TROUBLE SHOOTING WITH GANMVL*

P. Schütt, GSI, Darmstadt, Germany; M. Seebach, DESY, Hamburg, Germany
R. Pugliese, ELETTRA, Trieste, Italy; P. Santos, FhG IGD, Darmstadt, Germany

Abstract

GANMVL is the acronym for "Global Accelerator Network Multipurpose Virtual Laboratory". The tool is a mobile communication centre which provides video and audio capture. It is able to connect to standard measurement equipment (scopes, network analyzers etc.) and to elements of accelerator controls and make these connections available to a remote client. The remote user should be enabled to participate in trouble shooting of hardware or analysis of operations problems as if he or she would be present on site. A prototype installation will be presented.

THE EUROTEV/GANMVL PROJECT

The most likely scenario of the International Linear Collider (ILC) is that it will be built by a collaboration of existing laboratories, which will remain involved during the operation of the accelerator. Prototypes will be developed in one institution and tested with beam in another laboratory. Equipment will be built and delivered by one partner and needs to be integrated into the accelerator complex by another partner. Whole parts of the facility will be provided by a remote partner and need to be commissioned and possibly operated with the experts at their remote home institutions. In situ trouble shooting and repairs needs to be performed with the support of off-site experts

Advanced means of communication will be necessary to support efficient collaboration. The GANMVL project will design and build a novel collaboration tool and test it in existing accelerator collaborations.

The Multipurpose Virtual Laboratory is a tool to implement the Global Accelerator Network, a Virtual Organisation (VO) connecting international laboratories doing research in the field of accelerators.

The GANMVL project will provide valuable experience of a new way in designing, building and operating large accelerator complexes, and will address the important psychological and sociological issues of the Global Accelerator Network.

Remote control of an accelerator facility has the potential of revolutionizing the mode of operation and the degree of exploitation of large experimental physics facilities.

REMOTE ACCESS TO GSI

At GSI, several groups in the accelerator department recently made serious efforts to built individual solutions for remote monitoring of their equipment. There is a need for simplification and unification.

The IT department offers several access pathes to the GSI network, among them a VPN solution (Virtual Private Network), a ssh (UNIX secure shell) service and a commercial CITRIX ICA server. The latter technically allows opening an X Window on one of the accelerator controls computers and hence access to all accelerator devices.

In order to secure the accelerator network against traffic from outside and to ensure the necessary bandwidth, in the near future, the accelerator network will be physically separated from the GSI campus network, thus disabling any uncontrolled remote access, including the abovementioned individual solutions.

With the GANMVL tool, a secure, controlled remote access to the GSI accelerator network will be possible. This is the motivation for GSI to participate in the GANMVL project, although participation in the international linear collider project is not planned.

THE GANMVL TOOL

The tool will be a mobile communication centre which provides immersive video and audio capture and reproduction of an accelerator control room, a laboratory workplace environment or an accelerator hardware installation.

The tool should be able to connect to standard measurement equipment (scopes, network analyzers etc.) and to elements of accelerator controls and make these connections available to a remote client.

The remote user should be enabled to participate in accelerator studies, assembly of accelerator components, trouble shooting of hardware or analysis of on-line data as if he or she would be present on site.

User survey

With a first user survey [1] two years ago, we aimed at:

- making the community aware of our work
- assessing acceptability of MVL (as envisioned)
- getting feedback about planned/missing features and their importance
- pointing out issues which need to be recognized and properly taken care of (e.g. social / organizational challenges)
- getting suggestions/ideas from previous related experiences

At GSI, the most promising scenario for the use of the GANMVL tool is to open a controlled access to the accelerator equipment for the personal of the "on call" service.

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The most important features for this purpose are:

- audio contact
- full control of the operations group over the remote access
- stability of the system and ease of use
- remote access to the internal controls applications
- access to measuring devices.

Architecture

In the accelerator laboratory network, a MVL web server is installed, which enables the remote client to contact the services of the lab. The remote client is installed on a normal PC, which only needs to be connected to the internet and have a web browser installed.

All communication is tunneled by the system, such that only one channel in the firewall needs to be opened (see Fig. 1).

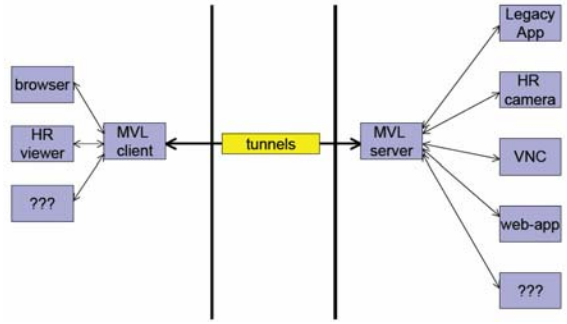

Figure 1: Tunnel Architecture

Any client software, which may be needed to use special services in the lab, is available for download via the same web portal.

Main Features

Any access to the system is via the web portal: remote users, local users, administration of the users and of the available lab resources etc.

Authorization can be fine grained controlled for every user on different levels: the user role (guest, user or admin) may be set by the administrators differently for every resource. Resources or capabilities can be associated to different levels.

The operators in the control room are always fully aware of the activity in the system: a tunnel monitoring service shows, who is using which service how long and even allows to cut off a connection or enable / disable the resources for the current needs. This ensures full control over the access to the accelerator.

The web portal is organized in two tabs:

- Knowledge management tab with e-log, help, download area
- GANMVL tab with an integrated resource and people browser

The types of resources / capabilities currently available in the system are:

- High resolution cameras,
- file manager,
- chat, audio and video conference (skype, VRVS, EVO),
- Web tools (IVI instrument integration),
- Remote Desktops (VNC tools),

Wizards

Instruments and control panels can be added by the web interface via a wizard. The wizard together with the help system will guide the Local Station administrator in the procedure.

Generally there are two modes of integration: http and remote desktop:

- The http is suitable when the instrument or control already has a web interface available
- The remote desktop (VNC) is suitable when the instrument or control is equipped with legacy software which was not designed for the web.

The help system which is a critical feature of the GANMVL will provide all the necessary information. In order to integrate instruments or control panels it is sufficient to fill a web form specifying

- the name of the tool which will be presented in the station tool menu
- the internal URL of the instrument or the internal address of the instrument (IP address and port)
- The local port
- An optional password (single sign-on)

This information will be used by the system to program the tunnel.

GANMVL AT WORK

The start page of the web portal is visible to anyone in the internet; see e.g. the laboratory server of ELETTRA [2]. Before first use, a new user must register, giving at least information on name, organisation and a valid eMail address. Per default, he or she is given guest status, which usually does not allow access to critical components.

Afterwards, the lab server administrator verifies the identity of the registered person and grants the necessary access rights to the resources. Furtheron, the registered user may login at any time. But, an admin watching the tunnel monitor (typically the operators will do that), will be aware of any resources beeing used.

For a typical trouble shooting session, assume that the oprations crew has a problem with some device. The expert for this device is "on call", for example at his/her home PC. In this case, the operator calls the expert on the phone or via skype or video conference to discuss the problem. This step is also assisted in the ganmvl tool.

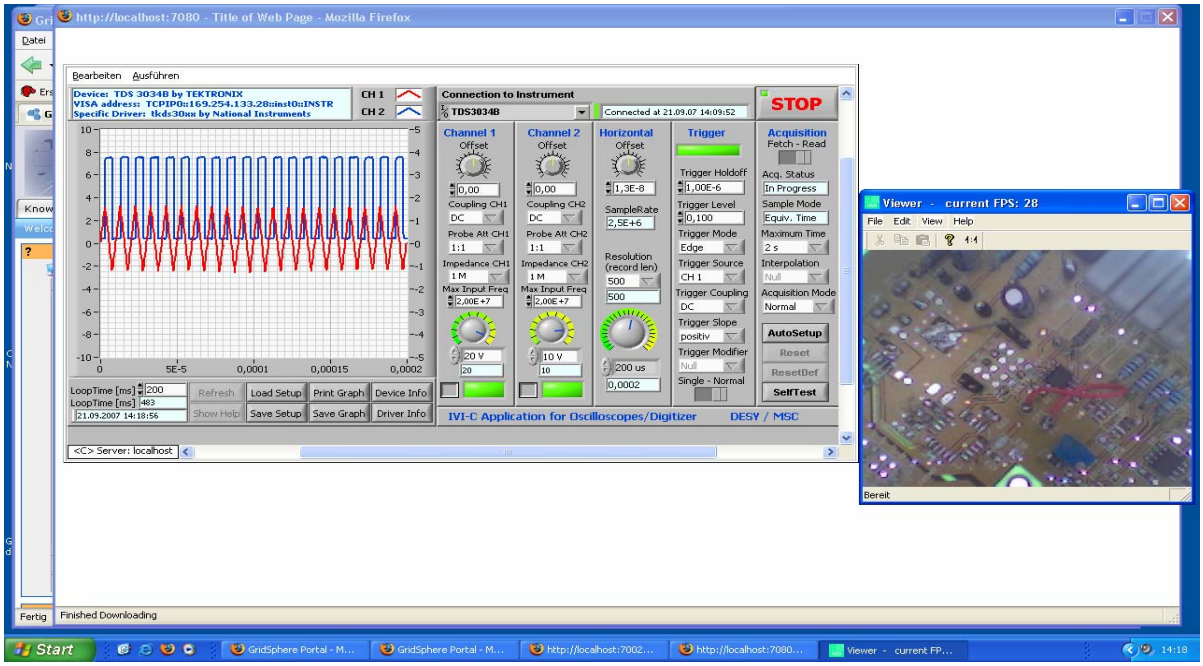

Figure 2: Remote View during trouble shooting session

In some cases, the remote expert needs to see the device and / or measure some signal. For that purpose, the operator takes a "mobile station" to the hardware. This mobile station comprises of a laptop equipped with a camera and a microphone and an oszilloscope. After connecting to the network, the operator can continue the discussion with the expert. The remote expert can see the camera video showing the device and direct the local person to move the camera or to connect special signals to the measuring device. Afterwards, the remote user will be able to set up the oszilloscope and check the signal (see Figure 2).

FUTURE DEVELOPMENTS

One of the main objectives of GANMVL is to assess the sociological aspects of remote cooperation: assuming that technically we can work together with a colleague in a far remote office; do we really want to do that? How does it change our daily work in a control room?

Two of colleagues, Markus Hodapp from the University of Mannheim (Business and Organisational Psychology) and Roberto Ranon from the University of Udine (Human Computer Interface Lab) will observe the impact of the GANMVL tool as well as the usability etc.

We will go through an intensive testing phase, starting with controlled scenarios to test the tool and aiming for standard use in the daily work of the accelerator laboratories ELETTRA, GSI, DESY and INFN Milano.

During this phase, the results of the prototype evaluation will be used to consequently tune the application. Furthermore, the installation process will be improved to ease the distribution.

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