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ENERGY SCIENCES NETWORK

ESnet Updates

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LHCOPN/LHCONE #49 meeting
2022-10-24

Agenda

- ESnet6 Launch
- Trans-Atlantic Networking Plans
- ESnet Backbone Planning
- Data Challenges
- DOE Site Connectivity
- Tier 2 Site Engagement

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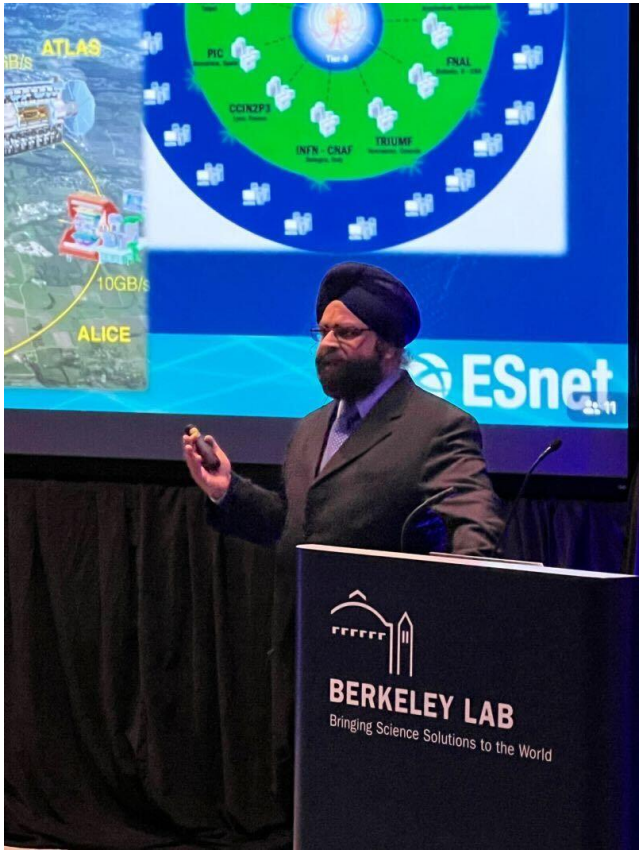
ESnet6 Unveiling & Confab

"Lo, and Behold, I present to you ESnet6"

-- Inder Monga

- Project finished early and under budget
- Attendance from US Govt representatives, DOE leadership
- Keynote from Vint Cerf
- 2 day facility user meeting



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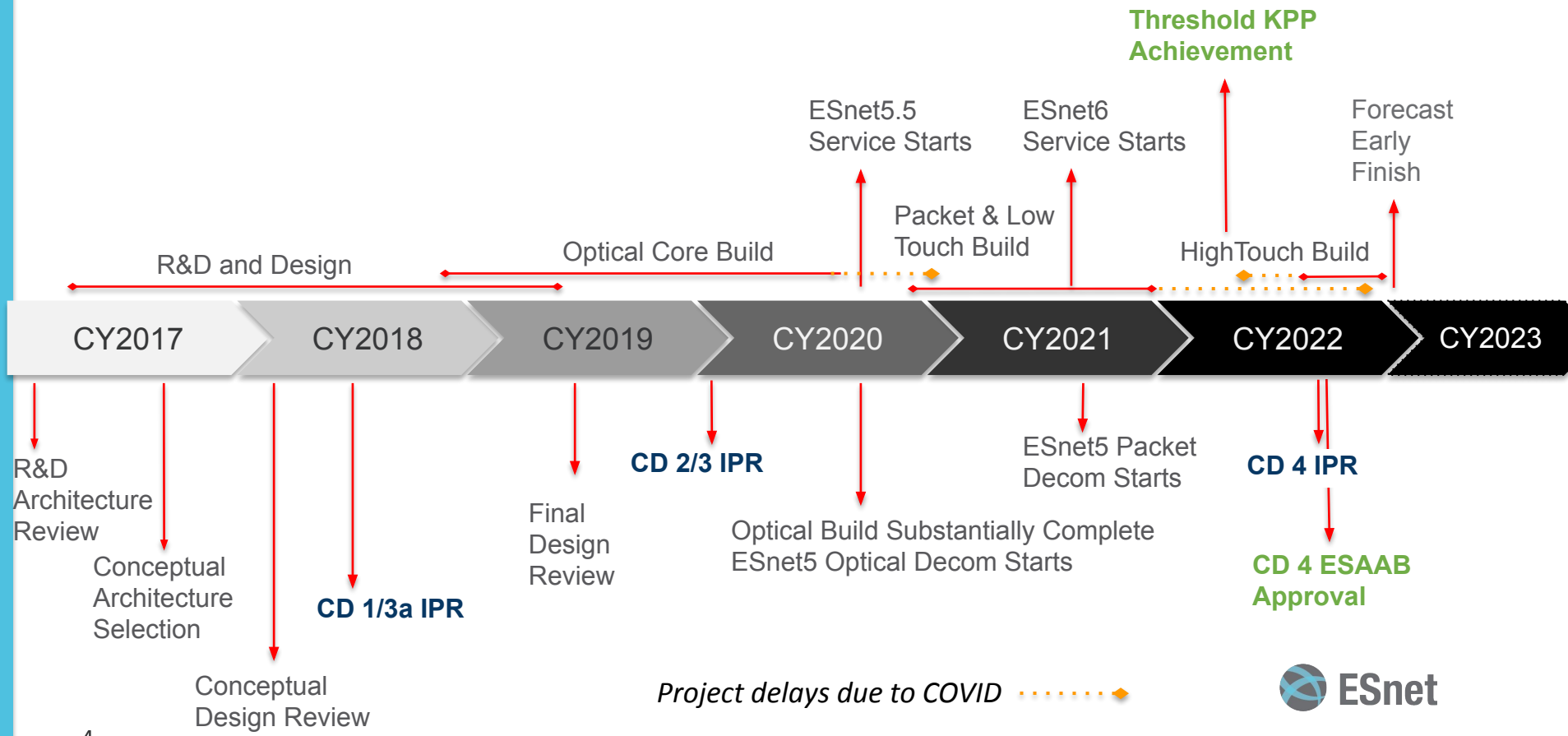
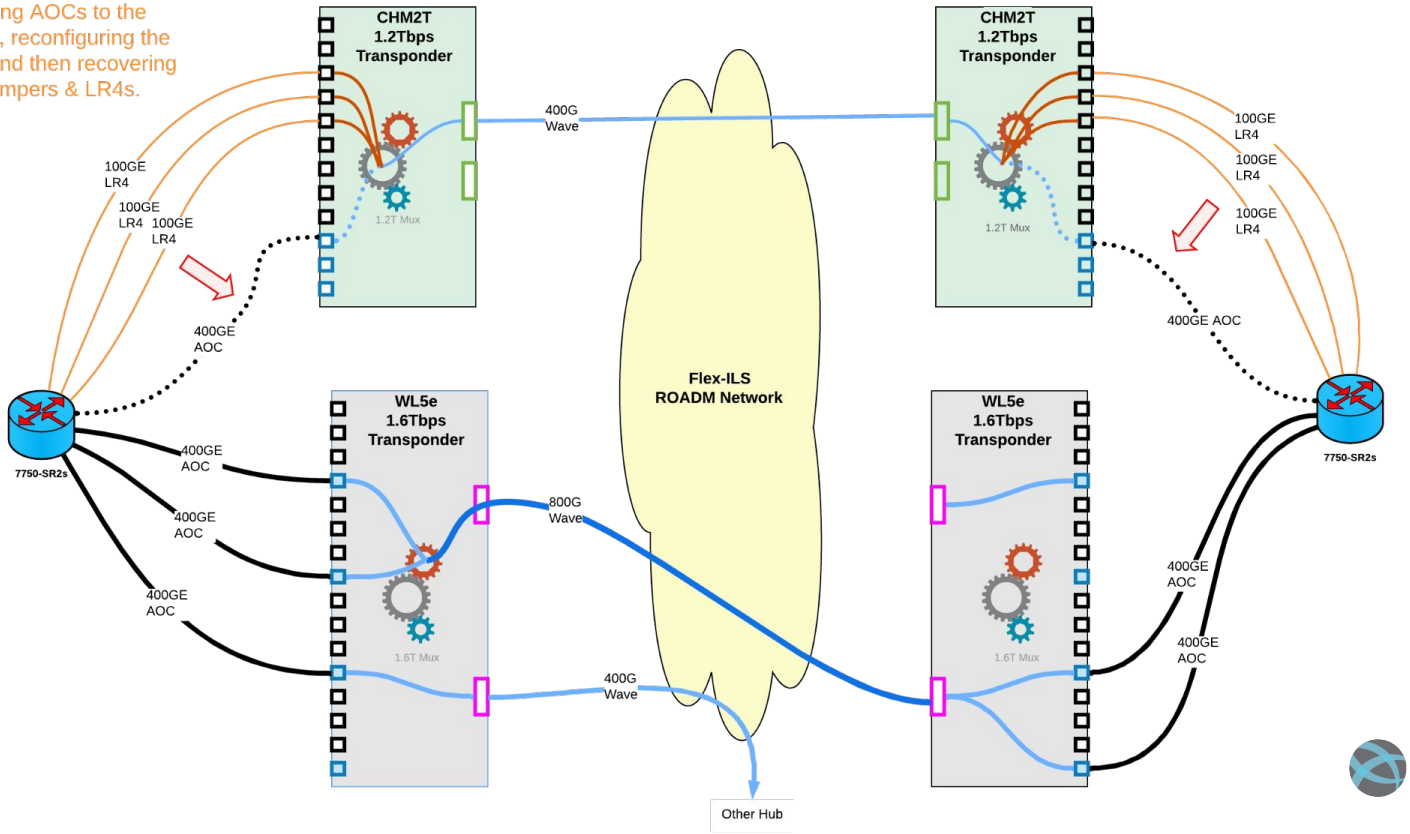
ESnet6 Project Implementation Timeline



Follow-on ESnet5 100G transition to 400G

"6.3" wave transition involves installing AOCs to the CHM2Ts, reconfiguring the groove, and then recovering the jumpers & LR4s.



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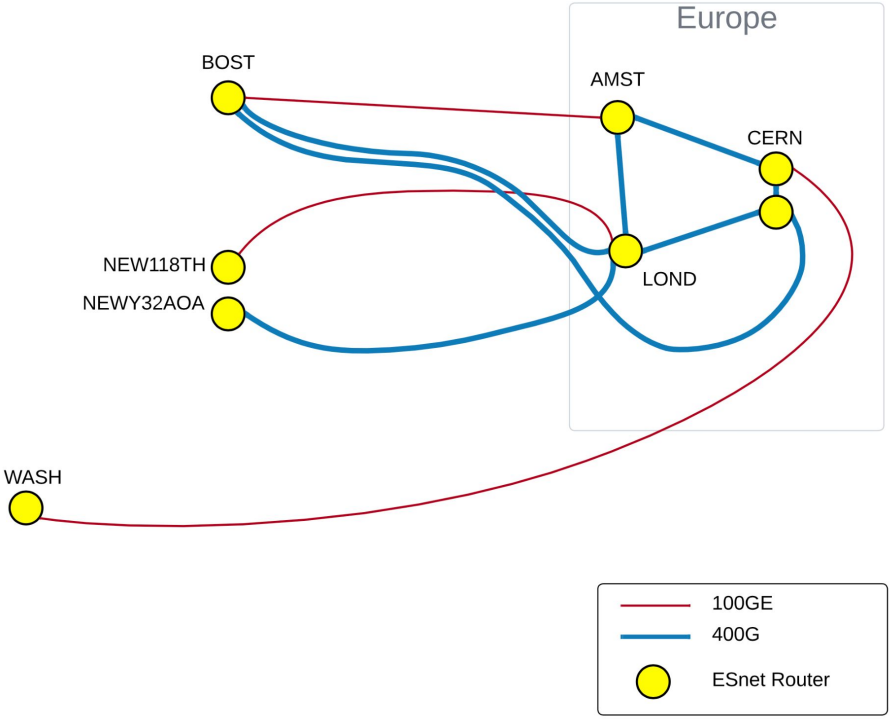
Trans-Atlantic & EU ring upgrades

- Currently underway:
  - 400G Boston - London
  - 400G Boston - CERN
  - 400G New York - London
  - 400G Europe Ring

- Trans-Atlantic capacity targets
  - 500G now
  - 1.5T in Q3 2023
  - …
  - **3.2T in 2027**, well in advance of Run 4



*Assuming funding continues as expected

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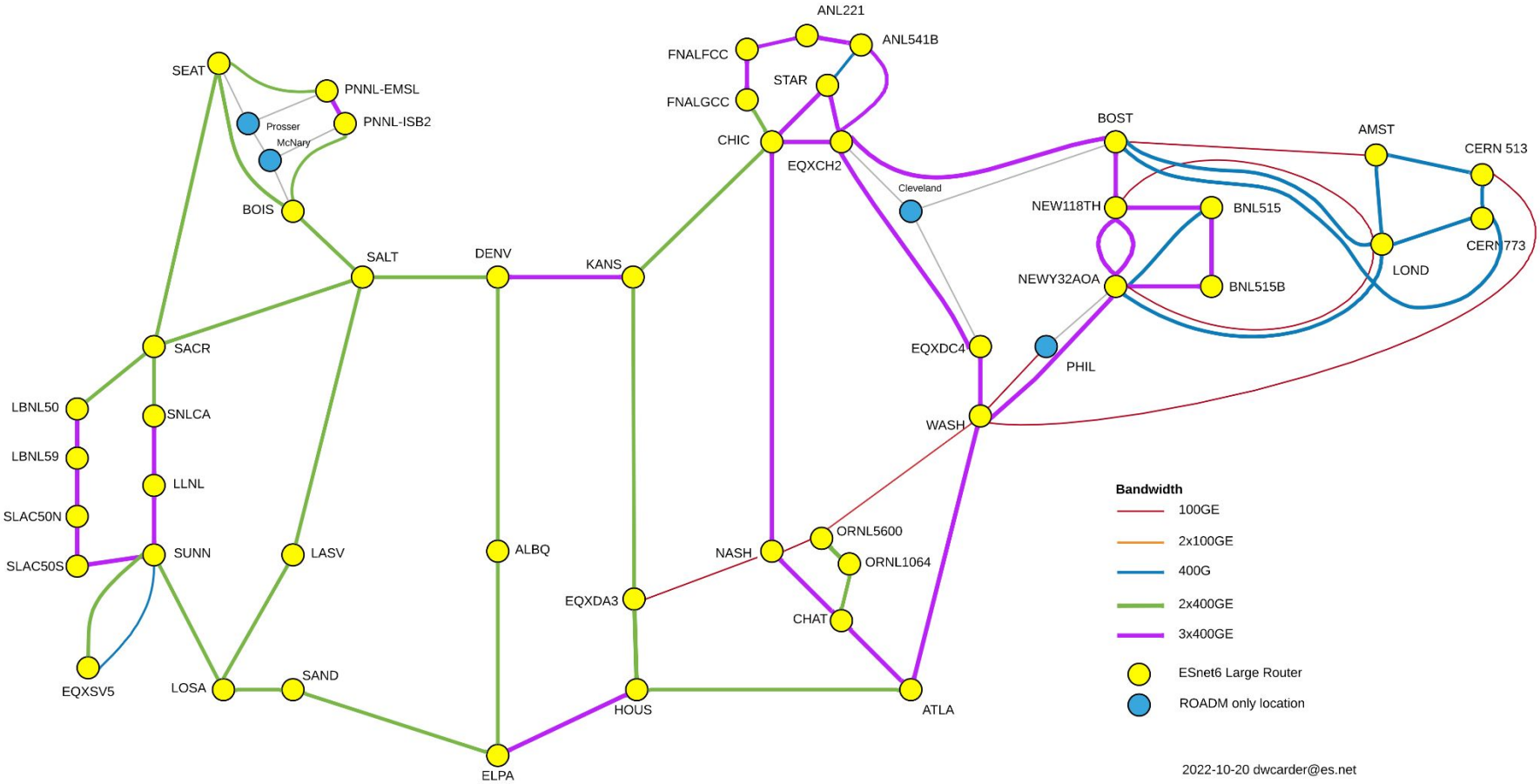
ESnet Backbone planning - Q3 2023



Data Challenge 1

Monitoring:

https://public.stardust.es.net/d/IkFCB5Hnk/lhc-data-challenge-overview?orgId=1

Findings:

TA capacity

Cloud connectivity

Exchange point connectivity

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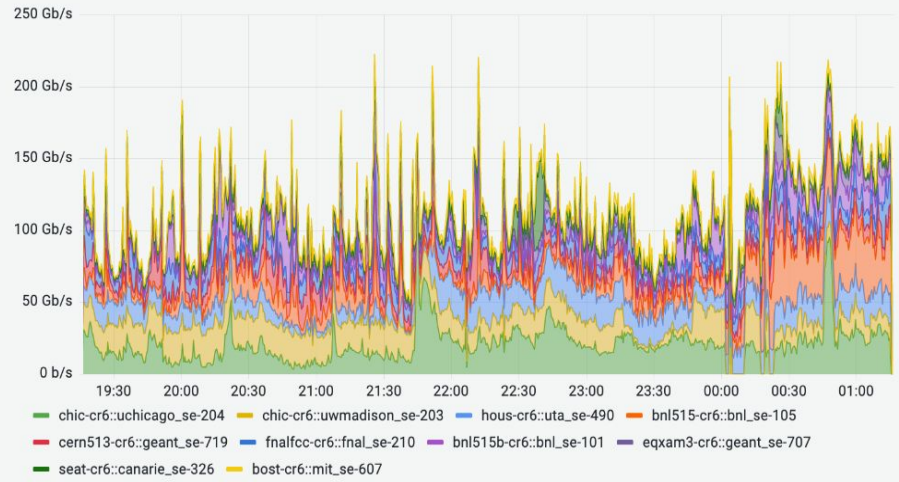
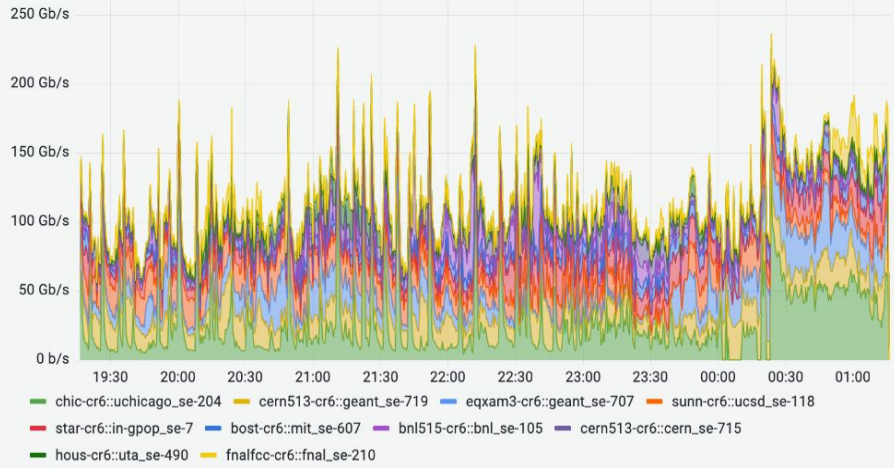
SNMP Statistics

Top 10 Interfaces by Incoming Rate (SNMP)



Top 10 Interfaces by Outgoing Rate (SNMP)



Top Interfaces by Incoming Volume (SNMP)

Interface	Volume
chic-cr6::uchicago_se-204	56.2 TB
chic-cr6::uwmadison_se-203	46.2 TB
hous-cr6::uta_se-490	40.6 TB
bnl515-cr6::bnl_se-105	40.4 TB
cern513-cr6::geant_se-719	29.9 TB

Top Interfaces by Outgoing Volume (SNMP)

Interface	Volume
chic-cr6::uchicago_se-204	72.0 TB
cern513-cr6::geant_se-719	44.5 TB
eqxam3-cr6::geant_se-707	41.0 TB
sunn-cr6::ucsd_se-118	39.7 TB
star-cr6::in-gpop_se-7	32.9 TB

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DOE Site Connectivity

- ESnet6 installed routers collocated at our sites
- Most are connected to our optical system at 1.2Tbit + redundancy
- We are now ready to accommodate upgrades as sites are able
  - BNL - US ATLAS Tier 1
    - Current: 300G (2 x 100G + 1 x 100G)
    - Near Future: 800G (1 x 400G + 1 x 400G)
  - FNAL - US CMS Tier 1
    - Current: 400G (2 x 100G + 2 x 100G)
    - Near Future: 800G (1 x 400G + 1 x 400G)
  - NERSC
    - Current: 200G (2 x 100G)
    - Near Future: 800G (1 x 400G + 1 x 400G)

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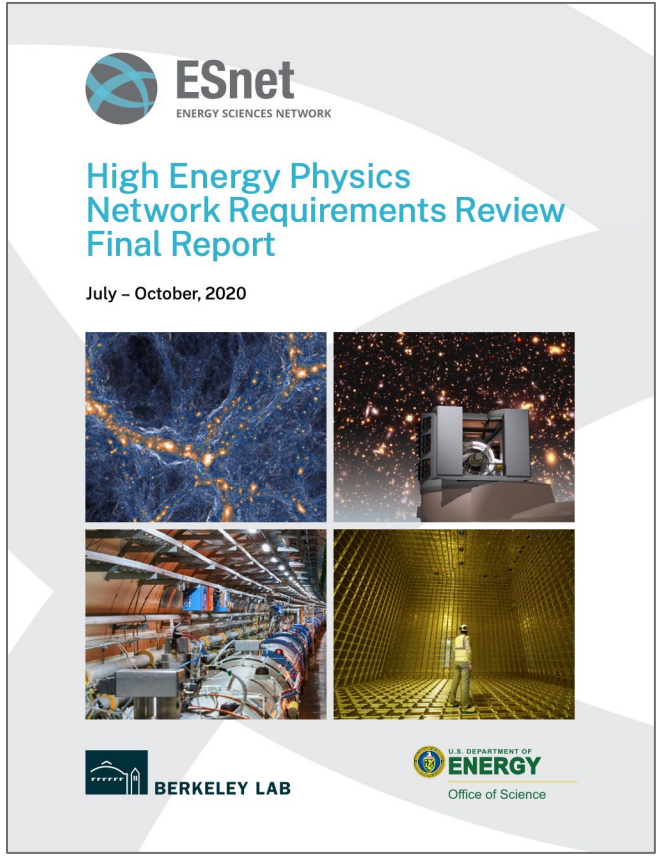
Tier 2 Site Connectivity

- Report identified connectivity needs for T2 Sites
- Projections codified into data challenges
- Data Challenges (full software stack)
  - 1: 10% of the target 2021 # should match Run 3
  - 2: 30% in 2023 # 2x100 LAG should be ok
  - 3: 60% in 2025 # probably want 400G
  - 100% in 2027 # 400G or more
- Engagement with T2 and their networks is critical



https://doi.org/10.2172/1804717

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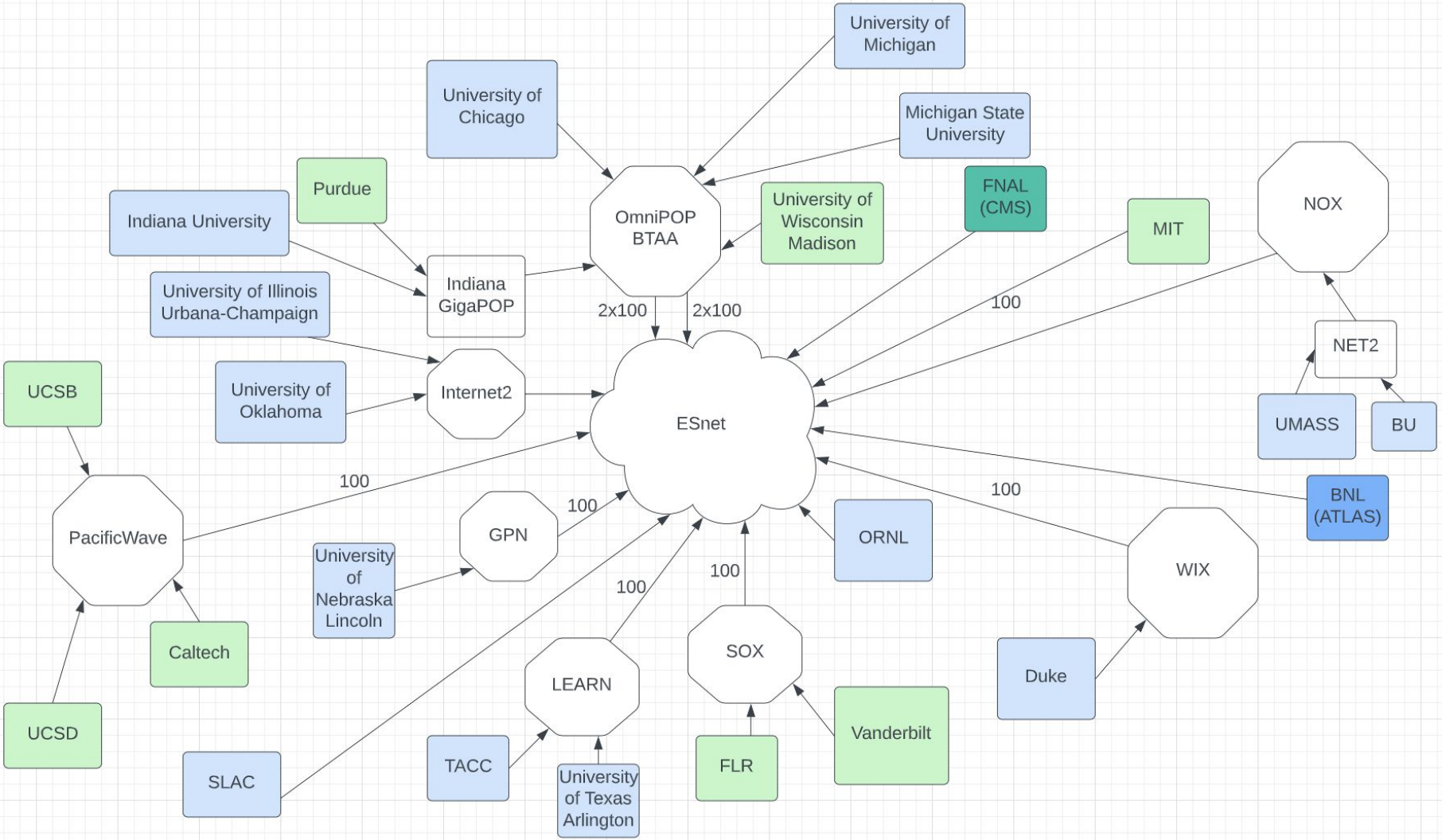
University of Michigan
University of Chicago
Michigan State University
Purdue
Indiana University
OmniPOP BTAA
University of Wisconsin Madison
FNAL (CMS)
MIT
NOX
Indiana GigaPOP
University of Illinois Urbana-Champaign
2x100
2x100
100
NET2
UCSB
University of Oklahoma
Internet2
ESnet
UMASS
BU
100
100
BNL (ATLAS)
PacificWave
GPN
ORNL
WIX
University of Nebraska Lincoln
100
100
Caltech
SOX
Duke
LEARN
Vanderbilt
UCSD
TACC
FLR
SLAC
University of Texas Arlington

US Tier 2 Site Connectivity

- ESnet making the rounds talking to *every* US T2 site
- Gathering and helping synchronize plans from
  - Individual PI's
  - Departmental Support Staff
  - Campus IT & CIO
  - Regional Networks
  - R&E Exchange points
- Plans assessed:
  - Vanderbilt, SoX, CalTech, UCSD, CENIC, Nebraska, GPN, Purdue, Wisconsin, OmniPoP, NET2, UMASSNET, MIT, NoX , LEARN
- Todo:
  - Florida, MWT2, AGLT2, UTA

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Tier 2 Initial findings

- Multi-party meetings with ESnet and sites are highly productive
- Wide variance on campus knowledge of HEP needs
- Wide variance on campus readiness
- Continuing regular conversations and data challenges will be critical to the success of HL-LHC

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