

Helix Nebula, the Science Cloud

A strategic Plan for a European Scientific Cloud Computing Infrastructure

NORDUNet 2012, Oslo 18th-20th September

Maryline Lengert, ESA

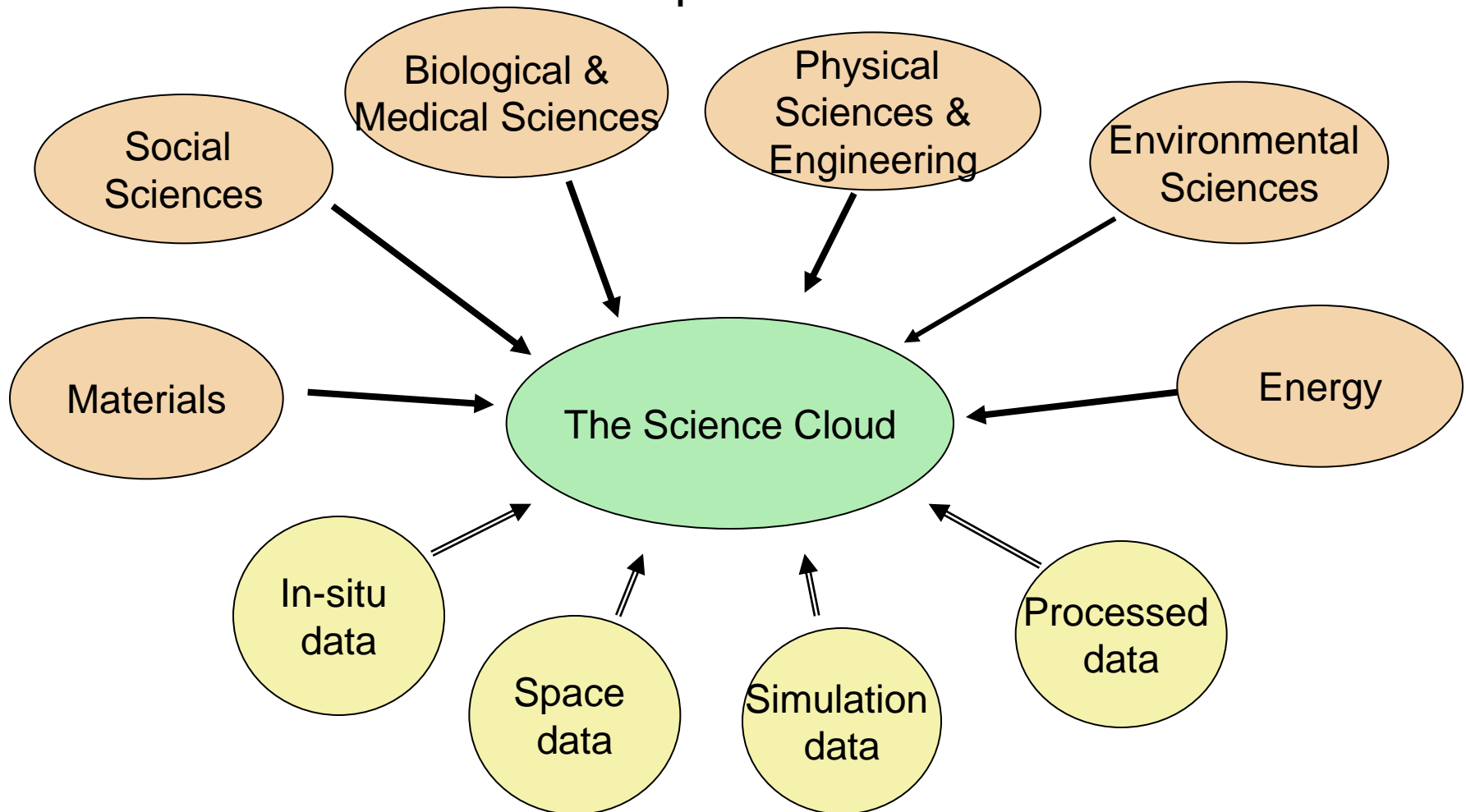
Strategic Goal

Helix Nebula, the Science Cloud

is a partnership that has been created
to support the **massive IT requirements**
of European scientists
and **create a Cloud computing market**
for the public sector in **Europe**.

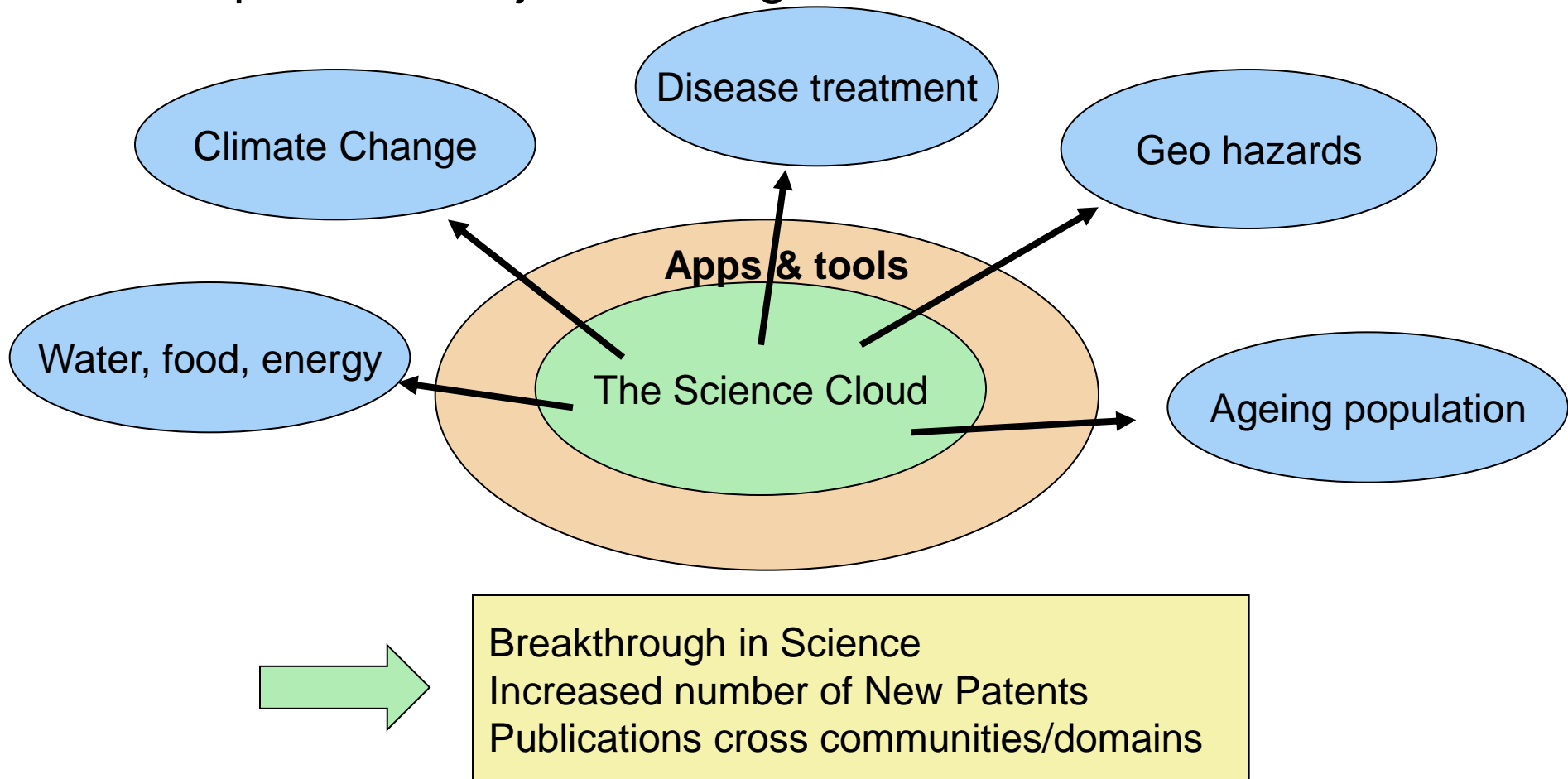
The Science Cloud : INPUT

The Science Cloud : a unique mine of scientific data



The Science Cloud: OUTPUT

The Science Cloud : a unique opportunity for Scientists to comprehend major challenges



Strategic Plan for a Scientific Cloud Computing infrastructure for Europe



1.1

8th August 2011

- **Establish a sustainable multi-tenant cloud computing infrastructure in Europe**
- **Initially based on the needs for the European Research Area & space agencies**
- **Based on commercial services from multiple IT industry providers**
- **Adhere to internationally recognised policies and quality standards**
- **Governance structure involving all stakeholders**

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4 Goals outlined in the Strategic Plan

1. Set up a **cloud computing infrastructure** for European Research Area
2. Identify and adopt **policies** for trust, security and privacy on a European-level
3. Create a light-weight **governance** structure involving all stakeholders
4. Define a short and medium term **funding** scheme

Addressing actions of the “Digital Agenda for Europe”

Helix Nebula strongly supports the Commission's Digital Agenda for Europe:

- It stresses a **unified approach to data protection regulations** and **lightweight, efficient governance**
- It has ambitions to support **European economic development** by making its services available to the wider community.



Digital Agenda @DigitalAgendaEU is now following you (@HelixNebulaSC).

DigitalAgendaEU Digital Agenda

This is the official account of the EU's Digital Agenda policy flagship - providing all the news you need about maximising the potential of ICT in Europe.

EC is strongly supporting Helix Nebula



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News ::

Helix Nebula makes Europe become Cloud Active in Science

(25/06/2012) The European Commission just took another step towards a Cloud Active Europe with the signature of a grant agreement for Helix Nebula. The Commission is giving €1.8 million in funding to this initiative which will develop cloud services in the scientific domain by partnering main research infrastructures in Europe (CERN, EMBL and ESA) with main stakeholders in the industry (e.g. Atos, T-systems, etc). The Commission's grant will support moving flagship applications (Atlas HEP, Genomic Assembly in the Cloud and Supersites Exploitation Platform) to the cloud, while identifying business opportunities for cloud services for the scientific community.

The signature of this agreement is one step in the implementation of the Digital Agenda for Europe, which calls for the further development of e-Infrastructures and the establishment of an EU strategy for cloud computing for government and science.

Helix Nebula as a cloud partnership for science launched under the e-Infrastructures activity of FP7, is a forerunner of the forthcoming Integrated Cloud Computing Strategy for the European Union expected to be adopted by mid-July and in particular is complementary to the European Cloud Partnership to promote public sector take-up of cloud services that was **announced by Neelie Kroes in Davos**.

More information
[Digital Agenda for Europe](#)
[Digital Agenda Cloud Computing home page](#)

A Collaboration Initiative

**European Commission
& relevant projects**

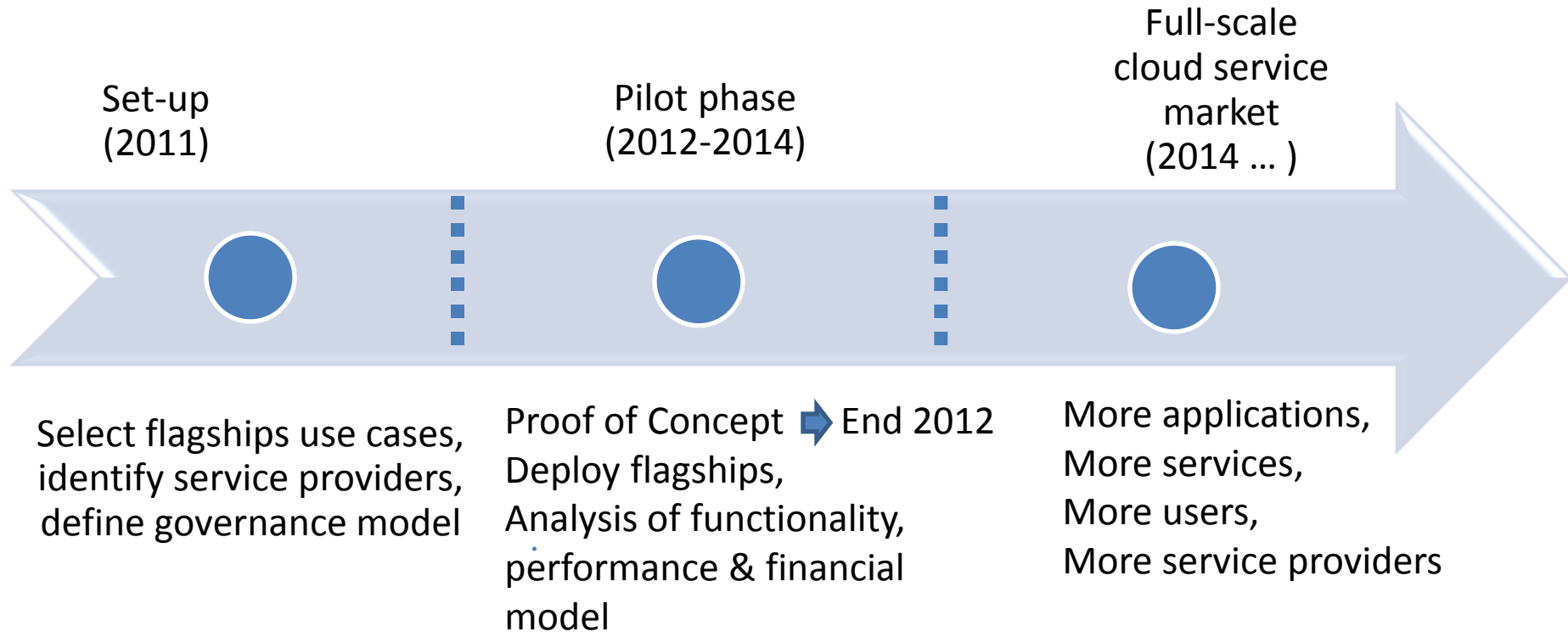
User organisations
Demand-side

**European
Cloud Computing
Strategy**

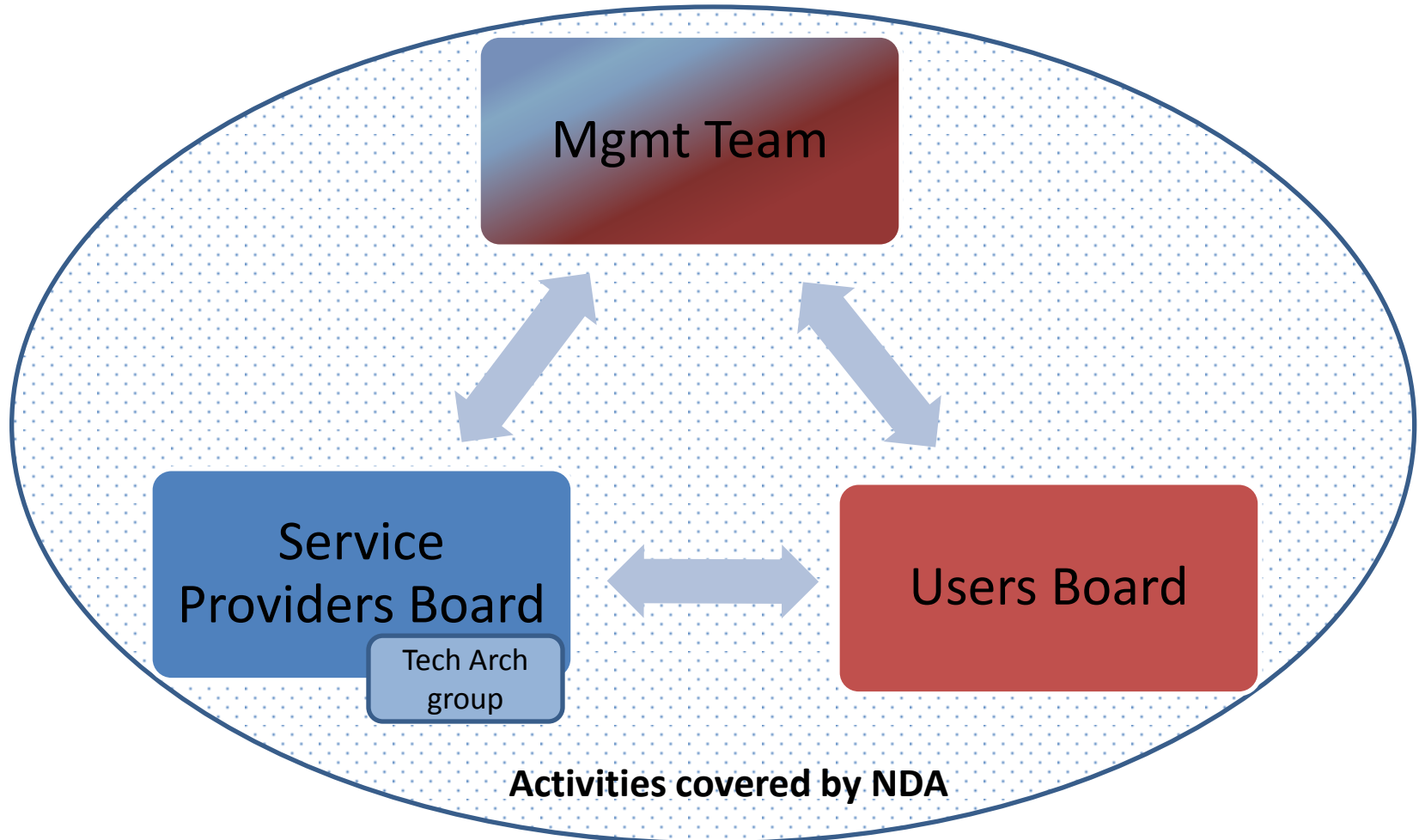
**Commercial Service
Providers**
Supply-side

Bringing together all the stakeholders to establish a **public-private partnership**

Timeline



Governance Model during Proof of Concept in the Pilot Phase



Consortium membership

- Consortium includes all participating supply-side and demand-side companies/organisations
 - Member status and adopter status
 - All sign a non-disclosure agreement
 - “interested parties” can also register
- Procedure to become a new member is on Helix-Nebula website <http://www.helix-nebula.eu/>

Become a new member !

as:

Users



Users: An organisation that applies to become a user member should be a science or space organisation and commit to provide at least one flagship use case for cloud computing that can be verified and validated through a Proof of Concept with multiple service providers. Users will name a representative to participate in regular meetings of the Helix Nebula Users Board.

Service
Providers



Service Providers: An organisation that applies to become a service provider member should commit to support a minimum set of cloud computing services and perform at least one Proof of Concept of a flagship use case with a user. Service Providers can apply to one or more of the following categories: Connectivity Provider, Infrastructure-as-a-Service Provider (IaaS), Platform-as-a-Service Provider (PaaS), Software-as-a-Service Provider (SaaS), Integrator, Consultant or Broker. Service Providers will name a representative to participate in regular meetings of the Helix Nebula Service Providers Board.

Adopters



Adopters: An organisation may apply to become an adopter, if they initially do not want to be directly involved in the flagship use cases but wish to make use of the Helix Nebula's products and services on a pay-per-use basis and be able to provide feedback. Adopters may be invited to Boards (either Service Providers or Users) meetings for information purposes. Adopters will name a representative to be informed or invited by the Helix Nebula Consortium on a regular basis.

Interested
Parties



Interested Parties: An organisation may apply to become an Interested Party, if they initially do not want to be directly involved in the flagship use cases but wish to be kept informed of the work of or use information provided by the Consortium.

For all types of members a formal acceptance procedure will apply (specified hereafter), to be implemented by the Helix Nebula Management Team following the receipt of the membership request. **Membership application implies acceptance of the vision of Helix Nebula** as outlined in the strategic plan [Strategic Plan for a Scientific Cloud Computing infrastructure for Europe, CERN-OPEN-2011-036, August 2011](#), and **willingness to collaborate with the other partners** in order to achieve the vision. All decisions must be adopted by consensus of both the user organisations and service provider companies. In case of lack of consensus, decision will be taken by a qualified majority of all members of the two Boards, which must include the positive vote of the public user organisations.

All users and service providers applying to become a member of the Helix Nebula Consortium (except as an Interested Party) agree to sign a multi-lateral NDA prior to becoming an active member.

For more details and updates about how to join, write to us at contact@helix-nebula.eu

Become a new member



Over the next two years the Helix Nebula Consortium is expected to involve an increasing number of members.

The potential members are likely to be stemming from the categories below:

Become a new member

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Become a new member

Events



Helix Nebula @ DCI Workshop, 18 September 2012, Prague
Bob Jones (CERN) and Michael Symonds (Atos) will participate to the DCI Workshop "Distributed Computing Infrastructures for e-Science: Future Perspectives".

[More](#)

Participants



Helix Nebula Pilot Phase

Flagship use cases



Pilot Phase Goals

- Through the pilot phase we expect to **explore/push** a series of **perceived barriers** to Cloud adoption:
 - **Security**: Unknown or low compliance and security standards
 - **Reliability**: Availability of service for business critical tasks
 - **Data privacy**: Moving sensitive data to the Cloud
 - **Scalability/Elasticity**: Will the Cloud scale-up to our needs
 - **Network performance**: Data transfer bottleneck; QoS
 - **Integration**: Hybrid systems with in-house/legacy systems
 - **Vendor lock-in**: Dependency on vendors once data & applications have been transferred to the Cloud
 - **Legal concerns**: Such as who has legal liability
 - **Transparency**: Clarity of conditions, terms and pricing

Flagship use cases

- **Proposed by demand-side user organisations addressing scientific challenges with societal impact**
 - High-profile applications that catch the public imagination and encourage others to use the services
 - Show need for significant scale of resources, federation/aggregation of data sets, long-term archiving and on-demand processing
 - Bring people and data together : Building communities and stimulating innovation



Use the Cloud for what it is good for !

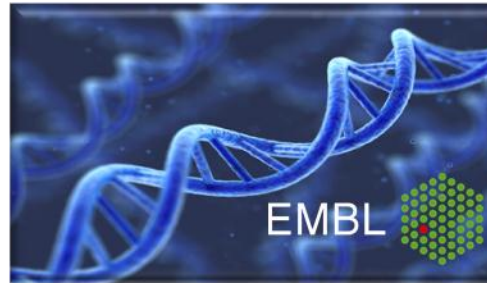
Initial Flagship Use Cases

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

Call for proposals

- Template agreed by demand and supply side
- Eligibility review and analysis with cloud service suppliers

CERN-ATLAS Flagship Use Case



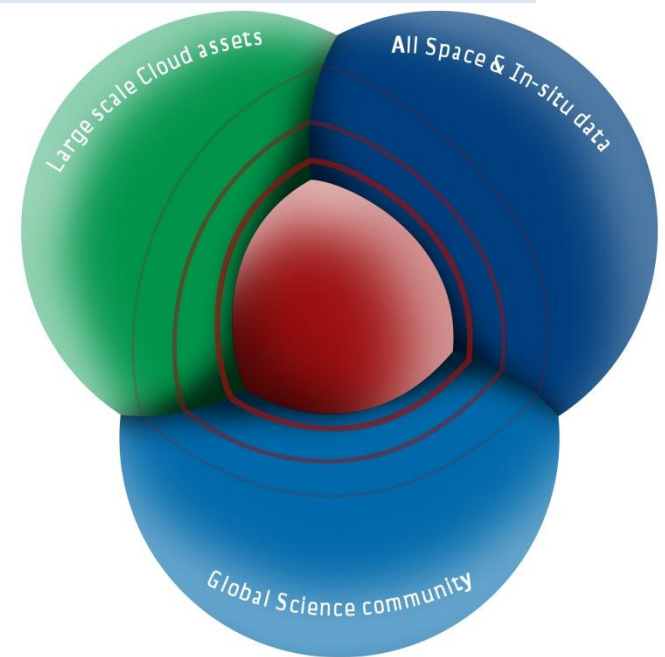
- Real time processing of ATLAS experiment
- Goals:
 - Evaluate cloud technologies for ATLAS use cases
 - Design model to integrate cloud resources with ATLAS distributed computing
 - Implementation in ATLAS software framework

EMBL Flagship Use Case

- Genomic Assembly in the Cloud
 - Genomic Sequencing is now an Affordable Solution and of interest for Academic Research Groups, Medical Research, Pharmaceutical industry and Agricultural Research
 - Sequencing technologies produce vast amount of data which need to be analysed
- Objectives
 - To provide a Genomic Assembly and Annotation Service to a broad range of researchers in various communities
 - To remove computational infrastructure hurdles that may prevent Genomic Assembly projects taking place

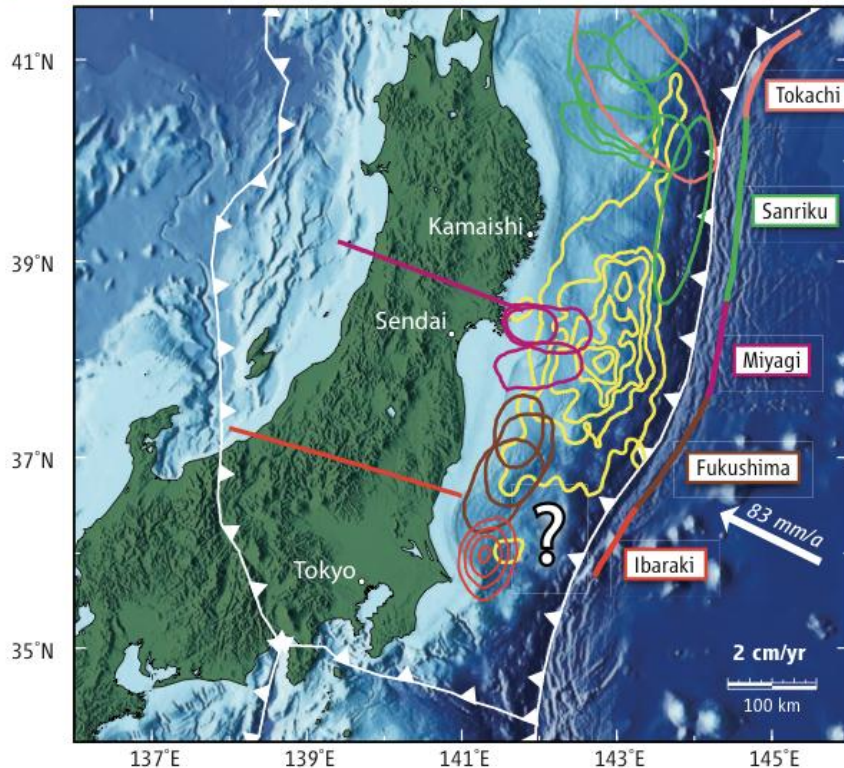
SuperSites Exploitation Platform (SSEP)

*“Science Cloud” flagship proposal
by CNES, DLR, ESA with the
participation of Italian CNR*



Geo Hazard : Japan earthquake

EARTHQUAKES OF THE JAPAN TRENCH



A game of ring toss. March's huge quake (yellow contours) and past smaller quakes (colored loops) have left a patch of threatening fault (question mark).

- Tohoku-oki: unprecedented >50 m slip in places (Simons et al., Science 2011, NASA-funded study).
- Will another magnitude 9 occur further south?
- It is unknown whether this fault segment has been accumulating slip.
- Need all InSAR, GPS, Seismic, Petrology, Geochemistry , ... !

(-2004 magnitude 9.2 Sumatra earthquake was followed by magnitude 8.7 half-a-year later)

→ The Science Cloud with its “unlimited” resources on data, processing capacity and tools will allow cross-domain science and ease data sharing. The easy usage of this infrastructure will pull “intelligence” to apprehend the challenges.

SSEP Expected Results

1. Science: better scientific understanding of geohazards with the aim of providing sound information about the risks and the potential mitigation measures
2. Data sharing: information extracted from different sources (satellite & in-situ) will open a wide range of new approaches: Cross-domain research
3. Building Communities : In return to SSEP access, scientists will be asked either:
 - to provide results into the information repository on the Science Cloud,
 - to provide their data processing open source code,
 - to provide application tools (“Apps”)

Flagship use cases

	ATLAS H.E.P. Cloud Use (CERN)	Genomic Assembly in the Cloud (EMBL)	SuperSites Exploitation Platform (ESA/CNES/DLR)
Scientific goal/society impact/photogenic	•	•	•
Scale of resources used	•	•	
Federation/Aggregation of datasets		•	•
Long-term archiving of data			•
On-demand processing	•	•	•
Impact on community & benefits	•	•	•
Potential increase of users	•	•	•
Interoperability	•	•	•
Data security	•	•	•
Maturity	•	•	•
Access to license-controlled sw			•

Flagship deployments

First results - 1

- Proof of Concept stage within the Pilot Phase started January 2012
- Each flagship has been deployed with a series of providers independently :

CERN, EMBL and ESA succeeded in deploying scientific applications each involving tens of thousands of jobs running at data centres operated by Atos, CloudSigma and T-Systems

Flagship deployments

First results - 2

- **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.

Flagship deployments

First results - 3

- The PoC extensively evaluated **scalability**, **performance** and **on-demand provisioning of resources** for high performance computing and **fast data storage** in the cloud computing resources provided by **Atos**, **CloudSigma** and **T-Systems**
- In addition to the infrastructure providers, SME's such as **SixSq**, **Terradue** and **The Server Labs** were vital to get the flagship applications up and running.

What's up now ?

The Helix Nebula consortium is now focussing on identifying a **common set of interfaces** for suppliers and users before the next wave of deployments, building on the lessons learned from the PoC.

What's next ?

- Process for new Suppliers / new Users to join is starting:
 - New comers can either submit flagships that propose some **innovation** in terms of functionality, performance, scope, business opportunities or impact of the European Cloud Computing infrastructure, or use the HN platform as is.
 - The flagship use cases must be **sponsored by user organisations** and **Service Providers**. Will be selected so as to be complementary and maximise coverage of the objectives outlined in the Strategic Plan



Templates will be provided

Relevance for NORDUnet

- Helix Nebula provides **opportunities** for the network community to work with the research communities and commercial cloud service providers in order to deploy flagship applications, as well as to investigate how a public-private cloud serving the research community could exist.

Linking Research Community
to Commercial Data Centres

- Constructive discussions are currently taking place with **Dante** and **NRENs** to collaborate during Helix Nebula pilot phase

A European Cloud Computing Partnership big science teams up with big business

The infographic is set against a background of a blue sky with white clouds. It features a large box on the left for the 'Strategic Plan' and three smaller boxes on the right for 'CERN', 'EMBL', and 'ESA'. At the bottom is a wide box containing logos for various business partners. The Helix Nebula logo is at the top left of the infographic.

**HELIX
NEBULA
THE SCIENCE CLOUD**

Strategic Plan

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

CERN
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

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

Partners: Atos, Capgemini, CloudSigma, CSA cloud security alliance, egi, interoute, logica, OpenNebula.org, orange Business Services, SAP, the SERVER LABS, sixsq, Telefonica, terradue 20, THALES, Trustit, T-Systems.

Email: contact@helix-nebula.eu Twitter: [HelixNebulaSC](https://twitter.com/HelixNebulaSC) Website: <http://www.helix-nebula.eu/>

Big science teams up with big business

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Highlights

Helix Nebula on ISGTW

isgtw international science grid this week

ISC Cloud'12 Keynote Session to Investigate Helix Nebula, Europe's Science Cloud - Article by Anna Schachoff, ISGTW, August 17th 2012

[More](#)

Helix Nebula on HPC Wire

HPC wire

Helix Nebula Cloud Targets European Scientific Research - Article by Robert Gelber, HPC Wire, July 10th 2012

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Cloud Computing & The 'New' DG CONNECT



Helix Nebula HelixNebulaSC

HelixNebulaSC CERN, EMBL and ESA will present HelixNebula, the Science Cloud at ISC Cloud'12 in Mannheim, Germany on September... [fb.me/1hzpWqkSp](#)
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HelixNebulaSC Helix Nebula Cloud Targets European Scientific Research Robert Gelber July 10, 2012 The scientific community is... [fb.me/1WuKkGBNz](#)
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Events

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Participants

Atos

Stay tuned on :

<http://www.helix-nebula.eu/>