NRENs - A Primer for Innovation and Collaboration

CEEUSER

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Viewpoints

- *"We are drowning in information, while starving for wisdom" E.O. Wilson (Harvard University)*

- *"Smarter, not faster is the future of computing research" E. Lazowska (Washington University)*

- *"With the right infrastructure and the right approach, we can bring on a new age of scientific practice and research" – Neele Kroes, VP of EC and responsible for Digital Agenda*

Content

- *Motivation*

- *A touch of history and the notion of invariance*

- *Current NREN services and challenges*

- *A case in point*

- *Return to the invariants*

Motivation

- *NREN concept*
  - *Is it still relevant?*
  - *Is it the best way for many countries to have e-Infrastructures and services for research and education communities*
  - *Is it still transformative in the times when some are possibly reduced to ISPs, offering less attractive and pertinent services for their respective user communities then highly popular and powerful clouds, skies, and social platforms.*

A Touch of History…

NREN is defined as an entity whose goal is to establish and to operate a computer communication network that interconnects research and educational institutions within a region (often this region is a country) and provides also external connectivity to other similar networks and to the global Internet.

... and a notion of invariance

To attain its objectives, a NREN must perform the following activities:

- *Provision of network technology necessary to interconnect research and academic institutions in the domain and to connect to the Internet.*

- *Identification, development and distribution of network services*

- *Analyses and implementation of novel network technology*

- *User assistance and support*

- *Education*

- *Participation in international network organizations and projects*

- *Transfer of network know-how to other institutions and enterprises*

Concerns

- *Fragmentation of efforts*
  - *Less than in the past, however still present*
- *Disturbing the market*
  - *"Monopoly" flavor*
  - *Exclusivity of well-defined user groups*
- *Impressions about "political influence"*

Current NREN services

- *Snapshots from two annual reports*
  - *NREN A*
    - *Connectivity and networking*
      - *From basic IP service to photonic DPPC*
      - *Traffic monitoring (including QoS)*
      - *CERTS and related educational efforts*
    - *Collaborative environment*
      - *Eduroam*
      - *Multimedia facilities*
      - *Certification*

Current NREN services/2

- *NREN A (continuation)*
  - *Applications*
    - *Intensive computations*
    - *SANs*
    - *Experimentation and testing*
  - *Technology transfer*
    - *Design and development*
    - *Delivery to the production gate and explotation*
  - *Research*
    - *Platform for large projects*
      - *National*
      - *International (GN3)*

Current NREN services/3

- *NREN B*
  - *Internet access*
  - *Web, e-mail, and servers provisioning*
  - *Networking (IP connectivity, DPPC, QoS and QA)*
  - *Multimedia (conferencing, A/V on demand)*
  - *AAI*
  - *Security through CERT activities*
  - *Registry*
  - *National and international projects (GN3)*

Funding and financing

- *Basically, two distinct funding models for a NREN (very few if any changes):*
    - *User/service dependent or a user funding model*
    - *User/service independent or central funding model*

NORDUnet IP - NIP

- *Four-tiered e-Infrastructure for science and education*
  - *Networking*
  - *Computation*
  - *AAI*
  - *Storage and data curation*

NIP – Challenges

- *Globalization*

- *e-Infrastructure organization*

- *Data – large, distributed and ownership*

- *Mobility*

- *Social networking*

- *Cloud integration*

- *Security*

NIP – Possible solutions

- *Global e-Infrastructure provider*
  - *Unifying and federative approach*
  - *Openness*
  - *Virtualization*
  - *Mobility*
  - *Cross-boarder access*
  - *Mobility and omnipresence*
- *e-Science and e-Education enabler*
- *Platform for innovation*

ASPIRE – The Prospects for the NRENs

- *Surveys and SWOT Analysis*

- *Recommendations with respect to NRENs*
  - *NRENs should look for novel funding models that lead to long term sustainability possibly via*
    - *Close collaboration with Public Service Networks*
    - *Increase inter- organizational and inter-institutional collaboration (demand, procurement, and services)*
  - *Next generation of management seasoned with business flavor and a visionary and bold leadership*

ASPIRE – The Prospects for the NRENs/2

- *Recommendations with respect to NRENs*
  - *Strategies and plans for efficient and effective service delivery*
  - *Understand and work with the user base – user centric and user driven services*
  - *Avoid competition with the "real world" on the commercial turf*
  - *Establish yourself through innovation, competence, integrity, responsibility towards the users - become a reference*

Global presence

- *Through dedicated international organizations such as TERENA, DANTE, NREN PC, CEENet*

- *The mission, the objectives, the work and even the relevance different, but the message is the same – it is a concept that works, evolves as demands of the users, technologies and societal needs change.*

- *Spread on four continents – Europe, Asia, Africa and Latin America*

EC

- *Massive investments through series of Framework Programmes*
  - *From connectivity to building regional and intercontinental grids as the foundations for e-Infrastructures as key enablers for research and innovation excellence and main building blocks of the European Research Area and the global one.*
  - *Cross-fertilization of various scientific disciplines, aggregation of human knowledge and*

e-Infrastructures

Integrated and identifiable ecosystem for research (including e-Science and e-Education) that provides E2E services as defined and demanded by the researchers/users.

Fundamental components: high-speed networks, high performance computing, sensor networks, data curation facilities, middleware, and people (competence that delivers what users need).

NRENs – stewards of e-Infrastructures

A Case in Point – I4ODI

- *Started about a year ago*

- *Still in the conception phase. Hence a lot of anticipated, but also not foreseen issues*

- *Trying to bring various academic environments on board, including the national network*

- *Tries to position itself both regionally and internationally*

I4ODI

- *Infrastructures for Open Data Innovation*
- *eGov living lab*
- *Cyber Systems Security (CS2 lab)*
- *Platform for simulation and modeling in DS*
- *Interoperability*
- *Several clouds and virtualization of all the research facilities*
- *Would not be possible without high bandwidth connectivity (SUNET), high-performance clusters (SU and other universities), and collaboration with other similar facilities*

eGov

- *The use of the technology (primarily information and communication) to enhance, modify and improve the access and the delivery of existing services and/or produce innovative ones for the benefit of the citizens (including individuals, groups, associations corporations, businesses).*

- *It is at least a two way relationship based on openness and transparency, where integration and easy of usage are the foundations for building a partnership to continuously produce better value and quality of life for all members of the society.*

Holy Trinity - PPAP
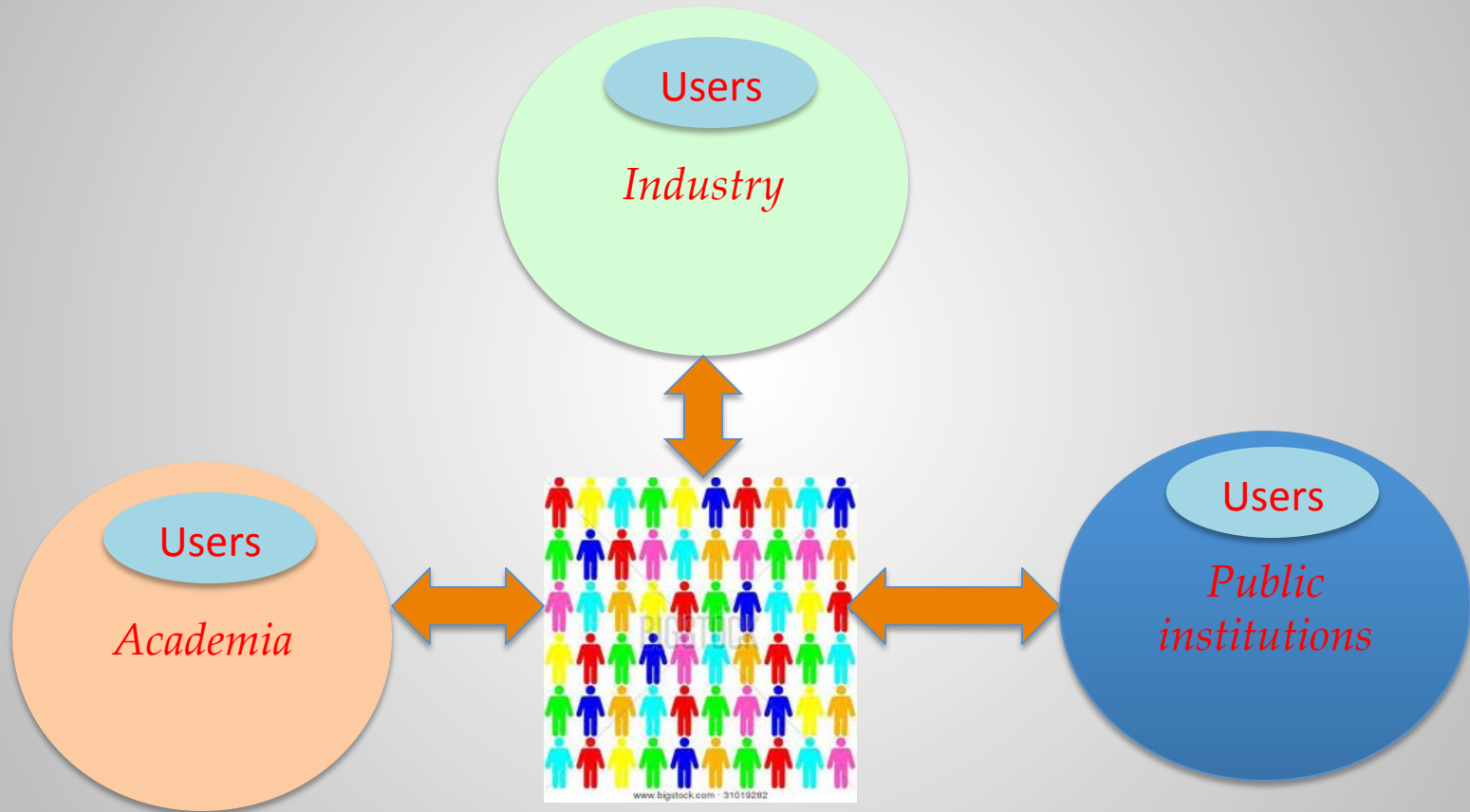
Following the virtuous principle

- *Start with a pilot infrastructure*

- *Identify and support communities/users who will deploy and use various applications*

- *Educate users how to administer, operate and work with the e-Infrastructure*

Open and Inclusive

- *The approach*
  - *E-Infrastructure is an integral part of the project*
  - *Long term funding – national and regional funding agencies, and government*
  - *Co-funding*
    - *Long term (from one year to five years) – EC, national funding agencies and foundations, government academia, industry*
    - *Short-term (from several months to a year) – national funding agencies, academia, industry*

Open and inclusive/2

- *Public institutions*
  - *Vinnova, Foundation for Strategic Research (SSF), VR, Tax Office, e-Delegation, eID-Board, Ministry of Enterprise, Office for Development, Ministry of ICT, National insurance board, The Agency for Civic Contingencies, FOI, KAW foundation*
- *Industry – Ericsson, IBM, Microsoft,…*
- *Academia – SU, LU, KTH, SUNET,…*

Open data innovation

- *In a digital world "service is everything and everything is a service" (usually prefixed by "e")*
  - *Looking for optimal/near optimal architectures and configurations based on formal and experimental models (elastic, responsive, secure and privacy enabling)*
  - *Methods and procedures for resource pooling and metrics for combination of technologies to measure stability and sustainability*

Infrastructures

- *To provide secure and reliable services and data to dynamic and complex set of actors*

- *Information resource sharing*

- *Resilience*

- *Self-organization and orchestration*

Interoperability

- *Internet of Things and Services*

- *Trying to be aware and smart – transport, public health environment, energy and governance*

- *Internal and external integration – dealing with similar and heterogeneous systems, legacy architectures and solutions*

Policy and decision support/ Visualization

- *Tools for open, inclusive, participatory and transparent policy development*

- *Consistent analysis and effective prediction of the consequences of particular decision making – state-of-the-art decision-support systems (possible reflection of democratic environments)*

- *Blending with crowdsourcing and the serendipity effects in large and open data sets*

Digital security, trust and privacy

- *Large and linked data, omnipresence of services and communication and computing resources = almost infinite attack surfaces and diversity*
- *The relationships between accountability, responsibility, transparency and openness and security, privacy, assurance and trust.*
- *Trusted digital environments*
- *Identity in the IoS*

Service Innovation

- *Design and evaluation of multi-faceted e-services based on novel business models.*

- *Citizen centric and active cooperation with all stakeholders*

- *Distribution models and process sequencing*

- *Supply chain in all service organizations and the question of management*

Nationally funded projects

- *SE Digital Agenda and e-Gov and e-Infra Building Blocks*

- *Funding: Vinnova*

- *Duration: 7 months*

- **Botswana Speaks**

- *Funding: SIDA*

- *Duration: 3 years*

Nationally funded projects/2

- ***DADEL (High Performance Data Mining for Drug Effect Detection)***
- *Funding: Foundation for Strategic Research*
- *Duration: 5 years*
- ***IRIS – Integrated Dynamic Prognostic Maintenance Support***
- *Funding: Vinnova (SGAFIS)*
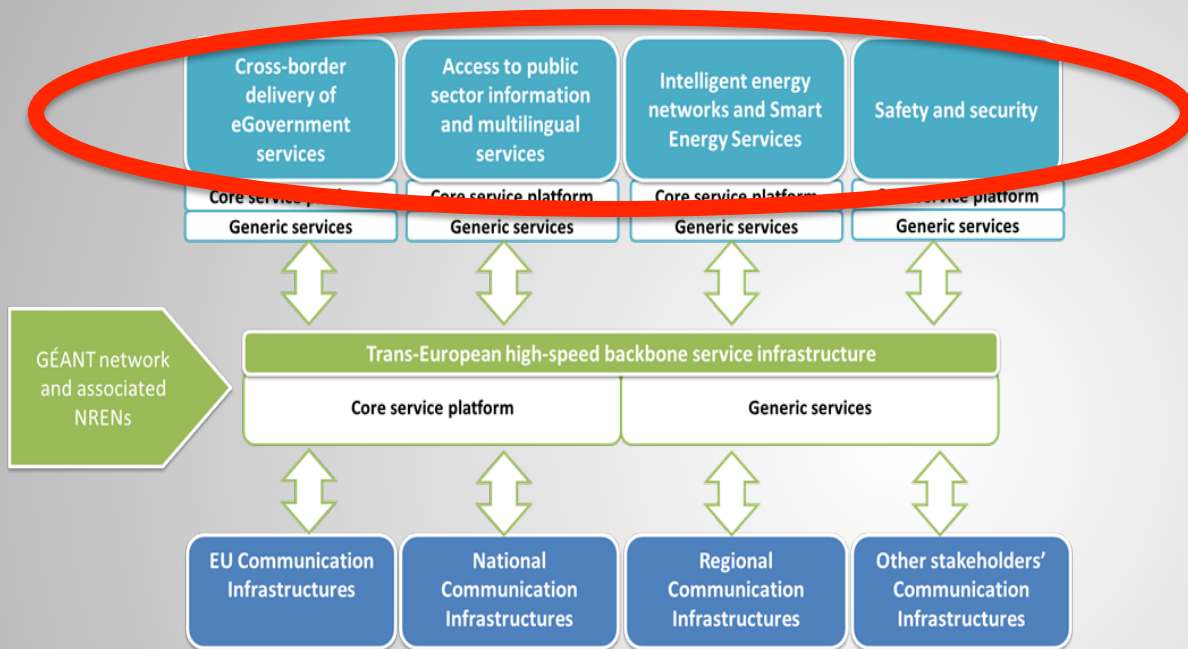- *Duration: 3 years*

EU projects

- *iMentors*
- *Funding: EU*
- *Duration: 2 years*
- *MOBIS*
- *Funding: EU*
- *Duration: 3 years*

Interaction with Public Service Networks

- *Public services of EU added value*
- *Communication infrastructures*
- *Trans-EU high-speed backbone SI*

STORK 2.0 – Secure Identity Across Boarders Linked

- *STORK 2*
- *Funding: EU*
- *Duration: 3 years*
- *Accelerate the idea of eID for public services*
  - *e-Learning and academic qualifications*
  - *e-Banking*
  - *Public services for business*
  - *e-Health*

e-SENS: *E*lectronic *S*imple *E*uropean *N*etworked *S*ervices

- *e-SENS*
- *Funding: EU*
- *Duration: 3 years*
- *Objectives*
  - *To produce a super pilot based on the consolidation of the existing large scale pilots using core building blocks such as e-ID, e-Documents, e-Delivery, and e-Signatures.*
  - *To develop a baseline architecture that can serve as a foundation for an infrastructure of cross-border services in EU.*

Long term sustainability

- *Several applications for five and ten year funding from the respective national agencies and foundations – app. EUR 20 millions*

Nordic fractals

CEENGINE
CEENet

- *Possible regional cooperation*
- *Scandinavian flavor with Baltic touch*
    - *Unified and harmonized approach*
    - *A joint platform for experimentation and production*
    - *All aboard and initial support from NCoM*
- *<u>Scaling up – opportunity for increased funding</u>*

Back to invariants

- *Users –they create and are behind the need for NREN existence – they are the main measure of our success and one of the conditions for sustainability*
- *Innovation – always on the cutting edge – that makes all the difference*
- *Countries should realize that science and research are the best way to prepare for the future*
- *Sharing and collaboration*
- *Continuous support of the EC - axiomatization of the integrative processes in the ecosystem of scientific excellence-moving the horizon*
- *e-Infrastructures for h-Infrastructures*

Thank you

References

- *Research Computing is Key to the Future of Innovation and Discovery, Srini Chari, Cabot Partners, 2010*

- *e-Infrastructure and e-Science, T. Hey, D.*