Distributed European Infrastructure for Supercomputing Applications

DEISA: Federated operation of the European HPC infrastructure

Johannes Reetz (RZG), Jules Wolfrat (SARA)
johannes.reetz@rzg.mpg.de

NEERI 09
Helsinki, Finland
October 1-2, 2009

www.deisa.eu

e-infrastructure

RI-222919

Agenda

Distributed European Infrastructure for Supercomputing Applications

Advancing the European HPC Infrastructure and Services

- Objectives and Strategy
- Inventory of Services and Resources
- Achievements

Organisation as a Virtual Distributed HPC Centre

- Applications, Technology, Operations

Federated Operation of the Infrastructure and User Services

- Organisation and Tasks of Operations
- Operation Management
- Facilities and Collaboration

Experiences

RI-222919

Objectives & Strategy for HPC in Europe

Distributed European Infrastructure for Supercomputing Applications

EU FP6 objective

Advancing capability computing for science and research in Europe by integrating the most powerful supercomputing systems in a European HPC infrastructure

DEISA strategy

building a European HPC Service on top of existing national HPC services. This service is based on the deployment and operation of a persistent, production quality, distributed supercomputing environment with continental scope

EU FP7 objective

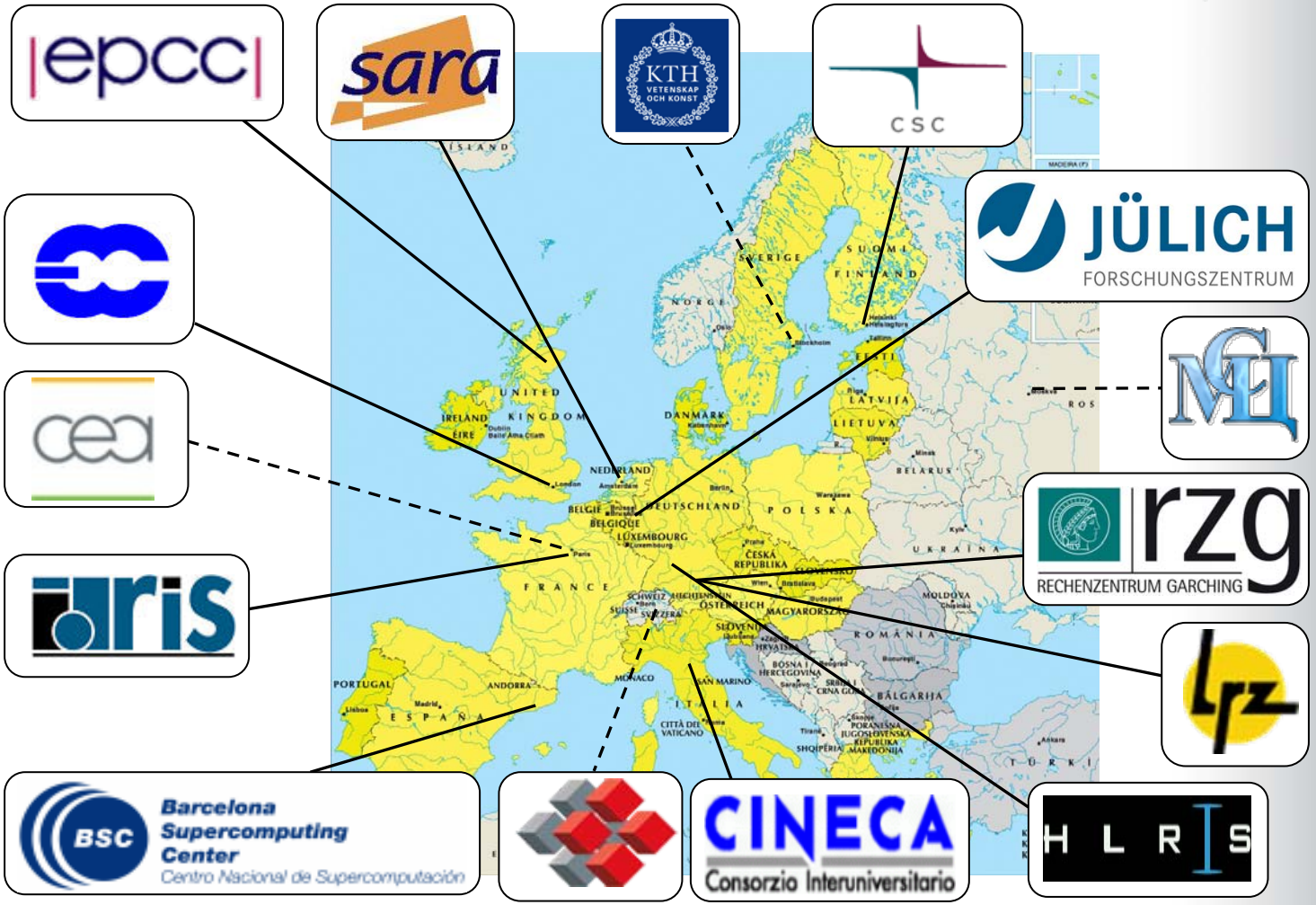
Establishing a persistent European HPC ecosystem that integrates national (tier-1) HPC centres and new large European Petascale (tier-0) centres

DEISA2 strategy

Consolidate the existing DEISA HPC infrastructure and services and **deliver a turnkey ready operational solution for the future European HPC ecosystem**

DEISA Partners

Distributed European Infrastructure for Supercomputing Applications



15 partners, 10 countries, EC support 2004-2011

Distributed European Infrastructure for Supercomputing Applications

Inventory of Services and Resources

RI-222919

Unified Access and Use of HPC Resources

Distributed European Infrastructure for Supercomputing Applications

Access via Internet

single sign-on (based on X.509 ‘Grid‘ certificates)
gsi-ssh -> D-ssh
Unicore, gridFTP

DEISA Common Production Environment

Different Software Environments

SE A1 | SE B1 | SE C1 | SE D1 | ..... | SE E1 | SE B2 | SE C2

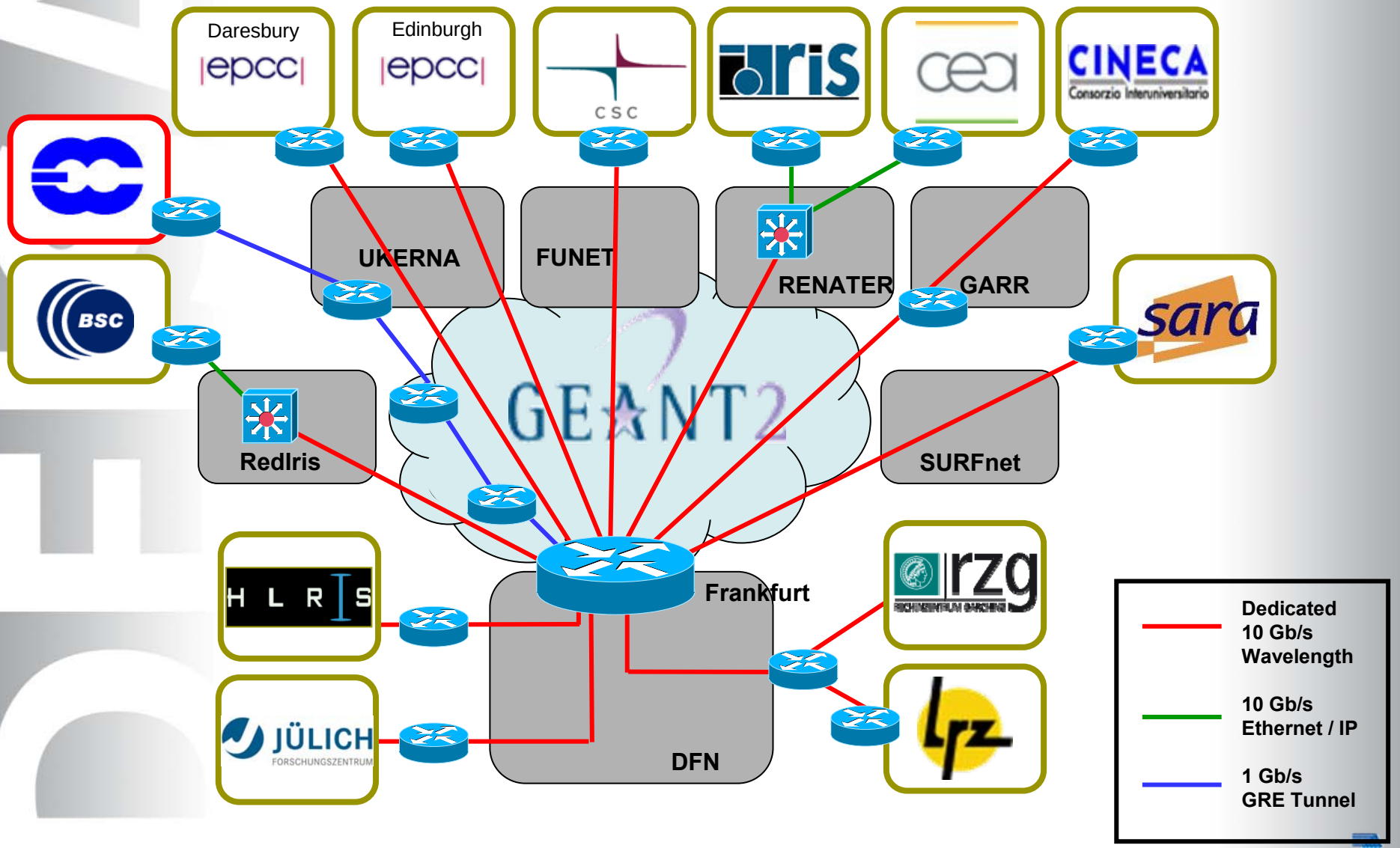
Different SuperComputers - Compute elements and interconnect

Dedicated 10 Gb/s network – via GEANT2

DEISA highly performant continental global file system

RI-222919

Dedicated high speed network (10 Gb/s)



RI-222919

DEISA Supercomputers

Distributed European Infrastructure for Supercomputing Applications

State-of-the art supercomputers

> 1 PF aggregated peak performance

- Cray XT4/5, Linux
- IBM Power6, AIX / Linux
- IBM BlueGene/P, Linux
- IBM PowerPC, Linux
- SGI ALTIX 4700, Linux
- NEC SX8/9 vector systems, Super UX

Fixed fractions of resources dedicated to DEISA usage

RI-222919

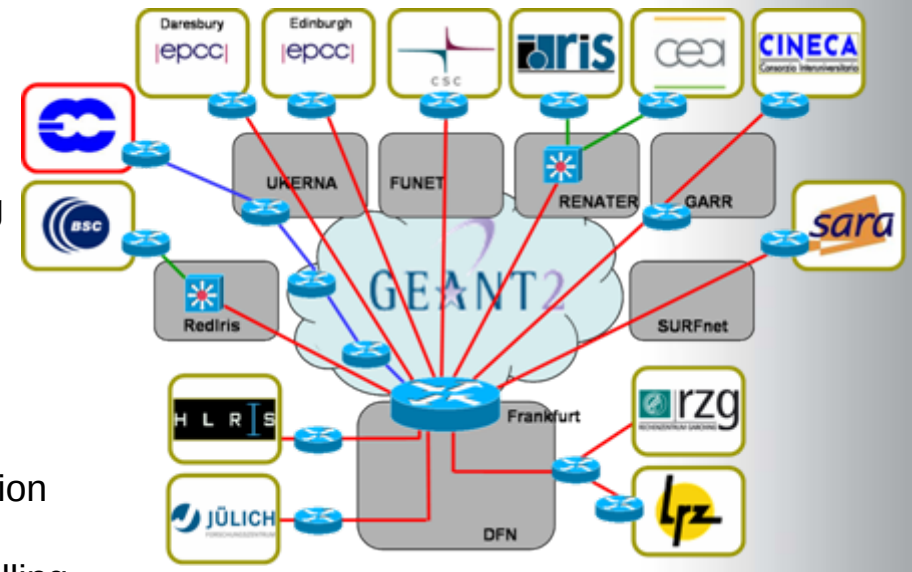
Distributed European Infrastructure for Supercomputing Applications

Achievements

RI-222919

Core Infrastructure and Services

Distributed European Infrastructure for Supercomputing Applications



Dedicated High Speed (10Gb/s) Network

Global Data Management

- High performance I/O and data sharing with a global file system (IBM GPFS)
- high performance transfers of large data sets (gridFTP)

Common AAA

- Single sign on (gsi-ssh, Middleware)
- Common Project and User Administration
- Accounting
- Project progress monitoring and controlling

User-related Operational Infrastructure

- Distributed Common Production Environment (DCPE)
- Job management service
- Common user support and central help desk

System-related Operational Infrastructure

- Common monitoring and information systems
- Common system operation

Global Application Support

Global Project and Resource Allocation Management

DEISA Extreme Computing Initiative

Distributed European Infrastructure for Supercomputing Applications

Projects from DECI calls 2005, 2006, 2007, 2008, 2009

Involvement of over 180 research institutes and universities from 25 European countries:

Austria	Belgium	Cyprus	Denmark	Finland
France	Germany	Greece	Hungary	Ireland
Italy	Latvia	Norway	Poland	Portugal
Romania	Russia	Slovac Rep.	Spain	Sweden
Switzerland	Netherlands	Turkey	Ukraine	UK

with collaborators from four other continents

North America, South America, Asia, Australia

Projects and Science Communities

Distributed European Infrastructure for Supercomputing Applications

DECI call 2005

29 proposals accepted — 12 mio core-h granted*****

DECI call 2006

28 proposals accepted — 12 mio core-h granted*

DECI call 2007

45 proposals accepted — 30 mio core-h granted*

DECI call and Science Communities 2008

42 proposals accepted — 50 mio core-h granted*

3 communities — 5 mio core-h granted*

DECI call and Science Communities 2009

50 proposals accepted — 60 mio core-h granted*

7 communities — 12 mio core-h granted*

***)** Core-h normalized to IBM P4+@1.7GHz

DECI: **D**EISA **E**xtreme **C**omputing **I**nitiative
Yearly call for proposals

Communities: Virtual Scientific Communities

RI-222919

Science Communities Support

Distributed European Infrastructure for Supercomputing Applications

Life Sciences

VIROLAB

Virtual Physiological Human network of excellence

Fusion Energy Research

EFDA EUROPEAN FUSION DEVELOPMENT AGREEMENT

EUFORIA

Space Science / Cosmology

esa planck

VIRGO

Climate Research

enes European Network for Earth System Modelling

2008 3 communities 5 mio core-h granted*
2009 7 communities 12 mio core-h granted*

RI-222919

Agenda

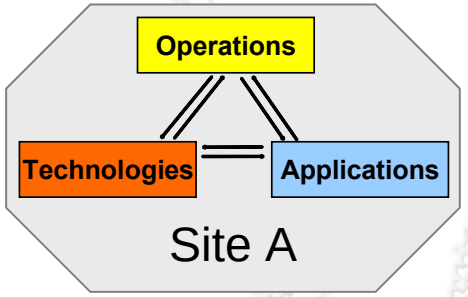
Distributed European Infrastructure for Supercomputing Applications

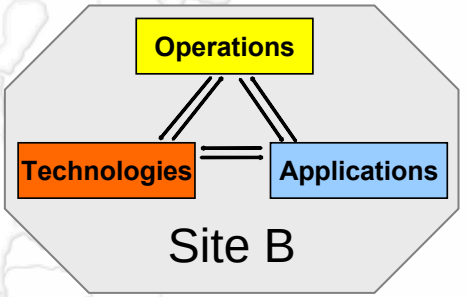
- Advancing the European HPC Infrastructure
  - Objectives and Strategy
  - Inventory of Services and Resources
  - Achievements
- ⇨ **Organisation as a Virtual distributed HPC Centre**
  - Applications, Technology, Operations
- Federated Operation of the Infrastructure and User Services
  - Organisation and Tasks of Operations
  - Operation Management
  - Facilities and Collaboration
- Experiences

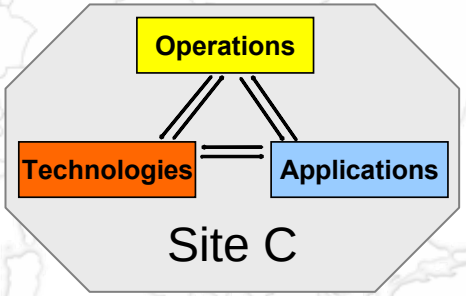
RI-222919

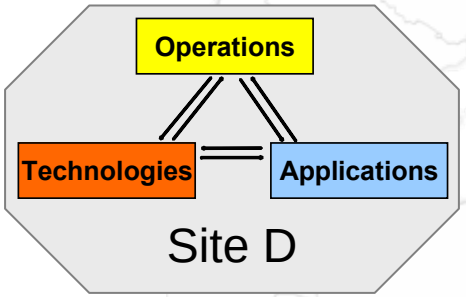
Virtual European Supercomputing Centre

Department Structure



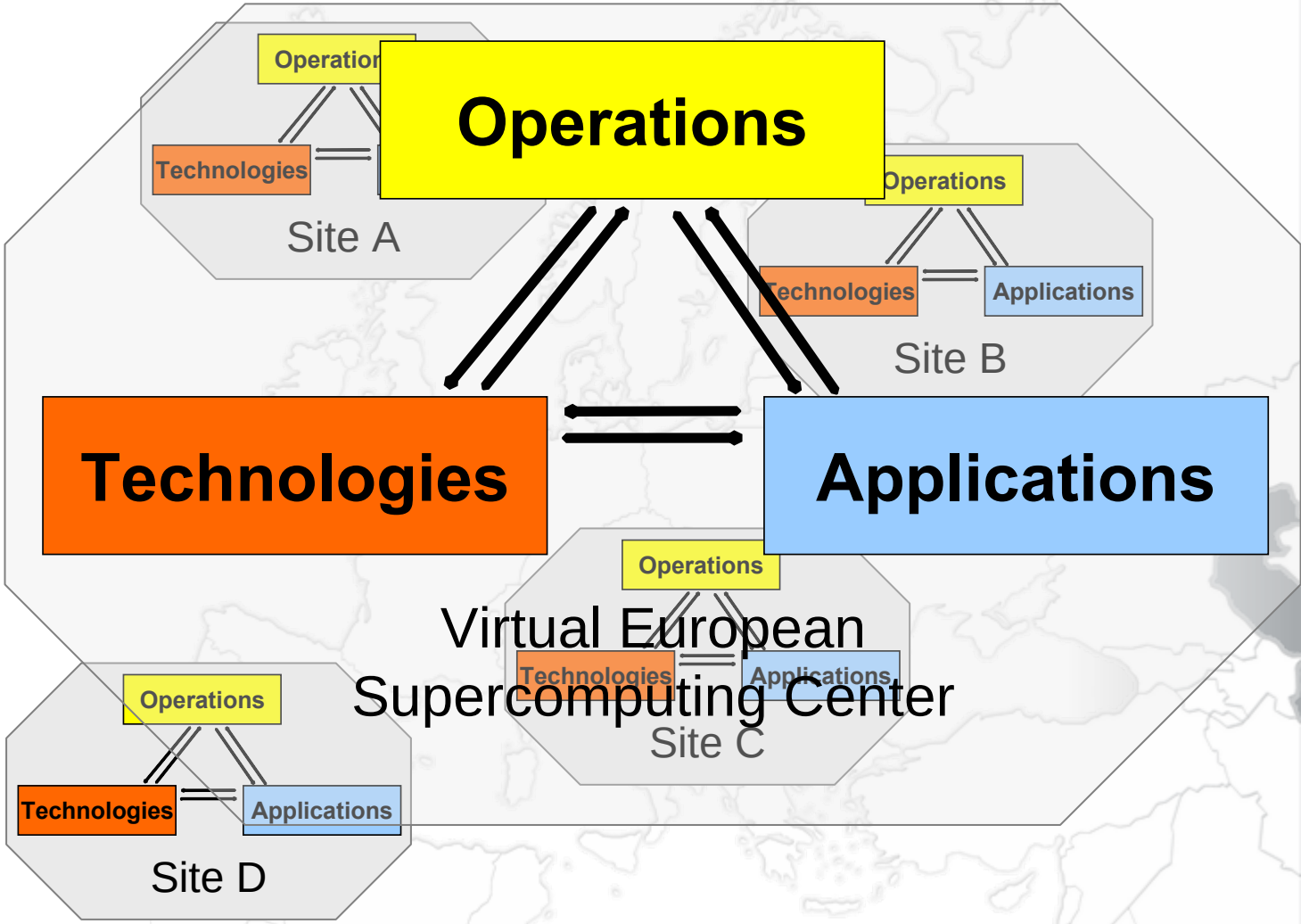






Virtual European Supercomputing Centre

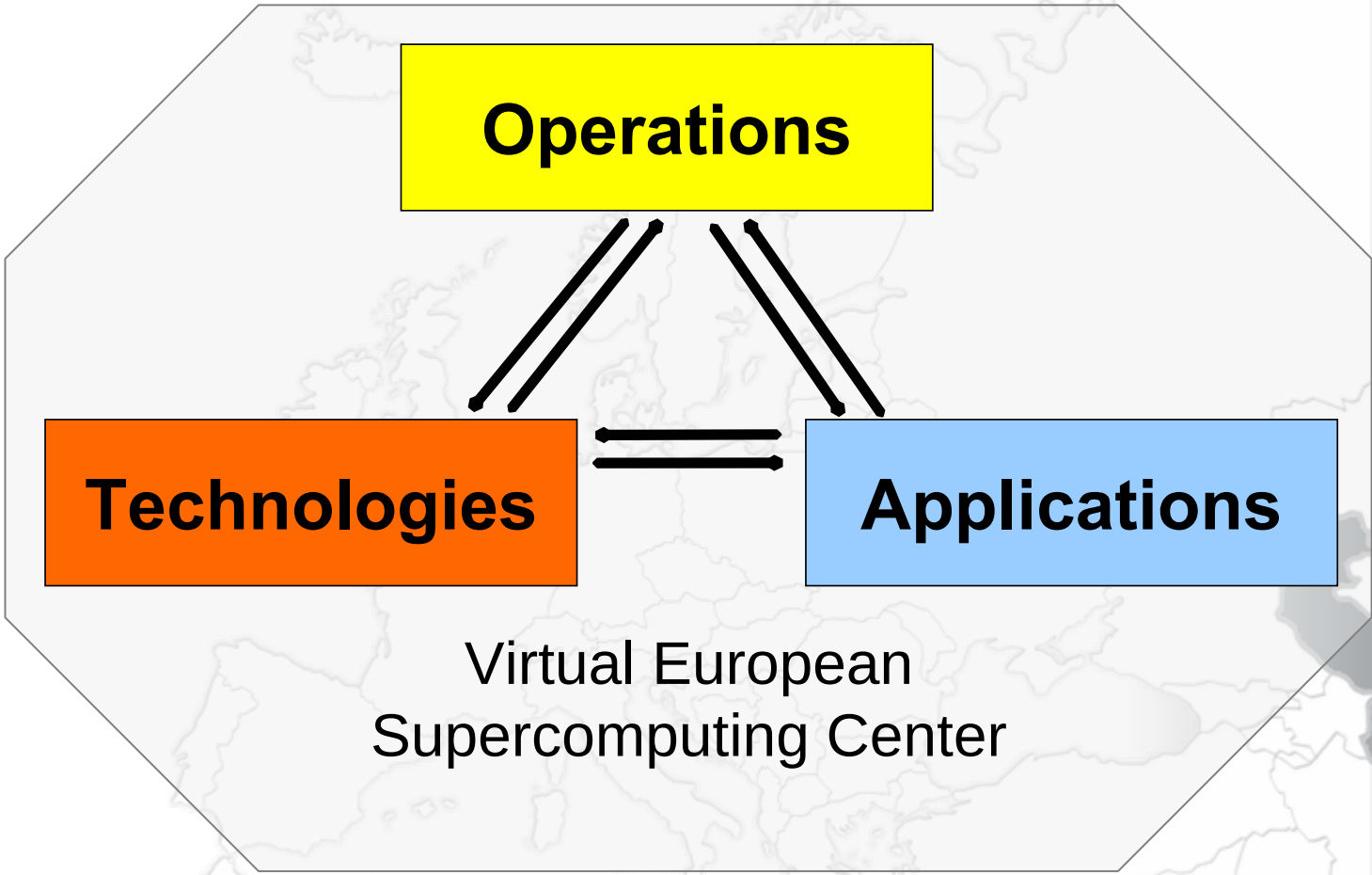
Department Structure



RI-222919

Virtual European Supercomputing Centre

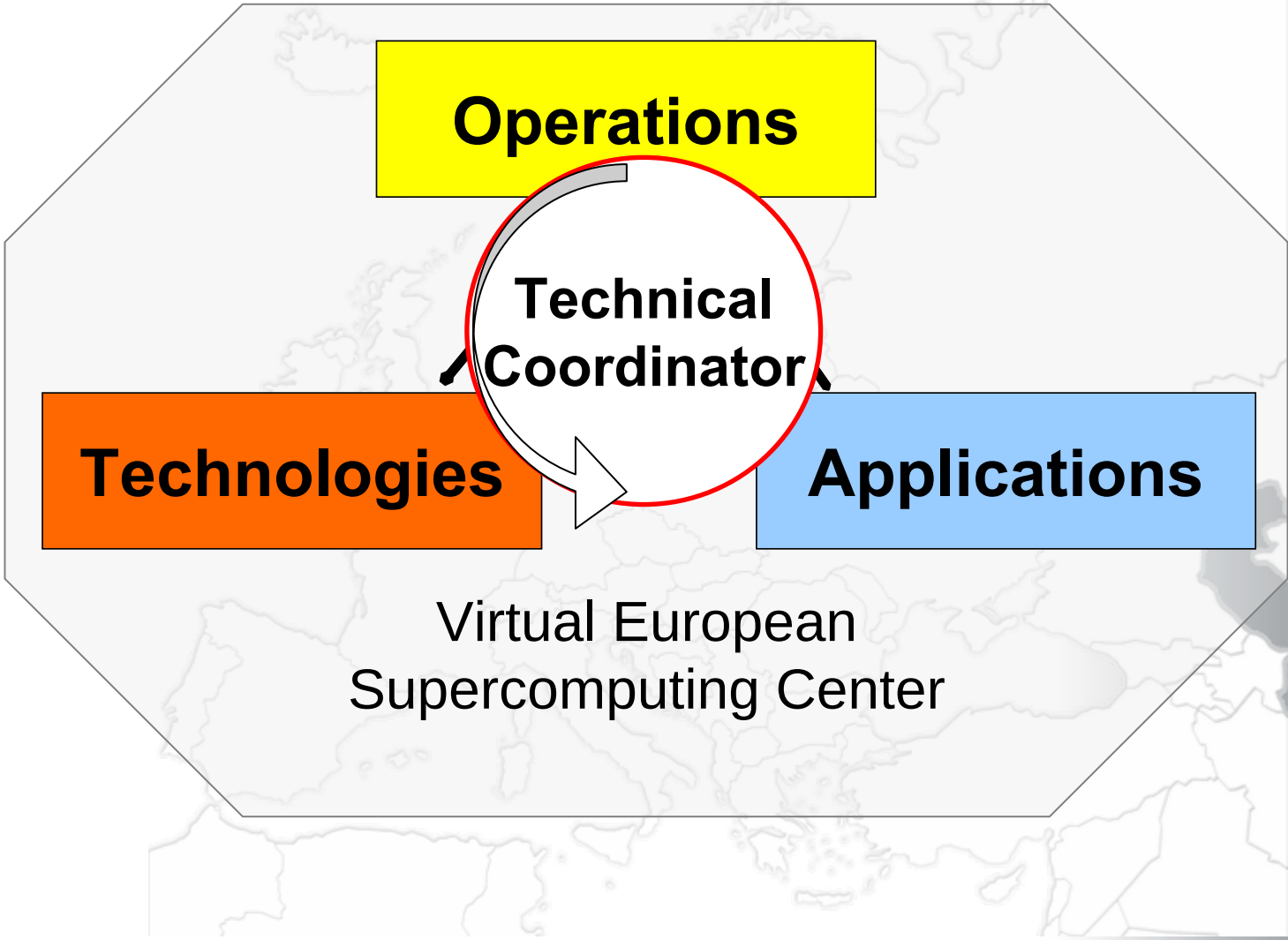
Department Structure



Virtual European Supercomputing Centre

Technical Coordinator

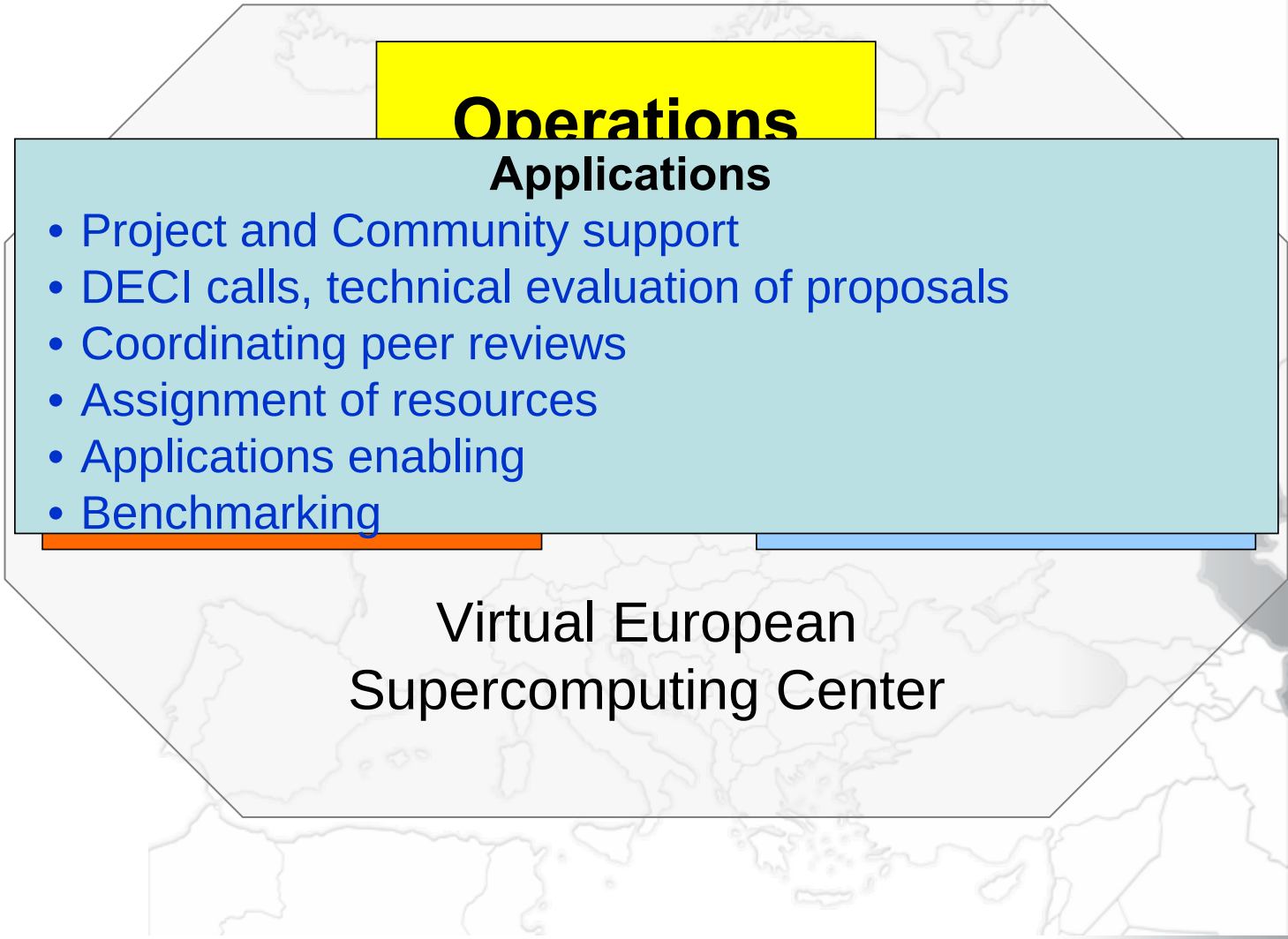
Distributed European Infrastructure for Supercomputing Applications



RI-222919

Virtual European Supercomputing Centre

Distributed European Infrastructure for Supercomputing Applications



Virtual European Supercomputing Centre

Distributed European Infrastructure for Supercomputing Applications

Operations

Technology

- Scouting for and identifying relevant (new) technologies
- Evaluating technologies, upgrading existing services
- Planning and designing specific sub-infrastructures
- pre-production deployment and deploym. documentation

Virtual European Supercomputing Center

RI-222919

Virtual European Supercomputing Centre

Distributed European Infrastructure for Supercomputing Applications

Operations

- Operating and Monitoring of the infrastructure and services
- Providing platforms for int./ext. communication and support
- Adopting new technologies from **Technologies**
- Change management concerning service upgrades/changes
- Coordinating the (daily) operation with **Applications**
- Advancing “Operations” as a turnkey ready solution for a future persistent European HPC ecosystem

Virtual European Supercomputing Center

RI-222919

Agenda

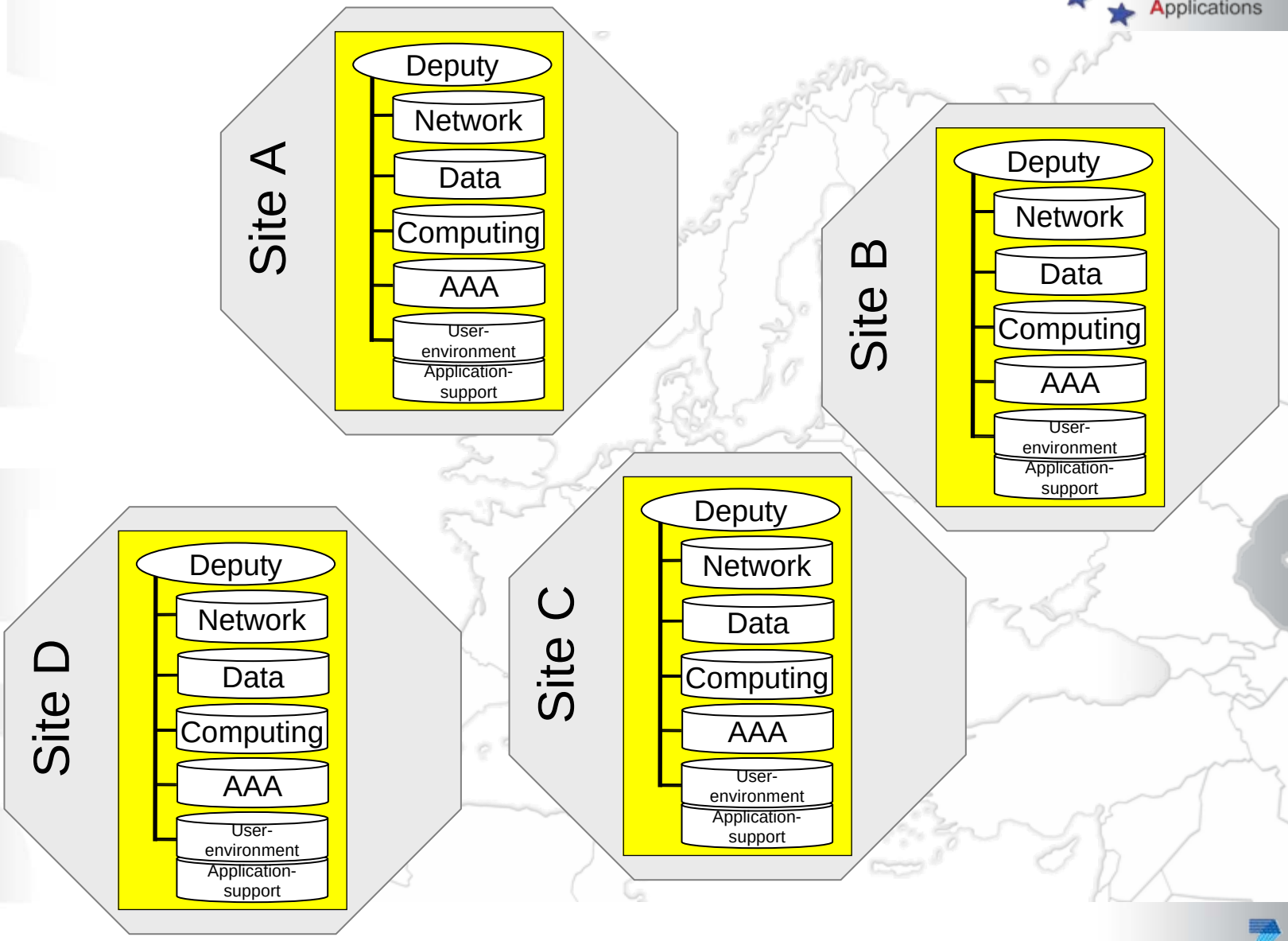
Distributed European Infrastructure for Supercomputing Applications

- Advancing the European HPC Infrastructure
  - Objectives and Strategy
  - Inventory of Services and Resources
  - Achievements
- Organisation as a Virtual Distributed HPC Centre
  - Operations, Technology, Applications
- ⇨ **Federated Operation of the Infrastructure and User Services**
  - Organisation and Tasks of Operations
  - Operation Management
  - Facilities and Collaboration Facilities
- Experiences

RI-222919

Federated Operation of DEISA

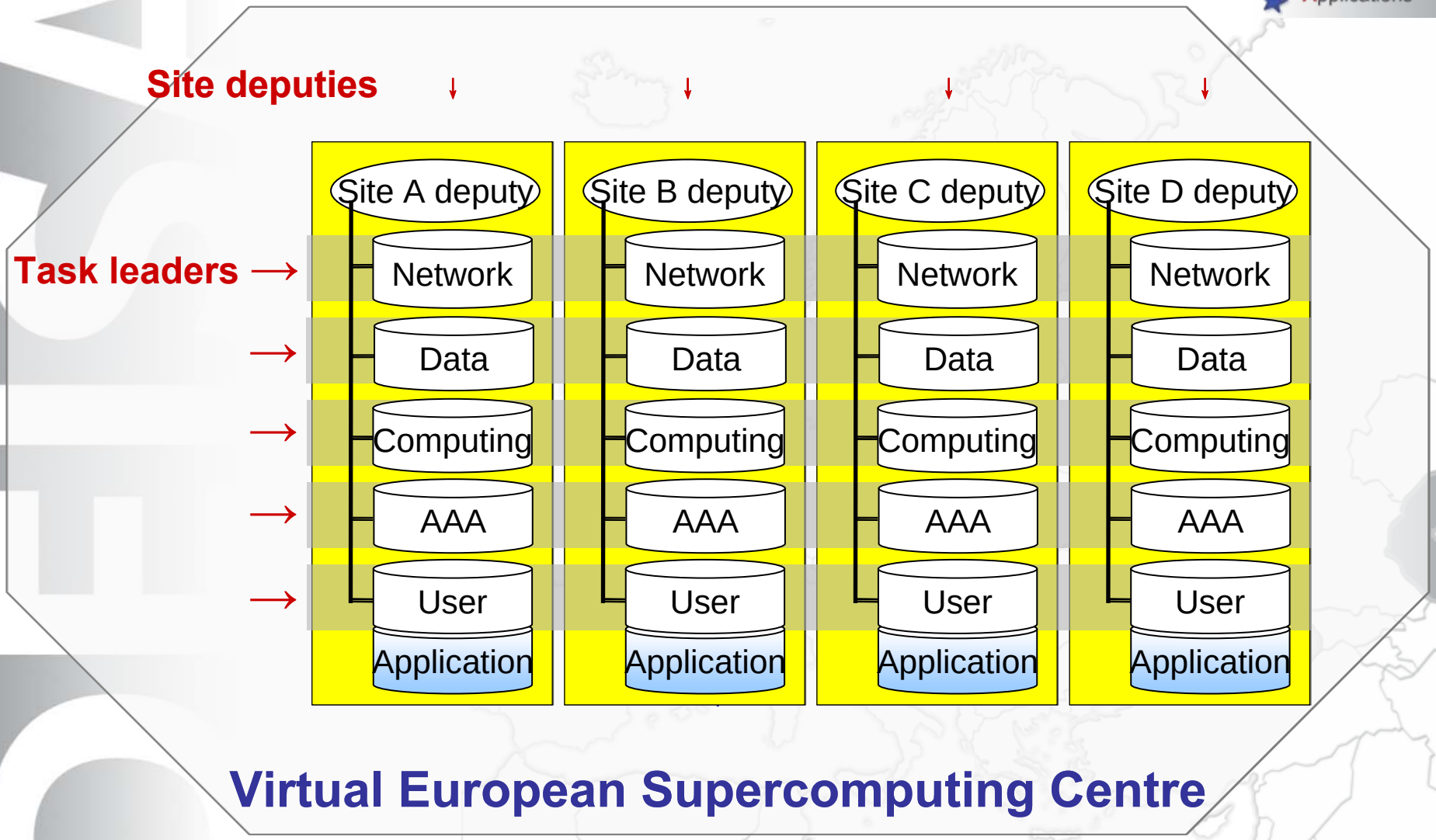
Distributed European Infrastructure for Supercomputing Applications



RI-222919

Federated Operation of DEISA

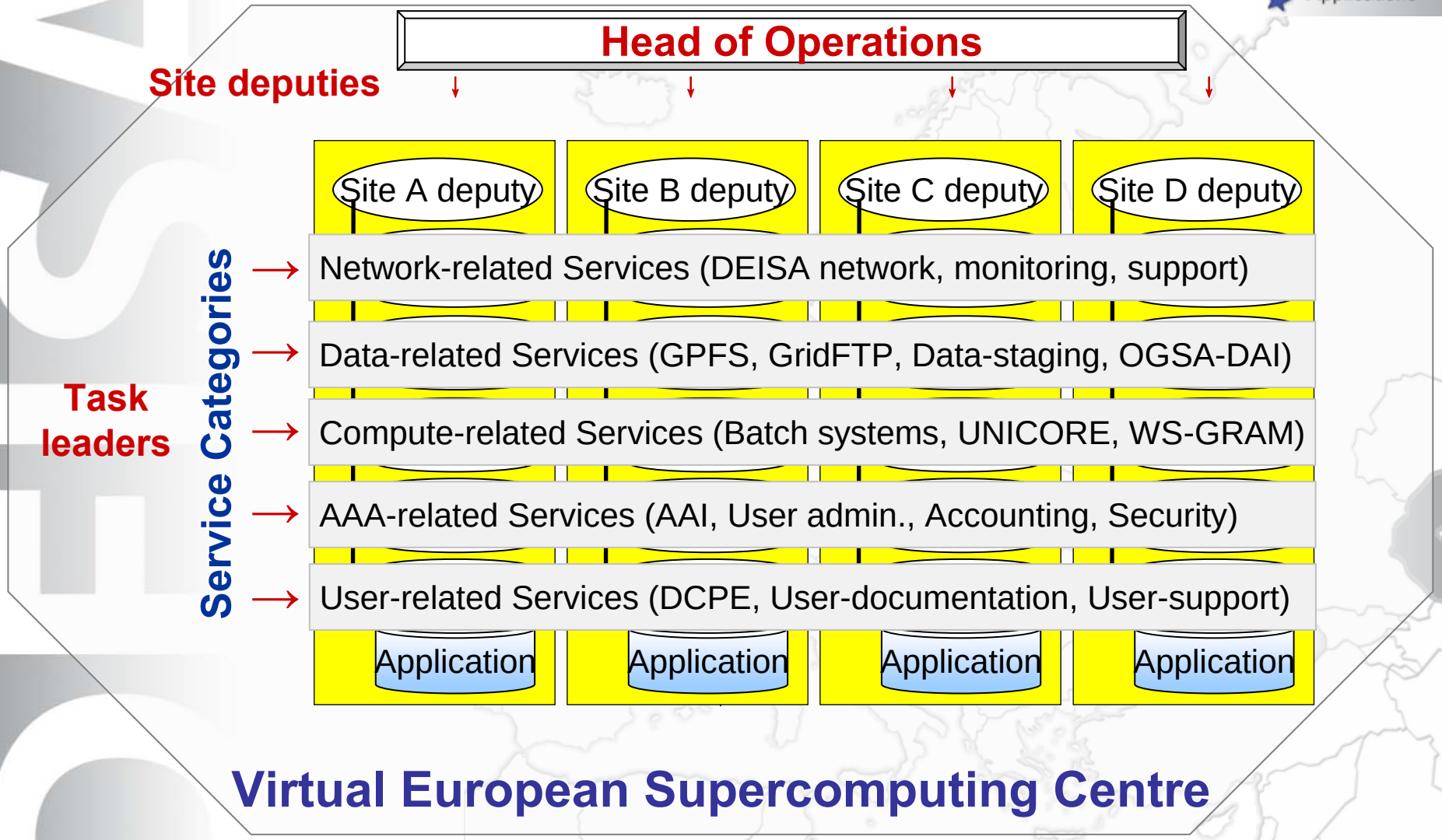
Distributed European Infrastructure for Supercomputing Applications



RI-222919

Federated Operation of DEISA

Distributed European Infrastructure for Supercomputing Applications



RI-222919

Tasks of Operations

Distributed European Infrastructure for Supercomputing Applications

- Operating and Monitoring the infrastructure and services
- Providing platforms for int./ext. communication and support
- Adopting new technologies from the **Technologies** department
- Change management
  - Concerning upgrades and changes of services or infrastructure
  - Security review
  - Documentation of the procedure of the change
  - Coordination of the change process
- Coordinating the (daily) operation with the **Applications** department
- Operational security
  - Security team
  - List of security contacts for actions in case of security incidents

- **Advancing "Operations" as a turnkey ready solution for a future persistent European HPC ecosystem**

Example: User Administration (AAA service)

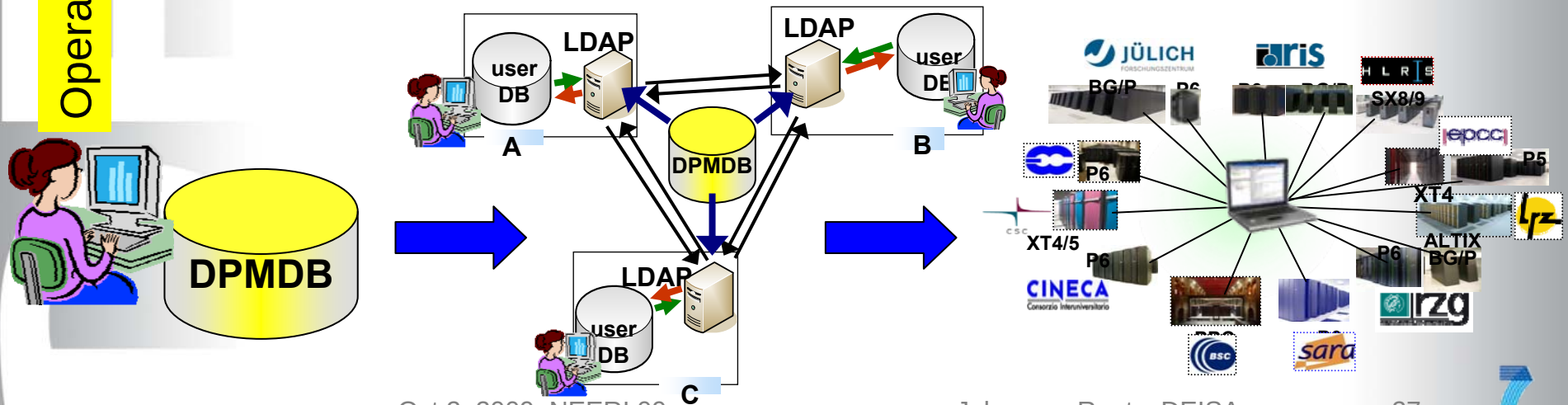
Distributed European Infrastructure for Supercomputing Applications

Applications

- Each user has an administrative DEISA **Home Site**
- Each Project (or community) is administrated by an **Home Site**
- A project is mapped to one or more **Execution Sites**
- The budget of compute cycles granted to a project is assigned to **Execution Sites** for a given period of time
- The resource consumption is collected regularly from every site for the purpose of project controlling.

Operations

Project and Community-related management information is stored in a central Project Management Data Base used by the DEISA User Administration System



RI-222919

Example: Monitoring services

Distributed European Infrastructure for Supercomputing Applications

Important for overall operation of the infrastructure particularly for DEISA Operator on Duty, site admins

INCA →

Globus GridFTP	BSC	CINECA	CSC	ECMWF	EPCC	FZJ	HLRS	IDRIS	LRZ	RZG	SARA
gridftp_to_BSC	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
gridftp_to_CINECA	pass	pass	pass	pass	pass	pass	error	pass	pass	pass	pass
gridftp_to_CINECA_ext	pass	pass	pass	n/a	pass	pass	n/a	pass	pass	pass	pass
gridftp_to_CSC	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
gridftp_to_EPCC	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
gridftp_to_EPCC_ext	pass	pass	incaErr	n/a	pass	pass	n/a	pass	pass	pass	pass
gridftp_to_FZJ	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
gridftp_to_HLRS	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
gridftp_to_IDRIS	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
gridftp_to_IDRIS_ext	pass	pass	pass	n/a	pass	pass	n/a	pass	pass	pass	pass
gridftp_to_LRZ	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
gridftp_to_LRZ_ext	pass	pass	pass	n/a	pass	error	n/a	pass	pass	pass	pass
gridftp_to_RZG	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
gridftp_to_RZG_ext	pass	pass	pass	n/a	pass	pass	n/a	pass	pass	pass	pass
gridftp_to_SARA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
Globus GSISSH	**BSC**	**CINECA**	**CSC**	**ECMWF**	**EPCC**	**FZJ**	**HLRS**	**IDRIS**	**LRZ**	**RZG**	**SARA**
gsissh_to_BSC	pass	pass	pass	pass	pass	pass	n/a	pass	pass	pass	pass
gsissh_to_CINECA	pass	pass	pass	pass	pass	pass	n/a	pass	pass	pass	pass
gsissh_to_CINECA_ext	pass	pass	pass	n/a	pass	pass	n/a	pass	pass	pass	pass
gsissh_to_CSC	pass	pass	pass	pass	pass	pass	n/a	pass	pass	pass	pass
gsissh_to_FZJ	pass	pass	pass	pass	pass	pass	n/a	pass	pass	pass	pass
gsissh_to_IDRIS	pass	pass	pass	pass	pass	error	n/a	pass	pass	pass	pass
gsissh_to_LRZ	pass	pass	pass	pass	pass	pass	n/a	pass	pass	pass	pass
gsissh_to_LRZ_ext	pass	pass	pass	n/a	pass	pass	n/a	pass	pass	pass	pass
gsissh_to_RZG	pass	pass	pass	pass	pass	pass	n/a	pass	pass	pass	pass
gsissh_to_RZG_ext	pass	pass	pass	n/a	pass	pass	n/a	pass	pass	pass	pass
gsissh_to_SARA	pass	pass	incaErr	pass	pass	pass	n/a	pass	pass	pass	pass

Network monitoring

- Integration of E2Emon services for multi domain link monitoring (GEANT2, NRENs and DEISA)

Distributed European Infrastructure for Supercomputing Applications

Operation Management

RI-222919

Operation management (1)

Distributed European Infrastructure for Supercomputing Applications

- ⇨ Head of Operations (= DEISA2 Workpackage Leader)
  - Convenes meetings (regular or unregular, e.g. in case of security incidents)
  - Ensures that all partners are collaborating efficiently in Operations
- ⇨ One task leader per service category
  - Convening task-related meetings
  - Contact point for issues related to the service category
  - Reporting to the operations leader and the operations team
- ⇨ Operations Team
  - Head of Operations + Site deputies + Task leaders
- ⇨ E-mail lists
  - operations, list for each service category, security list, maintenance list

RI-222919

Operation management (2)

Distributed European Infrastructure for Supercomputing Applications

- Bi-weekly **video conferences**
  - Attendance by all partners & task leaders → operations team
  - Agenda: daily operations, open actions, tasks reports
  - Action list: maintained on the DEISA Wiki
- Two **face to face meetings** per year together with **Technology**
- **Minutes** of all meetings available
- Central **Trouble Ticket System** (→ next slide)
- **Operator on Duty** (task rotating between sites)
  - DEISA-wide operational problem management and - if necessary - escalation
- **Helpdesk on Duty** (rotating task)
  - First level user contact
  - Application-related request are forwarded to the corresponding experts (usually at the site where the execution machine is located)

RI-222919

Distributed European Infrastructure for Supercomputing Applications

Facilities and Collaboration

RI-222919

Central Trouble Ticket System (TTS)

Distributed European Infrastructure for Supercomputing Applications

- Internally used and for user support (helpdesk) as the central tool for reporting problems or requests
- Central tool for tracking problems
- Used for documenting infrastructure support actions and user support actions
- General ticket queue and queue for each partner site
- *Operator on Duty* and *Helpdesk on Duty* are Supervisors of the TTS (e.g. assigning tickets to sites, task leaders) and can escalate if tickets are not handled appropriately.

RI-222919

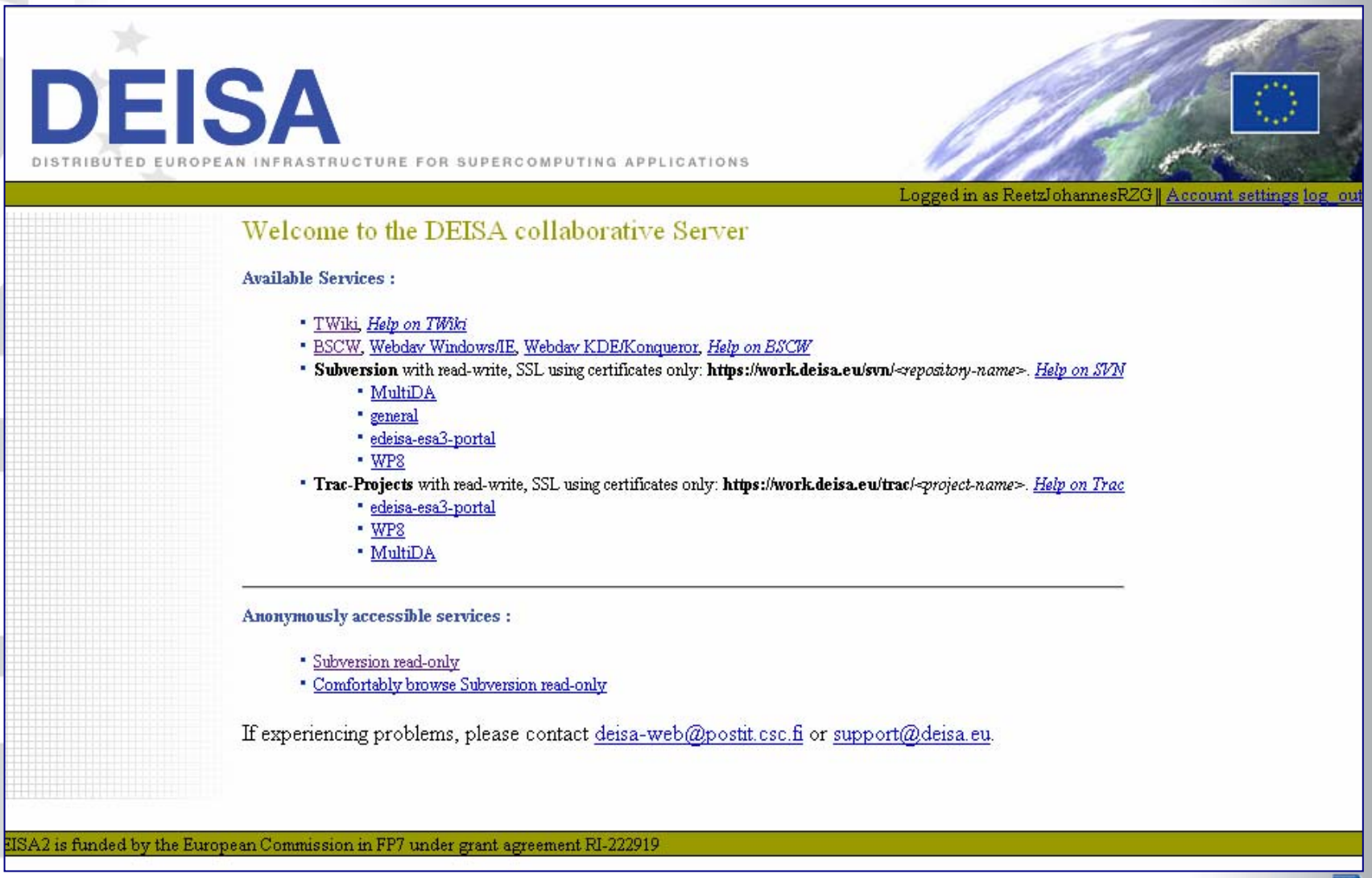
Collaborative workspaces

Distributed European Infrastructure for Supercomputing Applications

- Internal document management system (BSCW)
  (rather for long-lasting documents)
  - Minutes of meetings and video conferences
  - Presentations from meetings
  - Policy documents
  - Installation and configuration documents
- Wiki for internal information exchange and documentation (Twiki)
  - Maintenance information
  - Change management information
  - Deployment and Configuration documenation
  - Deployment documents and installation howto's
- Central software repository system (SubVersion)
  - DEISA related Software Bundles
  - Tools, Utilities for infastructure and services (e.g. Monitoring tools)
  - Configuration files, Schemas (e.g. UAS ldap schema)

Collaborative workspaces (Entry Point)

Distributed European Infrastructure for Supercomputing Applications



DEISA

DISTRIBUTED EUROPEAN INFRASTRUCTURE FOR SUPERCOMPUTING APPLICATIONS

Logged in as ReetzJohannesRZG || Account settings log_out

Welcome to the DEISA collaborative Server

Available Services :

- TWiki, *Help on TWiki*
- BSCW, Webdav Windows/IE, Webdav KDE/Konqueror, *Help on BSCW*
- **Subversion** with read-write, SSL using certificates only: **https://work.deisa.eu/svn/***<repository-name>*. *Help on SVN*
  - MultiDA
  - general
  - edeisa-esa3-portal
  - WP8
- **Trac-Projects** with read-write, SSL using certificates only: **https://work.deisa.eu/trac/***<project-name>*. *Help on Trac*
  - edeisa-esa3-portal
  - WP8
  - MultiDA

Anonymously accessible services :

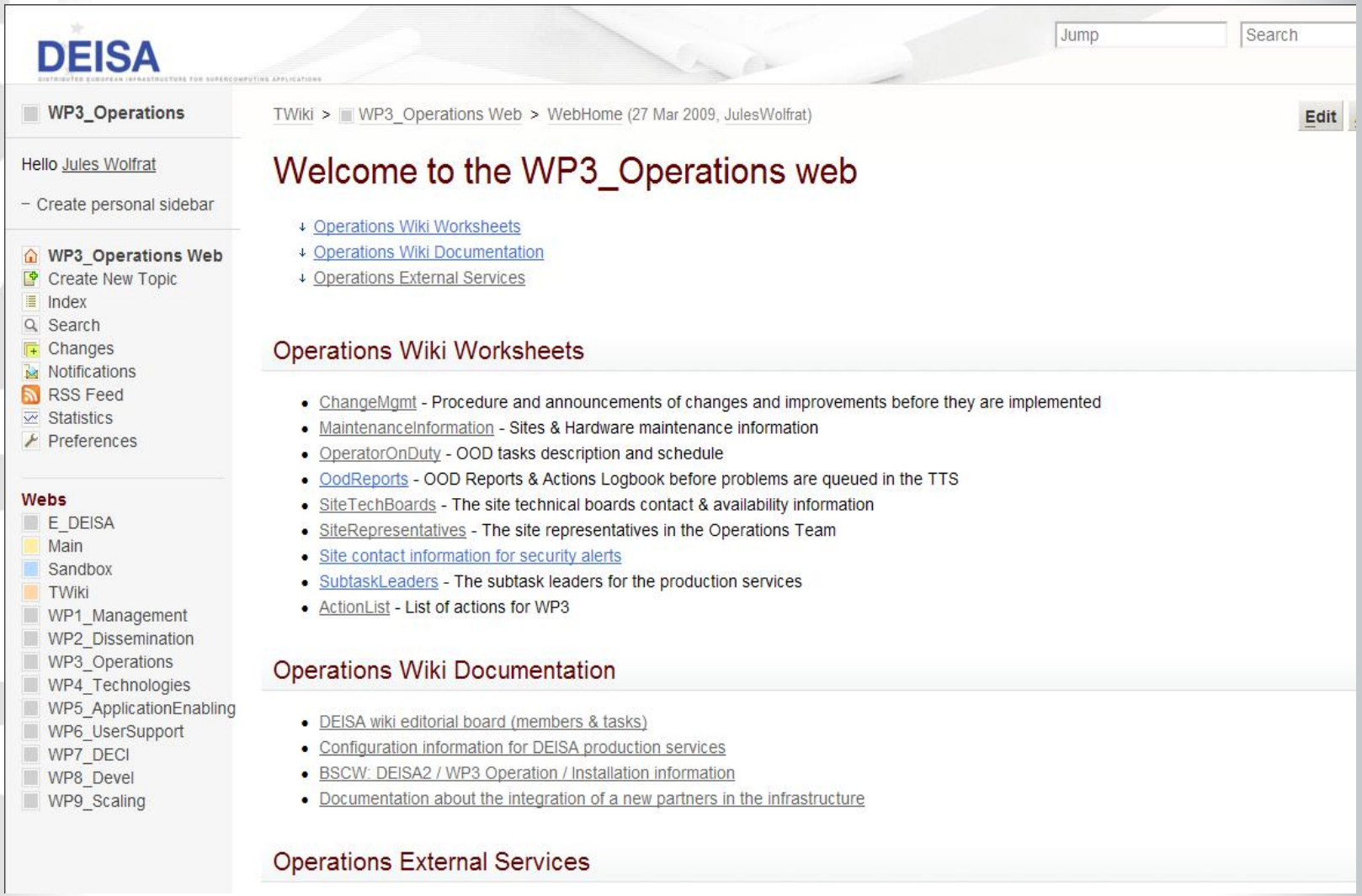
- Subversion read-only
- Comfortably browse Subversion read-only

If experiencing problems, please contact deisa-web@postit.csc.fi or support@deisa.eu.

EISA2 is funded by the European Commission in FP7 under grant agreement RI-222919

Collaborative workspaces (Wiki)

Distributed European Infrastructure for Supercomputing Applications



RI-222919

Policies

Distributed European Infrastructure for Supercomputing Applications

For example:

- ⇨ User administration policy
- ⇨ Acceptable Use Policy
- ⇨ Change management policy
- ⇨ Escalation Policy
- ⇨ Policy for adopting new technologies or technology upgrades
- ⇨ General Security Policies

Agenda

Distributed European Infrastructure for Supercomputing Applications

- Advancing the European HPC Infrastructure
  - Objectives and Strategy
  - Inventory of Services and Resources
  - Achievements
- Organisation as a Virtual Distributed HPC Centre
  - Operations, Technology, Applications
- Federated Operation of the Infrastructure and User Services
  - Organisation and Tasks of Operations
  - Operation Management
  - Facilities and Collaboration
- ⇨ **Experiences**

Experiences

Distributed European Infrastructure for Supercomputing Applications

- **Monitoring of services**, **auditing** the **compliance of services** are essential
- **Central Trouble Ticket System** tightens collaboration significantly
- Careful **documentation** of Policies, Deployment and Configuration **for staff**, and keeping it up-to-date (Wiki as easy-to-use collaborative platform)
- **Frequent meetings** (via VCs) of the **operations team** are essential
- **Regular joint meetings** of **Operations** + **Applications** + **Technologies**
- Documenting results of meetings (**Minutes**) and agreements
- **Influence** relevant **product vendors** concerning infrastructure requirements
- Make relevant **vendors be aware** that their products are used by an infrastructure (adapting of licensing policies, consistent product support)
- Make **site-local staff** aware of participation in a collaborative infrastructure
- **Keep staff members up-to-date** → improves quality of services
- **Provide project support by applications task force** to avoid operational issues reported by users