Testing of Cisco 3540 MCU and Radvision ViaIP MCU

Alan Stillerman and Ahmad Arqawi

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Introduction

The Indiana Higher Education Telecommunication System (IHETS) tests new and emerging technologies and products to keep current and up-to-date on equipment that might be a suitable replacement for existing technology already in use.

This evaluation compared the Cisco 3540 Multi Conference Unit (MCU) against the Radvision ViaIP MCU. The objective was to see how each MCU would receive video and audio from one codec and then send it out to two other codecs in the same conference. IHETS staff then watched the return video on two other codecs and recorded their impressions on an evaluation sheet.

How an MCU receives and transmits video and audio is of high importance in the day-to-day operation of providing distance education and other services via two-way videoconferencing. With technology rapidly changing and with constant change in the marketplace as companies are merged or acquired, IHETS is committed to remaining knowledgeable about current technology and its infrastructure implications for delivering high-quality service to our members.

Setup

The MCUs were tested individually using a test procedure based work completed by staff at the United Kingdom Education and Research Network (UKERNA). The objective was to see how each MCU handled signals given to it and then resend them to two codecs within a conference. A digital video cassette was used to record various categories of movement. This tape was then played through a machine that was connected to a Polycom Viewstation v7.5. Two testers watched the return feed (one tester at each codec) using a Tandberg 880 vF1.2 and a Polycom FX v5.1. The tape was played once at H.261 and H.263 protocols for a total of two tests for each MCU. Each test was conducted using 384 kbps of bandwidth.

The tape used was produced with the following categories. Each category was one minute in length except for the EBU color bars which are one minute thirty seconds (1:30) in length. There were ten seconds of black between each category.

Test Tape:

Categories recorded	Time on tape
EBU color bars	0:00 – 1:30
Grey scale	1:40 – 2:40
Blue field	2:50 – 3:50
Medium close up female face, still	4:00 – 5:00
Medium close up female face, talking	5:10 – 6:10
Close up face, nodding	6:20 – 7:20
Close up face, shaking head side to side	7:30 – 8:30
Zoom out slowly to wide angle three people	8:40 – 9:40
Zoom in quickly to close up of center person	9:50 – 10:50
Turntable speeds: 1 and 2	11:00 – 13:10
Football sequence	13:20 – 14:20
Zoom in and out of ‘A-to-Z’ map	14:30 – 15:30
Text legibility, font sizes 20 to 12 pt	15:40 – 16:40
Cut test, scenes various with camera movements	16:50 – 17:50
Man teaching at whiteboard	18:00 – 19:00

Evaluation criteria are listed below. Since all grading was being done by humans, no two responses are alike. Based on the items tested, a scale of impairments was used to give uniformity to the grading.

Subjective video impairments tested:

Lip synchronization	LS
Block distortion (tiling)	BLK
Blurring (reduced edge sharpness and spatial detail)	BLR
Color errors	CLR
Jerkiness (distortion of smooth motion)	JRK
Object persistence (Lagging images from previous frames as faded or outline images)	OP

Scene cut response (i.e. time to build up the new image) SCR

Scale of impairments:

Imperceptible	1
Perceptible	2
Slightly annoying	3
Annoying	4
Very annoying	5

Configuring Cisco 3540 MCU

Each board of the MCU was manually configured using Hyper Terminal. Each board had its own IP address, subnet mask, and gateway address. Duplex settings were set to auto. Once the boards were given their identity, the rest of the configuration took place using the graphical user interface.

The 3540 MCU comes with predefined prefixes that correspond to the desired conference type (i.e., continuous presence, voice activated, etc). A conference was created that could handle H.261 and H.263 video protocols. The audio codec used was G.711. The conference also included capability for bandwidth of 384 kbps. The prefix was five digits with another five being added to complete a ten-digit dial string as required by network policy.

Configuring Radvision ViaIP MCU

Each board of the MCU was manually configured using Hyper Terminal. A Radvision engineer came on site to configure the MCU. Each board had its own IP address, subnet mask and gateway address. Duplex settings were set to auto. Once the boards were given their identity, the rest of the configuration took place using the graphical user interface.

The Radvision ViaIP MCU comes with predefined prefixes that correspond to types of conference desired (i.e. continuous presence, voice activated, etc). A conference was created that could handle H.261 and H.263 video protocols. The audio codec used was G.711. The conference also included capability for bandwidth of 384 kbps. The prefix was five digits with another five being added to complete a ten-digit dial string as required by network policy.

Procedure

The Cisco 3540 MCU was placed on an isolated LAN behind a PIX 515 running v7.0 software and configured as stated above. The MCU consisted of a 100 port MCU blade, a videoconference gateway module with two PRIs, transcoder module for the gateway and an enhanced media processor. After initial configuration, conferences ended after 30 seconds without operator manipulation. After troubleshooting with Cisco's Technical Assistance Center, it was determined that the 100 port MCU blade and the gateway module with two PRIs were not functional. An RMA was created and the parts returned. The new parts that came back were a 60 port MCU blade and a new gateway module with two PRIs. During this process, testing was delayed for approximately two weeks.

Once testing resumed, we found the PIX firewall was blocking video from being returned to the codec. The Cisco 3540 MCU was moved outside the firewall and testing was continued.

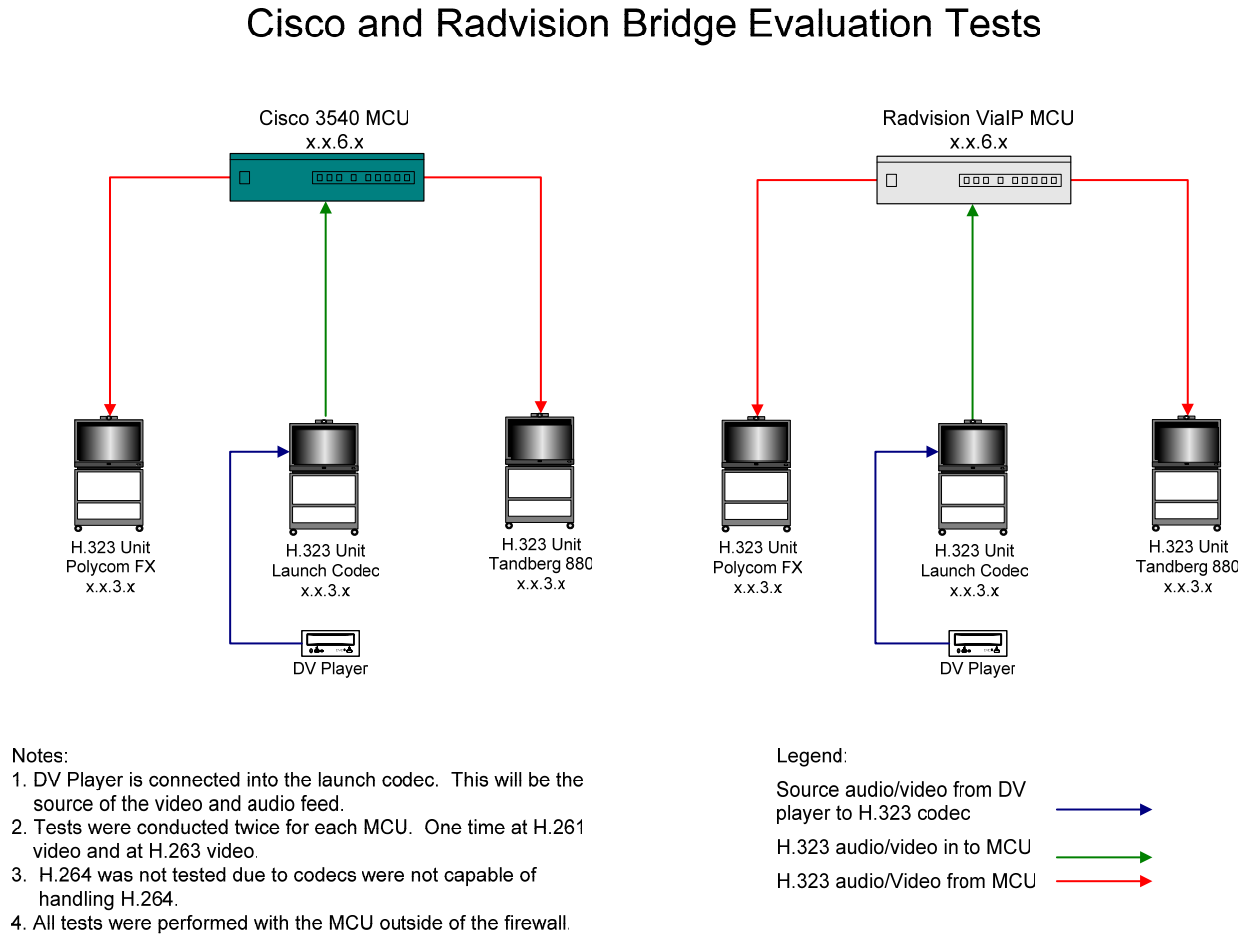
The Radvision ViaIP was placed on the same isolated LAN as the Cisco 3540 MCU. The ViaIP MCU consisted of a 60-port module, internal ECS firewall proxy solution, enhanced communication server gatekeeper, multimedia video processor and an audio transcoder module. The ViaIP MCU was placed behind the firewall and had the same issues as the Cisco 3540 MCU in that return video did not come back through the firewall. The ViaIP MCU was then placed outside the firewall and testing continued (see Figure 1).

Both MCUs were:

- Connected to the IHETS core gatekeeper (Cisco MCM).
- PRI option was not tested due to time constraints.
- Used similar interfaces.
- Built on the same Radvision stack.

The tests were done according to the procedure outlined above.

Figure 1.



Notes:
1. DV Player is connected into the launch codec. This will be the source of the video and audio feed.
2. Tests were conducted twice for each MCU. One time at H.261 video and at H.263 video.
3. H.264 was not tested due to codecs were not capable of handling H.264.
4. All tests were performed with the MCU outside of the firewall.

Legend:

Source audio/video from DV player to H.323 codec

H.323 audio/video in to MCU

H.323 audio/Video from MCU

Results

The table summaries below were calculated by totaling the individual score from each test (e.g., for test 1, adding numbers for blurriness, tiling, and color errors), then combining the totals for tests 1-15 (excluding test 13 which was yes/no). The lower the score, the better the MCU performed. A perfect score (scoring one for each measurement) would have produced a total score of 59. Due to lack of equipment, signal measurements for 75 percent EBU bars and grayscale were not taken and are not presented in this report.

All tests were conducted at 384 kbps at H.261 and H.263 video protocols. At both video protocols, the Polycom FX performed better than the Tandberg 880 in displaying content received from both MCUs (see Table 1).

While both MCUs performed in a satisfactory fashion (see Table 2), the Radvision ViaIP MCU performed better using the H.261 video protocol for both codecs (Table 1). The results were split on the H.263 protocol with the Polycom FX doing better with the Cisco 3540 MCU and the Tandberg 880 doing better with the Radvision ViaIP MCU. It should be noted that the MCU test was conducted once for each video protocol. It is inconclusive which MCU does better at the H.263 video protocol.

H.264 was not tested since both codecs are not capable of handling H.264 video.

Table 1 H.323 (IP) Video Performance

Radvision ViaIP MCU	384 kbps		
	H.261	H.263	H.264
Polycom FX	105	97	
Tandberg 880	127	121	
Cisco 3540 MCU	384 kbps		
	H.261	H.263	H.264
Polycom FX	100	86	
Tandberg 880	146	139	

Table 2 H.323 (IP) Inter-working Performance

Codec	Cisco 3540 MCU	Radvision ViaIP MCU
Polycom FX	Satisfactory	Satisfactory
Tandberg 880	Satisfactory	Satisfactory

Conclusion

While it appears that the Radvision ViaIP MCU is better at displaying H.261 video than the Cisco 3540 MCU, there were insufficient trials to reach a satisfactory conclusion. Also, the codecs were split on the H.263 video as to which MCU gave the better output.

We recommend this test be repeated with codecs are capable of H.264 video so the latest video standard can be included in the results. More trials of each protocol should be conducted to give accurate results.

References

Sheach, J.; Wood, U; Evaluation of IP/ISDN Videoconferencing Equipment, UKERNA, July 2005. http://www.video.ja.net/evaluation