

Network Camera IP Latency Test

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1. About the Test

One of the key features of the MVI AudioVisual Software Suite is to enable network cameras to be integrated in the conference control system and to stream to local and remote displays.

An important part of this integration is to make sure that the connected IP streaming camera will have a processing path that is fast enough for lipsync display of the participant.

With this test we have tried to gather some information about the latency of IP connected cameras using our EasyCam DirectX driven Software using the fastest supported video codec of the camera.

All recorded values are averaged between the 3 photos taken with a fast shutter speed of 1/2000th of a second for accuracy. No further video processing software was running on the Laptop at the time to limit other factors.

2. The Equipment

To conduct a fair and repeatable test we need several pieces of software and hardware so we can measure the complete processing path from the camera back to the computers display.

This will make sure that lipsync is guaranteed and will show deficiencies in the cameras on-screen performance. Color differences can occur because of camera shutter speed, white balance and zoom.

Test Setup:

Timer Hardware:MSI GE66 Raider 10UE Laptop with 240hz panel, Nvidia RTX GFX card, set to 1080p/240Timer Software:MSI Laptop with a computer generated timer with a 500fps refresh rate (upper timer)Timer Recorder:Samsung Galaxy S10e in Pro mode with shutter speed of 1/2000th or Canon EOS R in
Manual mode with shutter speed of 1/4000th



3. The Tables

In this document you will find 2 tables.

The RTSP URL table contains the URLs you need to use to get the RTSP stream from the cameras. This is used in MVI's EasyCam software but also VLC or FFMPEG to test the video streams.

The latency table is sorted by make and model and will show you the mode the stream was captured in, the resolution and refresh rate as set in the cameras web ui or osd and the images that were captured to calculate the 3 frame average. For this test we try to disable all the features of the camera such as noise reduction, predictions, labels or areas.

As time goes by the table size will increase with tested makes and models.

4. About I/P/B frames

When talking about video compression, the concept of I-frames, P-frames, and B-frames is fundamental.

These frame types are used to improve the codec's compression efficiency, the compressed stream's video quality, and the resilience of the stream to transmission and storage errors & failures.

Modern video codecs like H264 or HVEC break the video into blocks of pixels, also called macroblocks.

In order to compress each macroblock, the first step is to find a macroblock similar to the one we want to compress by searching in the current frame or previous or future frames. The best-match macroblock's location is recorded (which frame and its position in that frame). Then, the two macroblocks' difference is compressed and sent to the decoder along with the location information.

- An I-frame (Key-frame or Intra-frame) consists only of macroblocks that use Intra-prediction. I-frames are the least compressible but don't require other video frames to decode. It's like a complete image.

- P-frame stands for Predicted Frame and allows macroblocks to be compressed using temporal prediction in addition to spatial prediction. For motion estimation, P-frames use frames that have been previously encoded. Simply said, a P-frame holds only the changes in the image from the previous frame.

- A B-frame is a frame that can refer to frames that occur both before and after it. The B stands for Bi-Directional for this reason. It saves even more space by using differences between the current frame and both the preceding and following frames to specify its content.

Important: B-frames are resource-heavy – both at the encoder and decoder. They can also introduce a lot of latency which is not desired in live streaming network IP cameras.

The MVI EasyCam software does **NOT** support B-frames in the video stream!

5. About VBR and CBR bitrates

We have come across installations that have left the bitrate setting of the camera on VBR, variable bitrate. This of course means that the camera will use up as much resources as neccessary to try and encode the sensor images and send it over the network.

In these installations we have seen a huge amount of network traffic, especially in low lighting situations because of the image noise that got encoded and translated into a huge bitrate of up to 50mbps per camera.

Changing this from VBR to **CBR**, **constant bitrate**, solved this issue and the network load dropped considerably.

Make	Model	Stream
Angekïs	All Models	rtsp://x.x.x.x:554/stream/main
Avonic	CM60	rtsp://x.x.x.x
Avonic	Other Models	rtsp://x.x.x.x/live/av0
Bosch	Other Models	rtsp://x.x.x.x
Bosch	multi 7000i	rtsp://x.x.x.x/?line=1
Everett	All Models	rtsp://x.x.x.x:554/stream/main
Lumens	All Models	rtsp://x.x.x.x:8557/h264
Minrray	UV510AS	rtsp://x.x.x.x/live/av0
Panasonic	AW-HE40SKE	rtsp://x.x.x.x/mediainput/h264/stream_1
Sony	SRG-300	rtsp://x.x.x.x/media/video1
Sony	SRG-X400	rtsp://x.x.x.x:554/video1

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Make	Model	Mode	Video	Hz	Average	Images
Angekïs	Saber NDI 20x	RTSP	1080p h264	60	85ms	11:05:53.683927 11:05:57.647218 11:06:00.016844 11:05:59.950811
Angekïs	Saber NDI 20x	NDI	1080p HX	60	90ms	11:41:48.462053 11:43:33.908148 11:43:37.575533 11:43:37.480276
Angekïs	Saber Plus (U3D-12FHD6)	RTSP	1080p h265	30	108ms	11:39:03.511059 11:39:04.082545 11:39:04.658872 11:39:03.402284 11:39:03.958691 11:39:04.566485
Avonic	AV-CM40	RTSP	1080p h265	60	62ms	15:37:10.836298 15:37:11.807077 15:37:14.834725 15:37:14.772817
Avonic	CM60-IP	RTSP	1080p h265	60	103ms	14:46:27.860378 14:46:29.962971 14:46:33.699302 14:46:27.752295 14:46:29.855295 14:46:33.604766
Avonic	AV-CM70-NDI	RTSP	1080p h265	60	83ms	13:34:20.568564 13:34:26.652395 13:34:28.585305 13:34:20.485051 13:34:26.568545 13:34:28.502909
Avonic	AV-CM70-NDI	NDI	1080p HX	60	95ms	12:16:26.216510 12:16:29.146155 12:16:30.578206
Avonic	AV-CM73-IP	RTSP	1080p h265	60	83ms	09:43:14.931723 09:43:25.135791 09:43:27.194268 09:43:27.119691
Bosch	IP4000i	RTSP	1080p h264	60	165ms	10:20:57.801490 10:21:04.168049 10:21:09.062922 10:21:08.691151
Bosch	IP5000i	RTSP	1080p h264	60	159ms	15:48:03.866556 15:48:05.633407 15:48:09.307135 15:48:09.152722
Bosch	Flexidome 7000i	RTSP	1080p h264	30	198ms	10:08:02.257664 10:08:10.857242 10:08:20.653283
Bosch	Dinion IP 7000 HD	RTSP	1080p h264	60	182ms	10:14:13.689912 10:14:21.113354 10:14:28.101586 10:14:13.518617 10:14:20.926384 10:14:27.912404
Everett	EVP220N	RTSP	1080p h265	60	77ms	11:10:56.060340 11:10:57.926213 11:10:57.198422 11:10:55.983741 11:10:57.848697 11:10:57.121497
Everett	EVP220N	NDI	1080p HX	60	77ms	11:24:18.688502 11:24:21.212763 11:24:22.982960 11:24:22.921131
Everett	EVP412NW	RTSP	2160p h265	30	134ms	14:05:32.428321 14:05:40.216573 14:05:40.912944 14:05:32.273703 14:05:40.093477 14:05:40.787264
Everett	EVP412NW	NDI	2160p HX	30	302ms	13:31:32.977619 13:31:55.912308 13:32:00.081149 13:31:32.669145 13:31:55.620176 13:31:59.723158

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Make	Model	Mode	Video	Hz	Average	Images
Lumens	VC-A50P	RTSP	1080p h264	60	154ms	14:00:22.837600 14:00:27.830581 14:00:28.908195
Lumens	VC-A71P	RTSP	1080p h264	60	171ms	12:26:17.882201 12:26:19.007115 12:26:21.081327
Lumens	VC-A71P	RTSP	2160p hevc	60	154ms	12:43:19.989826 12:43:23.624857 12:43:29.924022 12:43:29.769448
Minrray	UV510AS	RTSP	1080p h265	60	78ms	16:02:20.437713 16:02:20.562487 16:02:20.687171 16:02:20.608335
Minrray	UV510AS	NDI	1080p HX	60	79ms	16:08:43.817983 16:08:44.193977 16:08:44.320698 16:08:43.739189 16:08:44.114193 16:08:44.240851
Panasonic	AW-HE40SKE	RTSP	720p h264	60	278ms	14:26:55.114187 14:26:59.785277 14:27:00.543818 14:26:59.508307 14:27:00.281756
Panasonic	AW-HE40SKE	RTSP	1080p h264	30	252ms	14:33:34.233773 14:33:48.544240 14:33:50.318041 ************************************
Panasonic	AW-UE80	RTSP	1080p h265	60	140ms	15:11:57.627035 15:11:57.751706 15:11:57.9999534 15:11:57.488115 15:11:57.611030 15:11:57.857913
Panasonic	AW-UE80	NDI	1080p HX	60	160ms	15:34:35.680648 15:34:55.599577 15:34:55.836240 15:34:35.525064 15:34:55.429700 15:34:55.679367
Panasonic	AW-UE80	NDI	1080p FULL	60	93ms	15:38:30.869249 15:38:31.121575 15:39:10.308576 15:38:30.776504 15:38:31.027829 15:39:10.214832
Sony	SRG-X400	RTSP	1080p h265	60	111ms	12:56:04.026902 12:56:05.428293 12:56:06.693654
Sony	SRG-X400	RTSP	2160p h265	30	187ms	15:23:05.97503415:23:08.14303615:23:09.76468015:23:05.79014015:23:07.95304915:23:09.578677

Disclaimer

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