VLAM-G: A Grid-based Virtual Laboratory

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Outline

- Introduction
- Objectives
- VLAM-G Components
- VLAM-G Experiments
- VLAM-G RunTime System
- Conclusions

VLAM-G
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A collaborative analysis environment for applied experimental science

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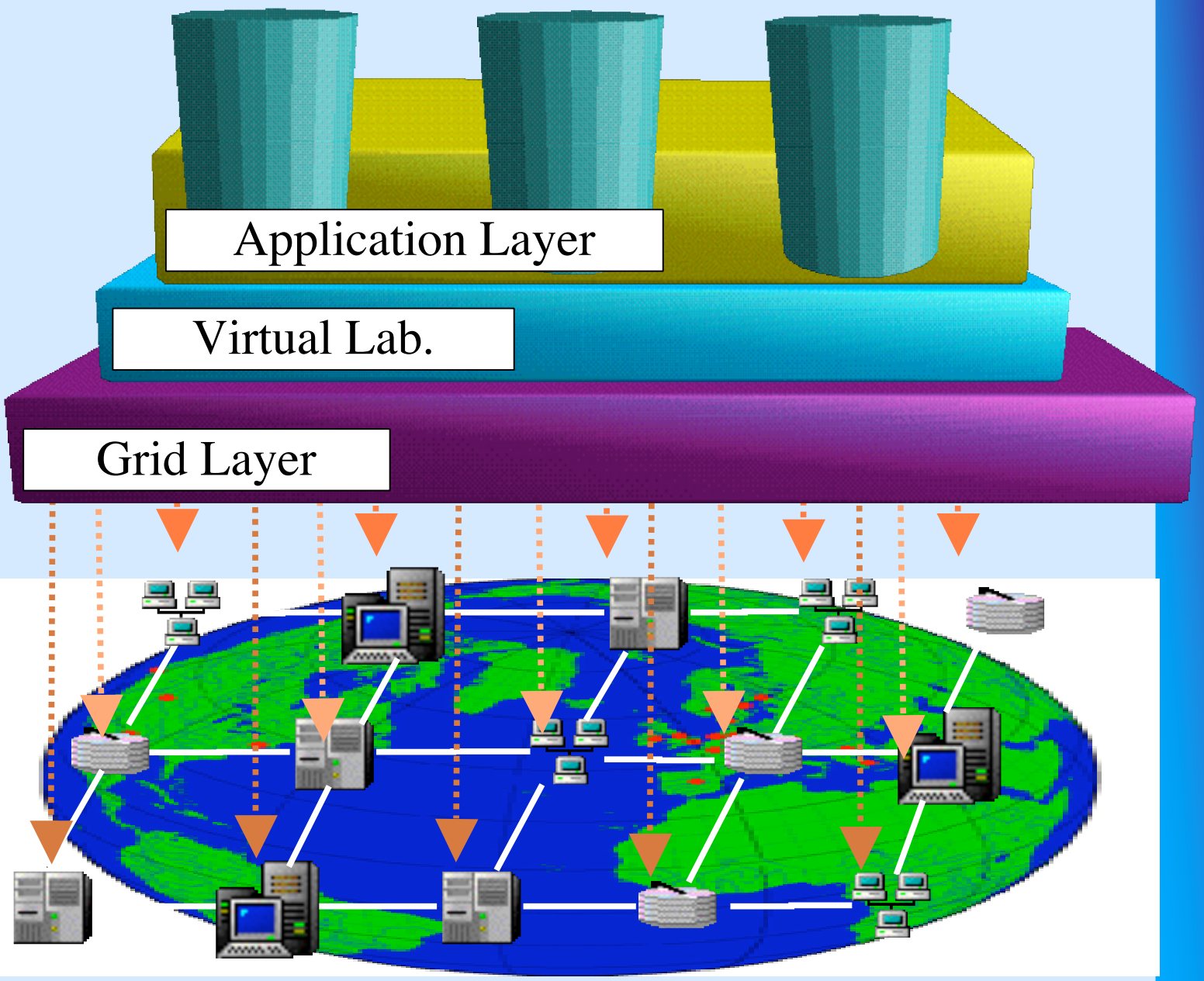

Objectives

- Designing **middleware:**
  bridge gap between **Grid-** and **application-**layer
- Enable VLAM-G users to **define**, **execute**, and **monitor** their experiments
- Provide to VLAM-G users:
  - location independent experimentation,
  - familiar experimentation environment
  - assistance during their experiments
  - Easy way to bring new applications to the Grid

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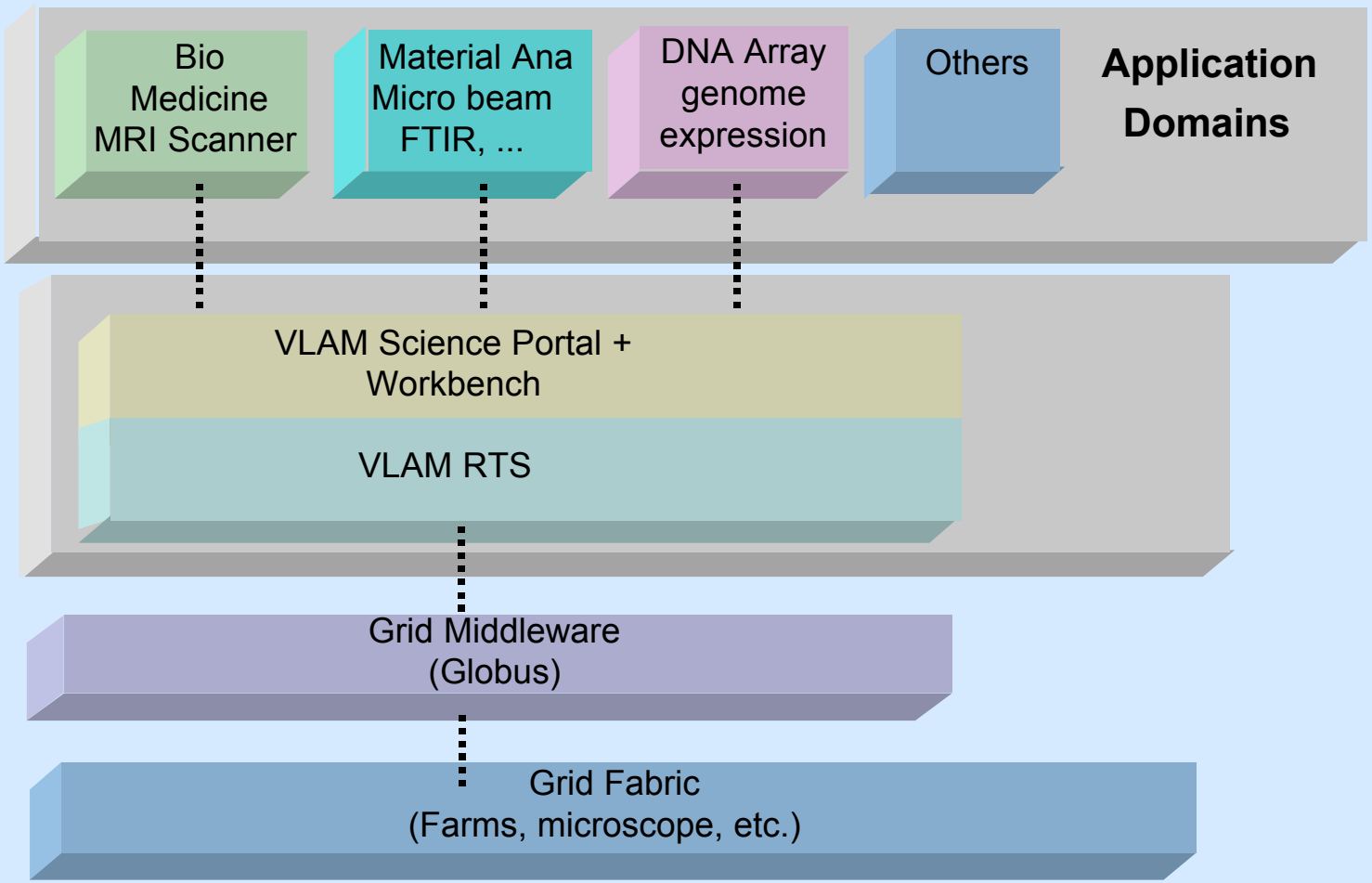
Why the VLAM-G project?

- The Grid deals only with raw data
  - A large number of potential applications require the manipulation of more than just raw data
- The Grid is just a bag of tools
  - The development of grid enabled applications require extensive knowledge in programming

VLAM Functional View



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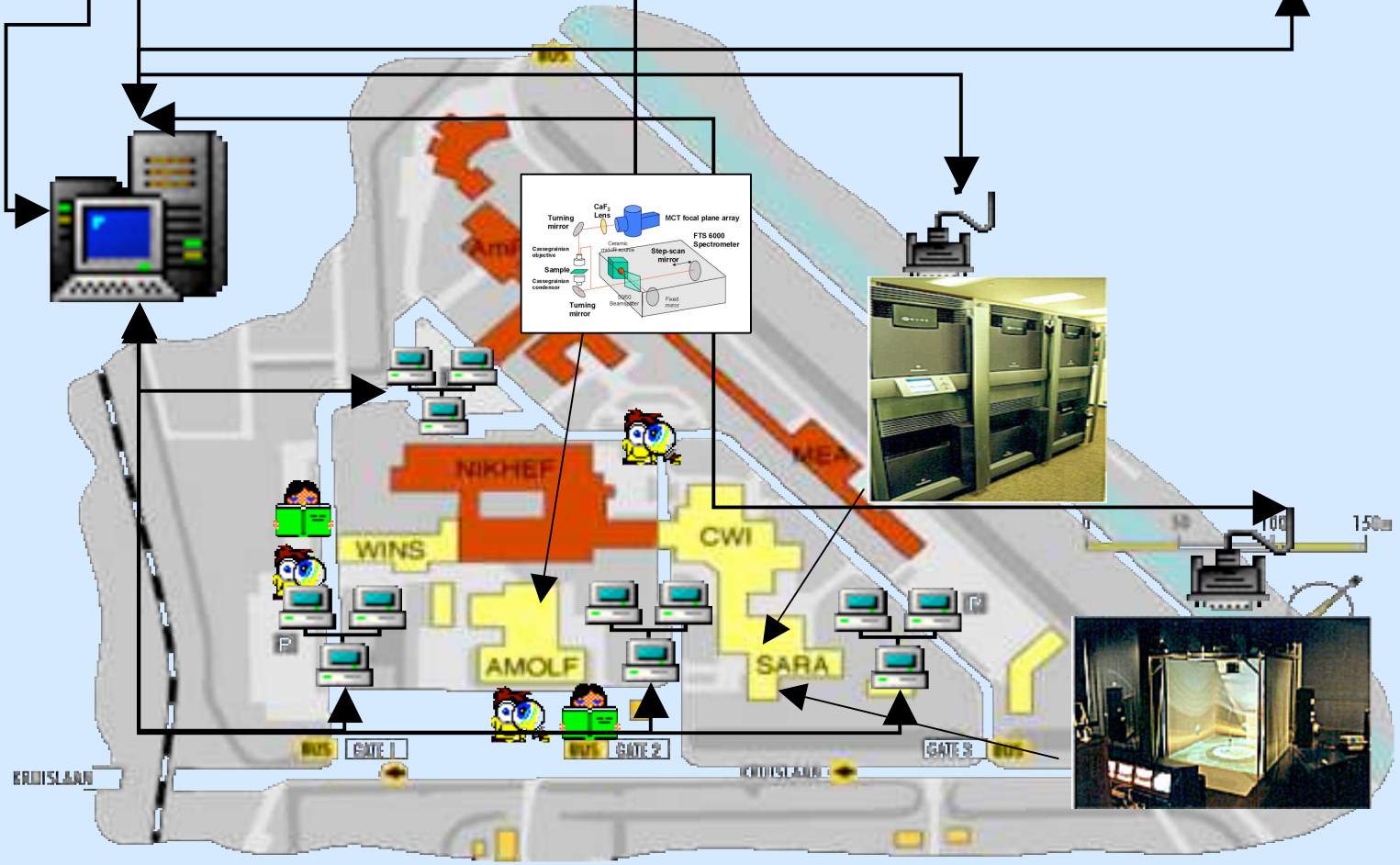

Experimental Workflow

Information gathering → Experimentation → Interpretation

Access to devices

Access to data

Access to information

Grid accessible infra: apparatus, systems, network

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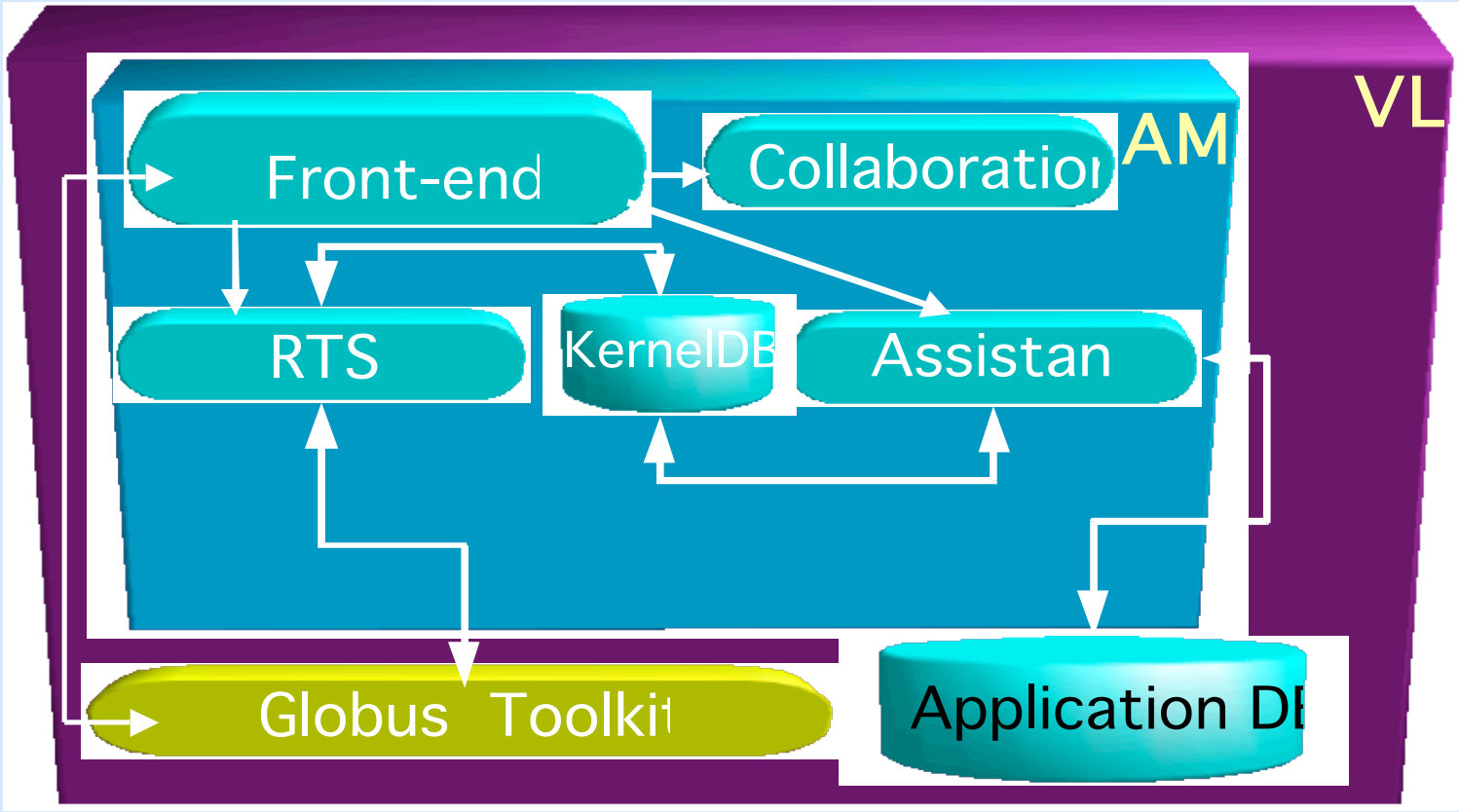
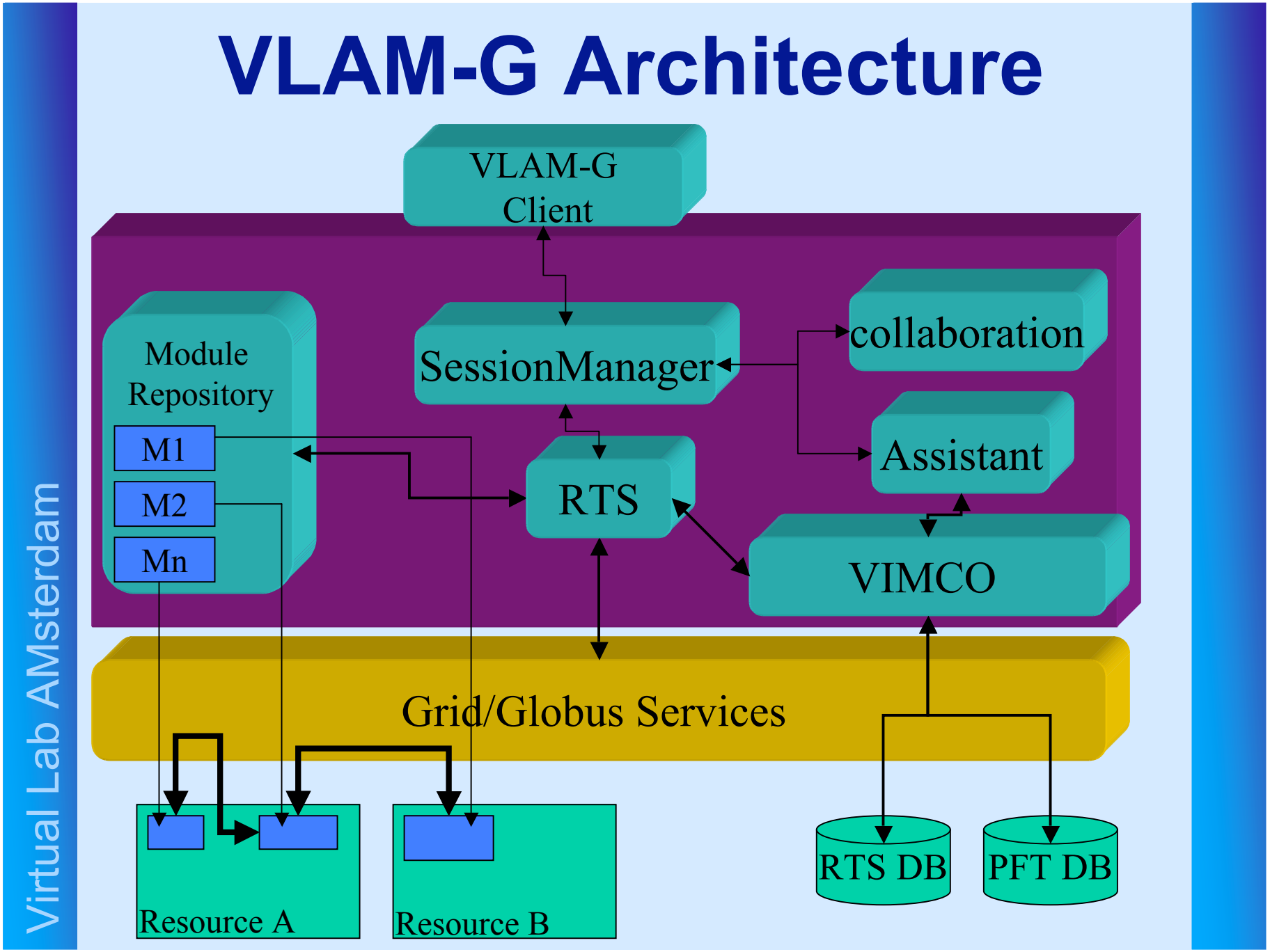
The VLAM Architecture



VLAM-G Architecture



RTS DB

- Stores user support information:
  - experiment topology definitions
  - module descriptions
  - user information
- Provides cross-links to application annotations
- Based on object-oriented database technology
- Extends resource directories now used in Grid

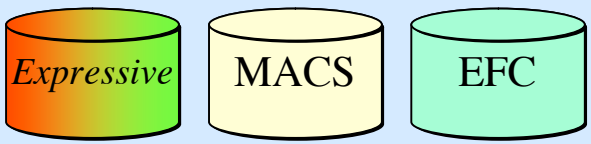
Application Domain DB

- **Characteristics of typical application**

  Scientist(s) performing the experiment on:

  - **objects** and **preexisting information & data** on which **processes** operate, using **apparatus** with specific properties
    - Resulting in **new data** and **information**

- A domain-specific **flow of processes**



Examples:
***Expressive*, MACS, EFC, ...**

Application Domain DB

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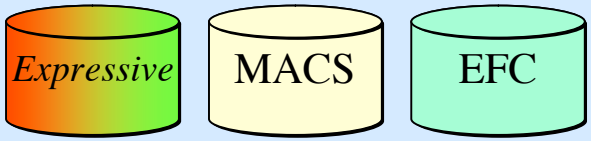
- A domain-specific **flow of processes**



Examples:
***Expressive*, MACS, EFC, ...**

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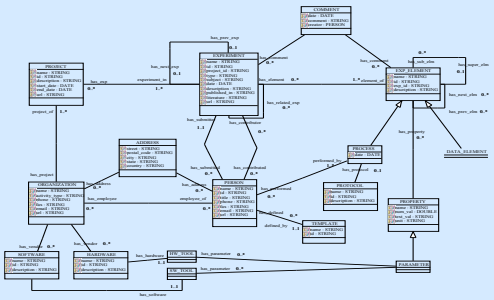
VLAM-G Experimentation Environment Data Model

DNA micro-array experiment

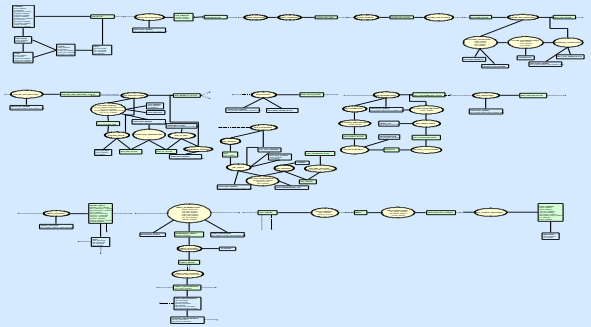
Micro-beam experiment

Common aspects of an experiment



Experimentation Environment Data Model

Process and data flow in an experiment



Process Flow Template

Annotations on an experiment

Application databases

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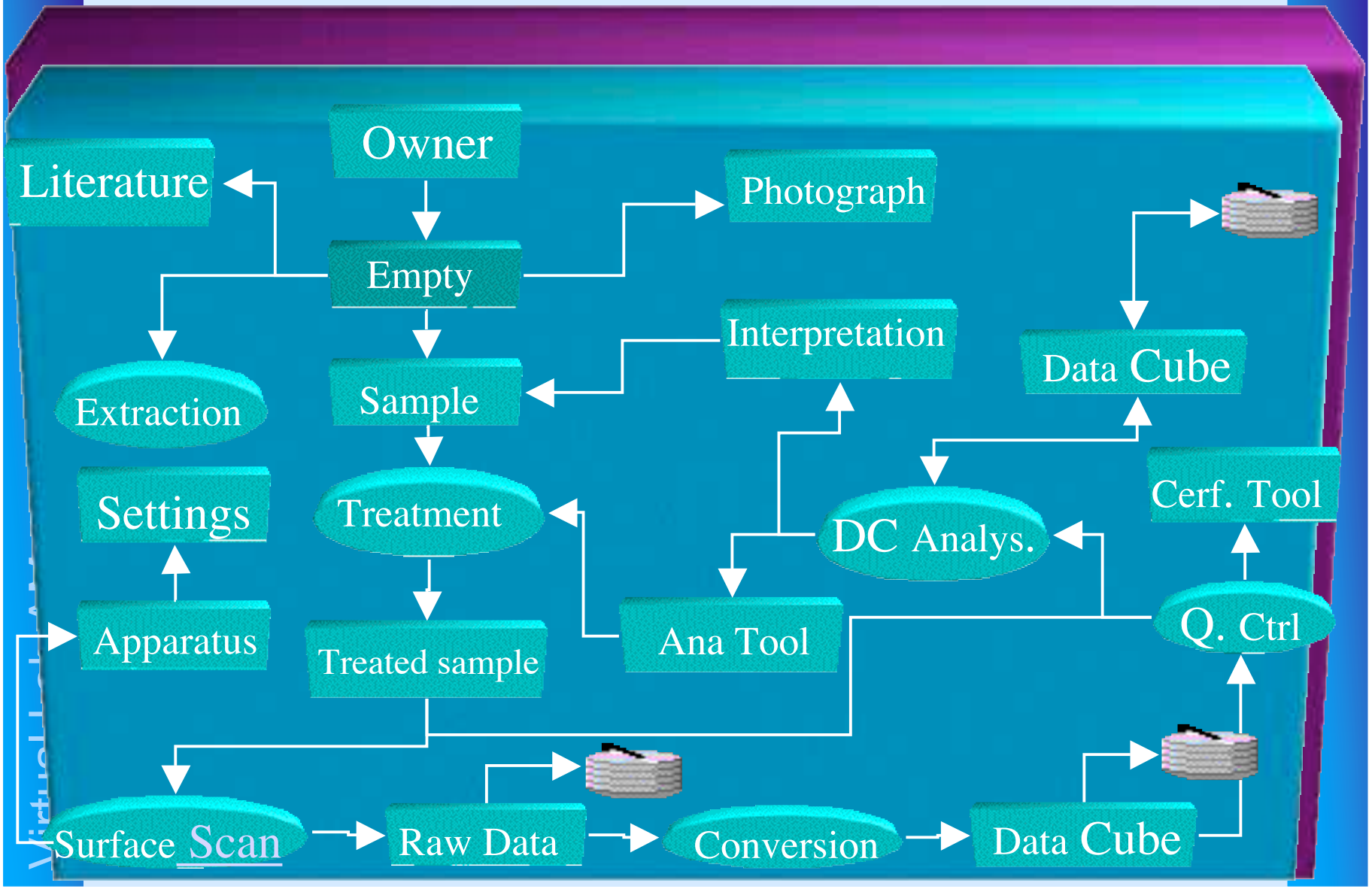
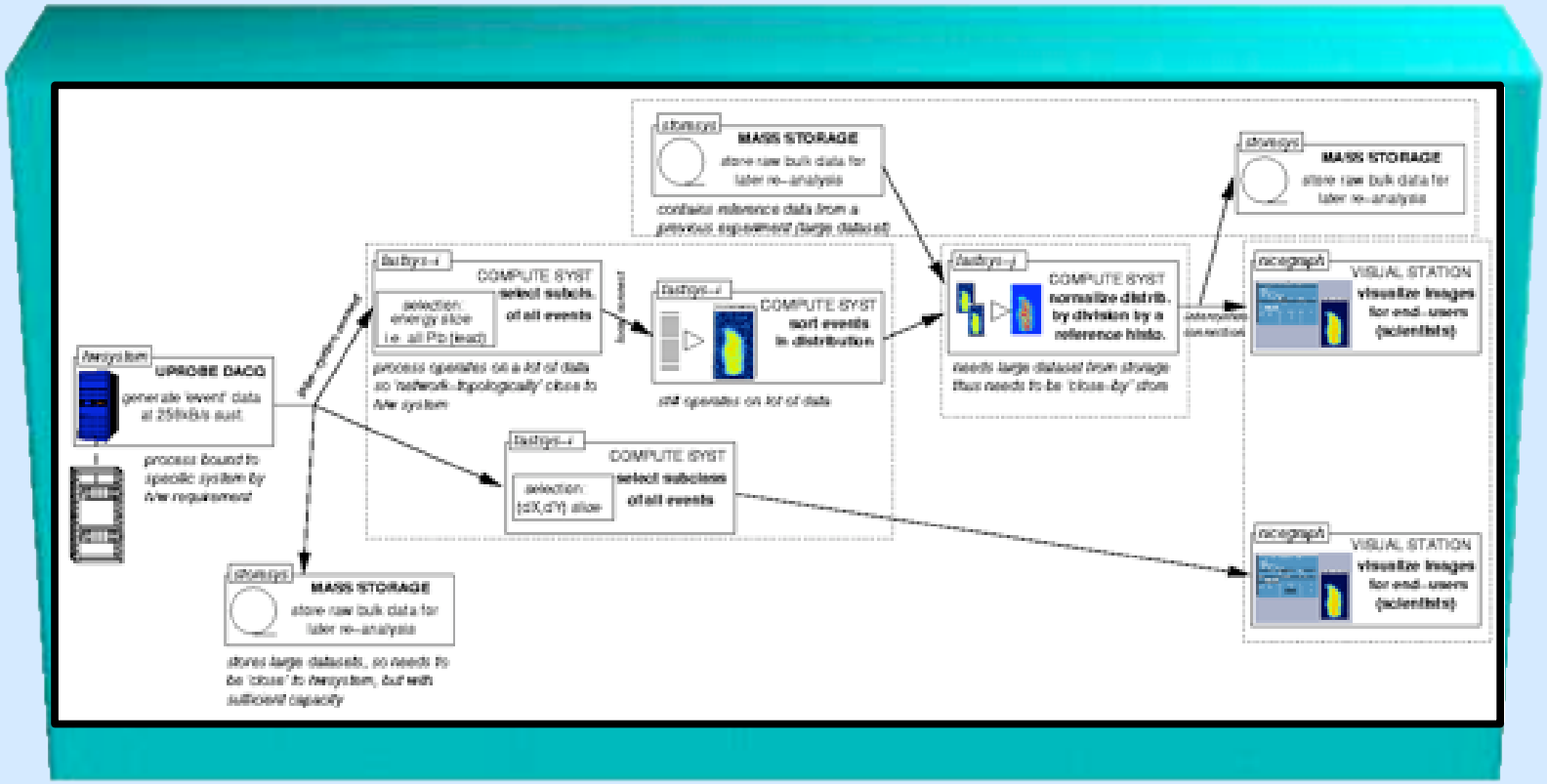
Process Flow Template (PFT)

- Used as a blueprint for a specific type of experiments
- PFT is designed offline by the experts in each scientific domain
- It is the main interface used by the VLAM-G users to perform a specific experimentation in the VLAM-G environment.
- It Guides the user while performing the experiment.

Process Flow Template



MacsLab Experiment



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VLAM-G Run Time System

- Features:
  - Data-flow-like experiments with modules
  - Control parameters & read state
  - Interact with the Grid layer
- Interaction with VLAM-G RTS?
  - Module developers: API
  - End-users: None (transparent)

Status of the VLAM-G Prototype

- VLAM-G RunTime System
  - Module skeleton and manager available
  - Parameter control available
  - Communication via GridFTP
- VLAM-G FrontEnd/GUI
  - Experiment topology editor
  - Process flow template editor

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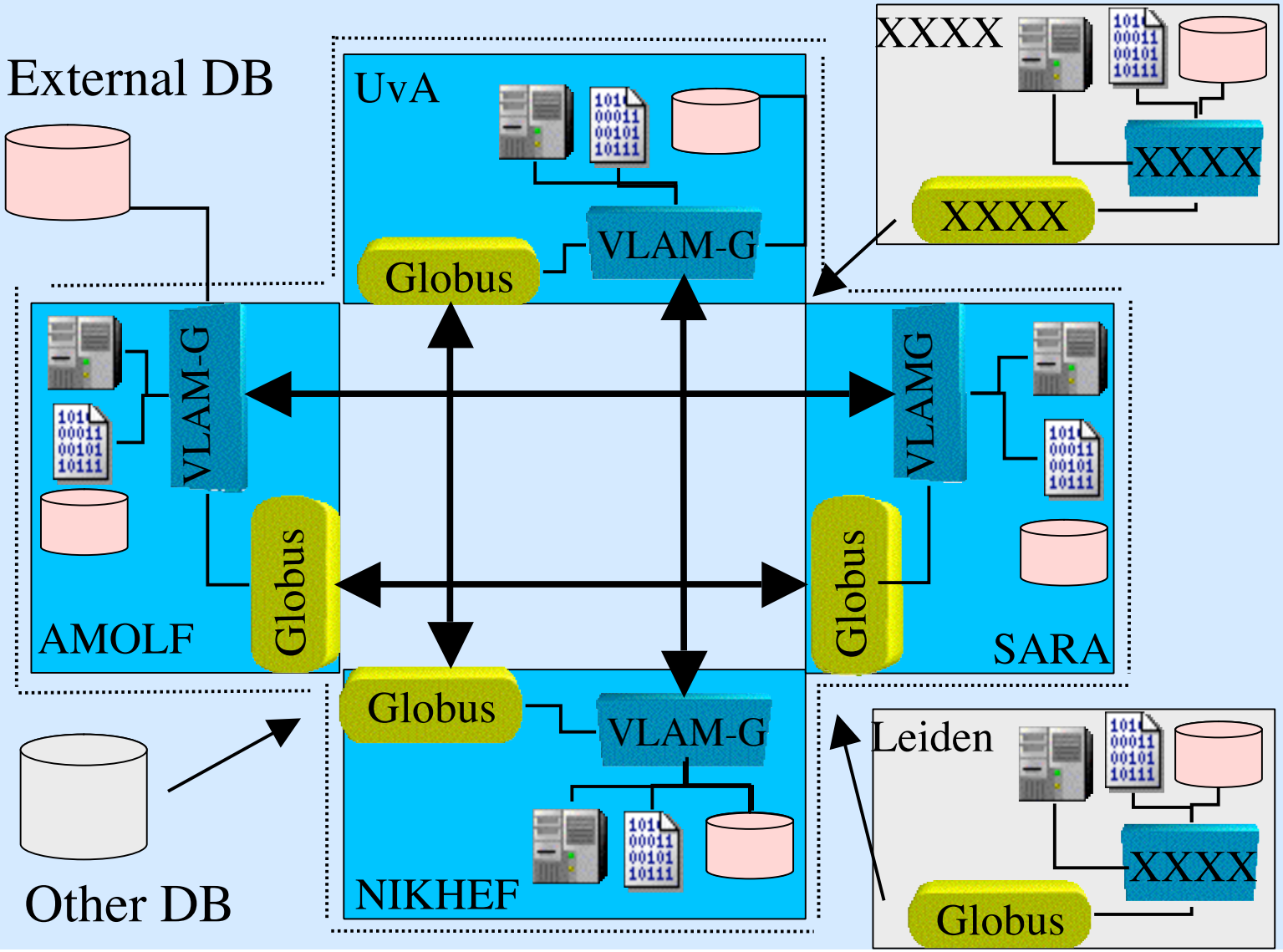
VLAM-G Testbed



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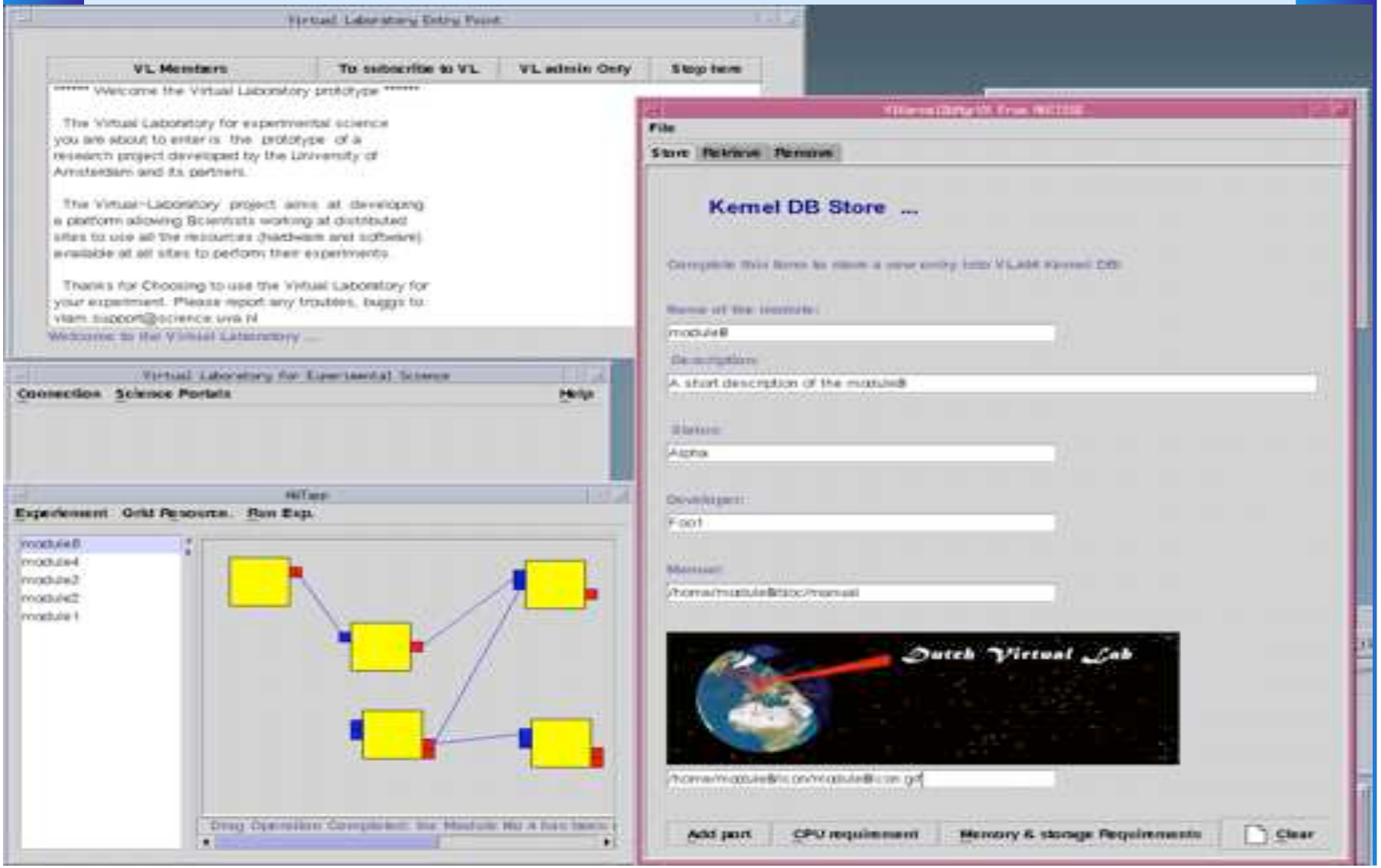
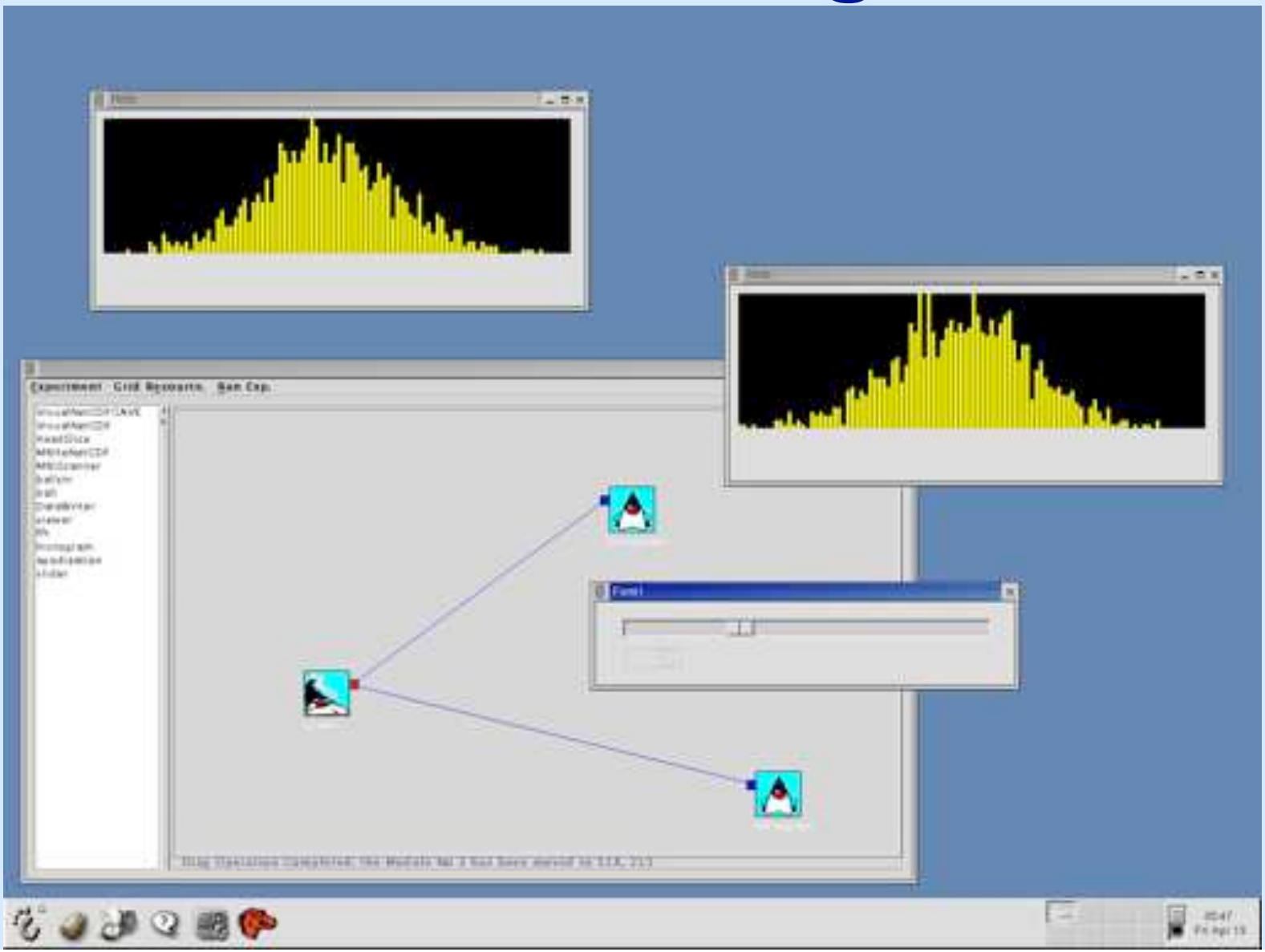
Current VLAM-G FrontEnd



Demo1: histogram



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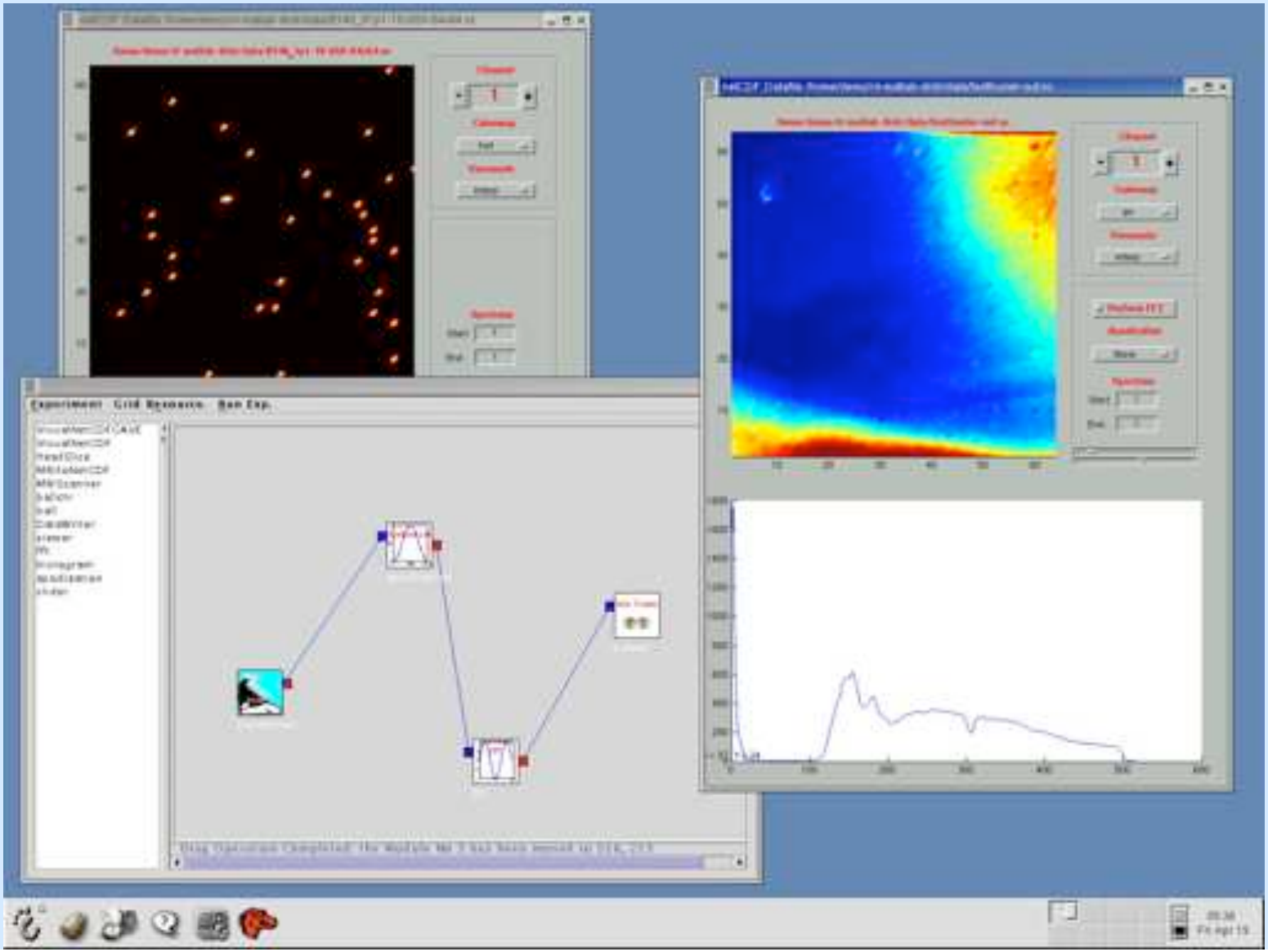
Demo2: Floating Ball

Demo3: MACSLab Exp



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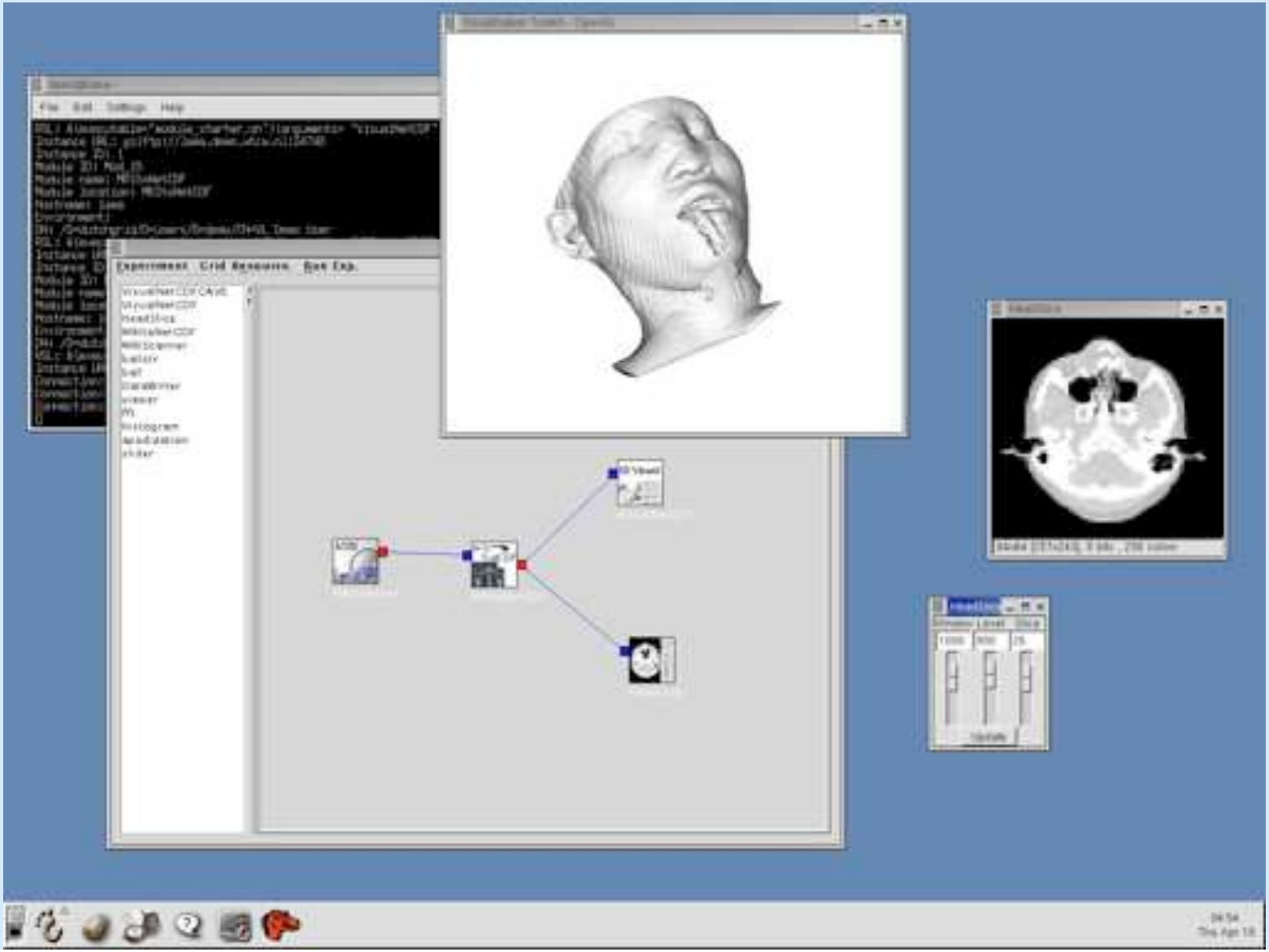
Demo4: RMI Scan



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Potential Research issues

- Resource Management on the Grid
  - One Ph.D student is going to study this topic in detail
- Security issues on the Grid
- Federating Data on the Grid

Conclusions

- VLAM-G: a science portal for exp. analysis
  - Workflow support for Bio-informatics, Materials Science and Biomedical Simulation & Visualisation
  - Seamless access to distributed resources
- Resource Management: based on Globus
- Content Management: VLAM-G middleware
- Current status: preparing the beta-release of the VLAM-G toolkit.

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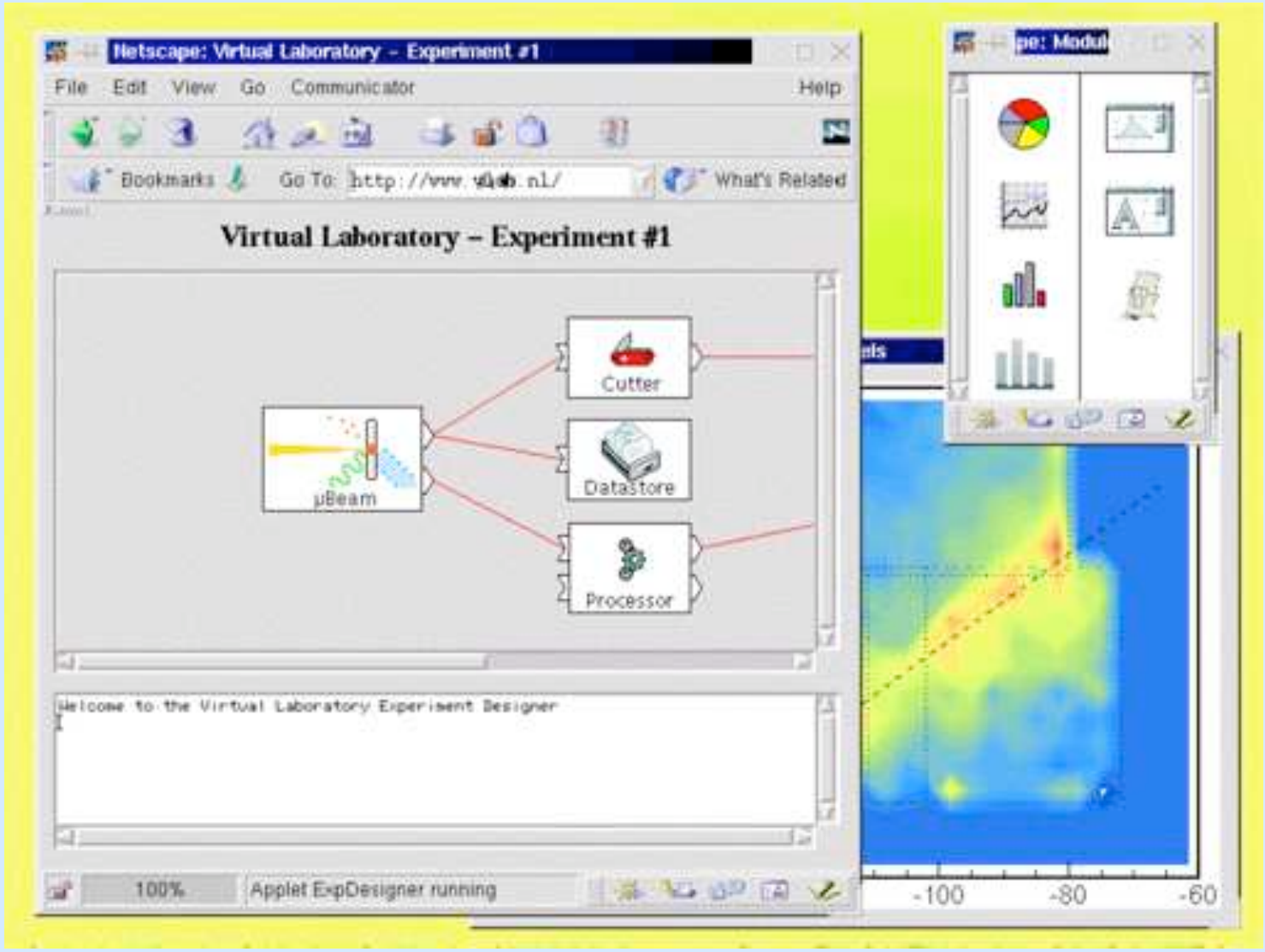
VLAM-G Front End



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People (not comprehensive)

- Adam Belloum
- David Groep
- Anne Frenkel
- Cees de Laat
- Toto van Inge
- Gert Eijkel
- Zeger Hendrikse
- Dmitry Vasunin
- Ersin Kaletas
- Vladimir Korkhov
- Robert Belleman
- Hakan Yakali
- Hamideh Afsarmanesh
- Timo Breit
- Peter Sloot
- Ron Heeren

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References

- Globus: `http://www.globus.org/`
- Globus doc: `http://www.globus.org/documentation/`
- Globus UvA: `http://www.science.uva.nl/~zegerh/globus/`
- Globus papers: contact me for Globus retreat 2001 papers and slides
- VLAM-G: `http://www.dutchgrid.nl/VLAM-G/`
- VLAM-G paper: bottom of above webpage