

# Interoperable e-infrastructures as seen by Helix Nebula

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# A European cloud computing partnership: big science teams up with big business



## Strategic Plan

- ▶ Establish multi-tenant, multi-provider cloud infrastructure
- ▶ Identify and adopt policies for trust, security and privacy
- ▶ Create governance structure
- ▶ Define funding schemes



To support the computing capacity needs for the ATLAS experiment

EMBL



Setting up a new service to simplify analysis of large genomes, for a deeper insight into evolution and biodiversity



To create an Earth Observation platform, focusing on earthquake and volcano research

AtoS

CloudSigma

CSA security alliance™

DANTE  
www.dante.net

CECMWF

egi

Ifremer

interoute  
from the ground to the cloud

logica  
be brilliant together

OpenNebula.org  
The Open Source Toolkit for Cloud Computing



..T..Systems..



Adopters



# Long Term Goal

To create a multi-tenant '**Open Market Place for Science**', where data, scientists, funding bodies, SMEs and downstream industry meet to work towards common interests

**An ecosystem to transform  
data into valuable information**

# Timeline

2011

- Endorse the Common **Strategy**
- Agree on the **Partnership**
- Select **flagships** use cases
- Define **governance** model

2012-2013

- **Pilot** Phase
- **Deploy** flagships,
- **Analysis** of functionality, performance & financial model

2014 ...

Towards an **open market for Science**

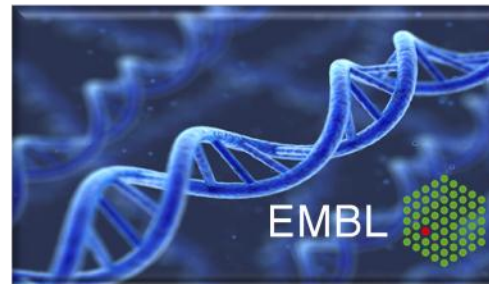
# Initial Flagship Use Cases

## ATLAS High Energy Physics Cloud Use



To support the computing capacity needs for the ATLAS experiment

## Genomic Assembly in the Cloud



A new service to simplify large scale genome analysis; for a deeper insight into evolution and biodiversity

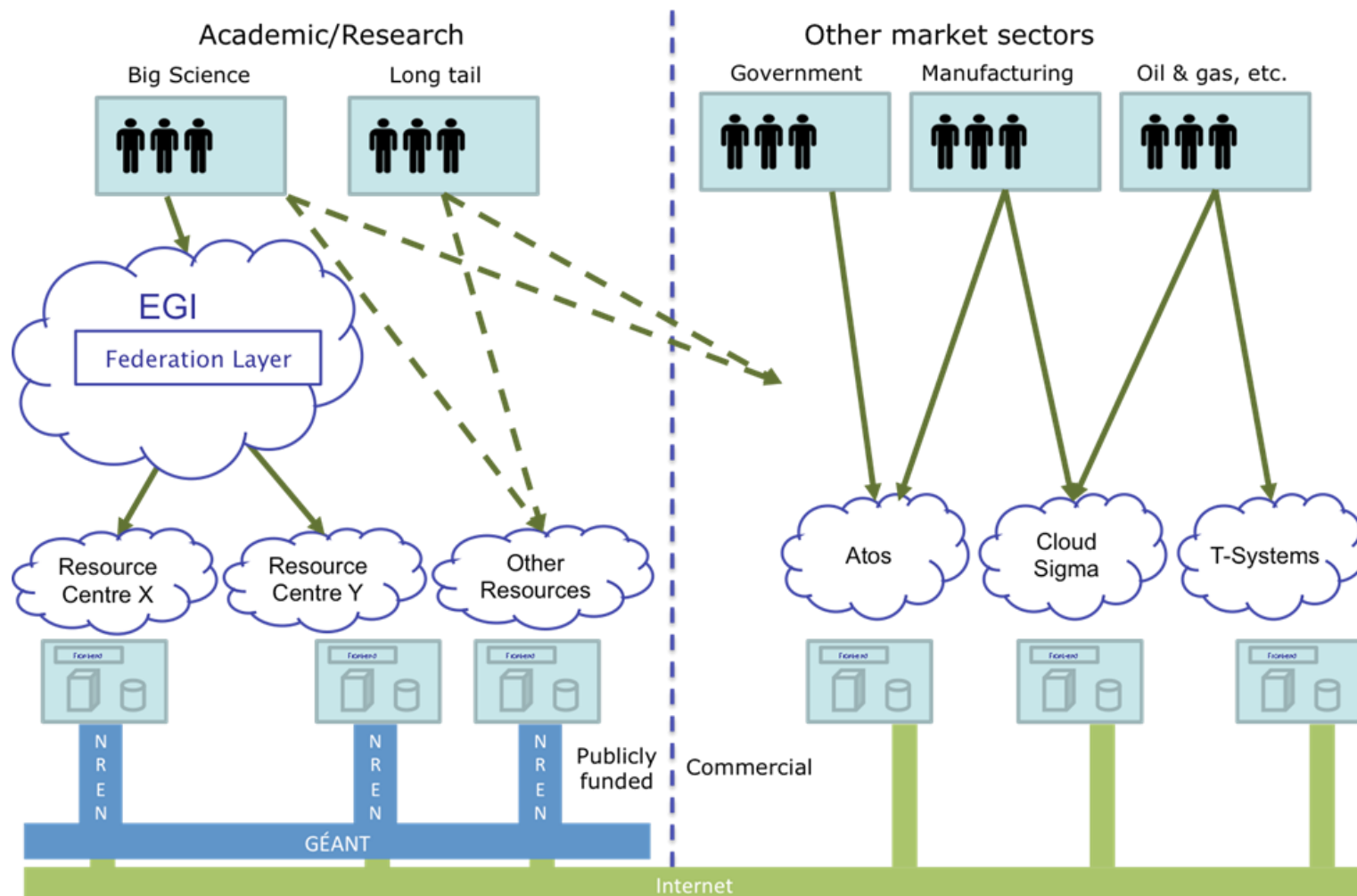
## SuperSites Exploitation Platform



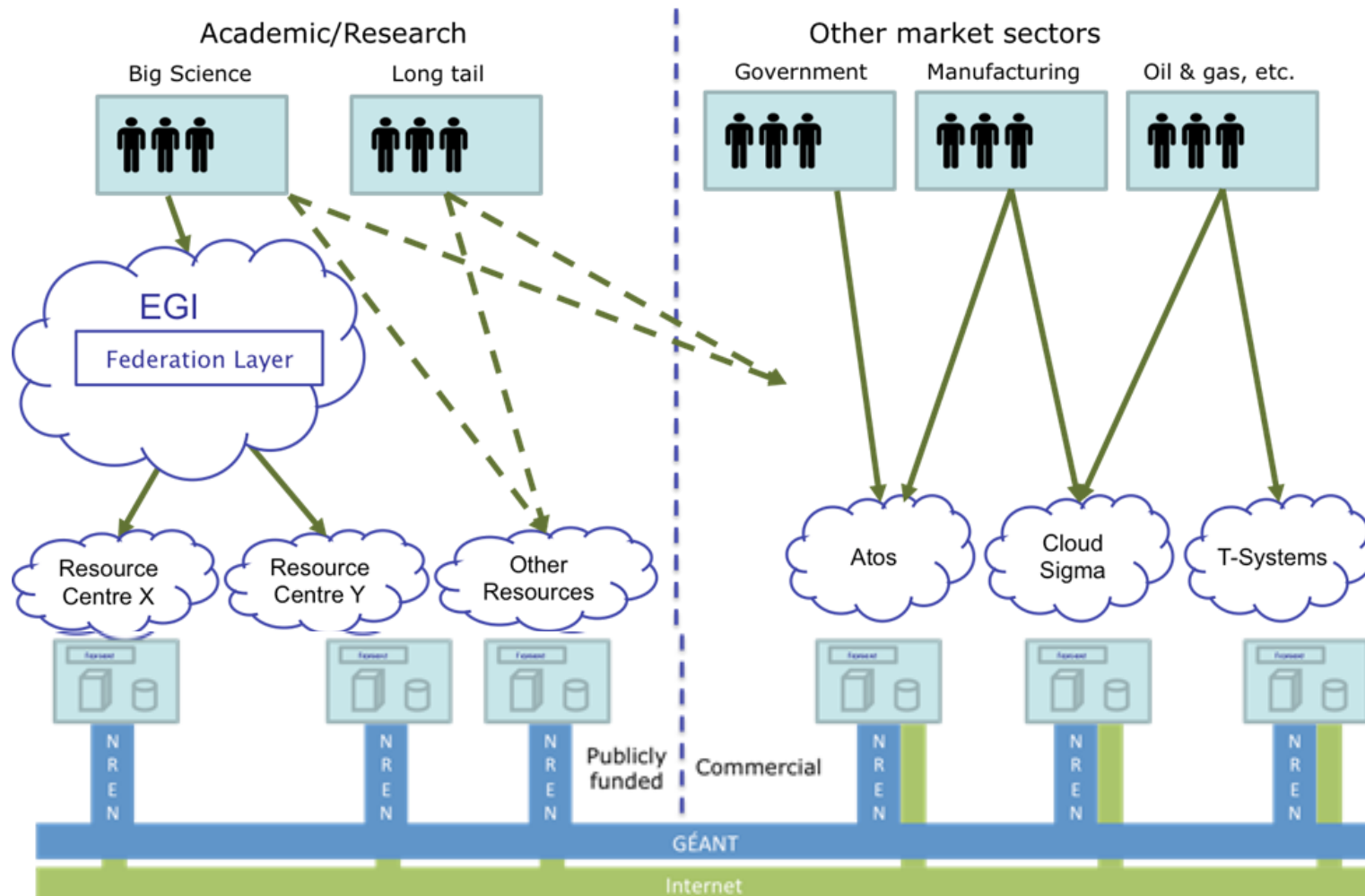
To create an Earth Observation platform, focusing on earthquake and volcano research

- Scientific challenges with societal impact
- Sponsored by user organisations
- Stretch what is possible with the cloud today

# The situation before Helix Nebula

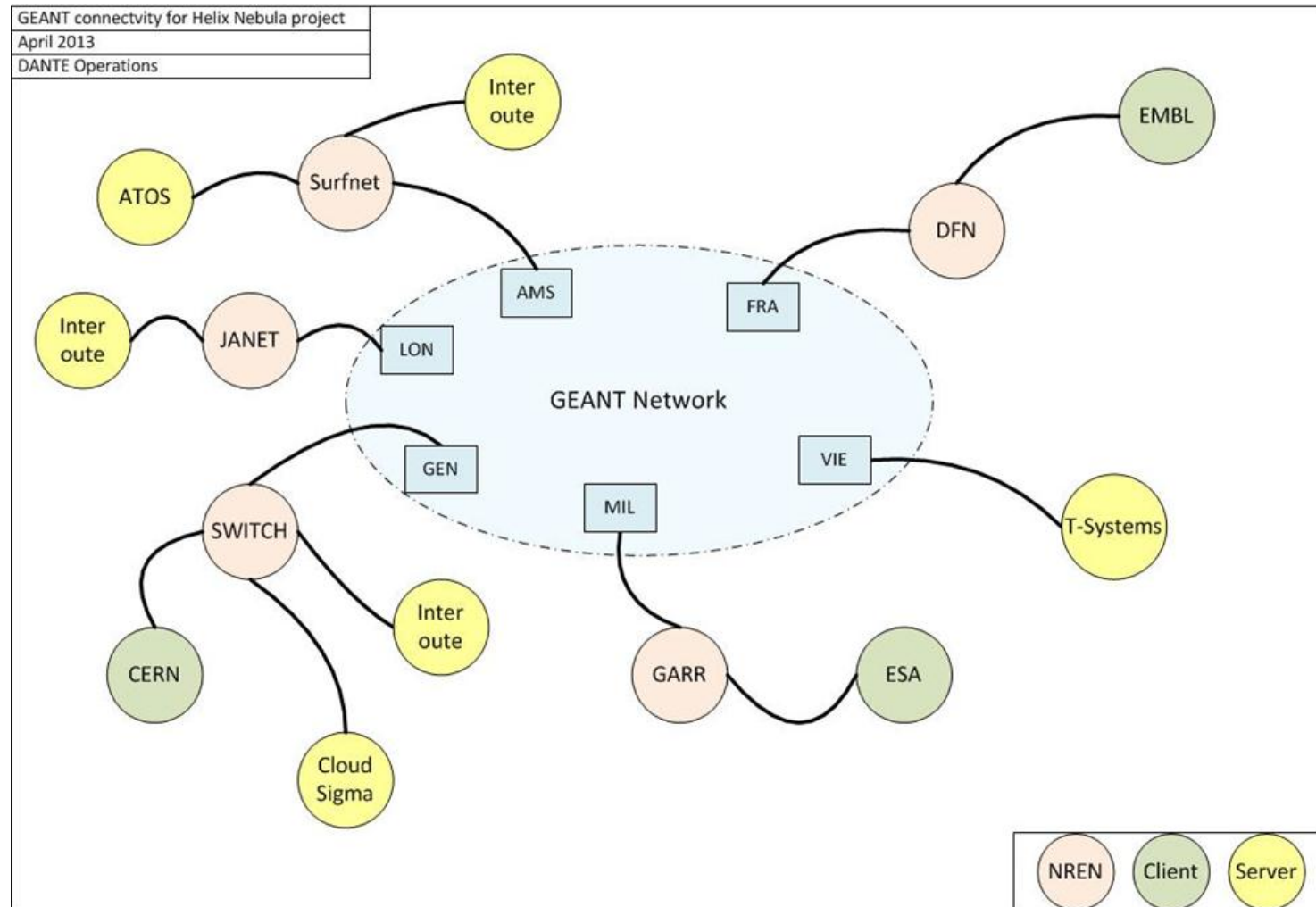


# The situation in 2012





# Connection of Helix Nebula partners to GÉANT





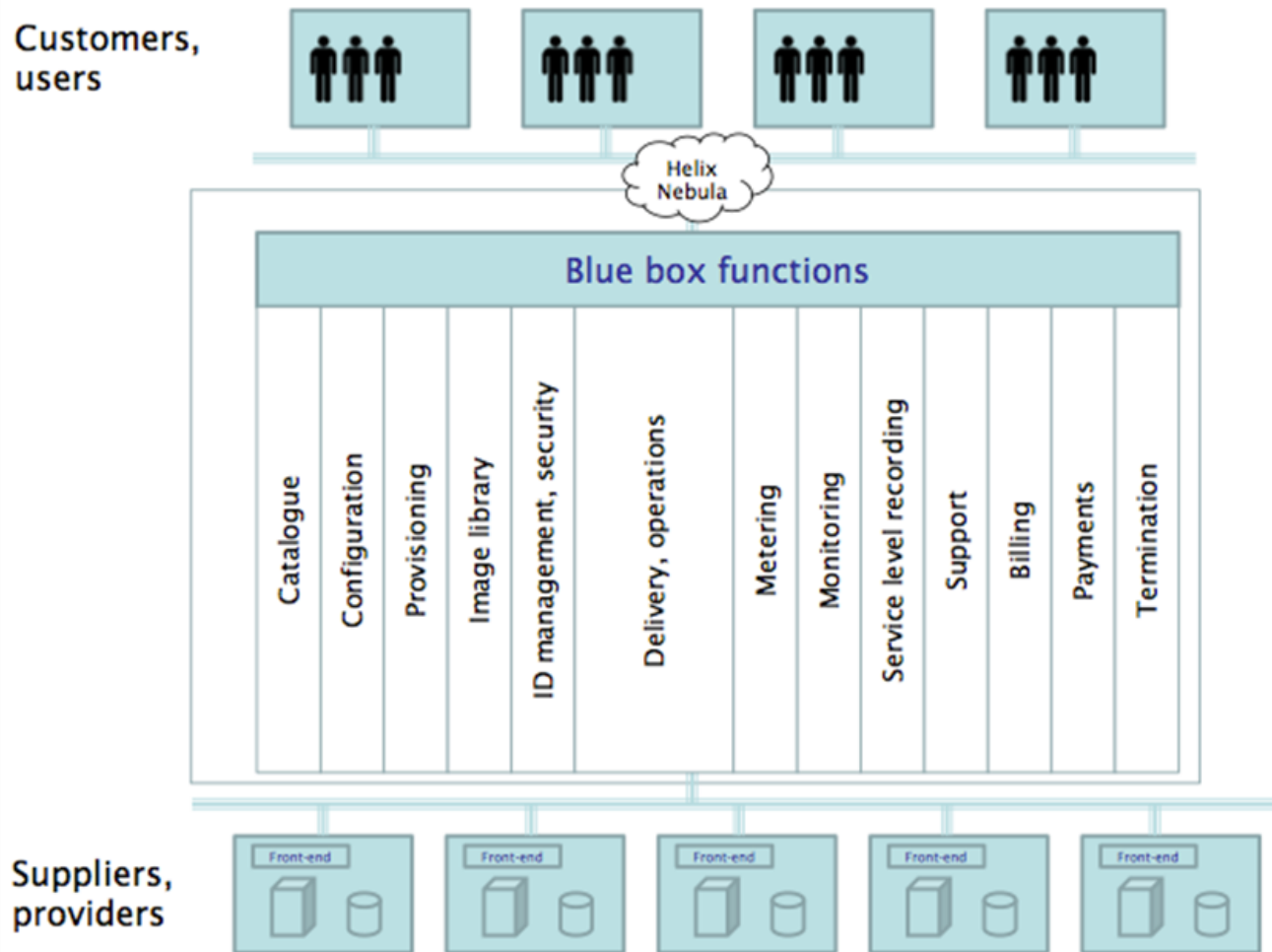
# Flagship deployments results 2012

- **CERN** was able to run simulations previously executed on the Worldwide LHC Computing Grid by quickly deploying ATLAS experiment flagship application on the Cloud.
- **EMBL** successfully deployed and tested their novel software pipeline for large-scale genomic analysis using real world large genomic data sets.
- **ESA** successfully tested large-scale data processing and dissemination for its radar satellites using different cloud provider infrastructure.

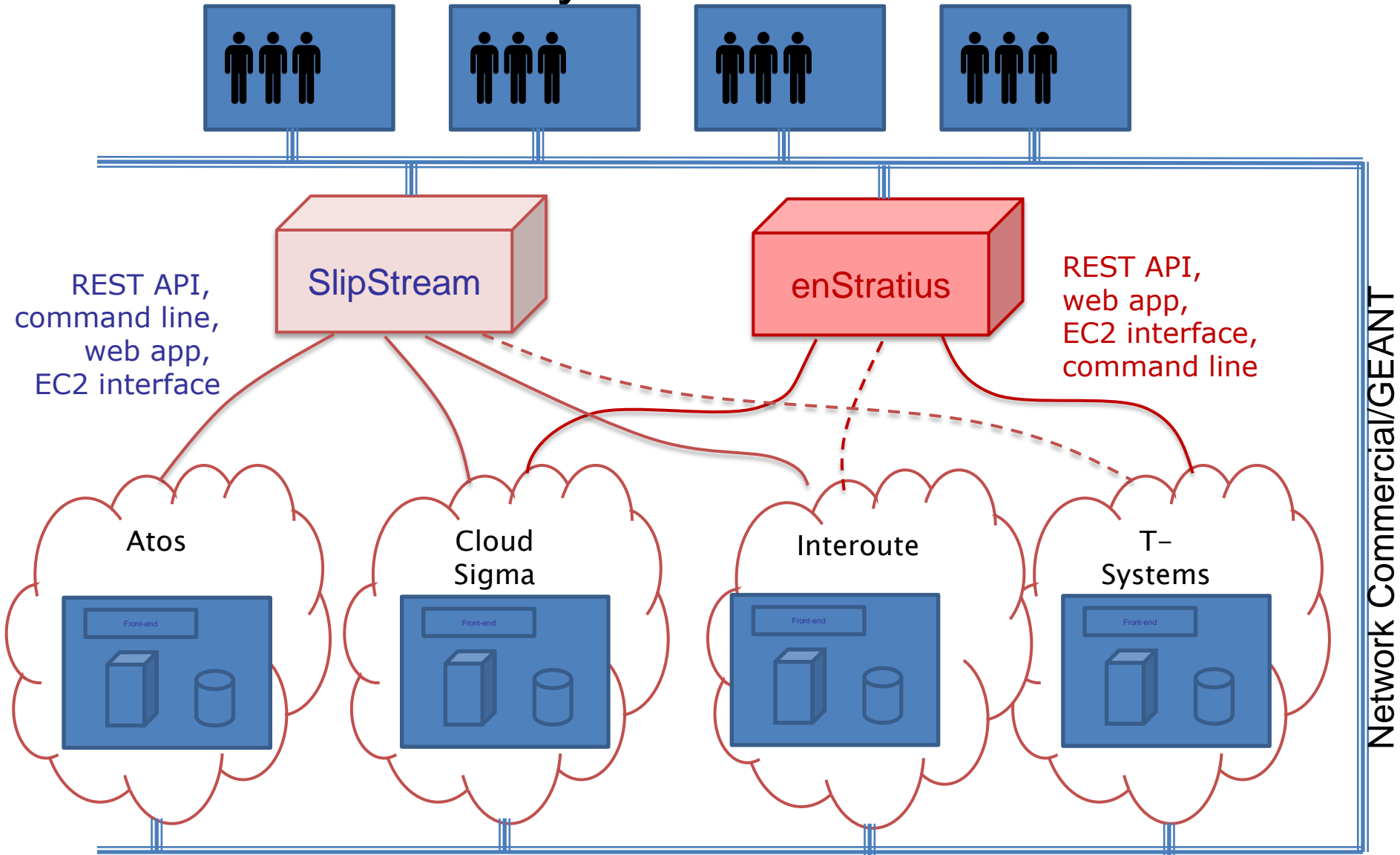
# Identified Gaps

- A **standard set of APIs** for suppliers and consumers; this needs to include relevant APIs of current global players offering ease of migration
- A **federated identity management** system offering a single sign-on facility to access cloud services across multiple-suppliers
- A means of **automation of cloud management processes** to provide on-demand services, resource pooling and rapid elasticity across cloud providers.

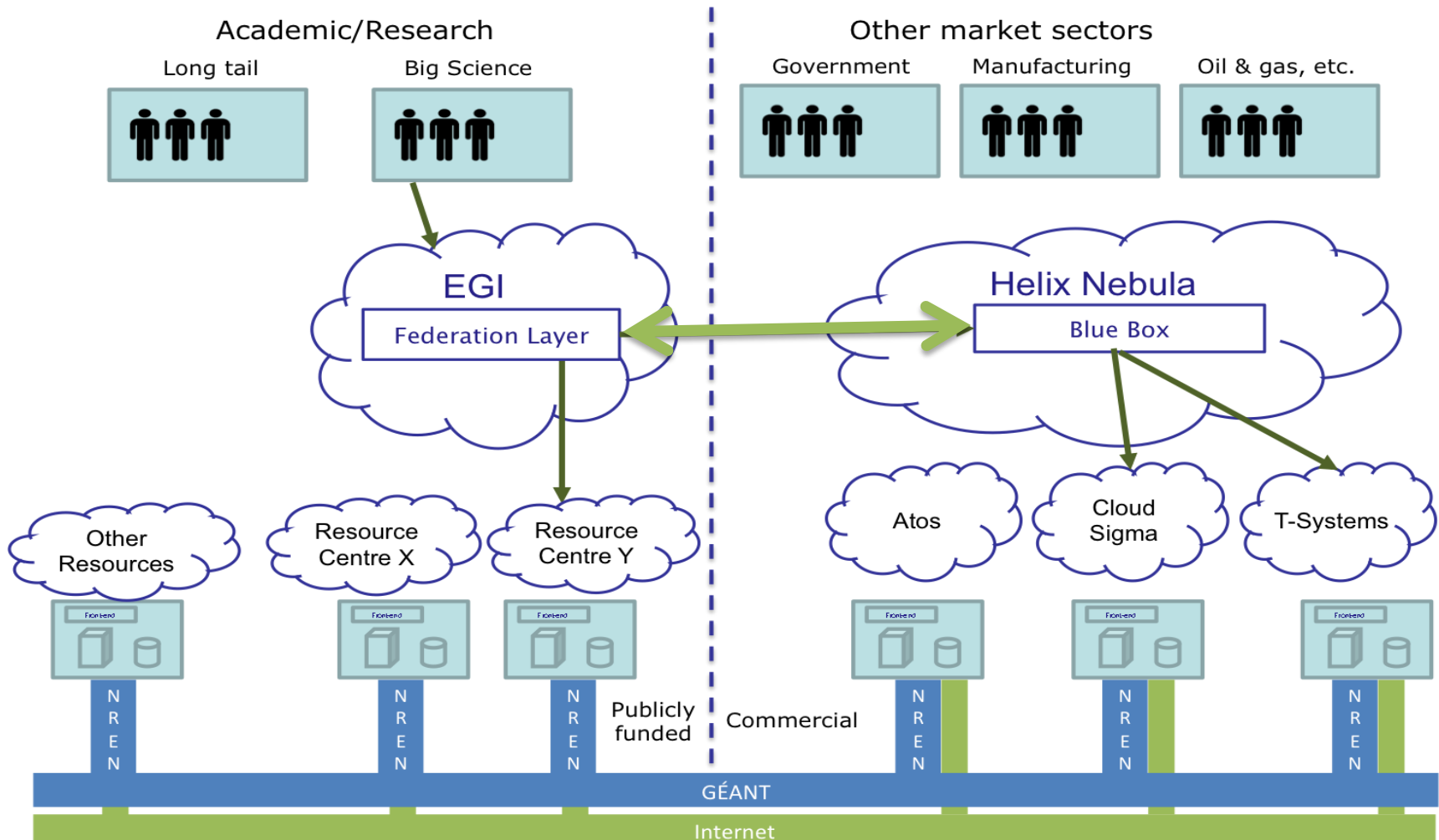
# Federation via Blue Box



# Helix Nebula Blue Box services currently under test



# What we will test next



# New flagships

- 3 selected from 15 proposals:
  - European Center for Medium Range Weather Forecasts (ECMWF)
    - Weather Data Information Supersite (WDIS) with 100 years of weather data
  - UNESCO (Intergovernmental Oceanographic Commission)
    - Ocean and Coastal Information Supersite (OCIS)
  - Port d'Informació Científica (PIC), Barcelona
    - Reduce costs and improve speed of delivery, increase volume and accuracy for Neuroimaging
- Foresee to deploy the new flagships in 2H 2013

# Helix Nebula and national structures

- The initial Helix Nebula flagships address the needs of international research organizations with big-science goals
- In 2013 we want to study how to work with national structures and funding agencies:
  - **Identify** potential commercial suppliers and research community users in the country for whom Helix Nebula would bring advantages
  - **Compare** the business models being developed in Helix Nebula with those used on a national basis
  - **Understand** how national engagement would impact the Helix Nebula governance model



# Interoperability aspects

Cooperating partners with compatible visions, aligned priorities, and focused objectives

**Political Context**

Aligned legislation so that exchanged data is accorded proper legal weight

**Legal Interoperability**

Legislative Alignment

Coordinated processes in which different organisations achieve a previously agreed and mutually beneficial goal

**Organisational Interoperability**

Organisation and Process Alignment

Precise meaning of exchanged information which is preserved and understood by all parties

**Semantic Interoperability**

Semantic Alignment

Planning of technical issues involved in linking computer systems and services

**Technical Interoperability**

Interaction & Transport

# Key documents

- **Helix Nebula – The Science Cloud:  
A catalyst for change in Europe**
  - <https://cds.cern.ch/record/1537032>
- **Interoperability requirements report**
  - <https://cds.cern.ch/record/1548323>

All Helix Nebula public documents are held in an open access repository:

- <https://cds.cern.ch/search?cc=Helix+Nebula&ln=en&jrec=1>