# What is perfSONAR?

*An introduction*

December 10, 2024 - Internet2 Technology Exchange - Boston, MA

*perfSONAR is developed by a partnership of*

ESnet · GÉANT · INDIANA UNIVERSITY · INTERNET2 · RNP · UNIVERSITY OF MICHIGAN

# perfSONAR

- perfSONAR is an **open source software suite** that runs, stores and displays **active measurements** such as **throughput, packet loss, latency and traceroute**
- Primarily maintained by consortium of **ESnet, GEANT, Indiana University, Internet2, RNP** and the **University of Michigan**
- **Over 2000 deployments** around the world across hundreds of institutions



*Map of perfSONAR deployments around the globe*
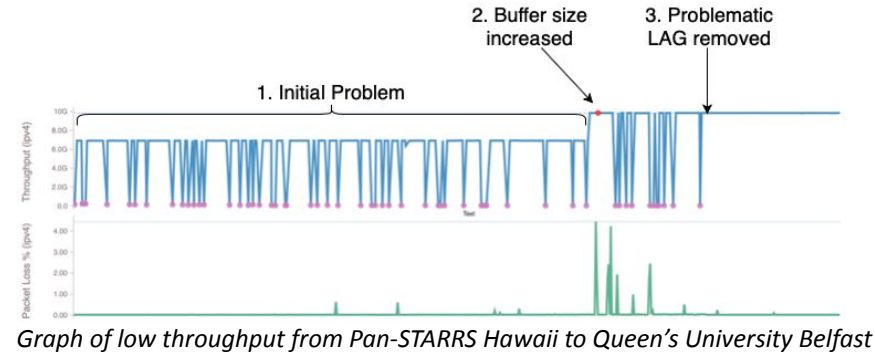


*Graph of low throughput from Pan-STARRS Hawaii to Queen's University Belfast*

**Example perfSONAR use cases:**
- Solving global network performance issues for for researchers transmitting data from **Pan-STARRS Hawaii** to **Queen's University Belfast** *(see above graph)*
- Identifying packet loss issues at **UT Arlington**
- Identifying performance bottlenecks as **Large Hadron Collider (LHC)** prepares for the "high luminosity" era

![perfSONAR]

# The R&E Community

While these networks all interconnect, each network is owned and operated by separate organisations (called "domains") with different policies, customers, funding models, hardware, bandwidth and configurations.
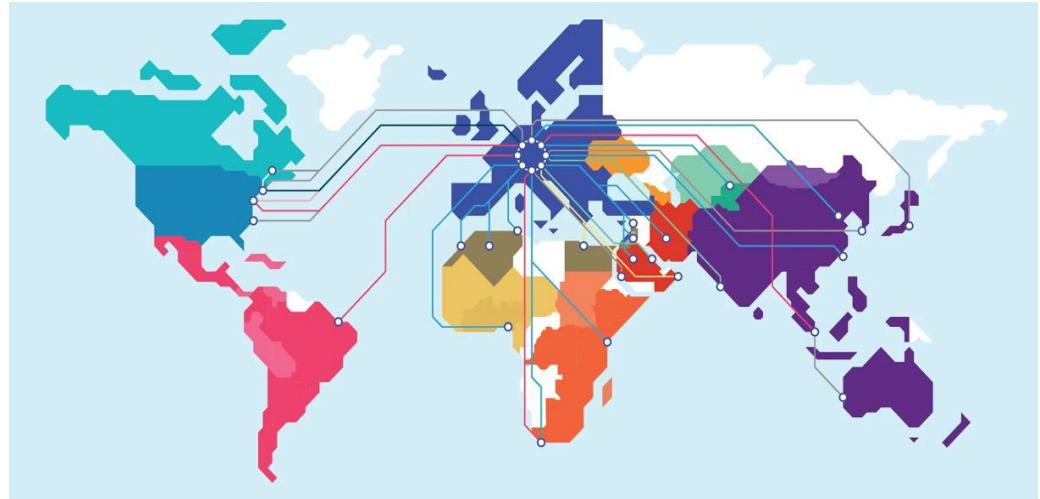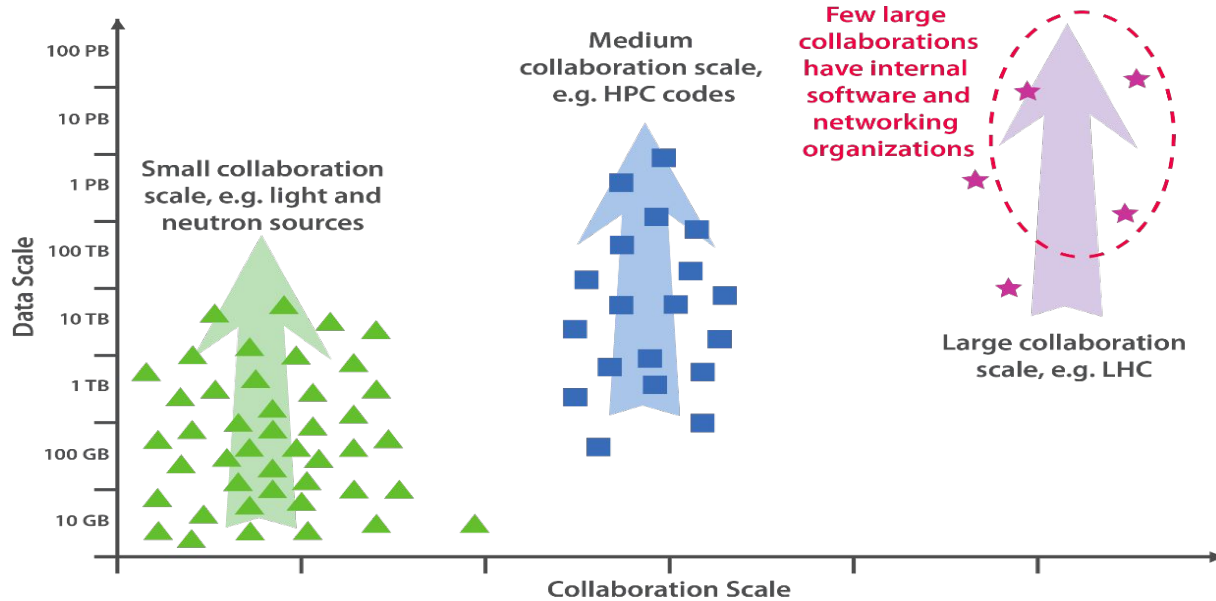


The global Research & Education network ecosystem

# Problem Statement: make data flow

- The global Research & Education network ecosystem

- This complex, heterogeneous set of networks **must** operate seamlessly from "end to end"

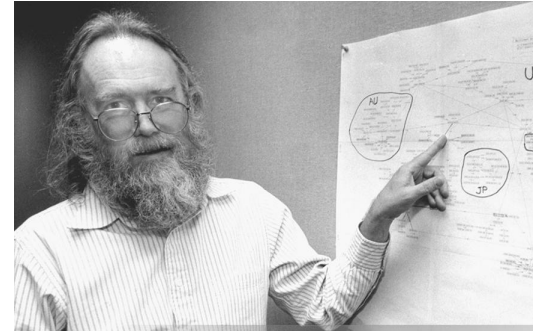- Data mobility is required
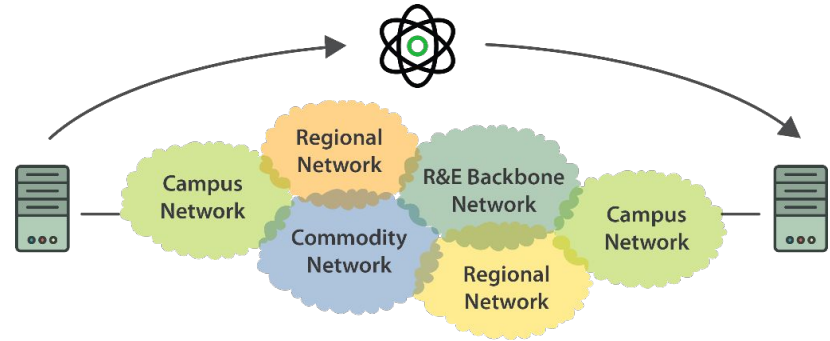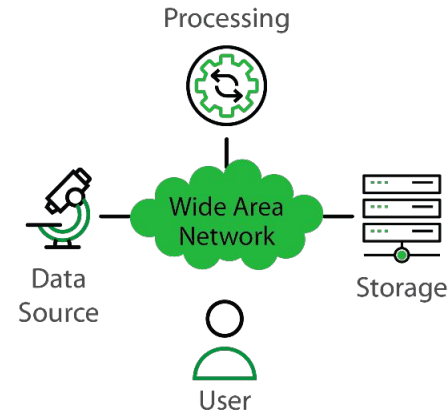
# Understanding Data Trends

# Let's Talk Performance …

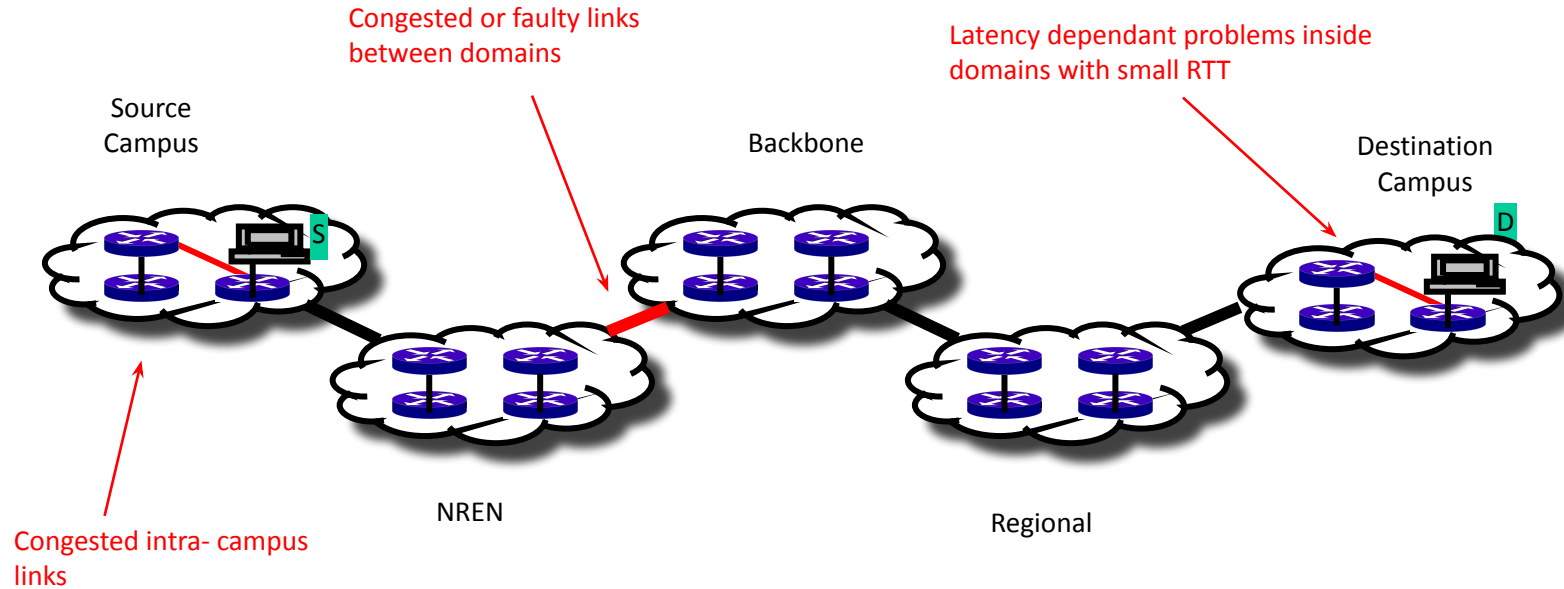"In any large system, there is always something broken."

- *Jon Postel*

Modern networks are occasionally designed to be *one-size-fits-most*

- It's mostly all TCP

- TCP suffers the most from unpredictability; packet loss/delays are the enemy

- It all starts with knowing your users, and knowing your network

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# Where Are The Problems?

# Local Testing Will Not Find Everything

Performance is poor when RTT exceeds ~10 ms

Performance is good when RTT is < ~10 ms

Source Campus

R&E Backbon

Destination Campus

Regional

Regional

Switch with small buffers
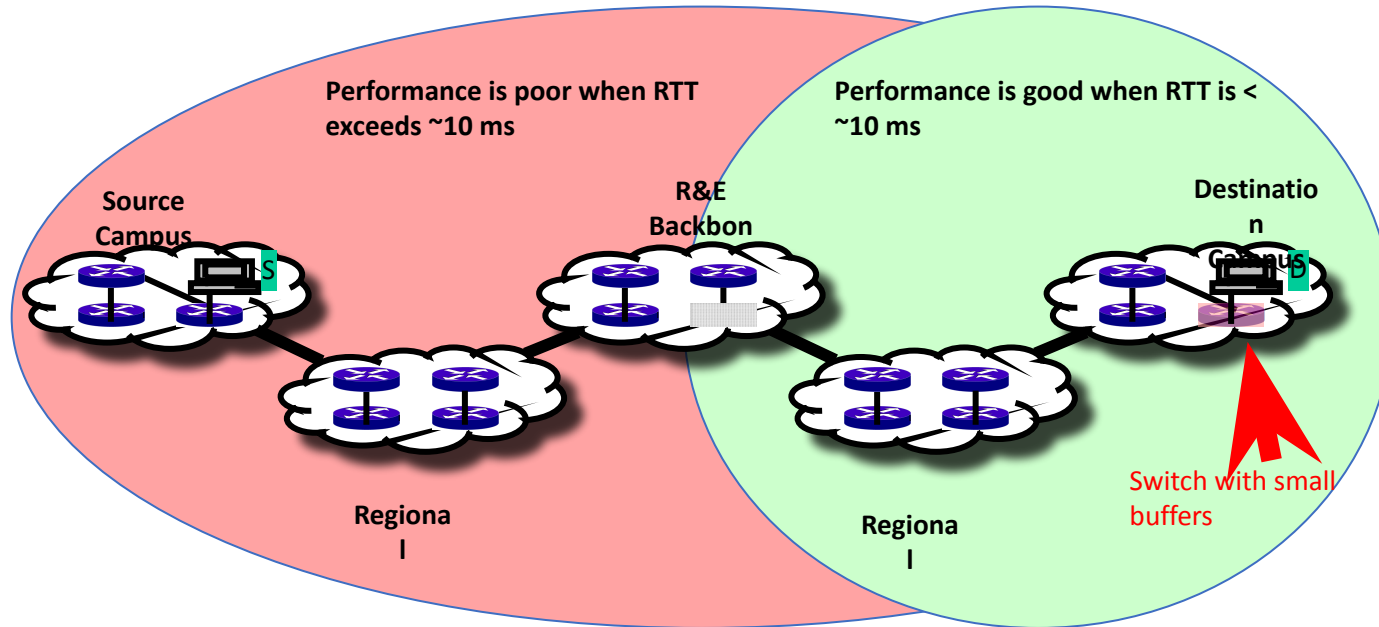
# Very small packet loss and TCP performance
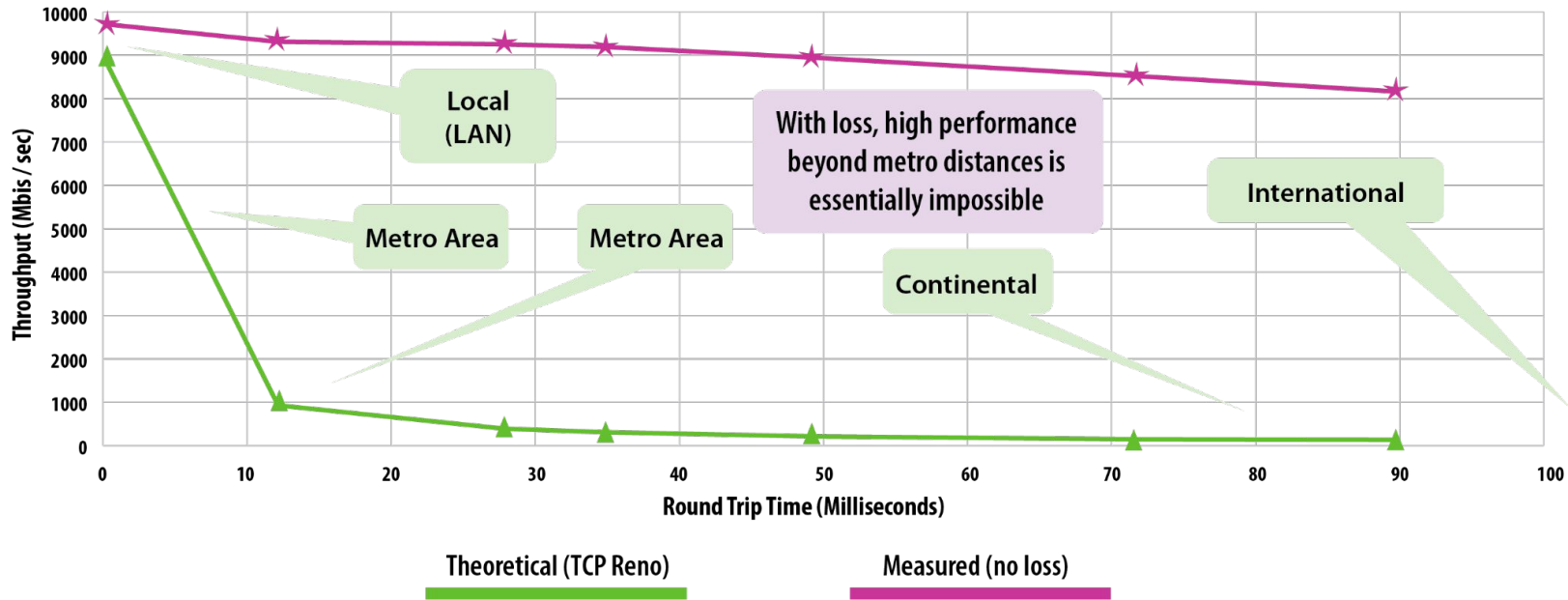
Throughput vs. Increasing Latency with .0046% Packet Loss

# Problem Statement: Hard vs. Soft Failures

**"Hard failures"**

The kind of problems every organisation understands.

Classic monitoring systems are good at alerting to hard failures.

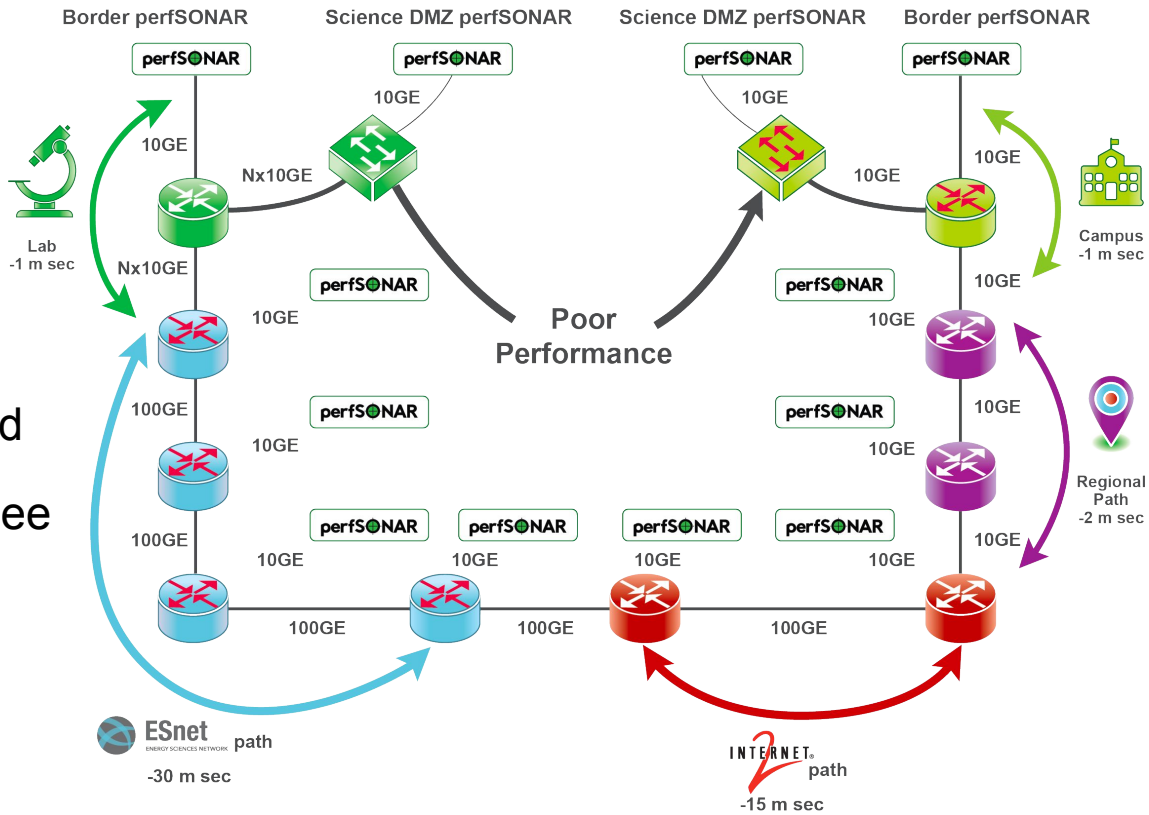**"Soft failures"**

Different and often go undetected

How much should we care about soft failures?

"As long as the TCPs continue to function properly and the internet system does not become completely partitioned, no transmission errors will affect the users."

# perfSONAR

You can't fix what you can't find

You can't find what you can't see

perfSONAR lets you see

# What is perfSONAR?

**perfSONAR** is a tool to:

- Set network performance expectations
- Find network problems ("soft failures")
- Helps coordinate fixing these problems

  … all in multi-domain environments

# perfSONAR is developed by a partnership of

# Collaboration Structure

- The perfSONAR collaboration is a Open Source project lead by ESnet, GEANT, Indiana University, Internet2, RNP and the University of Michigan.
  - Each organization has committed 1.5 FTE effort to the project
  - Plus additional help from many others in the community
- "Organizational" structure broken into three groups:
  - **Steering committee** provides feedback to group on high-level direction. These are mostly at executive/director level of respective organizations. (Meets 1-2 times a year.)
  - **Leadership team** manages day-to-day operation of project. (Meets weekly)
  - **Development team** produces and releases the code. (Multiple meetings a week, daily communication)
- The perfSONAR roadmap is influenced by
  - requests on the project issue tracker
  - user surveys sent to community
  - regular meetings with VO using perfSONAR such as the WLCG and OSG
  - discussions at various perfSONAR related workshops

# How to use it

- Get the software: https://docs.perfsonar.net/install_getting.html
- Run some tests to one of the over 2000 nodes around the globe!

# How to participate
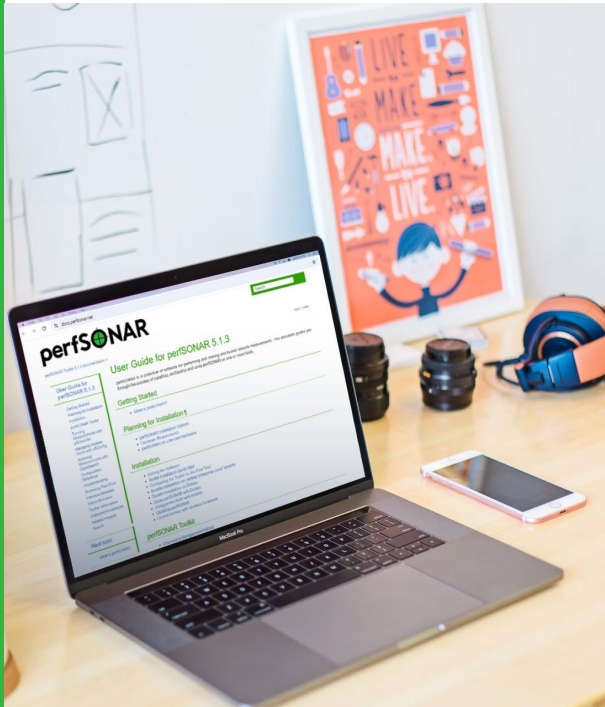
Multiple ways to contribute:

- **Option 1: Submit a merge request**
  - perfSONAR is an open source project, any way is free to contribute
  - This is a great model if you have a specific feature/project you want to implement
  - Encourage discussion with developers beforehand for bigger changes to increase success rate
- **Option 2: Unofficial Contributor**
  - If you are not at a place to dedicate a full 1.5 FTE but do want to contribute beyond just a single project, you can join dev meetings and more
  - Often a good way stepping stone to full partner
- **Option 3: Apply to become a formal partner**
  - You will need to dedicate 1.5 FTE and will meet with leads and steering committee to make sure partnership makes sense for all parties involved

# perfSONAR Community

- The perfSONAR collaboration is working to build a strong user community to support the use and development of the software.

- perfSONAR Mailing Lists
  - Announcement Lists: https://lists.internet2.edu/sympa/subscribe/perfsonar-announce
  - Users List: https://lists.internet2.edu/sympa/subscribe/perfsonar-user

# Resources

- perfSONAR Website http://www.perfsonar.net/

- perfSONAR Documentation http://docs.perfsonar.net/

- Lookup Service Dashboard https://stats.perfsonar.net/

- YouTube Channel https://www.youtube.com/perfSONARProject

- FasterData Knowledge Base http://fasterdata.es.net/

perfSONAR

**Thank you**

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