



Cisco Vision Product Deployment Requirements

Dynamic Signage Director



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About this Document

This document provides a detailed description of the Cisco Vision Dynamic Signage Director installation and deployment requirements from a product perspective. Deployment requirements for the solution are outside the scope of this document.

Document Audience

This document is intended for Cisco Engineers, Product Managers, customers, and partners. Additionally, technical sales and marketing people can use this document as a master reference guide for identifying what the product needs and what is supported.

Related Documents

[Cisco Vision Network, Server, and Video Headend Requirements Guide](#)

[Cisco StadiumVision Video Headend Design and Implementation Guide](#)

[Cisco Vision Deployment Guide for Digital Media Players: Dynamic Signage Director](#)

[Cisco Vision Software Installation and Upgrade Guide](#)

[Cisco Vision Administration Guide](#)

[Cisco Vision Dynamic Signage Director Operations Guide](#)

[Cisco Vision Content Planning and Specifications Guide](#)

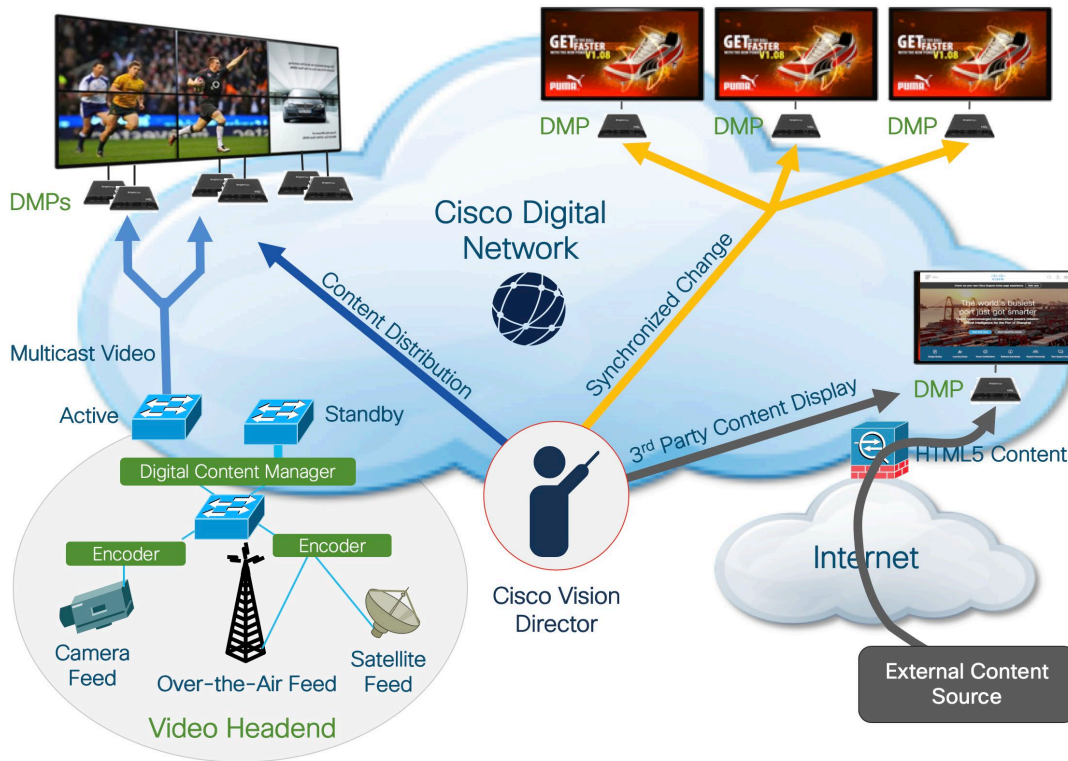
[Cisco Vision Director Data Integration Guide](#)

Document History

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Cisco Vision Dynamic Signage Director product is part of a larger signage solution. Figure 1 depicts an overview of the solution architecture and where Dynamic Signage Director sits in the overall solution. It also provides context on the interfaces and interconnects among the various components of the solution.

Figure 1. Cisco Vision Solution Architecture



The next sections describe the requirements for deploying Cisco Vision Dynamic Signage Director (DSD or Director)¹. It also touches on content requirements for the overall solution.

Server Requirements

This section describes the host server requirements for Director.

Director is designed to run on a virtual machine (VM) provisioned on an ESX server².

Director is available as an ISO image, where Release 6.2 ships with Red Hat Enterprise Linux 7, while Release 6.1 (and below) ships with RHEL5.

Two memory profiles are supported³:

- Standard
- Small

¹ Requirements in this document were based on Release 6.2. Unless otherwise noted, these requirements are also applicable to prior releases.

² Consult the [Software Installation and Upgrade Guide](#) for vSphere version compatibility as it may be release-specific.

³ Support for two configurations started in Release 6.1. Release 6.3 will introduce a large configuration.

Since Release 6.1, a full installation of Director will automatically choose the configuration based on the amount of RAM allocated to the VM. *Small* configuration is chosen by the installer when the detected RAM allotted to the VM is less than the minimum required for a *standard* configuration. Choose the configuration based on the size and scope of the overall signage solution.

Network Requirements

Refer to Cisco Vision Network, Server, and Video Headend Requirements Guide for details on configuring the network and role of the various network components.

When configuring Director’s network setting, make sure that Director is assigned a statically-assigned IP address. The current release supports IPv4 only.

The Director server must have a 10 Gbps NIC (configured as “eth0”). Jumbo frames must be enabled to support large packets sent by Director to the DMPs.

As of Release 6.2, a maximum of 20 concurrently running scripts is supported in standard configuration. To minimize data packets that the DMP processes, ensure that per-script multicast is enabled (default). Multicast addresses and ports for use by Director to send script state messages to the DMPs are defined in the registry.

Provision the DMPs with IP addresses that are dynamically-assigned but with infinite lease, or statically assigned. For network requirements, please refer to Cisco Vision Network, Server, and Video Headend Requirements Guide.

The following sections describe network requirements of Director and touch on solution network requirements that are relevant (but not exhaustive) to the solution.

Ports

The following two tables list input and output ports that are used by Director.

Director Input Ports

| Originator | Protocol | Port | Target Application | Usage |
|--------------------------|----------|------|--------------------|---|
| DMP | UDP | 123 | NTP | Time sync (when using DSD as NTP server in initial install) |
| External NTP Server | UDP | 123 | NTP | Time sync (DSD as NTP client) |
| DMP | UDP | 514 | syslog | Proof of play, Alerts |
| Laptop | TCP | 22 | ssh | Remote login by installer and TAC users |
| MPI client | TCP | 22 | sftp | for Media Planner API / playlist import |
| Director | TCP | 22 | sftp | System backup from primary server |
| Laptop (browser UI), DMP | TCP | 80 | http | Redirect to port 8080 |
| Laptop | TCP | 443 | https | Web UI access |
| DMP | TCP | 8080 | http | For fetching DMP configuration data, firmware, content |
| DMP | TCP | 9090 | http | For data feed from widgets |

Director Output Ports¹

| Originator | Protocol | Port | Target Application | Usage |
|------------|----------|------------------------------|---------------------|---|
| Director | UDP | 123 | NTP | As request to NTP server, and as response to DMPs |
| Director | UDP | varies (default=50001) | DMP runtime | Multicast commands (default = 239.192.0.254:50001) |
| Director | UDP | varies (default=50080-50099) | DMP runtime | Multicast commands when per-script multicast is enabled |
| Director | TCP | 21 | FTP server | Fetching integration broker data over FTP, playlist integration |
| Director | TCP | 22 | ssh | Remote login |
| Director | TCP | 22 | sftp | Automated content import |
| Director | TCP | 22 | sftp | System backup; Proof of play data |
| Director | TCP | 80 | http | Redirect to port 8080 |
| Director | TCP | 80 / 443 | external web server | fetching of data for integration broker |
| Director | TCP | 443 | https | Web UI access |
| Director | TCP | 8000 | DMP runtime | DMP control commands |

While the DMP is a separate product, you can refer to the input/output ports on the DMP to ensure the proper communication with Director and other external systems.

¹ Data integration with Daktronics or OES is over UDP. The port number is configurable in Director and must match the score data source.

DMP Input Ports

| Originator | Protocol | Port | Target Application | Usage |
|---------------------|----------|------------------------------|-----------------------------|---|
| Director | UDP | varies (default=50001) | DMP flash template | multicast commands (default = 239.192.0.254:50001) |
| Director | UDP | varies (default=50080-50099) | DMP flash template | multicast commands when per-script multicast is enabled |
| Video encoder | UDP | varies | video decoder | multicast video |
| SNMP client | UDP | 161 | snmp | Simple Network Management Protocol query (when enabled) |
| Laptop | TCP | 80 | diagnostic web server (dws) | DMP diagnostics (when enabled) |
| Laptop | TCP | 2099 | Embedded web browser | javascript inspector (when enabled) |
| Director | TCP | 8000 | DMP runtime | control and status messages |
| DMPs / PTP server | UDP | 319, 320 | ptp | event and general messages for time sync |
| DMP | UDP | 50001,50002 | DMP content sync manager | for synchronizing local video playback across a set of DMPs |
| DMP | UDP | 123 | NTP | time sync (when using DSD as NTP server in initial install) |
| External NTP Server | UDP | 123 | NTP | time sync (DSD as NTP client) |

DMP Output Ports

| Originator | Protocol | Port | Target Application | Usage |
|------------|----------|------------------------------|--------------------|--|
| DMP | UDP | 514 | syslog | Proof of play, Alerts |
| DMP | TCP | 8080 | http/Director | fetching of dmpconfig, firmware, content; autoprovisioning |
| DMP | TCP | 9090 | Director | Data feed used by widgets |
| DMP | UDP | varies (default=50080-50099) | DMP flash template | multicast commands when per-script multicast is enabled |
| DMP | UDP | varies | video decoder | multicast video |
| DMP | UDP | 161 | snmp | Simple Network Management Protocol query (when enabled) |
| DMP | UDP | 319, 320 | ptp | event and general messages for time sync |

DHCP Server

Director's address is statically assigned and it does not need a DHCP server. However, the DMPs rely on the DHCP server to obtain an IP address (with infinite lease).

To support auto-registration, the DHCP Server must support DHCP Options 43 and 60. Current DMP models do not require Option 60.

Refer to Table 4 to determine the Vendor Class Identifier string to use in DHCP Option 60 for specific DMP models. You may need to convert ASCII strings into either Binary or Hex, depending on what the DHCP server requirements are.

Table 1: Option 60 Vendor Class Identifiers

| DMP Model | Vendor Class Identifier |
|-----------------------------|-------------------------|
| CV-UHD2 | Cisco CV-UHD2 |
| CV-HD2 | Cisco CV-HD2 |
| CV-UHD | Cisco CV-UHD |
| CV-UHD (WiFi) | Cisco CV-UHD WiFi |
| CV-HD | Cisco CV-HD |
| SV-4K for North America | Cisco SV-4K-NA |
| SV-4K for Rest of the World | Cisco SV-4K-ROW |
| DMP-2K | Cisco DMP-2K |

DHCP Option 43 Vendor Specific Option URL must be set to¹:

http://director-ip-address:8080/CiscoVision/dmp_v4/scripts/boot.brs

Note: Option 43 should be TLV encoded.

Refer to Cisco Vision Network, Server, and Video Headend Requirements Guide for details on DHCP Option 43.

LLDP

The DMPs support Link Layer Discovery Protocol (LLDP). This allows the DMP and switch to learn more about each other, such as when performing power negotiation and when the DMP auto-registers to Director. The switch where the DMP is connected to must support LLDP.

NTP Server

Director instructs the DMPs to transition to a new screen state over multicast. The command message is timestamped. It is important to ensure that the time on Director and the DMPs are synchronized, or state changes may not be executed by the DMPs.

Director should be setup to use a reliable Network Time Protocol (NTP) server, ideally in-house. The DMPs can use the same NTP server as configured in Director. In some cases, Director may be configured with a pool of NTP servers. You can only configure 1 NTP server for the DMP.

On a new install of Director, the default NTP server that will be used for the DMPs is the Director IP address. Change this setting to the NTP server of choice before going into production. The chosen NTP server must provide reliable time and should be running on bare metal and not on a virtual machine.

¹ StadiumVision is still valid to use in place of CiscoVision.

PTP Server

Precision Time Protocol (PTP) provides a much more accurate time synchronization than NTP. A set of DMPs can be configured as PTP master candidates, or a single in-house PTP master can be configured. For synchronized playlist item transitions and local video file playback, PTP must be setup in Director as a global DMP setting. If the DMPs do not need to synchronize their content amongst each other, PTP is not required.

Director allows the PTP subdomain to be configured. The PTP multicast address cannot be configured or changed.

IGMPv2 or IGMPv3

Beginning with Release 6.2, the DMPs can be configured to use IGMPv3. This is the default on new installs. With IGMPv3, video multicast channels as well as multicast command messages from Director can use Source-specific Multicast (SSM) addresses.

Inter-VLAN multicast routing of PTP packets is not recommended. To use IGMPv3, the DMPs must be on firmware 8.0.77 or higher.

Content Requirements

The DMPs can render various content on the screen, possibly split across screen regions. With the exception of channels, content must be contained in a playlist that is then assigned to a screen region.

The following types of media content are supported:

- Still images
- Videos
- External URLs

Still Images

JPEG and PNG are the supported image formats in Cisco Vision Director.

Table 2: Static Graphics Formats

| Format | DMP-2K, SV-4K, CV-HD, CV-UHD, CV-HD2, and CV-UHD2 |
|------------------|--|
| JPEG | 8-bit RGB CMYK, grayscale, or black and white color spaces are not supported. |
| PNG | 8-, 16-, 24-, and 32-bit (24-bit with 8-bit transparency) recommended. |
| Image resolution | Max supported resolution: 2048x1280x32bpp (for 4K/UHD players). For non-4K/UHD players, use images that are no more than 1920x1080. |

Video

Cisco Vision Director supports the following video content:

- Local video file
- Streamed video

Local video files are distributed (or staged) to DMPs. Multicast videos are primarily in-house videos and referenced as video channels in Director.

Unicast video channels are also supported, but do not expect perfectly *synchronized* playback on the DMPs.

Table 3: Supported Video/Audio Formats for Local Files for the SV-4K (UHD), CV-UHD, and CV-UHD2 DMPs

| Models | SV-4K, CV-UHD, and CV-UHD2 DMPs |
|--------------------------|---|
| Format | <p>UHD/HD/SD is supported.</p> <p>Refer to for UHD video content specifications.</p> <p>MPEG-2 TS (transport stream) required for seamless looping of video files</p> <p>MPEG-4</p> <p>Supported file type: .mpg, .mpeg, .mp4, .m2t, .m2ts, and .ts file types.</p> <p>Codec: H.264 or H.265</p> <p>Encapsulation: MPEG2-TS or MPEG-4</p> <p>mp4 is recommended to reduce black frames.</p> <p>H.264 Specifications: Support for Main or High Profiles up to Level 4.2, AAC audio, CBR audio (VBR is not supported).</p> <p>H.265 is supported on CV-UHD2</p> |
| Video Resolution | Max supported resolution: 3840x2160x60p |
| Aspect Ratio | Widescreen 16:9 (1.0 square pixels) |
| Field Order | Progressive |
| Video Bit Rate Encoding | Recommend 30-40 Mbps constant bit rate. Note that a second video decoder can simultaneously support a 1080p video at up to 40 Mbps. |
| Audio Streaming | Cisco Vision Dynamic Signage Director does not support streaming audio, for example audio-only tracks. |
| Local Audio Sample Rates | 48kHz |

Table 4: Supported UHD Resolution Video Formats for the SV-4K, CV-UHD, CV-UHD2

| Models | SV-4K, CV-UHD, and CV-UHD2 DMPs |
|------------------|---|
| Format | <p>Only a video content type may have UHD resolution.</p> <p>Graphics with UHD resolution are not supported.</p> <p>MPEG-4 highly recommended. Other formats have not been tested.</p> |
| Video Resolution | 3840x2160x60p (maximum). |
| Video Encoding | <p>H.265 High Efficiency Video Coding (HEVC).</p> <p>H.265 version 1 profiles only—Main and Main 10. If you are using B-frames as references in H.265 “merge mode”, the size of the references list should be limited to two or less.</p> |

| | |
|--|--|
| Main Profile | If your display components support HDMI 2.0, you can display a UHD video at 60p; encode the file using the Main 10 profile (10 bits of color depth with 4:2:0 chroma sampling) at level 5.1. If your display components do not support HDMI 2.0, you can display a UHD video at a max of 30p (with 8 bits color depth). Use a Main profile at level 5.0. |
| Video Encode Bit Rate | 2000 to 25000 Kbps. |
| Bitrate | CBR between 30 and 40 Mbps. Note that the second video decoder can simultaneously support a 1080p video at up to 40 Mbps. |
| Max Streaming Bit Rate (with HDMI-In Encoding) | We recommend two times the video encode bit rate. DMP encoding can be up 60 fps at 720p, or up to 30 fps at 1080p. |

Table 5: Supported Color Depths for UHD Video

| Resolution | 8bit | 10bit | 12bit |
|-------------------------|----------------------|-------------|----------------|
| 4Kp24 4Kp25 4Kp30 | 4:4:4 (RGB) | 4:4:4 (RGB) | 4:4:4 (RGB) |
| 4Kp50 4Kp60 | 4:4:4 (RGB) 4:2:0 | 4:2:0 | 4:2:2 4:2:0 |

Table 6: Supported Video/Audio Formats for Local Files for DMP-2K, CV-HD, and CV-HD2 DMPs

| Models | DMP-2K, CV-HD, and CV-HD2 DMPs |
|--------|--|
| Format | <p>HD/SD is supported</p> <p>MPEG-2 TS (transport stream)</p> <p>MPEG-4</p> <p>Supported file type: .mpg, .mpeg, .mp4, .m2t, .m2ts, and .ts file types</p> <p>Codec: H.264 or H.265</p> <p>Encapsulation: MPEG2-TS or MPEG-4</p> <p>mp4 is recommended to reduce black frames</p> <p>H.264 Specifications: Support for Main or High Profiles up to level 4.2, AAC audio, CBR audio (VBR is not supported)</p> <p>H.265 is supported for Main and Main 10 profiles up to level 5.1.</p> |

| | |
|--------------------------|---|
| Video Resolution | 1920x1080 |
| Aspect Ratio | Widescreen 16:9 (1.0 square pixels) |
| Field Order | Progressive |
| Video Bit Rate | Recommend no more than 25 Mbps constant bit rate |
| Audio Streaming | Cisco Vision Dynamic Signage Director does not support streaming audio, for example audio-only tracks |
| Local Audio Sample Rates | 48 kHz |

Note: Use extreme care when referencing video content in an external HTML page. Cisco Vision Director's DMP runtime implicitly manages the video decoders. Playing video from an HTML page is unmanaged and may change the state of the decoders without the knowledge of the DMP runtime. When using dual video in Director-managed script states, avoid using external URLs that play video.

Video, like other content on the screen, can be rendered in portrait mode. However, when configuring a display to render in portrait mode using and video, restrict this use case to 4K/UHD DMPs only. Local video files must have duration that are at second boundary. Any extra duration (in milliseconds, or extra frames) may be truncated¹.

Video streams must be served within a local network to maintain quality and reduce any video decoding and presentation issues. While most remote video streams that conform to the formats below should work, the quality cannot be guaranteed.

The supported streaming video format configurations are listed as follows:

| Protocol | Format / Configuration |
|----------|---|
| HLS | Encapsulation: MPEG2-TS Codec: H.264 (and H.265 for Series 4 DMPs) Caveat: DVR playlists (i.e., large playlists) can cause performance issues and is not supported. |
| UDP/RTP | Encapsulation: MPEG2-TS or MPEG-4 Codec: H.264 (and H.265 for Series 4 DMPs) |

Refer to Table 6 and Table 9 for other video properties.

Video Decryption

Encrypted video is supported. The encryption algorithms that are supported/qualified are:

- AES-128 ECB
- AES-128 CBC

Video encryption algorithm (and associated encryption key) is site-wide, and not video-source-specific. Enabling video encryption does not affect the playback of unencrypted video content.

¹ The DMP runtime does not operate on a real-time environment. As such, the granularity of content playback operations (start/stop) is in seconds – it is possible that the DMP will play the trailing few milliseconds or frames of a video file past the second boundary.

External HTML

The HTML canvas where DMP runtime renders content on is fixed at 1920x1080 resolution. For 4K/UHD-enabled players connected to a UHD display, the DMP upscales the canvas and renders any UHD video in native UHD resolution.

An external URL can be added to Director as a piece of content that can be used in a playlist, or as a channel. In either case, the external page is rendered in a sandbox. That is, the page is rendered inside an HTML *iframe*.

In order for an external URL to be rendered by the DMP (either as a content or as a channel), the page (and the source web site) must not prevent the page from being rendered in an *iframe*.

Director and the DMP runtime make no effort to synchronize any elements contained in the external HTML page. It is up to the HTML content creators to synchronize its content if the intent is to display the page on multiple screens.

Caveats on using video in external HTML pages:

- Video elements must refer to streamed video. Non-streamed video (that is, video that must first be downloaded by the DMPs first) are not supported. There is no guarantee that the video will play reliably and at the time it is expected to play.
- The DMP runtime manages the video decoders. Any video playing in the HTML page is unmanaged. For 4K/UHD players, if you plan to play video on the external HTML page, limit it to 1 video playing at any given time, and only when the DMP is not playing dual video.
- For an external HTML page that is used as a channel or used as a playlist content inside a non-full screen region, design the page so that they are responsive, and scale based on the detected display/region dimension. Director will not scale the content by default.

Data Integration and Widgets

A widget is dynamic content that can be composed in Director. In its simplest form, it can contain information and images that do not change over time. However, some of the elements come from an external source and dynamically change, such as the team scores in a sporting event or the price of a menu item.

Widgets can get data feeds from external sources, pulled by Director through its data integration component. For HTTP-based data sources, TLS1.2 is the default cryptographic protocol since Release 6.2. Due to security requirements there are constraints on the encryption algorithms supported¹.

If the data source uses lower version of TLS1.2, or Director and the external data source cannot negotiate on the encryption algorithm, one option is to enable compatibility mode by setting a registry key named `security.integration.compatibility` to true.

Local Control API

Director provides RESTful APIs over HTTPS. Out of the box, it uses self-signed certificates to ensure secure communication over the wire.

¹ Restrictions are based on the combination of CiscoJ and Java version used in the data integration component.

Director provides a mechanism for customers to import their own certificate so that web UI access and local control API consumption will be seamless and not require special steps (or code) to handle self-signed certificates.

Starting with Release 6.2, the local control API restricts HTTPS communication over TLS 1.2. For control devices (such as Crestron) that do not yet support TLS 1.2, Director must be set to backward compatibility mode. To do this, change the registry key named `security.access.compatibility` to true.

The above will globally affect other RESTful APIs offered by Director, such as the input trigger API.

Video Wall Requirements

DMPs in a video wall must be on the same VLAN and connected to the same access switch. PTP is also required. Whenever possible, a PTP TTL of 1 provides better sync for file-based video content.

To achieve best synchronization with multicast video, the streamed video must conform to ISO-3818-1. With the current state of the DMP firmware, any 2 DMPs can be +/- 1 frame off sync. Ensure all video to be used in a video wall application complies with a 40 ms PCR interval and is +/- 500 ms jitter/accuracy.

Due to limitations in display technologies (where lines are scanned/displayed from left-to-right, top-to-bottom), a 2x2 video wall with fast motion may show out of sync, regardless of video source (multicast or file-based). The visual out-of-sync wall becomes more evident as the number of rows increase. A 1xn video wall, where objects move across the screens is less susceptible to left to right scan behavior.

Video walls have numerous physical deployment options in their arrangement. The content can be rendered on the video wall in multiple ways, consuming all or a portion of the video wall. File-based video can be stretched across displays or split into separate files for maximum resolution. Streaming video is most often stretched across displays. As part of each release, a two by two video wall in landscape orientation is used to test and certify support.

For formats and restrictions, refer to Video section for details.

When using DMPs that utilize wireless networking, synchronized content playback is not guaranteed. This is true whether the DMPs are deployed in a video wall configuration or not.