Kwaliteit in een virtuele wereld

Prof. dr. ir. Cees de Laat

Donderdag 27 januari 2011

Virtuele Laboratoria

voor 2000

Internet

na 2000

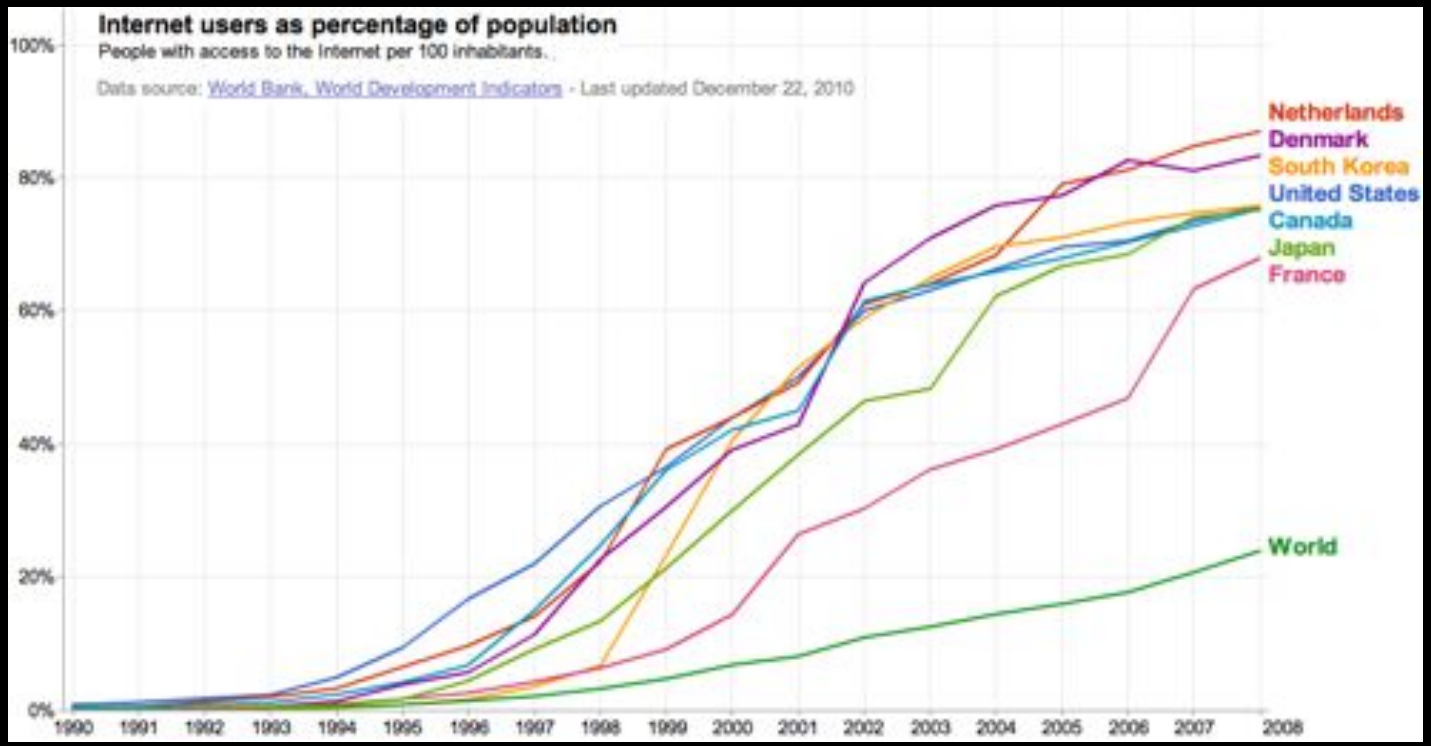
Internet

Internet

From a network experiment that never ended (Vint Cerf)

- 1974: for the first time the word **internet** (*RFC 675 - Specification of Internet Transmission Control Program) [note -> Open process!]*
- 1981: the **TCP/IP** standard was ready to be adopted (*RFC 791,792,793*)

To a network for society

- 1989: WWW was born
- 

- Jan 2011 → IANA IPv4 address space depleted! →

Internet is miljarden business!

Google	197
Amazon	83
Facebook	50
BAIDU	37
eBay	36
Yahoo	22
PriceLine	21
SalesForce	18
F5 Networks	11
CheckPoint	9
NetFlix	9
Expedia	7

guardian.co.uk Monday 3 January 2011

News | Sport | Comment | Culture | Business | Money | Life & style

News › Technology › Facebook

Facebook's value swells to $50bn after Goldman Sachs investment

Deal underlines Facebook's power and fuels rumours that Mark Zuckerberg is preparing a stock market flotation

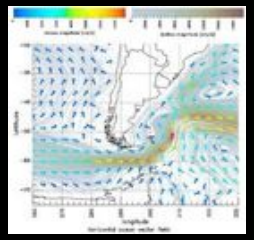
Vgl: Exxon Mobil 368

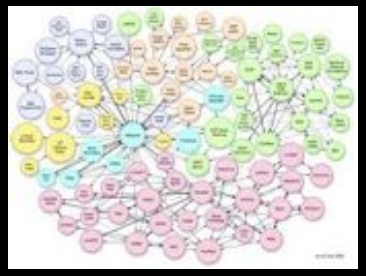
Apple Inc. 314

1 miljard in 100$ biljetten

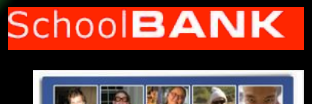
Internet ontwikkelingen

... more data!





... more realtime!



... more users!

Internet ontwikkelingen

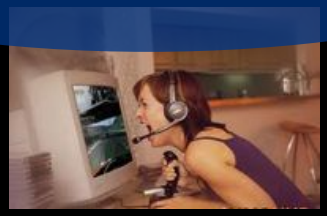
... more data!

Snelheid

Volume

Deterministisch

Real-time



... more realtime!

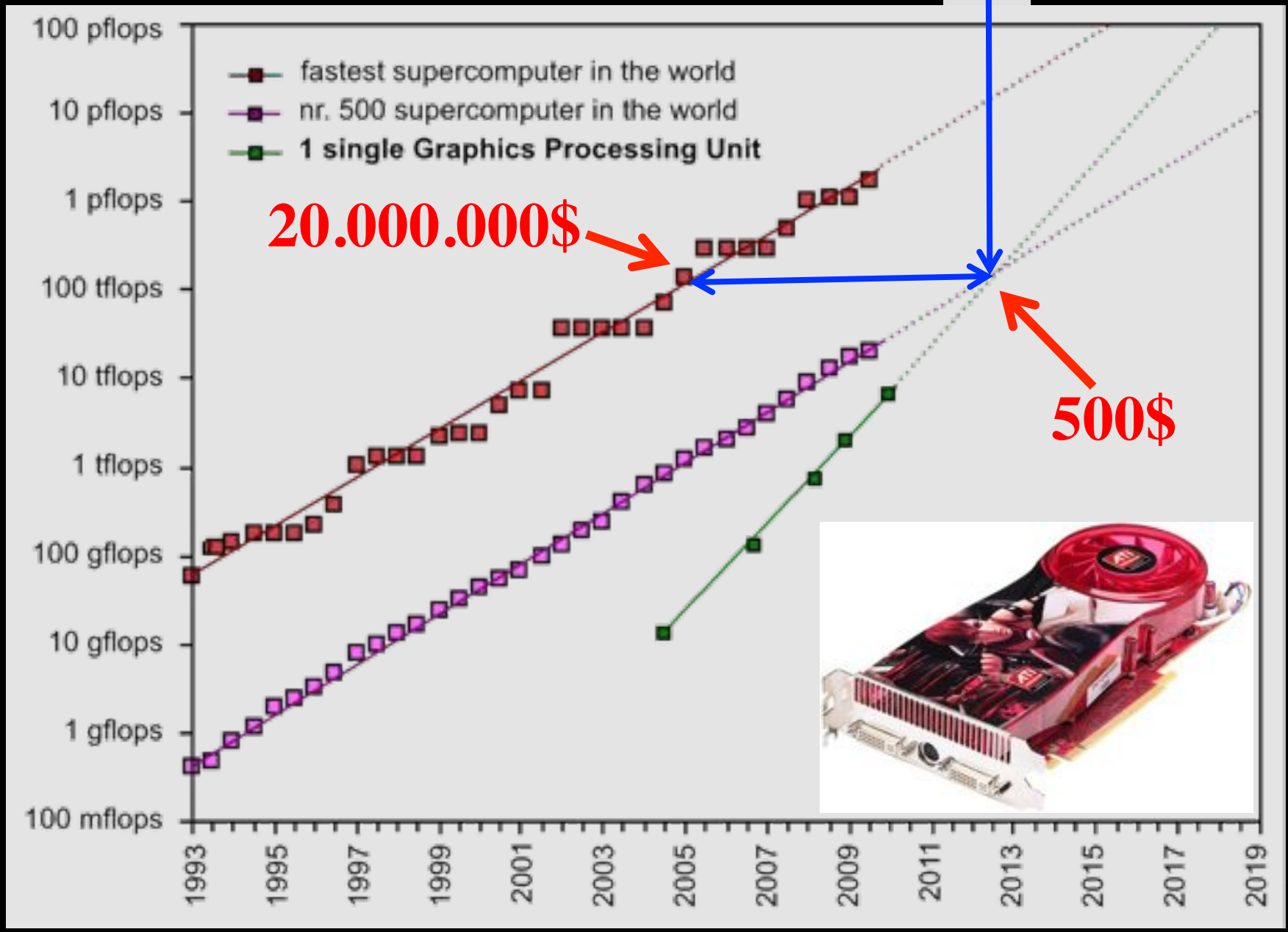
Schaalbaar

Veiligheid

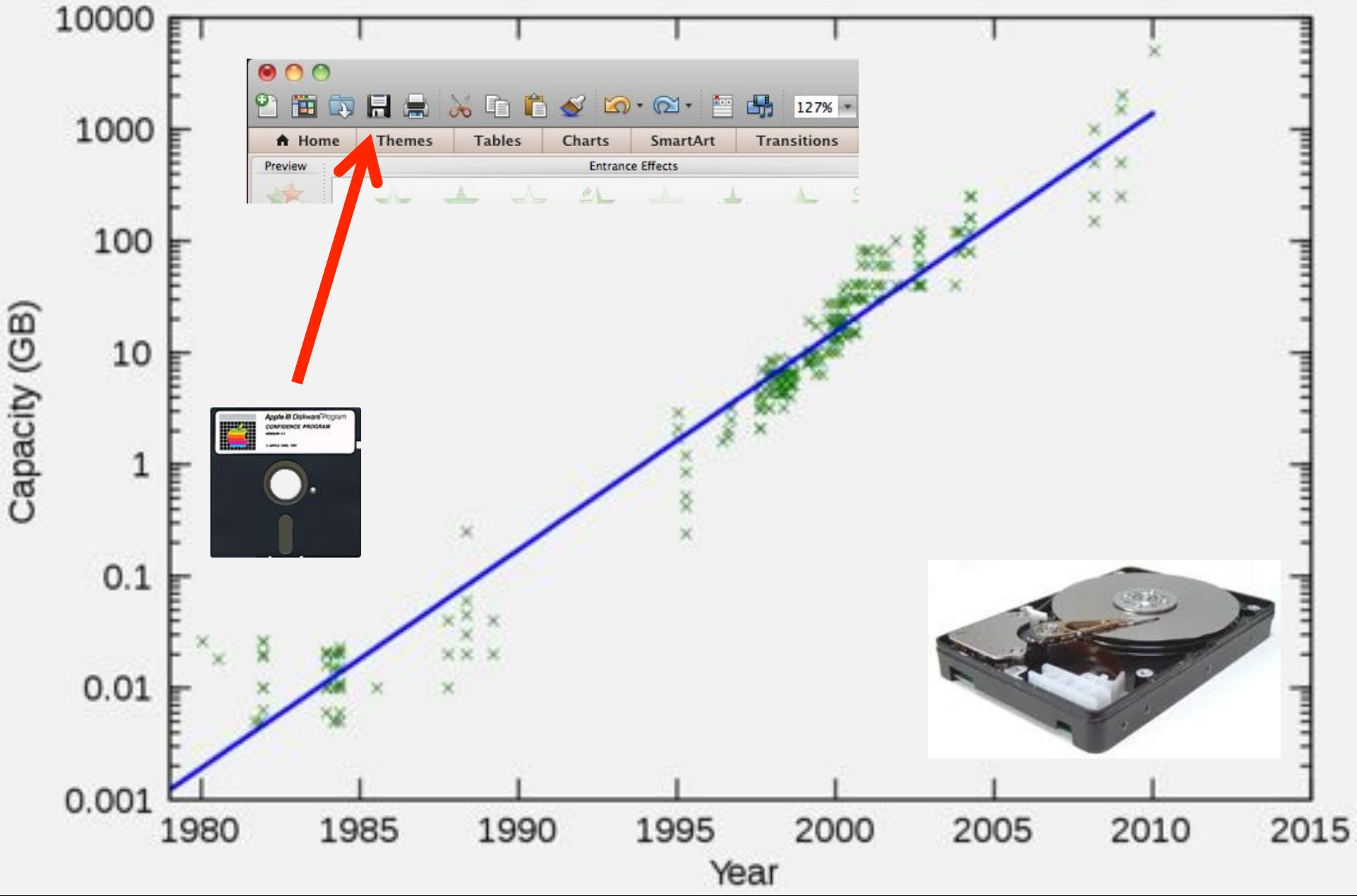
... more users!


AT&T
9:42 AM
SMS
9
Text
Calendar
Photos
Camera
YouTube
Stocks
Maps
Weather
Clock
Calculator
Notes
Settings
iTunes
App Store

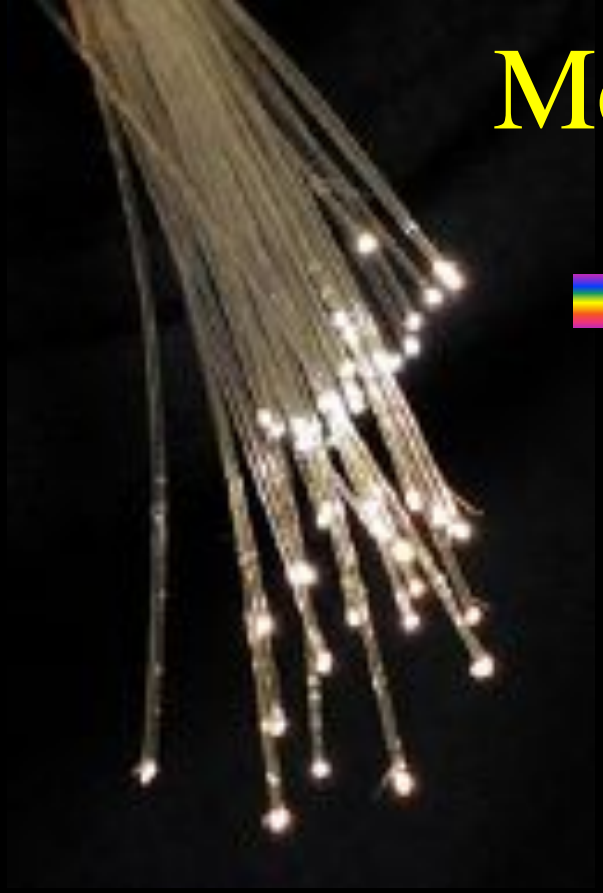
Grafische kaarten distruptive!

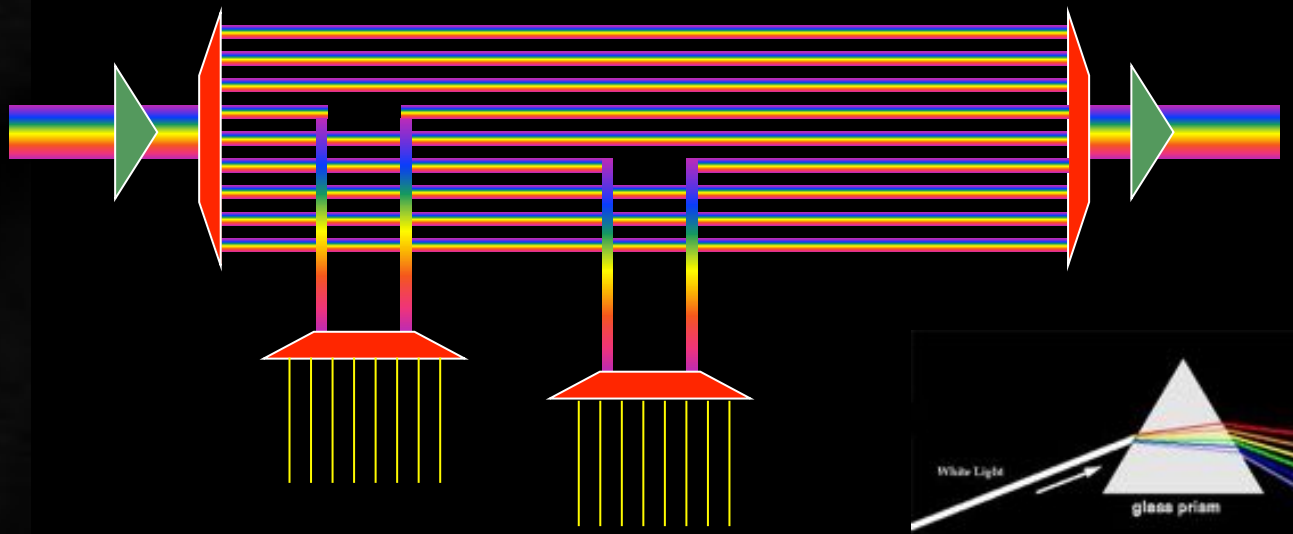


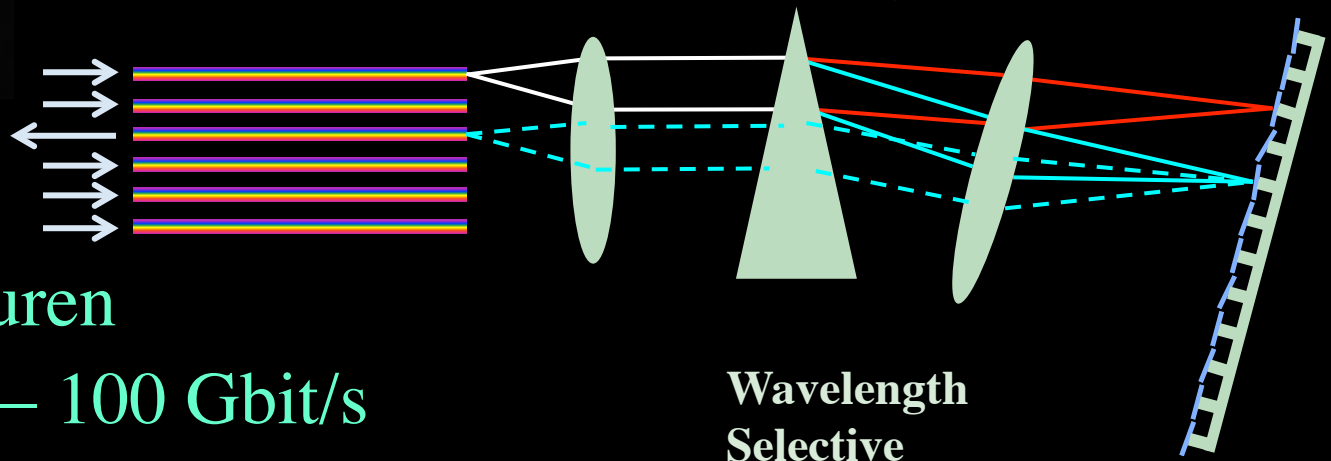
Data opslag: verdubbeling per 1,5 jaar!



Meerdere kleuren / Fiber







Per fiber: ~ 80 kleuren

Per kleur: 10 – 40 – 100 Gbit/s

Vgl: 1 Gbit/s = 1000 Mbit/s

ADSL: ~ 4 – 20 Mbit/s

Wavelength Selective Switch

New: Hollow Fiber!

Draadloze netwerken

Digital technology reviews

Tech XO provied latest Digital Technology reviews like digital camara,digital lens reviews,digital

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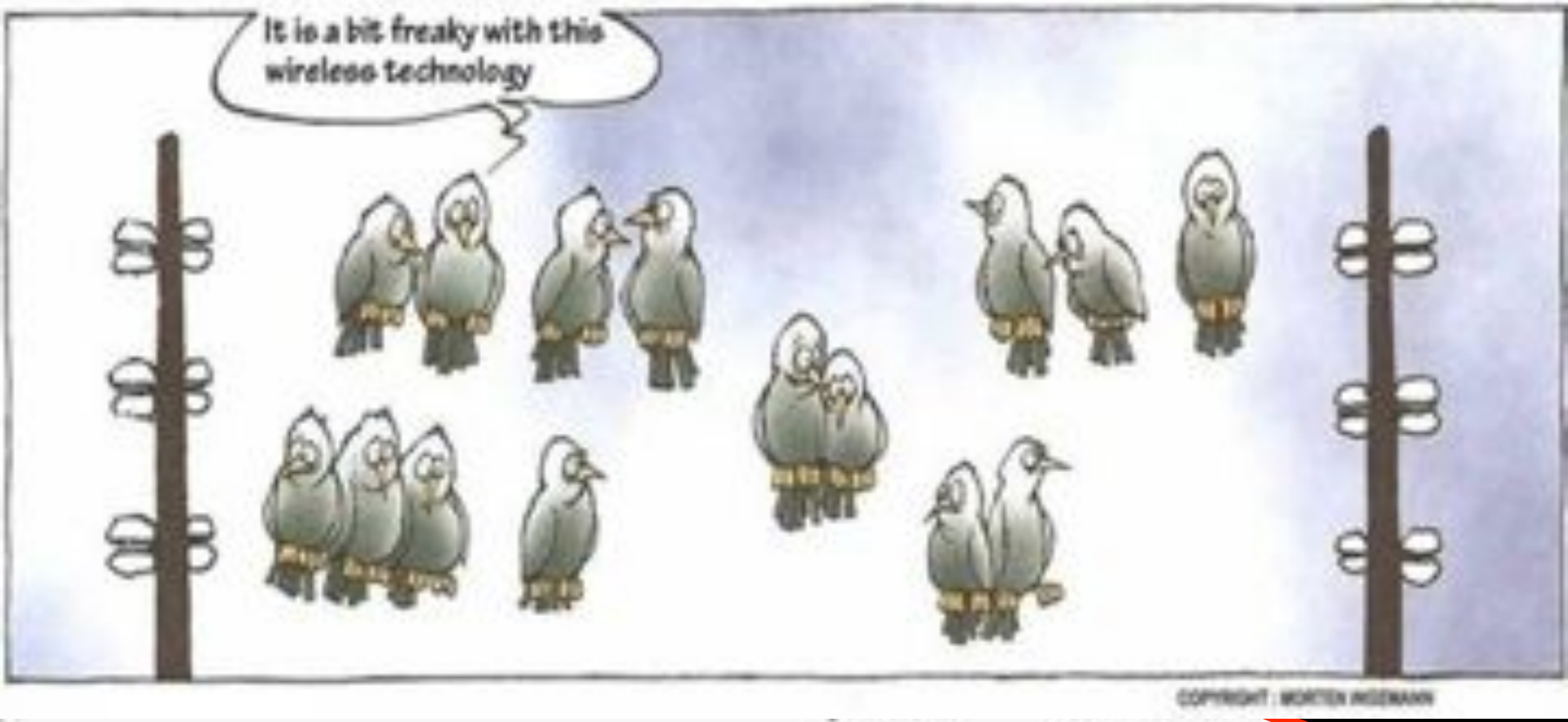
SEP 06

Next Generation Wireless LAN Technology 802.11ac 1 Gbps throughput with

Published By Admin under Network Devices Tags: 1gbps throughput, 1gbps wireless, 1gbps wireless lans, generation, new generation, technologies, technology, throughput, wireless, wireless lan

WiFi is one of the most preferred communication protocol LAN due to the easy comparison and convenience in the digital home. While consumer PC products has just started to migrate to a much higher bandwidth of 802.11n wireless LAN now working on next-generation standard definition is already in progress.

Draadloze netwerken



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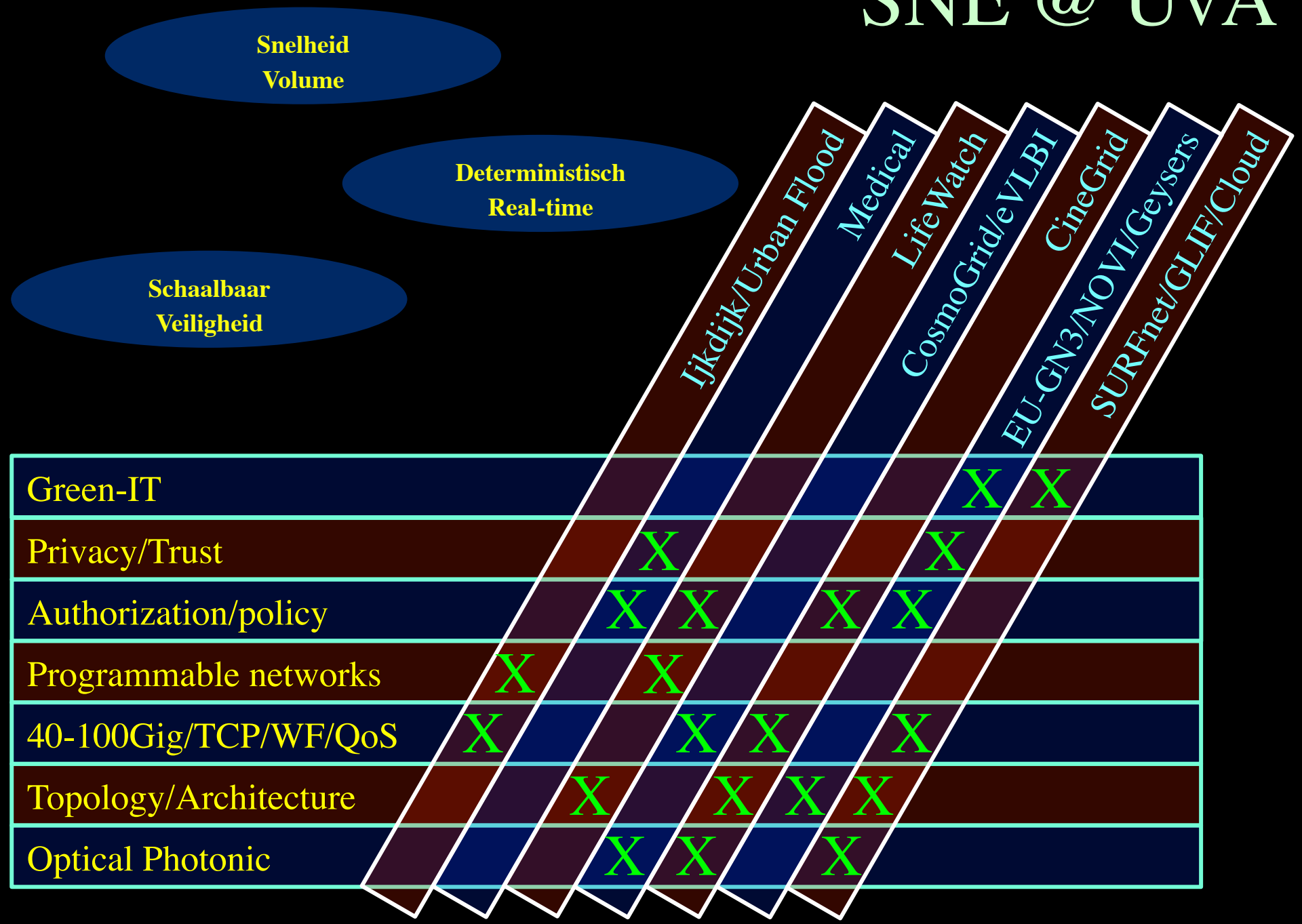
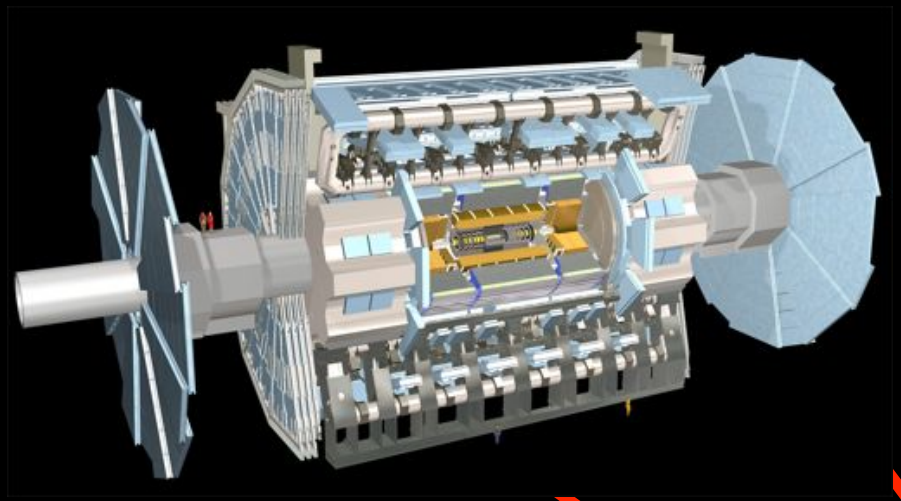
SNE @ UvA

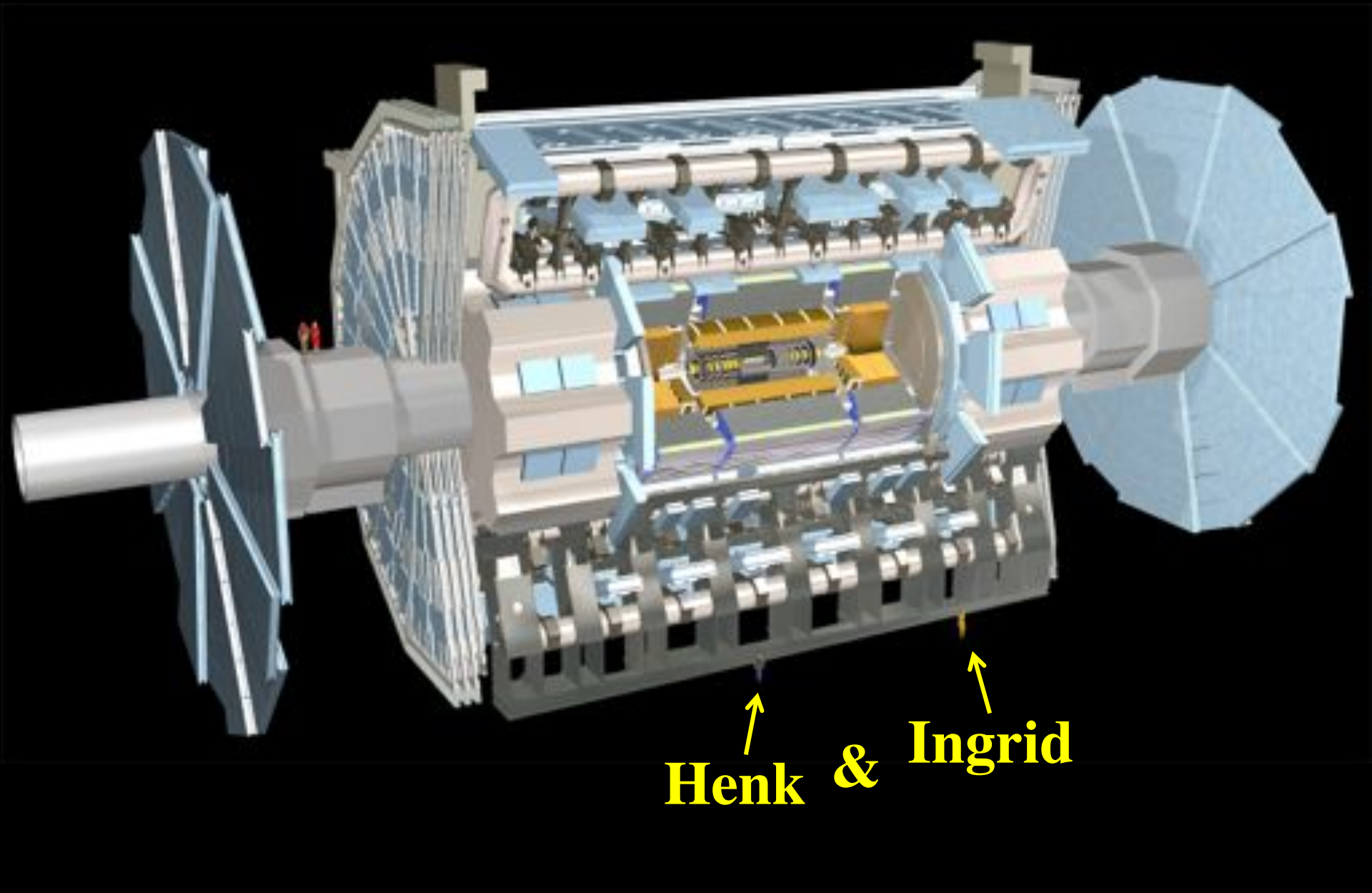

Snelheid
Volume
Deterministisch
Real-time
Schaalbaar
Veiligheid
Ijkdijk/Urban Flood
Medical
LifeWatch
CosmoGrid/eVLBI
CineGrid
EU-GN3/NOVI/Geysers
SURFnet/GLIF/Cloud
Green-IT
Privacy/Trust
Authorization/policy
Programmable networks
40-100Gig/TCP/WF/QoS
Topology/Architecture
Optical Photonic
X

SNE @ UvA



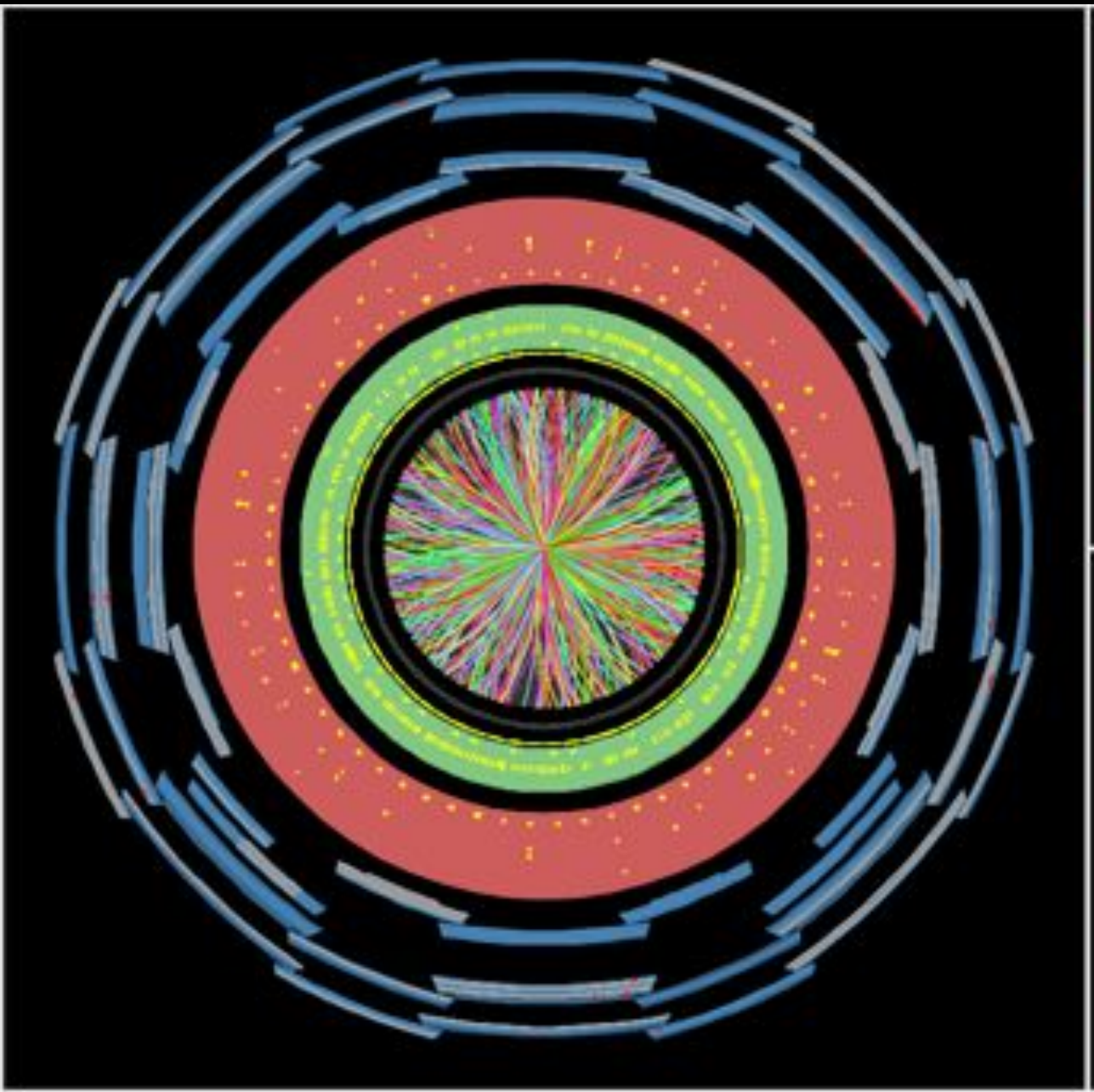
	Ijkdijk/Urban Flood	Medical	LifeWatch	CosmoGrid/eVLBI	CineGrid	EU-GN3/NOVI/Geysers	SURFnet/GLIF/Cloud
Green-IT					X	X	
Privacy/Trust		X			X		
Authorization/policy		X	X		X	X	
Programmable networks	X		X				
40-100Gig/TCP/WF/QoS	X		X	X		X	
Topology/Architecture		X		X	X	X	
Optical Photonic		X	X		X		

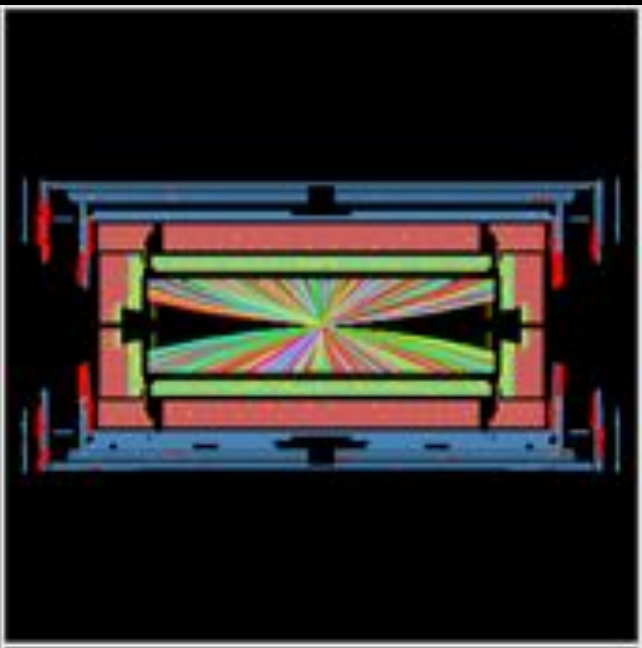
ATLAS detector @ CERN Geneve



ATLAS detector @ CERN Geneve

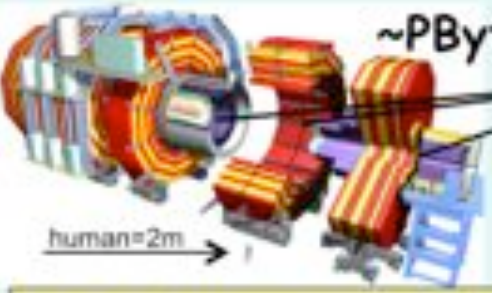
Een gebeurtenis





LHC Data Grid Hierarchy

CMS as example, Atlas is similar



~PByte/sec

Online System

~100 MBytes/sec

100000 flops/byte

10 Pflops/s

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

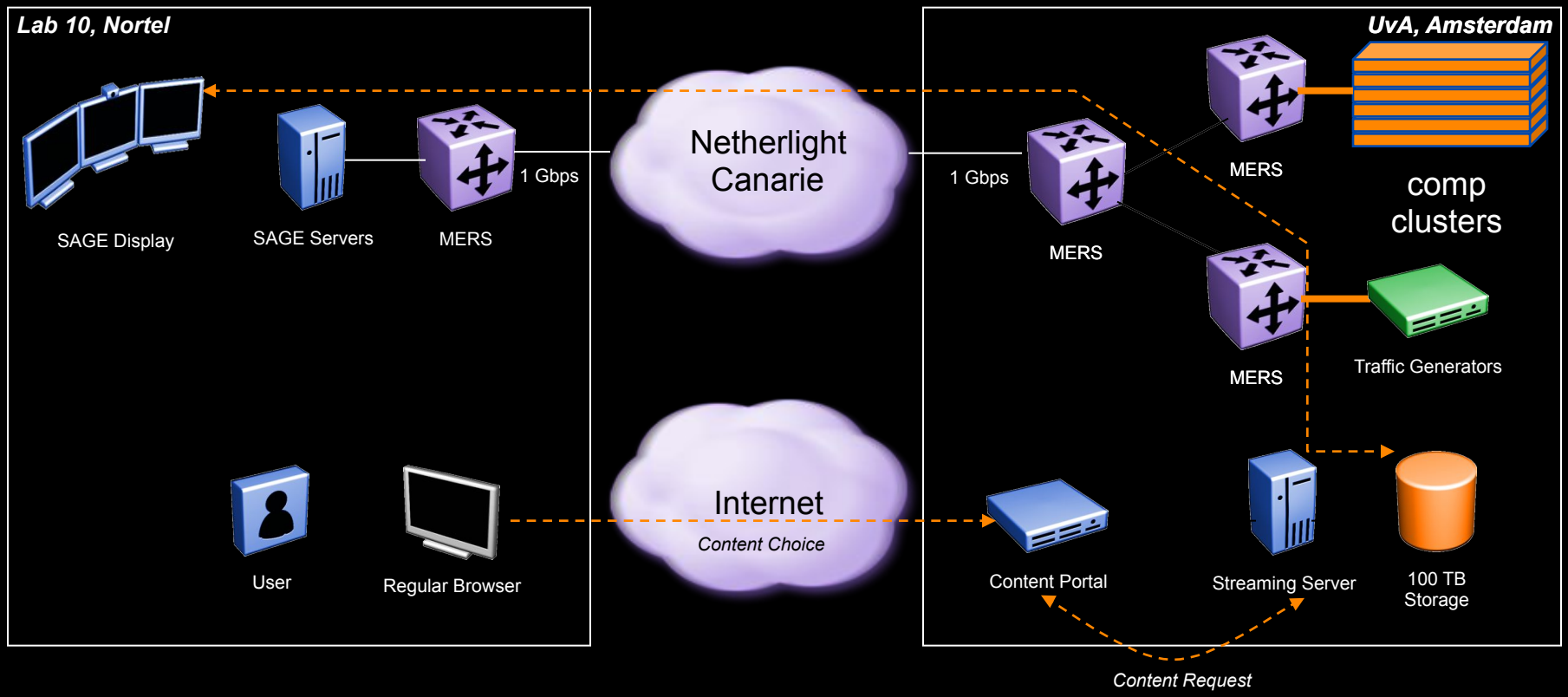
CERN/CMS data goes to 6-8 Tier 1 regional centers, and from each of these to 6-10 Tier 2 centers.

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.

Grote en kleine pakketten door elkaar

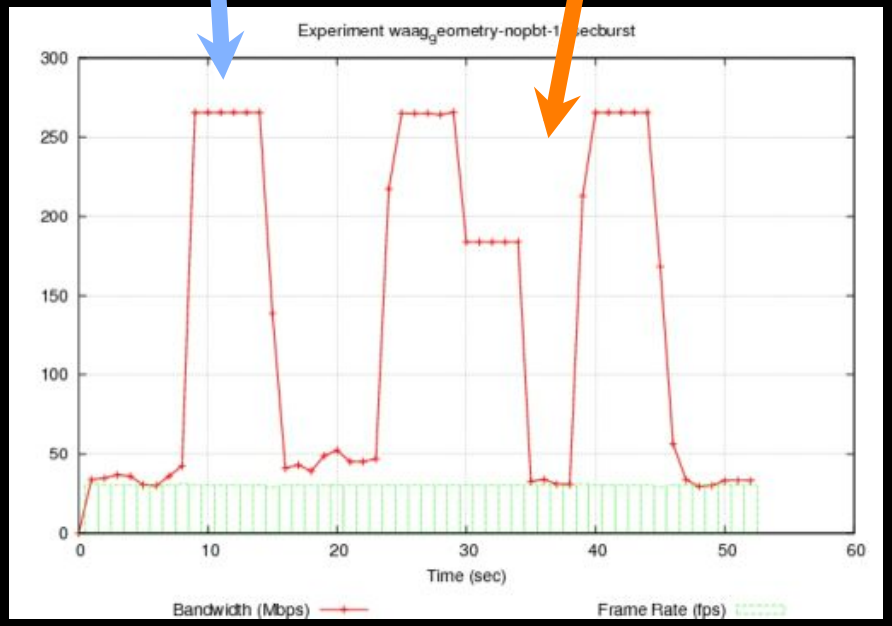
Diagram for SAGE video streaming to ATS



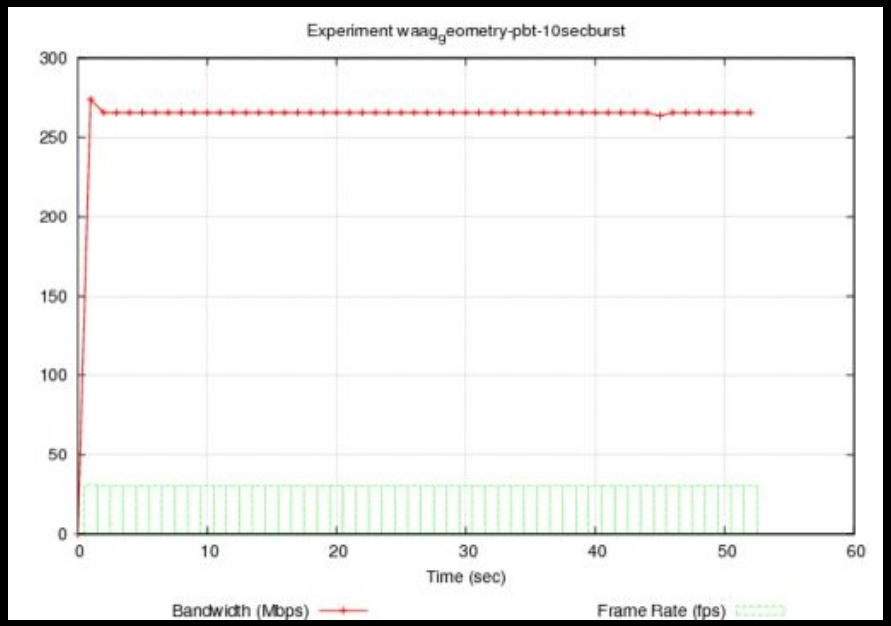
Experimental Data

Sage without background traffic

Sage with background traffic



10 Second Traffic bursts with No PBT



10 Second Traffic bursts with PBT

PBT is *SIMPLE* and *EFFECTIVE* technology to build a shared Media-Ready Network

Alien light From idea to realisation!

40Gb/s alien wavelength transmission via a multi-vendor 10Gb/s DWDM infrastructure

NCF

Alien wavelength advantages

- Direct connection of customer equipment[1] → cost savings
- Avoid OEO regeneration → power savings
- Faster time to service[2] → time savings
- Support of different modulation formats[3] → extend network lifetime

Alien wavelength challenges

- Complex end-to-end optical path engineering in terms of linear (i.e. OSNR, dispersion) and non-linear (FWM, SPM, XPM, Raman) transmission effects for different modulation formats.
- Complex interoperability testing.
- End-to-end monitoring, fault isolation and resolution.
- End-to-end service activation.

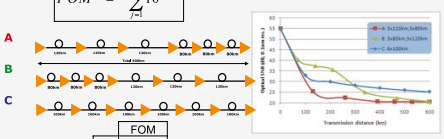
In this demonstration we will investigate the performance of a 40Gb/s PM-QPSK alien wavelength installed on a 10Gb/s DWDM infrastructure.

New method to present fiber link quality, FoM (Figure of Merit)

In order to quantify optical link grade, we propose a new method of representing system quality: the FOM (Figure of Merit) for concatenated fiber spans.

$$FOM = \sum_{j=1}^{N} 10^{\left(\frac{L_j}{10}\right)}$$

Lj, span losses in dB
N, number of spans

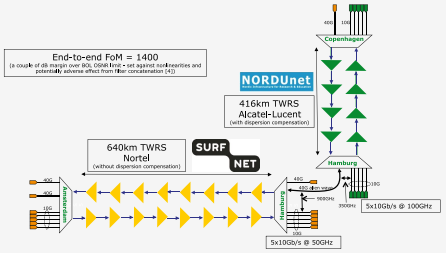


	FOM
A	5504
B	5504
C	1897

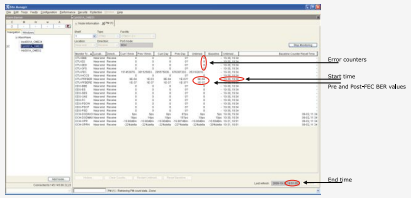
Easy-to-use formula that accurately quantifies transmission system performance

Transmission system setup

JOINT SURFnet/NORDUnet 40Gb/s PM-QPSK alien wavelength DEMONSTRATION.



Test results



Error-free transmission for 23 hours, 17 minutes → BER < 3.0 10^{-16}

Conclusions

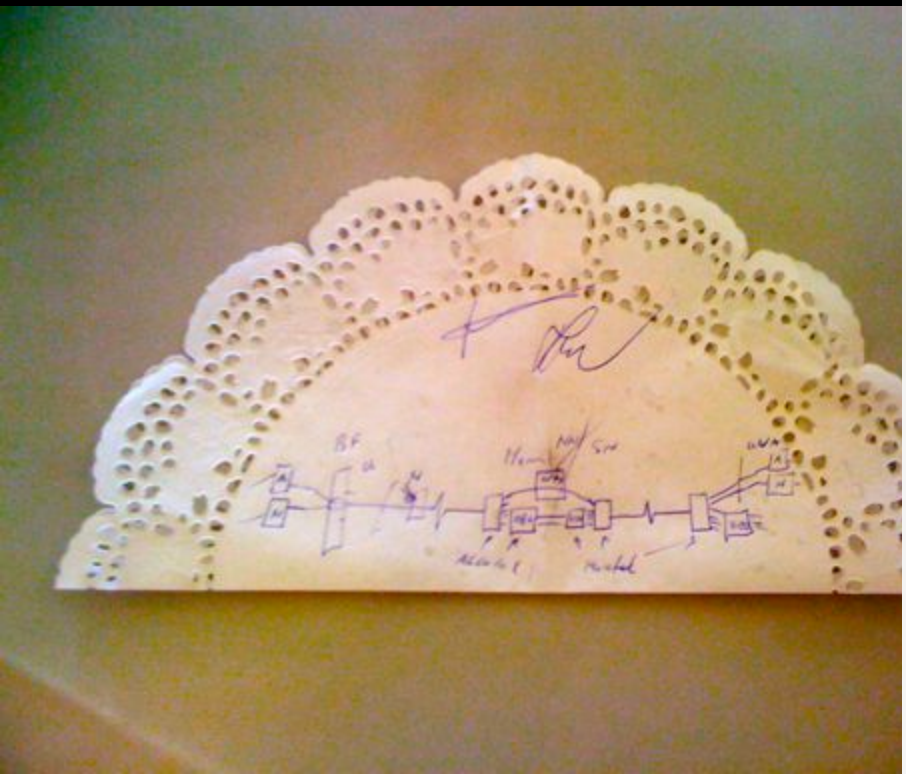
- We have investigated experimentally the all-optical transmission of a 40Gb/s PM-QPSK alien wavelength via a concatenated native and third party DWDM system that both were carrying live 10Gb/s wavelengths.
- The end-to-end transmission system consisted of 1056 km of TWRS (TrueWave Reduced Slope) transmission fiber.
- We demonstrated error-free transmission (i.e. BER below 10-15) during a 23 hour period.
- More detailed system performance analysis will be presented in an upcoming paper.

NORTEL NORDUnet telindus together with ISIT SURFNET

REFERENCES [1] "OPERATIONAL SOLUTIONS FOR AN OPEN DWDM LAYER", O. GERSTEL ET AL, OFC'2009 | [2] "AT&T OPTICAL TRANSPORT SERVICES", BARBARA E. SMITH, OFC'09
[3] "OPEX SAVINGS OF ALL-OPTICAL CORE NETWORKS", ANDREW LORD AND CARL ENGINEER, ECOC2009 | [4] NORTEL/SURFNET INTERNAL COMMUNICATION

ACKNOWLEDGEMENTS WE ARE GRATEFUL TO NORDUNET FOR PROVIDING US WITH BANDWIDTH ON THEIR DWDM LINK FOR THIS EXPERIMENT AND ALSO FOR THEIR SUPPORT AND ASSISTANCE DURING THE EXPERIMENTS. WE ALSO ACKNOWLEDGE TELINDUS AND NORTEL FOR THEIR INTEGRATION WORK AND SIMULATION SUPPORT

Alien light From idea to realisation!



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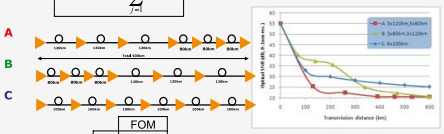

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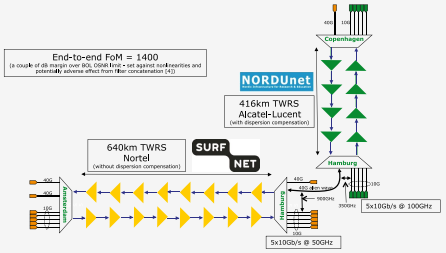
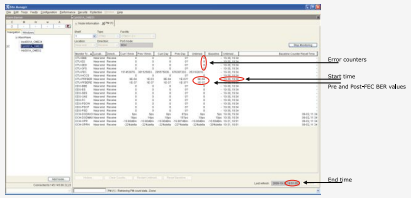


Test results



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SNE @ UvA

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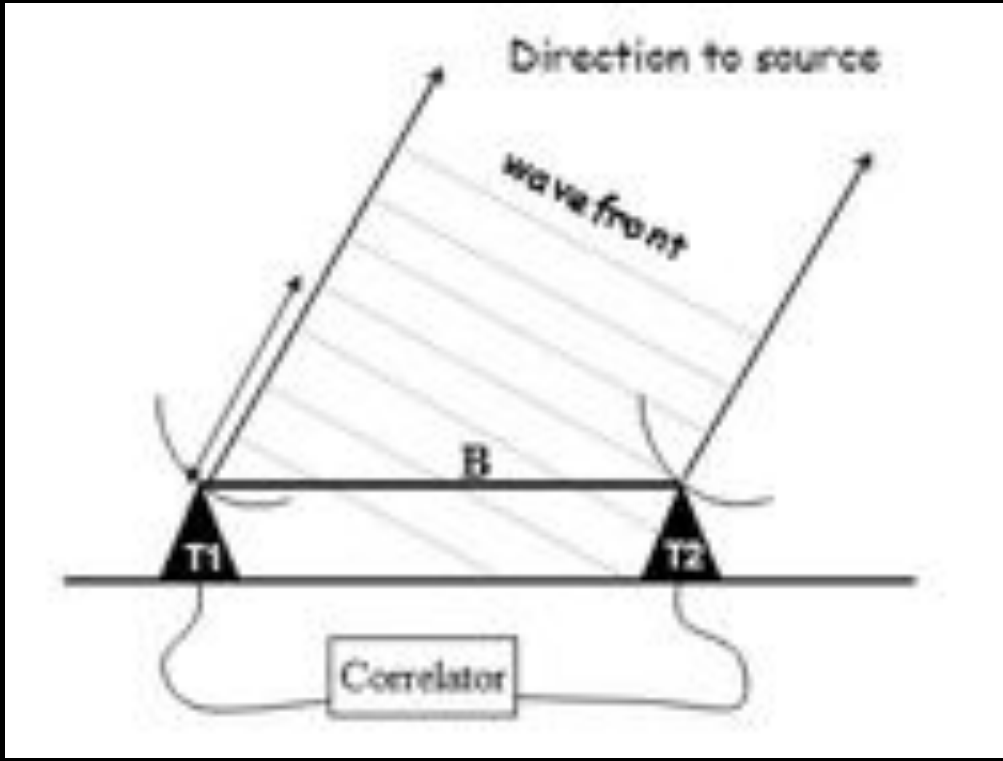
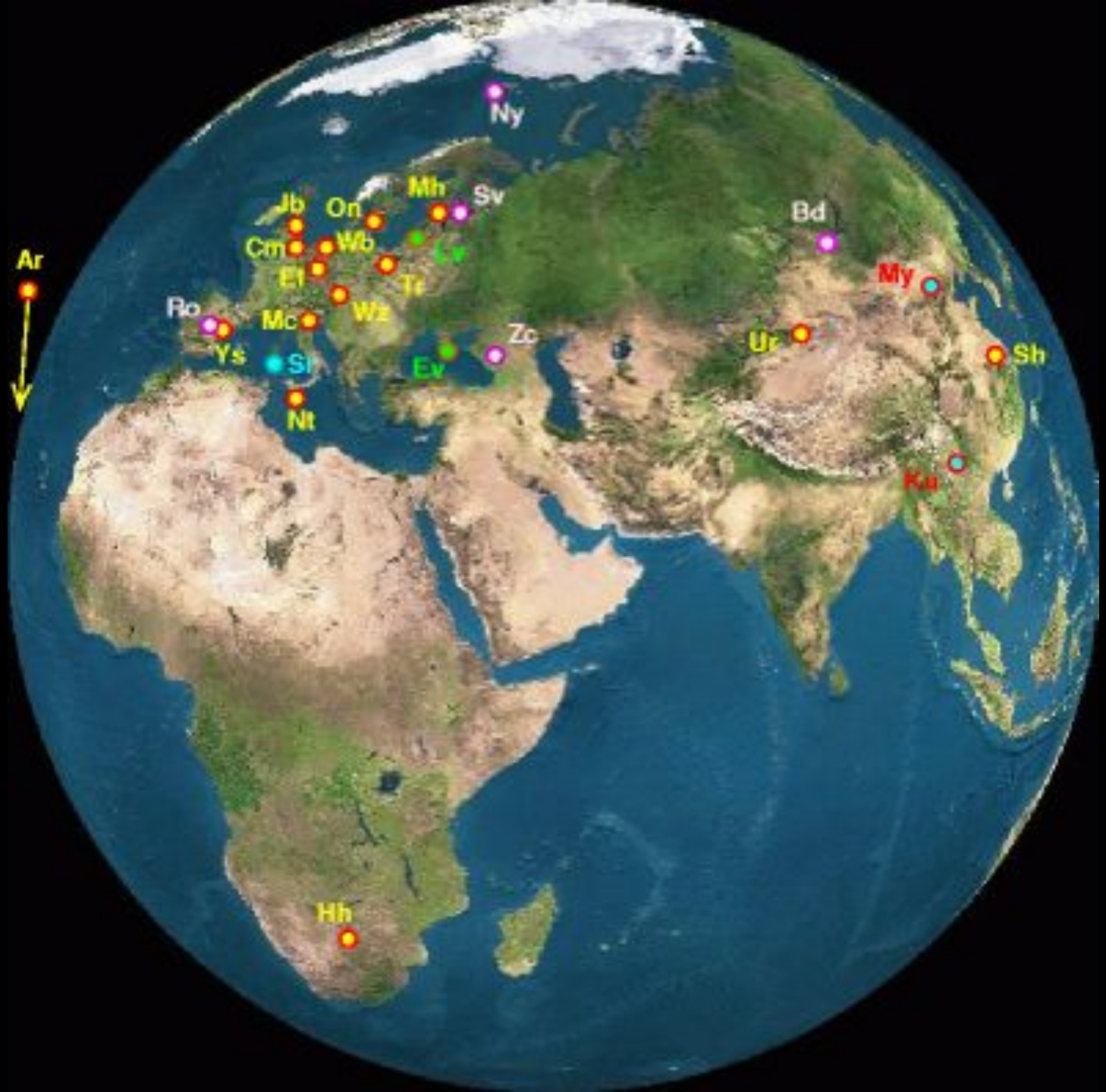
Green-IT						X	X
Privacy/Trust			X		X		
Authorization/policy		X	X		X	X	
Programmable networks	X		X				
40-100Gig/TCP/WF/QoS	X		X	X		X	
Topology/Architecture		X		X	X	X	
Optical Photonic		X	X		X		

e -Very Large Base Interferometer




Ny
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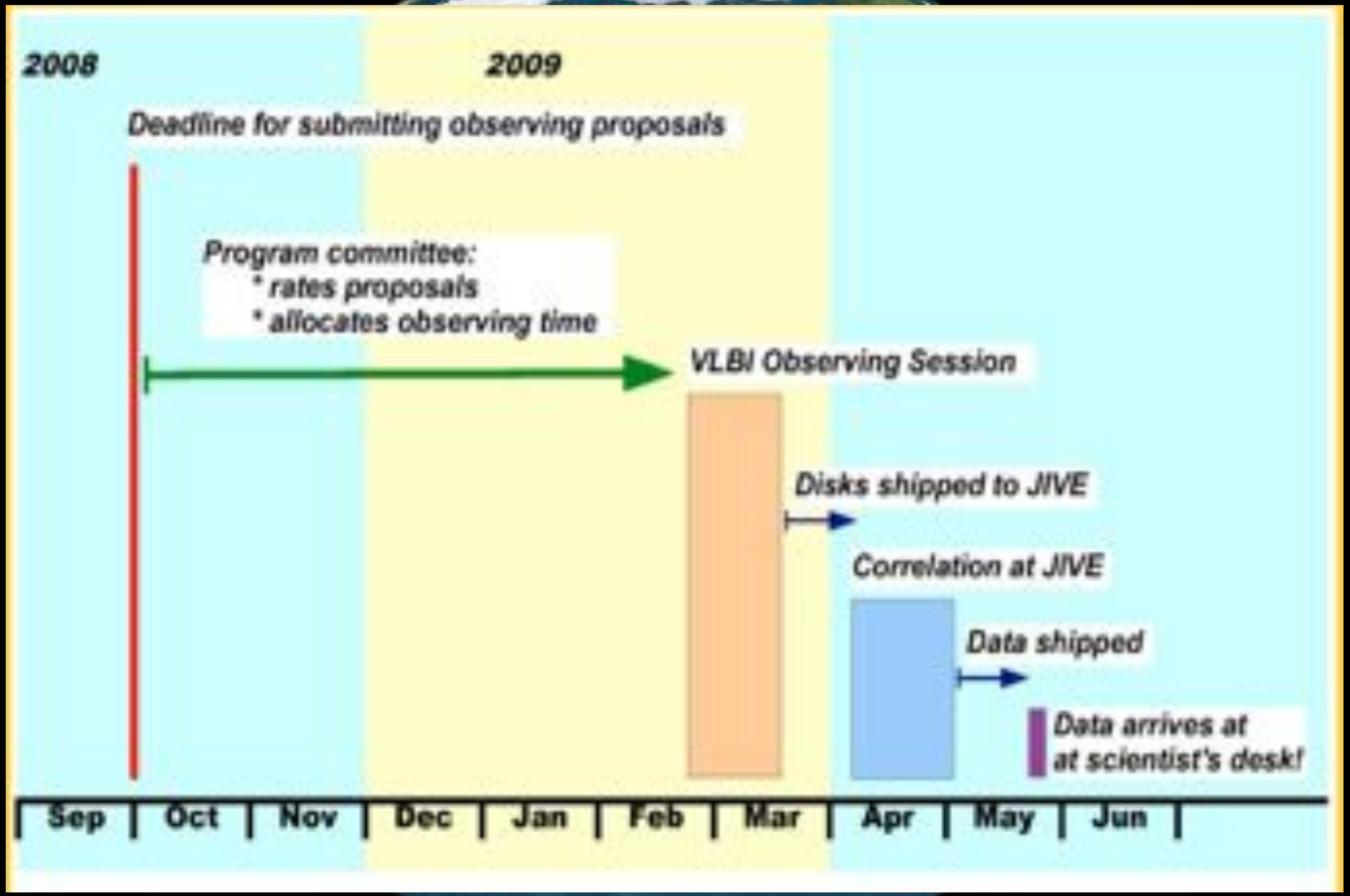
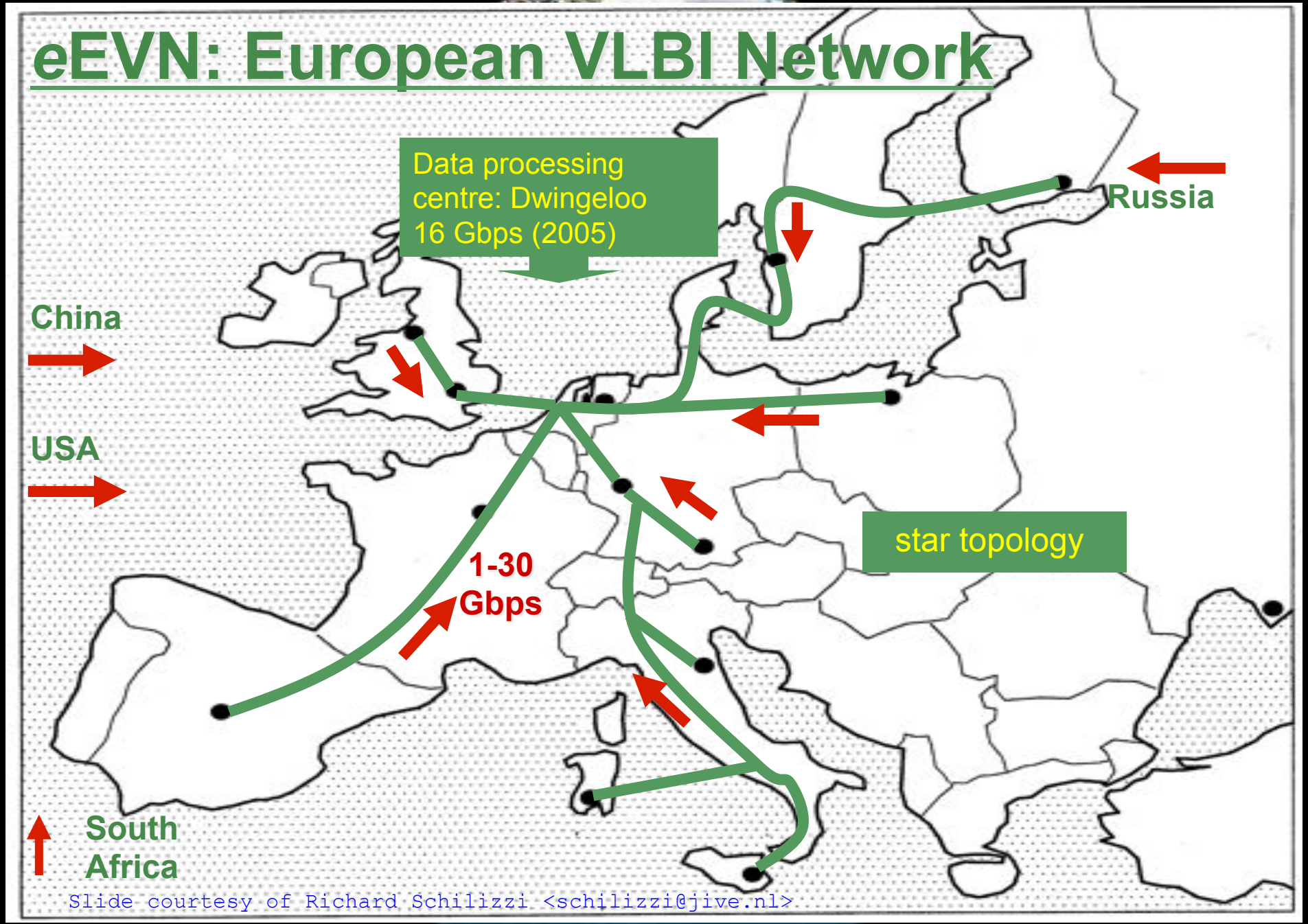
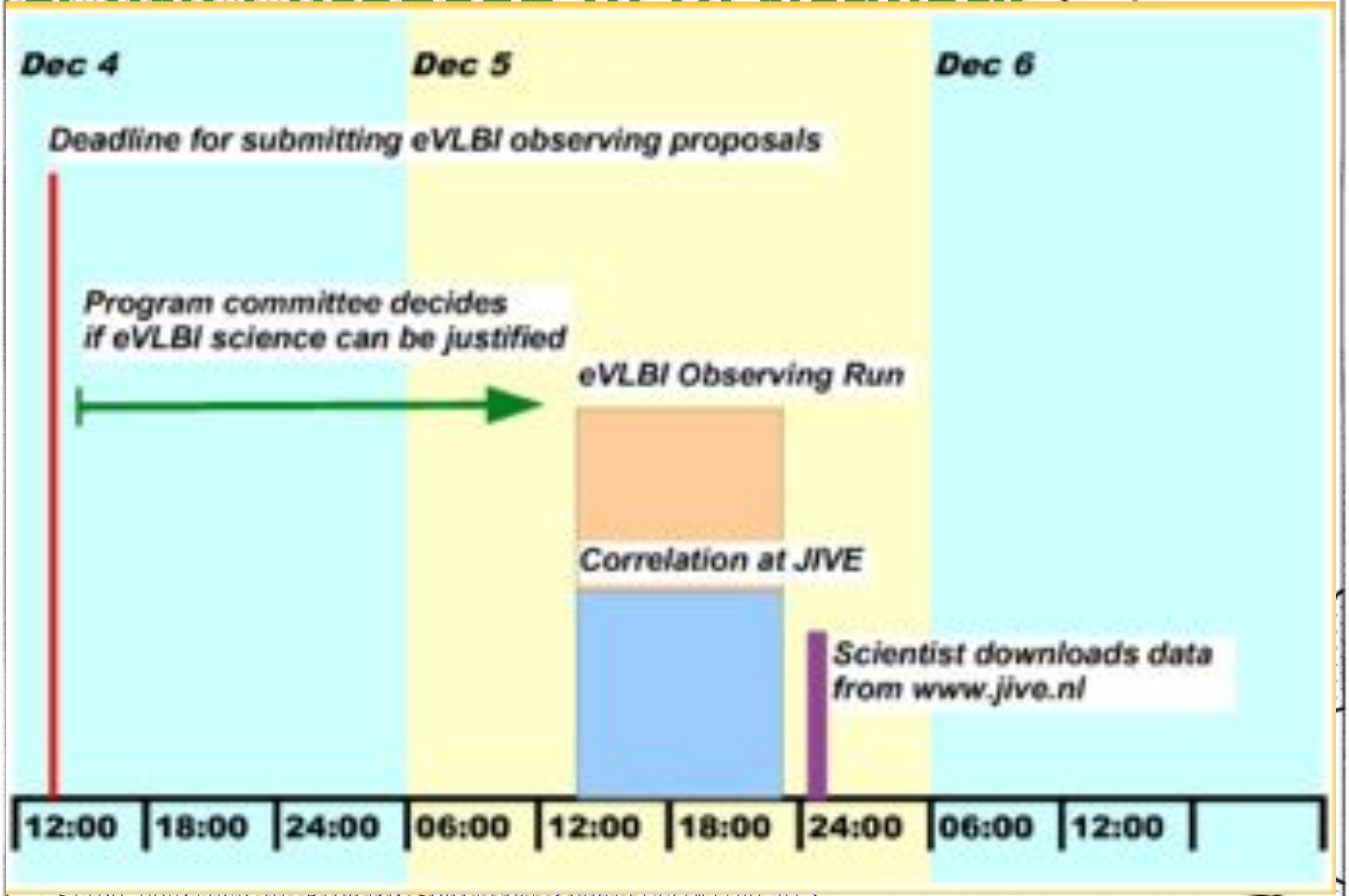

2008
2009
Deadline for submitting observing proposals
Program committee:
* rates proposals
* allocates observing time
VLBI Observing Session
Disks shipped to JIVE
Correlation at JIVE
Data shipped
Data arrives at
at scientist's desk!
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun

2008

2009


eEVN: European VLBI Network
Data processing centre: Dwingeloo
16 Gbps (2005)
Russia
China
USA
1-30 Gbps
star topology
South Africa
Slide courtesy of Richard Schilizzi <schilizzi@jive.nl>

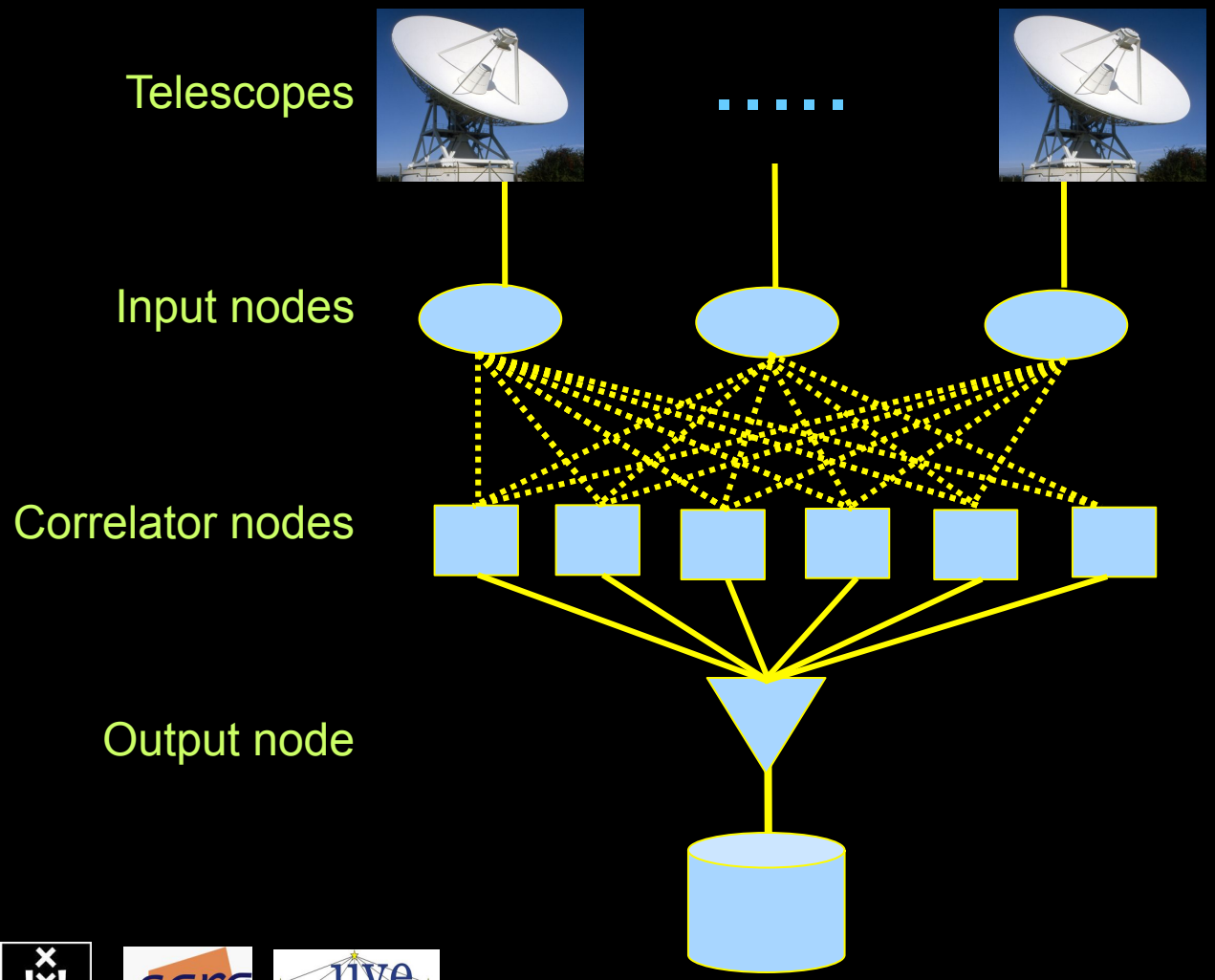
eEVN: European VLBI Network



Slide courtesy of Richard Schilizzi <schilizzi@jive.nl>

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.



16 Gbit/s - 2 Tflop ➔ THIS IS A DATA FLOW PROBLEM !!!

Research:

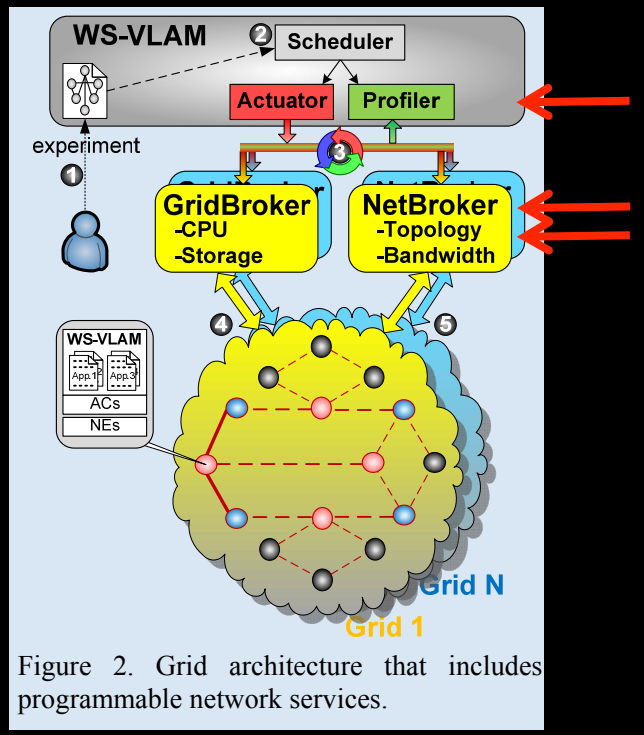
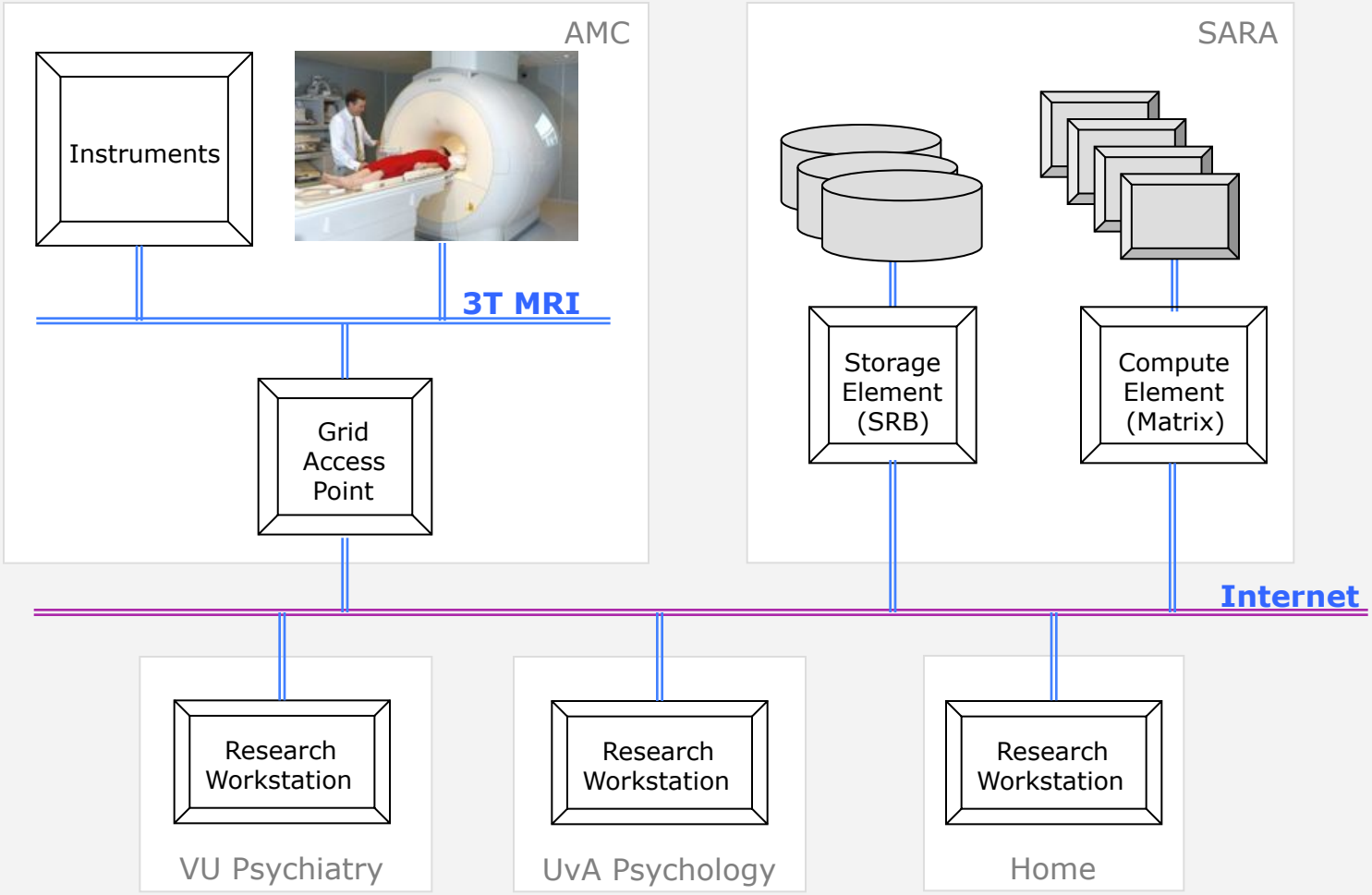


Figure 2. Grid architecture that includes programmable network services.

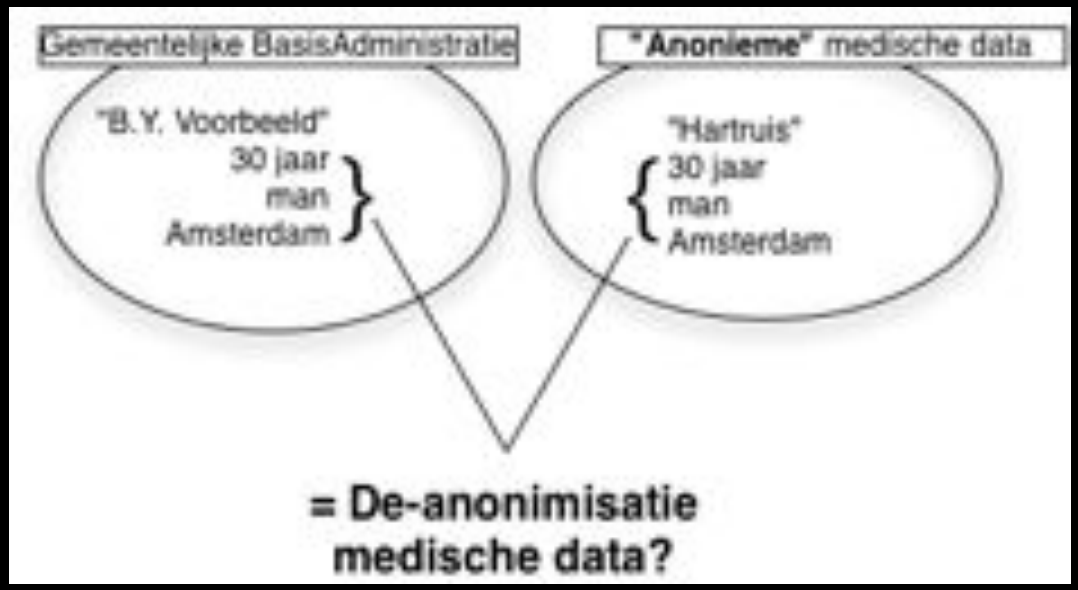
SNE @ UvA

	Ijkdijk/Urban Flood	Medical	LifeWatch	CosmoGrid/eVLBI	CineGrid	EU-GN3/NOVI/Geysers	SURFnet/GLIF/Cloud
Green-IT						X	X
Privacy/Trust		X			X		
Authorization/policy		X	X		X	X	
Programmable networks	X		X				
40-100Gig/TCP/WF/QoS	X		X	X		X	
Topology/Architecture		X		X	X	X	
Optical Photonic		X	X		X		

Virtual Lab for Neurosciences: Resources

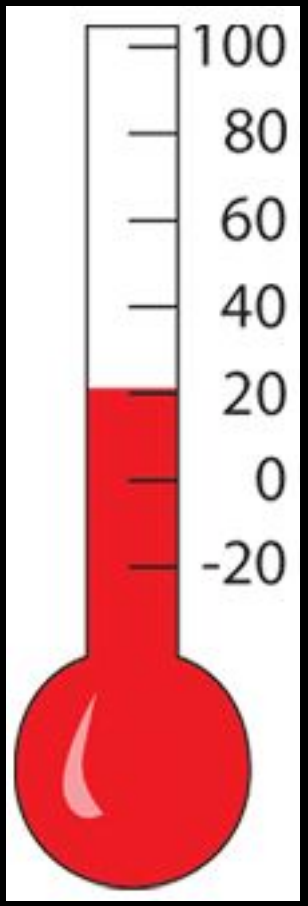


Anonimiteit of her-identificeerbaarheid



1. Empirische analyse van GBA
2. Kansrekening, bijv. kans op niet-uniciteit:

$$1 - \left(\frac{n-1}{n}\right)^{k-1}$$



Privacy thermometer!

SNE @ UvA

	Ijkdijk/Urban Flood	Medical	LifeWatch	CosmoGrid/eVLBI	CineGrid	EU-GN3/NOVI/Geysers	SURFnet/GLIF/Cloud
Green-IT						X	X
Privacy/Trust			X		X		
Authorization/policy		X	X		X	X	
Programmable networks	X		X				
40-100Gig/TCP/WF/QoS	X		X	X		X	
Topology/Architecture		X		X	X	X	
Optical Photonic		X	X		X		

IJKDIJK

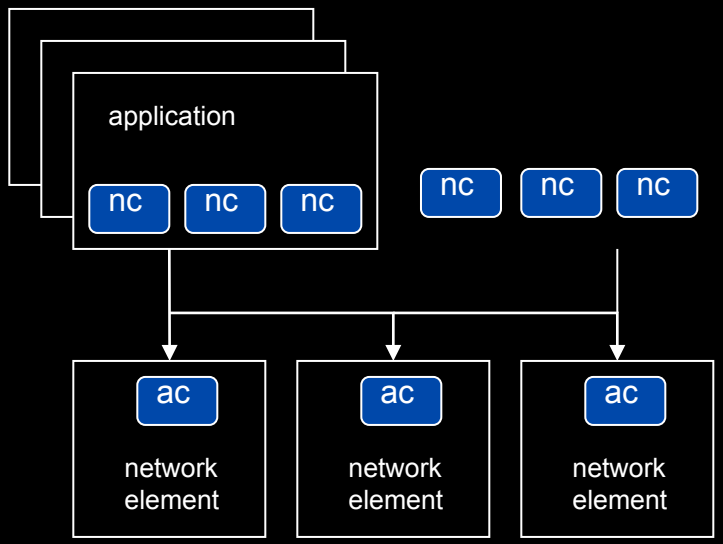
Sensors: 15000km* 800 bps/m ->12 Gbit/s to cover all Dutch dikes

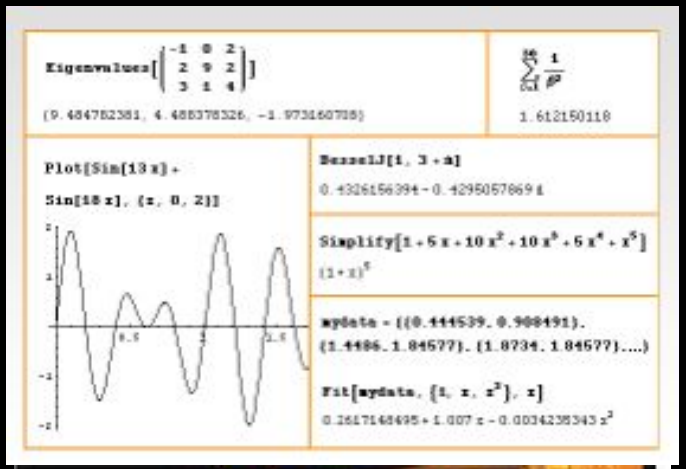
Sensor grid: instrument the dikes

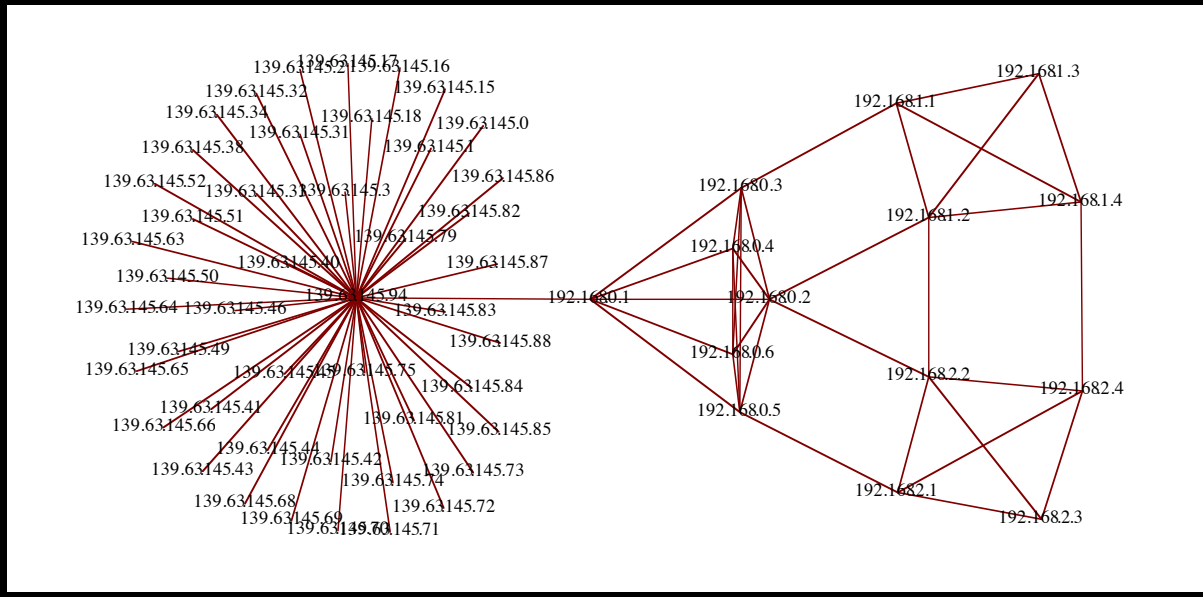
First controlled breach occurred on sept 27th ‘08:

User Programmable Virtualized Networks.

- The network is virtualized as a collection of resources
- UPVNs enable network resources to be programmed as part of the application
- Mathematica interacts with virtualized networks using UPVNs and optimize network + computation







ref: Robert J. Meijer, Rudolf J. Strijkers, Leon Gommans, Cees de Laat, User Programmable Virtualiized Networks, accepted for publication to the IEEE e-Science 2006 conference Amsterdam.

TouchTable Demonstration @ SC08

SNE @ UvA

	Kdijk/Urban Flood	Medical	LifeWatch	CosmoGrid/eVLBI	CineGrid	EU-GN3/NOVI/Geysers	SURFnet/GLIF/Cloud
Green-IT						X	X
Privacy/Trust		X			X		
Authorization/policy		X	X		X	X	
Programmable networks	X		X				
40-100Gig/TCP/WF/QoS	X		X	X		X	
Topology/Architecture		X		X	X	X	
Optical Photonic		X	X		X		

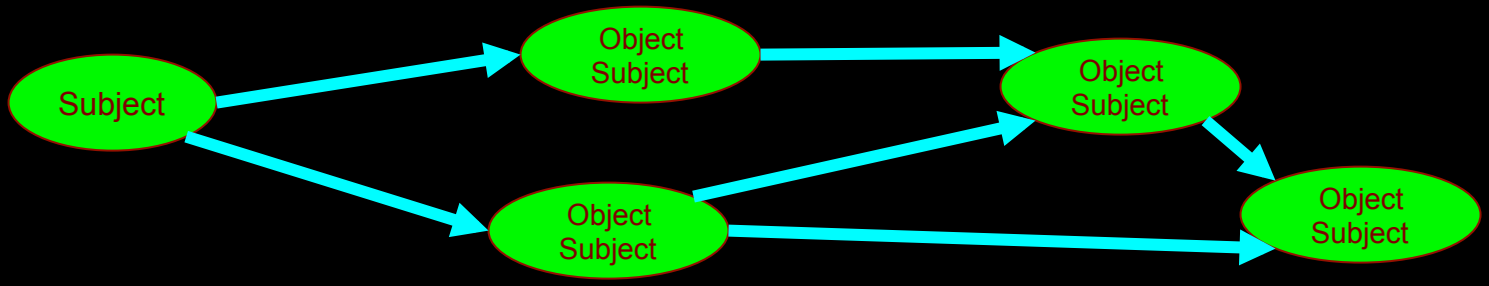
GLIF 2008

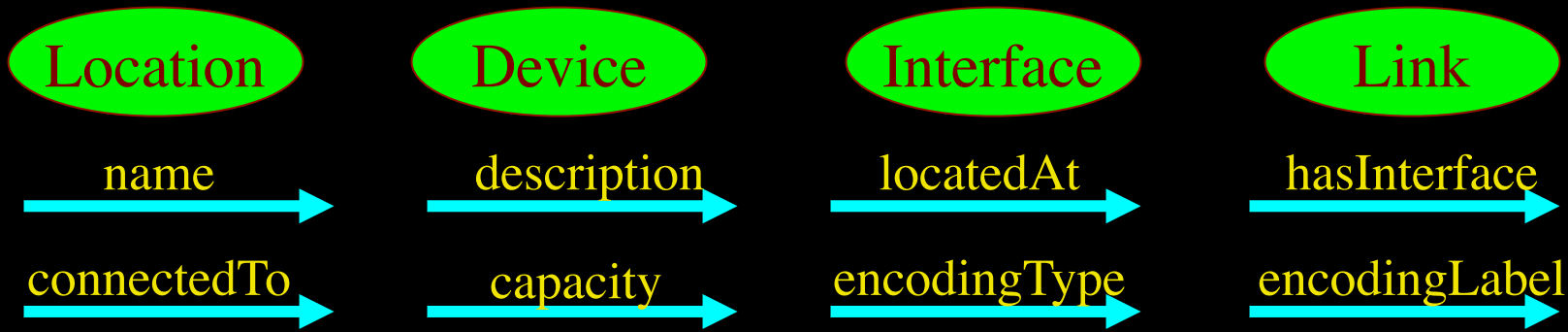
Visualization courtesy of Bob Patterson, NCSA
Data collection by Maxine Brown.

We zoeken: TOMTOM voor complexe netwerken!

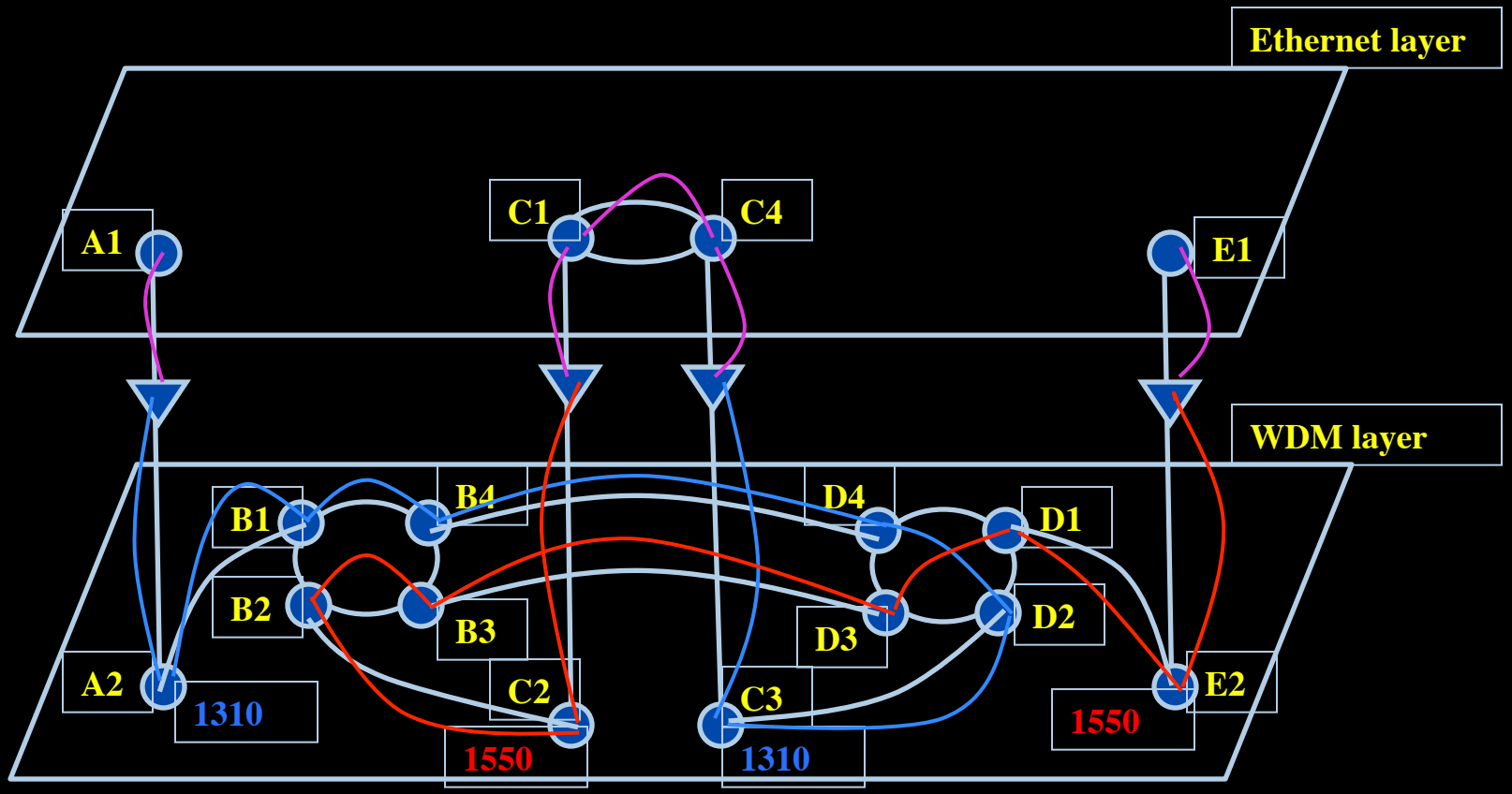
LinkedIN voor infrastructuur

- From semantic Web / Resource Description Framework.
- The RDF uses XML as an interchange syntax.
- Data is described by triplets (Friend of a Friend):





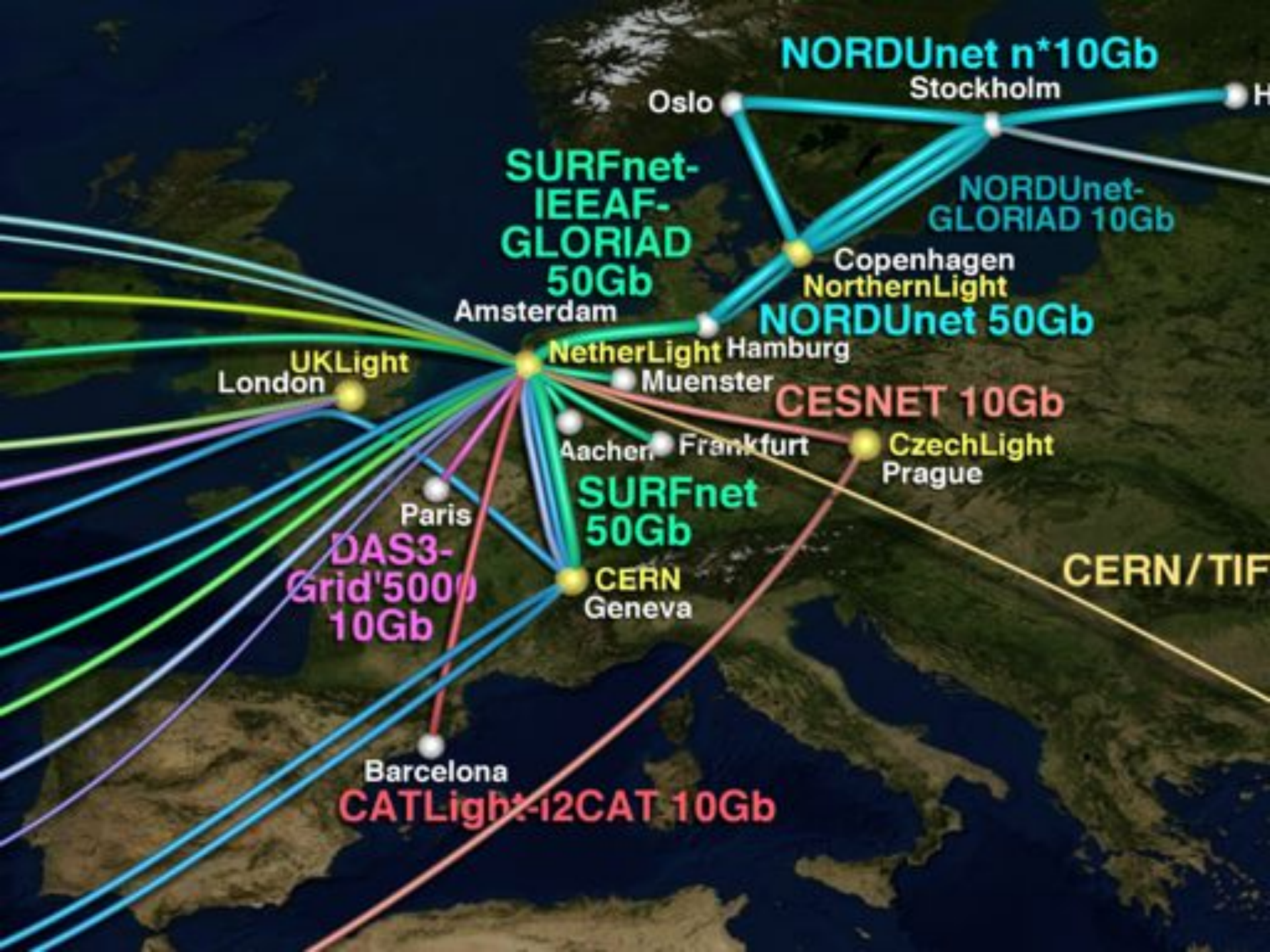
Multi-layer Network PathFinding



Path between interfaces A1 and E1:

A1-A2-B1-B4-D4-D2-C3-C4-C1-C2-B2-B3-D3-D1-E2-E1

Scaling: Combinatorial problem


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

VIZUALIZATION

DataExploration

RemoteControl

TV

Medical

CineGrid

Conference

Gaming

DATACENTER

Management

Backup

Mining

Media

Web2.0

Visualisation

Security

Meta

NetherLight

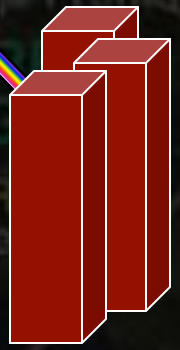
Workflow

Clouds

Distributed

EventProcessing

GRID&CLOUD



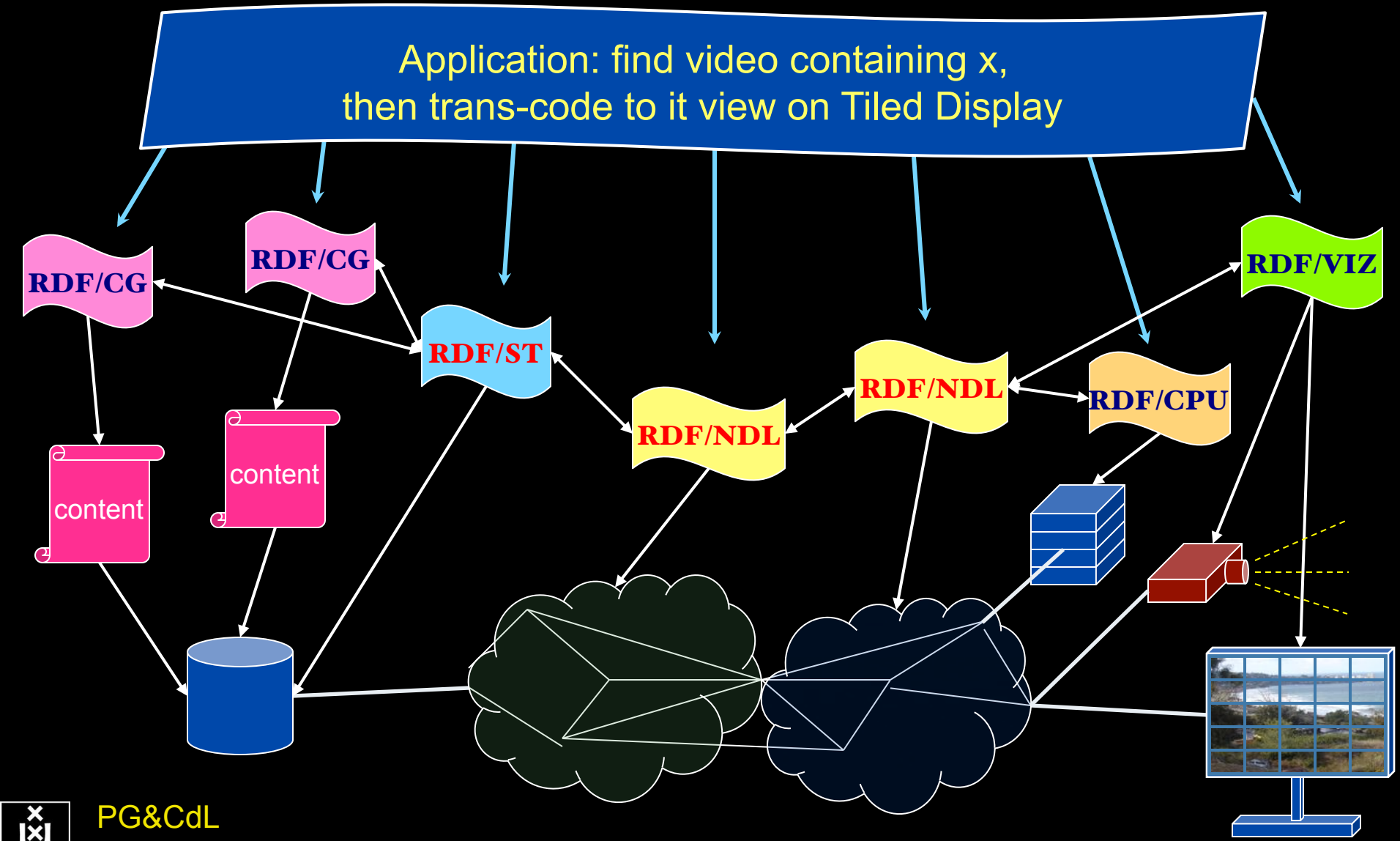
Simulations

StreamProcessing

Predictions

SUPERCOMUTTER

RDF describing Infrastructure



PG&CdL

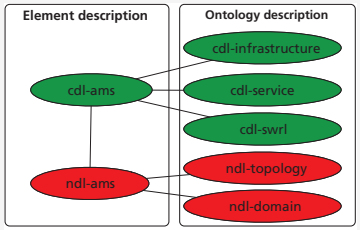
Applications and Networks become aware of each other!

CineGrid Description Language

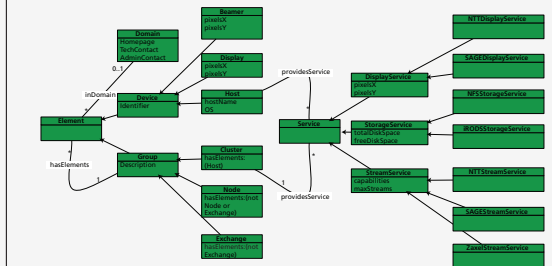
NCF

CineGrid is an initiative to facilitate the exchange, storage and display of high-quality digital media.

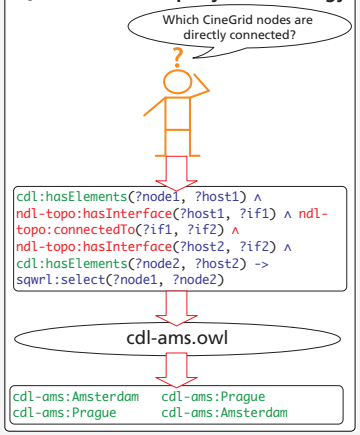
The CineGrid Description Language (CDL) describes CineGrid resources. Streaming, display and storage components are organized in a hierarchical way. CDL has bindings to the NDL ontology that enables descriptions of network components and their interconnections. With CDL we can reason on the CineGrid infrastructure and its services.



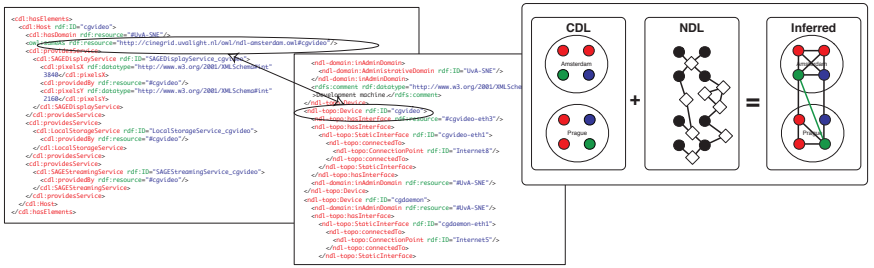
UML representation of CDL



SQWRL is used to query the Ontology.



CDL links to ***NDL*** using the ***owl:SameAs*** property. ***CDL*** defines the services, ***NDL*** the network interfaces and links. The combination of the two ontologies identities the host pairs that support matching services via existing network connections.



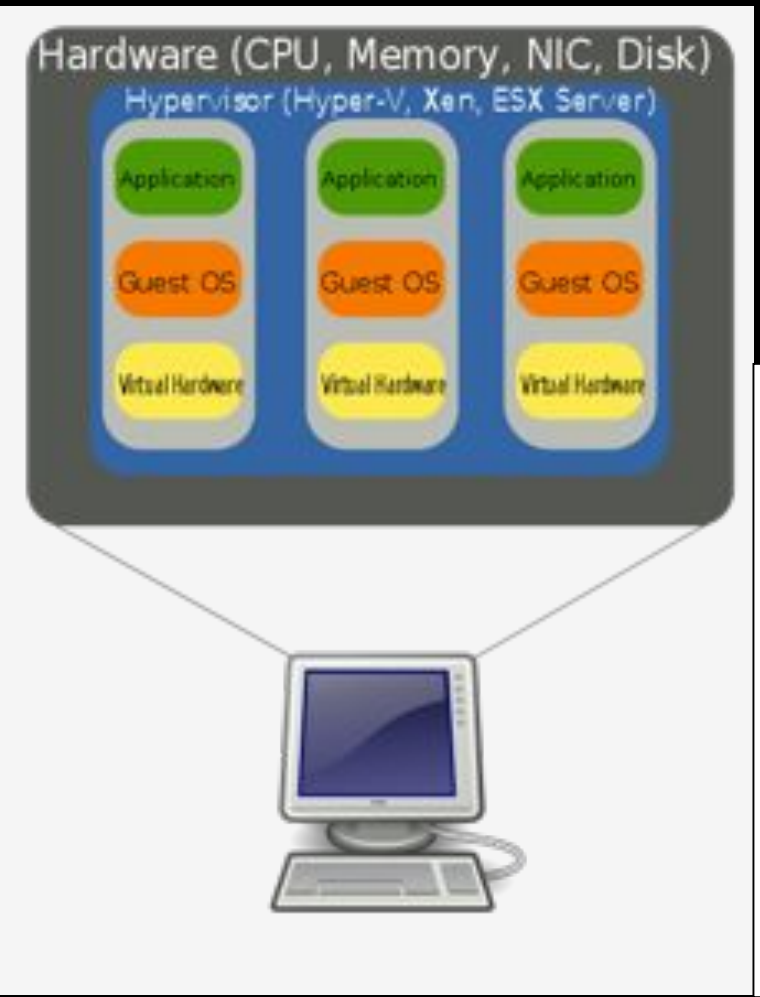
UNIVERSITEIT VAN AMSTERDAM

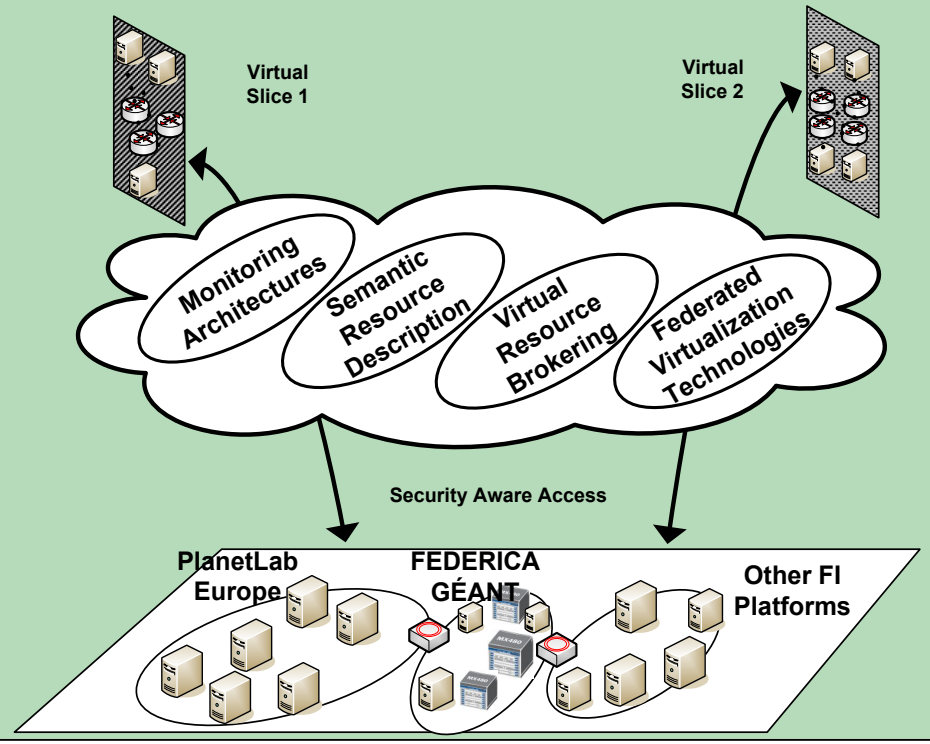
CineGrid

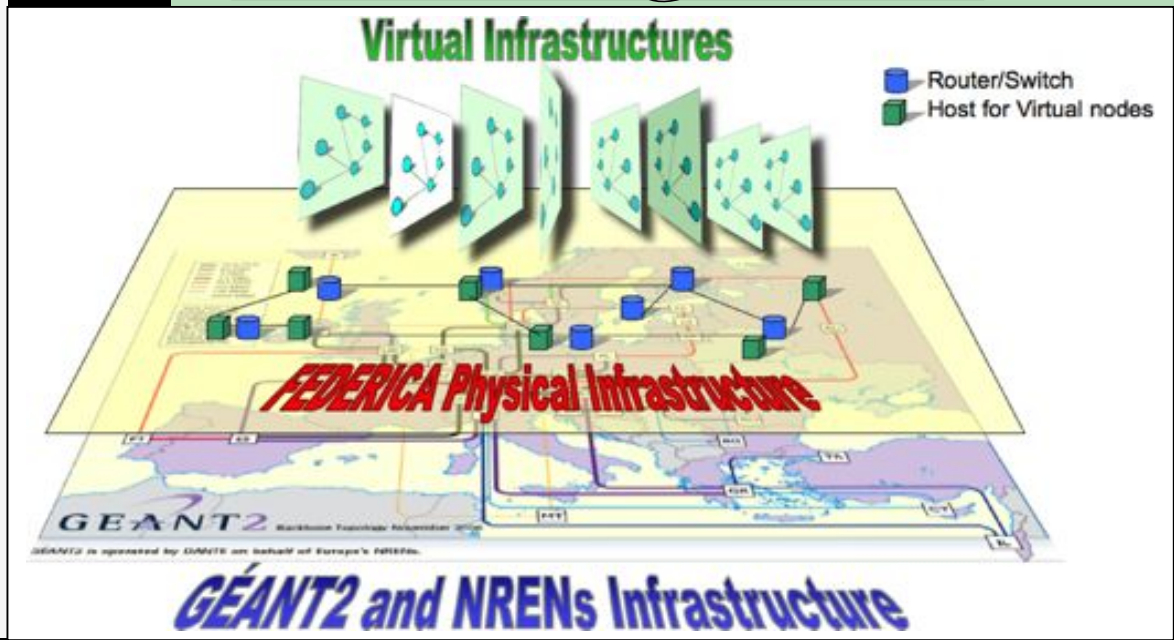
GigaPort

CREDITS CINEGRID.UVALIGHT.NL | WWW.CINEGRID.NL | WWW.CINEGRID.ORG
FACULTY OF SCIENCE UNIVERSITY OF AMSTERDAM | RALPH KONING: RALPH@SCIENCE.UVA.NL | PAOLA GROSSO: P.GROSSO@UVA.NL

Virtualisatie van infrastructuur & QoS

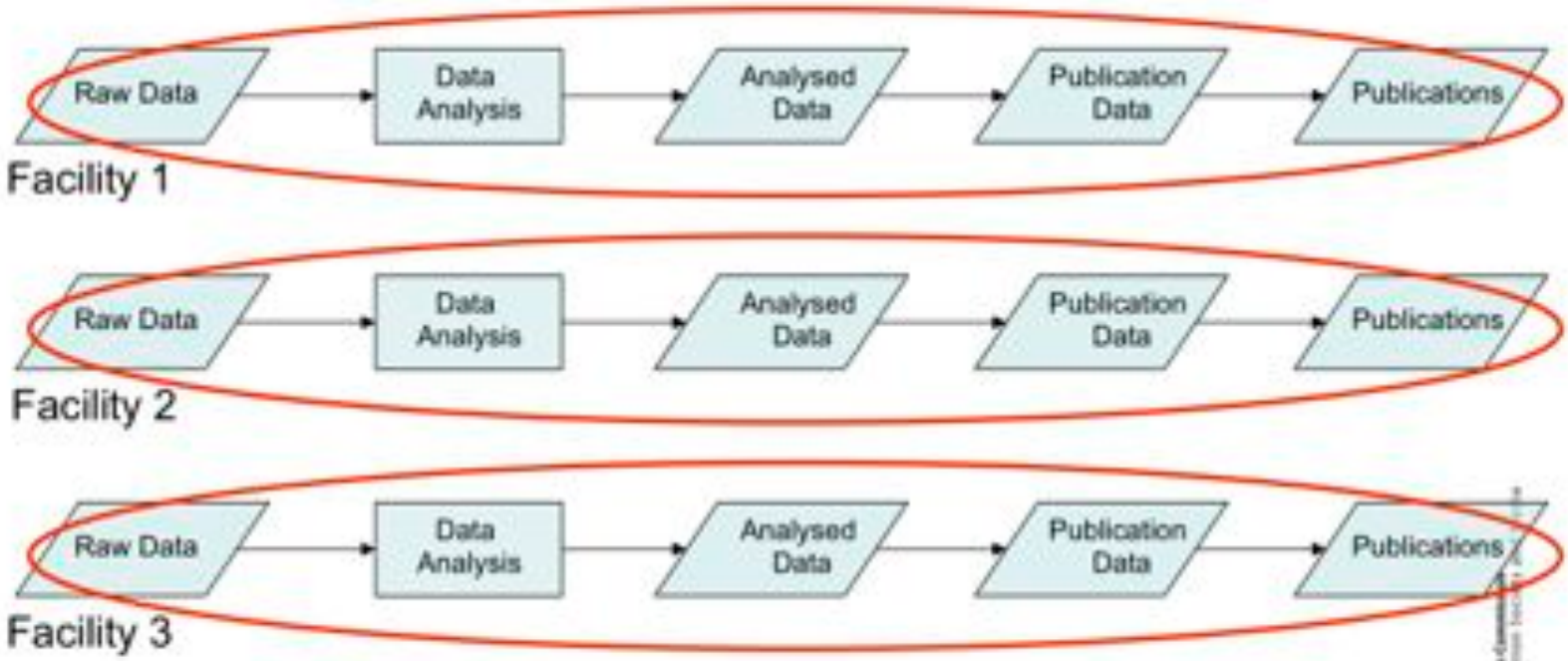






Current view

Distinct Infrastructures / Distinct User Experiences

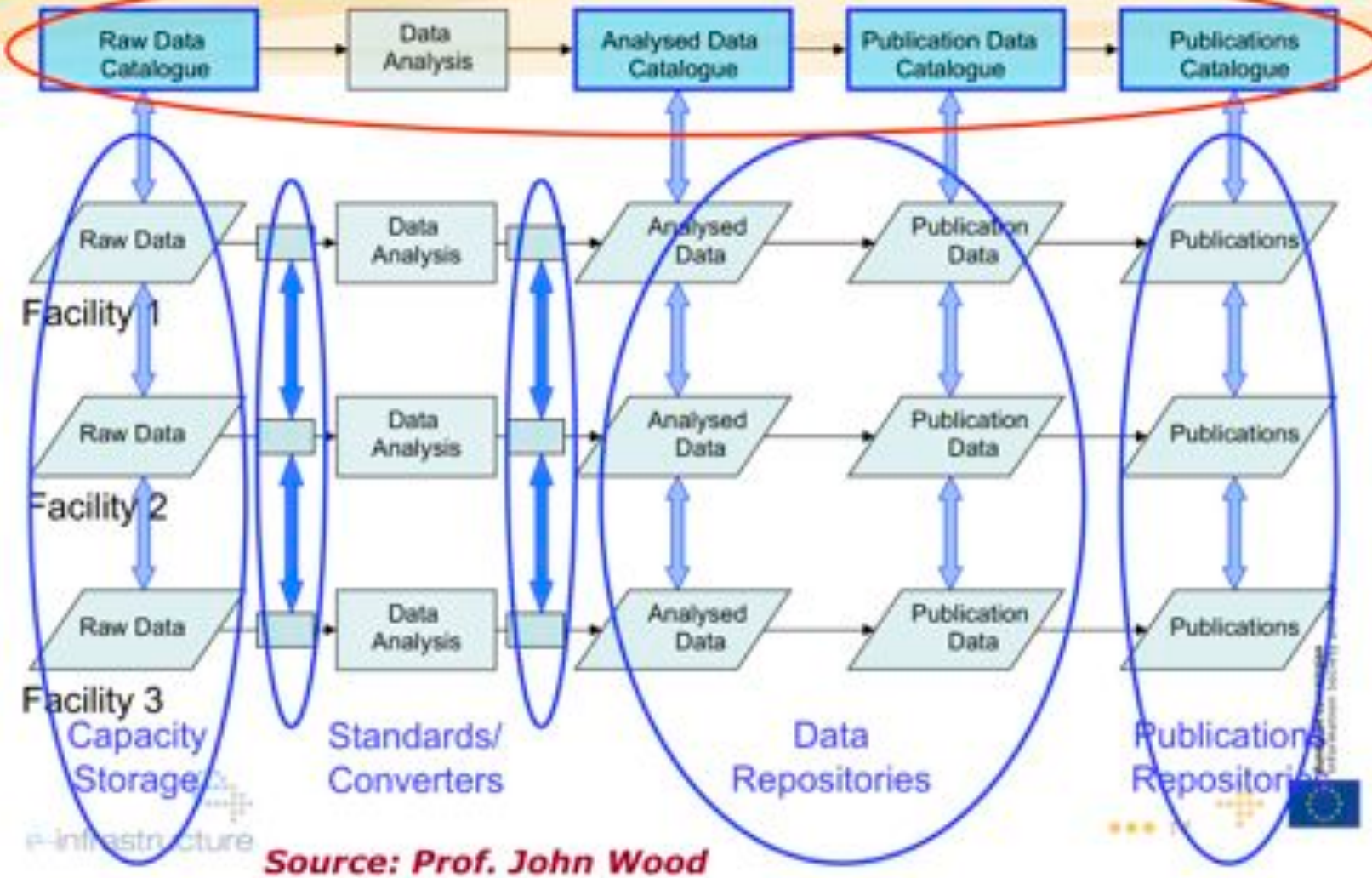


e-infrastructure

Source: Prof. John Wood

Future view (e-Infrastructure enabled)

Common Infrastructure / Common User Experience



Source: Prof. John Wood

SNE @ UvA

	Ijkdijk/Urban Flood	Medical	LifeWatch	CosmoGrid/eVLBI	CineGrid	EU-GN3/NOVI/Geysers	SURFnet/GLIF/Cloud
Green-IT						X	X
Privacy/Trust		X			X		
Authorization/policy		X	X		X	X	
Programmable networks	X		X				
40-100Gig/TCP/WF/QoS	X		X	X		X	
Topology/Architecture		X		X	X	X	
Optical Photonic		X	X		X		

Why is more resolution is better?

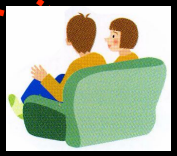
1. More Resolution Allows Closer Viewing of Larger Image
2. Closer Viewing of Larger Image Increases Viewing Angle
3. Increased Viewing Angle Produces Stronger Emotional Response

HDTV (2K)

1920

1080

30°



3.0 × Picture Height

UHDTV(8K)

24 Gb/s

7680

4320

0.75 × Picture Height

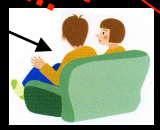
100°

SHD (4K)

3840

2160

7.6 Gb/s



60°

1.5 × Picture Height

Yutaka TANAKA
SHARP CORPORATION
Advanced Image Research Laboratories


Red End
Robin Noorda & Bethany de Forest


Hey at all
We're almost done. Shhh..


STEREO 4K Recording
Viktoria Mullova
Holland Festival 2010

Onderwijs - Master SNE

- Open Source aanpak

☺ Hij luistert naar ons!

- Gebaseerd op open en non-discriminatory standaarden
- Privacy en Security
- Digitale beveiliging & forensics
- Internet infrastructuur
- Opleiding nauw verweven met de onderzoeksgroep!


SNE/OS3 Homepage [OS3 Website] - Mozilla Firefox
File Edit View History Bookmarks Tools Help
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DNSSEC
Secured by DNSSEC
Domain name:
www.os3.nl
is secured by DNSSEC.
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SNE/OS3 Homepage [OS3 Webs...
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Master Education S
SNE is the University of Amsterdam master education in System and Network Engineering.
We focus on Open Standards, Open Software and Open Security, hence the name OS3.
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More in depth facts can be found on our
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LIA
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ICP
VA
RP2
Colloquia
OS3 Masters Theses
Archive
Links

Uitdagingen

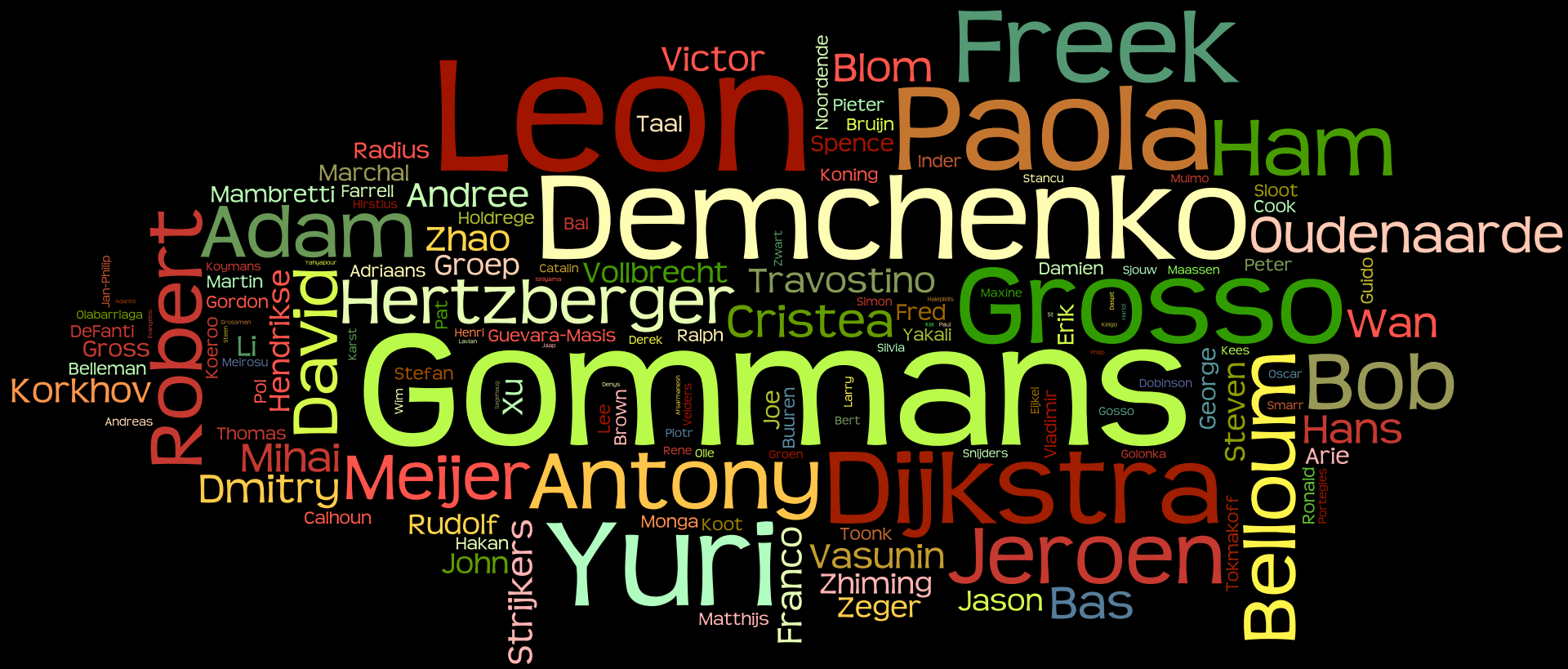
- Onderzoeksthema's:
  - Disruptive ontwikkeling infrastructuur
  - Slimme infrastructuur
  - Groene ICT & energie, smart – grids . . . . . .
  - Virtualisatie en deterministisch gedrag
  - Authorizatie & vertrouwen (trust)
  - Veiligheid en privacy in een Internet wereld
- Toepassingen
  - LifeWatch, IJkdijk, Medische beeldverwerking
  - Research Netwerken, Data intensieve app's (LHC)
  - Digitale Cinema, creatieve sector

Dankwoord

All co-Authors Ever

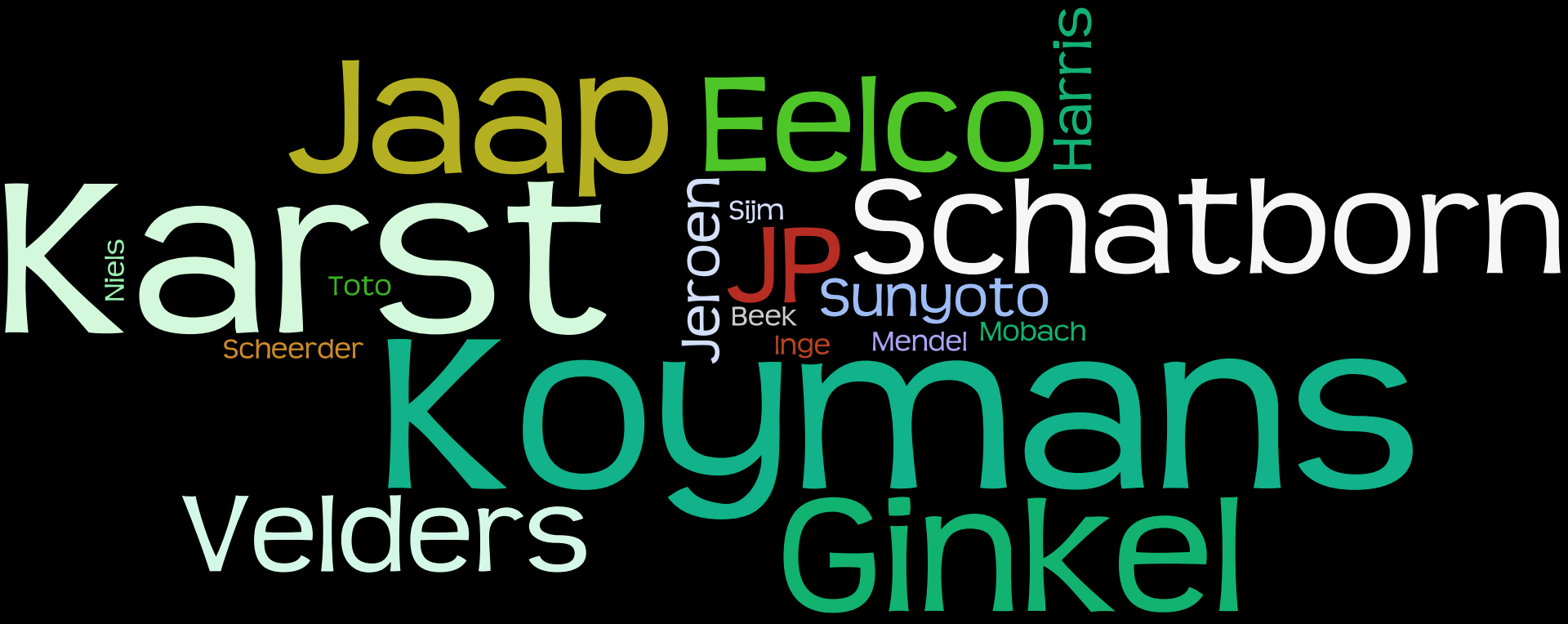
Many thanks to my research Group!

(co-authors since 2001 @ UvA)



Master OS3!

(master sinds 2003 @ UvA)



EU

SARA

SURF-eSRC

Pieken-in-de-Delta

SURFnet

FES

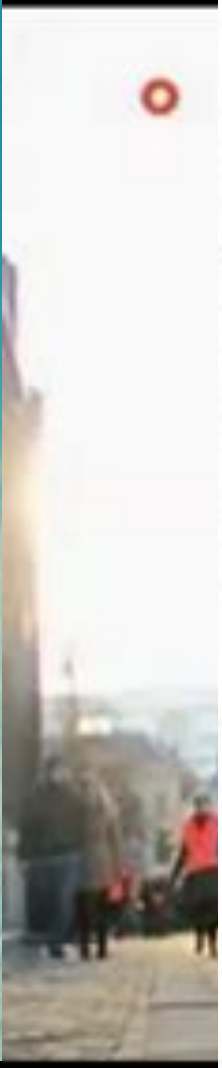
NWO-NCF

UvA

NWO

Tot slot …

De winter komt eraan…



Bezuinigingen in hoger onderwijs op een rij

19-01-2011 13:33 | gewijzigd 19-01-2011 14:57

DEN HAAG (ANP) – In het regeerakkoord is een aantal maatregelen aangekondigd o komende jaren te bezuinigen op het onderwijs. Bij de oppositie in de Tweede Kame betrokken organisaties zorgen met name de bezuinigingen op het passend onderwij het hoger onderwijs voor veel onrust. Duizenden studenten worden vrijdag in Den verwacht voor een protestbijeenkomst.

Het kabinet wijst er steeds op dat bezuinigingen nodig zijn om de overheidsfinanciën op orde t Ze maken volgens het kabinet bovendien financiële ruimte vrij om het onderwijs te verbetere 2015 gaan bezuinigingen en investeringen in het hoger onderwijs volgens het kabinet vrijwel

Een overzicht van de belangrijkste bezuinigingen in het hoger onderwijs:

-sociaal leenstelsel in masterfase: opbrengst in 2015 20 miljoen en jaren daarna 110 miljoen

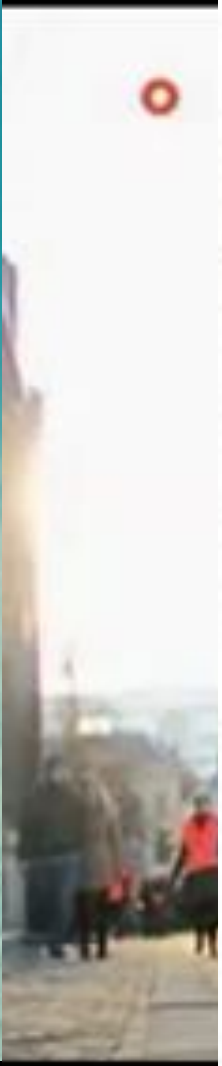
-verhoging collegegeld voor langstudeerders met 3000 euro: opbrengst vanaf 2015 140 miljoe

-'boete' voor instellingen per langstudeerder: opbrengst vanaf 2015 140 miljoen

-bezuinigingen door ander studeergedrag studenten: opbrengst vanaf 201 90 miljoen

-afschaffing OV-jaarkaart voor langstudeerders: opbrengst 40 miljoen vanaf 2015

-efficiency bij onderzoek en innovatie: opbrengst vanaf 201 90 miljoen



Bezuinig

19-01-2011 1

DEN HAAG (A
komende jare
betrokken or
het hoger on
verwacht voo

Het kabinet wi
Ze maken volg
2015 gaan bez

Een overzicht

-sociaal leenste

-verhoging coll

-'boete' voor in

-bezuinigingen

-afschaffing OV

-efficiency bij o

DINSDAG 18 JANUARI 2011

Bezuinigingen op hoger onderwijs zijn funest voor de kenniseconomie

NRC 18 januari 2012: Opinie

Anton Franken en Bas Ibelings

De studenten protesteren vrijdag tegen kortingen op het onderwijs. Ook andere maatregelen maken Nederland onaantrekkelijk, betogen Anton Franken en Bas Ibelings.

Het kabinet wil vanaf 2012 enkele honderden miljoenen euro's bezuinigen op hoger onderwijs. Hierdoor verdwijnen duizenden arbeidsplaatsen aan universiteiten en hogescholen. Dat betekent een enorm verlies van kwaliteit in het wetenschappelijk onderwijs – dat bovendien minder studenten zal trekken, onder meer door de langstudeerdersmaatregel. De kracht van universiteiten als motor voor de kenniseconomie zal alleen daardoor al afnemen.

Daarbij blijft het niet. Het wegvallen van de gelden uit het Fonds Economische Structuurversterking (FES) betekent een nog verdere verschraling. Uit het FES is de afgelopen vijftien jaar ruim 3 miljard euro – de laatste jaren minimaal 500 miljoen euro per jaar – geïnvesteerd in kennis en innovatie. De FES-gelden, een pot met aardgasbaten, zullen opgaan in de 'algemene middelen', lees: de staatsschuld.

Deze bezuinigingen zijn funest
voor de kenniseconomie!

Ik heb gezegd! …

En dan nog dit:

Ik verzoek U vriendelijk geen traditionele felicitatie rij te vormen bij de receptie maar meteen naar de drankjes en hapjes te grijpen!

Ik kom wel naar U toe.