



# Working with Video Walls

User Role: Administrator / Content Manager

This module provides information about how to design and deploy video walls.

## Information About Video Walls

A **video wall** is a group of displays that show synchronized content and convey a single, much larger screen. Cisco Vision Director supports different video wall design methods depending on the type of media player controlling the video wall.

A common use for video walls is to vary the video wall layout and content over the course of an event.

## Content Scaling

**Scaling** refers to support of two things:

- Stretching of the content.
- Showing only a portion of the content per display in a multi-screen video wall.

## Multicast Video Scaling

- Supported in Release 5.0 and later releases.
- Intended for use in video walls.
- Allows scaling of a multicast video region across a video wall display for both portrait and landscape orientation.

**IMPORTANT:** When using multicast video in a video wall, make sure you use a feed that complies to ISO13818, particularly with respect to program clock reference (PCR). PCR is a value in the transport stream that provides a means for the decoder to lock its video output clock to the video input clock to the encoder that is providing the transport stream. In a video wall, any two DMPs may be up to one frame out of sync.

## Video Wall Design Methods

Cisco Vision Director supports the following different video wall design methods, depending on your media player model:

- TV-based tile matrix
- DMP-to-DMP content synchronization
- Zone-based video wall synchronization

**Note:** While TV-based tile matrix video walls can be used for the SV-4K, the best practice for full HD resolution is to use either DMP-to-DMP content synchronization or zone-based video wall synchronization methods.

## TV-Based Tile Matrix

All media players support TV-based tile matrix video walls.

A TV-based tile matrix video wall requires the use of TVs that have built-in tile matrix capabilities, where video input from one player is stretched across all displays. Due to this stretching, the resolution is proportionately reduced.

The tile matrix functionality is configured using RS-232 commands that specify the overall "x" and "y" dimensions of the matrix, as well as each TV's position in the video wall.

## DMP-to-DMP Content Synchronization

The DMP-to-DMP Content Synchronization feature for the digital media player synchronizes content rendering of playlist items on the displays. For video files, synchronization can still be off by a few milliseconds. The DMP will resync every second.

This synchronization includes transitioning from one item to the next (such as for still images), and more accurate playback and rendering of local video content. For local video, this serves as the foundation for implementing video ribbon boards and video walls. This requires cabling of a single media player per display.

**Note:** Widgets, external URLs, and multicast video tuning synchronization are outside the scope of this feature.

Cisco Vision Director Release 4.0 and later supports enhanced content synchronization methods for the DMPs, with close synchronization of playlist item transition using the Precision Time Protocol (PTP).

## Zone-Based Video Wall Synchronization

Zone-based video wall synchronization is an alternative form of synchronization available for devices participating in a video wall.

The primary benefit of this form of synchronization is that if any device that is not the leader in the video wall reboots, it will "catch up" to play whatever content item that the rest of the video wall is currently playing. This form of synchronization is recommended for dedicated video walls that are running video content longer than 15 minutes.

If a device reboots in a video wall that is **not** using zone-based video wall synchronization (using normal DMP-to-DMP synchronization), the tradeoff is that the rebooting device synchronizes with the rest of the video wall at the next content item in the playlist, or at replay of a single-item playlist.

## Summary of Video Wall Synchronization Methods for the DMPs

[Table 1 on page 197](#) provides a comparison of the configuration guidelines and behavior for device reboot in a DMP video wall for the two content synchronization methods.

**Note:** Both content synchronization methods use single device cabling per TV display. See [Dynamic Video Wall Sizing, page 197](#).

Constant Bit Rate (CBR) is required for best performance.

**Note:** The unicasting feature has not been tested in a video wall configuration.

**Table 1 DMP Video Wall Synchronization Summary<sup>10</sup>**

Synchronization Method	Network Time Source	Multicast Config Required	Video Duration	Bit Rate	Video Wall Reboot Behavior
DMP-to-DMP	PTP	No	< 5 minutes	CBR	Sync at next content item in the playlist.
Zone-Based	PTP	Yes	>15 minutes	CBR	Video content syncs with current item being played by the device leader.  Still images sync at next content item in the playlist.  <b>Note:</b> If the leader reboots, all DMPs will display black and resync when the leader has completed its reboot.

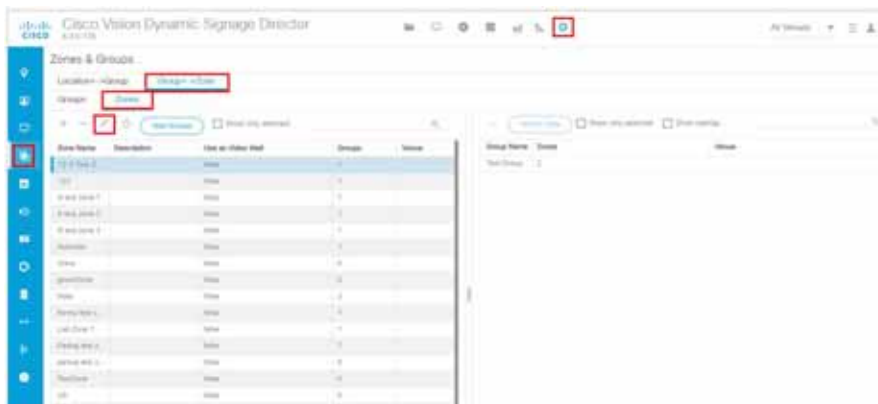
## Dynamic Video Wall Sizing

To synchronize local videos across multiple DMPs, set the **Use as Video Wall** to “true.” See [Figure 1 on page 197](#). **This is not for multicast streaming.** This tells the system to treat the DMPs in a zone or group to be part of a video wall or not. This means now you \*can\* change a video wall size from one state to another.

**To set this feature:**

1. Go to **Configuration > Groups & Zones** ([Figure 1 on page 197](#)).
2. Click the **Group <-> Zone** tab.
3. Click the **Zones** tab.

**Figure 1 Enable Dynamic Video Wall Sizing**



4. Select the zone to edit.
5. Click the **Edit** icon (pencil). The Edit Zone dialog box appears ([Figure 2 on page 198](#)).

**Figure 2** Edit Zone Dialog Box

6. Click the **Use as Video wall** check box.
7. Click **Save**.

Two good reasons to set a “Sync Manager”:

1. When **Use as Video Wall** is set to “**true**,” the system enables a “leader” DMP which maintains very tight synchronization between all the DMPs in the video wall. The leader DMP controls precisely where all DMPs play content, regardless of failure.
2. If one of the DMPs has to reboot or gets restarted, without a “Sync Manager” enabled, that DMP would restart the video file and start replaying the content **from the beginning**, and be unable to jump to the exact location of the other DMPs. This throws-off the continuity of the video wall.

## Video Wall Cabling

A video wall can be connected in the following ways:

- [Daisy-Chained TV Displays for TV-Based Tile Matrix Video Walls, page 198](#)
- [DMP Connection Per TV Display in a Video Wall, page 199](#)

### Daisy-Chained TV Displays for TV-Based Tile Matrix Video Walls

This cabling method is supported by all media players and uses the native tile matrix capabilities of the TV displays in the video wall.

In this cabling method, the TV displays in the video wall group are connected together using the DVI In/Out ports. One media player is connected to a single TV in the group using HDMI and RS-232 connections.

[Figure 3 on page 199](#) shows an example of a 2x2 tile matrix configuration with 4 displays daisy-chained in a group with control of the group by a single digital media player. In this example, notice that all displays are using 1920x1080 format.

**IMPORTANT:** For the 2x1 portion of the video wall, the DMP crops a 1920x1080 canvas to the 960x1080 signal resolution rather than shrinks it. Therefore, you must specify the correct template to match your signal resolution and your content must match the template. For more information, see [Understanding Content and TV Resolution, page 97](#).

**Figure 3** Daisy-Chained 2x2 Tile Matrix Example with the DMP

## DMP Connection Per TV Display in a Video Wall

The DMPs support display of synchronized local content (video or images) in your video wall.

In this cabling method for local video synchronization, a single media player is connected to each TV display in the video wall using the HDMI Out and RS-232 connections (Figure 4 on page 199). It can be used for video walls playing local video that do not rely on the tile matrix capabilities of the TV.

With this architecture, you can develop content at 3840x2160 resolution. Then, divide your video into four 1920x1080 pieces for synchronized playback. This method will use the maximum resolution for each display giving you the highest possible quality for your presentation.

**Figure 4** Video Wall with Single SV-4K Per TV Display

This cabling method also is required for zone-based synchronization, which is recommended to achieve enhanced functionality for dedicated video walls running videos with a duration greater than 15 minutes.

## Video Wall Design Examples

This section provides examples of some of the more common and currently deployed video wall designs in Cisco Vision venues.

**TIP:** Be sure to consult with the video wall experts from the Cisco Creative Services team for any of your video wall ideas, including non-standard configurations. This team can help you with ideas, best practices, and wiring diagrams to ensure a successful deployment.

### 2x3 TV-Based Tile Matrix Video Wall Example

Figure 5 on page 200 shows a video wall commonly used in a concourse area, with a larger game feed for groups of patrons to watch, along with rotating sponsor content displayed beside the game.

**Figure 5 2x3 Video Wall Content Example**

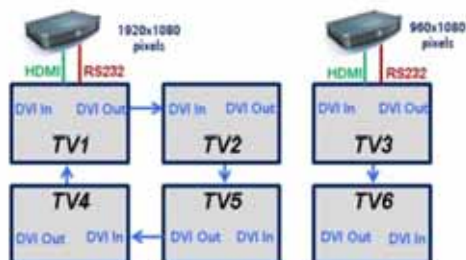
A 2x3 video wall is the most common video wall that Cisco recommends because in the left 2x2 group of displays, the game feed maintains the proper 16:9 aspect ratio of the HD game feed. This 2x3 TV/display grid can be implemented in Cisco Vision Director as two types of video walls: a 2x2 and a 2x1.

The right 2x1 group of displays can work independently from the game feed and show sponsor, social, or other content throughout the game. The user also can change the type of content that plays during the game. For example, during half-time or period break, when there is no game feed, the user can switch the 2x2 to play full screen sponsor content, while changing the 2x1 to show upcoming events or team branded content so that there are not any sponsor conflicts.

[Figure 6 on page 200](#) shows the cabling for the 2x3 video wall example, where two Cisco DMPs are used to break the wall into different display areas.

The first DMP provides the 2x2 game feed and the second DMP provides the 2x1 sponsor ads.

**Note:** This cabling design is not the recommended design for the digital media players. Instead, a single player per display is preferred for video walls. For more information, see the [DMP Connection Per TV Display in a Video Wall, page 199](#). In addition, use of any resolution other than 1920x1080 is not technically supported on the DMPs (although it might work).

**Figure 6 2x3 Video Wall Cabling Example Using TV Tile Matrix Functionality**

These dedicated DMPs provide the video signal for the group of TVs that the DMP is connected to through the daisy-chain. Depending on the screen manufacturer, the RS-232 connections can also be daisy-chained if this feature is available.

When operating in tile matrix mode, the TVs are fed the same video signal. Based on the TV's tile matrix configuration, the TV knows to first scale input video to the size of the configured x,y dimensions, and then to display its "piece" of the overall display based on its configured position within the matrix.

**Note:** If you want to show multiple types of content, such as four different channels on each of the screens, connect a DMP behind each TV. Please see [Best Practices for Video Walls, page 201](#) for further clarification and limitations.

## Other Video Wall Configurations

While the 2x3 video wall is the most commonly used video wall configuration, using the information and concepts from [Figure 6 on page 200](#), you can create any number of different video wall configurations ([Figure 7 on page 201](#), [Figure 8 on page 201](#), and [Figure 9 on page 201](#)). By arranging the physical layout of the displays, you can create a display that *appears* to be much larger. At center of [Figure 7 on page 201](#) is a 2 X 2 video wall.

**IMPORTANT:** These video wall examples require a different number of DMPs and cabling than the 2x3 video wall.

**Figure 7** 2 X 2 Video Wall in the Middle, Example



**Figure 8** 3x3 Video Wall in the Middle, Example



**Figure 9** Two, 2x2 Video Walls in the Middle, Example



## Best Practices for Video Walls

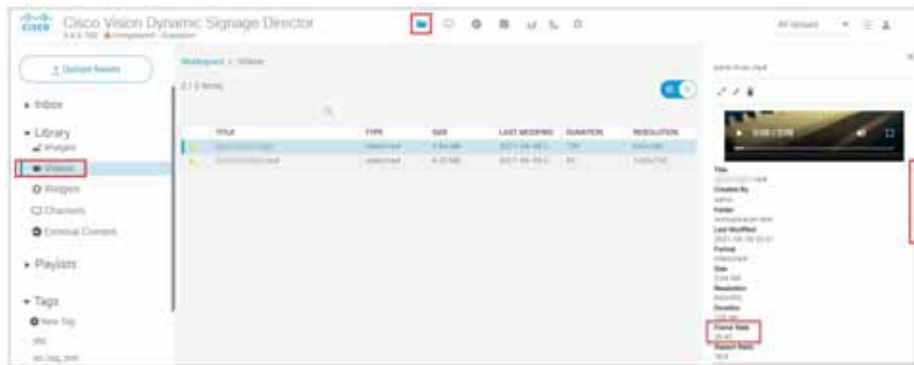
When implementing video walls, consider the following best practices:

- Use the same media player model (such as all CV-HD2, or all CV-UHD2 media players) throughout the video wall.
- Use the same TV model throughout the video wall with a uniform bezel size (ultra narrow bezel strongly recommended).
- For the best display output on your video wall, the settings for the frame rates must match on all of the following:
  - The video stream sources you deploy on the video wall
  - The DMPs in the video wall
  - The display models in the video wall

**Note:** TV screens with an ultra narrow bezel help ensure the best viewing experience without important text or data being cut off.

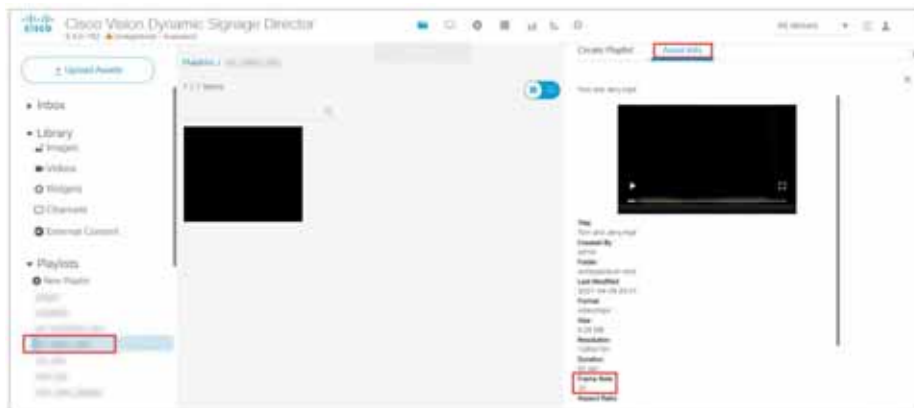
**To verify frame rate of video stream sources:**

1. Click **Library > Videos**.
2. Select a video file from the list. The Details panel appears.
3. Find the frame rate in the video details ([Figure 10 on page 202](#)).

**Figure 10 Video Stream Frame Rate**

For video stream sources in Cisco Vision Director Playlists:

1. Click **Library** > expand **Playlists**.
2. Select a Playlist and highlight video stream source from the playlist.
3. Click **+ New Playlist** to open the detail panel on the right.
4. Click **Asset Info** tab. Scroll to **Frame Rate** (Figure 11 on page 202).

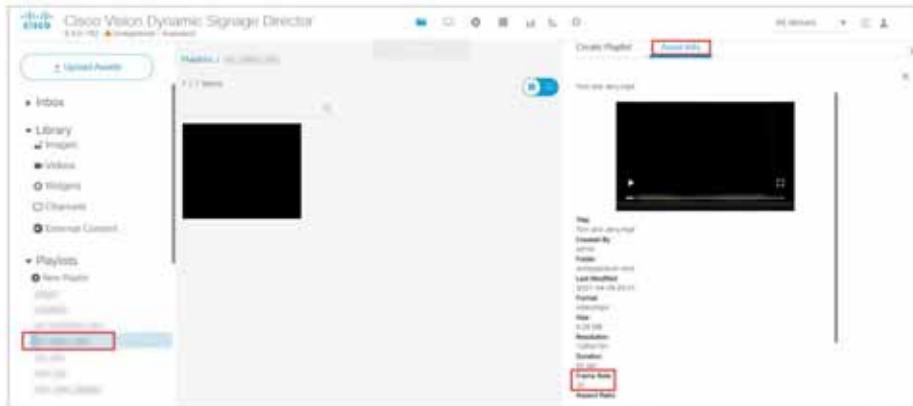
**Figure 11 Finding Frame Rate of a Video in a Playlist**

For video stream sources outside of Cisco Vision Director, such as third-party encoders, review manual for verifying video stream source frame rate settings.

#### To configure DMP frame rate:

- For the DMPs, override the negotiated signal resolution by configuring a requested signal resolution in the Cisco Vision Director. Click **Configuration** > **Devices**. See the Operations Guide, section [Configuring Resolution in Display Specifications](#).
- To verify the configured video mode matches the video stream source frame rate in Cisco Vision Director, click **Device Management** > select the DMP > **Status** tab > **Status Details** tab. Search for **Video mode** (Figure 12 on page 203).



**Figure 12 DMP Frame Rate****To configure display frame rate settings:**

Check the owner's manual of your display for how to set the display frame rate.

**IMPORTANT:** For multicast video, specifically, keep in mind the bezels in the monitors and the motion on the video to be displayed in the wall. Fast motion video, coupled with up-to-1 frame out of sync, in a wall larger than 3x3 magnifies the out-of-sync issue. Choose the right video wall strategy for your use case.

- While using multicast videos for both video regions is supported, it is recommended to use a combination of multicast and locally-stored videos for the video regions (or local video for both video regions).
- Create video to be the same size as the video region where it will be rendered. This avoids any unnecessary video scaling.
- Use consistent video aspect ratio, and design video regions so that they are consistent with the aspect ratio of video content.
- Use constant bit rate (CBR) for local video files for best performance in video walls.

## Restrictions for Video Walls

Before you create video walls, consider the following restrictions:

- In Release 4.1 and earlier releases, multicast video is not supported for a multi-screen video wall. For example, the DMPs cannot stretch multicast content across four displays to convey a single image.

**Note:** Support for multicast video scaling in a video wall was introduced in Release 5.0.

- All screens in the video wall should use 1920x1080 format.
- Widgets, external URLs, and multicast video tuning synchronization are not supported by the DMP-to-DMP content synchronization feature for the digital media players.
- When using zone-based content synchronization for video walls, one device controls synchronization. If that device stops showing video, then all displays in the video wall stop showing content.
- Multicast stream must be CBR and have PCR jitter within MPEG spec of +/-500 ns.

# How to Configure Video Walls with the Digital Media Players

## IMPORTANT:

- For streaming local content video files, local file sync can be within 1 frame of other DMPs.
- For multicast video streaming, the video can be within 1 frame. For successful display, the multicast stream feed must be CBR and have PCR jitter within MPEG spec of +/-500 ns.
- The network quality of service (QoS) must be within specifications. See [Cisco Vision Network, Server, and Video Headend Requirements Guide](#).
- The more you stretch / scale up content, the more noticeable the slightest sync differential is. Please consult Cisco Content Services for your specific video wall configuration.

This section includes the following topics:

- [Prerequisites for Video Walls, page 204](#)
- [Workflow Summary to Configure Video Walls, page 205](#)
- [Configuring Zone-Based Video Wall Synchronization for the DMPs, page 207](#)

## Prerequisites for Video Walls

Before you deploy video walls and create the content for them, be sure that the following conditions are met:

- Beginning in Release 5.0, scaling of multicast video is supported for a video wall in both portrait and landscape orientation. See [Content Scaling, page 195](#).
- Generally speaking, stretching a piece of content across multiple screens is not supported for local content.
  - Local video or image content to be played in a video wall first must be created in the overall format of the video wall to be supported, and then edited into separate 1920x1080 files that contain the segment of content to be shown on each display.
  - For example, in a 2x2 SV-4K video wall (4 screens), the original content should be in 3840x2160 format (that is, 2 times 1920x1080). Then, it should be broken into four individual files of 1920x1080 format to show the appropriate portion of the content for the 4-screen display.
- The DMPs in the video wall must be on the same virtual local area network (VLAN) and use the same access switch.
- For content synchronization:
  - Each digital media player must be in its own group.
  - For each region, the playlists must have the same number of items, type of item, and duration of each item, or have no playlist at all in the region (empty). [Table 2 on page 204](#) shows an example of playlist content for a 2x2 SV-4K video wall with a mix of local video and image content. Notice that all first items in each of the four playlists are of the same type (PNGs), with the same duration, but the content itself is not the same. Likewise, the second item in each playlist is video content with the same duration, but different files.

**Table 2** 2x2 Video Wall Playlist Example for the SV-4K

	Playlist 1	Playlist 2	Playlist 3	Playlist 4
1	30s: PNG 1-1	30s: PNG 1-2	30s: PNG 1-3	30s: PNG 1-4

	Playlist 1	Playlist 2	Playlist 3	Playlist 4
2	34s: MP4 2-1	34s: MP4 2-2	34s: MP4 2-3	34s: MP4 2-4
3	21s: MP4 3-1	21s: MP4 3-2	21s: MP4 3-3	21s: MP4 3-4

- Trim local video item duration to boundaries in seconds and not fractions of seconds.

**IMPORTANT:** If your imported video content duration is in fractions of seconds, then the Content screen shows the actual item duration for the video. However, the system actually rounds that content duration for the playlist to even time boundaries (in seconds). Also, if you manually change the item duration within the Cisco Vision Director UI, the content playback will be truncated.

- For zone-based video wall synchronization:
  - Each media player must be in its own group.
  - Collectively, the groups that are part of the video wall are placed in a zone.
  - The “Use as Video Wall” checkbox is selected when you create the zone for the DMP groups.

## Workflow Summary to Configure Video Walls

[Table 3 on page 206](#) provides a summary of the tasks and guidelines for you to complete when configuring a video wall using digital media players.

**Table 3 DMP Video Wall Task Workflow**

Step	Task	Guidelines
1	Determine the type of content that you want to display on the video wall.	<p><a href="#">Restrictions for Video Walls, page 203.</a></p> <p>Most video walls can reliably use standard DMP-to-DMP synchronization.</p> <p>Video content of longer duration (15 minutes or longer), will benefit most from zone-based synchronization.</p>
2	Determine your video wall configuration.	<p><a href="#">Video Wall Design Methods, page 195.</a></p> <p><a href="#">Best Practices for Video Walls, page 201.</a></p> <p><a href="#">Dynamic Video Wall Sizing, page 197.</a></p> <p>Be sure that the layout is designed to accommodate 1920x1080 screen formats. See <a href="#">Understanding Content and TV Resolution, page 97.</a></p>
3	Configure groups/zones.	<a href="#">Configuring Zone-Based Video Wall Synchronization for the DMPs, page 207</a>
4	Create (or verify) templates.	All content (and for all TVs in a video wall zone) must be deployed using the same template, with the same number of regions and playlists.
5	Create content.	<p>Consider the content changes for different times over the course of the event.</p> <p><a href="#">Prerequisites for Video Walls, page 204.</a></p> <p><a href="#">Restrictions for Video Walls, page 203.</a></p> <p><a href="#">Cisco Vision Content Planning and Specification Guide: Dynamic Signage Director.</a></p>
6	Create playlists.	<p>Create one playlist for each DMP/display in the video wall.</p> <p>For every region, the playlists must have the same number of items, type of item, and duration of each item, or have no playlist at all the region (empty).</p>
7	Stage content.	–
8	Create event scripts.	Determine the states that you need to vary the video wall layout and content over the course of an event.
9	Test the video wall.	–
10	Schedule the event.	<a href="#">Working with Event Scripts, page 211.</a>



The function must be applied to a “group” of DMPs that are typically on the same row of the video wall. To be clear, the “video wall” is a set of displays that, collectively, show one piece of content, that are all synchronized. A matrix of displays can be composed of multiple (Cisco Vision Director) video walls. The entire matrix of displays is also sometimes referred to as a video wall, but not all of the content in this case, is all synchronized.

Prior to setting the value for the video offset control, understand the refresh rate of your TVs which are part of the video wall. [Figure 14 on page 208](#) shows an example of the refresh rate for a sample TV.

**Figure 14 Sample of TV Display Refresh Rate**



To improve the video wall synchronicity and help compensate for the TV refresh rates, use this calculation.

$$(Row - 1) \times (1 / Rr) \times 1000 = Z \text{ ms}$$

Where

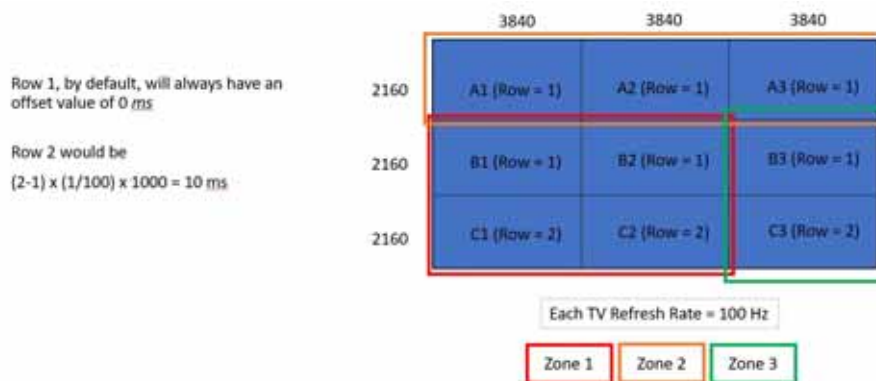
**Row = Row of TVs in the video wall**

**Rr = Refresh rate of the TV**

**Z = Video offset value in milliseconds (ms)**

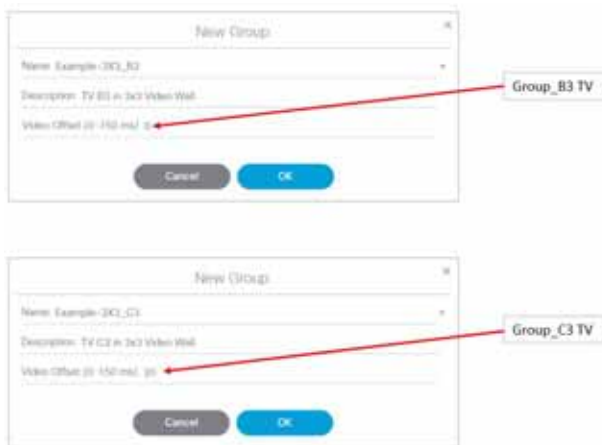
[Figure 15 on page 208](#) shows a video wall example creating the look of a 3 X 3 video wall using three separate video walls.

**Figure 15 Video Wall Example, Using 3 Walls**



Here’s how the video offset would look for Zone 3 ([Figure 16 on page 209](#)).

**Figure 16 Zone 3 Video Offset Values**



**To create or edit a video wall:**

1. Go to **Configuration > Groups & Zones**.
2. Click **Group <->Zone**.
3. Click **+ Add** or **Edit**. The dialog box appears (Figure 17 on page 209).

**Figure 17 New Group or Edit Group Dialog Boxes**



4. Calculate the **Video Offset** value.

The formula is:

$$(Row - 1) \times (1/Rr) \times 1000 = n \text{ milliseconds}$$

## 2X2 Video Wall

- Total wall resolution: 3840 X 2160
- Each TV videomode: 1920 X 1080 X 60p
- Row 1: delay 0 ms
- Row 2: delay 1 sec = 17 ms

**To configure zone-based video wall synchronization for the DMPs:**

1. Go to **Configuration > Groups & Zones > Groups<->Zone tab > Groups tab**.
2. Create a new group for each media player that is part of the video wall.

3. Add only one DMP location per group.
4. Create a new zone and select the **Use as Video Wall** checkbox (Figure 18 on page 210).

**Figure 18** New Zone Dialog Box



5. Add all DMP groups in the video wall to the zone.

**Note:** Synchronization applies only to video and still images. Synchronization cannot be guaranteed for other content such as tickers, external URLs, or widgets.

#### **IMPORTANT NOTES:**

All DMPs in the video wall must be using **at least** firmware 8.1.69 or later. For Release 6.4, the firmware version is 8.3.22.

The video offset value **ONLY** applies to a video wall formation if it has rows (e.g. 2x2, 3x3, 4x1, etc.)—vertical formations of TVs) since the function works on the playout rate of content from top to bottom. It does **NOT** apply to a video ribbon board formation (e.g. 1x4)—horizontal formations of TVs.

The function primarily benefits file-based video content. It will also provide enhanced synchronization benefits for multicast-based video content.

The Video offset control does not rely on the frame rate of the content, be it video file based, or stream based.

Zone based video wall synchronizations should be setup as per normal.

If the video wall is used in an individual TV formation (i.e., video wall formation is **NOT** used), then the user may experience a very slight delay in content playout when looking at all the screens **IF** the content is exactly the same. This is because each TV is playing out content with an offset value and it may be perceived that Row 1 is playing out content faster than Row 2 and 3, respectively. Its also important to understand that this formation is not a commonly deployed setup.

For more detailed information on how to enhance video wall synchronization on the DMPs, see the [Cisco Vision Content Planning and Specification Guide](#).