



perfSonar Analytics

Marian Babik, CERN
Shawn McKee, U Michigan
Petya Vasileva, U Michigan
Ilija Vukotic, U Chicago

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Making Sense of the R&E Networks

170

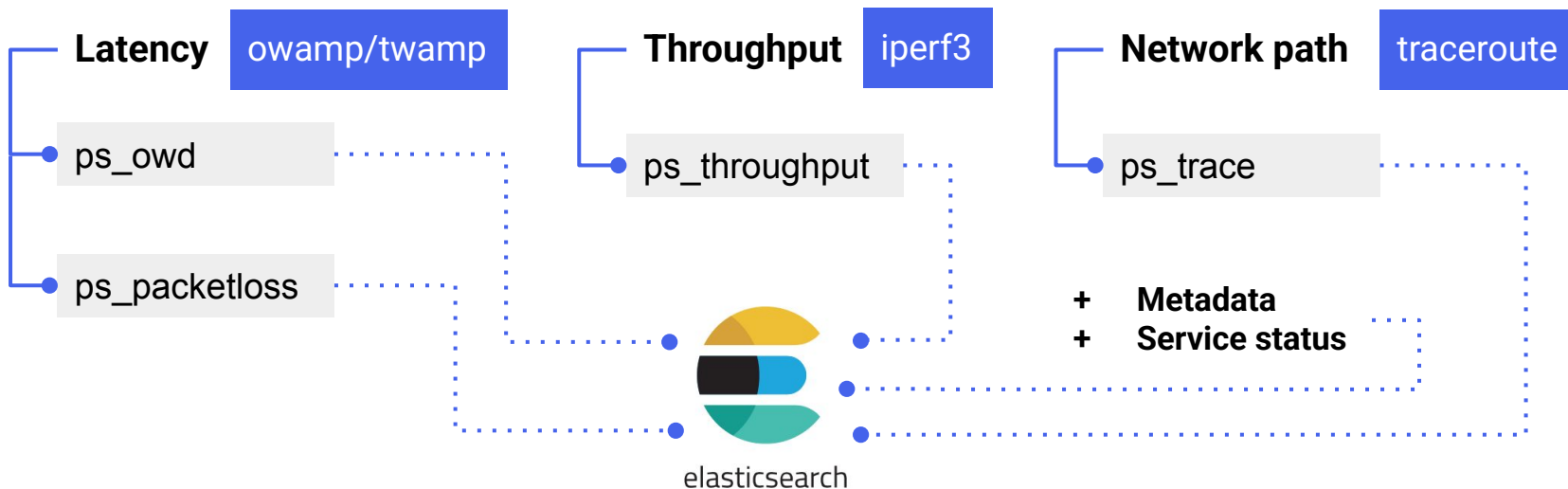
Active perSONARs

The WLCG sites we test



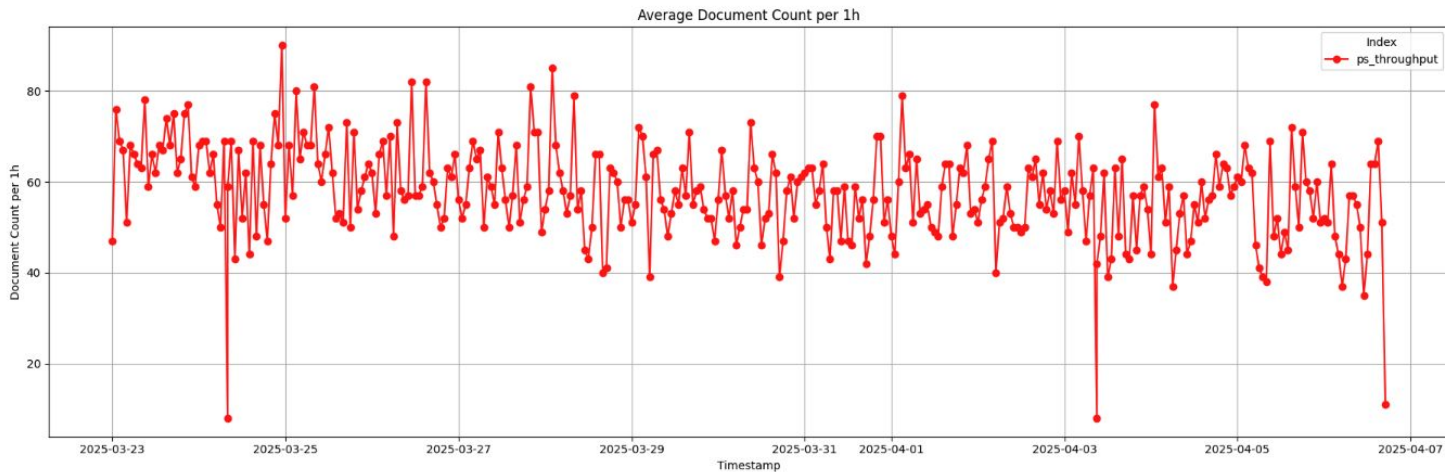
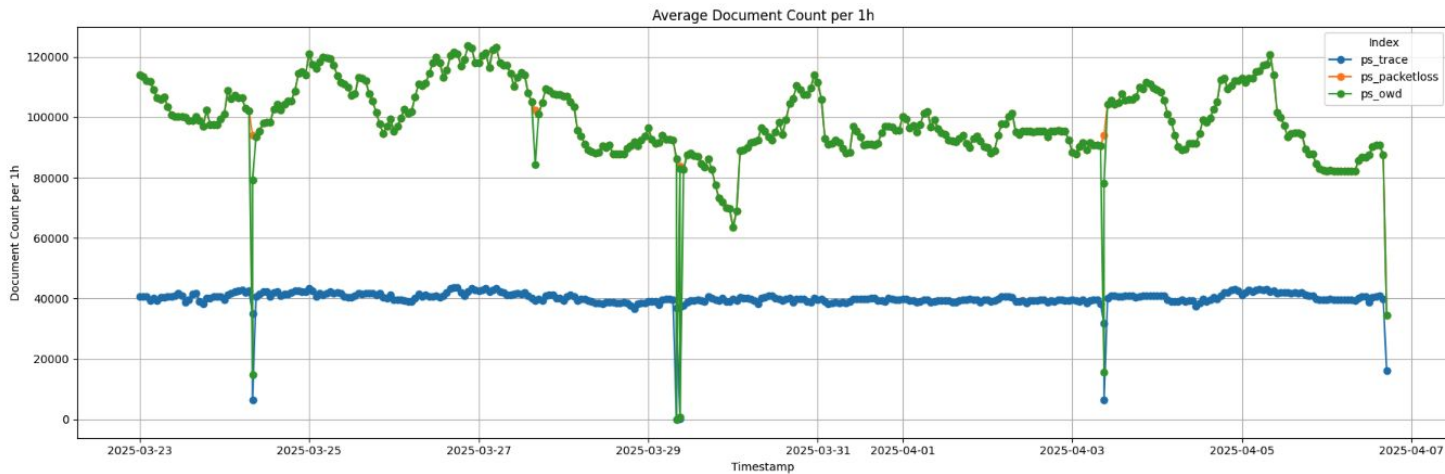
Measurements

All data from the **perfSonar** toolkits is stored in an ElasticSearch database @ UChicago

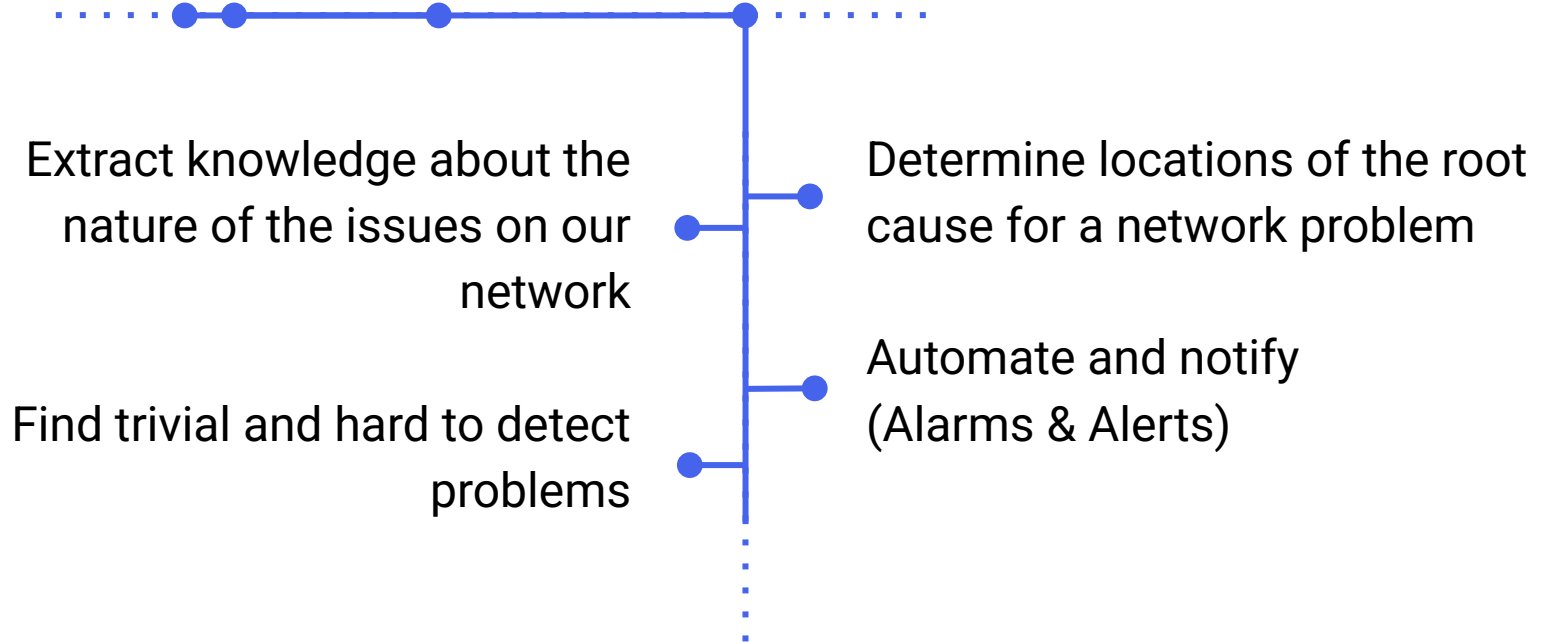


Rate of tests/hour for a period of 14 days

~7000 tested links daily



Goals



The Alarms & Alerts

NETWORK

- destination cannot be reached
- source cannot reach any destination
- bad owd measurements
- large clock correction
- complete packet loss
- firewall issue
- path changed
- ASN path anomalies

INFRASTRUCTURE

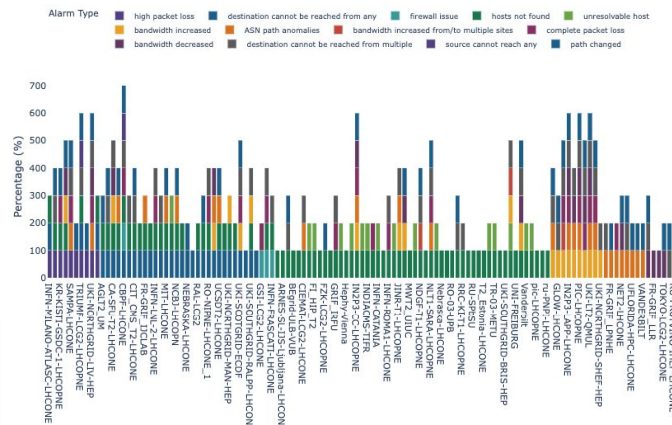
- bandwidth decreased on multiple sites
- path changed between sites
- unresolvable hosts
- no tests for a host

OTHER

- bandwidth increased
- bandwidth decreased (on a single pair)
- high packet loss

pSDash

The Site Status Dashboard - a **visual summary** of network and infrastructure status across multiple sites, helping users quickly identify issues



Status of all sites in the past 48 hours



critical
0



warning
49



ok
48



unknown
8

Highest number of alarms from site

PIC-LHCOPNE (ES): 28

Highest number of alarms from country

United Kingdom: 114

SITE NAME	NETWORK	INFRASTRUCTURE	OTHER	URL
PIC-LHCOPNE	19	4	5	See latest alarms
SAMPA-LHCONE	17	5	1	See latest alarms
IN2P3-CC-LHCOPNE	17	3	1	See latest alarms
FR-GRIF_LPINHE	13	0	0	See latest alarms
UCSDT2-LHCONE	12	3	0	See latest alarms
UKI-LT2-QMUL	10	3	3	See latest alarms
MIT-LHCONE	9	3	0	See latest alarms
UKI-NORTHGRID-LANCS-HEP	9	2	2	See latest alarms
GLOW-LHCONE	8	2	2	See latest alarms
UKI-NORTHGRID-LIV-HEP	7	7	2	See latest alarms

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How was the status determined?

Search the Networking Alarms

03/29/2025

03/31/2025

Search for a site

Search for an event type

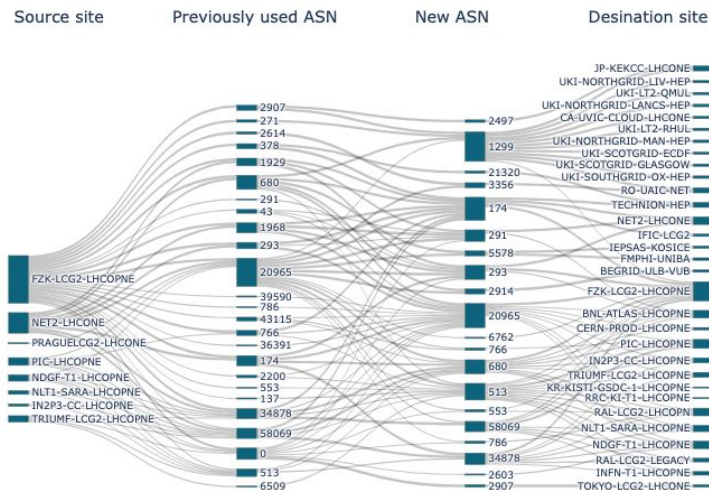
Search

Understanding the paths

We've implemented two ways of detecting routing changes. Both establish some notion of what is the common path between a pair of sites. However, the left side type is more sensitive to short-term changes.

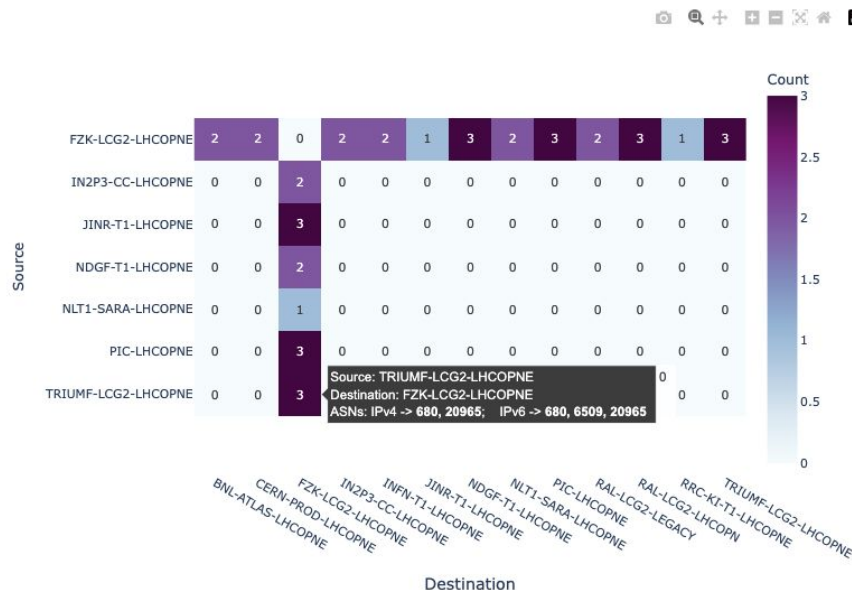
Short term path deviations between sites

The plot shows how ASNs were replaced in the period of 2 days. The data is based on the alarms of type "path changed"



ASN path anomalies

The plot shows new ASNs that appeared between two sites. The data is based on the alarms of type "ASN path anomalies"



Source
PIC-LHCOPNE
193.109.172.250

Destination
INFN-PISA-LHCONE
193.205.76.76

Total number of traceroute measures: 432
Other networking alarms: | Path changed between sites: 1 |

BASELINE PATH

Taken in 90.0% of time

Always reaches destination: YES

43115 20965 137 766

ALTERNATIVE PATHS

Taken in 10.0% of time

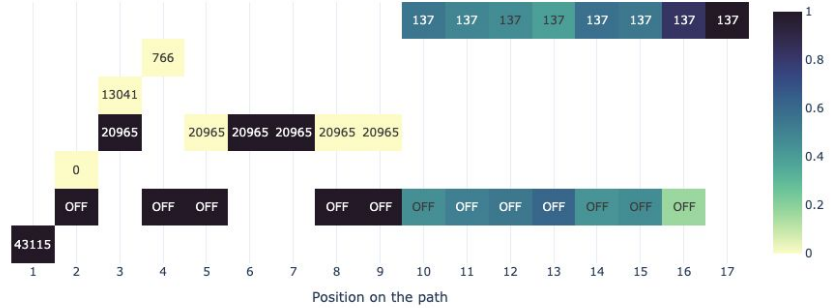
Always reaches destination: NO

43115 20965

Taken in 0.0% of time

Always reaches destination: NO

43115 13041 766 20965 137



The plot shows the AS numbers for every hop and the frequency of their occurrences at each position (source and destination not included). The dark blue values of 1 mean the ASN was always used at that position; Close to 0, means the ASN rarely appeared; OFF indicates the device did not respond at the time of the traceroute test; 0 is when there was a response, but the ASN was unknown.

At position

3

Typically goes through

20965

GEANT The GEANT IP Service, NL

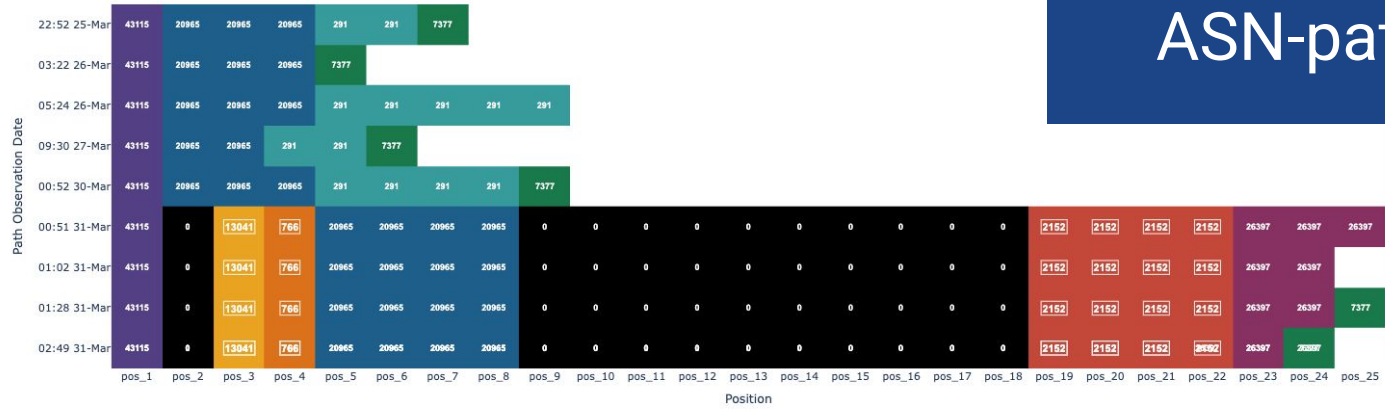
Changed to

13041

CESCA-AC, ES

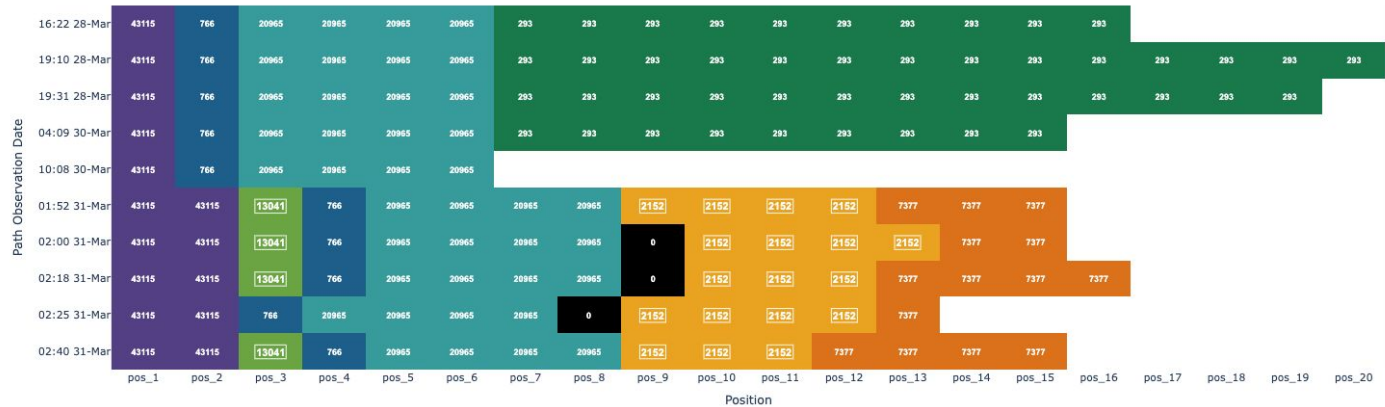
Short term path deviations

ASN path signature between PIC-LHCOPNE and UCSDT2-LHCONE for IPv4 paths



ASN-path anomalies

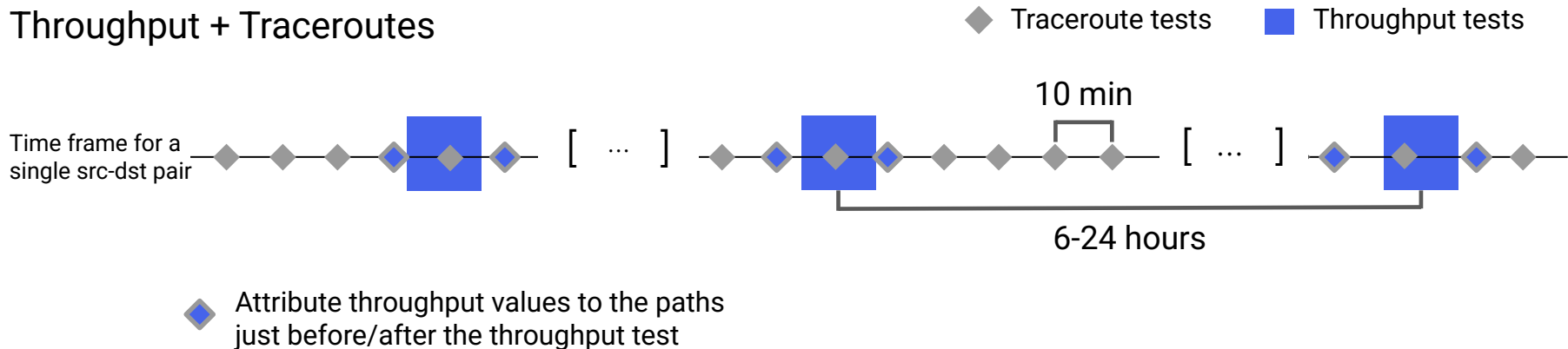
ASN path signature between PIC-LHCOPNE and UCSDT2-LHCONE for IPv6 paths



Plans and current work

- **Combine** the different test types
- Possibly **augment** the perfSonar data with BGP
- **Build** a realistic representation of the underlying **topology**
- Apply Deep Learning and look for **anomalies**, predict **failures**

Throughput + Traceroutes



Final words

Our data is **public**

[Link](#) to our **database**

We would love to **connect/collaborate**
with people doing
similar research

Contact us: net-discuss@umich.edu

Contact me: petyav@umich.edu

[Join](#) our weekly meetings

Acknowledgements



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**Thank
you!**

**Any
questions?**