

Data, computing and net – in the service of research

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Danish e-Infrastructure Cooperation (www.deic.dk)

Content

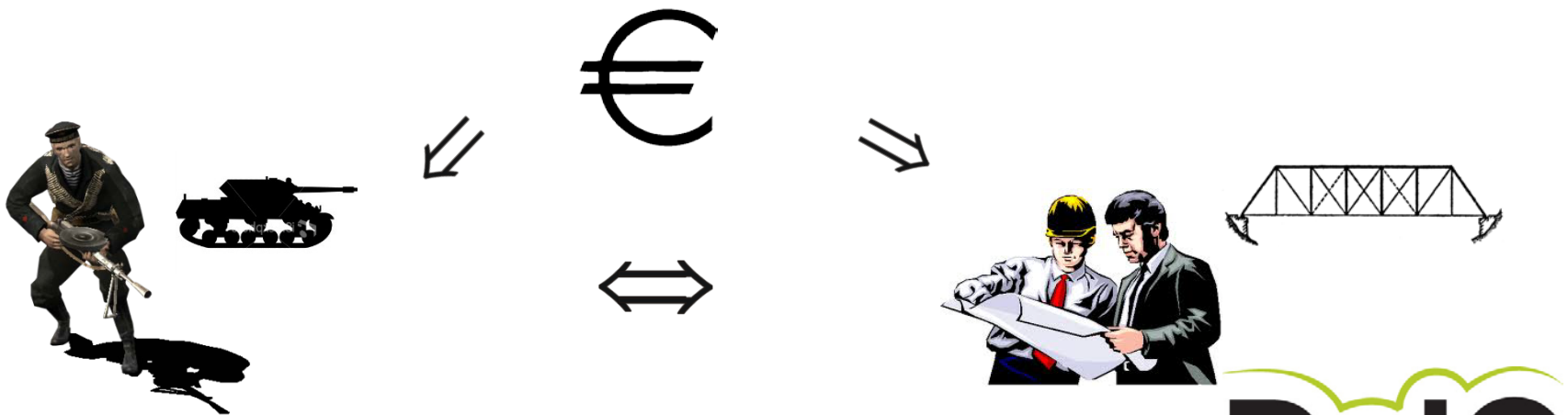
- e-Infrastructures – Raison d'être
- Organisation & funding
- e-Infrastructure support type, target actors, costs and interests
- Cooperation level
- Nordic cooperation – some concussions

e-Infrastructures – *Raison d'être*

Infrastructure has a right to exist only at the will and mercy of its usage.

Hence, main focus must be the control (organisational and funding) relationship between:

- Infrastructure users
- Infrastructure providers
- Infrastructure funders



e-Infrastructures – What is it?

Digital computing infrastructure that enables e-science; which currently can be approximated to:

- High Speed, High capacity, High QoS Data Network Infrastructure
- Distributed Infrastructure Operations
- High Performance Computing (HPC) Infrastructure
- Data Storage Infrastructure
- Security, Resource- and Identity Management

Case: Denmark – The Pendulum

From centralisation via decentralisation to centralisation, to ...

High Performance Computing (HPC)

< 2001: Centralised HPC organisation (UNI-C) ==>

- Little university engagement; little user influence.
- All funding to computer centre; investment decisions centralised.
- Focus on support, add-ons and overheads; i.e. vs. HPC cycles.

2001 - 2011: Danish Centre for Scientific Computing

(DCSC) established ==>

- University/Ministry consortium and co-funding agreement.
- Funding to researchers, investing in university facilities
- Focus on hardware vs. HPC R&D & user support

>2012: DeIC established ==> Centralisation

Data Networking

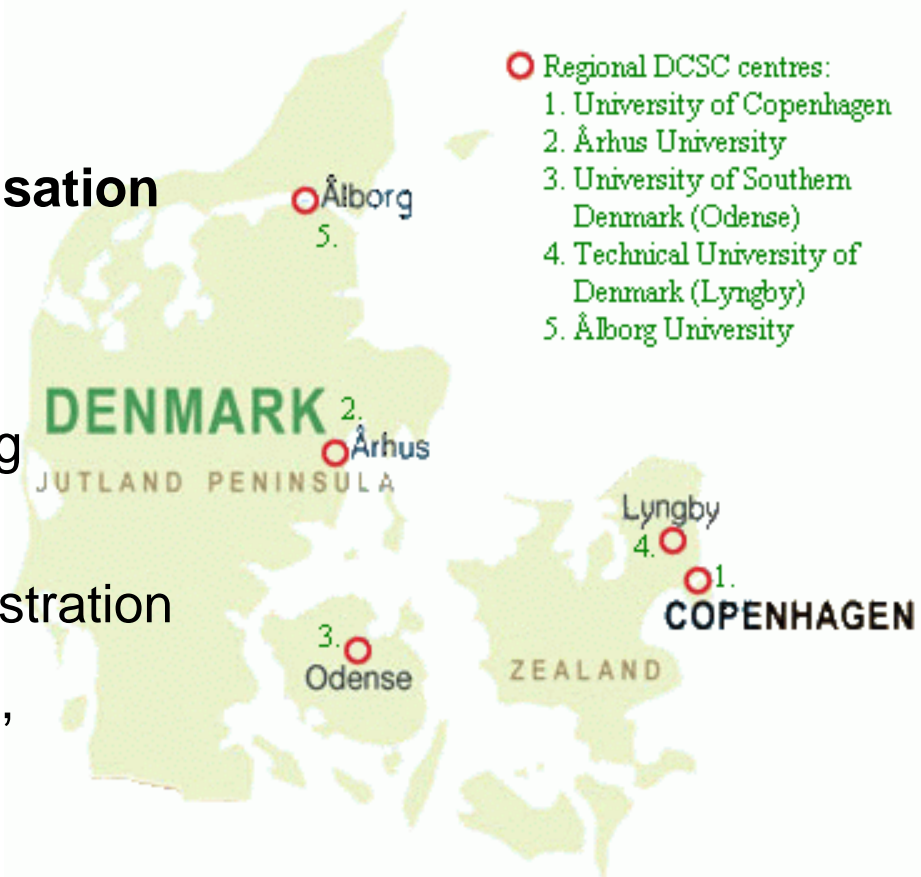
- **< 2001: Centralised driven and funded**

- **> 2010: Decentralized funding (100% university funded)**

High Performance Computing (HPC) within Danish e-Infrastructure Cooperation (DeiC): Organisation Specifics

National and decentralised organisation of HPC resources in Denmark

- University/ministry partnership
- 5 decentralised regional operating centres
- 1 centralised coordinating administration
- Board members from universities, abroad and industry



Changes in funding structure and extent

E.g. Centralized HPC funding model changed since year 2000; from centralized to shared cost coverage by ministry (50% covering hardware) and universities (50%, covering operations), to current renegotiating “new deal”.



**We note structural e-Infrastructure trends:
Consumption vs. Spécialisation & Infrastructure vs. Instrument &
International vs. Local**

Infrastructure – Consumption – International

E.g. general purpose computing clusters;
general purpose (slow) storage; Research Networks



vs.

Instrument – Specialisation – Local

E.g. specialised HPC and storage architectures; bandwidth
on demand (typically controlled by big R&D communities
e.g. within ESFRI).

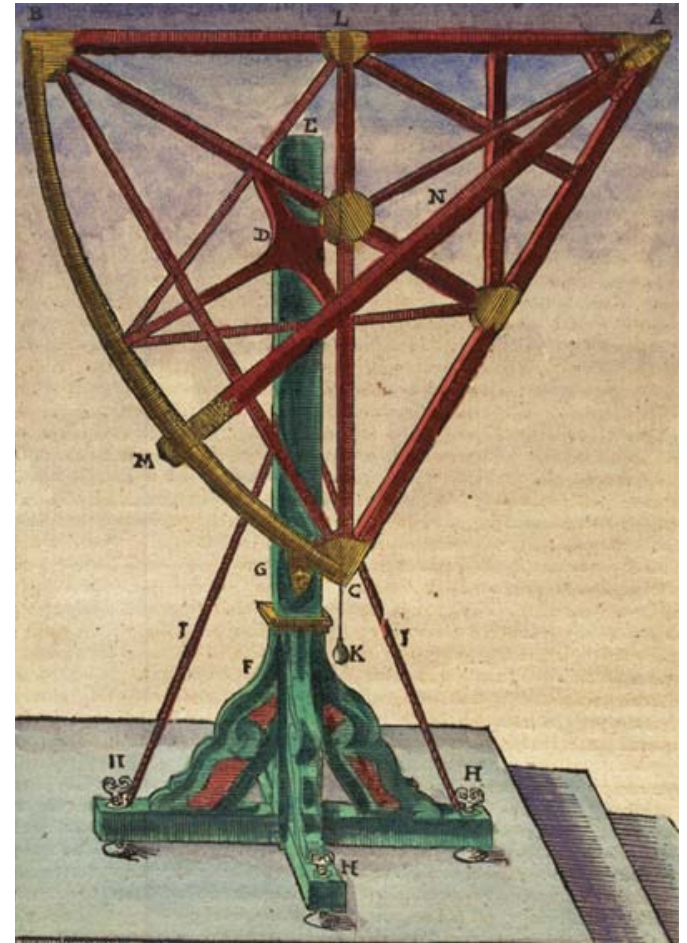


Structural e-Infrastructure trends

Specialisation: From infrastructure to instrument

Some researchers need:

- to build specialised e-Infrastructure
- to have instrument-proximity
- to have full control (root password, complete middleware and software dictatorship)
- To “own” the system administrator



Structural e-Infrastructure trends

Consumption: From instrument to infrastructure


Other researchers need:

- to just compute or store data...
Anywhere, cloud, abroad
wherever on whatever, as long as
it works, and is affordable
- to have a nice GUI; no voodoo,
command line scripts
- to have no hassle with a local
system administrator or computer
centre boss



National e-Infrastructure Provision

Mapping e-Infrastructure support type, target actors, costs sharing and the implied interests

	Advanced (Instrument)	Trivial (e-Infrastructure)	Computing (Net, HPC, Storage, Cloud ...)
Campus-IT (Department-IT) Computer Centers			
Researchers			
Deans and Department Heads			
Campus IT			
Rectors			

Approaching the right challenges at the right level:

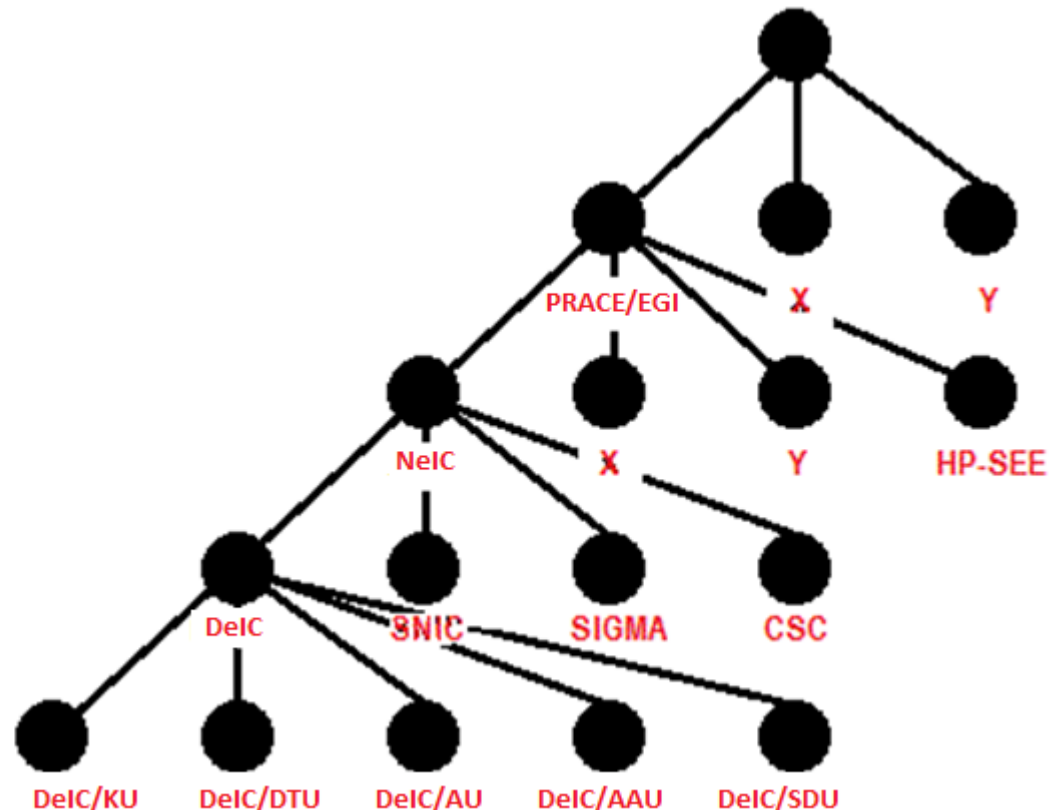
International

European

Nordic

Danish national

Danish regional



Nordic e-Infrastructure Collaboration (NeIC & NORDUnet)

- The merits of an Intermediate consolidating cooperation layer, between the national and European level
 - NeIC is a collaboration between the Nordic countries to facilitate good e-Infrastructure, i.e. data storage, high performance computing and networking, security, resource and identity management etc.
 - NORDUnet is likewise collaboration, within Networking.
- Pending task and organisational agenda

E.g.. Joint Infrastructure: Nordic-HPC



Hardware @ commercial host, abroad

Model	HP BI280cG6 Servers
CPU	Intel Xeon E5649 (2.53GHz) - Westmere -EP
Memory	24GB / Node
Disk	250GB / Node
Total Number of Nodes	288
Total Number of CPU / Node	2
Number of Cores / CPU	6
Total Number of Cores in all Nodes	3456
Total Number of teraflops in all Compute Nodes	35TFlops
Storage System	X9320 Network Storage System with IBRIX Fusion Software
Total storage Capacity	71.6TByte
Interconnect	Infiniband QDR



3.456 “green” Cores
with very low operations costs



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Danish e-Infrastructure Cooperation



Cost Efficiency and Environmental Protection - Do we need it?

HIGH PERFORMANCE COMPUTING
A FILTHY POLLUTING BUSINESS?

Should we possibly do something green to save our image, if not the planet

?

Competence spin off vs. Competence frog leaps



Q: How can National e-Infrastructures best Facilitate eScience?

A1: By providing scalable; standardised/specialised; cheap (remote) operations:

- High Speed, High capacity, High QoS Data Network Infrastructure
- Distributed Infrastructure Operations
- High Performance Computing Infrastructure
- Data Storage Infrastructure
- Security, resource and identity management

... which is useful, effective and affordable only to the extent to which the research “*infantry*” and research “*engineers*” cooperate well, in a world of absent or weak Darwinism

A2: ... and when doing so, by focusing on

- Policy and organization, and funding;
- Quality technology