Case Study

University of Virginia: Research Collaboration Using IP Videoconferencing

Introduction

A case may be made that, in scientific research at least, the easiest questions have been answered. "What remains," says Dr. Rick Horwitz, Director of the Cell Migration Consortium, "are complex, multi-faceted challenges that can best be solved by concurrent, focused research performed in tandem by large, distributed and yet centrally coordinated multi-disciplinary teams."

For the foreseeable future, scientific research and particularly biomedical research, will be a collaborative process. Experts in different domains and in different parts of the world, not always residing in world renowned institutions, contribute their investigative skills and resources to solving a problem jointly. At the same time, the scientists learn from their peers in other disciplines and can introduce their students to work being conducted by experts in remote laboratories.

It is with this collaborative vision in mind that the National Science Foundation funds the work undertaken by the Center for Biological Timing and the National Institutes of Health granted an innovative "glue grant" to the University of Virginia and its collaborators to study cell migration.

CASE STUDY QUICK FACTS

MXM Size: 100-user license for Cell Migration and
50-user license for Center for Biological Timing

Number of Desktop Endpoints: 60 VCON ViGOs

Number of Group Endpoints: 15 VCON MediaConnects

Number of non-VCON Endpoints: 5-10 non-VCON systems

MCUs Deployed: Cisco 3540 and Cisco 3510

Most Valuable MXM Features:

- Remote management and configuration of endpoints
- User directory
- User confidence in the video network
- Network transparency

Center for Biological Timing

Chronobiologists at the NSF Center for Biological Timing began using videoconferencing in 1999 when they expanded their weekly seminars to include audiences at remote sites. Hal Noakes, Network Administrator for the Cell Migration Consortium and Research Technologist for the Center for Biological Timing, directed the deployment of 3 VCON MC8000s at Northwestern University, the University of Virginia and at Morehouse College. Desktop level connections were also implemented at the University of Frankfurt, University of Alaska and Washington University in St. Louis, MO.

Technologies for these sites were purchased with funds awarded to the Center for Biological Timing headquartered at the University of Virginia by the National Science Foundation in order to help the center promote large scale multi-institutional research projects in biological rhythmicity which would be beyond the capabilities of an individual investigator or institution. Some of the projects undertaken by participants of the center have included:

- the Clock Genome Project, which sequenced and compared normal and mutant clock genes in a number of organisms;
- the first large-scale longitudinal study of the effects of shift differentials in a manufacturing envionment;
- studies on the effects of aging on human clock synchronization and the consequent health issues; and
- numerous studies in chronomedicine, sleep pathology, jet lag and seasonal affective disorder.

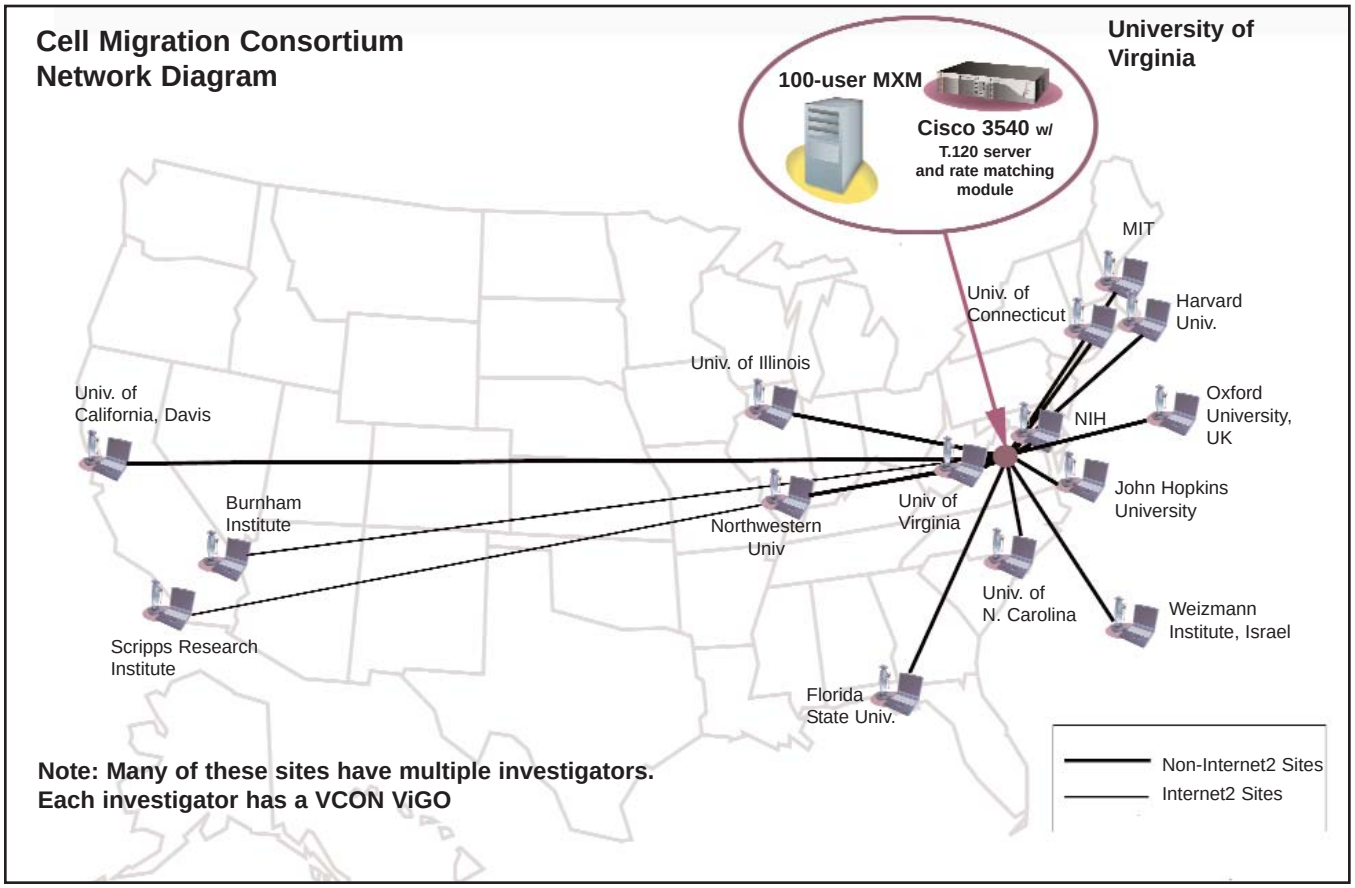
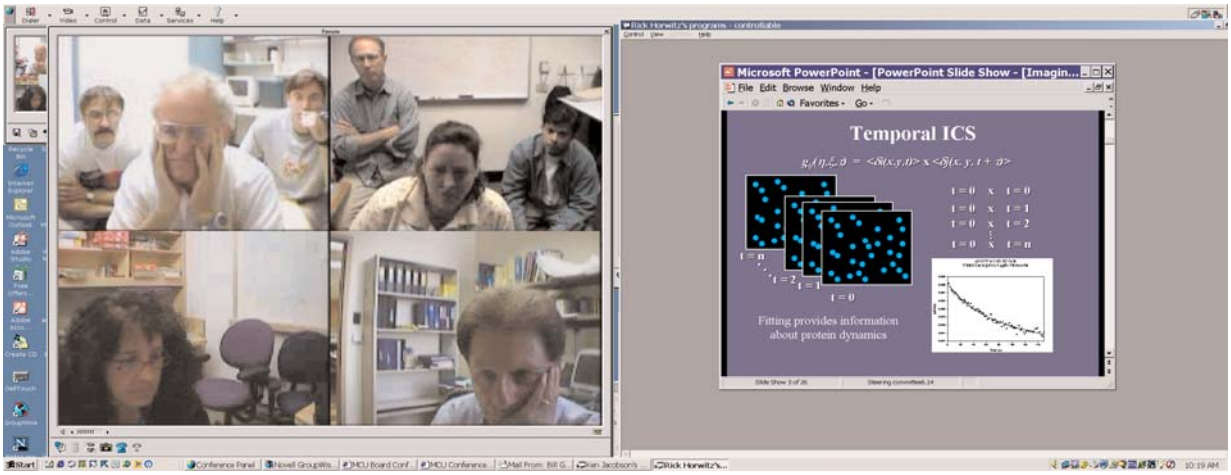


Diagram A: Cell Migration Corsortium Network Diagram

NSF funding includes significant requirements for outreach activities and the Center for Biological Timing used H.323 videoconferencing to satisfy some of these. They established a link to an underfunded primarily minority institution and included that site in numerous advisory meetings and a weekly seminar in chronobiology. A connection has also been made to the Thomas Jefferson High School in Northern Virginia so that advanced biology classes can be involved in real-time neurobiological experiments and interact with the scientist, Dr. Otto Friesen, while the experiment is underway. The students "see" through the microscope camera and discuss the cell structures with Dr. Friesen.

"Using our first bridge we could host a 9-way call at 384kpbs," Noakes recounts. "With this we were able to experiment and ultimately to demonstrate what we feel is an important component of future academic research. It's really exciting to be able to have young and ambitious researchers take positions teaching in a remote college without abandoning their research and publishing goals. For example, Dr. Erik Herzog from Washington University in Missouri and another U of V graduate, Stanley Wright, now based in University of Alaska Fairbanks, can both participate virtually in the Center for Biological Timing's *Fridays at Four* seminar series using IP videoconferencing."



They have purchased notebook computers and ViGO units and plan to expand this program to rural schools in Central Virginia so that these students will have access to mentoring and instruction from graduate students and faculty at the University of Virginia.

Multi-site meetings among various members of the Center for Biological Timing are frequently conducted using desktop videoconferencing and a Cisco 3510 MCU (with embedded gatekeeper) based in the Charlottesville, Virginia-based University of Virginia IT operations center and Internet2 connections at most remote sites.

Noakes says that he selected VCON products because the company was already a leader in IP-based videoconferencing and focusing all of its development efforts where he could use these. Given the uneven distribution of ISDN and the consistent access to the Internet provided to academic institutions through the penetration of Internet2, Noakes felt that there was really no choice but to go with IP end-to-end for transport and, now he has many other practical reasons as well.

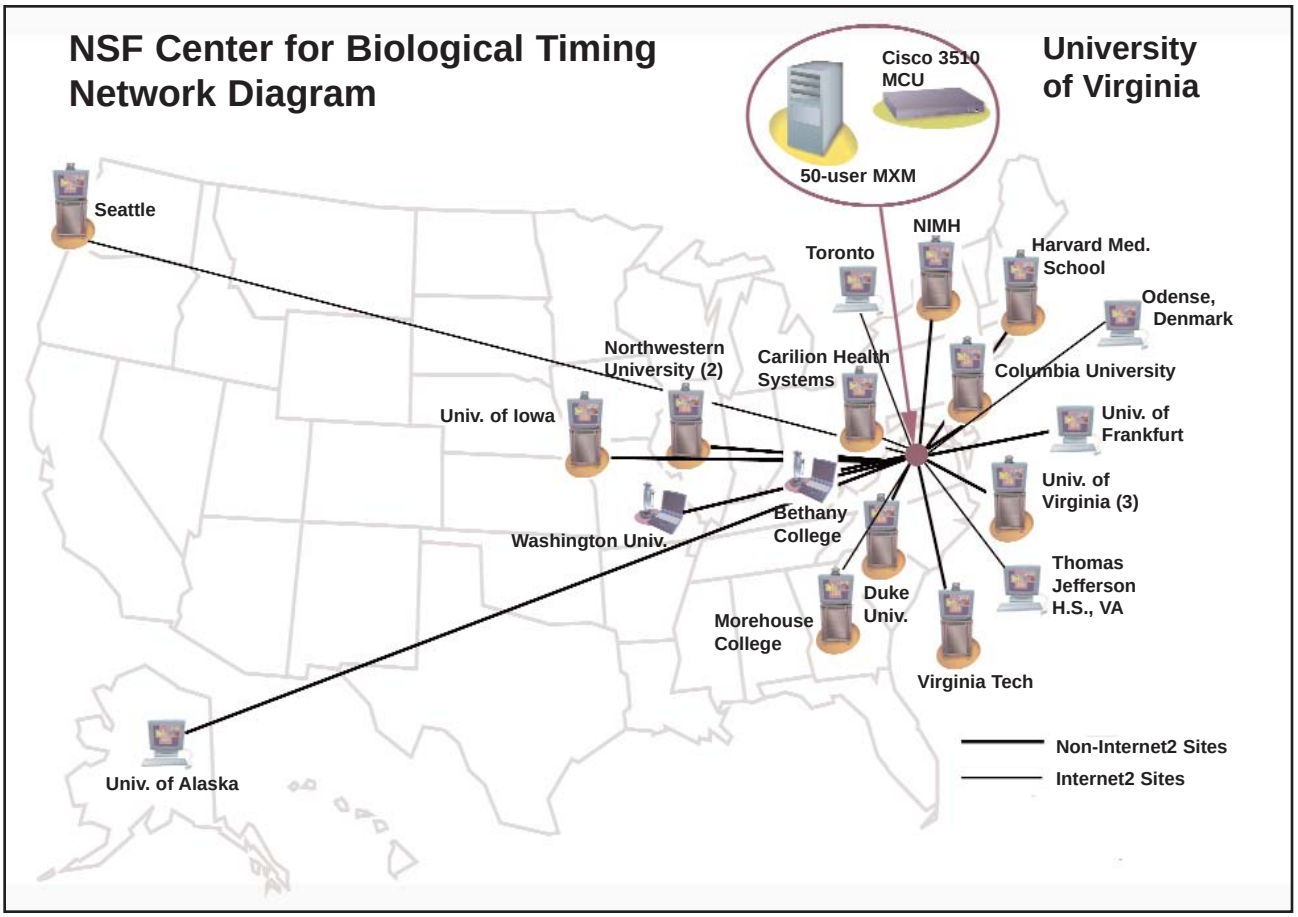


Diagram B: NSF Center for Biological Timing Network Diagram

Research Groups Connected to the Center for Biological Timing Network
(location and system used shown in diagram above)

Center for Biological Timing
- University of Virginia
- University of Alaska
- Washington University
- Morehouse College
- Northwestern University
- Bethany College
- University of Frankfurt (Germany)
- Thomas Jefferson, High School, Virginia

Proteomics Research
- MDS Proteomics in Toronto
- MDS Proteomics in Seattle
- MDS Proteomics in Odense, Denmark
- University of Virginia

Medical Robotics
- Carilion Health Systems
- Virginia Tech
- University of Virginia

Functional Genomics
- Northwestern University
- Duke University
- University of Iowa
- Columbia University
- NIMH
- Harvard Medical School

Expansion and upgrades

In the year that followed initial implementation, the Center for Biological Timing videoconferencing network expanded beyond the original design goals to include a number of small workgroups based at the University of Virginia. These include:

- a 5-site group working on medical robotics;
- a multinational group researching medically oriented proteomics;
- a four site group studying geriatrics; and
- several other small ad hoc conferencing groups.

As can be seen in the diagram, the network is very thinly distributed yet has a worldwide footprint.

In January 2001, when VCON launched the MXM 1.0, Noakes immediately knew how it could address a key obstacle to the expansion of videoconferencing among his users and he purchased a 25-user license for the Center for Biological Timing network.

with the assistance of Cisco and VCON Noakes overcame the technical difficulties and the researchers are now able to conduct multipoint data as well as audio/video conferences. They routinely share, and are able to collaboratively edit, grant applications, journal articles, micrographs, electrophoresis gel scans, DNA sequences, graphs and spreadsheets.

National Institutes of Health

Based on the experience gained with the Center for Biological Timing, Noakes and scientists at the University of Virginia responded to a National Institutes of Health request for proposals for large scale, multi-university, multi-disciplinary biomedical research projects. Videoconferencing was made the central integrative construct of the project and this persuaded the NIH that this group would be able to effectively function as a large collaborative unit rather than a collection of loosely related individual research projects.

"I could not expand and go to scale without centralized endpoint configuration and management... that is really what sold me on it," recalls Noakes. "MXM allows me to be everyone's technician instead of being dependent on the availability of technicians at each endpoint for each conference."

Another area in which the network evolved was with support for point to point and multipoint T.120 sessions. "Since all the meetings involve discussion of research of one type or another, usually from labs," reports Noakes, "it is essential that our collaborators have the ability to bring the data into their meetings with them. "At first, T.120 was only available point-to-point with any reliability, but

In 2001 the University of Virginia became the headquarters of this new NIH "Glue Grant" with a 5 year, $40 million budget. This Glue Grant unites prominent researchers in various disciplines toward the study of Cell Migration… how and why cells move through the body. Cell migration in the human body impacts many processes such as cancer metastasis, wound repair and neural

reconnection. All of these are subjects of intense current scientific interest. "Our 40 investigators are located in Israel (Weitzman Institute), England (Oxford University) and all across the United States. In America collaborators are based in University of Virginia, University of North Carolina, Florida State, Scripps Research Institute, Harvard, Johns Hopkins, Northwestern University, MIT, University of North Carolina, and Duke University.

MXM and Multipoint Resources

Since purchasing the original MXM license, Noakes has expanded and upgraded the network management software he uses as well as the multipoint port capacity. An additional 100-user MXM 2.2 license covered the initial participants of the Cell Migration consortium. Noakes is currently considering an upgrade to version 3.0.

"These people to whom we send out ViGOs have very little patience for technology that doesn't work," according to Noakes. "They are researchers, not hobbyists!"

Using the Glue Grant Noakes installed about 50 VCON ViGO systems. "We FEDexed each investigator a VCON ViGO and I e-mailed a PowerPoint file of instructions I had developed. These step-by-step instructions for installation and connection to our MXM gatekeeper helped the process go smoothly," Noakes says. The original plan was to have a formal room at each site on the network, but Noakes decided that more collaboration would happen if informal meetings from personal workstations were supported as well.

Installations were almost flawless. The only problems were encountered where the firewalls prevented complete establishment of calls. In each case a solution was found and connectivity achieved in short order.
A related group, studying Functional Genomics, hired Noakes to install about a dozen MC9000 beginning in September and October 2001 and to train the users. Most of the group systems also have Hitachi Plasma Screen monitors and Elmo-type document cameras.

Once a site is connected and registers with the MXM, Noakes can tune it up to the network specifications. Today, the Cell Migration network has its own Cisco 3540 MCU (Via IP) with two 100 user cards, sufficient resources for 50-60 users to meet at 384kbps. "Rather than worrying about rationing capacity, we bought excess capacity so that bridge ports would not be the limiting factor," rationalized Noakes. The 3540 was also configured with the Application Server module for T.120. And Noakes has also purchased the Rate Matching Module to improve the meeting quality for participants involving sessions with non-Internet2 sites.

With the added capacity and experience, many meetings are conducted on the Cell Migration network every week. There are organizational meetings of the Steering Committee, the meetings of the External Advisory Committee and the heads of the various initiatives within the Consortium. In addition researchers have bi-weekly lab meetings of each initiative and frequent ad hoc point-to-point meetings.

"I like the ability to sit here at my desk and manage the endpoints as well as network resources," concludes Noakes. "I can invite a bunch of people into a meeting so the users don't have to initiate the call. Or if someone is in the wrong meeting, I can get them out and put them where they should be, and I can even monitor participants to make sure that everyone has their T.120 enabled."

Researchers now know how to use the automated directory, however, with such a large network, scrolling through the potential conferencing sites can get tedious. Noakes' next objective is to use the MXM to automatically configure the users by group and by affiliation so that, based on the "presence" feature inherent in the MXM, they can quickly identify who in their group is available.

"I really like the VCON products and the robust and dependable network I have been able to put together with their products and the Cisco/Radvision MCU. For me the main issues are quality of the core functions (T.120, video and voice) and the growth of user competence and confidence. Without these, user frustration will prevent serious use in the academic environment. My goal is to keep the network running smoothly. Destablizing change" Noakes says, "is what keeps me awake at night before each patch or upgrade."

Conclusion

With the benefit of MXM-managed videoconferencing and data collaboration over IP, scientists like Dr. Horwitz are better able to focus on their area of expertise and spend fewer valuable resources and time traveling between facilities.

For those involved in the Center for Biological Timing and the Consortium on Cell Migration, there is no turning back. Research and teaching faculty are able to increase their impact on the world without increasing their budgets.

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