

DUNE Computing

Network requirements

**LHCOPN/ONE meeting
CERN 13/14 Jan 2020**

Pete Clarke on behalf of DUNE

DUNE Computing Network requirements

- ❑ DUNE Computing is “internationalizing”
 - This means DUNE will organize computing ~similar way to LHC experiments
 - Expect international contributions according to some sensible split
 - Expect a significant fraction of computing from outside of the USA (50% ?)

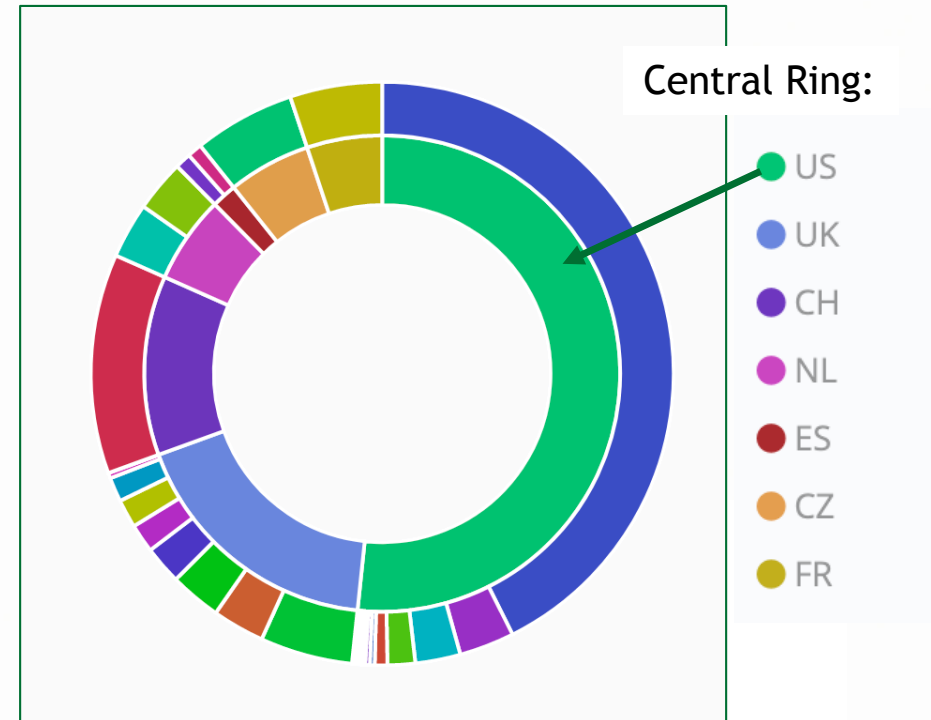
- ❑ Main DUNE Computing sites are currently:
 - USA
 - FNAL
 - BNL
 - Universities
 - Europe
 - UK -all GridPP
 - Czech Republic: FZU
 - NL: Sara
 - FR: IN2P3 Lyon
 - CH: CERN
 - ES: PIC
 - IT: INFN

- ❑ Thus from network point of view
 - Strong overlap with WLCG sites
 - We are well served by ESNET, Geant, and European NRENs

Percentage of successful production jobs over last year

- Central ring shows countries
- Outer ring shows sites

Country	% prod. jobs
USA	52
UK	18
CH	12
NL	6
ES	2
CZ	6
FR	5



Resources provided by:

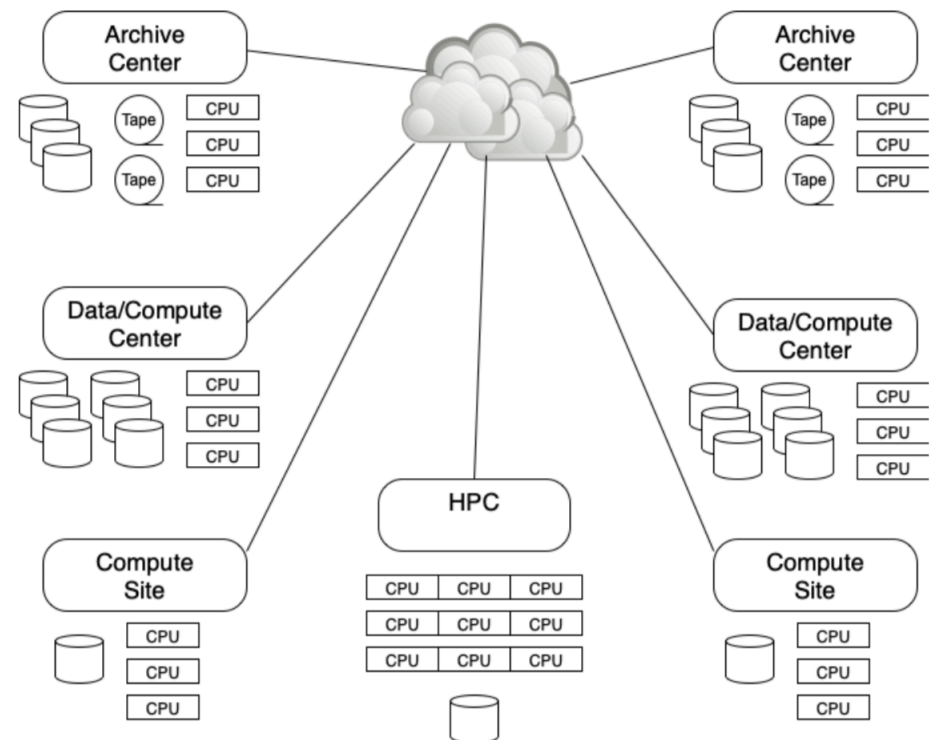
- OSG sites
- WLCG sites
- FNAL
- CERN (part of WLCG)

DUNE Computing model

Similar but “softer” model to LHC

Draft distributed computing model

- Less “tiered” than current WLCG model → **DOMA**
- Collaborating institutions (or groups of institutions) provide significant disk resources (~1PB chunks)
- **Rucio** places multiple copies of datasets
- **Raw data** → tape
- **Reconstructed and analysis data** --> ≥ 2 copies on disk



DUNE Computing

- Network requirements

- ❑ In the future we will include computing in
 - Brazil
 - ? possibly others ?

- ❑ DUNE includes protoDUNE at CERN
 - 2018/19 data
 - Will run again in 21/21
 - Data transfer CERN → FNAL

- ❑ DUNE also has a “different” network requirement to LHC
 - Connection from the SURF Lab in South Dakota → Fermilab
 - ESNET and FNAL are working on this.

- ❑ DUNE Computing Management, as a matter of policy, will work closely with FNAL Networking

DUNE computing scale

□ Latest DUNE CPU and storage estimates

	2020	2021	2022	2023	2024
CPU (Cores)	3600	6000	6000	8000	10000
Storage (PB)	12	20	25	~30	~40

- As a rule of thumb approx 50% of data will be stored in Europe as will 50% of the CPU usage be.
 - You can have more detail than this is you want
 - Several talks from H.Schellman/M.Kirby available if needed.
- This is still modest compared to LHC experiments in next few years

DUNE and MultiONE

- ❑ DUNE sites are highly overlapping with LHC sites
 - All are well connected on their NRENS and LHCONE → no bandwidth problems
 - We will set up a PerfSONAR mesh monitoring page
 - DUNE does not at present have a pressing need to call for a DUNEONE
 - I.e. DUNE is happy that sites are connected by LHCONE

- ❑ DUNE is however very happy to endorse the CERN ↔ FNAL work on a DUNEONE pilot.
 - Aimed at testing out technology, policy & routing multiple VRFs at a site (LHCONE+DUNEONE)
 - We are happy to be guinea pigs for a proof of principle for MultiONE

- ❑ ProtoDUNE Traffic CERN → FNAL
 - Currently carried over LHCONE over Atlantic
 - This is a CERN-FNAL matter to regulate whether a separate VRF is warranted.

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- ❑ If LHCONE policy, for example, became : “LHCONE is only for LHC traffic”
 - We (this meeting in discussion with DUNE) would have to consider whether to just use the production international network OR whether a DUNEONE would bring some benefit.
 - We should have a clear answer to : what problem would a DUNEONE solve.
 - Its not obvious today - keep open mind
 - But this sort of decision should be largely transparent to DUNE surely ?.
 - Its more of a WLCG / Site / Network Group issue.
 - Isn't it true that LHC experiments don't particularly discuss LHCONE per se ?