

# perfSONAR News and Updates

LHCOPN-LHCONE meeting, Beijing

October 10, 2024

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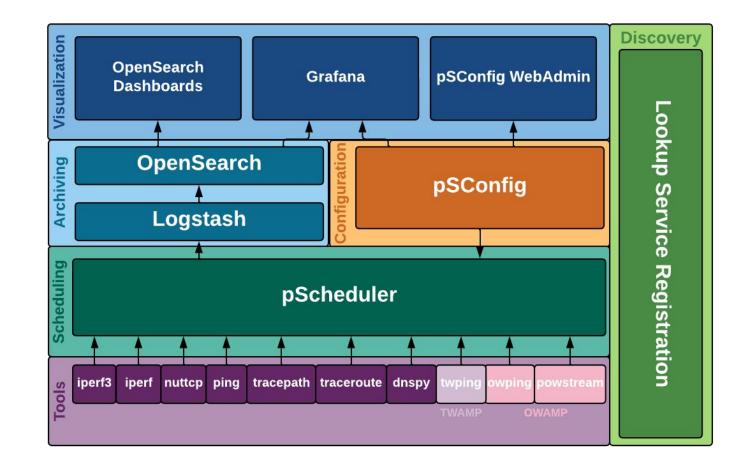
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# New perfSONAR architecture









# perf5.0NAR 5.1.3

- **OpenSearch backend** (already in 5.0)
- No Toolkit ISO (already in 5.0)
- New Grafana Interface
  - Customizable visualization, better integration with other data
- Threaded iperf3 Support
  - Ability to test at 100Gbps+
- Python pSConfig
  - Better maintainability of more modern codebase
- Installation helper scripts
- Better Instrumentation and Troubleshooting Tools
  - Makes it easier to identify issues when perfSONAR misbehaves
- New OS Support
  - Debian 11/12 and Ubuntu 20/22 support (+ Alma and Rocky Linux 9)
  - No CentOS 7 support



Image: New default Grafana UI

🗟 ESnet 🛛 G







### **OpenSearch Archive Replaces Esmond**

- perfSONAR has removed the Esmond software and now provides support for **OpenSearch**
  - Existing data not migrated on update. Data still live on disk.
- Clients can still write to Esmond so they should operate until administrators choose to migrate
- A central OpenSearch instance can be run in parallel with a legacy Esmond instance



#### **perfS NAR**

### pScheduler test plugins enchancements\*

\* since 5.0

Measure the clock difference between hosts clock dhcp Measure DHCP Response Time\* disk-to-disk Network testing of throughput and Read/Write speeds Test 802.1x Authentication\* dot1xMeasure DNS transaction time dns Measure HTTP Response Time http idle Consume time in the background idlebqm Consume time in the background - NOT FOR PRODUCTION Consume time exclusively - NOT FOR PRODUCTION idleex Measure network latency between hosts latency latencybq Run one-way latency tests in the background Find Maximum Transmission Unit (MTU) mtu Do nothing noop Measure pScheduler Response Time psresponse Measure the round trip time between hosts rtt s3throughput Test throughput of S3 web service storage simplestream Test communication between two hosts using TCP throughput Measure network throughput between hosts Trace the path between IP hosts trace wifibssid Outputs a list of BSSIDs in json format with the given SSID

\* Requires manual installation

NOTE: Run pscheduler plugins test to see all INSTALLED plugins



#### perfS NAR

### pScheduler tool plugins enchancements\*

\* since 5.0

Scans given interface for all BSSIDs. Returns a list of all associated BSSIDs in json format for
cURL-based tool for HTTP tests
Measure DHCP response time*
Measure DNS transaction time
Measure network throughput with ethr
Measure Maximum Transmission Unit (MTU)
halfping tool for approximate latency
Measure network throughput with iperf2
Measure network throughput with iperf3
Measure network throughput with nuttcp
Determine one-way latency with OWAMP
Determine the route between hosts with Paris Traceroute
Pass data from noop through as a result
Measure the round-trip time to another host with ping
Repeatedly measure latency with OWAMP's powstream
Compare the clocks on two pScheduler nodes
Measure pScheduler response time
Tool for measuring perfomance of an S3 web server
Stream data from one node to another with TCP
Sleep for periods longer than 15 seconds
Consume time in the background multiple times
Sleep for periods of 60 seconds or less
Measure the round-trip time to another host with tcpping
Map the route between hosts with tracepath
Map the route between hosts with traceroute
Determine latency with TWAMP

\* Requires manual installation

NOTE: Run pscheduler plugins tools to see all INSTALLED plugins







### What is iperf3?

 iperf3 is an open-source tool that measures network traffic performance between a client and server

 It was designed to be used in perfSONAR, but can also be used on its own

• Linux, MacOS, and FreeBSD are all officially supported





### iperf3 Multi-Threading

- Before multi-threading, iperf3 was capable of 30-50 Gbps, with single stream TCP, possibly more with tuning
- Many links are faster than iperf3

   Site connections: N x 100G

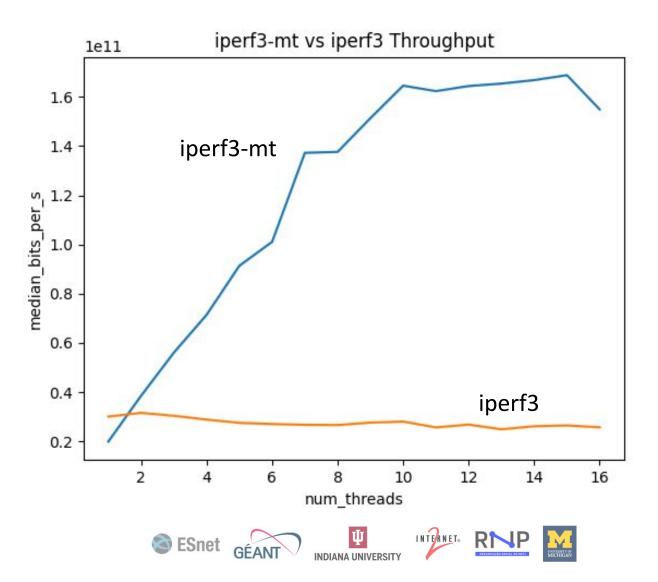
  - Backbone: 400G +
- So what if we want to support connections with higher bandwidth? How do we get more throughput?
- The problem: Adding more parallel connections doesn't increase throughput
- Solution: Adding multi-threading to iperf3 to use multiple CPU cores





### **Effects on Performance**

Internal testing showed that iperf3-mt has significant improvements in throughput performance over iperf3



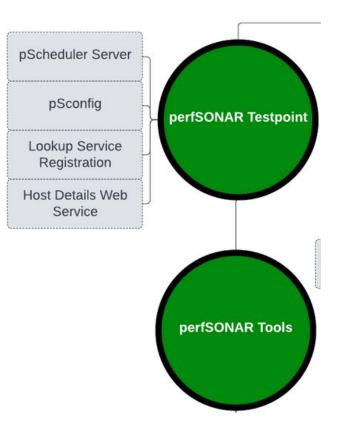


## Simple deployments

- perfsonar-testpoint **bundle**
- Automated scripts installation
  - o curl -s
     https://downloads.perfsonar.net/
     install | sh -s testpoint

#### To have auto-updates install perfsonar-toolkit-systemenv-testpoint bundle

• By default has host monitoring capabilities with Prometheus exporter



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#### **perfSNAR**

#### Yesterday's Toolkit UI

#### perfS ONAR Toolkit on HOST

#### ✓ Edit info)

All detected addresses are private, and private addresses are disabled. No addresses are being shown. To change this, edit /etc/perfsonar/toolkit/web/web\_admin.conf

#### Organization:

Address:

*Q* **HOST** 

Administrator:

Services			View services logs 🛛 🖓
SERVICE	STATUS	VERSION	PORTS
archive *	Running	5.0.1-1.el7	
Isregistration	Running	5.0.1-1.el7	
owamp +	Running	5.0.1-1.el7	861
pscheduler -	Running	5.0.1-1.el7	
psconfig	Running	5.0.1-1.el7	
twamp +	Running	5.0.1-1.el7	862

Test Results (2 Results)			Configu	re tests 🏾 🌣
Search:			Results for the	e last •
SOURCE	DESTINATION	THROUGHPUT	LATENCY (MS)	LOSS
ps-dev-staging-el7-tk-2.c.esnet- perfsonar.internal 10.128.15.192 Graphs   Traceroute Ø	ps-dev-prod-el7-tk-1.c.esnet- perfsonar.internal 10.128.0.54	⇒ n/a ∢ n/a	⇒ n/a ∉ n/a	⇒ 0.001% ∉ 0.001%

Log in Confi	guration <b>?</b> Help
네 Host Informatio	
Interfaces	Details ~
NTP Synced	Yes
Globally Registered	No
Allow Internal Addresses	OFF
Virtual Machine	No
RAM	16 GB
More Info	Details ~
perfSONAR Privacy P	olicy 🗗
🖉 On-demand test	ing tools
Reverse ping 🗷	
Reverse traceroute	7
Reverse tracepath 🗷	
Other services	
Global node director	y 🗗

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#### Yesterday's MaDDash UI

#### ESnet perfSONAR Dashboard

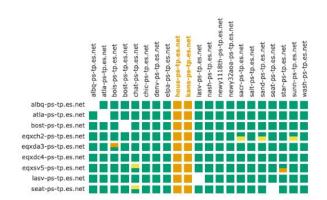
≡ Dashboards ≡ Reports NAdd Your Node @ Settings K External Resources

#### 20: ESnet to ESnet Throughput Testing Dashboard

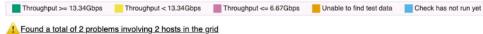
#### ESnet - 100G ESnet Hub to 100G ESnet Hub IPv6 Throughput Testing - Throughput

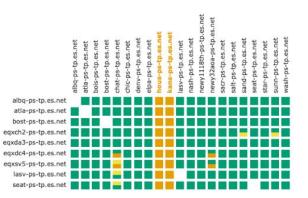
📕 Throughput >= 13.34Gbps 🧧 Throughput < 13.34Gbps 📕 Throughput <= 6.67Gbps 📒 Unable to find test data 📲 Check has not run yet

Found a total of 2 problems involving 2 hosts in the grid



#### ESnet - 100G ESnet Hub to 100G ESnet Hub IPv4 Throughput Testing - Throughput









### **Introducing Grafana**

- Grafana is an open source platform for for exploring data from a variety of sources
- It has a few key features
  - Its multi-data source
  - It has a bunch of built-in visualizations that don't require you to be a Javascript developer to use
  - It has a plugin framework for all of the above so they can be extended and a process for becoming official plug-ins
- More Info:

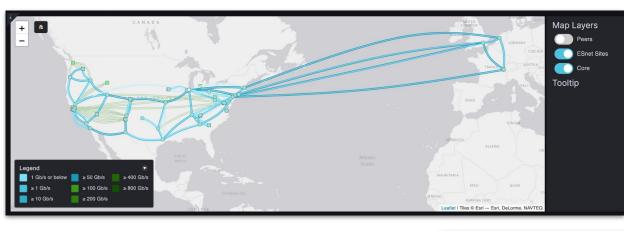
#### https://grafana.com/docs/grafana/latest/intr oduction/

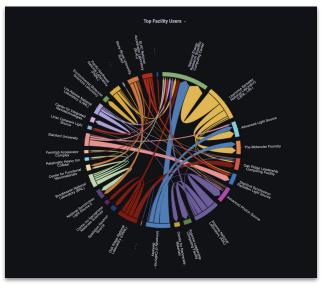


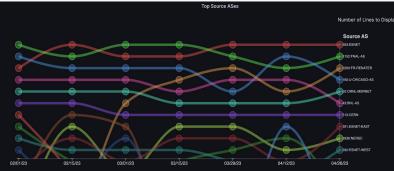


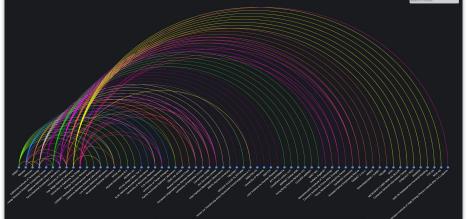


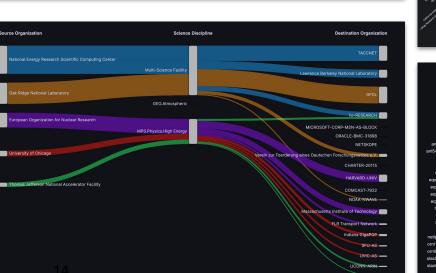
#### Custom Plugins by NetSage and ESnet

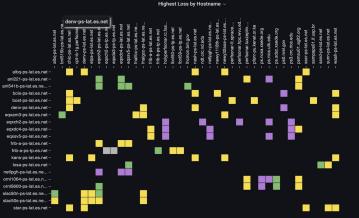


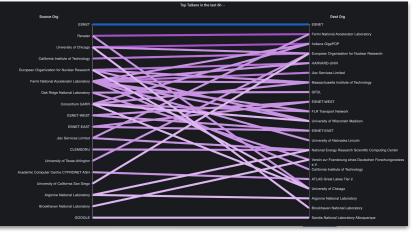














#### **New UI: Focus on Measurements**



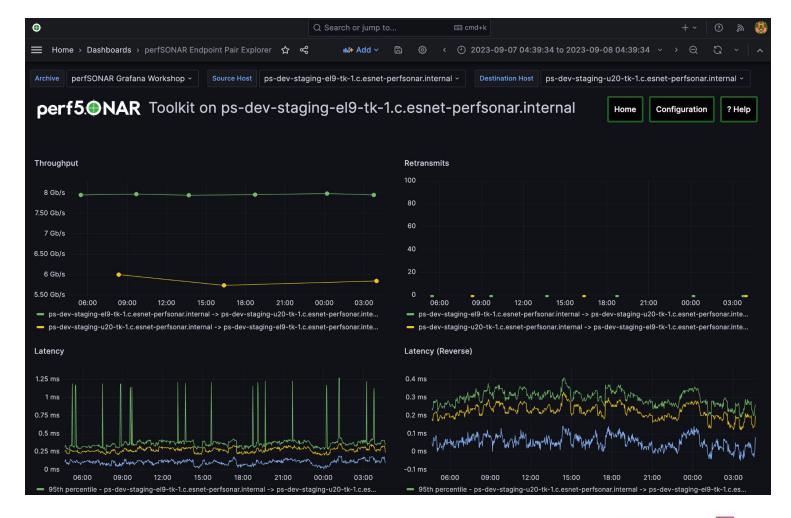


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#### New UI: Enhancing the Fundamentals



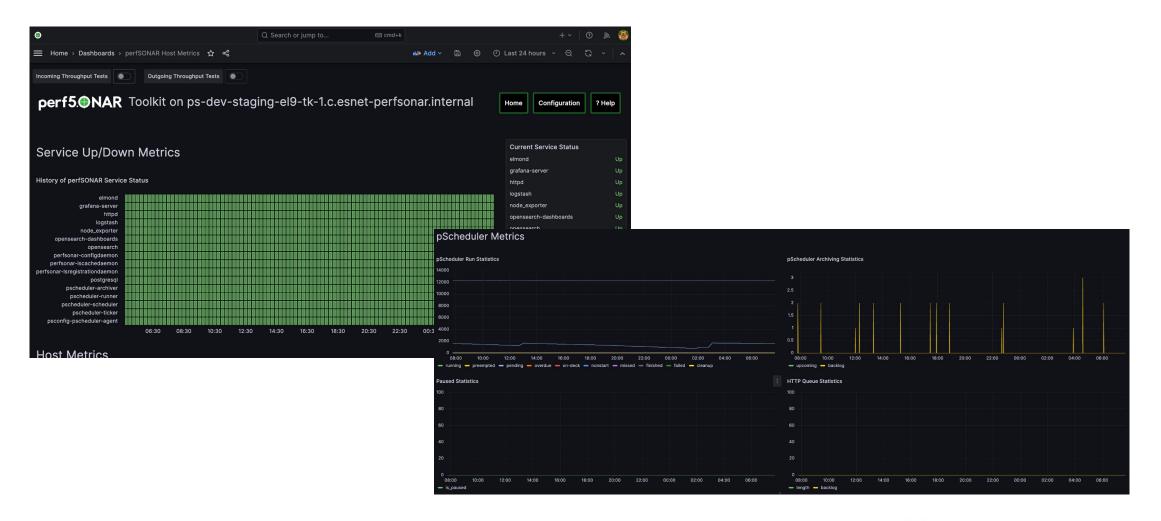
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#### **New UI: Instrumentation**







### **New UI: Data Correlation**

Throughput test overlay on host metrics



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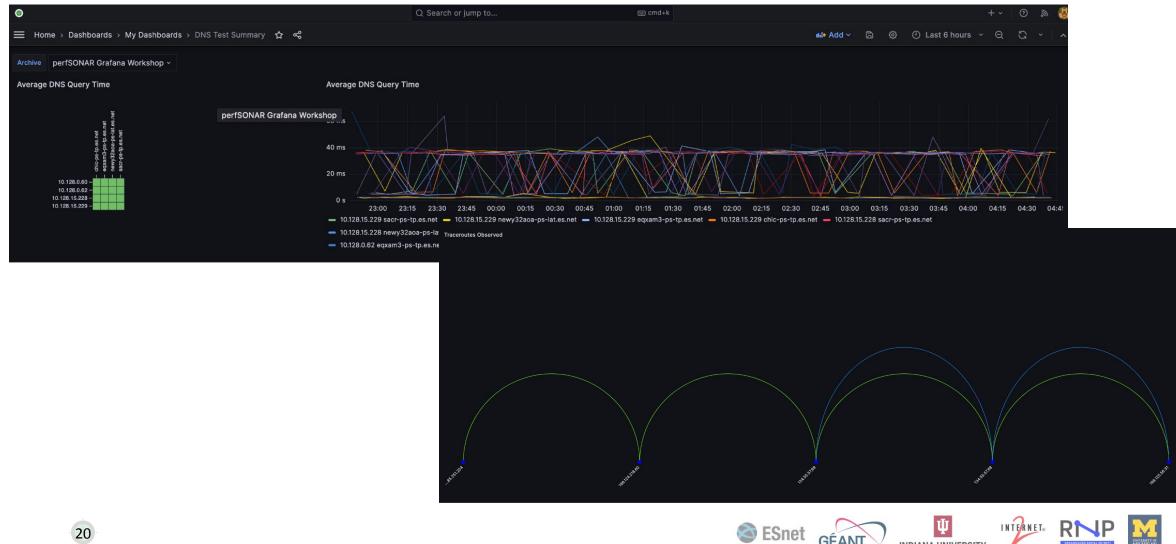
#### **New UI: MaDDash-like Integration**

•	Q Search or jump to	i⊞ cmd+k
$\blacksquare$ Home $ ightarrow$ Dashboards $ ightarrow$ External Dashboards $ ightarrow$ Grafana Workshop Dashboard $\ c$	æ	
Archive perfSONAR Grafana Workshop ~		
Throughput	: Pa	acket Loss
ps-dev-staging-el7-tk-1.c.esnet-perfsonar.internal – ps-dev-staging-el9-tk-1.c.esnet-perfsonar.internal – ps-dev-staging-el9-tk-1.c.esnet-perfsonar.internal – ps-dev-staging-el9-tk-1.c.esnet-perfsonar.internal –		bs-dev-staging-el2-tk-1:c:esnet-bert/sonar.internal = bs-dev-staging-el3-tk-1:c:esnet-bert/sonar.internal = bs-dev-staging-el3-tk-1:c:esnet-bert/sonar.internal = bs-dev-staging-el9-tk-1:c:esnet-bert/sonar.internal = bs-dev-staging-el3-tk-1:c:esnet-bert/sonar.internal = bs-dev-staging-el3-tk-1:c:esnet-bert/sonar.in
19	🗟 ESnet	



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#### **New UI: Customization**





#### psarchive troubleshoot

[root@ps-dev-staging-el9-tk1 andy]# psarchive troubleshoot OpenSearch running ..... OK Logstash running ..... OK OpenSearch API (Localhost) ..... OK Logstash Endpoint (Localhost) ..... OK OpenSearch API (HTTPS Proxy) ..... OK Logstash Proxy Credentials ..... OK Logstash Endpoint (HTTPS Proxy) ..... OK Logstash->OpenSearch Credentials ..... OK Logstash->OpenSearch Authentication ..... OK OpenSearch Data Exists ..... OK





#### LS dashboard refreshment

perfS@NAR					
Host Information					
losts Locations		Host name		Communities	
	a start and a	140.182.49.168	11	missing	187
		194.210.1.13	11	10G	10
•		fdc4:f303:9324::3	11	WLCG	1
NORTH AMERICA O		sonda-ipg.netop.fccn.pt	11	Internet2	7
	ASIA	128.171.235.51	10	ATLAS	e
400 82.8		156.110.41.13	10	100G	
Atlantic Ocean	e AFRICA	128.171.242.49	9	LHC	4
Pacific Ocean	Indian	Virtualisation of the nodes		Domains	
SOUTH	Ocean	Physical machine	1975	missing	50
		AUSTRALIA Virtual machine	445	fccn.pt	20
1.2	• •	missing	9	netop.fccn.pt	20
		, i i i i i i i i i i i i i i i i i i i		es.net	
				onenet.net	
				rnp.br	
				wustl.edu	
		and the second se		Wash.cou	
perating System	Operating System Version	i perfSONAR Package Bundle Insta	talled	Toolkit Version	
Ubuntu 394	Operating System Version 7.9.2009 (Core)		talled 1248		66
AlmaLinux 228		perfSONAR Package Bundle Insta		Toolkit Version	
Ubuntu 394 AlmaLinux 228 Rocky Linux 130	7.9.2009 (Core)	perfSONAR Package Bundle Insta 1295 perfsonar-toolkit	1248	Toolkit Version 5.0.8-1.el7	64
Ubuntu 394 AlmaLinux 228 Rocky Linux 130 Debian 76 Red Hat Enterprise Linux 54	7.9.2009 (Core) 22.04	1295 perfsonar-toolkit 223 perfsonar-teopint	1248 987	Toolkit Version 5.0.8-1.el7 5.1.3-1.el9	6 3. 2
Ubuntu 394 AlmaLinux 228 Rocky Linux 130 Debian 76 Red Hat Enterprise Linux 19	7.9.2009 (Core) 22.04 9.4 (Seafoam Ocelot)	1295     perfSONAR Package Bundle Instruction       1295     perfsonar-toolkit       223     perfsonar-testpoint       221     perfsonar-core	1248 987 99	Toolkit Version 5.0.8-1.el7 5.1.3-1.el9 5.1.3	6 3 2 2
Ubuntu 394 AlmaLinux 228 Rocky Linux 130 Debian 76 Red Hat Enterprise Linux 54	7.9.2009 (Core) 22.04 9.4 (Seafoam Ocelot) 9.4 (Blue Onyx)	perfSONAR Package Bundle Insta       1295     perfsonar-toolkit       223     perfsonar-testpoint       221     perfsonar-core       122     perfsonar-core       122     perfsonar-core	1248 987 99 48	Toolkit Version           5.0.8-1.el7           5.1.3-1.el9           5.1.3           5.0.2-1.el7	61

<sup>22</sup> https://stats.perfsonar.net/





# • The Future of perfSONAR







# perfSONAR 5.2.0 (Q4 2024)

- More of a medium feature/technical debt update
- Ubuntu 24 support
- Some additional features for dashboard generation requested by LHC
- Summary: Features too big for bugfix release, but we want to get in the wild sooner rather than later

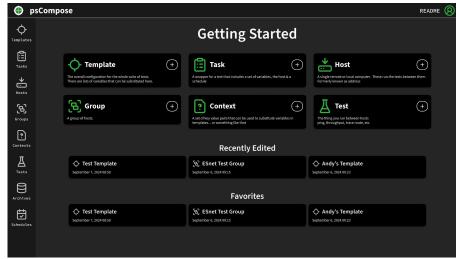


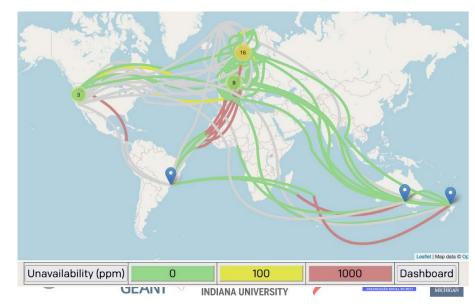


# perfSONAR 5.3.0 (Q2 2025)

- **psCompose**: Improving test configuration experience
- On-demand measurement UI
- Lookup service enhancements
- Micro-dependency analysis
- Exploring PTP support

perfS@NAR				
Host Information				
losts Locations	: Host name		Communities	
	194.210.1.11	14	missing	190
	sonda-ipca.netop.fccn.pt	14	10G	1
	172.58.0.1	13	Internet2	1
NORTH ERGE	128.171.235.51	12	WLCG	
	128.252.182.229	10	ATLAS	
	194.210.1.28	10	100G	
Atlantic Ocean AFRICA	128.252.182.225	9	LHC	
acific Scean	Virtualisation of the nodes		Domains	
SOUTH AMERICA	Physical machine	1998	missing	49
	Virtual machine	466	fccn.pt	2:
· · · · · · · · · · · · · · · · · · ·	missing	9	netop.fccn.pt	2
			es.net	
			onenet.net	
			wustl.edu	







#### What comes next?

#### **Operational analysis and alarming**

- Leverage features of current technology stack
- Better orchestration of debugging process
- Integration with existing data, processes and projects (e.g. MetrANOVA)
  Explore possibilities in AlOps for identifying relevant measurements
- Training the community on the new generation of perfSONAR
  - Refresh videos
  - Continue workshops
  - Can we leverage ML/NLP to better support user questions?
- Continue to invest in software reliability and sustainability
   Continue to automate build and test processes
   Eliminate single points of failure within the project







#### **Upcoming Events**

- November 8th: perfSONAR Office Hours @ Cl Lunch&Learn Zoom
   2:00 p.m. ET / 8 p.m. CET, https://esnet.zoom.us/j/804696793
- December 9th: perfSONAR Workshop @ Internet2's TechEx24 https://events.internet2.edu/website/69276/home/







### **Useful Resources**

- Central Archive with Grafana Cookbook <u>https://docs.perfsonar.net/cookbook\_central\_archive.html</u>
- Grafana perfSONAR Dashboard Cookbook <u>https://docs.perfsonar.net/grafana\_cookbook.html</u>





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