System and Network Engineering

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Overview

- Some history

- Where are we now

- What's next

- Some anekdotical stories

- Thanks

Some history

- Fascination for technology inspired by uncle, electronics, space age
- During early highschool I drove the physics teachers to madness with questions on symetry breaking (weak interaction) 1 book in town lib
- Ended up studying Physics at TH-Delft, hence the ir. title
- PhD in Physics on Exotic Atoms, experiments at PSI Villegen, NIKHEF and ocasionally visiting CERN
- Assistant professor in "Fysische Informatica" at Uni Utrecht
- Associate professor Advanced Networks at Univ. Amsterdam
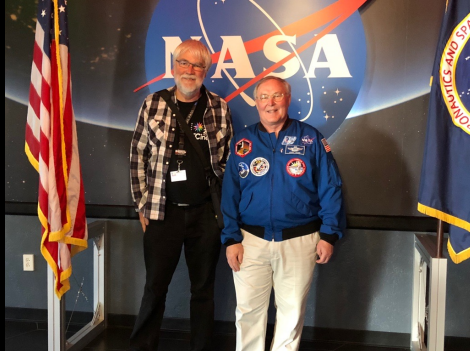- Full professor System and Network Engineering at Univ. Amsterdam

Finally got to attend a launch – STS88

Dec 1998

In oct 2018 – Jerry Ross

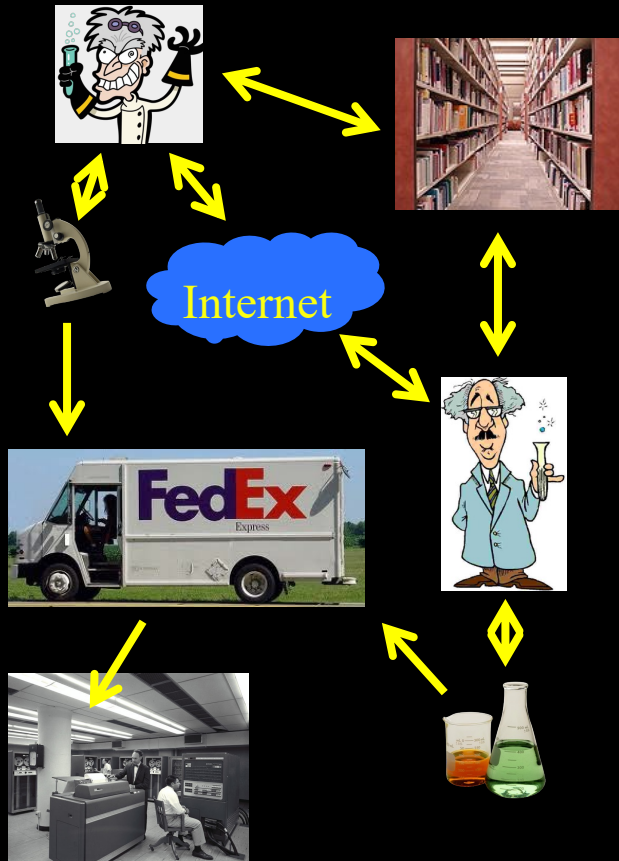True color => orange/yellow
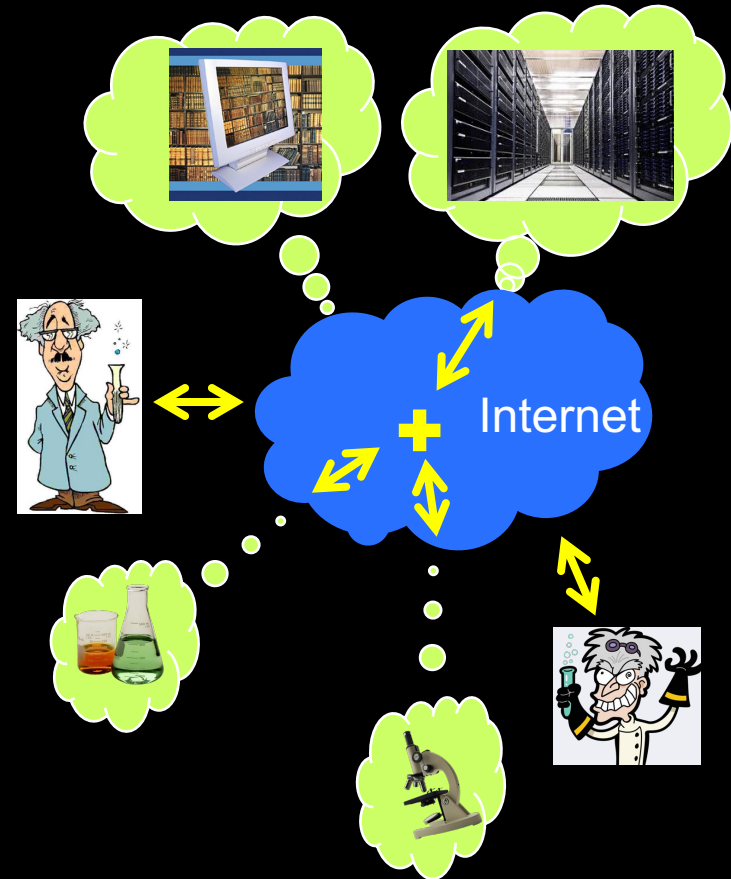
The constant factor is Change!

- Physics
- Data Acquisition and processing, VxWorks, RTlinux
- Networks (decnet, TCP/IP)
- Internet – Capacity, Architecture and Authorisation
- GRID - Cloud
- DATA - data aware internet - AMdEX
- Sovereignty, autonomy and security
- Common theme: Multi Domain Issues
- Change about every 5 year!

Virtual Laboratories
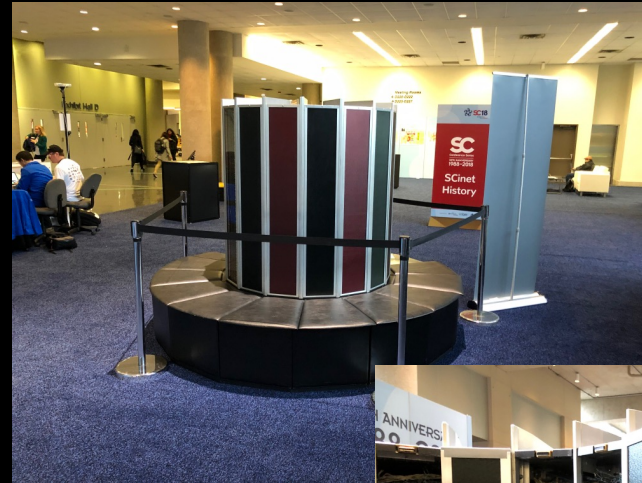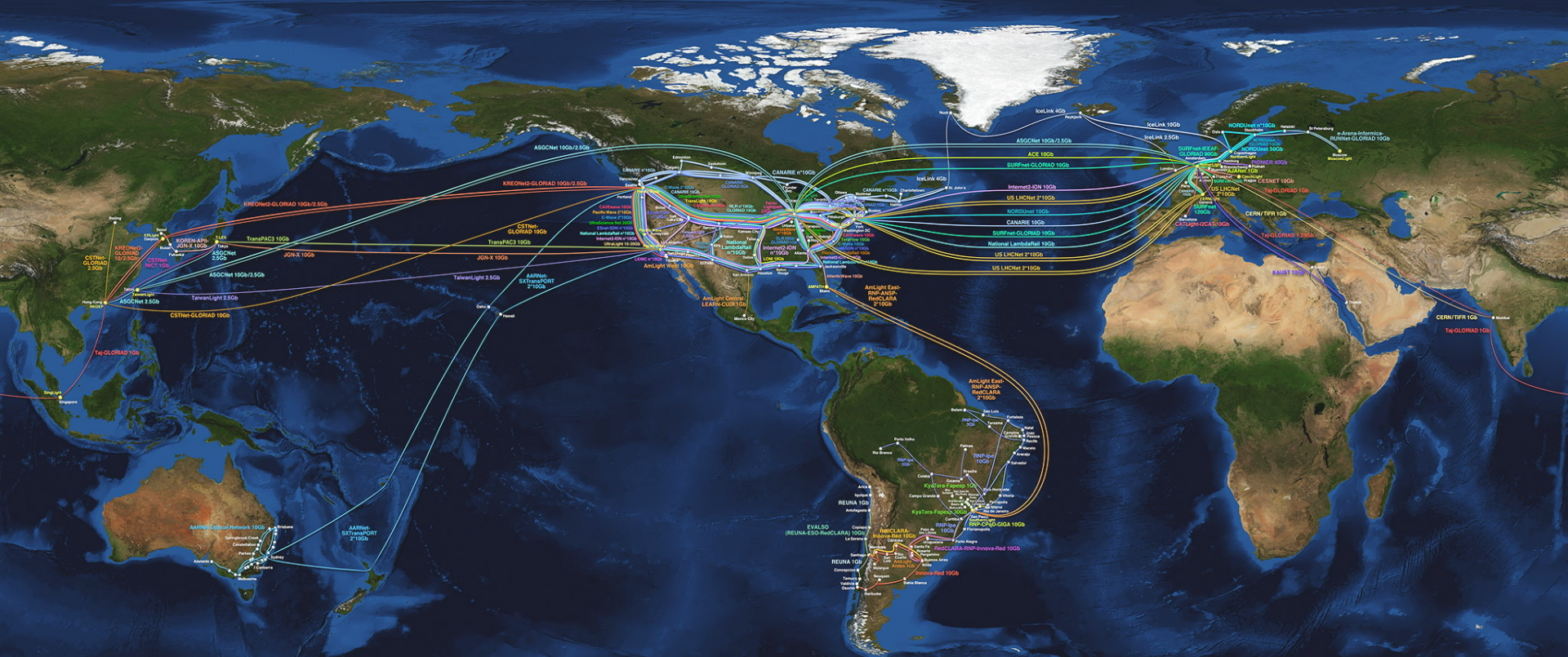
pre 2000

post 2000

Some progress

2018

= ~7×

1976

540 MHz
~ GFlops
1000 MByte memory
16000 MByte ssd
0,0012 kWh – 18 h

80 MHz
160 MFlops
8 MByte memory
300 MByte disks
120 kW

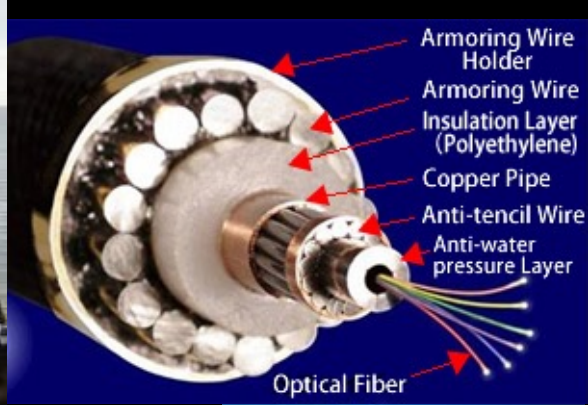We research: TomTom for complex networks!

GLIF Map 2011: Global Lambda Integrated Facility
www.glif.is

The voltages applied to the cables can be high **3,000 to 4,000 volts** for a typical trans-Atlantic telecommunications cable system, and 1,000 volts for a cross-channel telecommunications cable system.

Undersea Cable HV

Alien light From idea to realisation!

N C F

Alien wavelength advantages
- Direct connection of customer equipment[1] → cost savings
- Avoid OEO regeneration → power savings
- Faster time to service[2] → time savings
- Support of different modulation formats[3] → extend network lifetime
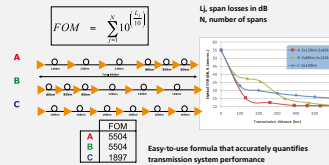
Alien wavelength challenges
- Complex end-to-end optical path engineering in terms of linear (i.e. OSNR, dispersion) and non-linear (FWM, SPM, XPM, Raman) transmission effects for different modulation formats.
- Complex interoperability testing.
- End-to-end monitoring, fault isolation and resolution.
- End-to-end service activation.

In this demonstration we will investigate the performance of a 40Gb/s PM-QPSK alien wavelength installed on a 10Gb/s DWDM infrastructure.

New method to present fiber link quality, FoM (Figure of Merit)
In order to quantify optical link grade, we propose a new method of representing system quality: the FOM (Figure of Merit) for concatenated fiber spans.
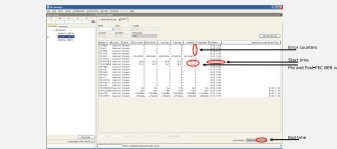
$$FOM = \sum_{j=1}^{N} 10^{\frac{L_j}{10}}$$

Lj, span losses in dB
N, number of spans

	FOM
A	5504
B	5504
C	1897

Easy-to-use formula that accurately quantifies transmission system performance

Transmission system setup
JOINT SURFnet/NORDUnet 40Gb/s PM-QPSK alien wavelength DEMONSTRATION.
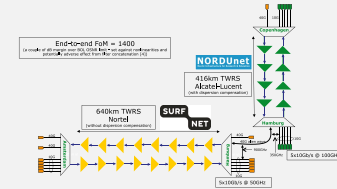
Test results

Error-free transmission for 23 hours, 17 minutes → BER < 3.0 10⁻¹⁶

Conclusions
- We have investigated experimentally the all-optical transmission of a 40Gb/s PM-QPSK alien wavelength via a concatenated native and third party DWDM system that both were carrying live 10Gb/s wavelengths.
- The end-to-end transmission system consisted of 1056 km of TWRS (TrueWave Reduced Slope) transmission fiber.
- We demonstrated error-free transmission (i.e. BER below 10-15) during a 23 hour period.
- More detailed system performance analysis will be presented in an upcoming paper.

NORTEL   NORDUnet   telindus   together with IN+IT   SURF NET
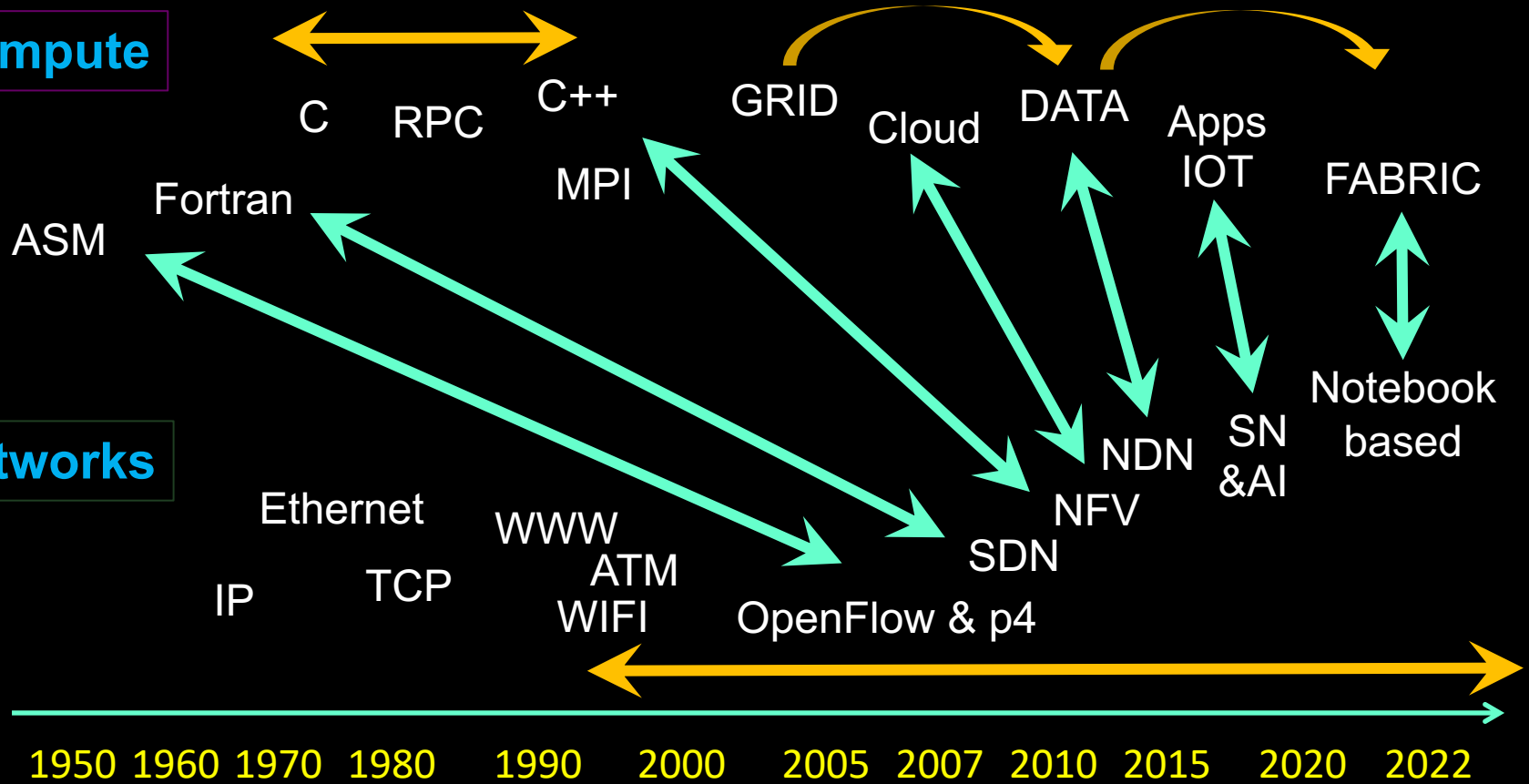
My involvement
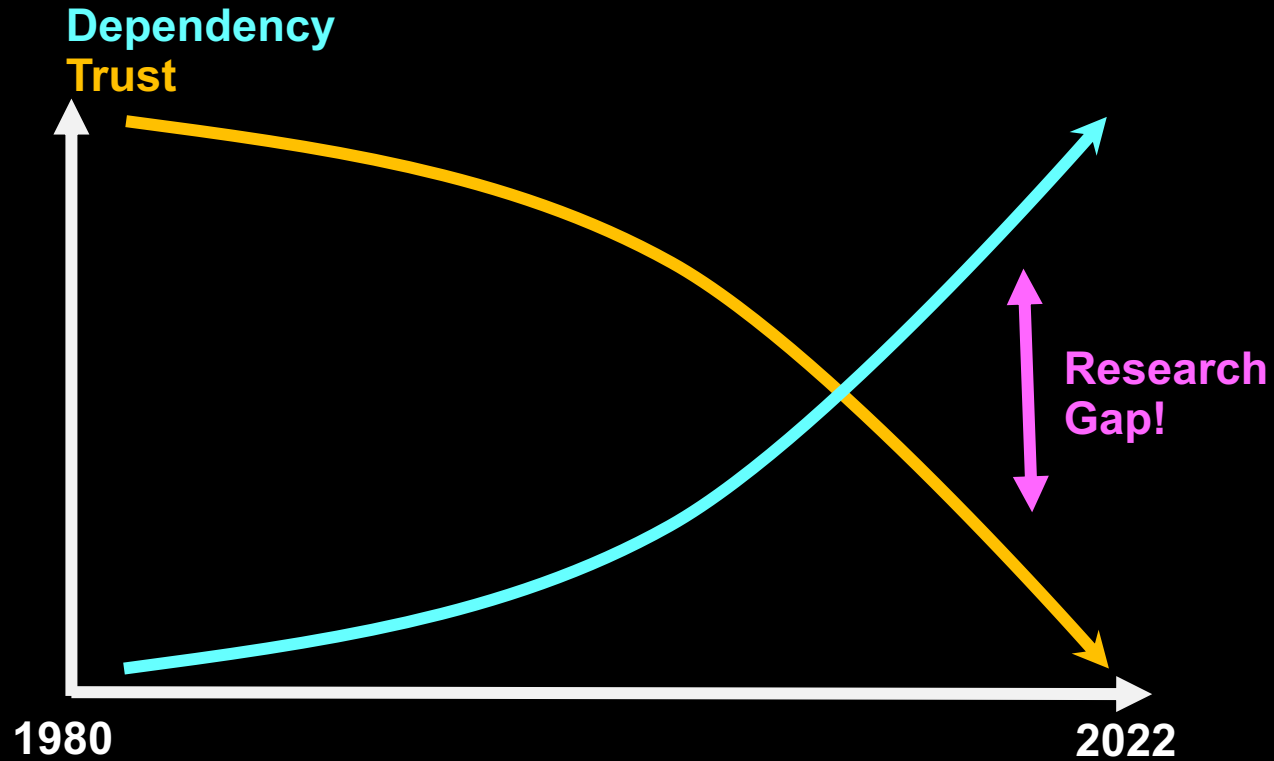
Challenges ahead

- Knowledge safety ("kennisveiligheid")
- Security – the attacks on our CI
- Cyber Infrastructure is not resilient wrt geopolitical changes
- The transformation of Science in the digital age
- The (in)dependence on big tech, plan a-b, exit strategies, etc.
- Sovereignty: Be yourself in a digital world!

Some OneLiners

- ## The Dead Cat Demo
  - Highly interactive distributed visualization
  - https://delaat.net/sc/sc04/

- ## The DSC story

- ## The Library 3.0

- ## The Rolex story

- ## Master of your house

Some Anekdotes

- Brown Purse
- SouthPark
- AirBNB
- Car key safety
- UvA ID card
- Carnaval
- PayBack time

Some tricks/Jokes

- Slide Counter

- No signal

- Zoom

NWO

SURFnet

UvA

EU

FES

CIENA   KPMG

EQUINIX   TNO   KLM   Philips

Many thanks to my research Group!

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all co-autors ever

SNE

Many Thanks

- Many many persons to thank!

And then this:

I kindly ask you not to form a traditional congratulatory queue at the reception but to immediately grab the drinks and snacks!

I will come to You.

This presentation will be available via my homepage: https://delaat.net