



Streaming Video Switching Optimization on Crestron Touch Screens

Best Practices
Crestron Electronics, Inc.

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Streaming Video Switching Optimization on Crestron Touch Screens

Introduction

This document provides the programmer with the best practices to follow when using H.264 and MJPEG video switching on Crestron® touch screens.

As residential installations move from analog to IP-based video for security cameras and door stations, streaming video on Crestron touch screens has become increasingly important.

The Crestron streaming video switching solution includes the following:

- Enhanced Embedded Video (EEV) object
- Smart Graphics® software to display multiple live thumbnail snapshots on a touch screen (camera view layouts)
- VT Pro-e® software sample project and SIMPL demo program

Refer to the applicable section in this document for more information.

NOTE: This solution is only compatible with the Crestron TSW-560, TSW-760, TSW-1060, TS-1542, TS-1542-C, DGE-100, and DGE-200 touch screens. The EEV object is not supported on other Crestron touch screens.

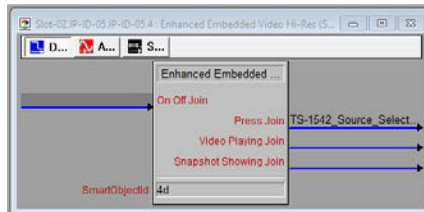
Enhanced Embedded Video Object

The EEV object has the ability to switch between multiple streaming video sources. The JPEG snapshot from the camera is displayed on the touch screen until the IP video stream is ready to play. Once the video stream is ready, the JPEG snapshot is hidden so that the video can be displayed.

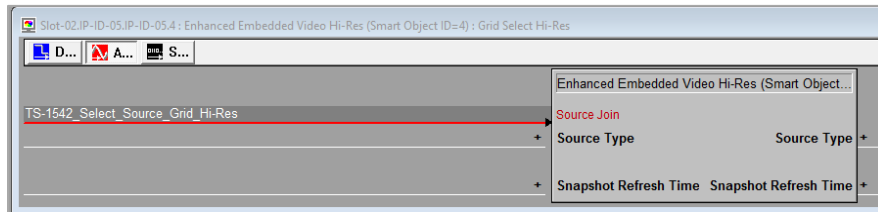
The EEV object contains a feature to add all the URLs for the IP stream and the JPEG snapshots into the EEV Smart Graphics object. An analog join is used to select which video stream is displayed.

Symbol definition examples are shown below.

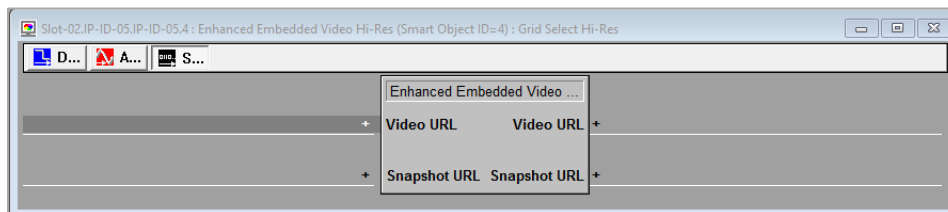
Digital Symbol



Analog Symbol



Serial Symbol



For more information on the EEV object, refer to the VT Pro-e help file.

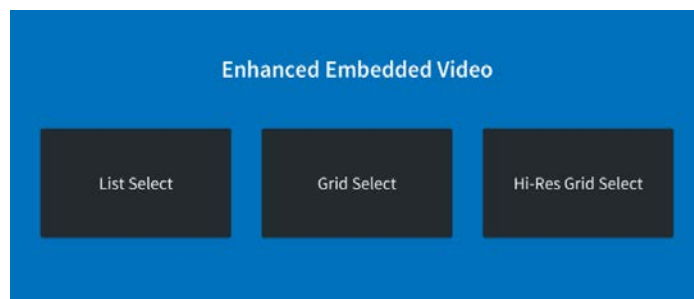
Camera View Layouts

As part of the video switching solution, Crestron has provided a demo program and sample project containing implementation suggestions.

Based on the touch screen size and the number of cameras, the programmer will select the applicable EEV camera view. Do not use the three different views together in one project or program.

NOTE: The camera view layouts (also referred to as the Grid View) are not part of the EEV object. The camera view layouts are a solution used to display snapshots of multiple camera feeds at the same time. They also provide a quick overview of multiple camera streams. For more details on each view, refer to the applicable section below.

Enhanced Embedded Video Camera View Layouts



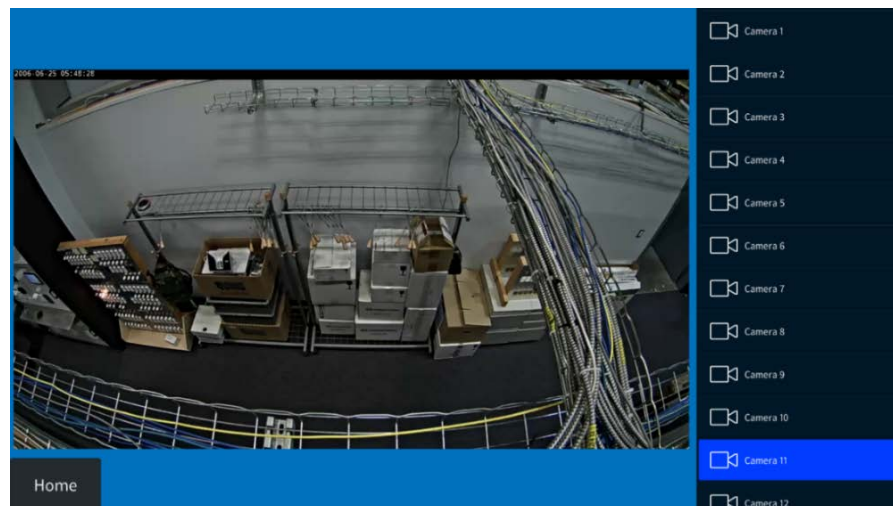
List View

The List View is designed for small touch panels or if there is a large number of cameras (up to 32 cameras). This view displays one live video stream from the selected camera.

Crestron recommends using a maximum JPEG snapshot size of 1920 X 1080 16:9. The 640 X 480 4:3 JPEG snapshot size is also supported. When switching to a new camera feed, the JPEG is initially shown until the live video is ready to display.

NOTE: Refer to the camera's documentation for camera snapshot settings.

List View Preview Screen



Grid View

The Grid View is designed for use with large touch panels displaying up to 12 cameras. Small JPEG thumbnails are displayed and are refreshed every few seconds. Click a thumbnail and the EEV object displays the live stream from that particular camera.

NOTE: In most cases, the source is a camera, but it could also be a Network Video Recorder (NVR).

Crestron recommends using a maximum JPEG snapshot size of 640 X 360 16:9. The 640 X 480 4:3 snapshot size is also supported. When switching to a new camera feed, the JPEG is initially shown until the live video is ready to display.

NOTE: Refer to the camera's documentation for camera snapshot settings.

Grid View Preview Screen



Hi-Res Grid View

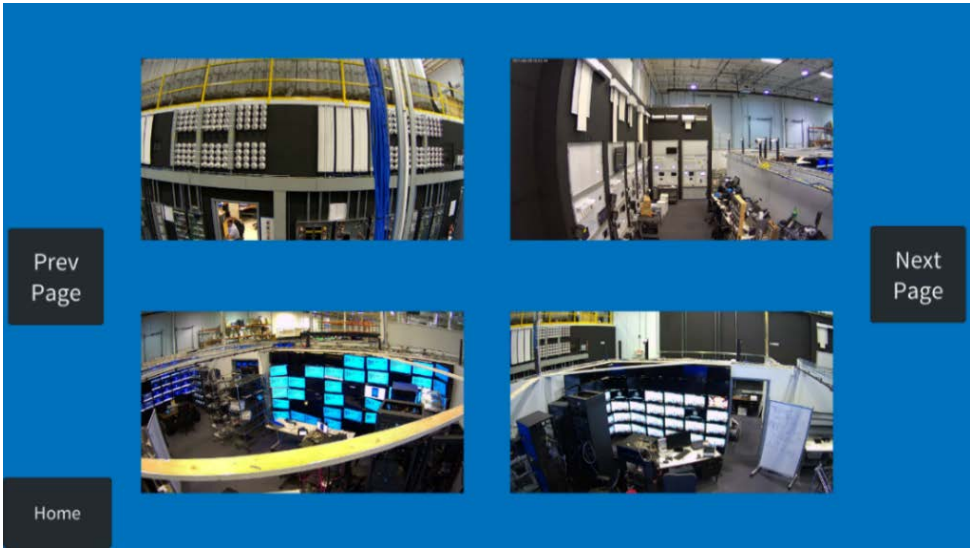
The Hi-Res Grid View is designed for touch panels with up to 12 cameras. There are four large thumbnails displayed on each page. Click a thumbnail and the page with the EEV object displays a live stream from the selected camera. Click **Next Page** to scroll to the next group of cameras.

The Hi-Res Grid View is the best option when the camera is not capable of providing lower resolution screenshots. If the camera cannot display a lower resolution JPEG snapshot, reduce the number of thumbnails on the page for the best performance.

Crestron recommends using a maximum JPEG snapshot size of 1920 X 1080 16:9. The 640 X 480 4:3 snapshot size is also supported. When switching to a new camera feed, the JPEG is initially shown until the live video is ready to display.

NOTE: Refer to the camera's documentation for camera snapshot settings.

Hi-Res Grid View Preview Screen



Implement and Customize the Sample Project and Demo Program

When implementing and customizing the included sample project and demo program, refer to the information below.

- The included VT Pro-e video sample project and SIMPL demo program should be used for implementation and customization.
- The demo program is a template that is used for implementation into actual projects and programs.
- The demo program runs on the Crestron TS-1542 and TSW-1060 touch screens.
- The programmer should adjust the settings regarding the number of cameras and then replace the URLs used for the RTSP H.264 streams and the MJPEG snapshot streams.
- The EEV object is used on the DGE-100, DM-DGE-200-C, TS-1542, and TS-1542-C touch screens. Crestron recommends using the following console command to improve the switching experience, DEDICATEDVIDEOSUPPORT ENABLE.

NOTE: In a future firmware upgrade, this command will no longer be necessary.

- The VT Pro-e project only allows one EEV video object per page.
- Multiple EEV objects can be used in a project as long as only one EEV object is visible at a time.

For more information, refer to the Enhanced Embedded Video Sample Program document provided in the sample program.

Camera Stream Integration

Camera Configuration

To configure the camera, refer to the information below.

Configure either the H.264 or the MJPEG video stream according to the recommended maximum resolution in the [Video Streaming with Crestron Touch Screens](#) online help article OLH 5195.

Generic streaming information:

- Configure the camera JPEG snapshots so that they do not exceed the maximum resolution as follows: List View: 1920 X 1080 16:9, Grid View: 640 X 360 16:9, and Hi-Res Grid View: 1920 X 1080 16:9
- Make note of the correct URL for the camera, as this URL will be used in the program.

H.264 information:

- Set the I-Frame rate of the camera as low as possible.
- Set the Frame per Second (FPS) rate as high as possible to improve the connection time from Crestron platforms.

NOTE: Refer to the camera's documentation for details on H.264 camera settings, H.264 (RTSP) URLs, MJPEG snapshot URLs, and camera snapshot settings.

UDP versus TCP for H.264 streams

To reduce latency when connecting and streaming from an H.264 stream, the preferred connection method is UDP.

The best way to make sure the touch panel is using UDP is to add “?rtsp_tcp=no” at the end of the rtsp:// URL, for example:

```
rtsp://user:pass@IPADDRESS:PORT/live.sdp?rtsp_tcp=no.
```

However, if the network is configured in a way where UDP is not supported when the camera is on a different subnet than the touch screen, the TCP method must be used, for example: `rtsp://user:pass@IPADDRESS:PORT/live.sdp?rtsp_tcp=yes`.

Streaming Buffer Size

When viewing IP videos, a buffer is needed for the incoming video. If the buffer length is reduced, the switching time is improved.

If there are any network limitations, video distortion may occur. Test and then use the lowest possible buffer setting that will work in the network environment. If video distortion occurs or if the stream appears choppy, then raise the value until the problem is alleviated.

The default buffer length for touch screens supporting the EEV object is 1,000 milliseconds (ms). Valid values are from 25 ms to 2,000 ms. The buffer length can be adjusted by using the following console command to set the length in milliseconds: `MEDIABUFFERLEN`.

Improve H.264 Switching Time

Before an H.264 video stream displays, a full frame needs to be transmitted from the camera and received by the touch screen. This avoids heavy pixilation when the stream starts. This frame is commonly called an I-Frame. The frames in between the I-Frame are P-Frames and only send the difference from the prior image, not the full image.

Some cameras always send an I-Frame as soon as a client connects, but other cameras send I-Frames at regular intervals. If the I-Frames are far apart, the connection might take longer. Note that the I-Frame frequency is set differently on different cameras, so be sure to check the camera documentation and the Web UI.

Different manufacturers may have different names for frame settings. They are often called I-Frame Interval or Group of Pictures (GOP).

An example of a default setting that will perform poorly is when the I-Frame interval is set to 50 and the Frames per Second (fps) is set to 10 fps. It can take up to 5 seconds before the first I-Frame is received and the video is displayed.

The connection time is improved by reducing the I-Frame interval and/or increasing the frame rate. If the interval is set too short, this can affect the bandwidth, quality, and performance.

Restrictions for Streaming Cameras

If an EEV object and the Grid solution is implemented on multiple touch screens, limitations on the camera may occur.

Live Stream

If the same camera is selected from many panels at the same time, do not exceed the maximum number of H.264 and MJPEG streams from the camera. Refer to the camera's documentation for information on the maximum number of streams.

JPEG Snapshots

The EEV object and the Grid View implementation request JPEG images from all cameras on a regular basis. Therefore, if several touch screens have the EEV object or Grid View active, the cameras receive multiple requests from all touch screens. This can be demanding on the camera.

For example, if a JPEG snapshot is not shown or if the snapshots are lagging behind, the user should reduce the number of touch screens that are active on the EEV or Grid View page and subpage.

NOTE: The camera documentation for the maximum number of simultaneous connections is mainly referring to the live H.264 or MJPEG video and not the maximum number of simultaneous JPEG requests. The maximum number of JPEG requests is usually an HTTP web request. Refer to the camera's documentation for specific information on simultaneous connections.

For generic streaming information, refer to the [Video Streaming with Crestron Touch Screens](#) online help article OLH 5195.

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