



*"drawing from the experience of Helix Nebula: collaboration between private sector and data providers in the scientific domain".*

**ECMWF Workshop on improving the socio-economic impact of  
NWP data**

**01 March 2017**

**Wolfgang Lengert (ESA)**



Addressing the experience of the  
“Helix Nebula – the Science Cloud”  
initiative with respect to:

- the collaboration between private sector and data providers,
- benefits from this collaboration,
- advantages for the private sector,
- the underlying business model of “Information as a Service”

# Strategic Plan for a Scientific Cloud Computing infrastructure for Europe

1.1

8<sup>th</sup> 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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# The European cloud public-private partnership



## 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



PIC port d'informació científica

To improve the speed and quality of research for finding surrogate biomarkers based on brain images

Additional Users:



## Suppliers



## Adopters

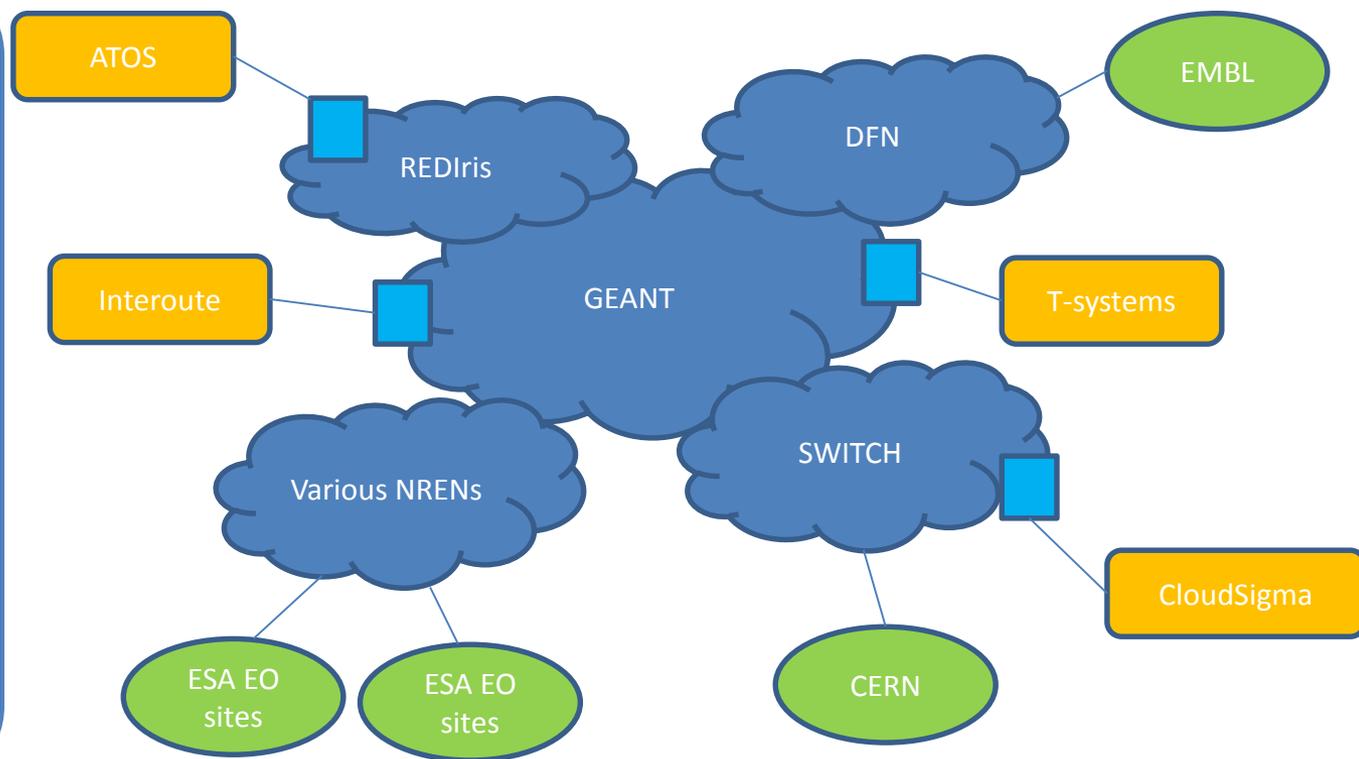


# Building the hybrid cloud

Connecting commercial cloud providers to GÉANT/NRENs

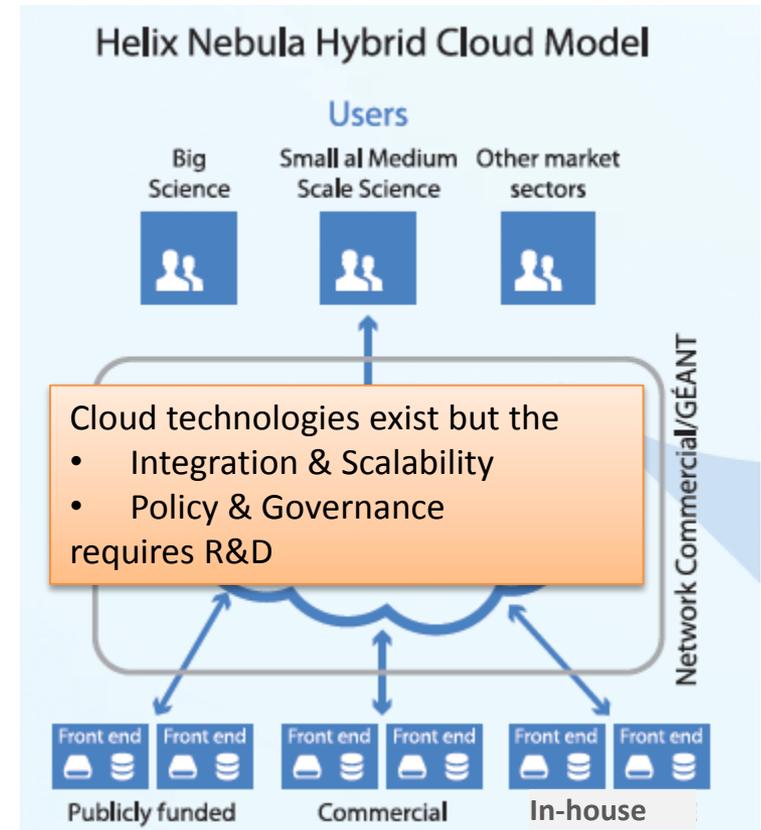
GEANT Association offering free IP connectivity in GÉANT for research traffic during the pilot phase

NRENs have different commercial agreements (usually they apply a fee)



# The Helix Nebula Initiative

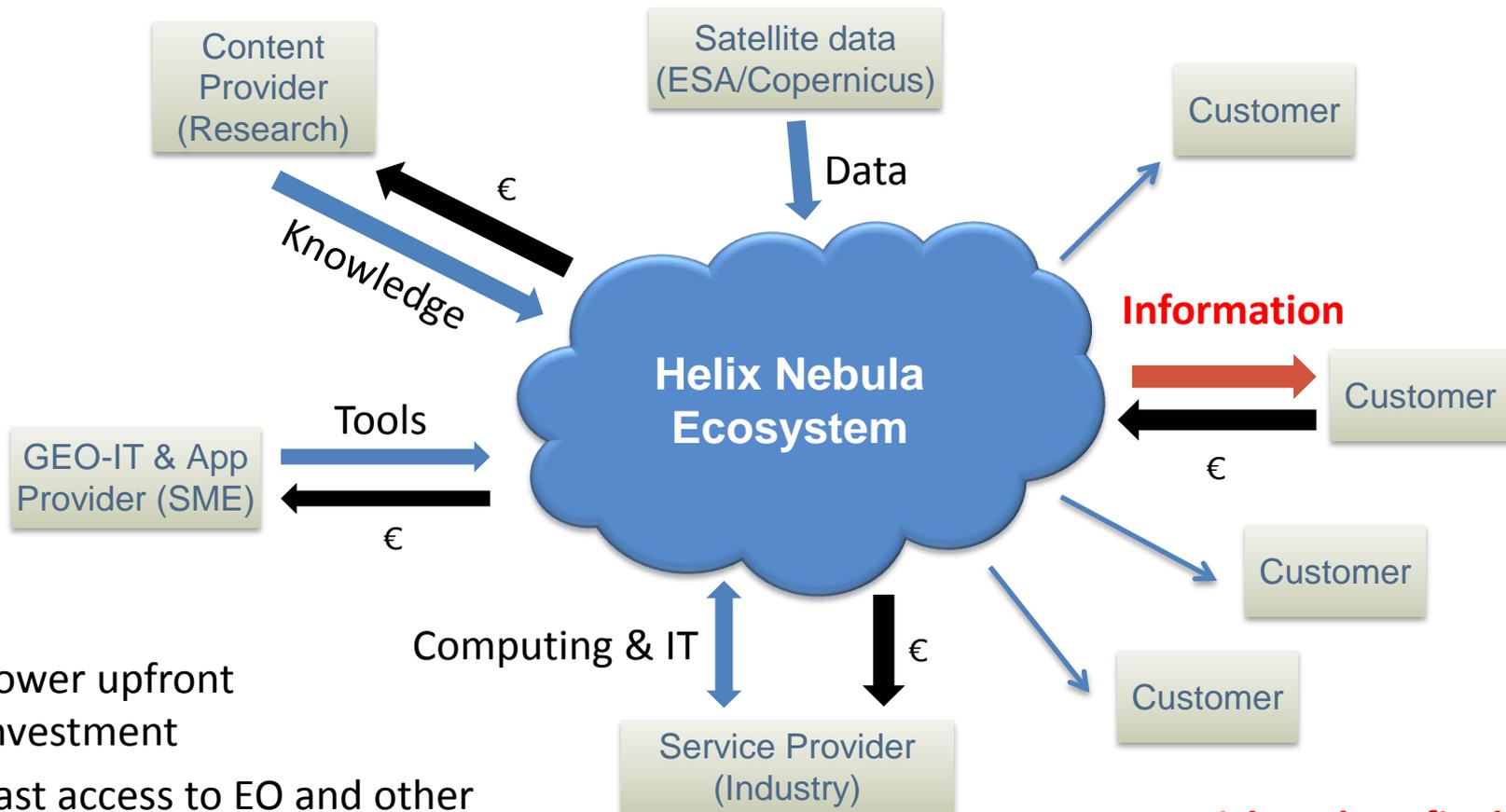
The Helix Nebula initiative has brought together research organisations, data providers, publicly funded e-infrastructures and European commercial cloud service providers to develop a hybrid cloud model with procurement and governance approaches suitable for the dynamic cloud market



The preferred model for public research organisations is a hybrid cloud that combines in-house resources with public e-infrastructures and commercial cloud services

# HN derived business model:

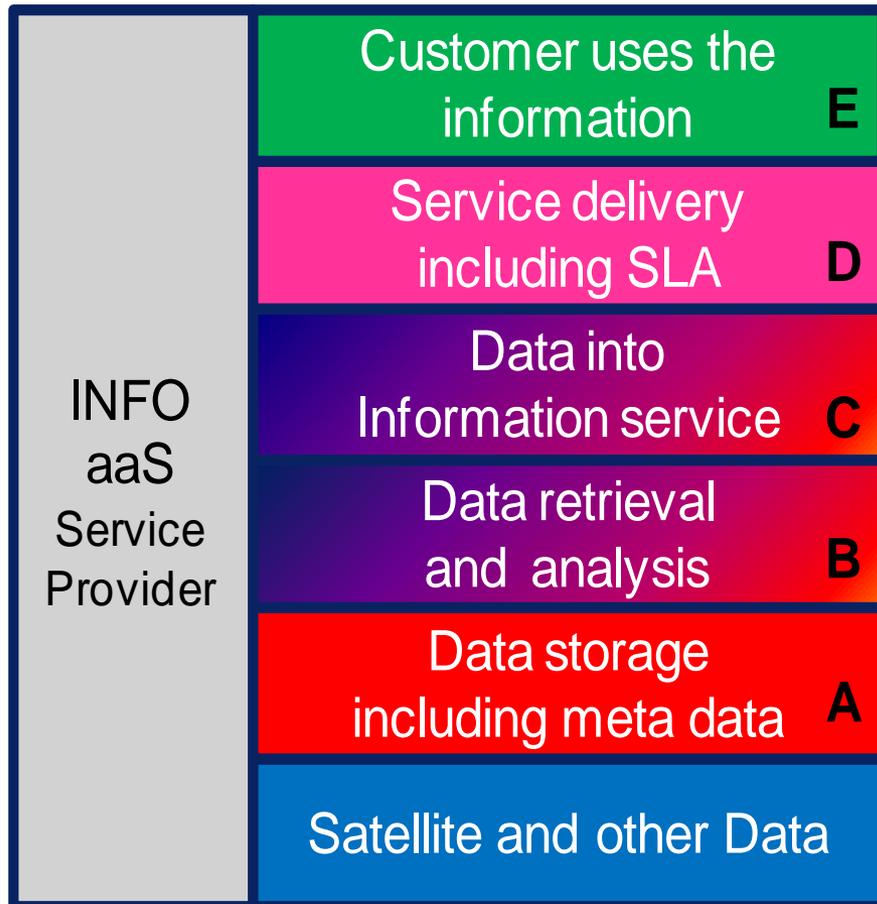
Information as a Service: Science interfacing with private sector



- Lower upfront investment
- Fast access to EO and other geodata resources
- Disruptive technology

- **Risk and profit sharing**
- **Sustainability**

# InfoaaS Overall Model



## Challenge:

Contracting and liability throughout the value chain

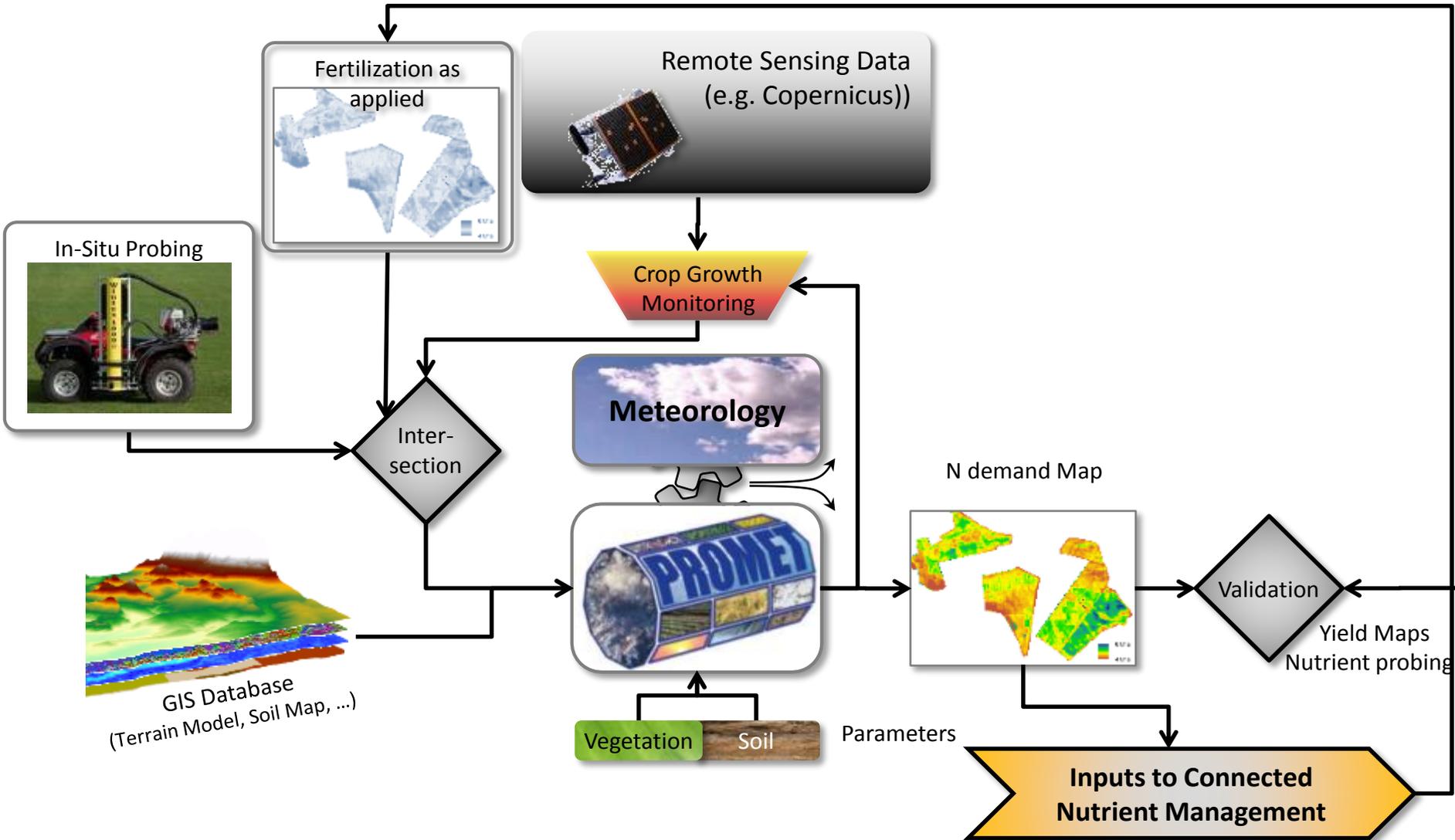
# Earth Observation Data to build a value chain from science to business

## 4 parallel INFOaaS Stimulus project:

- Prove that InfoaaS in the HNX environment provides sustainable revenues,
- Analyze the InfoaaS potential to create new jobs addressing modern information sector needs,
- Analyze and/or demonstrate if existing EC investments (e.g. Copernicus downstream services) can be reused. This project should provide indications how EC funded downstream service projects could become attractive to be picked up in a business environment.
- To provide evidence that the value adding chain works (price/cost throughout the value creation)
- Consider cross-domain (space & in-situ) use case developments

# INFOaaS Stimulus examples:

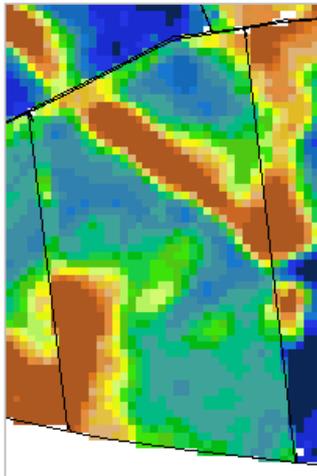
- Agriculture
- Hydro-power



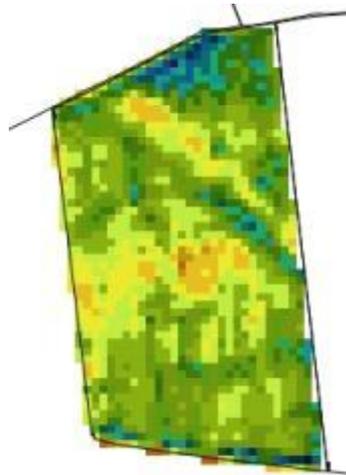
# Connected Nutrient Management

## The added-value (satellite map-overlay approach)

Yield Potential



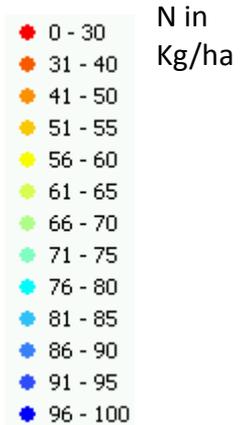
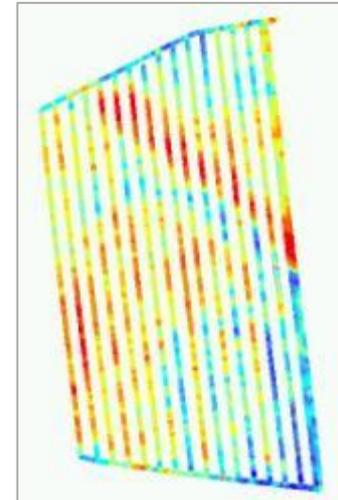
Actual Biomass



+

=

Smart Fertilization (Map Overlay)



| Fertilization Strategy       | Yield      | Nitrogen applied | Net Profit:<br>Revenue – N-costs |
|------------------------------|------------|------------------|----------------------------------|
| Uniform<br>(conventional)    | 84.1 dt/ha | 246 kg N         | 1 294 €/ha                       |
| Map-Overlay<br>Site-specific | 87.1 dt/ha | 242 kg N         | 1 353 €/ha                       |

**+4.5%**

Yield increase of 3% - 6% could be achieved even on best soils = 60 – 120 €/ha more net profit

Scientifically approved by multi-year research results of the TU Munich (Maidl, 2012)

## Value Chain 2

T-System  
with IPR from **VISTA** (SME)



## European Facts

- Hydroelectric power is the most efficient and planable renewable energy source
- Around 16 % of Europe's electricity comes from hydroelectric power
- Annual turnover in the EU in 2011: more than € 137 billion
- Hydroelectric power production is highest in the Northern and Alpine countries
- Optimizing the design and management of the energy grid as challenge

InputDataPortal  
**OPTICAL**  
Satellite Data



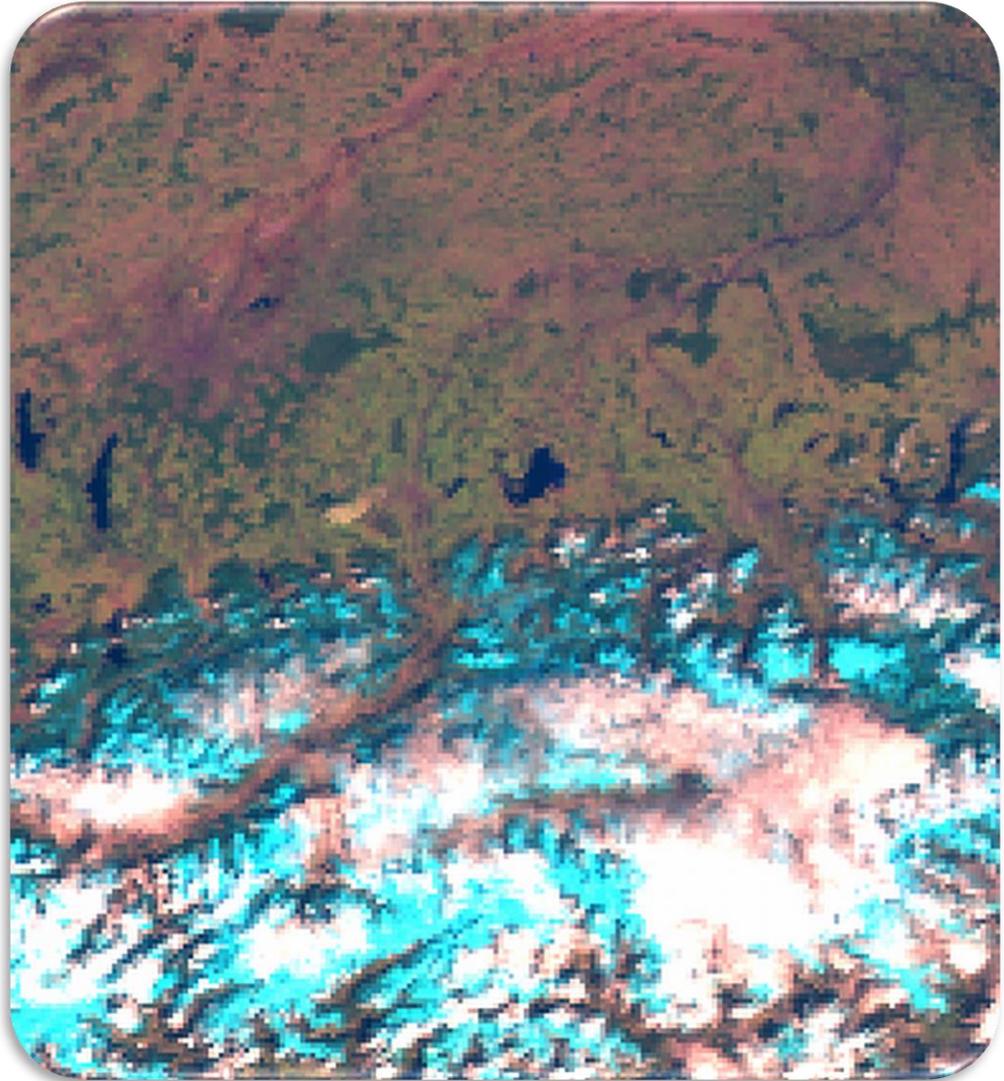
InputDataPortal  
**SAR**  
Satellite Data

**Snow Cover**

**SnowWater  
Equivalent**

**RUNOFF**

**HYDROPOWER**



0 Wird ausgeführt 0 Fehlgeschlagen

T-Systems Dynamic Services for Infrastructure with vCloud Datacenter Services

Powered by **vmware**

InputDataPortal  
**OPTICAL**  
Satellite Data

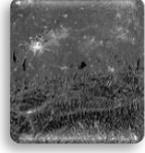
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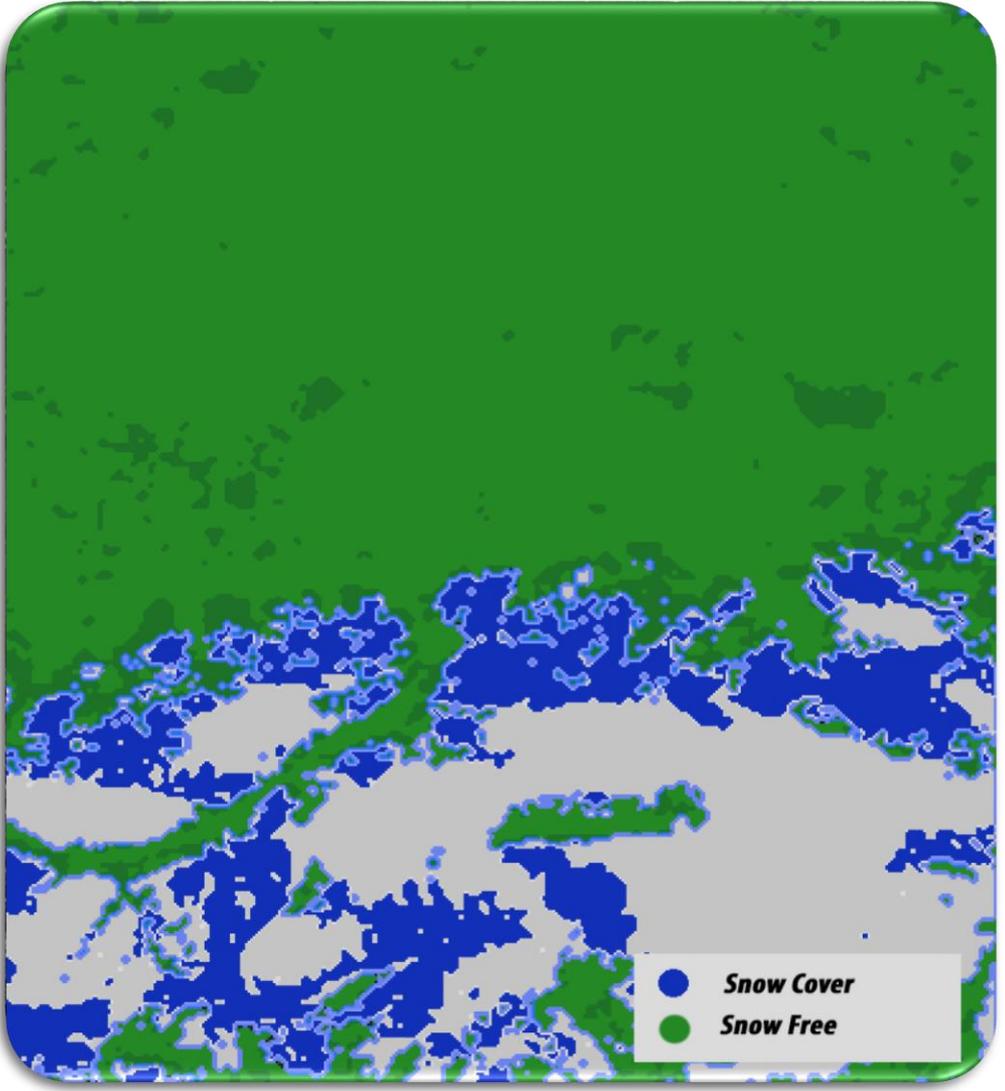
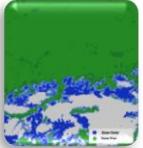
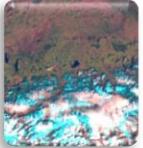
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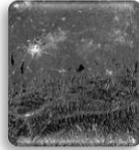
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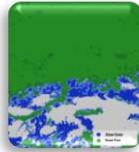
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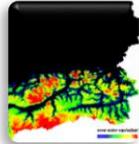
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**SAR**  
Satellite Data



**Snow Cover**

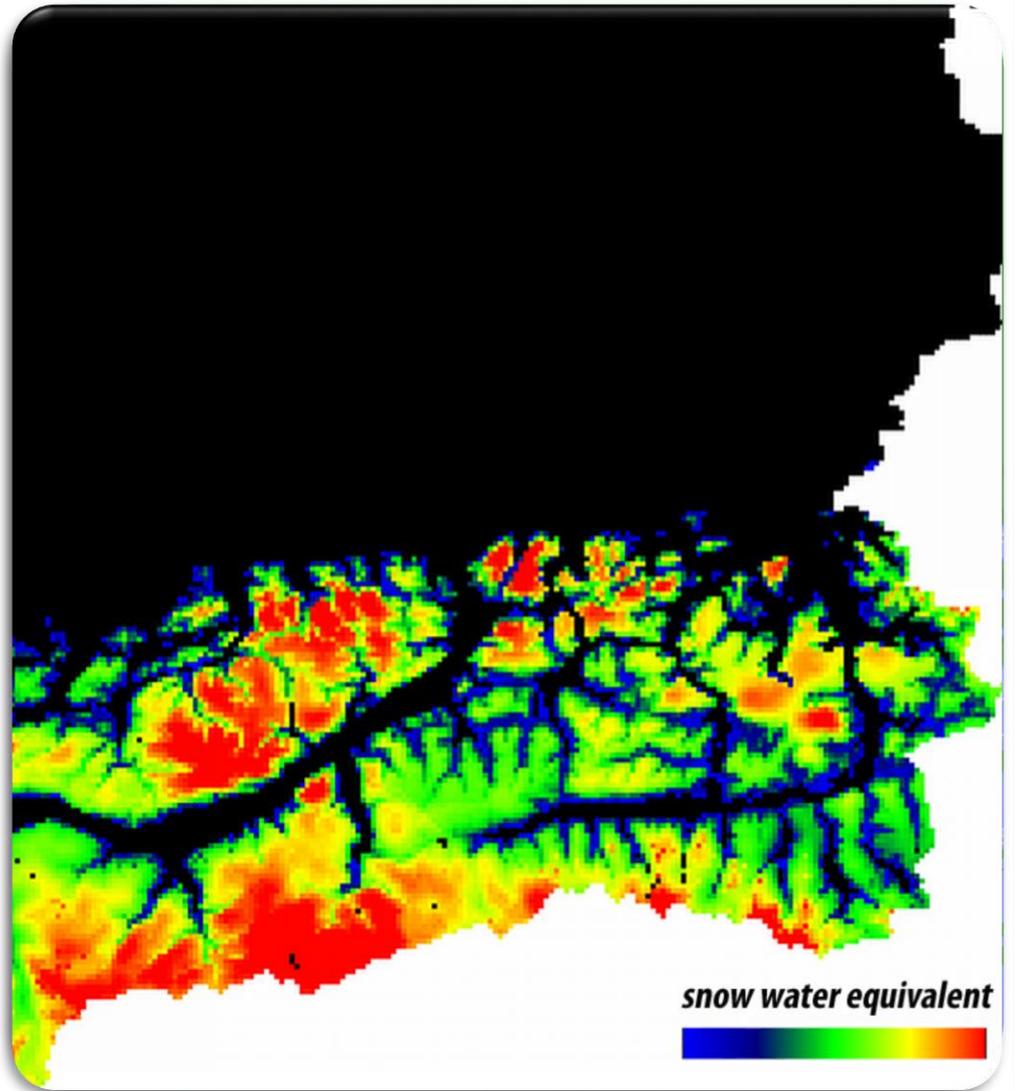


**SnowWater Equivalent**



**RUNOFF**

**HYDROPOWER**



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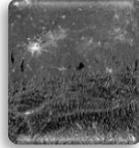
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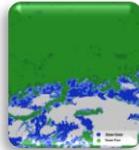
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OPTICAL  
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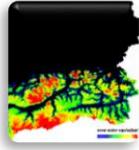
InputDataPortal  
SAR  
Satellite Data



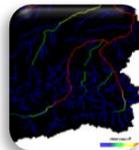
Snow Cover



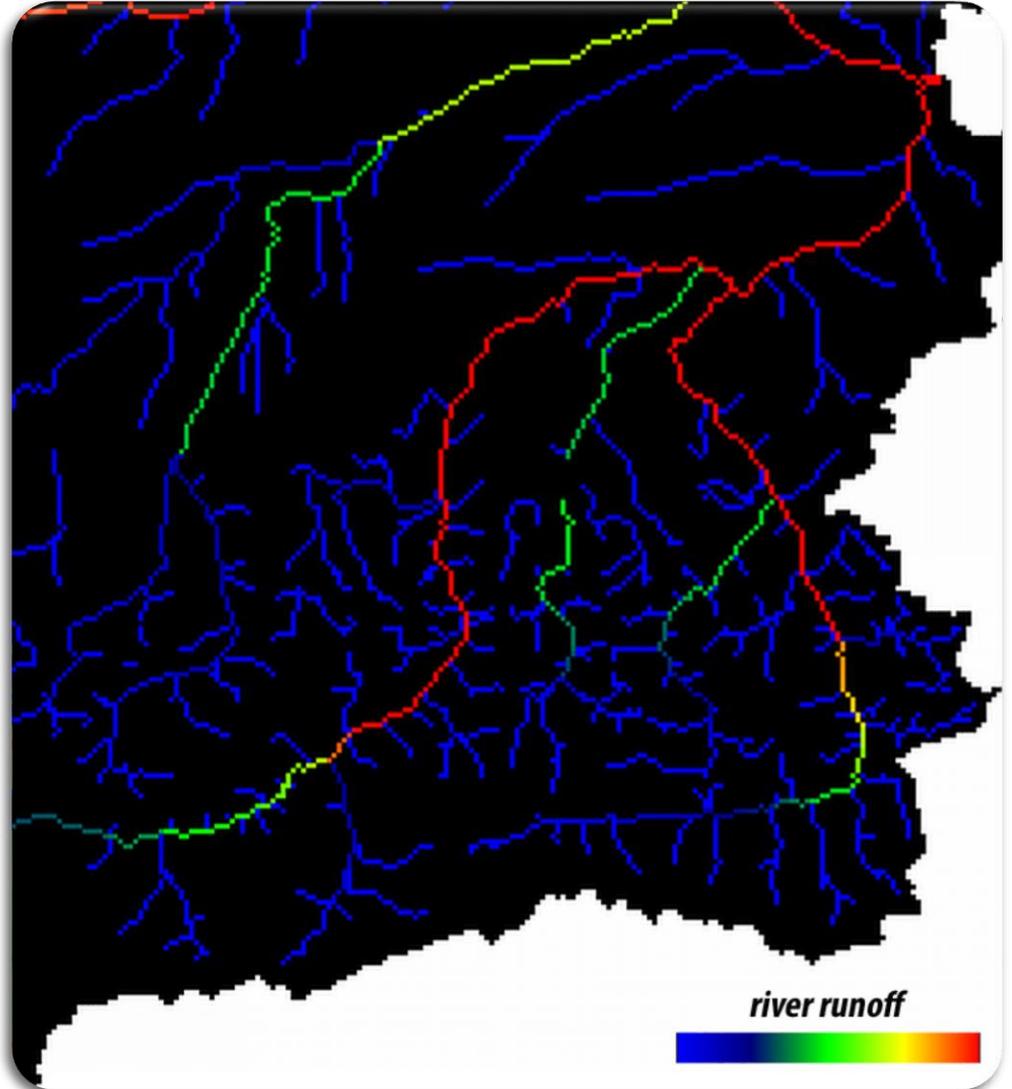
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Equivalent



**RUNOFF**



HYDROPOWER



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**OPTICAL**  
Satellite Data

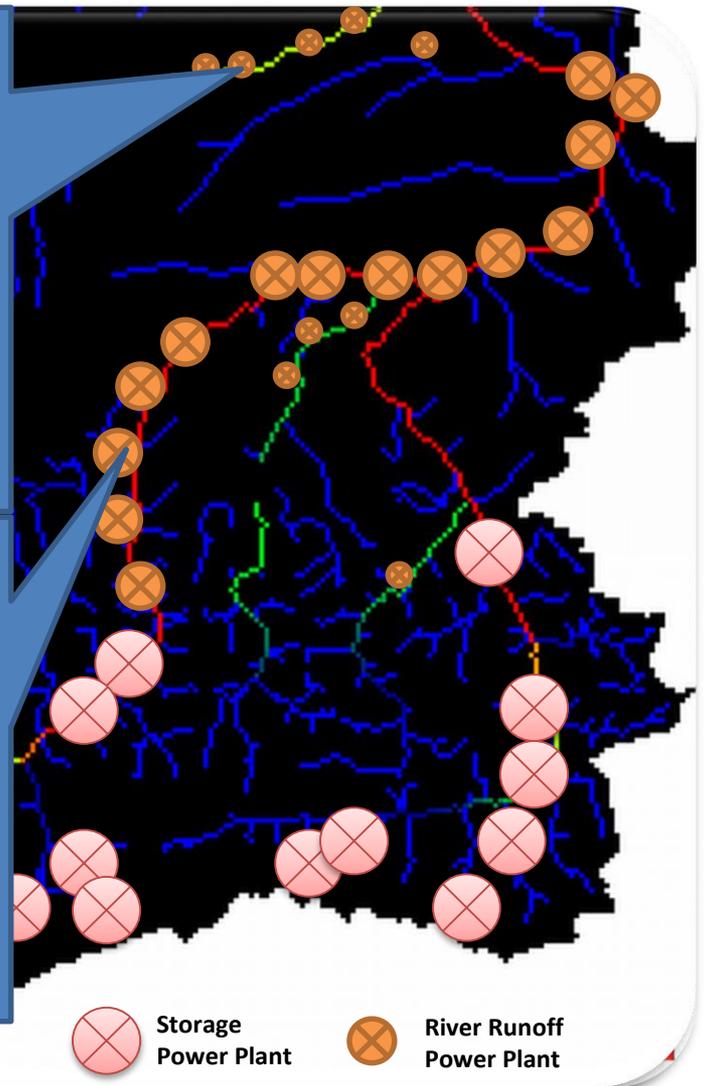
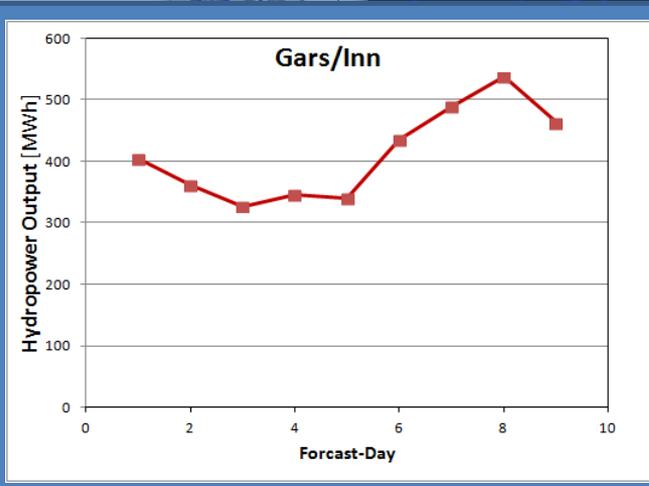
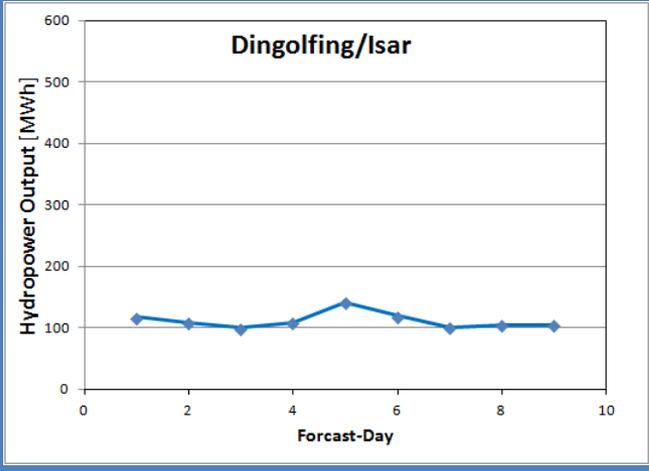
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**HYDROPOWER**



 **Storage Power Plant**
 **River Runoff Power Plant**

# Window of opportunity

“The workshop is aimed at policy makers and professionals interested in the evolution of the meteorological industries”

- Digital Single Market
  - **European Open Science Cloud** (EOEC started 2015)
  - **“Building a Data economy”** (<https://ec.europa.eu/digital-single-market/en/building-european-data-economy>) (Q4 2016, Q1 2017)
  - **General Data Protection Regulation** (GDPR) (Regulation (EU) 2016/679) of EU parliament, European Council, EC (Q4 2016, active 2018)
  - 10 R&D agencies are elaborating a **new Public Procurement model** (CERN lead [HNSciCloud.eu](http://HNSciCloud.eu) - PCP project, open for adopters ) ( 2016; )....

- ....
- ....
- ....
- ....

High Energy Physics



Astronomy



Life Sciences



Photon/Neutron Sciences



Long Tail of Science



- GEO collaboration and Copernicus services and uptake

# summary

- Building on a **common strategy & vision** collaboration of R&D, private sector, Public Infrastructure, and support of policy makers/implementers works! (In overall, no common project and budget)! The “team of teams” has delivered:
  - outcome which is of policy relevance,
  - a concept, building on diversity of data and the associated global community, which is capable to initialize a “data ecosystem” going cross-domain opening new markets (dynamic creation of value chains using clouds)
  - the confirmation that the R&D, what ever domain they are working in, are all facing the same digital challenge.
- Teaming-up of such a **diversity of R&D agencies is encouraging to think beyond domain borders**, at all levels (science, IT, structures, business, ...). It supported exploitation of synergies and leveraging. → see HNSciCloud.eu where 10 R&D agencies elaborate together a new public procurement model for cloud ecosystems.
- An enormous momentum at policy level is existing, targeting the **transition to a “data economy”** in Europe.
  - European Open Science Cloud, in support for a “Digital Single Market”
  - General Data Protection Regulation (2016/18) [GDPR]
  - & ....
  - EC European Political Strategy Centre ([https://ec.europa.eu/epsc/publications/strategic-notes/enter-data-economy\\_en](https://ec.europa.eu/epsc/publications/strategic-notes/enter-data-economy_en))
    - **Step 1: Understanding value creation in the data ecosystem**
    - **Step 2: Building a data-friendly regulatory framework**
    - **Step 3: Active public policies to support the digital transition**

# Backup slides

“The workshop is aimed at policy makers and professionals interested in the evolution of the meteorological industries”.



## DIGITAL SINGLE MARKET

### Digital Economy & Society

European Commission > Building a European Data Economy



The strategy

Economy

Society

Access & connectivity

Research & innovation

DG CONNECT

#### The strategy

##### Digital Single Market

Better access for consumers and business to online goods

Right environment for digital networks and services

##### Economy & Society

Digitising European Industry

Building a European Data Economy

## Building a European Data Economy

Article

Latest

Building a European data economy is part of the Digital Single Market strategy. The initiative aims at fostering the best possible use of the potential of digital data to benefit the economy and society. It addresses the barriers that impede the free flow of data to achieve a European single market

Delivering on the Digital Single Market  
Building the European Data Economy





EPSC

European Political Strategy Centre



European Commission > EPSC > Publications > Strategic notes > Enter the Data Economy

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## Enter the Data Economy

EU Policies for a Thriving Data Ecosystem

Issue 21 | 11 January 2017

### Step 1: Understanding value creation in the data ecosystem

- The data generators
- Data services
- Data business users
- End customers

### Step 2: Building a data-friendly regulatory framework

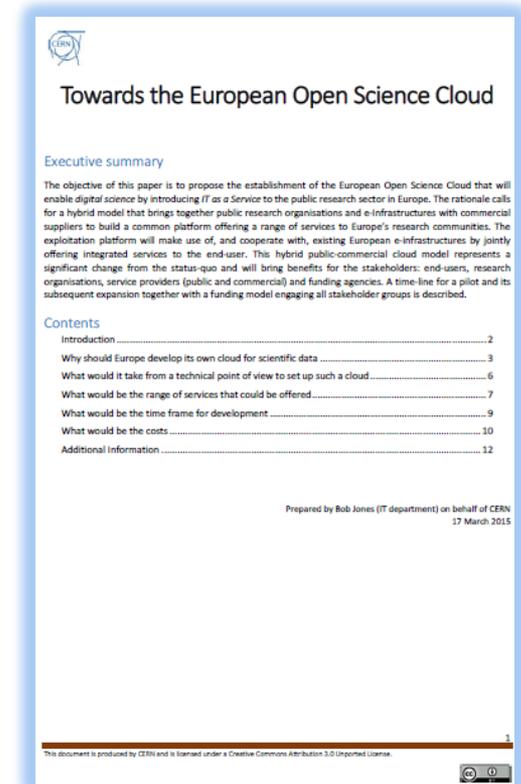
- Tackling restrictions to data flows
- From data ownership to open data
- Data portability and interoperability
- A fair allocation of data liability

### Step 3: Active public policies to support the digital transition

- Understanding the data phenomenon by creating a better evidence base
- Setting the right targets
- Promoting a mentality shift
- Developing the right skills sets
- Financial support and incentives

# What is the European Open Science Cloud?

- ☞ **Hybrid** – link public research organisations, e-Infrastructures & commercial cloud services
  - ☞ Use GEANT network to link Research Infrastructures, repositories (EUDAT, OpenAIRE), EGI, PRACE etc. to commodify commercial cloud services (multiple providers)
  - ☞ A cornerstone of the Open Science Commons\*
- ☞ **Trust** - Researchers keep control of the cloud and their data
  - ☞ Guarantee a copy of all the data is kept on public resources
  - ☞ Ensure long-term preservation of the data
  - ☞ Insulate users from changes of service supplier and technology
- ☞ **Economy** - Must be cheaper than the ‘*build our own*’ approach
  - ☞ Avoid separate ‘silos’ for each Research Infrastructure/Community
  - ☞ Profit from the economies of scale in commercial data centres



\* <http://go.egi.eu/osc>

<http://dx.doi.org/10.5281/zenodo.16140>

# Why a European Open Science Cloud?

- Europe's researchers have access to super-fast networks, common data storage facilities, and shared computing resources. The challenge now is to link them all together into a single science cloud.
- Mature open source technologies exist but integration, policy and governance requires careful attention
- A European Open Science Cloud will promote public-private innovation to satisfy the needs of the research communities and increase the global competitiveness of European ICT providers

# HNSciCloud Joint Pre-Commercial Procurement

Procurers: CERN, CNRS, DESY, EMBL-EBI, ESRF, IFAE, INFN, KIT, STFC, SURFSara  
Experts: Trust-IT & EGI.eu

The group of procurers have committed

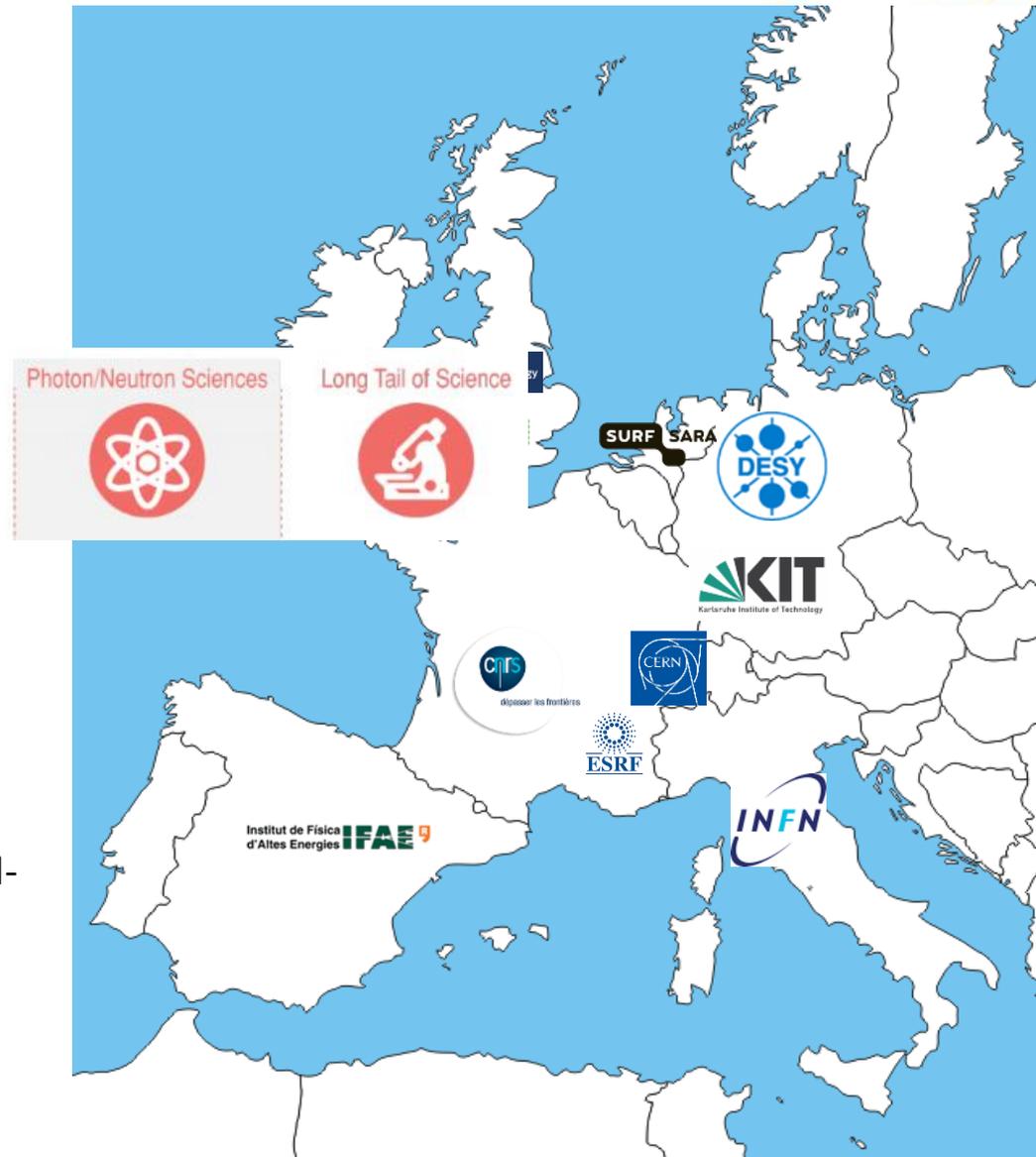
- High Energy Physics 
- Astronomy 
- Life Sciences 

To procure innovative IaaS level cloud services integrated into a hybrid cloud model with

- Data centres operated by the procurers
- European e-Infrastructures

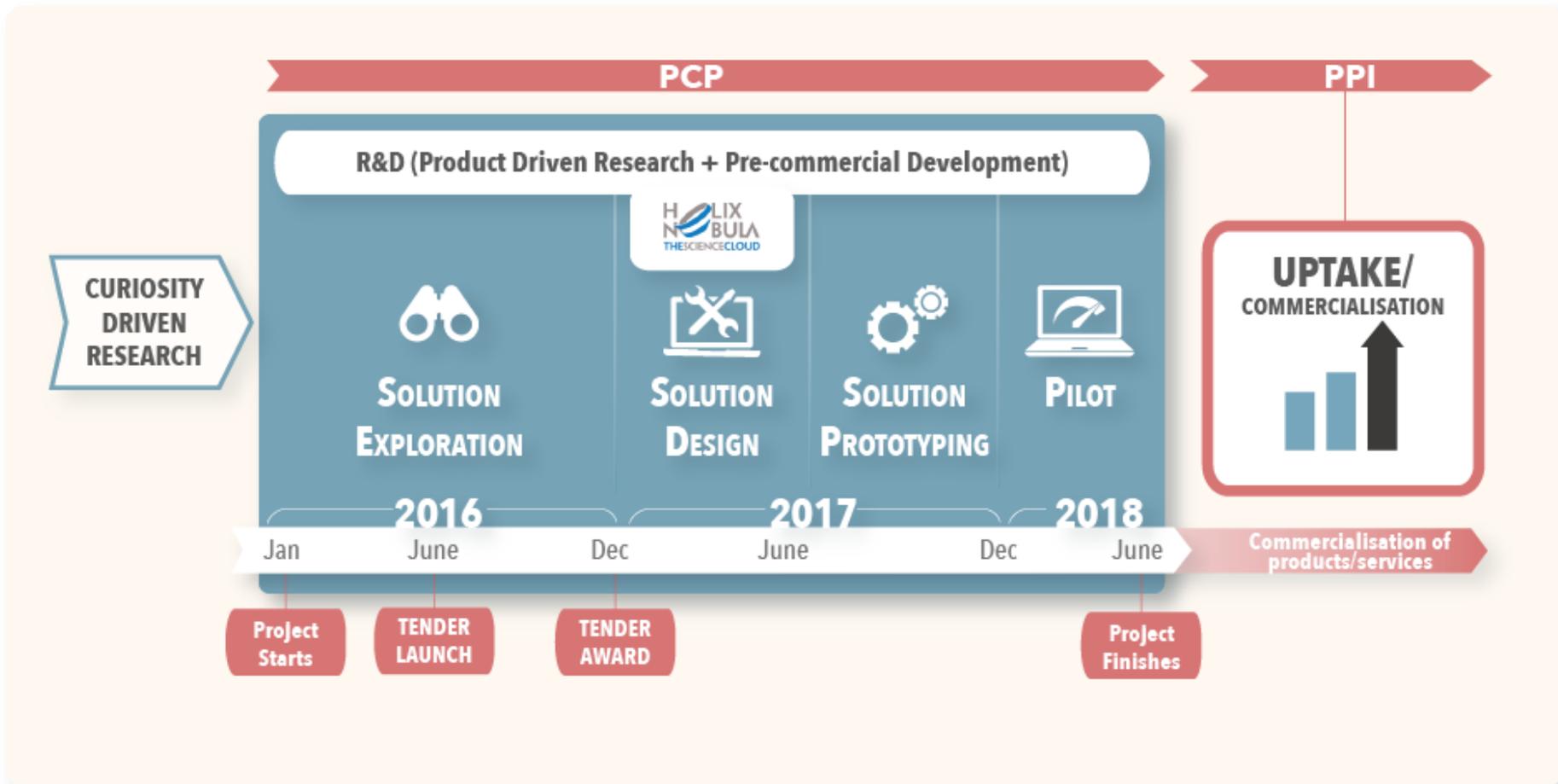
Resulting services will be made available to end-users from many research communities

Co-funded via H2020 Grant Agreement 687614



**Total procurement budget >5M€**

# Pre-Commercial Procurement Process and Timeline



## PROCUREMENT INNOVATION FOR CLOUD SERVICES IN EUROPE

- ☞ **Cloud services are suitable for scientific workloads** performed by public research organisations and they are now **prepared to consider procuring commercial cloud services on a significant scale.**
- ☞ Public research organizations have experience of **cross-border procurements**
- ☞ The cloud service suppliers within Helix Nebula, have developed a set of **draft contractual agreements** for an initial procurement of IaaS services with multiple suppliers via a broker-based model.
- ☞ Research organisations are working to ensure that the draft contract agreements **conform to their independent procurement processes.**
- ☞ Preparation of a **crossborder PCP or PPI** for at least one **shared common procurement need.**