

The Power of the Internet

Cees de Laat

SURFnet

BSIK

EU

University of Amsterdam

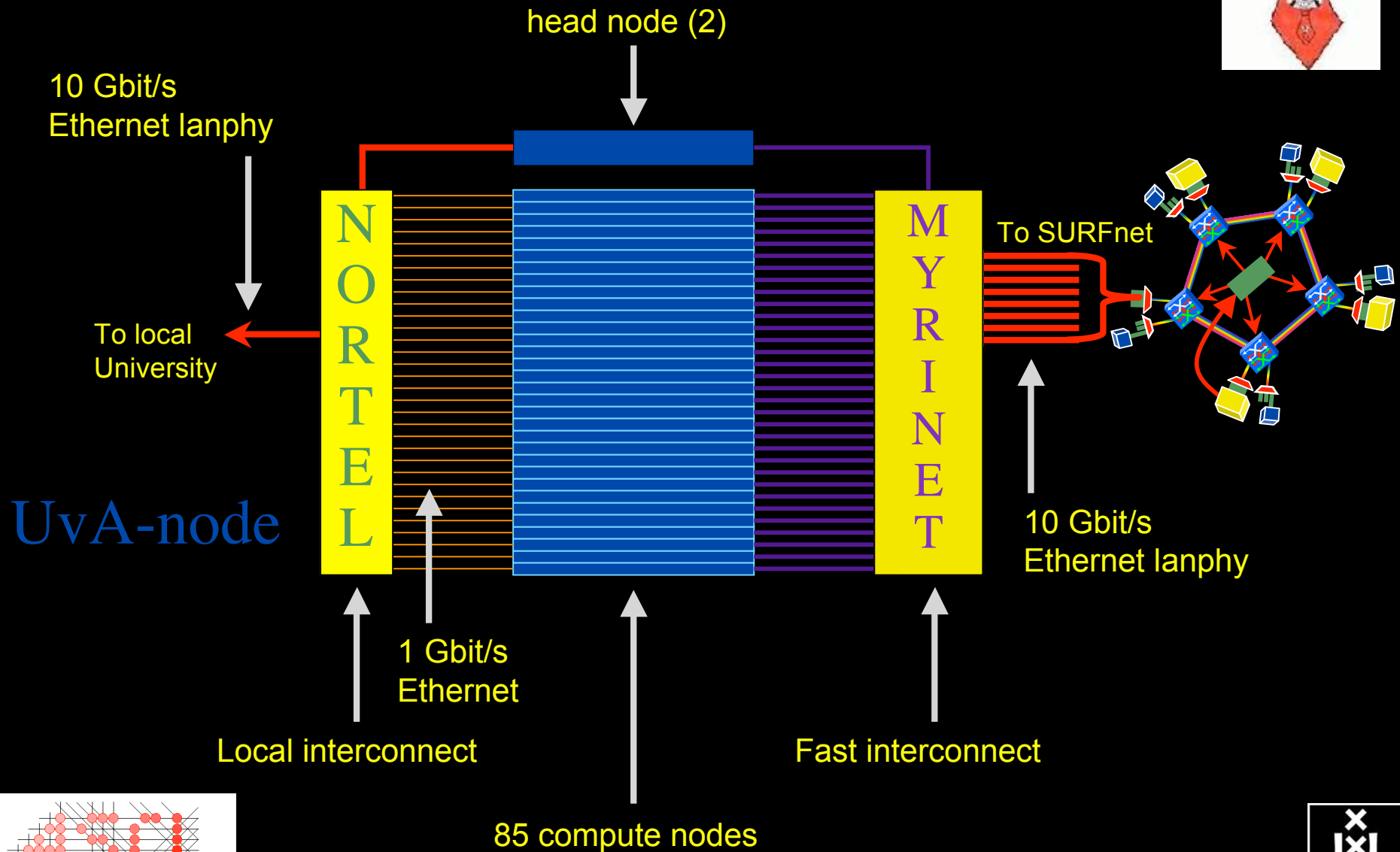
SARA

TNO
NCF



DAS-3 Cluster Tender

http://www.clustervision.com/pr_das3_uk.html



Power is a big issue

- UvA cluster uses (max) 30 kWh
- 1 kWh ~ 0.1 €
- per year -> 26 k€/y
- add cooling 50% -> 39 k€/y
- Emergency power system -> 60 k€/y
- per rack 10 kWh is now normal
- **YOU BURN HALF THE CLUSTER OVER ITS LIFETIME!**

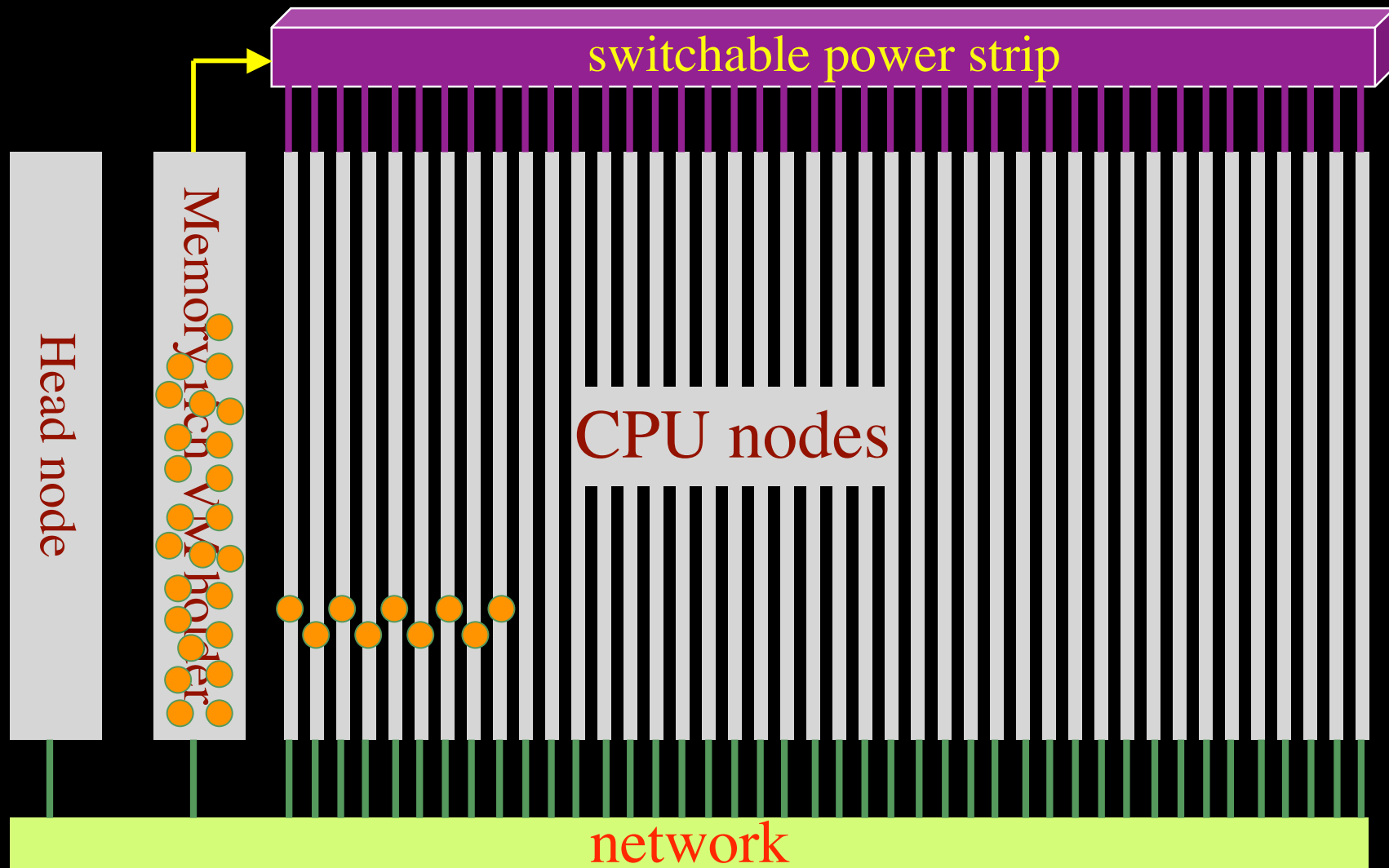


Power outages are a big problem

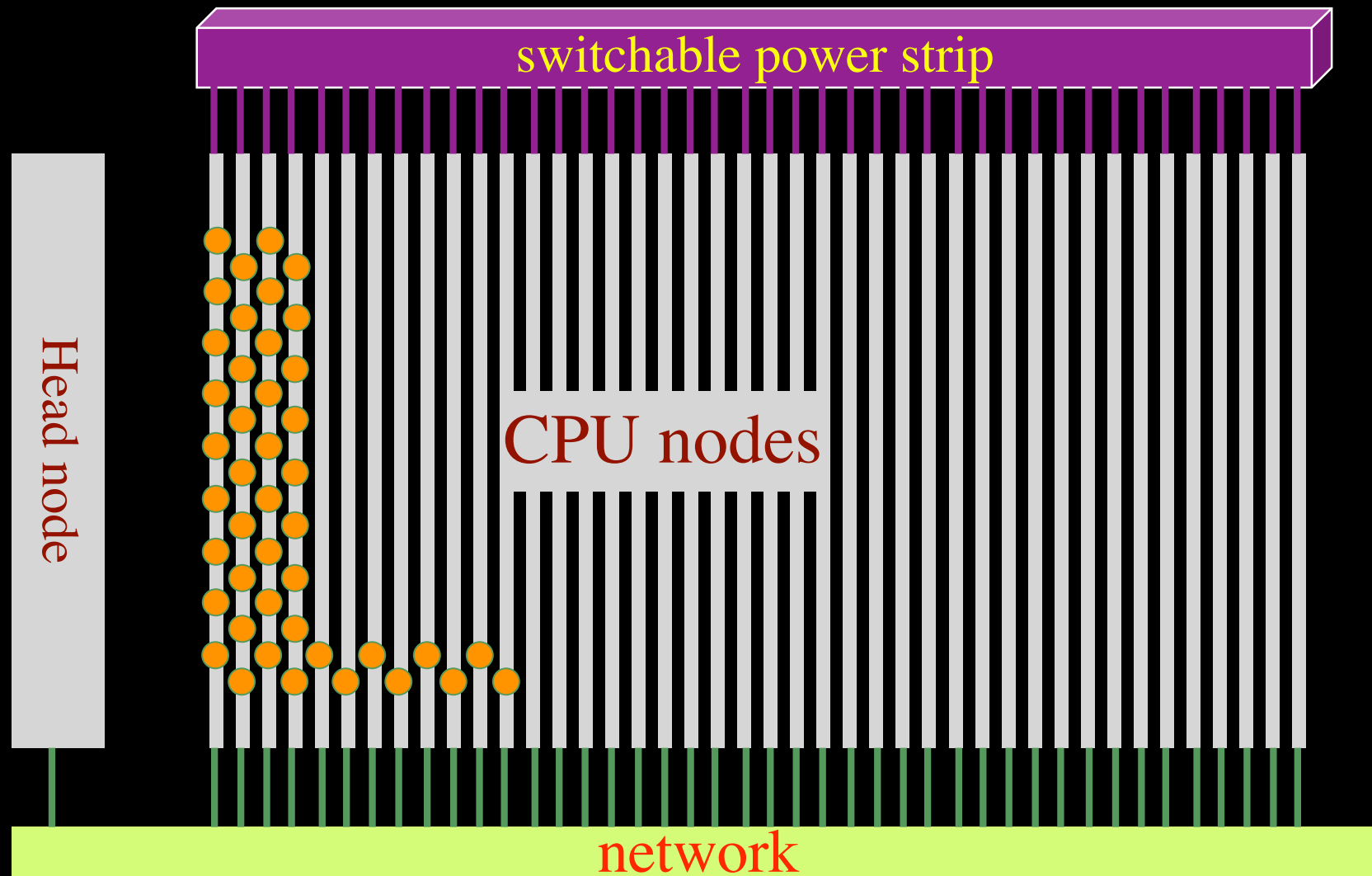
- on average about one outage per year
 - once the generator not starting/taking over
 - recently weekend explosion of cable
 - -> generator fine!
- battery power for 5 minutes, generator to take over
- priorities for emergency power/cooling



VM opportunity



VM opportunity - B





In The Netherlands SURFnet connects between 180:

- universities;
- academic hospitals;
- most polytechnics;
- research centers.

with an indirect ~750K user base

~ 6000 km
scale
comparable
to railway
system





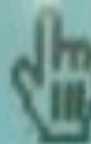
No Change
Minimum Credit
Billing \$3
For questions, comments, or info
(800) 484-9655...
Office Hours: 9:00 AM -

SURFNET PREMIERE

HELP

net

Three Easy Steps :



Click the START button



Insert money...

\$0.25 per minute...

Example :

\$1 = 4 minutes

\$5 = 20 minutes

No change is provided!



Surf the web!

surfnet
FAST FUN EASY

SURFNET PREMIERE

HELP

surfnet



Click the Start Button to begin

surfnet
FAST FUN EASY

SURFNET

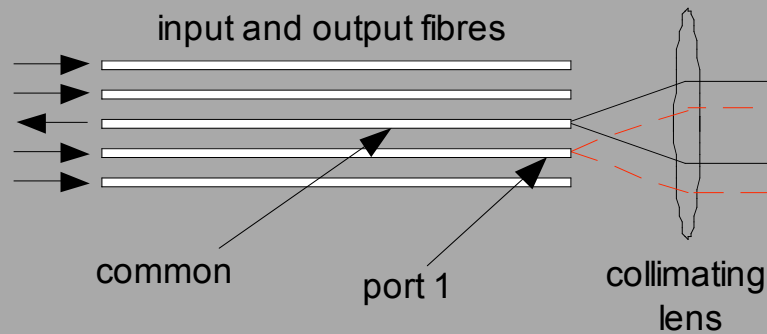
OUT OF
ORDER

Internet power

- 1 chassis CISCO CSR1
- max'd out with 40 Gbit/s cards -> 2 Tbit/s
- max nr of chassis interconnected
- power ~ 1 MWatt
- take a typical electrical loc, few 1000's PK
- Imagine what it takes to pull the Internet



Module Operation

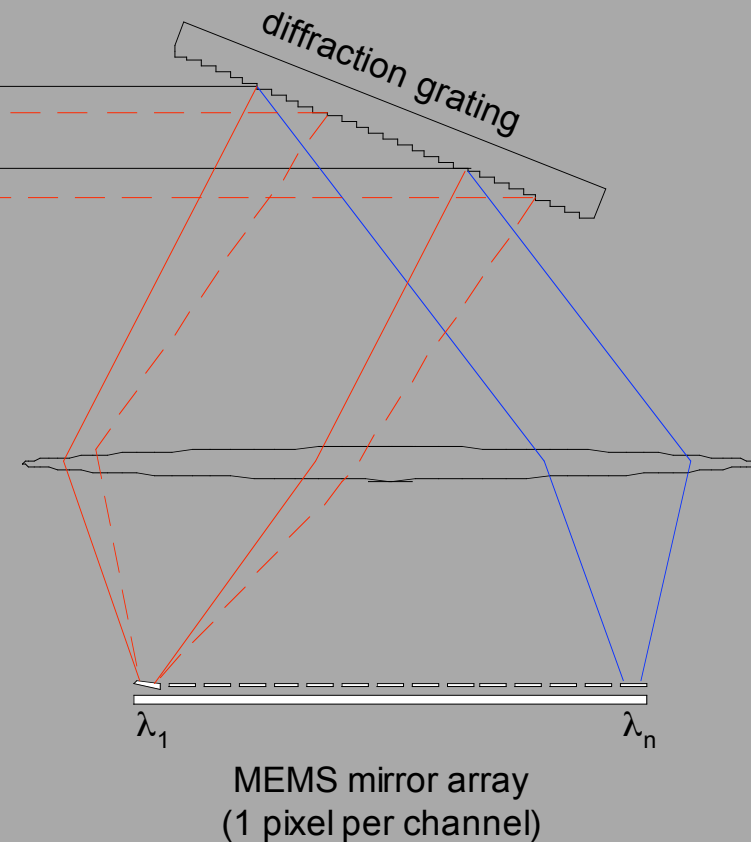


> this schematic shows

- several input fibres and one output fibre
- light is focused and diffracted such that each channel lands on a different MEMS mirror
- the MEMS mirror is electronically controlled to tilt the reflecting surface
- the angle of tilt directs the light to the correct port

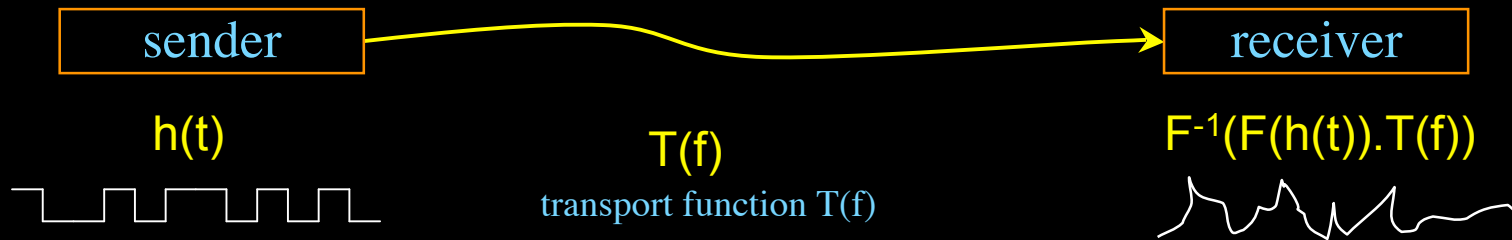
> in this example:

- channel 1 is coming in on port 1 (shown in red)
- when it hits the MEMS mirror the mirror is tilted to direct this channel from port 1 to the common
- only port 1 satisfies this angle, therefore all other ports are blocked



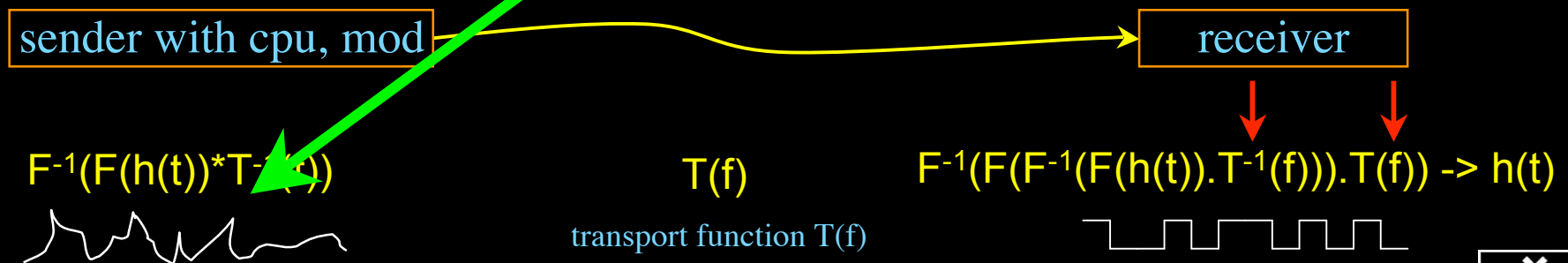
Dispersion compensating modem: eDCO from NORTEL

(Try to Google eDCO :-)



Solution in 5 easy steps for dummy's :

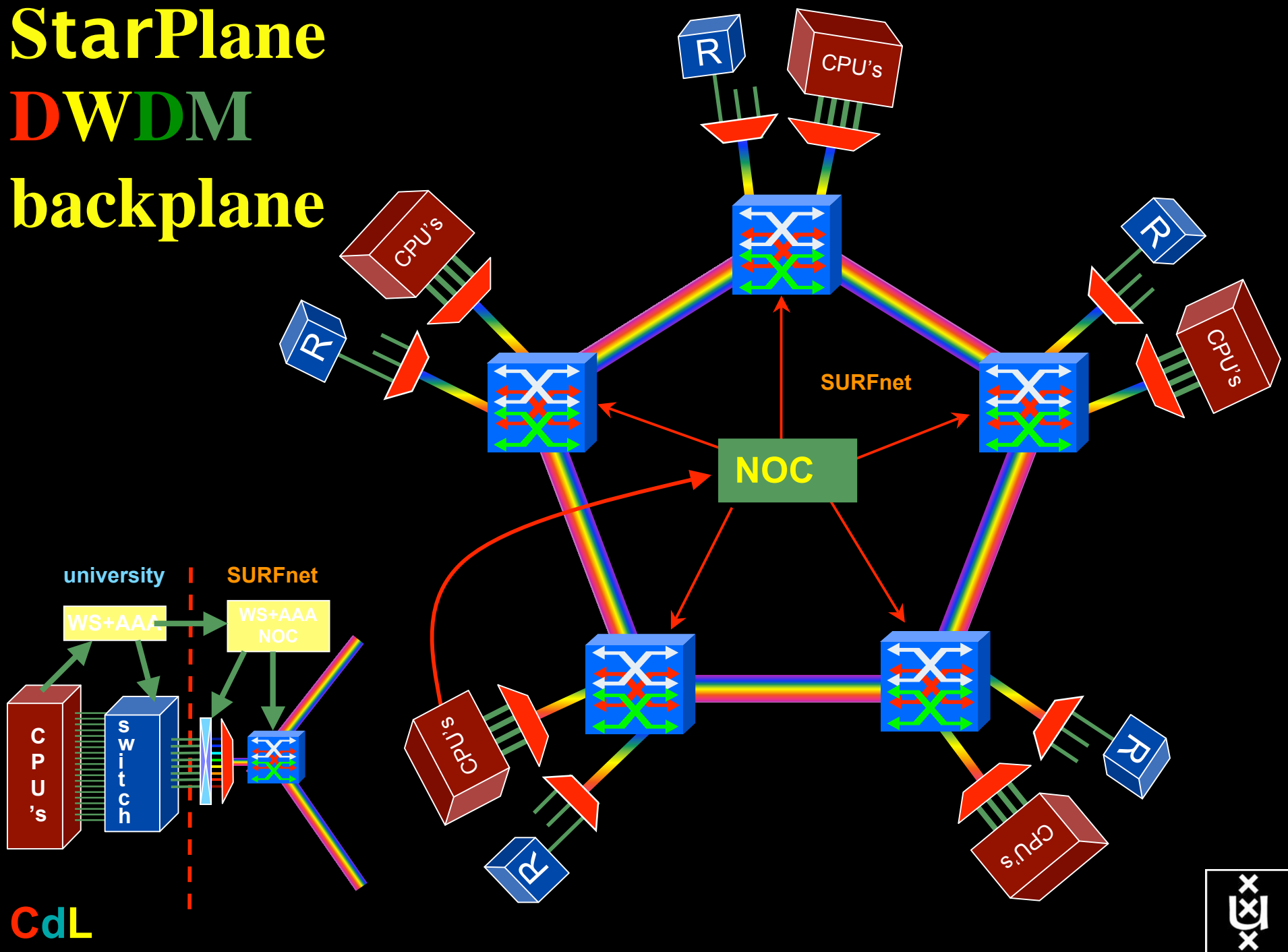
- try to figure out $T(f)$ by trial and error
- invert $T(f) \rightarrow T^{-1}(f)$
- computationally multiply $T^{-1}(f)$ with Fourier transform of bit pattern to send
- inverse Fourier transform the result from frequency to time space
- modulate laser with resulting $h'(t) = F^{-1}(F(h(t)).T^{-1}(f))$



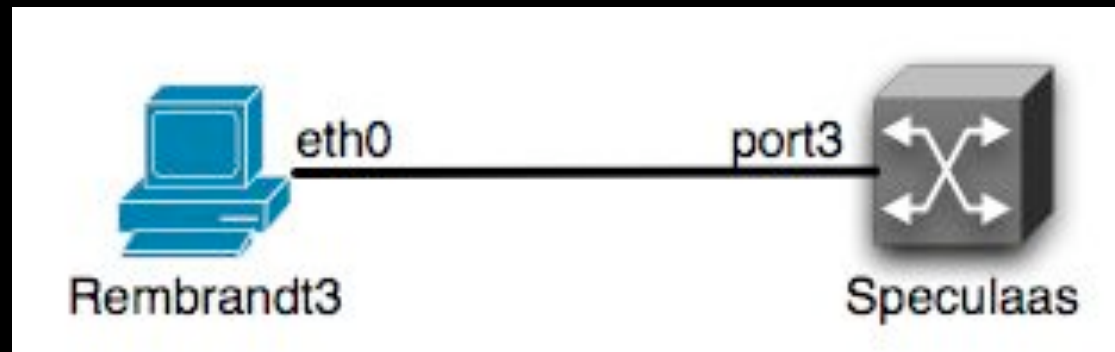
(ps. due to power \sim square E the signal to send **looks** like uncompensated received but is not)



StarPlane DWDM backplane



NDL Example



```
<ndl:Device rdf:about="#Rembrandt3">  
  <ndl:name>Rembrandt3</ndl:name>  
  <ndl:locatedAt rdf:resource="#Lighthouse"/>  
  <ndl:hasInterface rdf:resource="#Rembrandt3:eth0"/>  
</ndl:Device>  
<ndl:Interface rdf:about="#Rembrandt3:eth0">  
  <ndl:name>Rembrandt3:eth0</ndl:name>  
  <ndl:connectedTo rdf:resource="#Speculaas:port3"/>  
</ndl:Interface>
```

NDL Generator and Validator

NDL for the GLIF - NDL Validator

NDL - Network Description Language - is an ontology for description of (hybrid) networks, air provisioning. The GLIF collaboration makes use of NDL to describe each individual domain, maps.

This page will provide you with tools to validate an NDL file. We provide here two types of validation:

- Syntax validation
- Content validation

Syntax validation

We can validate that the NDL file you generated is written following the latest NDL schema. You will get back feedback on its validity.

Please paste your NDL file below:

```
<?xml version="1.0" encoding="UTF-8"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdflib="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:ndl="http://www.science.uva.nl/research/sne/ndl#"
  xmlns:geo="http://www.w3.org/2003/01/geo/wgs84_pos#">
  <!-- Description of foo -->
  <ndl:Location rdf:about="#foo">
    <ndl:name>bar</ndl:name>
    <geo:lat>0</geo:lat>
    <geo:long>0</geo:long>
  </ndl:Location>
  <!-- Rem2 -->
  <ndl:Device rdf:about="#Rem2">
    <ndl:name>Rem2</ndl:name>
    <ndl:locatedAt rdf:resource="#foo"/>
    <ndl:hasInterface rdf:resource="#Rem2:eth0"/>
  </ndl:Device>
</rdf:RDF>
```

Submit

Content validation

Often NDL files reference information contained in other files managed by others. Such as for example when an interface on a local device connects to an interface to a remote device. The content validator performs a few basic checks to see that the information contained in cross-referencing NDL files is consistent.

Please enter the URL of the NDL file to be validated:

Submit

Step 1 - Location

Indicate the name and a short description of the network that is going to be described in NDL.

Name Description

Provide also the latitude and the longitude of this location: this will aid the visualization programs.

Both latitude and longitude should use floating point notation.

Latitude Longitude

Step 2 - Devices

Indicate the name of all the devices present in the network. If you need to describe more than 3 devices just "Add a Device"

Device

Device

Device

see <http://trafficlight.uva.netherlight.nl/NDL-demo/>

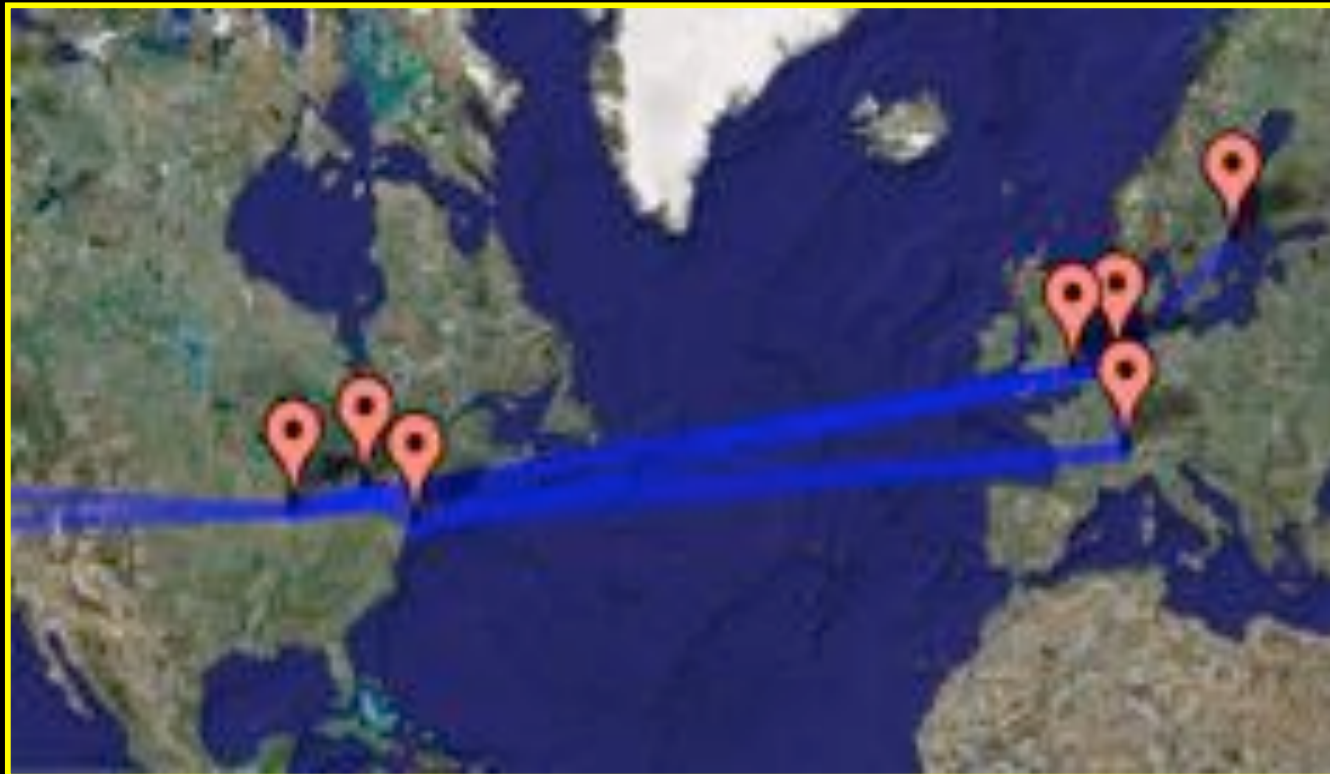
Current status: NDL

NDL - **Network Description Language** - an RDF based model for hybrid network descriptions.

It leverages all the semantic web tools, to provide:

- parsing of the RDF files
- graphs and visualization of connections and lightpaths
- lightpath provisioning support at inter and intra domain level.

Latest developments were presented at the GLIF meeting in Sep. '06.

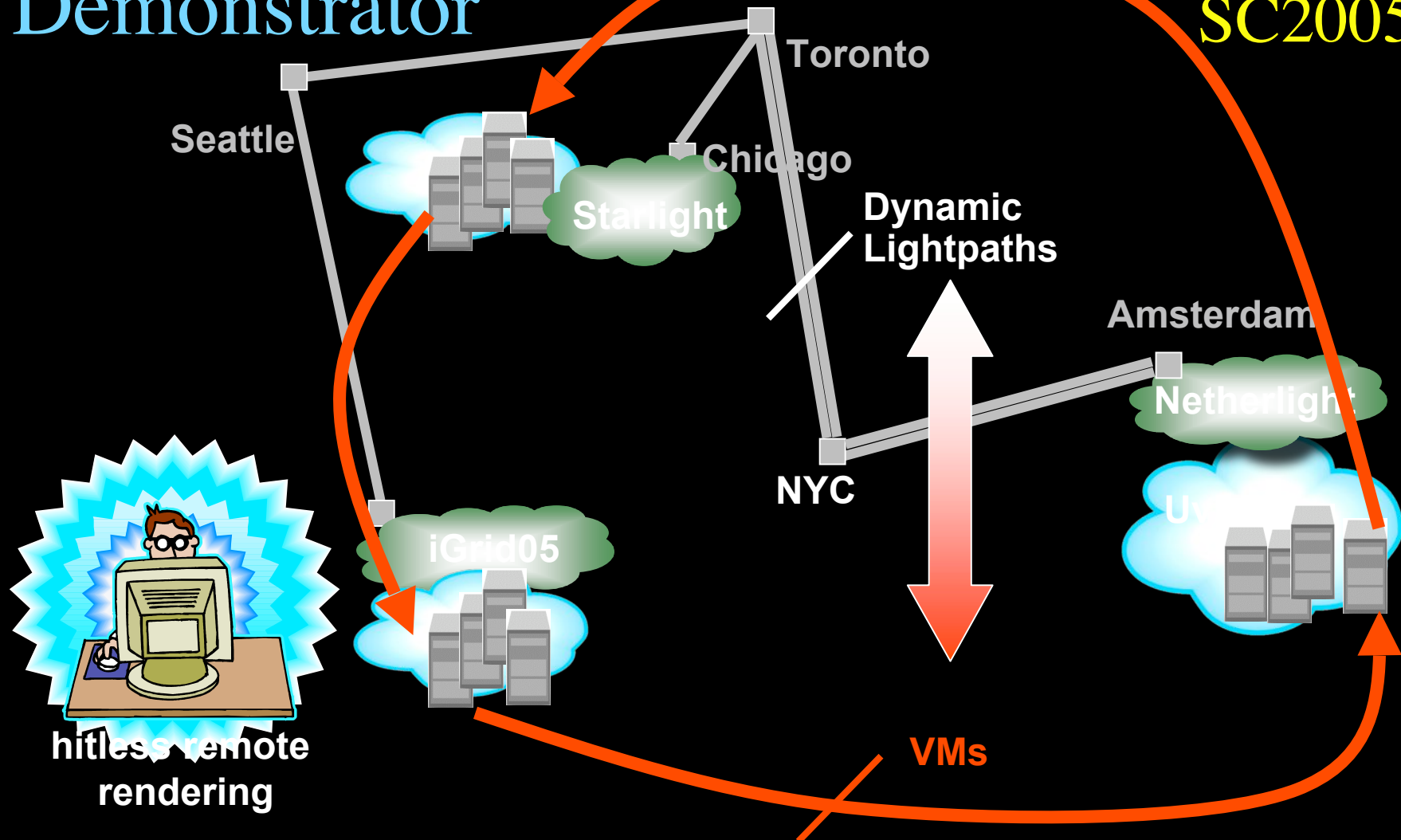


Google map and NDL...

...the GLIF connections described by NDL.

The VM Turntable Demonstrator

iGrid2005
SC2005



The VMs that are live-migrated run an iterative search-refine-search workflow against data stored in different databases at the various locations. A user in San Diego gets hitless rendering of search progress as VMs spin around

The “Dead Cat” demo

SC2004 & iGrid2005

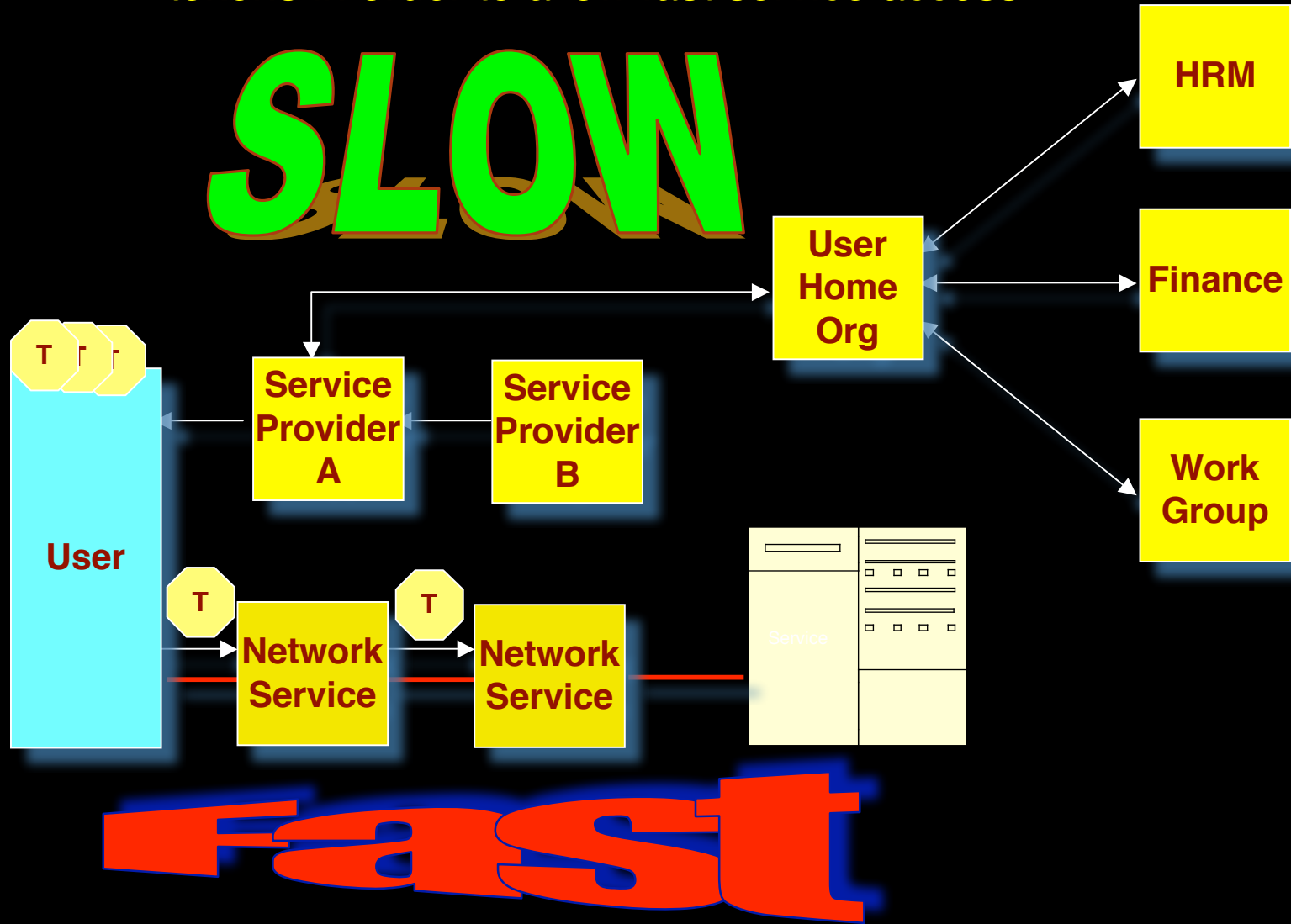
SC2004,
Pittsburgh,
Nov. 6 to 12, 2004

Produced by:
Michael Scarpa
Robert Belleman
Peter Sloot

Many thanks to:
AMC
SARA
GigaPort
UvA/AIR
Silicon Graphics, Inc.
Zoölogisch Museum



Use AAA concept to split (time consuming) service authorization process from service access using secure tokens in order to allow fast service access.



Questions ?

