Videoconferencing Quality

Videoconferencing Quality Issues

Note: these comments refer to Standard Definition videoconferencing.

It is useful to consider some very basic information on how standard definition VC systems operate which will help in understanding the limitations of video quality over a videoconference link.

There are two measures of quality in an image:

1. ?Frame Rate? the number of images transmitted per second which results in smooth motion with a high frame rate or jerky motion with a low frame rate

2. ?Resolution? the number of pixels in the image resulting in a sharp or blurry image.

Given the restrictions in the overall bandwidth available within a videoconference link it is not possible to have High Frame Rate AND High Resolution. The norm is for sources likely to have significant motion: Cameras and VCR/DVD players to use High Frame Rate/Low Resolution and for sources likely to have less motion content: PCs and Document Cameras to use Low Frame Rate/High Resolution hence optimising the image quality.

Image Source	Resolution	Frame Rate
Camera or VCR/DVD (Comp Video or S-Video I/P)	352 x 288	15-30
PC or Doc Camera (VGA I/P)	1024 x 768	~5

It is also important to emphasise that a VC link transmits changes in the image rather than the entire image to optimise the use of the available bandwidth. Hence if the image contains a static talking participant only a small part of the image is changing and the overall image quality will be acceptable, however if the participant is walking around the scene and a large percentage of the image is changing then the overall quality of the image will be degraded as the system struggles to transmit the large volume of image information to the other sites. In such a case the image will become ?blocky? and ?blurry? until the movement declines and the image builds up to full resolution.

The degree of blockyness and blurryness depends on the overall bandwidth of the VC link, increasing the call bandwidth will increase the image quality for the same amount of movement.

The following results are taken from a VTAS product evaluation where a football sequence with significant motion was rated across a number of connection speeds. It is evident that even at 768Kbit/s the overall effect of blurring is slightly annoying and blockyness is perceptible. At 384Kbit/s blurring is annoying, blockyness is slightly annoying and jerkyness is perceptible.

Subjective Impairments	384kbit/s	768kbit/s	3Mbit/s
BLK	3	2	1
BLR	4	3	2
JRK	2	1	1

When compared with the results below for a seated person talking the artefacts are reduced to perceptible but not annoying even at 384kbit/s.

Subjective Impairments	384kbit/s	768kbit/s	3Mbit/s
BLK	2	1	1
BLR	2	2	1
JRK	1	1	1

Block distortion **BLK**

Blurring (reduced sharpness) **BLR**

Jerkiness (distortion of smooth motion) **JRK**

Scale of impairments:

Imperceptible **1**

Perceptible **2**

Slightly annoying **3**

Annoying **4**

Very annoying **5**

Hence a key consideration in VC quality particularly at bandwidths below 1-2Mbit/s is to reduce the overall movement in the image, the quality of a seated participant will always be

better than that of a standing participant who moves around the image. Static images will resolve better than those with continual movement.

Where PC images are sent at the higher resolution the restricted bandwidth has similar effects, where a large area of the image changes the overall effect is a blurring of the image as the frame builds up to full resolution, where the entire image changes for example in a PowerPoint slide change it may take a number of seconds for the image to build up to full resolution.

Codec Adjustments

Within the administrator setup of many CODECs it is possible to adjust the setup for a particular input to favour Frame Rate (Motion) or Resolution (Sharpness), this adjustment is not one that can normally be made during a call but is set when the Codec in installed. The Motion/Sharpness setting can however be adjusted for a particular event if required. Care should be taken when adjusting this setting as the low frame rate effects on a camera input or the low resolution on a PC input can be annoying. The norm is video inputs are set to Motion and XGA inputs set to Sharpness, the exception is where a Document Camera is connected to the codec by a composite or S-Video connection, in this case the Doc Camera input should be set to Resolution as this device will normally view still images.

H.239

H.239 also commonly referred to as Duo Video or People and Content allows the transmission of two simultaneous video images, normally the presenter on camera and their presentation material, the type of signal that can be transmitted on each channel is Codec/Manufacturer specific so reference to the user manual for specific detail is required. When the second video channel is opened the available bandwidth is shared between the two images, CODECs calculate the bandwidth share in differing ways but the key point is the bandwidth is shared. Therefore to effectively use H.239 sufficient bandwidth is required to ensure adequate quality on both images. When bandwidth is restricted it may be advisable not to use H.239 and to concentrate available bandwidth on a single image channel.

Summary

In summary the key to Quality is Call Bandwidth and Image Content, the target is to increase the call bandwidth to as high a figure as possible and to restrict the movement in the image, to use ?motion? settings where movement will be evident and ?sharpness? settings for static video images and PC/XGA inputs. Where possible it is recommended that users share material with a colleague across a VC link to ensure that it has been tailored to fit the medium and is delivered effectively across the link. Perhaps content providers could be paired to carry out this evaluation. As the results are very content specific it?s difficult to objectively state what will and wont work, it is very subjective in the end.
