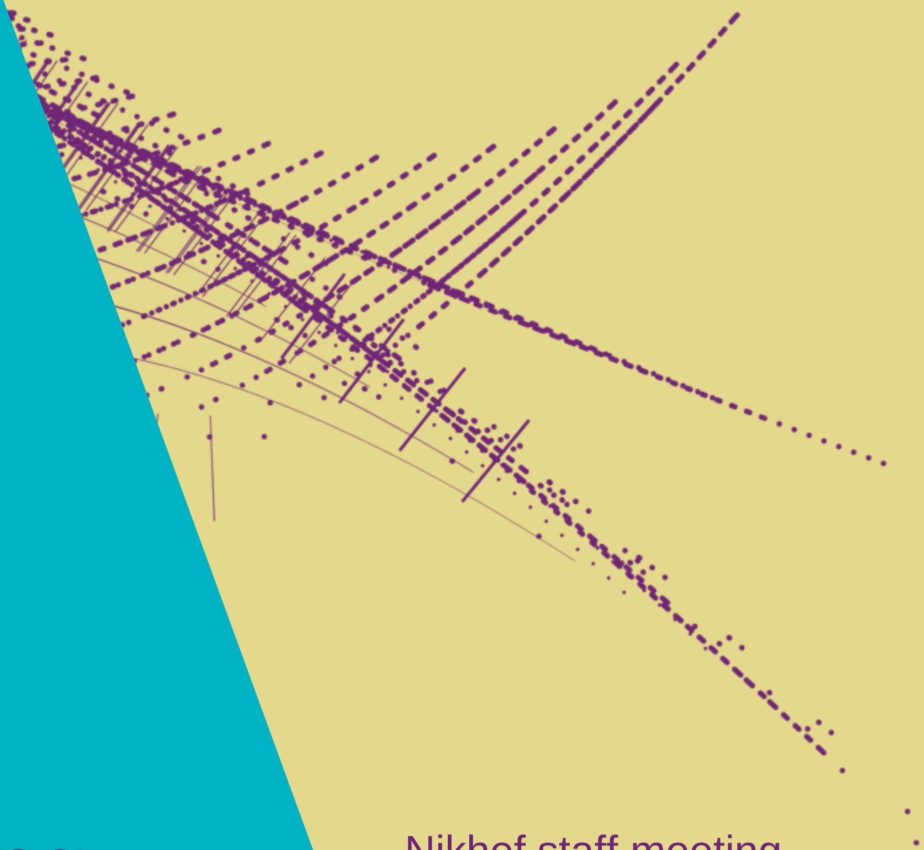
Nikhef

David Groep

Update
Physics Data Processing



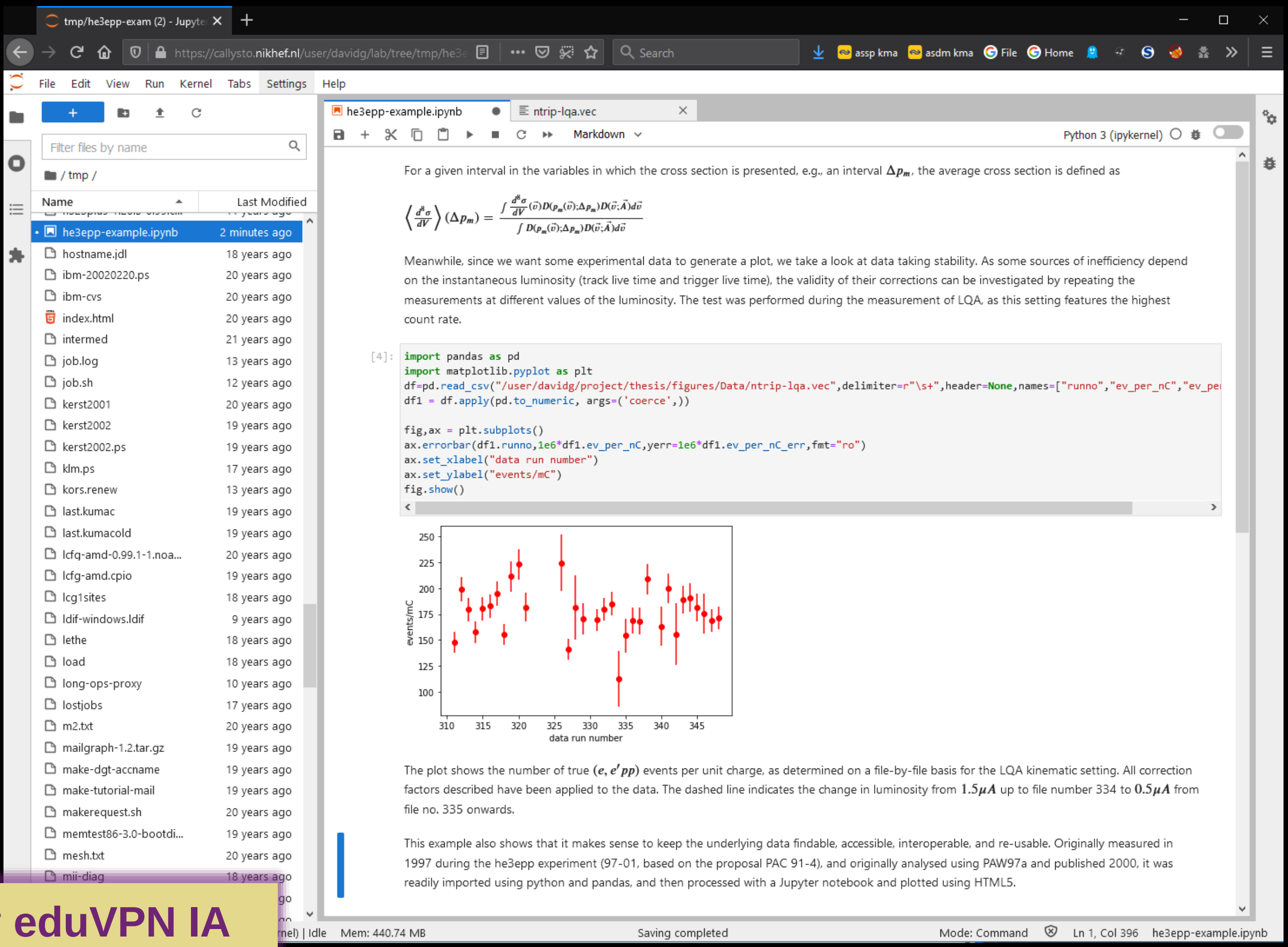
Nikhef staff meeting
15 October 2021

Today news: Callysto

Notebooks for (python) interactive analysis

- pre-production service
- comparable to stbc-*i**
- with your own home, project, data & dcache
- 64 EPYC AMD cores
- basis for ‘cloud’ analysis

co-creation = innovation



use **on-site network** or **eduVPN IA**
(see https://wiki.nikhef.nl/ct/EduVPN)
and go to **https://callysto.nikhef.nl/**

service will contain rough edges
and, yes, the login experience will improve soon ☺

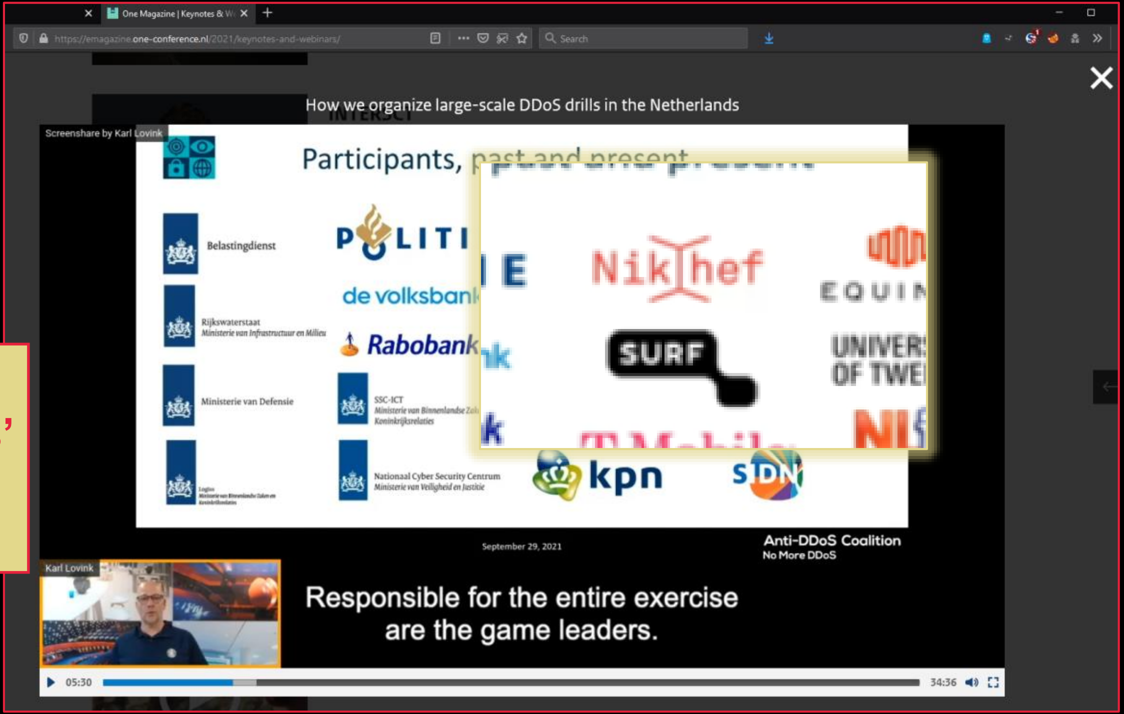
But such easy access is … ‘for your eyes only’

We have to protect our key assets, like $HOME, software on /project, or ‘/dcache’

and we join in exercises
to see what happens
if we, Nikhef,
deny key assets to others … ☺

‘How we organize large-scale DDoS drills in the Netherlands’

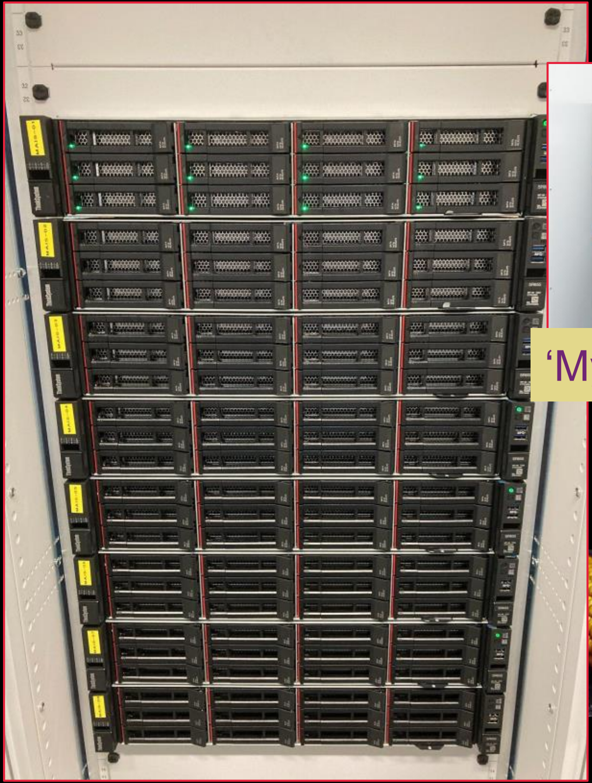
at the NCSC One Conference

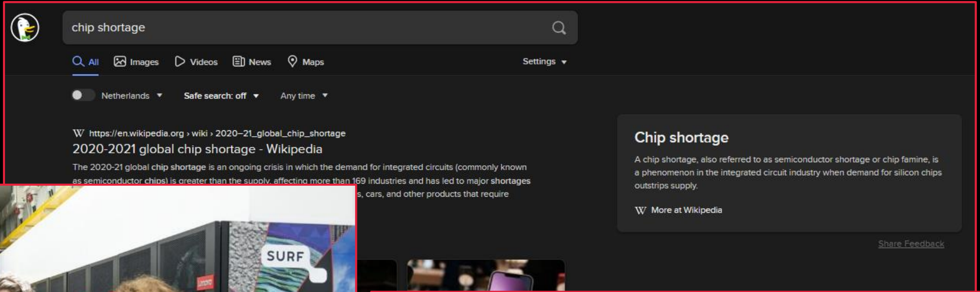


https://nationalespeeltuin.nl/

image sources:
NCSC One Conference 2021,
https://emagazine.one-conference.nl/2021/keynotes-and-webinars/

+ 1.6 PiB … + 2176 cores …





‘My name is Snellius – EPYC Snellius’

Taking occupancy into account:		
Infrastructure CPU+8GiB+100GB+500Mbps (p	61.95	Eur/core/yr
High-throughput compute service (per core)	77.19	Eur/core/yr
Direct personnel involvement (non-housi	2.93	FTE
Total infrastructure costs	1282848	Eur/yr
Facility service costs	1600738	Eur/yr
Infrastructure Storage Configuration (per TBy	77.58	Eur/TByte/yr
Capacity on-line storage service (per TByte)	96.99	Eur/TByte/yr

image sources:
https://www.hypotheek.nl/nieuws/overig/prijzen-elektronica-2021-omhoog/
Search engine results from duckduckgo.com
TCO for the NDPF HTC and HTS services cost for production year 2022

But even that won't get us to 2035+

Quantum computing for HEP and GW - Nikhef QuS

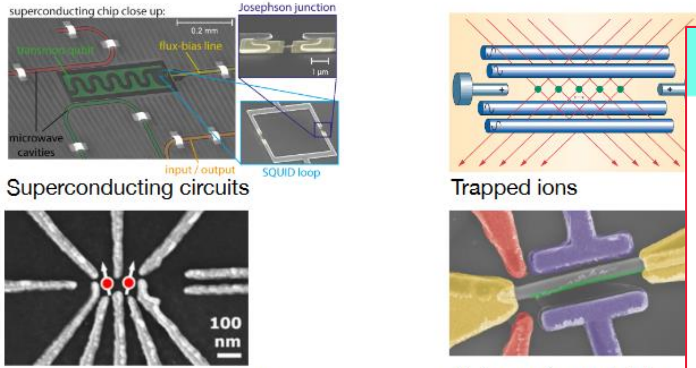
Tuesday 14 Sep 2021, 10:30 → 17:45 Europe/Amsterdam

10:30 **Introduction to the**

Speaker: David Groe

Physical qubits

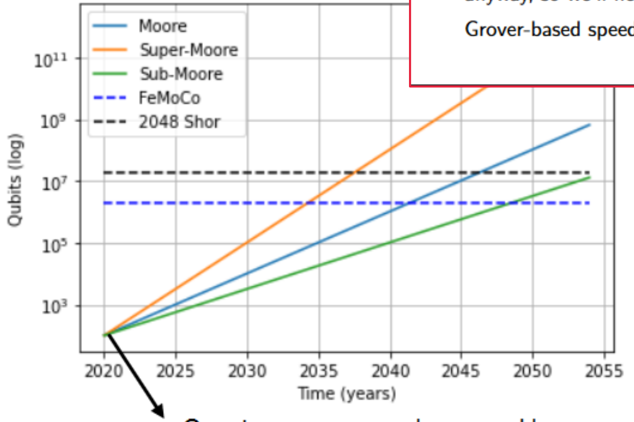
A non-exhaustive overview of current platforms



Superconducting circuits · Trapped ions · Single electron quantum dots · Majorana bound states

State of the art

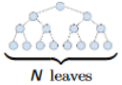
Some wild extrapolation



- Even assuming exponential (Moore-like) growth in qubit numbers
- Quantum supremacy (already achieved) is not a good indicator of the timeframe

Two big caveats

1. Grover-based speedups are $\leq$ quadratic. Is this any good?
   Compare quantum cost $C\sqrt{N}$ vs classical cost cN:
   quantum beats classical for instance-size $N > (C/c)^2$.
   If $C/c \sim 10^{10}$, then need huge $N > 10^{20}$ before get speed-up
2. If we are given classical data (eg, sequence of numbers, or input graph) we should be able to access this in superposition.
   Classical N-bit RAM is a piece of hardware of size $\sim N$ that can be accessed in $\sim \log N$ steps
   Quantum RAM should be the same ($|i, 0\rangle \mapsto |i, x_i\rangle$) accessible in superposition. Hard to implement with noise.



Data of HEP/GW experiments is probably too big to fit in a RAM anyway, so we'll need some sort of "streaming" model.

Grover-based speedups are probably not for the near term

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Slides thanks to:
Jonas Helsen (CWI & QuSoft)
Ronald de Wolf (QuSoft, CWI and UvA)