

QoS in e-Infrastructure for Science the GLIF System.

(Global Lambda Integrated Facility)

Cees de Laat

EU

SURFnet

NWO

University of Amsterdam

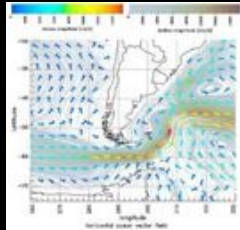
TNO
NCF



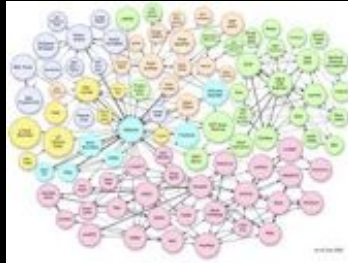
... more data!

Internet developments

Google



DATA



... more realtime!



twitter



myspace
a place for freedom



Linked in



SchoolBANK

Hyves

flickr
from YAHOO!



... more users!

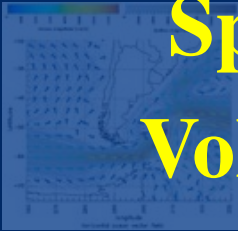
... more data!

Internet developments

Google

Speed
Volume

DATA



Deterministic

Real-time



twitter



Scalable

Secure

Linked in

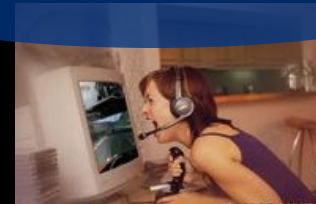


myspace

SchoolBANK

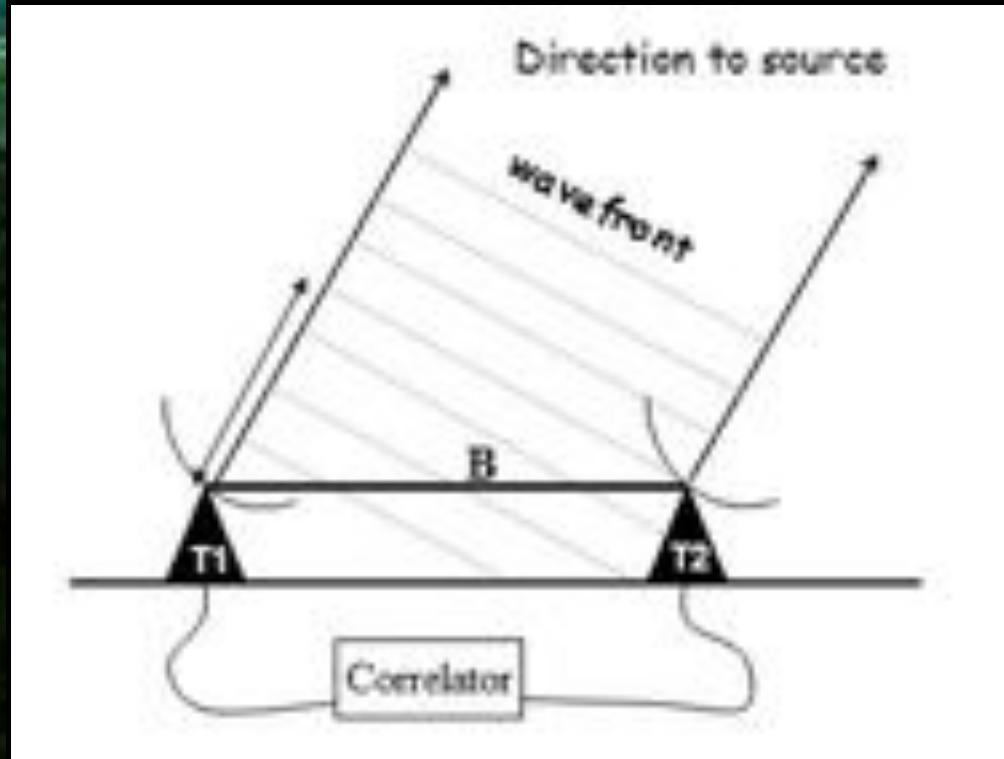
Hyves

flickr



... more users!

e - Very Large Base Interferometer





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

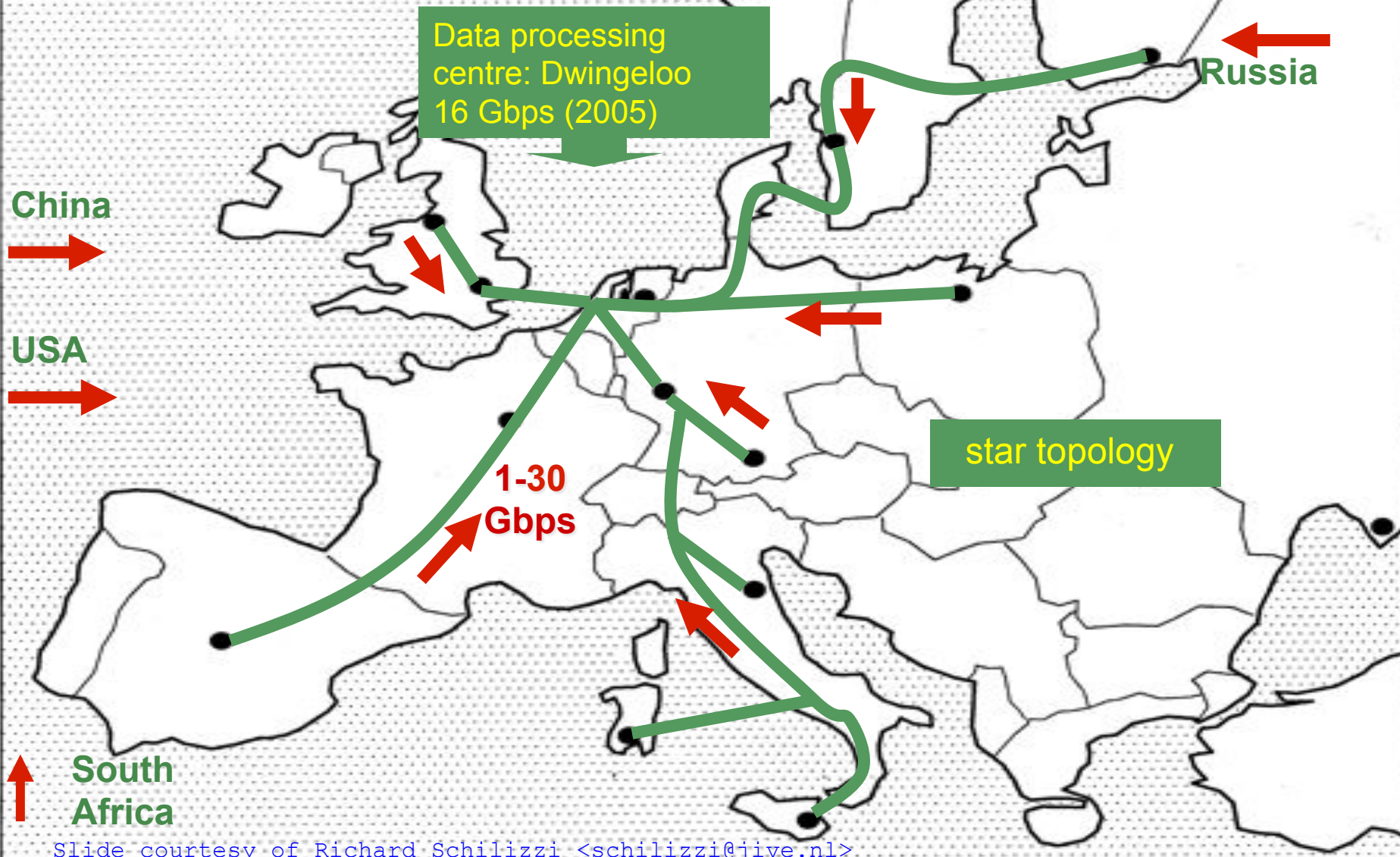
Jun

2008

2009



eEVN: European VLBI Network



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

eVLBI: European VLBI Network

Dec 4

Dec 5

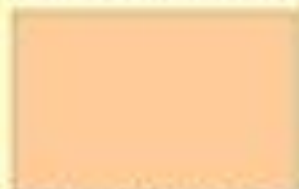
Dec 6

Deadline for submitting eVLBI observing proposals

Program committee decides if eVLBI science can be justified



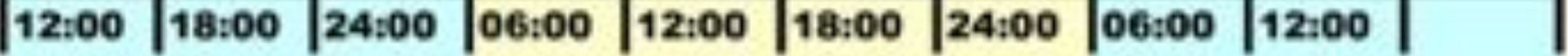
eVLBI Observing Run



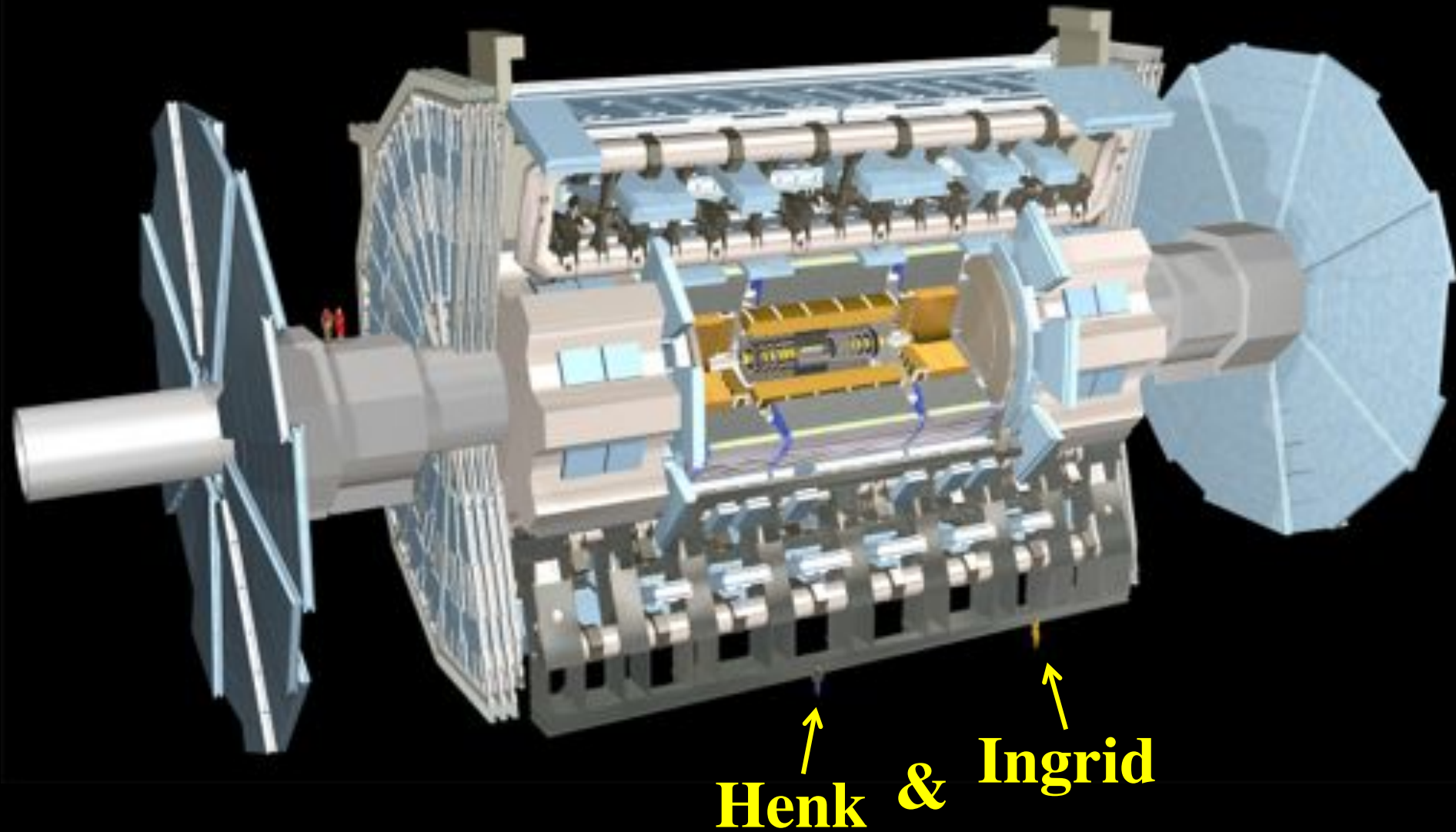
Correlation at JIVE



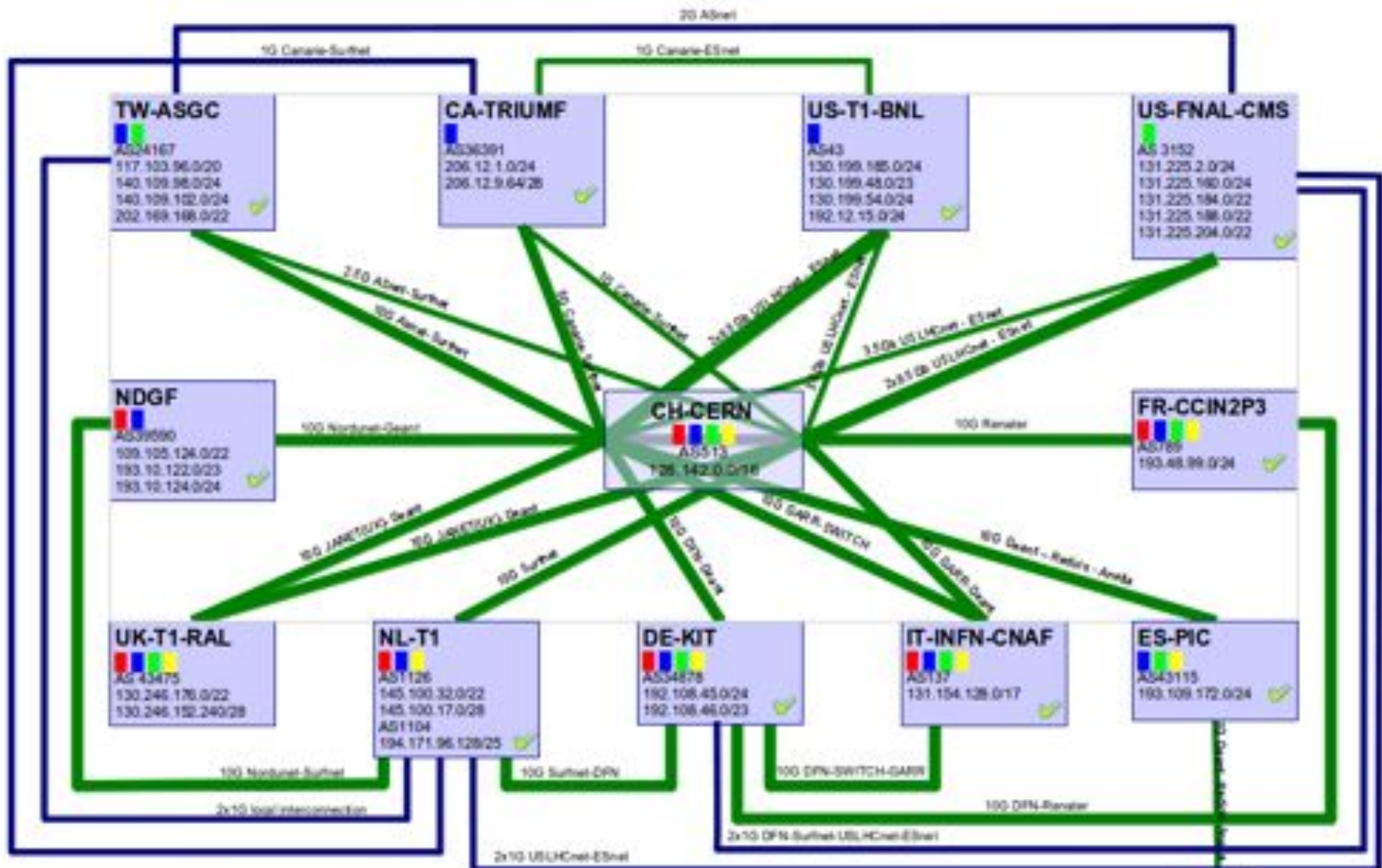
Scientist downloads data from www.jive.nl



ATLAS detector @ CERN Geneve



LHCOPN



— T0-T1 and T1-T1 traffic
— T1-T1 traffic only
 Not deployed yet
 (thick) = 100Gbps
 (thin) = 10Gbps

■ = Alice ■ = Atlas
■ = CMS ■ = LHCb
✓ = internet backup available
 g2y prefix: 192.16.168.0/24
 edwards.martel@cern.ch 20111013



Big and small flows don't go well together on the same wire!



... more data!

Google

Speed
Volume



Deterministic

Real-time

more realtime!



Scalable

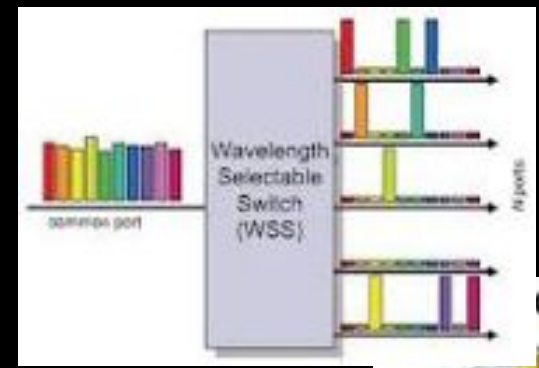
Secure



... more users!

L3

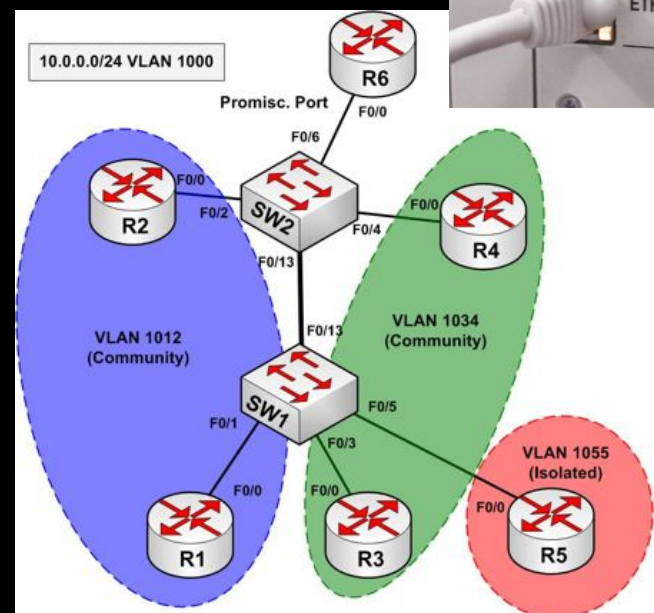
THE WHOLE INTERNET



L1



L2





GLIF Map 2011: Global Links Integrated Facility Visualization by Robert Patterson, NCSA, University of Illinois at Urbana-Champaign Data Collection by Maxine Brown, University of Illinois at Chicago Future Network by Jeff Casanova, NCSA Earth Future, earthfuture.ncsa.uiuc.edu www.glif.org



GLIF 2011

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



GLF Map (2011: Global Links Integrated Profile) - Visualization by Robert Patterson, NOAA, University of Illinois at Urbana-Champaign Data Collection by Marco B. Rosen, University of Illinois at Chicago Future Network by Jeff Dreyfus, MIT Earth Future, earthfuture.mit.edu www.glf.it

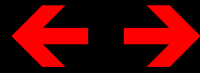
We investigate:  for complex networks!





Hybrid computing

Routers



Supercomputers

Ethernet switches



Grid & Cloud

Photonic transport



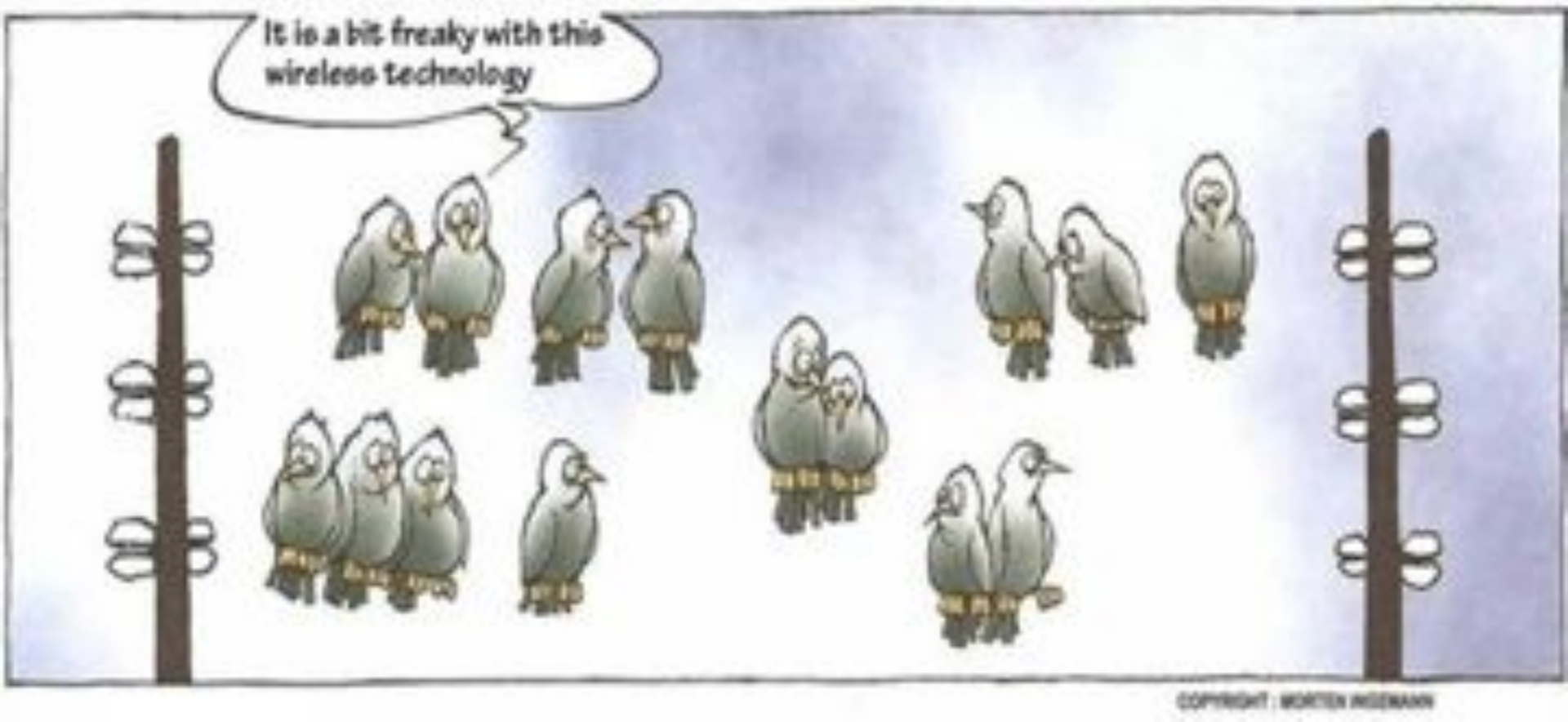
GPU's

What matters:

Energy consumption/multiplication

Energy consumption/bit transported

Wireless Networks



Q&A

This trip is funded by:

Eu-NOVI project

<http://www.fp7-novi.eu/>



Networking innovations Over Virtualized Infrastructures