



# Multipurpose Virtual Laboratory: *a tool to Support Maintaining, Optimizing, and Trouble Shooting Accelerator Components from Off-Site*

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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.



# 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, heuristic 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  
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are needed to see this picture.

# www.lightsources.org



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GANMVL  
www.eurotev.org



# www.linearcollider.org

QuickTime™ and a  
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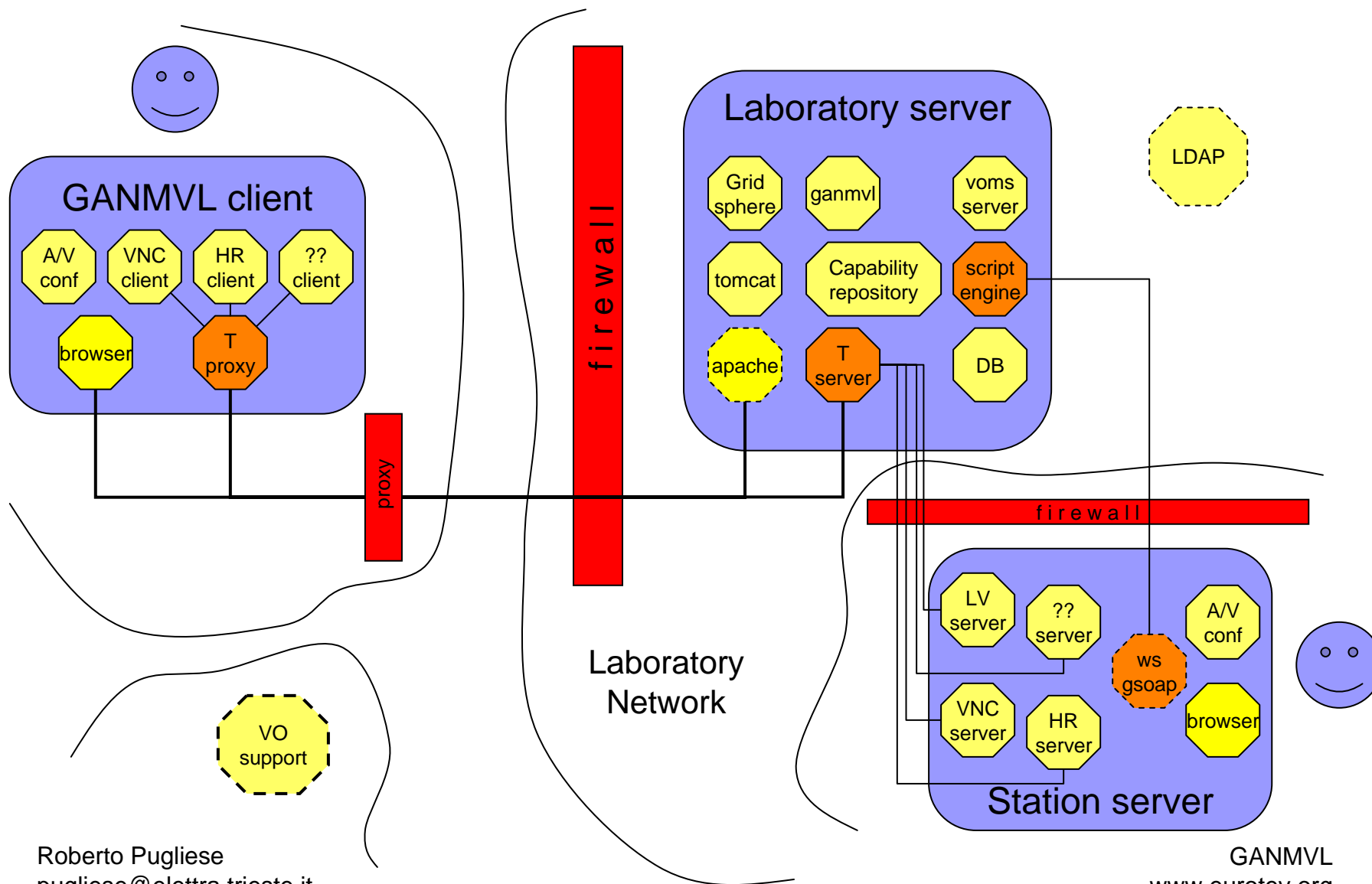
GANMVL  
www.eurotev.org



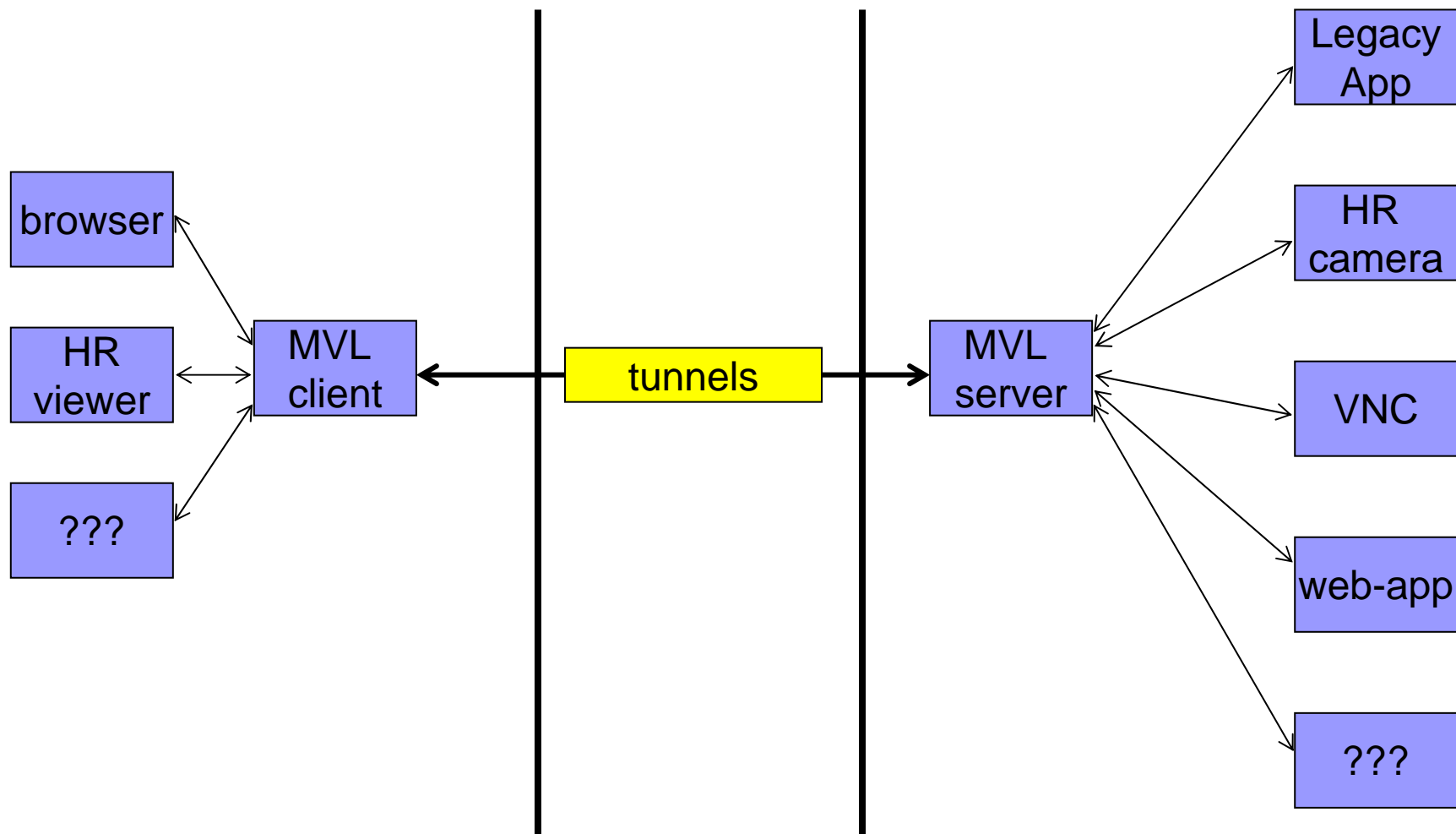
# Global GANMVL Architecture

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

# GANMVL internal architecture



# Tunnel architecture





# 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

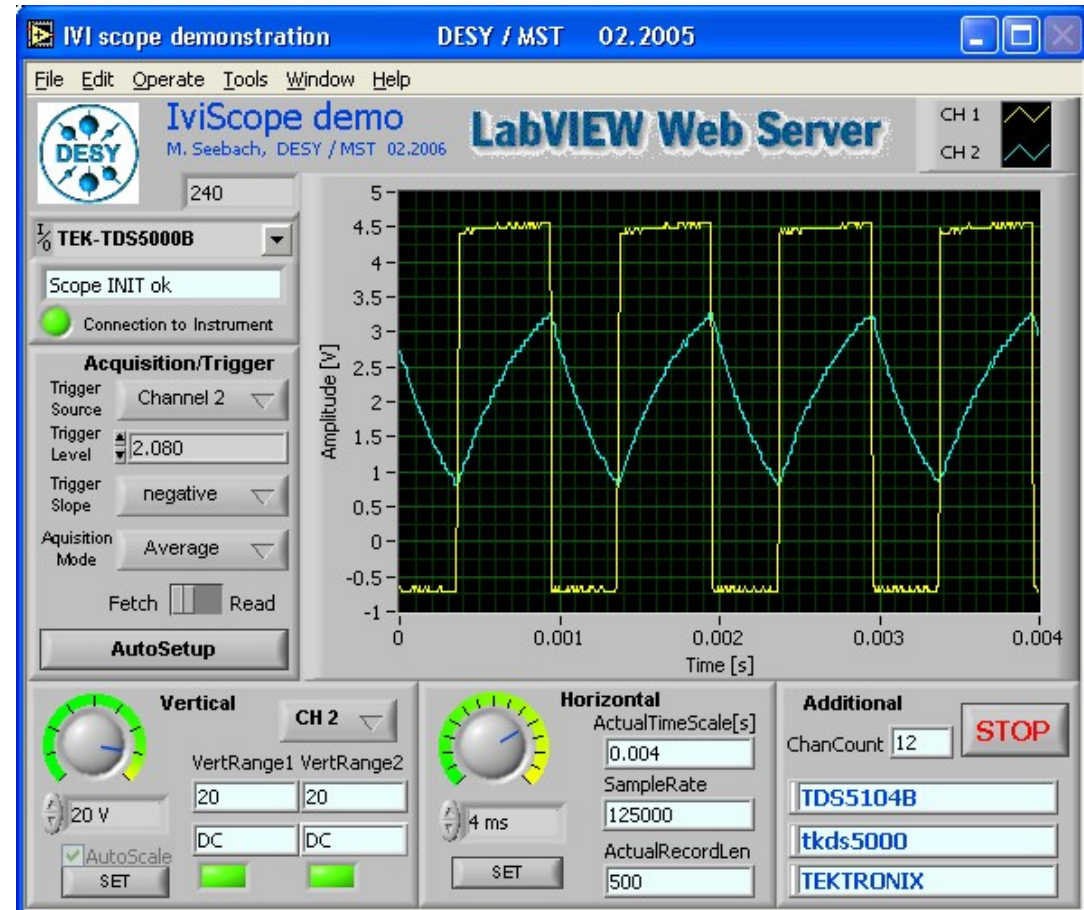


# Integrating instruments

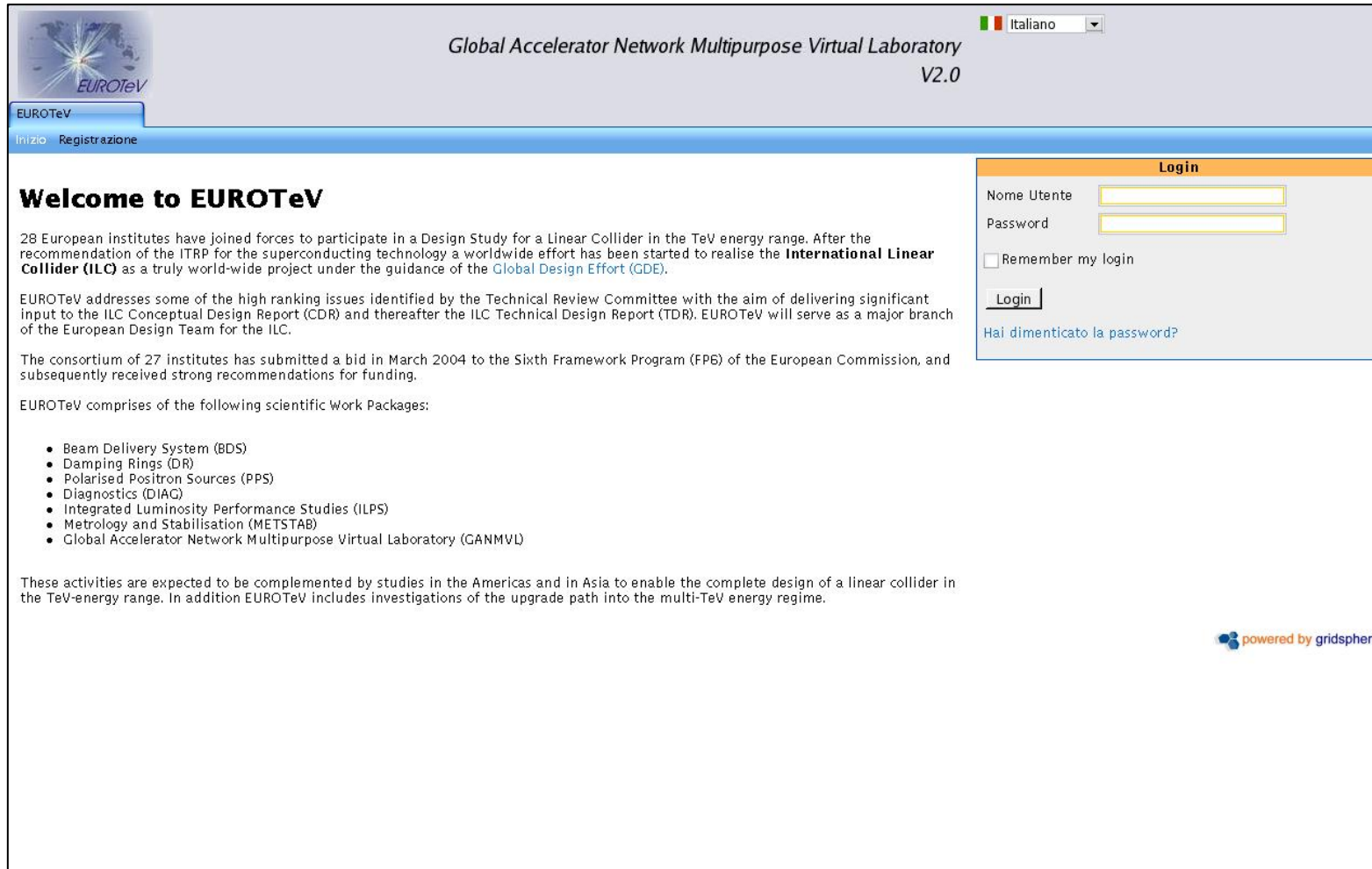
- In order to integrate instruments or control panels it will be sufficient to fill a web form specifying
  - the name of the tool which will be presented in the station tool menu
  - the internal URL of the instrument or the internal address of the instrument (IP address and port)
  - The local port
  - 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](#)



# GANMVL: Multipurpose Virtual Laboratory



The screenshot shows the homepage of the EUROTeV website. At the top, there is a header with the EUROTeV logo on the left, the text "Global Accelerator Network Multipurpose Virtual Laboratory V2.0" in the center, and a language dropdown menu set to "Italiano" on the right. Below the header is a navigation bar with "EUROTeV" and "Inizio Registrazione" links. The main content area is titled "Welcome to EUROTeV" and contains several paragraphs of text. On the right side, there is a "Login" form with fields for "Nome Utente" and "Password", a "Remember my login" checkbox, a "Login" button, and a link for "Hai dimenticato la password?". At the bottom right, there is a "powered by gridsphere" logo.

**Welcome to EUROTeV**

28 European institutes have joined forces to participate in a Design Study for a Linear Collider in the TeV energy range. After the recommendation of the ITRP for the superconducting technology a worldwide effort has been started to realise the **International Linear Collider (ILC)** as a truly world-wide project under the guidance of the *Global Design Effort (GDE)*.

EUROTeV addresses some of the high ranking issues identified by the Technical Review Committee with the aim of delivering significant input to the ILC Conceptual Design Report (CDR) and thereafter the ILC Technical Design Report (TDR). EUROTeV will serve as a major branch of the European Design Team for the ILC.

The consortium of 27 institutes has submitted a bid in March 2004 to the Sixth Framework Program (FP6) of the European Commission, and subsequently received strong recommendations for funding.

EUROTeV comprises of the following scientific Work Packages:

- Beam Delivery System (BDS)
- Damping Rings (DR)
- Polarised Positron Sources (PPS)
- Diagnostics (DIAG)
- Integrated Luminosity Performance Studies (ILPS)
- Metrology and Stabilisation (METSTAB)
- Global Accelerator Network Multipurpose Virtual Laboratory (GANMVL)

These activities are expected to be complemented by studies in the Americas and in Asia to enable the complete design of a linear collider in the TeV-energy range. In addition EUROTeV includes investigations of the upgrade path into the multi-TeV energy regime.

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# GANMVL: Multipurpose Virtual Laboratory

EUROTeV  
Inizio Registrazione

Global Accelerator Network Multipurpose Virtual Laboratory V2.0 Italiano

### New User Registration

User Name(\*)  
Full Name(\*)  
E-mail(\*)  
Organization(\*)  
Department(\*)  
Address

#### Phone and Fax number

Phone (Office)  
Phone (Mobile)  
Phone (Home)  
Fax

#### Internet Community

Skype Name  
VRVS Login Name  
VRVS Community

#### Desidered Virtual Organization

Virtual Organization(\*)

write the pictured code(\*)

[Send Request] [Cancel]

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# GANMVL: Multipurpose Virtual Laboratory

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TIFF (LZW) decompressor  
are needed to see this picture.

# GANMVL: Multipurpose Virtual Laboratory

The screenshot displays the GANMVL web interface. At the top, there is a header with the EUROTeV logo on the left, the text "Global Accelerator Network Multipurpose Virtual Laboratory V2.0" in the center, and a "Logout" link with the text "Benvenuto, busatoa" on the right. Below the header, there are navigation tabs for "Benvenuto", "Amministrazione", and "GAN Portal".

The main content area is divided into several panels:

- resource browser:** Shows a tree view of the "Global Accelerator Network" with sub-items "desy", "elettra", and "busatoa".
- toolbar:** Contains a "Laboratory Admin" icon and text.
- Calendar:** Displays a calendar for September 2006. The 22nd is highlighted. A legend indicates that yellow squares represent "Both Private and Virtual Organization Events", light yellow squares represent "Private Event(s)", and light blue squares represent "Virtual Organization". Below the calendar, it states "Event(s) From 00:00 To 24:00 No appointments [add]".
- Virtual Organization Administration - (VirtualOrganizations is the current selected group):** This panel contains several sections:
  - Users:** A list of users including "mario", "busatoa", "enrico", "blcs", "danfav1", and "test1". A "modify groups" dropdown is set to "VirtualOrganizations". There are "Create" and "Cancel" buttons. Below the list is an "add user to group" link.
  - Modify groups:** A dropdown menu.
  - Name:** A text input field with a "check duplicate definition" link.
  - Description:** A text input field.
  - LDAP DN:** A text input field.
  - Public:** A checked checkbox.
  - Users associated:** "No users associated!"
  - Portlet capabilities:** A list of capabilities including "HttpWizard", "vncWizard", "FileManagerWizard", "ScriptsAdmin", "skype", and "vrvs". Below the list is an "add portlet to group" link.
  - Capabilities associated:** "No capabilities associated!"
  - Service capabilities:** A list of capabilities including "JobsOnPhase", "StorageOnPhase", "JobOnphase", "StorageOnphase", "JobOnphase", and "StorageOnphase". Below the list is an "add service to group" link.
  - Services associated:** "No services associated!"

# GANMVL: Multipurpose Virtual Laboratory

Global Accelerator Network Multipurpose Virtual Laboratory Logout  
V2.0 Benvenuto, busatoa

Benvenuto Amministrazione GAN Portal

Welcome to GAN

**resource browser**

- Global Accelerator Network
  - + desy
  - + elettra
  - busatoa

**toolbar**

[HTTP Wizard](#)
[VNC Wizard](#)
[Chat](#)
[VNC Desktop\(local\)](#)
[Http Desktop\(elettra\)](#)

(popup)

**Calendar**

« September 2006 »

Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Event(s)

From 00:00 **No appointments**  
To 24:00 [add]

**organisation**

ELETTRA is a multidisciplinary Synchrotron Light Laboratory in [AREA Science Park](#), open to researchers in diverse basic and applied fields. The laboratory is equipped with ultra-bright light sources in the spectral range from UV to X-rays and offers a stimulating and competitive environment to researchers from all over the world.

**Free Electron Laser (FEL) the Next Generation Light Source**  
[Call for Letters of Intent for Partnerships in Development and Use](#)

Trieste, 26-27/06, 2006: FERMI@ELETTRA  
 International advisors panel meeting  
[Agenda](#)

**Science Update**

**Hiresmon: A fast High Resolution Beam position Monitor for medium and hard x-rays**  
*Ralf Hendrik Menk, Dario Giuressi, Fulvia Arfelli, Luigi Rigon*

The high resolution beam position monitor (XRPM) described in the following

[phonebook](#)  
[sitemap](#)  
[search](#)  
[links](#)  
[agenda](#)  
[seminars](#)  
[events](#)

**SAXS**  
 on Nanosystems Science and Technology  
 Trieste, Italy  
 23-24/11, 2006

**Users' Meeting**



# GANMVL: Multipurpose Virtual Laboratory

Global Accelerator Network Multipurpose Virtual Laboratory V2.0 [Logout](#)  
Benvenuto, busatoa

Benvenuto Amministrazione **GAN Portal**

Welcome to GAN

**resource browser**

- Global Accelerator Network
  - desy
  - elettra
  - busatoa

**Calendar**

September 2006

Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Event(s)

From 00:00 **No appointments**  
To 24:00 [add]

**toolbar**

HTTP Wizard VNC Wizard Chat VNC Desktop(local) Http Desktop(elettra) VNC Desktop(ulisse)

[popup]

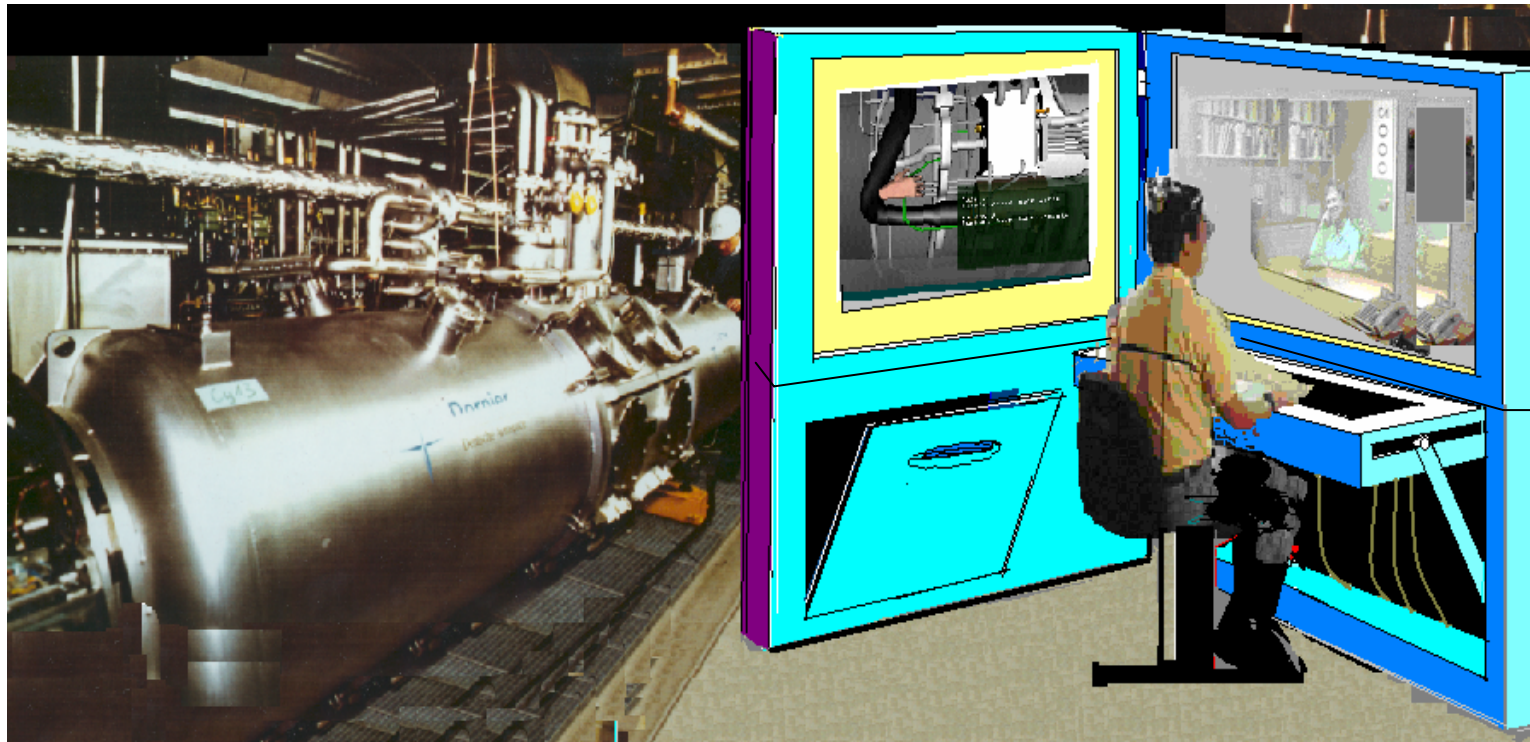
Disconnect Options Clipboard Record Send Ctrl-Alt-Del Refresh

Welcome to Elettra Control System (betty)

Please enter your user name

OK Start Over Options Help

# Original idea of the semi-mobile station



# Possible station setup



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



# Mobile Local-Server



Tablet PC



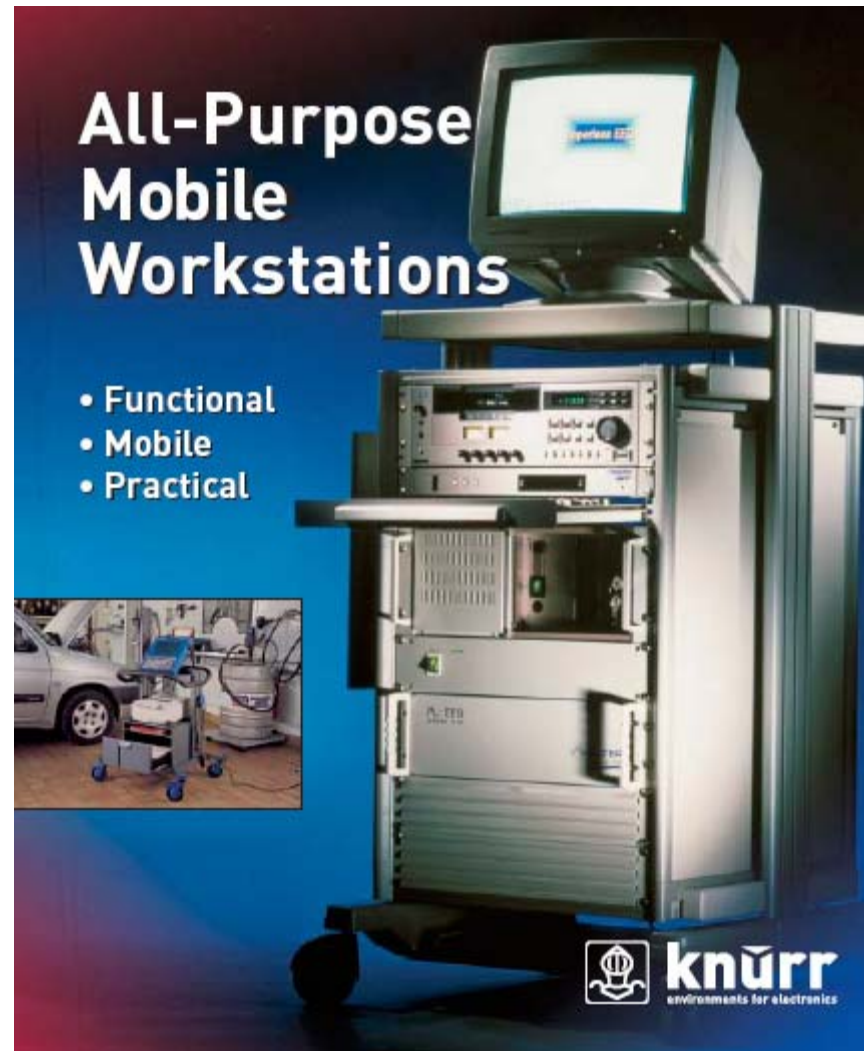
Micro PC

# Semi-Mobile Server



Portabel Computer EMP-390-20“

# New Concept for Semi-Mobile



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GANMVL  
www.eurotev.org



# GANMVL future developments

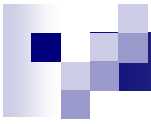
- Use of the prototypes in production (ELETTRA, DESY, GSI, INFN, ...)
- Multi facility support
- Awareness feature: tunnel monitoring and control, resource enable / disable
- Improvement of the installation process
- Evaluation of prototypes at work and consequent tuning of the application
- Integration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

