



WebTel 2009  
Venice, May 24-28, 2009



# e-Infrastructures for data and compute intensive applications

Internet, Web, Grids, Clouds,  
how do they come together?

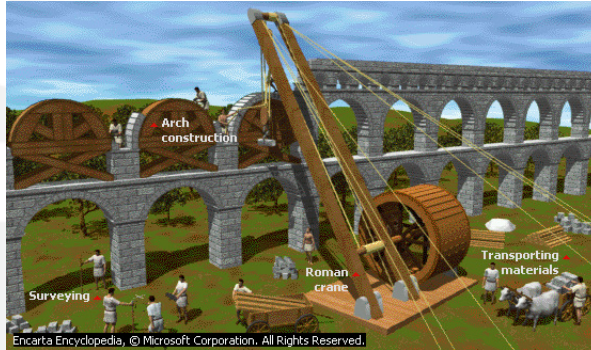
Wolfgang Gentsch  
The DEISA Project & Board of Directors of OGF  
gentsch at rzg.mpg.de



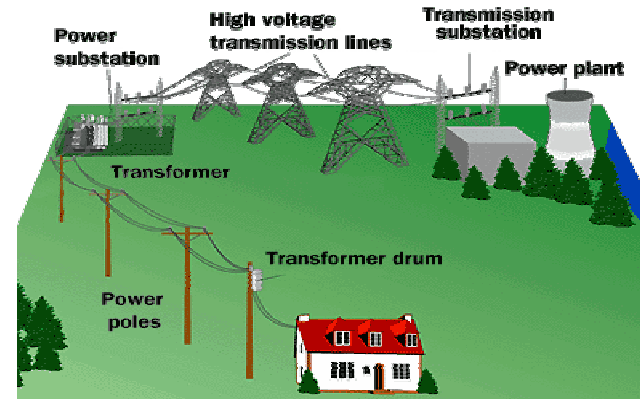
## Content

- Service Infrastructures
- Components: HPC, Grids, Clouds, Internet, Web,...
- Example: DEISA Ecosystem for HPC Applications
- Example: The Telecoms and their Potential
- Next-Generation e-Infrastructure: Digital City

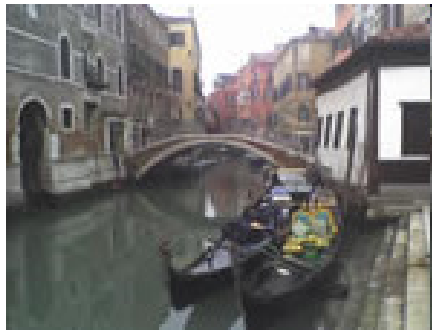
# Service Infrastructures



Ancient Rome: ten aqueducts,  
some 150,000 m<sup>3</sup> of water each day



Electrical Power Grid  
Infrastructure



Transportation  
Grids



EGEE – Enabling  
Grid in E-ScienceE

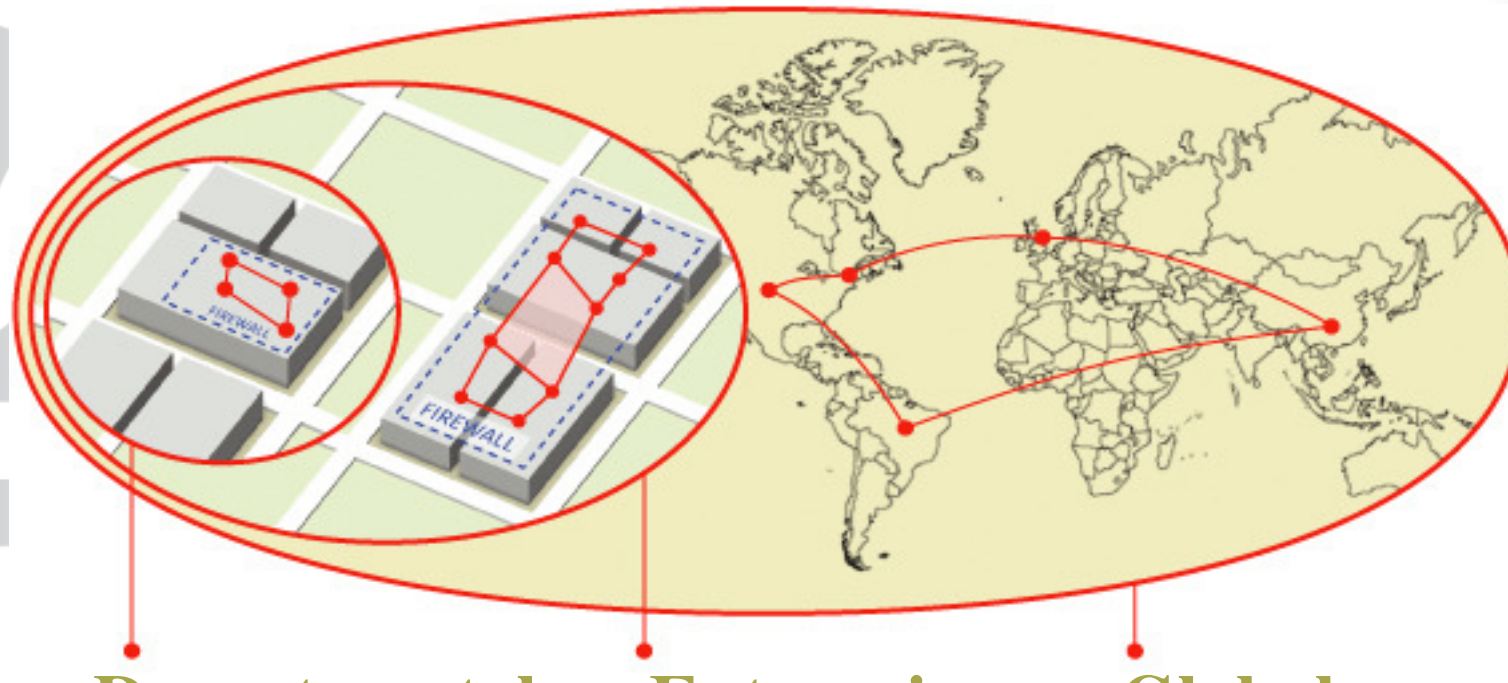
# HPC Centers

(in the light of Grids and Clouds)

- HPC Centers are **service providers**, for past 35 years
- Computing, storage, applications, data, etc IT services
- Serve (local) research, education, industry
- Very professional: to end-users, they look (almost) like Grid or Cloud services

(Amazon Cloud definition: easy, secure, flexible,  
on demand, pay per use, self serve)

# Grids



**Departmental  
Grids**

**Enterprise  
Grids**

**Global  
Grids**

# Cloud... as a **Service**

Cloud: dynamically **scalable** and **virtualized** resources provided **as a service** over the Internet

Infrastructure (**IaaS**)

Platform (**PaaS**)

Software (**SaaS**)

- Accessible online, anytime, anywhere
- Pay for what you use
- Available on demand
- Service Level Agreements
- Automated:
  - Scalability
  - Failover
  - Concurrency management

# The Cloud of Cloud Companies

- Amazon
- Google
- Salesforce
- Microsoft
- Sun
- IBM
- Oracle
- EMC
- Cloudera
- Cloudsoft
- Akamai
- Areti Internet
- Enki
- Fortress ITX
- Joyent
- Layered Technologies
- Rackspace
- Terremark
- Xcalibre
- Manjrasoft/ ANEKA
- ...

# e-Infrastructure Challenges (Inhibitors)

- **Sensitive data**, sensitive applications (med.patient records)
- Different organizations have different **ROI**
- **Accounting**, who pays for what (sharing!)
- **Security** policies: consistent and enforced across the grid !
- **Interoperability** of components and grids (standards ?)
- Current IT culture is not predisposed to **sharing** resources
- Not all applications are grid-ready or **grid-enabled**
- **Open source** is not equal open source (read the little print)
- SLAs based on open source (**liability**?)
- “Static” **licensing** model don’t embrace grid
- Protection of **intellectual property**
- **Legal** issues (FDA, HIPAA, multi-country grids)







DEISE



# Examples of a successful Research e-Infrastructures



# BIRN – Biomedical Information



The screenshot shows the BIRN Portal homepage. At the top left is the BIRN logo (Biomedical Informatics Research Network). To the right is a login section with fields for 'Username:' and 'Password:' and a 'login' button. Below the header is a navigation bar with links: 'Portal Home', 'BIRN Website', 'Account Request', 'Style', and 'Help'. The main content area is divided into two columns. The left column contains a 'Login Information' section with a 'BIRN Portal Login' form (username and password fields, a 'Login' button) and 'Portal Requirements' text. The right column contains a 'Welcome to the BIRN Portal' section with a paragraph of text and a large graphic titled 'BIRN Portal Biomedical Informatics Research Network' showing a 3D brain model.



# Geological Information Grid Portal



The screenshot shows the GEONgrid Portal search interface. At the top, the title "GEONgrid Portal" is displayed next to the GEON logo (CYBERINFRASTRUCTURE FOR THE GEOSCIENCES). A navigation bar includes links for PortalHome, GEONsearch, myGEON, GEONscience, System, UserProfile, and MapIntegration. The main content area is titled "GEON Search" and contains two main sections: "Metadata Related" and "Select a Subject to Show Resources".

**Metadata Related:**

- Choose resource type: <All Resource Types>
- Choose subjects: <All Subjects>
- Optional keywords: [input field]

**Spatial Coverage:**

- Type a place name: [input field] **GO**
- or select an area on the map: [map interface]

**Select a Subject to Show Resources**

Biological oceanography	Chemical oceanography	Cryology
Ecology	Education	Environmental science
Forestry	Geochemistry	Geologic time
Geology	Geophysics	Human geography
Hydrology	Mineralogy or petrology	Natural hazards
Other	Paleontology	Physical geography
Physical oceanography	Soil science	Structural geology
Technology		

(These subjects will be reorganized soon by something similar to the classification from [GeoRef.](#))

**Resources in Geology** 1-5 of 17 files ▶

**Title:** Arizona Geology Map  
**Format:** shapefile  
**Dataset Id:** GEON-25dfb3db-e710-11d8-b226-ab22ed7681c0  
**Spatial Coverage:** North: 37 East: -109.04 South: 31.33 West: -114.82  
**Temporal Coverage:** any  
**Description:** This is a geology map of Arizona in USA.  
**Semantic Annotations:** see details

# MyGrid - Bioinformatics

myGrid



## Navigate

- [Home](#)
- [About](#)
- [Downloads](#)
- [Components](#)
  - [Component Overview](#)
  - [Research Components](#)
- [Using myGrid](#)
- [Research Using myGrid](#)
- [Links](#)
- [Publications](#)
- [Contact](#)

## Log In

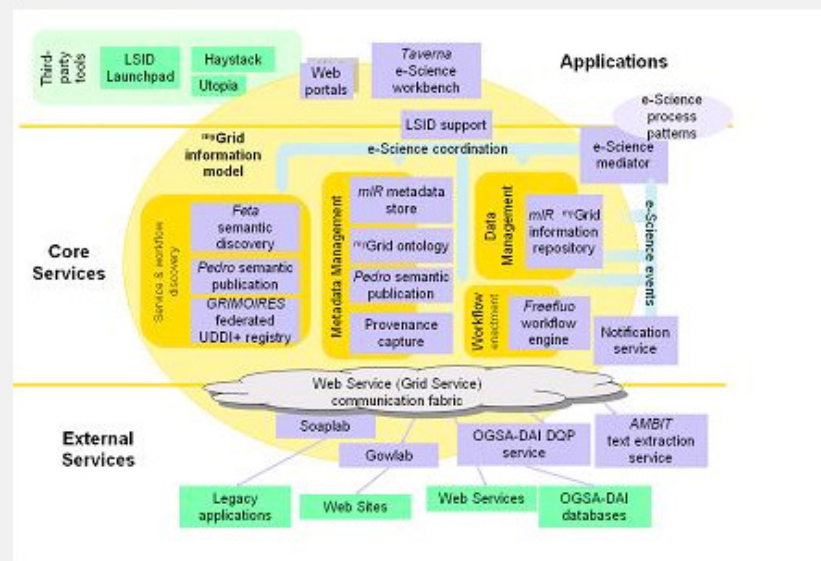
Username

Password

Log In

[New Account Signup](#)  
[Forgot Password](#)

## myGrid Architecture



## myGrid components - overview

myGrid is a collection of services and components that allows the high level integration of biological applications. The architecture provides the infrastructure necessary, in a web service environment, to support e-science workbench that actively supports the scientific lifecycle. Each component or service contributes to a system that allows the e-scientist to perform complex in-silico experiments across distributed bioinformatics resources.

# NEESGrid



Realtime access to earthquake  
Shake table experiments at remote sites.

Video Cameras

Home

Schedule

Announcements

Resources

Discussion

Telepresence Server

Video Cameras

ENotebook

Data Browser/Viewer

NEESgrid Repository

Chat

Browse Testbed

Select Camera: [1](#) [2](#) [3](#) [4](#) [5](#)

NEES Repository @ UNR

Symbol key:

- The folder is open (click to close).
- The folder is closed (click to open).
- Download this file using GridFTP.
- Upload a file to this folder using GridFTP.

Configure data streaming and recording for this event.

Make this event viewable with the NEES data viewer.

Follow a link between objects.

Folder "Data Acquisition"

name (string)  
Data\_Acquisition

lastAccessedTimestamp (timestamp)  
2002-11-12 13:15:06.055

lastModifiedTimestamp (timestamp)  
2002-11-12 13:15:06.055

originalVersionID (object)  
Data Acquisition

versionNumber (integer)  
0

creationTimestamp (timestamp)  
2002-11-12 13:15:06.055

lockTimestamp (timestamp)  
1969-12-31 18:00:00.0

NEESgrid

My Workspace | NEESgrid UNR | NEESgrid Support | NEESgrid All

Data Viewer

Event: "core: ex2 sine1-4"

Event	Timestamp
sine1	0.062791
sine2	0.24869
sine3	0.187381
sine4	0.125333

Home

Schedule

Announcements

Resources

Discussion

Telepresence Server

Video Cameras

ENotebook

Data Browser/Viewer

NEESgrid Repository



# Renci Bio Portal



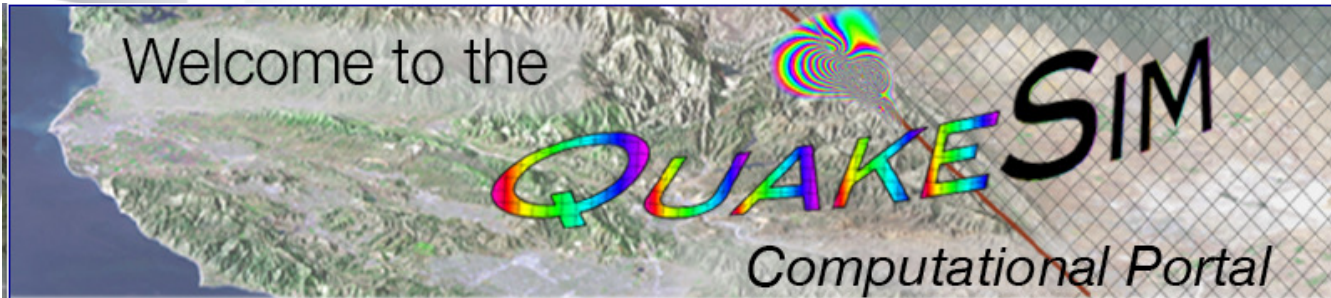
Providing access to biotechnology tools running on a back-end Grid.

- leverage state-wide investment in bioinformatics
- undergraduate & graduate education, faculty research
- another portal soon:  
national evolutionary synthesis center



InfoSys

# ServoGrid Portal



Username:

Password:

[Create New Account](#) | [Login Help](#)

[SERVOGrid](#) [FaultDB](#) [Search](#) [QuakeTables Portal](#) [Search](#)

SERVOGrid

## SERVO Grid

### Solid Earth Research Virtual Observatory Grid

- [QuakeSim](#) home page.
- Old GEM General Earthquake Modeling [Web Site](#)
- SLIDE Distributed [File System](#) for NASA Computational Technology Project
- [Report](#) from the Earth Science Enterprise Computational Technology Requirements Workshop April 30-May 1 2002 where SERVO concept first introduced
- Discover the Grid at the [Grid Forum](#) or at this [collection](#) of papers
- Other collected papers and presentations on SERVOGrid and related topics are available from the Community Grids Lab [publications page](#).

[QuakeSim Web Portal](#)

[User Manual](#)

[Support](#)

[Report Bugs](#)

[QuakeSim Web Site](#)

### Participating Institutions:

[IU CGL](#) | [NASA JPL](#) | [UC Davis](#) | [UC Irvine](#) | [USC](#)





**Example of an e-Infrastructure:**

# The DEISA Ecosystem for HPC Grand-Challenge Applications

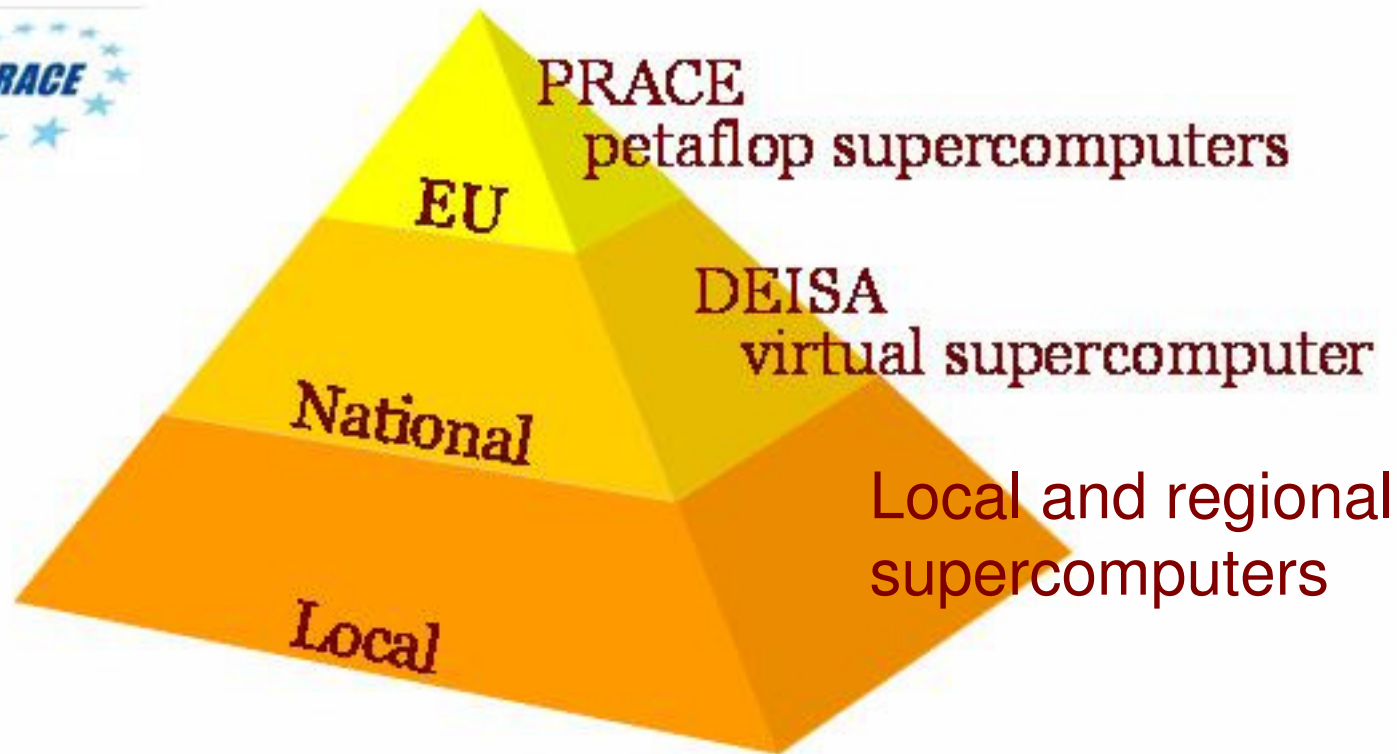
## Distributed European Infrastructure for Supercomputing Applications

DEISA





# new "petaflop" supercomputers



Mario Campolargo  
European Commission  
OGF23, June 2008

European Commission  
Information Society and Media



# DEISA: Vision and Mission



## Vision:

Persistent European HPC ecosystem integrating Tier-1 (Tflop/s) centres and European Tier-0 (Pflop/s) centres.

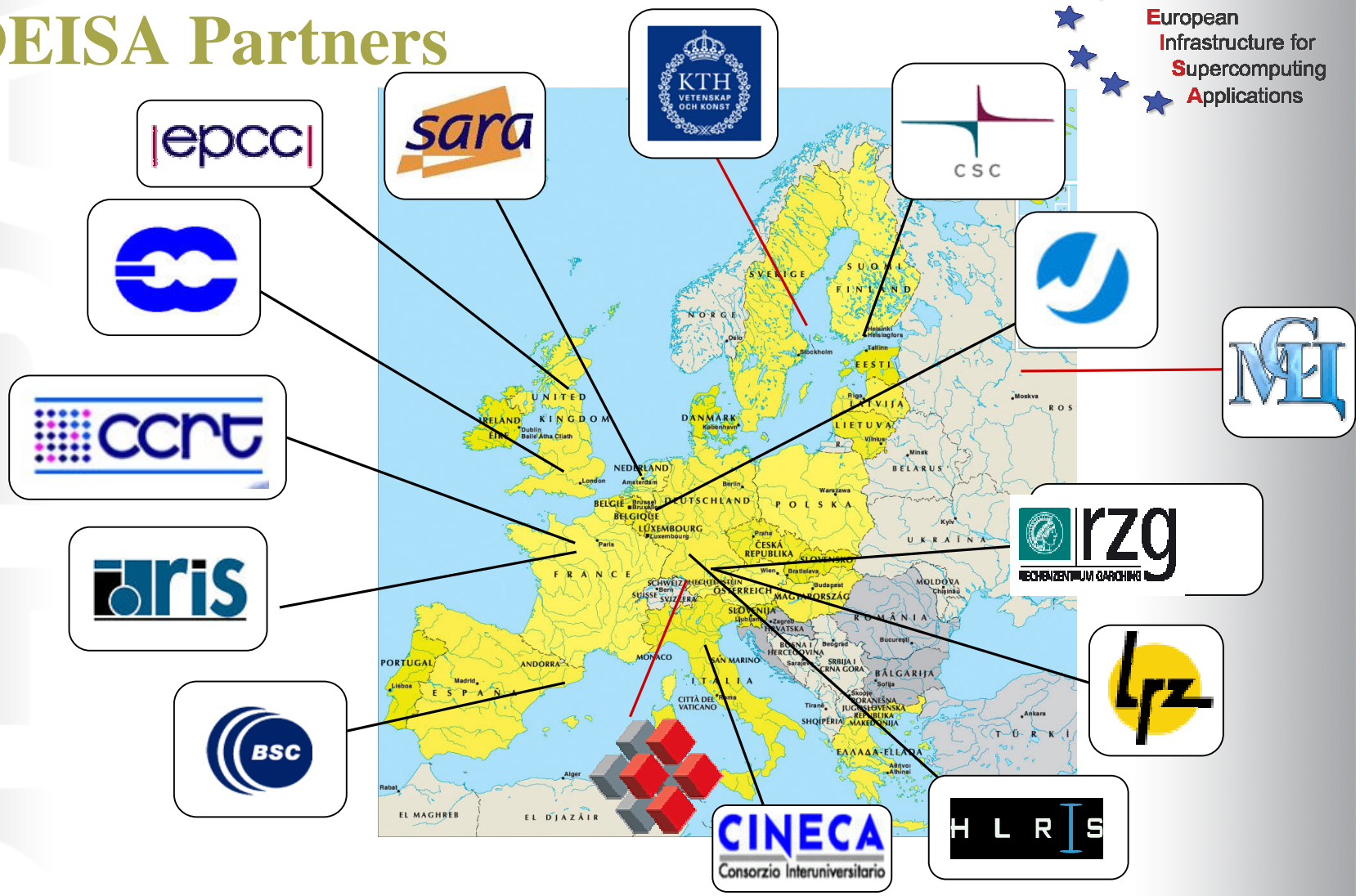
## Mission:

**Enhance** Europe's capability in computing and science by integrating most powerful supercomputers into a European HPC e-infrastructure.

**Build** European Supercomputing Service **on top of existing** national services, based on the deployment and operation of a persistent, production quality, distributed supercomputing environment with continental scope.

# DEISA Partners

**Distributed European Infrastructure for Supercomputing Applications**

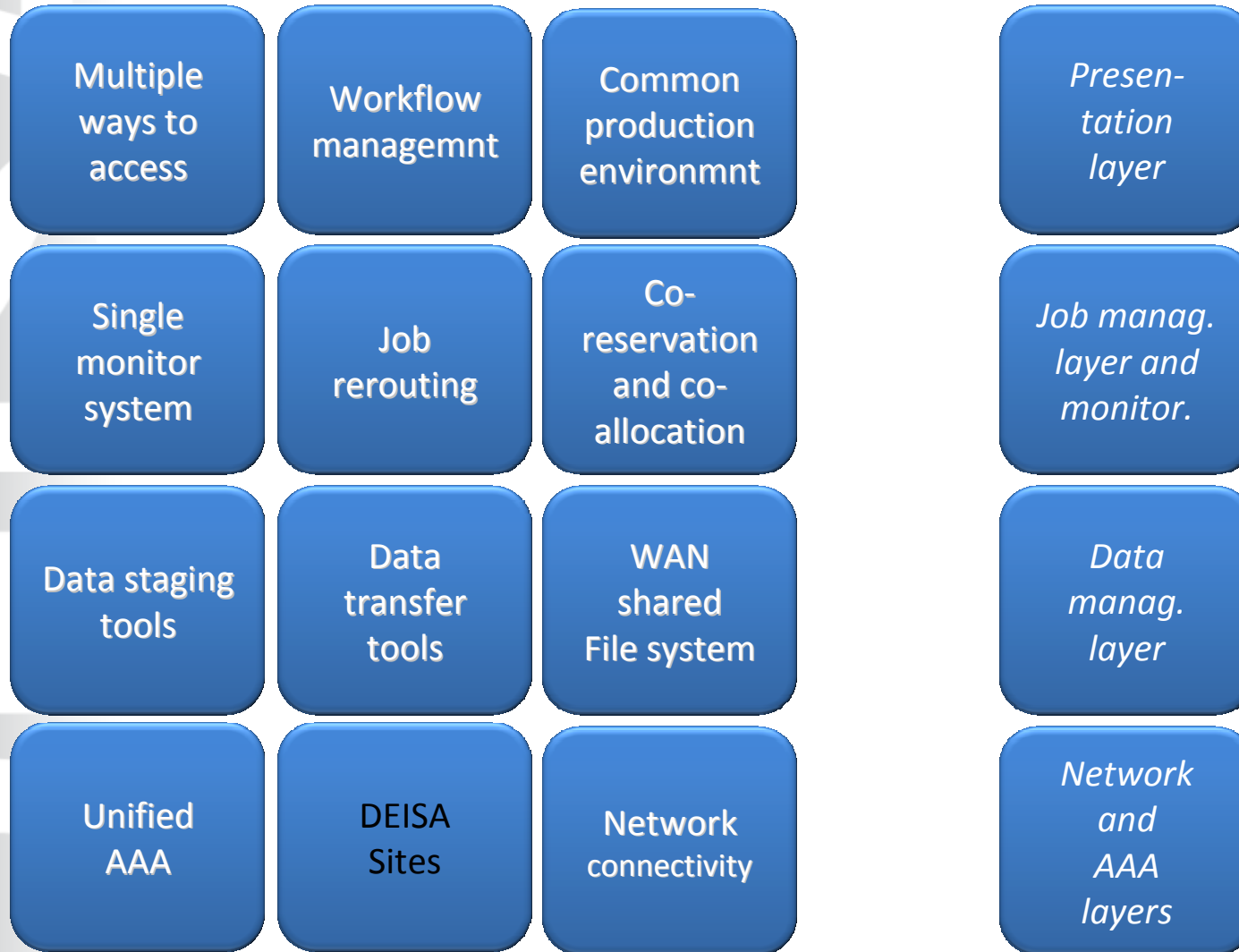


DEISA1: May 1st, 2004 – April 30th, 2008

DEISA2: May 1st, 2008 – April 30th, 2011

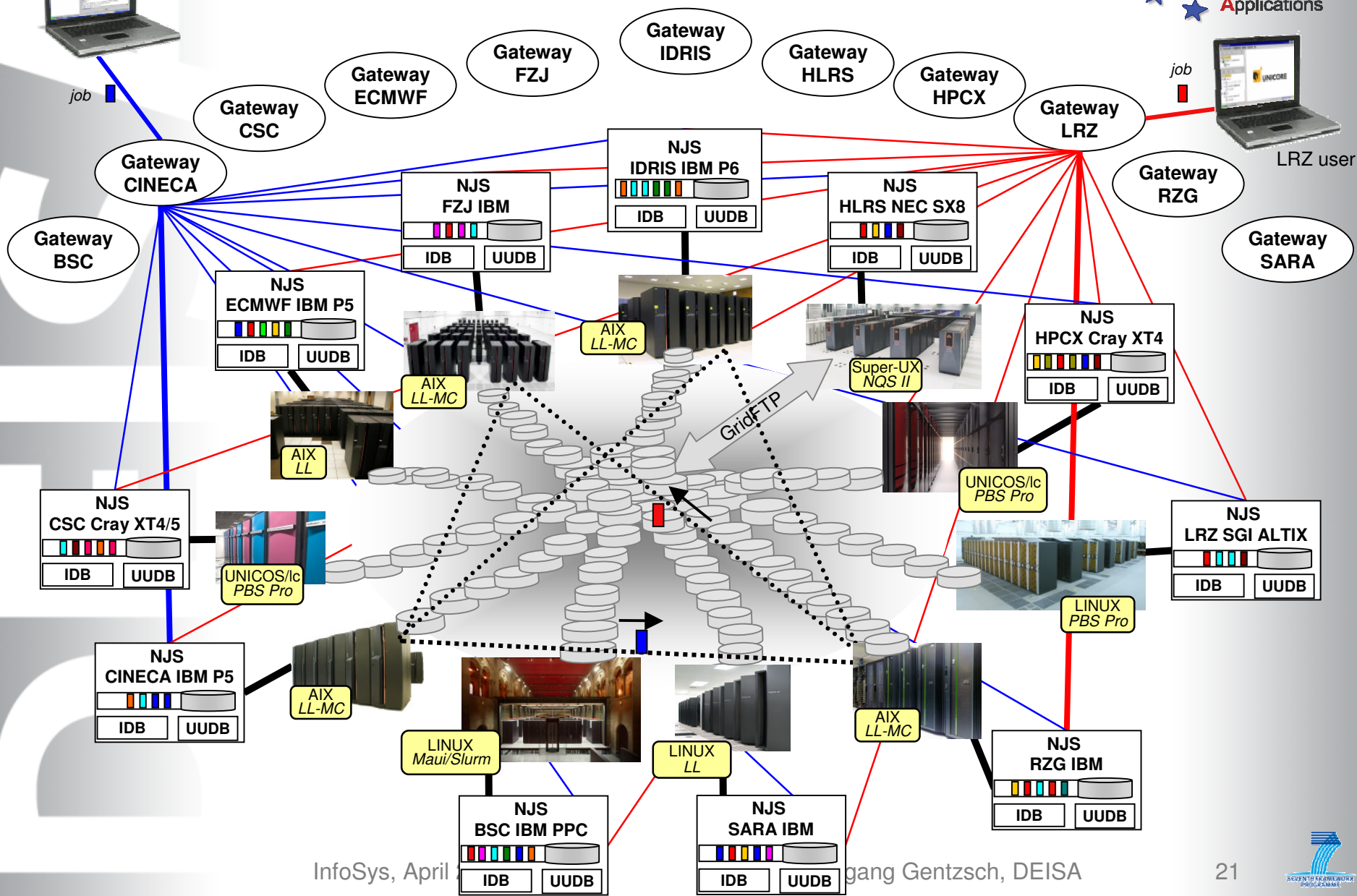


# DEISA Service Layers

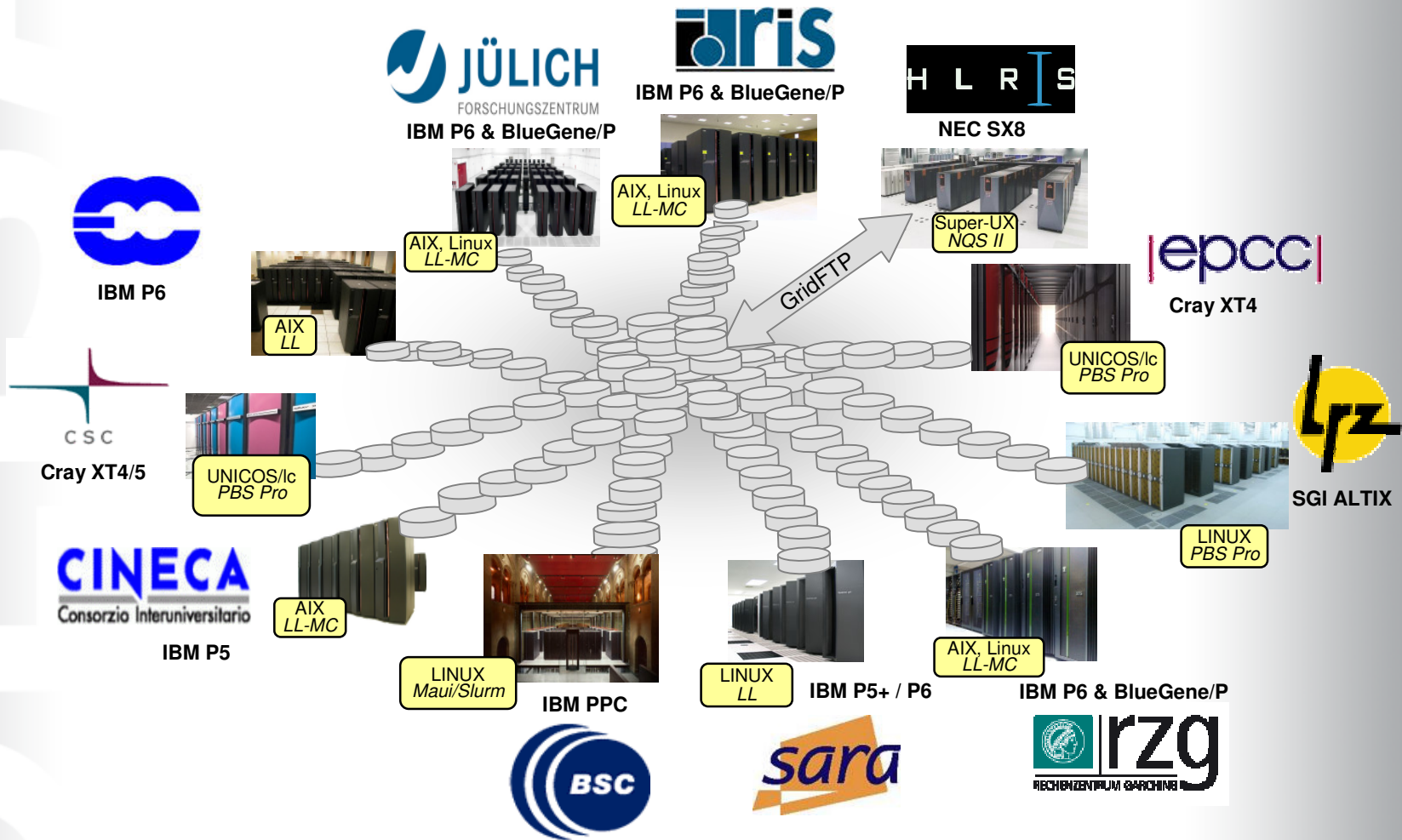


# DEISA UNICORE Infrastructure

Distributed European Infrastructure for Supercomputing Applications



# DEISA Global File System

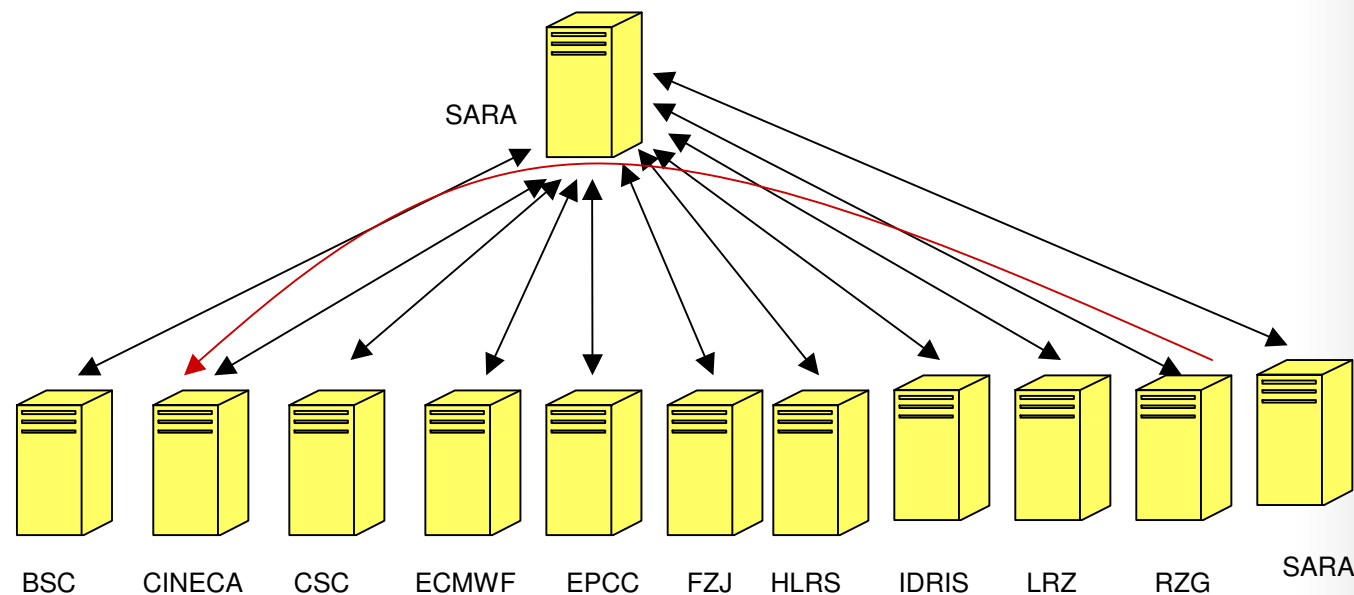


Global transparent file system based on the Multi-Cluster General Parallel File System (MC-GPFS of IBM)



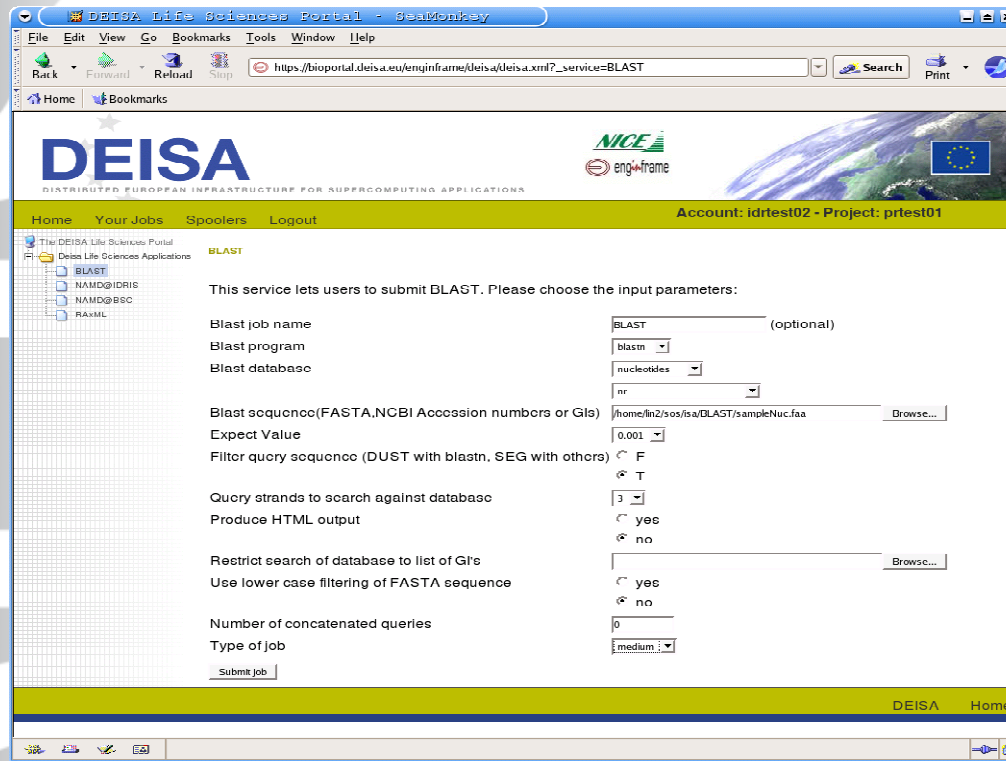
# Management of users in DEISA

- A dedicated LDAP-based distributed repository administers DEISA users
- Trusted LDAP servers are authorized to access each other (based on X.509 certificates) and encrypted communication is used to maintain confidentiality



# One Example of Virtual Communities: Joint Research Activity “Life Sciences”

## The DEISA Life Science Portal



The screenshot shows a web browser window displaying the DEISA Life Science Portal. The page title is "DEISA Life Science Portal - SeaMonkey". The address bar shows the URL: "https://biportal.deisa.eu/enqinframe/deisa/deisa.xml?\_service=BLAST". The page features the DEISA logo and the NICE enginframe logo. A navigation bar includes "Home", "Your Jobs", "Spoolers", and "Logout". The main content area is titled "BLAST" and contains a form for submitting BLAST queries. The form includes fields for "Blast job name", "Blast program", "Blast database", "Blast sequence", "Expect Value", "Filter query sequence", "Query strands to search against database", "Produce HTML output", "Restrict search of database to list of GIs", "Use lower case filtering of FASTA sequence", "Number of concatenated queries", and "Type of job". A "Submit job" button is located at the bottom of the form.

**Joint Research Activity (JRA)**

**Promoting parallel apps in the  
life science community**

**Running big simulations  
on DEISA infrastructure  
that couldn't be done locally**

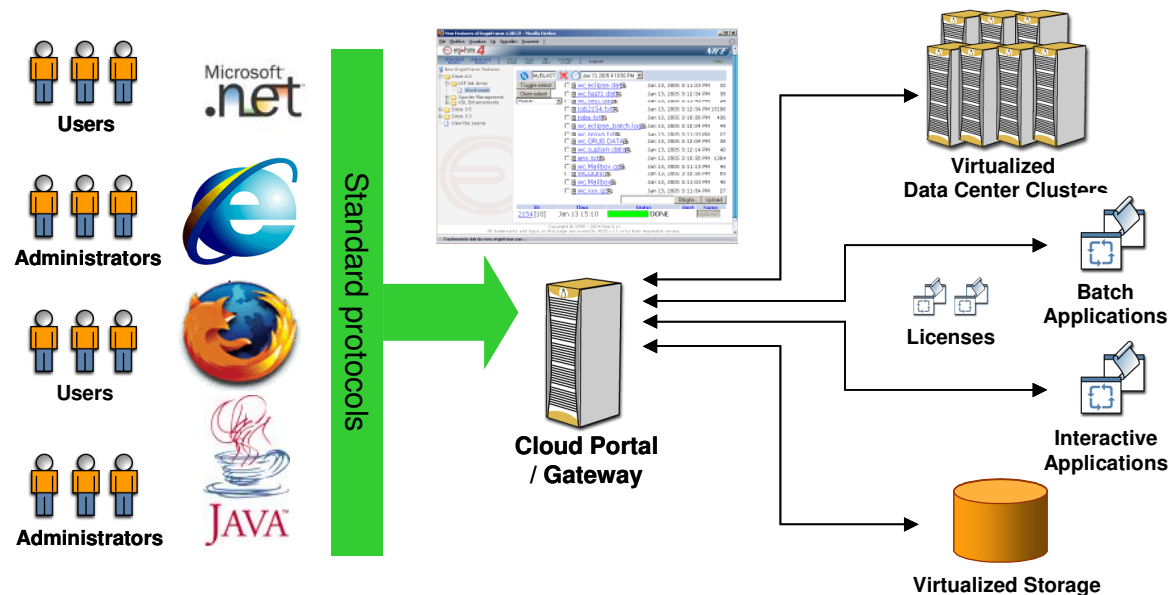
**Providing ease of access to  
resources**

**Application support for life  
science portal**



# NICE EnginFrame Cluster/Grid/Cloud Portal

Provides remote, interactive, transparent, and secure access to applications and data on your corporate Intranet or Internet, or in the Cloud.



Users and administrators can access and control computing resources via an intuitive and standard Web interface virtually anywhere using a standard Web browser.



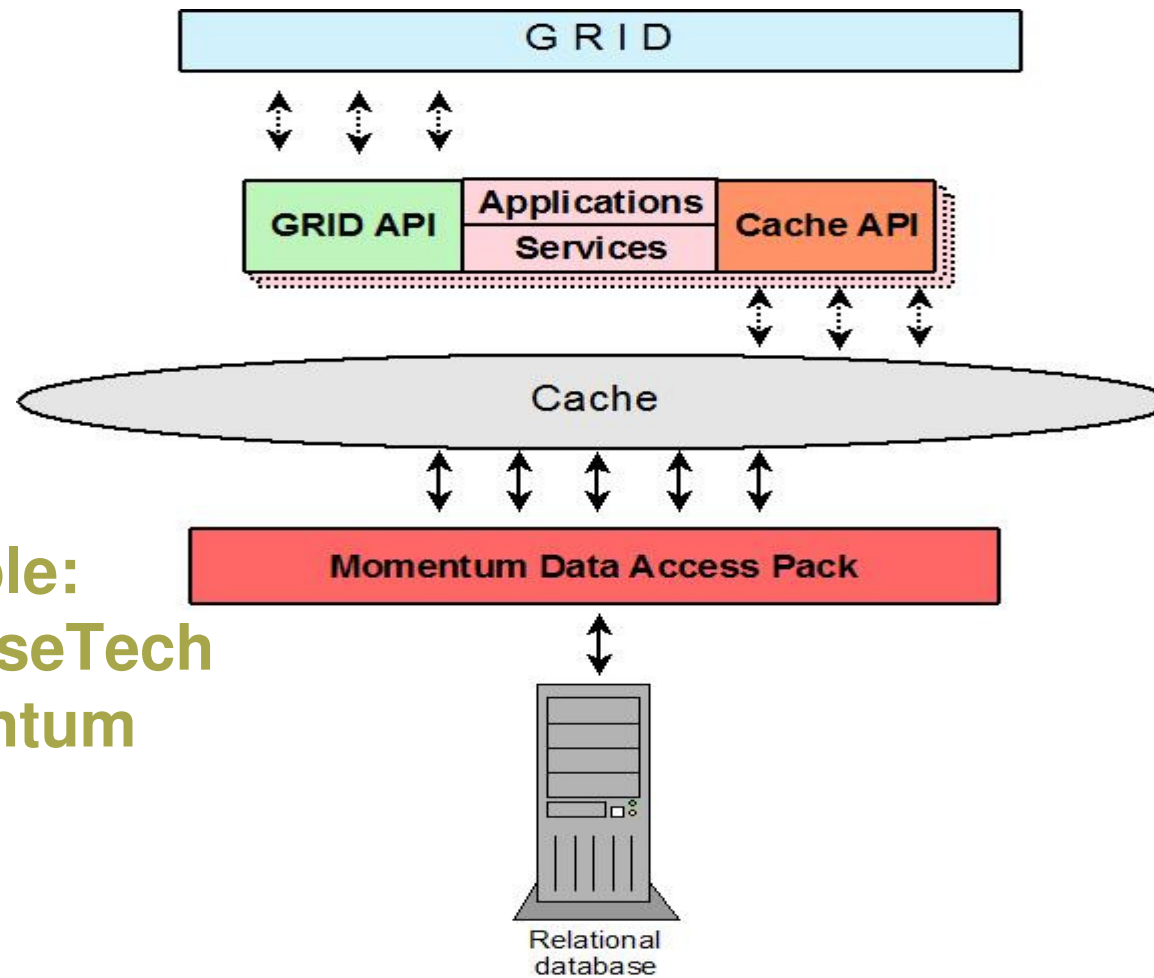
DEI S



# e-Infrastructure for Business: Example: Telecommunications



# The Core: A scalable Infrastructure



**Example:  
GridwiseTech  
Momentum**

# New Powerful End-User Devices

Carry-along PCs (CAPS) , Ultra-Mobile PCs (UMPC) , Cellphones



CAPC, from Samsung, South Korea



## OLPC from MIT



Fujitsu UMPC



T83 Tablet from Asus, Taiwan, demoed at CeBit 2007



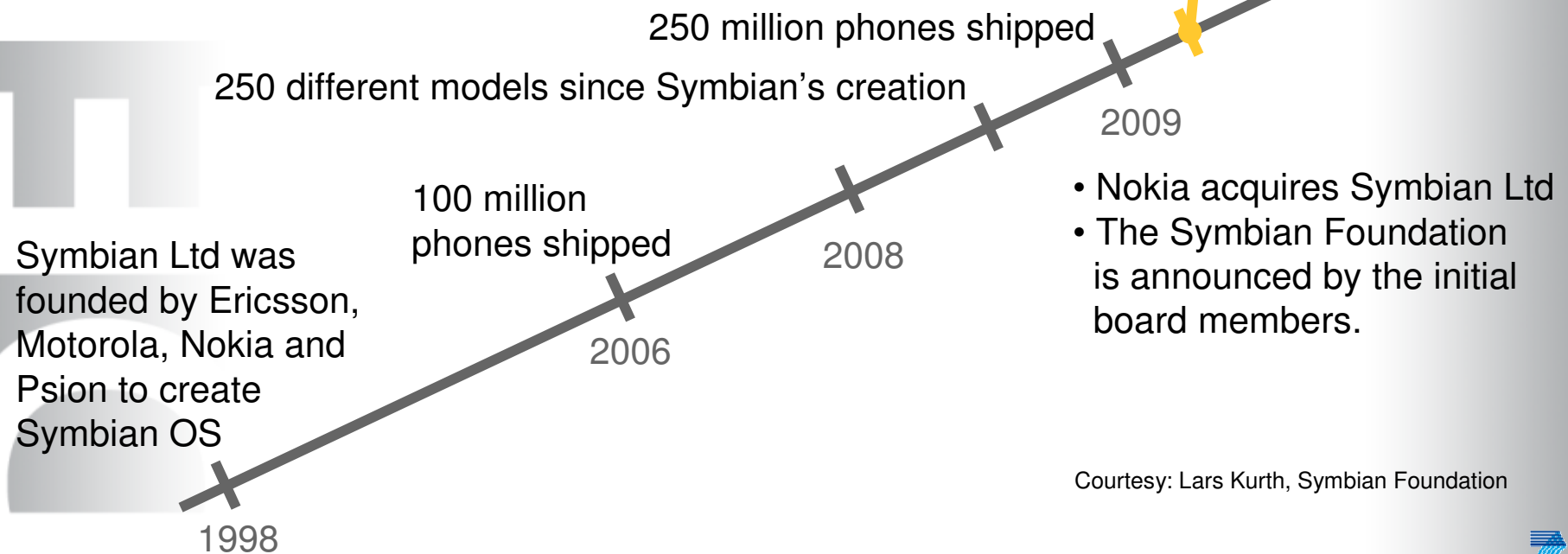
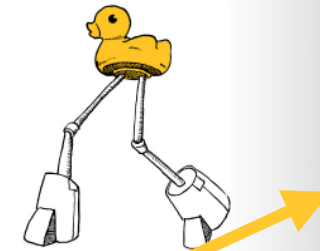
CAPC from HTC



Asus R2H

# The Symbian OS

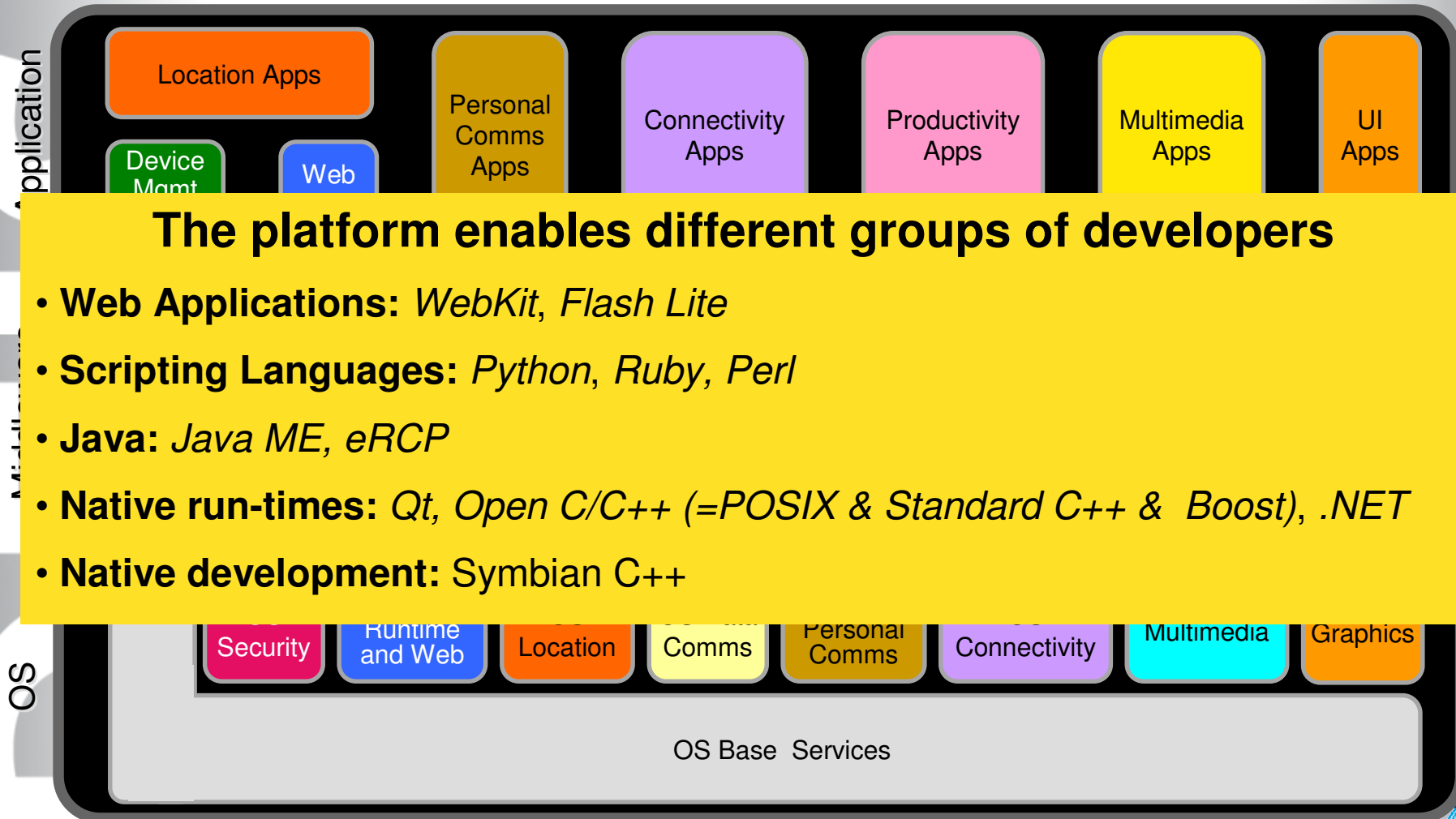
**SYMBIAN  
FOUNDATION**



Courtesy: Lars Kurth, Symbian Foundation

# The Symbian Platform

(code on the device)




# A Peek at Intel's Digital City Vision




Courtesy Robert Fogel, Intel

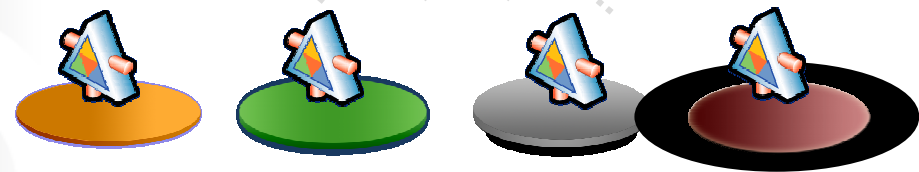
# Today's Digital Challenge

  
 Taxes Shopping Working Banking

Multiple Identities

  
 Wimax WiFi Wired Cellular

Incompatible Networks

  
 Business Citizen Govt Employee

Disconnected Agencies



# Tomorrow's Integrated Digital City



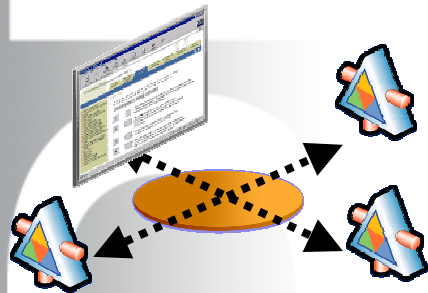
A single, portable identity based on strong security

One Identity



An intelligent infrastructure supporting seamless access

One Network



A gateway to integrated e-Services spanning multiple agencies

One Face

# Facets of the Digital City

 **Distributed European Infrastructure for Supercomputing Applications**



Serving Citizens



Digital Education



Economic Vitality  
(Digital Office)



Digital Govt  
GAPP Programs

**Digital City**

Digital Healthcare



Bridging the  
Digital Divide

Digital Home



Safety & Security

**The Digital City is the Fabric that Connects the Community**

# Finally: connected anyone, anywhere anytime, any device



- **Integration** of new devices, data and information sources, PDAs, cell phones, smart sensors, sensor arrays, health monitors
- **Embedded** in cars, engines, roads, bridges, clothes,...
- **Real-time** analysis of huge amount of data
- **Policies**, grid & cloud economy, maintain stability and efficiency
- **Society** support, to bridge political and social boundaries . . .

... very much like any other vital infrastructure today,  
such as roads, telecom, water, electricity, etc...

DEISA

## More about DEISA in:



# Thank You!

[Gentsch@rzg.mpg.de](mailto:Gentsch@rzg.mpg.de)

