# US ATLAS HPC Projections

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(+Danila, Doug, …)

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Our Goal

- **Produce 12% of ATLAS Full Simulation Events on US HPCs**
  - 50% of US ATLAS 23% share
- **That corresponds to 1.2B G4 Evts**
  - Close to 1B in 2017
  - (Probably) over 1.2B in 2018

**Immediate goal:
estimate allocation hours needed to
run 1.2B G4 Events**

MEvents per resource (FullSim only)

1417 (14.4%)

920 (9.3%)

7527 (76.3%)

● Grid ● HPC ● Cloud
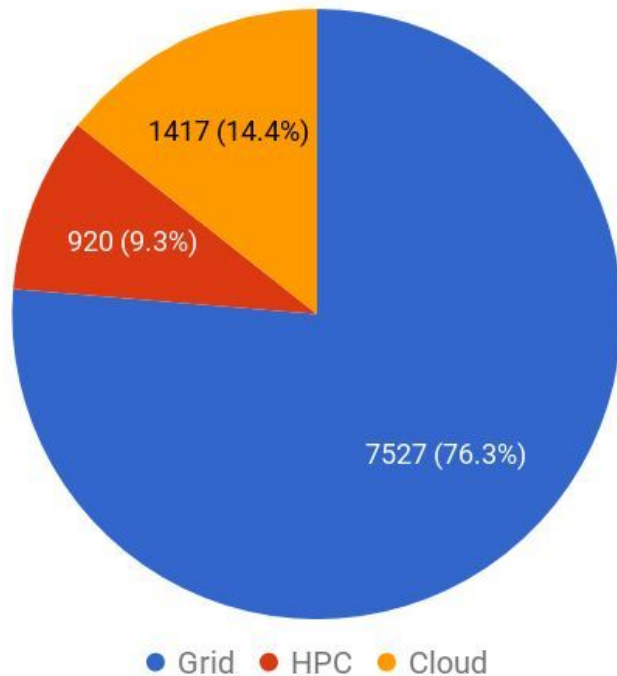
From Dashboard

According to the Dashboard, Jan/Sep 2018:

- **240M core-hours (167M NERSC hrs) on cori/edison**
  - Produced 320M G4 Events $\Rightarrow$ 2 events NERSC hour
- **60M core-hours on ALCF theta**
  - Produced 45M G4 even $\Rightarrow$ 0.75 events theta core hour
- **125M core-hours on OLCF titan**
  - Produced 320M G4 Events
- **7M core-hours on TACC stampede**
  - Produced 250M G4 Events

Problem: Dashboard is Wrong

- **According to Danila calculations titan's in 2018 produced 576M G4 Evts in 233M titan-hours (150M core hours). 1.8x more events**
- **Stampede CPU time looks off by a large factor**
- **We expect cori and theta to produce 2-3 events core-hour. Dashboard "sees" ~1.**
- **Grafana does not seem to be better (see backup)**

Alternative Methods

Run test jobs, count events/hour

Count jobs, multiple by 1000 (G4 evts/job), divide by allocation hours

- cori : 3 G4 evts core/hr ⟹ 1.9 evts NERSC/hr
- theta: 3 G4 evts core/hr ⟹ 2.7 evts theta/hr
- Titan: 5 G4 evts core/hr ⟹ 3 evts titan/hr
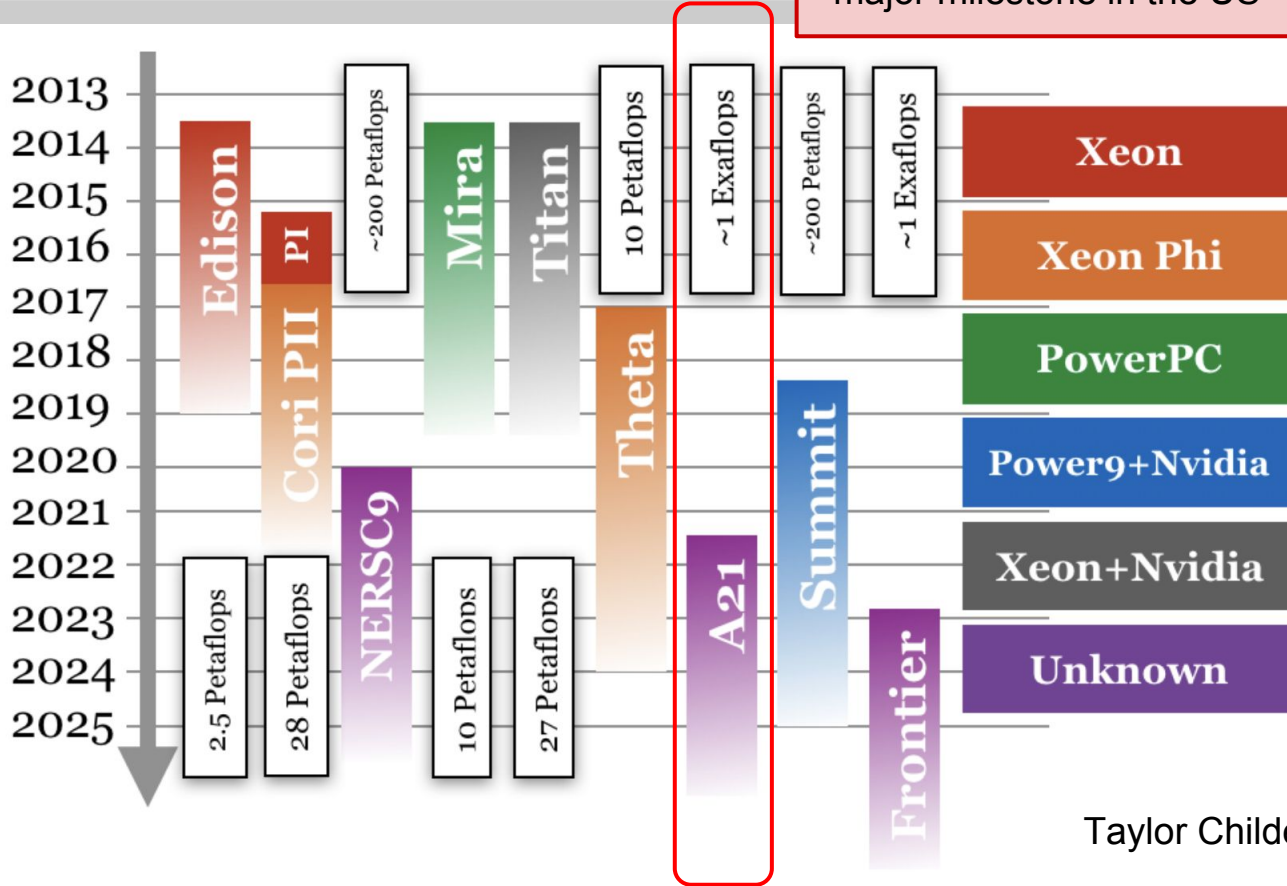
Result

DOE HPC Allocation in 2018

- **100M NERSC-hours**
  - Through NERSC ERCAP program (Jan-Jan)
  - Enough to process ~190M G4 Evts on cori
- **80M node-hours on ALCF theta**
  - Through DOE ALCC (Jul-Jun)
  - Enough to process ~220M G4 Evts on theta
- **80M titan core-hours**
  - Through DOE ALCC (Jul-Jun)
  - Enough to process ~240M G4 Evts on titan

Targets for 2019/2020

- **Assume ATLAS needs 10B G4 Evts/yr**
  ⇒ US HPC 1.2B G4 Evts/yr
  - 2018 allocation would get us 55% of that (~650M evts)
- **Goal is to get 1.2B evts from long-term allocations, and pledge it**
  - Increase current DOE allocations by $x2$
    200M NERSC-hours, 160M hours each @ ALCF, OLCF
    - Will be challenging
      - E.g. 200M hours is 17% of total HEP NERSC allocation

Backup

HPC evolution at DOE

First exascale in 2021: a major milestone in the US

Taylor Childers, ANL

Grafana vs Dashboard

LBL 170M vs 320M G4 evts

OLCF 372 vs 320

ANL 42 vs 45

NEvents Processed in MEvents (Million Events) (Sum: 971.00)

NERSC_Cori_p2_mcore - 29.80%

Titan_long_MCORE - 21.74%

CONNECT_STAMPEDE_MCORE - 21.45%

ORNL_Titan_MCORE - 10.92%

Events processed