

# Back to the Future!

Cees de Laat

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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:

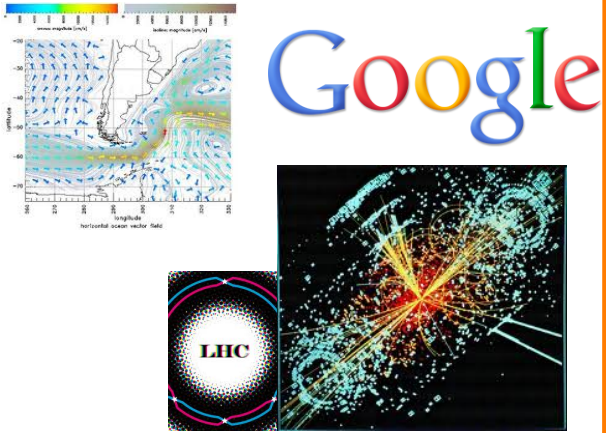


“Show Big Bug Bunny in 4K on my Tiled Display using green Infrastructure”

- 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!



... more realtime!

LinkedIn

Hyves



... more users!

# 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
- Multicast
- Receiver Control
- Support for Data Aggregation and Transformation
- Support for Streaming Data
- Virtualization

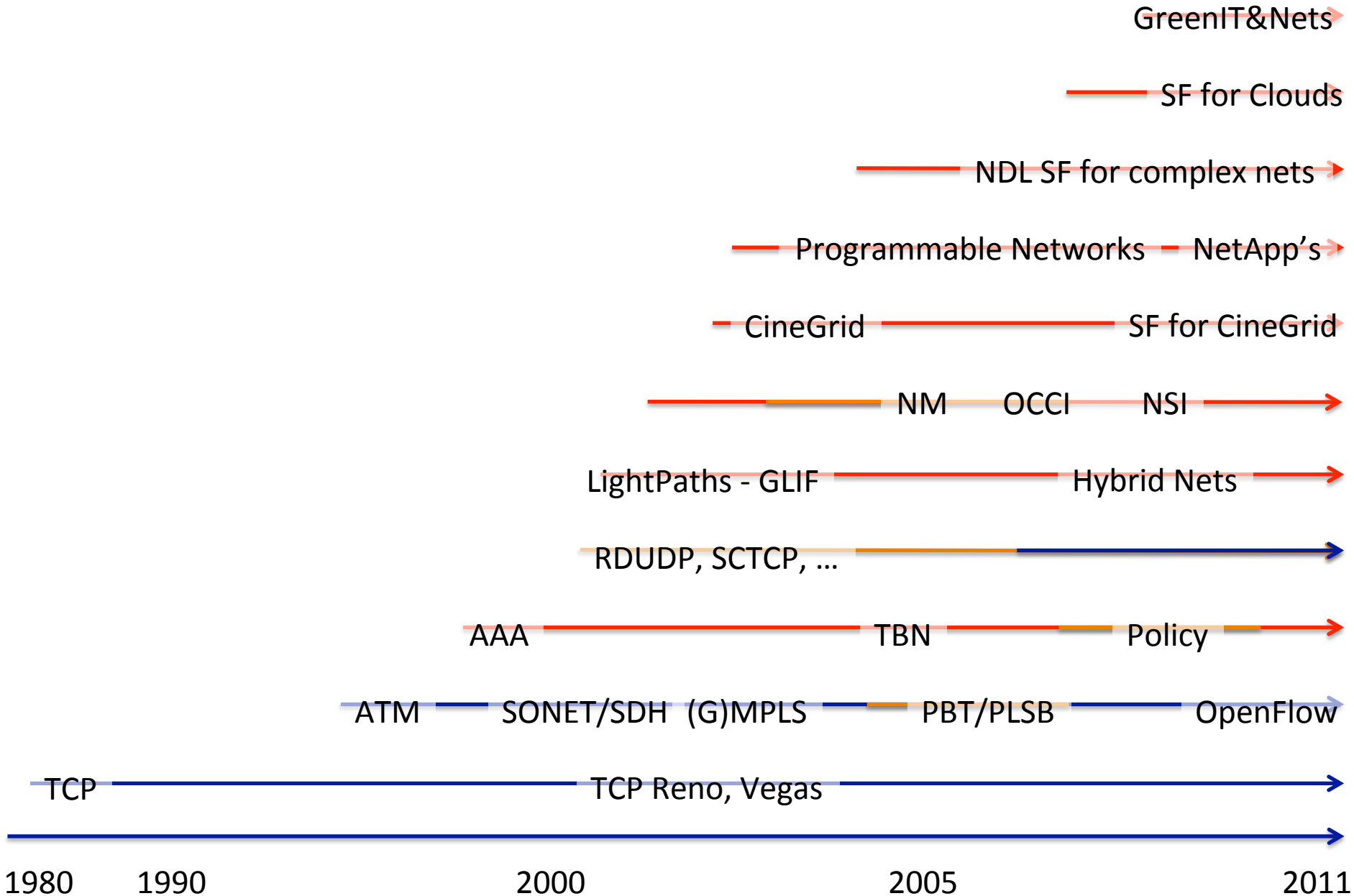
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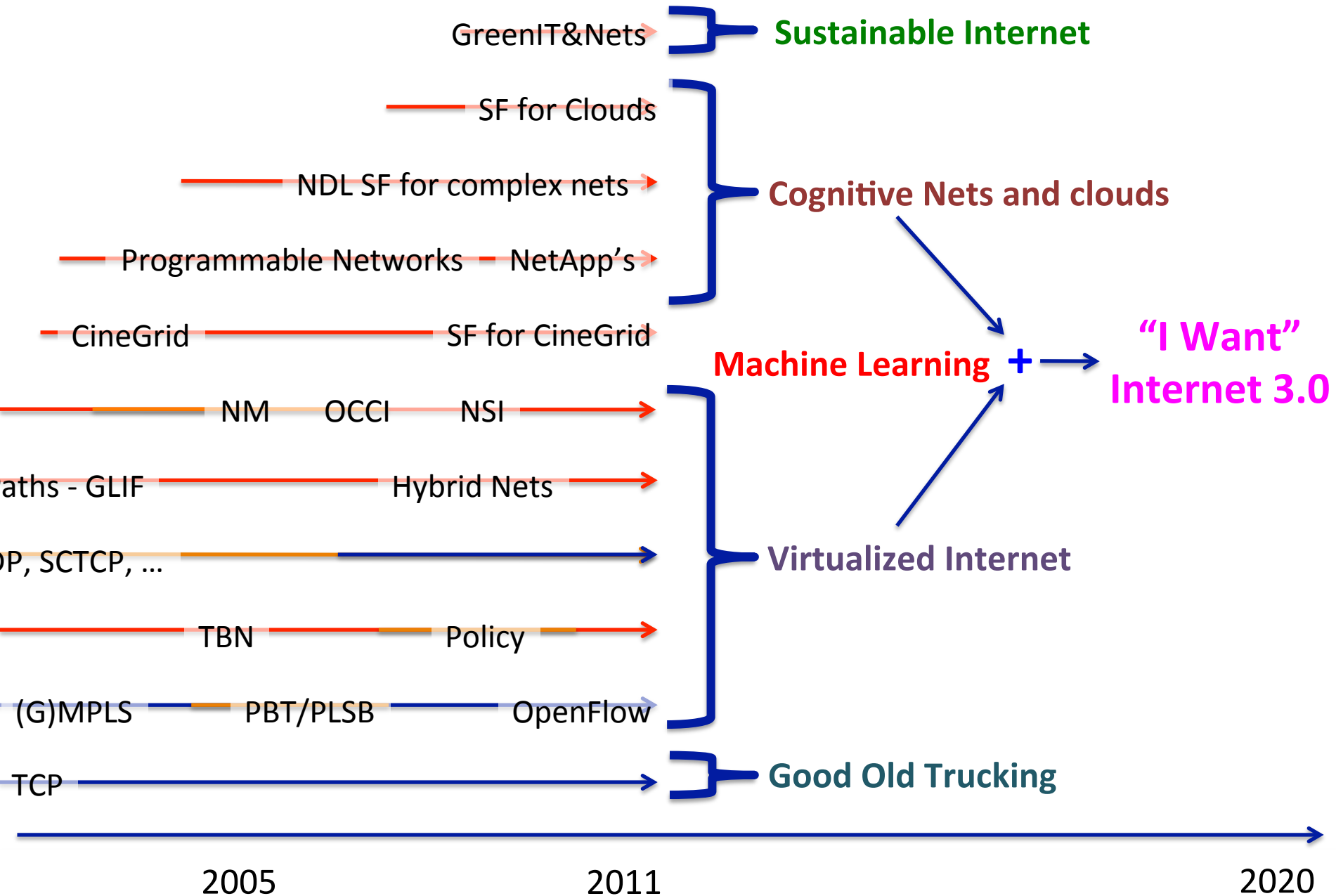
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- **Support for Streaming Data**
- **Virtualization**

# TimeLine





# TimeLine



# TimeLine

• Sustainable Internet

• Cognitive Nets and clouds

• Machine Learning +

• Virtualized Internet

• Good Old Trucking

“I Want”  
Internet 3.0



I  
retire

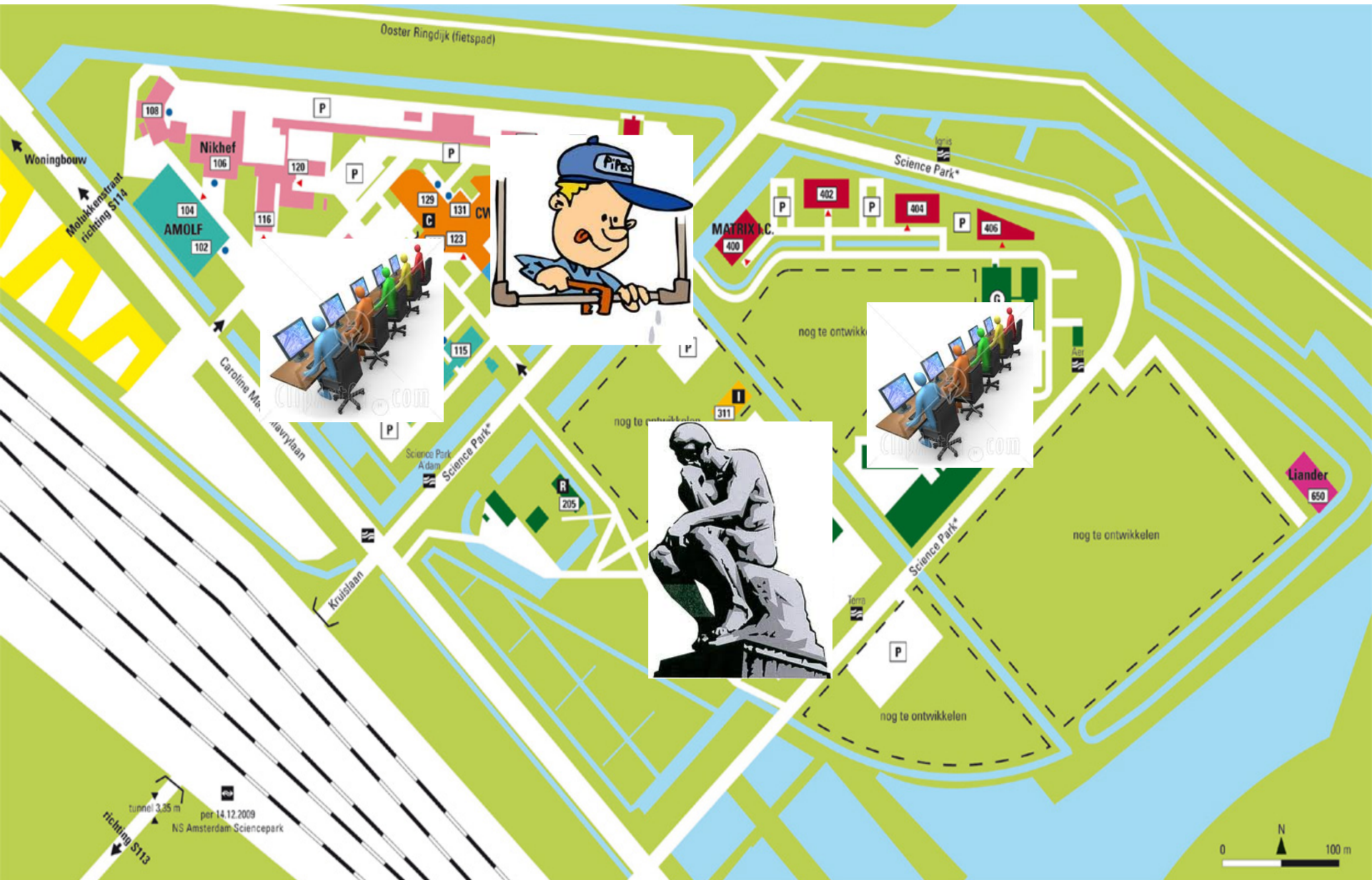
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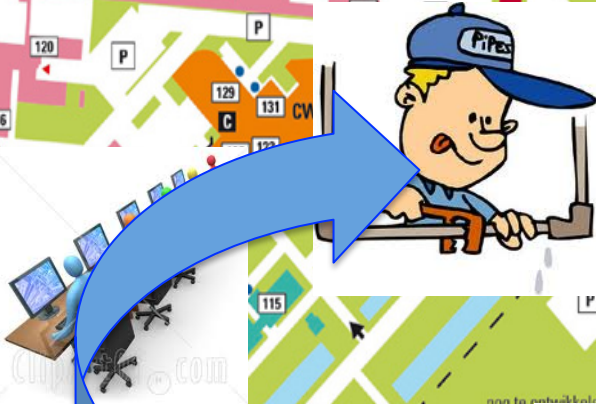
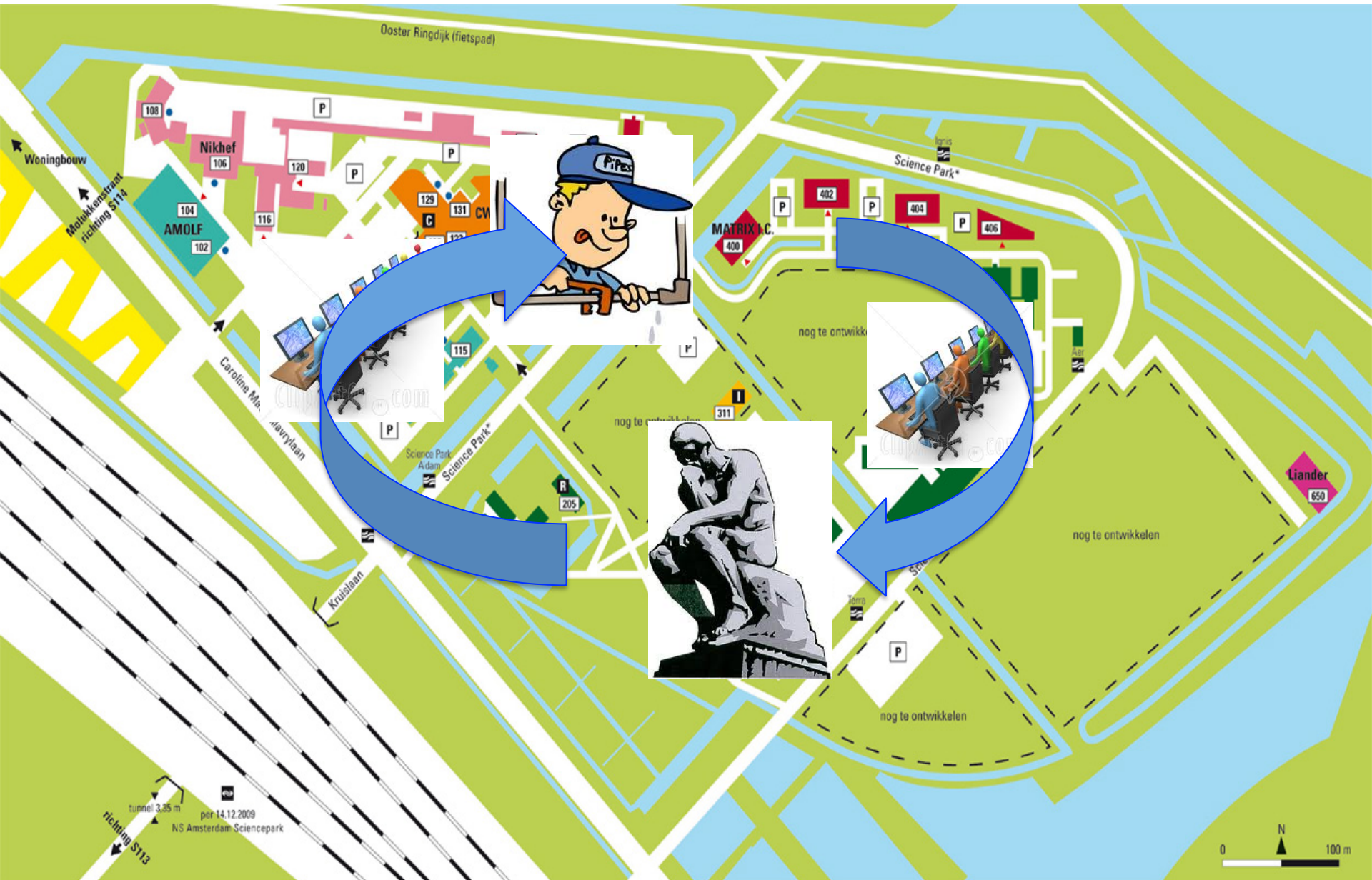
# Science Park Amsterdam

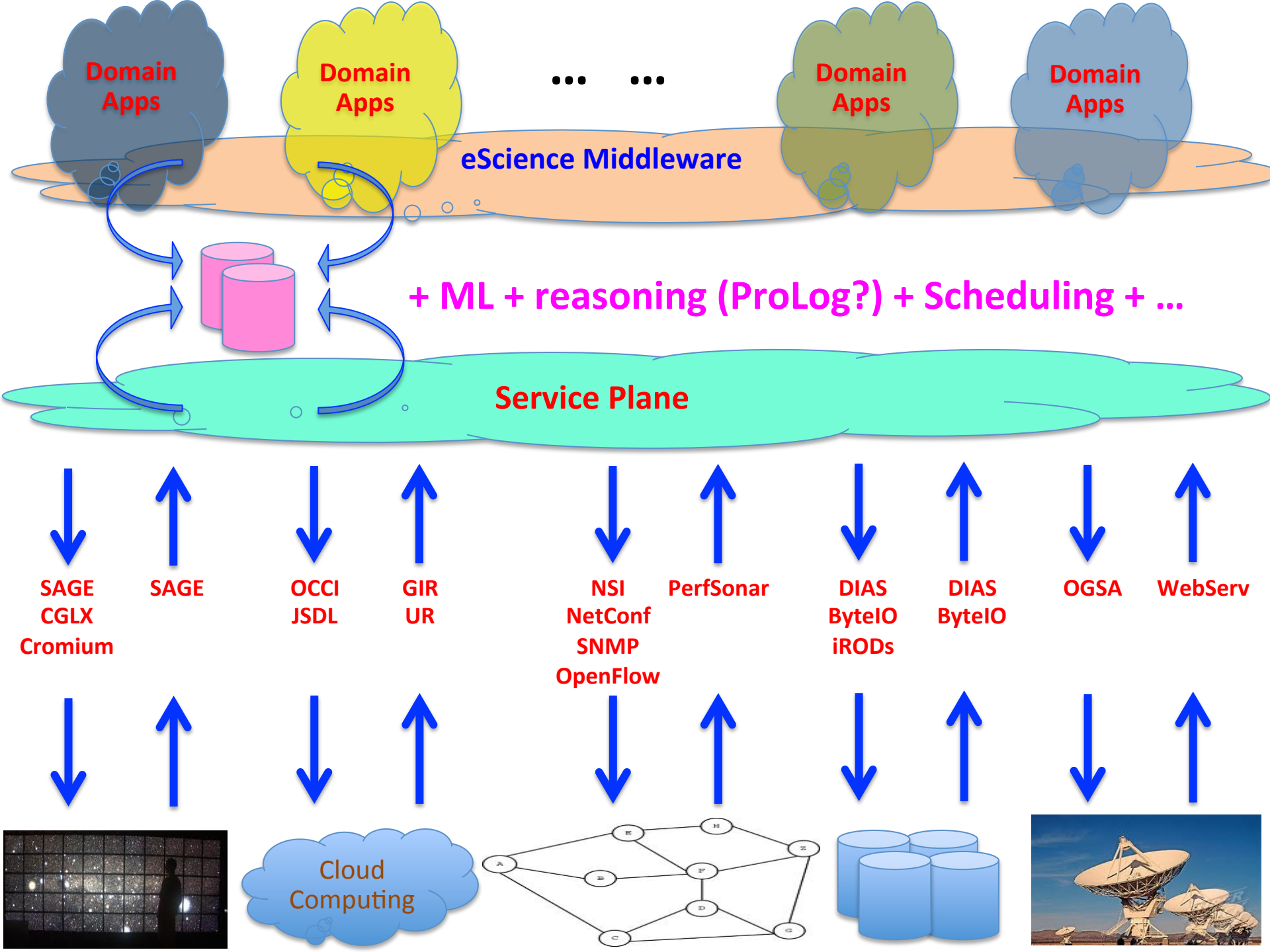


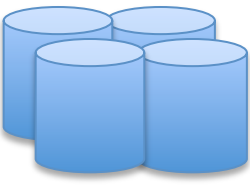
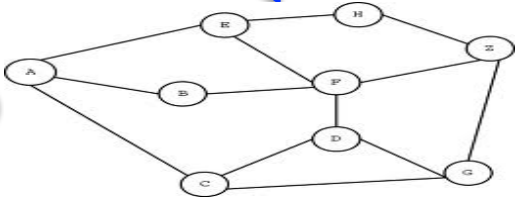
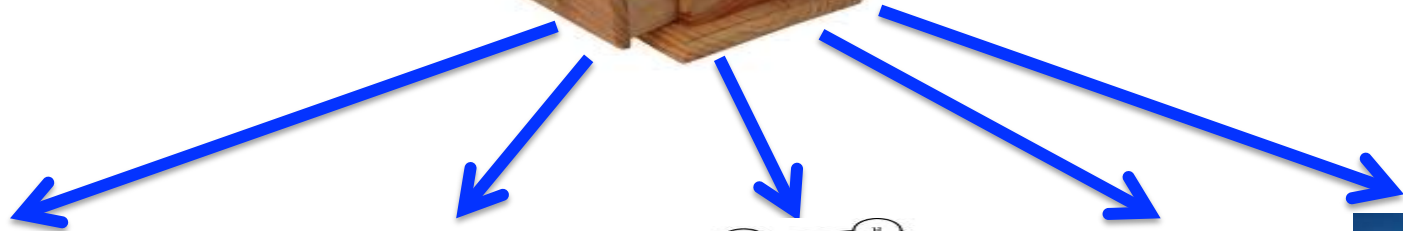
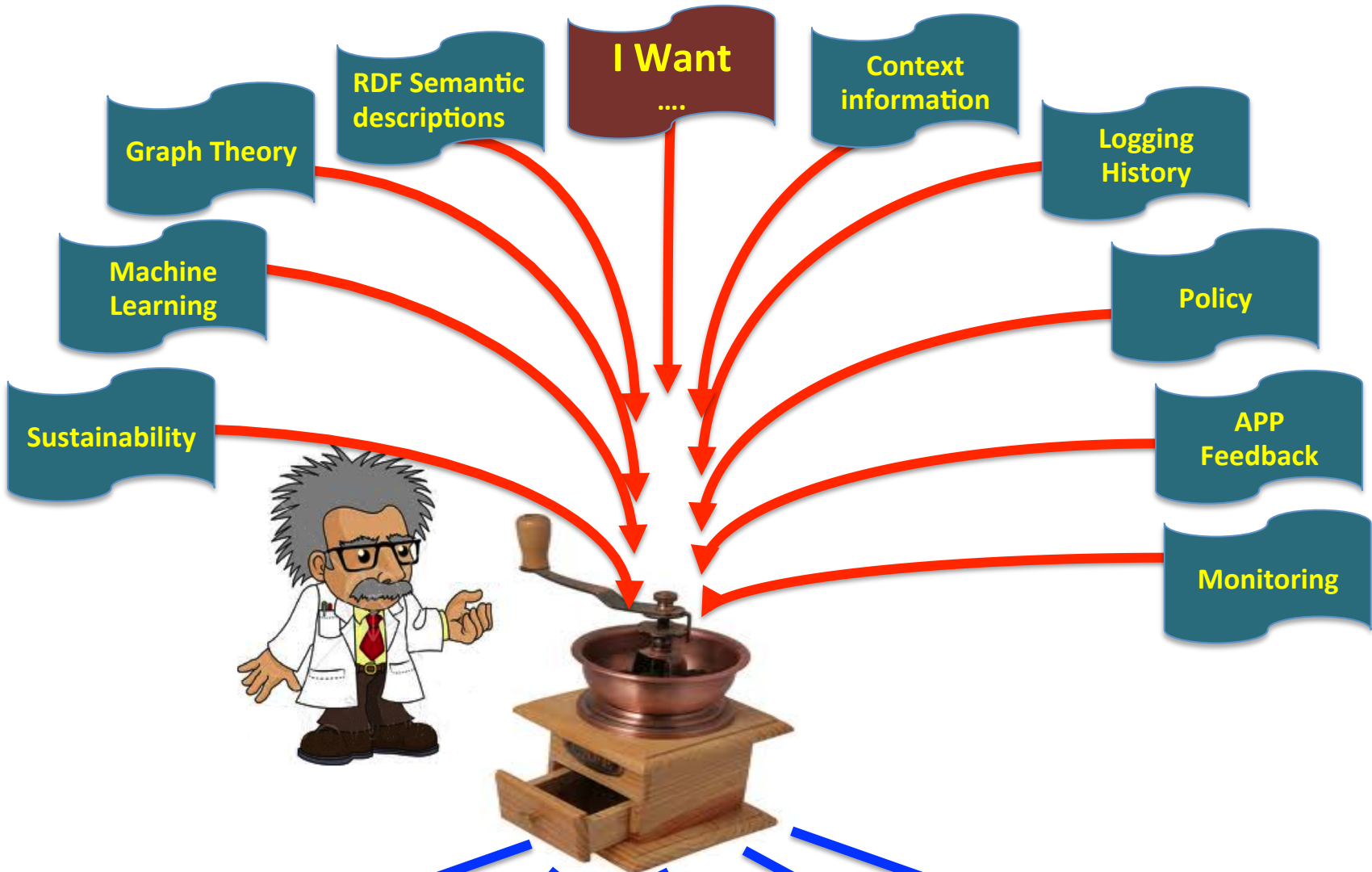
# Amsterdam Science Park



# Science Park Amsterdam





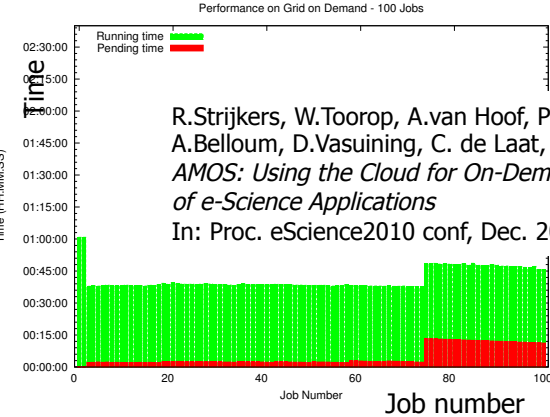
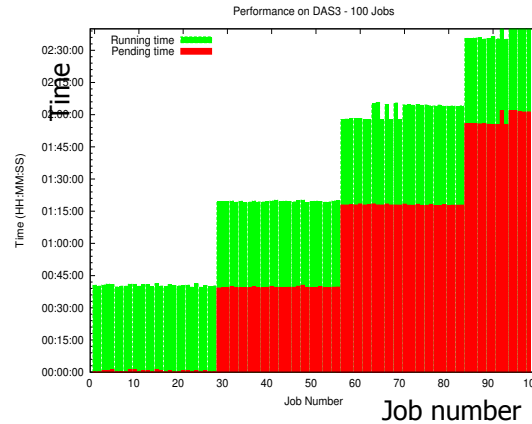


# Demonstration of *optimizing the computing problem* ("Clouds")

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





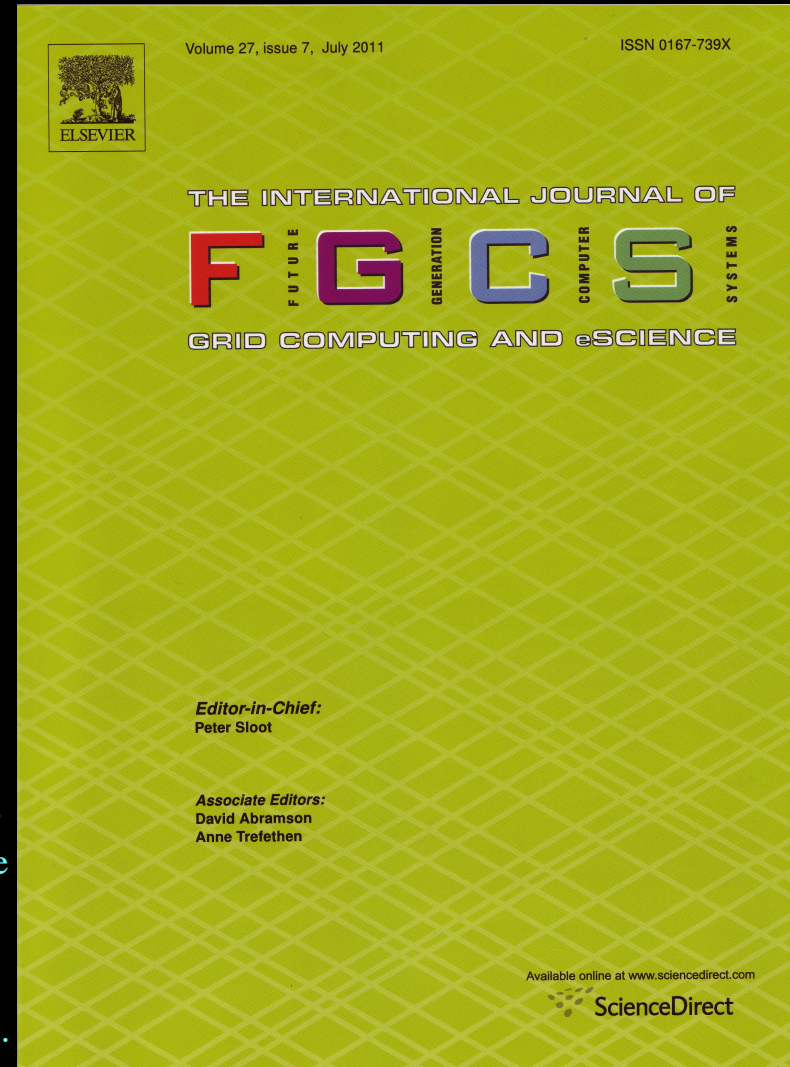
# Scientific Publications: FGCS Special Issue on CineGrid!

Volume 27, Issue 7, June 2011

Guest Editors: Naohisa Ohta & Paul Hearty & Cees de Laat

Editorial: CineGrid: Super high definition media over optical networks.

1. Real-time long-distance transfer of uncompressed 4K video for remote collaboration.
2. Media Network (HPDMnet): An advanced international research initiative and global experimental testbed.
3. Producing and streaming high resolution digital movies of microscopic subjects.
4. Enabling multi-user interaction in large high-resolution distributed environments.
5. Tri-continental premiere of 4K feature movie via network streaming at FILE 2009.
6. A collaborative computing model for audio post-production.
7. Design and implementation of live image file feeding to dome theaters.
8. Beyond 4K: 8K 60p live video streaming to multiple sites.
9. Using ontologies for resource description in the CineGrid Exchange.
10. CineGrid Exchange: A workflow-based peta-scale distributed storage platform on a high-speed network.
11. CSTEP: A parallel data transfer protocol using cross-stream coding.
12. Multi-point 4K/2K layered video streaming for remote collaboration.



# Q & A

Visit:

<http://sc.delaaat.net/>

Slides thanks to:

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

