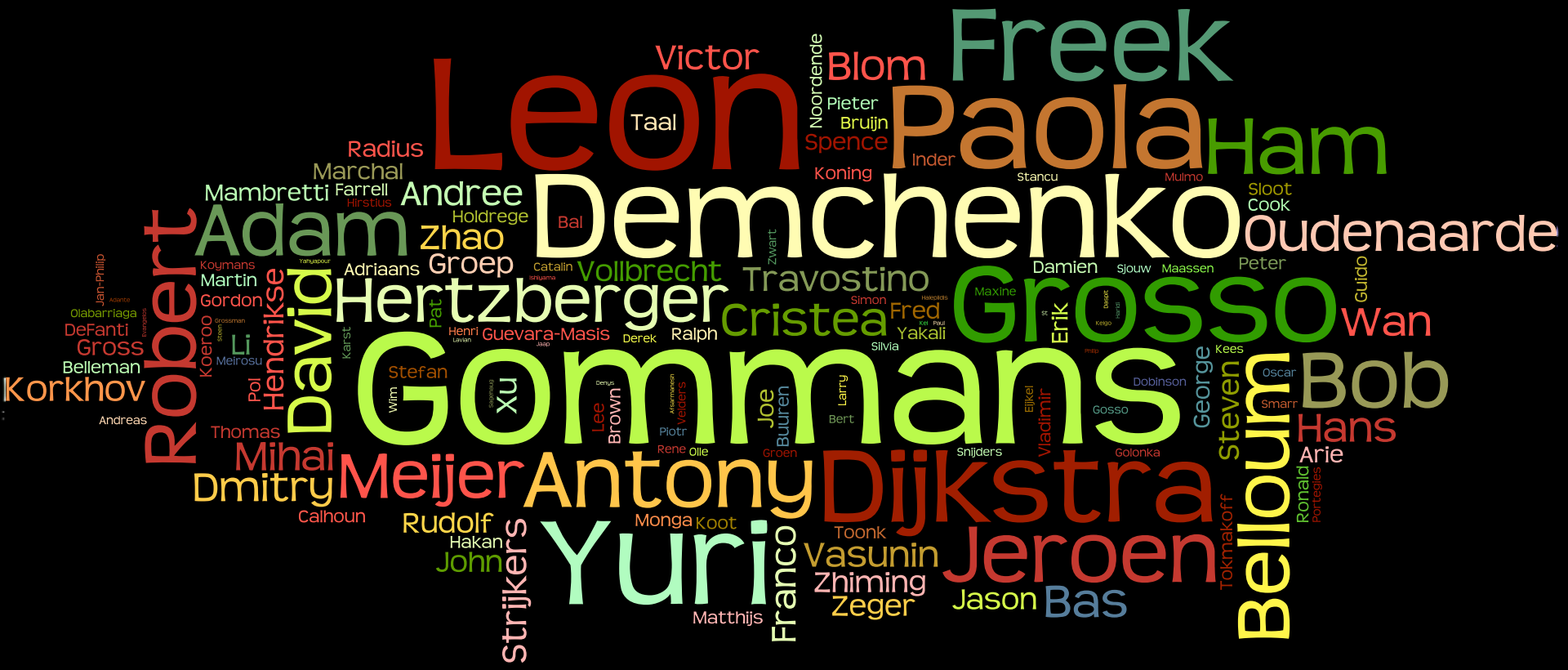
System and Network Engineering Science in Amsterdam

Smart Cyber Infrastructure.

Cees de Laat



Science Faculty @ UvA

Informatics Institute

- AMLAB: Machine Learning (Prof. dr. M. Welling)
- FCN: Federated Collaborative Networks (Prof. dr. H. Afsarmanesh)
- ILPS: Information and Language Processing Systems (Prof. dr. M. de Rijke)
- ISIS: Intelligent Sensory Information Systems (Prof. dr. ir. A.W.M. Smeulders)
- CSL: Computational Science Laboratory (Prof. dr. P.M.A. Sloot)
- SNE: System and Network Engineering (Prof. dr. ir. C.T.A.M. de Laat)
- TCS: Theory of Computer Science (Prof. dr. J.A. Bergstra)

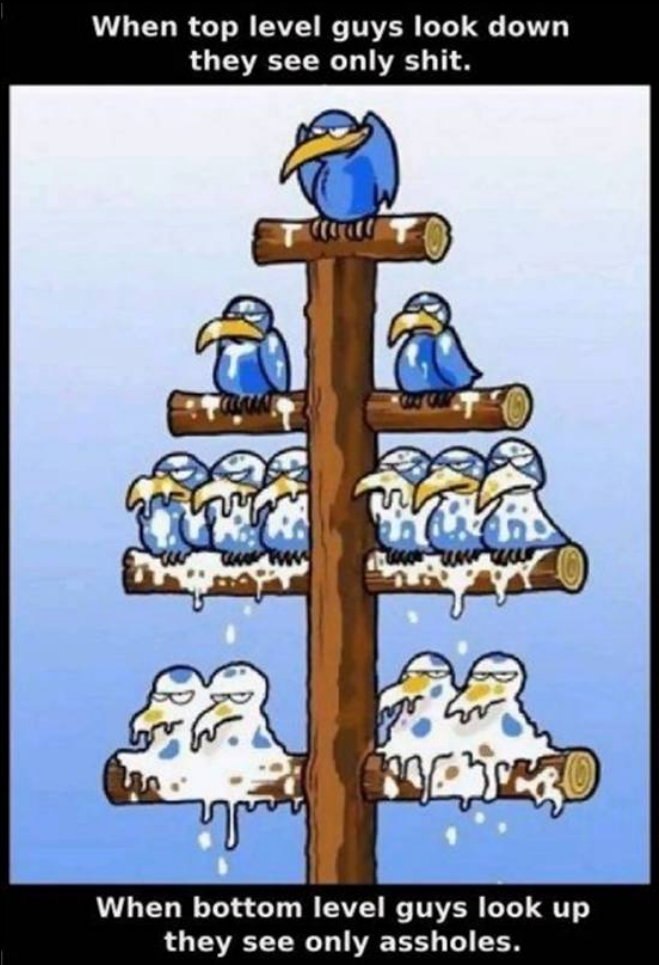
SNE - Staffing

Group leader: ***prof. C. de Laat***

Deputy group leaders: ***dr. Andy Pimentel, dr. Paola Grosso***

- 1 full prof (CdL)
- 2 part time professors
- 2 endowed professors
- *2 senior researchers*
- 1 associate prof (AP)
- 4 assistant professors (inc PG)
- ~12 postdoc's
- *About 15 phd students*
- ~10 guests

- *Yearly turnover ~ 3,5 MEuro*



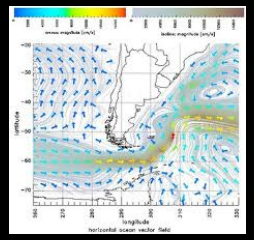
SNE - Mission

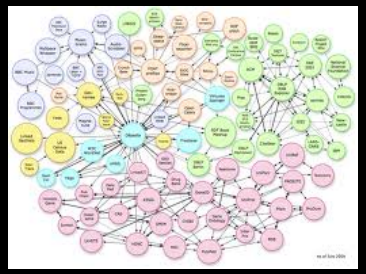
Can we create smart and safe data processing infrastructures that can be tailored to diverse application needs?

- *Capacity*
  - *Bandwidth on demand, QoS, architectures, photonics, performance*
- *Capability*
  - *Programmability, virtualization, complexity, semantics, workflows*
- *Security*
  - *Policy, Trust, Anonymity, Privacy, Integrity*
- *Sustainability*
  - *Greening infrastructure, Awareness*
- *Resilience*
  - *Failures, Disasters, Systems under attack*

Internet developments

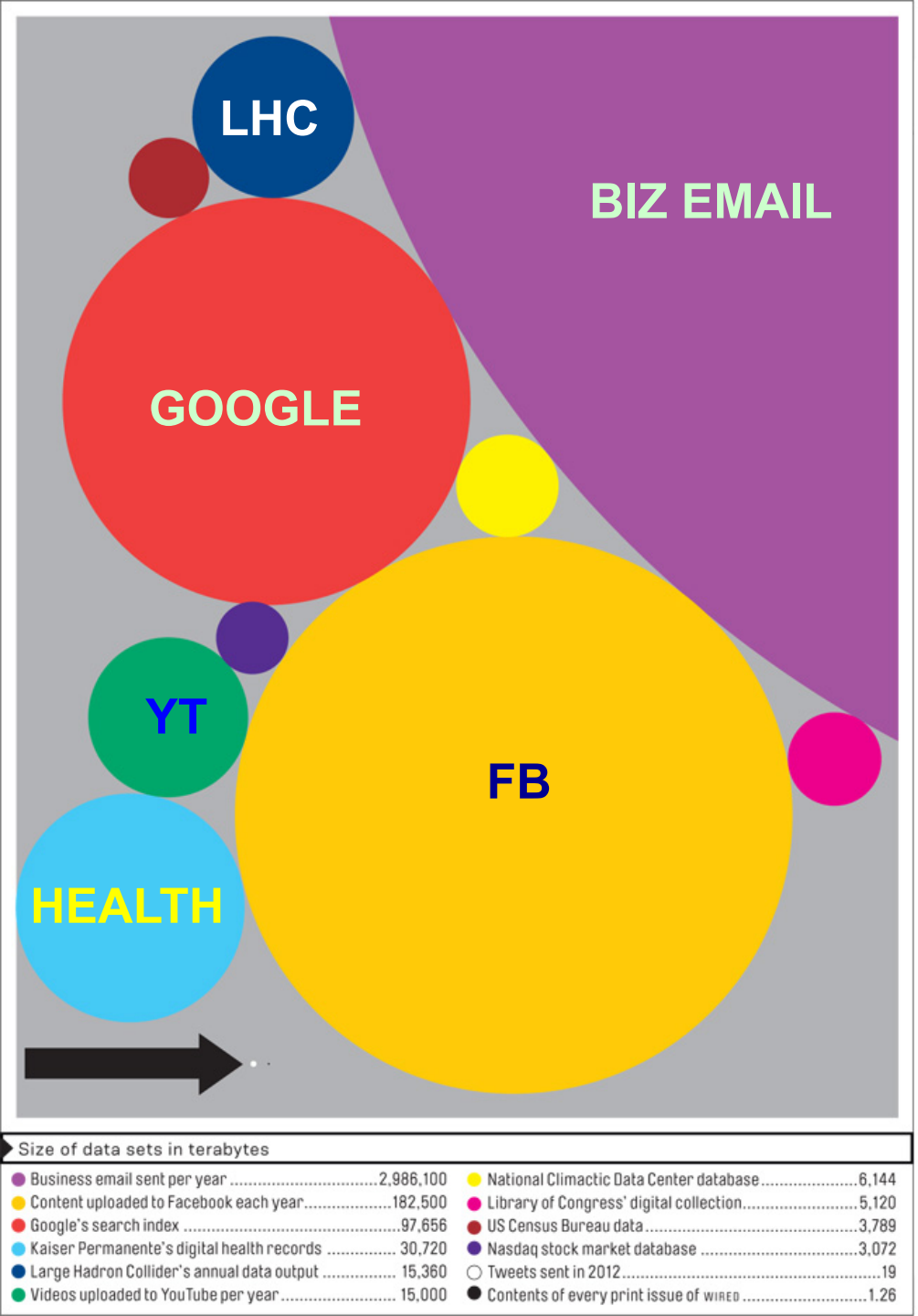
... more data!





... more realtime!

... more users!



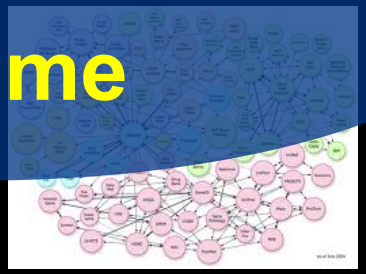
There
is
always
a
bigger
fish

Internet developments

... more data!

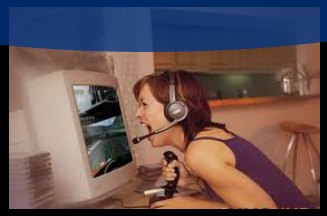
Speed

Volume



Deterministic

Real-time



Scalable

Secure

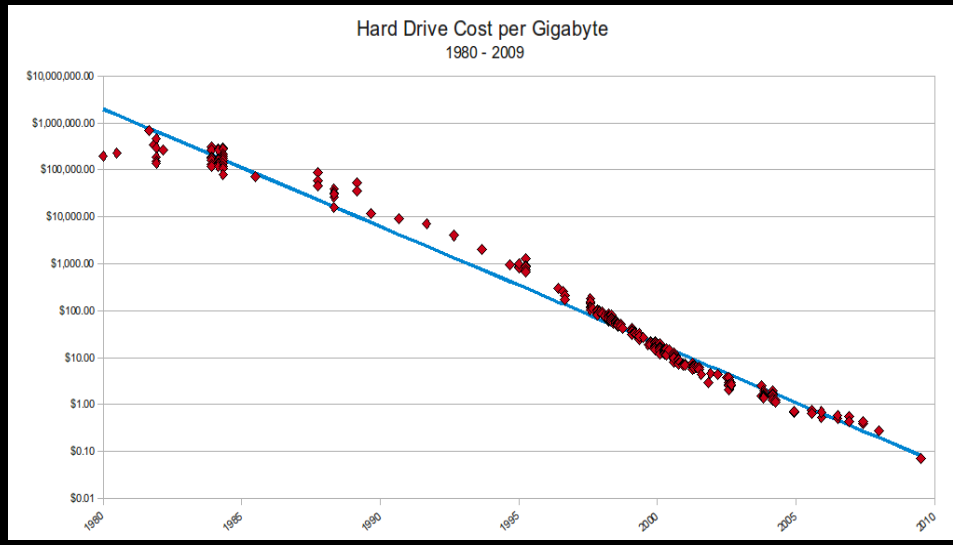
... more users!

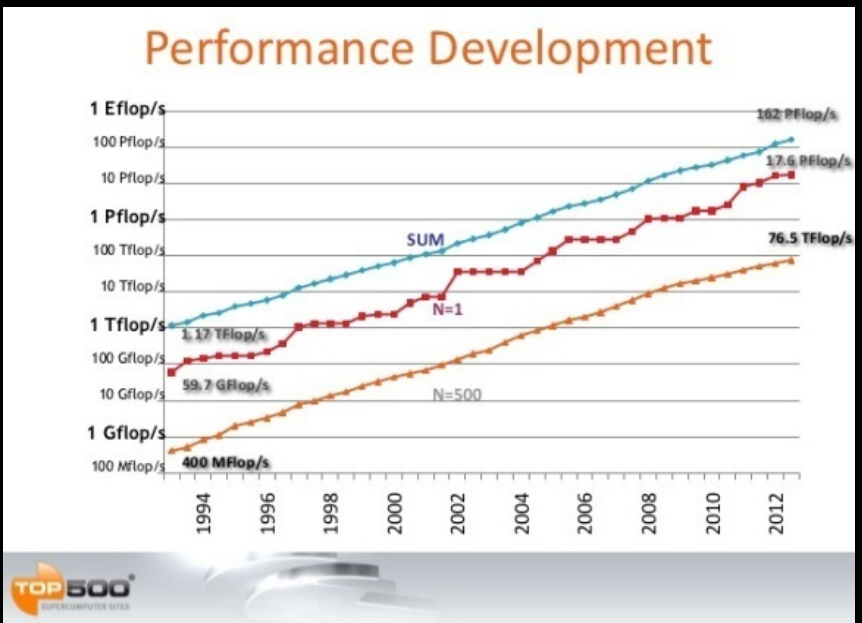
Reliable and Safe!

This omnipresence of IT makes us not only strong but also vulnerable.

- A virus, a hacker, or a system failure can instantly send digital shockwaves around the world.

The hardware and software that allow all our systems to operate is becoming bigger and more complex all the time, and the capacity of networks and data storage is increasing by leaps and bounds.



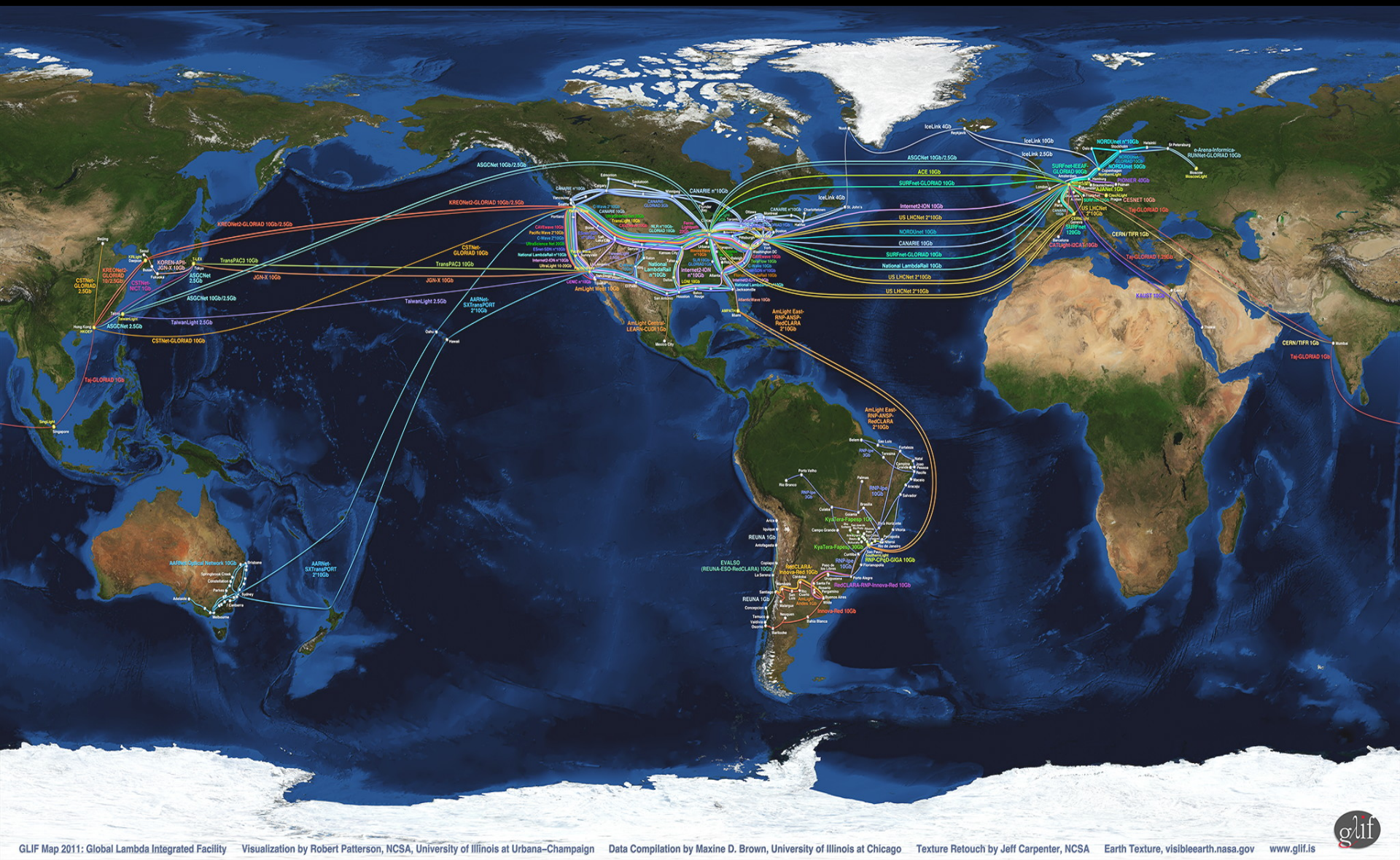


We will soon reach the limits of what is currently feasible and controllable.

https://www.knaw.nl/shared/resources/actueel/publicaties/pdf/20111029.pdf

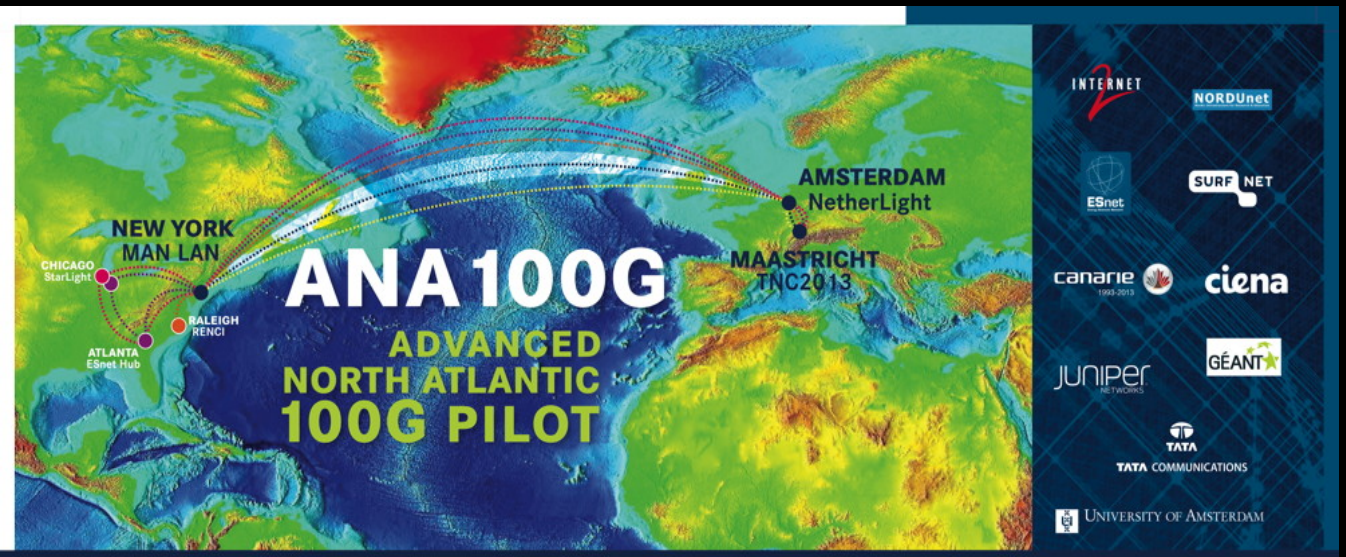
The GLIF – LightPaths around the World

F Dijkstra, J van der Ham, P Grosso, C de Laat, “A path finding implementation for multi-layer networks”, Future Generation Computer Systems 25 (2), 142-146.



ExoGeni @ OpenLab - UvA

Installed and up June 3th 2013



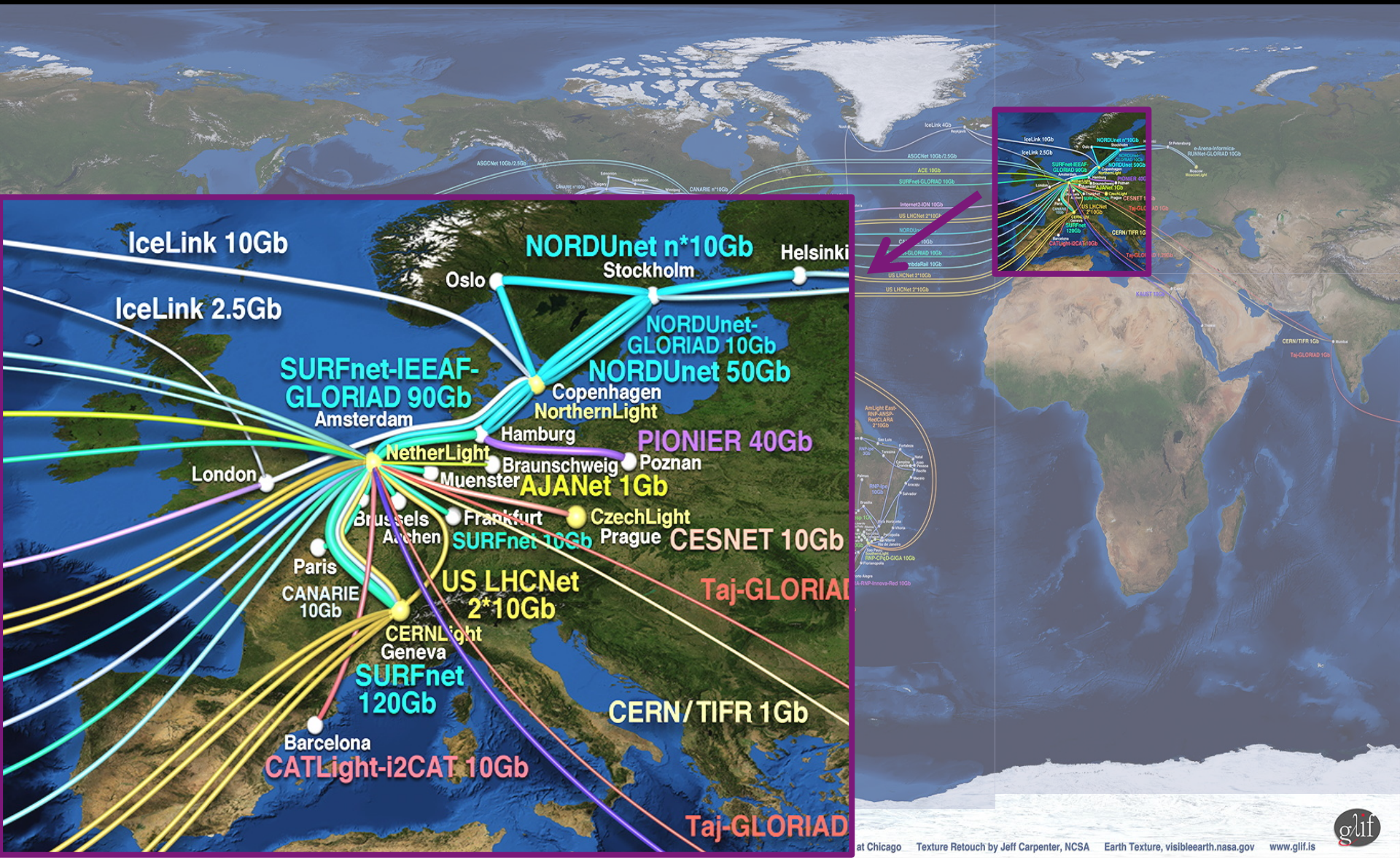
TNC2013 DEMOS JUNE, 2013

DEMO	TITLE	OWNER	AFFILIATION	E-MAIL	A-SIDE	Z-SIDE	PORTS(S) MAN LAN	PORTS(S) TNC2013	DETAILS
1	Big data transfers with multipathing, OpenFlow and MPTCP	Ronald van der Pol	SURFnet	ronald.vanderpol@surfnet.nl	TNC/MECC, Maastricht NL	Chicago, IL	Existing 100G link between internet2 and ESnet	2x40GE (Juniper)+ 2x 10GE (OME6500)	In this demonstration we show how multipathing, OpenFlow and Multipath TCP (MPTCP) can help in large file transfers between data centres (Maastricht and Chicago). An OpenFlow application provisions multiple paths between the servers and MPTCP will be used on the servers to simultaneously send traffic across all those paths. This demo uses 2x40G on the transatlantic 100G link. ESnet provides 2x40G between MAN LAN and StarLight, ACE and USLHCnet provide additional 10GEs.
2	Visualize 100G traffic	Inder Monga	ESnet	imonga@es.net					Using an SNMP feed from the Juniper switch at TNC2013,and/or Brocade ALZS node in MANLAN, this demo would visualize the total traffic on the link, of all demos aggregated. The network diagram will show the transatlantic topology and some of the demo topologies.
3	How many modern servers can fill a 100Gbps Transatlantic Circuit?	Inder Monga	ESnet	imonga@es.net	Chicago, Ill	TNC showfloor	1x 100GE	8x 10GE	In this demonstration, we show that with the proper tuning and tool, only 2 hosts on each continent can generate almost 80Gbps of traffic. Each server has 4 10G NICS connected to a 40G virtual circuit, and has iperf3 running to generate traffic. ESnet's new "iperf3" throughput measurement tool, still in 'beta', combines the best features from other tools such as iperf, nuttcp, and netperf. See: https://my.es.net/demos/tnc2013/
4	First European ExoGENI at Work	Jeroen van der Ham	UvA	vdham@uva.nl	RENCI, NC	UvA, Amsterdam, NL	1x 10GE	1x 10GE	The ExoGENI racks at RENCI and UvA will be interconnected over a 10G pipe and be on continuously, showing GENI connectivity between Amsterdam and the rest of the GENI nodes in the USA.
5	Up and down North Atlantic @ 100G	Michael Enrico	DANTE	michael.enrico@dante.net	TNC showfloor	TNC showfloor	1x 100GE	1x 100GE	The DANTE 100GE test set will be placed at the TNC2013 showfloor and connected to the Juniper at 100G. When this demo is running a loop @ MAN LAN's Brocade switch will ensure that the traffic sent to MAN LAN returns to the showfloor. On display is the throughput and RTT (to show the traffic traveled the Atlantic twice)

Connected via the new 100 Gb/s transatlantic To US-GENI

Amsterdam is a major hub in The GLIF

F Dijkstra, J van der Ham, P Grosso, C de Laat, “A path finding implementation for multi-layer networks”, Future Generation Computer Systems 25 (2), 142-146.



SARNET: Security Autonomous Response with programmable NETworks

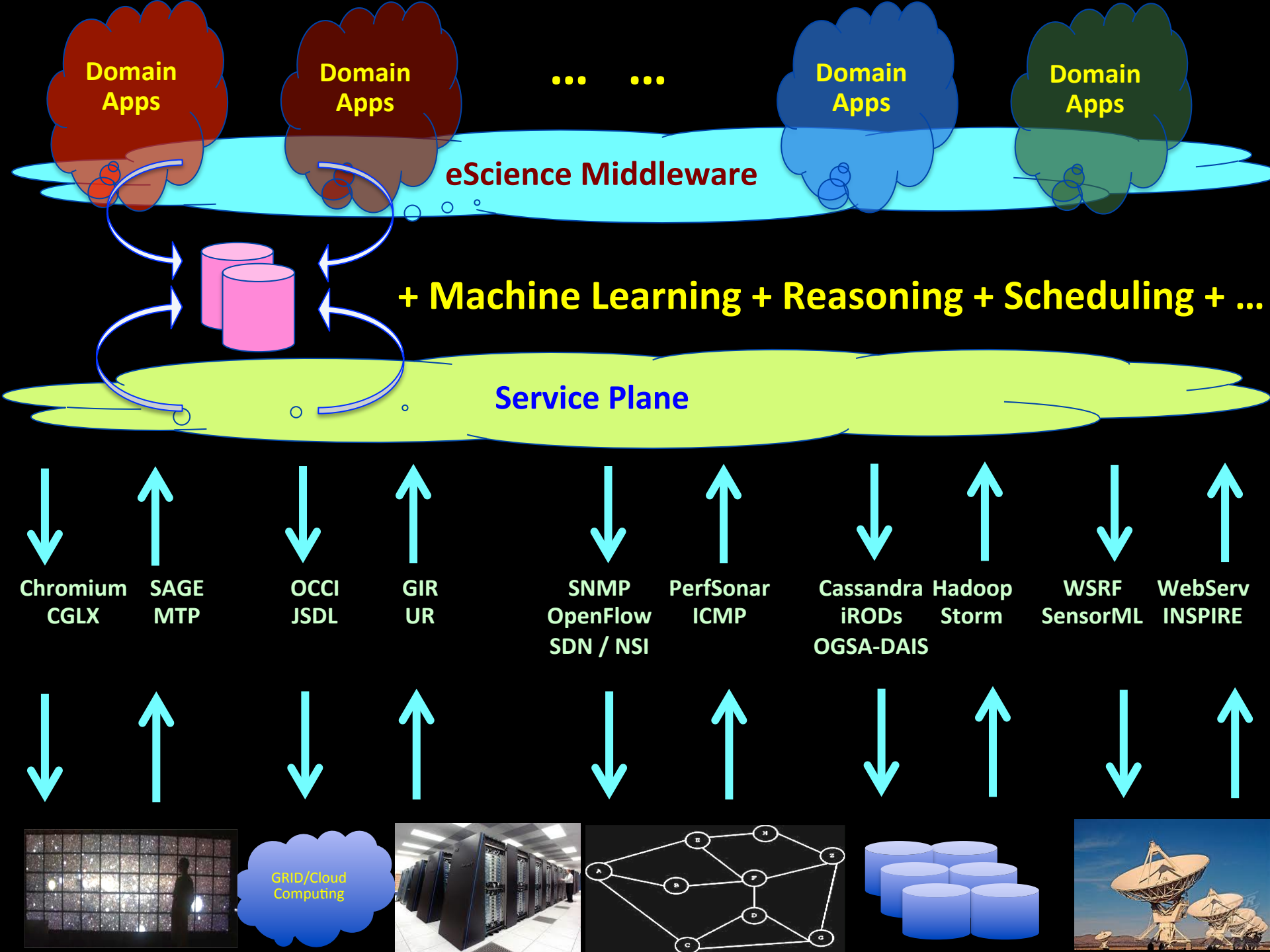
Cees de Laat
Leon Gommans, Rodney Wilson, Rob Meijer
Tom van Engers, Marc Lyonais, Paola Grosso, Frans Franken,
Ameneh Deljoo, Ralph Koning, Ben de Graaff, Stojan Trajanovski

UNIVERSITY OF AMSTERDAM

Cyber security program

- Research goal is to obtain the knowledge to create ICT systems that:
  - model their state (situation)
  - discover by observations and reasoning if and how an attack is developing and calculate the associated risks
  - have the knowledge to calculate the effect of counter measures on states and their risks
  - choose and execute one.

  In short, we research the concept of networked computer infrastructures exhibiting SAR: Security Autonomous Response.


Domain Apps
Domain Apps
... ...
Domain Apps
Domain Apps
eScience Middleware
+ Machine Learning + Reasoning + Scheduling + …
Service Plane
Chromium CGLX
SAGE MTP
OCCI JSDL
GIR UR
SNMP OpenFlow SDN / NSI
PerfSonar ICMP
Cassandra iRODs OGSA-DAIS
Hadoop Storm
WSRF SensorML
WebServ INSPIRE
GRID/Cloud Computing

The Big Data Challenge

Doing Science

Wis dom

Knowledge to act

Information

Data

a.o. from ESFRI's

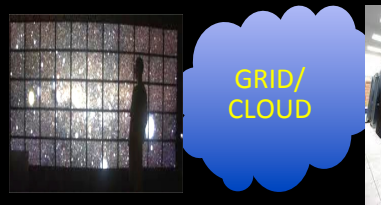
ICT to enable Science

e-IRG

Workflows Schedulers to act

OWL

XML, RDF, rSpec, SNMP, Java based, etc.



The Big Data Challenge

Doing Science

ICT to enable Science

Scientists live here!

Science App Store?

Wis dom

Knowledge to act

e-IRG

Workflows Schedulers

MAGIC DATA CARPET

curation - description - trust - security - policy – integrity

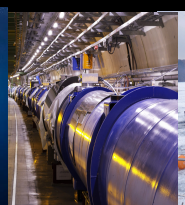
Information

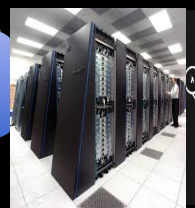
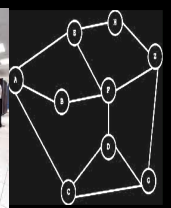
OWL

Data

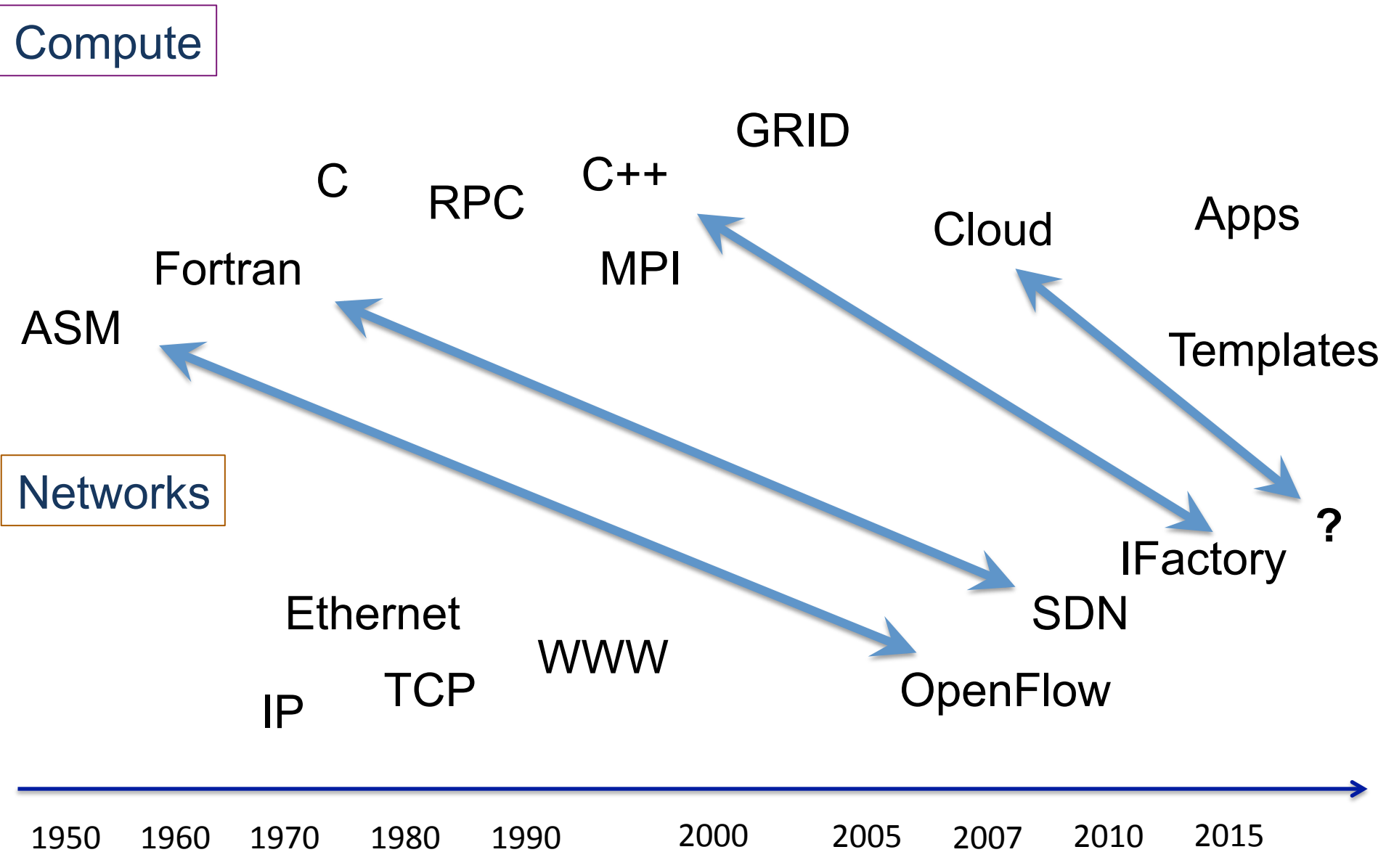
a.o. from ESFRI's

XML, RDF, rSpec, SNMP, Java based, etc.



TimeLine


Compute
GRID
C
RPC
C++
Cloud
Apps
Fortran
MPI
ASM
Templates
Networks
?
IFactory
Ethernet
SDN
WWW
TCP
OpenFlow
IP
1950
1960
1970
1980
1990
2000
2005
2007
2010
2015

Questions?

http://delaat.net

http://sne.science.uva.nl

http://www.os3.nl/

http://sne.science.uva.nl/openlab/

http://pire.opensciencedatacloud.org

http://staff.science.uva.nl/~delaat/pire/

https://rd-alliance.org

http://envri.eu