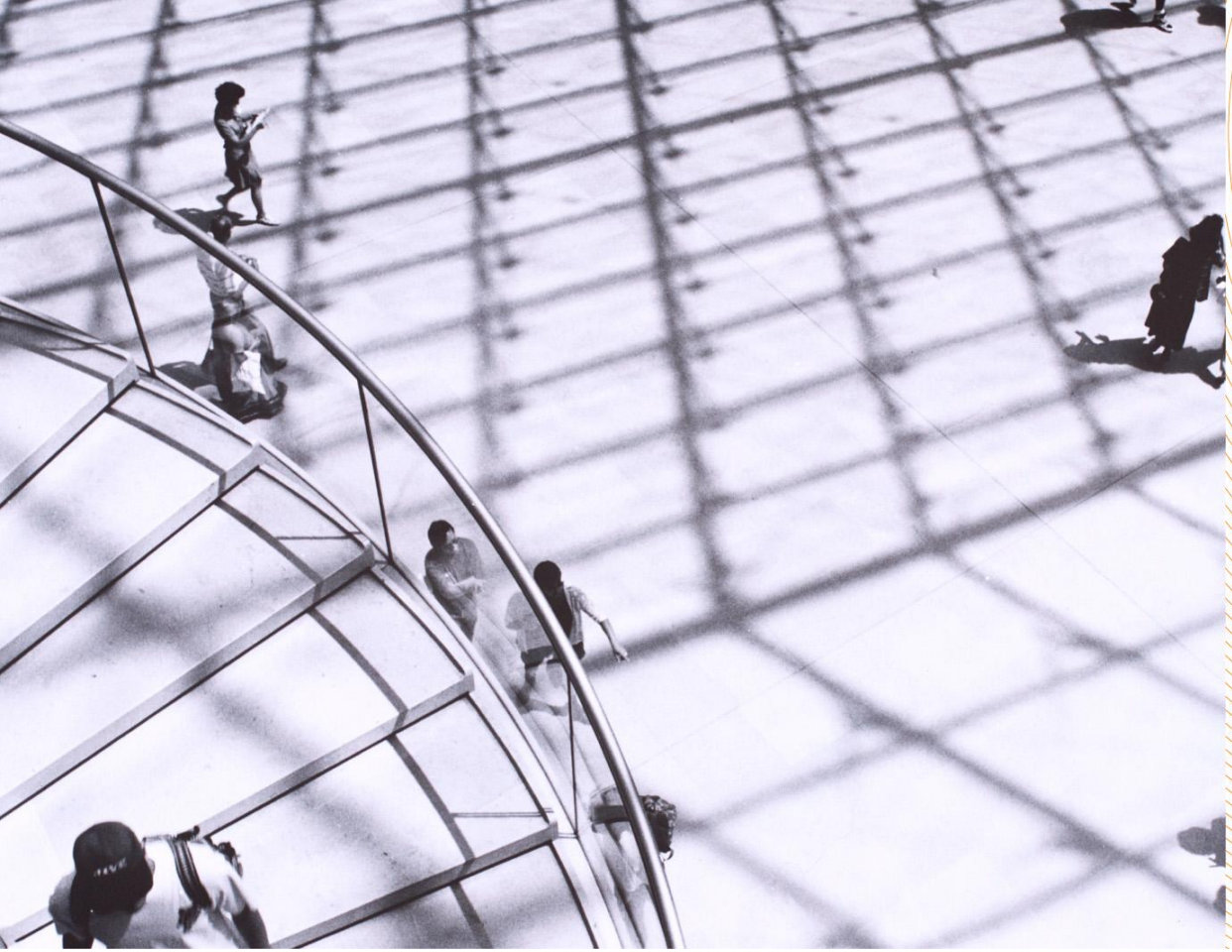


National R&E Networks: Engines for innovation in research

Erik-Jan Bos – EGI Technical Forum 2010

Amsterdam, The Netherlands – September 15, 2010

Erik-Jan Bos

- Chief Technology Officer at Dutch NREN SURFnet
- Member of the Executive Committee of the FP7 Project GN3
- Co-chair of the Technical Working Group of GLIF, the Global Lambda Integrated Facility

The opinions in this presentation are mine, and not necessarily those of one or more of the bodies mentioned above.

E-Infrastructures users today experience...

- Many separate components of the e-Infrastructure:
  - Computing
  - Storage & Data Management
  - Networks
  - Identity management systems & solutions
  - Tools and applications
  - Scientific instruments

- Components that are not aligned and do not interoperate well today

E-Infrastructure Vision

- Researchers can work together simply and efficiently by seamlessly linking all kinds of e-Infrastructure services

- The development of new applications for the e-Infrastructure is stimulated

- Middleware enables the usability of these e-Infrastructure services in a user-friendly way

- Bandwidth, for IP & Lightpaths, does not need to be scarce

Some observations: User perspective

- More and more data-centered
- Research within virtual organisations
- Research is a global activity
- Clouds and cloud services are coming towards us fast, fuelling the discussion “build or buy”
- Open Access
- Facilities shared and linked by ICT

Some observations: Provider perspective

- Requirements ahead of general needs and markets
- High demands coming from ICT-competent users
- Growing set of demands coming from researchers without ICT knowledge
- Huge amount of ICT-service offerings outside of the institutes

Hence…

- It’s about services and their integration
- Close collaboration with users and e-Infrastructure providers is urgently needed
- Coordination between domains on a worldwide scale should be our focus
- Open innovation is KEY

E-Infrastructure is global

- Environment is inherently multi-domain
- Each domain is progressing at its own pace

- Federated services
- Open standards
- (Re-)using best current practices

- Users and providers together need to work on finding and walking on an optimal path forward:
  - Nurture domains and grow them strong
  - Avoiding lowest common denominators

Nordic situation

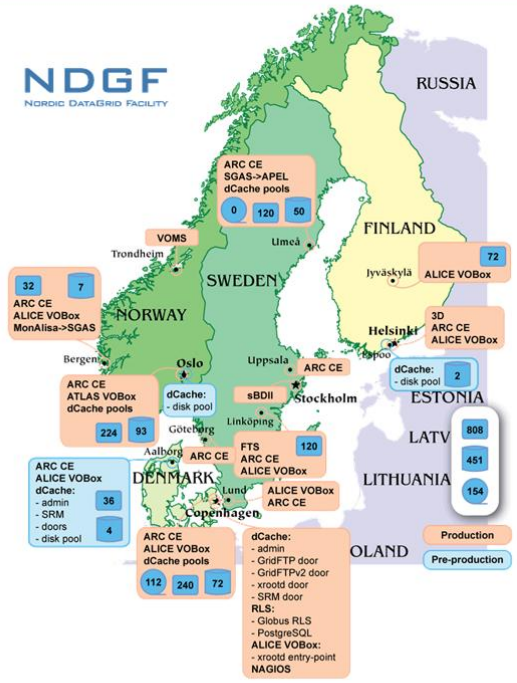
- NORDUnet & Nordic DataGrid Facility

NORDUnet
Nordic Infrastructure for Research & Education

NDGF
Nordic DataGrid Facility

Nordic DataGrid Facility

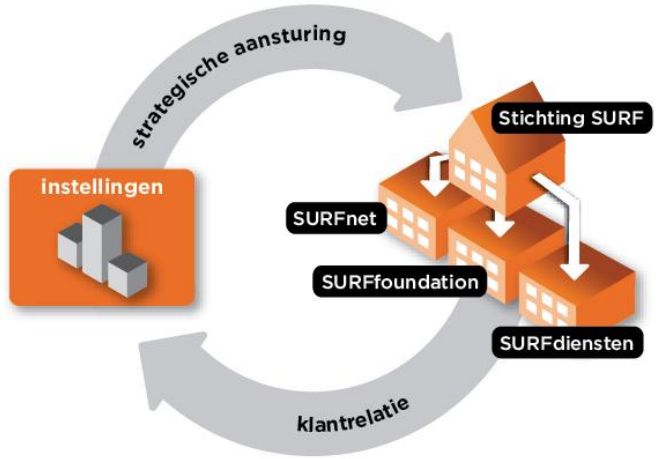
OpenGridForum



- Provides a Grid infrastructure, incl. a unique distributed Tier1 centre
- Involves 7 largest Nordic academic HPC centres
- …plus a handful of University centres (Tier2 service)
- Inter-Nordic shared 10Gbit network from NORDUnet
- Budget: staff only, 2 MEUR/year, by Nordic research councils

Dutch situation

- ICTRegie Report
- SURFnet: Owned by and working for the users in R & HE in NL: On the demand side of the market



BiG Grid
the dutch e-science grid

Open Innovation is KEY

- The power of collaboration, with users and with peers worldwide

- Select the most appropriate way for achieving results:
  - Basic services (core package)
  - Temporary services and showcases
  - Collaborate, challenge, and share knowledge

- Challenge talented people and organisations

New research -> new ICT requirements

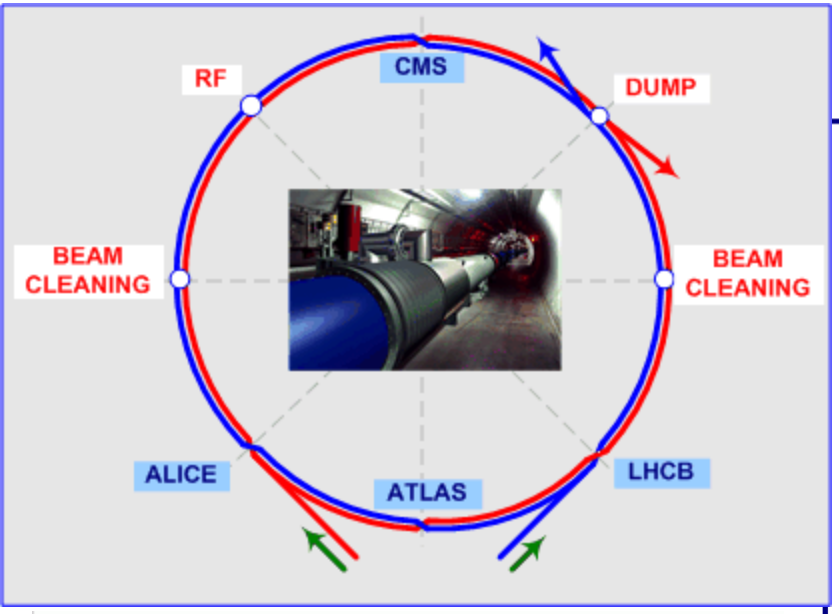
- Explosion in the amount of data from experiments and simulations
  - Examples: LHC, LOFAR, e-VLBI
- Need for near real-time processing of very large datasets
  - Example: LHC Atlas trigger
- Increase in remote collaboration:
  - Distributed sensors
  - Shared computing and storage grids
  - Virtual teams, virtual organisations
  - Accessing cloud services in a seamless way

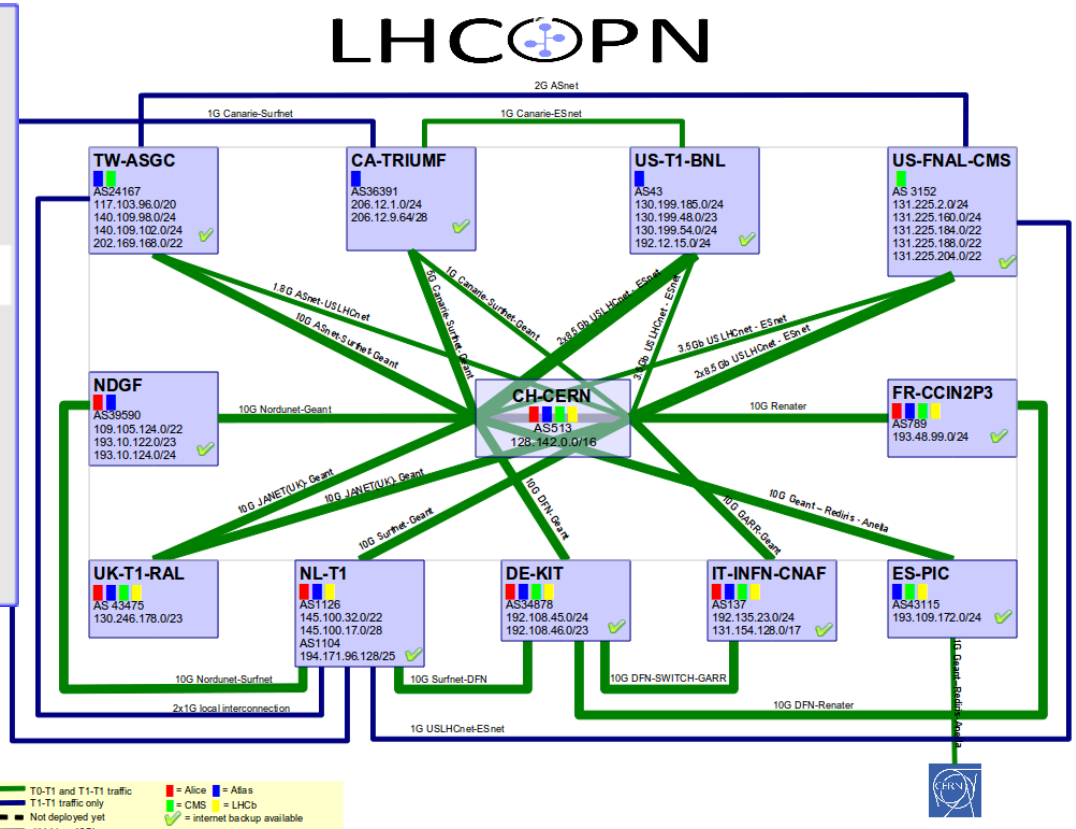
Example: distributed low frequency array LOFAR

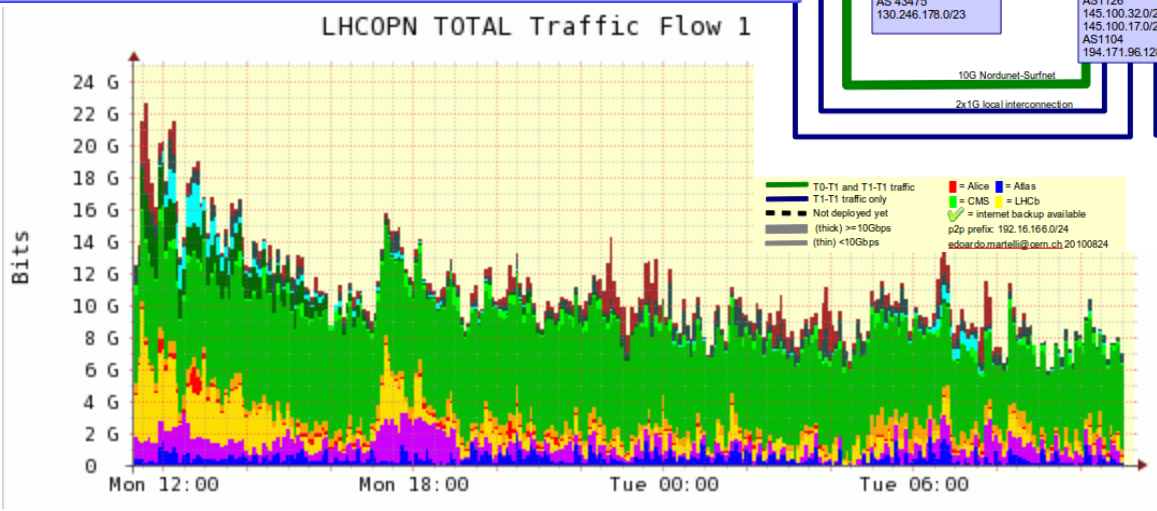
- A distributed multibeam array for radioastronomy
- Large number of very simple antennas, with very high bandwidth connections

Example: e-VLBI, a global radiotelescope

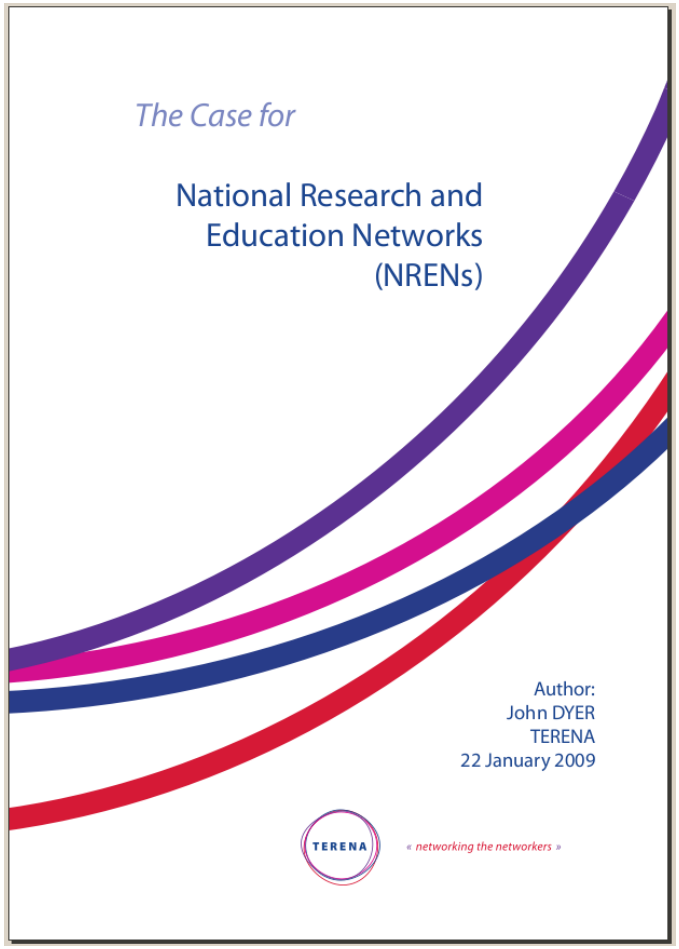
Example: LHC Computing Grid and LHCOPN







The Case for NRENs



- NRENs are special, providing advanced services to (H)E&R
- Spill-over of results into commercial sector of country
- Country should cherish the NREN
- Can lead to large advances in knowledge economy of country

[15] http://www.terena.org/publications/files/20090127-case-for-nrens.pdf

Areas to work on

Hybrid end-to-end network

The basis for all collaboration, providing efficient, unlimited data transport.

Trusted identity

offering secure and seamless access to all the electronic materials and facilities that researchers, instructors, and students need.

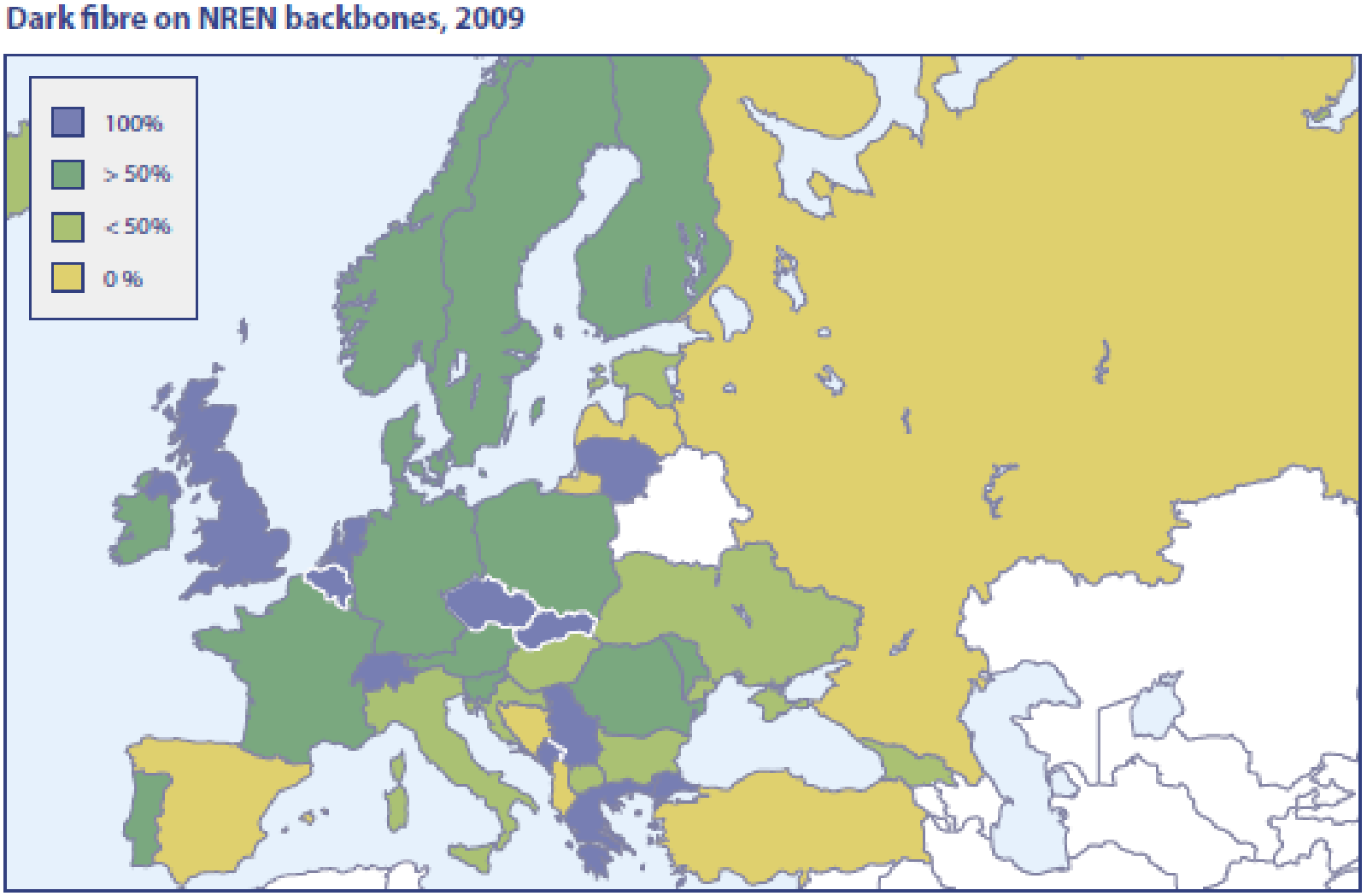
Pioneering collaboration environment

that reaches beyond existing boundaries and that seamlessly integrates the services and tools provided by a large number of suppliers.

Hybrid end-to-end network in NL

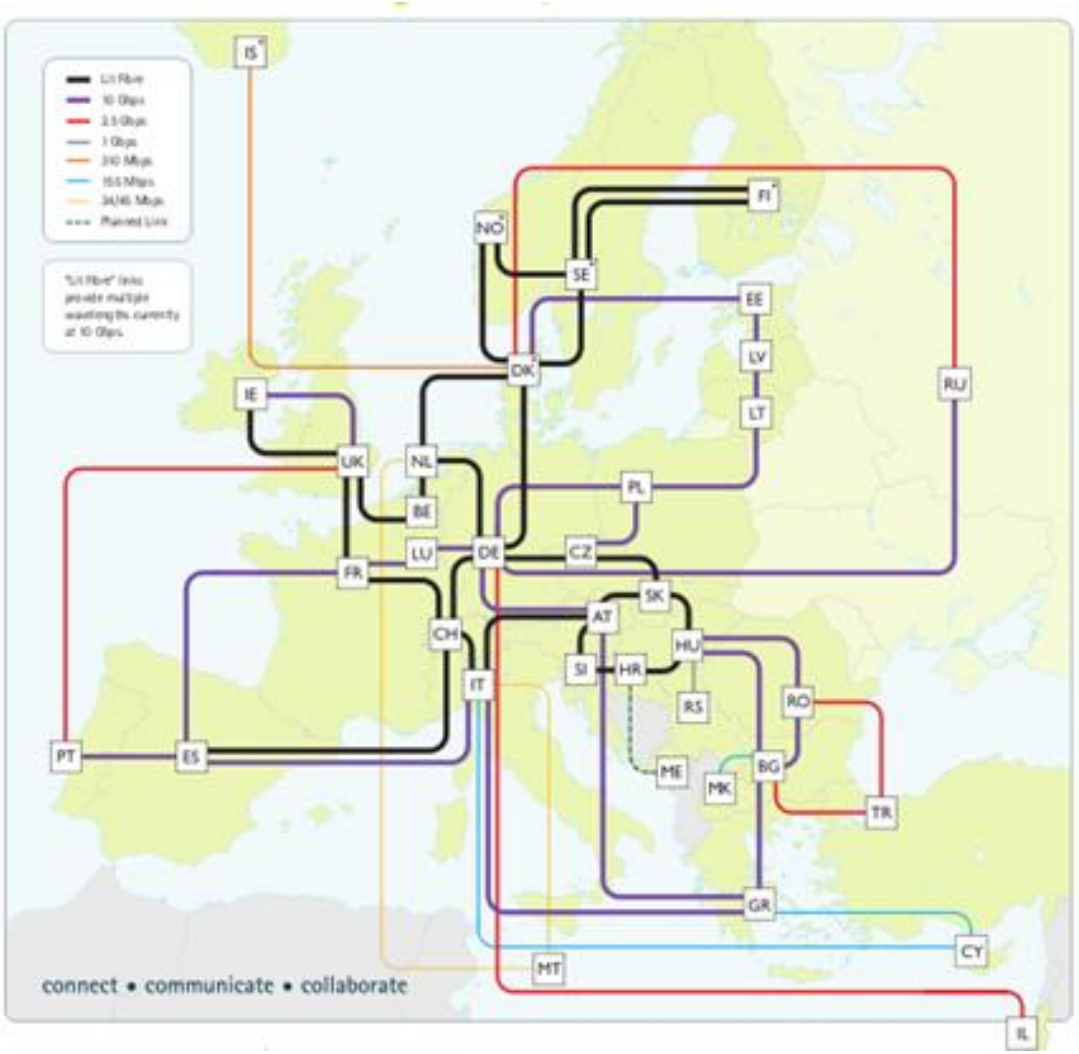
- 11.000+ km dark fiber, into connected organisations
- Own photonic network
- Network Services:
  - IPv4 and IPv6
  - Fixed and dynamic Lightpaths
- Collapsed IP backbone with routers at only 2 locations

NREN Dark Fibers - 2009



Source: TERENA Compendium 2009

The GÉANT Network

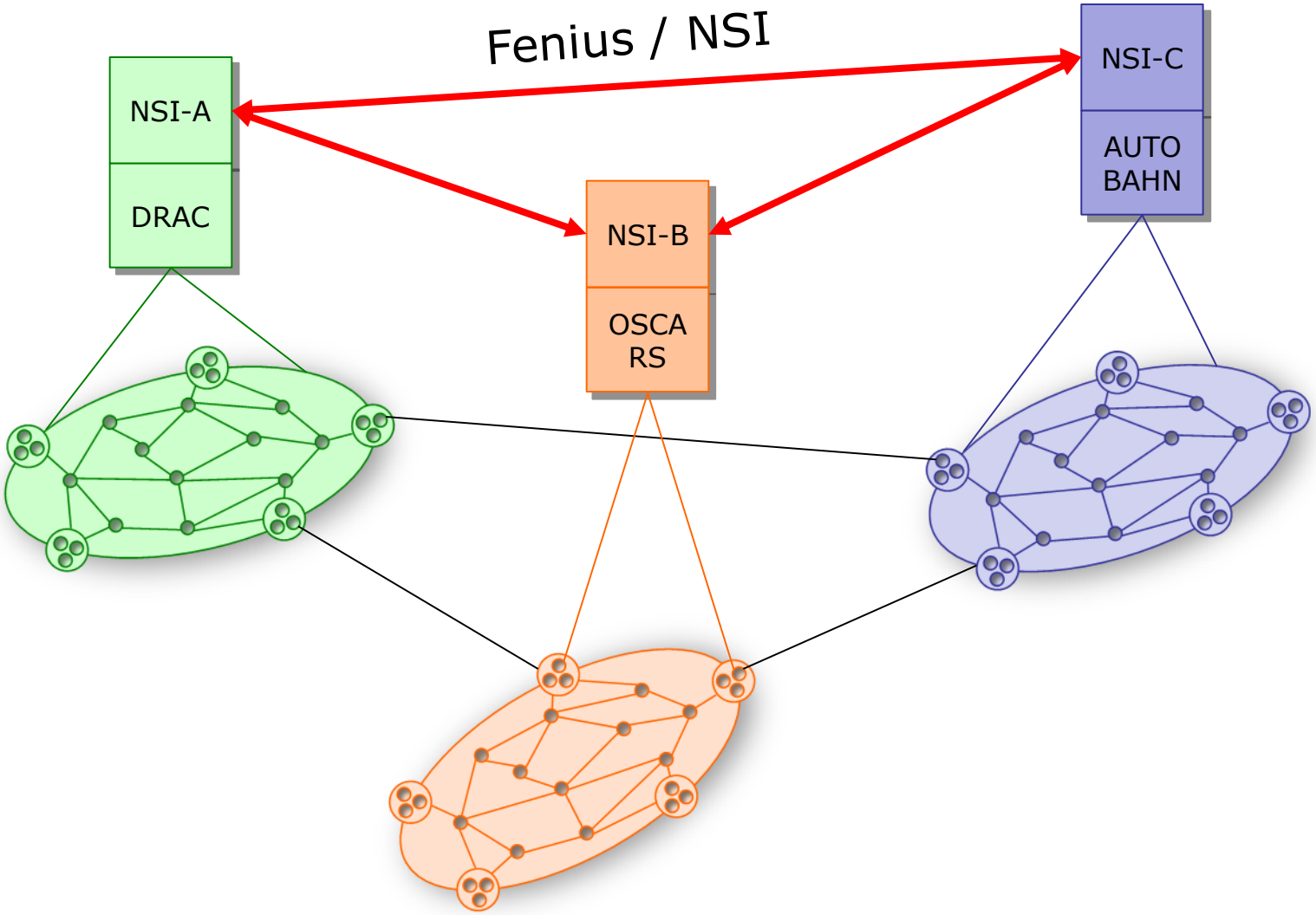


Hybrid end-to-end network: Lightpaths

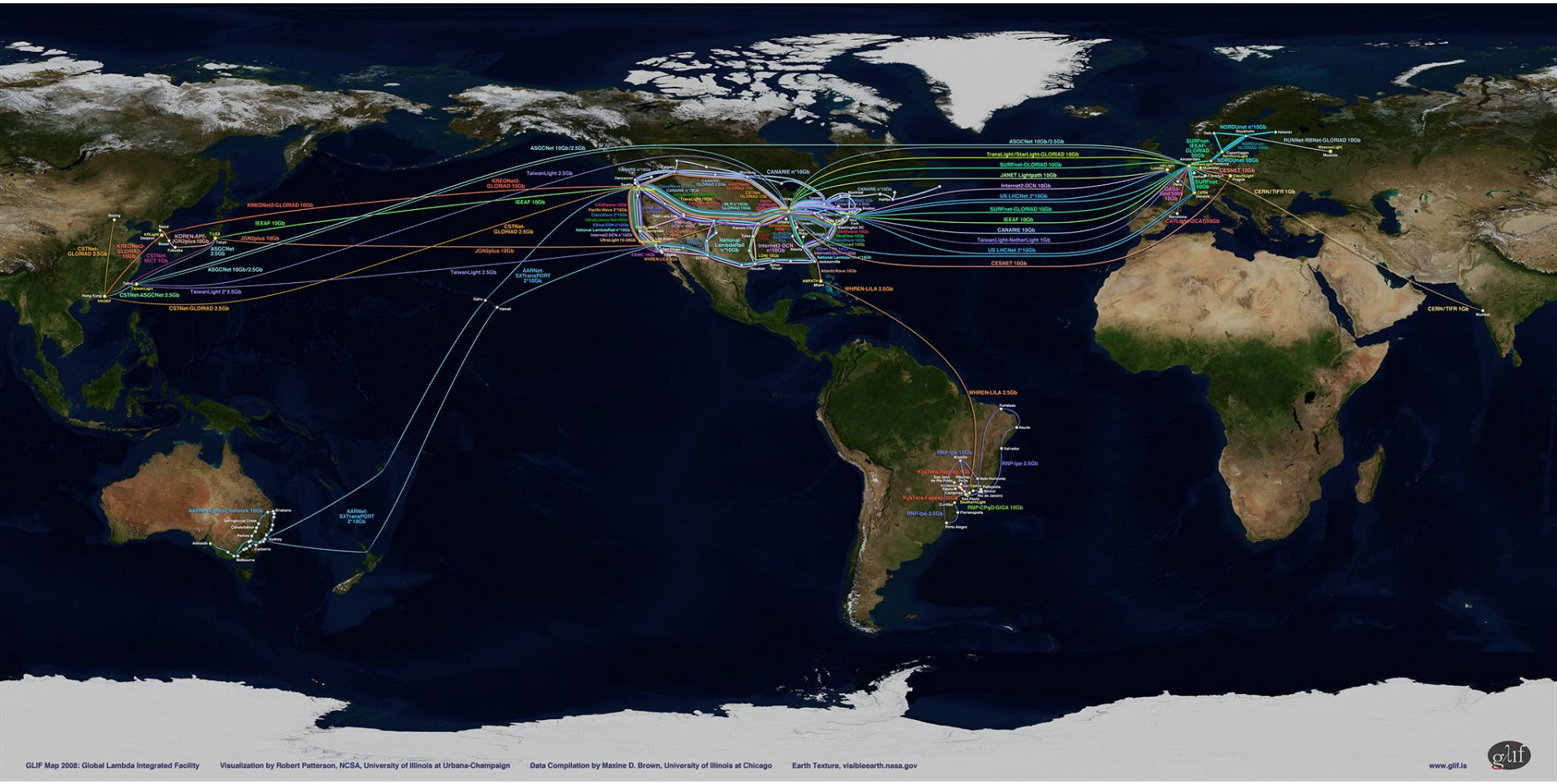
- Dark Fiber is the basis for building research infrastructures
- Lambdas form the building block for high capacity research networks
- Lightpaths are full lambdas or a dedicated part, for end-to-end, high bandwidth data transport with fixed characteristics

- Fixed lightpath: always on
- Dynamic lightpath: under control of users and their applications

Federated Multi-Domain Networking



Global Lambda Integrated Facility



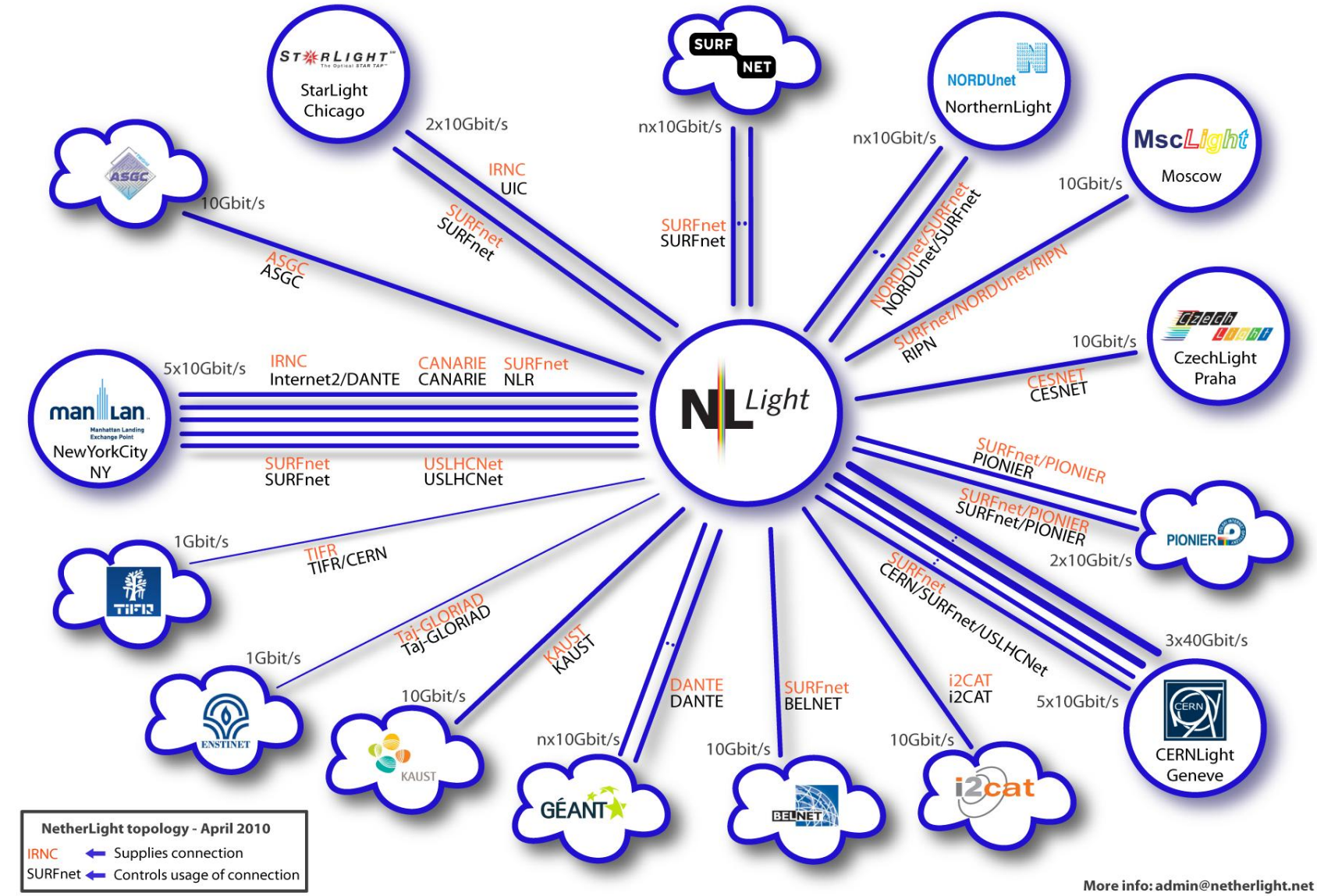
Resources in GLIF

- Lambdas
- GOLEs (GLIF Open Lightpath Exchanges)

- GOLEs form a crucial part of the emerged and growing global lambda grid:
  - Open = Policy Free
  - Exchange = Cross-connect your lightpaths

Vision: Linking the World with Light

NetherLight: The GOLE in Amsterdam



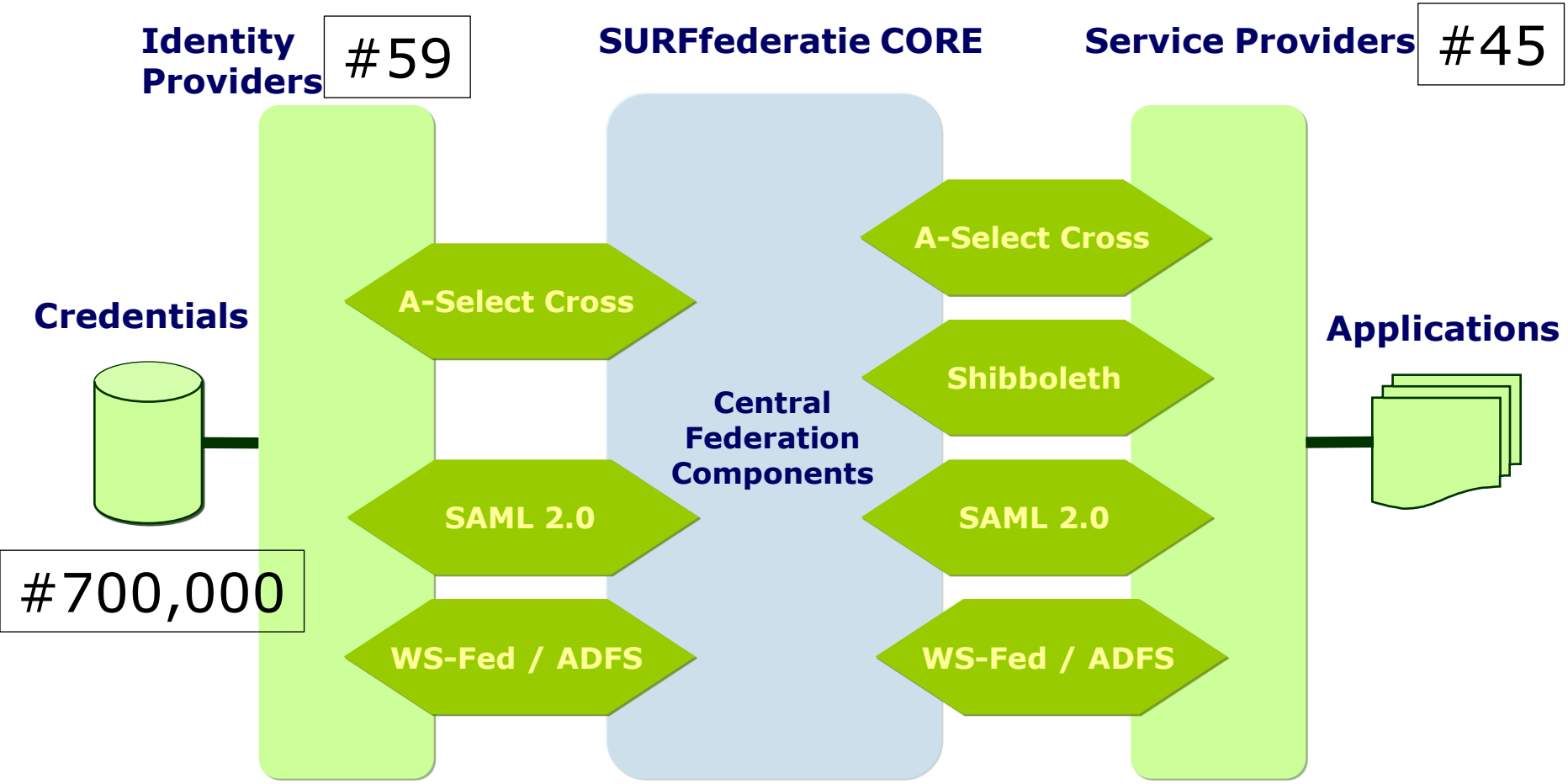
Federated Identity Management

Trusted identity

offering secure and seamless access to all the electronic materials and facilities that researchers, instructors, and students need.

- Interconnect Service Providers and Identity Providers in a scalable and flexible way for SSO and ZSO
- Challenges ahead are to expand the functionality of Identity Federations for:
  - the pioneering collaboration environment
  - greater control of privacy by the end user
  - scalable support for use/guest use
  - multi-domain through inter-/confederations

SURFfederatie Functional View



Certificates for Grids, possibilities to explore

- NREN (TERENA) server certificate service to identify Web/SSL servers and service endpoints

- NREN federation infrastructure and trust available to obtain certificates for grid access

- Machine-to-machine Web Services (SOAP/REST) access through delegated (person) authentication
  - From legacy SSL/PKI based transport to WS-Trust/Oauth 2.0 calls
  - Short-lived tokens for offline jobs

Online Collaboration

Pioneering collaboration environment
that reaches beyond existing boundaries and that seamlessly integrates the services and tools provided by a large number of suppliers.

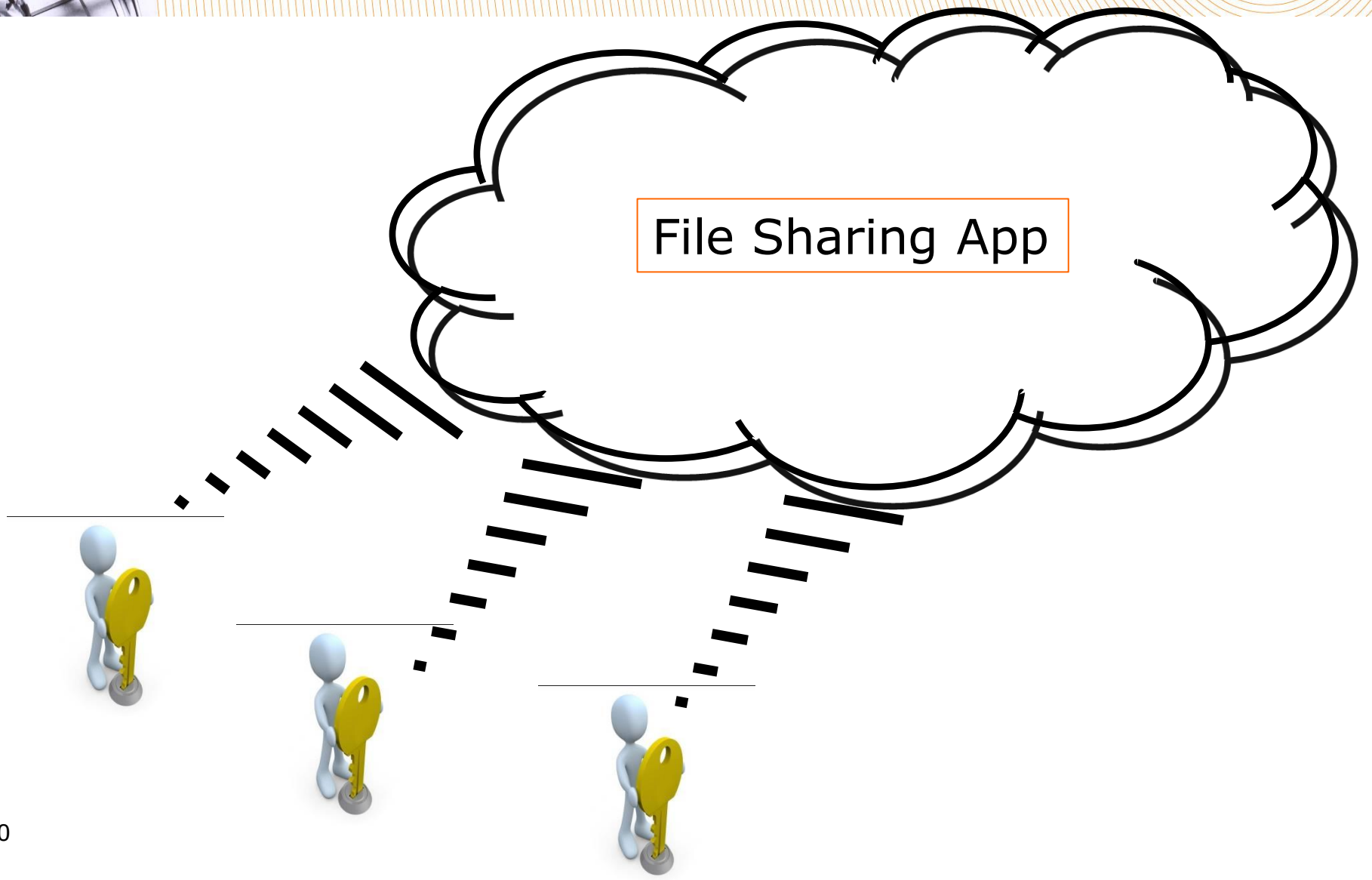
Three generations of collaboration tools

- 1. Stand alone applications:
  - Like ships in the night

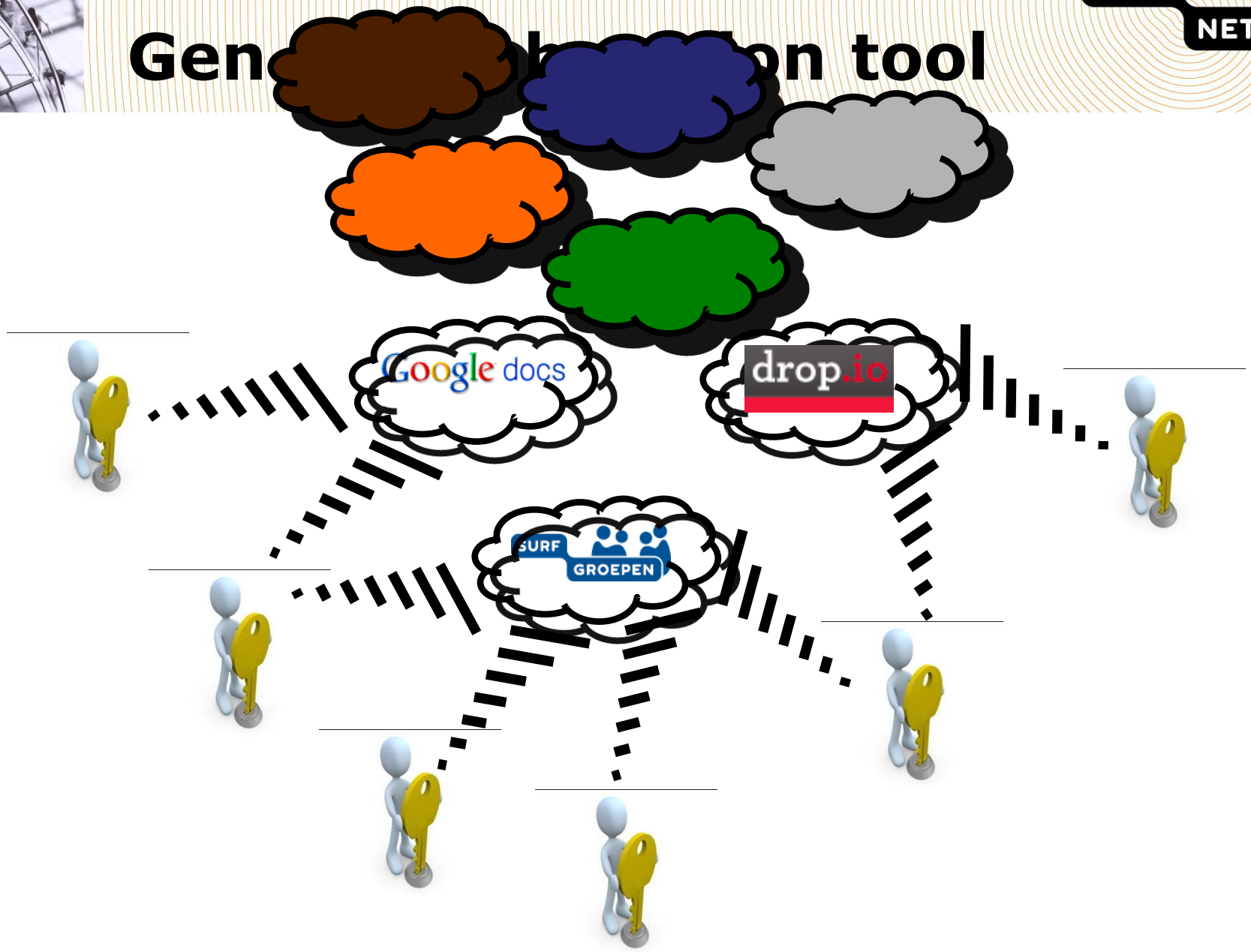
- 2. Applications connected to Federated Identity Management infrastructures:
  - Uniform method for AuthN and AuthZ
  - Still much unaware of each other

- 3. Applications aware of each other:
  - Access through Federated IdM infrastructures
  - Group functionality as the basis -> VOs
  - Ability to share data between apps

Gen 1 collaboration tool

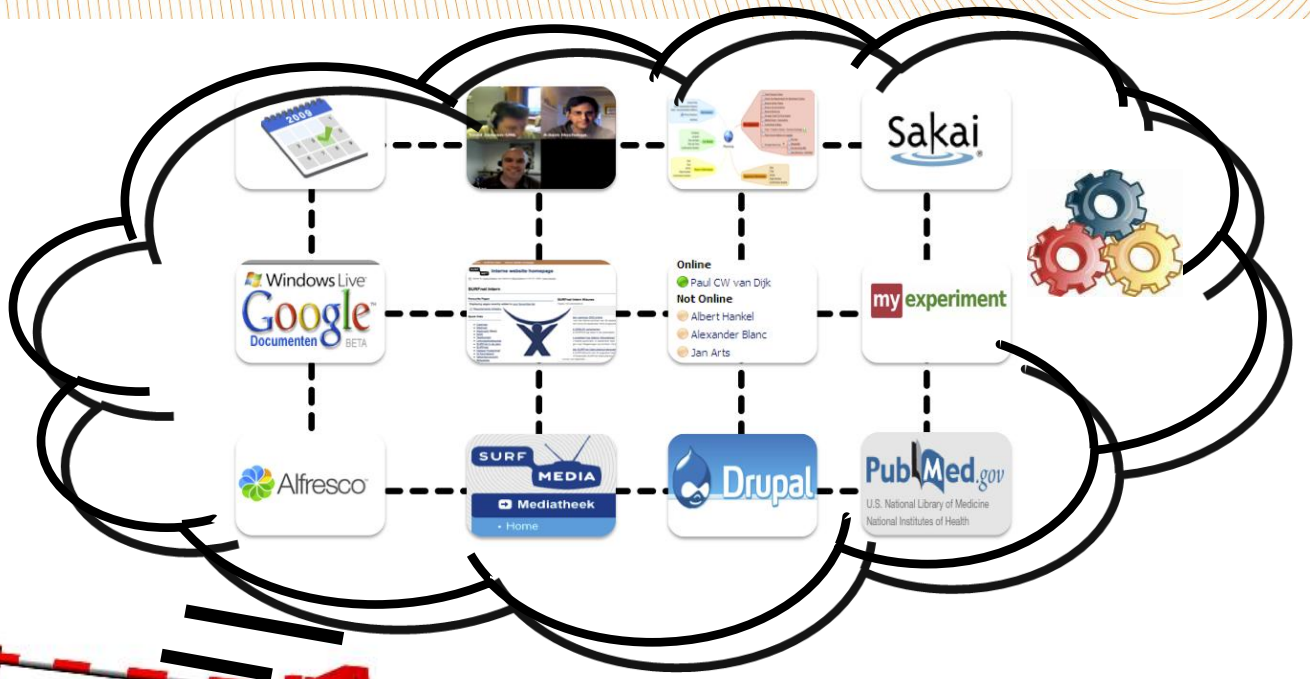


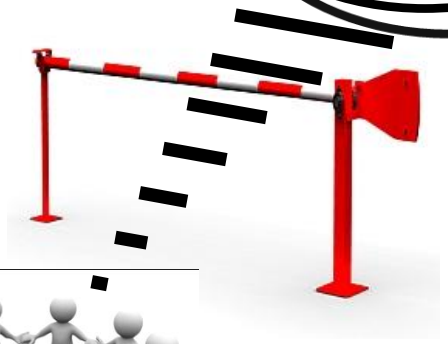
Gen[illegible]n tool

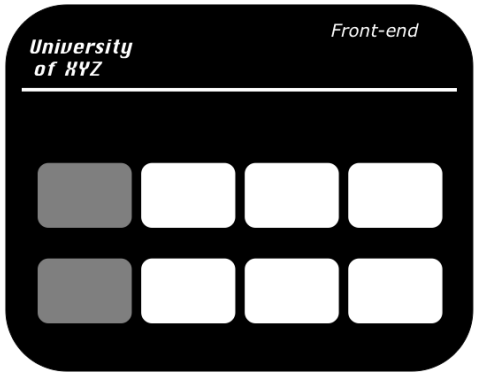


Adding federated Identity Management

Collaboration Infrastructure



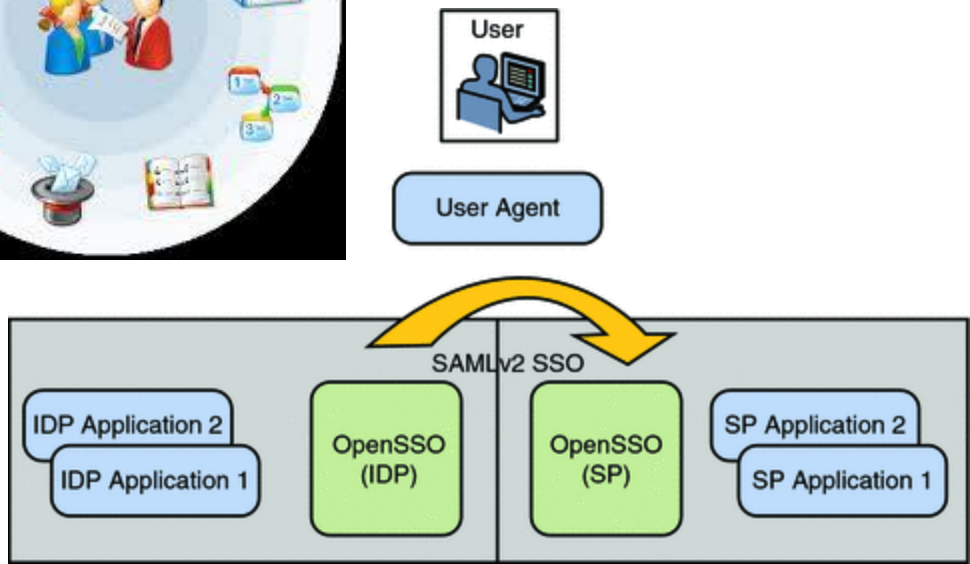




Collaboration Infrastructure

- CoIn is a blend, a synergy between:
  - Federated IdM and Group middleware
  - Social Networking
  - Collaboration Tools

OpenSocial enables apps, containers, and other clients to collaborate and move the social web forward.



Conclusions

- The demands from scientific research users are still ahead of what the market can provide

- The integration of Computing, Storage, Networks, Identity Management, Collaborations Tools and Scientific Instruments is the true next paradigm shift

- Clouds and cloud services will become an integral part of research networks

- Close collaboration between users and e-Infrastructure providers is essential to realize the true Collaboration Infrastructure

Thank you! Questions?

10th Global LambdaGrid Workshop:

- CERN, Geneva, Switzerland
- 13-14 October 2010

- Hosted by: CERN
- Program and details at: http://www.glif.is/meetings/2010/

E: erik-jan.bos@surfnet.nl
T: +31 30 2305305