

# CERN Tier0 update

LHCOPN meeting - Umeå  
4<sup>th</sup> of June 2019

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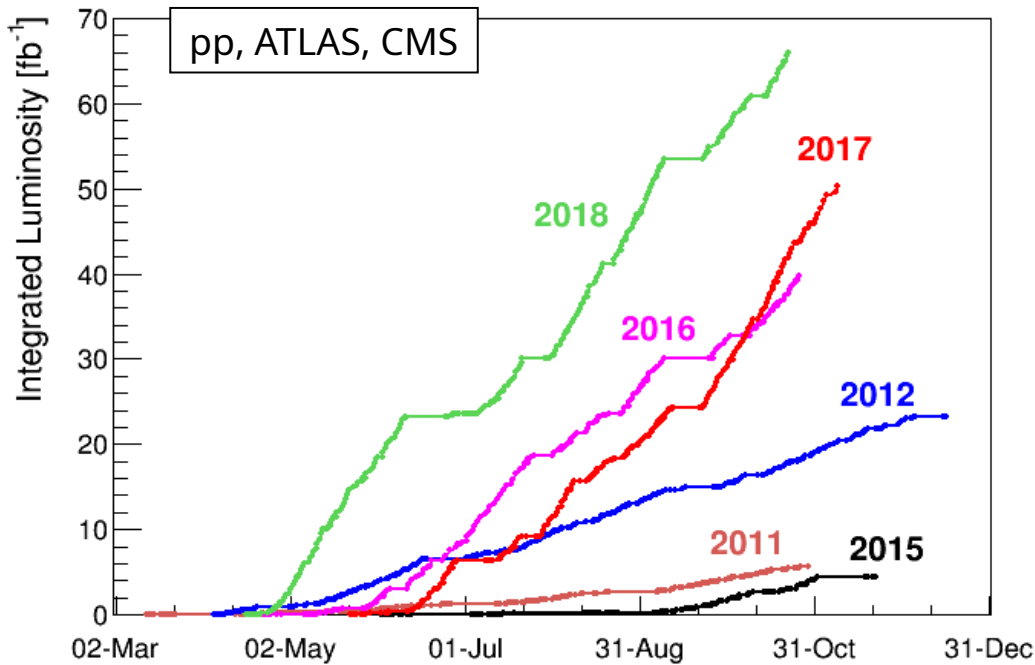


# Summary

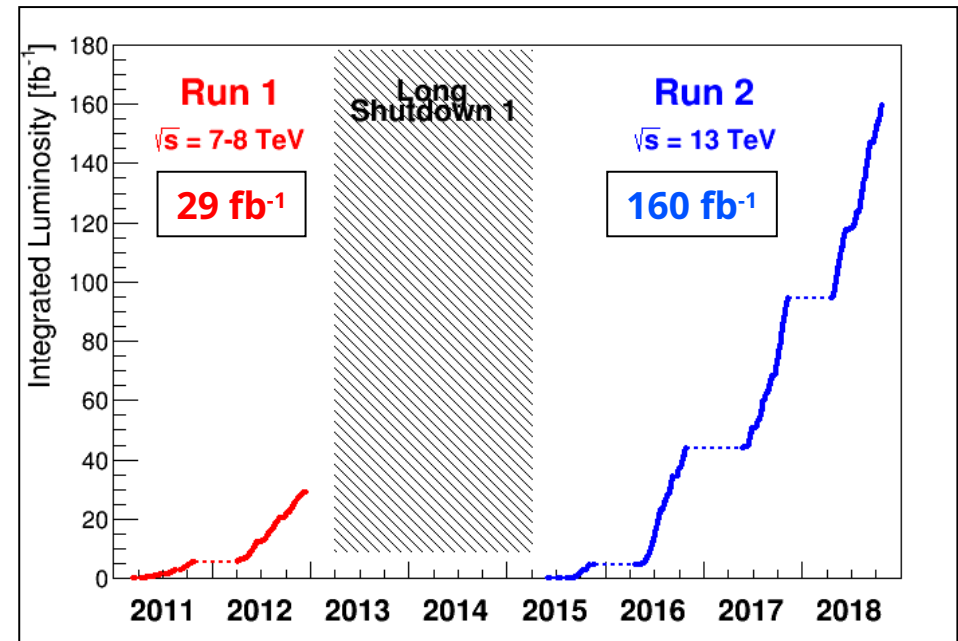
- 2018 performances
- LHC planning
- Beyond the LHC
- IT data-centres
- LHC Experiments
- Other networks

**- 2018 performances**

# LHC performance in 2018

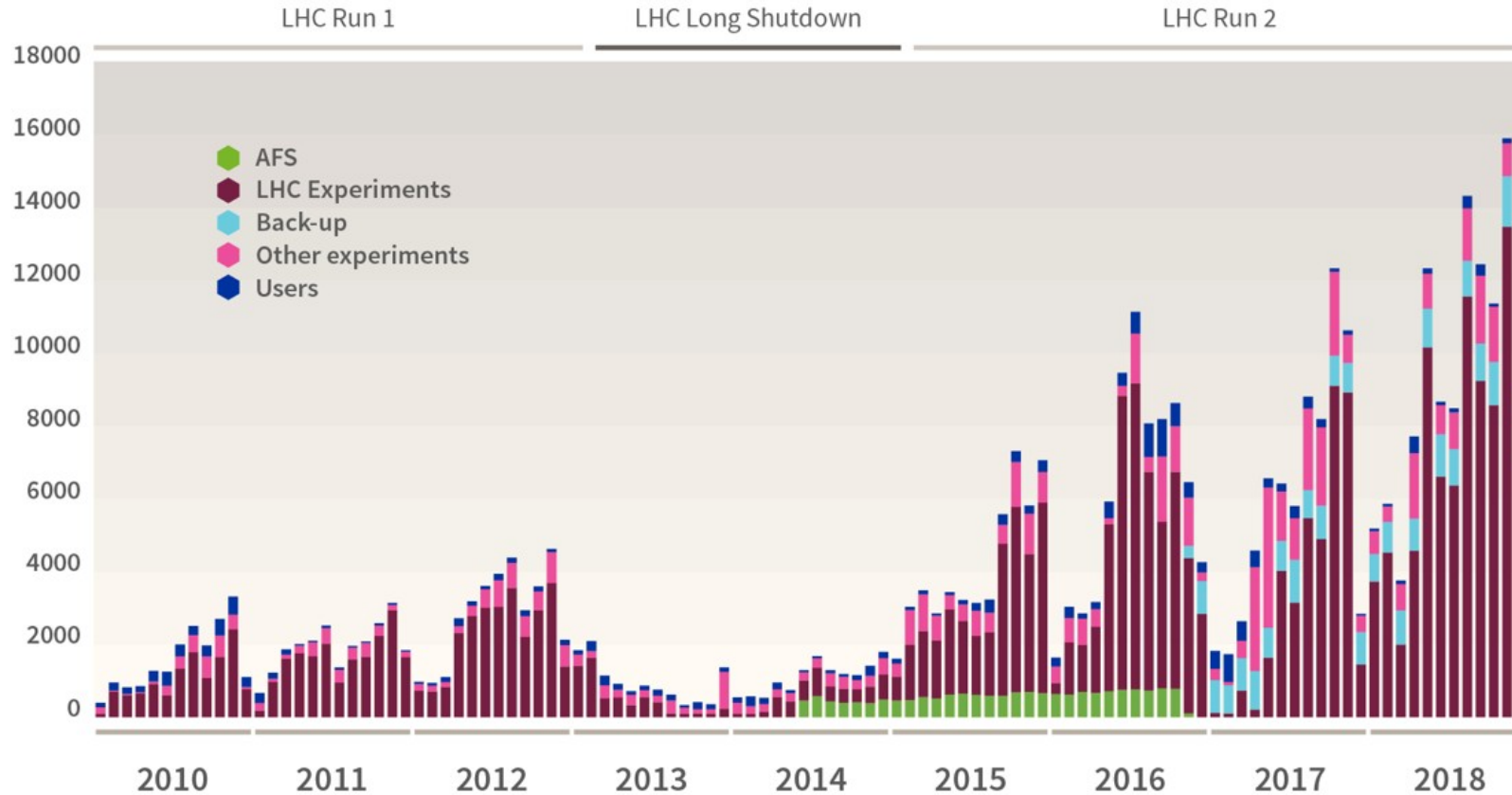


Record breaking luminosity also in 2018



Source: <https://indico.cern.ch/event/779524/attachments/1779072/2894129/Jan-2019-Fabiola.pdf>

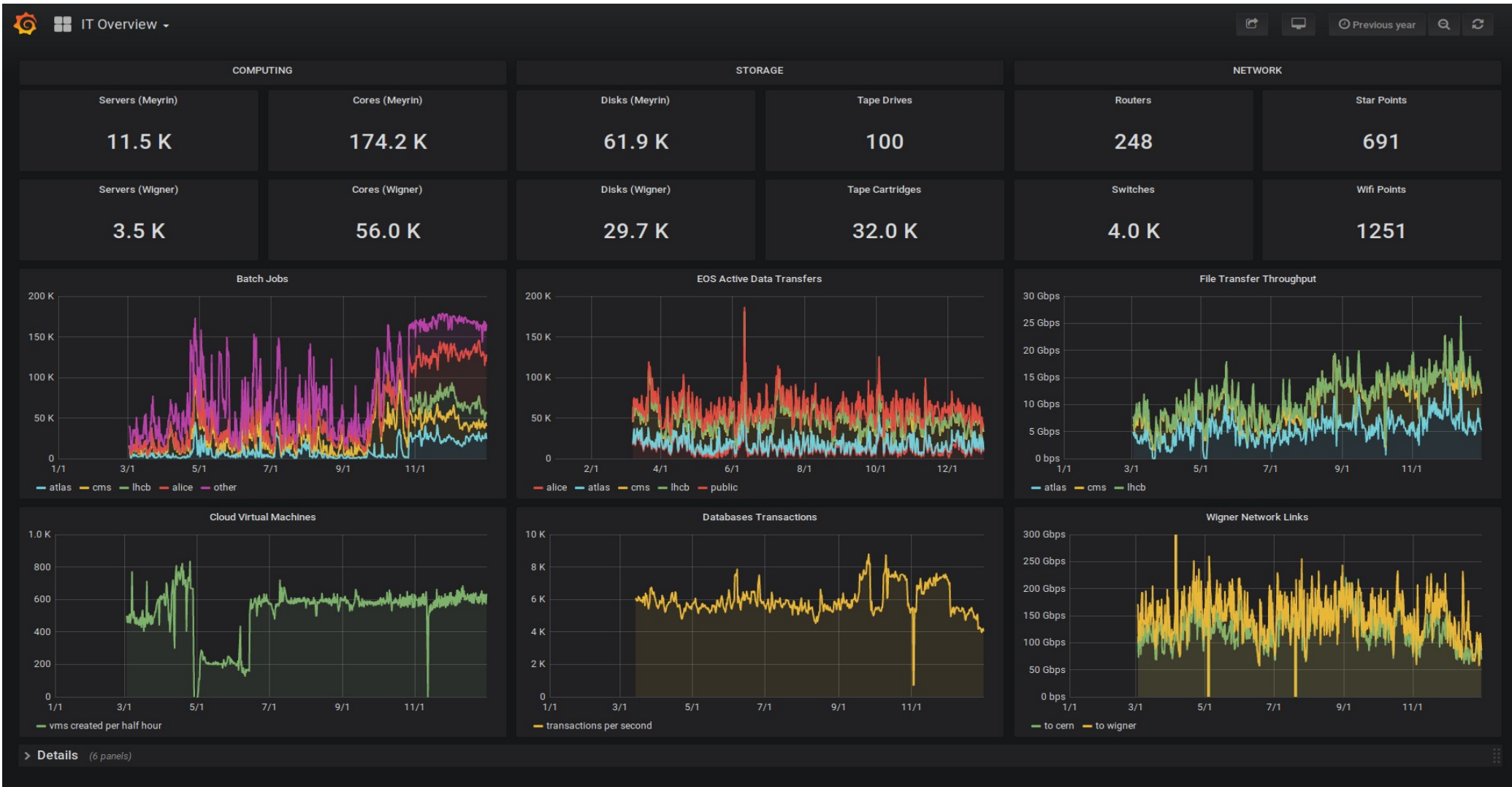
# IT performance: recorded data on tapes



CERN computing: amount of data recorded on tape generated by the LHC experiments, other experiments, various back-ups and users (Tbps). In 2018, over 115 PB (petabytes) of data in total (including about 88 PB of LHC data) were recorded on tape, with a record peak of 15.8 PB in November.

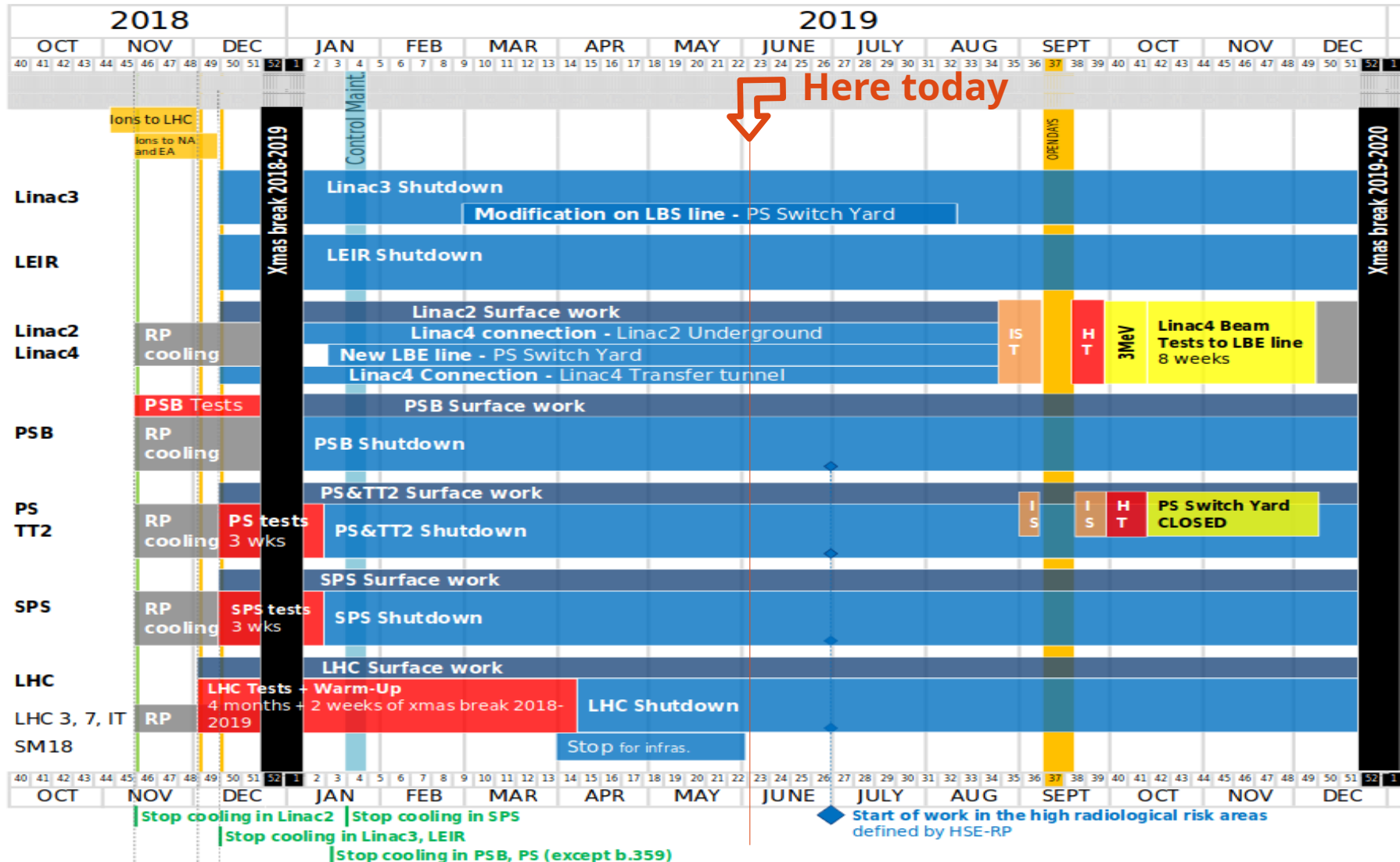
Source: <https://cds.cern.ch/record/2665015>

# IT overview of 2018



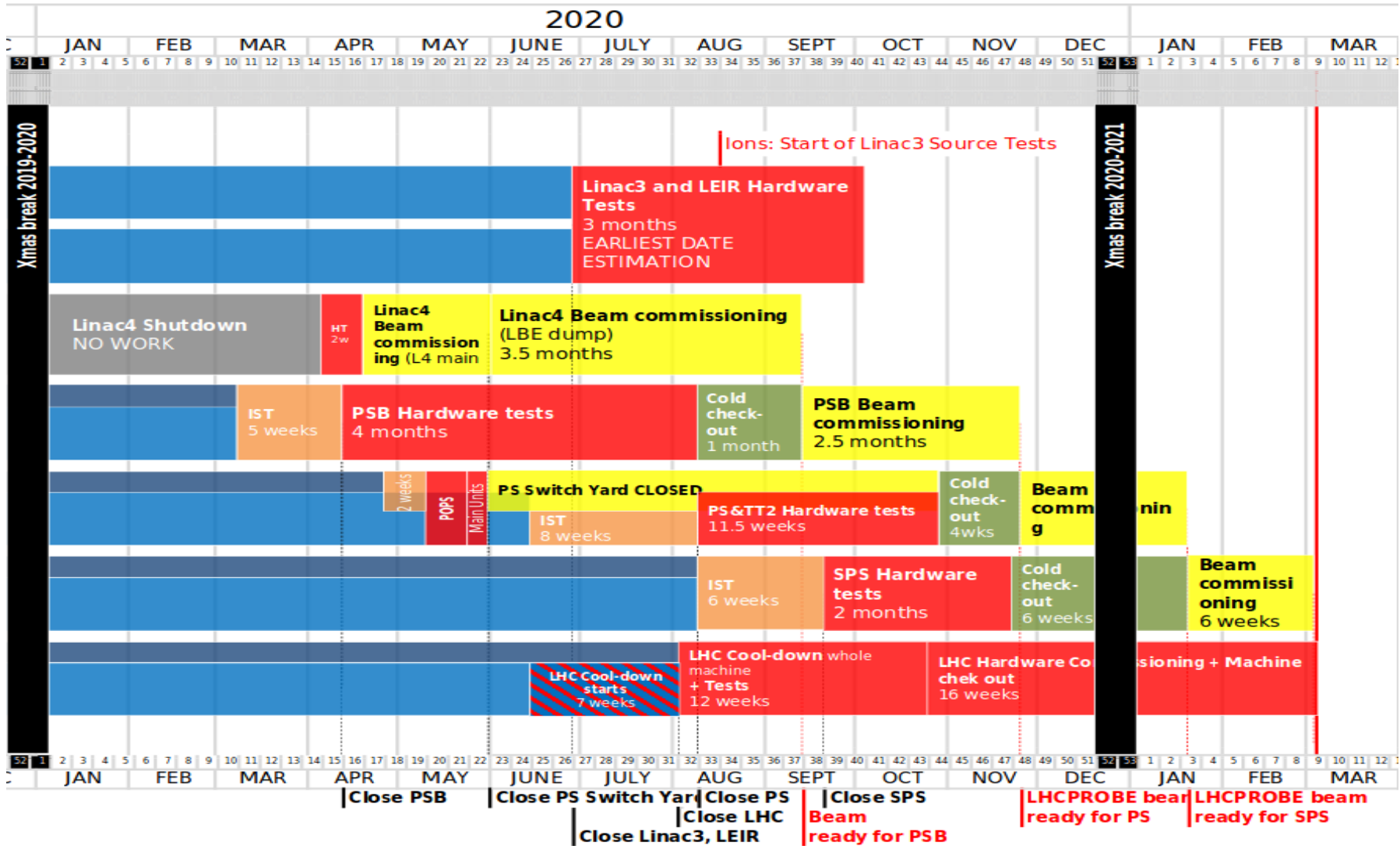
**- LHC planning**

# Long Shutdown 2 - Schedule 2019

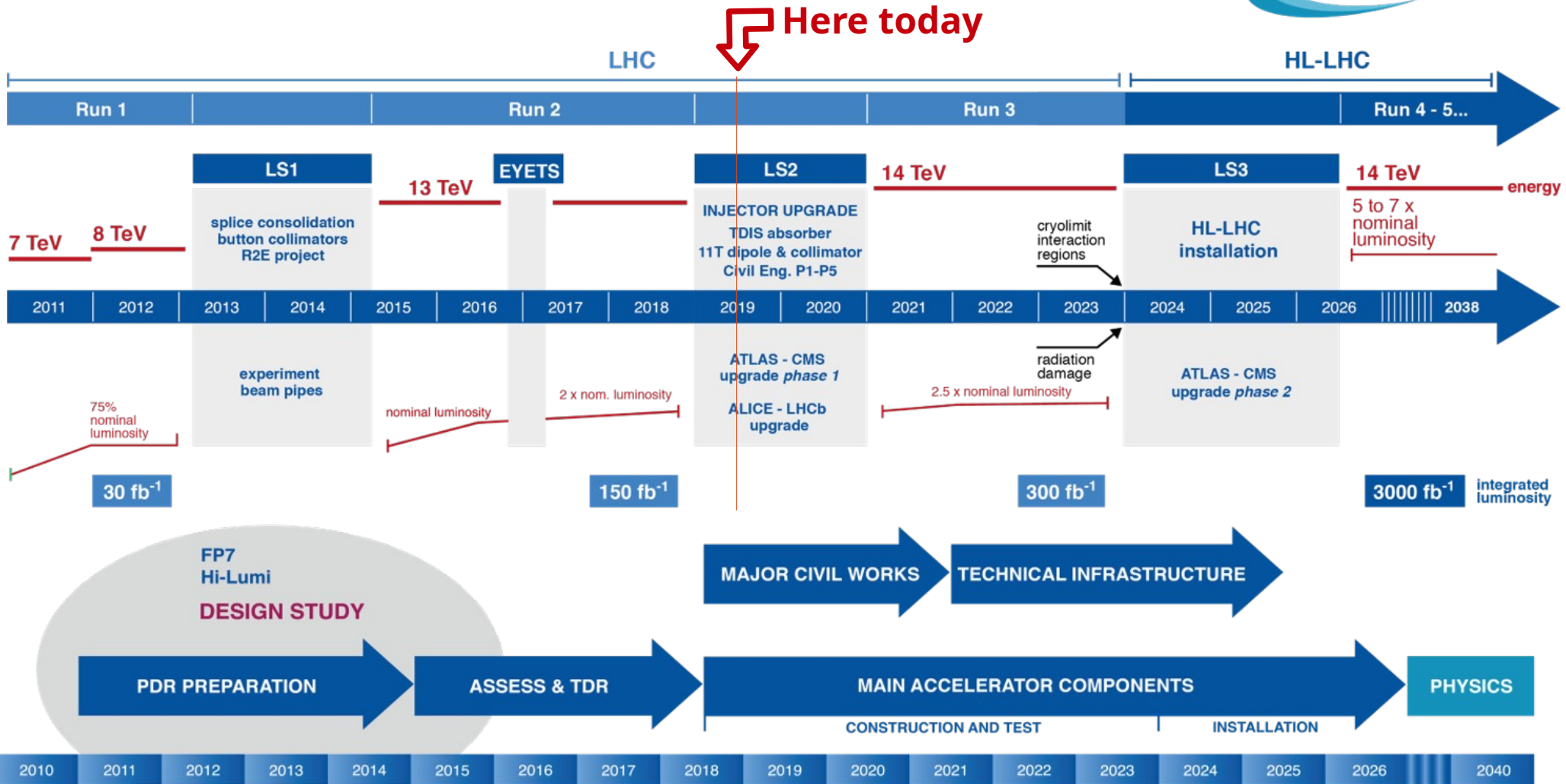




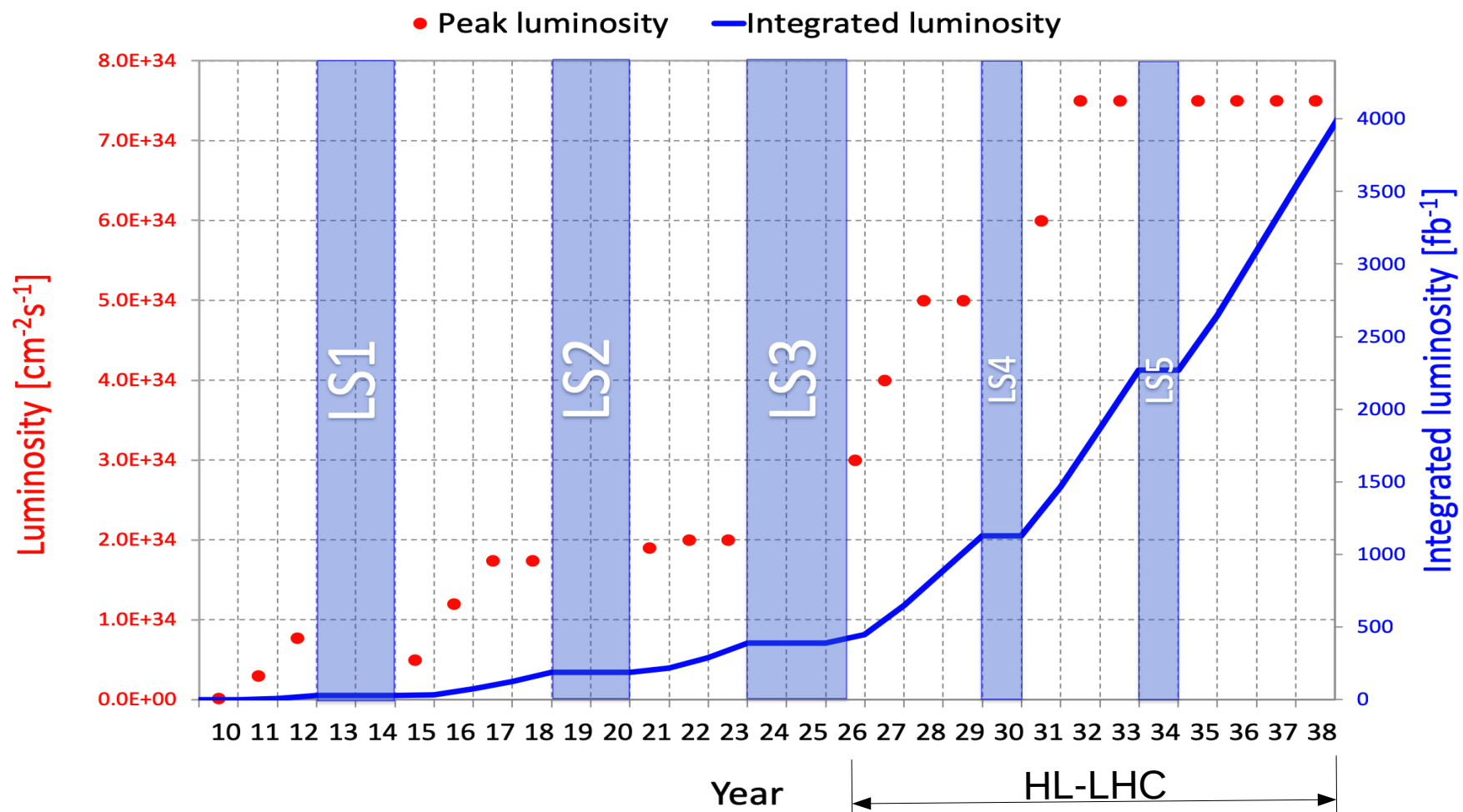
# Long Shutdown 2 - Schedule 2020



# HL-LHC plan



# HL-LHC luminosity forecast



<https://lhc-commissioning.web.cern.ch/lhc-commissioning/schedule/HL-LHC-plots.htm>

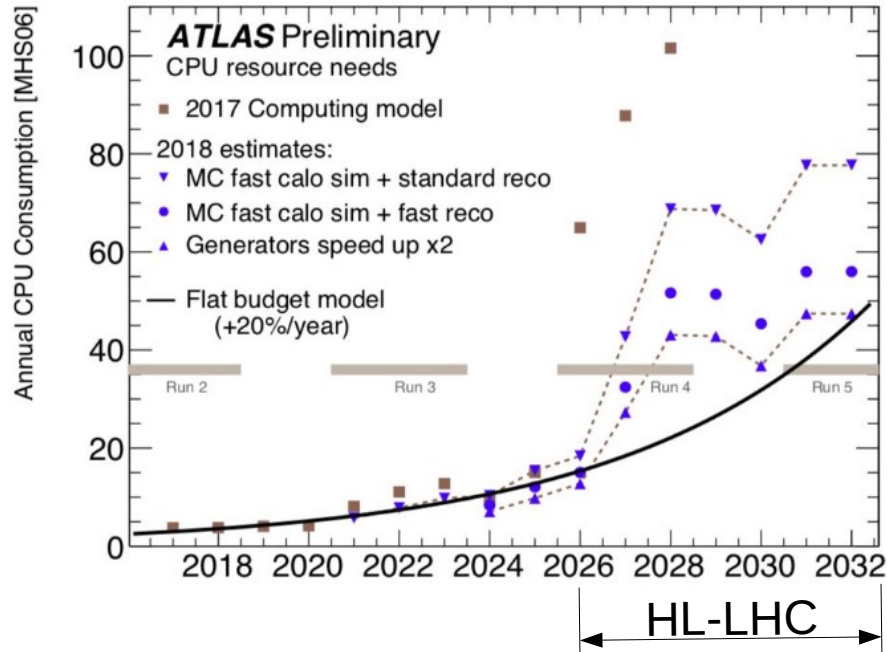
# Computing resources needs for HL-LHC

## CPU projections for HL-LHC

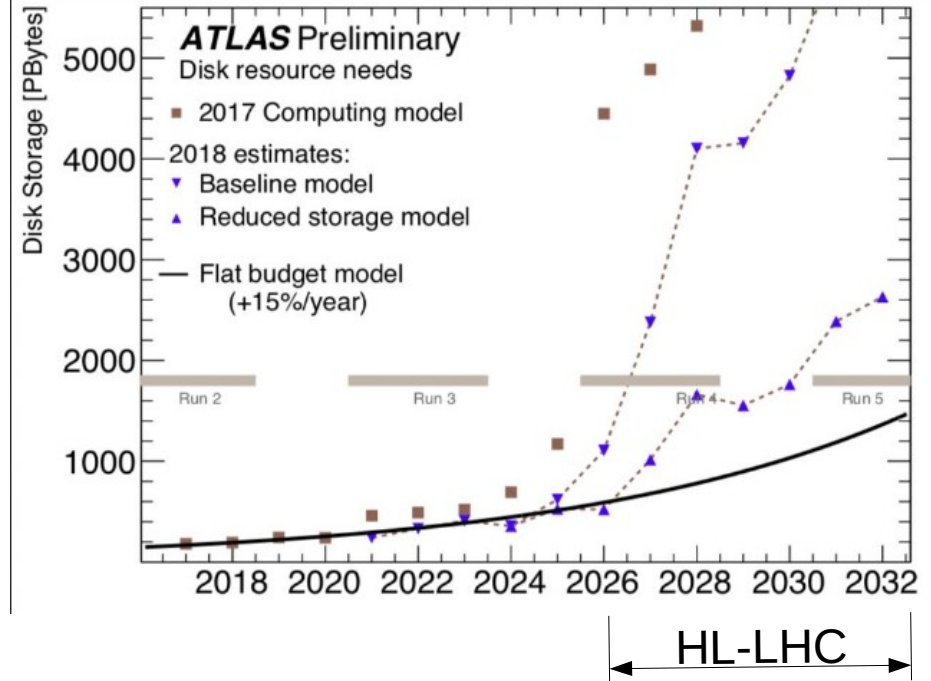
Fast vs Full simulation:

Run 3: 50% of simulation with fast sim

Run 4: 75% of simulation with fast sim



## Disk storage projections for HL-LHC

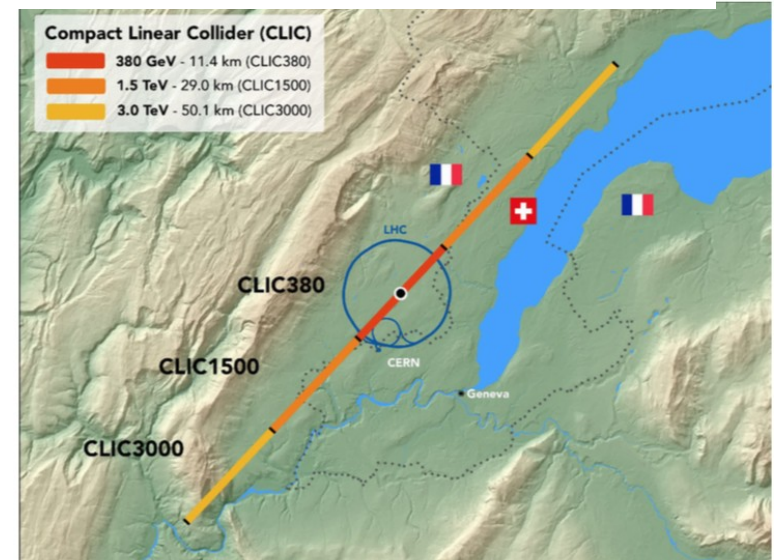
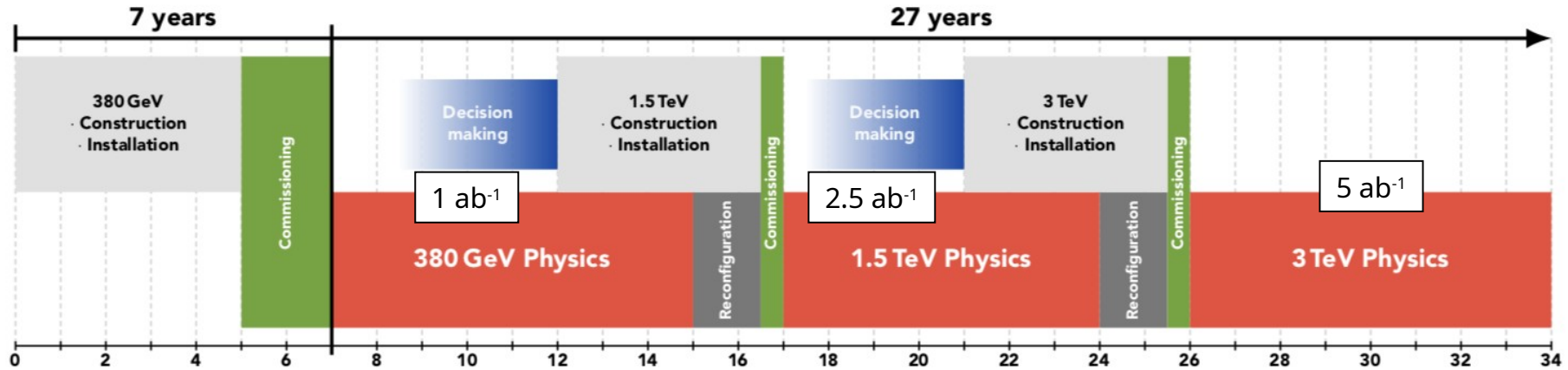


HOW workshop 2019: [https://indico.cern.ch/event/759388/contributions/3302195/attachments/1813484/2962970/HOW\\_20190318\\_Costanzo.pdf](https://indico.cern.ch/event/759388/contributions/3302195/attachments/1813484/2962970/HOW_20190318_Costanzo.pdf)

**- Beyond the LHC**

# CLIC - Compact Linear Collider

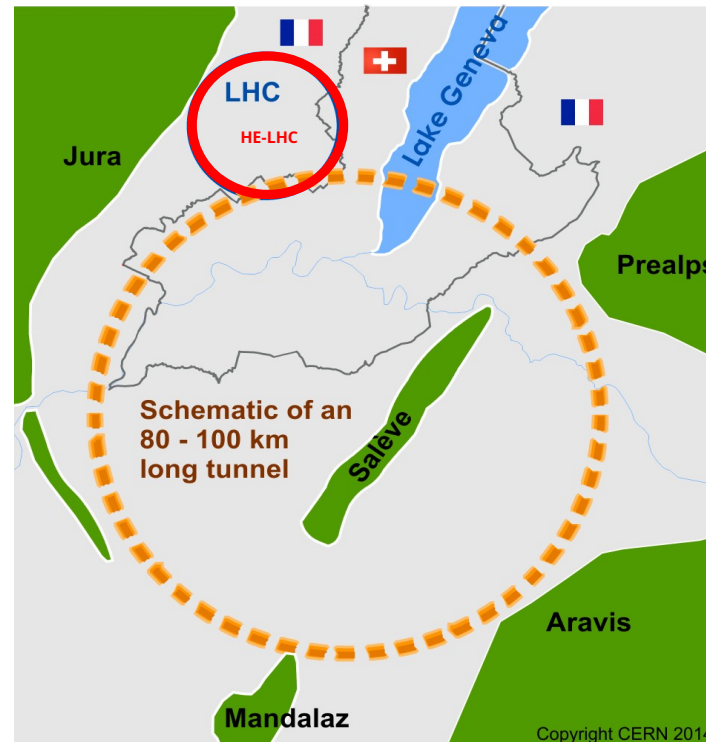
**Technically**, construction could start in ~2026 (TDR in 2025) → first collisions at  $\sqrt{s}=380$  GeV in ~2035 → 25-30 years of physics exploitation



# FCC – Future Circular Collider

**Purely technical** schedule, assuming green light to preparation work in 2020.  
**A 70 years programme**

8 years preparation	10 years tunnel and FCC-ee construction	15 years FCC-ee operation	11 years FCC-hh preparation and installation	25 years FCC-hh operation pp/PbPb/eh
2020-2028		2038-2053		2064-2090



# Granada meeting

- Update on European Strategy for Particle Physics  
<https://cafpe.ugr.es/epps2019/>
- CLIC and FCC presented
- still wondering whether Japan will build an ILC and what will happen with the Chinese plans for a large collider



**- IT data-centres**

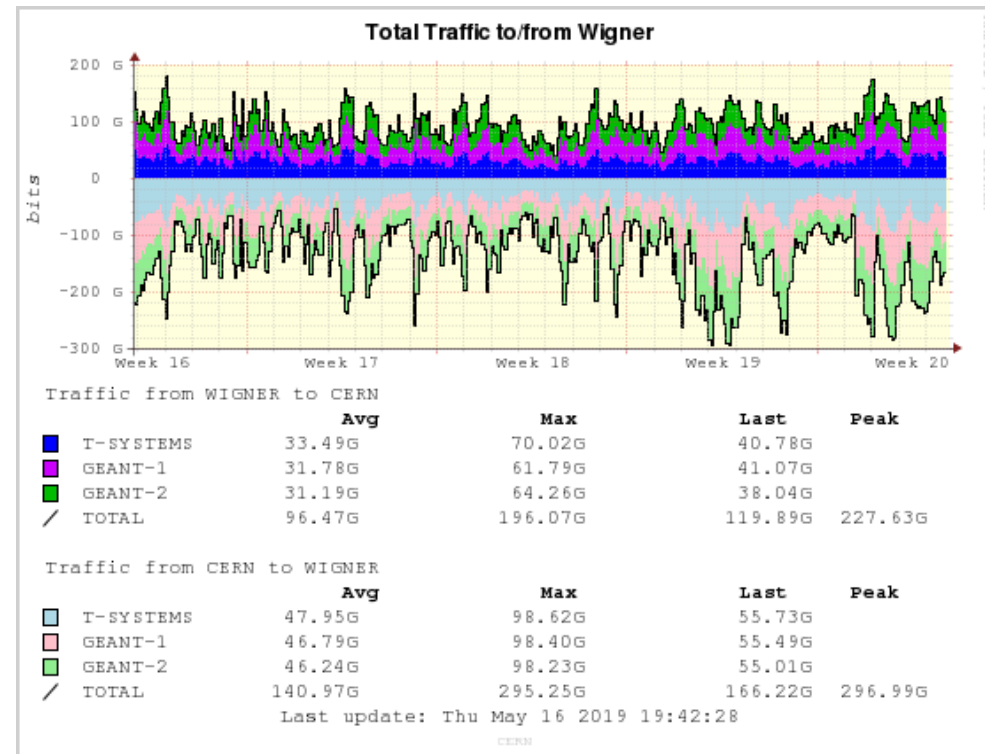
# Meyrin (Geneva) Data-centre

- Brocade MLXE being replaced by Juniper QFX10008
  - Increasing new routers' interconnections to 1.6Tbps
  - Deploying new architecture with router redundancy (VXLAN or MCLAG).
- Testing Openstack integration for IP mobility



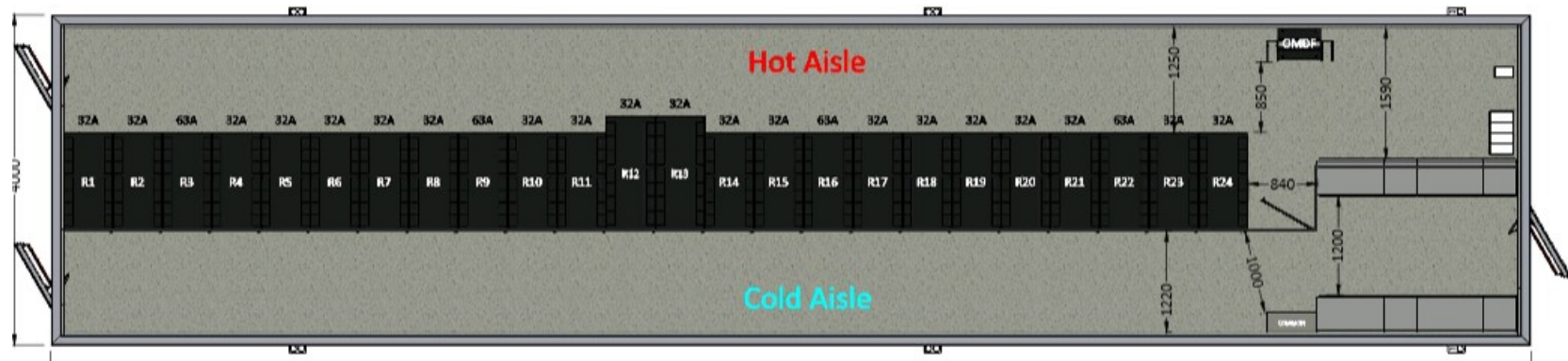
# Wigner (Budapest) Data-centre

- Contract will end in December 2019
- Data draining and servers repatriation already started
- Most recent servers will be re-used in Point8 DC extension (see next slide)



# Point8 (LHCb) Data-centre extension

- Two LHCb containers (of six) will be used by CERN IT to host hypervisors during Run3
- Being filled with refurbished servers coming from Wigner
- 800Gbps connection to Meyrin Data-centre with DWDM PAM4 system
- To be returned to LHCb at the end of Run3



# Point8 (LHCb) Data-centre extension



# B773 – Second Network Hub

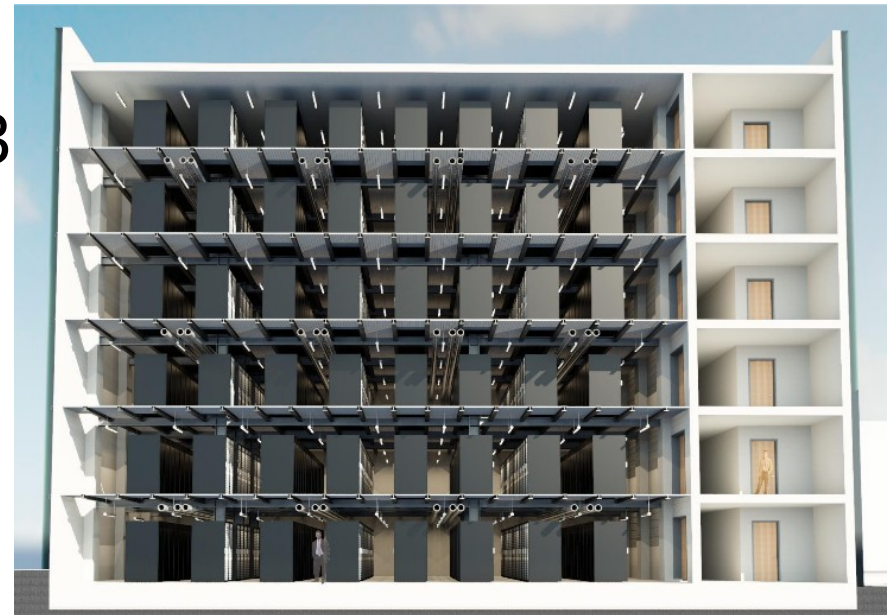
- Move of CERN equipment completed
- ESnet and GEANT PoP operational
- SURFnet and NORDUnet installation on going



# PCC: Preveessin Computer Centre

Plan for the Construction of new Computer Centre in the CERN French site of Preveessin:

- Project fully supported by CERN management
- Should be approved at the next Finance Committee in June (coming weeks)
- To be built during Run3 and LS3 to be ready for Run4
- Thanks to GEANT for the help in estimating network costs to remote locations



GSI Green Cube

# - LHC Experiments



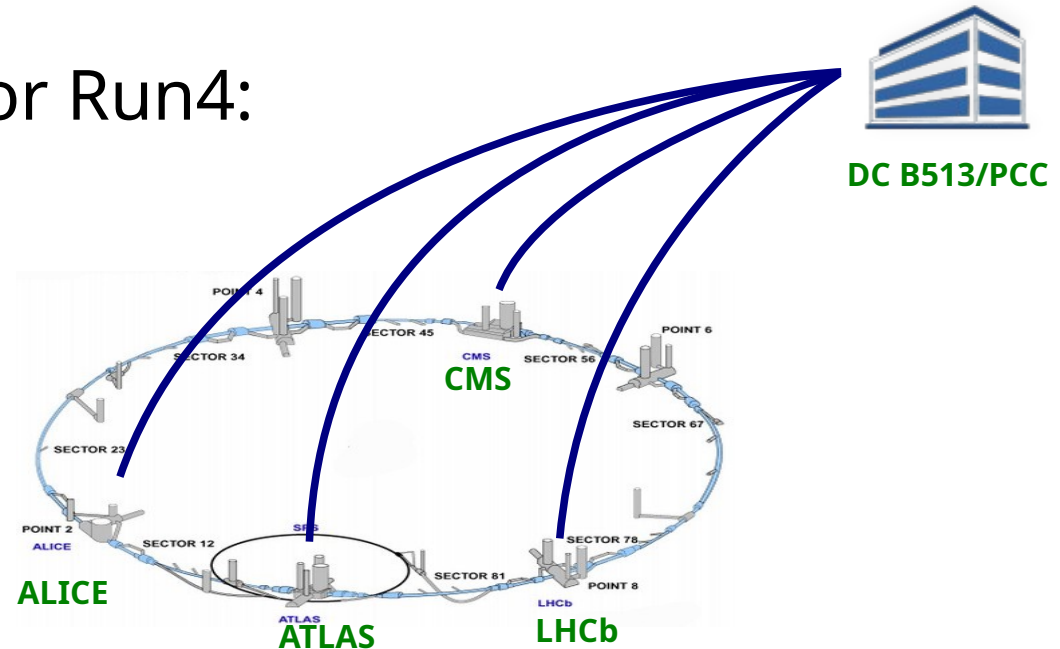
# Experiments' DAQ lines to data-centre

Received requirements for Run3:

- ALICE: 2Tbps
- LHCb: 1Tbps
- CMS: 400Gbps

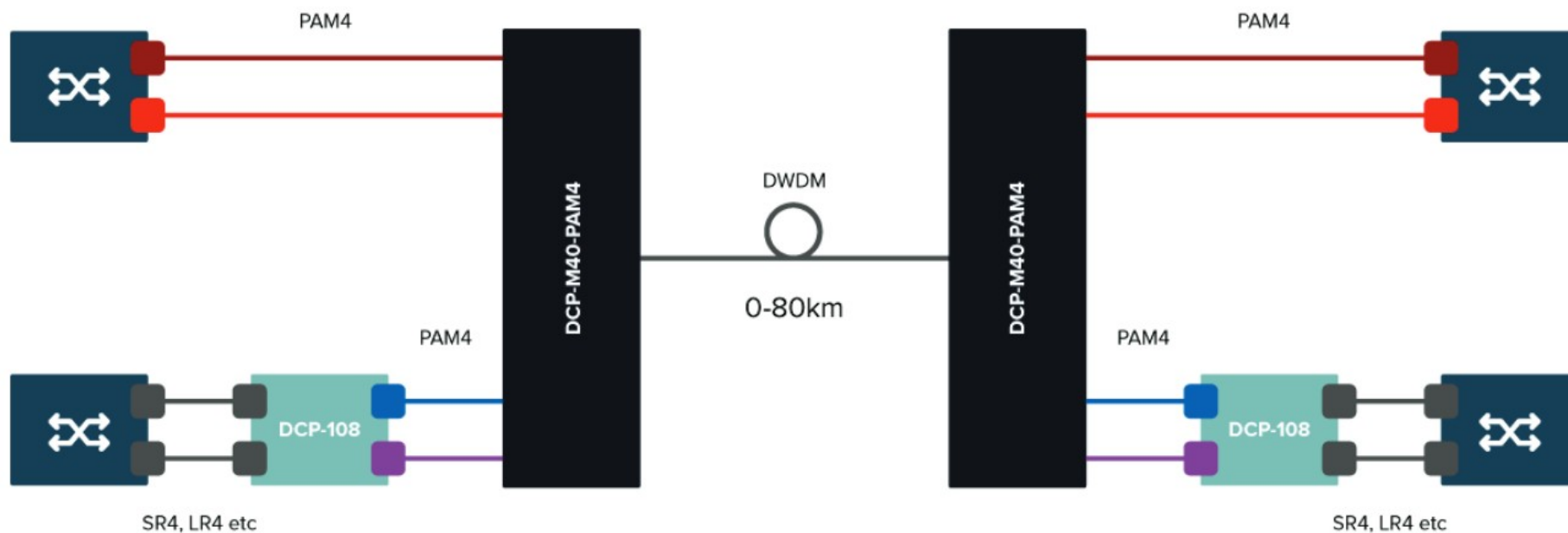
Estimated requirements for Run4:

- ATLAS: 4Tbps
- CMS: 4Tbps



# Experiments' DAQ lines to data-centres

- Acquired PAM4 DWDM system from Smartoptics
- To be used for LHCb and ALICE connections



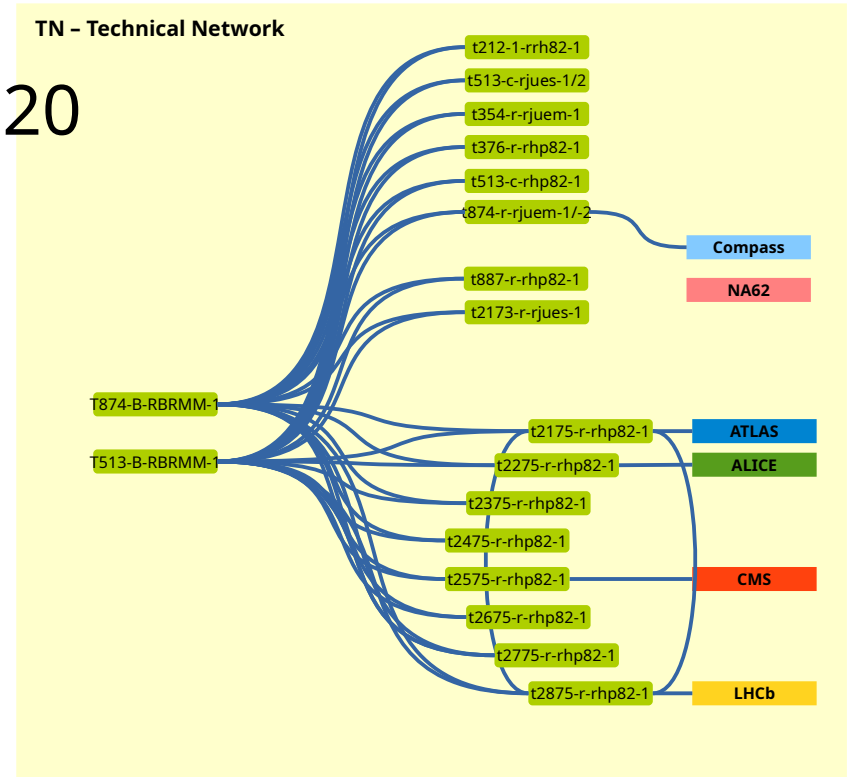
**- Other networks**

# Technical Network upgrade

Technical network (TN), the LHC control network.

Undergoing major upgrade:

- all routers being replaced by pairs of Juniper EX9200
- VRRP everywhere
- must be completed by mid 2020



# Campus Network upgrade

The Campus network will be upgraded after the TN upgrade (end of 2020, 2021)



# External Network and Firewall upgrade

External routers and perimeter firewall will be upgraded during LS2

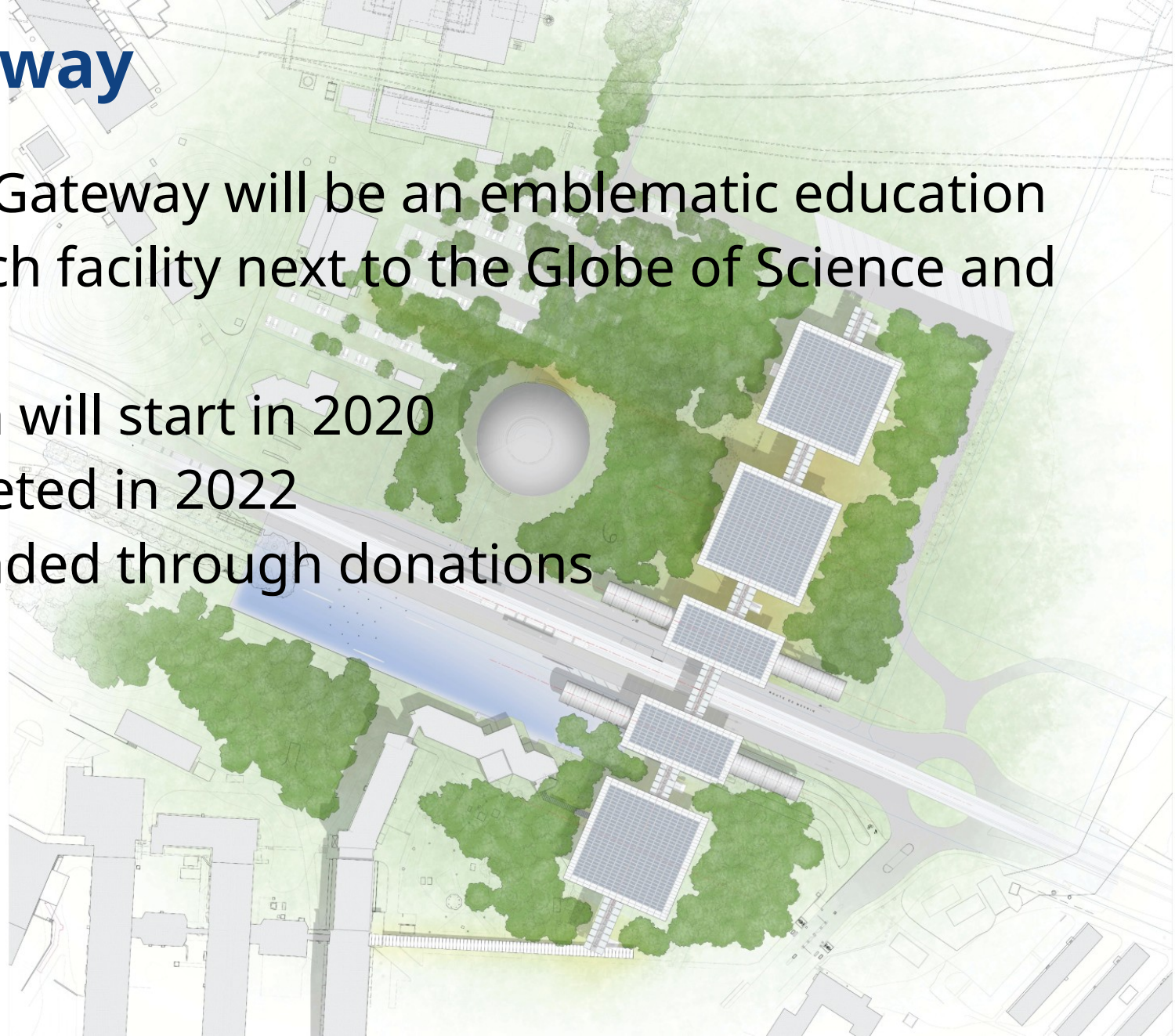
Aiming to an “affordable” Firewall capable of 200Gbps with Threat Intelligence inspection.  
On-going market survey.

# CERNlight

- Replaced Brocade MLXE with Juniper QFX5200
- Moved 100G Geneva-Amsterdam to SURFnet ECI
- SURFnet is procuring a better fibre Amsterdam-Geneva to be able to light 400G lambdas

# Science Gateway

- The Science Gateway will be an emblematic education and outreach facility next to the Globe of Science and Innovation
- Construction will start in 2020
- To be completed in 2022
- 79M CHF funded through donations





*Questions?*

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