

LnetD network discovery

Based on IGP information

Catalin Petrescu
@cpetrescu

<https://github.com/cpmarvin/lnetd>



About me/project

Network engineer focused on SP networks

- ❑ Changed quite a few jobs(small and big ISPs) , need to learn their network fast.
- ❑ Not all of them had tools / diagrams <insert shock gif here >
- ❑ Some had but limited access to new hire's :) , so no day one topology for me.
- ❑ Worked with all 3 big modeling tools (Car... , Wan..., Pa....) <- those are better go buy one

Build one based on information from ISIS MPLS-TE extensions

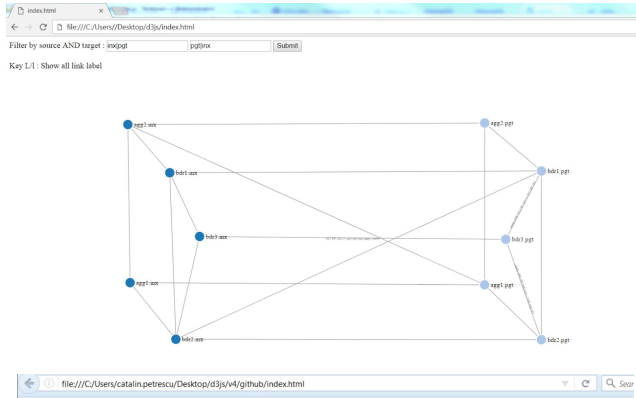
- ❑ ISIS speaker/parser (no hello/lsp auth) - legacy (fire up a vMX/XRV)
- ❑ JNP XML (netconf)
- ❑ IOS XR (netconf)
- ❑ Nokia SR OS (netconf)
- ❑ BGP-LS via GoBGP

Started as a fork of eNMS (<https://github.com/afourmy/eNMS>) <- big thanks , go check his project out

- ❑ Frontend bootstrap html / Backend python flask
- ❑ D3js for network graphs using parallel links (someone did half of the math for me <https://webiks.com/d3-js-force-layout-straight-parallel-links/>)
- ❑ LnetD-QT for traffic modeling , what if analysis

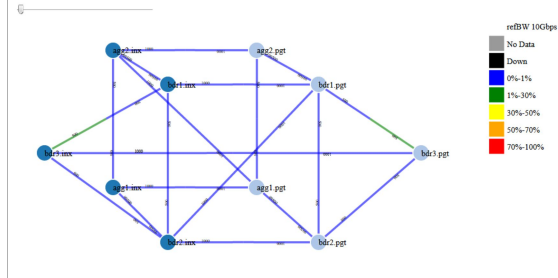
History

2017

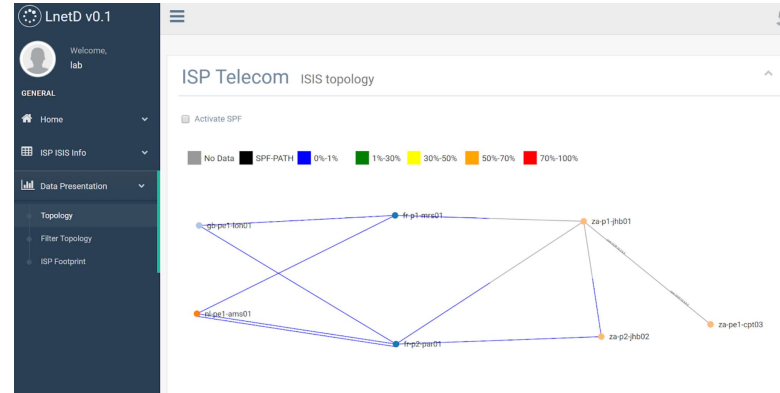


Select traffic levels from last 0 hours ago

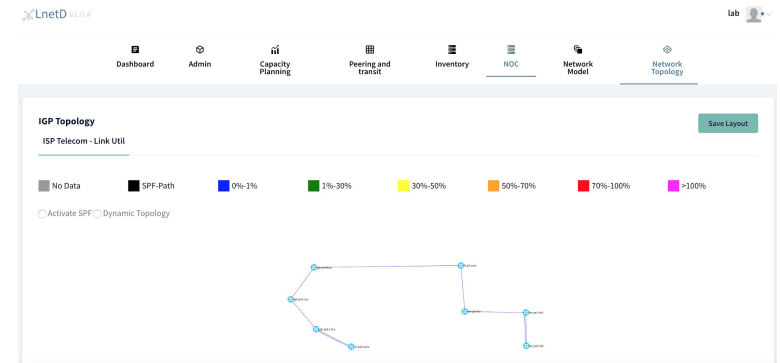
Hours:



2018



2020



Topology acquisition - JNP XML

```
lab@ke-pe3-nbi> show isis database ke-pe2-nbi.00-00 extensive | display xml | find "IS extended neighbor:"
  <reachability-tlv heading="IS extended neighbor:">
    <address-prefix>ke-pe3-nbi.00</address-prefix>
    <metric>10</metric>
    <isis-reachability-subtlv>
      <address>10.2.3.2</address>
    </isis-reachability-subtlv>
    <isis-reachability-subtlv>
      <neighbor-prefix>10.2.3.3</neighbor-prefix>
    </isis-reachability-subtlv>
```

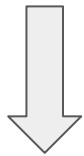


Sqlite3 Database

```
sqlite> select * from rpc_links where source='ke-pe2-nbi' and l_ip='10.2.3.2';
index|source|target|metric|l ip|r ip|l ip r ip
17 ke-pe2-nbi|ke-pe3-nbi|10|10.2.3.2|10.2.3.3|('10.2.3.2', '10.2.3.3')
```

Topology acquisition - XR Netconf XML

```
<isis xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-clns-isis-oper">
  <instances>
    <instance>
      <instance-name>64</instance-name>
      <host-names>
        <host-name>
          <system-id>0000.0000.0002</system-id>
          <host-name>ke-pe2-nbi</host-name>
        </host-name>
        <host-name>
          <system-id>0000.0000.0003</system-id>
          <host-name>ke-pe3-nbi</host-name>
        </host-name>
      </host-names>
      <topology-link>
        <topology-link-type>p2p</topology-link-type>
        <topology-link-interface-address>10.2.3.2</topology-link-interface-address>
        <topology-link-interface-id>331</topology-link-interface-id>
        <topology-link-neighbor-address>10.2.3.3</topology-link-neighbor-address>
        <topology-link-neighbor-id>331</topology-link-neighbor-id>
        <topology-link-neighbor-system-id>0000.0000.0003.00</topology-link-neighbor-system-id>
        <topology-link-neighbor-node-id>2</topology-link-neighbor-node-id>
        <topology-link-neighbor-generation>53688</topology-link-neighbor-generation>
        <topology-link-fragment-id>0</topology-link-fragment-id>
        <topology-link-te-metric>10</topology-link-te-metric>
        <topology-link-igp-metric>10</topology-link-igp-metric>
      </topology-link>
    </instance>
  </instances>
</isis>
```



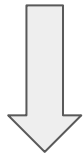
Sqlite3 Database

```
sqlite> select * from rpc_links where source='ke-pe2-nbi' and l_ip='10.2.3.2';
index|source|target|metric|l ip|r ip|l ip r ip
17 | ke-pe2-nbi|ke-pe3-nbi|10|10.2.3.2|10.2.3.3|('10.2.3.2', '10.2.3.3')
```

Topology acquisition - Nokia RPC

```
<get>
  <filter>
    <state xmlns="urn:nokia.com:sros:ns:yang:sr:state">
      <router>
        <{router}>
          <database/>
        </{router}>
      </router>
    </state>
  </filter>
</get>
```

```
<get>
  <filter>
    <state xmlns="urn:nokia.com:sros:ns:yang:sr:state">
      <router>
        <{router}>
          <hostname/>
        </{router}>
      </router>
    </state>
  </filter>
</get>
```



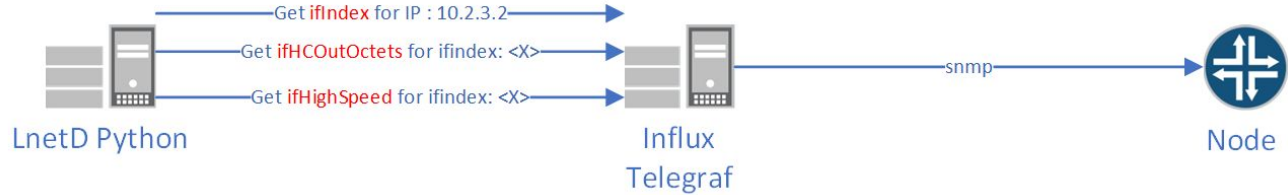
Sqlite3 Database

```
sqlite> select * from rpc_links where source='ke-pe2-nbi' and l_ip='10.2.3.2';
index|source|target|metric|l ip|r ip|l ip r ip
17 ke-pe2-nbi|ke-pe3-nbi|10|10.2.3.2|10.2.3.3|('10.2.3.2', '10.2.3.3')
```

Data enrichment

ifHighSpeed = Capacity
ifHCOutOctets = Util
ifIndex = I_int

- sysDesc
- Iindex_ip_map
- ifHCInOctets
- ifHCOutOctets
- ifHighSpeed
- ifIndex



```
index|source|target|metric|l_ip|r_ip|l_ip_r_ip|l_int|util|capacity|errors
17|ke-pe2-nbi|ke-pe3-nbi|10|10.2.3.2|10.2.3.3|('10.2.3.2', '10.2.3.3')|523|4102|1000|0
```

D3js Network Graph

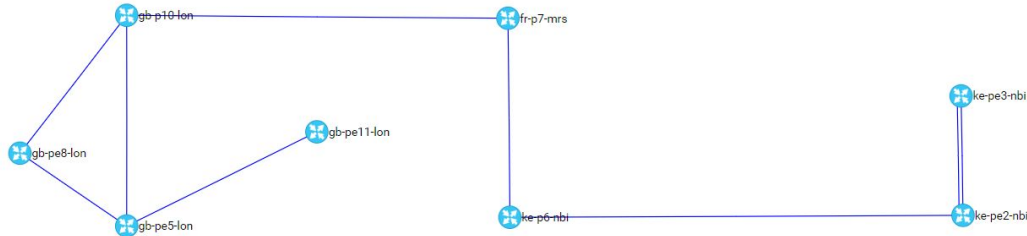
ISP Telecom

Topology

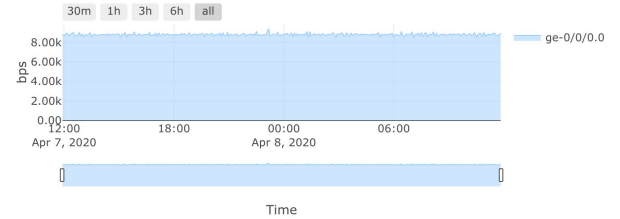
Save Layout



Activate SPF Dynamic Topology



Router: fr-p7-mrs Interface: ge-0/0/0.0 Speed: 10 Mbps



Close

D3js Network Graph - SPF Calculation

ISP Telecom

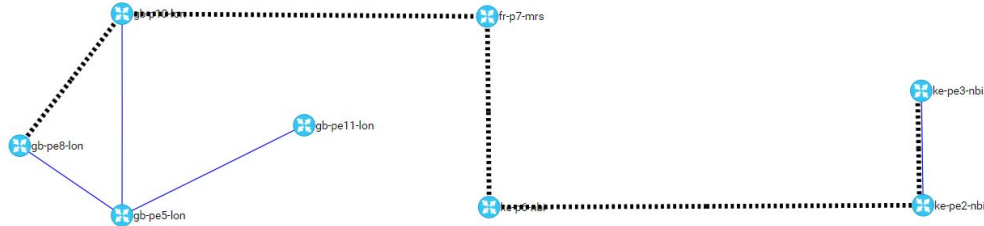
Topology

Save Layout

No Data SPF-PATH 0%-1% 1%-30% 30%-50% 50%-70% 70%-100% >100%

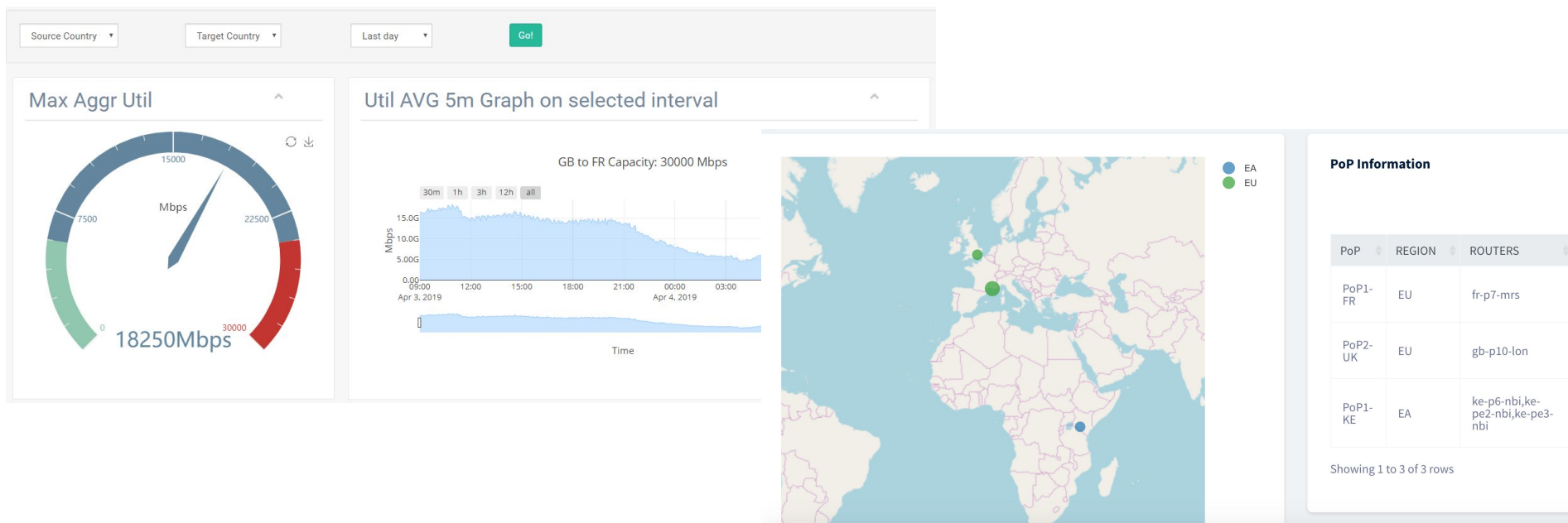
Activate SPF Dynamic Topology

SPF between Source: gb-pe8-lon Target: ke-pe3-nbi



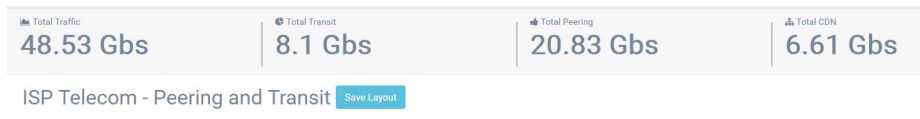
Other features

- CC to CC capacity and util (dummy data)
- PoP Map (dummy data)

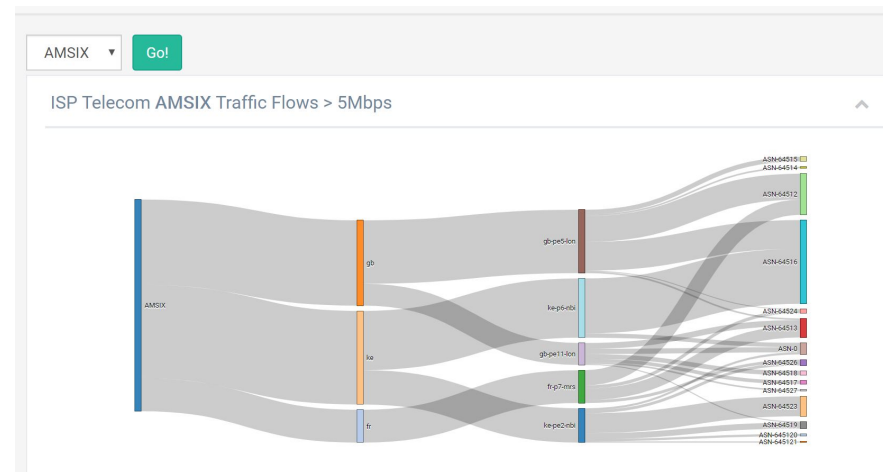
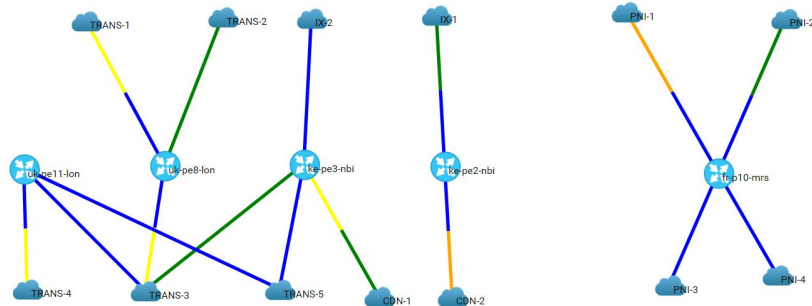


Other features

- P&T capacity map (dummy data)
- Netflow Data (dummy data)



■ No Data ■ 0%-20% ■ 20%-40% ■ 40%-60% ■ 60%-85% ■ 85%-100% ■ >100%



Other features

- Device/Interface Inventory

ISP Telecom Device overview

dummy-p10-lon

Inventory : dummy-p10-lon ^

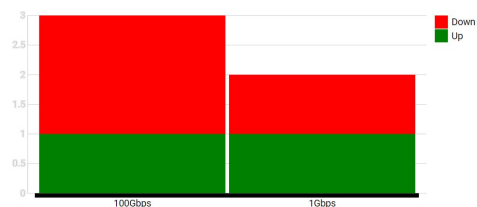
Show 8 entries

Slot	Description
0/RP1/CPU0	A99-RP2-TR(Standby)
0/RP0/CPU0	A99-RP2-TR(Active)
0/6/CPU0	A9K-8X100GE-L-SE
0/4/CPU0	A9K-8X100GE-L-SE
0/3/CPU0	A9K-2x100GE-TR
0/2/CPU0	A9K-36x10GE-TR
0/11/CPU0	A9K-8X100GE-L-SE
0/10/CPU0	A9K-8X100GE-L-SE

dummy-p10-lon : ASR-9922



dummy-p10-lon Interfaces



All interfaces on Device

Show 10 entries

Search:

InterfaceName	InterfaceStatus	InterfaceSpeed
GigabitEthernet0/0/1/0	Up	1Gbps
GigabitEthernet0/0/1/1	Down (Reason: Link loss or low light, no loopback)	1Gbps
HundredGigE0/1/0/0	Down (Reason: Link loss or low light, no loopback)	100Gbps
HundredGigE0/1/0/1	Up	100Gbps

Other features

- BGP Peer Inventory
- Traffic forecast

ISP Telecom

BGP PEERS

Show 10 entries

Search:

Router	Neighbour	Neighbour IP	Remote ASN	UP	Type	PXL RCV	IX	Uptime
ke-pe3-nbi	PEER1-ASN2	10.2.2.2	2	1	peering	0	IX-LINX01	36 days 07:12:00
ke-pe3-nbi	iBGP-R5	10.5.5.5	1	1	internal	0	n/a	25 days 05:06:00
ke-pe3-nbi	iBGP-R7	10.7.7.7	1	1	internal	0	n/a	25 days 05:06:00
ke-pe3-nbi	iBGP-R8	10.8.8.8	1	1	internal	4	n/a	0 days 00:20:00
ke-pe3-nbi	iBGP-R11	10.11.11.11	1	1	internal	1	n/a	0 days 00:18:00
ke-pe3-nbi	iBGP-R13	10.13.13.13	1	1	internal	0	n/a	0 days 00:17:00
ke-pe3-nbi	IPT-CST-ASN22	10.22.22.22	22	0	customer	-1	n/a	3 days 23:50:00

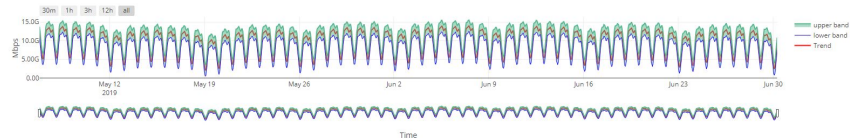
Showing 1 to 7 of 7 entries

Previous 1 Next

Traffic Forecast with fbProphet

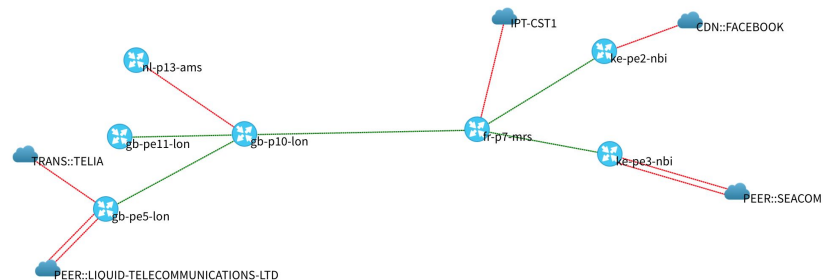
Forecast

Traffic Forecast

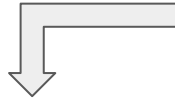


BGP TOPOLOGY

BGP Topology iBGP Topology eBGP Topology



What if scenario - Import LnetD topology

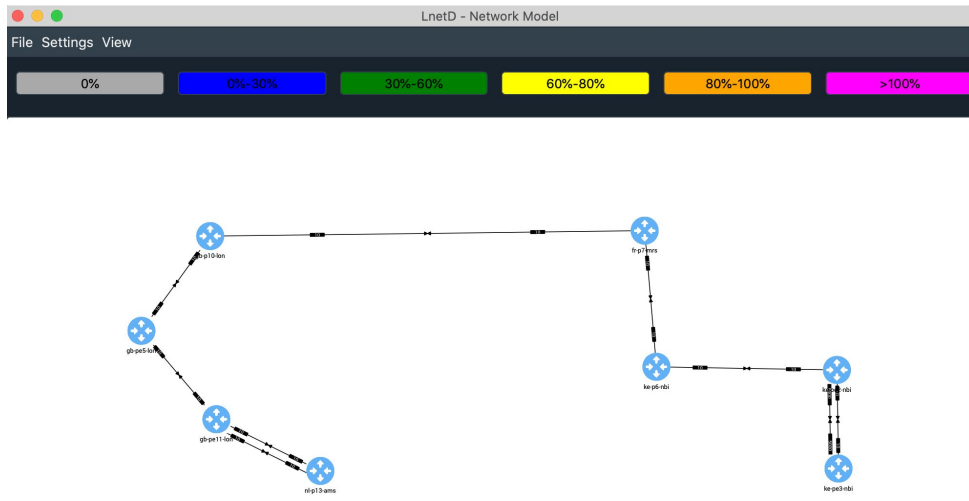
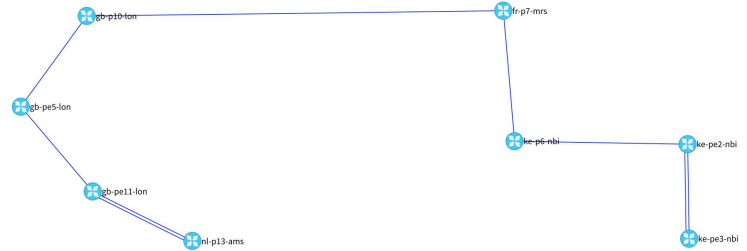


IGP Topology

ISP Telecom - Link Util

■ No Data ■ SPF-Path ■ 0%-1% ■ 1%-30% ■ 30%-50% ■ 50%-70% ■ 70%-100%

Activate SPF Dynamic Topology



What if scenario - Import Netflow Demands



kentik Library Data Explorer

Run Query

Query Cancel

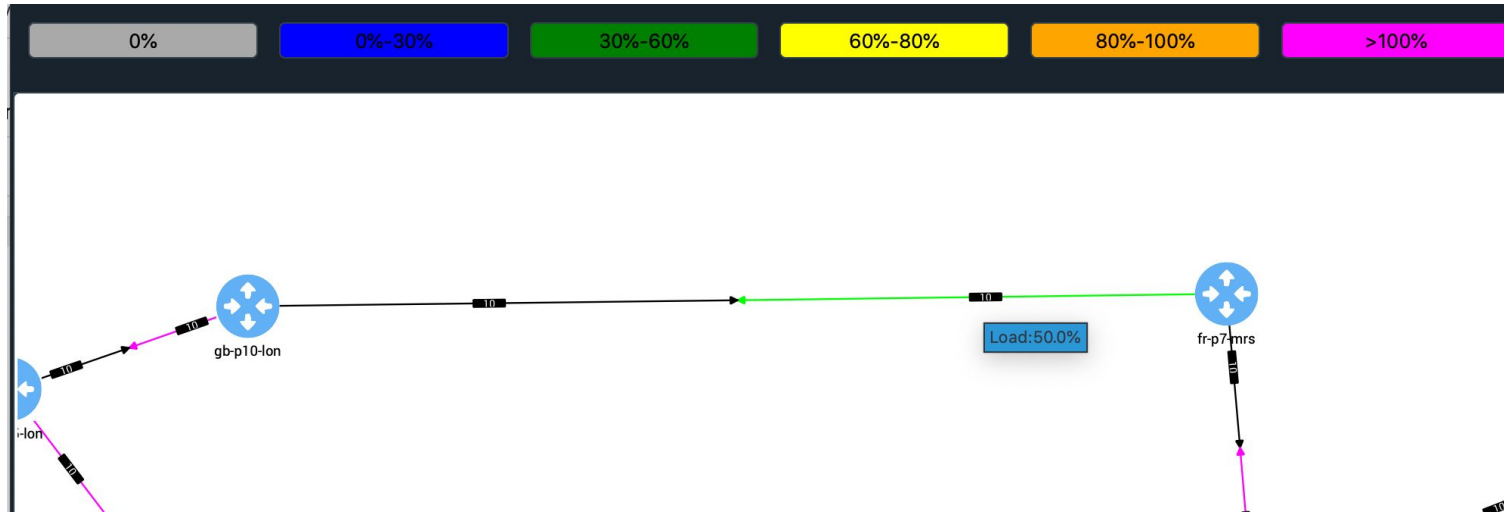
Group By Dimensions

- Source Next Hop IP/CIDR
- Destination Next Hop IP/CIDR

V4 CIDR: 32 V6 CIDR: 128

Metrics: bits/s

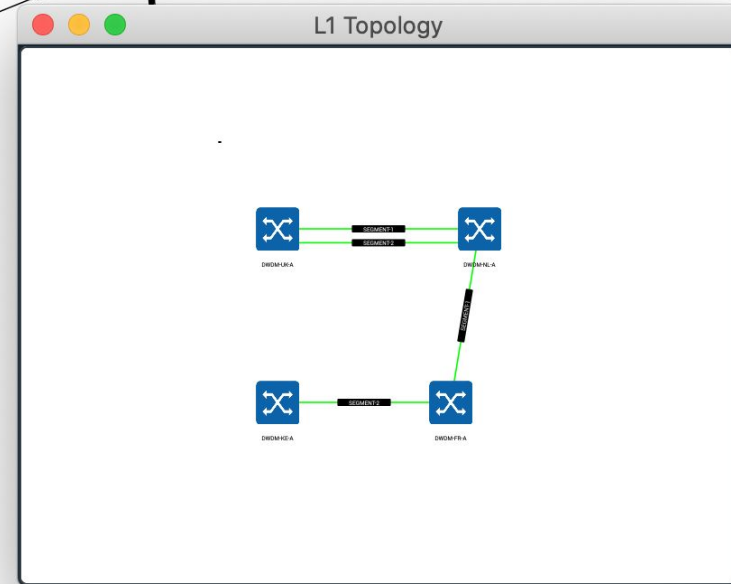
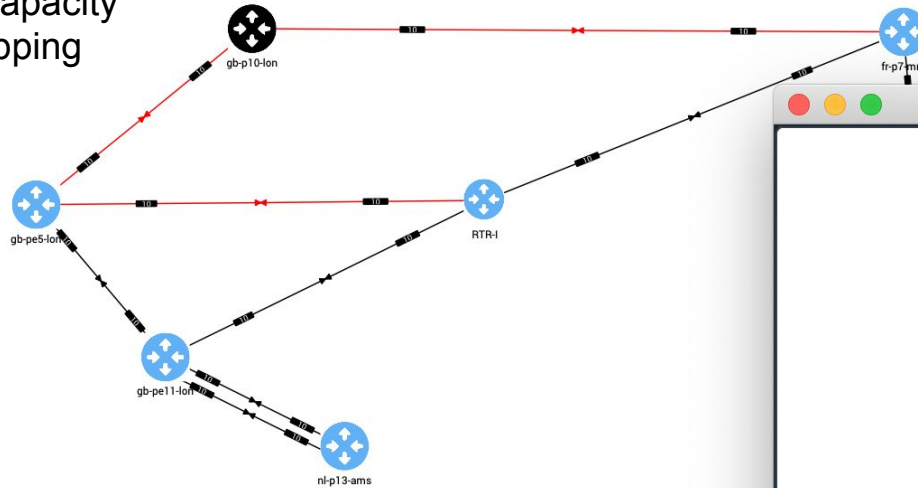
[Customize Metrics](#)



What if scenario

Other features:

- Add link/Nodes
- Change metric/capacity
- L1 Topology Mapping



Demo time

