

# DRIHM

DISTRIBUTED RESEARCH INFRASTRUCTURE  
FOR HYDRO-METEOROLOGY

## Concept of Grid and High Performance Computing DRIHM and DRIHM2US approach

DRIHM and DRIHM2US Final Conference  
Savona/Genoa, 24th/25th Feb. 2015

Michael Schiffers, LMU, Munich, Germany



POLITÉCNICA



advancing the frontiers

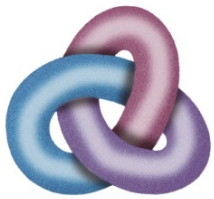




# HMR General Objective

*“[...] to combine weather/climate models, with hydrologic/water cycle models, down to hydraulic models to evaluate the impacts on people, the natural environment and infrastructure.”*





# HMR e-Science

*Meteorological  
Model*

*Hydrological  
Model*

*Hydraulic  
Model*

*Impact  
Model*

**pkg Meteo Models**

Cb-Tram

WRF-ARW

Arome

PhaSt

Meso-NH

WxFusion

RainFARM

Rad-TRAM

COSMO

WRF-NMM

**pkg Hydrologic Models**

Continuum

DriFt

HBV

RIBS

HYPROM

**pkg Hydraulic Models**

MASCARET

SOBEK-FLOW

TELEMAC-2D

RFSM

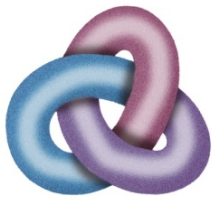
Delft3D-FLOW

Inundator

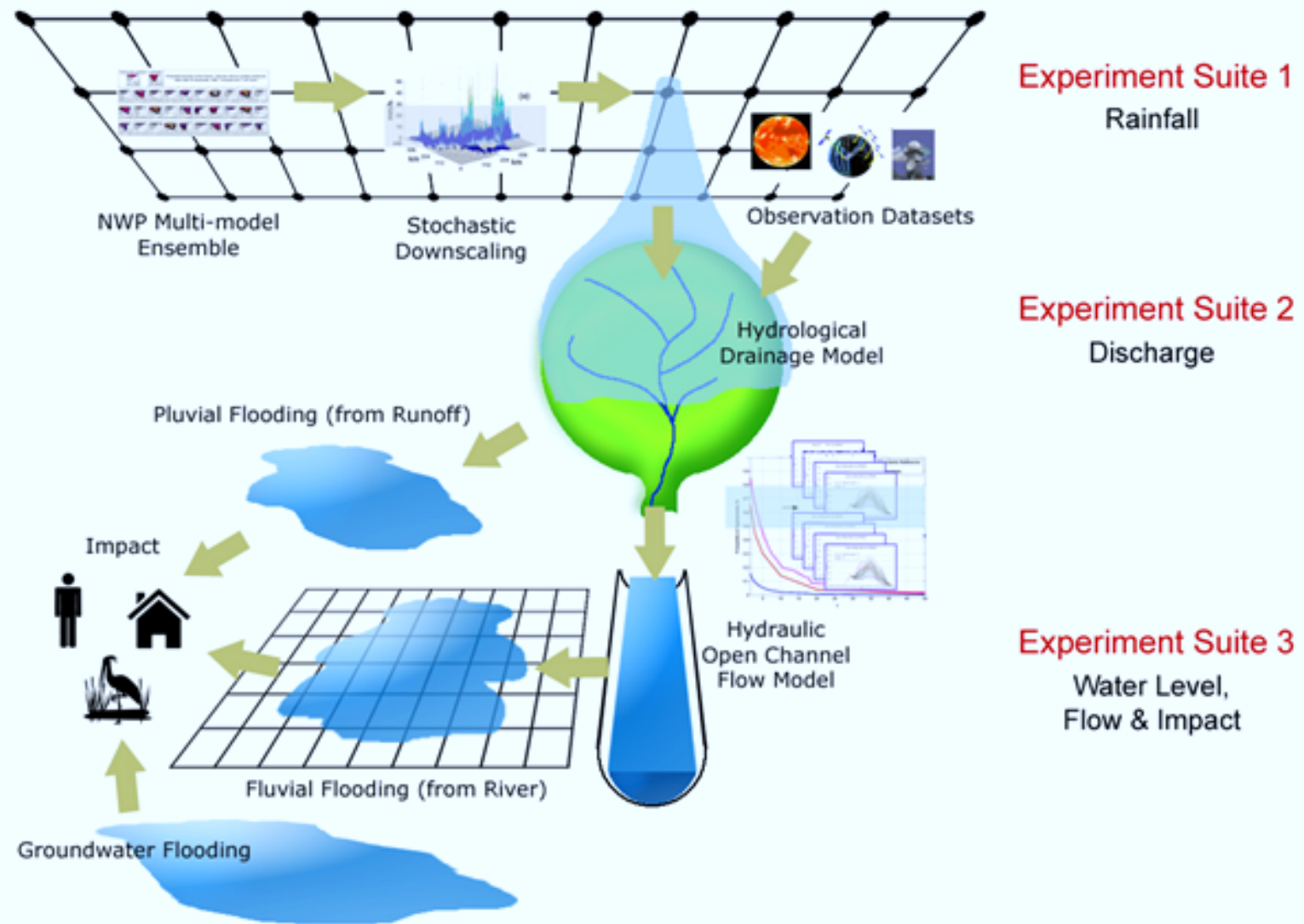
**pkg Impact Models**

SISYPHE

Property Damage



# DRIHM Experiment Suites







# Scenario

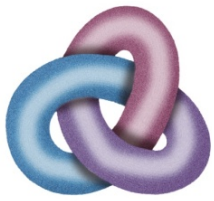
- Enable the HMR community
  - to setup a sequence of coupled models,
  - to identify the appropriate data sources,
  - to fetch the data,
  - and to execute the sequence on the most appropriate resources available for the community



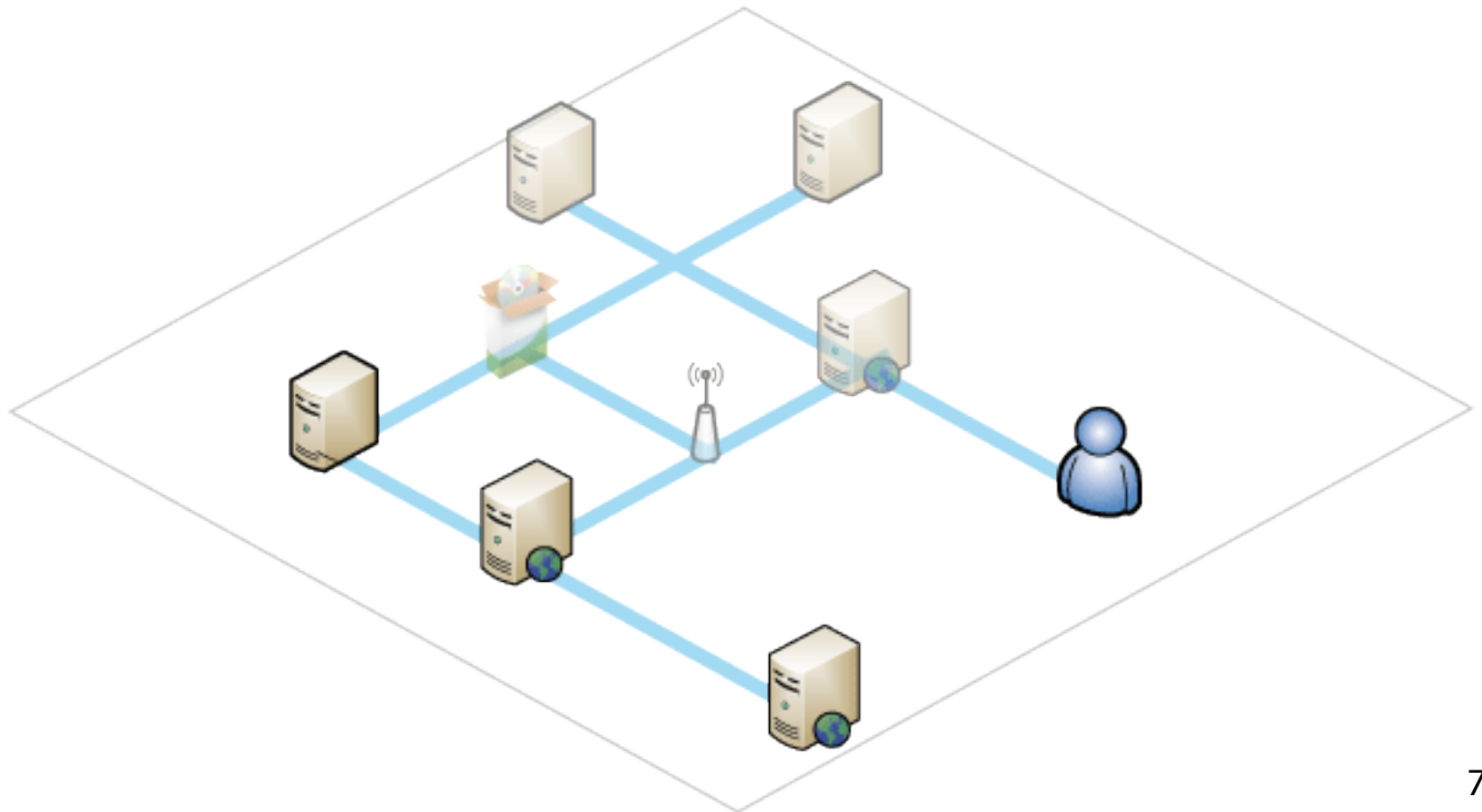
# The Grid Problem

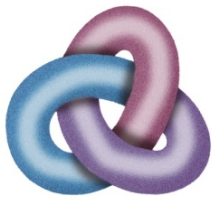
*„coordinated resource sharing and  
problem solving in dynamic, multi-  
institutional virtual organizations”*

Foster, Kesselman, Tuecke:  
The Anatomy of the Grid: Enabling Scalable Virtual Organizations,  
Int. J. High Perform. Comput. Appl. 15(3), 2001

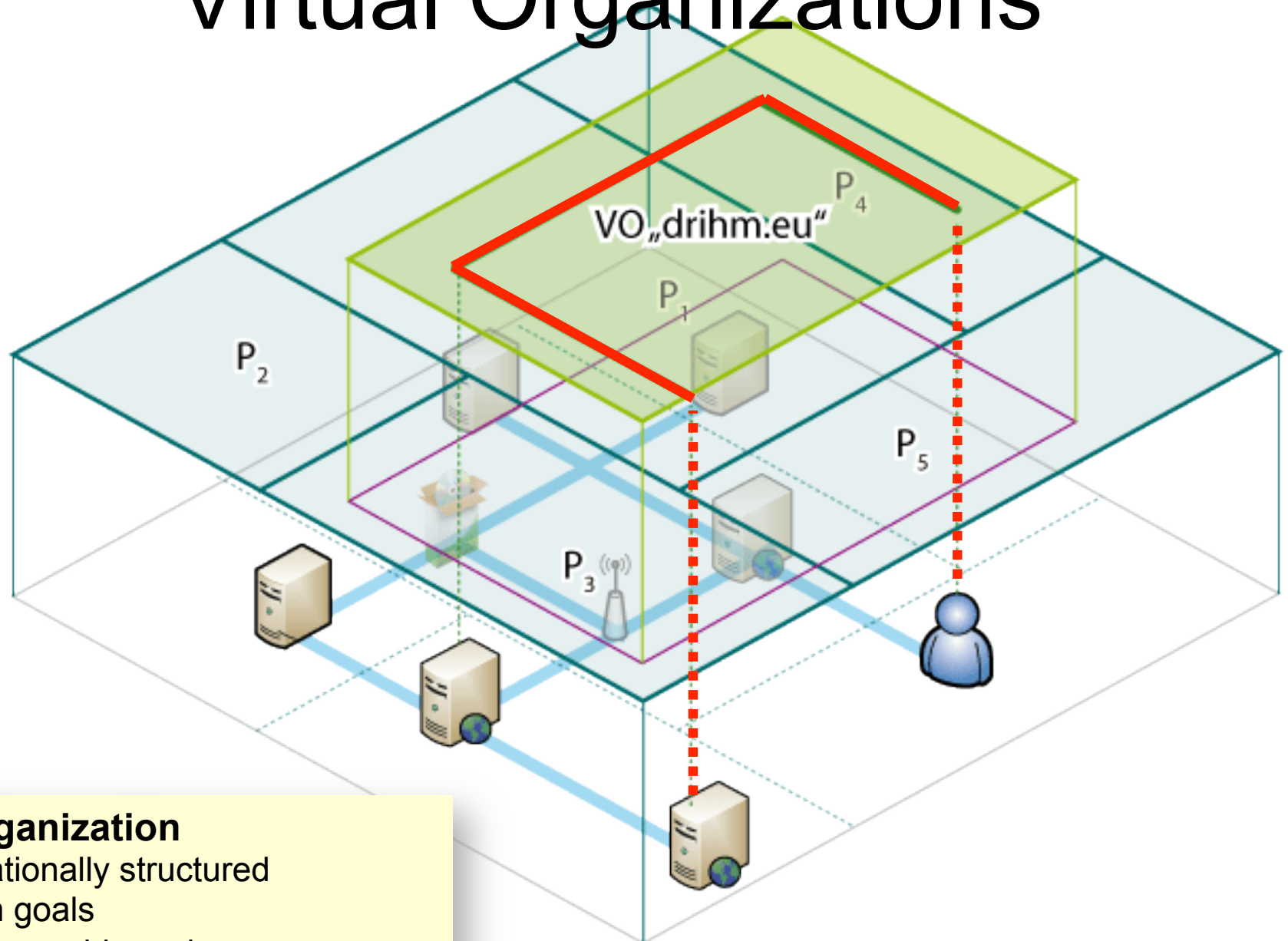


# Resource Sharing





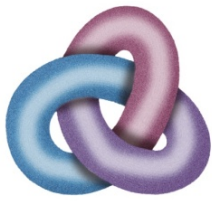
# Virtual Organizations



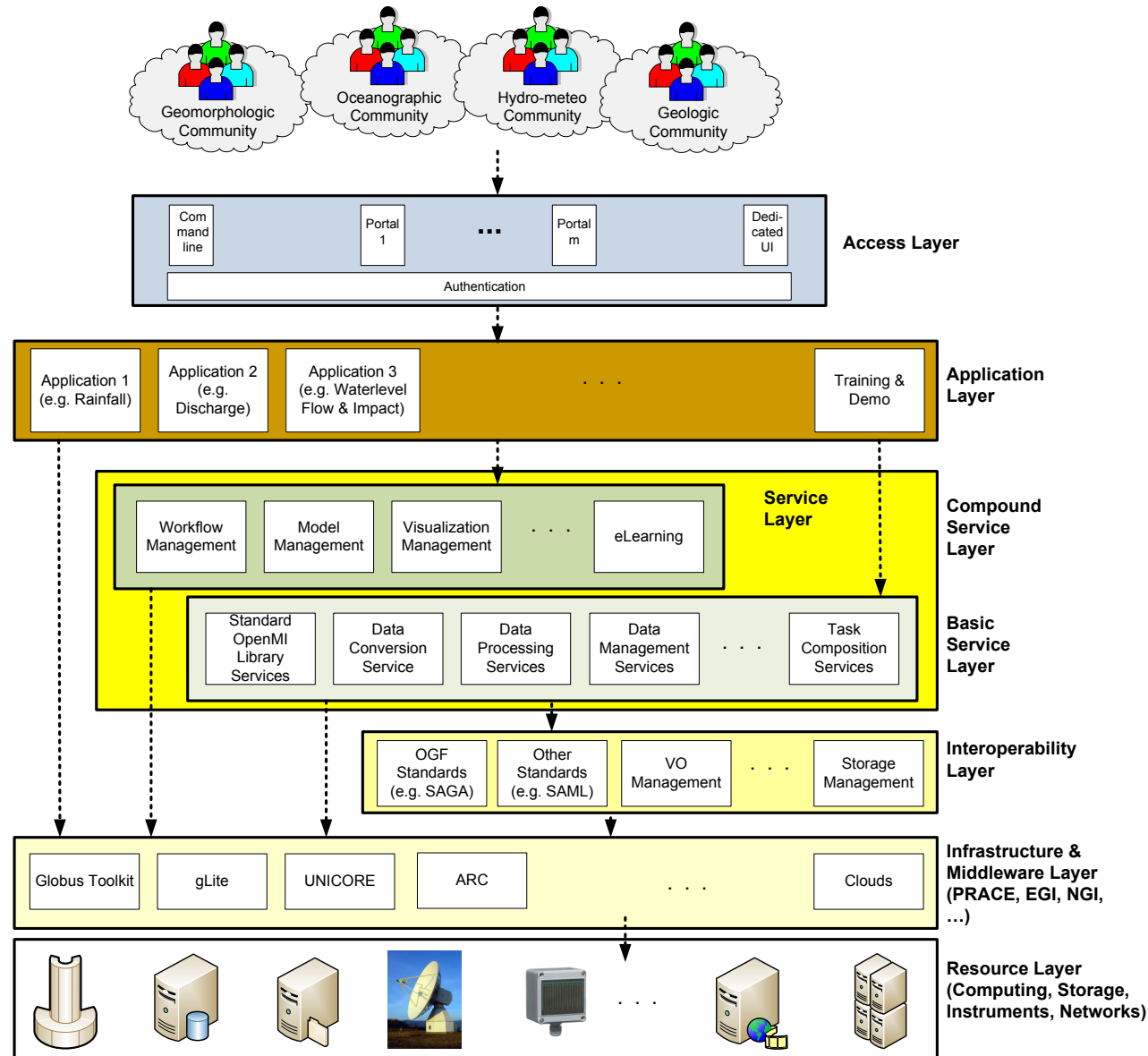
## Virtual Organization

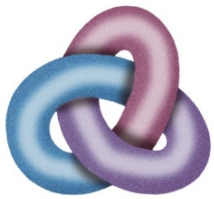
- Organizationally structured
- Common goals
- Members provide and use resources





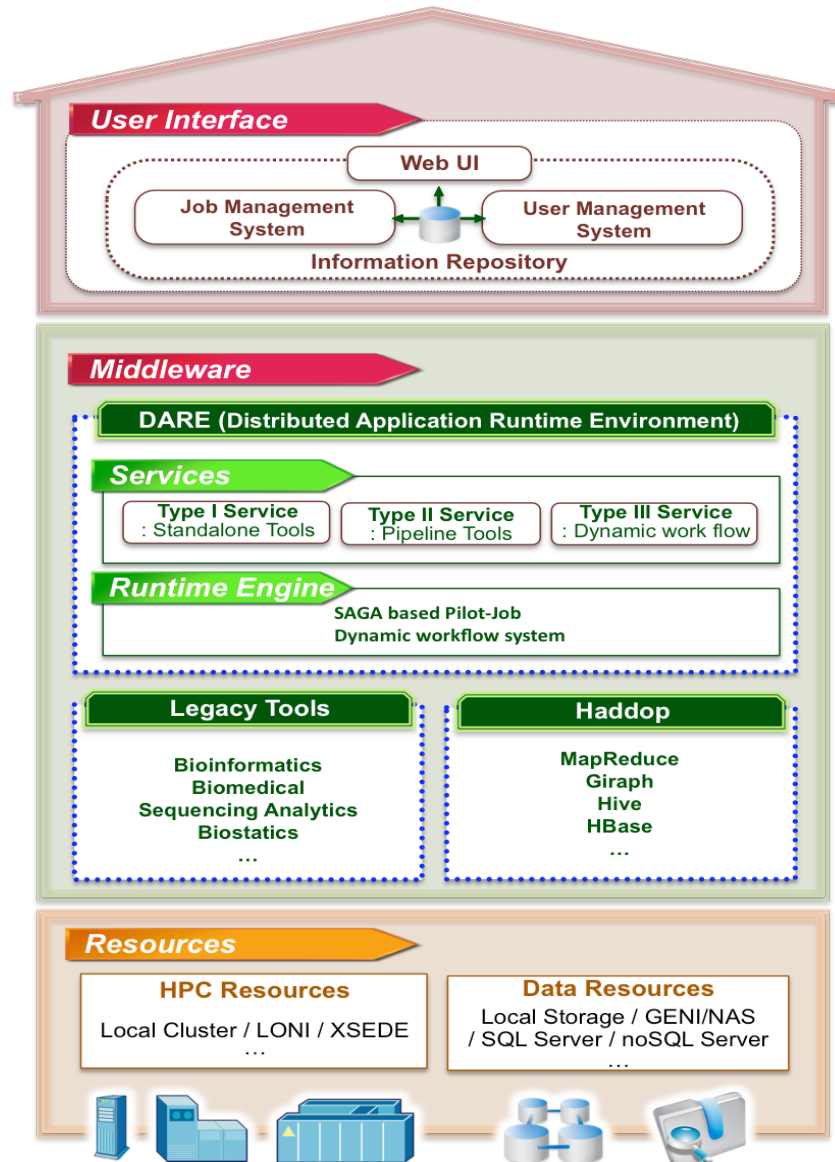
# DRIHM's Conceptual Vision



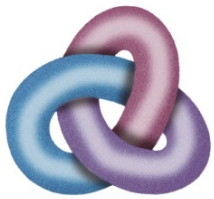


# XSEDE Science Gateway

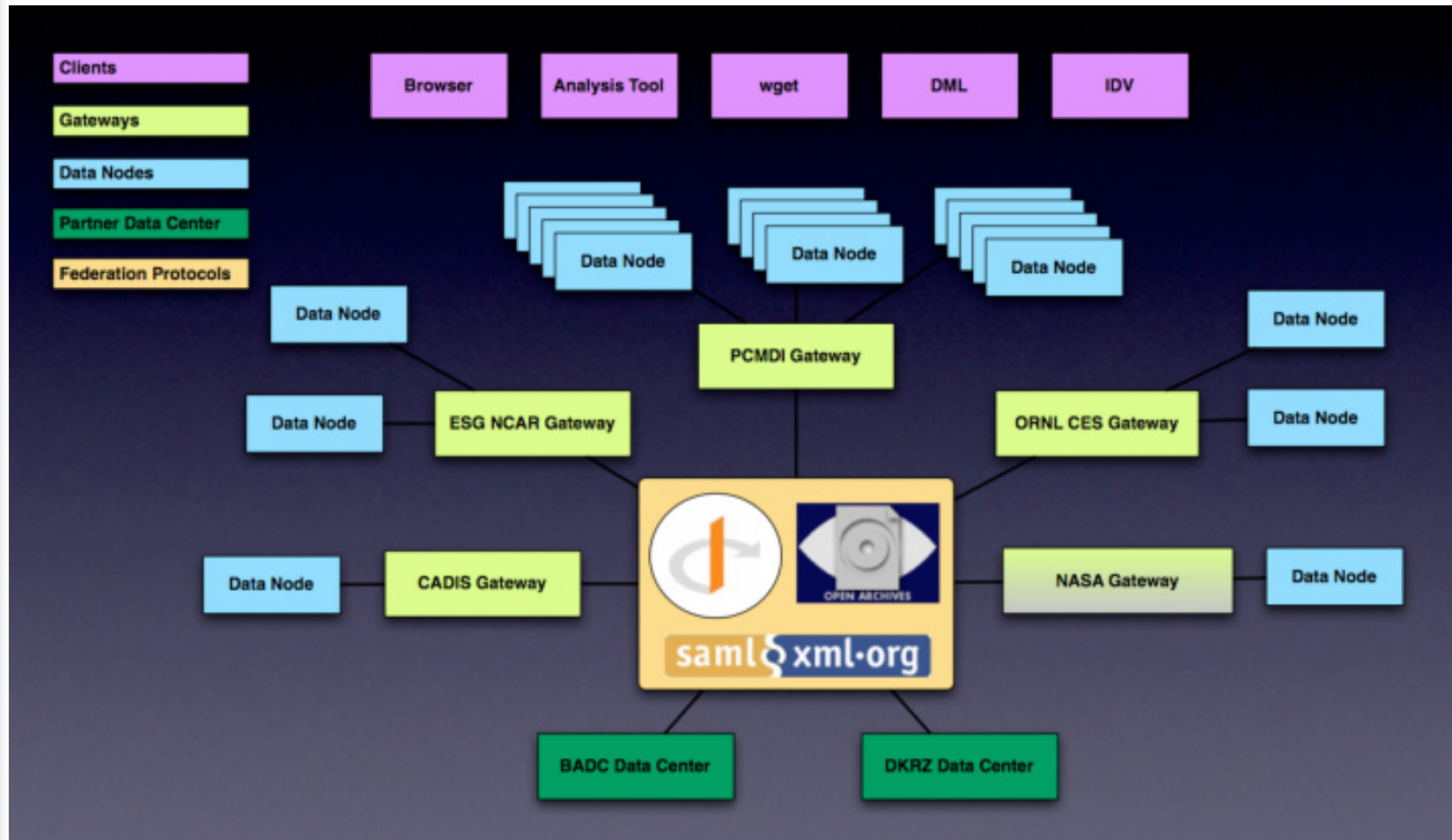
(Example: Science Gateway for Life Science Big Data Research)

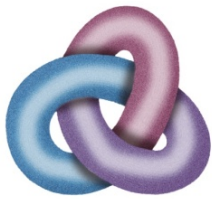


Sharath Maddineni, Joohyun Kim, Yaakoub El-Khamra, and Shantenu Jha,  
“Dynamic Application Runtime Environment (DARE): A Standards-based Framework For Building Science Gateways”,  
J. Grid Computing, (2012), 10(4):647



# NCAR Science Gateway Framework



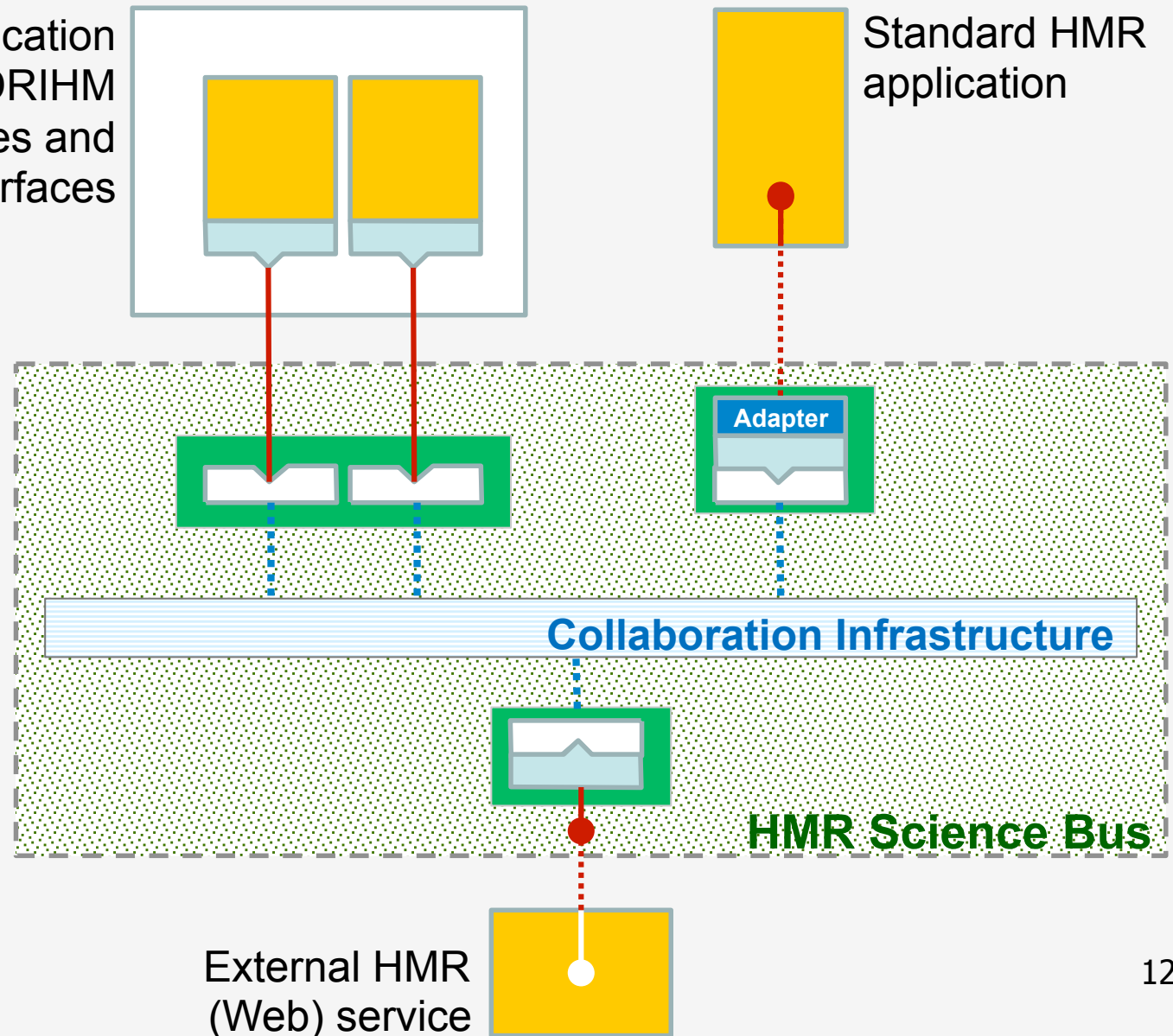


# HMR „Science Bus“



HMR Application  
using DRIHM  
services and  
service interfaces

Standard HMR  
application







# The VO „drihm.eu“



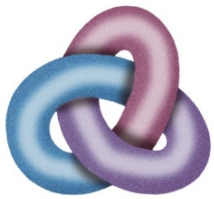
drihm.eu

## General information

Name <sup>?</sup>	drihm.eu
Scope <sup>?</sup>	Global
Status	Production
Validation date	2013-05-27
Discipline	Natural Sciences Earth sciences
Supported services	Globus
Enrollment Uri <sup>?</sup>	<a href="https://vomsmania.cnaf.infn.it:8443/voms/drihm.eu/">https://vomsmania.cnaf.infn.it:8443/voms/drihm.eu/</a>
Homepage Uri <sup>?</sup>	<a href="http://www.drihm.eu/">http://www.drihm.eu/</a>
Support Procedure Uri <sup>?</sup>	
GGUS dedicated user support <sup>?</sup>	Yes
VOMS setup support	No


## Description <sup>?</sup>

The Distributed Research Infrastructure for Hydro-Meteorology (DRIHM) project intends to develop a prototype e-Science environment to facilitate this collaboration and provide end-to-end HMR services (models, datasets and post-processing tools) at the European level, with the ability to expand to global scale. The objectives of DRIHM are to lead the definition of a common long-term strategy, to foster the



# VO Membership Service

Filter (clear)

Service Type:  NGI:  Search:  

Production:  Monitored:  Scope:  Certification:  Include Closed Sites: ☐

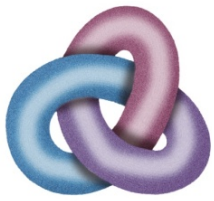
Extension Name:

8 Services (Showing 1 - 30)

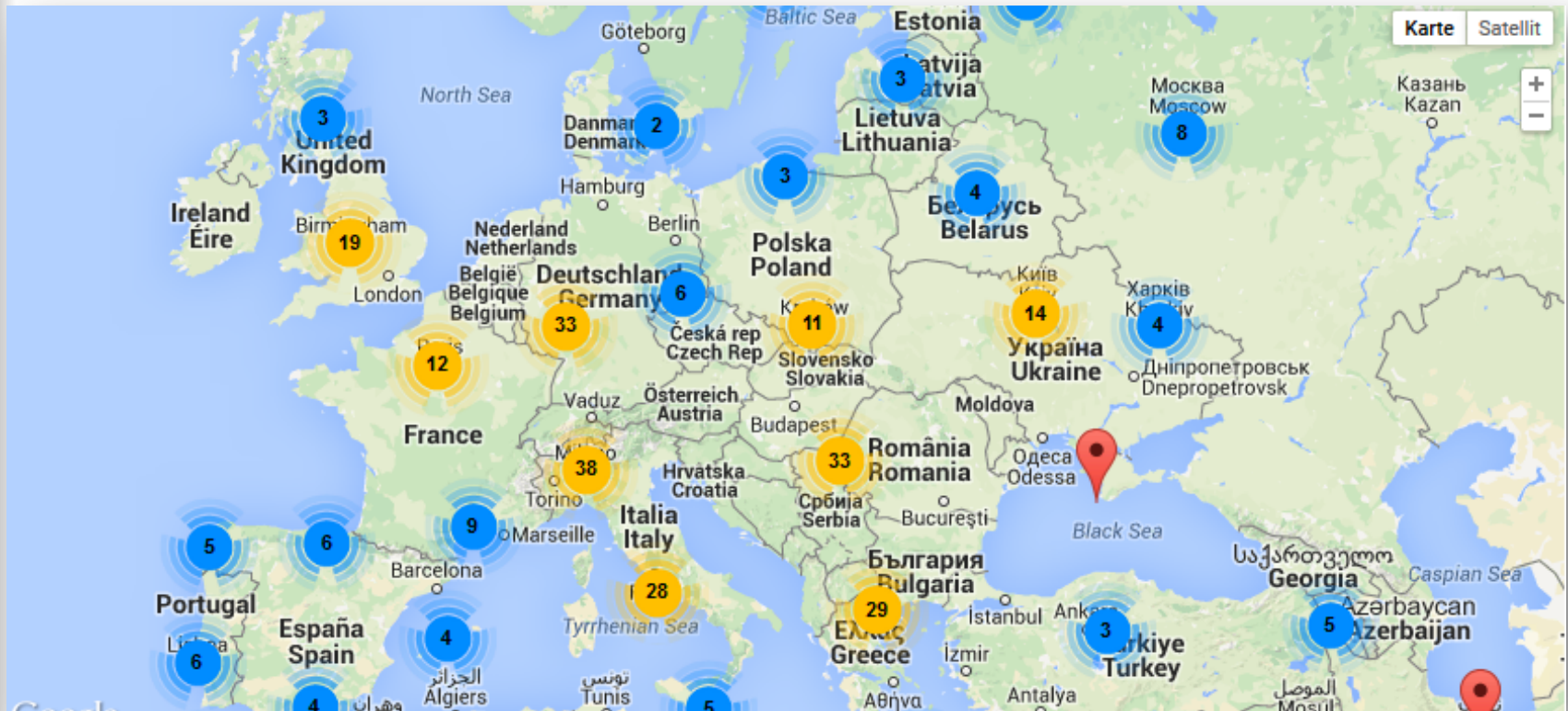


Hostname	Service Type	Production	Monitored	Scope(s)	Host Site
» voms-01.pd.infn.it	VOMS	✓	✓	EGI	INFN-PADOVA
» voms-02.pd.infn.it	VOMS	✓	✓	EGI	INFN-PADOVA
» voms.cnaf.infn.it	VOMS	✓	✓	EGI	NGI_IT
» voms.ct.infn.it	VOMS	✓	✓	EGI	GILDA-INFN-CATANIA
» voms02.scope.unina.it	VOMS	✓	✓	EGI	UNINA-EGEE
» voms2.cnaf.infn.it	VOMS	✓	✓	EGI	NGI_IT
» vomsIGI-NA.unina.it	VOMS	✓	✓	EGI	UNINA-EGEE
» vomsmania.cnaf.infn.it	VOMS	✓	✓	EGI	NGI_IT





# EGI Resources







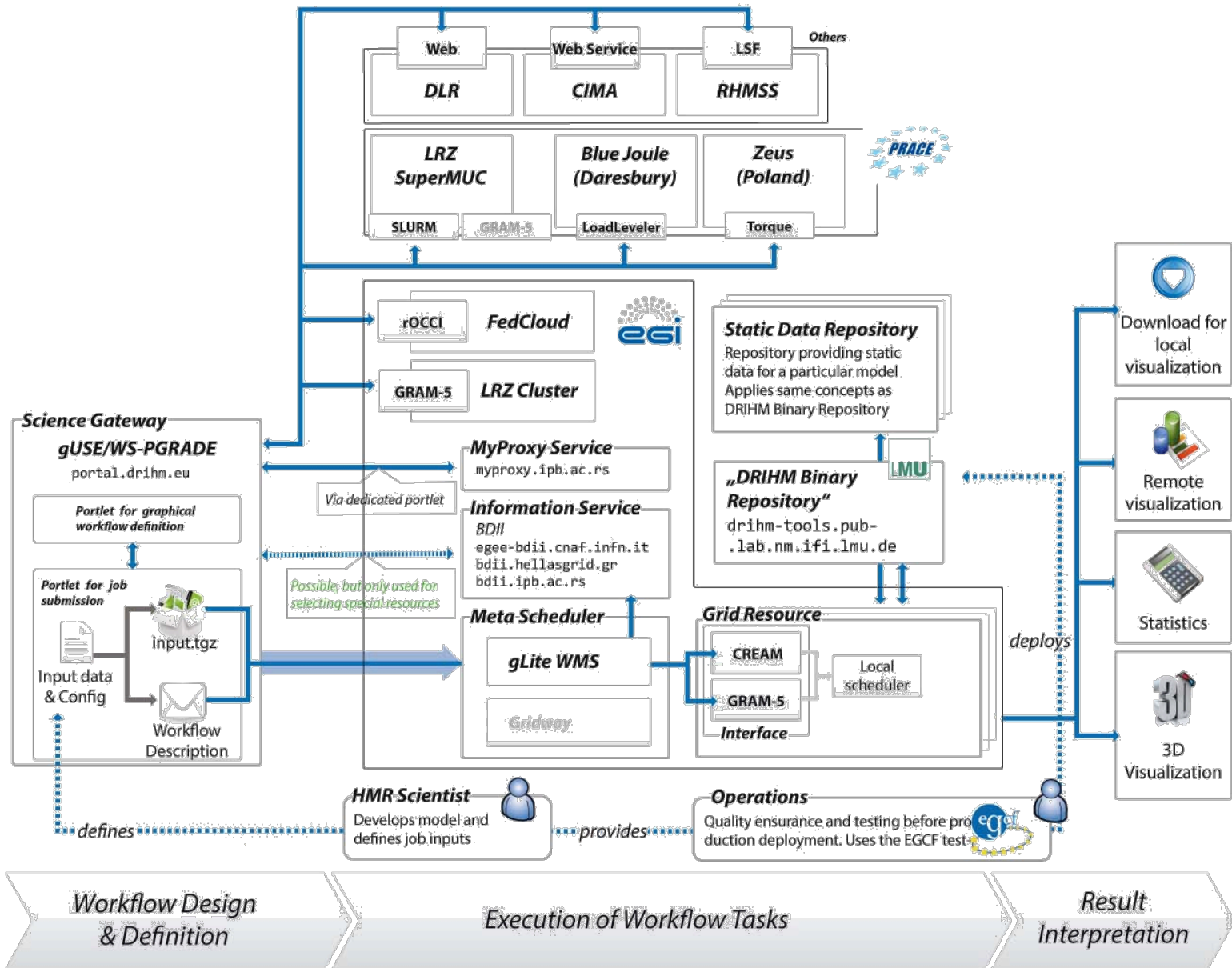
# PRACE Tier-0/1 Resources

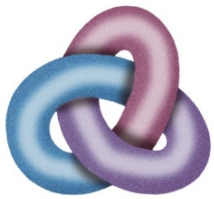




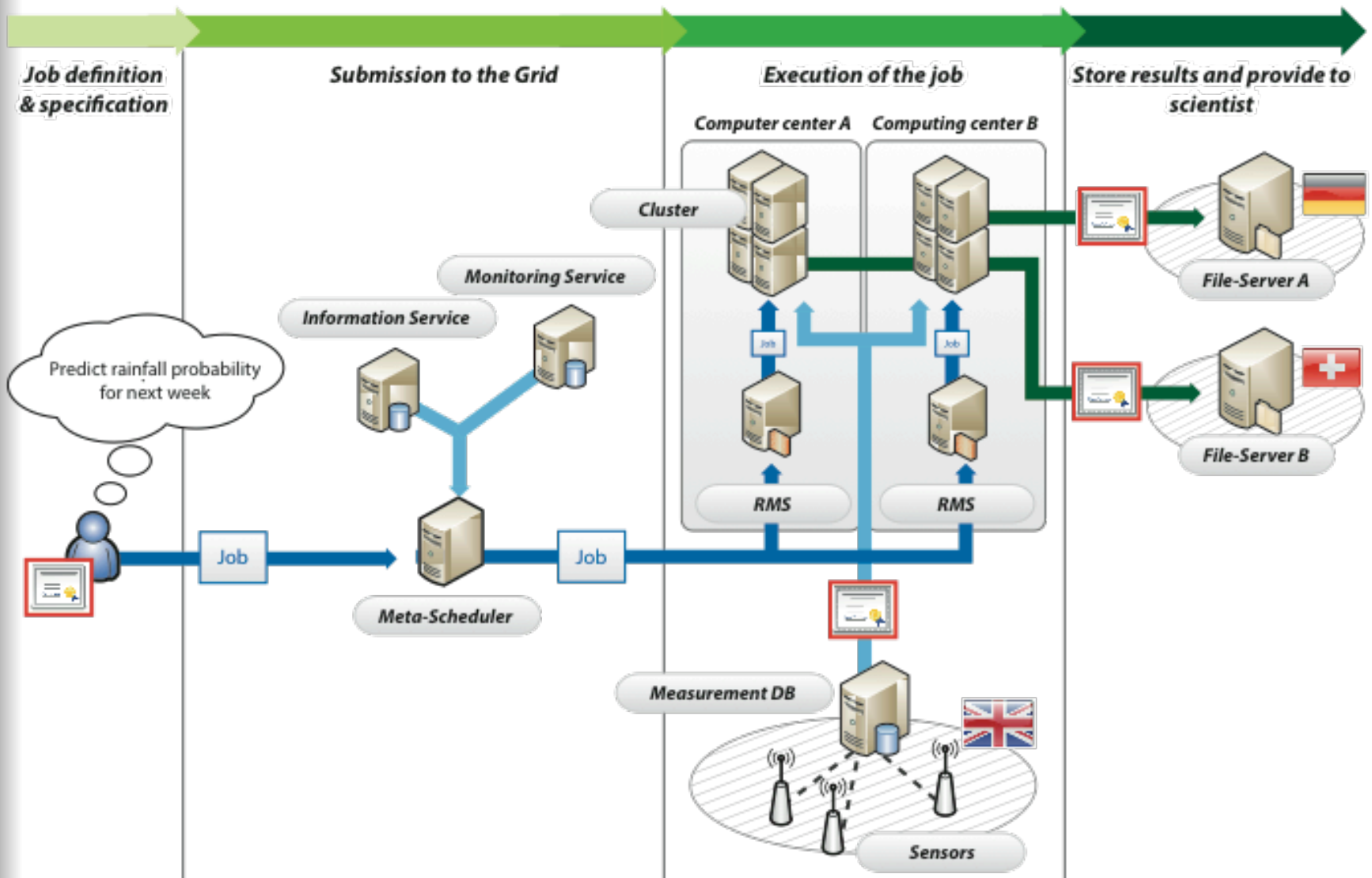


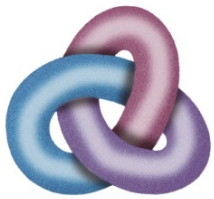
# DRIHM DCI



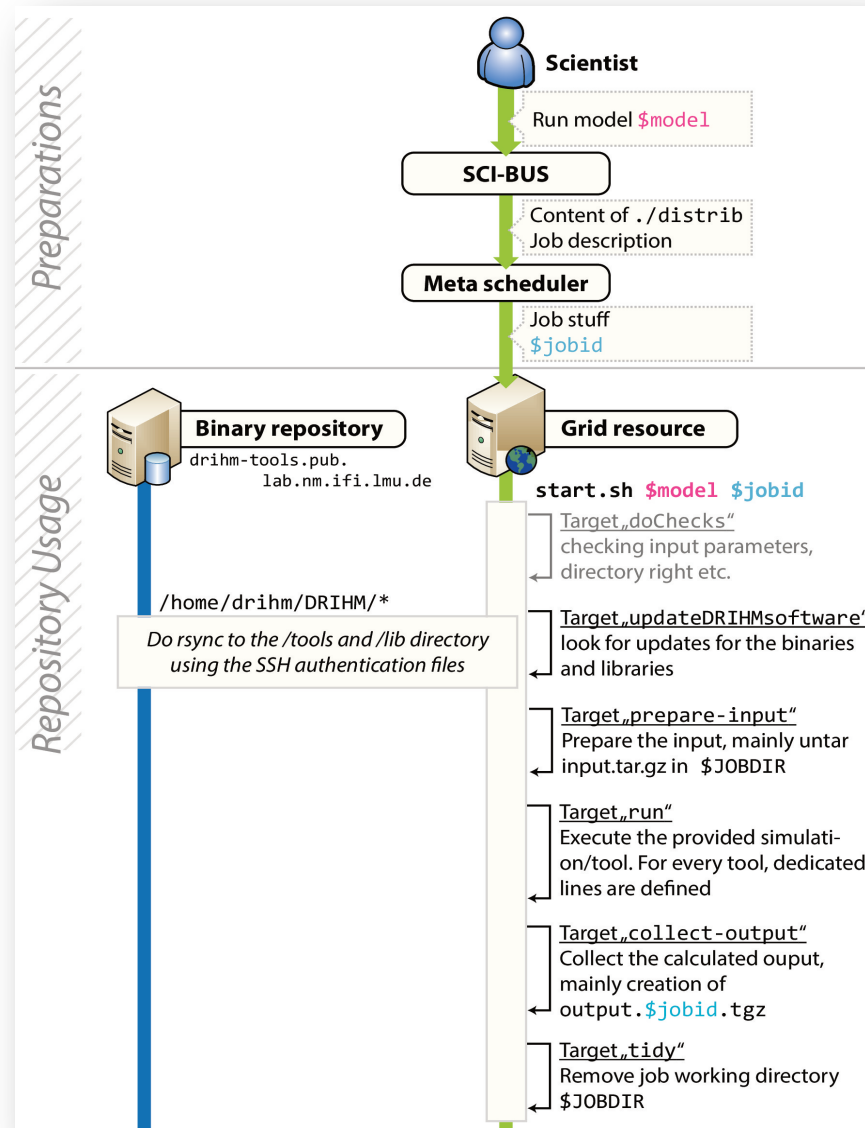


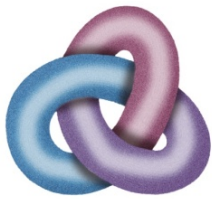
# Executing Jobs in the Grid



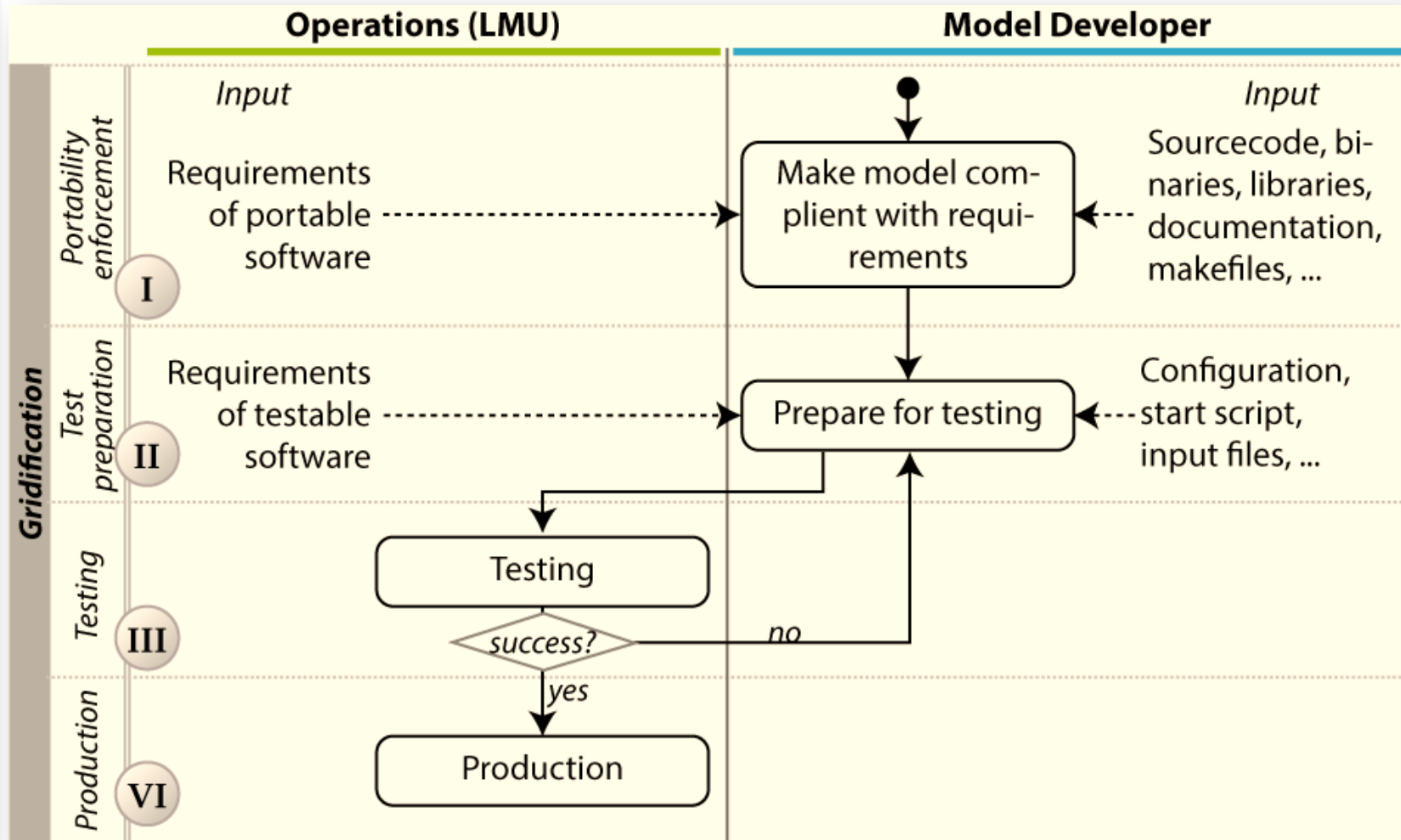


# Simplified Repository-Based Job Submission





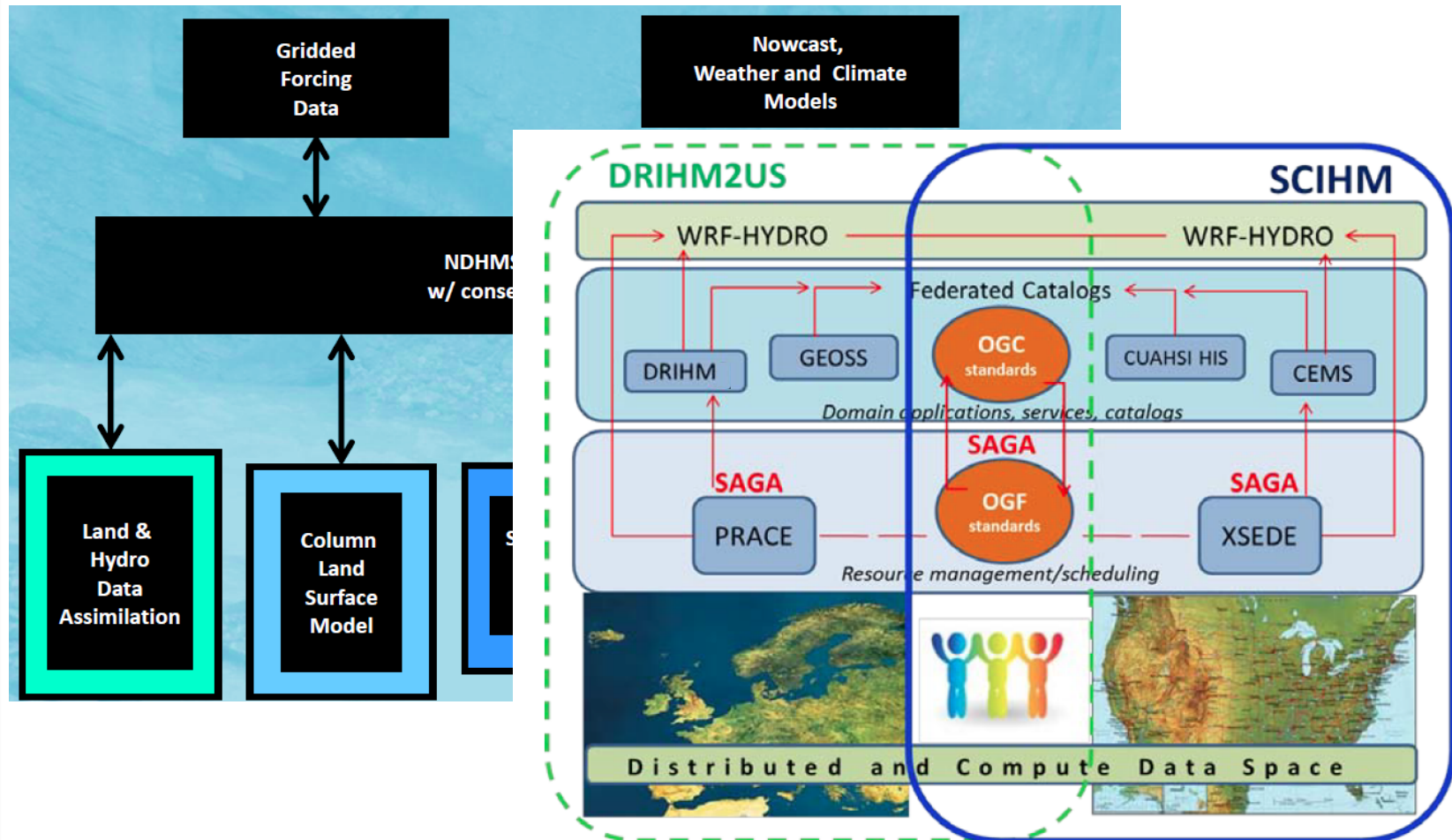
# Gridification/DRIHMification

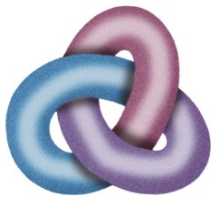






# DRIHM Extension I

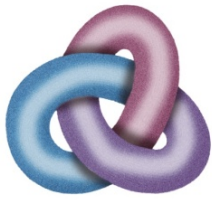




# Additional Resources (XSEDE)

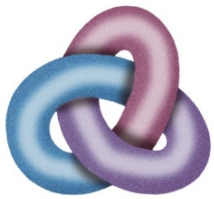




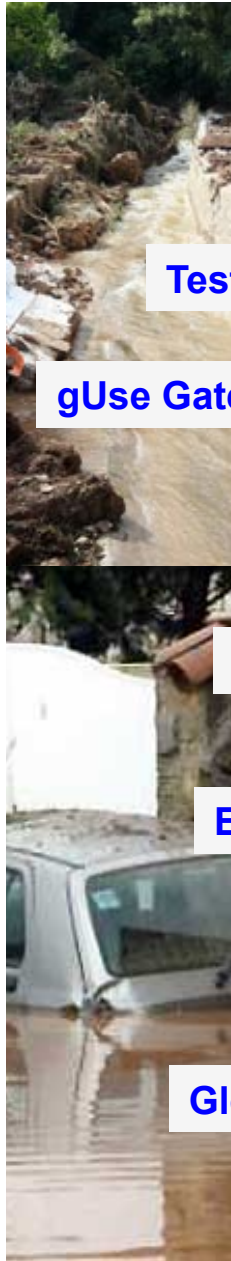


# Further DRIHM Extensions





# DRIHM Stack (Excerpt)



Test bed

gUse Gateway

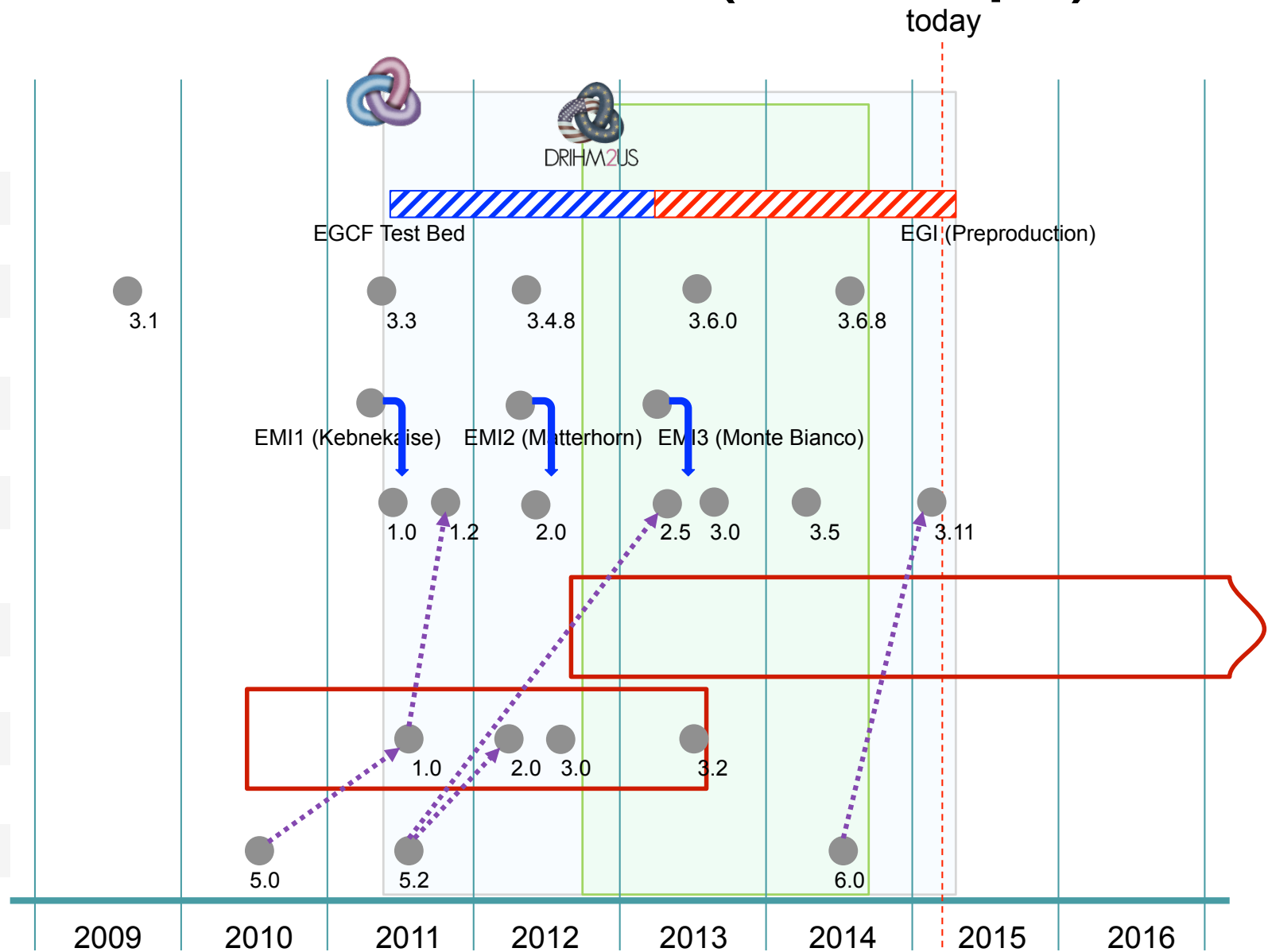
EMI

UMD

EGCF

IGE

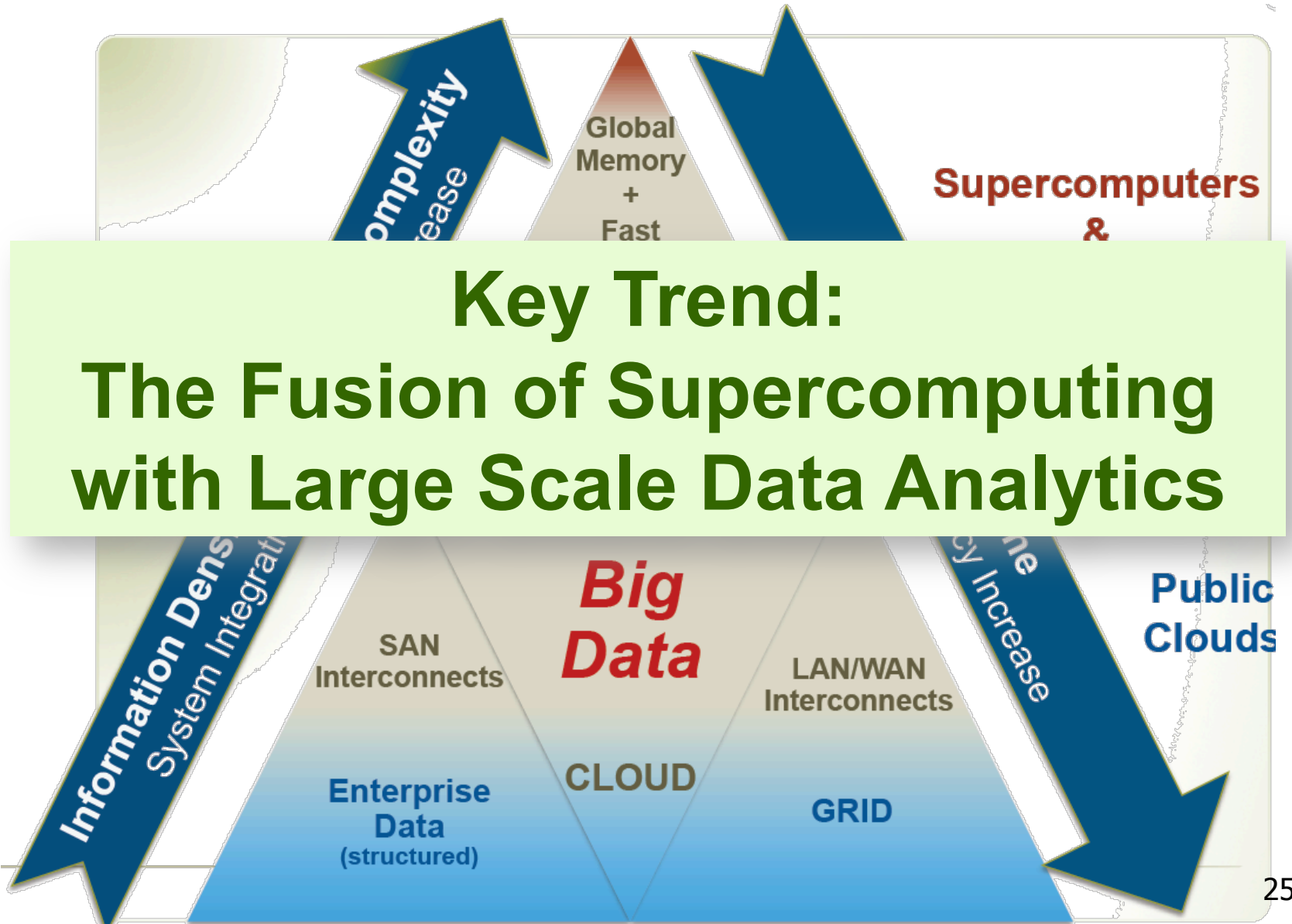
Globus

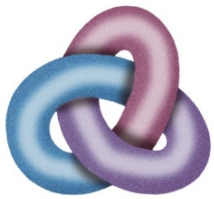






# The Future

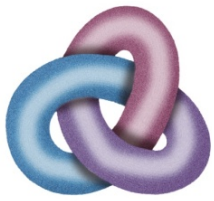




# DRIHM's ELEVEN

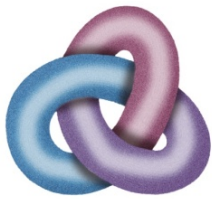
1. Model chaining works.
2. Experiment suites prove this.
3. We use Grid infrastructures.
4. „drihm.eu“ VO is in production.
5. Resources from EGI, PRAISE & local ones.
5. HMR Grid jobs are portal-triggered and repository-based.
6. The portal and the repository act as wrappers.
7. Bus-like extension of science gateways.
8. DRIHM2US extends DRIHM (XSEDE).
9. Standards are mandatory.
10. Trend: Fusion of HPC and Big Data Analytics.
11. DRIHM attracts students.





# Discussion





# Structure of a Multi-Physics Execution Framework

