Back to the Future!

Cees de Laat

EU

COMMIT

UvA

NWO

PID/EFRO

SURFnet

TNO

NCF

Why?

I want to:

"Show Big Bug Bunny in 4K on my Tiled Display using green Infrastructure"

Why?

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Why?

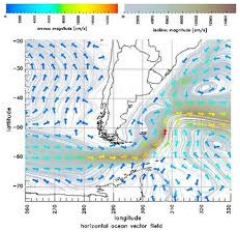
I want to:

"Show Big Bug Bunny in 4K on my Tiled Display using green Infrastructure"

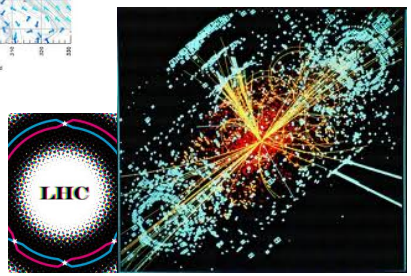
- Big Bugs Bunny can be on multiple servers on the Internet.
- Movie may need processing / recoding to get to 4K for Tiled Display.
- Needs deterministic Green infrastructure for Quality of Experience.
- Consumer / Scientist does not want to know the underlying details.
  ➔ His refrigerator also just works.

Many demands….

… more data!



Google



… more realtime!

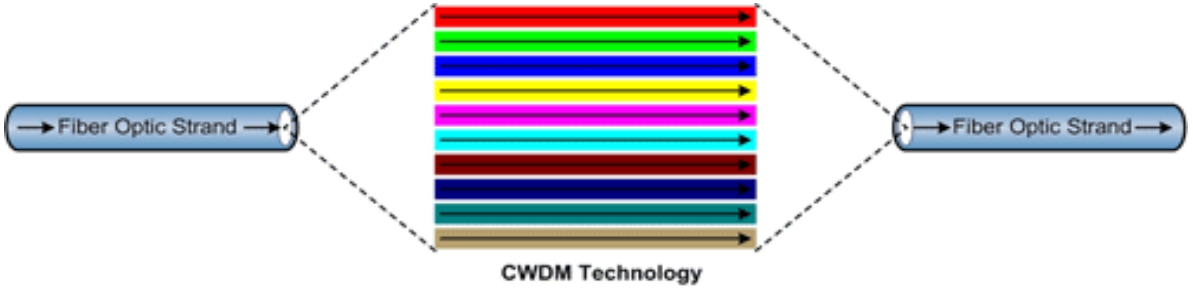
LinkedIn

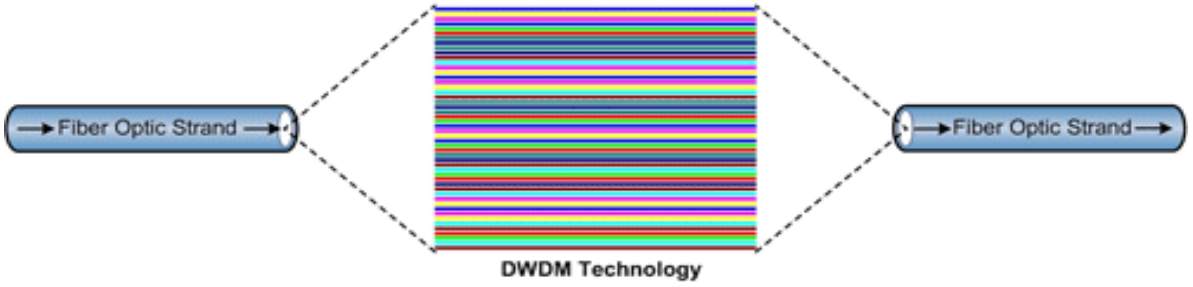
Hyves

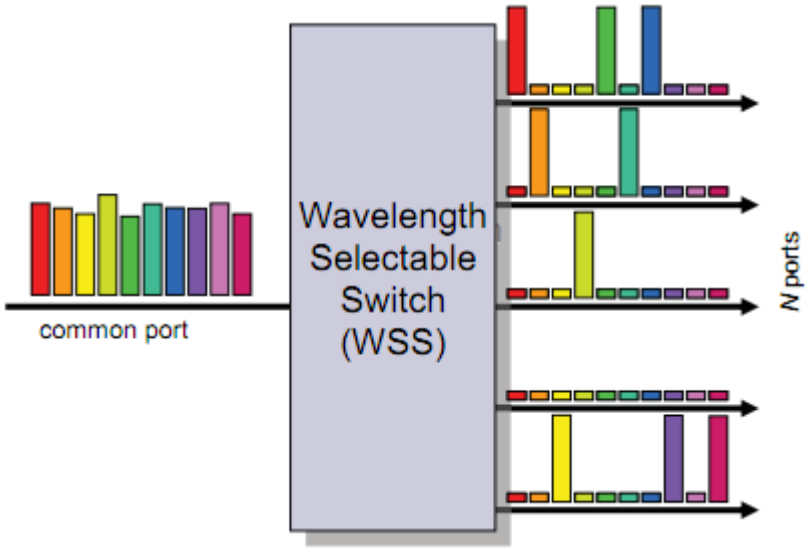
… more users!

... more possibilities

Optical transmission

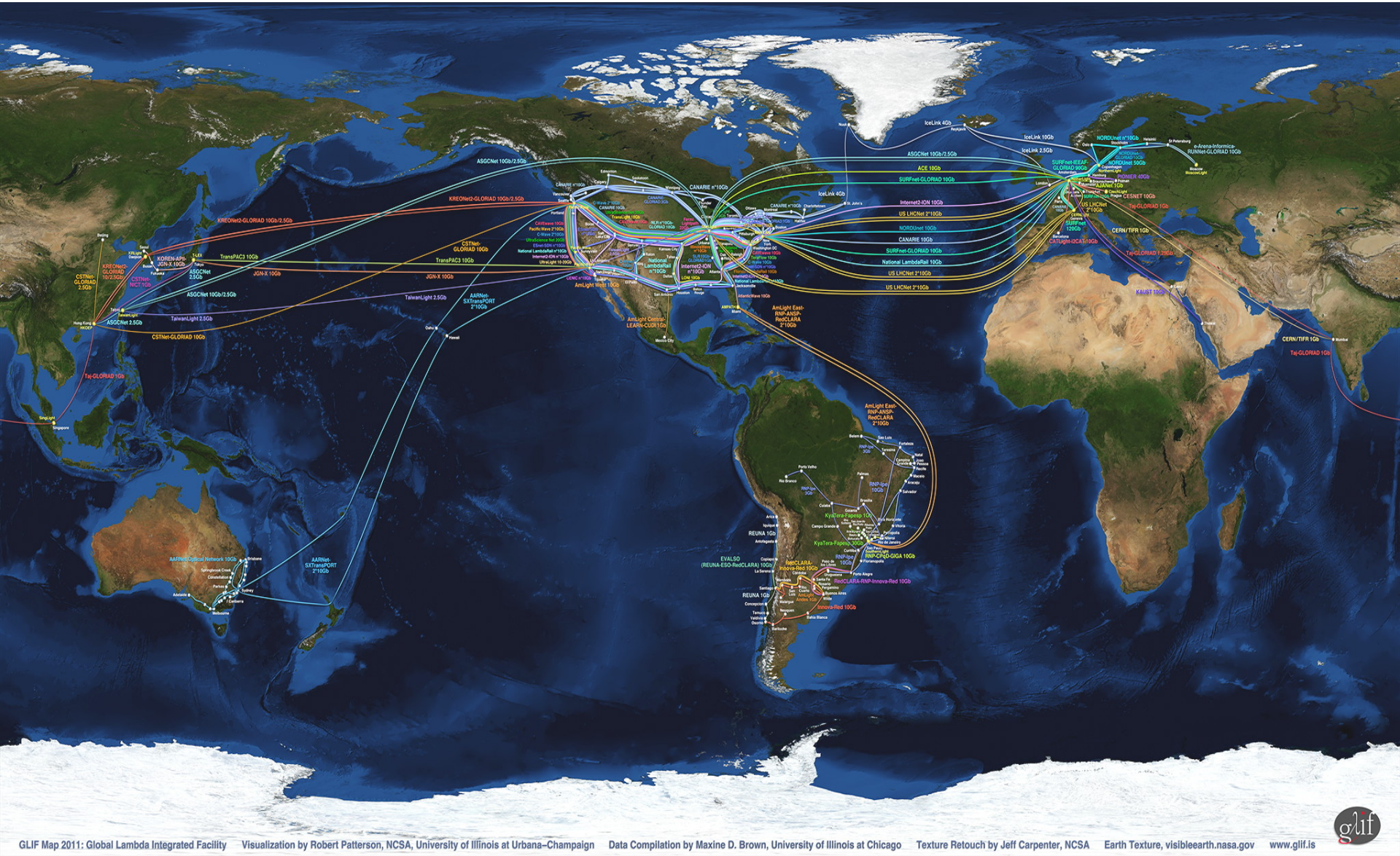






Virtualization

The GLIF – lightpaths around the world



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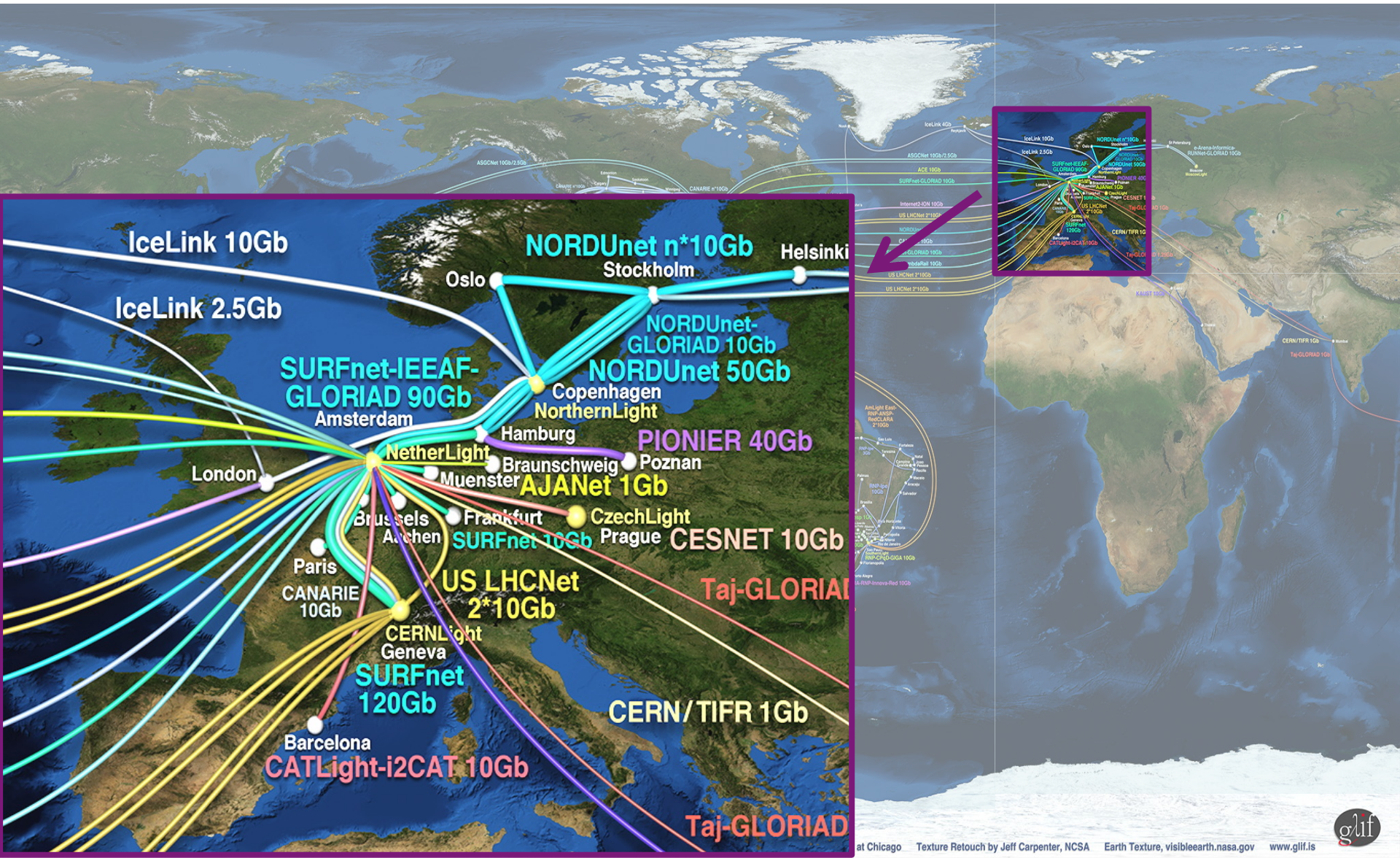

The Ten Problems with the Internet

1. Energy Efficient Communication
2. Separation of Identity and Address
3. Location Awareness
4. Explicit Support for Client-Server Traffic and Distributed Services
5. Person-to-Person Communication
6. Security
7. Control, Management, and Data Plane separation
8. Isolation
9. Symmetric/Asymmetric Protocols
10. Quality of Service

Nice to have:

- Global Routing with Local Control of Naming and Addressing
- Real Time Services
- Cross-Layer Communication
- Manycast
- Receiver Control
- Support for Data Aggregation and Transformation
- Support for Streaming Data
- Virtualization

ref: Raj Jain, "Internet 3.0: Ten Problems with Current Internet Architecture and Solutions for the Next Generation", Military Communications Conference, 2006. MILCOM 2006. IEEE

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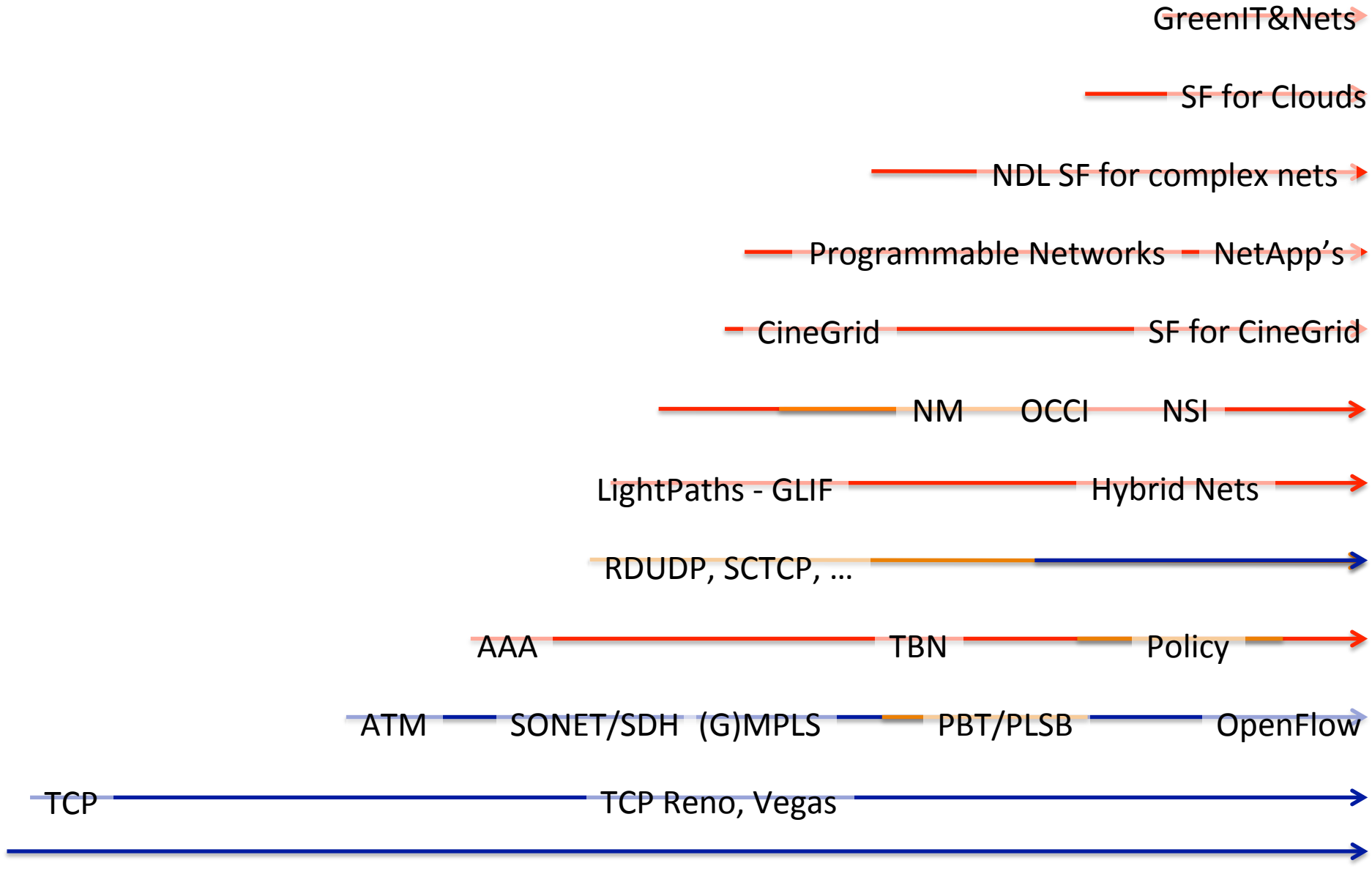
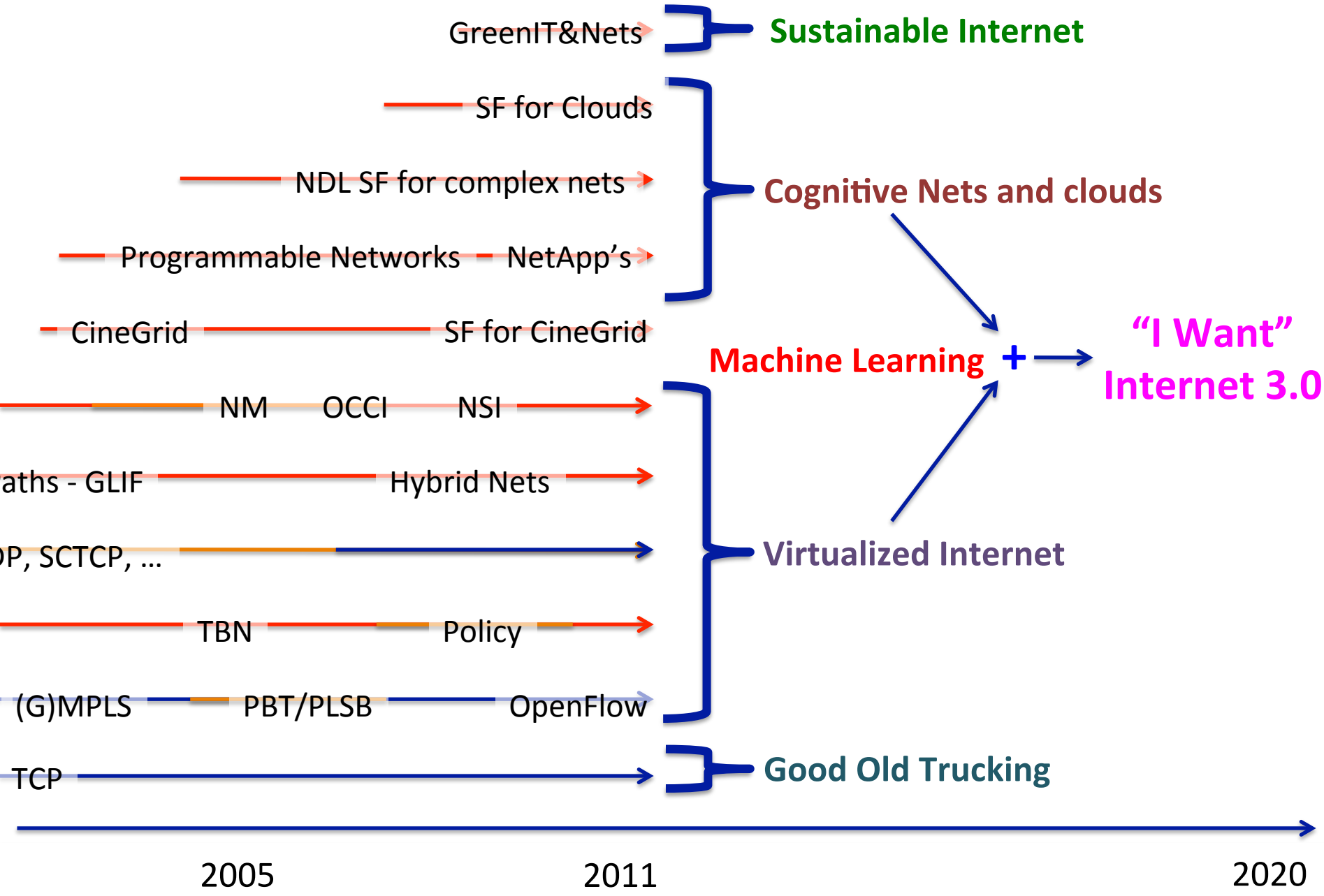
TimeLine


GreenIT&Nets
SF for Clouds
NDL SF for complex nets
Programmable Networks
NetApp's
CineGrid
SF for CineGrid
NM
OCCI
NSI
LightPaths - GLIF
Hybrid Nets
RDUDP, SCTCP, …
AAA
TBN
Policy
ATM
SONET/SDH
(G)MPLS
PBT/PLSB
OpenFlow
TCP
TCP Reno, Vegas
1980
1990
2000
2005
2011

TimeLine


GreenIT&Nets
Sustainable Internet
SF for Clouds
NDL SF for complex nets
Programmable Networks
NetApp's
Cognitive Nets and clouds
CineGrid
SF for CineGrid
Machine Learning
+
"I Want"
Internet 3.0
NM
OCCI
NSI
aths - GLIF
Hybrid Nets
OP, SCTCP, …
Virtualized Internet
TBN
Policy
(G)MPLS
PBT/PLSB
OpenFlow
TCP
Good Old Trucking
2005
2011
2020

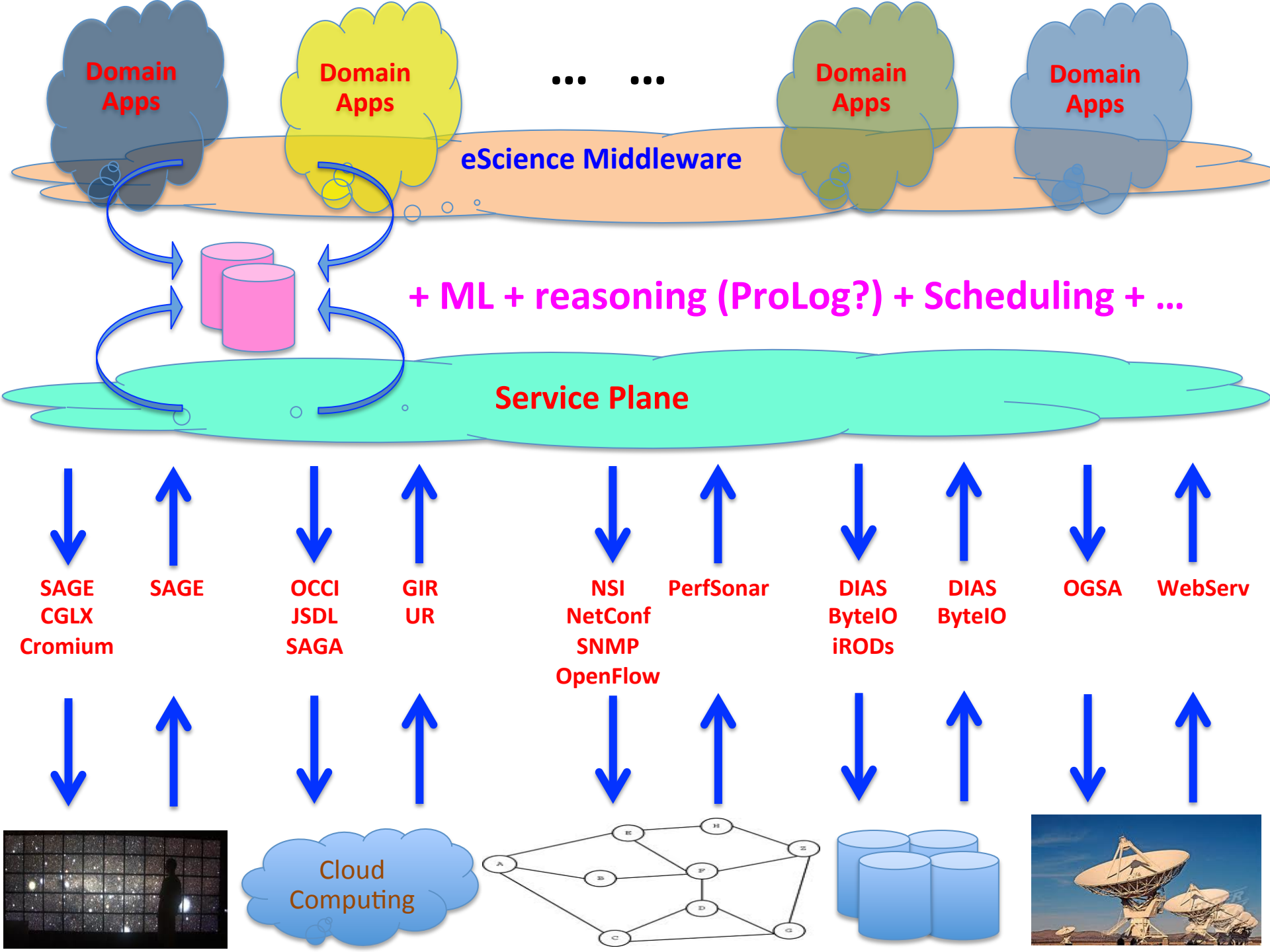
TimeLine

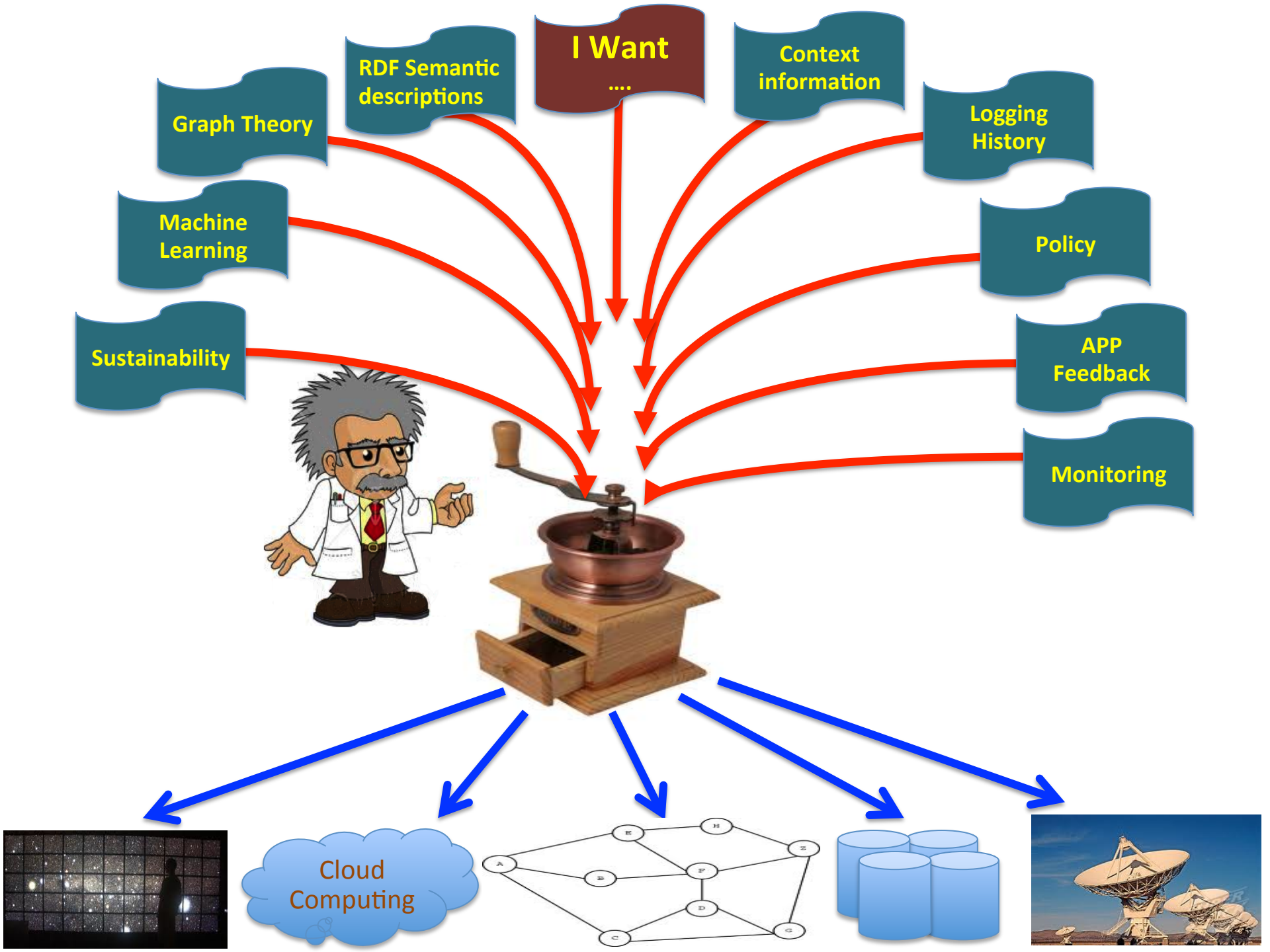
- Sustainable Internet
- Cognitive Nets and clouds
- Machine Learning + → "I Want" Internet 3.0
- Virtualized Internet
- Good Old Trucking

I retire

2020

2040


Domain Apps
Domain Apps
... ...
Domain Apps
Domain Apps
eScience Middleware
+ ML + reasoning (ProLog?) + Scheduling + …
Service Plane
SAGE
CGLX
Cromium
SAGE
OCCI
JSDL
SAGA
GIR
UR
NSI
NetConf
SNMP
OpenFlow
PerfSonar
DIAS
ByteIO
iRODs
DIAS
ByteIO
OGSA
WebServ
Cloud Computing

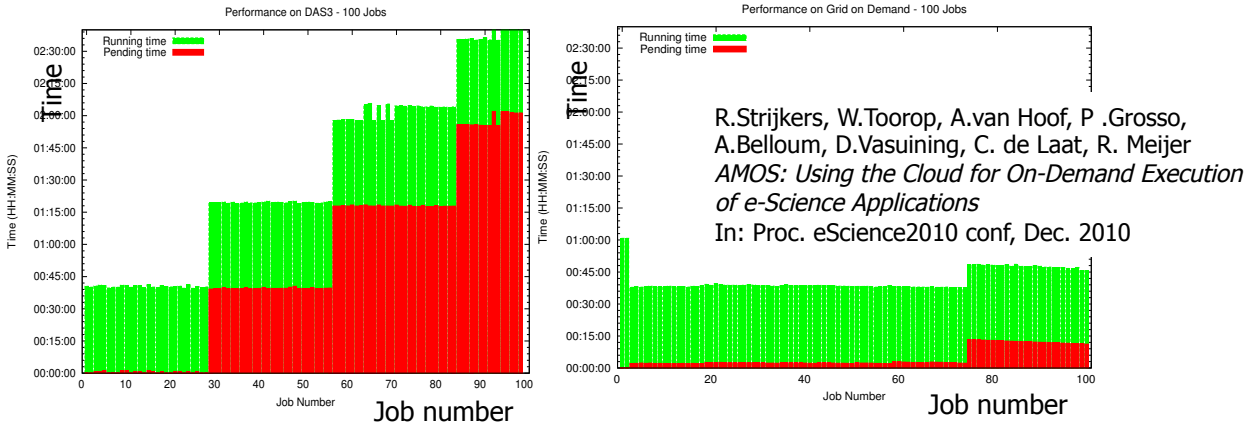

I Want
....
Graph Theory
RDF Semantic descriptions
Context information
Logging History
Machine Learning
Policy
Sustainability
APP Feedback
Monitoring
Cloud Computing

Demonstration of *optimizing the computing problem* ("Clouds")

If computing is 'infinite' and movable, then workflows and applications can ***program*** the network.

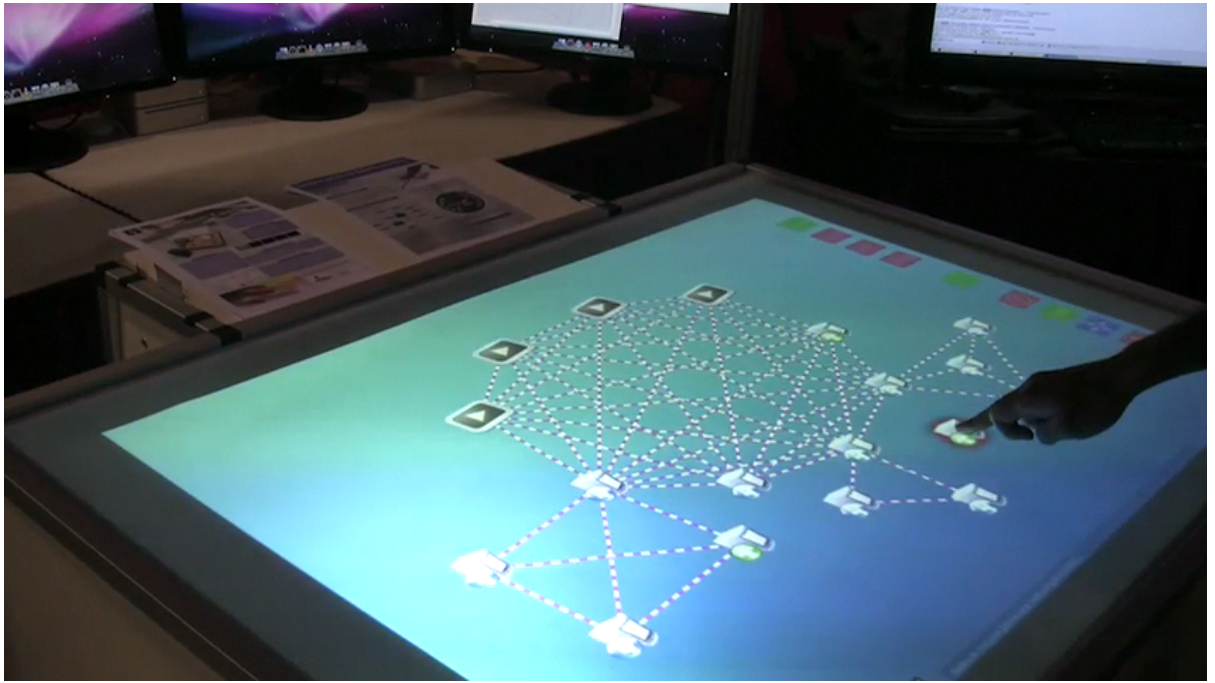
You can also introduce new metrics when creating and optimizing these infrastructures (*e.g* power consumption)

Grid-on-demand



R.Strijkers, W.Toorop, A.van Hoof, P .Grosso, A.Belloum, D.Vasuining, C. de Laat, R. Meijer
AMOS: Using the Cloud for On-Demand Execution of e-Science Applications
In: Proc. eScience2010 conf, Dec. 2010

User programmable networks



Q & A

Visit:

http://sc.delaat.net/

Slides thanks to:

- Paola Grosso
- SNE Team & friends
- Sponsors see slide 1. ☺