



NSF CC\* REGIONAL  
AWARD #2346589

PA SCIENCE DMZ PROJECT

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# PA-DMZ PROJECT OVERVIEW

- Frictionless Science DMZ Network Paths
  - Goal - establish the foundation for a statewide Pennsylvania Regional Science DMZ (PA-DMZ) that enables and enhances access for under resourced PA institutions of higher education to cyberinfrastructure-based resources and services in support of science driven research and education applications.
- Grant supports
  - Networking hardware and connectivity
  - Installation and support for 2+ years (organizations to provide support years 3-5)
  - Broader Impacts and Research Enablement
- Wayne Figurelle, PI, Penn State

# 2023 AWARD HIGHLIGHTS

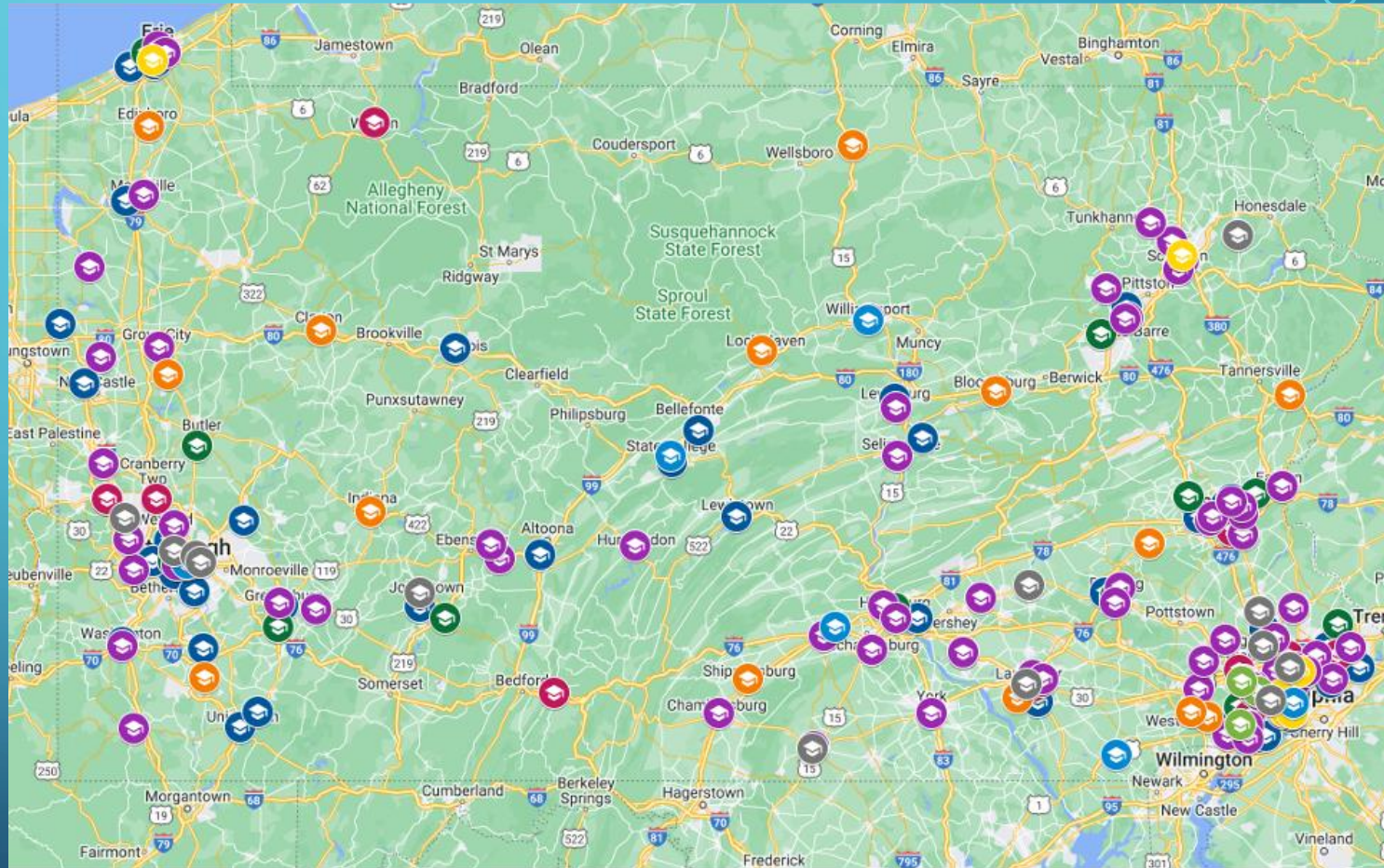
- \$1.1M funding - NSF Award #2346589
- 5 partners
- PA Science DMZ for Under-resourced Institutions
  - Existing 1-2Gb/s Internet only
  - Adding 10/25Gb/s router, 10Gb/s Internet2, with 10G perfSONAR and 10G DTNs
- Install and Operational in 2024
- Research Enablement in 2024/2025
- Growth and Expansion in 2025

# PA-DMZ CURRENT STATE



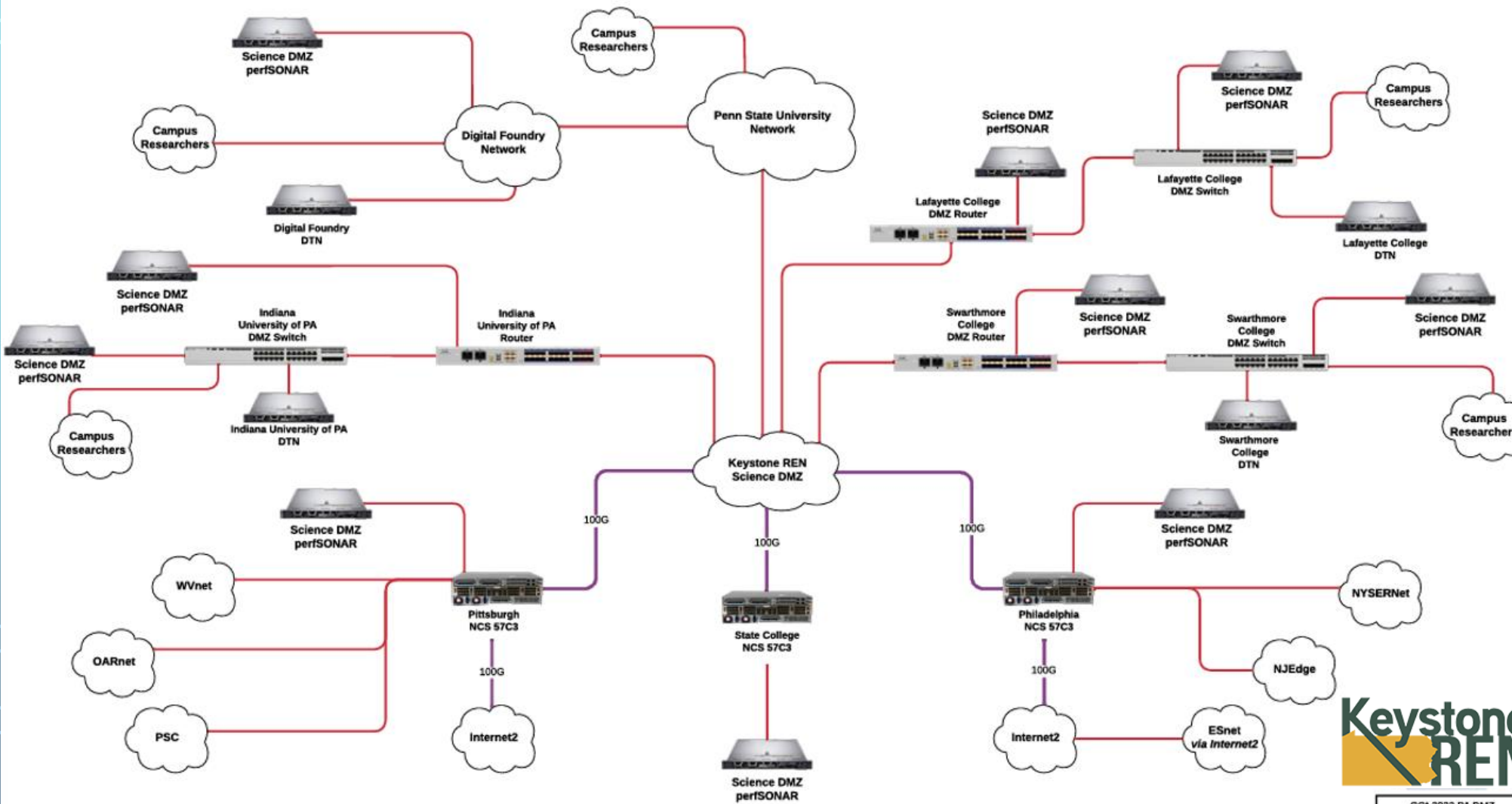
# PENNSYLVANIA'S POTENTIAL SCIENCE DMZ SITES

- In PA – There have been 24 CC\* awards (as of Jan 2024)
- Many under-resourced institutions
- Chance to provide research enabling services to scale discovery



# NETWORK DIAGRAM

## CC\* 2023 - PA Science DMZ



10G — 100G



CC* 2023 PA DMZ	
Version 4 (08/09/2023)	Author: Ben Miller

# CAMPUS NETWORK DIAGRAM

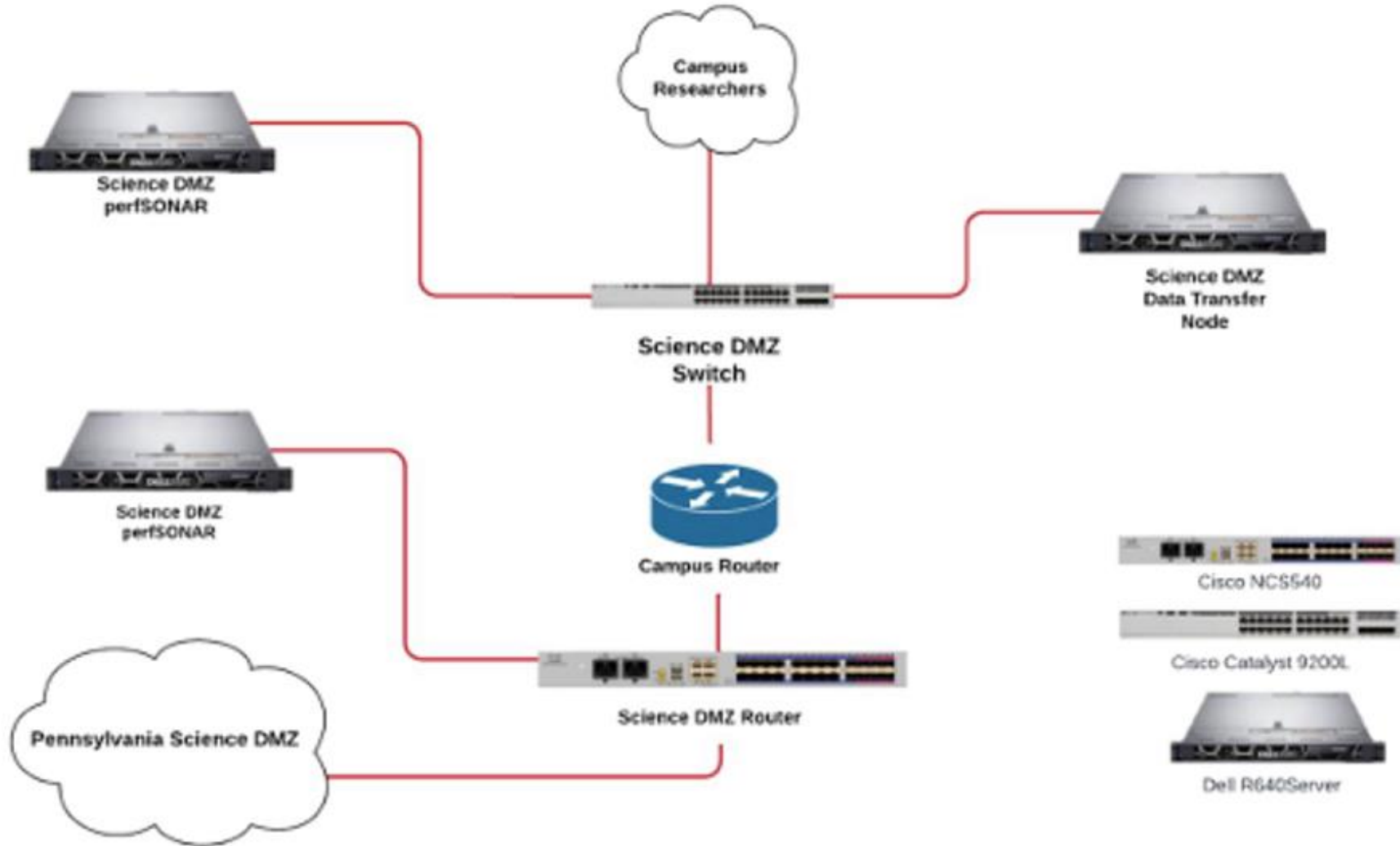


Figure 3 - Campus Science DMZ

# CYBERSECURITY ON PA SCIENCE DMZ

- Implicit Deny all ACLs for IPv4 and IPv6
- ACLs opened as science drivers are identified and documented
- ACL accounting on all accepted and denied packets logged to campus security
- All accepted packets mirrored to campus security
- sFlow or Netflow/IPFIX will be captured on PA Science DMZ equipment
- Routing Optimization to prefer R&E networks only



# PA SCIENCE DMZ PERFORMANCE

- perfSONAR testing IPv4 and IPv6
  - MTU 9000 verification or at least MTU consistency
  - Throughput = iperf3 (single and multi threaded) to verify network capacity
  - Latency = One-way and round trip
  - Traceroute to make sure traffic is on R&E paths only
- Data Transfer Node testing
  - Once network performance is validation, DTN will be tested with datasets toto well tuned endpoints at ESnet measure against [Data Transfer Scorecard](#) – 1-3 TB/hr or 2-6 Gb/s
  - Utilize the [Modern Research Data Portal](#) with Globus and ESnet's [data architecture](#) design pattern. Free Code [here](#)
  - Collaborate with Science Driver to validate data transfer against [Data Transfer Scorecard](#)

# DATA TRANSFER SCORECARD

	10G DTN				x10G, 25G, 40G, 100G DTNs			x400G
DTN host Transfer Rates	1/6 PetaScale	1/3 PetaScale	1/2 PetaScale		PetaScale: 1 PB/wk	PetaScale 2.0: 1 PB/day		Future ExaScale: 1 XB/month
Data Transfer Volume (Researcher)	1 TB/hr	2 TB/hr	3 TB/hr		5.95 TB/hr	41.67 TB/hr		33.33 PB/day
Network Transfer Rate (Network Admin)	2.22 Gb/s	4.44 Gb/s	6.67 Gb/s		13.23 Gb/s	92.59 Gb/s		3.09 Tb/s
Storage Transfer Rate (Sys/Storage Admin)	277.78 MB/s	555.54 MB/s	833.33 MB/s		1.65 GB/s	11.57 GB/s		385.80 GB/s

# SCIENCE DRIVER METRICS & OUTCOMES

- Baseline: Gather existing data transfer bottleneck or limitations
- Top Source/Destination
  - IPs/Collaborators
  - ASNs/Sites
  - Applications
- Total Science Data Transferred
- How has Science Improved?
- Develop a performant data architecture to assist others within PA

# UPCOMING TRAININGS & RESOURCES

- Trainings

- PA Science DMZ – CyberAccelerate [Workshop](#)
  - Thursday, October 24, 2024 – Penn State
- [IPv6 Workshop](#) – NYSERnet, EPOC, TACC, Univof South Carolina
  - October 7-8, 2024, East Syracuse, NY
- [2024 NSF Cybersecurity Summit](#) –
  - October 7-10, 2024, at Carnegie Mellon University in Pittsburgh, PA.

- Resources

- [Engagement and Performance Operations Center \(EPOC\)](#)
  - Roadside Assistance and Consultation as well Network Analysis enabled [by NetSage monitoring](#)
- [ESnet Science Engagement](#)
- [Internet2 Research Engagement](#)
- Coming Soon.... MetrANOVA <https://www.metranova.org/>
  - Network measurement and monitoring within the research and education networking community



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# NETWORK AS ~~INFRASTRUCTURE~~ INSTRUMENT

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