



## **Advancing Campus Research:** Partnering with Campuses on HTC and HTC Facilitation

**PATH** PARTNERSHIP to ADVANCE  
**THROUGHPUT  
COMPUTING**



# HTC Services for Campuses

- Build ‘Local’ HTC Capacity with **HTC**ondor
- Support Your Researchers to Use **OSG**
  - **NOW!** (via OSG Connect)
  - Local access points
- HTC Facilitation Training
- Share Local Resources via **OSG**



*All “FREE” and OPEN, with Facilitation for Campuses*

email [support@opensciencgrid.org](mailto:support@opensciencgrid.org) to discuss





# Partnership to Advance Throughput Computing

PATH brings together the Center for High Throughput Computing and the Open Science Grid in order to advance the nation's campuses and science communities through the use of distributed High Throughput Computing.



<https://path-cc.io/>



This project is supported by National Science Foundation under Cooperative Agreement **OAC-2030508**. Any opinions, findings, conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.



# Build Local HTC Capacity with HTCondor

- **Personalized Consulting on:**
  - **Your Campus HTC Plan**
  - **HTCondor Implementation and System Configuration**
    - regular meetings with HTCondor staff
    - access to all other CHTC experts (sys admins, facilitators, etc.)
- **Ongoing Support and Community**
  - HTCondor Team: [htcondor-admin@cs.wisc.edu](mailto:htcondor-admin@cs.wisc.edu)
  - User Community Support: [htcondor-users@cs.wisc.edu](mailto:htcondor-users@cs.wisc.edu)
  - HTCondor Community Meetings:  
[https://research.cs.wisc.edu/htcondor/past\\_condor\\_weeks.html](https://research.cs.wisc.edu/htcondor/past_condor_weeks.html)





# Build Local HTC Capacity with HTCondor

- **Personalized Consulting on:**

**Hear about GWU's 'local'  
plan later this morning!**

- **Your Campus HTC Plan**
- **HTCondor Implementation and System Configuration**
  - regular meetings with HTCondor staff
  - access to all other CHTC experts (sys admins, facilitators, etc.)

- **Ongoing Support and Community**

- HTCondor Team: [htcondor-admin@cs.wisc.edu](mailto:htcondor-admin@cs.wisc.edu)
- User Community Support: [htcondor-users@cs.wisc.edu](mailto:htcondor-users@cs.wisc.edu)
- HTCondor Community Meetings:  
[https://research.cs.wisc.edu/htcondor/past\\_condor\\_weeks.html](https://research.cs.wisc.edu/htcondor/past_condor_weeks.html)



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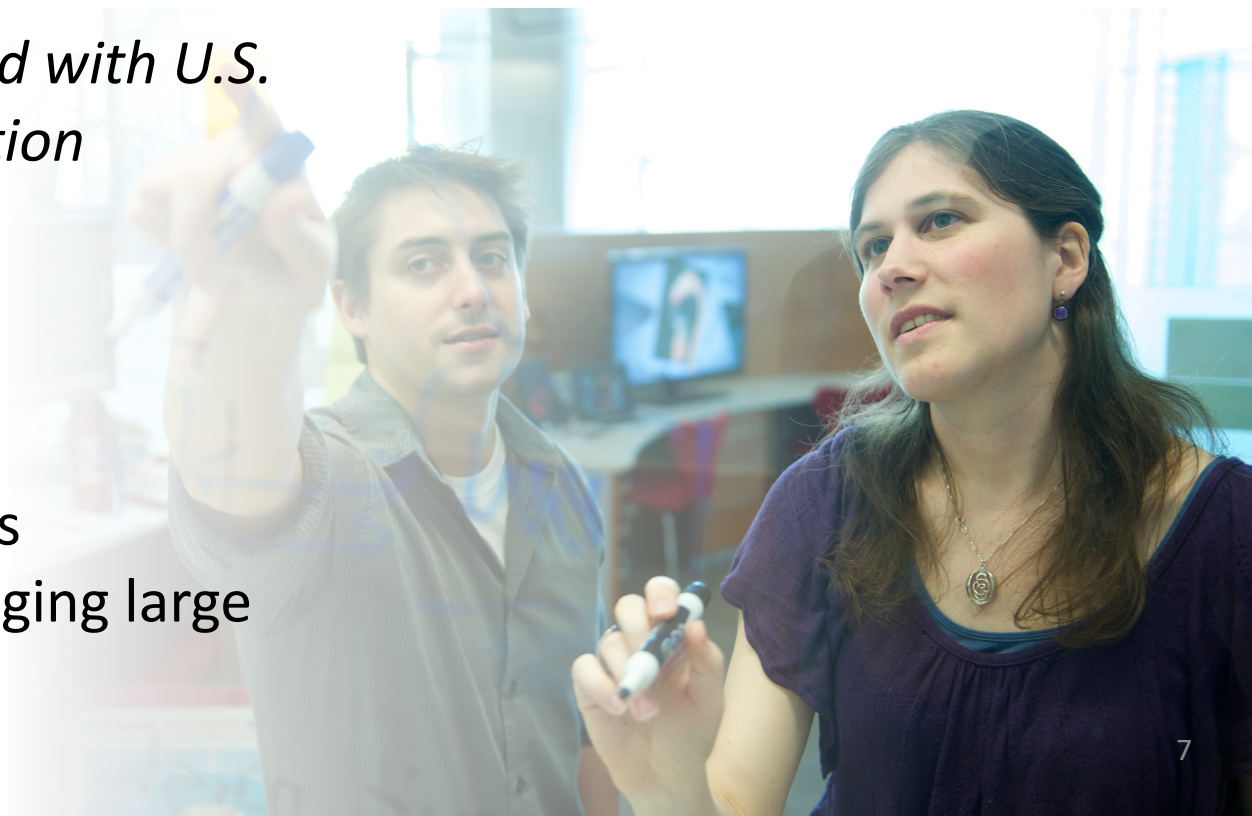


Open Science Grid

# For individual researchers: **OSG Connect**

***FREE access to dHTC/HTCondor and Facilitation,  
on OSG's Open Science Pool via an OSG-supported access point***

- **osgconnect.net > “Sign Up”**
- *available to individuals and projects affiliated with U.S. academic, government, or non-profit institution*
- includes:
  - **obligate initial consultation with an OSG Research Computing Facilitator**
  - online documentation and examples
  - access to OSG's central software modules
  - (roughly) unlimited scratch; space for staging large input (Stash) w/ caching across OSG





Open Science Grid

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**Hear from OSG Connect user  
Nick Cooley later today!**

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What is OSG?

a consortium of researchers and institutions who share compute and data resources for ***distributed* high-throughput computing (dHTC)** in support of open science

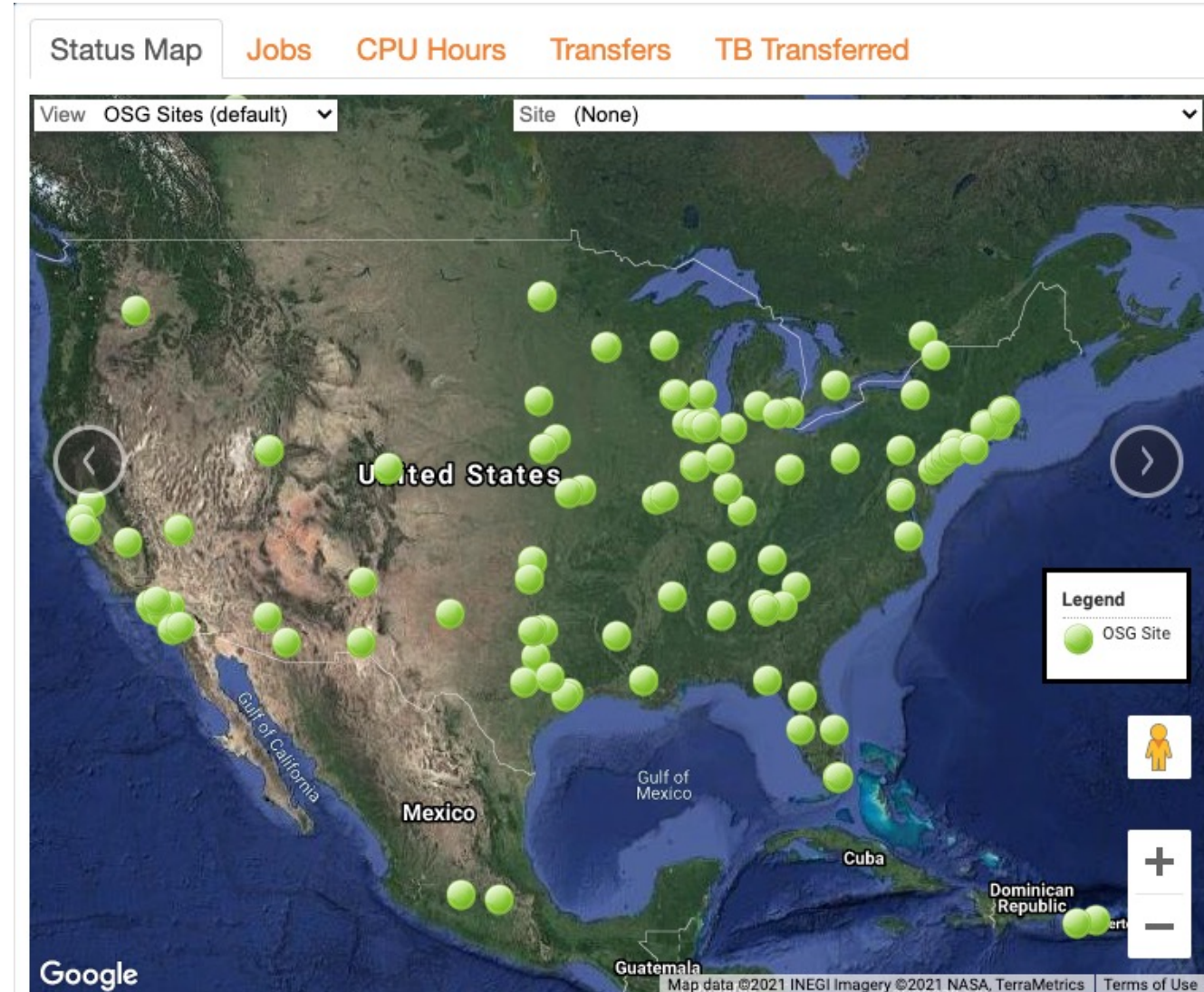


Open Science Grid

# Who Participates?

- Researchers
- Multi-Institution Collaborations
  - Atlas/CMS (Higg Boson), IceCube, South Pole Telescope, and others
- Science Gateways
- **Academic Institutions and National Laboratories** that support the above

*Campuses are critical to OSG's ability to advance research.*

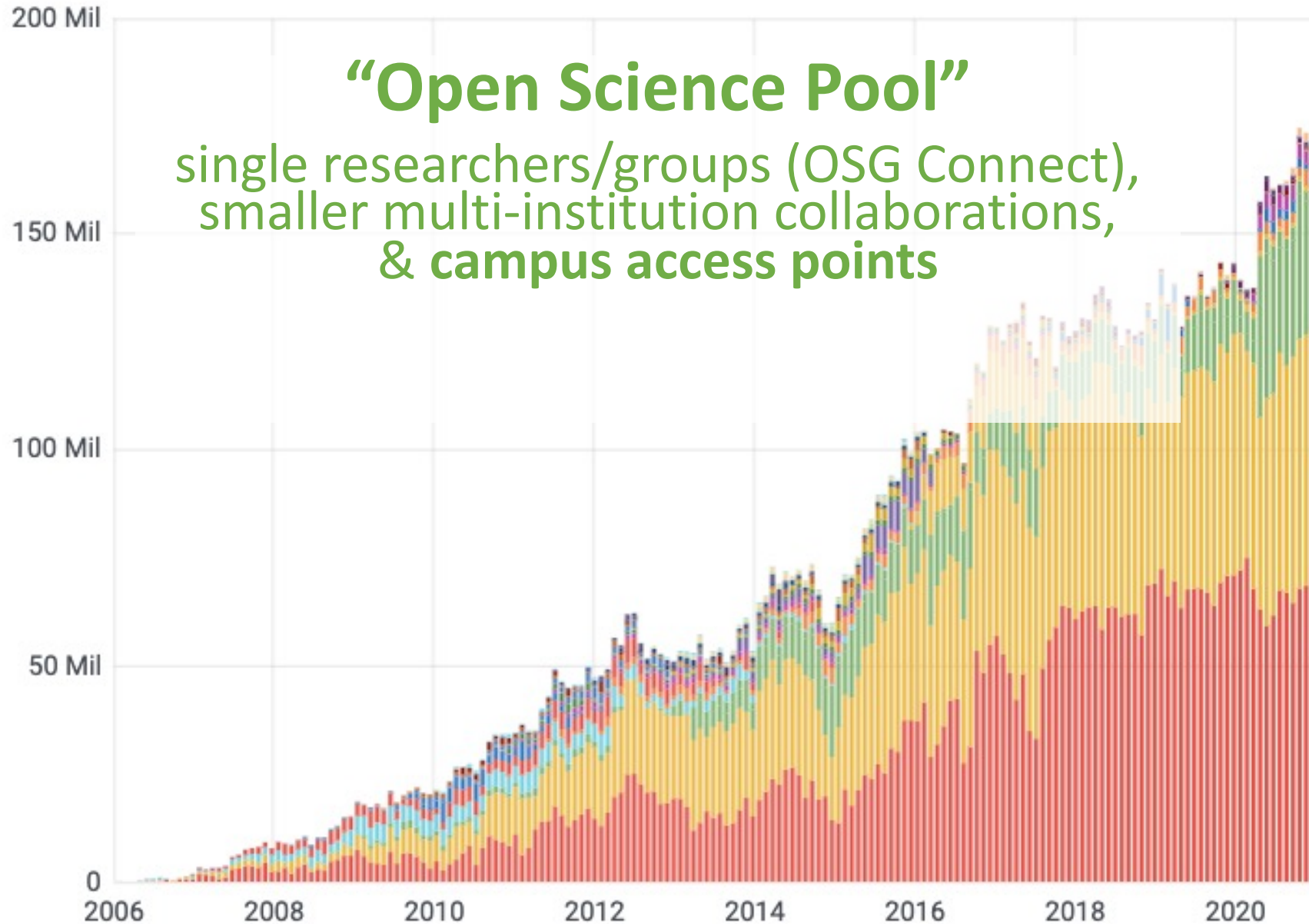




## Total Core Hours per Month

### “Open Science Pool”

single researchers/groups (OSG Connect),  
smaller multi-institution collaborations,  
& campus access points



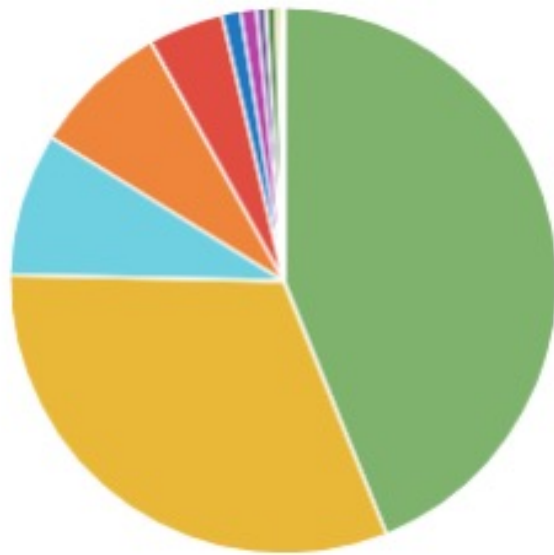
total ▾	
cms	4.9676 Bil
atlas	4.4822 Bil
osg	1.0743 Bil
desy	216.8 Mil
fermilab	295.2 Mil
cdf	259.4 Mil
glow	255.7 Mil
dzero	225.4 Mil
ligo	114.5 Mil
alice	113.3 Mil
mu2e	94.4 Mil
gridunesp	80.1 Mil
nova	76.2 Mil
engage	64.5 Mil
minos	62.9 Mil
hcc	57.8 Mil



## Open Science Grid

# Open Science Pool

Core Hours by Field of Science



	total
Biological Sciences	133.4 Mil
Physics	95.7 Mil
Astronomy	25.7 Mil
Chemistry	24.7 Mil
Engineering	13.47 Mil
Integrative Activities	3.34 Mil
Mathematics	2.834 Mil
Agricultural Sciences	1.712 Mil
Health	1.679 Mil
Education	746 K
Computer Sciences	546 K
Other	90.4 K
Economics	87.4 K
Earth and Ocean Sciences	13.70 K
Other Social Sciences	0.0047

Core Hours by Institution

	total
Folding@Home Consortium (FAHC)	86.7 Mil
Massachusetts Institute of Technology	35.4 Mil
Stanford University	26.4 Mil
University of Pittsburgh	22.1 Mil
University of Hawaii at Manoa	15.0 Mil
Fermilab	12.39 Mil
Rochester Institute of Technology	12.31 Mil
New Mexico State University	12.14 Mil
Wayne State University	11.62 Mil
University of Chicago	8.40 Mil
University of Pennsylvania	8.35 Mil
University of North Carolina at Chapel Hill	7.09 Mil
Lancaster University	6.01 Mil
University of Arizona	5.64 Mil
Arizona State University	5.60 Mil
University of Wisconsin-Madison	5.04 Mil
LSU School of Public Health	3.69 Mil
Georgia Institute of Technology	3.49 Mil
Rutgers, The State University of New Jersey	2.150 Mil
Brookhaven National Laboratory	2.079 Mil





Open Science Grid

# Institutions with Projects using the Open Science Pool in 2020!

**183 projects from >95 campuses**  
(top 20 at right)

- 25+ from campuses with recent CC\* awards in collaboration with OSG
- 35+ projects from non-R1

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Open Science Grid

# OSPool **Access Points** that YOU Control

*... like having a cluster where you don't have to administer the 'worker' nodes, and **can still own the user experience.***

## **The institution decides and executes:**

- engagement with and support of users
  - incl. help with software/data portability (OSG modules available), troubleshooting, etc.
  - leverage support from OSG staff (co-facilitation, etc.)
- user authentication *and* authorization (not restricted to US affiliates)
- administering/integrating any institutional data storage
- (some) HTCondor administration on the submit node

***Resource sharing not required to have an access point!***





Open Science Grid

# OSPool **Access Points** that YOU Control

See AMNH's presentation at  
**OSG All Hands Meeting 2021!**

<https://indico.fnal.gov/event/47040/overview>

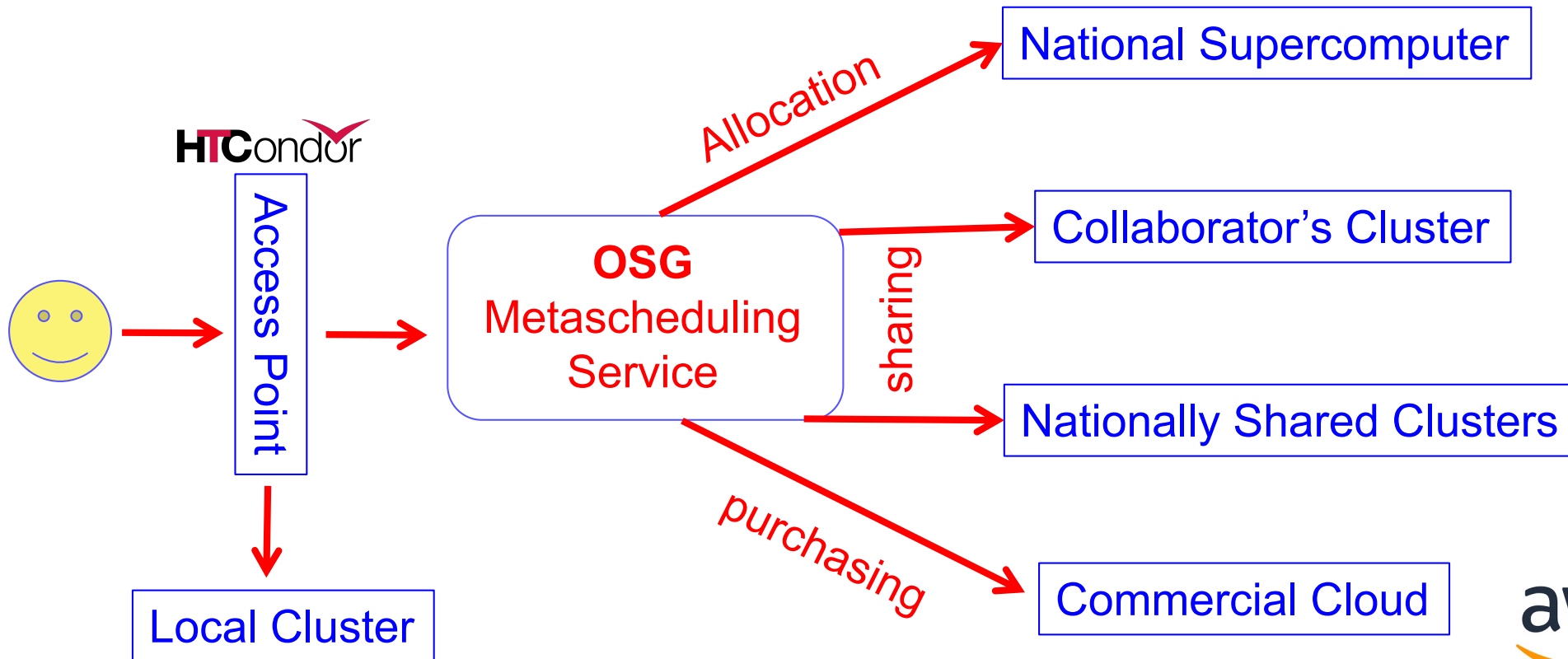
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# OSG Technologies







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# HTC Facilitation Training

*Learn from OSG's Research Computing Facilitators*

- **HTC Facilitation Shadowing**
  - Join OSG RCFs in facilitating use of **OSG Connect** by researchers from your institution
  - Co-Facilitation of users on your local access point
  - Intensive shadowing at **UW-Madison (CHTC)**
- **Formalized HTC Facilitation Training**
- **dHTC Campus Workshop Series: Feb 2021**  
<https://indico.fnal.gov/event/46925>
- **External presentations and trainings**
  - PEARC21; past: RMACC2021, PEARC20, others







# Research Computing *Facilitation*

*accelerating research transformations*

proactive engagement  
personalized guidance  
teach-to-fish training  
technology agnostic  
collaboration liaising  
upward advocacy





# Agile, Shared Compute Systems

*“submit locally, run globally”*

**>100,000**  
*CPU hrs/day/user*

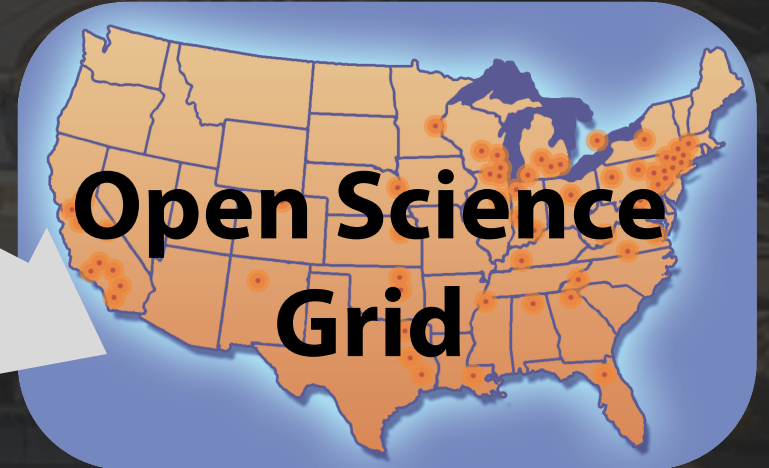


**Campus Grid**

**CHTC**  
**pool**



**The  
Cloud**



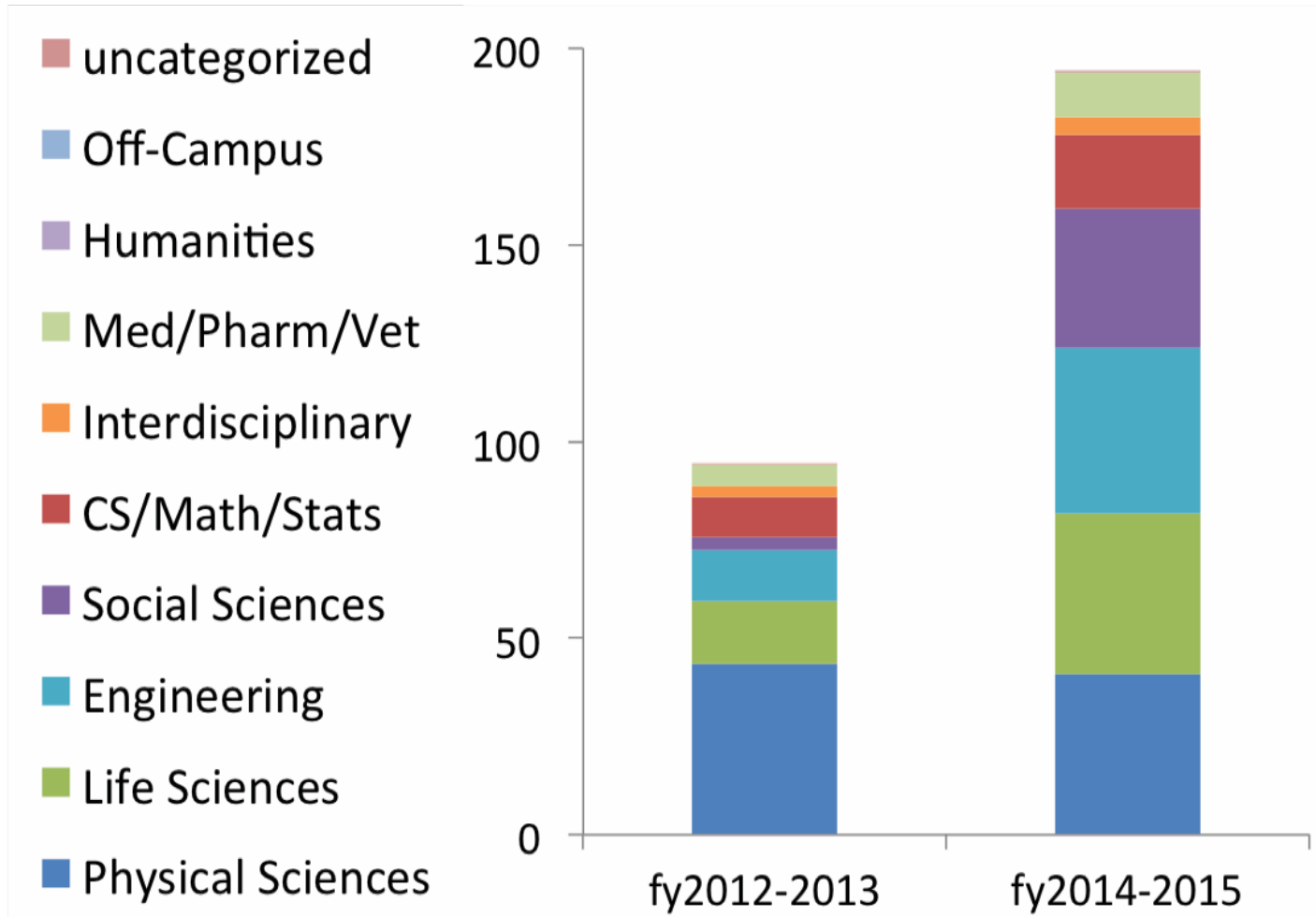
**Open Science  
Grid**





# Understanding Facilitator Impact

## Millions of CPU Hours via CHTC

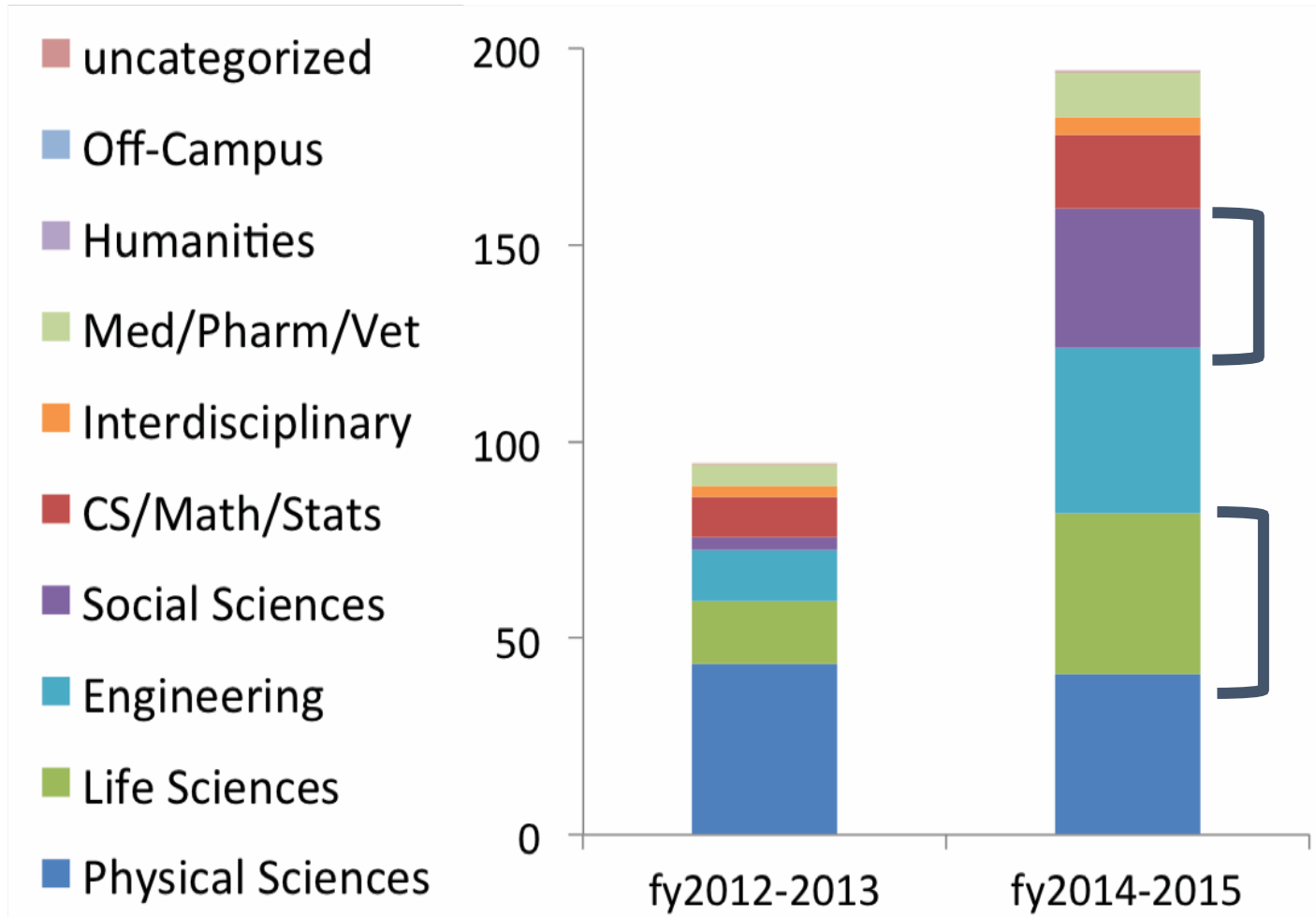


**Facilitators hired:  
Jan 2013, Nov 2014**



# Impact Across Domains

## Millions of CPU Hours via CHTC

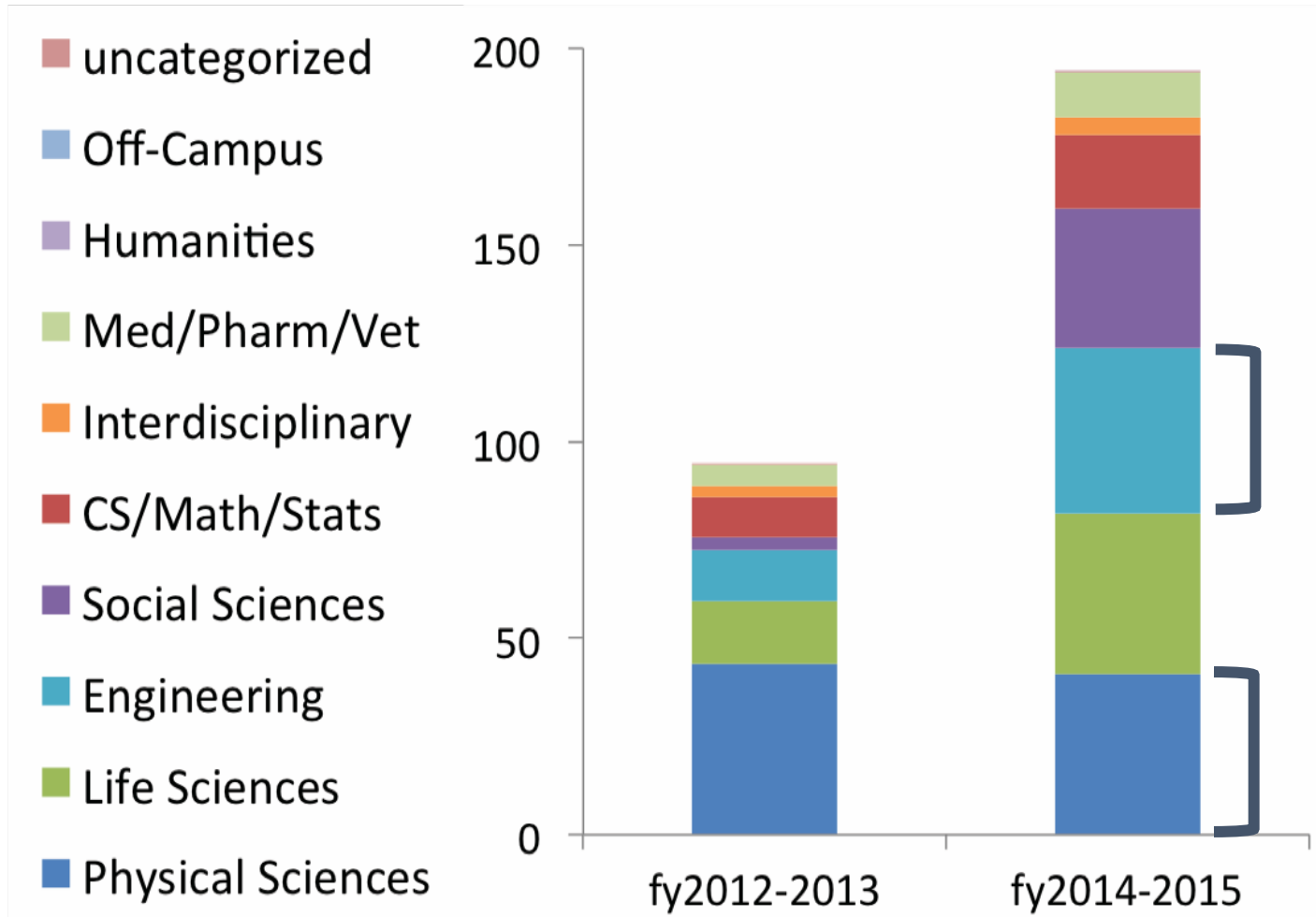


**>95% high  
*throughput*  
computing**



# Impact Across Domains

## Millions of CPU Hours via CHTC



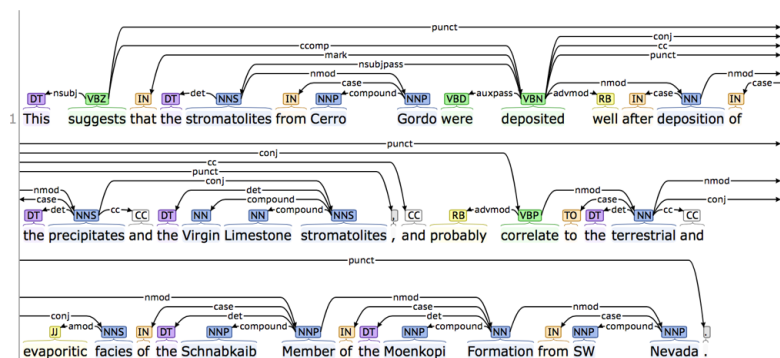
**>60% high  
*throughput*  
computing**

[Future Directions for NSF Advanced Computing Infrastructure to Support U.S. Science and Engineering in 2017-2020](#)

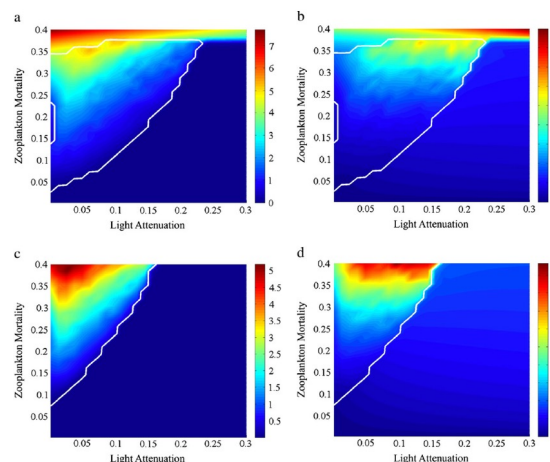


# Is it HTC-able?

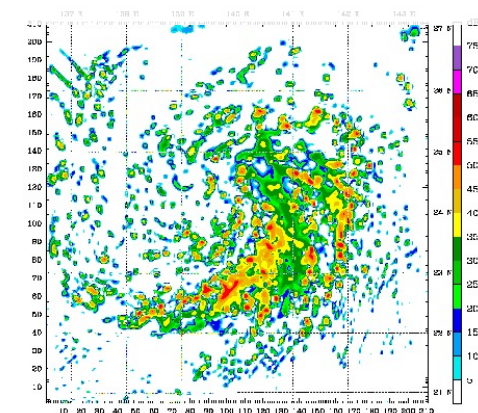
Is your problem potentially computable as lots of independent pieces? For example ...



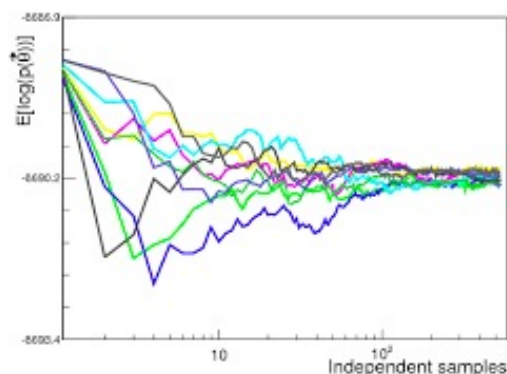
**text analysis (most genomics ...)**



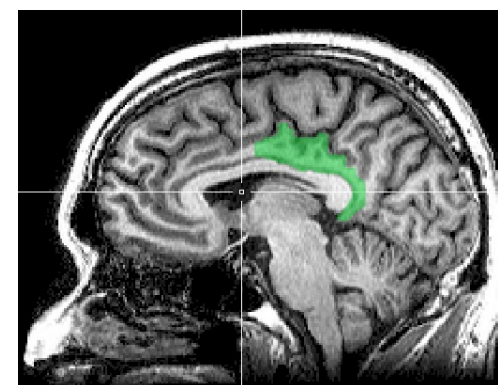
**parameter sweeps**



**multi-start simulations**



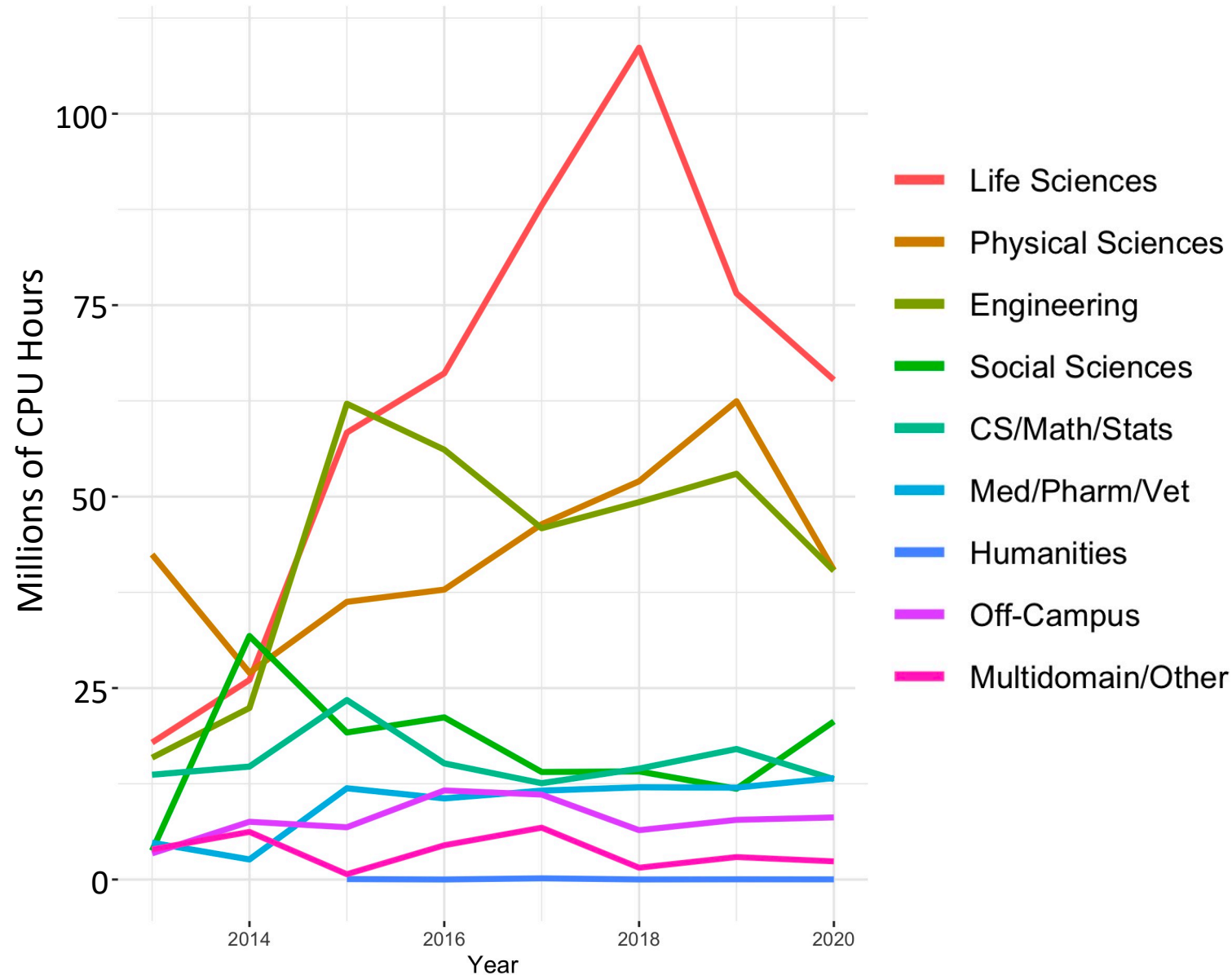
**statistical model optimization  
(MCMC, numerical methods, etc.)**



**(multi-)image and  
sample analysis**



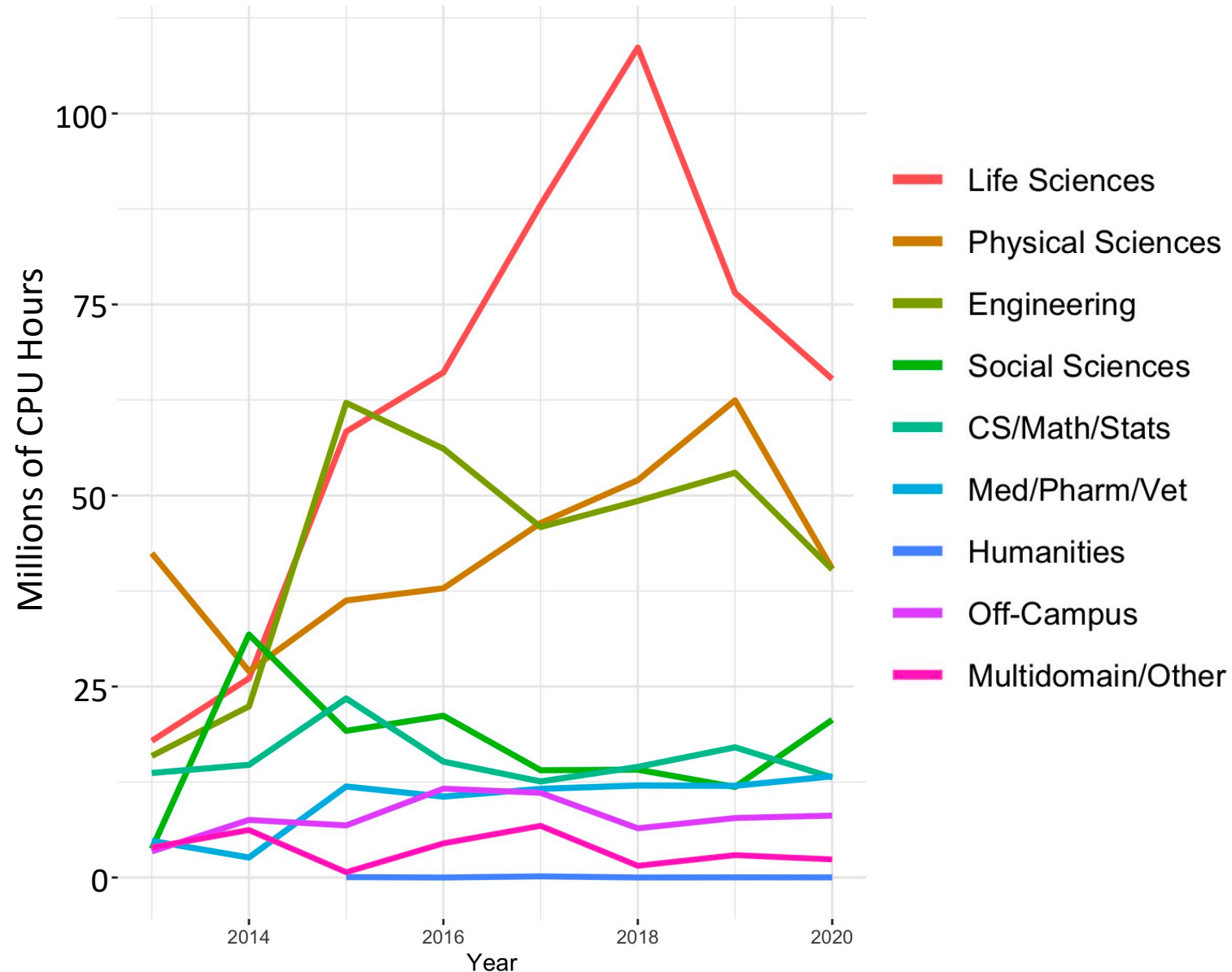
# Impact Across Domains



In 2020	
Research Groups Supported	320+
Researcher Consultations	500+
Office Hours Visits	300+



# Impact Across Domains



**Hear research examples  
on Thursday!**

In 2020	
Research Groups Supported	320+
Researcher Consultations	500+
Office Hours Visits	300+





# We're Hiring!

*Apply by May 31 to Join the UW-Madison and OSG RCF teams!*

## **Research Computing Facilitator**

- serve as the human interface for researchers using UW-Madison and OSG computing resources!
- inform the development of HTCondor and OSG tools and services
- engage with a diverse and international community

### **Ideal Candidates:**

- have prior computational research experience
- enjoy teaching others to 'fish' with computing
- recent research MS/PhD or experienced facilitator

<https://jobs.hr.wisc.edu/en-us/job/508948/research-computing-facilitator>





# HTC Facilitation Training

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<https://indico.fnal.gov/event/46925>
- **External presentations and trainings**
  - PEARC21; past: RMACC2021, PEARC20, others



# OSG (Virtual) User School 2021

**Apply by May 28!** <https://opensciencegrid.org/virtual-school-2021/>

- for researchers and research computing facilitators
- **2021 virtual experience for selected applicants (half-time over two weeks) includes:**
  - personalized consultations with CHTC/OSG staff
  - short presentations coupled with hands-on exercises during designated help times
- **Public materials and presentations.**

## **Resuming the on-site experience in 2022**

- week-long, with group activities, LARP, meals
- held at UW-Madison, including site-seeing and socializing time
- support for travel, lodging, meals







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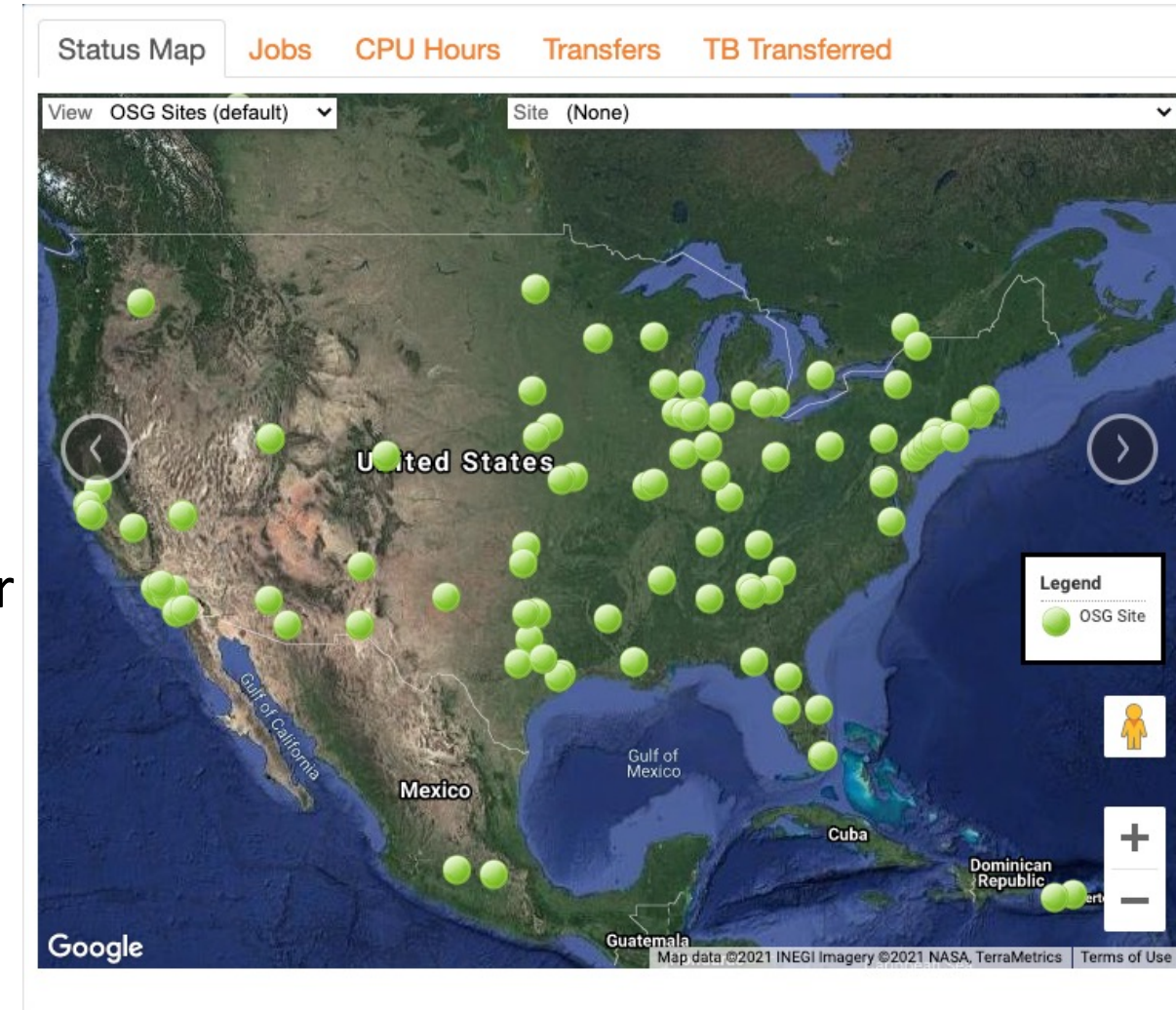
email [support@opensciencgrid.org](mailto:support@opensciencgrid.org) to discuss



Open Science Grid

# Resource Sharing that YOU Control

- >100 US campuses federated
- **Owners decide** which pools (research communities) they share with
- **Most support the Open Science Pool**
- You or OSG operate a “Compute Entrypoint” (CE) that submits jobs via your existing cluster scheduler
  - you decide job handling details (local partitions, job sizes, priority)
  - OSG data on research you impact!
  - more: <https://opensciencegrid.org/docs>





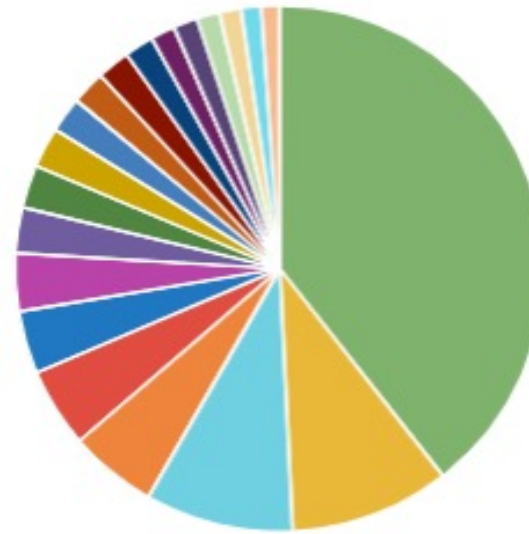
Open Science Grid

# Institutions Supporting the OS Pool in 2020!

55 Campuses in the last year  
(top 20 in 2020 at right)

15+ of 28 committed 2019 & 2020 CC\*  
awardees are already sharing

<https://opensciencegrid.org/campus-cyberinfrastructure>



Core Hours by Facility

	total
SU ITS	93 Mil
MWT2 ATLAS UC	23 Mil
BNL-SDCC	21 Mil
IRISHEP-SSL-UCHICAGO	13 Mil
MIT CMS	11 Mil
FermiGrid	9 Mil
IIT - Illinois Institute of Technology	8 Mil
FNAL USCMS Tier1	7 Mil
BNL ATLAS Tier1	6 Mil
Nebraska-CMS	6 Mil
UConn-HPC	5 Mil
UColorado_HEP	5 Mil
GLOW	5 Mil
FNAL HPC	4 Mil
SWT2 ATLAS UTA	4 Mil
AMNH	3 Mil
T2_Estonia	3 Mil
AGLT2	3 Mil
Vanderbilt ACCRE	3 Mil
UCSD CMS Tier2	3 Mil





Open Science Grid

# Support for CC\* Awards

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## Campus Cyberinfrastructure (CC\*)

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### PROGRAM SOLICITATION

NSF 21-528

### REPLACES DOCUMENT(S):

NSF 20-507



National Science Foundation

Directorate for Computer and Information Science and Engineering  
Office of Advanced Cyberinfrastructure  
Division of Computer and Network Systems

**Full Proposal Deadline(s)** (due by 5 p.m. submitter's local time):

March 01, 2021

October 11, 2021

- **Consulting for Your Proposal**
  - Science drivers
  - OSG integration
- **Support Letters**
  - >60 letters provided since 2019

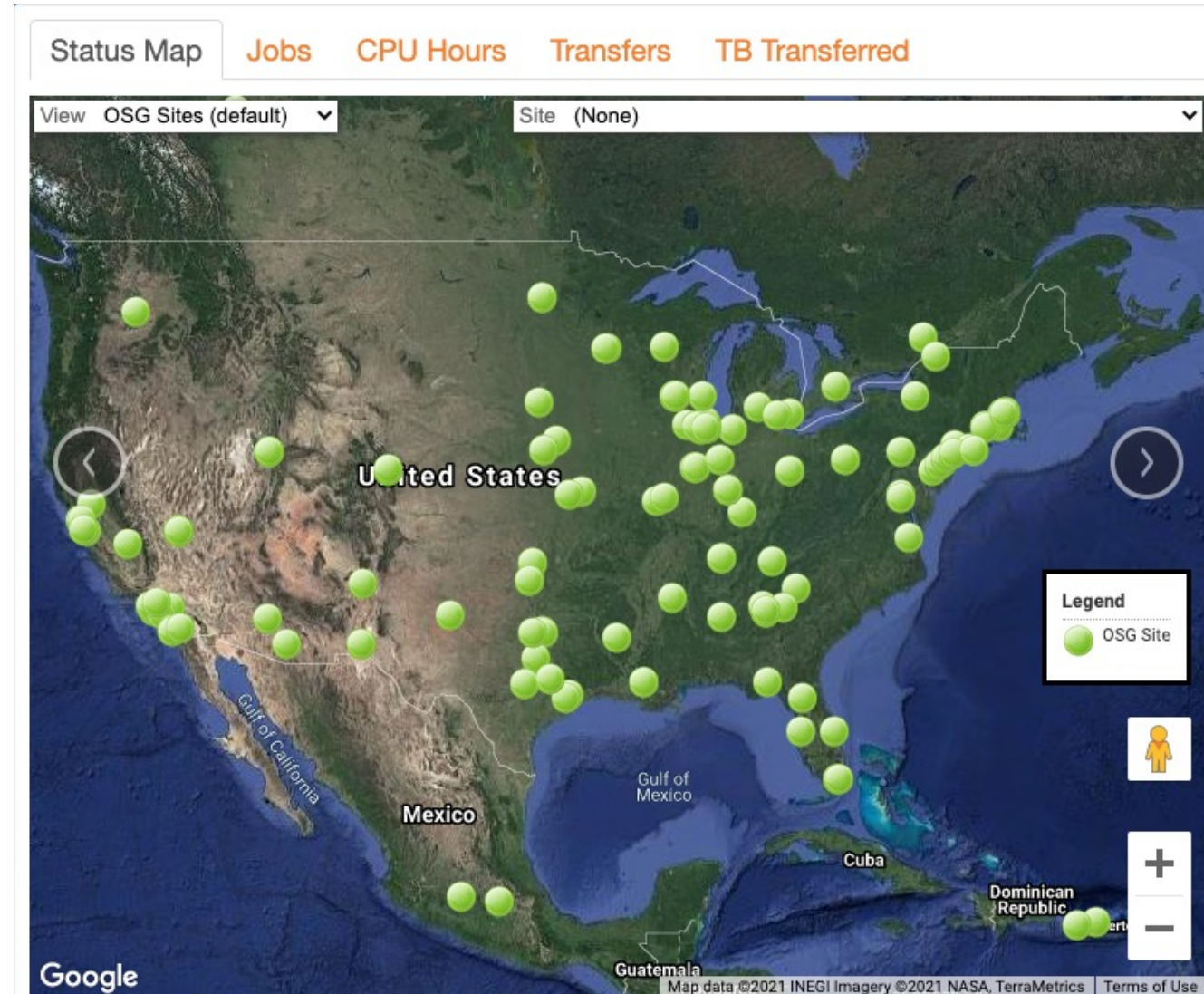
**[cc-star-proposals@opensciencegrid.org](mailto:cc-star-proposals@opensciencegrid.org)**  
**<https://opensciencegrid.org/campus-cyberinfrastructure>**



# Secondary Benefits of Engaging with the **HTC**ondor and **OSG** Communities

Engage with the  
(Inter)National CI Ecosystem!

- Learn from OSG and CI staff in other institutions and countries
- Identify collaboration opportunities
- Funding advantages





# Learn More

**path-cc.io**

**htcondor.org**

**opensciencegrid.org**

## **Presentations and Trainings at Community Events**

*targeted for campus IT/research computing staff, gateway developers, etc.*

- **Past HTCondor Weeks**, [https://research.cs.wisc.edu/htcondor/past\\_condor\\_weeks.html](https://research.cs.wisc.edu/htcondor/past_condor_weeks.html)
- **OSG All Hands Meetings**, <https://opensciencegrid.org/all-hands/>
- **dHTC Campus Workshop Series**
  - Oct 2020: Emphasis on Resource Sharing, <https://indico.fnal.gov/event/45998>
  - Feb 2021: Emphasis on Using/Facilitating HTC, <https://indico.fnal.gov/event/46925>
- **External presentations and trainings**
  - Upcoming: RMACC 2021, PEARC21; Past: PEARC20, Gateways 2020
- **Institution and Research Presentations throughout HTCondor Week 2021!**



# **PATH** PARTNERSHIP to ADVANCE **THROUGHPUT COMPUTING**

## Next Steps

- **Discuss HTC Strategies for Your Campus**
  - [support@opensciencegrid.org](mailto:support@opensciencegrid.org)
- **You and Your Researchers Can Use OSG, NOW!**
  - [osgconnect.net](http://osgconnect.net) > **Sign Up**
- **Consulting and Letters of Support for CC\* Proposals**
  - [cc-star-proposals@opensciencegrid.org](mailto:cc-star-proposals@opensciencegrid.org) (to OSG leadership, only)



A photograph of two women in a professional setting. One woman, with blonde hair tied back, is seen from the side, wearing a dark blue shirt. The other woman, with blonde hair, is facing her, wearing a light-colored blazer over a white top. She is holding a blue marker and gesturing with her hands. The background is a blurred office environment with red and white elements.

[lmichael@wisc.edu](mailto:lmichael@wisc.edu)

