RHIC Beam Experiments Workshop

Beam Experiments and remote operations

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Summary

- Linear Colliders→GAN

  Global Accelerator Network
- Integral and central part of GAN: Remote Operations
- Workshop 17-20 September
- Workshop summary by Todd
- Here→ remote operations and beam experiments

RHIC Beam Experiments Workshop

Working Groups

1. Experimental and Accelerator Demonstrations

Convener: Nobu Toge (KEK) Co-convener: John Haggerty (BNL)

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.

2. Communication and Operations Communities

Convener: Don Hartill (Cornell) Co-convener: Todd Satogata (BNL)

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.

3. Engineering Designs for Remote Operations

Convener: Ray Larsen (SLAC) Co-convener: Joe Skelly (BNL)

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?

WG1 Charges

as given by the organizers

- 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, FNPL, RHIC, SNS and TTF

- In addition, there are number of astronomical and industrial projects of direct relevance. ← We have not really gotten around to touch these.

What we actually did in WG1

- Hear presentations given during the WS
- Try to digest the contents of these presentations.

- **Tabulate possible GAN-oriented experiments** (existing, proposed or new). Compile a list of experiments with
  - Timescale, subject of focus, players, status, benefits for GAN, limitations, resource requirements (existing or new), requirements on the control architecture, etc.

- Attempt to extract some conclusions or recommendations by reviewing the table of currently conceived GAN-oriented experiments.

- **Review the required functionality and capacity for standard elements considered in GAN-type remote OPS, notably the console.**
- Examine the possible **benefits of GAN-oriented R&D for existing accelerators**.

GAN oriented console

We care, because this is one of the things whose adequate technical implementation needs to be firmly established through GAN-oriented R&D.

- **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**

List of Remote Ops tests (Excel)

Excel spreadsheet with list of possible tests of remote ops

- Host laboratory
- Experiment
- Time scale
- Goals
- Collaborating institutions
- Benefits
- Limitations (w.r. to GAN)
- Requirements
- Cost
- Contact person
- Status

Benefits of GAN for existing labs

- **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 (**Andrew's dream**…..)

Conclusions WG1

- **Suggested experiments are good first steps, calling for a review of their success/problems in about a year time scale.**
- However, 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 exp are for "planned campaign actions" for a limited period.
  - I.e. 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.
- **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.

Continued…

Conclusions WG1 –cont'd

- **We recommend deployment of consoles in control rooms of several existing accelerators, <u>capable of some limited range of GAN interactions</u>.**

- 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 **<u>international coordination body</u>**.

RHIC remote operations

Possible limited scale tests of Remote Ops at RHIC (in increased order of complexity and necessary commitment….):

- "Remote" ops in within RHIC complex (1 lab)
- Beam experiments (2 labs – study time)
  - small in time and resources
  - yet all the complexity of operations
- RHIC-LHC collaboration, PLL+tune feedback (2 labs – testing and operations)
- SNS commissioning remote ops (2 labs – operations)
- US-LHC LARP's: (3 US labs + CERN comm. MD's)

"Remote-local" RHIC ops

RHIC-AGS MCR ops core of complex

Ops not (yet) completely remotely connected from MCR:

- Experiments magnets
- Polarimeters
- Instrumentation houses
- RF control room
- Tandem control room

Integration of 1-3 planned at the RHIC Retreat (mar 02) and in place for run 2003 to improve efficiency in RHIC ops

Remote Ops → improvement local ops efficiency (lab management support)

Examples of testing scenarios of remote ops in within complex:

- Dumping collider store
- Beam studies periods

Beam experiments as Remote Ops tests

Limited in scope/time/resources but all complexity of operations

Ingredients:

- Interested and committed small group at 2 labs
- Beam study (common expertise, previous experience)
- Scheduled time (few hours to a shift)
- Supporting Infrastructure
  - Console in CR, for access to remote applications
  - (remote and local control room support)
  - Remote e-log access
  - Communication (ideally video conferencing but continuous voice communication would do…)
  - Data access and sharing

Possible time scale at RHIC : ~ 6 months- 2years (run dec 02→ may 03)

Beam Ex & Remote Ops

- Worth exploring the possibility of remote operations for collaborative beam studies
- Staged approach: testing building blocks first, setting up a remote study test eventually

  remote expertise (passive) →remote experiment(active)

Issues to be resolved:

- Required control room training
- Access to control system, operations

Possible solutions:

- Trained point of contact at collaborating lab (cryptocard)
- Time limited remote access to operations
- Access to elogs via password system

RHIC Run 2003 → testing building blocks, preparation

RHIC Run 2004 → remote experiment (for which shared expertise exists)

RHIC – LHC instrumentation

Collaboration RHIC - LHC instrumentation groups

- Phase lock-loop system
- Tune feedback ("day 1")
- Chromaticity feedback ("day 1.5")
- Head-tail monitor: instabilities, chromaticity measurement
- Pickup studies

Possible case for remote operations:

Stage 1: remote expertise

Stage 2: testing from CERN of RHIC PLL

Time scale: 6months- 2 years (rhic run 2003 and 2004)

Conclusions

- Remote operation is an intellectually exciting concept (beyond the original political motivation that caused its injection for LC)
- Worth exploring if it can be useful for collaborative beam studies (and later on operations)
- Interest at CERN, LBL, FNAL
- Staged approach to testing: ground work during Run 2003, remote experiment and/or linited operation in Run 2004?