# **Nordic Networks**

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## Who are they?

#### The Nordic national networks for research and education

- Forskningsnet in Denmark
- FUNET in Finland
- RHnet in Iceland
- UNINETT in Norway
- SUNET in Sweden

together own and control the international network

NORDUnet

for their international service provision

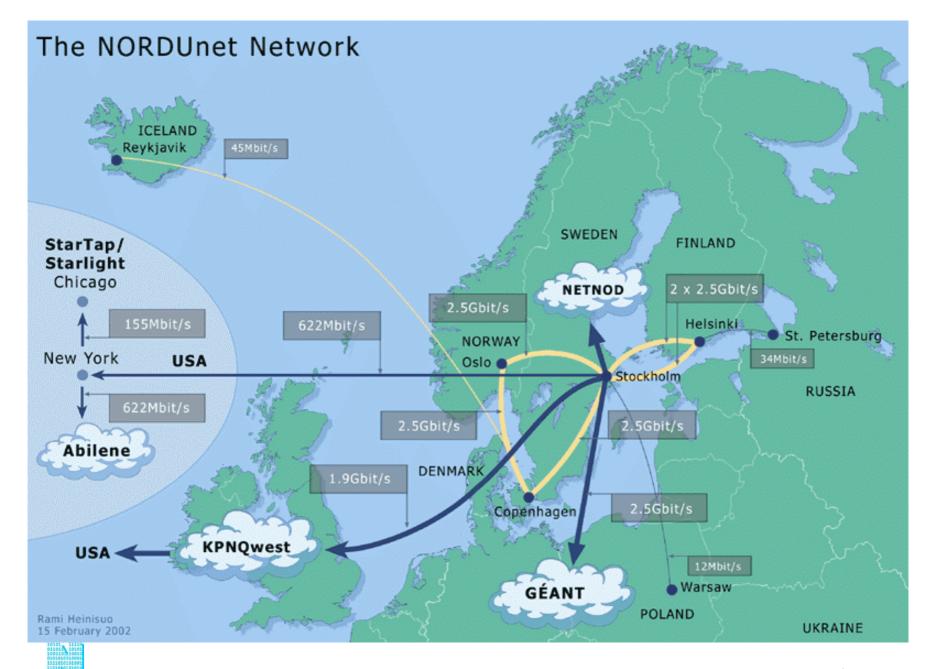


## **Last slide from 2000 report**

- Plan for next year
  - Set up a Nordic 2.5G structure as the physical basis for the Nordic collaboration
  - Create and connect to a 2.5G European backbone (Géant)
  - Consolidate USA connections into possibly 2.5G, with assured bandwidth for the research traffic

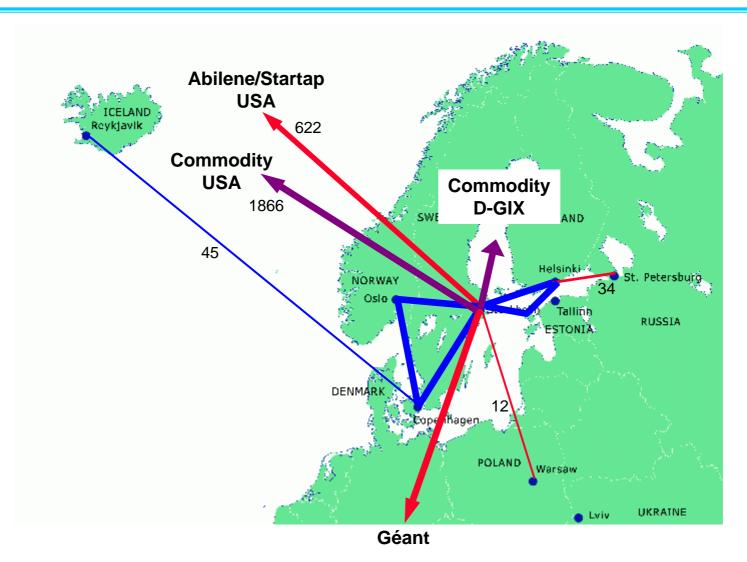
2002 follow up ......





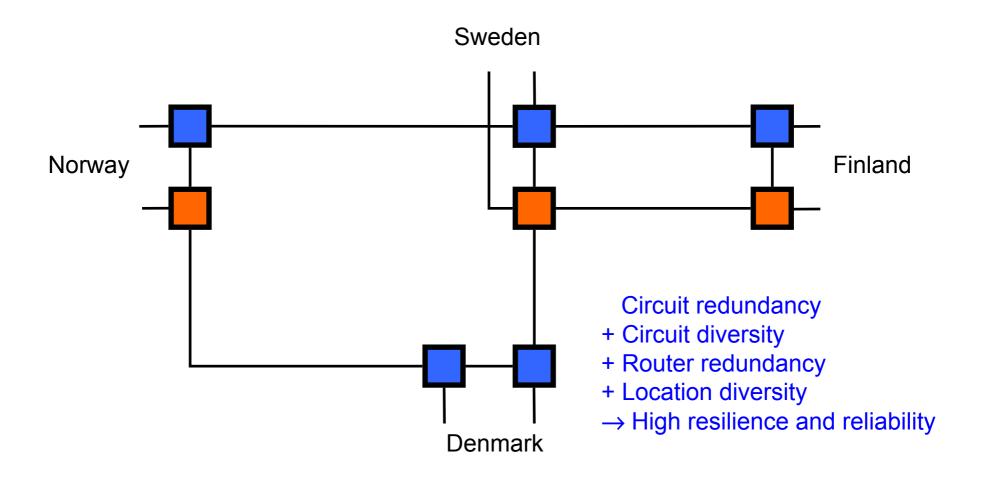
**NORDUnet** 

### **NORDUnet 2002**



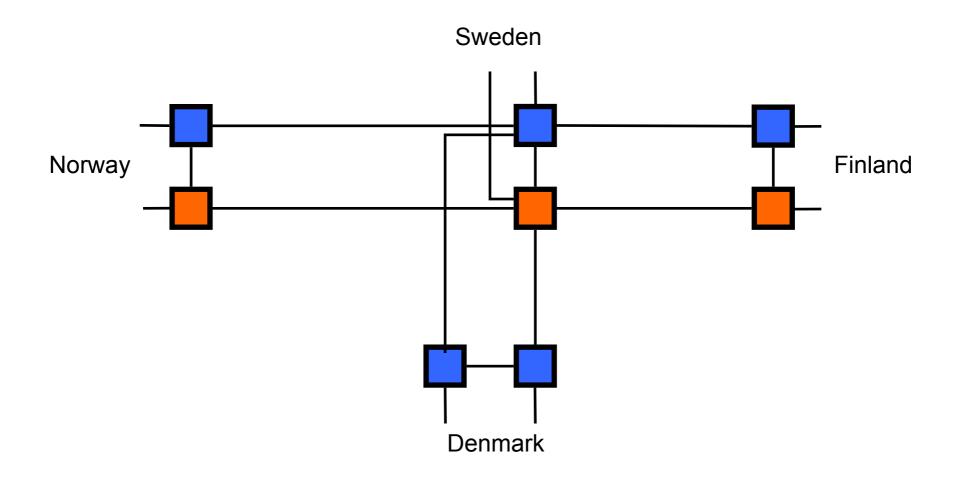


## **Central Nordic 2.5G system**



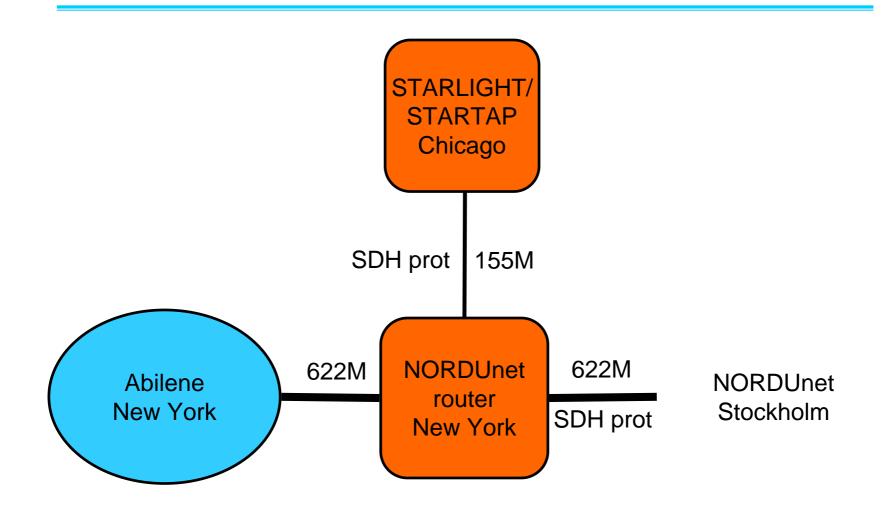


# **Central Nordic 5G system**





## **USA** research connectivity





## **USA system revision 2001**

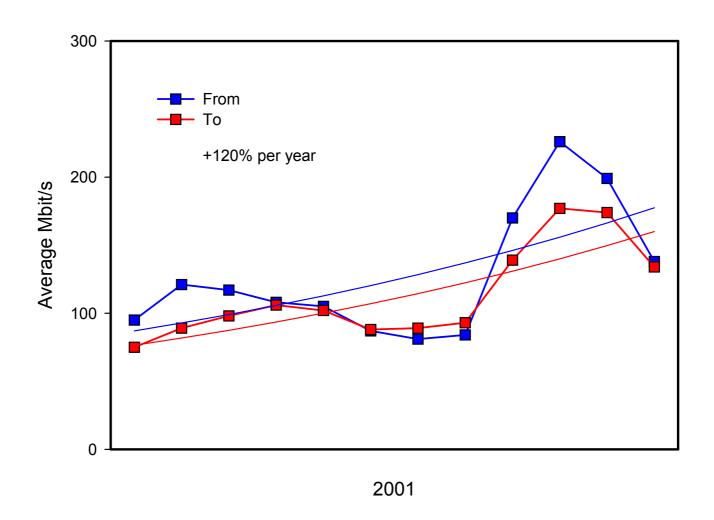
- System at begin 2001
  - 3 direct STM-1 to New York
  - 6 STM-1 ports in Stockholm
  - 2 providers
  - Cost about 800 KEUR/month
- Tender at begin 2001 showed
  - Cost for twice the capacity is less than one half
  - Local connection to commodity IP provider cheaper than connection in USA
  - Dedicated bandwidth for research link (0.66)
  - Commodity provision from Stockholm (1.96)
- Marketplace very dynamic
  - 3 of the tendering providers experienced economic problems since the tender



## Nordic 6NET - 155M backbone

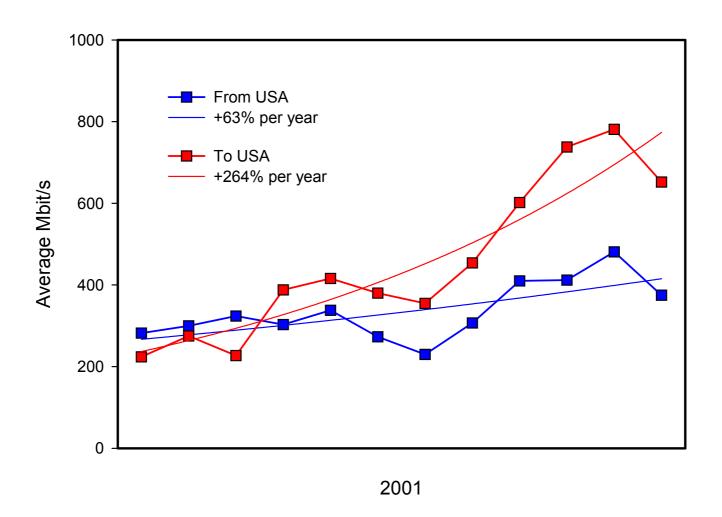


## **Research traffic with EU and USA**



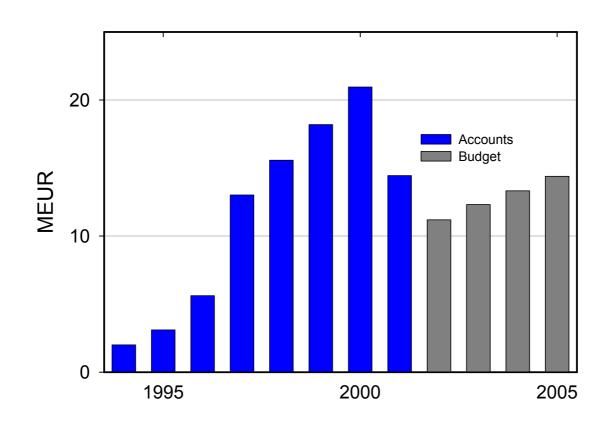


# **Commodity traffic (USA)**



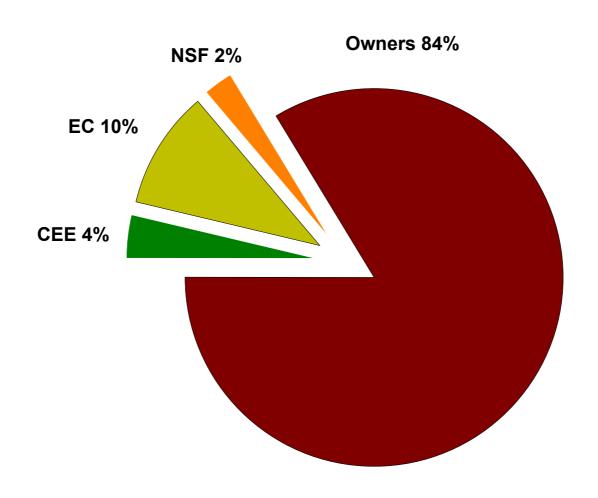


## **Cost of NORDUnet**





## **Income distribution 2001**





## **Non Nordic support**

• GÉANT

EC pays 50% of the connection to GÉANT (but no EC support to the NORDUnet backbone)

6NET

EC pays 50% of Nordic part of 6NET backbone

EUROlink

NSF pays 35% of the connection to USA research networks



#### **Evaluations**

Nordic funding authorities:

A general auditing of NORDUnet's operation renewed the funding authorities' understanding of the value of NORDUnet.

Danish independent consultants:

NORDUnet provides relevant services and is a valuable asset for Denmark, but Denmark uses it too little

Nordunet2 evaluators:

NORDUnet should carry out more network research



#### **Nordic NRENs**

- DK Forskningsnet
  - 622M since 2000
  - Digital video activities
  - In 6NET
- FI FUNET
  - 2.5G since 2001
  - now upgrading accesses to 2\*622M
  - FUNET-TV multicasts Parliamentary sessions
  - Electronic identification in higher education project
  - In 6NET
- IS RHnet
  - New organisation and network in 2001
  - 16 backbone in Reykjavik
  - Akureyri connected over fibre in 2002
  - 90% institution funded



## **Nordic NRENs (cont)**

#### NO - UNINETT

- "The history of Internet in Norway"
- Community owned fibre networks to schools
- Wireless campus networks
- AAA technology with universities and colleges
- Multimedia technology transfer
- IPv6 (6NET and 6BONE)

#### SE - SUNET

- GigaSunet 10G Backbone
- ftp.sunet.se connected at 2.5G
- Swedish "Net university"



# **Capacity**

		Backbone Gbit/s	Site Mbit/s
DK	Forskningsnet	0.6-1	200
FI	FUNET	2.5	155-622
IS	RHnet	1.0	1000
NO	UNINETT	0.15-2.5	155-2488
SE	Sunet	0.6-10	155-2488



## **Size and cost**

		Institutions	Users	MEUR per year
DK	Forskningsnet	110	200,000	5.1
FI	FUNET	85	250,000	7.6
IS	RHnet	15	18,000	0.3
NO	UNINETT	283	250,000	11.5
SE	Sunet	80	300,000	15.0
	Sum	573	1010,000	39.5

Unit cost	69,000	39	EUR/year
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#### **Future**

- Evaluations have confirmed the strengths and the necessity of Nordic collaboration in NORDUnet
  - obtain critical mass
  - platform for international cooperation
  - maintain the Nordic standing
- but there are challenges
  - increased level of network development
  - coordination of NORDUnet's international services with the 50% EC supported GÉANT services

