Cisco Vision Dynamic Signage Director Release 6.3

Product Deployment Requirements

Version 2.1

October 2020

Cisco Systems, Inc.

www.cisco.com

Contents

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 is outside the scope of this document.

In the documentation for Cisco Vision Dynamic Signage Director, we changed the terms "master" to "lead, leader, source or primary," the term "slave" to "secondary, replica, or follower," the term "whitelist" to "allowlist," and the term "blacklist" to "blocklist." There are currently no changes to the product's syntax, so these terms are still present in the documentation where the current code requires their use. Where an industry standard exists, such as IEEE terminology, we cannot alter the term until the standards change.

Document Audience

This document is intended for Cisco engineers/product managers. Additionally, technical sales and marketing people can use this document as a primary reference guide for identifying what the product needs and what is supported.

Related Documents

Cisco Vision Network, Server, and Video Headend Requirements 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

Date	Revision	Comments
October 2020	2.1	Removed racially biased terms from document
September 2020	2.0	Updated for Release 6.3
May 2020	1.0	First published

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.

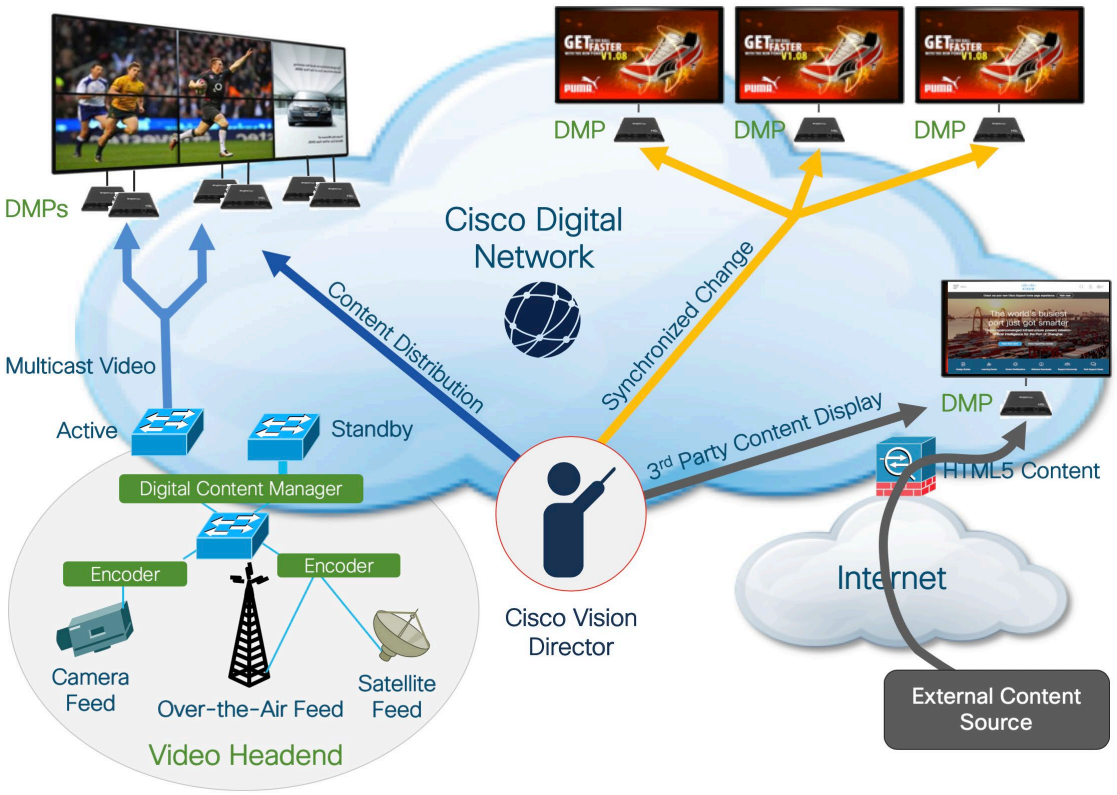

Figure 1: Cisco Vision Solution Architecture

The succeeding 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.

[1] Requirements in this document were based on Release 6.3. Unless otherwise noted, these requirements are also applicable to prior releases.

Configurations and Limits

Cisco Vision Director is designed to run on a virtual machine (VM) provisioned on an ESX server[2]. Cisco Vision Director is available as an ISO image only.

Four server profile configurations are supported[3] in Release 6.3:

- Large
- Standard
- Small
- Mini

A full installation of Cisco Vision Director Release 6.3 will automatically choose the highest configuration that meets the requirements, based on the minimum resources. Using the text UI (TUI), you can also change the configuration if you decide to scale up or down.

Small and mini configurations only differ in the clock speed. For details on server requirements for each configuration, please refer to Cisco Vision Software Installation and Upgrade Guide.

Configuration Limits

The limits[4] for each configuration are listed in Table 1. The Release 6.2 limit, if changed, is noted on parenthesis. Large configuration is new in Release 6.3.

Table 1: Configuration Limits

Specification	Mini/Small	Standard	Large
Maximum number of media player devices	1,250	5,000	5,000
Maximum number of zones	25	250 (100)	250
Maximum number of groups	125	5,000 (500)	5,000
Maximum number of groups per zone	5	20	20
Maximum number of states in a script	12	25	25
Maximum number of templates in different groups/zones for a script state	12	50	50
Maximum number of regions in a template	5	5	5
Maximum number of luxury suites	125	500	500
Maximum number of channel guides	125	500	500
Maximum number of contents in entire script	300	1,200	1,200
Maximum number of playlists	250	1,00	2,200
Maximum number of items per playlist	300	1,200	1,200
Maximum number of playlists per group	25	100	100
Maximum number of scripts	50	200	500
Maximum number of simultaneously running scripts	5	100 (20)	250

[2] Consult the Software Installation and Upgrade Guide for vSphere version compatibility as it is release-specific.
[3] Support for two configurations started in Release 6.1. Release 6.3 introduces a large and mini configuration.
[4] These limits are not enforced at run time.

Maximum number of venues[5]	0	25	250
Maximum number of groups in a venue	NA	100	100
Maximum number of data sources	50	100	250
Maximum number of widgets	50	200	200
Maximum number of DMPs that that widgets pulling data from Cisco Vision Director	50	200	200
Maximum data feed size sent over multicast	16KB	16KB	16KB

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 the network settings of Cisco Vision Director, make sure that Cisco Vision Director is assigned a statically-assigned IP address. The current release supports IPv4 only.

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

To minimize data packets that the DMP needs to process, ensure that per-script multicast is enabled (default). Multicast addresses and ports for use by Cisco Vision Director to send script state messages to the DMPs are defined in the registry (`transport.dynamic.send_range`)[6].

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 Cisco Vision Director and touch on solution network requirement that are relevant (but not exhaustive) to the solution.

Ports

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

Cisco Vision Director Input Ports

Table 2: Input Ports

Originator	Protocol	Port	Target Application	Usage

[5] Venues that have associated DMPs and scripts.

[6] In Release 6.3, this registry setting is unchanged. Depending on the number of simultaneous scripts in your environment and your configuration, adjust this registry value as needed.

DMP	udp	123	ntp	Time sync (when using Cisco Vision Director as ntp server in initial install).
External NTP Server	udp	123	ntp	Time sync (Cisco Vision Director 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	Media Planner API / playlist import.
Cisco Vision 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.

Cisco Vision Director Output Ports[7]

Table 3: Output Ports

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

[7] Data integration with Daktronics or OES is over UDP. The port number is configurable in Cisco Vision Director and must match the score data source.

Cisco Vision 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 Cisco Vision Director and other external systems.

DMP Input Ports

Table 4: DMP Input Ports

Originator	Protocol	Port	Target Application	Usage
Cisco Vision Director	udp	varies (default=50001)	DMP flash template	multicast commands (default = 239.192.0.254:50001)
Cisco Vision 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
Cisco Vision 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

Table 5: DMP Output Ports

Originator	Protocol	Port	Target Application	Usage
DMP	udp	514	syslog	Proof of play. Alerts
DMP	tcp	8080	http/ Cisco Vision Director	fetching of dmpconfig, firmware, content; autoprovisioning
DMP	tcp	9090	Cisco Vision 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

The address of Cisco Vision Director is statically assigned and it does not need a DHCP server. However, the DMPs will 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 (CV-UHD2 and CV-HD2) do not require Option 60.

Refer to Table 6 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 6: 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-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 to[8]:

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

LLDP

The DMPs support Link Layer Discovery Protocol. 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 Cisco Vision Director. The switch where the DMP is connected to must support LLDP.

NTP Server

Cisco Vision 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 Cisco Vision Director and the DMPs are synchronized, or state changes may not be executed by the DMPs.

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

[8] `StadiumVision` is still valid to use in place of `CiscoVision`.

On a new install of Cisco Vision Director, the default NTP server that will be used for the DMPs is the Cisco Vision 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 is ideally running on bare metal and not on a virtual machine.

PTP Server

Precision Time Protocol provides a much more accurate time synchronization than NTP. A set of DMPs can be configured as PTP leader candidates, or a single in-house PTP leader 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.

Cisco Vision 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 Cisco Vision Director can use Source-specific Multicast (SSM) addresses.

Inter-DMP multicast messages (such as for synchronization or PTP messages) are not SSM-capable. 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 URL

Still Images

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

Table 7: 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

Video content that can be used in Cisco Vision Director may be:

- Local video file
- Streamed video

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

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

Table 8: Supported Video/Audio Formats for Local Files for the SV-4K (UHD), CV-UHD, and CV-UHD2 DMPs

Format	SV-4K, CV-UHD, and CV-UHD2 DMPs
Models	HD/SD is supported. Video content with UHD resolution is supported only on the SV-4K, CV-UHD and CV-UHD2 players. Refer to for UHD video content specifications. MPEG-2 TS (transport stream) required for seamless looping of video files MPEG-4 Supported file type: .mpg, .mpeg, .mp4, .m2t, .m2ts, and .ts file types. mp4 is recommended to reduce black frames. H.264 Specifications: Support for Main or High Profiles up to Level 4.2, AAC audio, CBR audio (VBR is not supported). H.265 for CV-HD2 and CV-UHD2 CV-UHD2 supports HDR/HDR10/Dolby Vision.
Video Resolution	Max supported resolution: 3840x2160x60p
Aspect Ratio	Widescreen 16:9 (1.0 square pixels)
Field Order	Progressive
UDP Multicast and File-Based Video	Codec: H.264 Encapsulation: MPEG2-TS or MPEG-4
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 9: Supported UHD Resolution Video Formats for the SV-4K, CV-UHD, CV-UHD2

Format	SV-4K, CV-UHD, and CV-UHD2 DMPs
Models	Only video content with UHD resolution is supported. Graphics with UHD resolution are not. MPEG-4 highly recommended. Other formats have not been tested. CV-UHD2 supports HDR/HDR10/Dolby Vision.
Video Resolution	3840x2160x60p or 4096x2160x60p
Video Encoding	H.265 High Efficiency Video Coding (HEVC). H.265 version 1 profiles only—Main and Main 10.
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 10: Supported Color Depths for UHD Video

Resolution	8 bit	10 bit	12 bit
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 2: 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	HD/SD is supported. MPEG-2 TS (transport stream) MPEG-4 Supported file type: .mpg, .mpeg, .mp4, .m2t, .m2ts, and .ts file types mp4 is recommended to reduce black frames. H.264 Specifications: Support for Main or High Profiles up to level 4.2, AAC audio, CBR audio (VBR is not supported). CV-HD2 supports UHD (SDR) video.
Video Resolution	1920x1080
Aspect Ratio	Widescreen 16:9 (1.0 square pixels)
Field Order	Progressive
UDP Multicast and File-Based Video	Codec: H.264 Encapsulation: MPEG2-TS or MPEG-4
Video Bit Rate	Recommend 30-40 Mbps constant bit rate. Note that a second video recorder can simultaneously support a second 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	48 kHz

Extreme care must be taken when referencing video content in an external HTML page. The Cisco Vision Director 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 Cisco Vision 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 and video content will be used, restrict this use case to 4K/UHD players.

Local video files must have duration that are at second boundary. Any extra duration (in milliseconds, or extra frames) may be truncated[9].

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

- AES ECB
- AES 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.

Streamed Video

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 formats are listed as follows:

Table 32: Supported Streamed Video Formats

Protocol	Form at / Configuration
HLS	Encapsulation: MPEG2-TS Codec: H.264 or H.265 Caveat: DVR playlists (i.e., large playlists) can cause performance issues and is not supported.
UDP/RTP	Encapsulation: MPEG2-TS or MPEG4 Codec: H.264 or H.265 for video streams

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 Cisco Vision 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*.

[9] 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 may lose a few frames on playback.

Cisco Vision 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, create the page so that they are responsive and scale based on the detected display/region dimension. Cisco Vision Director will not scale the content by default.

Data Integration and Widgets

A widget is dynamic content that can be composed in Cisco Vision Director. In its simplest form, it can contain information and an image that does not change over time. In general, 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 Cisco Vision Director through its data integration component. For HTTP-based data sources, TLS1.2 is the default cryptographic protocol since Release 6.2. However, due to security requirements, there are constraints on the encryption algorithms supported[10].

If the data source uses a lower version of TLS1.2 or Cisco Vision 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

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

Cisco Vision 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.

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

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, Cisco Vision 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 Cisco Vision 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 would provide 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.

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 becomes more evident as the number of rows in the wall increase. A 1xn video wall, where objects move across the screens, is less susceptible to the TV display's scan behavior.

Video wall size tested and supported is up to 3x3 (landscape orientation). When using local video files for display in a video wall, cut up the video files so that each display renders the full cut-up video versus scaling it. This allows for better video quality and reduces pixelation.

For formats and restrictions refer to Video section for details.