

# e-Infrastructure Challenges Towards 2020

René Buch, CEO NORDUnet

# NORDUnet

Nordic Infrastructure for Research & Education

## Based on Conversations with GLOBAL CEO Forum

- Chris Hancock - AARNet (Australia),
- Jim Roche - CANARIE (Canada),
- Jianping Wu - CERNET (China),
- Carlos Casaus - CUDI (Mexico),
- Christian Grimm - DFN (Germany),
- Dave Lambert - Internet2 (USA),
- Tim Marshall - Janet (UK),
- René Buch - NORDUnet (European Nordics),
- Steve Cotter - REANNZ (New Zealand),
- Florencio Utreras - RedCLARA (Latin America),
- Patrick Donath - RENATER (France),
- Nelson Simões - RNP (Brazil),
- Erwin Bleumink - SURFnet (The Netherlands)

Some of the thoughts might be provocative & controversial and should probably carry a Health Warning ...

## NORDUnet Service Matrix

	Research Network Connectivity	Global IP transit	OPN Lambda	Community Peering	Cross Border Fibre Coordination	Central NOC	End User NOC	GN3 Project Coordination	Project Hosting & Coordination	Software Development	AAI Community Services	Equipment Hosting	Virtual Server Hosting	Network Media Transcoding & Distribution	Adobe Connect	VCONF MCU Service	WEB based Vconf Service	Telepresence Gateway Service	EU project Coordination	File Sharing Service	Spam Filtering Service	Community Communication	Commercial Cloud Services	Procurement Service	Conference Video Production	Conference Streaming	Conference WIFI
<b>2005</b>																											
<b>FORSKNINGSNETTET</b>																											
<b>FUNET</b>																											
<b>Rhnet</b>																											
<b>SUNET</b>																											
<b>UNINETT</b>																											
<b>WAYF</b>																											
<b>NDGF</b>																											
<b>GEANT 3</b>																											
<b>RUNNET</b>																											
<b>NCM</b>																											
<b>NORDUnet</b>																											
<b>2012</b>																											
<b>FORSKNINGSNETTET</b>																											
<b>FUNET</b>																											
<b>Rhnet</b>																											
<b>SUNET</b>																											
<b>UNINETT</b>																											
<b>WAYF</b>																											
<b>NDGF</b>																											
<b>GEANT 3</b>																											
<b>RUNNET</b>																											
<b>NCM</b>																											
<b>Terena</b>																											
<b>Surfnets</b>																											
<b>Pionier</b>																											
<b>OTHER NREN</b>																											
<b>Others</b>																											
<b>NORDUnet</b>																											

- 1. Research & Higher Education is changing.**
- 2. Commoditization of base Services.**
- 3. Change in Organization role.**
- 4. The e-Infrastructure Cultural Challenge.**
- 5. Financial Challenges.**
- 6. Regional & Global collaboration.**

- 1. Research & Higher Education is changing.**
2. Commoditization of base Services.
3. Change in Organization role.
4. The e-Infrastructure Cultural Challenge.
5. Financial Challenges.
6. Regional & Global collaboration.

## Rethinking Education, Thomas Frey, Davinci Institute based on 2011 US Data:

“By 2020 80% of all college education online; 50% of campuses closed or transitioned into different kind of institution”.

## Pew Research Center 2011 survey among 1055 presidents of colleges and universities, and 2142 adult student:

- 77% of presidents:
  - “We offer online courses (89% of public vs 60% of private).
- 58% of colleges and universities offering online courses grant degrees based on online courses only
- 62% of presidents:
  - “In 2020 more than half of undergraduate textbooks entirely digital”
- Offering Online Courses:
  - Highly selective schools (51%)
  - Mid-tier (80%)
  - Low-tier (86%)
- Value of online education versus classroom teaching:
  - Students consider online education have lower value as classroom.
  - Presidents consider online education of at least same value as classroom
  - General public (even young adults) value even less than students

### Researchers on different levels of digital readiness Global Virtual communities; large-scale collaborations

- Data-driven science
- Extreme demands from new generation facilities and upcoming practices
  - LHC ongoing
  - SKA: 100 Gb/s for global centers
  - Life Sciences/systems biology
  - Medical sciences and surgery: images
  - Humanities: dynamic, fuzzy, complex data
- Example of European ESFRI distributed research infrastructures
  - CLARIN: linguistics in broadest sense
  - Life Watch: Biodiversity
  - BBI: biobanks
  - Etc

Public-private collaborations; open innovation: how to serve "open innovation hotspots". Special Regulatory Zones?

**All need specialized solutions, and not just for networking !!**



1. Research & Higher Education is changing.
2. **Commoditization of base Services.**
3. Change in Organization role.
4. The e-Infrastructure Cultural Challenge.
5. Financial Challenges.
6. Regional & Global collaboration.



- NRENs environment becomes service environment:
  - Many NRENs cannot cope.
  - Moving up the value chain – New Innovative services
  - How do we avoid that Campuses are getting left behind
  - Change in Service Matrix –> change in staff requirements.
  - Wholesale Service Development & Delivery -> avoid the **“Not Invented Here”** syndrome
- Changes in NRENs’ own ranks – digital gap widens
- Niche Products/Services

“A product that is made and marketed for use in a small and specialized but profitable market”
- Commodity Products/Services

“A class of goods for which there is demand, but which is supplied without qualitative differentiation across a market and where the main driver is price.”

**“From the taste of wheat it is not possible to tell who produced it, a Russian serf, a French peasant or an English capitalist.”**

Karl Marx: Critique of Political Economy. 1859

### **Campus ICT**

Will no longer be technical focused as this has moved into the commodity sphere but to add value as technology enablers and digital knowledge transfer assistants

**NRENS** are no longer just about connectivity but will in the future ....

1. Research & Higher Education is changing.
2. Commoditization of base Services.
3. **Change in Organization role.**
4. The e-Infrastructure Cultural Challenge.
5. Financial Challenges.
6. Regional & Global collaboration.

- Traditionally NRENs clientele was clear:
  - Higher education and
  - Research institutions (both Public and Private)
- User base has diversified:
  - UK & US (US UCAN) for example:  
All of education, health and culture institutions, public sector at large
- FCC in USA gave clear mandate to extend base widely; UK accepts; many countries don't

1. Research & Higher Education is changing.
2. Commoditization of base Services.
3. Change in Organization role.
4. **The e-Infrastructure Cultural Challenge.**
5. Financial Challenges.
6. Regional & Global collaboration.

Is future still for separate organizational structures for various parts of e-Infrastructure?

## So far

- NRENs for networking services
- Supercomputer centres and local sub-mainframes for computing
- Data centres and repositories still unclear: central, attached to large computing centres, institutional, community-based, individual?
- GRID organisations: in Europe emulated NRENs. How respond to cloud services? To large-scale communities? EGI in Europe serves 18,000 scientists
- E-science centres for developing generic and community-specific software tools for data-centric and computational science

## But

- Need common services: e.g. AA. Who to provide? E.g. Networks or GRIDs?
- Heterogeneous user communities expect more integrated services (IaaS) with tailor-made aspects for community, not institutions
- How to organize the data storage? 'Green aspects'; Curation and long-term preservation.

- Merging unlikely:
  - Core roles and culture is different !
- Decide on who provides AAI and similar services ?
- Flexible, open and competitive approach to global connectivity
- NRENs to think about forming open and non-exclusive clusters to meet demands
- Support global collaborations:
  - Joint user support desks ?
  - Joint overall governance ?

1. Research & Higher Education is changing.
2. Commoditization of base Services.
3. Change in Organization role.
4. The e-Infrastructure Cultural Challenge.
5. **Financial Challenges.**
6. Regional & Global collaboration.

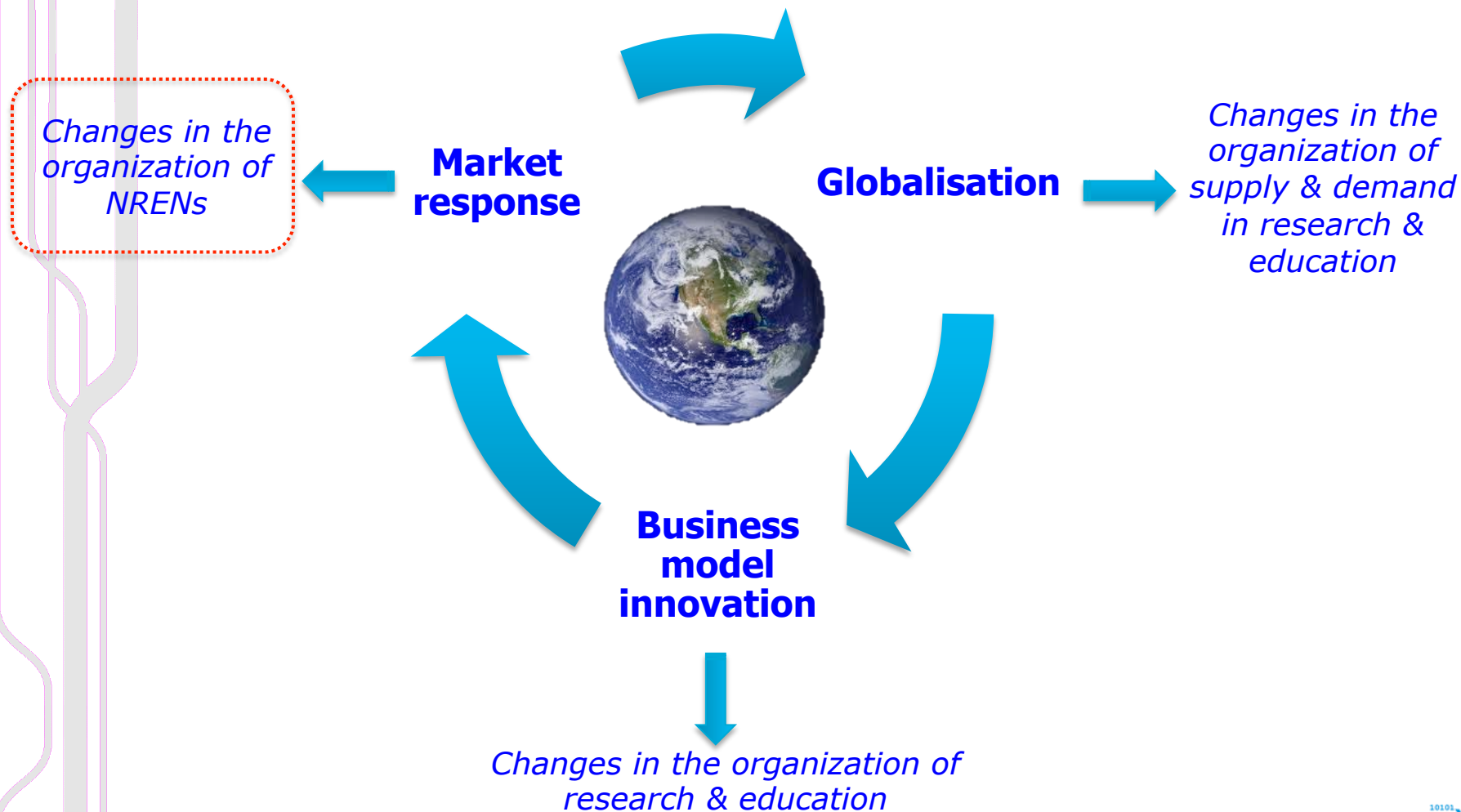


- **Reaching the – Do more for same / less limit.**
- **Change in Finance model – Service income versus contribution.**
- **GÉANT Expert Group's case for public funding**
  - Analogy to funding research in general: ensuring society captures benefits of research when risk of private underinvestment: social vs private benefits
  - Key to further building of Europe
  - Contribute to key European values: trust, security, privacy
- **GÉANT Expert Group's proposal**
  - Core backbone (all international connectivity) for sustaining European Communications Commons: EU; check need, quality
  - Member States should continue to invest, including campus networks
  - High-end users to bear greater part of burden: include in investment and operational budget. E.g. SKA
  - Users of commodity services to pay; involve commercial providers
  - Budgets for innovation to increase significantly
  - EU Structural Funds to systematically address digital divide
  - On all levels: funding should be planned and stable

1. Research & Higher Education is changing.
2. Commoditization of base Services.
3. Change in Organization role.
4. The e-Infrastructure Cultural Challenge.
5. Financial Challenges.
6. **Regional & Global collaboration.**

1. Cross-border higher education, implying **mobility of student, faculty and institutions**, will grow
2. Academic research will become **increasingly international** and will continue to be affected by both **collaborative and competitive** forces
3. Higher education systems in **Asia and Europe** will like North America gradually increase their global influence.
4. Private higher education **provision** and **financing** will increase worldwide, especially outside the OECD area
5. Growth of **market-like mechanisms** will increase in higher education governance through the use of performance-based and competitive allocation of funds
6. Focus on **quality assurance** will strengthen in response to the growing importance of private and cross-border higher education, institutional rankings and the quest for accountability

OECD (2009)

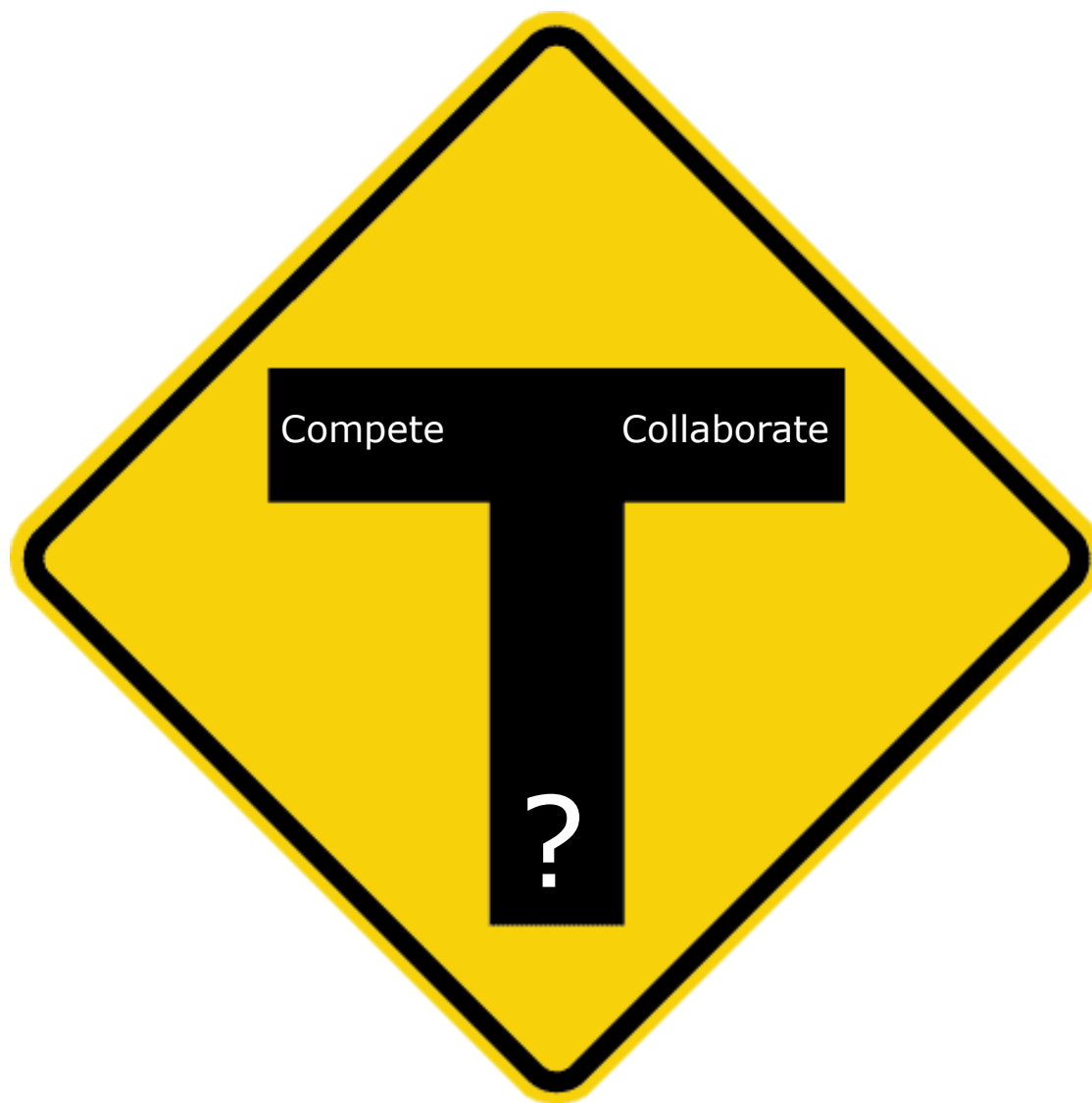


“IT has long been seen as a major key to increase productivity, but the results thus far have been disappointing”

*Rethinking Higher Education Business Models (2012)*

- “Higher Education business models need to adjust to capture the investments and opportunities in IT”.
- ‘Open’ business models allow creation of ‘platforms’ that attract investment from third-parties, increasing their value (e.g., Amazon)
- Platforms can be ‘unbundled’ into separate CRM, Product Innovation & Infrastructure Management functions (e.g., many mature industries)
- ‘Unbundling’ yields economies of *scale* and *scope*, increasing productivity of the entire value chain

- R&E will **out-source** their Product Innovation and Infrastructure Management functions, to focus on their core CRM function: delivering similar types of products, at scale, to their customers
- These functions, and R&E's customers, will still have 'local' presence, but 'foreign' presence will become part of '**business as usual**'
- R&E organizations will need to be able to **organize** their businesses **globally**
- The R&E constituency will become **broader** and so the NREN-client relationship will become **more commercial**
- The market for NREN services will become **increasingly competitive**; particularly for those "beyond the network"
- A national focus will become **increasingly irrelevant** (and possibly a **liability**); **global reach** will become high valued proposition
- R&E organizations will organize themselves into **multi-lateral, trans-national consortia**

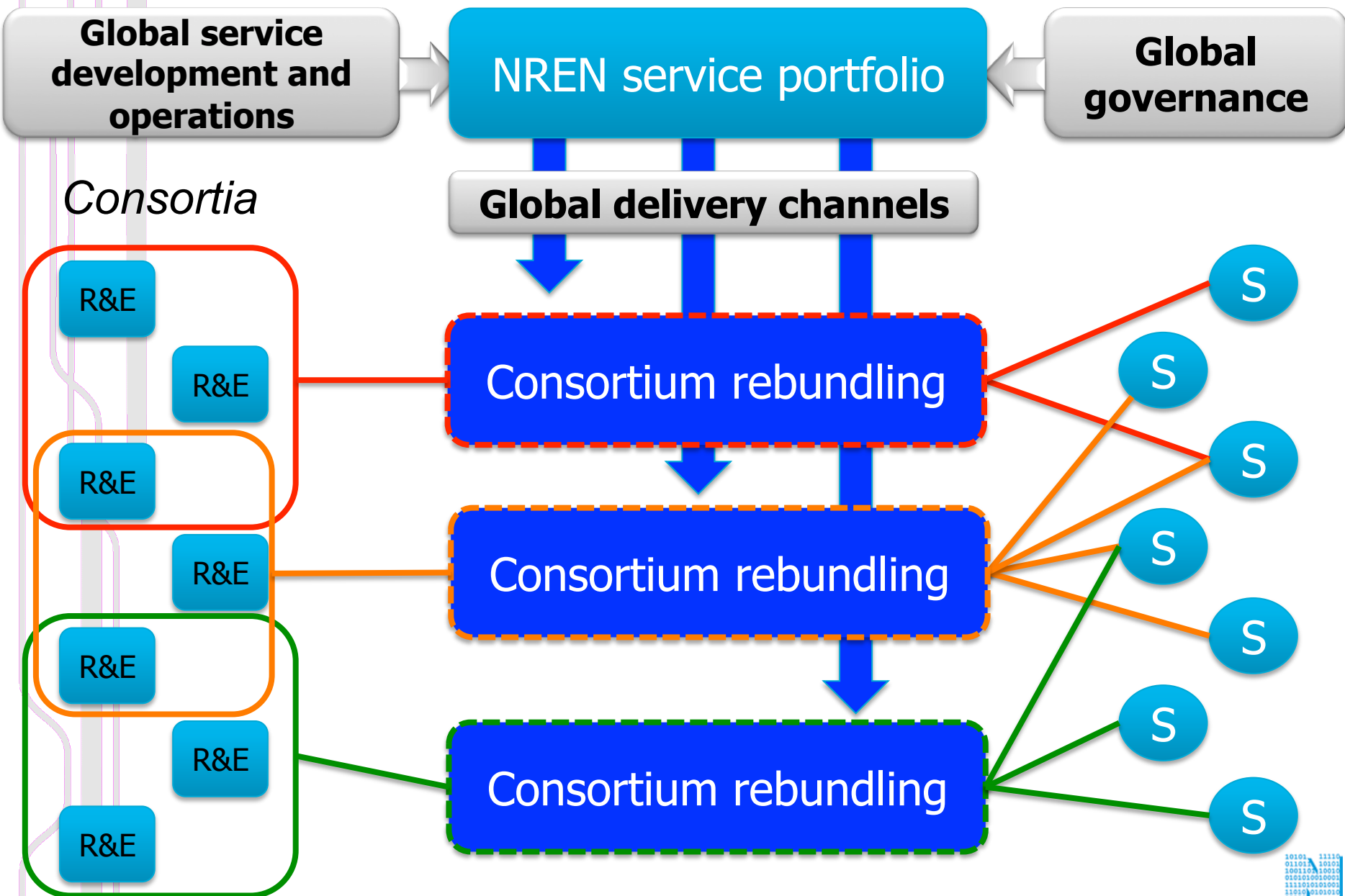




## Re-imagining the NREN



- The unbundled R&E ecosystem will need to be 're-bundled' back into a value chain to be useful
- Today, NRENs provides a 'soft' re-bundling capability
  - But only to a single national constituency (effectively a 'consortium')
  - And only loosely integrated to the customer's business
- Tomorrow, a 'hard' re-bundling capability will
  - Serve many consortia, both locally and globally
  - Integrate diverse business functions within these consortia
- Change of emphasis
  - Today: connecting R&E **networks**; end-to-end is the value proposition
  - Tomorrow: connecting R&E **functions**; B2B is the value proposition



- **C**yber
- **L**ogistic
- **I**nfrastructure
- **P**latform
- **P**rovider  
for
- **E**ducation  
And
- **R**esearch

*"Leaders win through logistics! Vision, sure. Strategy, yes. But when you go to war, you need to have both toilet paper and bullets at the right place at the right time."*

(Tom Peters, Fast Company - March 2001)

- It is a not-for-profit organization, serving R&E by delivering **superior global cyber-logistics and services**
- It's primary customers are **Research** and **Education** organizations, their **Consortia**, and other **Infrastructure** and **Product Providers**
- It creates value by efficiently managing the **supply** and **delivery chains** of its customers, and so **increasing productivity**

## How does NREN 2020 **make** money?

- By imposing service tariffs on its customers
- By sharing revenue of franchisees licensing “CLIPPER” products & services within its franchise area
- By sharing revenue from CLIPPER franchisees in other global franchise areas
- By sharing revenue from private-label delivery to other industries & sectors (i.e. other than R&E)

## How does NREN 2020 **save** money?

- By moving out of areas of business performed more efficiently by specialist area franchisees (e.g., connections)
- By moving out of areas of business performed more efficiently by other CLIPPER partner
- By aggregating service development and operations functions with other CLIPPER partners (e.g., NOC)

- By operating 'local-bound' infrastructure within its CLIPPER 'franchise area' (local connections, network caches, sales...)
  - The network and connection-related services remains a core part of the business, but less visible to customers
- By operating elements of the global infrastructure (network backbone; 'beyond the network' services...)
- By **sharing service delivery**; not federation of  
*"Similar-but-subtly-different services that nearly-works-but-not-quit"*
  - The portfolio's proposition is focused more on the mediation of diverse business R&E processes, and less the means of connectivity between
  - The portfolio has expanded 'upwards' into the spaces where mediation is required between R&E organizations and their many providers

- Service operations (Smaller) tightly focused
  - Some functions out-sourced to other global CLIPPER partners
  - What remains is 'local-bound' or delivered to other CLIPPER partners as part of global operations
- Service development (similar size, tighter focus)
  - Deep specialism in areas related to operations and core competencies
- Business development (larger size, broader focus)
  - Franchising → significant area of complexity and activity
- Customer Engagement (larger size, broader focus)
  - Function requires deep understanding of customer businesses
- Significant 'dilution of sovereignty' of CLIPPER partners
- Similar size, but more highly & diversely skilled

## 1. **Global Network Architecture**

A well-defined, inclusive, global architecture for, and a roadmap towards, interconnecting the Research and Education Networks on a global scale, taking into account input from the large science & education projects.

## 2. **Global Federated Identity Management**

A global, interworking architecture for, and a roadmap towards, the delivery of federated identity management for the R&E community to fully interoperate, using open standards and enabling global service delivery.

## 3. **Global Realtime Communications Exchange**

An interworking system for multi-domain video/audio conferencing systems, with directory systems that interwork based on open standards, using their identity federation & directories, capable of supporting virtual organizations.

## 4. **Global service delivery**

A model for global beyond-the-net service delivery





# Thank you

*My logisticians are a humorless lot. They know if my campaign fails,  
they are the first ones I will slay.* (Alexander the Great)

## E-Infrastructure Challenges Towards 2020

René Buch, CEO NORDUnet

# NORDUnet

Nordic Infrastructure for Research & Education