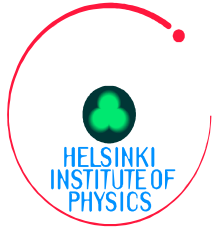# Finnish Grid Activities

## Nordic Grid Neighbourhood Seminar
## January 20th, 2005

**Michael Gindonis, Helsinki Institute of Physics (HIP)**
**Arto Teräs, CSC - The Finnish IT Center for Science**

# Grid Research Activities at HIP

- **HIP Datagrid project which began in 2001 will split into two projects for the next 3 year period**
  - **Grid Applications – Tapio Niemi**
  - **Grid Middleware Developement – Miika Tuisku**
- **6 Full-time researchers at CERN**
- **6 Full-time and 2 Part-time researchers in Finland**
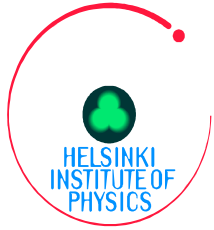  - **4 MSc Theses currently in progress**
  - **2 PhD Theses currently in progress**

# Grid Research Activities at HIP

- **Cluster Computing**
  - **Michael Gindonis**
  - **Kalle Happonen**
- **Data Management**
  - **Mikko Pitkänen**
  - **Tapio Niemi**
- **Grid Security**
  - **John White**
  - **Joni Hahkala**
  - **Mika Silander**
- **OpenLogbook**
  - **Antti Pirinen**

- **Federated Identity**
  - **Henri Mikkonen**
  - **Tuomas Nissi**
- **GridBlocks Agent**
  - **Juho Karppinen**
- **GridBlocks Portal**
  - **Jukka Klem**
- **Virtual Organisations**
  - **Tuomas Nissi**
  - **XiaoWang**
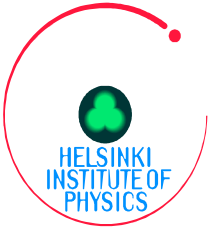
# HIP: Cluster Computing

- **ARC (Nordugrid) Middleware**
  - **Maintain Top level Finnish GIIS since September 2002**
  - **Maintain & Update ARC middleware on Computing Resources in Otaniemi and Kumpula**

- **Cluster Projects**
  - **Jaspis MGrid Cluster @ Tekniikantie**
  - **Hirmu Cluster @ Tekniikantie (Temporarily down)**
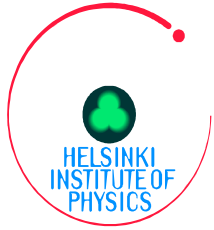  - **Romu RS6000 Cluster @ CERN (R.I.P.?)**

# HIP:Data Management

- **Secure distributed filesystems and replicas**
    - **Improving Performance**
    - **Load balancing**
    - **Minimizing response time**
    - **Fault Tolerance**

- **Data Integration using Semantic Web technologies**
    - **Design an ontology for describing the contents of data sources**
    - **Design methods to integrate these ontologies**

- **Virtualization of Resources**

# HIP: Federated Identity

- **Platform independent Authentication Architecture**

- **Liberty Alliance and Grid Interoperability**
  - **Using the Liberty Alliance Identity Architecture to access grid resources**
  - **Reducing barriers to access for potential grid users**

- **Banking solutions to charge for Grid services**
  - **Experiment with "Digital Cheques" issued by a VOMS server**
  - **Access via Mobile Devices**

# HIP: Grid Security

- **EGEE Project**
    - **Define OGSA Security Architecture**
    - **Coordination of Security testing activities**

- **Granularity**
    - **What level is suitable in a grid**
    - **How best to**

- **Delegation of Rights**

# HIP: GridBlocks Agent

- **GridBlocks Agent is a simple and efficient framework for executing Java Agents on Heterogeneous distributed environments**

- **Based on standard grid technologies**
  - **Security**
  - **Virtual Organizations**
  - **Web services**

- **Current focus:**
  - **Using agent based technologies to access (data intensive) grid resources from location aware mobile devices**
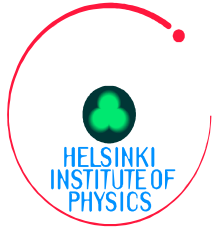
# UNOSAT Use-Case

- A new agent is sent from a mobile phone to the GRID with world coordinates downloaded from Bluetooth GPS receiver.

- Running at the GBAgent server, the agent makes database queries to find the satellite image above the current location.

- After the map is found, agent compresses, scales and sends it back to the user.

- User can stay on- line and visualize the same image with different parameters (resolution, position, layouts).

- Only a small amount of data is sent through the network, saving both time and money.

# HIP: GridBlocks Portal

- **Deployed on Nordugrid**
- **Web-based interface to grid software**
  - **move data between different locations**
  - **submit jobs to a grid**
- **Middleware independence**
  - **Will handle LCG, EDG, NorduGrid, EGEE metadata and Job managers**

# HIP: OpenLogbook

- **Analysis and visualization tool for multimedia data sets**

- **Grid Enabling of the application planned**

- **Customers:**
  - **Lausanne "Imagination Lab"**
  - **CERN Athena Experiment**
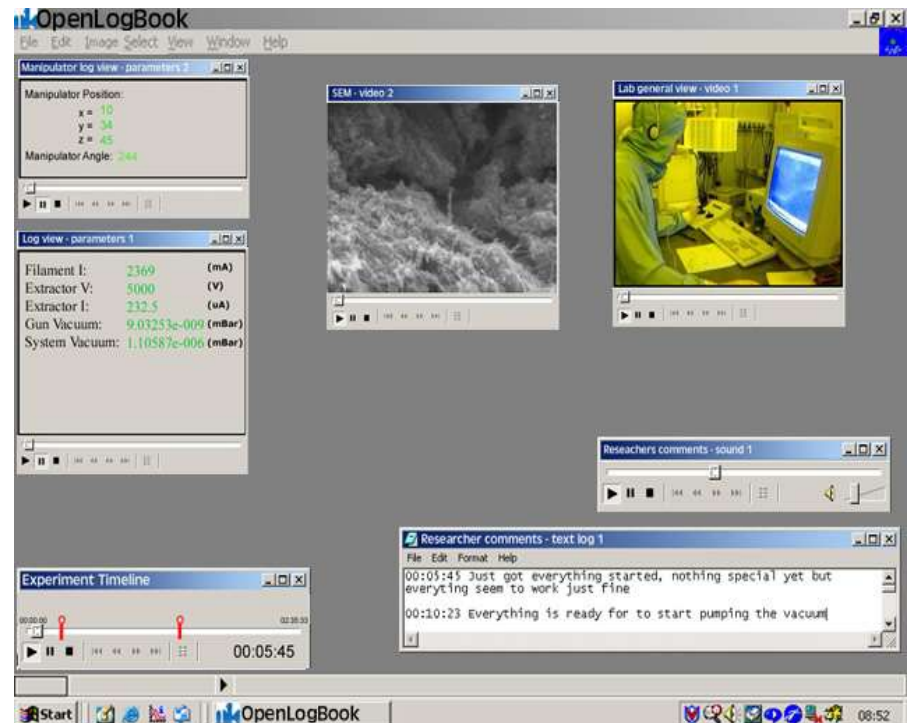
# HIP: Virtual Organisations

- **Implementing a Java Client for VOMS**
    - **Facilitate development of user interfaces**
    - **Integration of the Client into GridBlocks Agent**

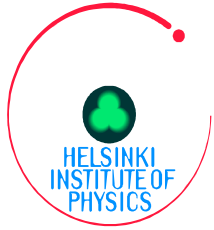- **Digital Cheques issued by a VOMS server  (w/ Federated Identity)**

# HIP: Project involvement

- **EGEE – Security Work package**
  - **EGEE has 70 partners, 30 M Euros for 2 years**
  - **Likely to continue for another 2 years**
- **LCG (LHC Computing Grid)**
- **M-grid**
- **NorduGrid**
- **Netgate**

# HIP: Netgate project

- **Netgate proposal (follow up to TEKES funded Netgest)**
    - **Build prototype software integrating grid technology with emerging standard and best practices in Web and Mobile environments.**
    - **Emphasis on user authentication, authorization and charging (billing)**
    - **Work Packages**
        - **Federated Network Identity**
        - **Operator Authorised Transactions**
        - **Business Models and Service Scenarios**
        - **Grid Applications**
    - **3 Academic partners**
    - **8 Industrial partners**
    - **2 Years of funding application sent to TEKES**

# Netgest Project

- **Combining the Grid with commercial Internet and wireless solutions**

- **Developing service scenarios and demonstrations**

- **Evaluate business models based on technologies and service scenarios**

- **Three academic partners:**
  - ⑤ **Telecom Business Research Center, Lappeenranta Technical university, University of Tampere, Wirlab Network Research Center (administrative coordination) & Helsinki Institute of Physics (technical coordination)**

- **Six industrial partners**
  - ⑤ **Nokia Research Center, Nokia Mobile Phones, Valimo Wireless, Necsom, Cygate, Vaasan Läänin Puhelin, Alajärven Puhelinosuuskunta**
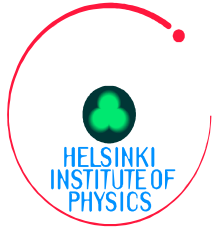
# Finnish Grid Activities - VTT

- **CoreGRID**
  - **EU 6$^{th}$ FP**
  - **VTT pariticipates in th Programming models and System Architecture  areas**

- **intelliGrid**
  - **Interoperability of information systems of participating organisations while maintaining privacy**
  - **Rapid joining and leaving a VO**
  - **VTT's interests are in collaboartive work in dynamic Vos using engineering applications characterised by distributed date with complex semantics**
  - **VTT is the dissemination manager for intelliGrid**
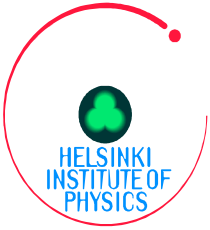
# Finnish Grid Activities - CSC

- ## ESO (European Southern Observatory)
  - **Development of a distributed data analysis for extensive astronomical data (Finnish in-kind contribution to ESO)**
  - **Project started in 2005, two full-time employees at CSC and four at the University of Helsinki**
  - **http://www.csc.fi/proj/eso/**

- ## ENACTS (Ended Dec. 2004)
  - **Reports and Surveys of current state and trends in Grid Computing and HPC**
  - **CSC contributed the User Survey (in collaboration with CINECA Italy), now available at the ENACTS web site**
  - **http://www.enacts.org/**

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# Finnish Grid Activities - CSC

- **EMBRACE**
  - **Integrating major databases and Software tools in Bioinformatics**
  - **Evaluate technologies and implementation**
- **DEISA**
  - **1st phase, tightly coupled IBM centers in Europe, CSC to contribute 1 node of IBM SC (32 CPUs)**
  - **2nd phase, extension to other platforms (eg. linux clusters, SGI), will use UNICORE as the middleware**
  - **CSC responsible for Dissemination**
  - **http://www.deisa.org**
- **NDGF**
  - **1 FTE funded by the Finnish Academy**
  - **Working towards a more formal nordic grid collaboration**
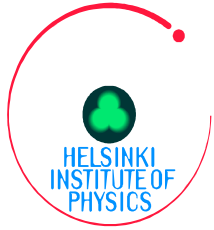
# Finnish Grid Activities - CSC

- ## Nordugrid
    - **Putting ARC middleware into production in Finland**
    - **Dissemination and Training in Finland**

- ## M-grid
    - **A collaboration between CSC and several Finnish university groups to deploy a network of Linux clusters with ARC middleware**
    - **http://www.csc.fi/proj/mgrid/**

- ## HAKA
    - **Interoperability between University user administration systems**
        - **common schema for student data**
        - **Shibboleth middleware**
    - **Improved access to services across universities for students**

# M-grid Users

- **Geared primarily towards users in Material Sciences in the M-grid Consortium**
  - **Physicists, Chemists and some Bioscientists**
- **Mainly serial jobs, some "pleasantly parallel" jobs**
- **Clusters are accessed both locally and via grid middleware**
- **Typical Applications**
  - **Gromacs**
  - **Gaussian**
  - **Dalton**

# M-grid Consortium

- **Center for Scientific Computing (CSC)**
- **Helsinki Institute of Physics**

**Physics and/or Chemistry departments/labs at the following universities:**

- **University of Helsinki**
- **Helsinki University of Technology**
- **University of Jyväskyla**
- **Tampere University of Technology**
- **University of Oulu**
- **Lappeenranta University of Technology**
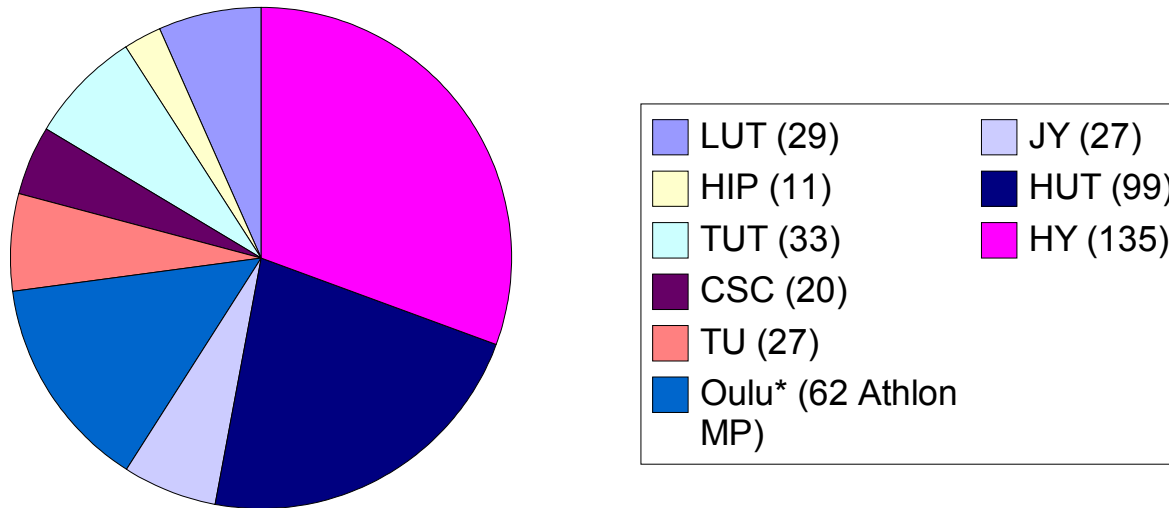- **University of Turku**

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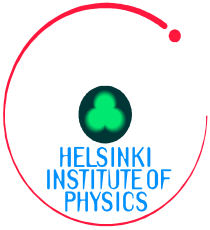
# M-grid – Hardware and Software

- **Hardware**
  - **Dual AMD Opteron 1.8-2.2 Ghz nodes with 2-8 GB memory (Dual Athlon MP 2800+ in Oulu)**
  - **Storage (typically 1 - 2 TB)**
  - **Separate Gbit Ethernet Networks for Communication and NFS**
  - **Remote Administration**

- **Operating System**
  - **NPACI Rocks Cluster Distribution**
    - **64 bit, based on RedHat Enterprise Linux 3**

- **Grid Middleware**
  - **NorduGrid ARC middleware**
    - **compiled with Globus 3.2.1 libraries**
  - **Sun Grid Engine as LRMS**

# CPU Distribution



Legend:
- LUT (29)
- JY (27)
- HIP (11)
- HUT (99)
- TUT (33)
- HY (135)
- CSC (20)
- TU (27)
- Oulu* (62 Athlon MP)

- **Size of sites varies greatly**
- **Number of CPUs: 410 (computing nodes only, 443 total)**
- **Total theoretical computing power: 1.5 Tflops (CSC IBM SC 2.2 Tflops)**
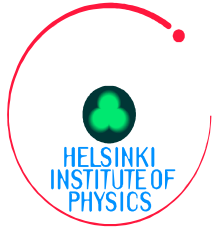
# M-grid - Administration

- **Administrative tasks are divided between CSC and site administrators**
- **CSC**
  - **Maintain Operating System, LRMS, Grid middleware, certain libraries**
  - **Tools for system monitoring, integrity checking, etc.**
- **M-grid Site administrators**
  - **Admins are typically working for the department or lab, NOT I.T.**
  - **Install local applications, libraries, user support**
  - **System monitoring**
- **Regular meetings of administrators**
  - **M-grid administrator support network**

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# M-grid – Timeline and Status

- **Funding application November 2003**
- **RFP April-June 2004**
- **Vendor (HP) chosen July 2004**
- **Clusters delivered September 2004**
- **Installation September-October 2004**
- **Acceptance tests October-November 2004**
- **Currently being used locally, not full load in most clusters yet**
- **Grid middleware to be deployed February 2005 (estimate)**

# More Information

- ## HIP
  - **http://wikihip.cern.ch**
  - **Michael Gindonis <michael.gindonis@hip.fi>**
- ## CSC
  - **http://www.csc.fi/grid/gsuomi.phtml.en**
  - **M-grid: http://www.csc.fi/proj/mgrid/**
  - **Arto Teräs <arto.teras@csc.fi>, Juha Lento <juha.lento@csc.fi>**
- ## VTT
  - **http://www.vtt.fi**
  - **http://www.coregrid.net**
  - **http://www.intelligrid.net**