



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/>

For a given interval in the variables in which the cross section is presented, e.g. an interval  $\Delta p_m$ , the average cross section is defined as

$$\left\langle \frac{d\sigma}{dV} \right\rangle (\Delta p_m) = \frac{\int \frac{d\sigma}{dV}(\vec{v}) D\theta_{p_m}(\vec{v}; \Delta p_m) D\vec{v}; A d\vec{v}}{\int D\theta_{p_m}(\vec{v}; \Delta p_m) D\vec{v}; A d\vec{v}}$$

Meanwhile, since we want some experimental data to generate a plot, we take a look at data taking stability. As some sources of inefficiency depend on the instantaneous luminosity (track live time and trigger live time), the validity of their corrections can be investigated by repeating the measurements at different values of the luminosity. The test was performed during the measurement of LQA, as this setting features the highest count rate.

```
[4]: import pandas as pd
import matplotlib.pyplot as plt
df=pd.read_csv("/user/davidg/project/thesis/figures/Data/ntrip-lqa.vec",delimiter=" ",header=None,names=["runno","ev_per_nC","ev_pp",
df1 = df.apply(pd.to_numeric, args=('coerce',))

fig,ax = plt.subplots()
ax.errorbar(df1.runno,1e6*df1.ev_per_nC,yerr=1e6*df1.ev_per_nC_err,fmt="ro")
ax.set_xlabel("data run number")
ax.set_ylabel("events/mC")
fig.show()
```

The plot shows the number of true ( $e, e'pp$ ) events per unit charge, as determined on a file-by-file basis for the LQA kinematic setting. All correction factors described have been applied to the data. The dashed line indicates the change in luminosity from  $1.5\mu\text{A}$  up to file number 334 to  $0.5\mu\text{A}$  from file no. 335 onwards.

This example also shows that it makes sense to keep the underlying data findable, accessible, interoperable, and re-usable. Originally measured in 1997 during the he3epp experiment (97-01, based on the proposal PAC 91-4), and originally analysed using PAW97a and published 2000, it was readily imported using python and pandas, and then processed with a Jupyter notebook and plotted using HTML5.

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**

The screenshot shows a video player interface. The main content is a slide titled "How we organize large-scale DDoS drills in the Netherlands". The slide features a grid of logos for various Dutch government departments and organizations, including Belastingdienst, Politie, de Volksbank, Rabobank, Ministerie van Defensie, SSC-ICT, and Nationaal Cyber Security Centrum. A yellow box highlights the Nikhef logo. Below the logos, it says "Participants, past and present". At the bottom of the slide, it reads "September 29, 2021" and "Anti-DDoS Coalition No More DDoS". A video player control bar at the bottom shows a progress bar at 05:30 and a total duration of 34:36. A small video thumbnail of Karl Lovink is visible in the bottom left corner of the slide.

<https://nationalespeeltuun.nl/>

# + 1.6 PiB ... + 2176 cores ...



'My name is Snellius – EPYC Snellius'

chip shortage

Wikipedia

2020-2021 global chip shortage - Wikipedia

The 2020-21 global chip shortage is an ongoing crisis in which the demand for integrated circuits (commonly known as semiconductor chips) is greater than the supply, affecting more than 169 industries and has led to major shortages in cars, and other products that require

Chip shortage

A chip shortage, also referred to as semiconductor shortage or chip famine, is a phenomenon in the integrated circuit industry when demand for silicon chips outstrips supply.

More on Wikipedia

https://www.cbc.com/news/2021/10/03/semiconductor-chip-shortage

Semiconductor chip shortage could extend through 3 Oct 2021 - The semiconductor chip shortage that is hamstringing the production of computers to appliances and toothbrushes will extend into 2022 and potentially

Geldzaken voor thuis

Mogelijk gemaakt door: hys

Voorpagina Geld Wonen Leven Overig

Home > Nieuws > Overig > Tekort aan chips zorgt voor prijsstijgingen elektronica in 2021

Meest gelezen

1. Hypotheekvrij leven | Is en hoe pak je het aan?

2. Geld verdienen naast je om bij te verdienen!

3. Passief inkomen gener kunt het! (11 tips)

4. In grote steden vanaf 2 opkooperbod voor vastgoedbeleggers

5. Meer starters kiezen vo aflossingsvrije hypothe weel slim?

Het beste van ons in je Ontvang rentenierse

Tekort aan chips zorgt voor prijsstijgingen elektronica in 2021

Chiptekort werkt nu ook door in prijs en levertijd elektronische apparaten

Juni 2021 door Romy Veul 522x gelezen

at tekort aan chips begint een serieus probleem te worden. Op korte termijn prort een forse prijsstijging voor elektronica verwacht door het tekort. En dat niet een lange levertijd zijn ook aan de orde van de dag. Het is geen uitzondering

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-hous	2.93	FTE
Total infrastructure costs	1282848	Eur/yr
Facility service costs	1600738	Eur/yr
Infrastructure Storage Configuration (per TB	77.58	Eur/TByte/yr
Capacity on-line storage service (per TByte)	96.99	Eur/TByte/yr

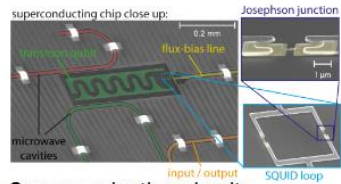
# But even that won't get us to 2035+

## Quantum computing for HEP and GW - Nikhef QuSoft

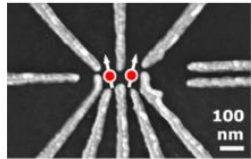
Tuesday 14 Sep 2021, 10:30 → 17:45 Europe/Amsterdam

### Physical qubits

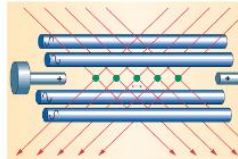
A non-exhaustive overview of current platforms



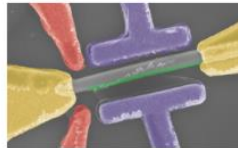
Superconducting circuits



Single electron quantum dots

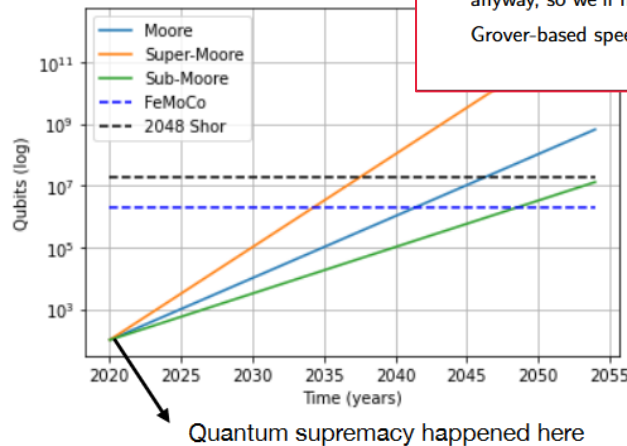


Trapped ions



Majorana bound states

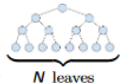
### State of the art Some wild extrapolation



- 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

10:30

Introduction to the  
Speaker: David Groe

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