



VisIVO, a library and integrated tools for large astrophysical dataset exploration



Ugo Becciani, A. Costa, N. Ersotelos,
M. Krokos, P. Massimino, C. Petta, F. Vitello



**MIUR: Italian Ministry
of Scientific Research**



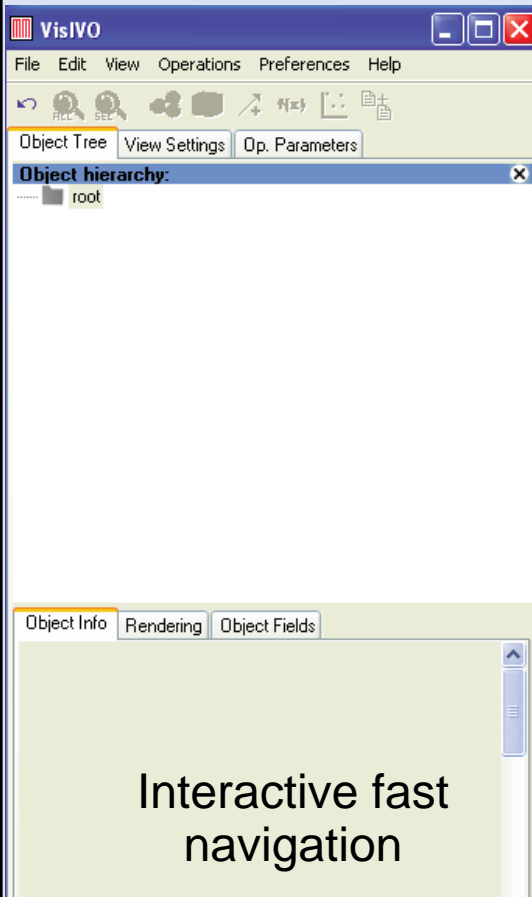
**ADASS XXI Conference
Paris, November 6-10, 2011**

Visualisation interface
to the
Virtual Observatory

VisIVO Server



VisIVO Desktop



VisIVOWeb

VisIVO Server

```
--fformat votable  
/home/user/demo/vizier.xml  
.....  
--x x --y y --z z --color --colortable  
--colorscalar scalar0 --glyphs  
sphere
```

Linux

Mac Osx

Windows



VisIVO C/C++ Library

*Closely integrated, complementary
and independent !*

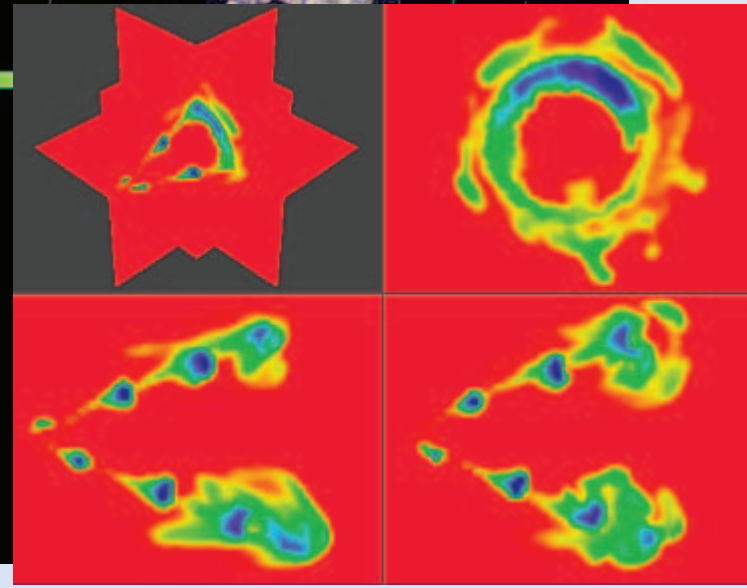
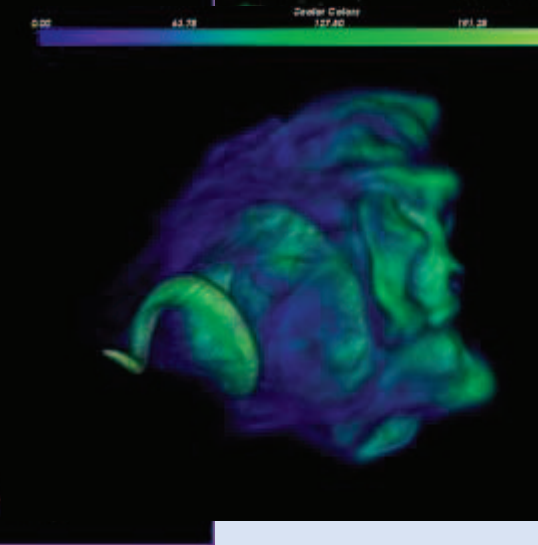
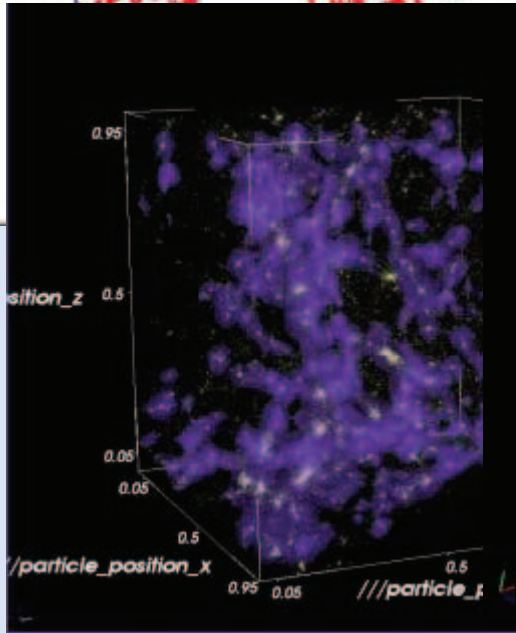
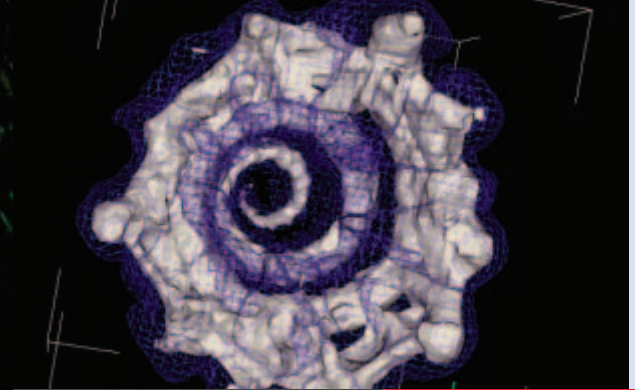
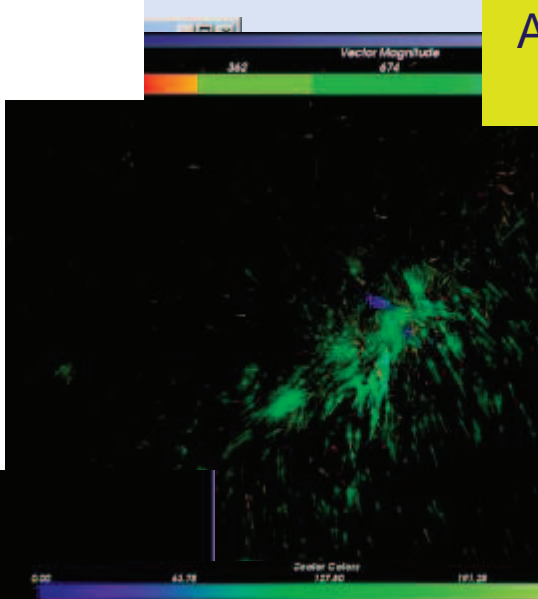
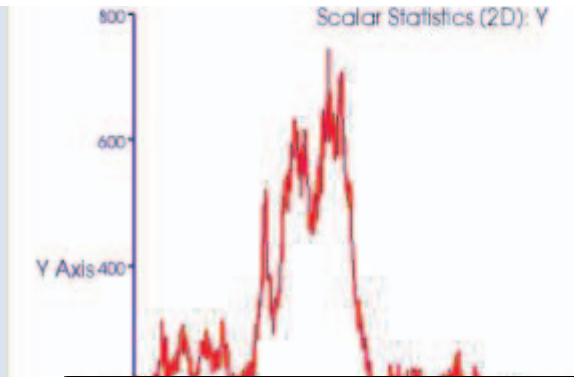
Visualisations

Visualisation Interface
to the
Virtual Observatory

VisIVO Server



Navigation -- Zoom -- Palette --
Algorithms -- Data selection --
Picker op.





VisIVO Server

Basic Architecture

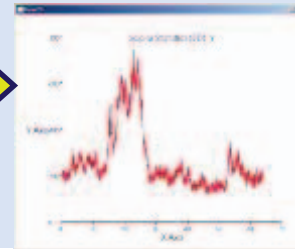
Local or Remote (URL) User Data

VisIVO Importer

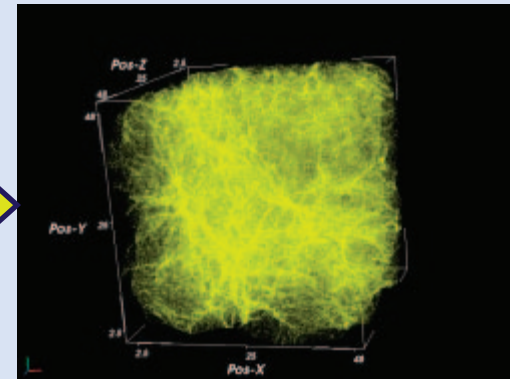
VBT: VisIVO Binary Table

VisIVO Filters

New VBT

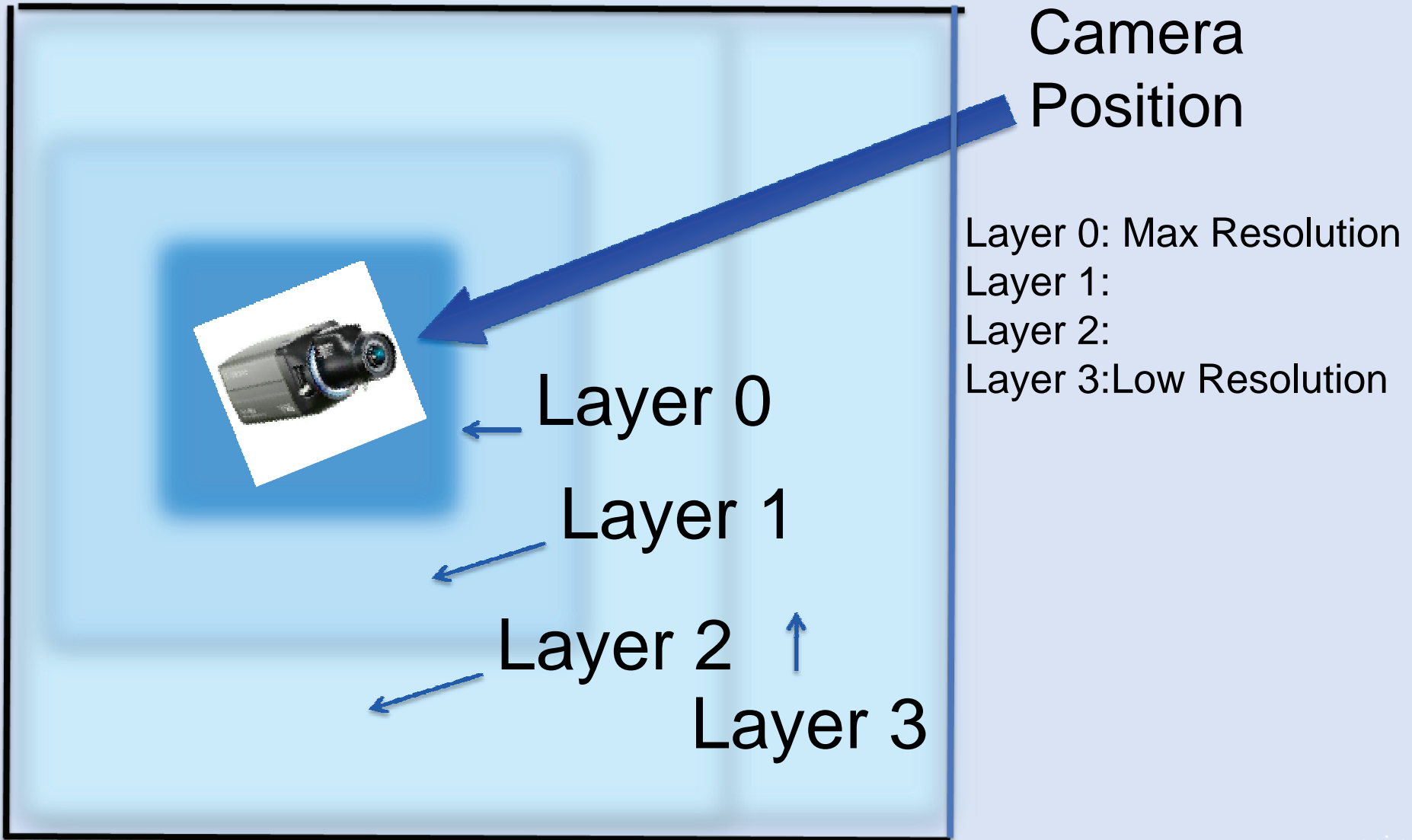


VisIVO Viewer



VisIVO Filters → data exploration

An example: Multi Layer Resolution





VisIVO Viewer

VisIVO Viewer is a command line application that produces 3D images from the binary internal data format table (VBT)

The user must specify three fields of the table for 3D representation.

The user can also specify the following main options:

- Camera (azimuth/elevation or position, zoom)
- Opacity
- Point shape (pixel/sphere, cube, cone etc..)
- Palette
-

OUTPUT: VTK / SPLOTCH



<http://visivoweb.oact.inaf.it>
<http://visivo.port.ac.uk>
<http://palantir7.oats.inaf.it/>

VisIVO Web

Home

Main Menu
Home
Return to Application

Documentation
VisIVO Importer
VisIVO Filters
VisIVO Viewer

Useful Link
• VisIVO

Login
Username

Password

 Remember Me
Log in
Lost Password?
No Account Yet? Create an account

Anonymous Nick

Visivo server

Upload your data View your images Home About Us

Home -> Return to Application

Navigation Tree
View
open all | close all
AnonymousEpa
Demo Data
User Data

ASCI CSV VOTABLE BINARY
FLY FITS GADGET HDF5
RAW GRID RAW BINARY TVO XML CHECK JOBS

ASCI files are expected to be in tabular form. The file can contain N variables organized in columns. Each column represent a different array. Columns are separated by blank characters (space, tab, etc.). In the first row the names of the variables are stored.

ASCI

Table Volume

Description:

Local File Browse...

or Remote File

URL:

URL requests authentication insert username and password of remote server

Username: Password:

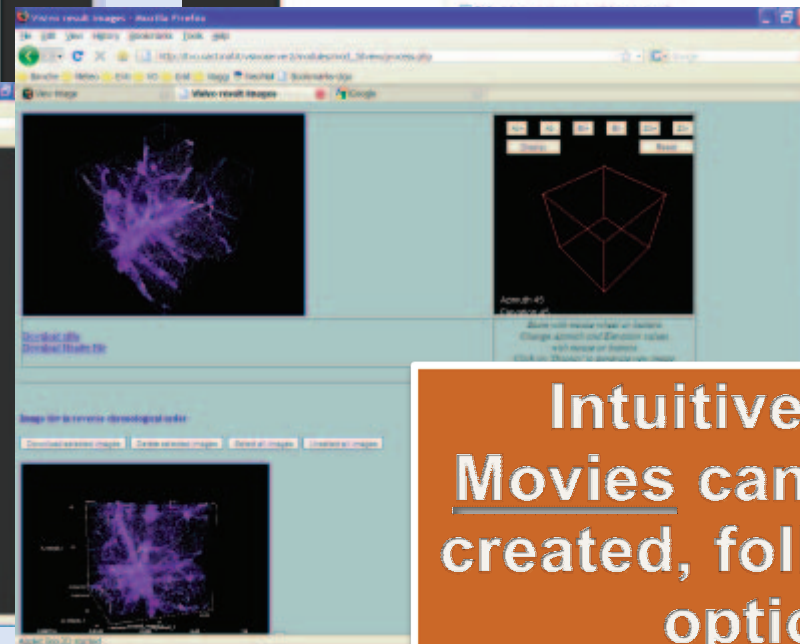
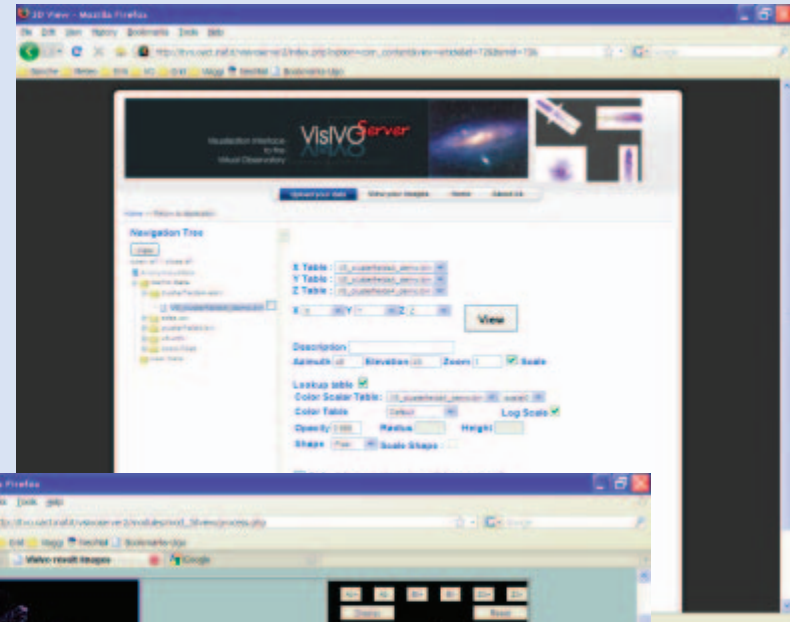
La pagina sul server <http://itvo.oact.inaf.it> ...

! This account has 4 days validity since last access.
At the end of period all data will be lost

OK

Visualisation Interface
to the
Virtual Observatory

VisIVO
Server



Intuitive usage
Movies can be easily
created, following the
options



API VisIVO Library

VisIVOLibrary is a **C/C++ library**

The Library can create images directly from the **binary arrays** of the user program **without having the output files**

The Library also allows the user program to open **local**, **remote** (URL) or **grid catalogue** data files.

WHERE: <http://visivo.oact.inaf.it/>

VisIVO Library Basic concepts

VisIVO Library sets one or more environment variables for each VisIVO component: Importer, Filters and Viewer. The *VisIVO API* is used to set the variable attributes

Environments Declaration

VisIVOImporter *lenvVariable*

VisIVOFilter *FenvVariable*

VisIVOViewer *VenvVariable*

Importer Environment Setting

VI_SetAtt(lenvVariable, int code, char *value)

codes: VI_SET_FFORMAT,
VI_SET_ENDIANISM, VI_SET_FILEPATH
...
values: ascii, bigendian, /home/usermytab,
...

Filter Environment Setting

VF_SetAtt(FenvVariable, int code, char *value)

codes: VF_SET_OPERATION,
VF_SET_OUTVBT, VF_SET_FIELDS ...

values: randomizer, /home/user/newtab, X Y Z
...

Viewer Environment Setting

VV_SetAtt(VenvVariable, int code, char *value)

codes: VV_SET_CAMERA
VV_SET_COLORTABLE, VV_SET_OUT ...

values: camerapos, mypalette,
/home/user/myImages ...



VisIVO Library Basic Concepts

After the environments variables setting, the actions are executed by calling the specific VisIVO module: e.g. VV_View, using the envV variable setting, can create a very complex movie.

Blocking functions

```
int VI_Import(VisIVOImporter *envI)
int VF_Filter(VisIVOFilter *envF)
int VV_View(VisIVOViewer *envV)
```

NON Blocking functions

```
int VA_Import(VisIVOImporter *envI, VisIVOAsynchId *idI)
int VA_Filter(VisIVOFilter *envF, VisIVOAsynchId *idF)
int VA_Viewer(VisIVOFilter *envV, VisIVOAsynchId *idV)
```

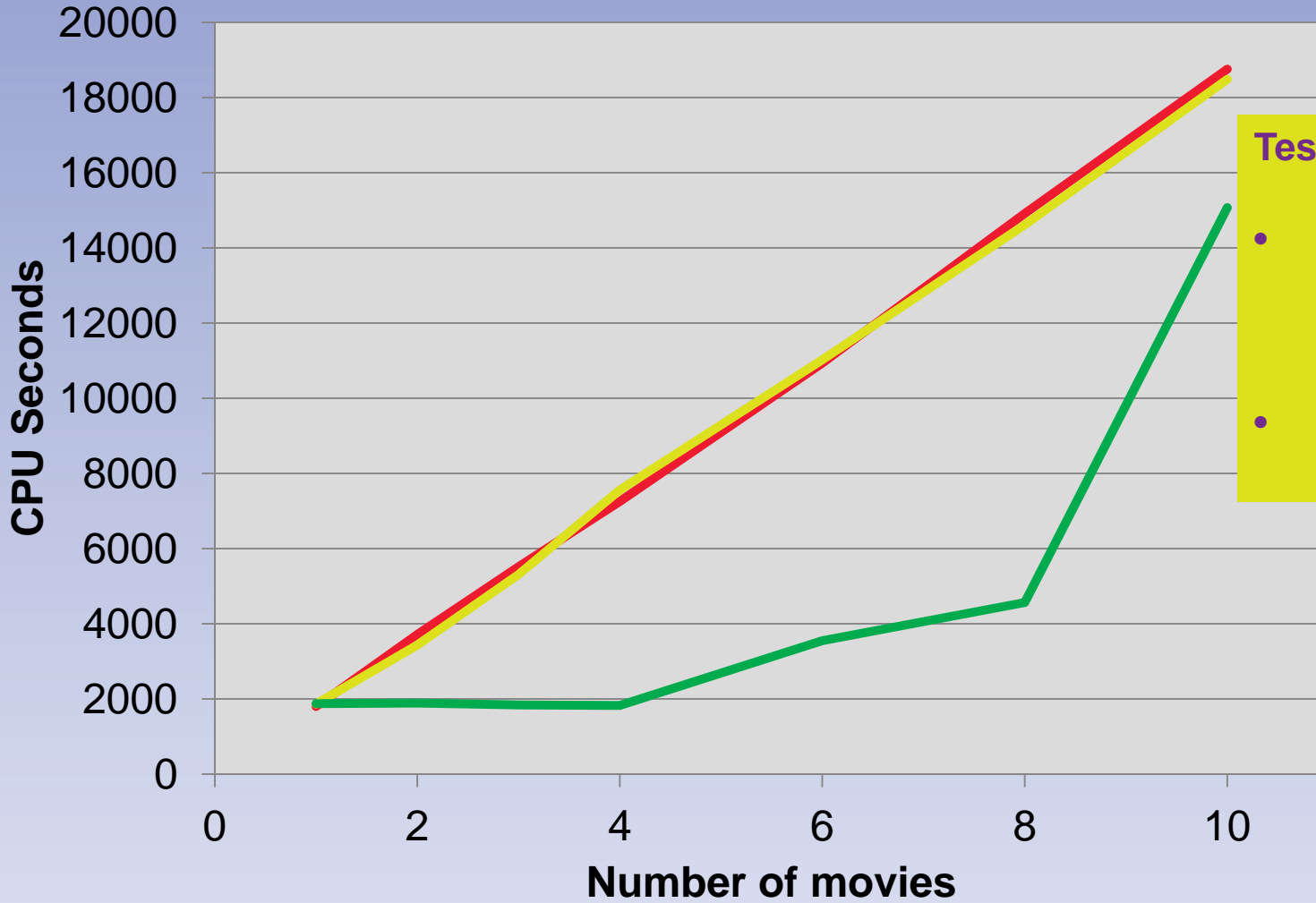


VisIVO Library Basic Concepts

- The NON Blocking functions execute threads or separate processes
- VTK (graphic library used in VisIVO) is not fully thread-safe: the threads are executed in sequence of calls.
- However the calling program can continue the execution without waiting for completion.
- Processes are executed in parallel.



Testing VisIVO Library



Testing Node :

- dual processor AMD Opteron 2.6 GHz (dual core)
- 8 GB di RAM

— Blocking — Threads — Processes



Movie obtained using VisIVO API and Splotch during a post processing phase. We started from 1 MML particles on 80 Mpc cosmological simulation and we built the dynamic evolution of a sub-box of 20 Mpc. This movie displays the evolution of a big cluster formed by the simulation.



VisIVO @ Future

EDGI project (<http://edgi-project.eu/>)

→ Porting on DG Infrastructure

EGI-Inspire (<http://www.egi.eu/projects/egi-inspire/>)

→ Porting on gLite

→ MPI and CUDA on the grid

SCI-BUS (<http://www.sci-bus.eu/>)

→ VisIVO Portlet Liferay

→ VisIVO iPhone

Nuclear Portal (MIUR)

→ Nuclear Screening Portal System Designed To
Identify the Contraband of Nuclear Devices and Materials (**P115**)

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VisIVO @ EDGI

Subcontract for VisIVO porting on DG, in collaboration with University of Westminster and University of Portsmouth (UK)

The screenshot shows the INTECH website interface. At the top, there is a logo for 'intech science centre | planetarium' and three small images with captions: 'Family day out', 'All-weather site', and 'Holiday activities'. Below this is a navigation bar with tabs for 'Visitor Info', 'Education', 'Planetarium', 'Corporate', 'Groups', and 'STEMPOINT'. The main content area is divided into two columns. The left column has a green sidebar with a 'Return Home' link and a list of links: 'Visitor Admission Prices', 'Map, Directions & Public Transport', 'Events', 'About Gift Aid', 'About Us', 'Birthday Parties', 'Contact Details', 'Frequently Asked Questions (FAQ)', 'INTECH supporters', and 'Visitor Facilities'. At the bottom of the sidebar is a 'Site Tools' section with links for 'Print this page' and 'Site map'. The right column is titled 'Contact Details' and lists contact information: 'By Post' (INTECH, Telegraph Way, Morn Hill, Winchester, Hampshire, SO21 1HZ), 'By Telephone' (General Enquiries: 01962 863791, School Bookings: 01962 891900, Corporate Hire: 01962 891904), 'By Fax' (General: 01962 868524), and 'By E-mail' (General: htct@intech-uk.com). It also notes 'Last Modified: 24/08/2010'.

VisIVO Corner

Prizes for using
VisIVO on DG



2 iPods

80,000 Visitors each year



VisIVO @ EGI-Inspire

Services for Heavy User Communities

- VisIVO Library porting on gLite → DONE
- VisIVO using gLite grid catalogue → DONE
- VisIVO Web portal for gLite → In progress (80% completed)
- VisIVO MPI version for gLite → In progress (40% completed)
- VisIVO CUDA version for gLite → In progress (60% completed)

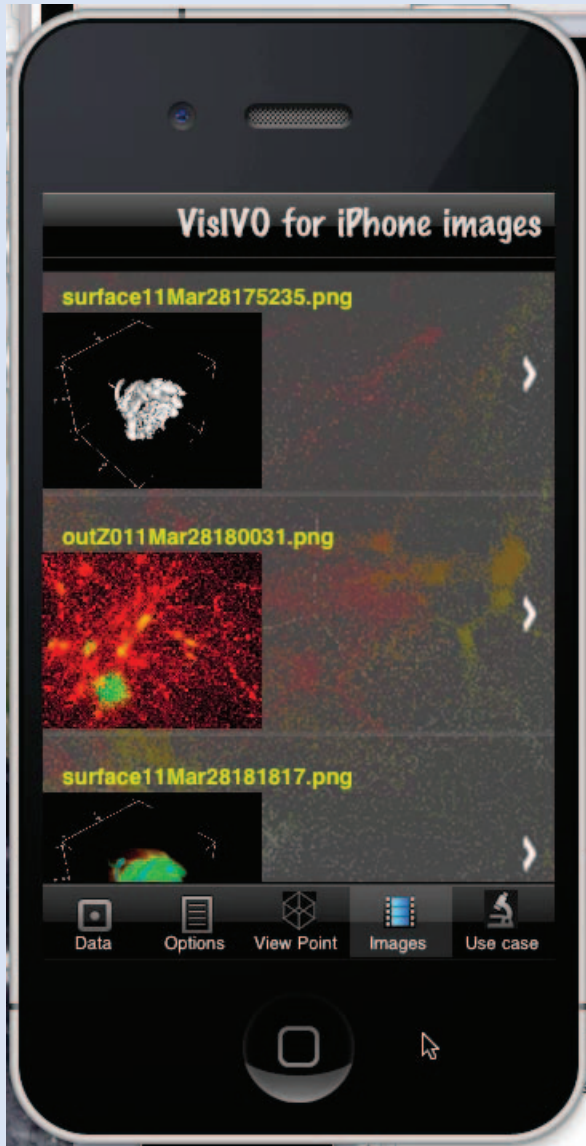


VisIVO @ SCI-BUS

- Creation of the portlet with Liferay and gUse/WS-PGrade to extend the VisIVO portal, and the capability to use DCI (Grid, HPC, cloud computing)
- Creation of workflows to explore the dataset and to create movies
- VisIVO iPhone application development



VisIVO iPhone Application



IMAGES AND MOVIES

Movies are shown inside the same area of the image.

The iPhone zoom can be used

The movie is downloaded using the network (it is stored in the server)

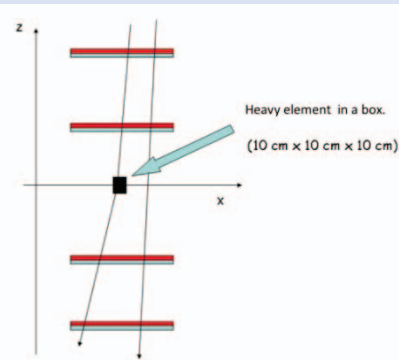
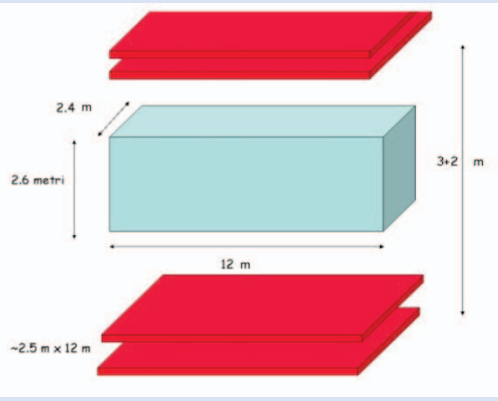
Images and movies can also be locally downloaded.



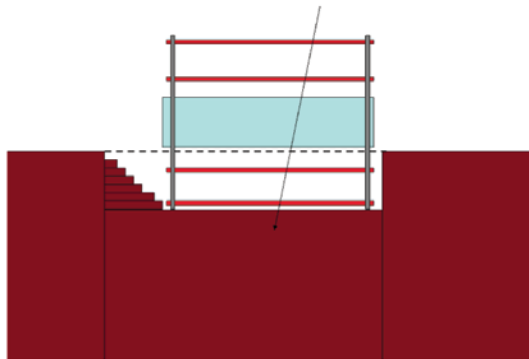
VisIVO @ Nuclear Portal

Industrial project → transfer of technology
(see Poster 115 - C. Petta et al.)

Prototype → muon track deviation



Compute: coordinates and deviation angle that the muon track has when high-Z material element is in the path.



Ugo Becciani – Vilnius

