enterprise TV requires multicast. The Digital Media Player supports Internet Group Management Protocol (IGMP) v3 and the use of Source Specific Multicast (SSM) is recommended, if possible.

Within the campus, use of technologies to segment or virtualize the network may be implemented, such as Virtual Private Networking (VPN) Routing and Forwarding Lite (VRF Lite) to segment some or all video content if desired.

Branch PIN Design Considerations

Branch locations may be designed with a single WAN connection or multiple WAN connections. Multiple connections combined with redundant Cisco Integrated Services Routers (ISR) give the highest availability. Dual links and Cisco ISRs also enable the use of additional optimization services—such as PfR.

Single Tier Branch Architecture

This profile is recommended for smaller enterprise branches that do not require platform redundancy and do not have a large user base. This profile consists of a Cisco ISR acting as the access router with an Integrated EtherSwitch network module for LAN and WAN connectivity. High availability is achieved through a T1 link with an Asymmetric Digital Subscriber Line (ADSL) backup. This profile is intended for branch networks that are to incorporate as many services as possible into a single platform solution. This profile is very cost effective and contains the least number of devices to manage at the branch. The drawback to this profile is network resiliency and capacity planning. By having a single platform solution, there is a common point of failure. There is no platform redundancy, so a network can affect users. User capacity is also limited in this design to the number of LAN ports that the Cisco ISR platform can support. For future growth, either an external desktop switch must be used, or another router platform is needed for additional slot capacity. The figure below represents a single tier branch.

Dual Tier Branch Architecture

This profile is based on legacy branch networks that exist today. The intent of this profile is to illustrate how to apply advanced services within a branch network without requiring a forklift upgrade or the redesign of an existing network. This profile consists of two ISR access routers connected to an external switch. Dual WAN links and hardware redundancy provide a greater level of high availability compared to the single-tier branch profile, at the expense of additional equipment costs and more components to manage at the branch. This branch is typical of most branches in traditional enterprise branch networks.

WAN PIN Design Considerations

Cisco DMS services available to branch locations are dependent on the WAN type. A high-speed, multicast-enabled WAN is required for live video delivery to Digital Signage and Enterprise TV. Live video deliver to Desktop Video clients does not have this requirement and may be implemented over a lower-speed, non-multicast WAN.

Enabling quality of service (QoS) on the WAN is essential for any critical content being delivered. Within Cisco DMS, live-streaming content relies on a QoS-enabled WAN for guaranteed delivery meeting specific requirements for latency, jitter, and (especially) packet loss.

Summary

The medianet enables Cisco DMS, a powerful collection of video centric tools, to benefit both internal and customer facing aspects of business. More information is available at the following URL:

http://www.cisco.com/go/designzone.