South Pole Telescope Computing on OSG

OSG All Hands Meeting @ SDSC

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Open Science Grid

Overview

- Experiment & Science
- Computing Requirements
- New Infrastructure Deployment
- OSG Usage
- Future Plans

SPT Experiment

- Microwave-Millimeter telescope located at the South Pole
- Upgrades in 2016/2017:
  - SPT 3G - Third generation detectors installed - Data taking about to start
  - 10x detectors = 10x data rate
  - Added detection channel
  - New compute and storage hardware at South Pole and UChicago
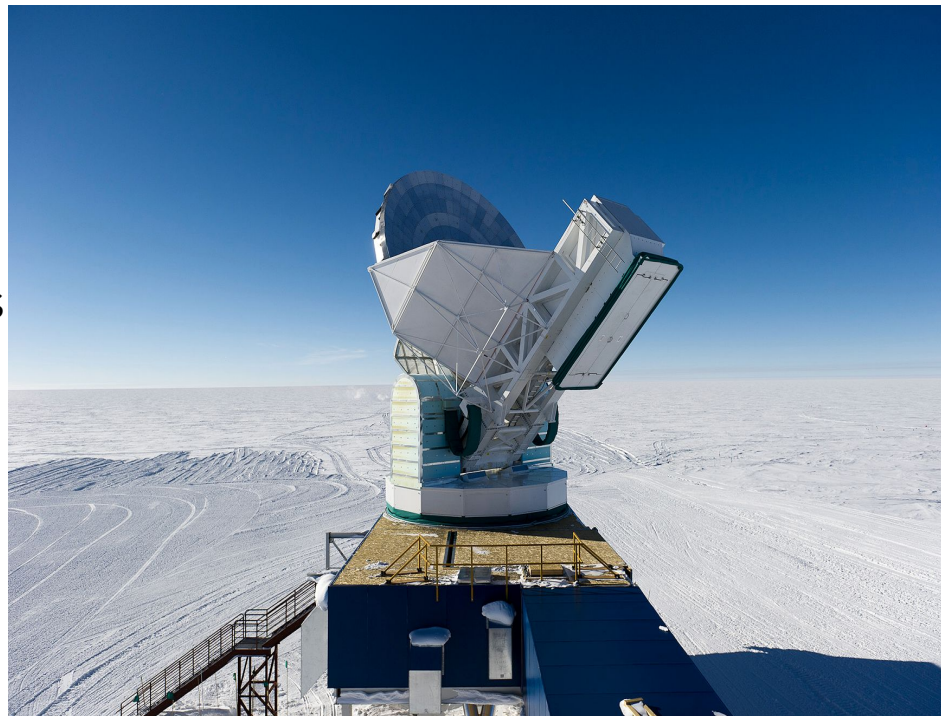
The SPT-3G Collaboration (Feb. 2016)
~70 scientists, across ~20+ institutions

Science

- Cosmic Microwave Background: CMB power spectrum, CMB Lensing, CMB Polarization, Epoch of Reionization
- Galaxy Clusters: Cluster Cosmology, Cluster Catalog
- Galaxy Evolution: High-z strongly-lensed star-forming galaxies, Catalog of mm sources

Computing Requirements

- Particle Physics/Astronomy-style computing: Processing exposures of the sky, MC generation of comparison skies
- Data:
  - South Pole: 450 TB storage for data
  - North: ~100 GB/day over satellite, ~200 TB/year carried back from pole
- CPU:
  - South Pole: ~0.5M CPUhours/year
  - North: ~30M CPUhours/year, 1000ish jobs requiring 70 - 100 GB RAM
- Main Support Tasks:
  - Setup of new compute infrastructure at South Pole and UChicago
  - OSG access and support for data processing and Monte Carlo production
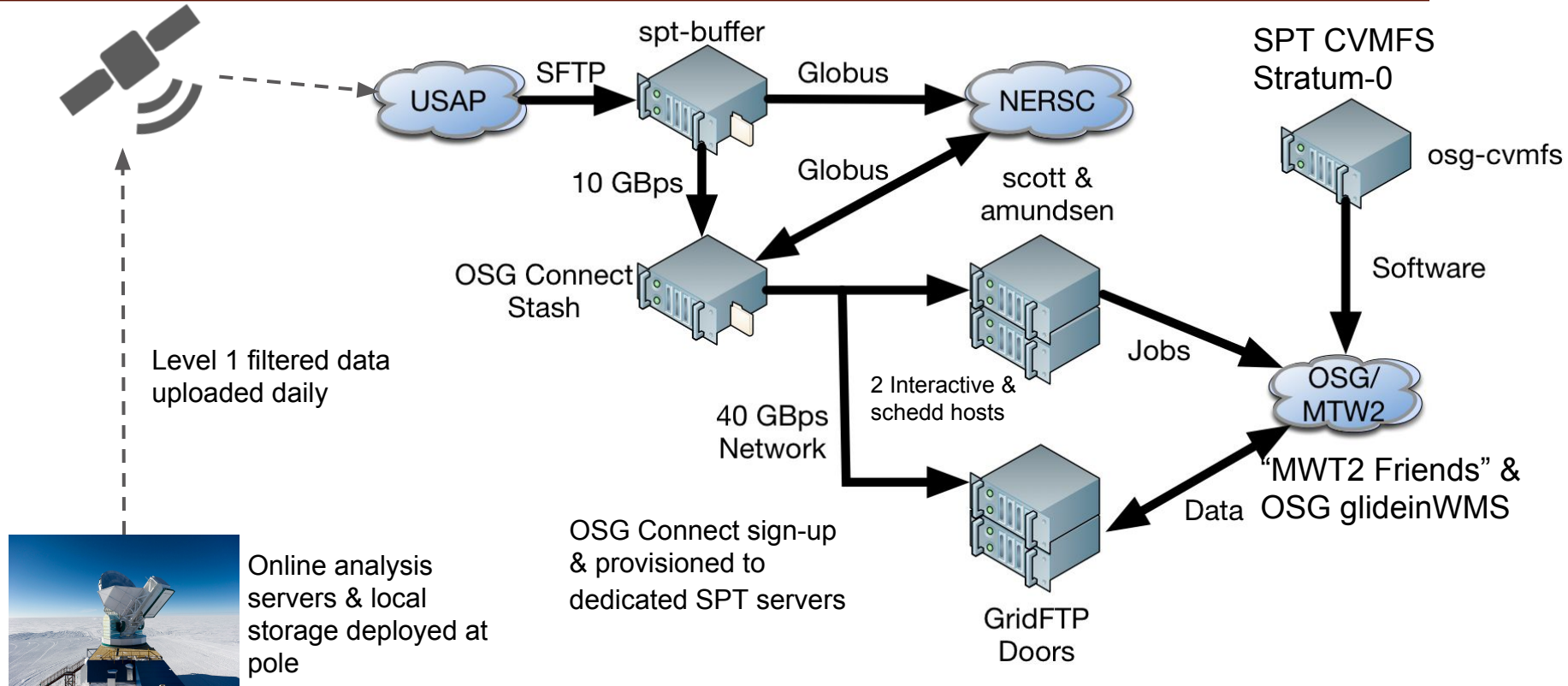
At the South Pole
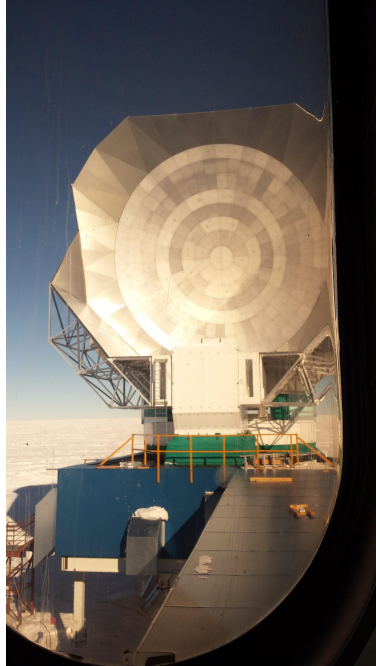
New Infrastructure Deployment - South Pole

- New Hardware in red (no Fry's down the road edition):
  - 4x Dell R730s:
    - 2x R730 for analysis work (HTCondor pool)
    - 1x R730 as hypervisor
    - 1x R730 hot spare
  - 2x Dell R330s: Storage controller + backup
  - 2x Dell MD1280s:
    - Primary Copy: ZFS pool, 42x 8 TB, NFS mounted to all R730s
    - Secondary Copy: JBOD, 28x 8 TB
  - 2x UPSes, 6x PDUs
- Old hardware in green - Part of analysis HTCondor pool

New Infrastructure Deployment - UChicago

spt-buffer

USAP — SFTP → spt-buffer — Globus → NERSC

SPT CVMFS Stratum-0

osg-cvmfs

10 GBps

Globus

scott & amundsen

OSG Connect Stash

Software

Level 1 filtered data uploaded daily

Jobs

2 Interactive & schedd hosts

40 GBps Network

OSG/ MTW2

OSG Connect sign-up & provisioned to dedicated SPT servers

Data   "MWT2 Friends" & OSG glideinWMS

Online analysis servers & local storage deployed at pole

GridFTP Doors

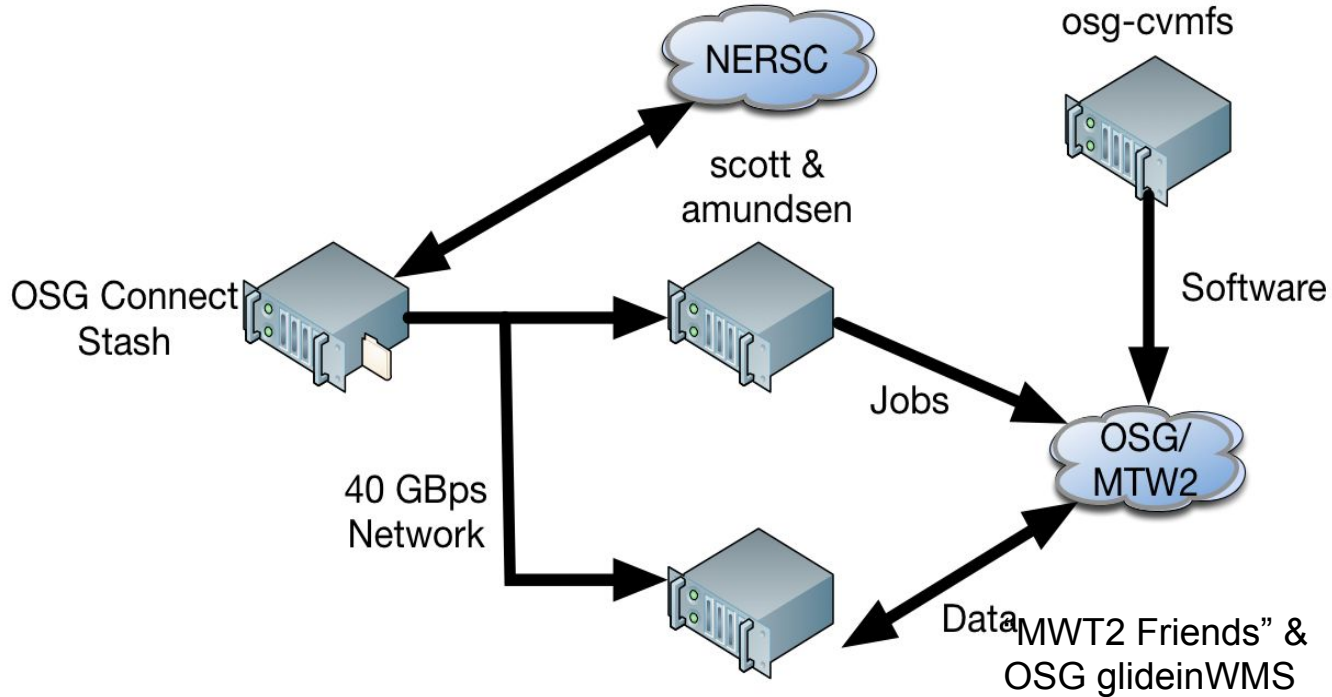# New Infrastructure Deployment - UChicago

- Data Infrastructure:
  - spt-buffer:
    - VM with 4 TB disk attached
    - Total 40 day buffer
  - /spt
    - Part of OSG Stash (CephFS)
    - rsync'ed from spt-buffer
  - Backup from spt-buffer to NERSC HPSS, partially automated
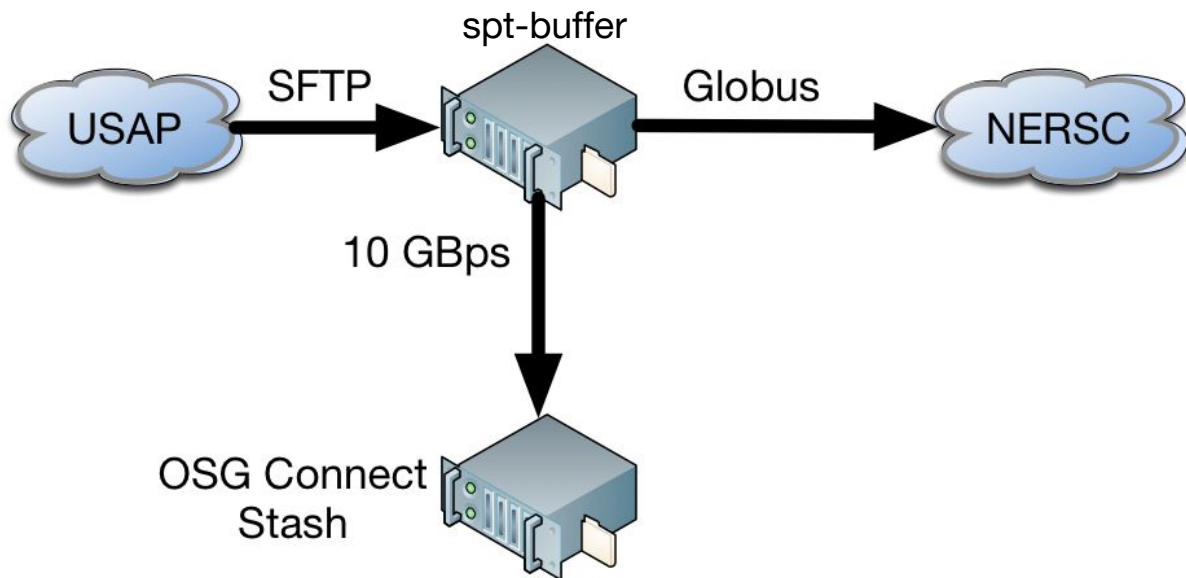
New Infrastructure for Software & Analysis

- Analysis Servers
  - "scott" & "amundsen"
  - Dell R630s
  - Login, interactive, schedd
  - 10Gbps
- /spt from OSG Stash
- 2x gridftp with bonded 2x10 Gbps
- osg-cvmfs - SPT OASIS Sratum-0

New Infrastructure for processing: OSG "ready"

- MWT2 Friends - Special opportunistic priority on MWT2 compute resources for groups working with UChicago OSG Team
- Data Movement - SPT groups with local storage pull data through Stash Globus endpoint or gridftp endpoint, depends on local security

Status Today

- Data (experiment is **live**!)
  - Ingested over 1 TB of new data into /spt
  - Ingesting data from 2nd generation experiment into Stash Object Store
- Compute:
  - 100k jobs submitted to OSG so far
  - Consistently getting 500 slots
  - Usage continuing to rise as more data comes in and users come back from South Pole

OSG Usage

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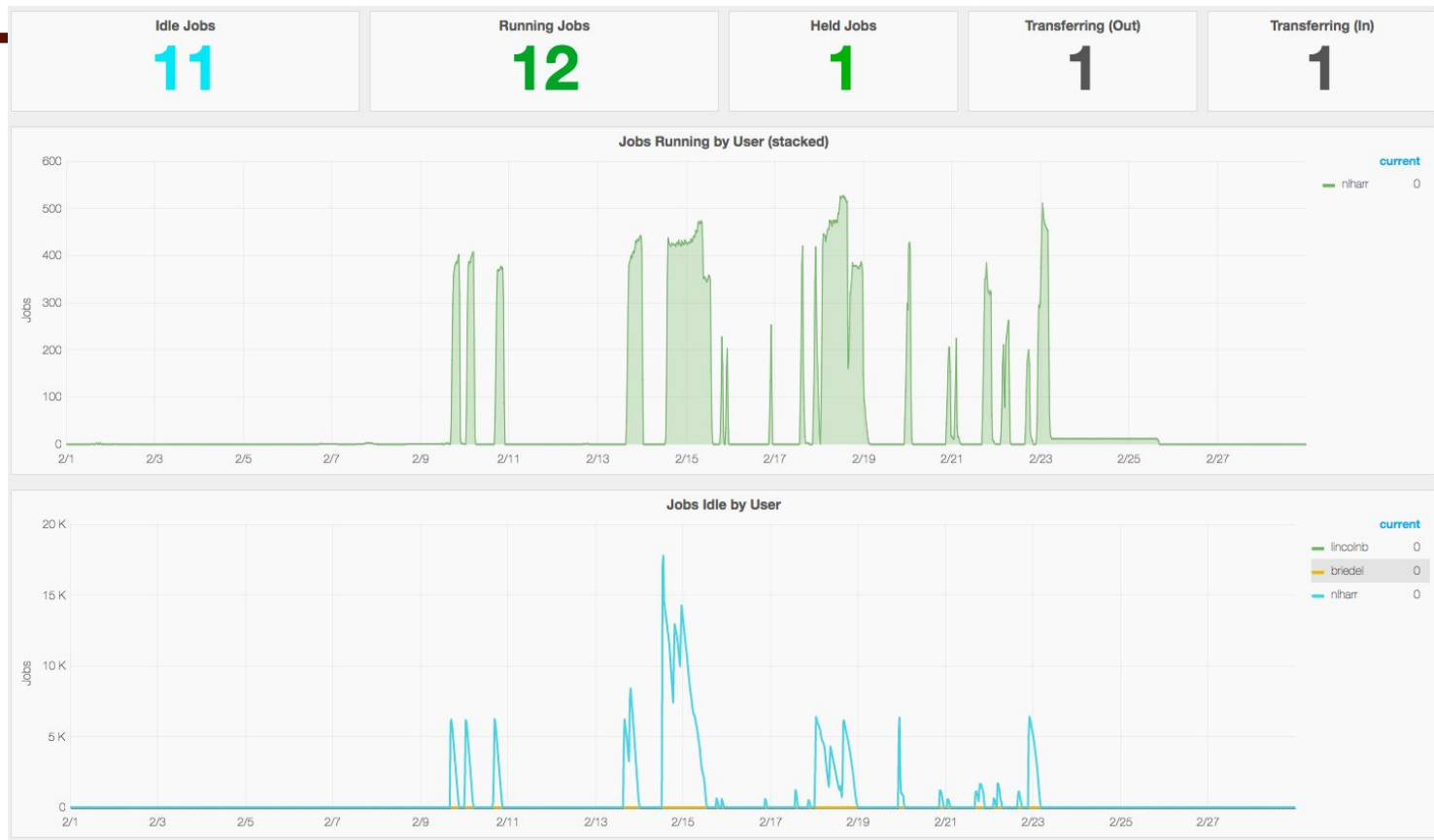
Future Plans

- Backup Automation
  - Looking into automating the backup to NERSC - Globus Shared Endpoints, GridFTP-based data management, etc.
- Juypterhub
  - Replace VNC-based workflows with JupyterHub-based workflows
  - Easier to administer and maintain
- SL7 Builds in CVMFS: Adding machine to generate SL7 builds for cvmfs

Summary

- OSG is working closely with SPT from the telescope at the pole to the grid to facilitate data handling, processing & simulation
- Online data collection and analysis facility built at the South Pole
- OSG-"ready" infrastructure deployed and ready for SPT-3G data
- Looking forward to new physics in 2017!