ESnet
ENERGY SCIENCES NETWORK

ESnet Flow Telemetry

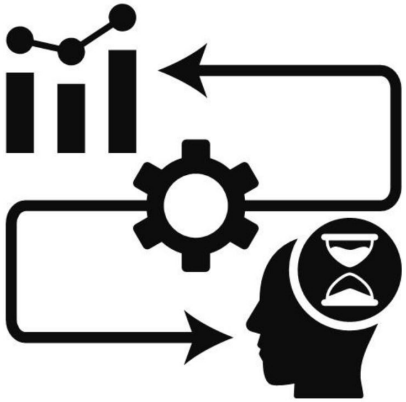
Chin Guok
Chief Technology Officer
Scientific Networking Division
Lawrence Berkeley National Laboratory

13th SIG-NGN Meeting
Virtual
Oct 26, 2023

U.S. DEPARTMENT OF ENERGY
Office of Science

BERKELEY LAB

What are we trying to do with flow information?

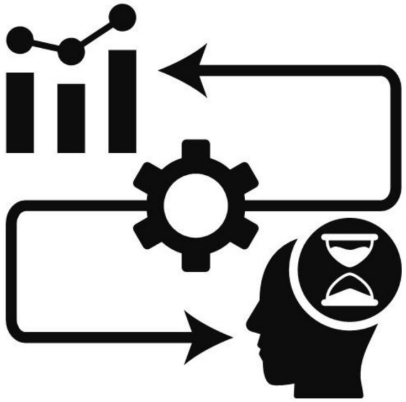


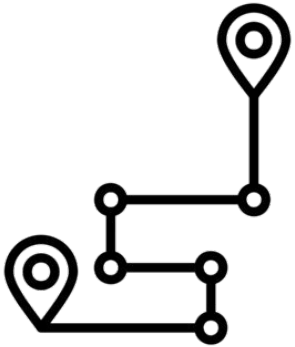
Capacity Planning

- Usage trends
- Link failure scenario planning

ESnet

What are we trying to do with flow information?





Capacity Planning

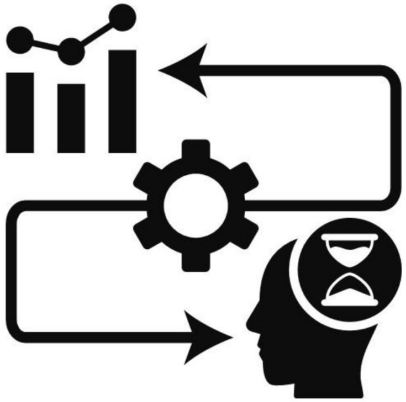
- Usage trends
- Link failure scenario planning

Traffic Engineering

- Bottleneck structures
- Traffic rerouting
- Load balancing

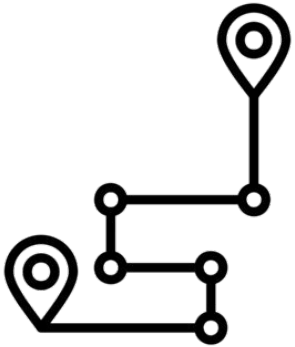
ESnet

What are we trying to do with flow information?



Capacity Planning

- Usage trends
- Link failure scenario planning



Traffic Engineering

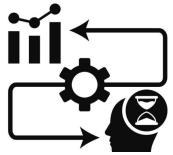
- Bottleneck structures
- Traffic rerouting
- Load balancing

Anomaly Detection

- Security events
- Unusual but valid usage pattern

ESnet

Capacity Planning Example



- Use flow data and topology information to understand capacity requirements under steady state and various failure states
- Conduct what-if analysis and simulation for arbitrary traffic matrix and network scenario.

P90

tm_id	link_name	router_a	interface_a	router_z	capacity_Gbps

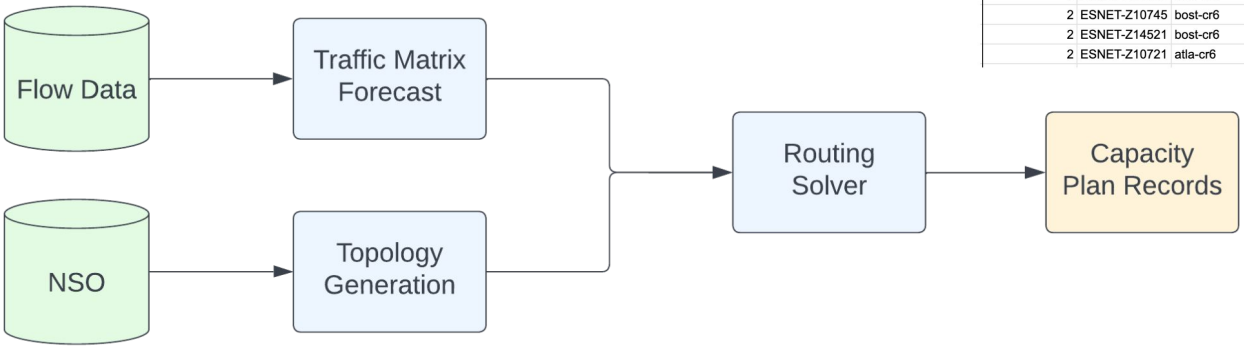
P99

tm_id	link_name	router_a	interface_a	router_z	capacity_Gbps

P95

tm_id	link_name	router_a	interface_a	router_z	capacity_Gbps
2	ESNET-Z07046	anl221-cr6	a	chic-cr6	377.319
2	ESNET-Z11848	wash-cr6	a	cern513-cr6	339.794
2	ESNET-Z10763	chic-cr6	c	fnalgcc-cr6	334.357
2	ESNET-Z11690	chic-cr6	d	fnalgcc-cr6	334.357
2	ESNET-Z09869	nash-cr6	b	hous-cr6	325.355
2	ESNET-Z10790	denv-cr6	b	salt-cr6	316.091
2	ESNET-Z14030	denv-cr6	c	salt-cr6	316.091
2	ESNET-Z10766	chic-cr6	c	kans-cr6	304.312
2	ESNET-Z14075	chic-cr6	d	kans-cr6	304.312
2	ESNET-Z13409	eqxam3-cr6	a	bost-cr6	277.881
2	ESNET-Z10850	losa-cr6	b	sand-cr6	246.54
2	ESNET-Z13696	losa-cr6	c	sand-cr6	246.54
2	ESNET-Z12523	wash-cr6	a	ornl5600-cr6	244.65
2	ESNET-Z10796	elpa-cr6	b	sand-cr6	242.475
2	ESNET-Z14009	elpa-cr6	c	sand-cr6	242.475
2	ESNET-Z10871	sacr-cr6	b	salt-cr6	233.297
2	ESNET-Z14067	sacr-cr6	c	salt-cr6	233.297
2	ESNET-Z10745	bost-cr6	b	eqxch2-cr6	232.746
2	ESNET-Z14521	bost-cr6	c	eqxch2-cr6	232.746
2	ESNET-Z10721	atla-cr6	c	hous-cr6	230.274

191.082
220.193
707.584
194.162
777.524
194.162
621.471
115.648
621.471
115.241
986.543
115.241
1089.5
116.832
1089.5
116.832
004.433
185.368
004.433
86.952
617.267
86.952
712.367
157.998
712.367
83.051
536.38
83.051
737.798
95.746
737.798
95.746
773.63
126.675
773.63
126.675
747.087
102.748
747.087
102.748
597.153

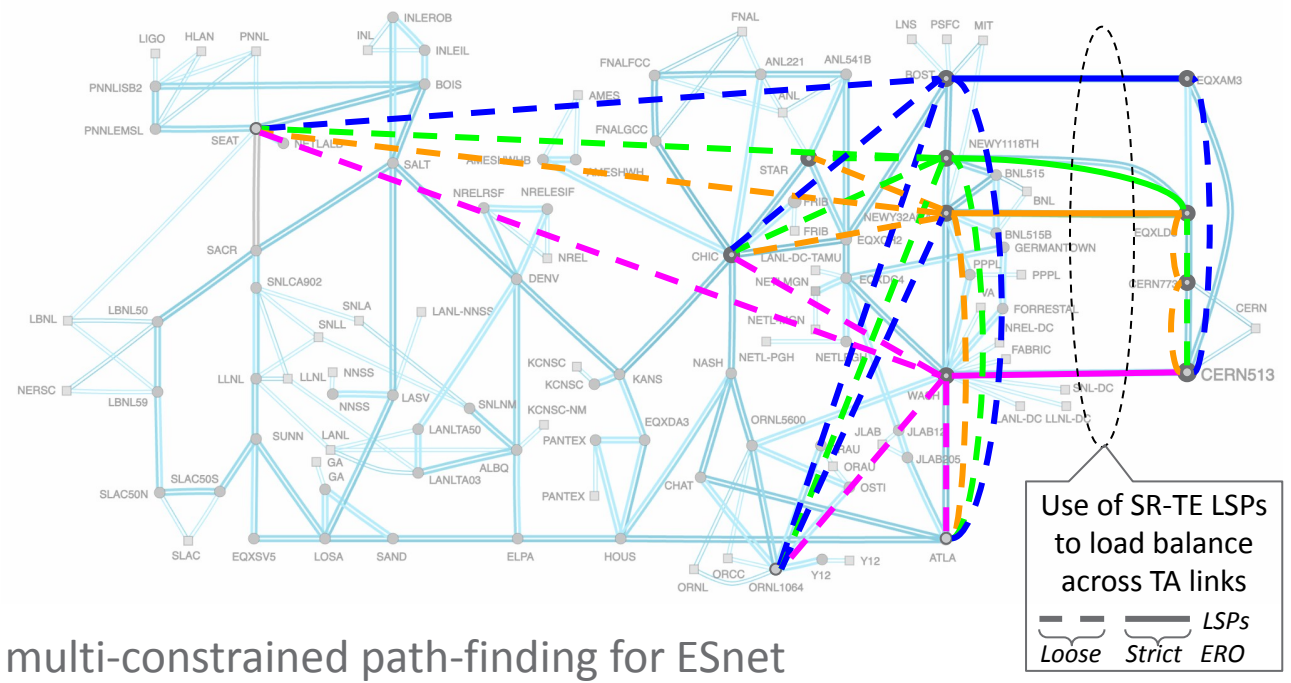


ESnet

J. Tian at el

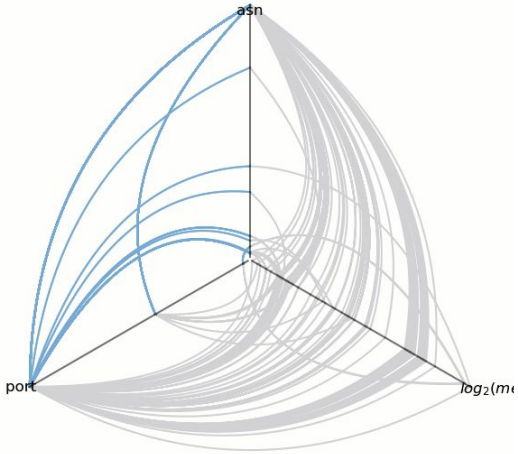
Traffic Engineering Example

- Understand where the bottlenecks are.
- Drive decisions on static (SR-TE) circuits to load balance across TA links.
- Input as parameter to multi-constrained path-finding for ESnet guaranteed bandwidth dynamic circuit provisioning (i.e., OSCARS).

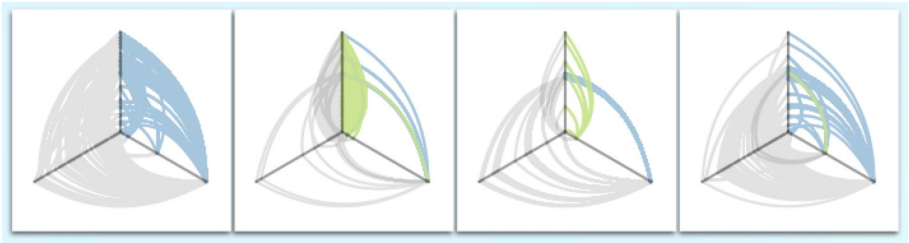


ESnet

Anomaly Detection Example



- Track outgoing connections
- Build historical context across assets, multiple features
- Goal is identify **unexpected connection events** and (with the help of ML techniques) reduce the number of false positives when a new outgoing connection is logged



ESnet

M. Haberman at el

Questions...

ESnet