Distributed
European
Infrastructure for
Supercomputing
Applications

e-Infrastructures for
data and compute intensive applications

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

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Content

Distributed
European
Infrastructure for
**S**upercomputing
Applications
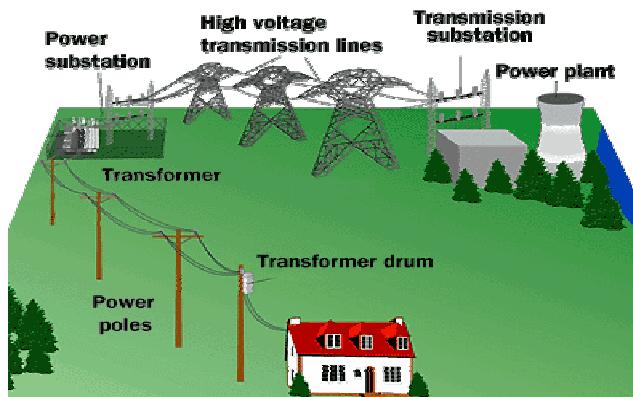
Service Infrastructures

Ancient Rome: ten aqueducts,
some 150,000 m^3 of water each day

Electrical Power Grid
Infrastructure

Transportation
Grids
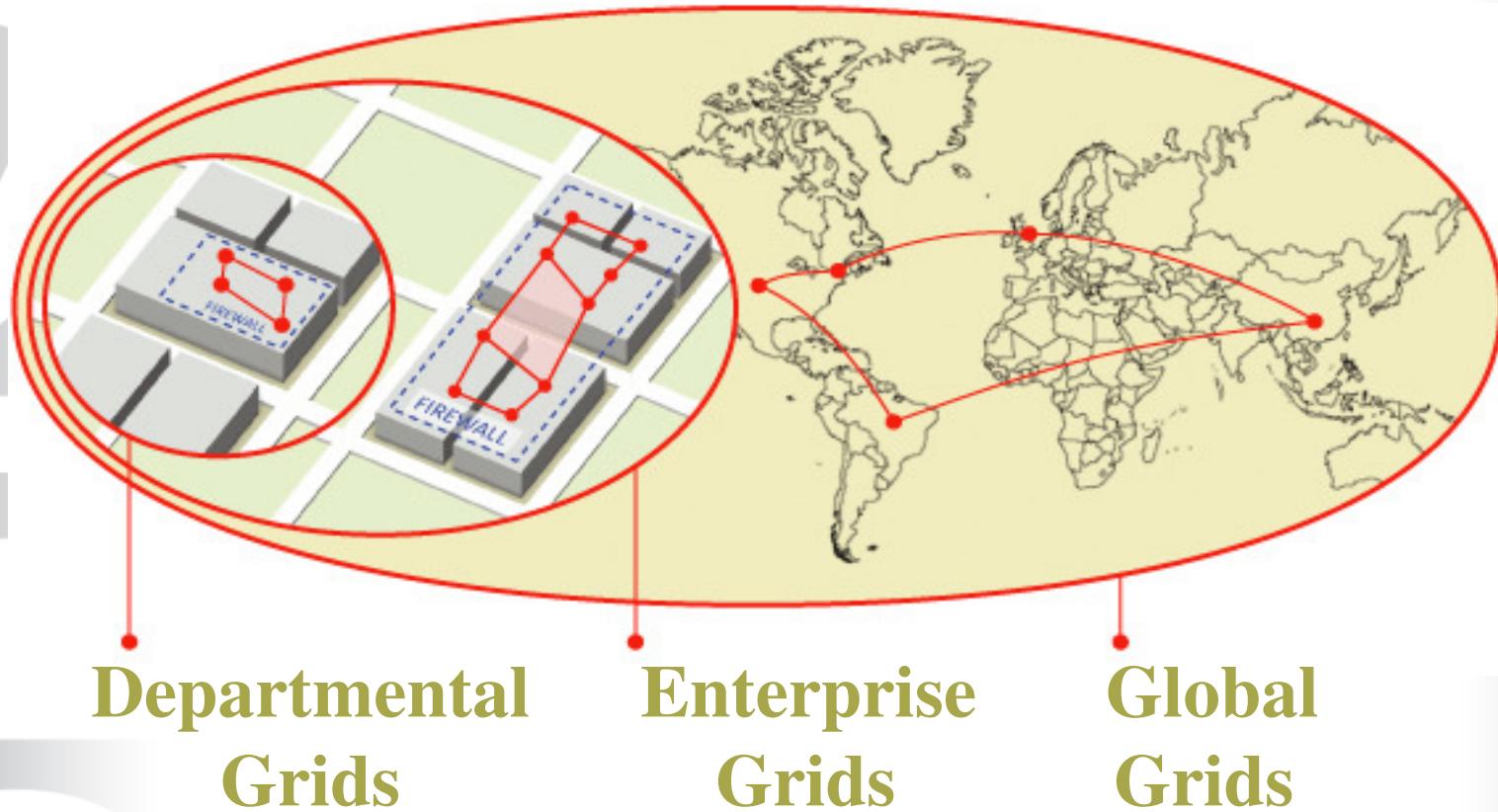
EGEE – Enabling
Grid in E-SciencE

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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

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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
  - Concurency 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
- . . .

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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)

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Examples of a successful Research e-Infrastructures

BIRN – Biomedical Information

Geological Information Grid Portal

MyGrid - Bioinformatics

Navigate

Home
About
Downloads
Components
   Component Overview
   Research Components
Using myGrid
Research Using myGrid
Links
Publications
Contact

Log In
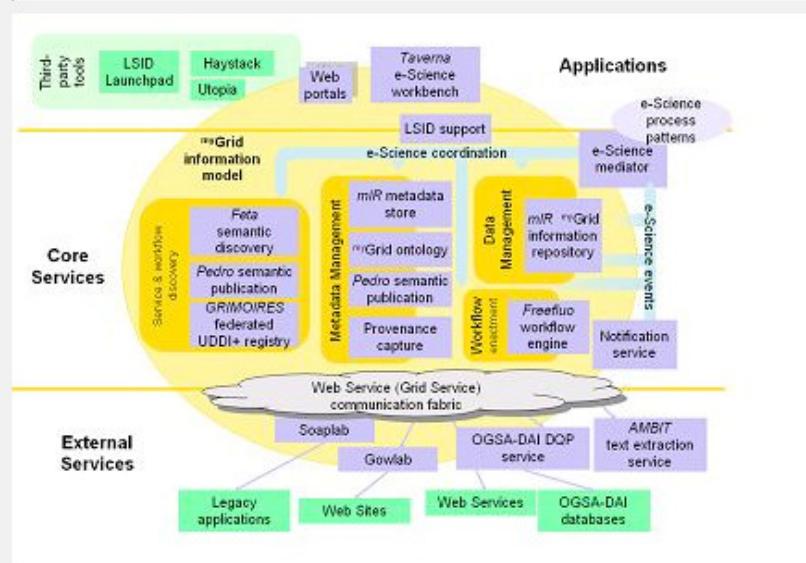
Username

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, e-science workbench that actively supports the scientific lifecycle. Each component or service contri system that allows the e-scientist to perform complex in-silico experiments across distributed bioinfo resources.

NEESGrid

Realtime access to earthquake
Shake table experiments at remote sites.

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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

Distributed European Infrastructure for Supercomputing Applications

ServoGrid Portal

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Example of an e-Infrastructure:

Distributed European Infrastructure for Supercomputing Applications

The DEISA Ecosystem for HPC Grand-Challenge Applications

Distributed European Infrastructure for Supercomputing Applications

new "petaflop" supercomputers

PRACE
petaflop supercomputers

EU

DEISA
virtual supercomputer

National

Local and regional supercomputers

Local

Mario Campolargo
European Commission
OGF23, June 2008

e-infrastructure

DEISA: Vision and Mission

Distributed European Infrastructure for Supercomputing Applications

Vision:

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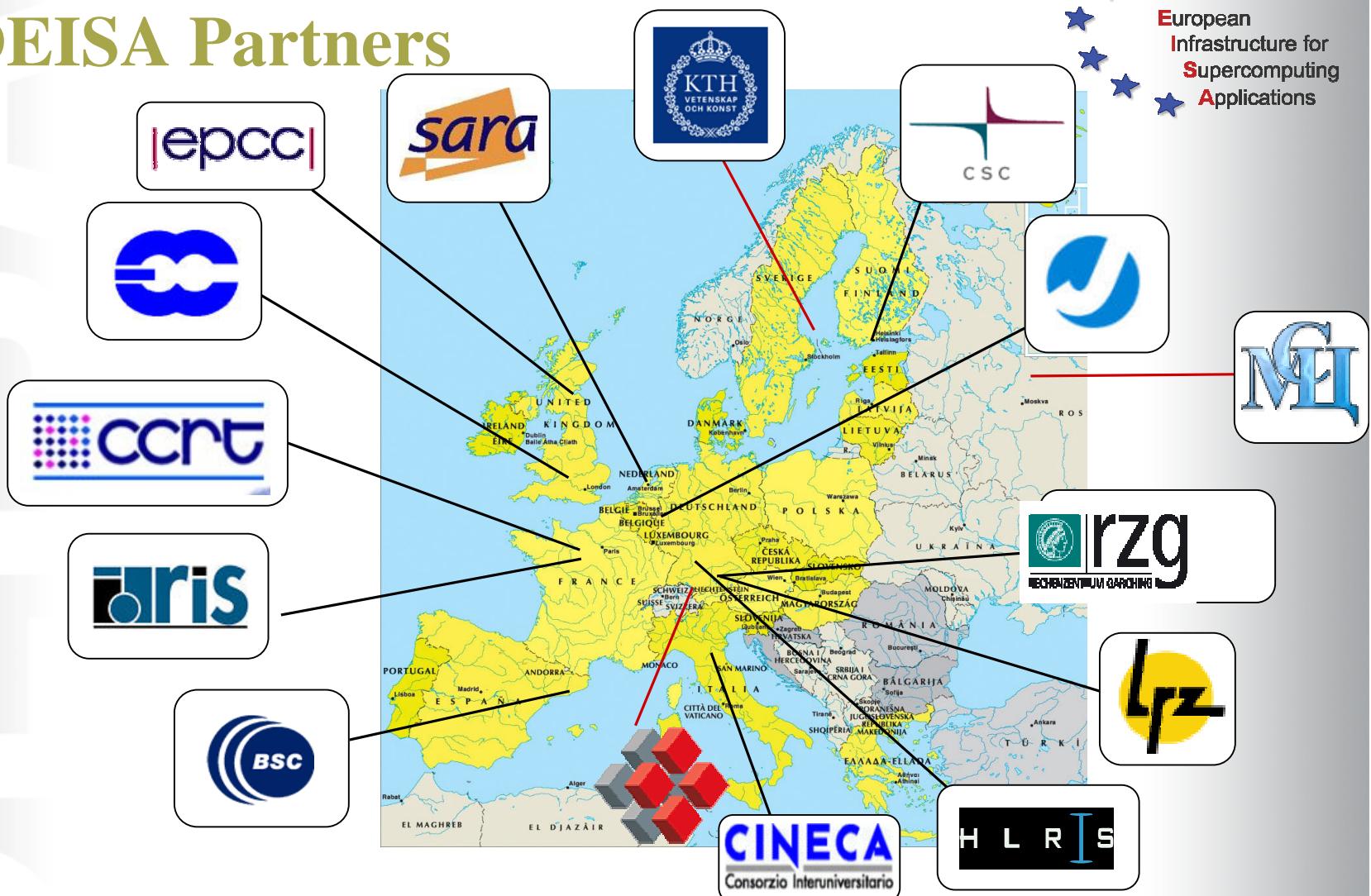
Mission:

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.

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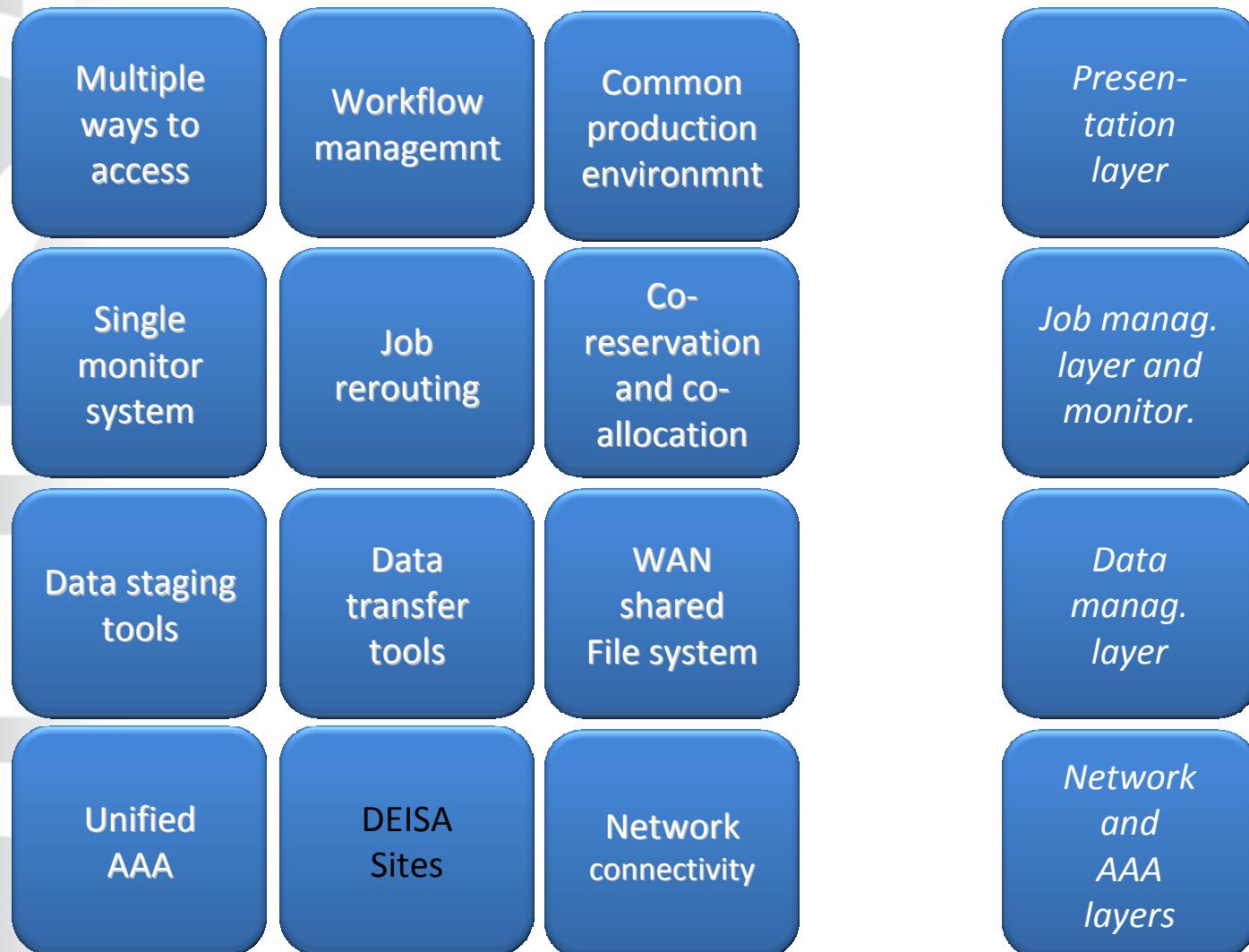
DEISA1: May 1st, 2004 – April 30th, 2008

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

DEISA Service Layers

Multiple ways to access	Workflow managemnt	Common production environmnt		*Presen-tation layer*
Single monitor system	Job rerouting	Co-reservation and co-allocation		*Job manag. layer and monitor.*
Data staging tools	Data transfer tools	WAN shared File system		*Data manag. layer*
Unified AAA	DEISA Sites	Network connectivity		*Network and AAA layers*

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DEISA UNICORE Infrastructure

Distributed European Infrastructure for Supercomputing Applications

CINECA user

job

Gateway CSC

Gateway ECMWF

Gateway FZJ

Gateway IDRIS

Gateway HLRS

Gateway HPCX

Gateway LRZ

job

LRZ user

Gateway CINECA

Gateway BSC
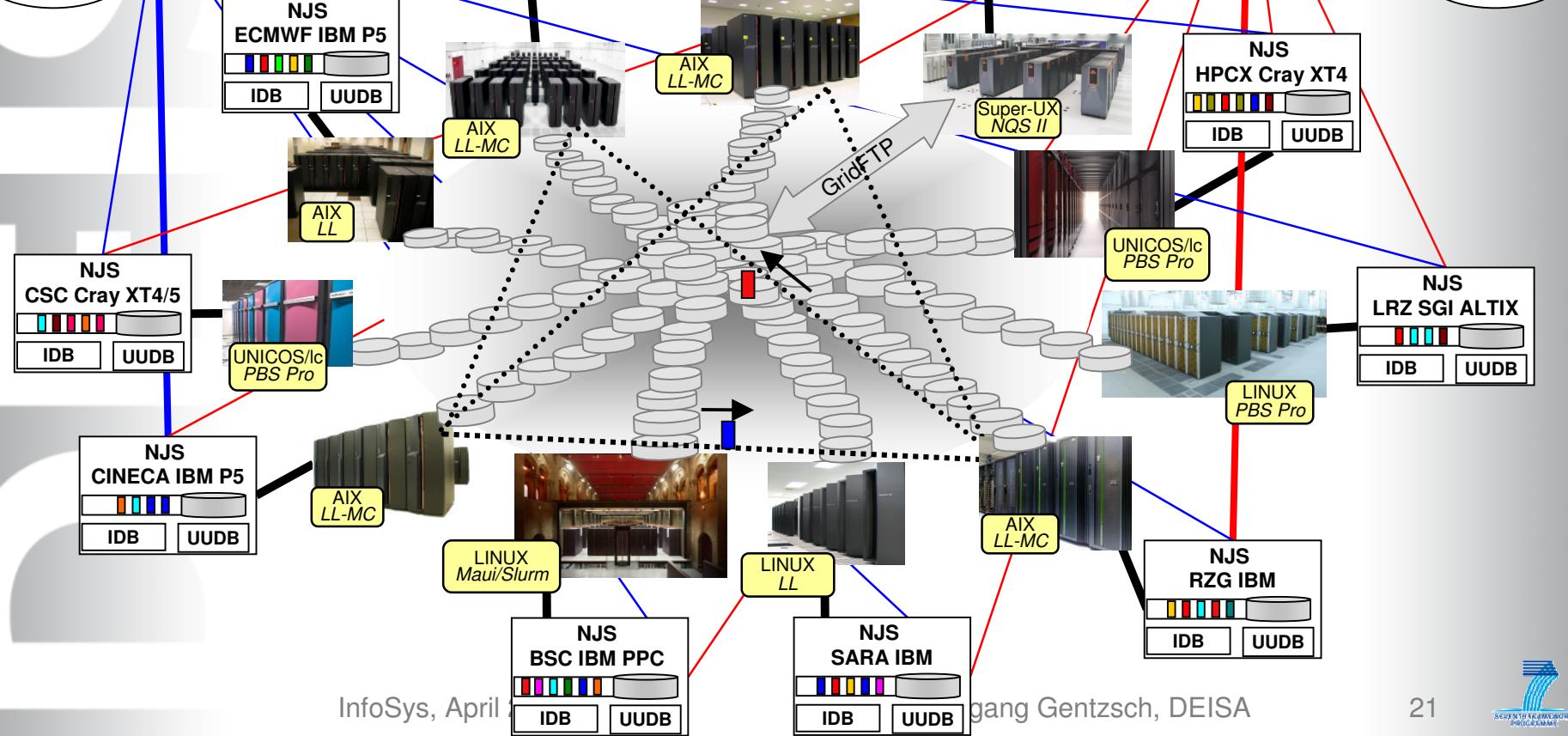
Gateway RZG

Gateway SARA

NJS IDRIS IBM P6 — IDB | UUDB

NJS FZJ IBM — IDB | UUDB

NJS HLRS NEC SX8 — IDB | UUDB

NJS ECMWF IBM P5 — IDB | UUDB

NJS HPCX Cray XT4 — IDB | UUDB

AIX LL-MC

AIX LL

AIX LL-MC

Super-UX NQS II

GridFTP

UNICOS/lc PBS Pro

NJS CSC Cray XT4/5 — IDB | UUDB

UNICOS/lc PBS Pro

NJS LRZ SGI ALTIX — IDB | UUDB

LINUX PBS Pro

NJS CINECA IBM P5 — IDB | UUDB

AIX LL-MC

LINUX Maui/Slurm

LINUX LL

AIX LL-MC

NJS BSC IBM PPC — IDB | UUDB

NJS SARA IBM — IDB | UUDB

NJS RZG IBM — IDB | UUDB

InfoSys, April 2... gang Gentzsch, DEISA   21

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DEISA Global File System
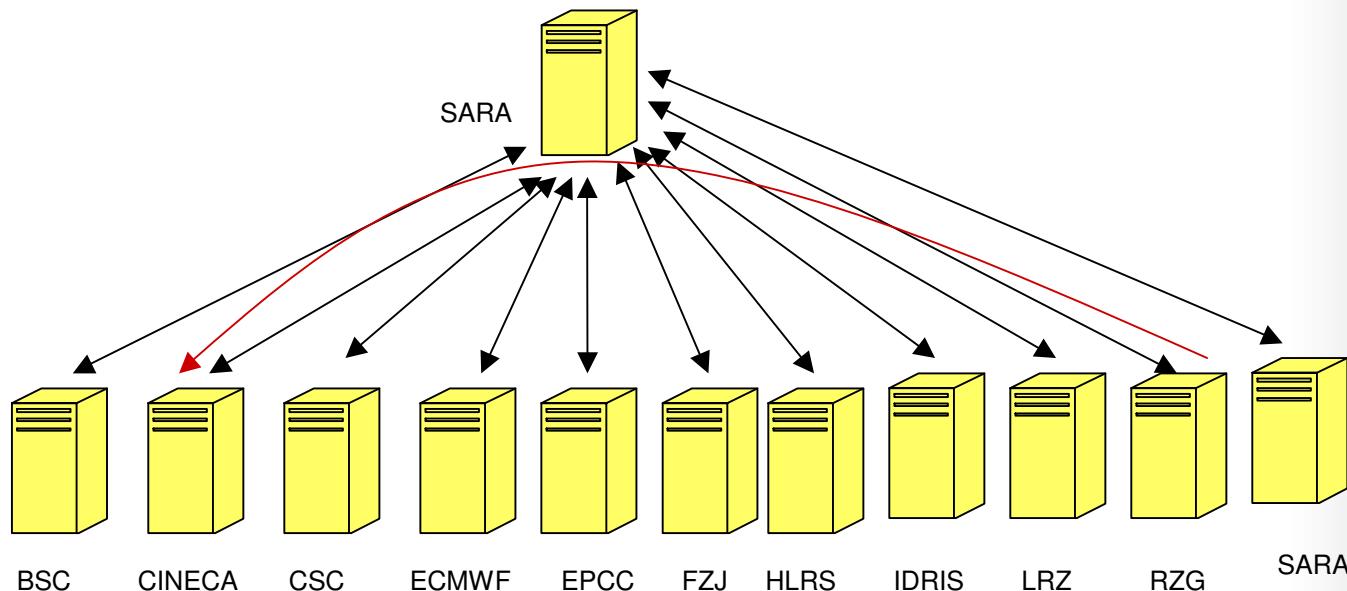
Distributed
European
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Applications

IBM P6 & BlueGene/P

IBM P6 & BlueGene/P

NEC SX8

AIX, Linux
LL-MC

AIX, Linux
LL-MC

Super-UX
NQS II

Cray XT4

IBM P6

AIX
LL

GridFTP

UNICOS/lc
PBS Pro

SGI ALTIX

Cray XT4/5

UNICOS/lc
PBS Pro

LINUX
PBS Pro

AIX
LL-MC

IBM P5

LINUX
Maui/Slurm

IBM PPC

LINUX
LL

IBM P5+ / P6

AIX, Linux
LL-MC

IBM P6 & BlueGene/P

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

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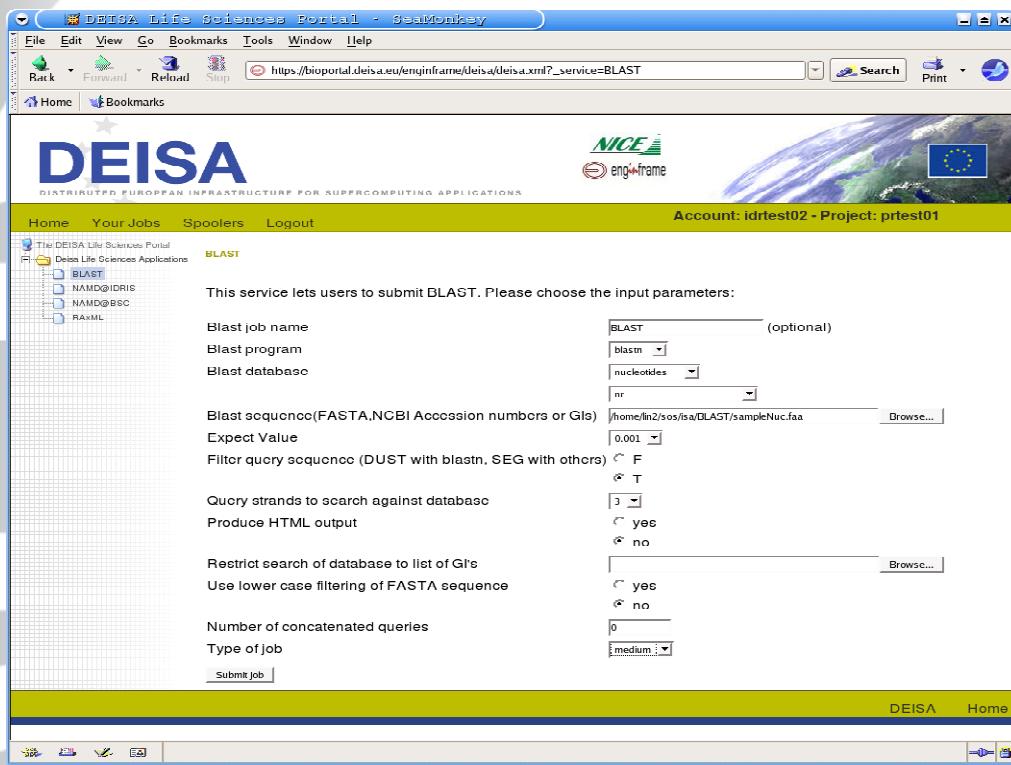
Management of users in DEISA

- 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

SARA

BSC   CINECA   CSC   ECMWF   EPCC   FZJ   HLRS   IDRIS   LRZ   RZG   SARA

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One Example of Virtual Communities:
Joint Research Activity "Life Sciences"

The DEISA Life Science Portal

Joint Research Activity (JRA)

Promoting parallel apps in the life science community

Running big simulations on DEISA infrastructure that couldn't be done locally
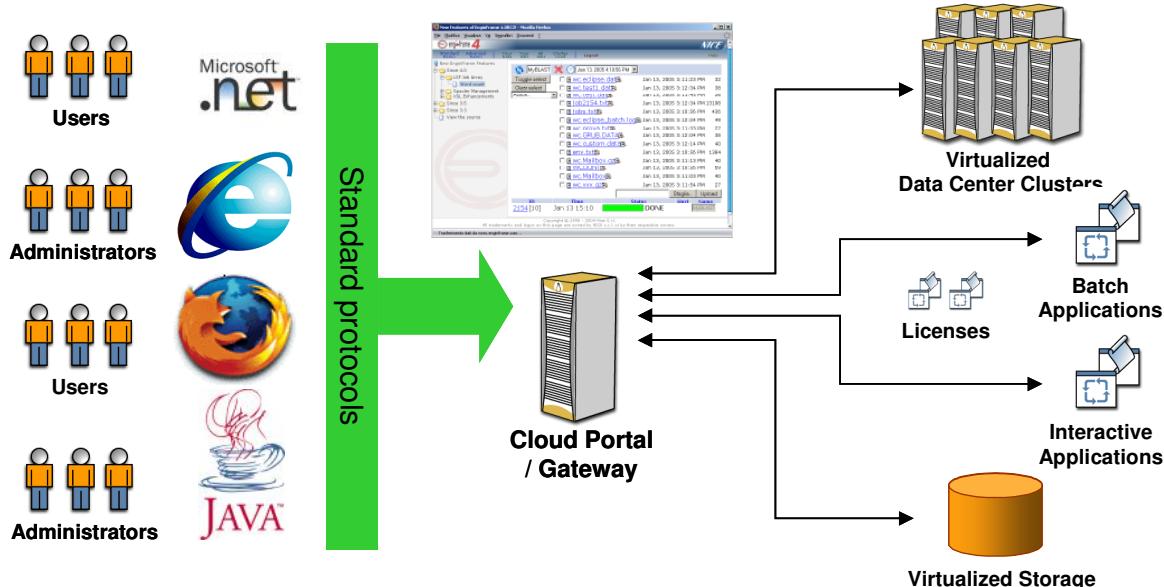
Providing ease of access to resources

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.
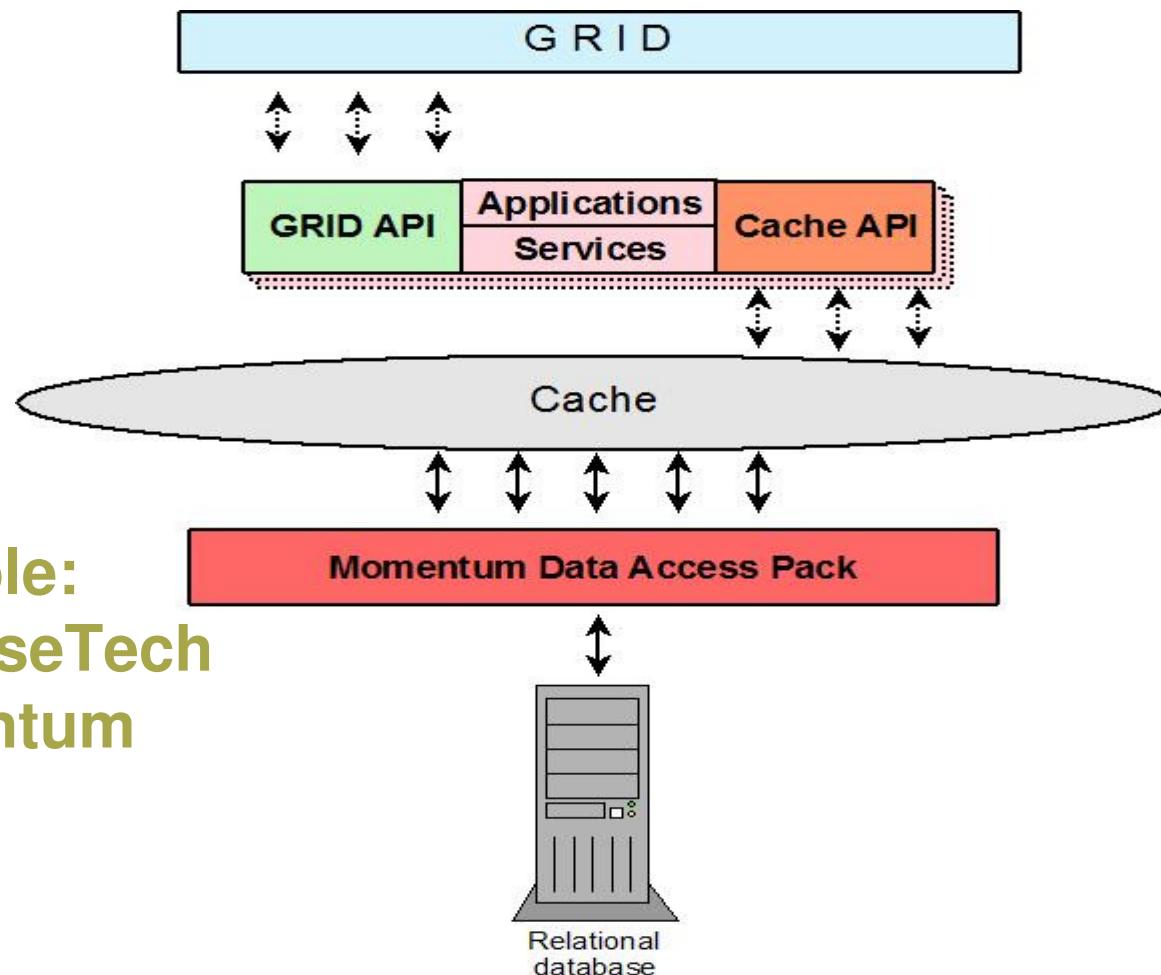
e-Infrastructure for Business:

Example: Telecommunications

The Core:
A scalable Infrastructure

Distributed
European
Infrastructure for
Supercomputing
Applications

Example: GridwiseTech Momentum

GRID

GRID API | Applications Services | Cache API

Cache

Momentum Data Access Pack

Relational database

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

Asus R2H

CAPC from HTC

The Symbian OS

SYMBIAN FOUNDATION

250 million phones shipped

250 different models since Symbian's creation

100 million phones shipped

2009

2008

Symbian Ltd was founded by Ericsson, Motorola, Nokia and Psion to create Symbian OS

2006
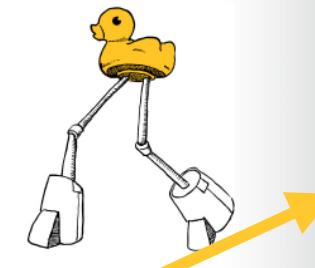
- Nokia acquires Symbian Ltd
- The Symbian Foundation is announced by the initial board members.
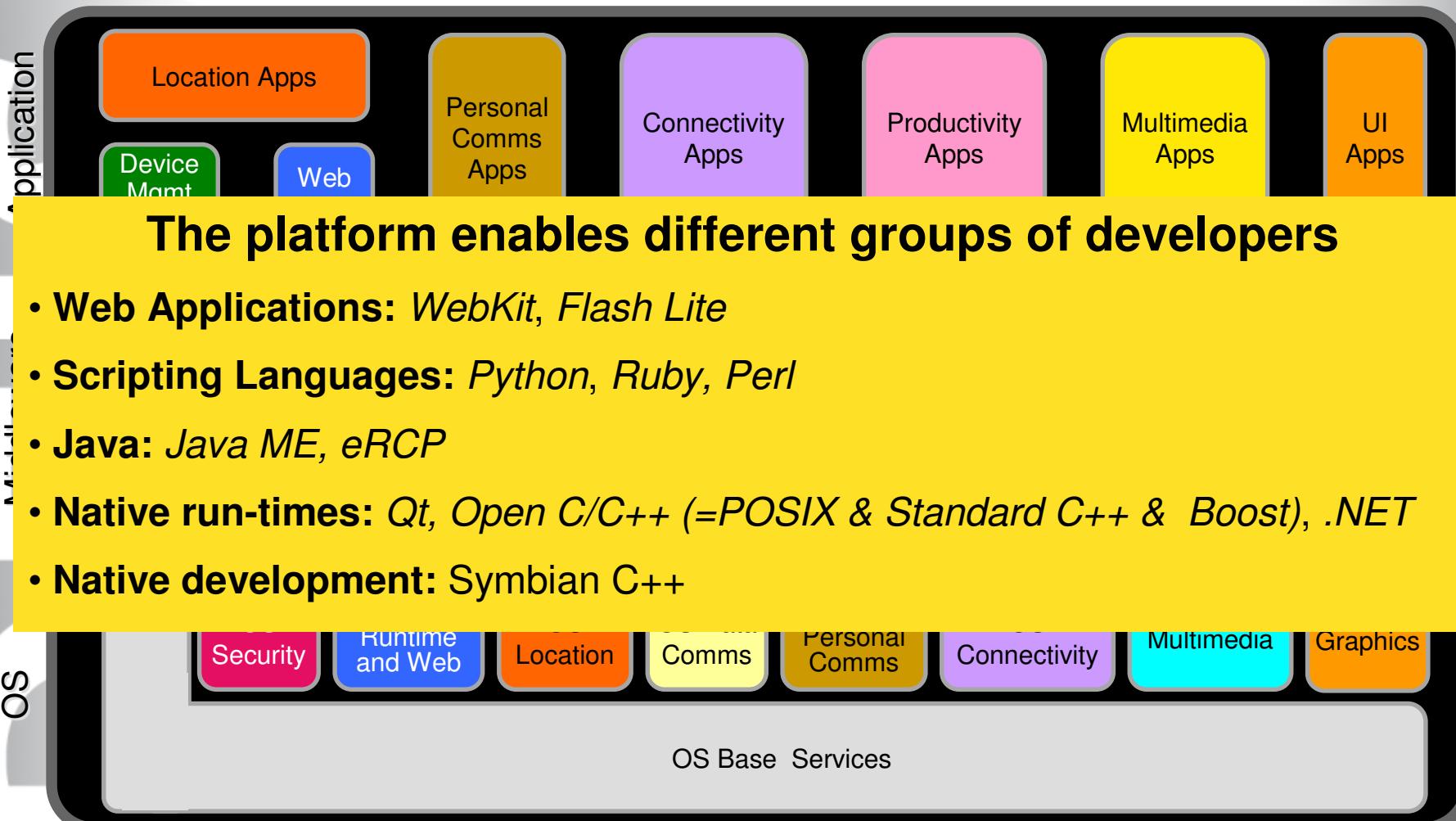
Courtesy: Lars Kurth, Symbian Foundation

1998

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The Symbian Platform

(code on the device)

Location Apps

Device Mgmt

Web

Personal Comms Apps

Connectivity Apps

Productivity Apps

Multimedia Apps

UI Apps

The platform enables different groups of developers

- **Web Applications:** *WebKit*, *Flash Lite*

- **Scripting Languages:** *Python*, *Ruby*, *Perl*

- **Java:** *Java ME, eRCP*

- **Native run-times:** *Qt, Open C/C++ (=POSIX & Standard C++ & Boost), .NET*

- **Native development:** Symbian C++

Security

Runtime and Web

Location

Comms

Personal Comms

Connectivity

Multimedia

Graphics

OS Base Services

Application

OS

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A Peek at Intel's Digital City Vision

Imagine a city...

That Transforms the way we Work, Live & Play...

Courtesy Robert Fogel, Intel
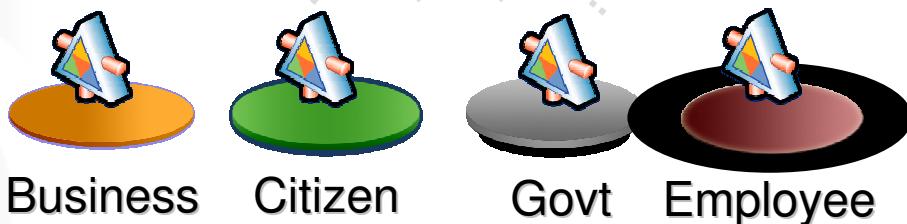
Today's Digital Challenge

Taxes Shopping Working Banking

Multiple Identities

Wimax WiFi Wired Cellular

Incompatible Networks

Business Citizen Govt Employee

Disconnected Agencies
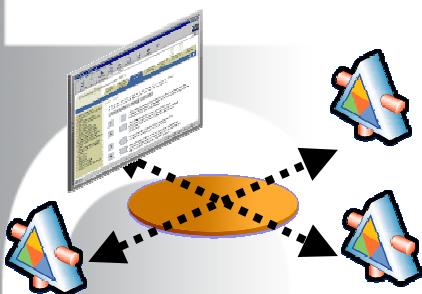
# Tomorrow's Integrated Digital City

A single, portable identity based on strong security
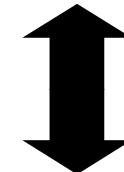
One Identity

An intelligent infrastructure supporting seamless access

One Network

A gateway to integrated e-Services spanning multiple agencies

One Face

Facets of the Digital City

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
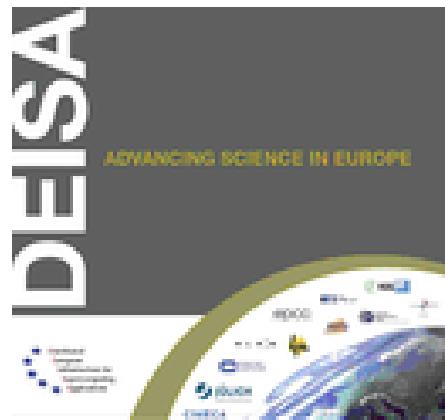
Finally:
connected anyone, anywhere
anytime, any device

- **Integration** of new devices, data and information sources, PDAs, ell 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…

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More about DEISA in:

Thank You!

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