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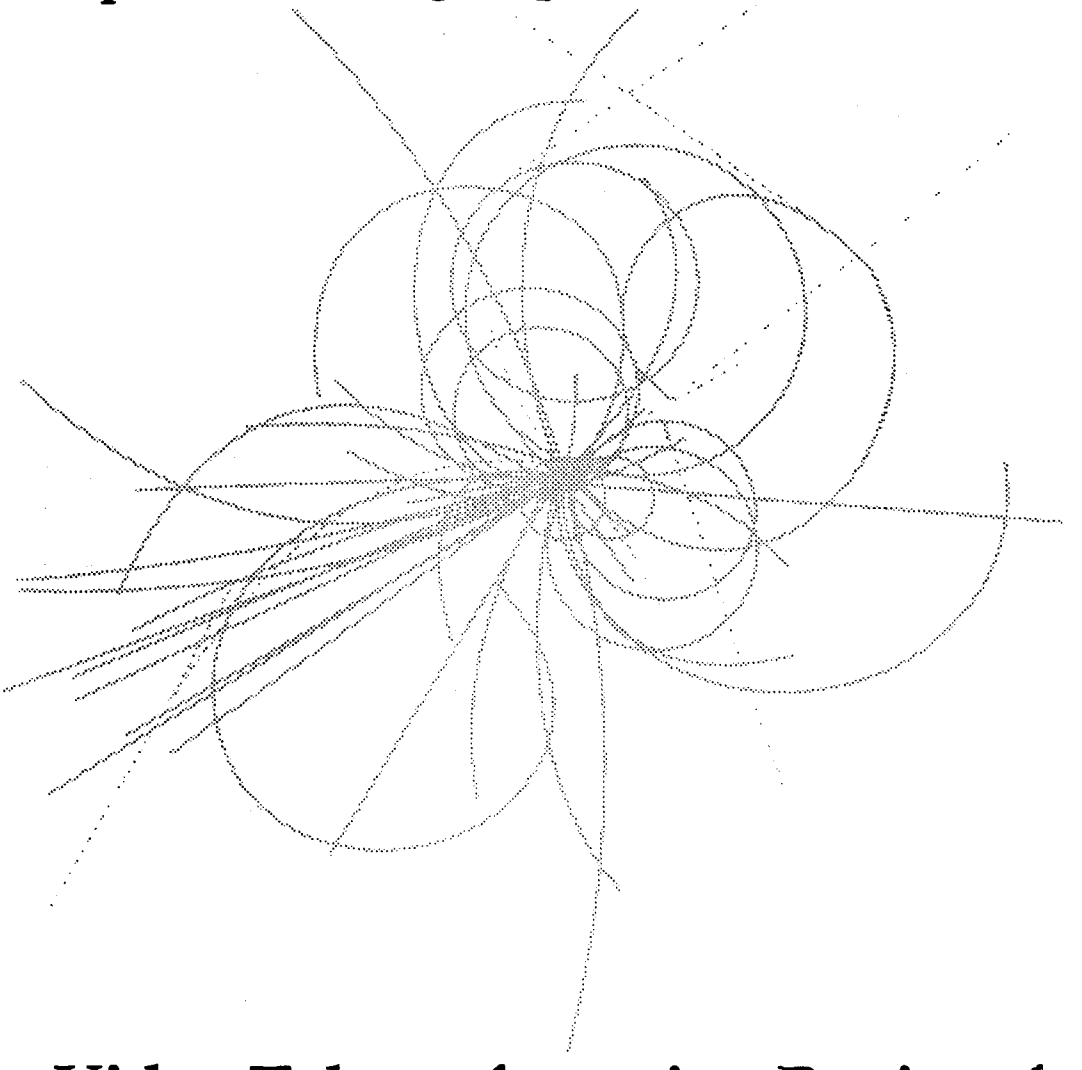

Video Teleconferencing Review for Support of High Energy Physics Activities

G. Chartrand

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VIDEO TELECONFERENCING REVIEW FOR SUPPORT OF HIGH ENERGY PHYSICS ACTIVITIES*

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INTRODUCTION 1

OVERVIEW OF CURRENT VIDEO TELECONFERENCING STATUS 1

PRESENT VIDEO NETWORK CONFIGURATION 2
- OPERATIONAL SPEED 2
- MULTIPLE VIDEO BRANCH EXCHANGES 2
- ISDN (INTEGRATED SERVICES DIGITAL NETWORK) 3

VIDEO TELECOM CORPORATION (VTC) SYSTEMS 3

COMMUNICATIONS FOR THE SUPPORT OF VIDEO TELECONFERENCING 5
- ISDN 5
- BANDWIDTH ON DEMAND 5
- SWITCHED 64 KB. SERVICE 5
- FRACTIONAL T-1 6
- LINE MULTIPLEXING 6

COMMUNICATIONS R&D 6

RESOURCE AND SYSTEMS MANAGEMENT 6
- SCHEDULING 6
- NETWORKING 6

NEAR-TERM PROJECTS FOR VIDEO TELECONFERENCING 6
- MULTI-SITE SCHEDULING 7
- AUDIO CONFERENCING 7
- PORT CONTENTION 7

FUTURE EXPANSION CONSIDERATIONS 7

CONCLUSION 7

VIDEO TELECONFERENCING REVIEW
FOR
SUPPORT OF HIGH ENERGY PHYSICS ACTIVITIES

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INTRODUCTION

Although video teleconferencing systems have been available for many years, their cost has been considered prohibitive for both the actual teleconferencing equipment and for the communications circuits associated with their use. New technology has significantly reduced these costs making video teleconferencing a practical means of communication for the first time, and creating a new way in which HEP personnel can work and interact electronically.

The recent rapid evolution in video teleconferencing technology has been driven primarily by advances in microprocessor and DSP components. Advanced systems available today provide significant performance improvements in the "frames delivered per-unit-per-time" over systems designed just a few years ago. This improved performance and reduced costs for communications bandwidth are the most important factors creating the potential for widespread use of video teleconferencing within the HEP community.

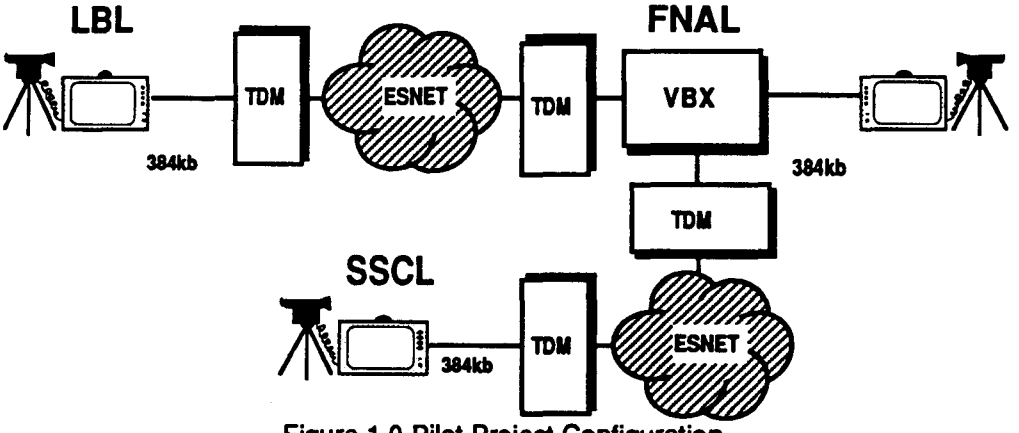

Figure 1.0 Pilot Project Configuration

The HEP community has made extensive use of electronic communication in the form of computer networking for over a decade. Within the last year, a limited video teleconferencing capability was established in the form of a pilot project linking LBL, FNAL, and SSCL (See Figure 1.0). The pilot project demonstrated that video teleconferencing can, in certain circumstances, be a viable alternative to travel. Due to the growing size and dispersion of experimental collaborations, video teleconferencing will almost certainly become a necessity in the conduct and management of large projects and programs in HEP.

OVERVIEW OF CURRENT VIDEO TELECONFERENCING STATUS

Current video technology is far from perfect, and strong parallels can be drawn between the developmental history of computer networking and the emerging video technology. For example, as in early computer networking, video teleconferencing systems are proprietary and cannot communicate between unlike vendors. Additionally, because of their inherent communications limitations, they also tend to promote centralized networks.

In contrast to early computer networking, video teleconferencing is rapidly moving toward the adoption of internationally recognized standards. While standards adopted in the near term will not encompass the full scope of relevant compatibility, distribution, and communications issues, they will permit increased flexibility in the design and use of video teleconferencing systems.

The CCITT H.261 or PX64 (P "times" 64) standard defines common video compression and control methods which every major video teleconferencing vendor has committed to

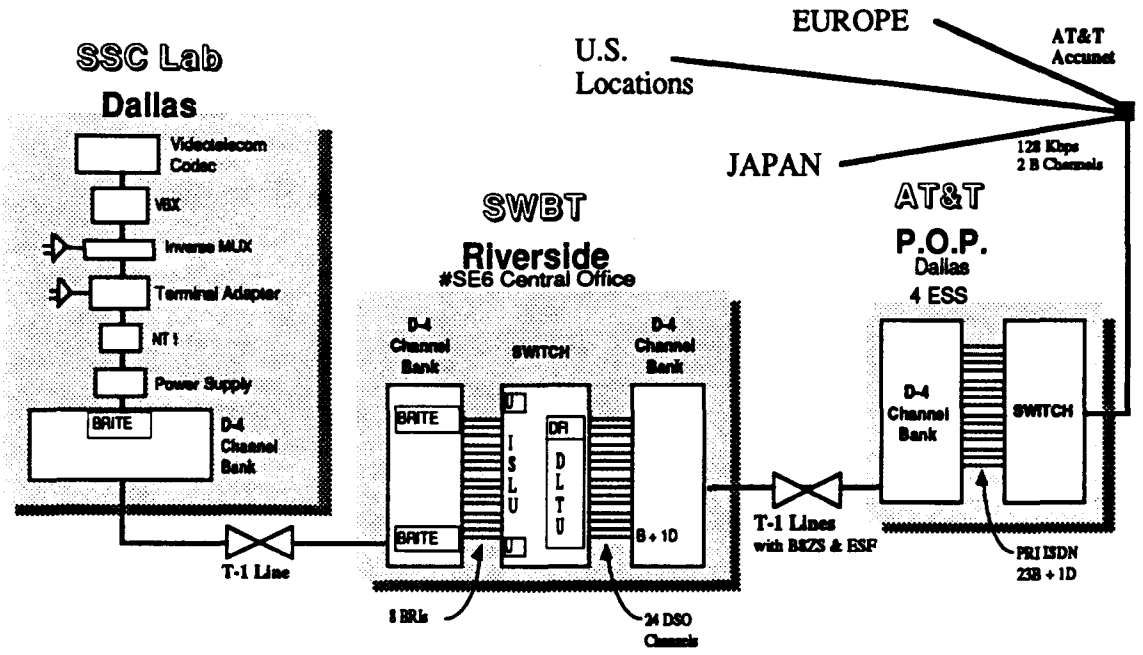

Figure 3.0 SSCL ISDN Systems Configuration

ISDN (INTEGRATED SERVICES DIGITAL NETWORK)

The SSCL successfully completed an R&D project with Southwestern Bell Telephone and AT&T to establish the first clear channel switched ISDN service[1]. Two VBX ports are currently connected to four ISDN BRI channels[2]. The ISDN connection presently provides video connectivity with Japan and England. Several other European countries will soon be accessible with Italy being one of the first. (See Figure 3.0).

VIDEO TELECOM CORPORATION (VTC) SYSTEMS

In January 1990 an evaluation of video systems by LBL and SSCL determined that Video Telecom Corporation (VTC) of Austin, Texas offered the best system in terms of both price and performance. VTC teleconferencing systems were leased at LBL, FNAL, and SSCL for the pilot project. The following factors were instrumental in making this selection.

The VTC system fulfills low-performance needs very well and operates over a wide range of communications speeds. Because the Codec[3] is software-based, it will comply with the H.261 CCITT standard without replacement of any hardware. VTC has made a strong commitment to implementing this standard and their chief designer is directly involved in the H.261 committee.

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[1]The first switched ISDN service to a customer provided through a regional bell operating company.

[2]Each BRI (Basic Rate Interface) is an independent 64 Kb. channel.

[3]Codec- Coder/Decoder. The device that stores, compresses, transmits and receives video frames and audio.

COMMUNICATIONS FOR THE SUPPORT OF VIDEO TELECONFERENCING

It is anticipated that ESnet will begin supporting video teleconferencing at some level in FY-92. Eventually, extensive worldwide implementation of ISDN will make video teleconferencing as easy as making a phone call. At present, other means must be used to provide connectivity.

The following is a brief description of communications services that will probably be used in the near-term. (See Figure 4.0.) Note that all these services require a local-loop T-1 circuit from the user's site to the supplier's network point-of-presence (POP). Local loop costs vary among suppliers because the POP's are located at different distances from the desired location. Under certain circumstances, local loop costs can dominate the total cost for communications. ISDN, bandwidth on demand, and switched 64 Kb. service allows video sites on the same network direct-dial access to other sites, while the fractional T-1 circuits and line multiplexing can only communicate with parties who are connected to a VBX.

ISDN

The expanding use of ISDN in countries of interest to HEP makes it one of the most effective means of providing international connectivity today. Basic rate ISDN includes two "B" channels (of 64 Kb. each) and one "D" (or data) channel for control and signalling. The "2B+D" combination is ideally suited to provide the 128 Kb. which was determined to be the lowest acceptable speed for video teleconferencing.[4] Unfortunately, true ISDN Basic Rate Interfaces do not exist for inter-LATA[5] usage in the USA outside of "beta-test" locations.[6] ISDN connectivity will require a T-1 ESF[7] connection from your location and a Central Office switch and equipment to provide the basic rate and terminal interfaces (See Figure 3.0). Wide-spread USA ISDN implementation will be delayed for several years in many areas due to the need to replace incompatible switching equipment in Regional Bell Operating Companies.

BANDWIDTH ON DEMAND

Several offerings for reservation bandwidth systems are expected in the near future. Only one telecommunications provider, Williams Telecommunications, now offers a system on a nationwide basis. That system (named "Will Band"), allows for the reservation of bandwidths from 56 Kb. to T-1 on a 15 minute notice. This network may be extended to include international locations in the coming year. Reservations are made over a dial-up modem connection with both a PC and dumb terminal interface.

SWITCHED 64 KB. SERVICE

A few non-ISDN switched 64 Kb. services are expected to be made available in the coming year. These systems will use some type of out-of-band signalling system (similar to Will Band), to establish and terminate connections.

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[4] 128 Kb.was determined to be the lowest acceptable speed as a result of the pilot project.

[5] Inter-LATA communications can be defined as beyond the geography defined by a regional bell company.

[6] The SSCL has functioning ISDN as a result of a recent R&D effort.

[7] ESF- Extended Super Frame. A full T-1 circuit of 1.544 Megabits.

MULTI-SITE SCHEDULING

Methods for multi-site scheduling for video conferences need to be developed. A complete scheduling system should incorporate the ability for anyone on the computing network to view the schedule.

AUDIO CONFERENCING

Not every entity in HEP can afford to purchase a video teleconferencing system and the communications to support it. The inclusion of "audio only" participants in a video teleconference should be explored.

PORT CONTENTION

As more sites are connected with non-switched service, some type of port contention device will be needed to better utilize VBX resources.

FUTURE EXPANSION CONSIDERATIONS

The state of current video technology imposes limitations on the size in which the video network can practically be developed. Any expansion impacts support personnel at all the major video network hubs, especially when it involves international sites where time zones differences extend the normal working hours. Video teleconferencing must be planned and coordinated globally, and have the endorsement and support of laboratory management to be successful.

CONCLUSION

Video teleconferencing has proven to be very useful as implemented on a limited scale. Because of communications and video technological limitations, careful planning and coordination throughout the entire HEP community is necessary to assure effective deployment of an extensive video network.