Roles for Video Conferencing at the NRAO

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HTML Version Available[1]

[1] http://www.cv.nrao.edu/~abridle/videorole/videorole.shtml

Contents

1 Purpose

This memo addresses the NRAO Communications Task Force's agenda question 6: *"How can we use video conferencing more effectively?"*.

Section 2 reviews how the current video conferencing system has been used, noting its strengths and its weaknesses.

Sections 3, 4 and 5 suggest ways to expand and enhance our use of video in the NRAO conference rooms, auditoriums, and other locations.

Section 6 summarizes recommendations.

2 Overview

2.1 Background

An NSF computer networking grant was used to purchase video conferencing systems for the AOC, Charlottesville, Green Bank and Tucson conference rooms, and a multi-conferencing unit (hub) and ISDN Gateway were installed in Charlottesville. These systems allow compressed digital video and audio signals to be exchanged between the four NRAO sites over the frame-relay Intranet, and video communication with non-NRAO sites over ISDN phone lines or the Internet. Our original goals were:

- **to add video capability to inter-site meetings previously held by telephone** in the main conference rooms;
- **to explore the use of video to cover auditorium presentations such as colloquia and workshops**;
- **to explore the use of video conferencing with non-NRAO sites**;

Regular use of the video conferencing systems began in March 2000.

2.2 Experience with the existing systems

Video conferencing is now routinely[2] used for small inter-site meetings at the NRAO, to share lunch talks and in-house tutorial presentations between the conference rooms, and for personnel interviews that involve staff at multiple sites. Data Management and scientific staff are the most frequent users, but work groups in Human Resources, Fiscal and EPO have also had experience with use of the video systems for inter-site meetings and presentations. "Set-piece" video presentations require a little more advance preparation and awareness of the video capabilities, but have also generally worked well. Some strengths and weaknesses of video for the conference-room setting are now clear.

In addition to enabling the use of visual aids, video meetings engender a much greater sense of actually meeting with colleagues at the other NRAO sites than do phone meetings. Video helps to integrate new employees into the inter-site working groups that use it regularly. Regular visual contact with staff at other sites reinforces personal awareness of the NRAO as a multi-site organization, especially for staff who do not travel to other sites frequently. Some meeting organizers now say that they feel short-changed if a room scheduling conflict makes them revert to a phone meeting.

The main limitations of video meetings are *(a)* a small but noticeable inter-site time delay in three or four-way meetings that use the video hub, and *(b)* occasional difficulty in hearing quietly-spoken participants in competition with "noises off" such as projector fans. To get the best results, some care is needed over microphone placement, and some active camera control is required.

Trial use of video to cover auditorium presentations has shown that visual aids, speakers *and* audience discussions in these larger rooms can all be captured successfully *if attention is paid to*

[2]About half of all inter-site meetings scheduled at Edgemont Road use the video system, and the fraction would be higher but for room scheduling conflicts.

obtaining good audio quality. Placing permanent video systems and additional microphones in the larger rooms at the NRAO would let staff attend *and participate in*, colloquia, lunch talks, workshops, and "special events" at the other sites on a routine basis. In-house tutorials, software demonstrations and informational presentations could also be made available to larger remote audiences than can be accommodated in the conference rooms.

Video conferences have also been held with non-NRAO sites in Canada, Germany, Spain, and Japan. Those held over ISDN lines have been fully satisfactory. Connections over the commodity Internet vary greatly in quality but can be useful if wide-area network traffic is not too congested.

2.3 Expanding the system

Video conferencing could play a greater role in both internal and external communications than it does now. A modest investment in new equipment, and in making more NRAO staff familiar with the system capabilities, could contribute significantly to increased awareness of the NRAO as one organization and to sharing expertise between sites.

We plan to add permanent auditorium installations at the AOC, Charlottesville and Green Bank, and to extend video conferencing to the VLA Site and to smaller rooms at other NRAO sites. We will also add further hub capability so that, for example, Socorro could host a meeting between staff at the AOC, VLA and Tucson independently of the video hub in Charlottesville.

The direct costs of an expanded role for video conferencing can partly be offset by reducing travel costs and time overhead associated with face-to-face meetings.

Video conferencing cannot substitute entirely for face-to-face meetings, however. The multiple one-on-one interactions by which NRAO staff get to know colleagues at other sites personally will always be an essential component of inter-site co-operation and mutual understanding. Our goal should be to use video conferencing to reinforce these face-to-face interactions, not to supplant them.

The following sections discuss use of video conferencing in more detail.

3 Conference Room Use

Video has been used in the conference rooms for:

- **routine inter-site meetings and workgroup discussions**, *e.g.,* Data Management inter-site working groups and Scientific Staff meetings;
- **personnel interviews** involving staff at all NRAO sites;
- **"tutorial" presentations**, both within divisions such as Data Management and Human Resources, and between divisions, *e.g.,* computing security presentations to other divisions at multiple sites;
- **opening "lunch talks" and discussions at one site to interactive participation from others**, *e.g.* TUNA Lunch and Computer Lunch in Charlottesville have been attended from Green Bank and Socorro, VLA and VLBA Test Meetings at the AOC have been attended from Charlottesville;
- **meetings with sites outside the NRAO**.

Video conferencing has several specific advantages over telephone conferencing for such small-room meetings:

- Non-verbal communication can be an important factor in any meeting that is trying to achieve full agreement on, or comprehension of, an issue by all participants. For example, someone may signify in words that they understand or agree with a point while their facial expression or body language implies otherwise. Frowns, nods, puzzled looks, inattention, etc. convey

messages that are absent from phone meetings and may differ from those conveyed verbally. It has been estimated that over 75% of message transfer in face-to-face human communication is non-verbal. Video conferencing can make up much of this deficit *if some effort is made to provide clear views of the meeting participants at all sites.*

- Visual aids such as overhead transparencies, paper documents shown on a document camera, sketches or notes on a whiteboard can also be used during meetings (although NRAO's long history of telephone meetings may make us somewhat slow to capitalize on this new capability).
- Not all NRAO staff recognize each other by voice, so video meetings can be much better than phone meetings as a way for new staff to begin to know colleagues at other sites (as well as making it easier for everyone to identify who is speaking during a meeting).
- For better or worse, participants can get a truer sense of meeting dynamics in video conferences (who is present, level of attention being paid to discussion, etc.)
- Video meetings over the Intranet or Internet do not incur long-distance phone charges.

Video meetings also have some disadvantages:

- The equipment is only available in one room at each site, and these rooms are often heavily booked. Video meetings can therefore be harder to schedule than phone meetings.
- To gain full value from a video meeting requires some camera awareness by participants and some camera movement to provide clear views of all speakers. This can increase the burden on meeting organizers.
- A small but noticeable time delay between sites occurs in multi-site meetings because the audio and video signals must be compressed, transmitted to the hub, retransmitted from the hub, and then decompressed. The departure from true "real time video" when using the hub makes it harder to interrupt a speaker at another site than it would be during a phone meeting. This effect must be taken into account by participants and particularly by meeting chairs. (Future software and hardware improvements may reduce the delay, but are unlikely to eliminate it.) Video meetings with many attendees at multiple sites therefore need attentive chairing to structure the discussion and to ensure that contributions from all sites are "heard" equally. Multi-site meetings in which vigorous unstructured discussion is expected, and which do not require visual aids, may still be better hosted by phone.

3.1 How can we enhance conference-room meetings?

More effective use of the system requires some technical improvements, but also some attention to effectiveness by meeting chairs.

- *Use the video hub only when more than two sites are involved.* Audio and video quality are significantly better point-to-point than through the hub as less signal processing is needed. The video hub should not be used unless its multiplexing capability is needed.
- *Be aware that good audio is as critical to a successful video meeting as it is to a phone meeting.* The microphone pods for the video systems can pick up even quiet speakers at the edges of the rooms clearly *in isolation*. Their built-in switching may, however, prevent someone with a quiet voice in a room corner from being heard if competing with a projector fan or with someone closer to a pod who creates a distraction. Speakers who face away from the pods while pointing to a projected slide may become hard to hear over someone in their audience who is next to a microphone. Audio could be improved by adding extra microphones but meeting chairs should also pay attention to where the microphone pods are placed relative to noisy devices such as overhead projectors, LCD projectors, laptop keyboards. Meeting chairs

could also ask whether remote sites have any difficulty hearing speakers at their site, and remote site participants should not be shy to ask inaudible people at another site to speak louder. Meeting participants who sit far from the microphones should also *expect* to speak louder in order to be heard clearly. (These factors apply to phone meetings as well, but, unlike in phone meetings, people at far sites can become aware of the reason for poor audio from someone at another site and can therefore provide useful feedback about a problem that the originating site is unaware of.)

- *Meeting chairs should try to stay as aware of, and responsive to, people at the remote sites as they are to people at their own site.* Chairs should poll remote sites for comments on important items and also watch the video attendees as well as those in their own room when soliciting discussion. In the largest inter-site meetings, we might encourage the polite (but unusual, at the NRAO) practice of raising your hand to be recognized by the chair before speaking. This would also allow a site to focus its camera on someone who wants to speak, thus "queuing" them to the meeting chair[3]. People who chair meetings in which not all participants know each other well should make introductions at the start of the meetings, if they would have done so in a face-to-face meeting between the same people. These steps would of course increase the formality of large meetings, but in general the more structured multi-site meetings are those most likely to be enhanced by video.

- *At a site with many attendees in a video meeting, someone should be asked to be "local video chair"*, to assist the meeting chair by pointing their camera to local site speakers, or would-be speakers, so they can be seen clearly[4]. It would be helpful if a few more staff at each site became familiar with the operation of the video cameras and of the overall capabilities of the system, as described in the Video Conferencing Manual[5].

- *Consider the response and resolution of the video system when planning to use visual aids.* Presenters should use large fonts on transparencies where possible and not rely on subtle color differences to distinguish items. If possible, they should test visibility of a sample visual aid on the video monitor as well as in the room while preparing the aid. (Visual aids that are clear over the video system will always be easier to read in the live room as well.)

- *Use direct Intranet links to share computer presentations in parallel with the video feed.* This is important for software demonstrations, computer tutorials, etc. Each video conferencing system originally came with a computer intended for this purpose. It is much more effective to share computer screens with the other sites' computers and LCD projectors directly over the Intranet in parallel with the video feed than it is to degrade them to TV video resolution and color fidelity via the video camera. Direct data links can also be used to share control of a computer application across sites during a tutorial or demonstration. Every NRAO conference room and auditorium should be permanently equipped with a small-footprint computer that is connected to our Intranet, and with an LCD projector to project that computer's screen locally. (An immediate goal is to reduce the footprint of the TV monitors in the AOC conference room to make more room for such ancillary equipment to be used there.)

4 Auditorium Use

Video has already been used to share workshops, colloquia, and special events such as the VLA 20th Anniversary Ceremony among the sites. Such use has however been limited by the need to move the

[3]The "continuous presence", (*i.e., "Hollywood squares"*) modes that are now available on the video hubs may also help this problem, though at the expense of smaller images of individuals in a meeting and possibly some longer time delays.

[4]This is helped by using camera presets, as the cameras slew faster and more precisely between presets than they can be panned

[5]http://www.cv.nrao.edu/~abridle/videoconf/vcm.shtml

equipment to and from the conference rooms, often with little time to spare, and by the need for *ad hoc* extra microphone systems to pick up speakers and audience discussion well in a large room.

Despite these limitations, the response to trial "videocasts" of events in the larger rooms has been strongly positive. We should expand our use of video to the larger rooms and thus to activities than involve larger groups of staff at a time.

Many staff would like to *participate* interactively in colloquia at other sites by video. Once permanent auditorium video systems and additional microphones are in place, all that is needed to enable this will be for sites to locate their TV monitors so that the colloquium chair and speaker can see remote participants clearly. As well as increasing the range of colloquia available at each site, this would let staff learn more about each other's interests through the discussions that occur.

Auditorium video use would also allow general-interest talks, presentations aimed at large groups of employees, "state of the observatory" addresses, etc. to be shared across sites. An auditorium might also function as an alternate venue for a video meeting if a site's conference room is too small for the attending group or is pre-empted.

Some technical points are specifically relevant to large-room video conferencing:

- A video-capable LCD projector can be used to project the incoming video feed in large format for viewing by a big group.
- Ancillary microphones are essential to deal with speakers (who may roam, face away from the audience while they are pointing to slides but towards them at other times), *and* to capture audience discussion. We have had good experience with using lapel mikes for speakers and sensitive wide-angle mikes for discussion, mixed appropriately with the output from Polycom pod units in the auditorium ceilings. The AOC Auditorium in particular would benefit by having several additional ceiling microphones installed at the front of the room.
- Runion and Bridle have developed a way to control remote cameras through the video hub from a PC keyboard. This allows someone at a remote site to do most of the work needed to make an auditorium presentation available NRAO-wide by video, thereby sharing the workload of an event between originating and receiving sites.

5 Video at other locations

There have been requests from NRAO staff for:

- a "video phone booth" capability (*i.e.,* a one-person video facility) so that we do not tie up a site's main conference room for video meetings that only one or two people will attend,
- video conferencing to operations sites, specifically the VLA Site and VLBA antenna sites.

Successful video conferencing requires both adequate bandwidth and good quality-of-service assurance throughout the network. To ensure good video and uninterrupted audio performance, each video conferencing system must be on its own dedicated subnet. It is also desirable to set precedence bits in the packet traffic to obtain priority in routers, etc. Increased deployment of video conferencing at the NRAO must be tied to appropriate network infrastructure improvements.

It should be possible to meet these requirements for a video connection to the VLA Site in the near future (the hardware to support this is now being requisitioned). We also plan to add a further system in a small conference room at Green Bank. A portable unit, able to work with any Win2000 PC to provide a "video phone" *with the same video and audio quality as our existing systems*, will also be evaluated for future use.

It will be impractical to extend video conferencing to the VLBA antenna sites while they have their current narrow-bandwidth connections to the NRAO. If improved connectivity to VLBA sites becomes affordable, point-to-point video conferencing between the AOC and VLBA antenna sites might become an interesting option.

6 Summary

To use video conferencing more effectively at the NRAO, we should:

- Install permanent video systems *and* ancillary microphone systems in the auditoriums so that these rooms can be used routinely for video presentations, and install video systems in some smaller rooms to relieve scheduling pressure on the conference rooms. (This expansion is underway, funded by the Data Management budget.)
- Use video to share in-house tutorials, informational presentations and colloquia NRAO-wide, as well as for routine meetings.
- Encourage meeting organizers to become more familiar with the capabilities of the video systems.
- Use direct data links between sites to share computer displays between sites in parallel with the video feed. LCD projectors should be permanently installed in all rooms where we do such "data conferencing". This would greatly increase the effectiveness of computerized presentations and software demonstrations that are now shared between sites. (Data Management has not allocated funds to purchase additional LCD projectors for all sites).
- Give general guidance to NRAO meeting chairs on how to run meetings more effectively[6] perhaps including points of "video etiquette and preparation".

[6]Several sidebar discussions at the Communications Task Force have noted that good chairing of meetings could increase the effectiveness of meetings at the NRAO in other ways (clear agendas and purpose, keeping discussions relevant, summaries or minutes made available on the web, etc.).