Open Science and Open e-Infrastructure: From vision to policy
Context: European Research Area

A unified area open to the world, in which scientific knowledge, technology and researchers circulate freely

- More effective national research systems
- Optimal transnational co-operation and competition
- Facilitating mobility, supporting training and ensuring attractive careers
- Gender equality and gender mainstreaming in research
- Optimal circulation and transfer of scientific knowledge

http://ec.europa.eu/research/era/
Opening of the creation and dissemination of scholarly knowledge towards a multitude of stakeholders, from professional researchers to citizens

It needs:

» Shared resources
  › Integrated, easy and fair access

» Engaged communities
  › Participating in the process
  › Collaborating in the management and stewardship

» Governance
  › Rules to access/exclude
  › Rules to resolve conflicts

» Financial support
  › For long-term availability
# Context: Philosophy of Open Science

<table>
<thead>
<tr>
<th>School of thought</th>
<th>Involved groups</th>
<th>Central assumption</th>
<th>Central Aim</th>
<th>Tools &amp; Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Democratic</td>
<td>Scientists, politicians, citizens</td>
<td>The access to knowledge is unequally distributed</td>
<td>Making knowledge freely available for everyone</td>
<td>Open access, intellectual property rights, Open data, Open code</td>
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<tr>
<td>Public</td>
<td>Scientists &amp; citizens</td>
<td>Science needs to be made accessible to the public</td>
<td>Making science accessible for citizens</td>
<td>Citizen Science, Science PR, Science Blogging</td>
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<tr>
<td>Infrastructure</td>
<td>Scientists &amp; platform providers</td>
<td>Efficient research depends on the available tools, applications and shared infrastructures</td>
<td>Creating openly available platforms, tools and services for scientists</td>
<td>Collaboration platforms, tools, computing platforms</td>
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<td>Pragmatic</td>
<td>Scientists</td>
<td>Knowledge creation could be more efficient if scientists collaborated</td>
<td>Opening up the process of knowledge creation</td>
<td>Wisdom of the crowds, network effects, Open Data, Open Code</td>
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<tr>
<td>Measurement</td>
<td>Scientists &amp; politicians</td>
<td>Scientific contributions today need alternative impact measurements</td>
<td>Developing an alternative metric system for scientific impact</td>
<td>Altmetrics, peer review, citation, impact factor</td>
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Source: [Opening Science book, 2013](http://example.com)
A Common Endeavour (EU Perspective)
Institutionalised community governance of the production and/or sharing of a particular type of resource (from natural to intellectual)

GÉANT: European Communications Commons

Constructing Genome Commons

Wikipedia

e-Infrastructure Commons

Linux

Internet

Enter the “Commons”
“Commons” Background and Theory

• What is Commons?
  – Commons are resource management / governance institutions that enable sustainable shared use of certain resources within a community.

• Why Commons?
  • Open Science is a complex resource system.
  • Many shared resources are infrastructural.
  • The scientific community defines and is defined by commons.

• How Commons?
  – Open access works for some resources.
  – But for most, governance is complex, contextual, resource-specific and community-specific.
  – Much more than “openness.”
1. The resource may be consumed nonrivalrously;

2. social demand for the resource is driven primarily by downstream productive activity that requires the resource as an input; and

3. the resource is used as an input into a wide range of goods and services, including private goods, public goods and/or social goods.
Founded in 2003 to provide strategic advice and guidance on the development of a European e-infrastructure for science and research.

» Delegates appointed by ministries – represents nations (EU member states and associated states + EC)

» Vision: an open and innovating e-Infrastructure that enables flexible cooperation and optimal use by international user communities of all electronically available resources.

http://www.e-irg.eu
e-IRG: e-Infrastructure Commons

ESFRI RIs

Other RIs

International research projects

The e-Infrastructure Commons

Tools and Services
Data
Computing
Networks/Connectivity
Enabling components for Open Science

» Definitions, policies, rules and standards

» **e-Infrastructure** and e-Science tools for enabling discovery, easy access, and use of the results

» Funding schemes for the costs for providing access to and storing/maintaining the results

» A refined system for giving credit to researches that provide access to their results to others

Sometimes full open access to research results can not be implemented. Note that the components above still are essential for efficient progress of science!
e-IRG: Current European e-Infrastructure landscape

- **Networks**: GEANT association
- **Computing and Data**: PRACE, EGI, EUDAT, Helix Nebula (in different ways)
- **Tools and Services**: All above (but different tools and services)
- **Open Access**: OpenAIRE
- **Data Sharing**: RDA
- **Disciplinary e-Infrastructures (e.g. in ESFRI projects)**:
  - Sometimes coordinated with the general e-Infrastructures above at international and/or national level
- **National e-Infrastructures**:
  - this is where the bulk of resources and funding is!

Researchers were (and still are) often confused by the complex e-Infrastructure landscape in Europe

- insufficient coordination, collaboration, and integration of e-Infrastructure services
- lack of “visibility” of European e-Infrastructure services
- lack of coherence between national and European structures
- lack of clarity of roles
  - e.g. for data: end users, data owners, storage providers, providers for preserving data, data service providers, and data service developers
- lack of business models for sustainability
- lack of models for integration with commercial providers
- lack of coherence from many user communities
1. **Community building, high level strategy and coordination**: a single organisation with a central role for user communities

2. **Service provisioning**: a flexible, open, and competitive approach to national, European, and global service provision; with advanced collaboration among the interested public and commercial service providers.

3. **Innovation**: Implementation of major innovation projects through the best consortia including e-Infrastructure suppliers, industry, users and academia.

» includes a platform for coordination of sustainable and interoperable e-infrastructure services and innovation projects

» comprises a set of constantly evolving but clearly defined, comprehensive, interoperable and sustained set of services

› provisioned by several e-Infrastructure providers to fulfill specific needs of the users

› maximal in the sense that all essential user needs are covered

› minimal in the sense that all services are explicitly motivated by user needs and that any overlap of services are thoroughly motivated
**e-IRG: Recommendations and Actions**

- **e-Infrastructure needs and data aspects** should be fully taken into account from the beginning of the RI study phase

- The availability of existing e-Infrastructures services should be carefully examined before defining the ICT infrastructure for a new RI. Also, it should be explored how existing RIs realized their ICT infrastructure

- The e-needs have to be assessed and the data policy, including the data sharing rules, and the data life cycle, have to be defined

- Build e-infrastructure solutions consisting of multiple layers, successively adding more specialised higher-level services using standardised interfaces. Here, different layers can be provided by different actors

- Adopt a global, standardised lowest-level data infrastructure, including e.g. authorisation and authentication and persistent data identifiers. Here, federative approaches could be used to include existing solutions

- **ESFRI invited e-IRG representatives to be members of the ESFRI SWGs and Implementation Group**
  - Provided input to the ESFRI format + indicators ("e-Needs") for the 2015 ESFRI call for proposals (ESFRI 2016 Roadmap Update)
  - Participates in the on-going evaluation of ESFRI proposals

- **e-IRG has formed an Overarching WG with these e-IRG reps.**
  - Coordinates the evaluation of e-Needs in the ESFRI proposals
  - Has been asked by ESFRI to provide a draft for an e-Infrastructure/data landscape analysis in the new ESFRI roadmap document
EGI.eu: Open Science Commons

EGI.eu Vision
Researchers from all disciplines have easy, integrated and open access to the advanced digital capabilities, resources and expertise needed to collaborate and to carry out data/compute intensive science and innovation

EGI.eu Mission
Create and deliver open solutions for science and research infrastructures by federating digital capabilities, resources and expertise between communities and across national boundaries

Open Science Commons vision
Researchers from all disciplines have easy, integrated and open access to the advanced digital services, scientific instruments, data, knowledge and expertise they need to collaborate and achieve excellence in science, research and innovation. They feel engaged in governing, managing and preserving these resources for everyone’s benefit, with the support of all stakeholders

website: www.opensciencecommons.org - paper: http://go.egi.eu/osc
## Principles of the Commons

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<tr>
<th>Shared community resources</th>
<th>What it means to the Open Science Commons</th>
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<tbody>
<tr>
<td>Research data, scientific instruments, digital services, software, scientific publications, educational and training, expertise</td>
<td></td>
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</tbody>
</table>

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<tr>
<th>Community-based rules and procedures in place with built-in incentives for responsible use</th>
<th>Access modes are well defined and non-discriminatory for all members of the ERA (e.g. see charter for open access to RIs); clear points of access and support</th>
</tr>
</thead>
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<tr>
<th>Governance: the community is part</th>
<th>Governance model with multiple stakeholders, including research communities, scientific infrastructures, resource providers, national and European infrastructures, etc.</th>
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<tr>
<th>Long-term, persistent care for a given resource for the benefit of oneself and others</th>
<th>Long-term support of funding agencies to allow for infrastructures to take a long-term view and build for a common European future</th>
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</table>
Governance and Funding

» Analyse governance structure of existing infrastructure/knowledge resource systems in open science
  › Identify best practices and patterns for commoning
  › Develop guidelines

» Define a multi-level governance – European and national – bringing together the different stakeholders including communities

» Identify funding models for sustainability and capacity building
EGI.eu: Developing an Open Science Commons

Shared Digital ERA Backbone

- Federated operations and support
  - Service desk
  - Monitoring and accounting
  - Capacity management
  - Service level management
- Network of CSIRT
- Federated IdPs, Auth and Authz
- Management of different levels of assurance
- Research platform built on top of shared capabilities plus community owned resources
- Data products, tools, scientific gateways, virtual labs
- Multi-level governance with community participation
  - Local
  - National
  - European
- Shared capabilities based on open standards
- Research Infrastructures and long tail of science
- Common national pools of resources
  - From Member States
    - Capacity dedicated to large RIs
    - Free pools for long tail communities
- Core capabilities
  - Open Science Cloud (e.g., VM management, data storage/access/discovery)
  - PID
  - Service registry and marketplace
Research Data
Provide new capabilities for the data commons: easy discovery, access, use and reuse of open data

» Open data federated cloud platform allowing caching and depositing of data, including services for citizen science
  › Open data as a service: scalable access through caching of open datasets of European relevance
  › Federation of national and international institutional/community archives on cloud/HTC/HPC
  › Open data available to SMEs and industry
Open Knowledge Hub

» Sustained by multiple stakeholders
   » e-Infrastructures, RIs, Virtual Research Communities, Data Providers ...

» Offering federated scientific software, applications, tools, knowledge and expertise
   » Scientific software is open, documented, discoverable, supported
   » Open source publications + datasets + scientific software (repeatability of science)
   » Knowledge and expertise from a network of European training and education centres
   » Different capabilities (HTC, HPC, cloud, open research data, tools, applications, software...)

Open Knowledge Hub
Commoning in EGI.eu

» Types of shared resources
  › Large-scale computing/storage/cloud IaaS-PaaS-SaaS/data services
  › Applications, tools, science gateways
  › Knowledge, expertise, training

» Rules
  › Various types of access modes
  › e.g., policy-based, excellence-driven, membership-based
    – Not yet fully harmonized across Member States

• Governance
  – Mainly service providers at the moment
  – Evolving to include research infrastructures
  – Advisory board for user communities

• Funding
  – National funding agencies, EC, service providers, user communities

Developing an Open Science Commons
A “Communications Commons” - GÉANT

Management

Communications and Promotion

Status and Trends

International Business Development

Governance, coordination, events, finance, IT, training and talent management

Project communication, marketing and promotion, as well as web and digital design

Supports the NREN innovation, provides optimal conditions for sharing best practice

Account management service, outreach to other European e-Infrastructures

http://www.geant.org
GÉANT: Operations

Network Services
Operation of the GÉANT backbone network, cost optimisation

Production Application Services and Infrastructure
Ensure software products satisfy all PLM criteria – security before they go into production

Production Support
Incident management and support, procurement
GÉANT: Development

Testbeds
- Software to offer scalable and easy-to-use production-level testbed services

Network Delivery and Support
- Multi-domain VPN services easy-to-use, with top-quality security and monitoring facilities

Trust and Identity Service Development
- Improve eduroam, eduGAIN, development of virtual organisations and e-Research services

Supply Chain Support
- Build and operate scalable delivery of online services through the use of brokerage and procurement

Real-Time Applications and Multimedia
- Evaluate videoconference facilities, WebRTC, and OER production services
GÉANT: Joint Research

Future Network Topologies

Drive the Evolution of the Network

Future Network Services

NaaS, SDN and NFV use cases – new service models

Trust and Identity Research

Federated access management
“Data Commons”: EUDAT
All Research Infrastructures are facing data challenges
- Where to store the growing amount of data?
- How to find it?
- How to make the most of it?

Many research communities are developing own solutions
- This is good...
- ... but we also need to make sure that the solutions remain interoperable

EUDAT mission is to fill this gap
- Providing a set of services to help RIs managing their growing amount of data
- Providing these services across communities to ensure maximum level of interoperability
- Closer integration of data and computing (HPC centres core partners)

Service-oriented
- B2 Service Suite
Community driven
- Within and outside the consortium
Sustainable
- Legal, costs and business model
Integrated
- Cross-infrastructure collaboration
EUDAT: Services

http://www.eudat.eu/services
EUDAT interacts / serves 32 scientific communities. Target is 50!
EUDAT: Collaboration

Policy & Guidelines
Data Management Plans
Service integration

RDA

Policy & Networking
Output adoption

OpenAIRE

Cross-Infra services &
operation
HPC/HTC/Clouds

LERU
LIBER

PRA
CE

Data
Cloud

EGI

Helix
Nebula

GEANT

HPC/HTC/Clouds

Output adoption

Policy & Guidelines
Data Management Plans
Service integration

17/06/2015  Title of presentation (Go to 'View' menu > 'Header and Footer...' to edit the footers on this slide)  30
"Open Access Commons" - OpenAire


» Build a pan-European Research Information platform to monitor OA research outcomes from the EC and other national funders. Develop research analytics tools to promote new scientific metrics and support evidence-based decision-making.

» Create an international OA repository collaboration platform to support truly global research and scholarly communication.

» Make OpenAIRE a hub for 3rd party providers to build innovative services that explore new forms of scholarly communication and promote alternative, competitive Open Access publishing models.

» Make OpenAIRE a legal entity to promote its long-term sustainability and uptake.

» Network of National Open Access Desks

» Technical Infrastructure for Open Access

» Support the EC Open Research Data Pilot

» Operate a European Research Information System

» Researching the Future of Scholarly Communication

» Linked Open Data

» FP& APC Gold Open Access Pilot

» International Repository Network Alignment

http://www.openaire.eu
But many others involved...
Includes content from:

- Brett Frischmann – Infrastructure and Knowledge Commons
  - http://indico.egi.eu/indico/contributionDisplay.py?sessionId=27&contribId=49&confId=2452
- Sverker Holmgren – e-IRG and e-Infrastructure Commons
  - http://indico.egi.eu/indico/contributionDisplay.py?sessionId=100&contribId=224&confId=2452
- Damien Lecarpienter – EUDAT
- Tiziana Ferrari, Sergei Andreozzi – EGI.eu and Open Science Commons
  - http://indico.egi.eu/indico/contributionDisplay.py?sessionId=27&contribId=48&confId=2452
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