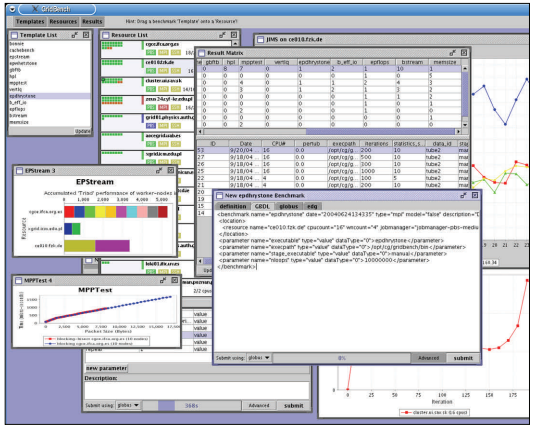
SATELLITE PLATFORM FOR HEALTH-CARE

HPCLaboratory infrastructure includes a satellite platform, to support real-time tele-medicine applications (e.g. remote consultation) to local health-care institutes. Installed within the framework of the EMISPHER project.

SOFTWARE

Our software development includes **GridBench**, a tool for evaluating the performance of Grids and Grid resources by facilitating the easy definition of parameterized executions of benchmarks on the Grid, **Ovid**, a Browser that supports the seamless navigation of users in the Grid information space, and the **WebRACE** Crawler, a modular, programmable, adaptive and distributed profile-driven proxy infrastructure that collects information from Internet sources.



GridBench tool: Benchmarking for Grids

FUNDING AGENCIES

Information Society Technologies

EUMEDIS

HPCL RESEARCH INTERESTS

- **Network-centric Computing**
- **Grid Computing**
- **Parallel and Distributed Systems**
- **Performance Engineering**
- **Web Technologies & Applications**

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ICGrid: Intensive Care Grid

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1) Introduction

Healthcare Industry:
among the world's largest, fastest-growing and most information intensive industries.

Complexity:
i) vast amounts of data; ii) varied data quality; iii) privacy constraints, iv) analysis and storage of real signals.

Grid:
i) thousands of computers, ii) trillions of commands per second, iii) petabytes of storage

=> the right place to solve the challenges!

2) CyGrid @ Univ. of Cyprus (UCY)

- **The Grid Authority in Cyprus (est. 2002)**
- **TestBed:** 72 CPU site, 1TB Storage Element SEE Resource Broker, SEE Information Index,
- 38,000 job submissions in Mar05–Jun06
- **Related Projects:** EGEE (2004-2008), Healthware (2005-2008), gEclipse (2006-2008), eScience-CY (2004-2008), CoreGrid (2004-2008), **Older:** Emispher, CrossGrid.

3) Nicosia General Hospital (NGH)

- The largest (500-beds) and most technologically advanced medical premise on the island, covering a **wide range** of medical **specialties**.
- **Intensive-Care-Unit (ICU):** 17 beds, each equipped with a Phillips Intellivue Monitor, Blood Gas Analyzer, Mechanical Ventilation, Infusion Pumps, many other devices.

4) ICGrid Motivation

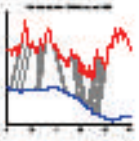
- ICUs monitor inpatients that are in a critical (life-threatening) **physiological state**.
- Inpatients are connected to a very large number of **monitoring devices** that continuously acquire the state of the respective inpatient.
- **Clinically Interesting Episodes (CIE), e.g.** (temp>X and press>Y) => cerebral emergency **95% represent a minority in the acquired signals, but are of critical importance.**
- **Proactively** mining the local CIE log is not enough (due to the small size). Currently, doctors can only **reactively** respond to alerts.

ICGrid Goal

*Create a (distributed) tool that enables the seamless **integration, correlation** and **retrieval** of clinically interesting episodes across Intensive Care Units.*

5) Projected Features

- Storage / Archiving of Interesting Episodes
- Automatic **identification of similar episodes** using (high performance) **timeseries similarity methods**: *Given a real signal, find other signals with a similar movement.*

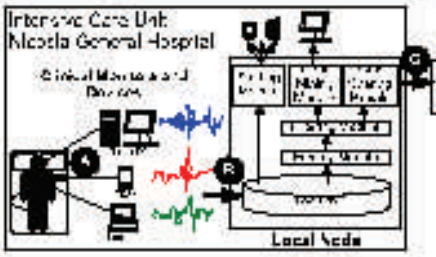


- Other High Performance Mining Tools:
  i) **Predicting** the future value of a signal
  ii) **Clustering** similar patient states

All Computational/Storage Intensive Tasks!

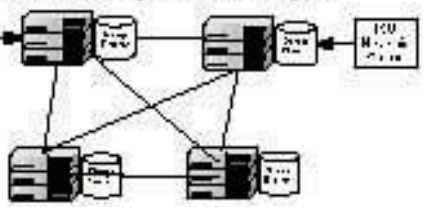
6) icGrid Architecture: Local

A) Local Data Acquisition ✓
B) Storage and Indexing ✓
C) Sharing Filtered Data on the Grid



7) icGrid Architecture: The Grid

D) File Storage and Replication ✓
E) Information Processing and Aggregation ✗
F) Query Interface Modules ✗



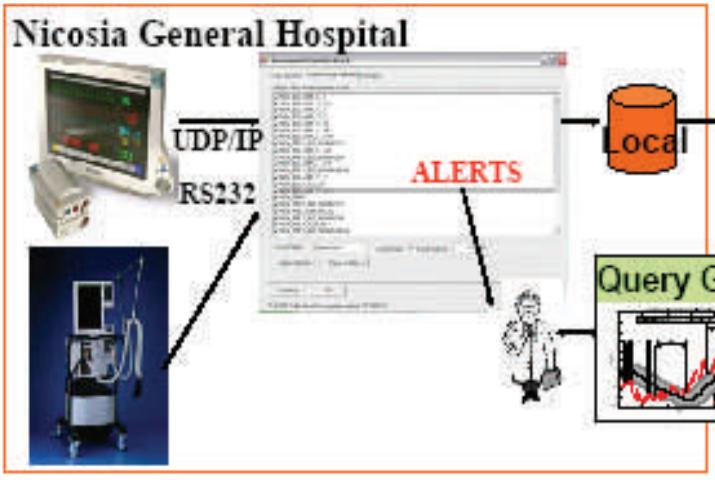
8) Bilateral Collaboration Benefits

Benefits for UCY

- **Apply the GRID technology** in the local **Life Sciences**.
- Develop Techniques for **Temporal Data Management**, build libraries for the **high performance storage and retrieval of real signals**.

Benefits for NGH

- Stimulate the evolution of **icGrid**.
- Build the required tools for: **I) Early Diagnosis, II) Education** and **III) Defining Early Warning Systems / Safety Thresholds** (identify when a human life is in jeopardy).
- Acquire **technological know-how** necessary due to the imminent installation of the local Clinical Information System.



Required Grid Services

Replica Location Service
- Maintaining several replicas of the temporal sequences acquired by ICUs
- Fault tolerance and increasing performance.

Resource Broker
Control the matching of processing requests to available resources.

Availability of EGEE Grid Resources is essential for the success of ICGrid:

- Hospitals don't have dedicated computational platforms.
- Hospitals don't have the required expertise to operate such frameworks.