



# CROSSGRID

Vilnius, 6 October 2004

**CrossGrid Project Presentation**

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**CROSSGRID**

# CrossGrid



Information Society  
Technologies

**IST-2001-32243**

**March 1, 2002 – February 28, 2005**



# **CrossGrid Project initiative**

**To develop, implement and exploit  
new Grid services and tools  
for supporting interactive compute-  
and data-intensive applications**



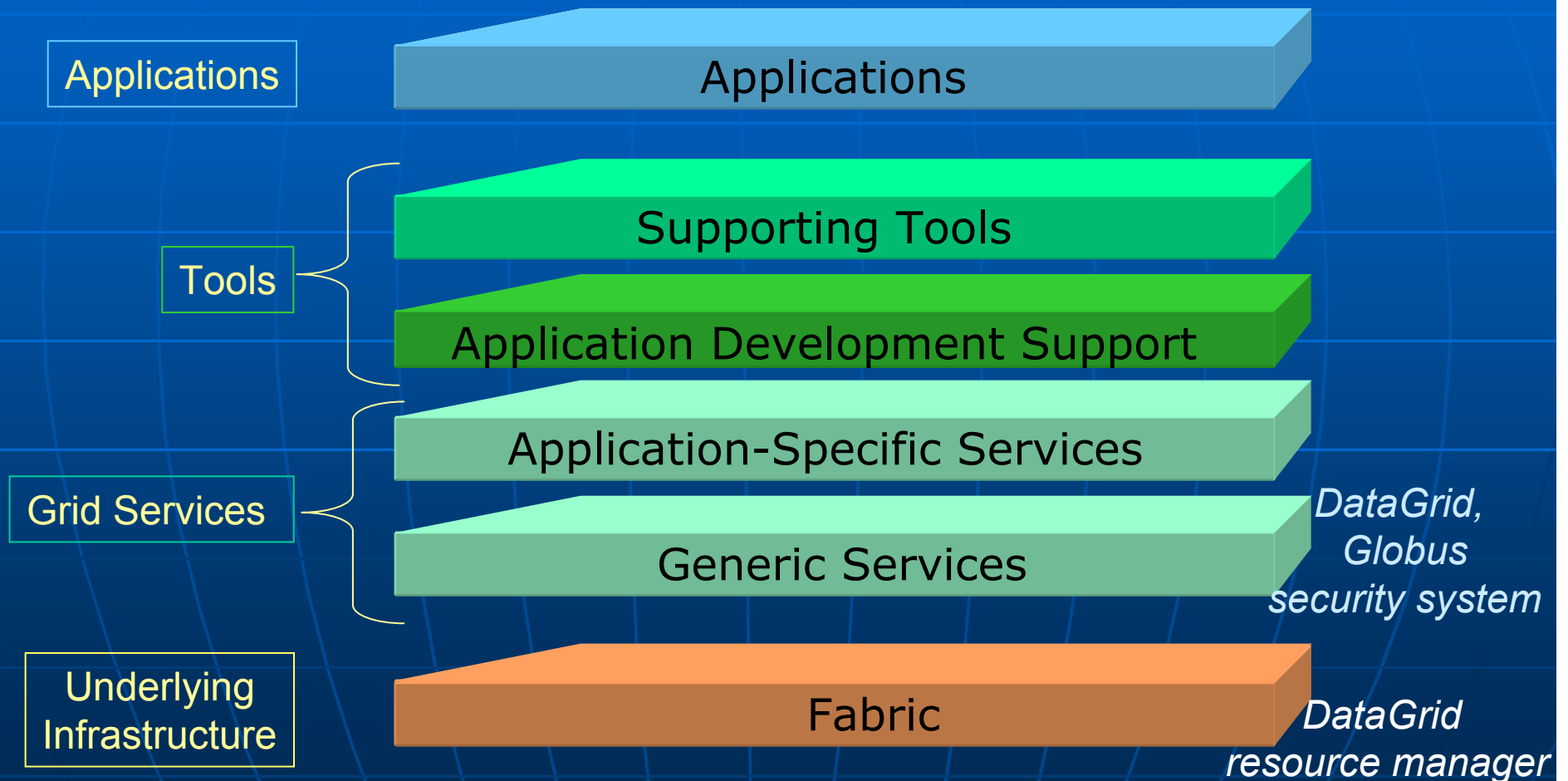
# CrossGrid Partners

21 organizations from  
11 EU countries





# Layered Structure of the CrossGrid Architecture

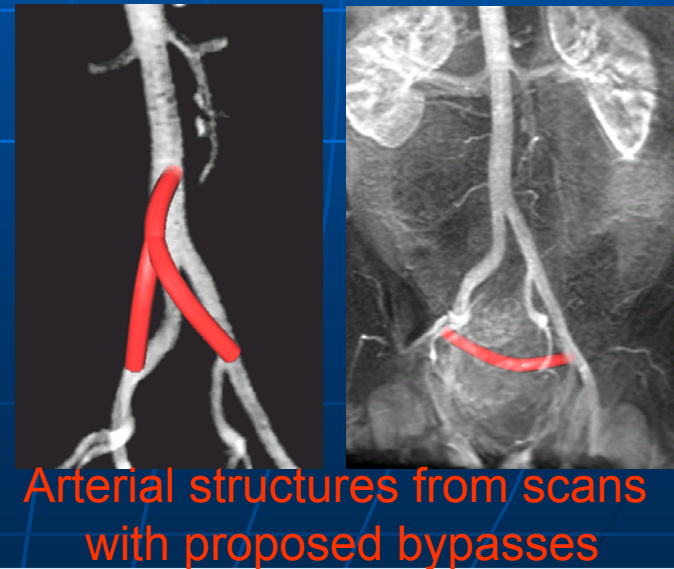




# CrossGrid Applications

## Interactive simulation and visualization in biomedicine

A prototype system for pre-treatment planning in vascular interventional and surgical procedures is included as an application of GRID computing in the CrossGrid project.

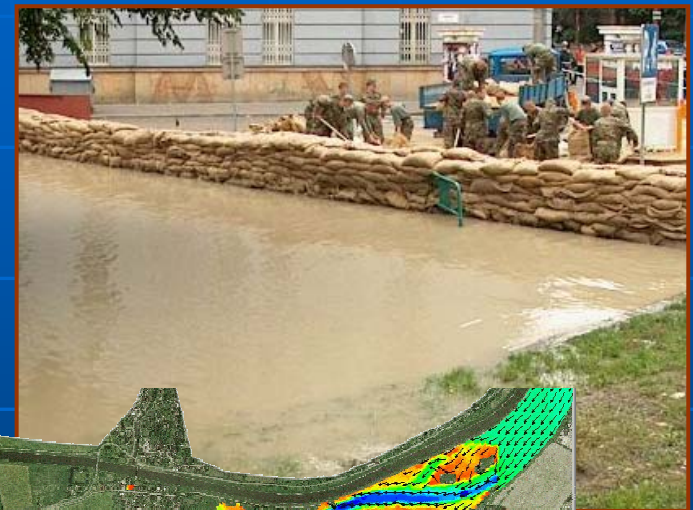




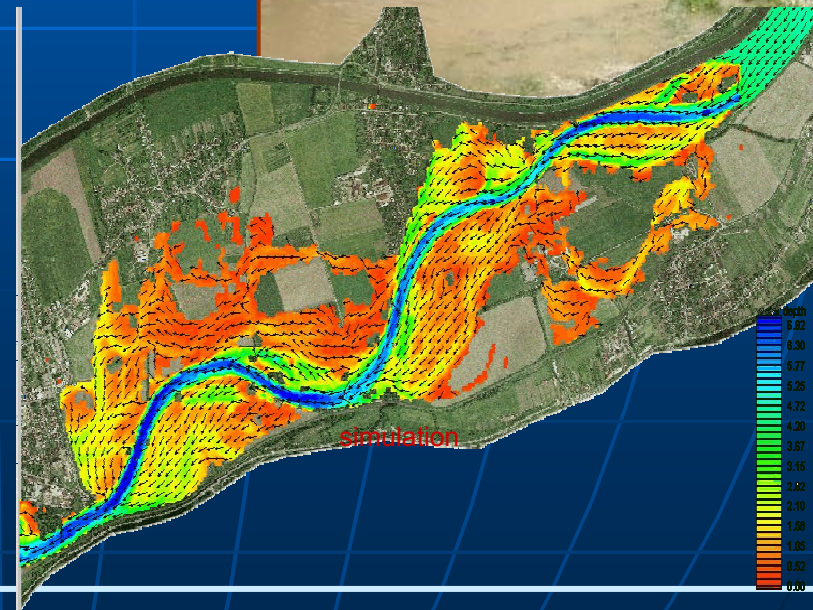
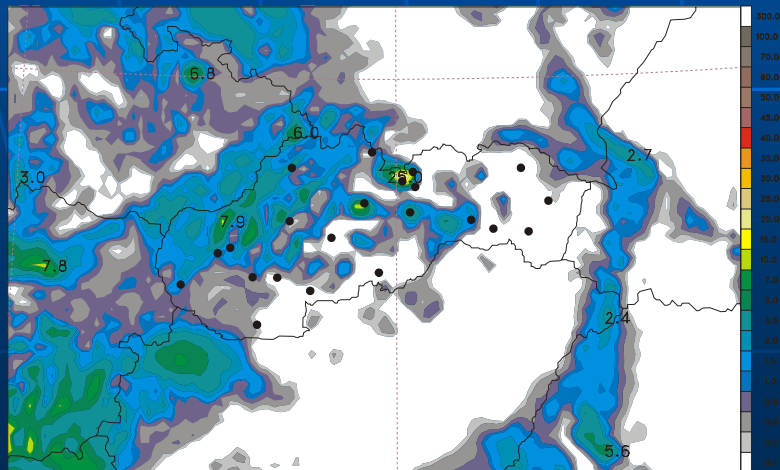
# CrossGrid Applications

## Flooding crisis team decision support system

The system should result in improvements in both the long-term and the short-term protection against floods caused by severe rainfall and snow melts that frequently plague large areas of Europe and often affect several countries simultaneously.



Base 02/05/13 00UTC  
Valid 02/05/13 12UTC 12 ZRAZKY KUMULOVANE [mm]

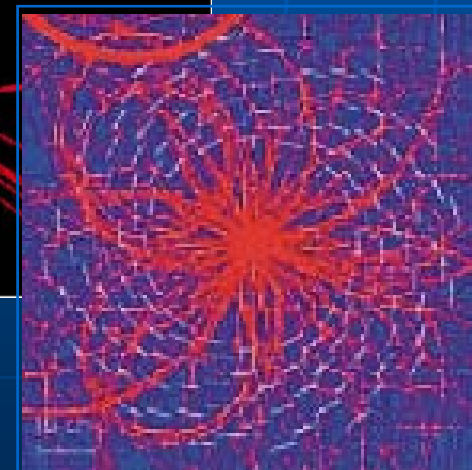
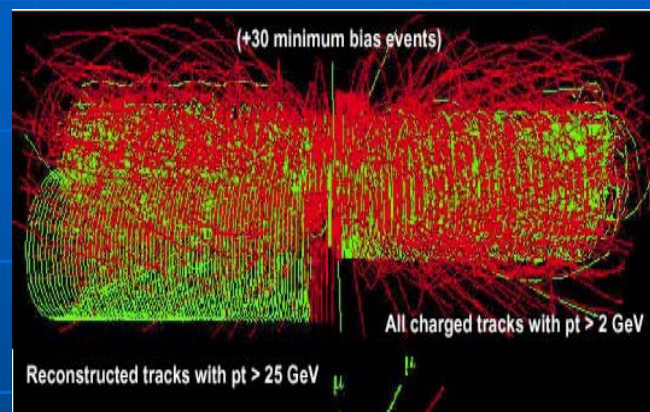




# CrossGrid Applications

## Distributed data analysis in High Energy Physics

Powerful interactive applications will be used by the physicists operating the next Large Hadron Collider at CERN, in search for fundamental new particles, like the Higgs Boson.



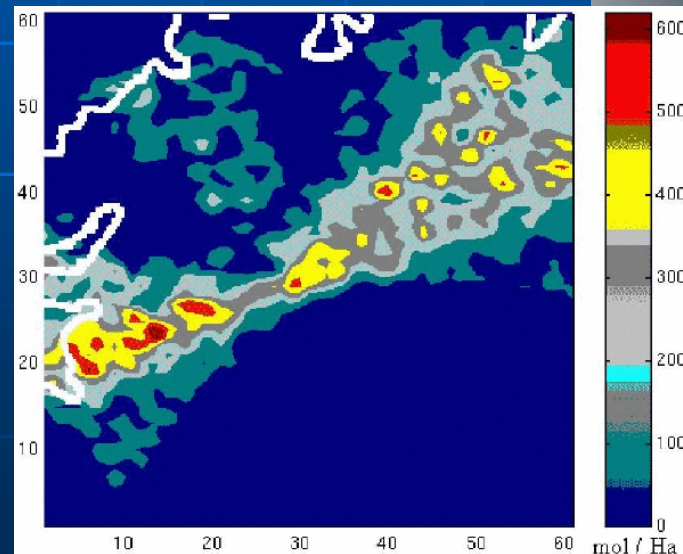
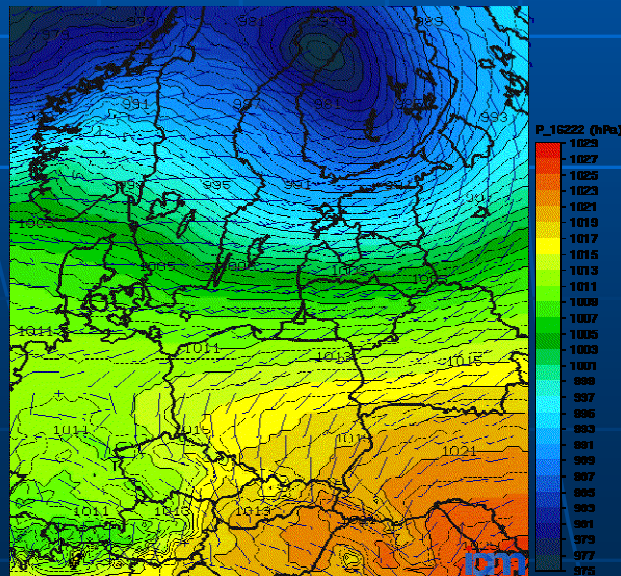
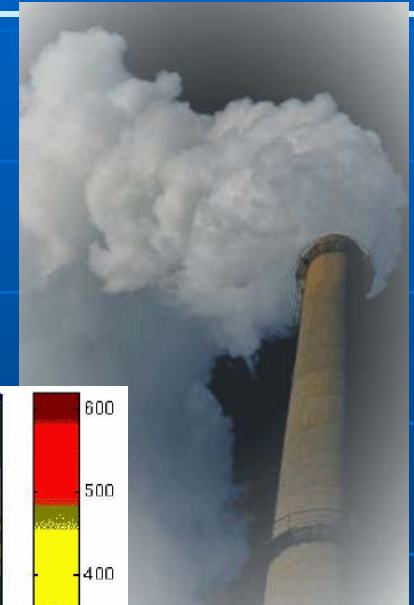




# CrossGrid Applications

## Weather forecasting and air pollution modelling

The system will integrate advanced communication techniques, allowing air pollution and maritime experts to run simulations with different parameters and analyze the impact of weather conditions on air and sea pollution.





# CrossGrid Tools

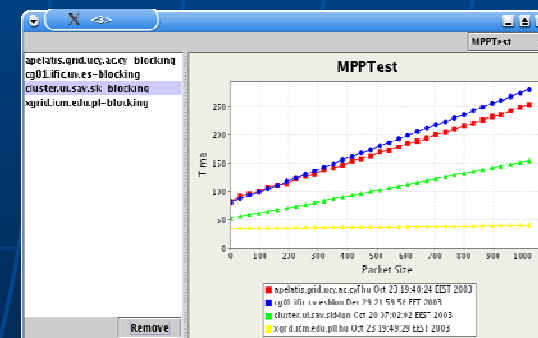
## MPI Verification

MARMOT – a tool for automatic verification of MPI code submitted for processing in a Grid environment (enables quick elimination of bugs without wasting valuable resources and computing time). Detects anomalous situations, including deadlocks, race conditions and inefficient resource usage.



## Metrics and benchmarks

GridBench – a tool for evaluating the performance of Grids and Grid resources. It facilitates easy definition of parameterized executions of benchmarks on the Grid, while at the same time allowing for archival and retrieval of results and the creation of customized charts from the results

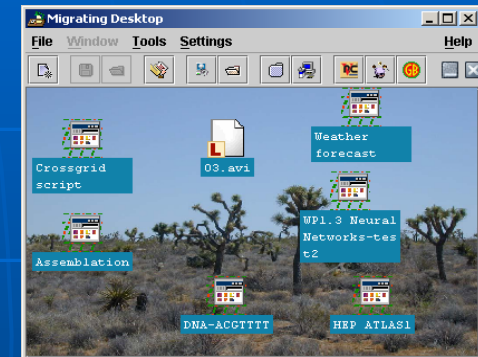




# CrossGrid Services

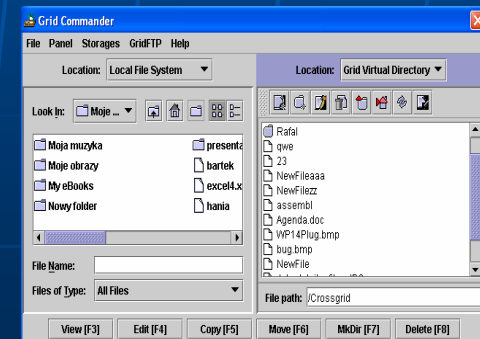
## Portal and Roaming Access

Access to Grid resources from any entry point, using a simple Web browser. The CrossGrid Portal and Migrating Desktop offer user-friendly interfaces for all Grid-related operations, from authentication, through job preparation to execution monitoring and result download.



## Grid Commander

A tool (integrated with the Migrating Desktop) for easy manipulation of files stored in the Grid, built in the widely-accepted „commander” fashion. Supports all types of storage resources through GridFTP.

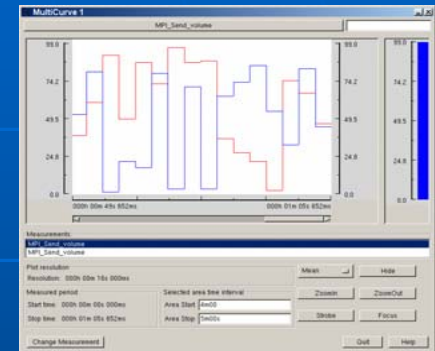




# CrossGrid Services

## Grid Monitoring

OCM-G and G-PM – a set of services for monitoring individual Grid building blocks (i.e. computing/storage nodes), in a producer-consumer fashion. The monitoring system is easily adaptable for use in debuggers, visualizers etc.



## Data Access Optimization

A unified data access layer (UDAL), based on collaboration with the European DataGrid (EDG) and built around a connection between EDG Reptor and Data Access Estimators located in each CrossGrid storage node.





# International Testbed Organization

CG testbed sites involve:

16 partners from  
9 countries



Central services:  
LIP, Lisbon

The central CVS  
repository:  
Research Center  
of Karlsruhe



# Project Phases

**first development phase:**

design, initial prototypes, refinement of requirements

**third development phase:**

complete integration, final versions of software components

Months:



requirements definition and merging

**second development phase:**

integration of components, additional prototypes

**final phase:**

demonstration and documentation



**Applications**

- Flood Simulation
- Meteo/ Pollution
- Particle Physics
- Medical Support**

**Tools**

- Performance Prediction
- Benchmarks
- Migrating Desktop
- Portal
- Performance Analysis
- MPI Verification

**Services**

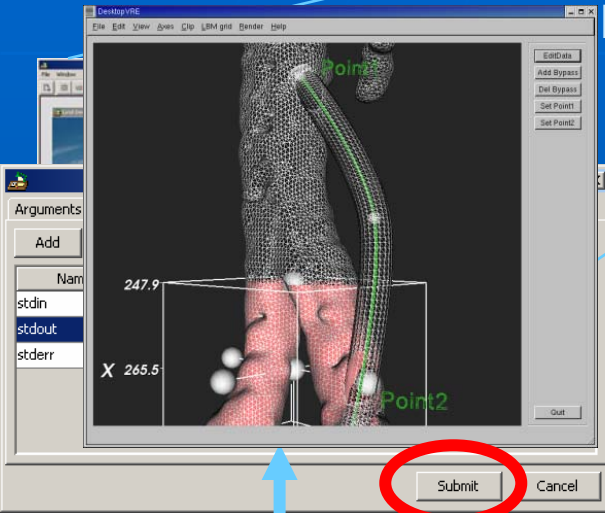
- Infrastructure Monitoring
- Post-processing
- Network Monitoring
- Scheduler
- DataGrid
- Roaming Access Server
- Application Monitoring
- MPI Library
- Visualization Kernel
- Data Access
- Globus Toolkit

**Testbed**

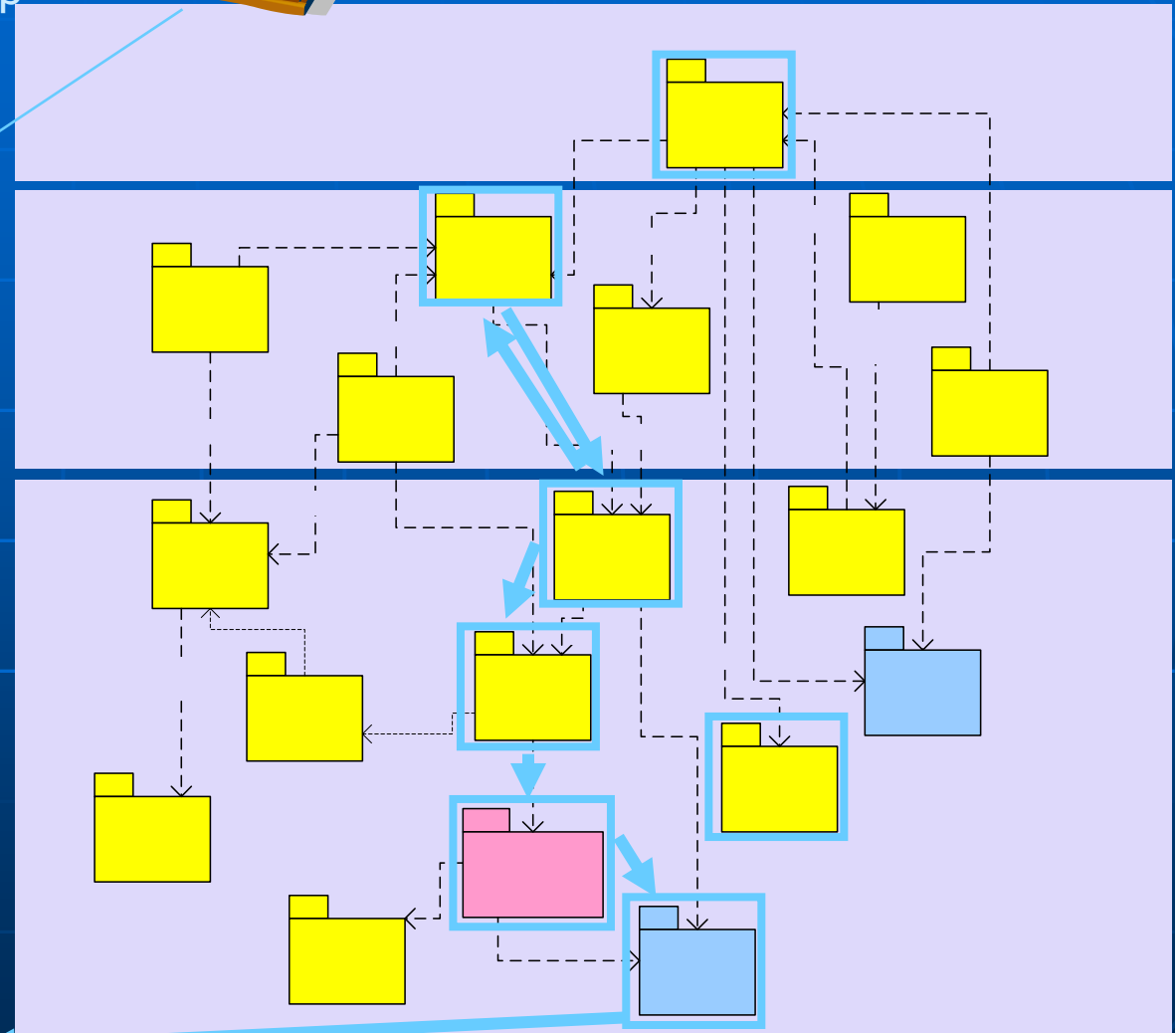
- 16 sites
- 9 countries
- over 200 CPUs
- 4 TB of storage



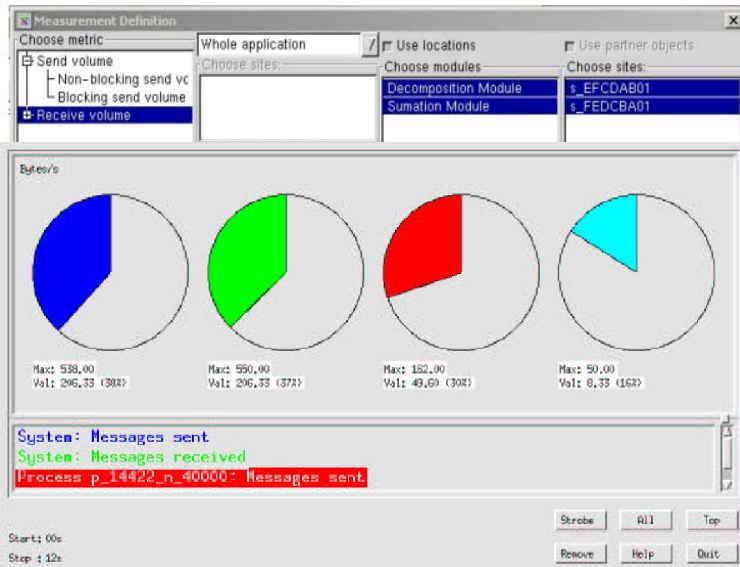
Migrating Desktop



Simulation Output

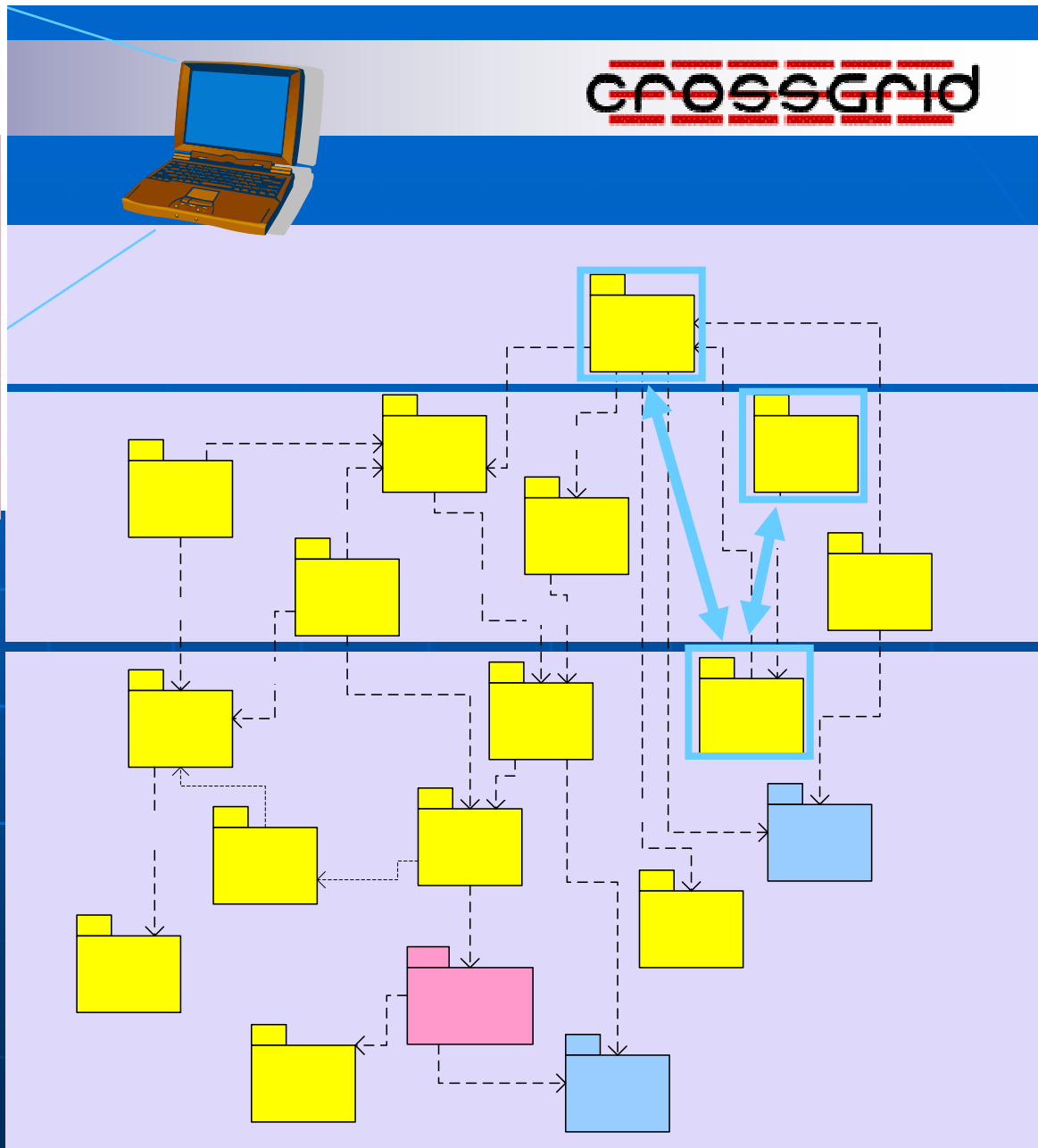
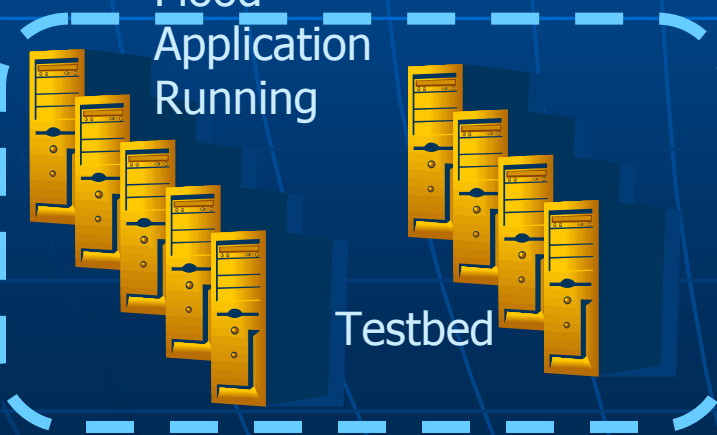






## G-PM Performance Analysis Tool

Parallel Flood Application Running



```
8 rank 1 performs MPI_Recv
8 Rank 0 is pending!
8 Rank 1 is pending!
```

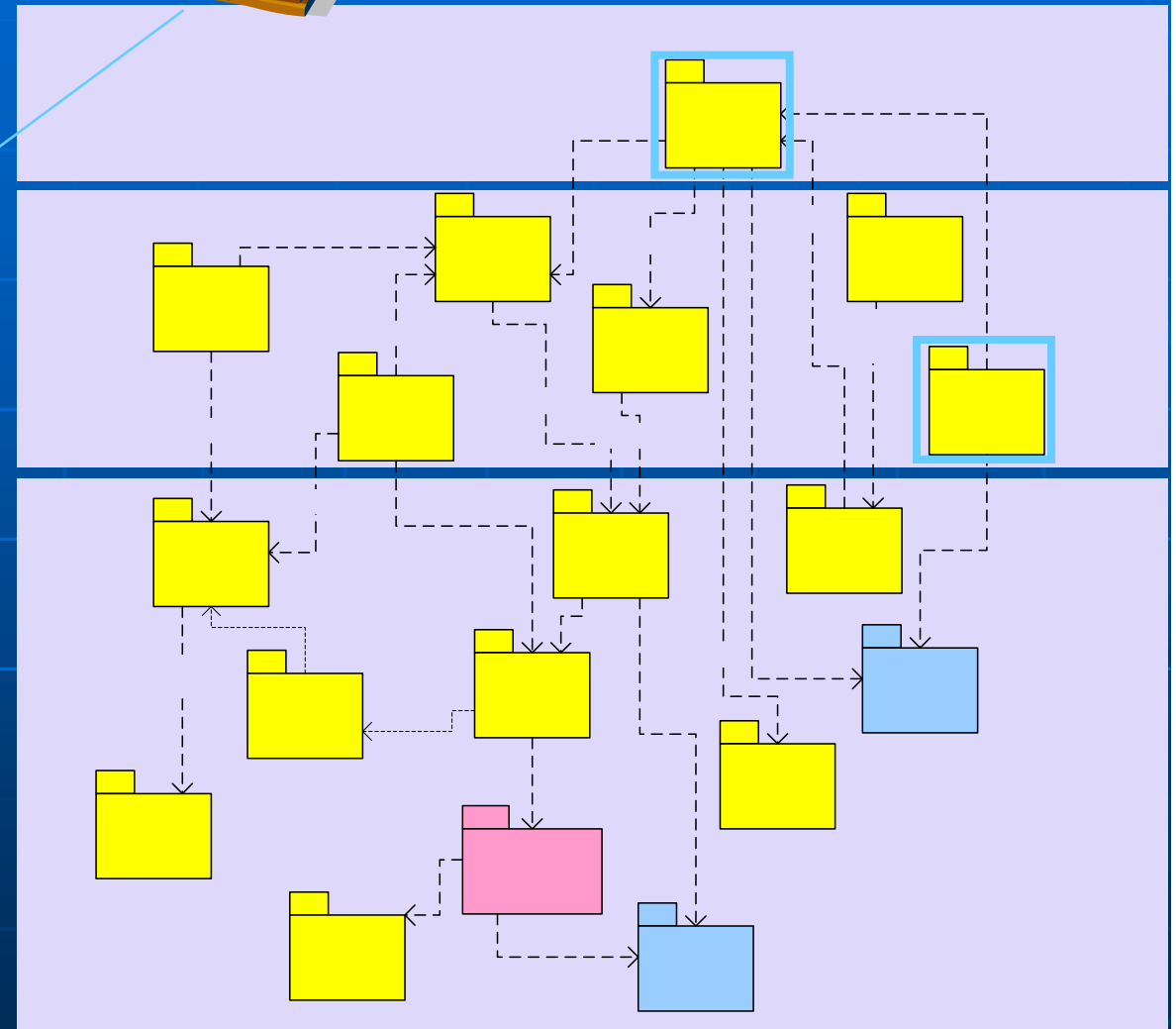
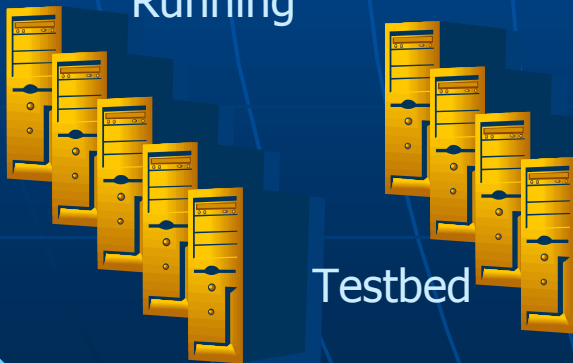
**WARNING: deadlock detected**

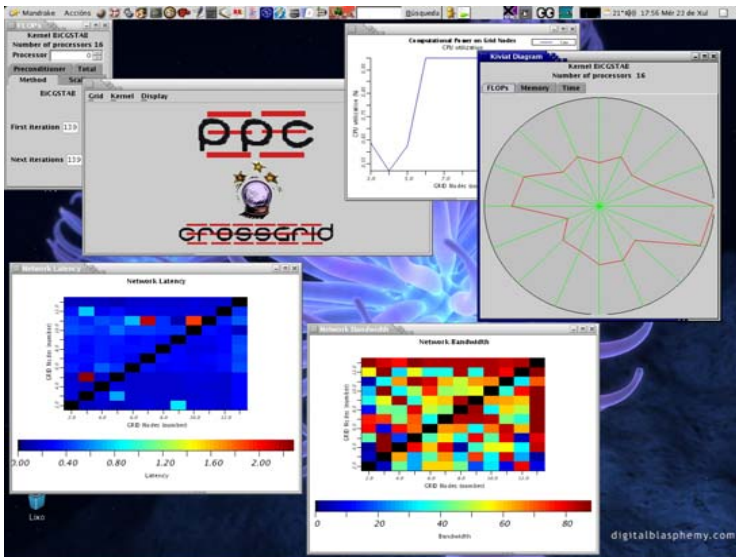
**CROSSGRID**



MARMOT MPI  
Verification Tool

Parallel Flood  
Application  
Running





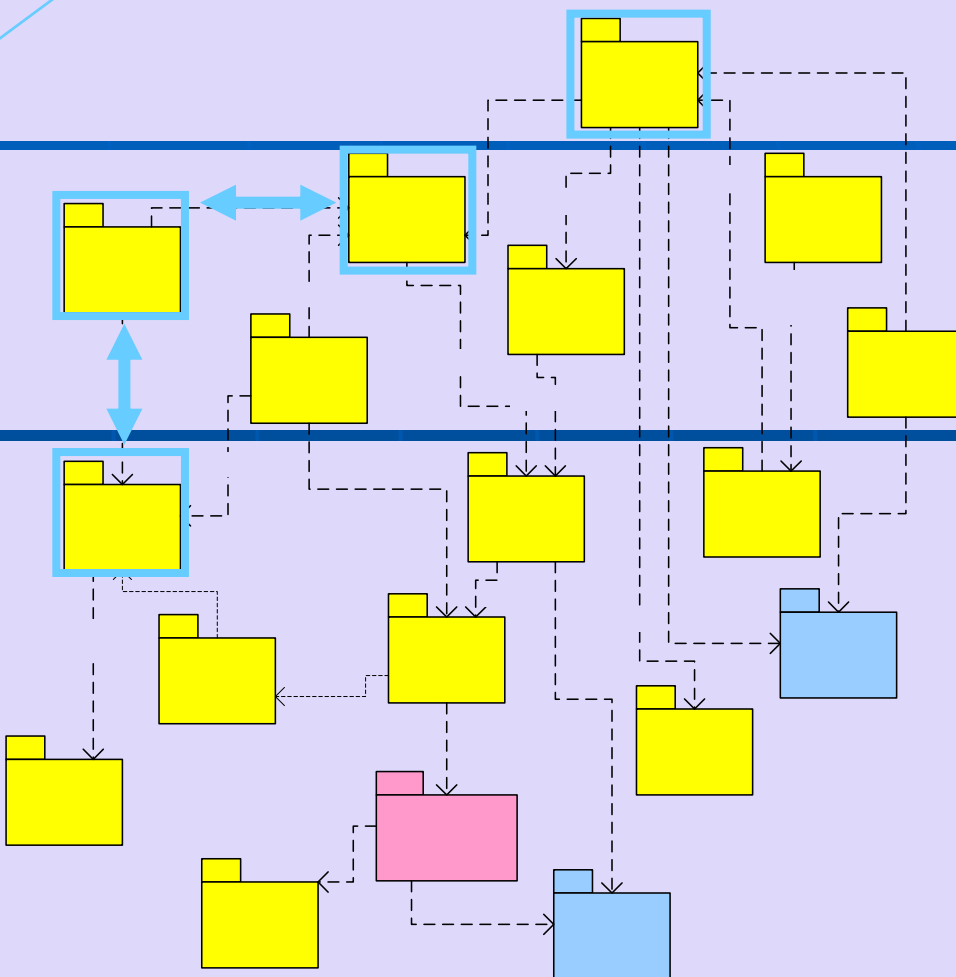
Performance  
Prediction Tool +  
JIMS Infrastructure  
Monitoring

Parallel Meteo  
Application  
Running



Testbed

**CROSSGRID**



Query

```
SELECT Ethernet.packetid, Ethernet.source_address, Ethernet.destination_address FROM Ethernet WHERE Ethernet.field = 0
```

timestamp seconds	capture length	actual length	destination address	source address	packet type
20.20722925484	284	224	00:20:41:1c:01:7b	00:07:41:37:40:00	0x0000

Packet Ethernet

ip version	header length	service type	packet length	datagram id	control flags	fragment offset	time to live
4	5	0x00	1300	0x1904	0x04	0	32

IP4

source port	destination port	sequence number	acknowledge number	header length	reserved
3254	3205	2725957346	3221680354	0	0

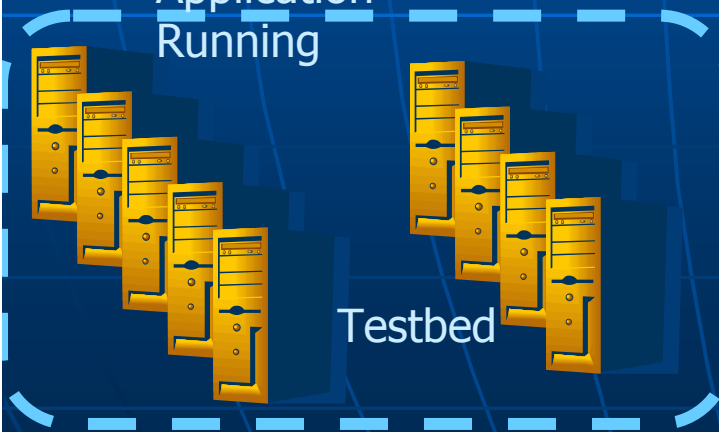
TCP

Show/Hide File File Id: 0 Packet Id: 10 View < Previous Next >

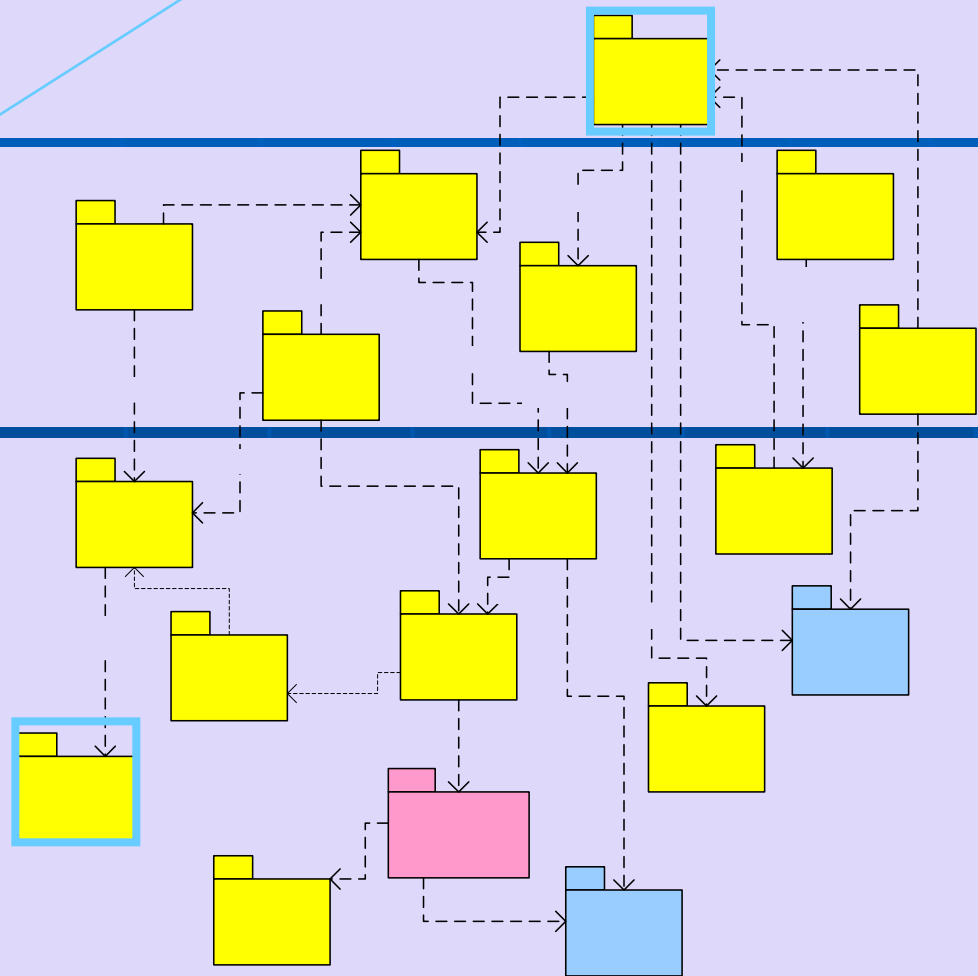
## SANTA-G Network Packets Monitoring

Parallel Application Running

Testbed

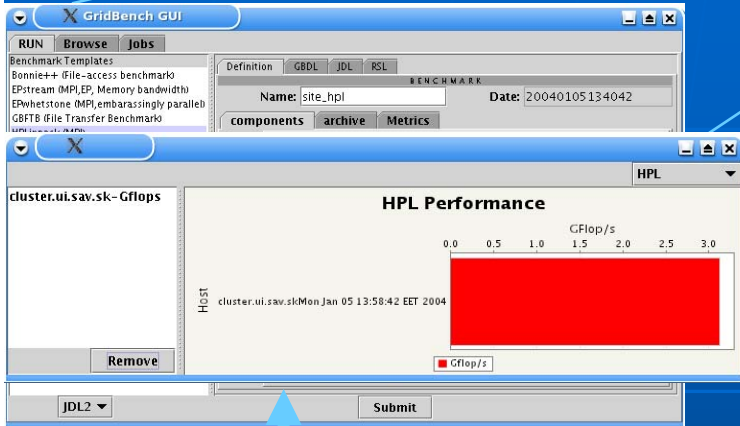


Site Administrator





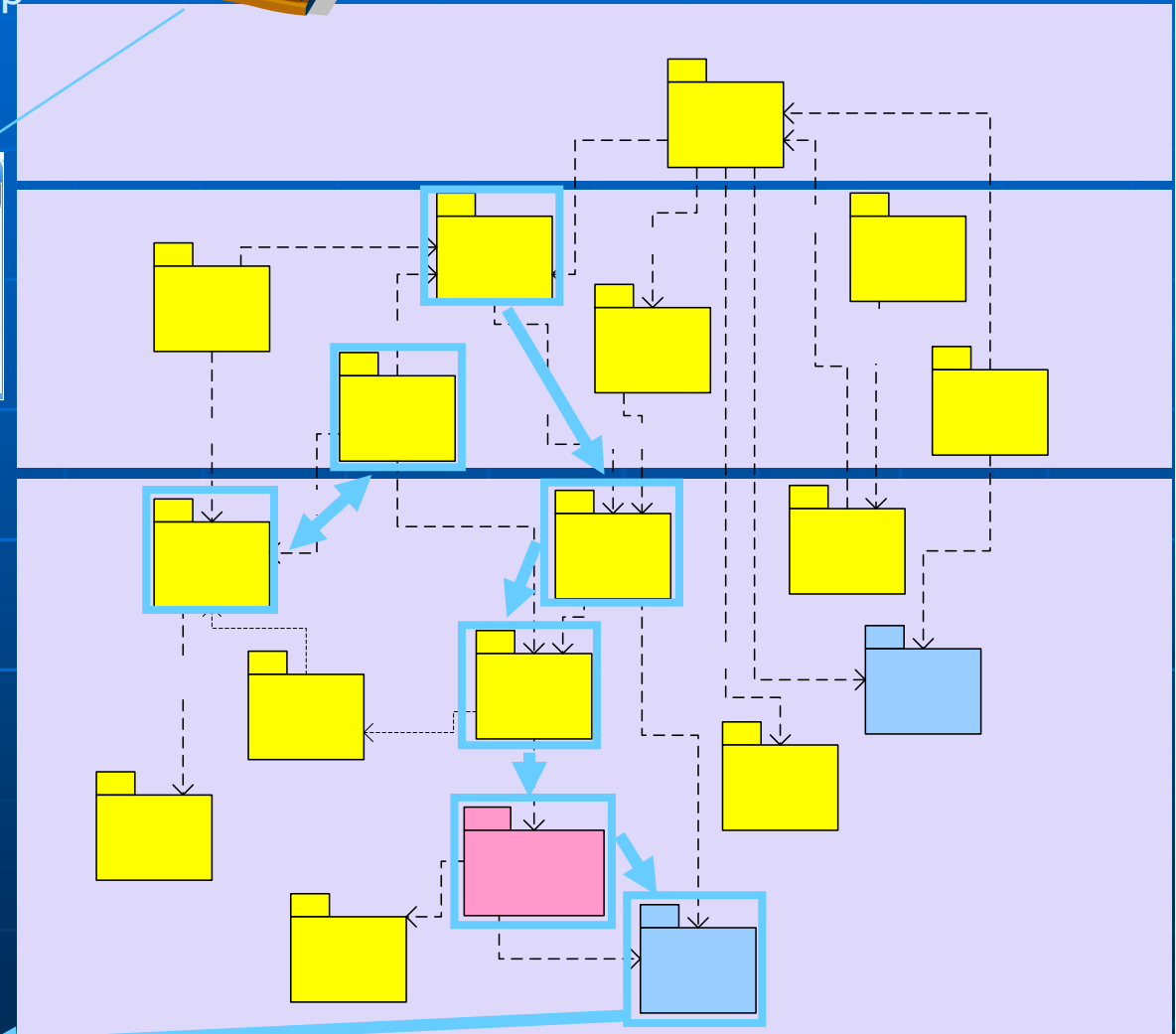
Migrating  
Desktop



Benchmark  
Results



Testbed





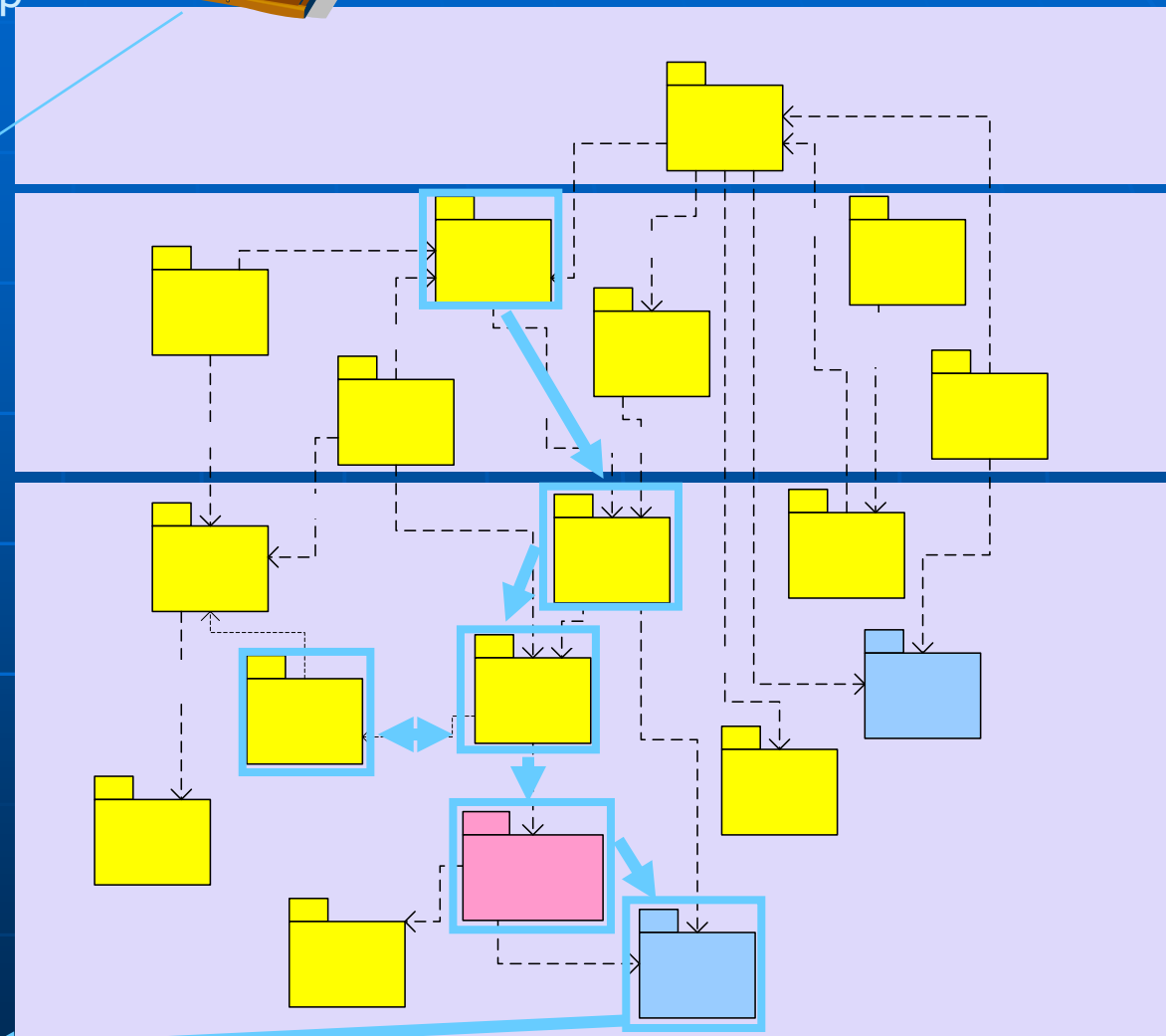
Migrating Desktop



Postprocessing + Scheduler



Testbed

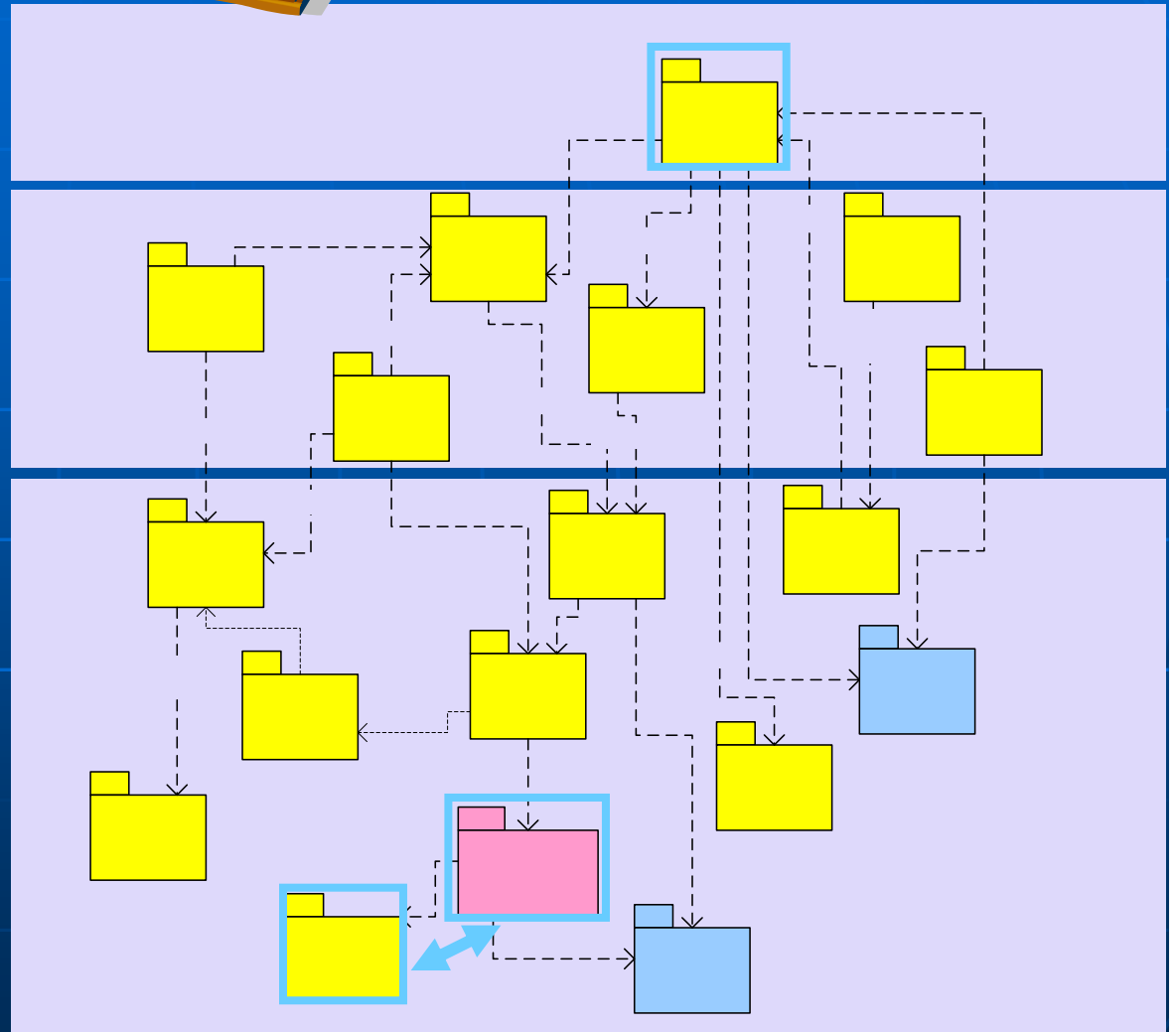




Data Access  
Optimization



Testbed





# Collaboration with Other Grid Projects

- **GRIDSTART**
  - Active participation in Technical Board meetings
  - Conferences: Cracow Grid Workshop, AcrossGrids – to stimulate exchange of information and personal contacts
- **GLOBUS**
  - Regular contacts
  - CrossGrid uses cases for OGSA
- **GridLab**
  - Development of grid applications
  - Application monitoring
  - Portals, data access, security
  - Participation in joint testbeds
- **EuroGrid and GRIP**
  - Regular contacts and exchange of information
- **EGEE**
  - Joint middleware deployment, testbed compatibility (LHC-2)
- **CoreGrid and K-WfGrid**
  - Further development and deployment of selected CrossGrid components







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