Multipurpose Virtual Laboratory:

a tool to Support Maintaining, Optimizing, and Trouble Shooting Accelerator Components from Off-Site

Roberto Pugliese
Sincrotrone Trieste SCpA

on behalf of the
EUROTeV/GANMVL collaboration

Shaping the Future of Collaboration in Global Science Projects
Genève, 11-13 December 2006

Outline

- The EUROTeV/GANMVL project
- The GANMVL
  - design principles
  - first tests
  - architecture
- The status of the GANMVL
- The GANMVL at work
- Future developments

The GANMVL project

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Roberto Pugliese
pugliese@elettra.trieste.it

GANMVL motivation

- The most likely scenario of a linear collider 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.

GANMVL motivation

- 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.

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.

The GANMVL tool

- What is a Collaboratory?
  - The core capabilities that constitute a collaboratory are technologies to link:
    - People to people (e.g., electronic mail, and tools for data conferencing, such as VRVS)
    - People to information (e.g., the World Wide Web and digital libraries)
    - People to facilities (e.g., status of remote instruments) to enhance utilization by expanding access to resources
- In our vision the GANMVL is a peer-to-peer network of collaboratories

Development approach

- Focus on both technical and non-technical aspects
- Deep involvement of human computer interaction and psychology experts
- User surveys, interviews, feedbacks, euristic evaluation
- Extensive use of prototypes
- Extreme programming

The User Survey

- Personal Data
- Experiences with Previous Collaborations: status, issues, tools, …
- Activities to be supported by MVL: usage scenarios
- Cooperation with off-site Experts: critical aspects?
- Elements of MVL: technical features
- Remote Access to Accelerator: safety, security, ethics, regulations
- Benefit of MVL: perceived

Survey results

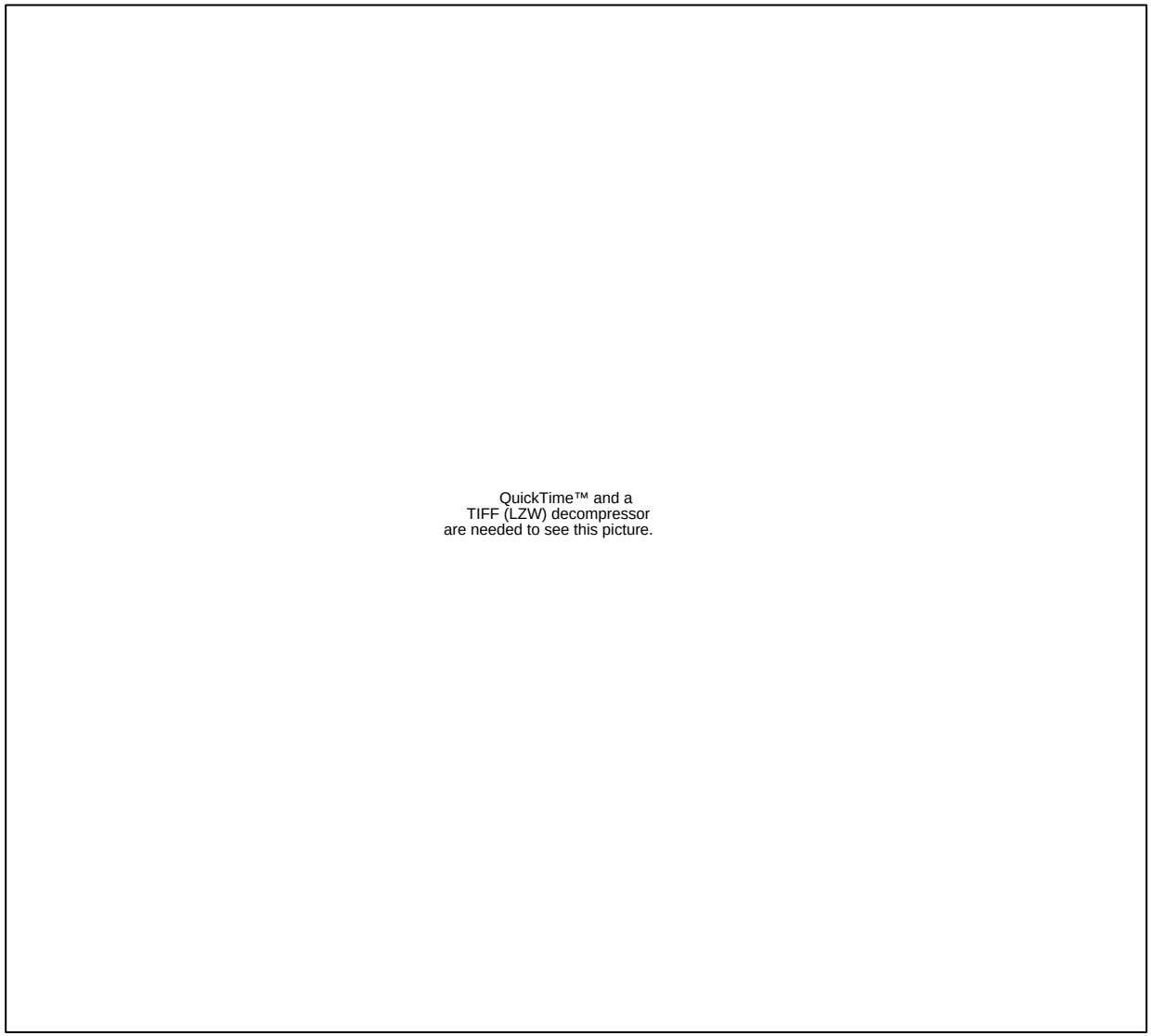
QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Roberto Pugliese
pugliese@elettra.trieste.it

www.lightsources.org

Roberto Pugliese
pugliese@elettra.trieste.it

www.linearcollider.org

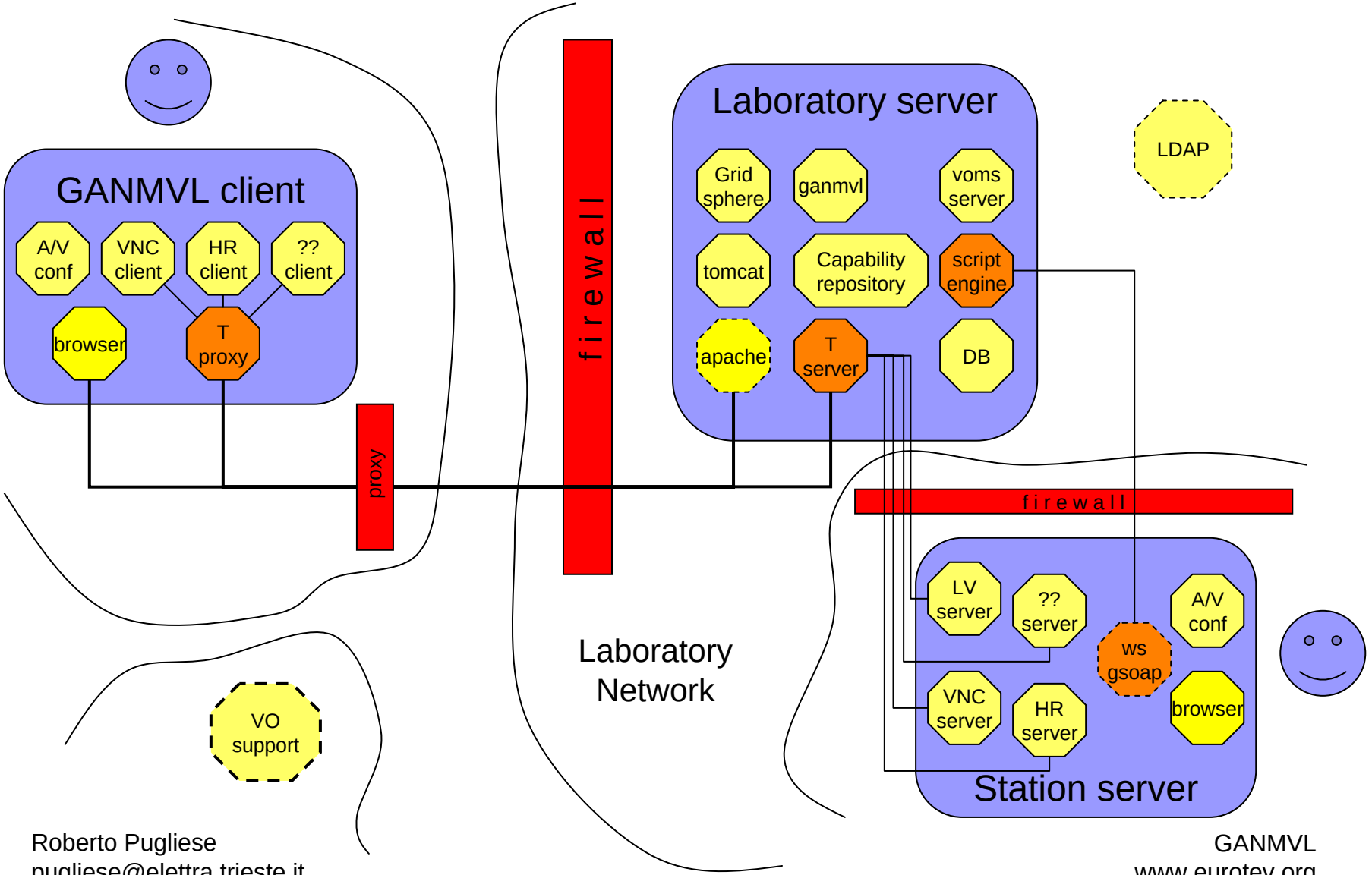


Roberto Pugliese
pugliese@elettra.trieste.it

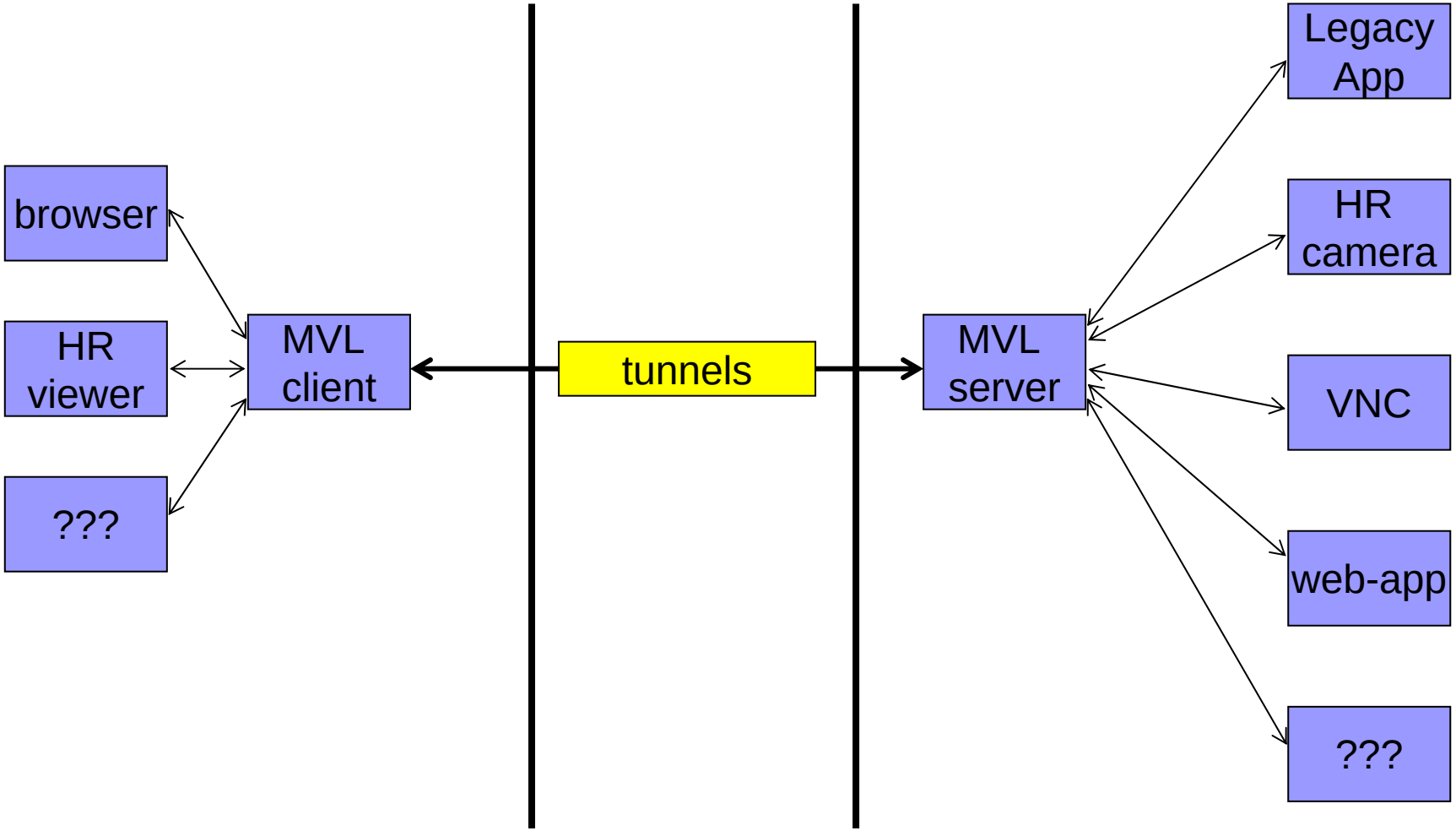
Global GANMVL Architecture

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

GANMVL internal architecture



Tunnel architecture



Roberto Pugliese
pugliese@elettra.trieste.it

Current GANMVL features

- Web portal interface for all the type of users (remote, laboratory admin, station admin) and all usage scenarios
- Fine grain control on authorization (VOMS)
- Resource or capabilities can be associated to different levels
- Knowledge management tab with e-log, help, download area
- GANMVL tab with an integrated resource and people browser
- By selecting a node in the browser associated and authorized capabilities are presented on a menu
- Different kind of capabilities: High resolution cameras, file manager, chat, audio and video conference (skype, VRVS), Web tools (IVI instrument integration), VNC tools, Wizards
- Open source, modular distribution, plug-in architecture

Wizards

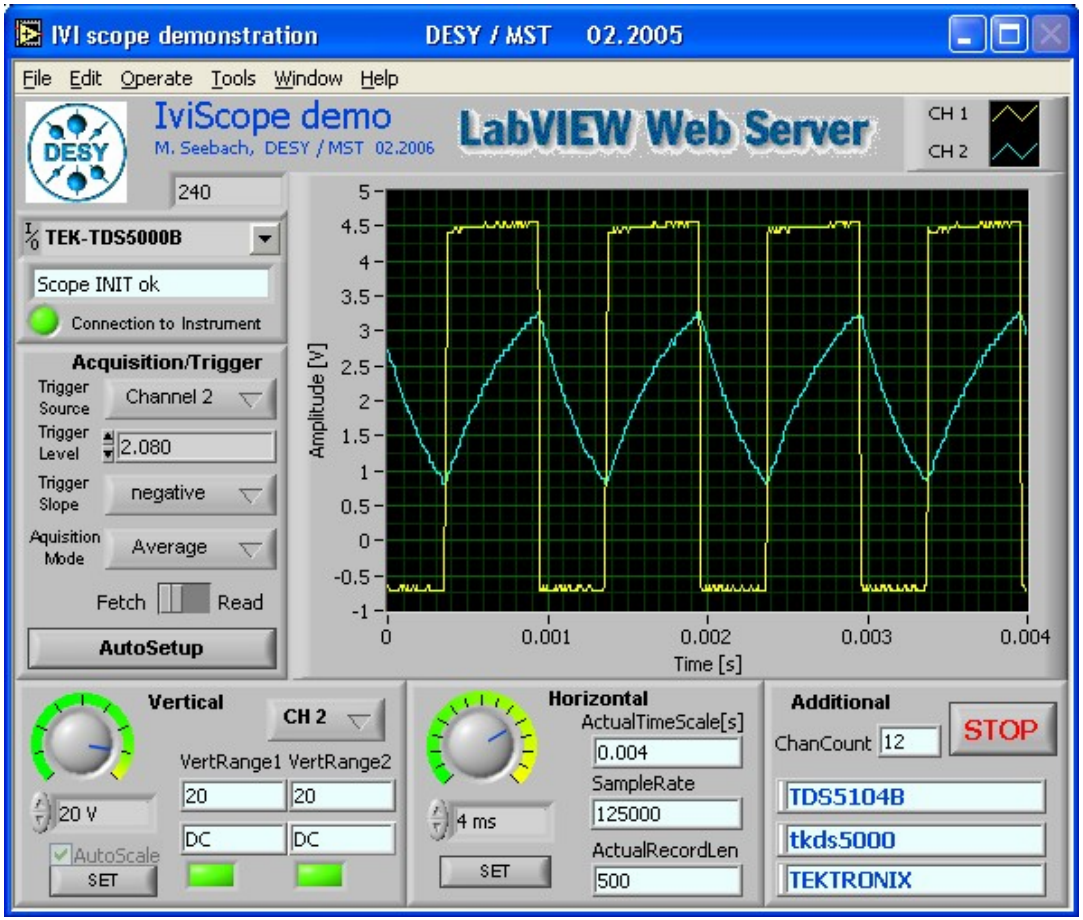
- Instruments and control panels can be added by the web interface via a wizard. The wizard together with the help system will guide the Local Station administrator in the procedure.
- Generally there are two modes of integration: http and remote desktop.
  - The http is suitable when the instrument 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

Integrating instruments

- In order to integrate instruments or control panels it will be 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

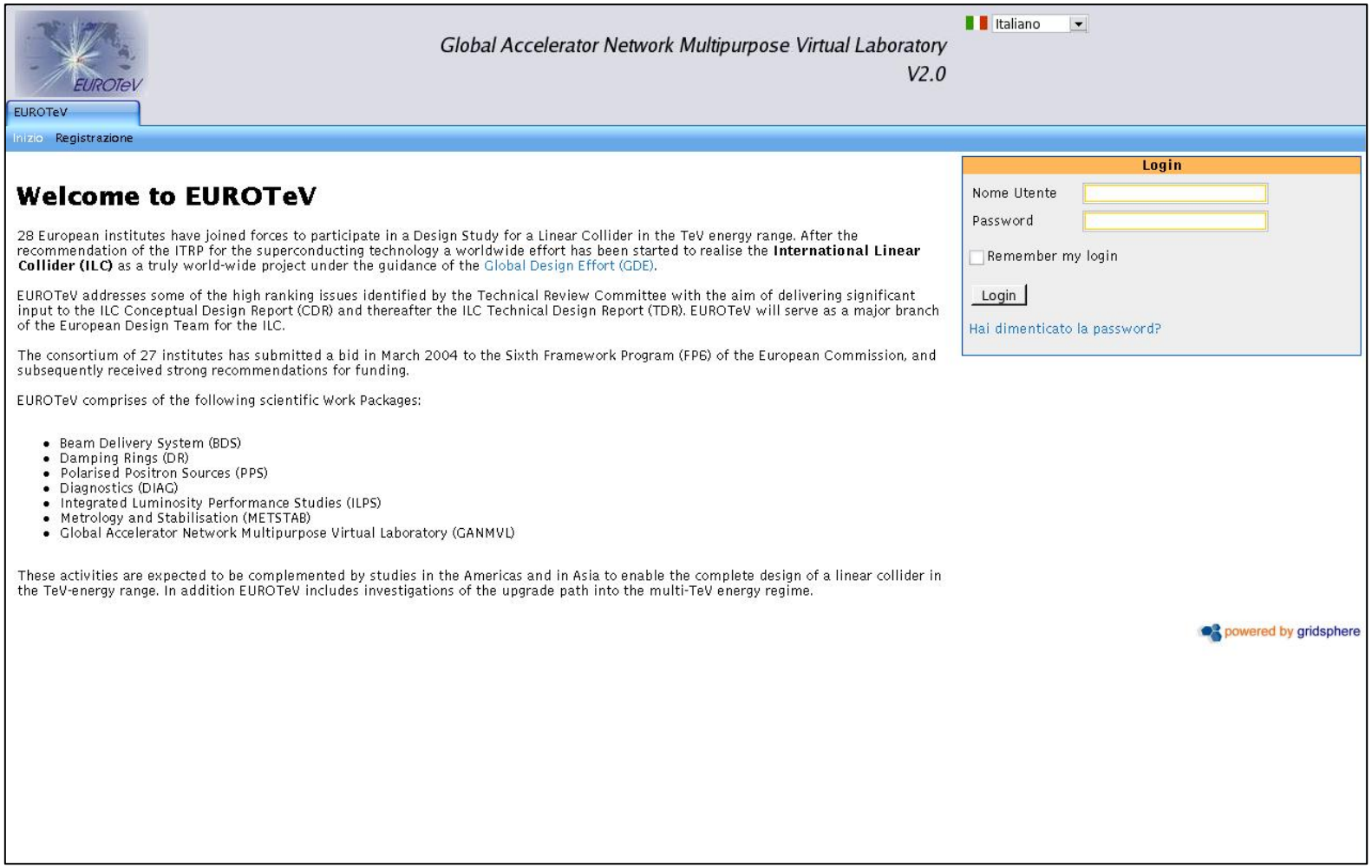
Generic IVI Scope Application

- Implemented with LabView
- Based on IVI scope class libraries
- Tested with:
  - NI USB-5102
  - TEK TDS5104
  - TEK TDS3054
  - LC WR 6200



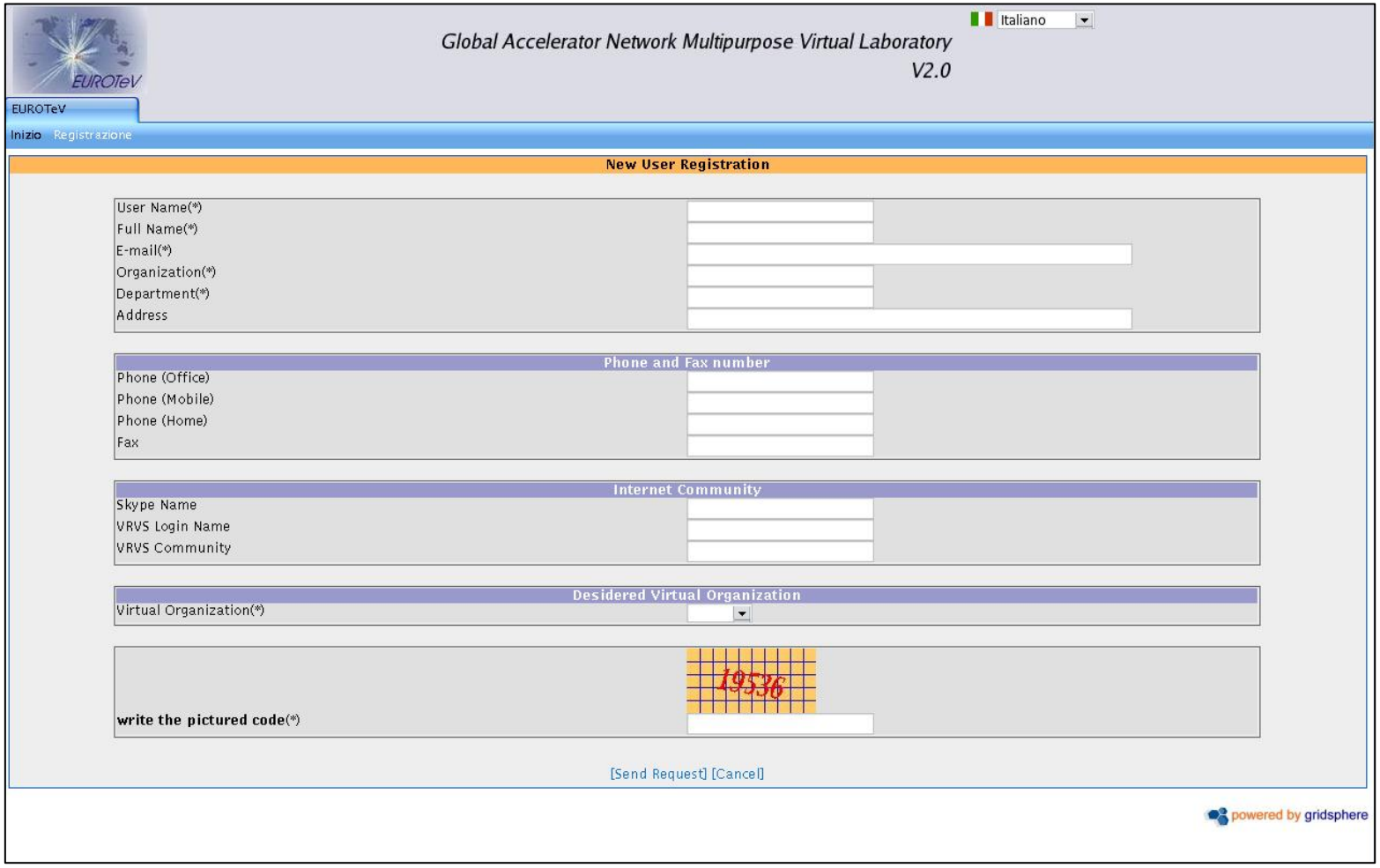
Roberto Pugliese
pugliese@elettra.trieste.it

GANMVL: Multipurpose Virtual Laboratory



Roberto Pugliese
pugliese@elettra.trieste.it

GANMVL: Multipurpose Virtual Laboratory

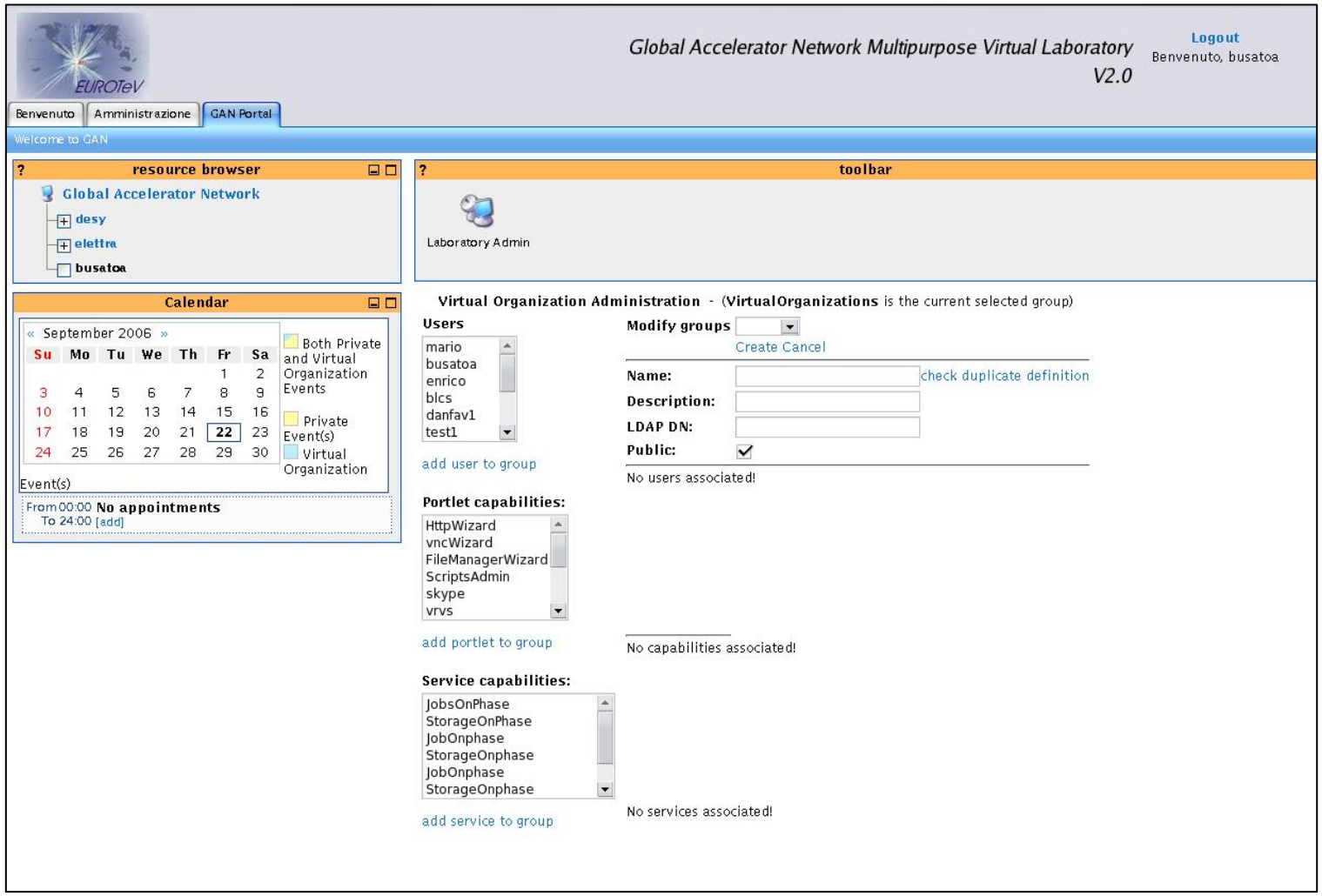


Roberto Pugliese
pugliese@elettra.trieste.it

GANMVL: Multipurpose Virtual Laboratory

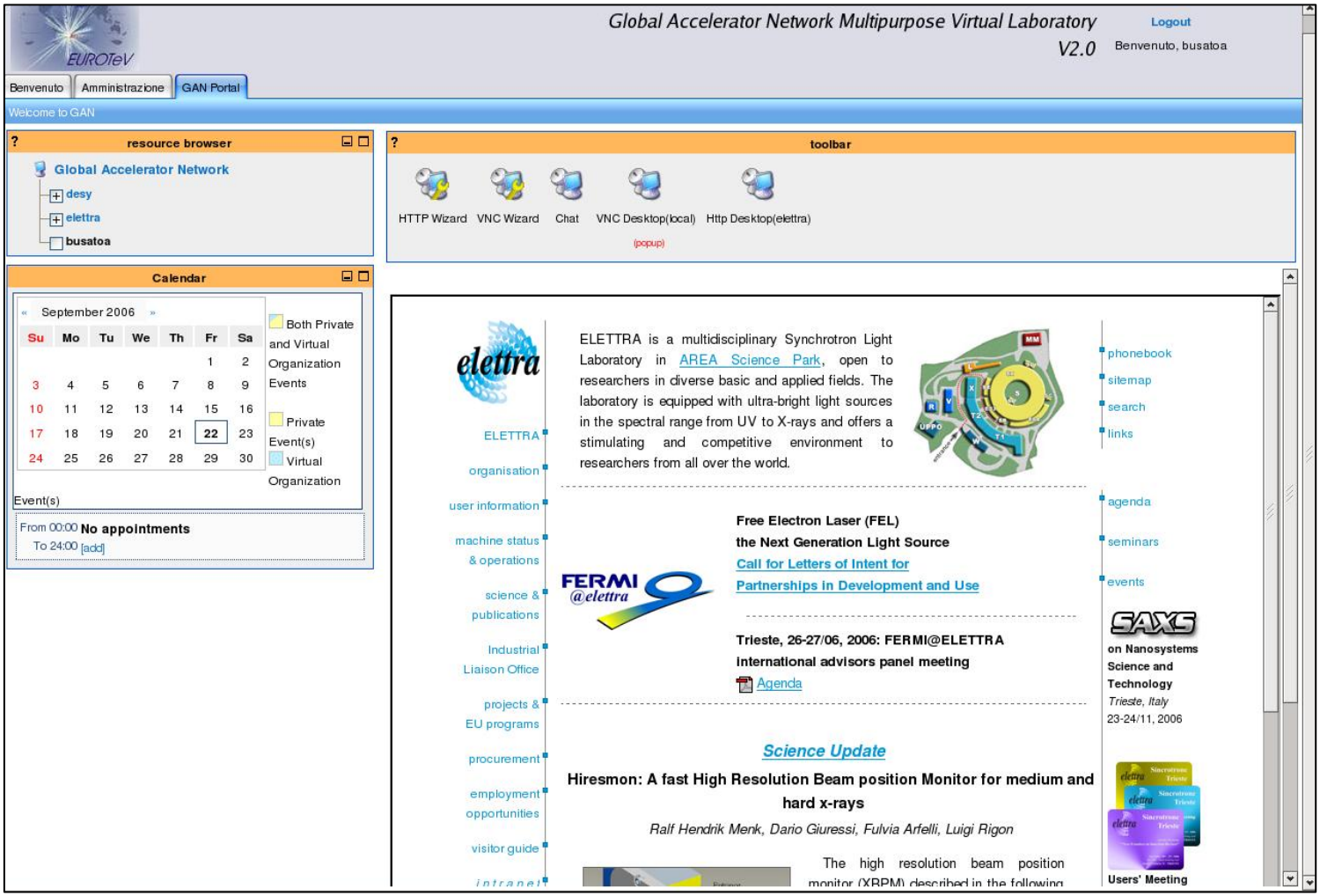
Roberto Pugliese
pugliese@elettra.trieste.it

GANMVL: Multipurpose Virtual Laboratory



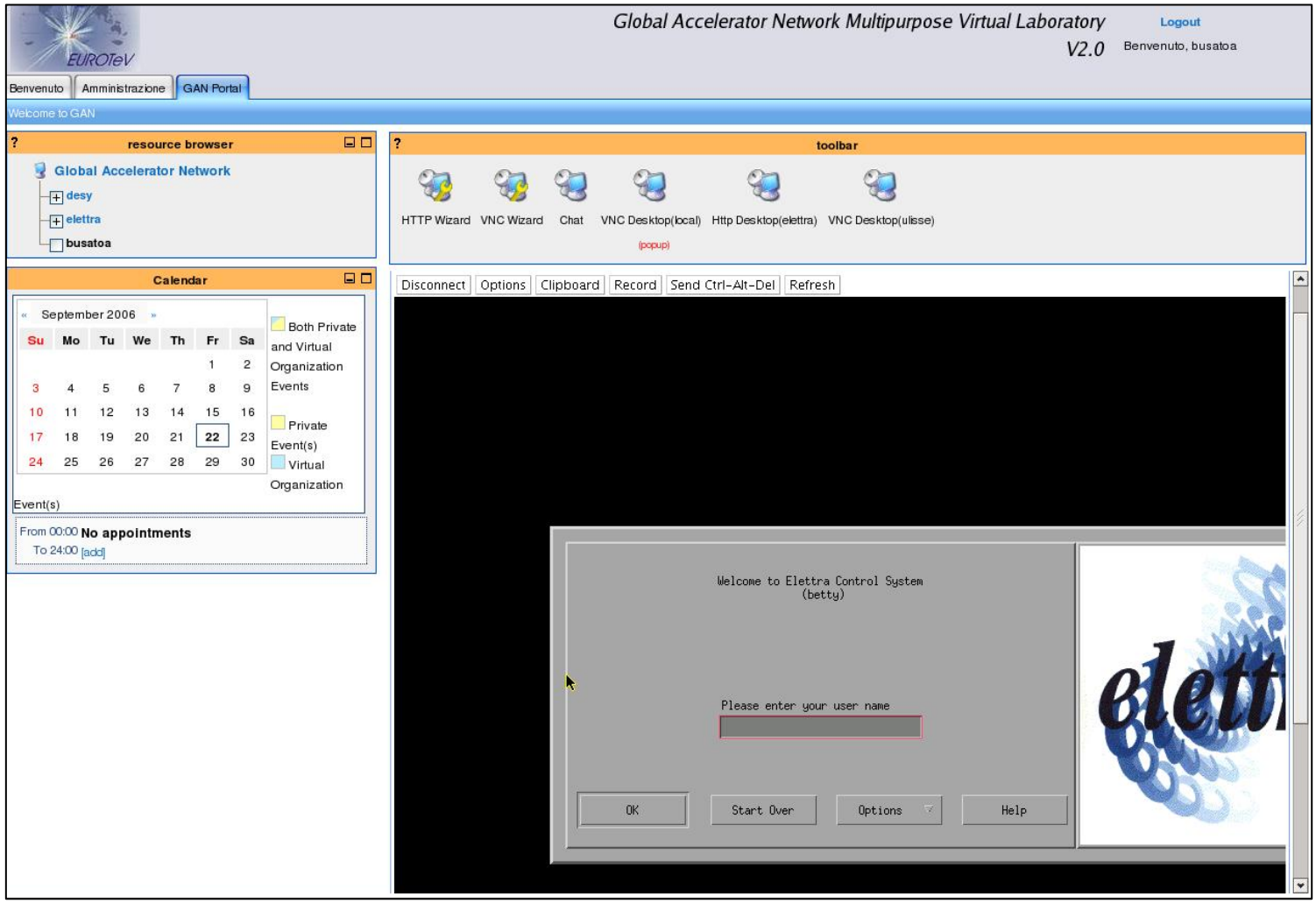
Roberto Pugliese
pugliese@elettra.trieste.it

GANMVL: Multipurpose Virtual Laboratory



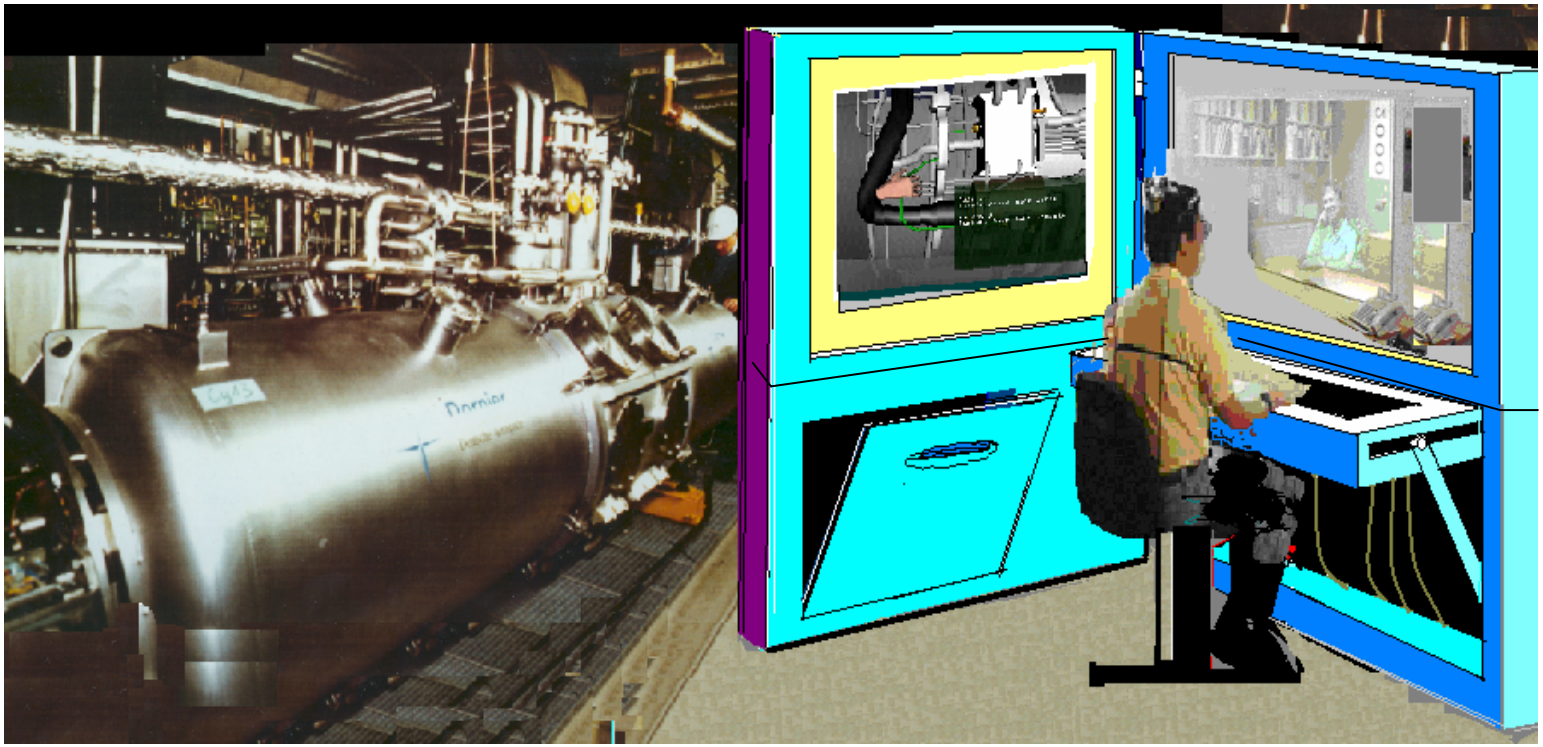
Roberto Pugliese
pugliese@elettra.trieste.it

GANMVL: Multipurpose Virtual Laboratory



Roberto Pugliese
pugliese@elettra.trieste.it

Original idea of the semi-mobile station



Roberto Pugliese
pugliese@elettra.trieste.it

Possible station setup

		Video Conference Cameras	High Resolution Video&Cameras	3-D high resolutionVideo	Multiple Screens	Large Display	Lighting	Audio Support	Stands	Virtual Instruments	Control System Interface	Wireless Access Point
Stationary Setup	remotely assisted Accelerator Experiment	x	x	x	x	x		x			x	
	Remotely assisted Accelerator Commissioning	x	x	x	x	x		x			x	
Semi-mobile Setup	Remotely assisted Test preparation	x	x	x		x	x	x	x	x	x	x
	Remotely assisted Assembly	x	x	x		x	x	x	x	x	x	x
Mobile Setup	Remotely Assisted Maintenance	x	x				x	x		x	x	
	Remotely Assisted Repair	x	x				x	x		x	x	
	Remotely assisted Trouble Shooting	x	x				x	x		x	x	
	...											

Roberto Pugliese
pugliese@elettra.trieste.it

Mobile Local-Server

Tablet PC

Micro PC

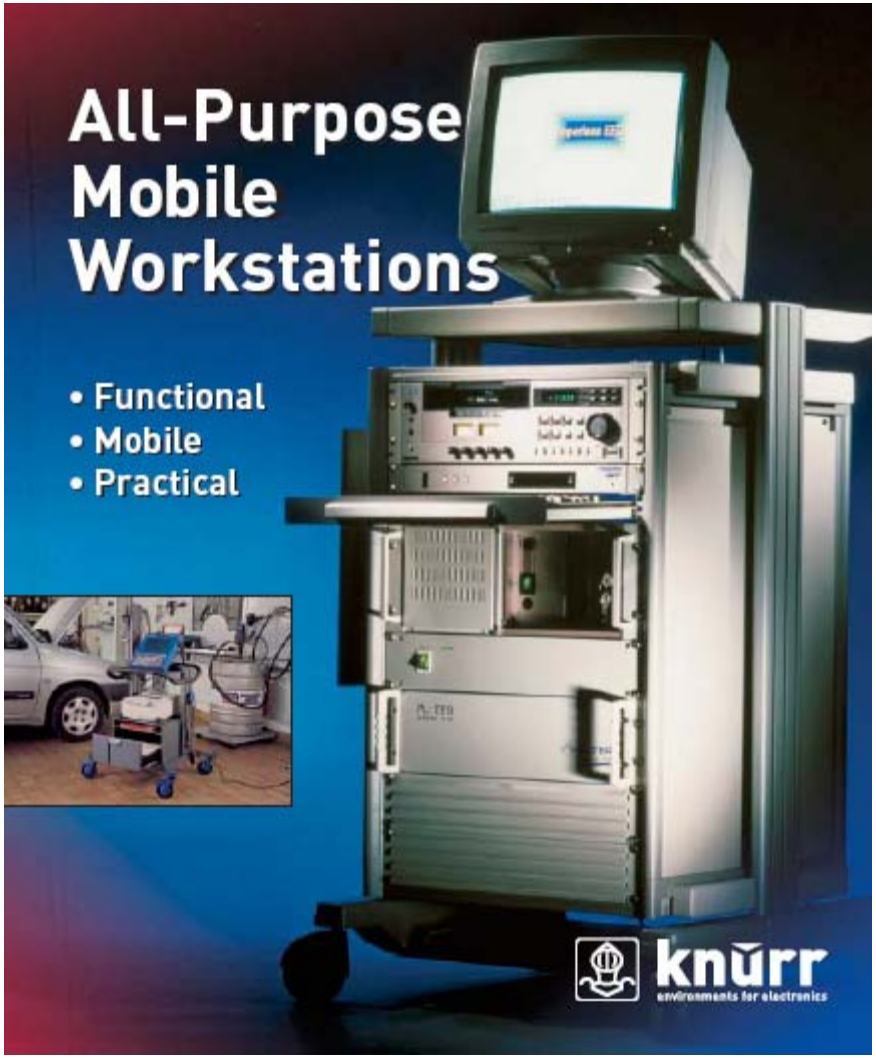
Roberto Pugliese
pugliese@elettra.trieste.it

Semi-Mobile Server

Portabel Computer EMP-390-20“

Roberto Pugliese
pugliese@elettra.trieste.it

New Concept for Semi-Mobile



Roberto Pugliese
pugliese@elettra.trieste.it

GANMVL future developments

- Use of the prototypes in production (ELETTRA, DESY, GSI, INFN, …)
- Multi facility support
- Awareness feature: tunnel monitoring and control, resource enable / disable
- Improvement of the installation process
- Evaluation of prototypes at work and consequent tuning of the application
- Integration with the GRIDCC middleware

Acknowledgements

- All the members of the collaboration
- All the key users
- The developers of the tools we integrated in the GANMVL (VRVS, EVO, …)

GANMVL: Multipurpose Virtual Laboratory