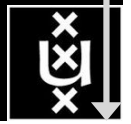
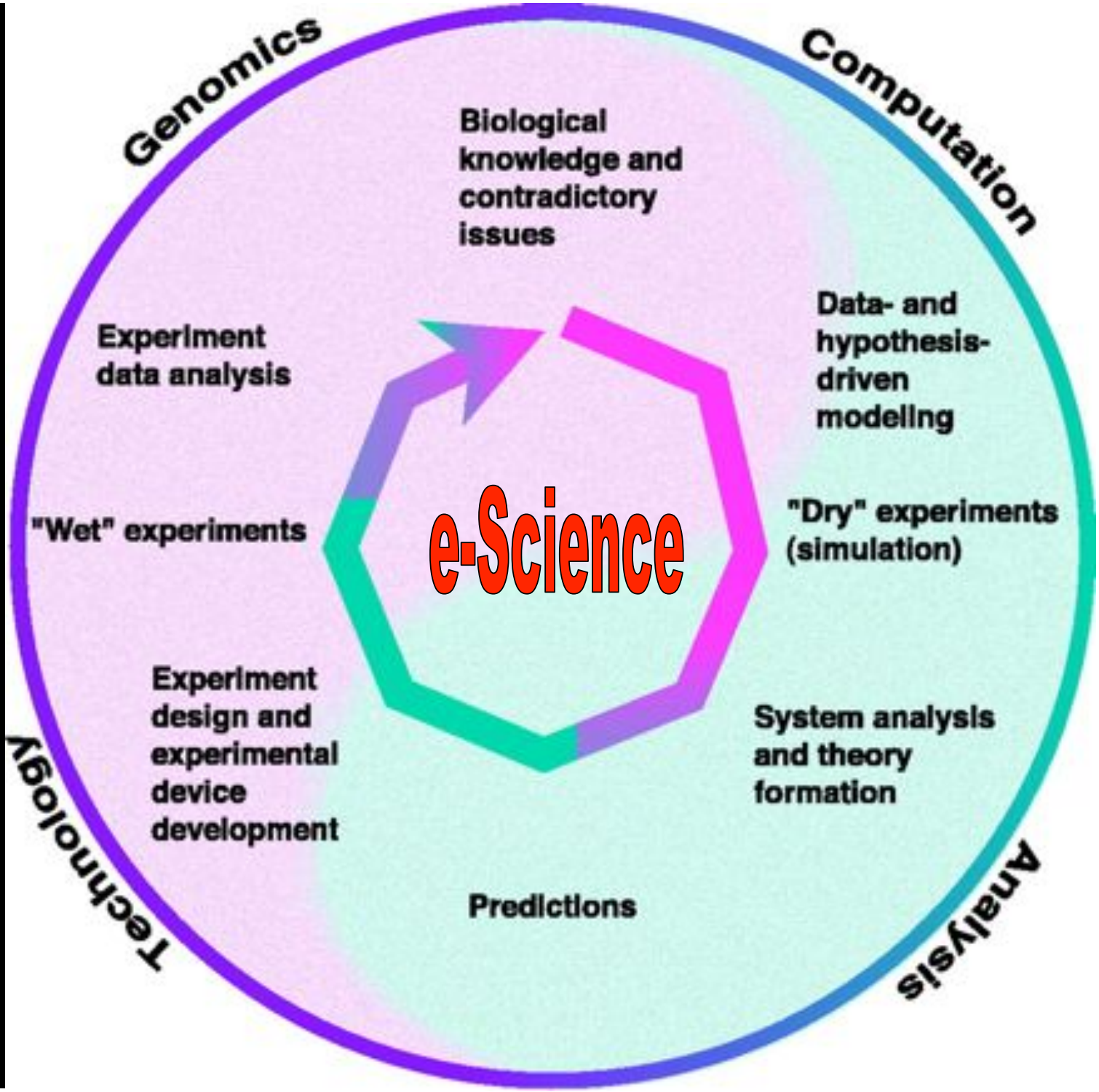
S(t)imulating eScience

Cees de Laat

University of Amsterdam

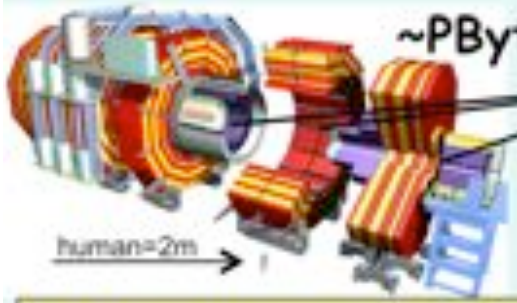


e-Science in operation



LHC Data Grid Hierarchy

CMS as example, Atlas is similar



~PByte/sec

Online System

~100 MBytes/sec

100000 flops/byte

event simulation

Tier 0 +1

HPSS

event reconstruction

CMS detector: 15m X 15m X 22m

12,500 tons, $700M.

~2.5 Gbits/sec

Tier 1

Italian Regional Center

German Regional Center

NIKHEF Dutch Regional Center

FermiLab, USA Regional Center

...

~0.6-2.5 Gbps

analysis

Tier2 Center

Tier 2

~0.6-2.5 Gbps

Tier 3

Institute ~0.25TIPS

Physics data cache

100 - 1000 Mbits/sec

Tier 4

Workstations

Courtesy Harvey Newman, CalTech and CERN

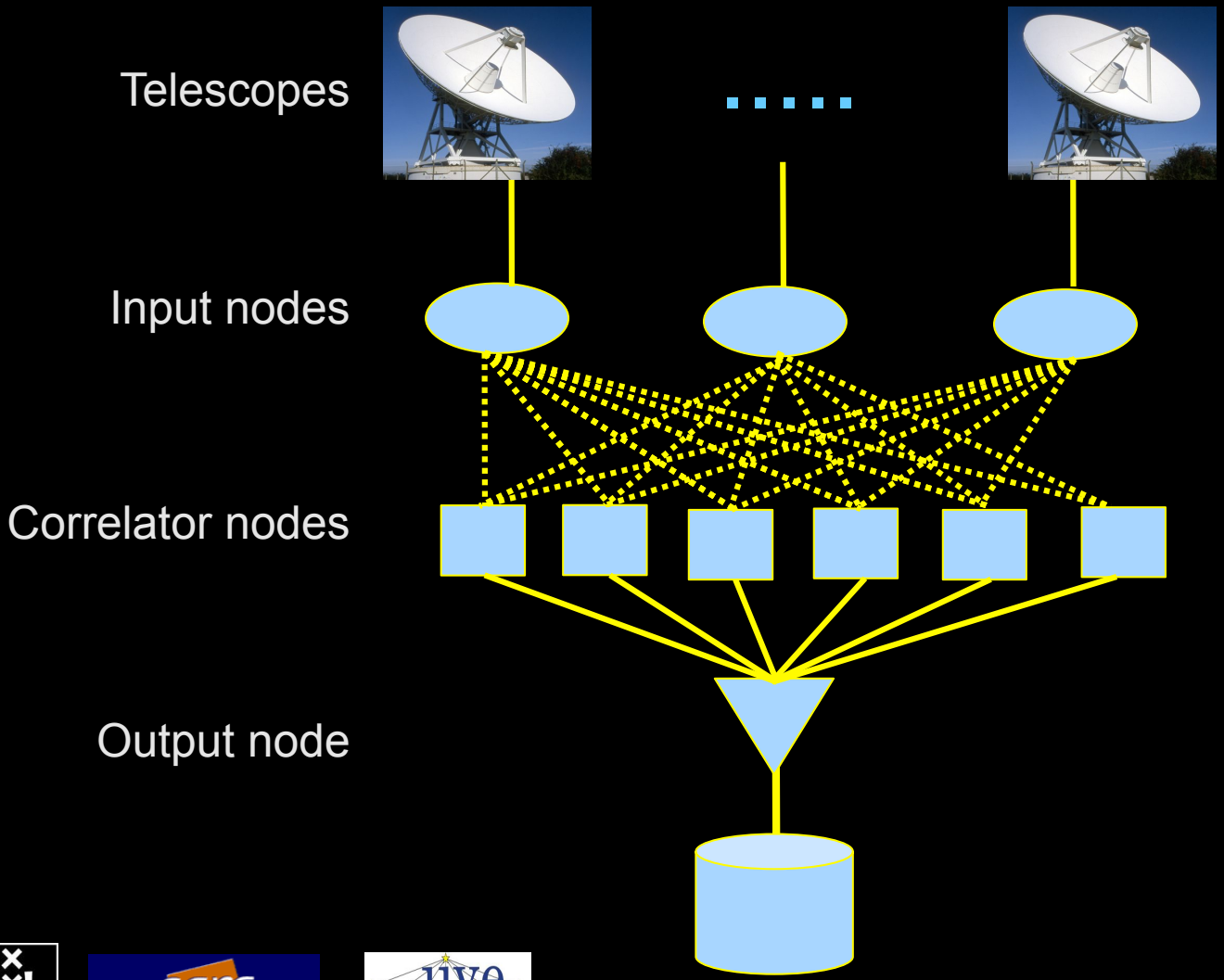
CERN/CMS data goes to 6-8 Tier 1 regional centers, and from each of these to 6-10 Tier 2 centers.

Physicists work on analysis "channels" at 135 institutes. Each institute has ~10 physicists working on one or more channels.

2000 physicists in 31 countries are involved in this 20-year experiment in which DOE is a major player.

The SCARIe project

SCARIe: a research project to create a Software Correlator for e-VLBI.
VLBI Correlation: signal processing technique to get high precision image from spatially distributed radio-telescope.



To equal the hardware correlator we need:

16 streams of 1Gbps

16 * 1Gbps of data

2 Tflops CPU power

2 TFlop / 16 Gbps =

1000 flops/byte

THIS IS A DATA FLOW PROBLEM !!!

sara Computing & Networking Services

jive JOINT INSTITUTE FOR VLBI IN EUROPE

The “Dead Cat” demo

1000000 flops/byte

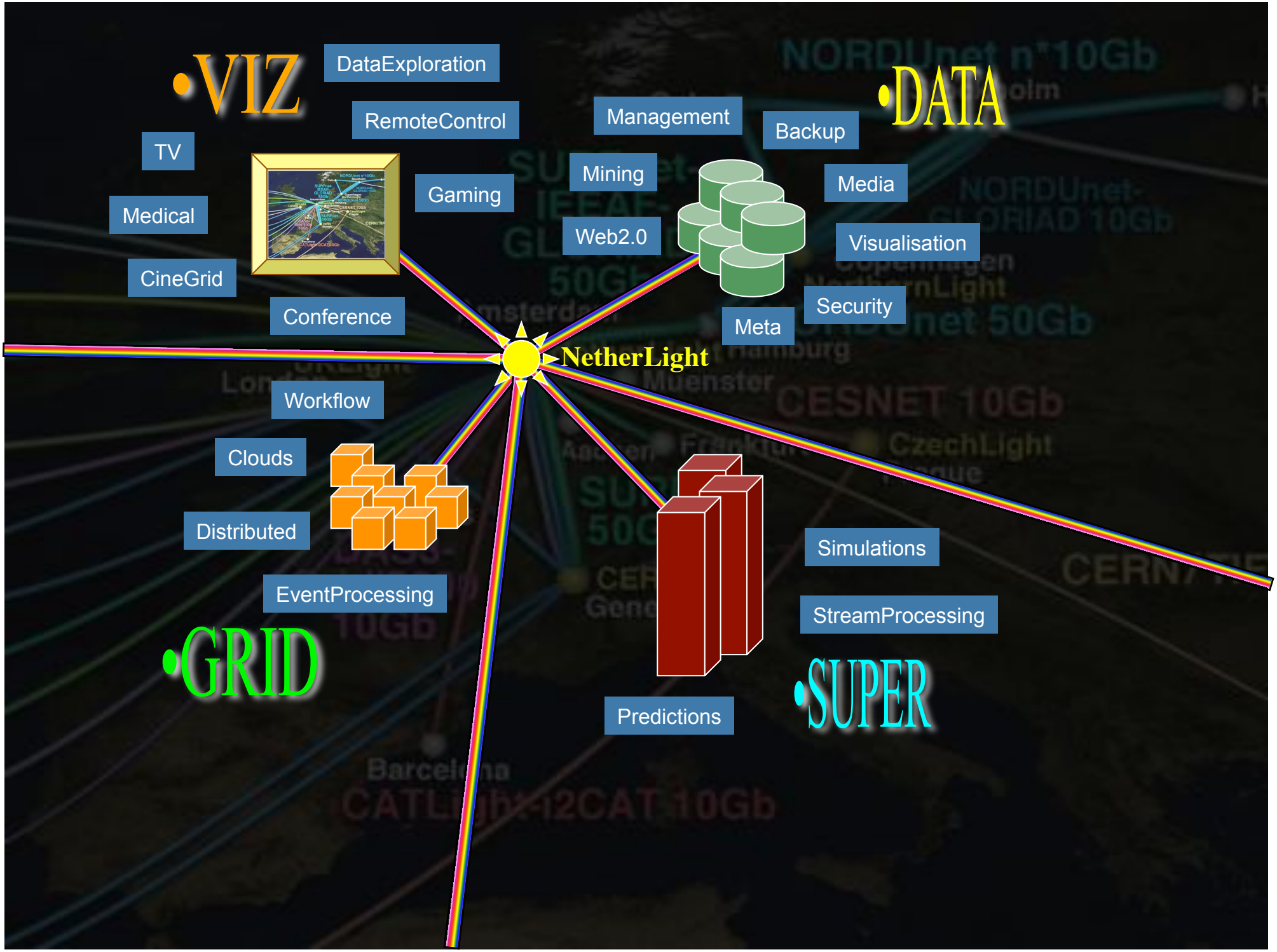
SC2004,
Pittsburgh,
Nov. 6 to 12, 2004
iGrid2005,
San Diego,
sept. 2005

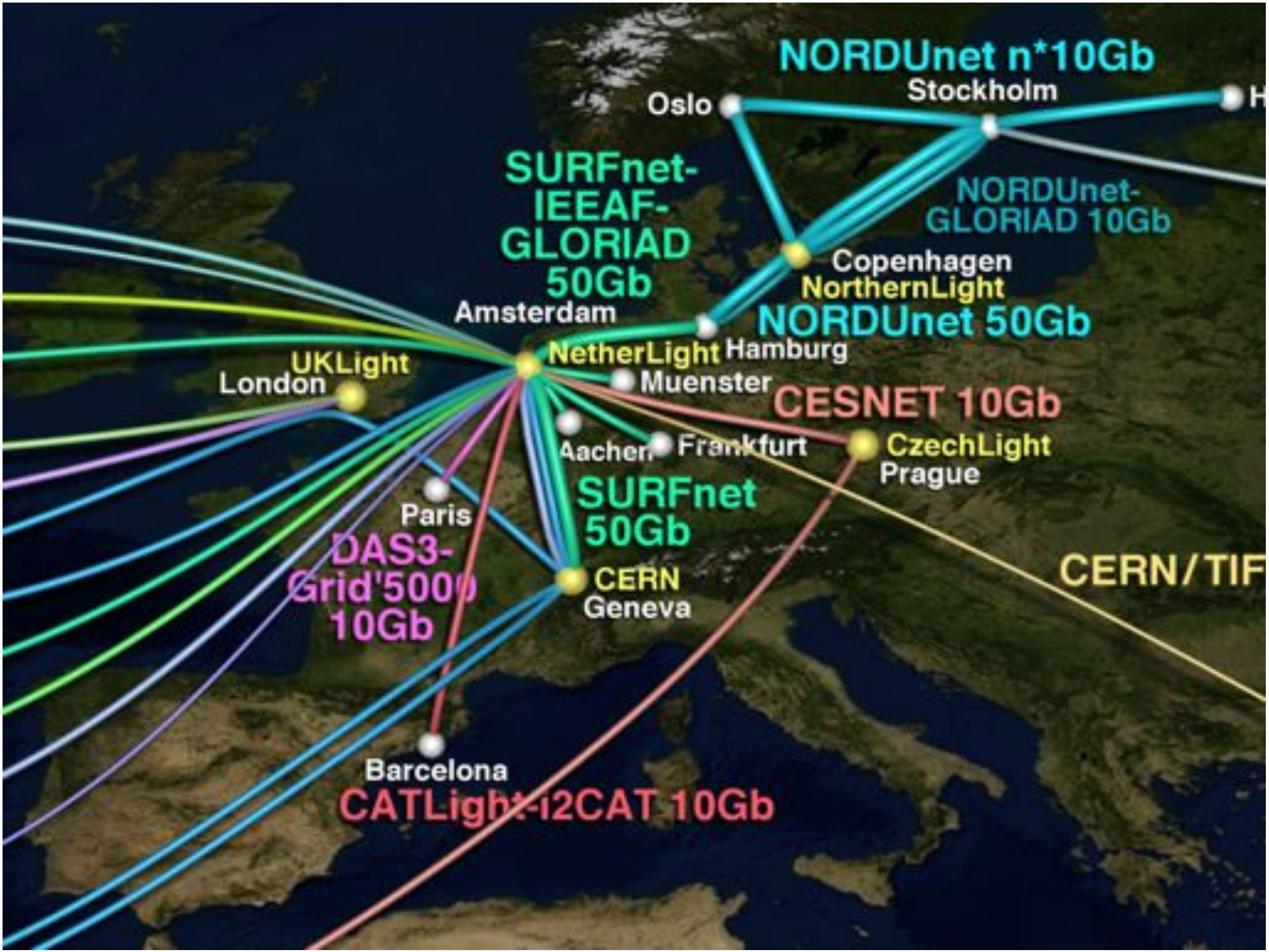
Many thanks to:
AMC
SARA
GigaPort
UvA/AIR
Silicon Graphics, Inc.
Zoölogisch Museum

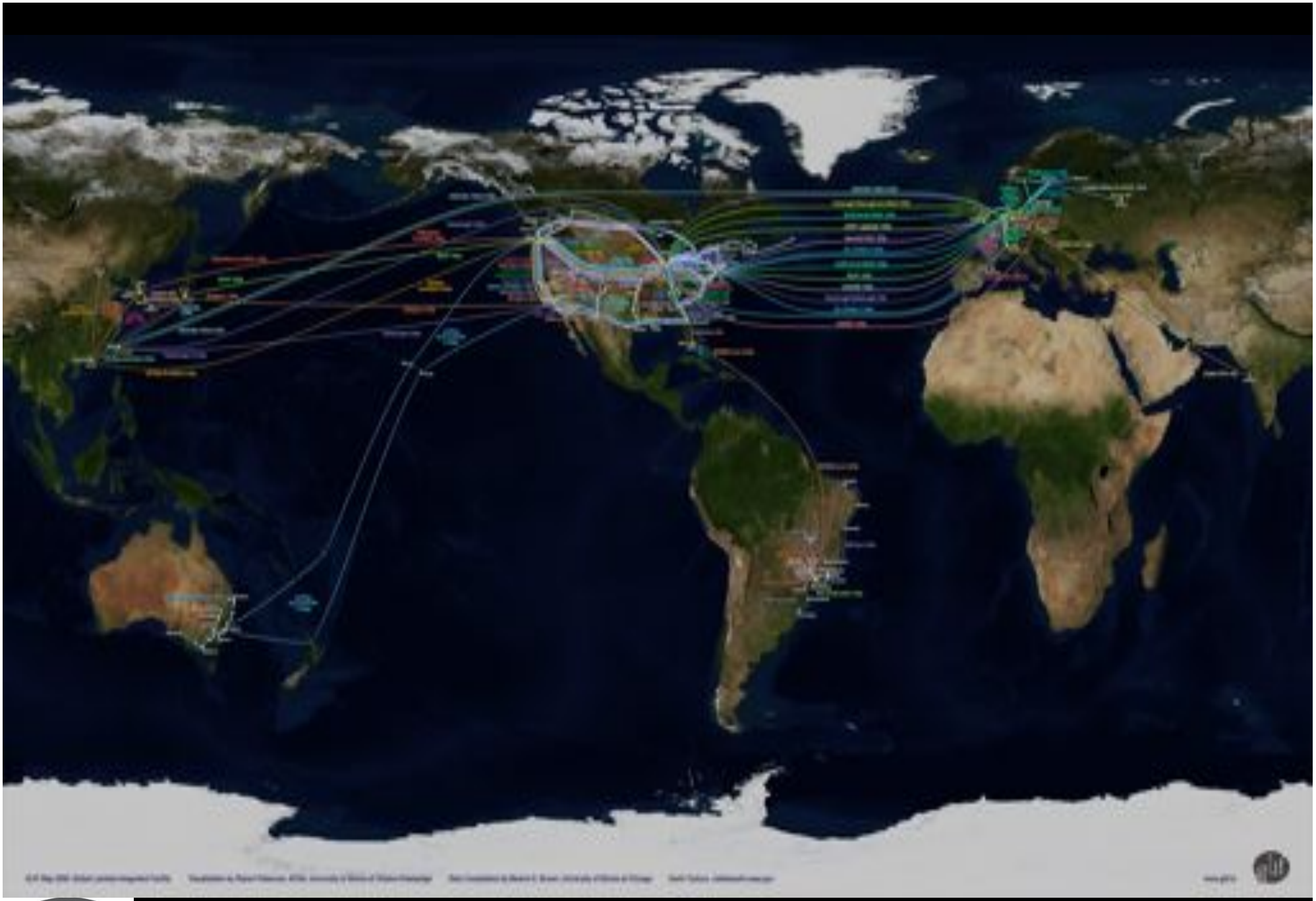
M. Scarpa, R.G. Belleman, P.M.A. Sloot and C.T.A.M. de Laat, "Highly Interactive Distributed Visualization", iGrid2005 special issue, Future Generation Computer Systems, volume 22 issue 8, pp. 896-900 (2006).

US and International OptIPortal Sites

Real time, multiple 10 Gb/s

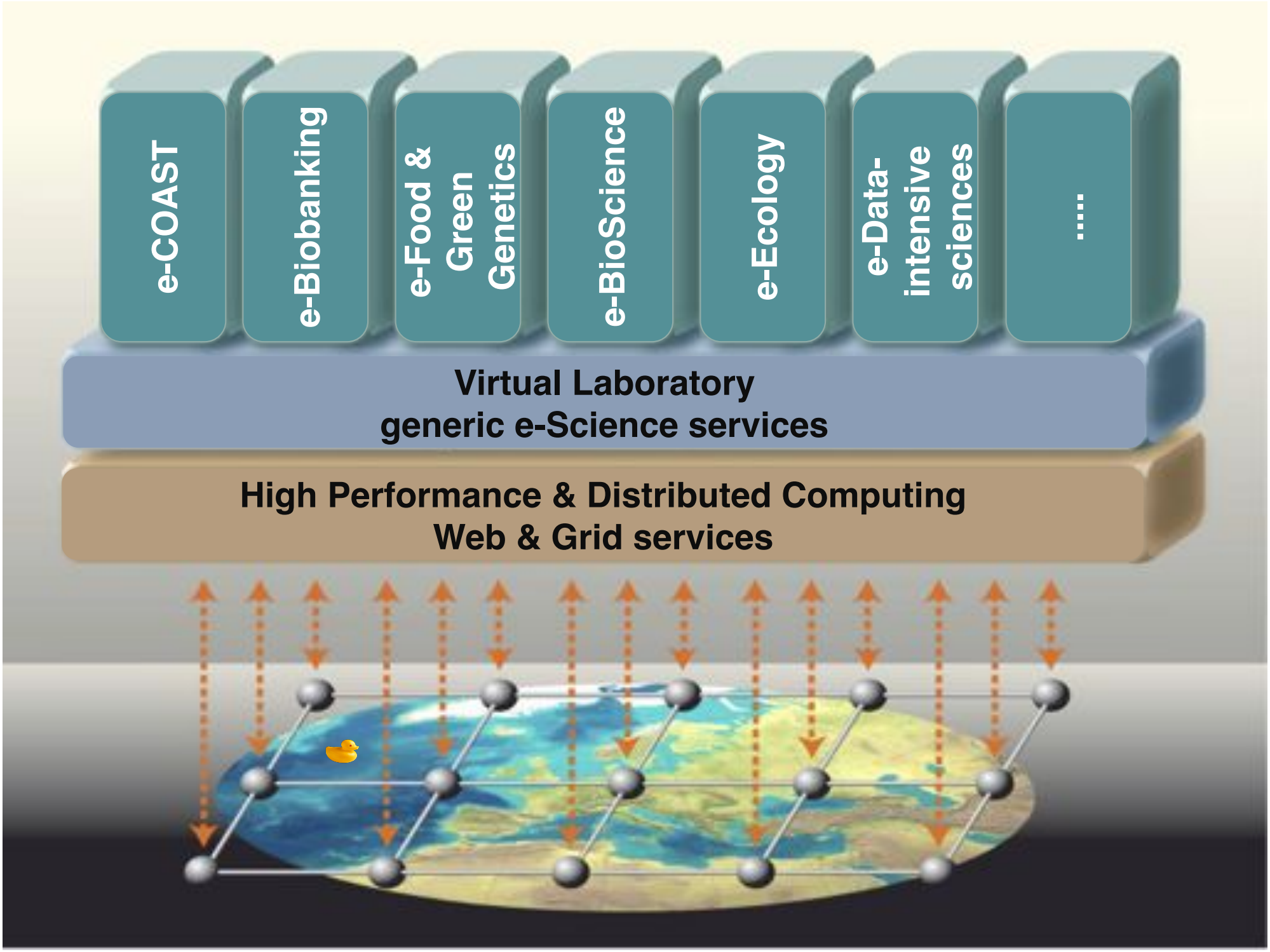

•VIZ
DataExploration
RemoteControl
TV
Medical
CineGrid
Conference
Gaming
•DATA
Management
Backup
Mining
Media
Web2.0
Visualisation
Security
Meta
NetherLight
Workflow
Clouds
Distributed
EventProcessing
•GRID
Simulations
StreamProcessing
Predictions
•SUPER

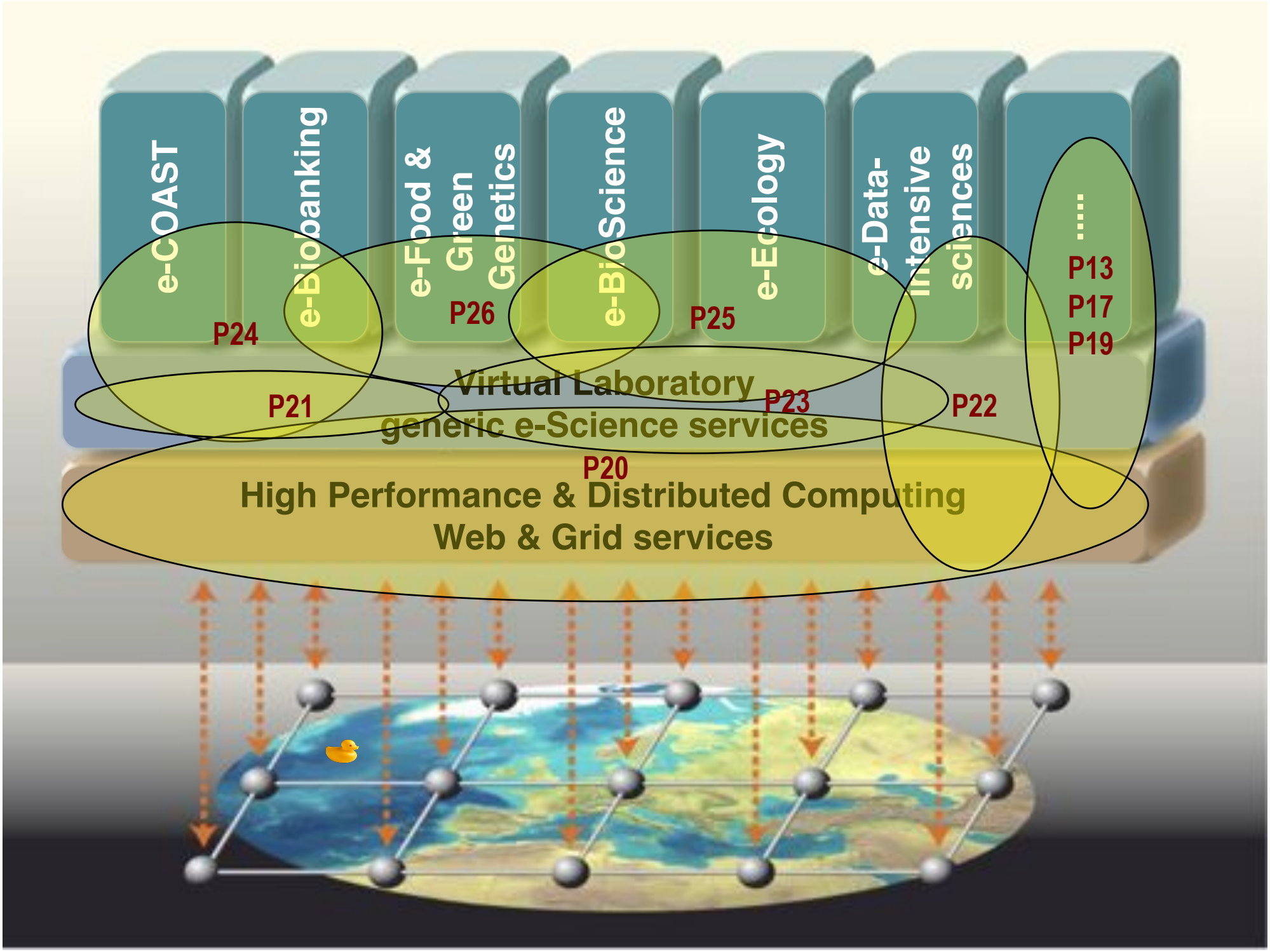

NORDUnet n*10Gb
Oslo
Stockholm
SURFnet-
IEEAF-
GLORIAD
50Gb
NORDUnet-
GLORIAD 10Gb
Copenhagen
NorthernLight
NORDUnet 50Gb
Amsterdam
NetherLight
Hamburg
UKLight
London
Muenster
CESNET 10Gb
Aachen
Frankfurt
CzechLight
Prague
SURFnet
50Gb
Paris
DAS3-
Grid'5000
10Gb
CERN
Geneva
CERN/TIF
Barcelona
CATLight-i2CAT 10Gb

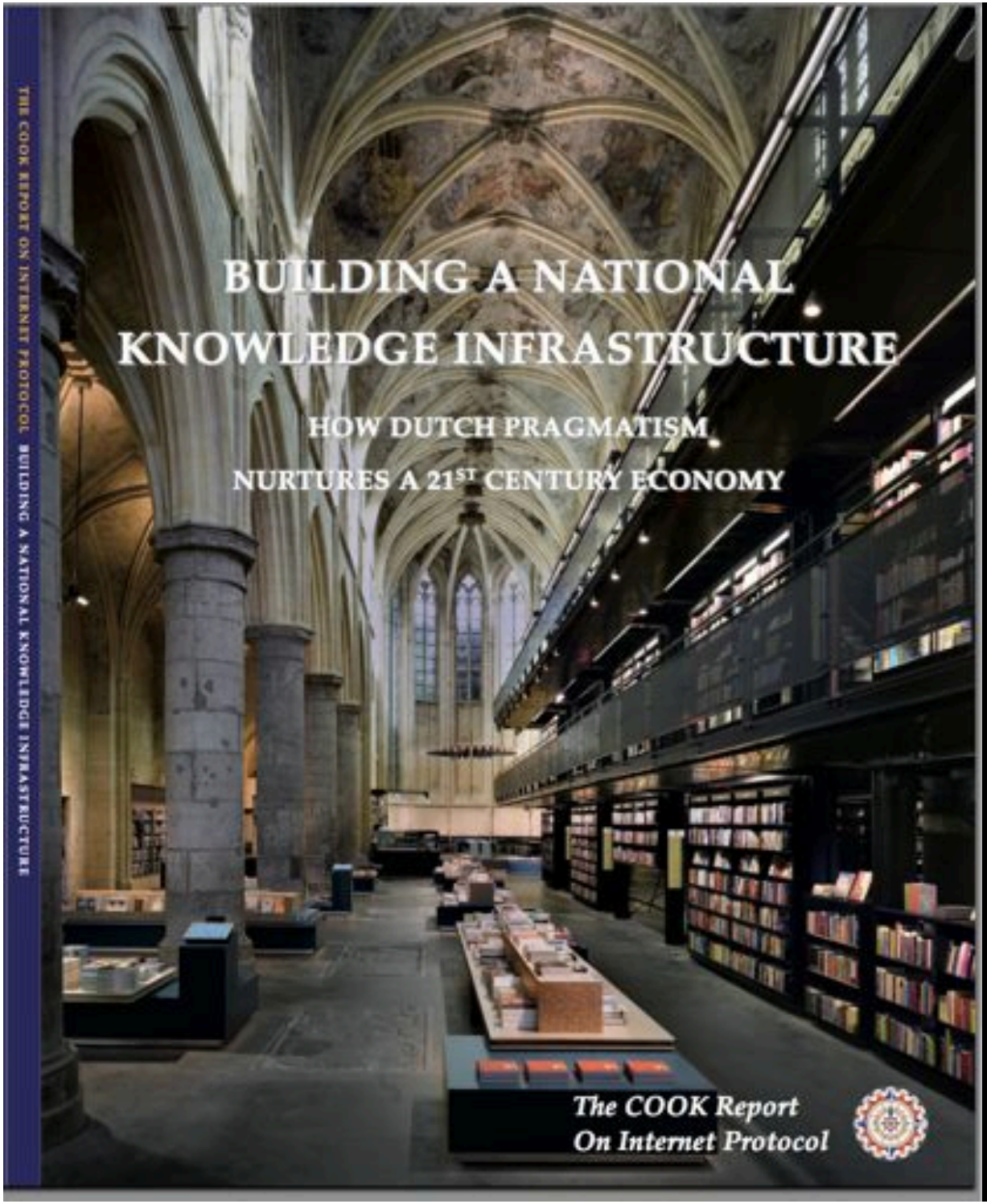


GLIF 2008

Visualization courtesy of Bob Patterson, NCSA
Data collection by Maxine Brown.


e-COAST
e-Biobanking
e-Food & Green Genetics
e-BioScience
e-Ecology
e-Data-intensive sciences
.....
Virtual Laboratory
generic e-Science services
High Performance & Distributed Computing
Web & Grid services


e-COAST
e-Biobanking
e-Food & Green Genetics
e-BioScience
e-Ecology
e-Data-intensive sciences
.....
P13
P17
P19
P24
P26
P25
P21
P23
P22
P20
Virtual Laboratory
generic e-Science services
High Performance & Distributed Computing
Web & Grid services



CookReport
feb 2009 and feb-mar 2010
nov '08 interview with
Kees Neggers (SURFnet), Cees de Laat (UvA)
and furthermore nov '09 Wim Liebrandt (SURF), Bob Hertzberger (UvA) and Hans Dijkman (UvA)

BSIK projects
GigaPort &
VL-e / e-Science

cookreport.com