

International Networks at IU

perfSONAR use and trainings abroad

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Overview

- NEAAR collaboration with GÉANT, in a cooperative partnership with the African regional RENs:
 - UbuntuNet Alliance
 - Arab States Research and Education Network (ASREN)
 - West and Central African Research and Education Network (WACREN)
 - the South African National Research Network (SANReN)
 - the Kenya Education Network (KENET)
 - And domestically, in the US, with Internet2 and ESnet
- TransPAC a collaboration composed of a cooperative partnership with the Asia Pacific Advanced Network (<u>APAN</u>), <u>GEANT</u>, and <u>Internet2</u>
- Meshbuilder Workshops
- perfSONAR small node support





What we do?

- Creating User-friendly Quicksheets/Cookbooks for common tasks and troubleshooting based on user experiences
- Meshbuilder Workshops
 - MaDDash Quicksheet
 - pS configuration Quicksheet
 - MaDDash Thresholds Quicksheet
 - Etc...
- Troubleshooting in Support of deployed partner MaDDashi
 - Continued communication and coordination after workshops to assist in deployment and growth







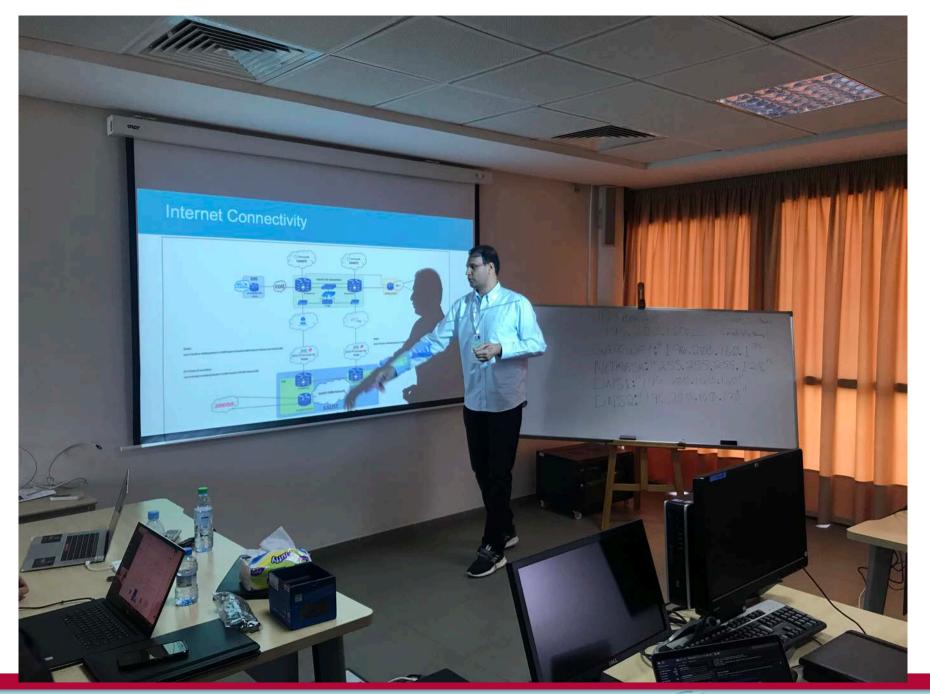






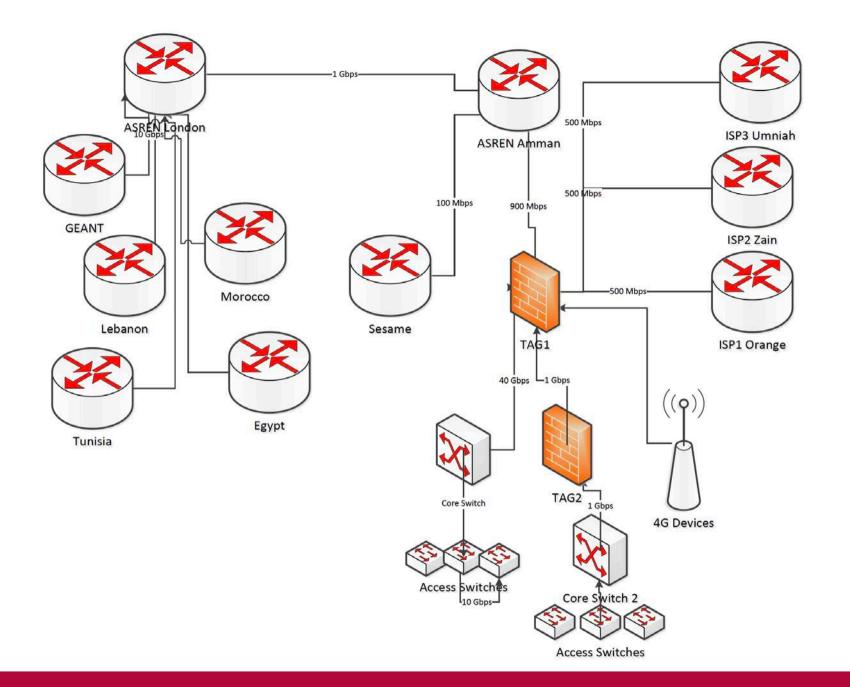












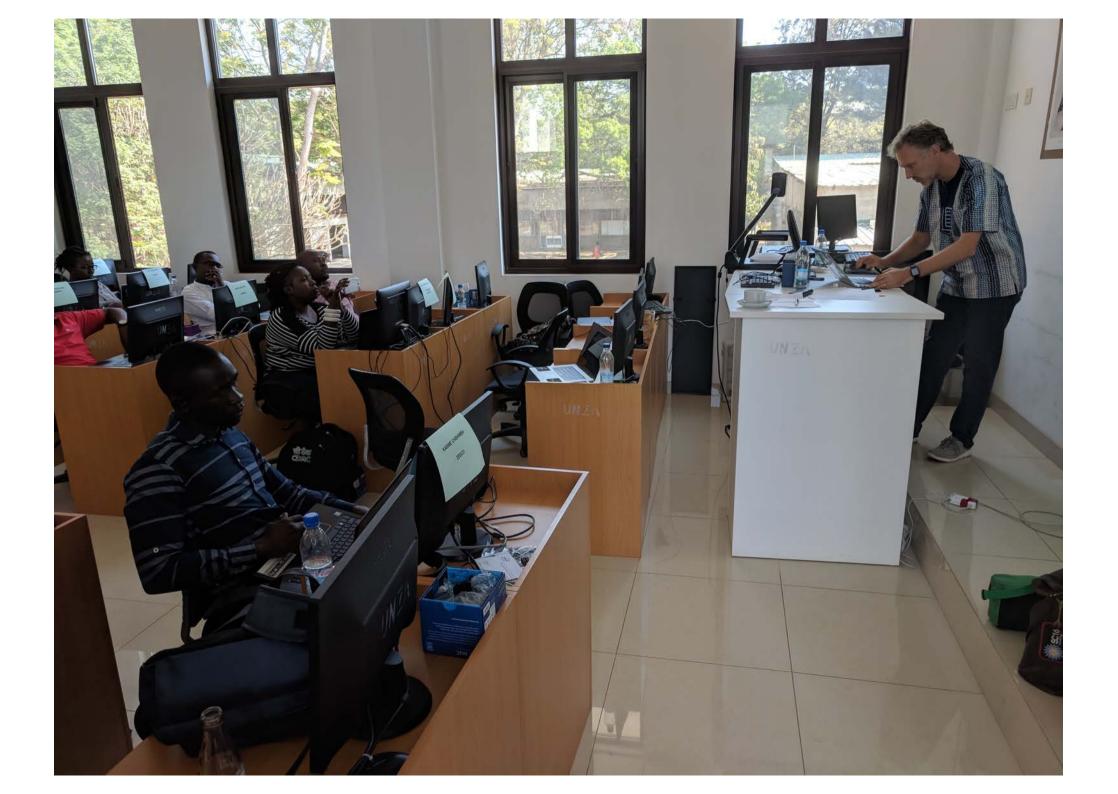








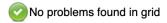












ESnet MaDDash

- Beautiful example of a 100GE backbone network
- Extremely fine-tuned
- Serves as a good example of a well maintained MaDDash running on a clean network
- Visual tool for showing issues immediately which will be addressed very quickly through alerting

	albq-owamp.es.net	ameslab-owamp.es.net	anl-owamp.es.net	aofa-owamp.es.net	atla-owamp.es.net	bois-owamp.es.net	bost-owamp.es.net	chic-owamp.es.net	denv-owamp.es.net	east-dc-owamp.es.net	elpa-owamp.es.net	fnal-owamp.es.net	ga-owamp.es.net	hous-owamp.es.net	kans-owamp.es.net	lbl-owamp.es.net	llnl-owamp.es.net	lsvn-owamp.es.net	nash-owamp.es.net	nersc-owamp.es.net	newy-owamp.es.net	ornl-owamp.es.net	pnwg-owamp.es.net	pppl-owamp.es.net	sacr-owamp.es.net	slac-owamp.es.net	snll-owamp.es.net	star-owamp.es.net	sunn-owamp.es.net	test-pt1.es.net	wash-owamp.es.net
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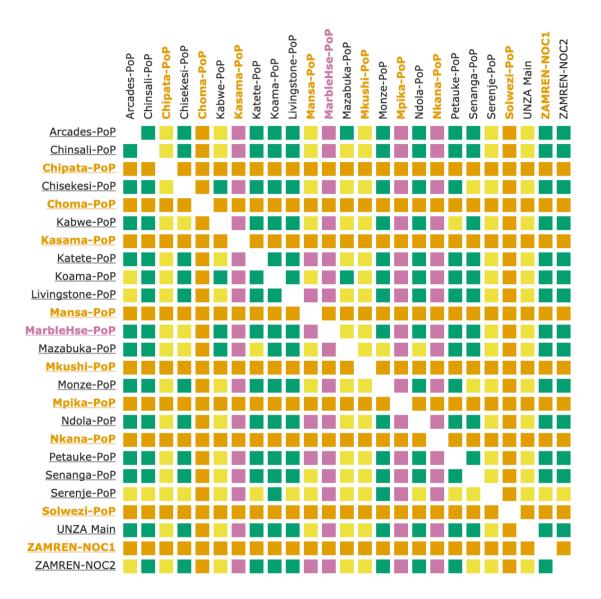




Found a total of 10 problems involving 10 hosts in the grid

ZAMREN MaDDash.

- Setup in the Fall of 2018
- Still being deployed in a couple of places
- Serves as a good example of use commodity/NREN challenges on the African continent
- Less a tool for fine tuning a perfectly deployed and uncluttered western Backbone
- More a tool for expectation management and for holding providers accountable







Where we've been?







NEAAR Workshops

- ASREN perfSONAR Workshop April. 2019 (4-day) Rabat, Morocco
- TERNET perfSONAR Workshop Feb. 2019 (4-day) Dar es Salaam, Tanzania
- ZAMREN perfSONAR Workshop Sep. 2018 (4-day) Lusaka, Zambia
- <u>AfriNIC / AIS 18 Conference Internet Measurements and Research in</u> <u>Africa Workshop - May 2018 (1-day)</u> - Dakar, Senegal
- WACREN Conference Oct. 2017 (4-day) Accra, Ghana
- <u>SANREN OIN Workshop May 2017</u> (two 1-day) Cape Town / Pretoria, South Africa
- KENET Training with NSRC Sep. 2015 (4-day) Nairobi, Kenya





TransPAC and Asi@Connect

- In Planning <u>APAN 48 perfSONAR Troubleshooting and Joining the APAN</u> <u>Dashboard – July 2019</u> (1 day) – Putrajaya, Malaysia
- In Planning Asi@Connect Workshop July 2019 (3-day) New Dehli, India
- Asi@Connect Workshop Mar. 2019 (3-day) Loas
- APAN 46 perfSONAR Workshop Aug. 2018 (1 day) Aukland, New Zealand
- APAN 44 perfSONAR Workshop Aug. 2017 (1 day) Dalian, China
- International OIN sponsored by PREGINET Mar. 2017 (2-day) Manilla, Philippines
- APAN 43 perfSONAR Workshop Feb. 2017 (1 day) New Dehli, India
- APAN 42 OIN Workshop Aug. 2016 (2-day) Hong Kong
- <u>APAN 41 perfSONAR Workshop Jan. 2016</u> (half-day) Manilla, Philippines
- APAN 40 perfSONAR Workshop Jan. 2015 (1-day) Kuala Lampur, Malaysia



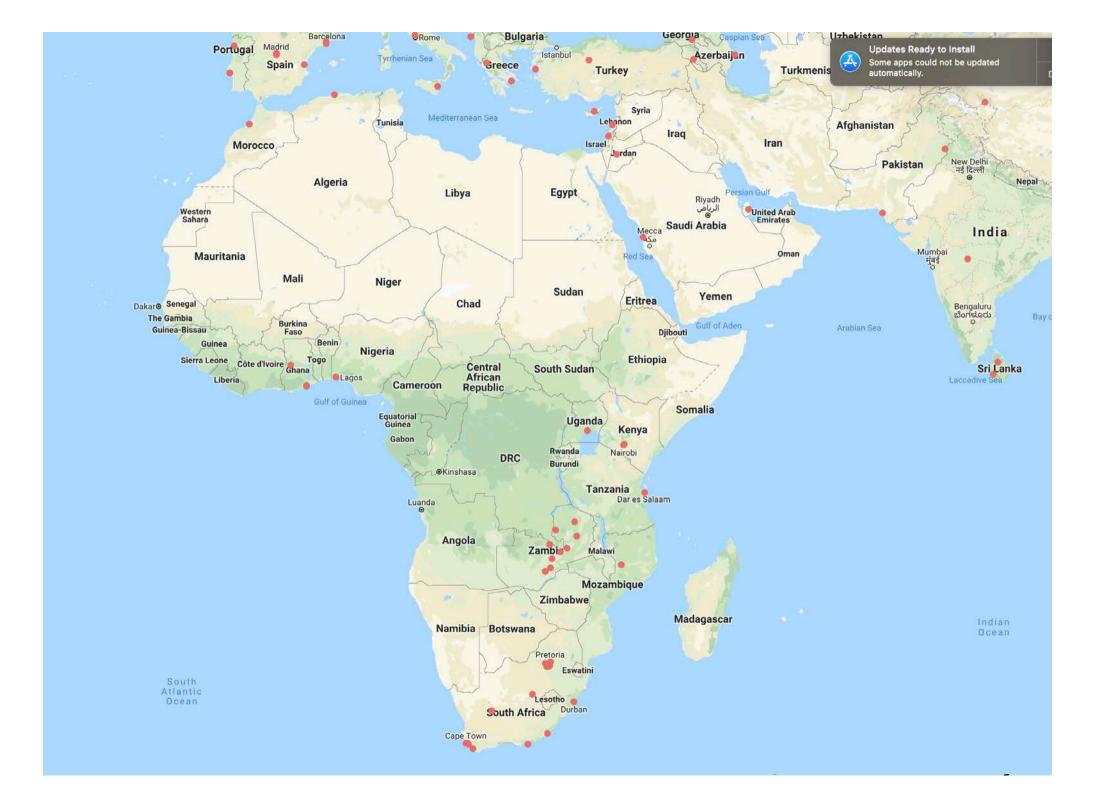


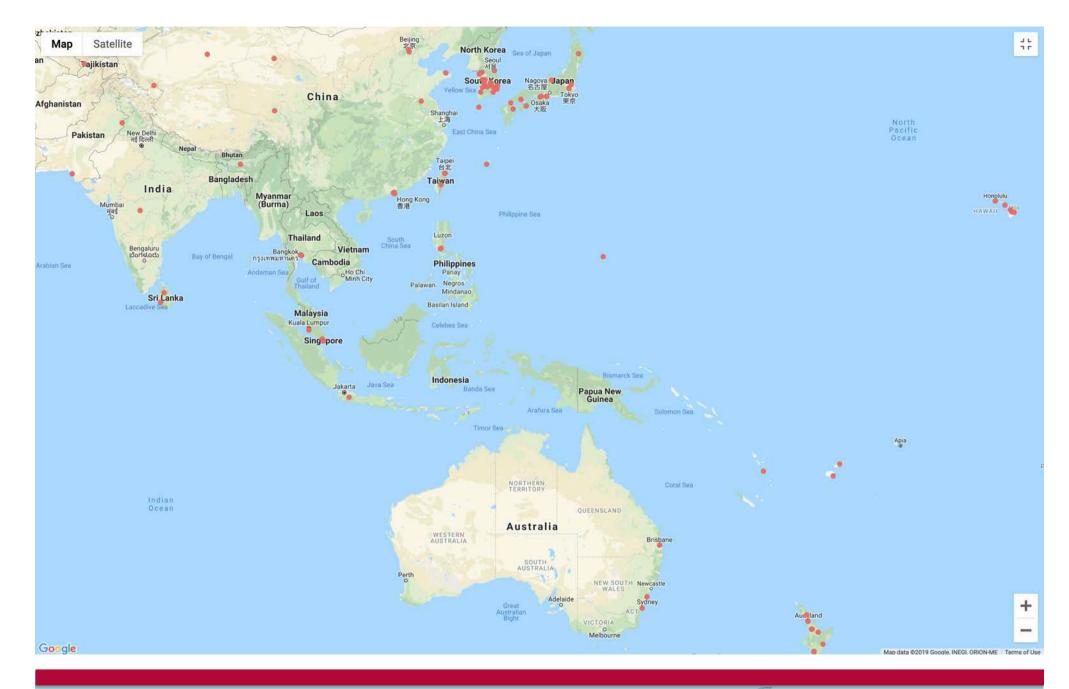
ESnet Lookup Service

Search	Service Informa	tion				
filter results by searching for specific terms: O	Service Name	Addresses	Geographic Location	Communities	Version	Custom
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Next steps in these areas...

- Continue to improve User-friendly documentation
 - Have an experience you would like better documented? Let us know!
- Continue holding trainings for developing NRENs in Africa and Asia
 - Know of an NREN in these areas that is in need of assistance/has reached out to you? Point them our way!







perfSONAR – Small, low-cost Nodes "the Flock"

INTERNATIONAL NETWORKS At Indiana University

Supported by the National Science Foundation





Problem Statement



- Typical rack-mounted servers can cost hundreds, even thousands, per device (dollars, yen, myr)
- Some locations have power or size restrictions
- Want to test at least 1G
- Would like the cost under \$250 per testpoint





Why do we do this?

Report was generated on 2019-06-04 11:37:19.167205 Displaying all values Lookup data for 2186 hosts (239 duplicates found): Ls Count (1): percent count 35,237,255,214:8090 2186 100.0 % Ps Version (51): percent count 4.1.6-1.el7 942 43.09 % 4.0.2.5-1.el6 476 21.77 % 3.5.1.7 79 3.61 % 4.1.5-1.el7 2.79 % 61 57 3.5.1.3 2.61 % 52 2.38 % MonIPE 4.1.3-1.el7 48 2.2 % unknown 41 1.88 % 4.0.2.2 38 1.74 %





Why do we do this?

Bundles (8):

	count	percent
perfsonar-toolkit	1632	74.66 %
perfsonar-testpoint	180	8.23 %
unknown	115	5.26 %
test-point	102	4.67 %
perfsonar-centralmanagement	87	3.98 %
perfsonar-core	60	2.74 %
tools	9	0.41 %
perfsonar-complete	1	0.05 %





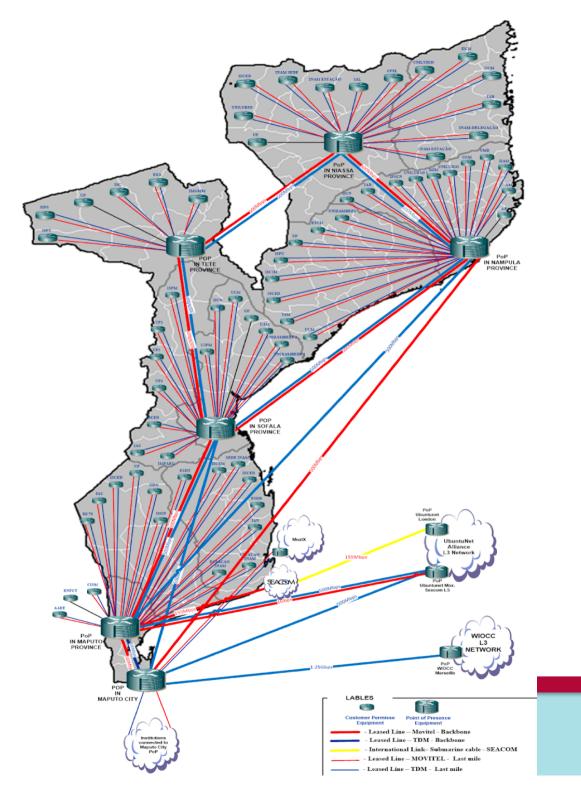
Why do we do this?

Iface Speed (9):

count	percent
1158	42.43 %
1103	40.42 %
329	12.06 %
66	2.42 %
50	1.83 %
16	0.59 %
4	0.15 %
2	0.07 %
1	0.04 %
	1158 1103 329 66 50 16 4







Another Network Map example

- 6 pops around the country
- Each with duplicate connections at 500Mbps
- Exterior connections currently at ~1Gbps via various providers
- Desire to deploy nodes at each member's connection
- Those connections range from 10Mbps-100Mbps



Small, less costly perfSONAR nodes

- Problem statements
 - Limited budgets for perfSONAR deployments
 - Need many boxes for mobile, adhoc test-points
- One possible solution: Low-cost, Small-form Nodes
- Primary Benefits and Use Cases
 - Low-cost nodes for multiple, meshed testpoints
 - Small-form for easy transport as adhoc testers





Possible Solutions – Intel NUC NUC8i3BEH

- Price-point: \$200-350 (all pieces)
- Supported Build: CentOS Toolkit
- 1GE tested
- 2/4/8G memory
- Recommend 32G SSD (Requires mSATA)
- Requires memory, drive, and power cord purchase separately (price at top includes)







Small Node Results – 1GE

Destination Report range

4

1 month

149.165.239.247 149.165.239.246 Sun 05/05/2019 to Wed 06/05/2019 Host info ~ Host info ~ 12:52:55 (GMT+1) 12:52:55 (GMT+1) Tput (TCP) Tput (UDP) Loss (UDP) Loss (one way) Retrans . Latency (one way) Failures 06/03/2019 12:53:54 (GMT+1) Throughput - ipv4 Throughput (ipv4) -> 939.60 Mbits/s (TCP) [iperf3] <- 938.81 Mbits/s (TCP) [iperf3] -> 50.00 Mbits/s (UDP) [iperf3] <- 50.00 Mbits/s (UDP) [iperf3] Loss - ipv4 -> 0% lost (0 of 31800 packets) (one way) [powstream] <- 0% lost (0 of 32400 packets) (one way) [powstream] Packet Loss % (ipv4) > 0% lost (0 of 43160 packets) (UDP) [iperf3] <- 0% lost (0 of 43160 packets) (UDP) [iperf3] -> 0% lost (0 of 120 packets) (rtt) 0.40-<- 0% lost (0 of 120 packets) (rtt) Latency - ipv4 -> 0.17 ms (one way) [powstream] <- -1.1 ms (one way) [powstream Latency ms (ipv4) -> 0.26 ms (rtt) <- 0.21 ms (rtt) Sat 11 Mon 13 Wed 15 Fri 17 May 19 Tue 21 Thu 23 Sat 25 Mon 27 Wed 29 Fri 31 Mon 03 Wed Of June



perfSONAR test results - documentation

Source

ps-lab-1ge-07.in.iu.edu



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Possible Solutions – SuperMicro by Servers Direct

- Price-point: \$900-1200 (all pieces)
- Supported Build: CentOS Toolkit
- Rack-mounted
- 1GE/10GE tested
- Customizable builds







"Small" Node Results – 10GE







IN@IU Lab LAT1 (Cent 7, 4.1

IN@IU Lab LAT2 (Cent 7, 4,1

IN@IU Lab LAT THRPT

IN@IU Lab LAT THRPT 3 (Debian 16, 4.1)

IN@IU Lab LAT THRPT 4 (Debian 18, 4.1)

IN@IU Lab THRPT 1 (Cent 7, 4.1) IN@IU Lab THRPT 2 (Cent 7, 4.1)

IN@IU Lab LAT THRPT 2 ()

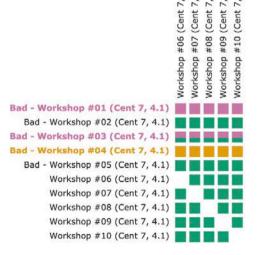
IN@IU TestLab MaDDash

- Setup initially in 2015 as a learning tool for myself
- Continually being rebuilt to • showcase issues for workshop purposes
- Learning example. ullet
- Looking to better utilize built-٠ in options to explain to users what they are seeing for the various builds



4.1)

(Cent 7,







Small Nodes Next Steps

- Continued investigation and testing of new technology/options as they become available
- The new next best small node is out there already
 - the next next best small node is right behind it...





Acknowledgements

- IN@IU is funded by
 - US NSF award #1450904 for TransPAC
 - US NSF award #1638863 for NEAAR
- NEAAR / ANA 100Gbps links
- The TransPAC PacificWave 100gb/s network fabric is provided by Pacific Northwest GigaPop
- Our partners and collaborators in Europe and elsewhere





Questions? Comments?

IN@IU

• https://in.iu.edu

perfSONAR Training Documents

 <u>https://drive.google.com/drive/folders/10Hn9X4WW</u> <u>PA54X6f8N9VaGUe4Ae5K4pDm?usp=sharing</u>



