

# Grid enabled Remote Instrumentation with Distributed Control and Computation (GRIDCC)

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ELETTRA - Sincrotrone Trieste SCpA  
On Behalf of the GRIDCC Collaboration

Remote Instrumentation Services in  
Grid Environment (RISGE)  
OGF21 - Seattle, October 2007



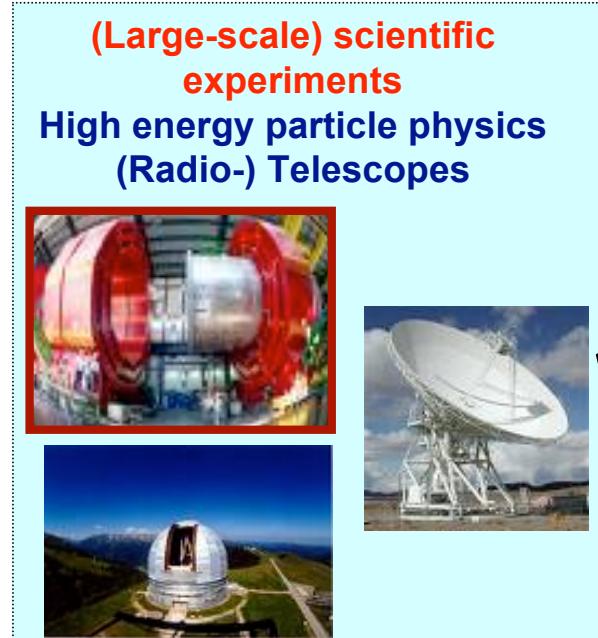
# The GRIDCC Project

- GRIDCC is a 3-years EU FP6 project started in September 2004
- The goal of this project is to build a widely distributed system that is able to remotely control and monitor complex instrumentation
  - develop generic Grid middleware, based on existing building blocks (eInfrastructure) to allow remote control and monitoring of sensors and instruments
  - evaluate the middleware on a set of pilot applications

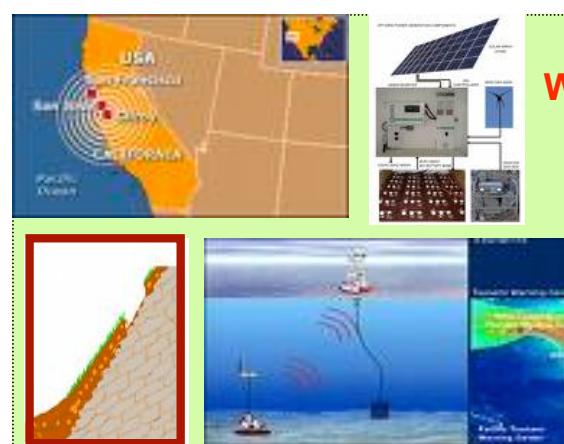
# GRIDCC project partners

Participant name	Country
Istituto Nazionale di Fisica Nucleare	Italy
Institute Of Accelerating Systems and Applications	Greece
Brunel University	UK
Consorzio Interuniversitario per Telecomunicazioni	Italy
Sincrotrone Trieste S.C.P.A	Italy
IBM (Haifa Research Lab)	Israel
Imperial College of Science, Technology & Medicine	UK
Istituto di Metodologie per l'Analisi ambientale – Consiglio Nazionale delle Ricerche	Italy
Universita degli Studi di Udine	Italy
Greek Research and Technology Network S.A.	Greece

# GRIDCC main application areas



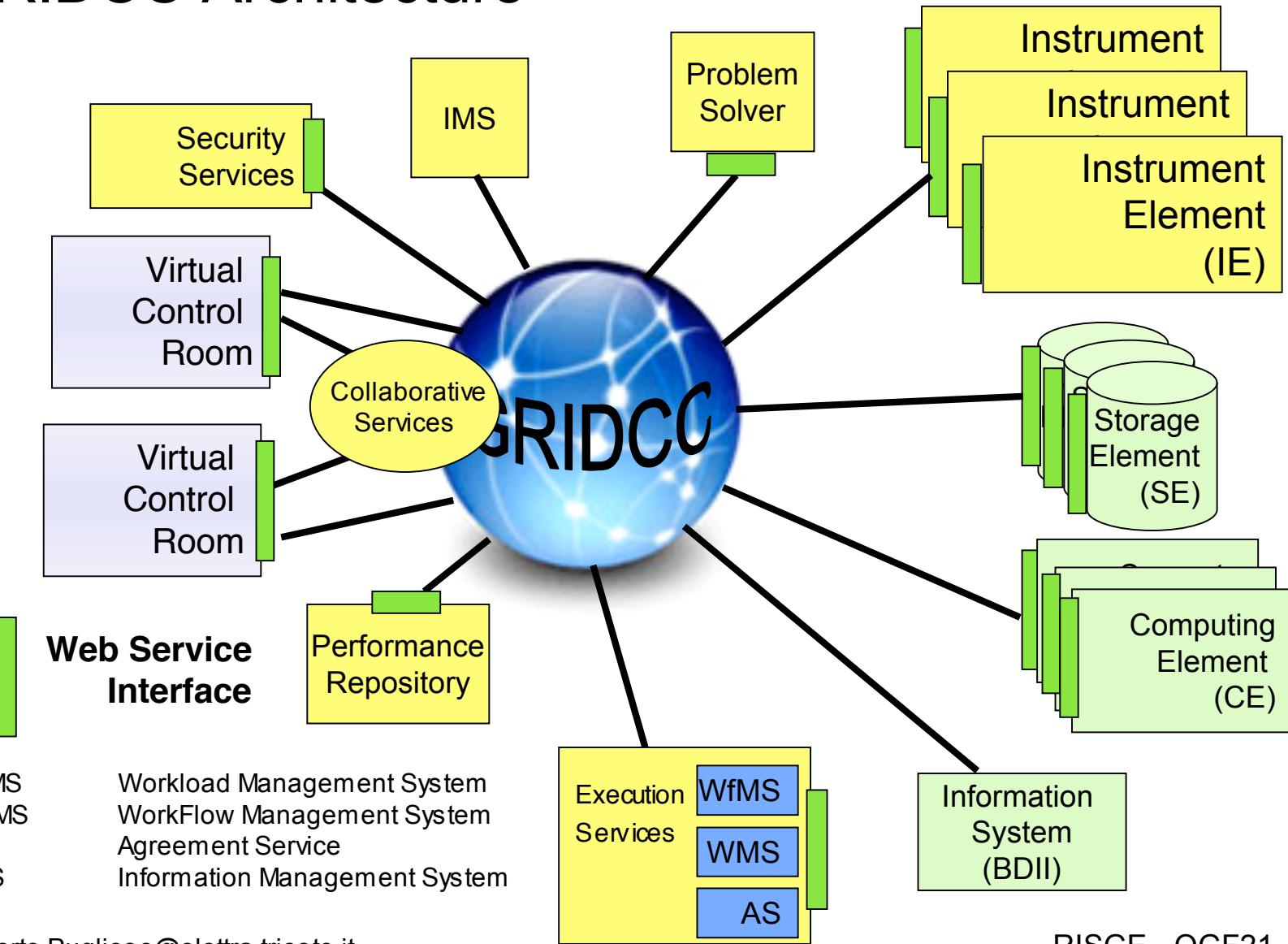
GRIDCC  
Middleware



**Widely Sparse Instrumentation**  
**Power Grids**  
**Monitoring of the territory**  
**Monitoring of the sea**  
**Geo-hazard prediction**  
**Distributed laboratories**  
**Transportation monitoring**  
**Sensor network**



# GRIDCC Architecture



# Instrument Element (IE)

Instrument Reservation  
Service (IRS)

WS-I Compliant  
GSI Security  
Kerberos Security

Web Service

Instrument Quality  
of Service(IQS)

Instrumentation Control

JMS  
Data and Info  
Publishing

Instrument  
Element

Instruments Access  
Custom,Plugin

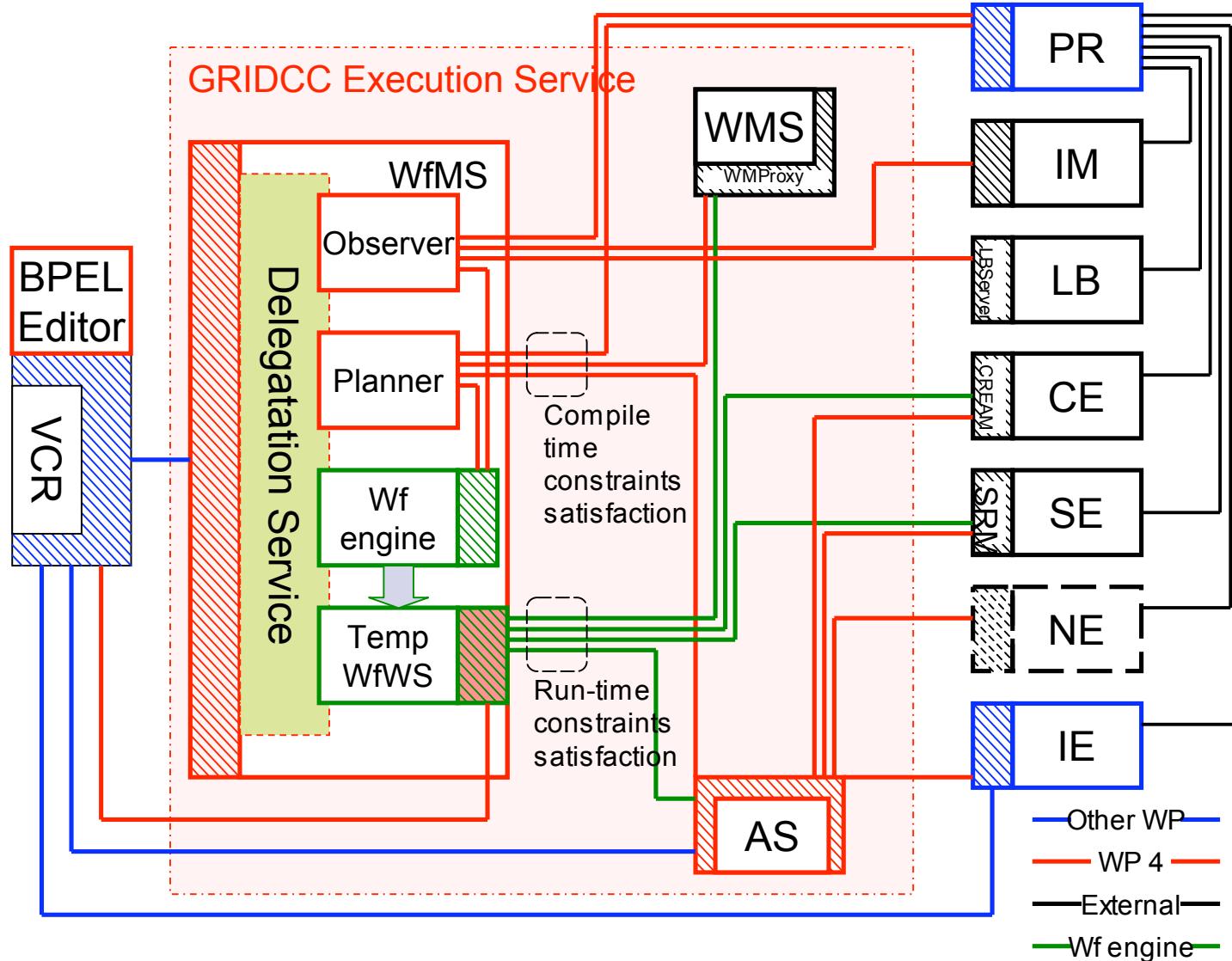


Grid Access

SRM/GRIDFTP

BDII  
GlueSchema extension  
P2P Discovery

# WfMS architecture



# The Virtual Control Room (VCR)

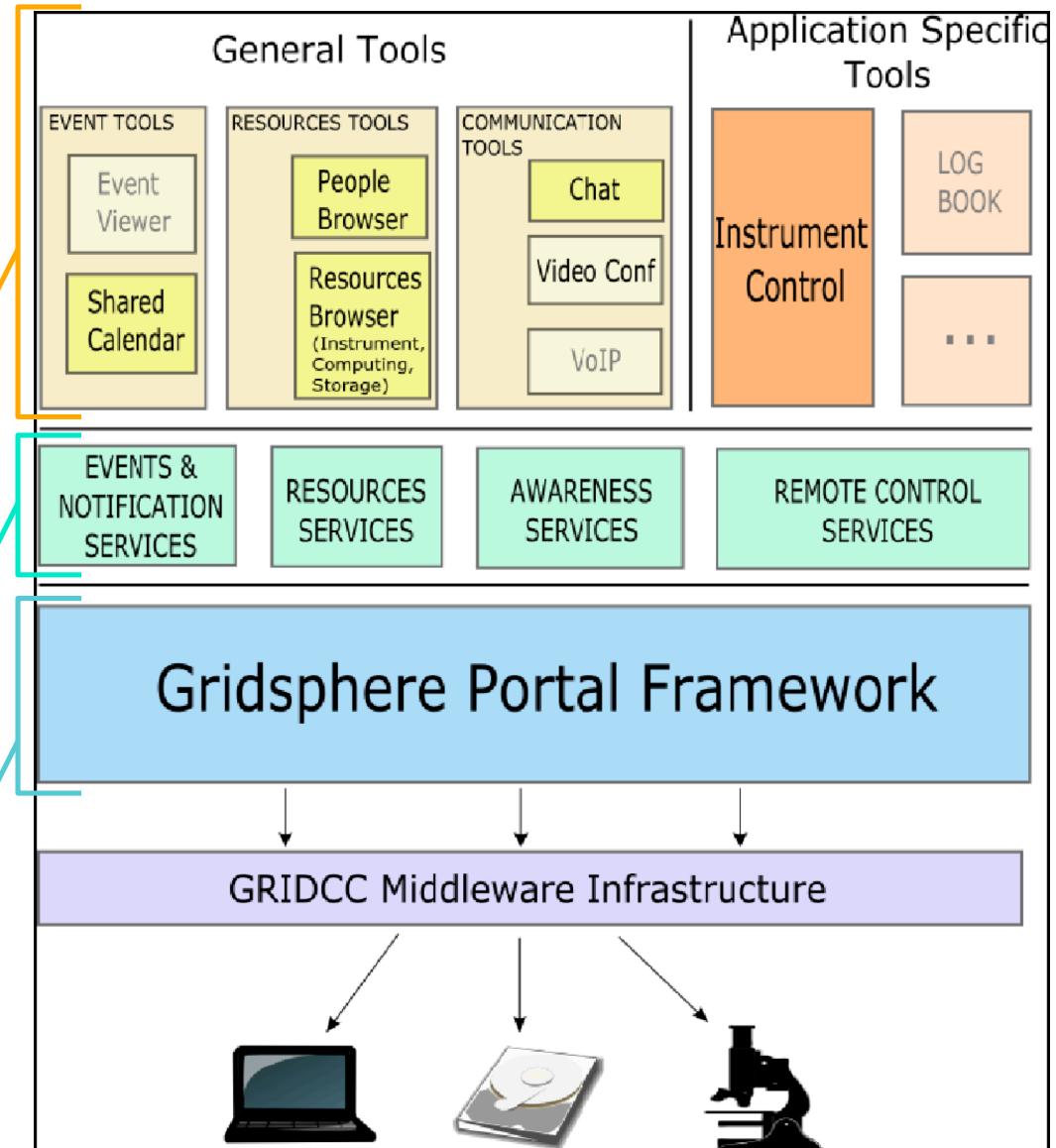
- The VCR provides a web-based collaborative environment where users:
  - **Meet and collaborate** by means of groupware tools (e.g. chat, shared calendar, logbook, video conference tools)
  - **Browse resources** such as people, instruments and other Grid resources (e.g. computing and storage ones)
  - **Transparently operate with remote Grid / non Grid resources**, including the GRIDCC instruments and services

# Architecture of the VCR

**User interface Layer**  
providing General and Application Specific tools

**Services Layer**  
providing low-level functionalities needed by the VCR

**Web-based portal**  
providing some basic functionalities and support for aggregating components



# VCR in action

**Elettra Virtual Control Room**

<http://testbed.grid.elettra.trieste.it/GridSphere/GridSphere?cid=82&JavaScript=enabled#>

Getting Started   Latest Headlines   EVO, the future of co...

**Accelerator**

- PositionMonitors
- Correctors
- CorrectorCE

<a href="#">cheesecake.grid.elettra.trieste.it:8080/rcms/</a>	<a href="#">AS QoS</a>
<a href="#">gladgw.lnl.infn.it:2010/rcms/</a>	<a href="#">AS QoS</a>
<a href="#">gladgw.lnl.infn.it:8110/rcms/</a>	<a href="#">AS QoS</a>
<a href="#">IE DUMMY</a>	<a href="#">AS QoS</a>

Computing Elements

<a href="#">gridcc01.grid.elettra.trieste.it:2119/blah-pbs-gridcc</a>	<a href="#">QoS</a>
<a href="#">gridcc01.grid.elettra.trieste.it:2119/blah-lcpbs-gridcc</a>	<a href="#">QoS</a>
<a href="#">sadgw.lnl.infn.it:8553/cream-lsf-cream</a>	<a href="#">QoS</a>

Storage Elements

<a href="#">gridcc01.grid.elettra.trieste.it:2811</a>	<a href="#">AS QoS</a>
<a href="#">stormse2.grid.elettra.trieste.it:2811</a>	<a href="#">AS QoS</a>
<a href="#">gladgw.lnl.infn.it:2811</a>	<a href="#">AS QoS</a>

**People Browser**

Select: [All](#), [None](#), [On-line](#), [Off-line](#)

Organization

- ELETTRA
  - Milan Prica
  - guest user
  - VCR admin
  - Roberto Pugliese
  - Laura del Cano
  - Andrea Del Linz
  - user demo VCR
- HCI Lab
  - Luca De Marco
  - Roberto Ranon
  - Augusto Senerchia
  - Silvia Gabrelli

Status:

ON

Transitions List:

Choose Trans...

Arguments:

No Transition Selected

**COMMANDS**

Commands List:

Choose Comm...

Arguments:

No Command Selected

**MONITORING**

Name	Min	Max	Value	Unit	Op.
num_correctors	--	--	82	--	SET
current	--	--	206.19462280663262	--	SET
lifetime	--	--	86400.0	--	SET
status	--	--	The device is in ON state.	--	SET
num_bpm	--	--	96	--	SET

Add Time chart, Add Bar chart

Show/Hide Parameter



# VCR in action



The screenshot displays a workflow management system interface. On the left, under 'AVAILABLE WORKFLOWS', there is a list of workflow definitions:

- Full\_FeedbackCorrection
- Full\_FeedbackCorrection\_withCREAM
- Full\_FeedbackCorrection\_withWMS
- Full\_OneButtonMachine
- semo
- hello

Below this list is a 'Submit' button.

On the right, under 'SUBMITTED WORKFLOWS', is a table showing the status of submitted workflows:

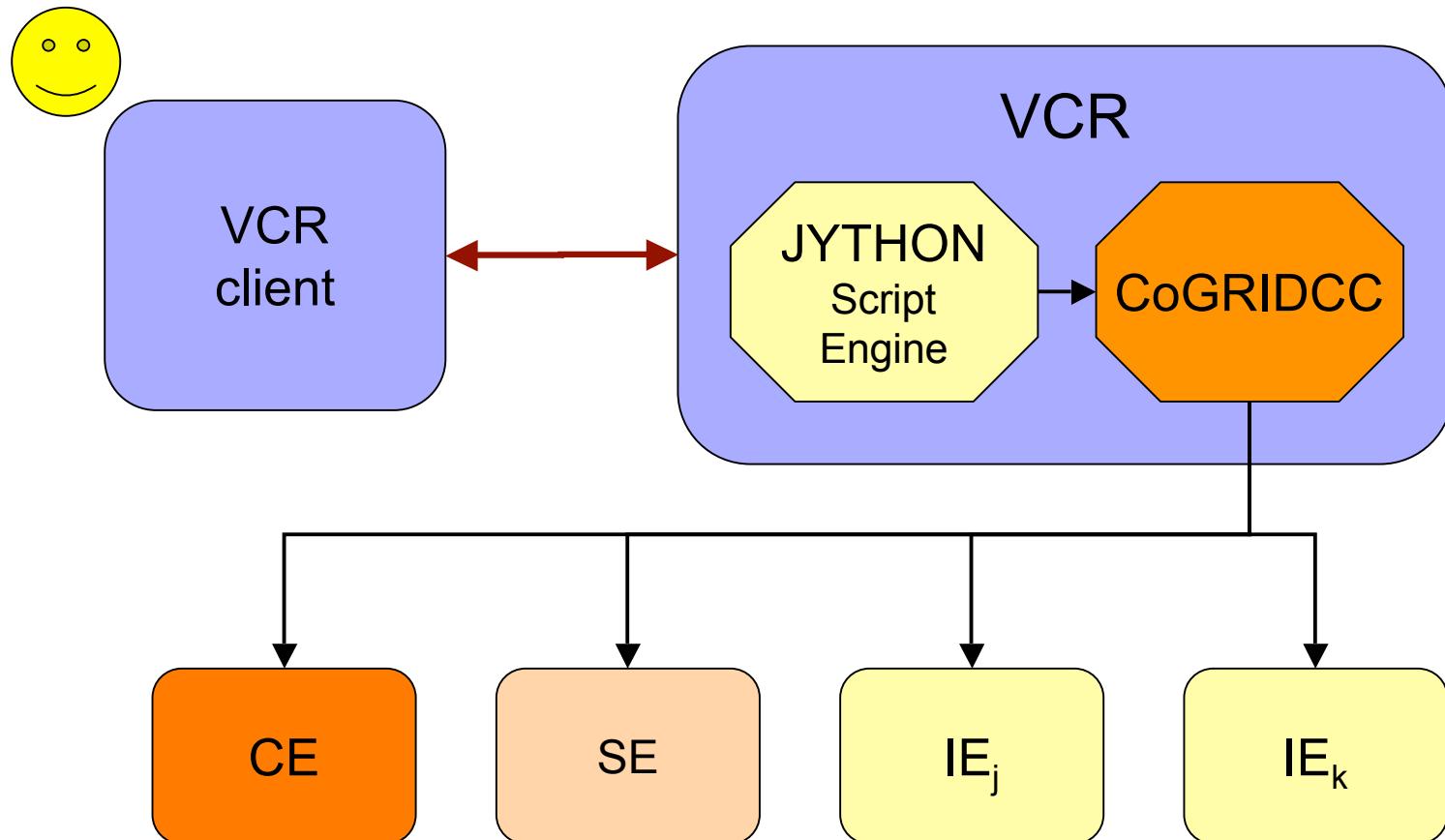
ID	File Name	Status	Date Submitted	Operation
1	Full_OneButtonMachine-wfms-withBPR.xml	submitted	Mon Oct 15 16:12:35 CEST 2007	Monitor
2	Full_FeedbackCorrection_wfms-withBPR.xml	submitted	Wed Oct 17 14:35:50 CEST 2007	Monitor
3	Full_FeedbackCorrection-wfms-withBPR.xml	submitted	Wed Oct 17 14:46:15 CEST 2007	Monitor
4	Full_FeedbackCorrection-wfms-withBPR.xml	submitted	Wed Oct 17 14:54:27 CEST 2007	Monitor
5	Full_FeedbackCorrection-wfms-withBPR.xml	submitted	Wed Oct 17 14:57:11 CEST 2007	Monitor
6	Full_FeedbackCorrection_withCREAM-wfms-withBPR.xml	submitted	Wed Oct 17 15:07:30 CEST 2007	Monitor

Below the table are buttons for 'Refresh List', 'Cancel Jobs', and 'Update Jobs'.

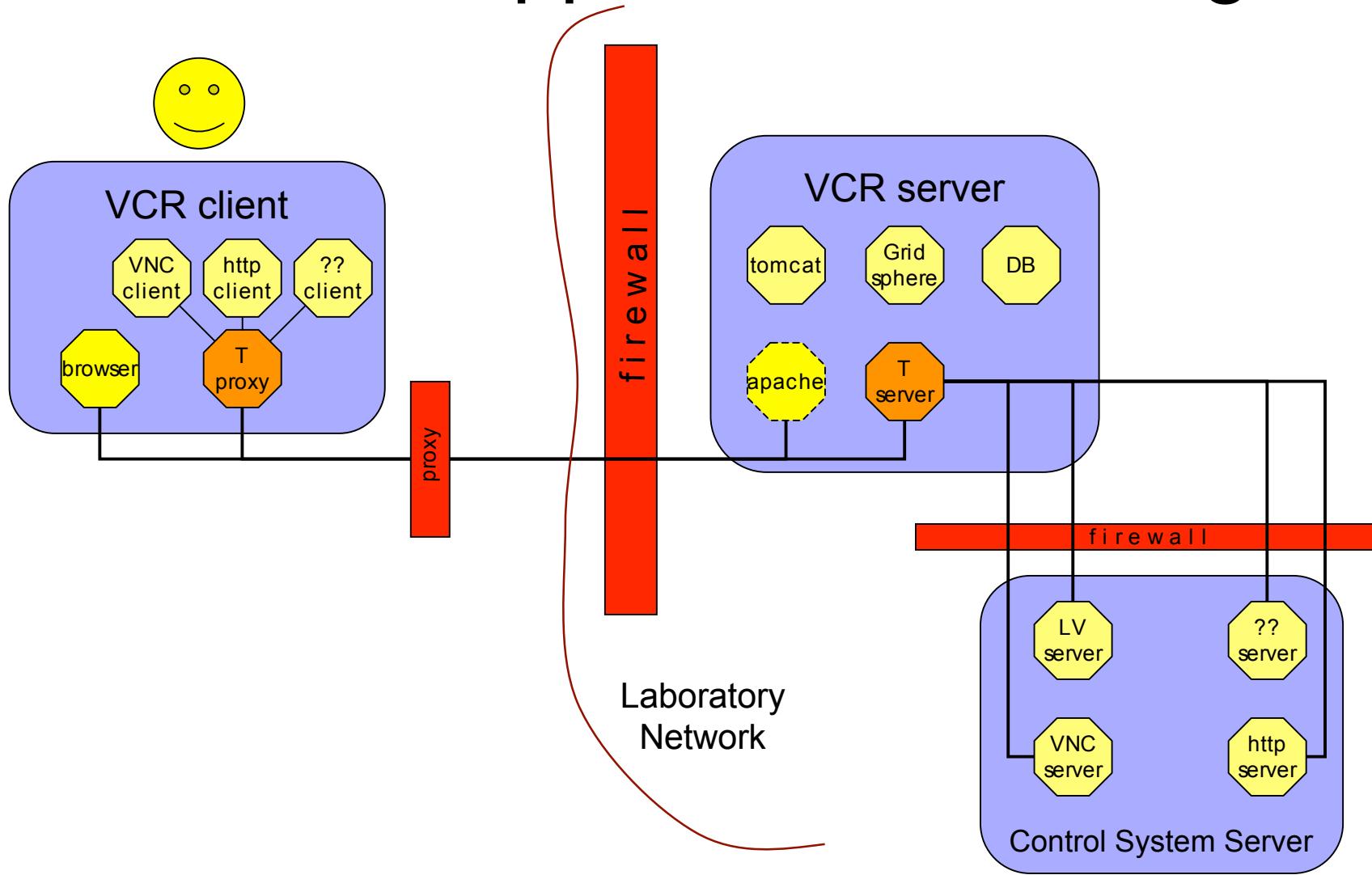
The main area shows a workflow timeline with two columns. The left column lists states: Inactive, Executing, Finished, Suspended, Terminated, and Failed. The right column shows the actual workflow steps:

- Started
- Report\_Submitted\_Involve\_monitor
- Report\_StatusChanged\_Involve\_monitor
- A5\_SF\_newAgreement\_Involve\_monitor
- Report\_SE\_ReservatinInvolve\_monitor
- A5\_IK\_createAgreement\_Involve\_monitor

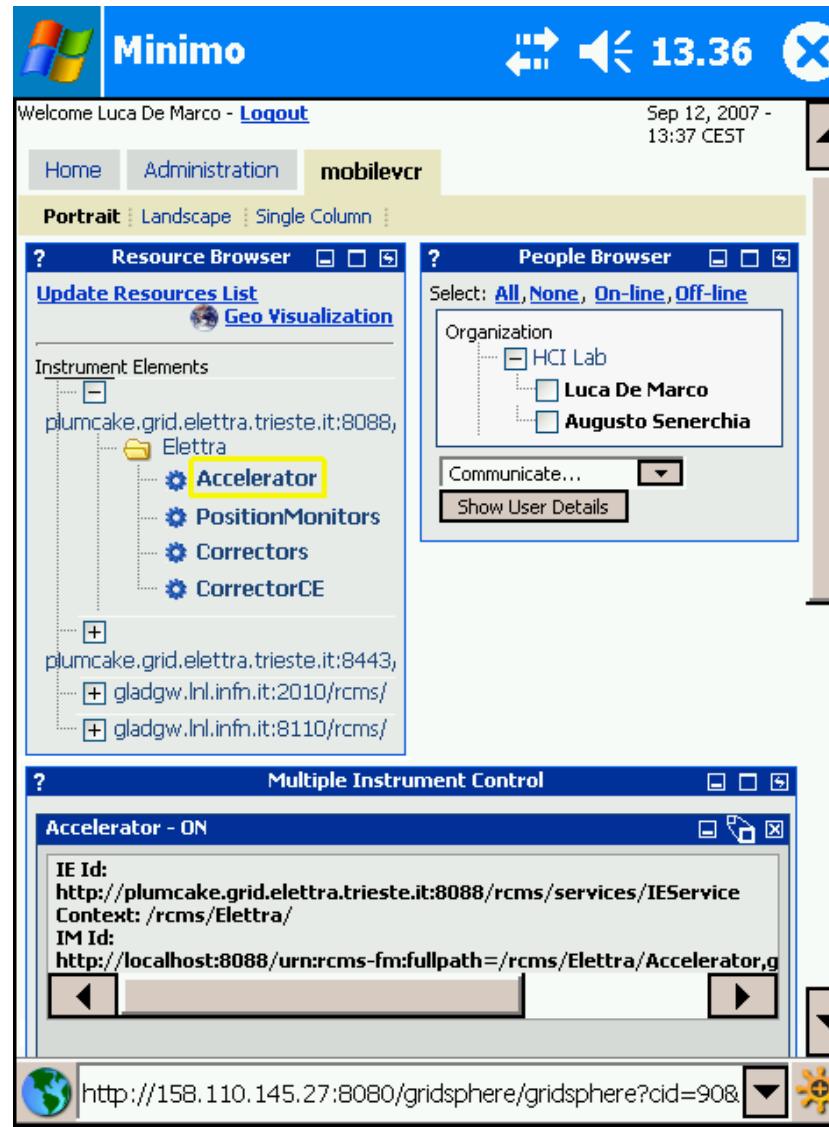
# VCR CoGRIDCC - Scripting



# VCR remote application tunneling



# VCR for Mobile Devices

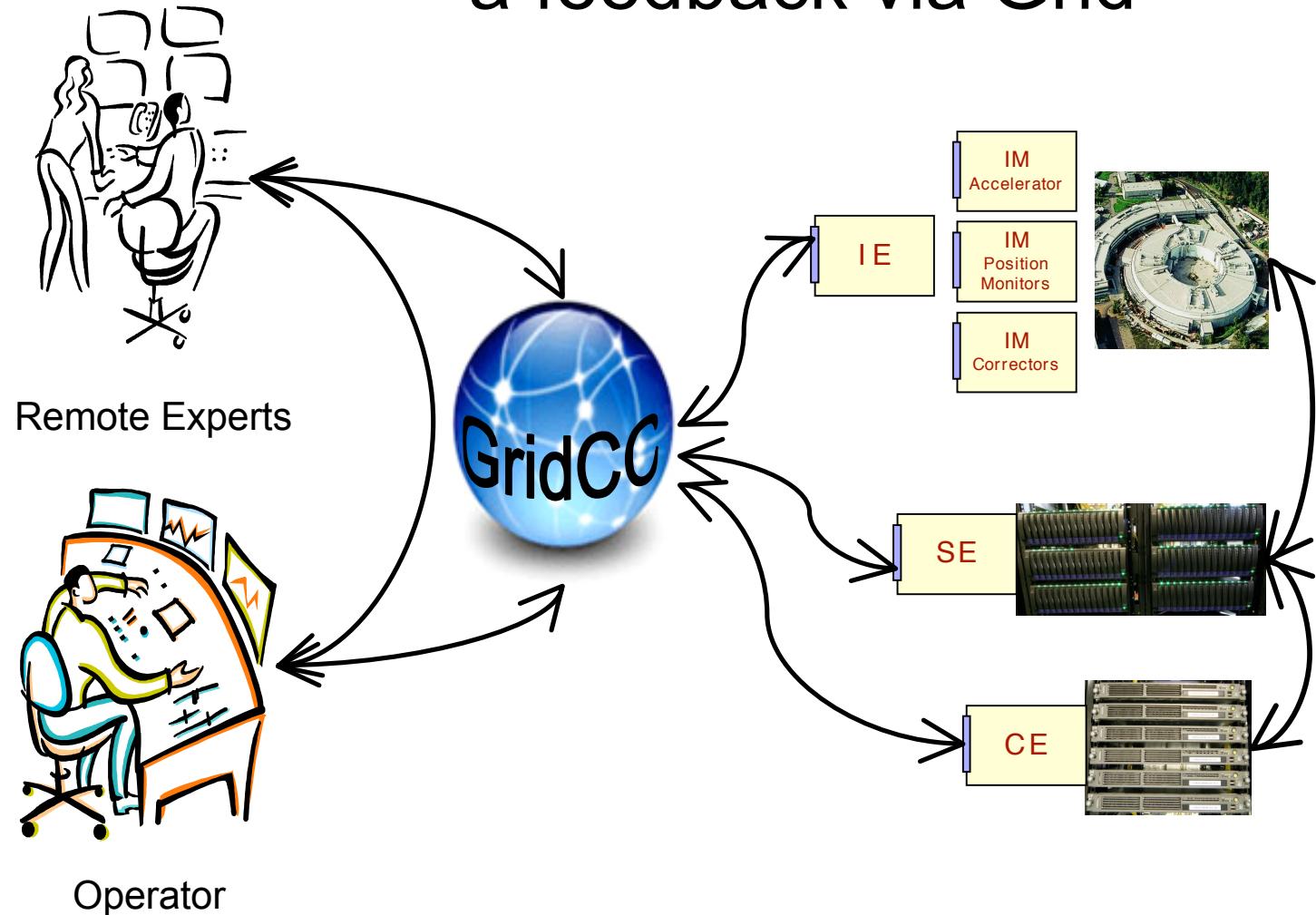


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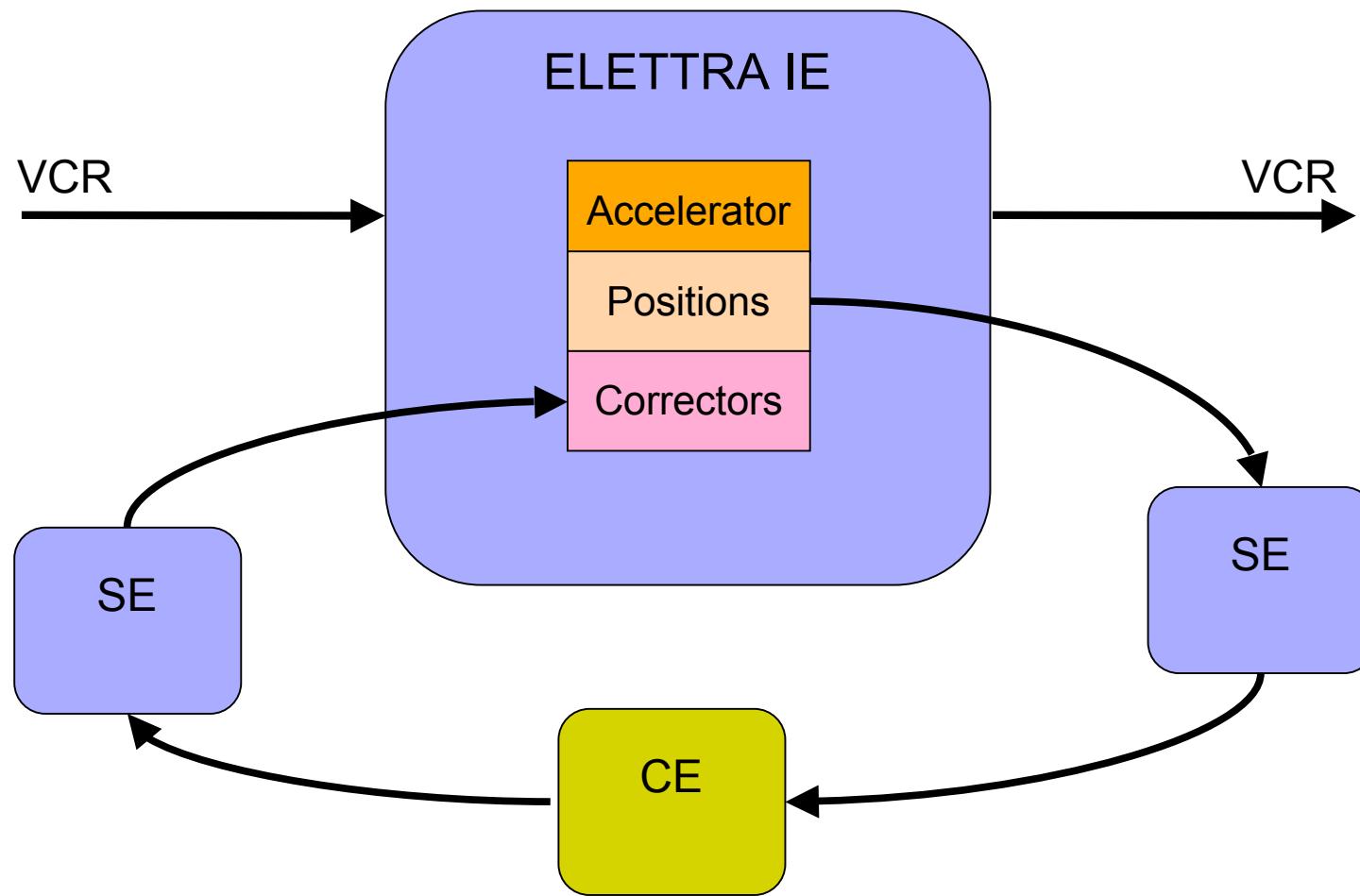


RISGE - OGF21

# Remote Operations of ELETTRA: a feedback via Grid



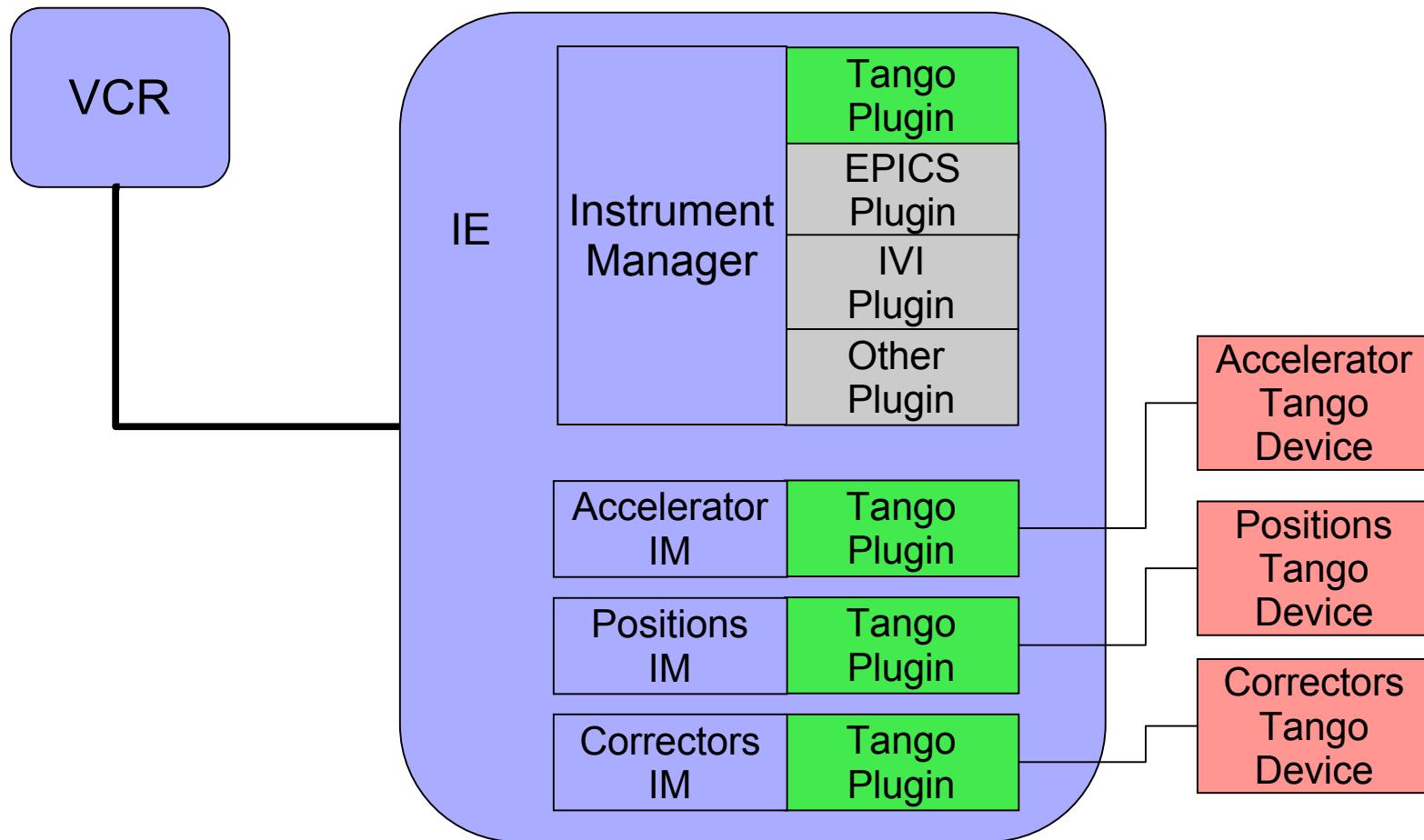
# A feedback via GRID



# Deployment in the ELETTRA Control Room



# Control Systems Plugins: Tango Plugin



# Final remarks

- The GRIDCC project is integrating instruments into the “classic” computational Grids
- The Instrument Element allows:
  - virtualisation of the real instruments
  - support of a variety of instruments from high end to embedded devices
- The Virtual Control Room is a Web-based collaborative environment that interacts with all the components of an Instrument Grid
- Complex collective behaviours integrating instruments, computational and storage resources can be code using BPEL4WS workflows or via CoGRIDCC scripting

# Final Remarks

- In order to guarantee (hard and soft) time constraints:
  - An Agreement Service has been developed to use reservation to guarantee hard time constraints
  - QoS has been added to guarantee soft time constraints. The workflow engine uses these parameters in the matchmaking process. The Instrument Element has been enriched with a Instrument QoS Service (IQS) that provides parameters defining the execution time of the IE methods and the accessibility of the service
- Components of the GRIDCC will be reused in other EU projects (DORII, CYCLOPS, GRIDCC-II, ...)
- More info and demos [www.gridcc.org](http://www.gridcc.org)