Experience from HPCs

Doug Benjamin

Soon to be Brookhaven National Lab
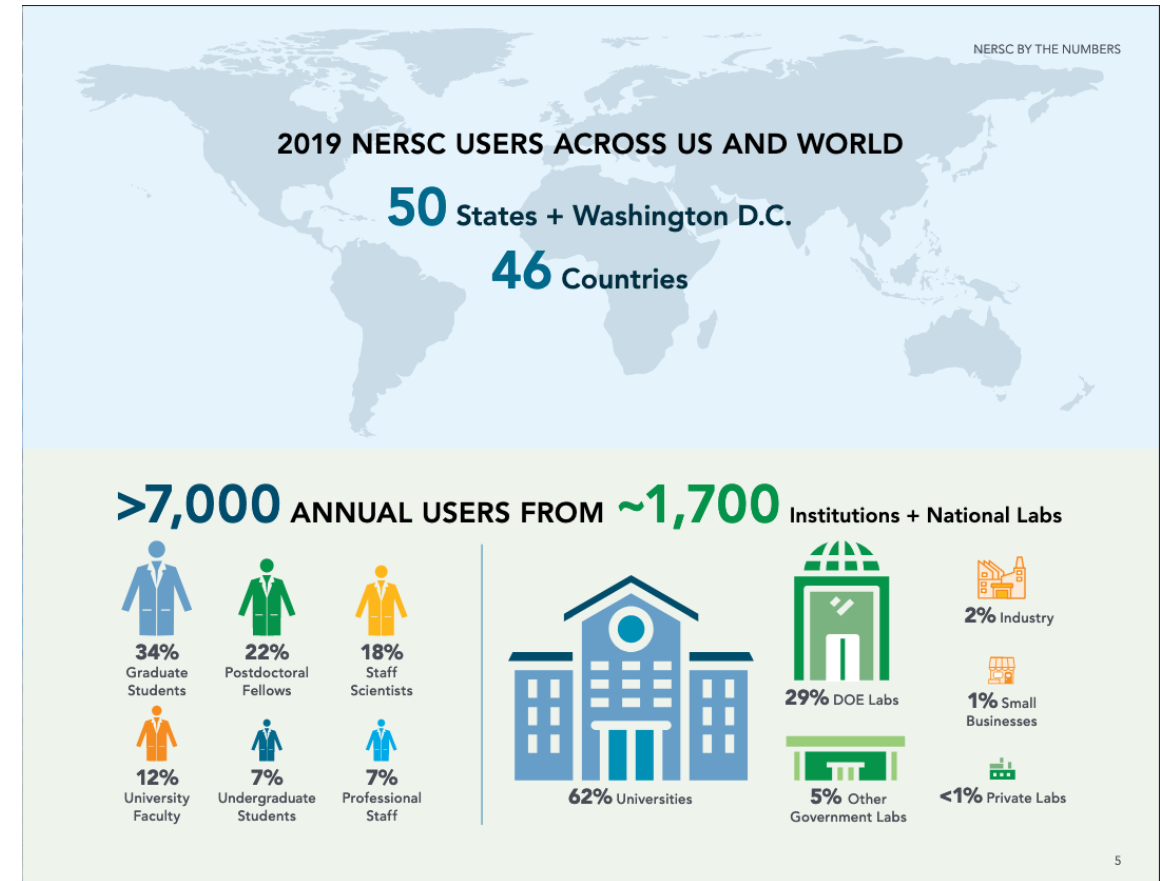
The Problem

- Big HPC centers serve wide community of users

- Self Service tools that are easy for users to use are important

- Tools including those for WAN transfers must comply with local Site authentication policy

- Data transfer services must be powerful and scalable

NERSC BY THE NUMBERS

2019 NERSC USERS ACROSS US AND WORLD

50 States + Washington D.C.

46 Countries

>7,000 ANNUAL USERS FROM **~1,700** Institutions + National Labs

- **34%** Graduate Students
- **22%** Postdoctoral Fellows
- **18%** Staff Scientists
- **12%** University Faculty
- **7%** Undergraduate Students
- **7%** Professional Staff
- **62%** Universities
- **29%** DOE Labs
- **5%** Other Government Labs
- **2%** Industry
- **1%** Small Businesses
- **<1%** Private Labs

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US HPC WAN Transfer challenge

- Eli Dart – PetaScale DTN Project

- To achieve these data transfer rates – multiple data transfer nodes deployed at each HPC
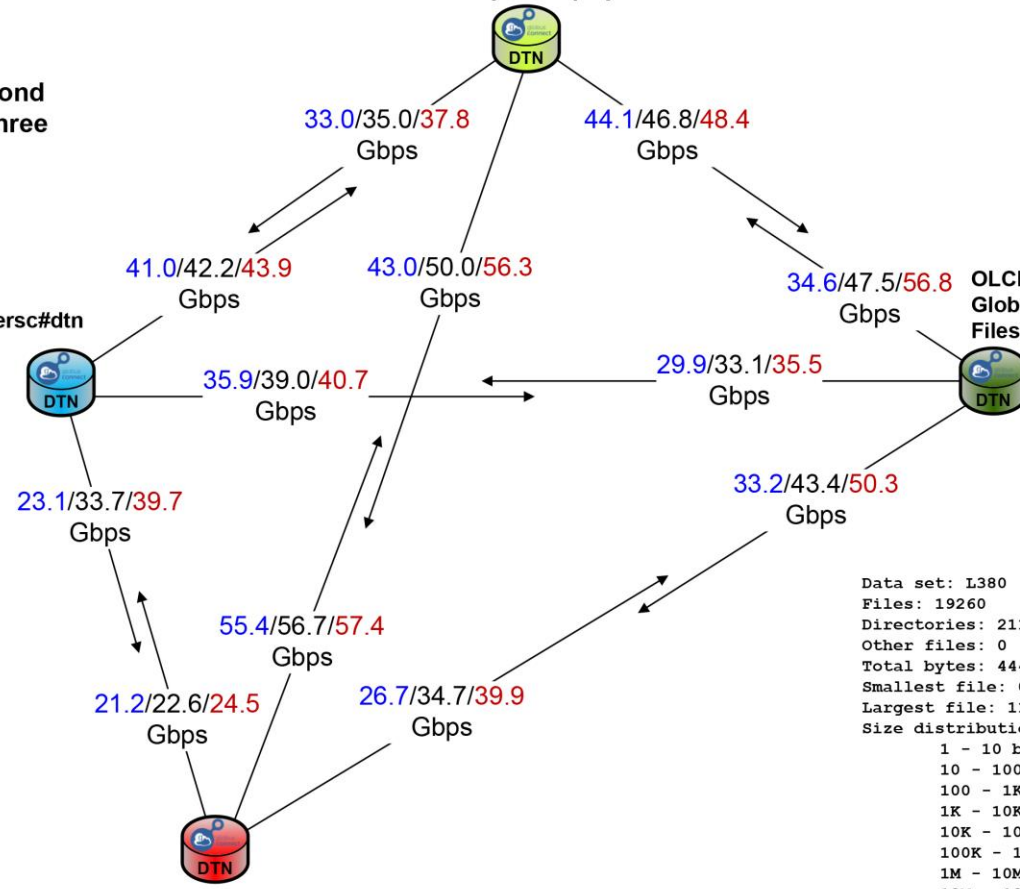

Petascale DTN Project

November 2017
L380 Data Set

Gigabits per second
(min/avg/max), three
transfers

ALCF DTN cluster
Globus endpoint: alcf#dtn_mira
Filesystem: /projects

33.0/35.0/37.8 Gbps

44.1/46.8/48.4 Gbps

41.0/42.2/43.9 Gbps

43.0/50.0/56.3 Gbps

34.6/47.5/56.8 Gbps

NERSC DTN cluster
Globus endpoint: nersc#dtn
Filesystem: /project

35.9/39.0/40.7 Gbps

29.9/33.1/35.5 Gbps

OLCF DTN cluster
Globus endpoint: olcf#dtn_atlas
Filesystem: atlas2

23.1/33.7/39.7 Gbps

33.2/43.4/50.3 Gbps

55.4/56.7/57.4 Gbps

21.2/22.6/24.5 Gbps

26.7/34.7/39.9 Gbps

Data set: L380
Files: 19260
Directories: 211
Other files: 0
Total bytes: 4442781786482 (4.4T bytes)
Smallest file: 0 bytes (0 bytes)
Largest file: 11313896248 bytes (11G bytes)
Size distribution:
        1 - 10 bytes: 7 files
        10 - 100 bytes: 1 files
        100 - 1K bytes: 59 files
        1K - 10K bytes: 3170 files
        10K - 100K bytes: 1560 files
        100K - 1M bytes: 2817 files
        1M - 10M bytes: 3901 files
        10M - 100M bytes: 3800 files
        100M - 1G bytes: 2295 files
        1G - 10G bytes: 1647 files
        10G - 100G bytes: 3 files

NCSA DTN cluster
Globus endpoint: ncsa#BlueWaters
Filesystem: /scratch

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A Solution for WAN transfers – Globus Service
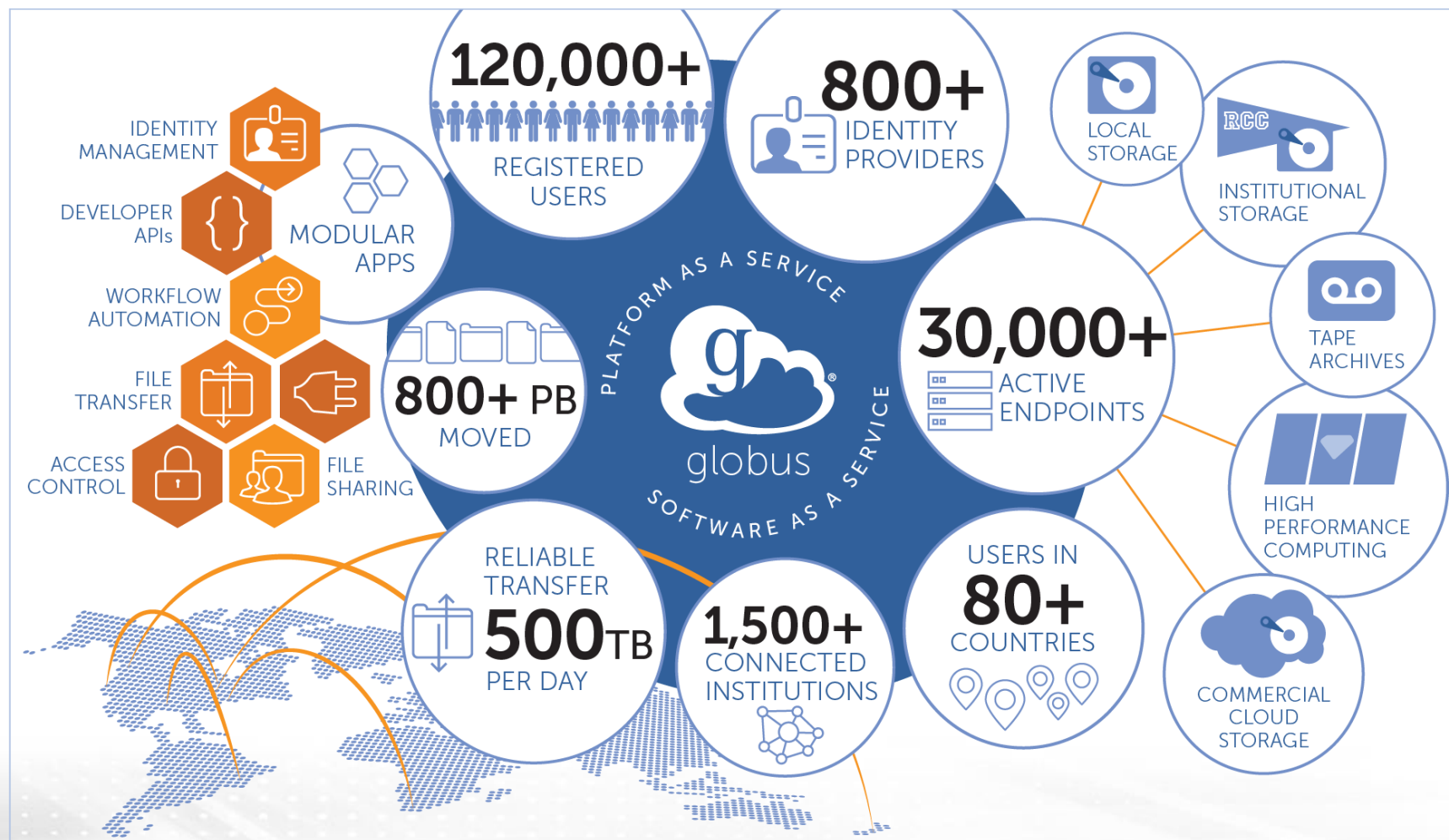
At a HPC Center in Europe – LRZ (experimentally)

US – All large HPC's

No official discussion from Euro-HPC.

Not likely to use GLOBUS

Easy to use Web interface

- User can manage her own transfers -

Endpoints used recently

Comply with local HPC authentication policies and tools

Argonne NATIONAL LABORATORY
Argonne Leadership Computing Facility

NERSC – w/ MFA

ALCF – w/ Dongle

Welcome to the ANL ALCF Authorization Page

Science Gateway Access

The Science Gateway listed below is requesting access to your ANL ALCF account. If you approve, please sign in using your ALCF username along with your CryptoCard PIN+password (for physical token), or CryptoCard password (for mobile token).

Name: Globus

URL: https://www.globus.org/

Sign in

Username

benjamin

Password

Sign In   Cancel

Please send any questions or comments about this site to support @ alcf.anl.gov.

MyProxy Client Authorization

Welcome to the OAuth for MyProxy access to your account. If you appro

Client Information

Name: Globus
URL: https://www.globus.org

Username

Password

MFA Token

Sign In   Cancel

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Used by ATLAS in US

- Use Globus Python SDK and Harvester to transfer data

- Used extensively in US between BNL and NERSC – Cori HPC and BNL - ALCF Theta and University of Chicago (MWT2) and TACC-Frontera.

- In user for many years

- Not perfect
  - Manual intervention
    - authentication endpoints 1x week
  - **Not integrated w/ Rucio**

3 GBytes/sec
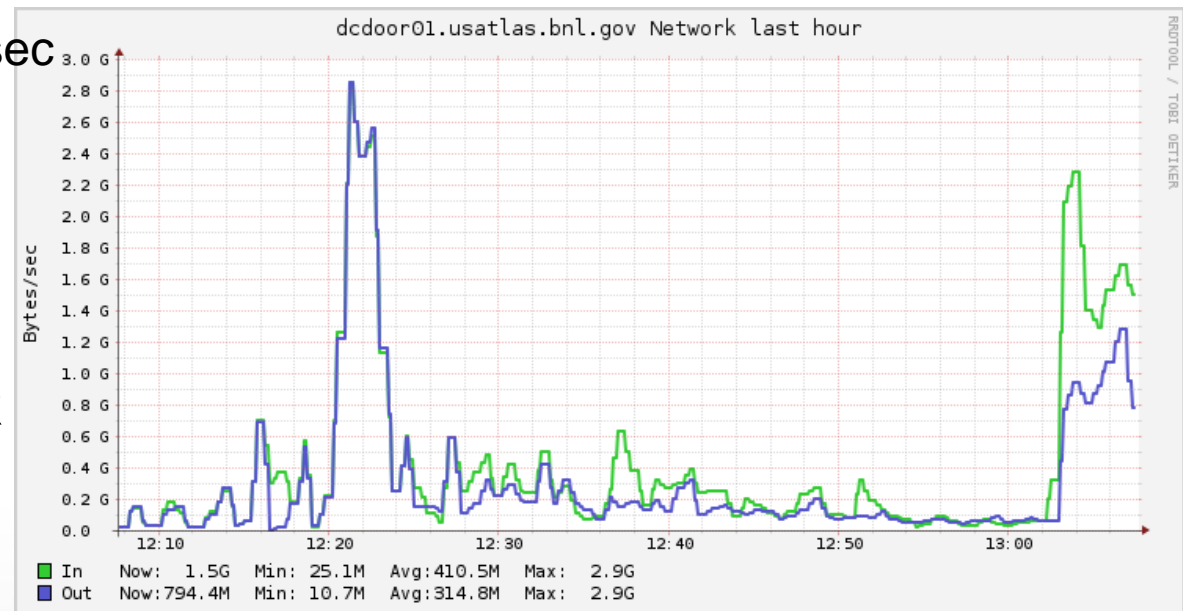
Network traffic gridftp door in 1 hour at BNL

EuroHPC (Andrej Filipcic)

- EuroHPC federation plan with hyperconverged network (1Tb/s) to GEANT

- Relying on PRACE MDVPN (similar to LHCONE), although it connects only GEANT, SurfNET, JANET, DFN for now (and HPCs attached there)

- Data transfers not discussed within EuroHPC yet, <u>initially</u> adopting PRACE model (using ssh)

- no technical details or policies yet
    - (primary focus is to commission the machines in 2021)

European HPC's and US HPC's will have different solutions

Summary

- Globus provides easy to use service to transfer data between HPC centers and their users
  - NERSC Users use it to move a lot of data internally w/ NERSC
- Scalable – Complies with local authentication policies
- Manages transfers
- Many Sites are subscribers
- **Used in US extensively**
- **Not w/ Europe-HPC**