



Networking & perfSONAR Task 2.4

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CERN

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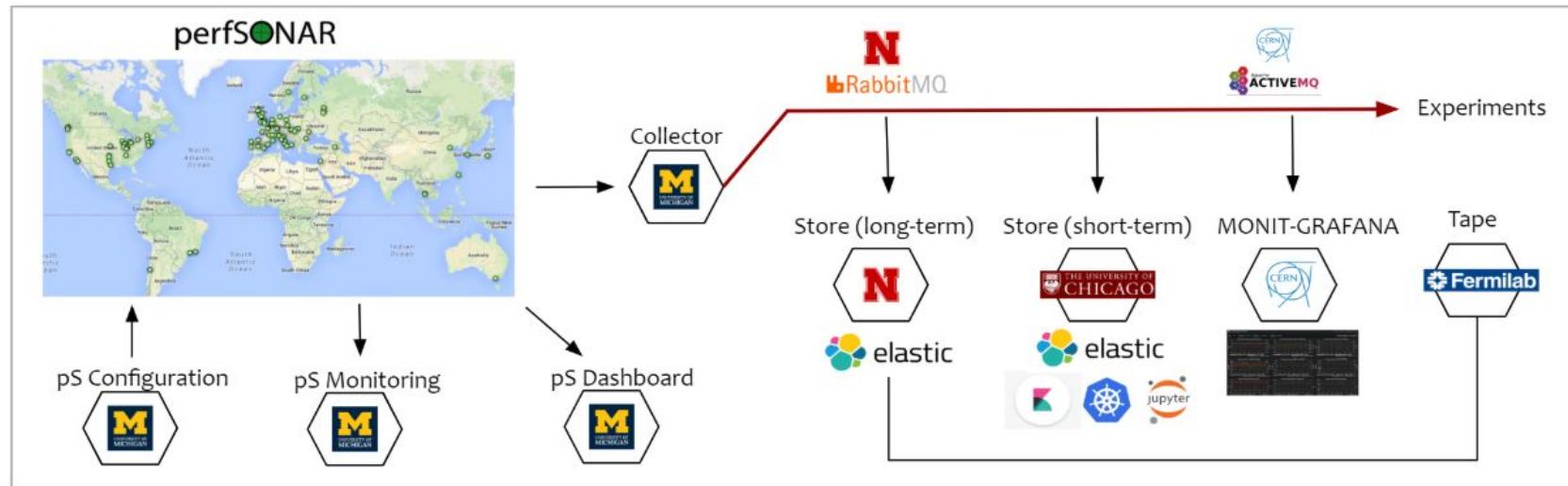
Overview

- The perfSONAR system
- Datalake perfSONAR status
- Configuration tools
- Monitoring tools
- Future work
- References



The perfSONAR system

- perfSONAR is a collection of open source software for performing and sharing end-to-end network measurements
- It consists of multiple tools brought together (iperf, ping, traceroute, nuttcp, owping, and other..)
- WLCG and OSG (Open Science Grid) jointly operate a network of perfSONAR agents deployed world-wide, which provides an open platform that can be used to baseline network performance and debug any potential issues



Datalake perfSONAR status

Institute	Technology	Version	Quota	XROOT	HTTPS	GSIFTP	ESCAPE VO enabled (X509)	Token based auth/z	perfSONAR Enabled	perfSONAR Hosts (bandwidth & latency)	
CERN	EOS	?	?	YES	YES	YES	WiP	NO	YES	psb01-gva.cern.ch psl01-gva.cern.ch	
LAPP	DPM (DOME)	1.13.1	?	YES	YES	YES	WiP	?	YES	lapp-ps01.in2p3.fr lapp-ps02.in2p3.fr	
SURFsara	dCache	?	?	YES	YES	YES	YES	?	YES	perfsonar-bandwidth.grid.surfsara.nl perfsonar-latency.grid.surfsara.nl	
LAPP	dCache	?	?	NO	YES (http)	NO	YES	?	YES	lapp-ps01.in2p3.fr lapp-ps02.in2p3.fr	
GSI	xRootD	?	?	?	?	?	?	?	NO	?	?
INFN-CNAF	StoRM	?	?	NO	YES	NO	YES	YES	YES	perfsonar-ps.cnaf.infn.it perfsonar-ow.cnaf.infn.it	
INFN-ROMA1	DPM	?	?	WiP	WiP	WiP	WiP	?	YES	perfsonar1.roma1.infn.it perfsonar2.roma1.infn.it	
DESY	dCache	?	?	YES	YES	YES	YES	?	YES	perfsonar-ps-04.desy.de perfsonar-ps-03.desy.de	
CC-IN2P3	dCache	?	60 TB	YES	YES	YES	YES	?	YES	cpperfsonar1.in2p3.fr cpperfsonar2.in2p3.fr	
PIC	dCache	?	?	YES	YES	?	YES	?	YES	psb01.pic.es psl01.pic.es	



perfSONAR - Central Configuration (Hosts)

- Some **hosts** are dedicated for latency testing and others for bandwidth testing

HOSTS
List of all toolkit hosts on configured sLS
2240 Hosts

Filter

	psfrascati01.infn.it	(BWCTL Measurement Point at infn.it)
	ps-development.bnl.gov	(BWCTL Server at bnl.gov)
	psnode2.it.chula.ac.th	(BWCTL Server at chula.ac.th)
	en-is-compute26.coecis.cornell.edu	(BWCTL Server at coecis.cornell.edu)
	psifca02.ifca.es	(BWCTL Server at ifca.es)
	ps02.ncg.ingrid.pt	(BWCTL Server at ingrid.pt)
	2a04:a181:0:1::9	(BWCTL Server at int:soundmouse.net)
	ps-600dc-agg1-test.jpl.nasa.gov	(BWCTL Server at jpl.nasa.gov)
	speedtest4.net.siu.edu	(BWCTL Server at net.siu.edu)
	perfsonar.ornl.gov	(BWCTL Server at ornl.gov)
	perfsonar2.pi.infn.it	(BWCTL Server at pi.infn.it)
	hongkong-nms-1.ps.jgn-x.jp	(BWCTL Server at ps.jgn-x.jp)
	bw-test-1	(BW)

New host

HOSTS
List of all toolkit hosts on configured sLS
2240 Hosts

Filter

Hostname *

Datasource

Information about this host came from above sLS URL.

The host information has not been received for more than 7 days. Last update was 7 months ago

BASIC INFORMATION

Site Name *
Comes from the lookup service (or guessed if it's not set)

Host Description
Host description is used by maddash for host labels. If not set, Site Name will be used instead

toolkit_url
For graphical displays that wish to provide a link to more information about this host (such as MadDash)

No Agent
If checked, this host will not read the mesh config. This is significant because it means these test to are responsible for initiating tests in both directions and storing the results. If un-checked, it means other testers can assume this host is reading the mesh and will initiate its portion of the tests accordingly.

MEASUREMENT ARCHIVE (MA) SETTINGS

You can configure whether to store test results in the host's local MA, as well as additional MAs to store results for all tests involving this host.

Use local MA
If checked, test results for all tests involving this host will be written to the host's local MA. Not all hosts run their own MA, so in some cases this may not be desired (disabled by default).

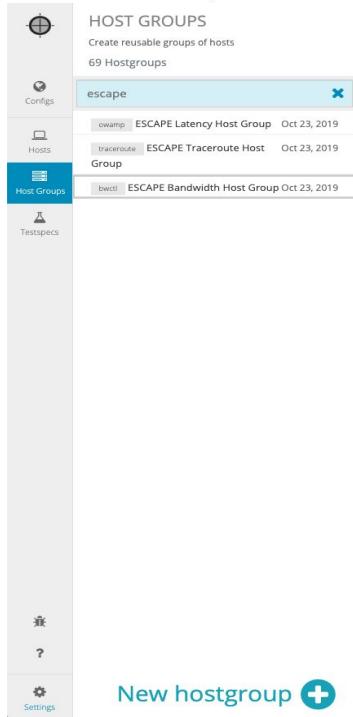
Local MA URL
Allows you to override the local MA URL for this host, in case you need https instead of http, alternative ports, etc.

Additional MA URLs
Providing additional MA URLs (one per line) will allow you to send test results for all tests involving this host to additional MAs.



perfSONAR - Central Configuration (Hostgroups)

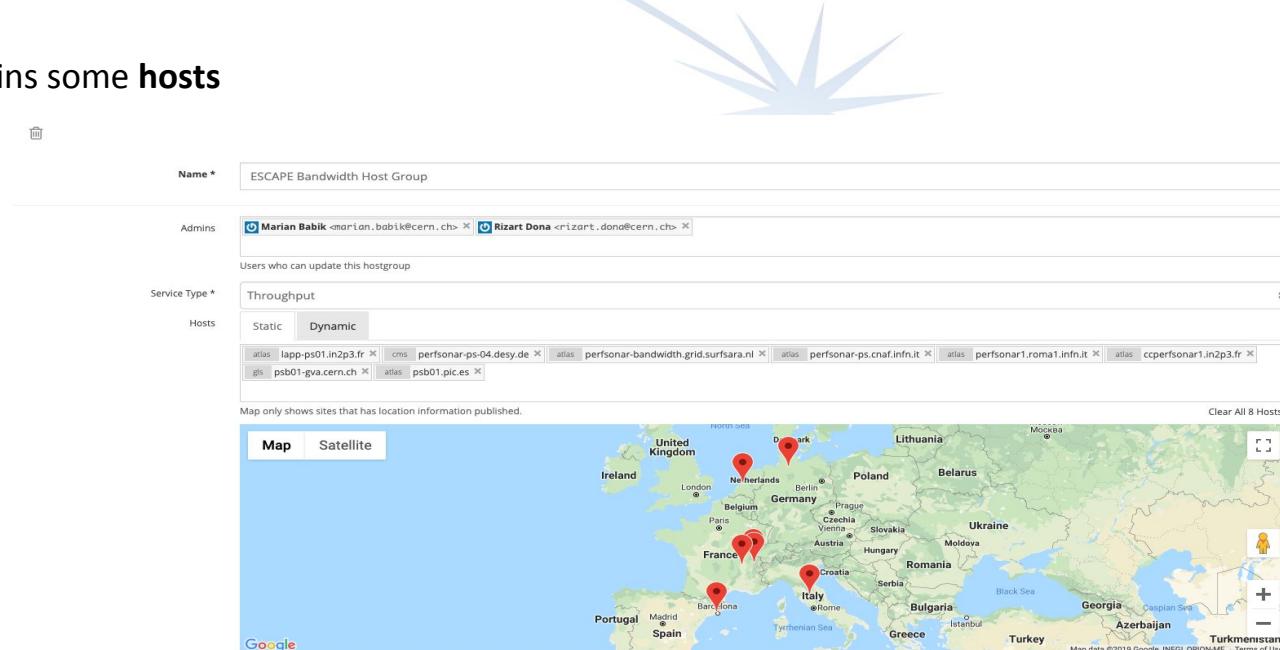
- Each **hostgroup** contains some **hosts**



The screenshot shows the 'HOST GROUPS' section of the perfSONAR interface. It includes a sidebar with icons for Configs, Hosts, Host Groups (selected), and Testspeccs. A 'New hostgroup' button with a plus sign is at the bottom.

HOST GROUPS
Create reusable groups of hosts
69 Hostgroups

Group	Description	Date
escape	ESCAPE Latency Host Group	Oct 23, 2019
traceroute	ESCAPE Traceroute Host	Oct 23, 2019
bwctrl	ESCAPE Bandwidth Host Group	Oct 23, 2019



The screenshot shows the 'Create New Hostgroup' form. It includes fields for Name (set to 'ESCAPE Bandwidth Host Group'), Admins (Marian Babik and Rizart Dona), Users who update this hostgroup, Service Type (set to 'Throughput'), and Hosts (with tabs for Static and Dynamic). The Dynamic tab lists several host entries. Below the form is a map of Europe showing the locations of the hosts.

Name *: ESCAPE Bandwidth Host Group

Admins: Marian Babik <marian.babik@cern.ch> X, Rizart Dona <rizart.dona@cern.ch> X

Users who update this hostgroup:

Service Type *: Throughput

Hosts: Static, Dynamic

Dynamic Hosts:

- alias lapp-ps01.in2p3.fr X
- alias perfsonar-ps-04.desy.de X
- alias perfsonar-bandwidth.grid.surfsara.nl X
- alias perfsonar-ps.cnaf.infn.it X
- alias perfsonar1.roma1.infn.it X
- alias ccperfsonar1.in2p3.fr X
- alias psb01-gva.cern.ch X
- alias psb01.pic.es X

Map only shows sites that has location information published. Clear All 8 Hosts

Map | Satellite

Google

Map data ©2019 Google, INEGI, ORION-ME Terms of Use



perfSONAR - Central Configuration (Mesh)

- Each **mesh** configuration can have different **tests** (latency, traceroute, throughput, ping)
- Each **test** is connected with a **hostgroup**

CONFIGS
Showing registered configs
21 Configs

UK	UK Mesh Config	May 15, 2017
LHCONE-all	LHCONE Mesh Config	May 15, 2017
WLCG-cms-latency	WLCG CMS Latency	May 15, 2017
Mesh Config		
/open-all	OPN Mesh Config	May 15, 2017
WLCG-cms-bandwidth	WLCG CMS Bandwidth	May 15, 2017
Bandwidth Mesh Config		
WLCG-atlas-latency	WLCG ATLAS Latency	May 15, 2017
Mesh Config		
WLCG-atlas-bandwidth	WLCG ATLAS Bandwidth	May 15, 2017
Bandwidth Mesh Config		
/BelleII	Belle II Mesh Config	May 15, 2017
/global	Global Mesh Config	May 15, 2017
/RR	RR Mesh Config	Sep 21, 2018
/alice	ALICE	Jul 17, 2019
Nautilus	Nautilus	Jul 22, 2019
#nscloud_exoscale	HNSciCloud ExoScale	Nov 7, 2017
#nscloud_ottc	HNSciCloud OTC	Nov 9, 2017
/lhcb	LHCb Mesh Config	Dec 7, 2018
Escape	ESCAPE Mesh Config	Oct 23, 2019

New config +
Un-licensed: ONLY LOCAL TESTING Apr 20, 2019

AUTO CONFIG
Enter hostname of perfSONAR node to generate a Config URL containing tests for that instance as test endpoints.
Enter hostname

Config URL: <http://psconfig.opensciencegrid.org/pub/config/> escape

Tests

Test Name	<input checked="" type="checkbox"/> Enabled (include in mesh config) ESCAPE Latency	<input type="button" value="Remove Test"/>
Service Type	Latency	Topology Mesh
<input type="radio"/> Map <input type="radio"/> Satellite		
		
Google Map data ©2019 Google, INEGI, ORDN-NE Terms of Use		
Host Group A	ESCAPE Latency Host Group (8 Hosts)	
No Agent Hosts (Optional)	Enter Hostnames	
Defines an address that will not initiate tests when used in this group. This will override the no_agent field specified in the host directive if defined. It is recommended you use the host directive to define this if a address cannot initiate tests for any group. Only use this form if you want a host to initiate tests when used in some groups but not others.		
Testspec	WLCG-OSG Latency	
<input type="button" value="tool: ping"/> <input type="button" value="bucket_width: 0.001"/> <input type="button" value="sample_count: 600"/> <input type="button" value="packet_interval: 0.1"/>		
Test Name	<input checked="" type="checkbox"/> Enabled (include in mesh config) ESCAPE Traceroute	<input type="button" value="Remove Test"/>
Service Type	Traceroute	Topology Mesh
<input type="radio"/> Map <input type="radio"/> Satellite		
		



Monitoring - Check_MK (Infrastructure Monitoring)

- A portal to check individual perfSONAR boxes and the status of their services

state	Host	Icons	OK	Wa	Un	Cr	Pd
UP	perfsonar2.roma1.infn.it		2	0	8	4	0
UP	cmsrm-perfsonar1.roma1.infn.it		13	0	2	1	0
UP	ccperfsonar1.in2p3.fr		14	1	0	0	0
UP	ccperfsonar2.in2p3.fr		14	0	0	0	0
UP	lapp-ps01.in2p3.fr		14	1	0	0	0
UP	lapp-ps02.in2p3.fr		13	1	0	0	0
UP	perfsonar1.roma1.infn.it		14	1	0	0	0
UP	perfsonar-bandwidth.grid.surfsara.nl		14	1	0	0	0
UP	perfsonar-latency.grid.surfsara.nl		13	1	0	0	0
UP	perfsonar-ow.cnaf.infn.it		13	1	0	0	0
UP	perfsonar-ps-03.desy.de		14	0	0	0	0
UP	perfsonar-ps-04.desy.de		15	0	0	0	0
UP	perfsonar-ps.cnaf.infn.it		14	1	0	0	0
UP	psb01-gva.cern.ch		14	1	0	0	0
UP	psb01.pic.es		13	2	0	0	0
UP	psl01-gva.cern.ch		13	1	0	0	0
UP	psl01.pic.es		13	1	0	0	0

psb01-gva.cern.ch						
State	Service	Icons	Status detail			
OK	perfSONAR configuration: contacts		OK - Contact and organization found			2019-11-15 10:35:23
OK	perfSONAR configuration: location		OK - Location: 6.0457234/46.2324045			2019-11-15 10:35:23
OK	perfSONAR configuration: meshes		OK - Auto-URL configured correctly			2019-11-15 10:35:23
WARN	perfSONAR esmond freshness: bwctl		WARNING - esmond 63.25 % complete for event type: throughput			35 h
OK	perfSONAR esmond freshness: trace		OK - esmond 97.93 % complete for event type: packet-trace			43 h
OK	perfSONAR hardware check		OK - CPU:2/16cores/3000.0000Mhz RAM:126GB NIC:40Gbps/1500MTU/IPv6 enabled			2019-11-15 10:35:23
OK	perfSONAR json summary		OK - Toolkit metadata successfully retrieved			59 m
OK	perfSONAR services: bwctl		connect to address psb01-gva.cern.ch and port 4823: Connection refused			2019-11-15 10:40:19
OK	perfSONAR services: http/https		OK - Toolkit homepage reachable			59 m
OK	perfSONAR services: ndt/npad disabled		OK - NDT/NPAD disabled			2019-11-15 10:35:23
OK	perfSONAR services: ntp		OK - NTP synchronized			59 m
OK	perfSONAR services: pscheduler		OK - pscheduler stats retrieved			2019-11-15 10:15:17
OK	perfSONAR services: regular testing/pscheduler		OK - pscheduler is enabled and running			59 m
OK	perfSONAR services: versions		OK - Toolkit version found: 4.2.2-1.el7			2019-11-15 10:35:23
OK	perfSONAR services: web/https IPv6		TCP OK - 0.111 second response time on psb01-gva.cern.ch port 443			2019-11-15 10:20:25



Monitoring - MaDDash

- The Monitoring and Debugging Dashboard (MaDDash) software is aimed at collecting and presenting two-dimensional monitoring data as a set of grids referred to as a dashboard.

ESCAPE Mesh Config - ESCAPE IPv4 Bandwidth - Throughput

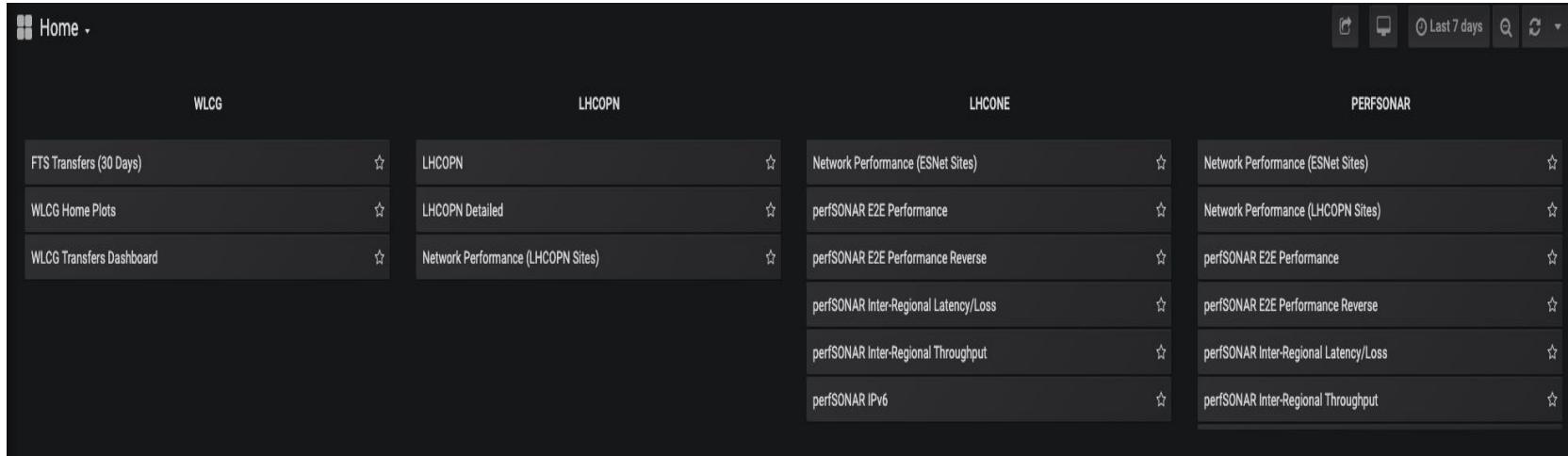


ESCAPE Mesh Config - ESCAPE Latency - Loss



Monitoring - Monit Grafana (I)

- CERN Monit Grafana instance to visualize network statistics concerning LHCOPN, LHCONE and perfSONAR sites that participate in the OSG (Open Science Grid)
- Already provides some statistics for datalake hosts



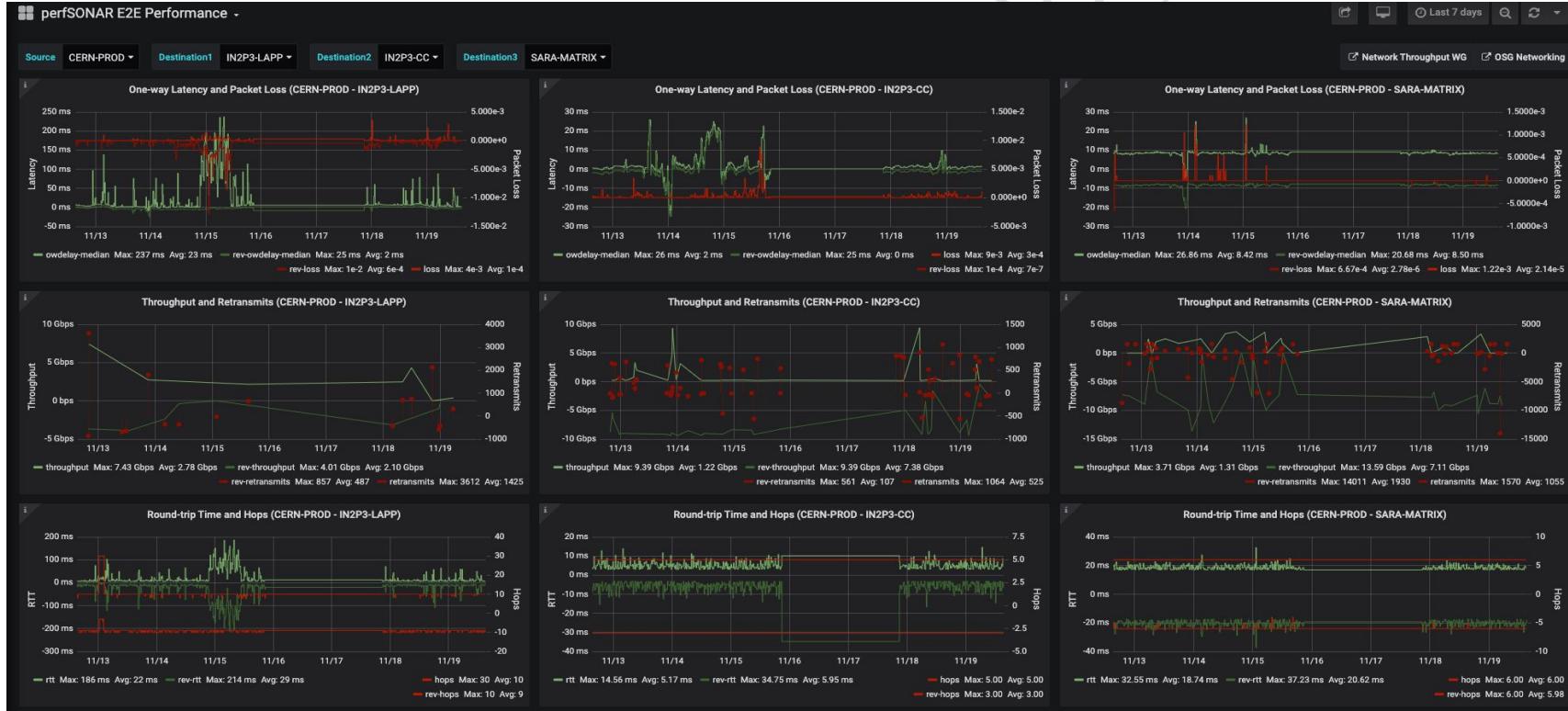
The screenshot shows a dark-themed Grafana dashboard with four main panels:

- WLCG:** Contains three cards: "FTS Transfers (30 Days)", "WLCG Home Plots", and "WLCG Transfers Dashboard".
- LHCOPN:** Contains three cards: "LHCOPN", "LHCOPN Detailed", and "Network Performance (LHCOPN Sites)".
- LHCONE:** Contains five cards: "Network Performance (ESNet Sites)", "perfSONAR E2E Performance", "perfSONAR E2E Performance Reverse", "perfSONAR Inter-Regional Latency/Loss", "perfSONAR Inter-Regional Throughput", and "perfSONAR IPv6".
- PERFSOAR:** Contains six cards: "Network Performance (ESNet Sites)", "Network Performance (LHCOPN Sites)", "perfSONAR E2E Performance", "perfSONAR E2E Performance Reverse", "perfSONAR Inter-Regional Latency/Loss", and "perfSONAR Inter-Regional Throughput".

At the top right of the dashboard, there are several interface icons: a refresh button, a search bar, a time range selector set to "Last 7 days", and other navigation controls.



Monitoring - Monit Grafana (II)



Future Work

- Datalake sites need to confirm that the current perfSONAR hosts are correct
 - See Datalake status
- Remaining datalake sites need to setup the perfSONAR hosts in order to join the ESCAPE mesh tests (GSI, etc..)
- Grant admin access to relevant parties in the perfSONAR Central Configuration platform for the ESCAPE mesh configuration
 - SKA & GSI
- Aggregated real time visualization of network monitoring data
 - We need to specify what and how will be visualized



References (I)

- perfSONAR (<https://docs.perfsonar.net/index.html>)
- perfSONAR Web Admin (<https://psconfig.opensciencegrid.org>)
- Open Science Grid Netowking (<https://opensciencegrid.org/networking/>)
- HEPiX Fall 2019 OSG/WLCG Networking Update
(<https://docs.google.com/presentation/d/1DnpVpwuOyx464nmtvdIQoxreT7-qCqGERkuu7PQ9F20/edit#slide=id.p>)
- LHCONE Wiki (<https://twiki.cern.ch/twiki/bin/view/LHCONE/WebHome>)
- LHCOPN Wiki (<https://twiki.cern.ch/twiki/bin/view/LHCOPN/WebHome>)
- CHECK_MK Monitoring (https://psetf.aglt2.org/etf/check_mk/index.py)
- Grafana Network Monitoring (<http://monit-grafana-open.cern.ch>)



References (II)

- ESCAPE Datalake status (https://wiki.escape2020.de/index.php/WP2 - DIOS#Datalake_Status)
- ESCAPE Hosts MadDash Monitoring
(<http://maddash.aglt2.org/maddash-webui/index.cgi?dashboard=ESCAPE%20Mesh%20Config>)
- ESCAPE Hosts CHECK_MK Monitoring
(https://psetf.aglt2.org/etf/check_mk/view.py?hostgroup=ESCAPE&opthost_group=ESCAPE&view_name=hostgroup)

