Remote Operations Workshop
Shelter Island
September 17-20, 2002

Andrew Hutton

Mike Spata

Global Accelerator Network History

In March 2000, ICFA set up a Task Force to study the proposal by Albrecht Wagner (DESY) for a Global Accelerator Network (GAN)

This is a global collaboration to construct, commission and operate a large new accelerator facility, based on the experience of current large detector collaborations

The multiple tasks involved are carried out at the home institutions of the collaboration members; this allows active remote participation from laboratories dispersed around the world and maintains accelerator expertise and involvement in all of the collaborating institutions

Previous Workshop

Enabling The Global Accelerator Network, GAN

Jointly sponsored by Brookhaven National Laboratory, Cornell University and Deutsches Elektronen Synchrotron, DESY

Mar. 21 - 23, 2002 at Cornell, Ithaca, NY

There were three working groups

WG1 - “Elements of a Global Control System”

WG2 - “Tools for Implementing Control Systems”

WG3 - “Communication and Community Building”

Focus was primarily on Computer tools

Conclusion of First Workshop

- The conclusion was that there were few technical problems with remote collaboration using presently available computer tools
- However – there were already signs of problems arising from the social interactions
- The second workshop at Shelter Island was designed to include more “operations” oriented people and aimed to address the sociological problems


Ray Larsen
Dave Rice
Roger Erickson
Kay Rehlich
Klaus Honscheid
Francesco Lanni
Tom Himel
Johannes van Zeijts
John Haggerty
Steve Hunt
Joerg Eckoldt
Ferdi Willeke
Martin Koehler
Tim Wilksen
Wolfgang Krechlok
Reinhard Bacher
Matthias Clausen
Erik Hofer
Bob Mannix
Mike Zisman
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Judy Olson
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Michael Spata
Paul Avery
Kai Desler
Karen White
Doris Rueger
Steve Peggs
Joe Skelly
Todd Satogata
Nobu Toge
Sveta Shasharina

Working Groups at Shelter Island

1. Experimental and Accelerator Demonstrations (Andrew Hutton)

    Convener: Nobu Toge (KEK)

    Co-convener: John Haggerty (BNL)

2. Communication and Operations Communities (Mike Spata)

    Convener: Don Hartill (Cornell)

    Co-convener: Todd Satogata (BNL)

3. Engineering Designs for Remote Operations (Karen White)

    Convener: Ray Larsen (SLAC)

    Co-convener: Joe Skelly (BNL)

1. Experimental and Accelerator Demonstrations

Discuss and evaluate concrete examples of Remote Operations Demonstration Projects for accelerators and experiments

Imagine that you are preparing to remotely operate an accelerator and/or an experiment that is NOT located at your laboratory

What are the tools, and the communication challenges? Accelerator and experimental facilities with active remote operations projects include:

- CMS experiment (CERN)
- FNPL accelerator (FNAL)
- RHIC operations (BNL)
- SNS accelerator (ORNL)
- TTF accelerator (DESY)

In addition there are numerous astronomical and industrial projects of direct relevance

3. Engineering Designs for Remote Operations

Examine in more detail the remote operation of accelerator hardware subsystems, in both commissioning and routine operations

Will presently designed hardware (for example, power supplies and klystrons) perform well enough with the experts not present on site?

What additional design features need to be built in? What level of engineering expertise is necessary on site to assure effective operation of the facility?

Karen attended this session – there was little new information

PLENARY & WORKING GROUP PRESENTATIONS

Agarwal, D (LBL) Olson, J (U Mich)	"Collaboration Tools for the GAN"
Agarwal, D (LBL) Olson, J (U Mich)	"Collaboration Tools WG2 Discussion Slides"
Avery, Paul (U Florida)	"Global Data Grids for 21st Century Science" PPT PDF
Bacher, Reinhard (DESY)	"Installation of a VC System in the DESY Control Room"
Bacher, Reinhard (DESY)	"Thoughts about Remote Operations: Engineers & Operators"
Clausen, Matthias (DESY)	"Proposed GAN Projects for TTF & for other Sites"
Eckoldt, Joerg (DESY)	"Power Supplies for TESLA Test Facility 2"
Frese, Hans (DESY)	"Security planning from the start"
Galambos, John (ORNL)	"SNS Remote Operations Experience & Thoughts on Using Java"
Hofer, Eric (U Mich)	"An Overview of IP-based Video: Technical & Social"
Hunt, Steve (PSI)	"Remote Operations @ PSI"
Hutton, Andrew (JLAB)	"Remote SRF Operation"
Ingrassia, Pete (BNL)	"Operations Concerns"
Joshi, Umesh (FNAL)	"A Virtual Control Room for CMS"
Larsen, Ray (SLAC)	"Designing For Availability"
Larsen, Ray (SLAC)	"Engineering Designs for Remote Operations"
Loken, Stu (LBL)	"Collaboration Tools for the GAN"
Pilat, Fulvia (BNL)	"List of Tests"
Pilat, Fulvia (BNL)	"RHIC Remote Operations"
Rehlich, Kay (DESY)	"GAN @ Tesla Test Facility"
Shrey, Travis (BNL)	"Idiot's Guide to VRVS Videoconferencing"
Shasharina, Sveta (Tech-X)	"Collaborative Tools at Tech-X"
Skelly, Joe (BNL)	"Power Supply Controller Interfaces"
Siskind, Eric (NYCB RT Computing)	"Real Time Communications in Pulsed Accelerators"
Wilksen, Tim (Cornell)	"CLEO Remote Shifting"

Recurring Question: What exactly is GAN?

- Fairly clear view from DESY
  - Remote operation for bulk part of regular runs
- An alternative:
  - Remote monitoring / diagnostics by experts who support centralized OPS team on site
- Very close coupling to organizational structure of a Linear Collider collaboration
  - Difficult to come to a rapid, definitive resolution
- Would different thoughts on German-, American-, or Japanese-GANs lead to wildly different notions on required demonstration experiments?
  - Answer: most likely no

Plenary Talks

- There were many plenary talks
- I found the most interesting to be the sociological presentations
- I will present two of them

Collaboration Technologies

- Access to
  - People
  - Instruments
  - Stored information
- Synchronous vs asynchronous
  - Chat, video conferencing, audio streaming
  - Shared objects of conversation (like data)
  - Threaded discussions
  - Electronic notebooks
- Transitions between them

Collaboration Tools for the GAN

Report of the August 26, 2002 workshop @ Berkeley Lab

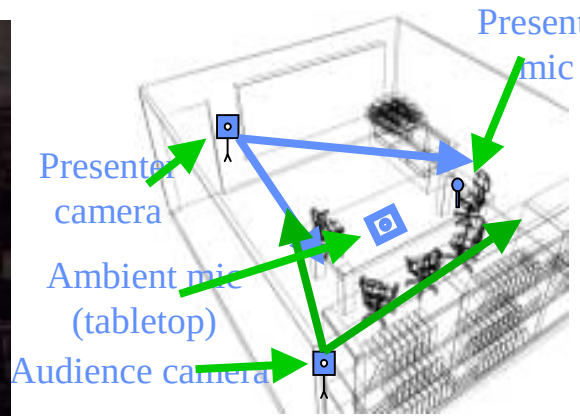
Deb Agarwal Judy Olson

LBL UMich

Collaboration Technologies

- Meeting support
  - Remote presentations
  - Shared applications/whiteboards
  - Annotation capabilities
  - Natural audio
  - Video of all
  - Easy setup
  - Captured for replay
  - Back channels

Access Grid Nodes (ANL)



Collaboration Technologies

- Informal meetings
  - Awareness and calendars for finding people
    - (requires appropriate sensitivities)
  - Desktop meeting support
  - Discussion support
  - Messaging support
  - Shared whiteboards

Collaboration Technologies

- Remote operations
  - Observation of panel, instruments, people
  - Discussion
  - Remote control of some parameters
    - Instrumentation
    - Data collection
    - Not the beam
  - Auditory communication for operator
    - Nearby video stream

Collaboration Technologies

- Asynchronous communication
  - Electronic notebook
    - Agendas
    - Open issues
    - Notes
  - Annotated capture of meetings
  - Annotated documents and data displays
  - Project management/workflow tracking

Security

- Public Key Infrastructure
  - Grid Security Infrastructure
- Kerberos
- Virtual Private Network
- Username/password
- Features
  - Identification
  - Access Control/Authorization
  - Guests
  - Privacy
  - Vulnerabilities
  - Ease of use

Social issues

- Privacy
- Reciprocity
- Ease of use
- Agreed “rules of the road”
- Culture
- Adoption
- Training

Video Conferencing

An Overview of IP-based Video: Technical and Social Considerations

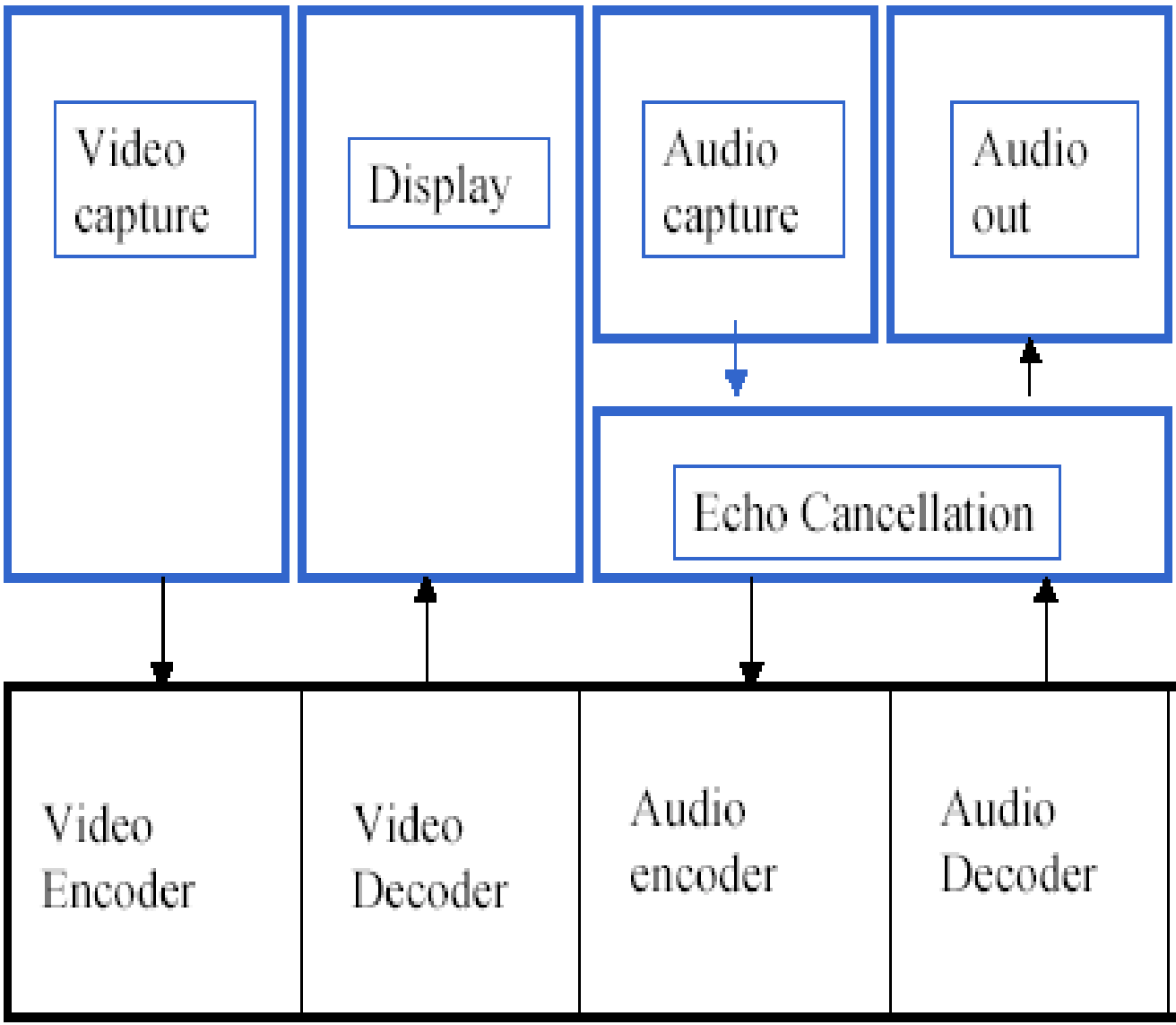
Erik C. Hofer

Collaboratory for Research on Electronic Work (CREW)

University of Michigan

In my opinion, this talk was the highlight of the conference!

Ingredients of a VTC System



This is 90% of what matters. It has nearly nothing to do with the underlying technology that you select (e.g. AG, H.323. MPEG2).

Social Overview

- The right technology is not the end of the road
- Must give attention to the social ergonomics of a video-mediated interaction
- Small differences in physical setup can elicit large changes in behavior
  - e.g. lie detection (Horn, 2002)
- People are deemed “untrustworthy” if they appear to think about an answer before responding
  - But - interaction at a distance leads to audio delay
- Data shows that prior face-to-face interaction is required to make video conferencing successful

Gaze awareness

- Knowing where someone is looking in a video conference is not easy. Manipulations of eye contact can alter power relations of a conference
  - Sort of a tricky problem, but some solutions exist
  - Easiest is to leverage how we perceive eye contact
    - Chen (2002)
  - Recommendation
    - Mount camera above screen

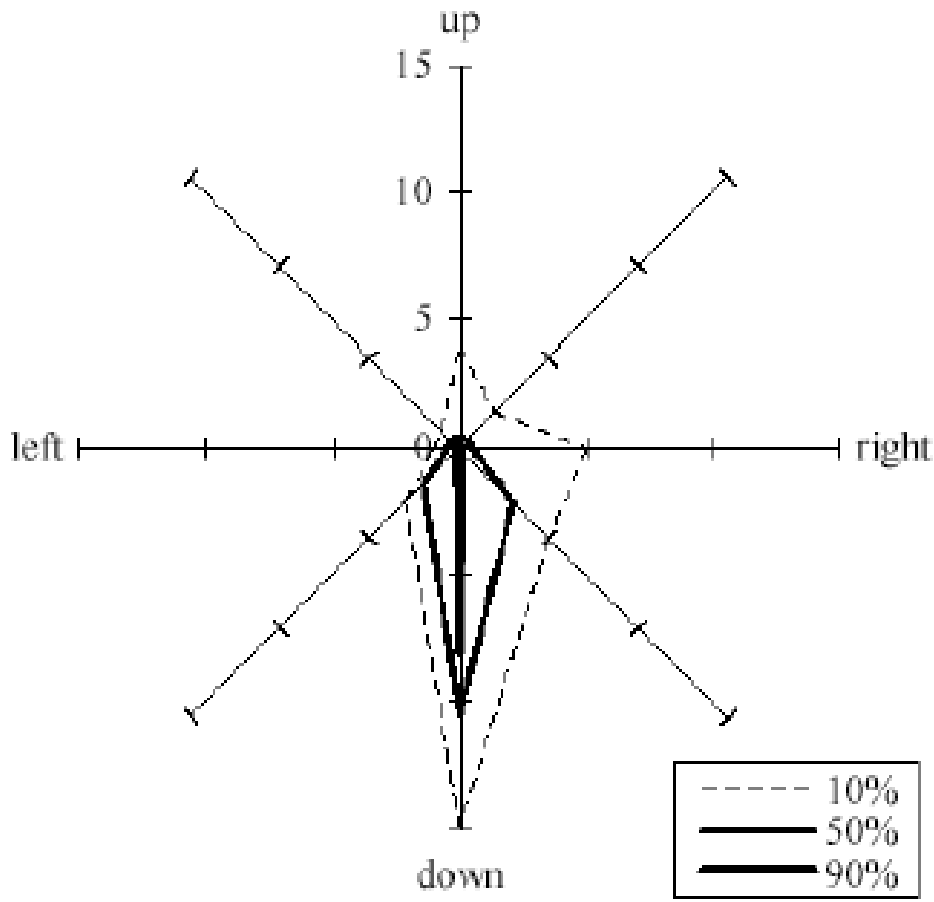


Figure 2. Sensitivity to gaze direction, experiment 1.

Social conventions

- Schedule video conferences or initiate with phone
- Establish:
  - Time
  - Who calls
  - Alternate contact info
- Many efforts have been made to support “natural” interaction over video over distance
  - These have only enjoyed mixed success
- Why?

Choreography of collaboration

- One reason for shortcomings may be that a single, open audio and video channel does not adequately support the “choreography of collaboration”

Public encounter

- Semi-private discussion
- Private meeting

Encounter via a video wall

Conclusions of Experimental and Accelerator Demonstrations Working Group

- We came up with a list of experiments that would demonstrate some aspect of GAN
  - A spreadsheet of the proposals was created
- Proposed the creation of the “video coffeepot”
  - A video conferencing facility in every control room for informal “chats”
- Proposed to define a standard console that could be used for GAN experiments
  - The consoles would be placed in accelerator control rooms for reasons of security oversight

    Operators trusted other operators – no-one else!

GAN-Oriented Console - One of the basic building blocks

- Video, audio with whiteboard and chatting capability
- GUI-like environment – Unix/Linux as the minimum, for instance
- Connection to control the hardware, access to e-logs, documentation, notes
- Compatibility and availability of interface equipment across the collaboration
- Some kind of mechanisms to ensure that everyone can run the most up-to-date, “official” control SW. ← How we do this depends on the architecture of the system…(CVS, etc)
- Sufficient network bandwidth. ← needs quantification, of course, but not by us now
- A corner in the CR to have this thing placed

Possible Benefits of GAN-oriented R&D for Existing Accelerators

- Remote access to the data / equipment that are not currently available remotely
- Exchange and sharing of knowledge, tools, system ideas and experience among those who are involved
- GAN console as an education tool
- Expect improved team capability on: system diagnosis, trouble-shooting, accelerator development efforts, or training
- Analysis of requirements for successful GAN can stimulate improvement in operational and managerial practice of non-GAN-based accelerators
- Imagine the ability to look at operations in any machine around the world from any control room

WG1 Conclusions

- Suggested experiments are good first steps, calling for a review of their success/problems in about a year time scale
- Currently listed experiments, when put together, would not address all the issues with a GAN-type operation at major accelerator facilities, (particularly if it is “remotely distributed OPS centers” rather than “remotely distributed expert/support centers”)
  - Most proposed experiments are for “planned campaign actions” for a limited period
  - Not much provision for long-term set-up or “stress testing”, addressing unexpected failure recovery / diagnostic actions
- Hence, a serious exercise of remote operation/maintenance of an accelerator facility is desirable, before claiming we are technically ready for full GAN implementation

WG1 Conclusions (continued)

- Light sources in general, with similar hardware functionality and many with similar EPICS-based control systems, could be a candidate platform for such an exercise
- Similar exercises of remotely operating HEP experiments are worthwhile
- We recommend deployment of consoles in control rooms of several existing accelerators, capable of some limited range of GAN interactions
- More efforts (parallel or joint) are also needed on development and validation of collaborative tools
- To go beyond the list of experiments compiled during this WS, and to proceed towards more advanced experimental studies of GAN-type technical issues, it is desirable to establish some sort of an international coordination body

2. Communication and Operations Communities

Bring together an eclectic mix of experts and skills from information technology, experimental physics, accelerator technology, and commercial enterprise, building on the success of the Cornell workshop, to explore the scope of remote operations solutions, as well as social and collaborative aspects of the subject

Include and consider the perspective of accelerator operations groups

Mike attended this session, he will address the issues raised

Working Group II
Communication and Operations Communities

- Major topics of discussion for WG II
  - Workflow Process
  - Collaborative Tools
  - Social Issues
  - Operations Reality Check

Workflow Process

- Facilitated by Judy Olson (CREW: The Collaboratory for Research on Electronic Work - School of Information, University of Michigan; http://intel.si.umich.edu/crew/). Research at CREW focuses on the design of new organizations and the technologies of voice, data, and video communication that make them possible.
- Operations staff from Brookhaven, Fermi, SLAC, JLAB, and DESY provided descriptions of workflow process for each lab with particular focus on information flow and organizational structure. Similarities and differences in process intended to serve as a framework for subsequent sessions.

Collaborative Tools

- Access Grid
- White Boards and Smart Boards
- Virtual Room Videoconferencing System (VRVS)
- Chat
- Electronic Notebooks

ACCESS GRID

Supporting group-to-group interaction across the Grid. . .

Extending the Computational Grid

Group-to-group interactions are different from and more complex than individual-to-individual interactions. Large-scale scientific and technical collaborations often involve multiple teams working together. The Access Grid concept complements and extends the concept of the Computational Grid. The Access Grid project aims at exploring and supporting this more complex set of requirements and functions.

An Access Grid node involves 3-20 people per site. Access Grid nodes are “designed spaces” that support the high-end audio/video technology needed to provide a compelling and productive user experience.

The Access Grid consists of large-format multimedia display, presentation, and interaction software environments; interfaces to grid middleware; and interfaces to remote visualization environments. With these resources, the Access Grid supports large-scale distributed meetings, collaborative teamwork sessions, seminars, lectures, tutorials, and training.

Ensuring Persistent Electronic Spaces

The Access Grid project addresses the need for persistent electronic spaces. We believe persistence is necessary to build true electronic communities, create lasting maps of the real world to distributed virtual environments, and enable experimentation with new modes of collaboration.

Providing New Capabilities

The Alliance Access Grid project has prototyped a number of Access Grid Nodes and uses these nodes to conduct remote meetings, site visits, training sessions and educational events.

Capabilities include

- high-quality multichannel digital video and audio
- prototypic large-format display
- integrated presentation technologies (PowerPoint slides, mpeg movies, shared OpenGL windows)
- prototypic recording capabilities
- integration with Globus for basic services (directories, security, network resource management)
- macroscreen management
- integration of local desktops into the Grid
- multiple session capability

The Access Grid nodes provides a global research environment for developing of distributed data and visualization corridors and for studying issues relating to collaborative work in distributed environments.

http://www.accessgrid.org

ANL Mathematics and Computer Science Division

VRVS

- VRVS is a web oriented system for videoconferencing and collaborative work over IP networks.The Virtual Room Videoconferencing System provides a low cost, bandwidth-efficient, extensible means of videoconferencing and remote collaboration over networks within the High Energy and Nuclear Physics communities. Recently VRVS also extends the service to other various academic/research areas.
- Since it went into production service in early 1997, deployment of the Web-based system has expanded to include 12150 registered hosts running the VRVS software in 63 countries.
- www.vrvs.com

Social Issues

- Understanding sociological issues perceived as a key element in successful GAN deployment
- Privacy
  - need a back channel for private conversations
  - who is watching or who attends electronic meetings
- Reciprocity
  - can only see/hear me if I can see/hear you
- Mechanics
  - Eye contact an important component of communication

Social Issues

- Trust
  - combination of benevolence and competence
  - how do you establish it
  - need personal contact
  - rotation among collaborators could generate trust
- Culture
  - extremely important
  - need to understand cultural background of colleagues that you are working with

Operations Reality Check

- Need strong central management at host site
- Need strong local maintenance staff
- Need uniform standard for ops group makeup
- Continuous day shift might not be the most efficient way to operate
- Consistent training required. Over-the-shoulder training will be difficult

Operations Reality Check

- Personnel and radiation safety issues must be handled by local staff
- Need formal ops procedures for fault recovery, emergency response, etc.
- Information management is a critical element

Next Steps

- Complete the studies that we have started to see if likely technology will enable full remote operation in an acceptable manner
- Explore feasibility of holding the next workshop remotely
- Continue to be very sensitive to the social issues involved in remote collaboration and operation
- Continue the dialog with current operations staff at the laboratories as a reality check

Conclusions

- Likely that technology will sufficiently enable the GAN concept
- Social aspects will generate new behavior patterns with casual conversation being the most difficult to enable
- Optimistic that it will actually work as long as onsite presence is strong during commissioning and operational phases
- "Remote operations appear feasible, but given that some level of local on-site, 24/7 support is necessary, why not implement a concept with a central control room and full operations/support staff on-site with remote "consoles" distributed to enable remote Beam Studies and expert troubleshooting/monitoring"