Efficient Provisioning and Monitoring of Cisco NXOS through objects and REST API

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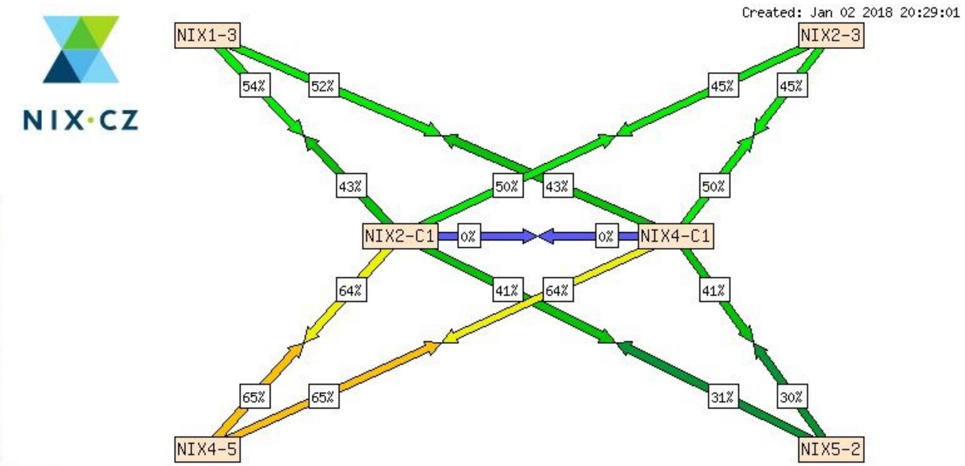
NIX·CZ

NIX.CZ motivation

- Migration from “dual-star vPC” to “leaf-spine”
- Expansion from four to nine POPs



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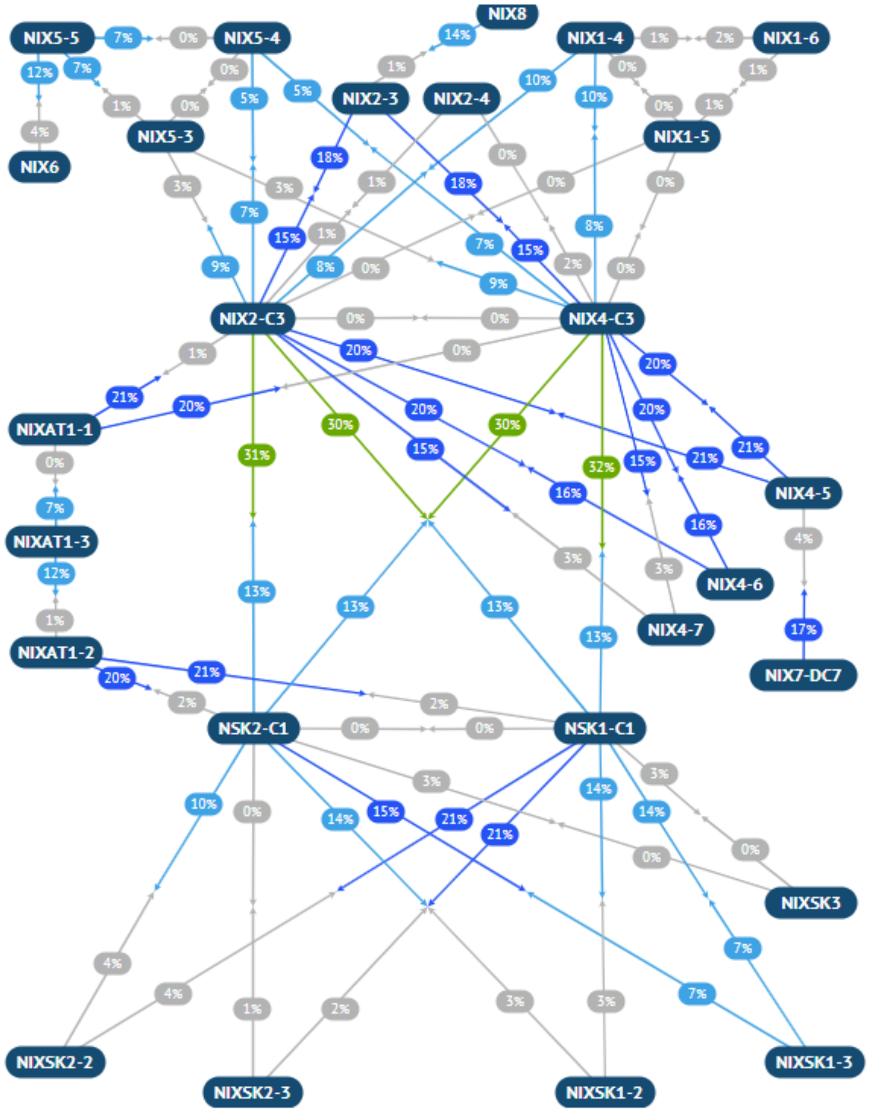


NIX.CZ motivation

- Migration from “dual-star vPC” to “leaf-spine”
- Expansion from four to nine POPs
- Capacity upgrade (20 x 400 GE)
- IXP API

What we wanted

- Fast, reliable template-based provisioning
- (streaming) telemetry and monitoring

NX OS DME
(templates translating)

```
snmp-server contact email@domain.cz
snmp-server location Site 1, Prague, CZ
```

→

```
POST /api/mo/sys/snmp/inst.json

{
  "snmpInst": {
    "children": [
      {
        "snmpSysInfo": {
          "attributes": {
            "sysContact": "email@domain.cz",
            "sysLocation": "Site 1, Prague, CZ"
          }
        }
      }
    ]
  }
}
```

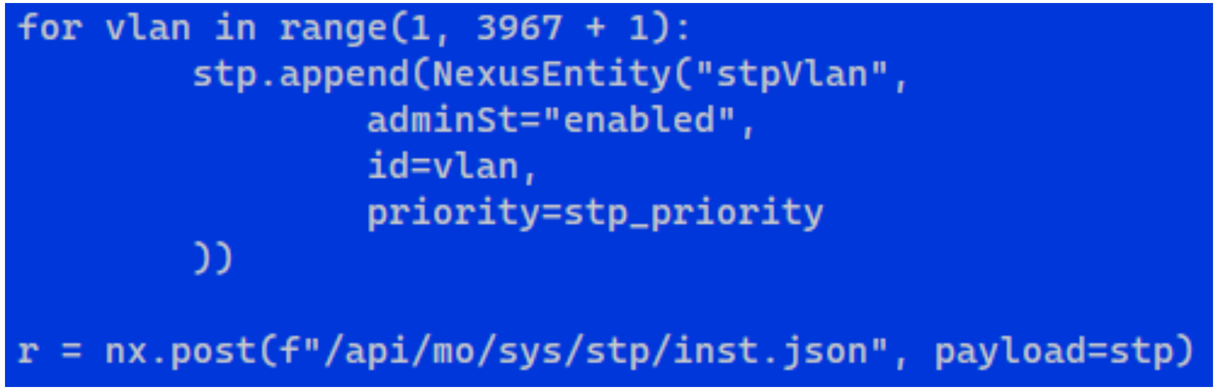
NX OS DME

What’s tricky

- UDLD
  - CLI doesn’t allow you to configure without TRX
  - API does, but it’s not visible in CLI
- STP settings

  Instead of “spanning-tree vlan 1-3967 priority 24576”

  You have to go through a loop for all VLANs



```
for vlan in range(1, 3967 + 1):
        stp.append(NexusEntity("stpVlan",
                adminSt="enabled",
                id=vlan,
                priority=stp_priority
        ))

r = nx.post(f"/api/mo/sys/stp/inst.json", payload=stp)
```

NX OS DME

Why is that?

- **Nexus is internally object-based, and CLI is emulated**
  - **Configuring objects is not translated to CLI by 100%**
  - **You can easily break things (a couple of restarts needed)**

NX OS DME

What you get ?

- Speed
  - Requests takes milliseconds (full switch setup ~5s)
  - Individual requests (interface, VLAN, VNI, BGP settings) ~100ms
  - Reliability of the REST API

- Operational parameters

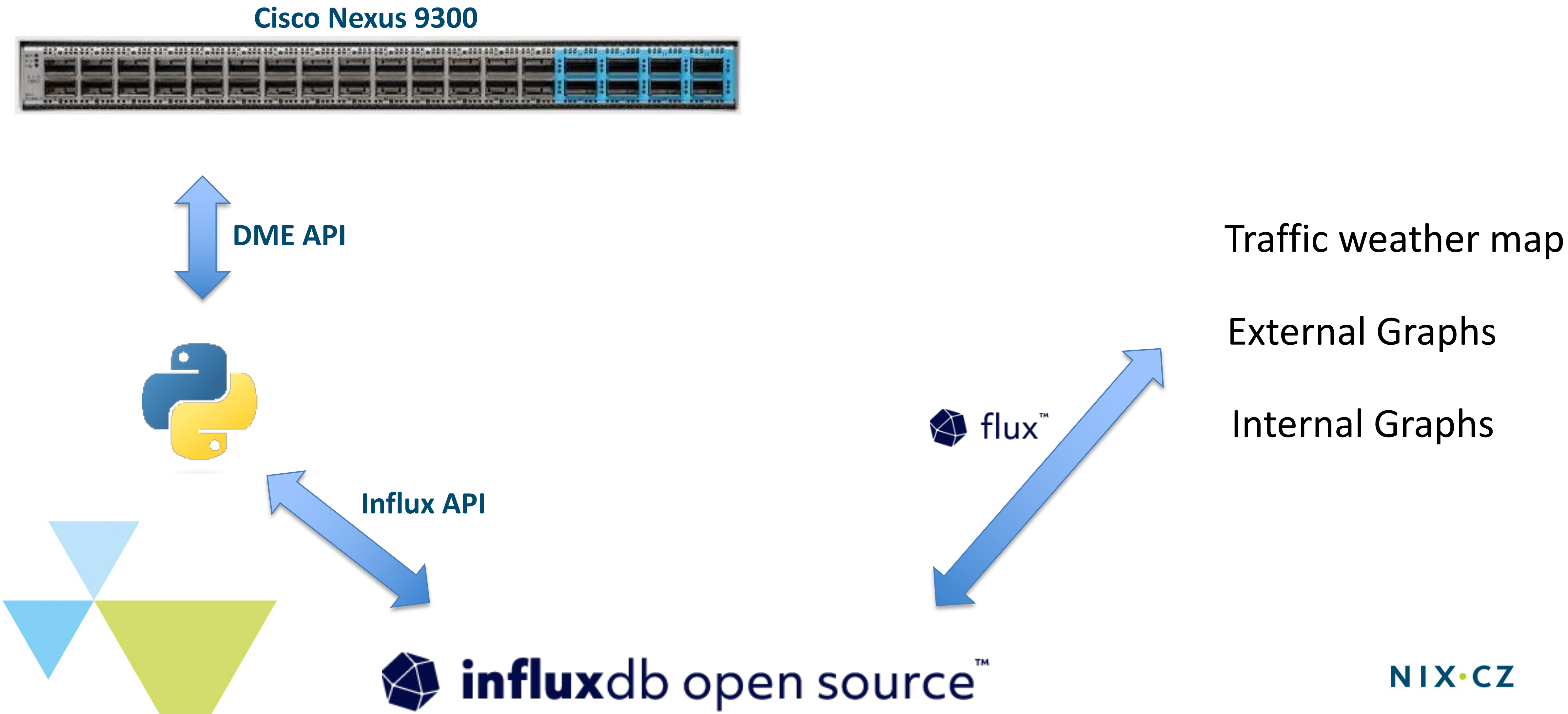
NX OS Telemetry

We will

- use telemetry for alarms/operational changes

- use API for interface statistics polling

Statistics in the real world



Cisco Nexus 9300

DME API

Influx API

flux™

influxdb open source™

Traffic weather map

External Graphs

Internal Graphs

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Collecting objects

```
"rmonIfIn": {
               "attributes": {
                   "broadcastPkts": "3",
                   "clearTs": "never",
                   "discards": "0",
                   "dn": "sys/intf/phys-[eth1/5]/dbgIfIn",
                   "errors": "0",
                   "modTs": "2023-07-11T09:44:04.692+00:00",
                   "multicastPkts": "1995153",
                   "nUcastPkts": "1995156",
                   "noBuffer": "0",
                   "octetRate": "4947614883",
                   "octets": "6067327164407718",
                   "packetRate": "5404507",
                   "rateInterval": "300",
                   "ucastPkts": "63082941837541",
                   "unknownEtype": "0",
                   "unknownProtos": "0"
               }
           }
       }
```

Collecting objects

Data are

- Collected every 30s
- Pre-processed (calculated items)
- Saved to TSDB

Scale

We are collecting

34 devices

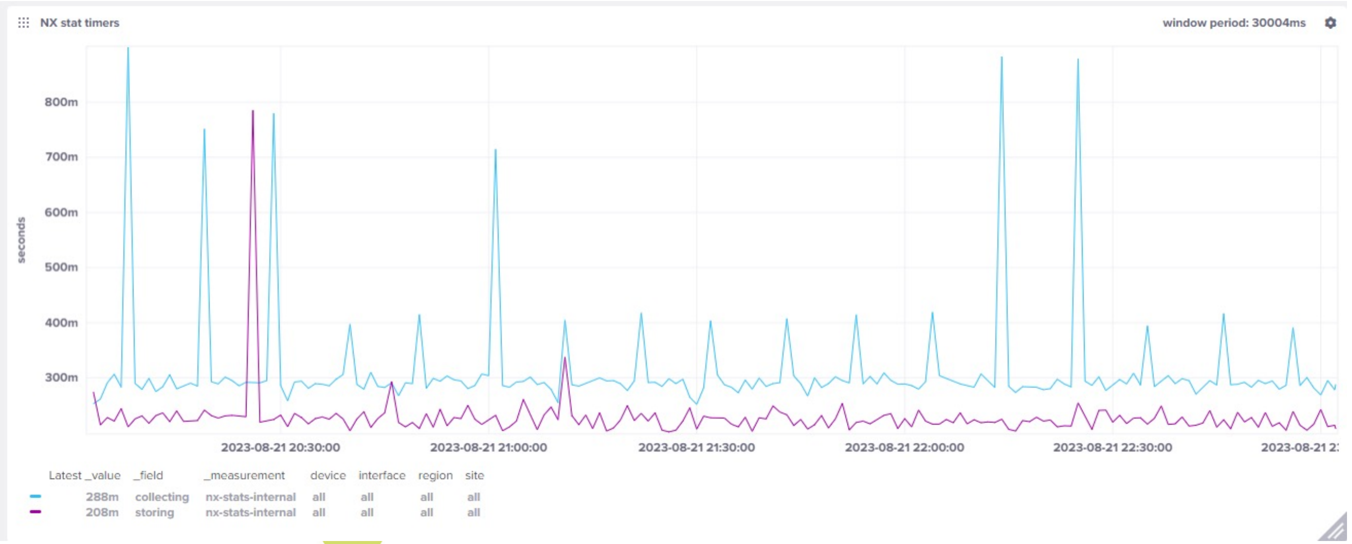
2155 interfaces

58130 metrics

The best part

And this all takes…

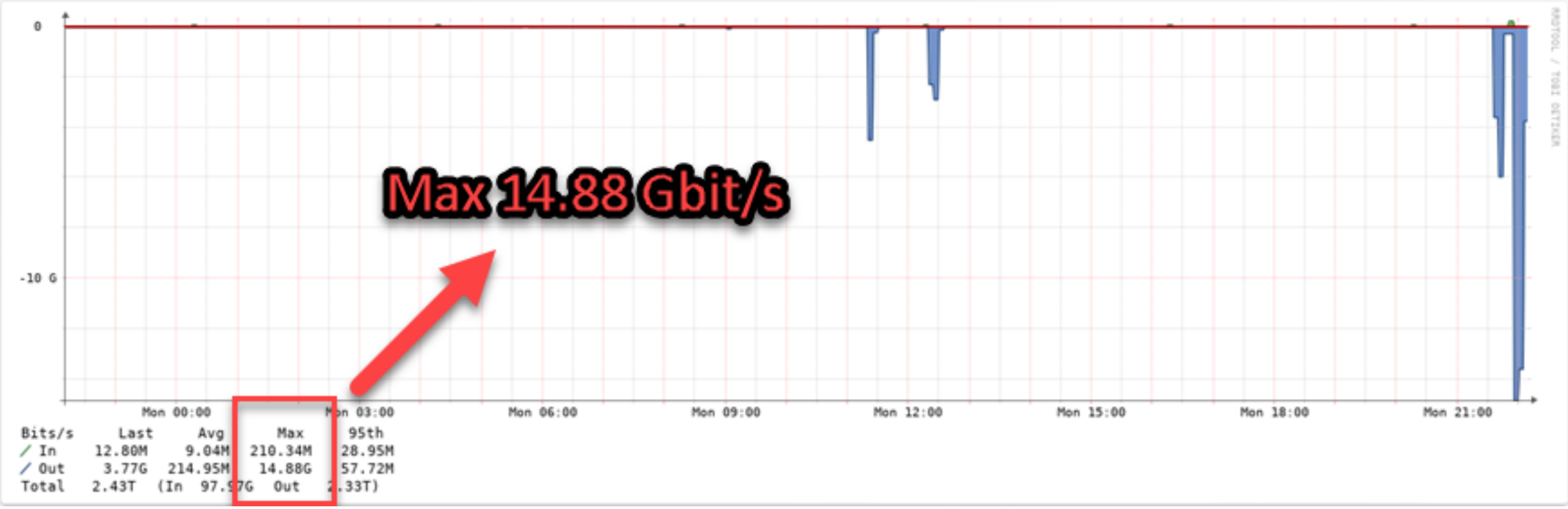
280ms to collect
210ms to store



	Latest _value	_field	_measurement	device	interface	region	site
▬	288m	collecting	nx-stats-internal	all	all	all	all
▬	208m	storing	nx-stats-internal	all	all	all	all

Real life scenario - DDoS

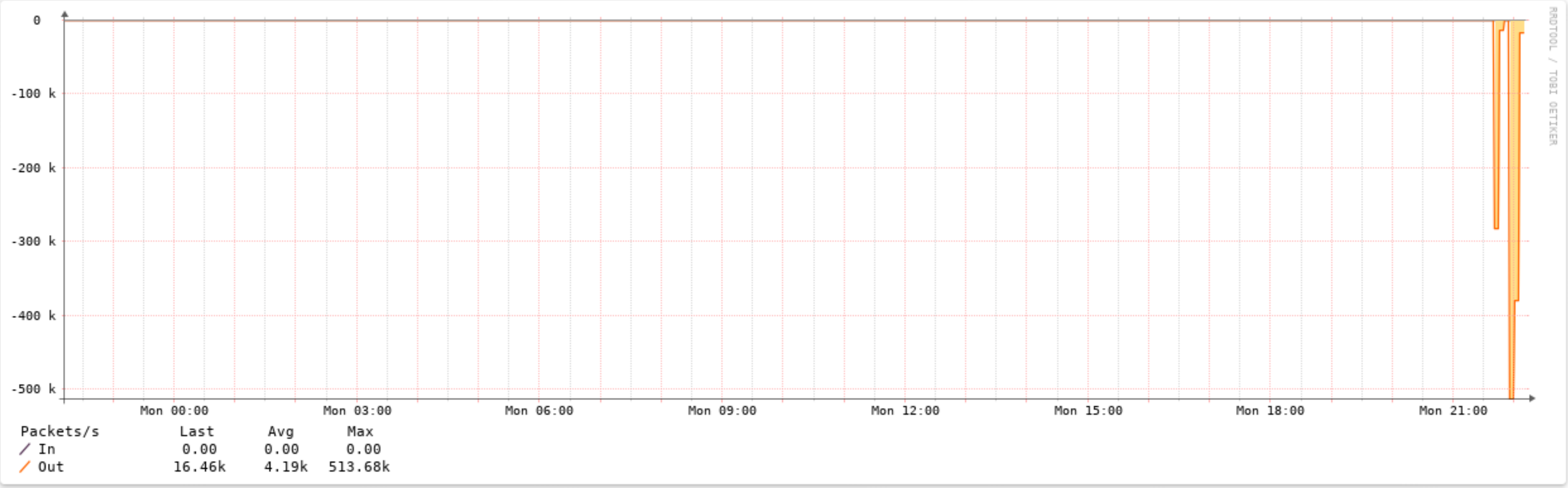
Traffic bit/s



Max 14.88 Gbit/s

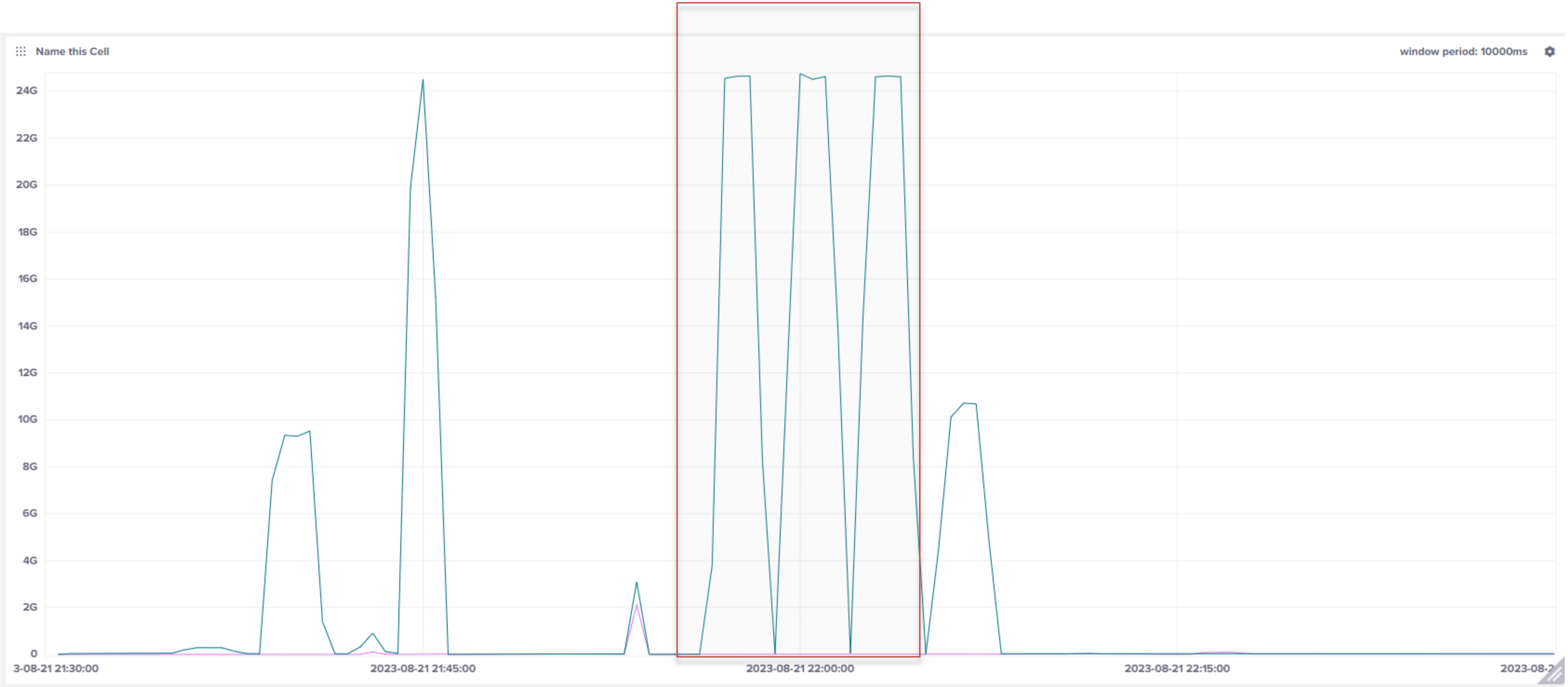
```
Bits/s      Last      Avg      Max      95th
∕ In      12.80M    9.04M  210.34M   28.95M
∕ Out      3.77G  214.95M   14.88G   57.72M
Total      2.43T  (In  97.97G  Out   2.33T)
```

Discards p/s



```
Packets/s          Last      Avg      Max
∕ In               0.00     0.00     0.00
∕ Out            16.46k    4.19k  513.68k
```

Real life scenario - DDoS



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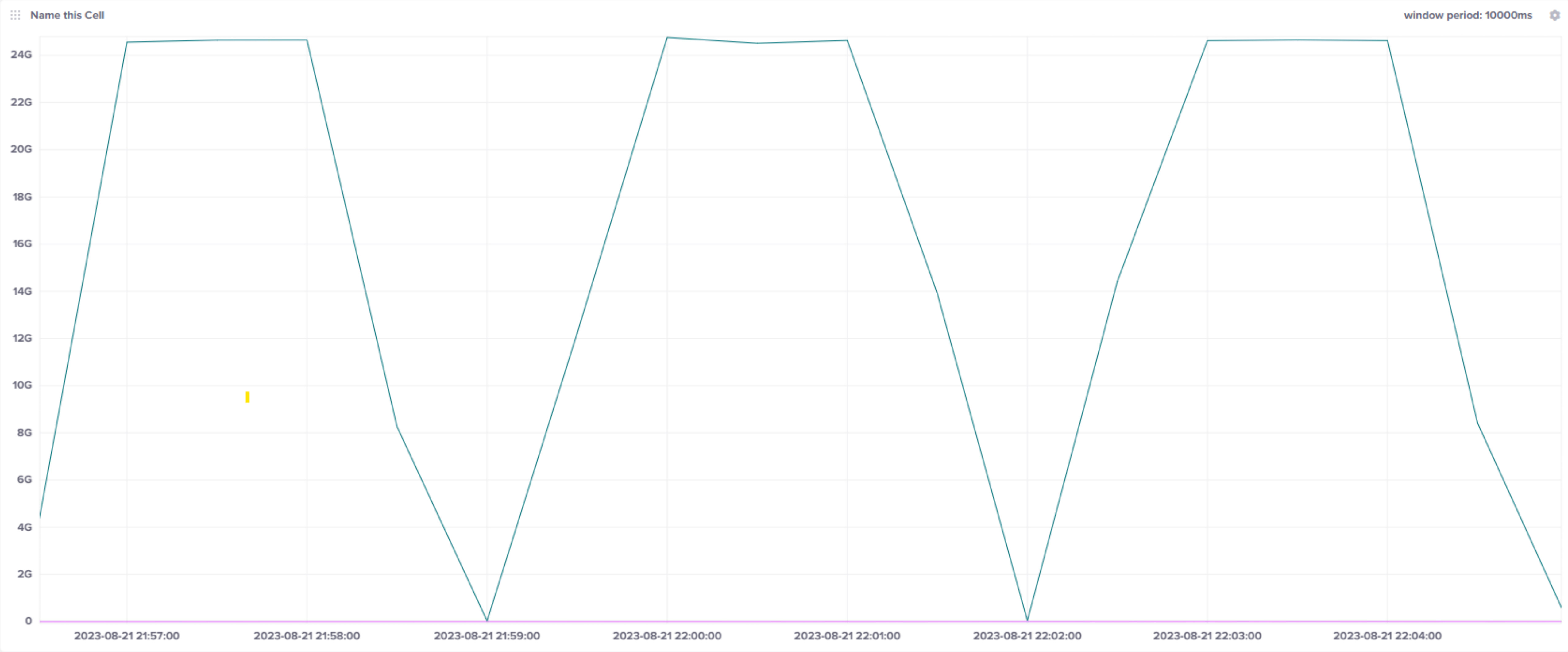

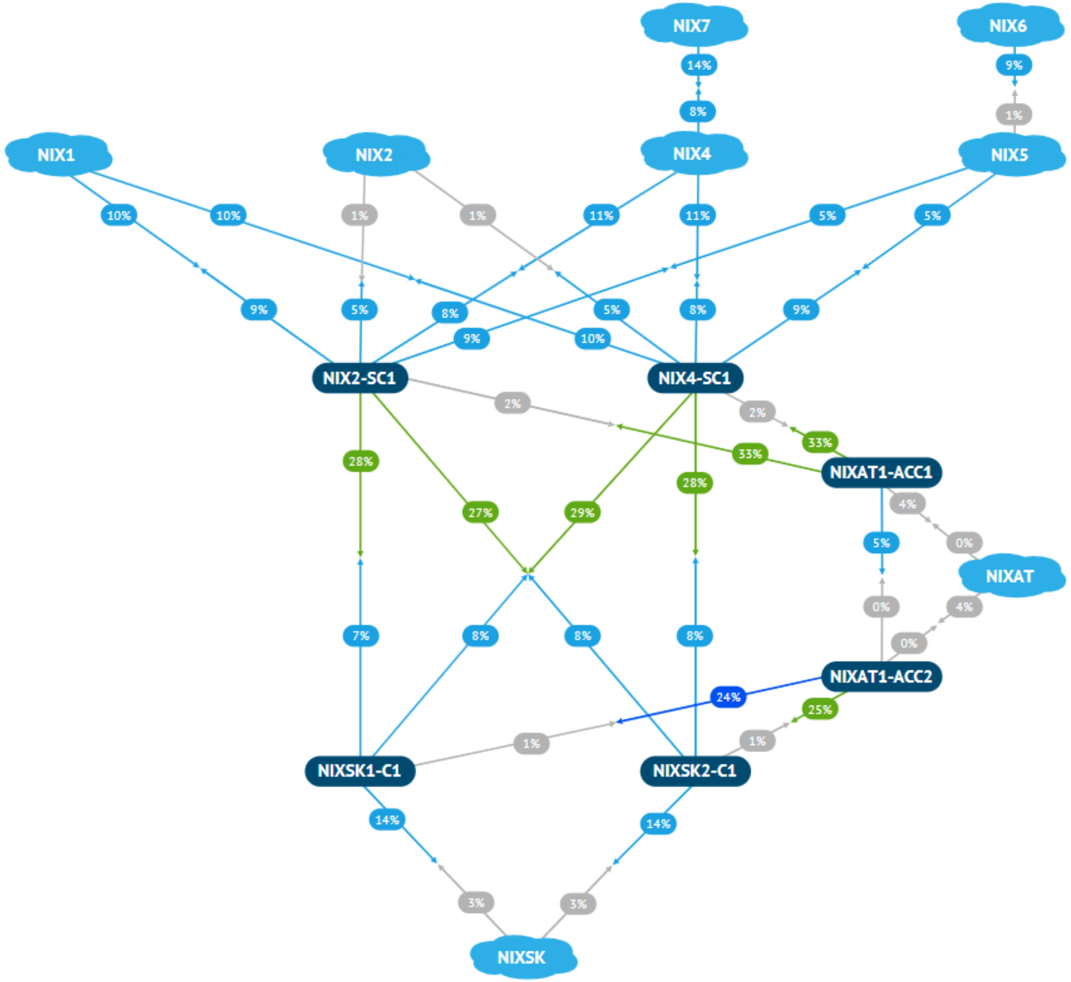

Thank you for your attention.

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