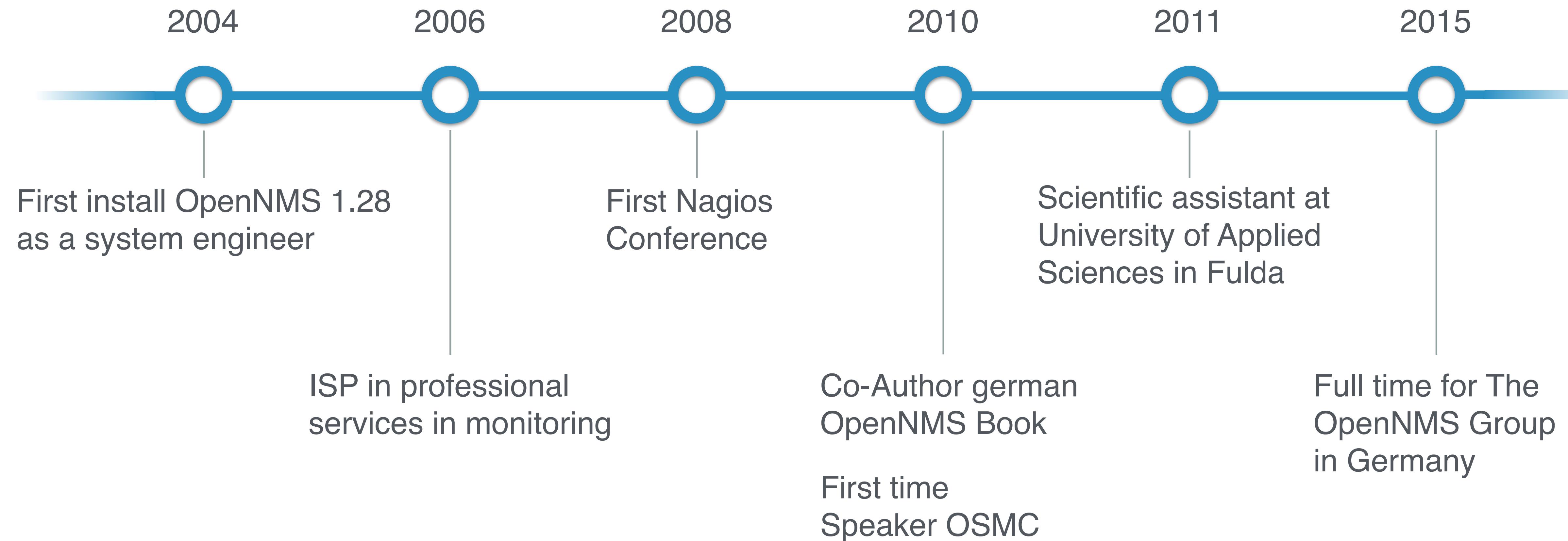


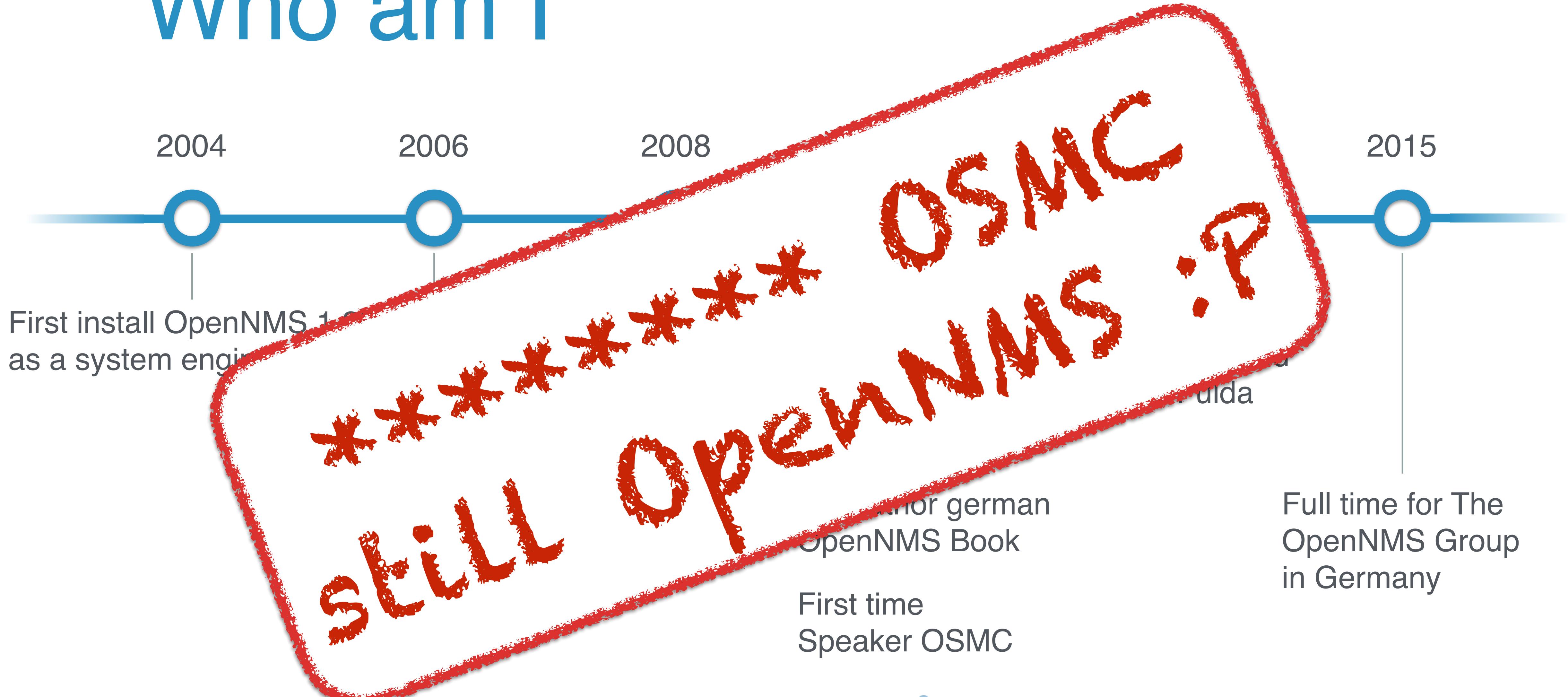




# Who am I



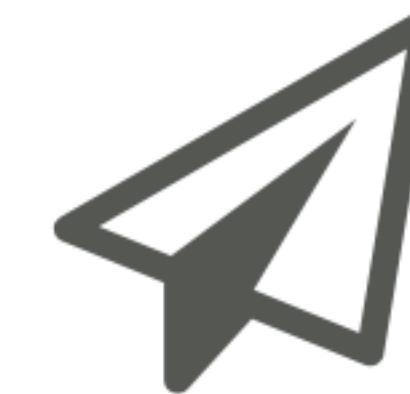
# Who am I



# OpenNMS in a Nutshell



Service Assurance



Event Driven



Performance Management



ReST API



Topology Framework



Integration



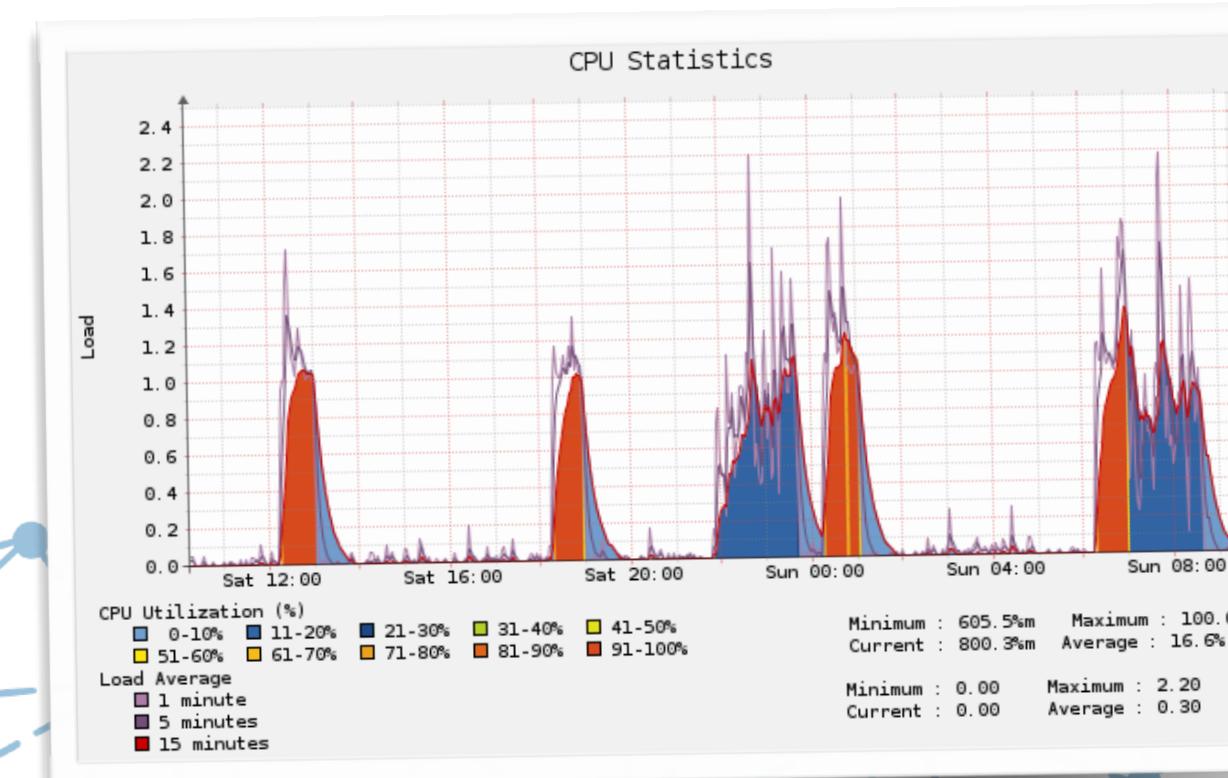


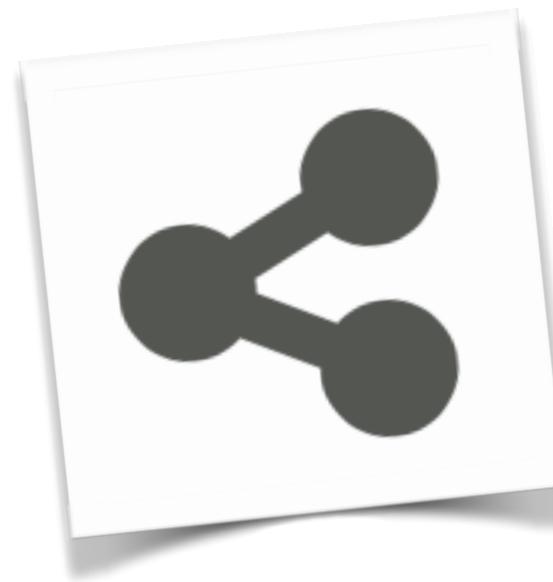
## Blackbox Testing

- ***ICMP, TCP, HTTP, SMTP, DNS, LDAP, SSL, Radius, etc.***

## Whitebox Testing

- ***SNMP, JMX, WS-Man, WMI, JDBC, NSClient++, HTTP JSON / XML Documents***





# Topology Framework

Network Topology Discovery with *Enlinkd*

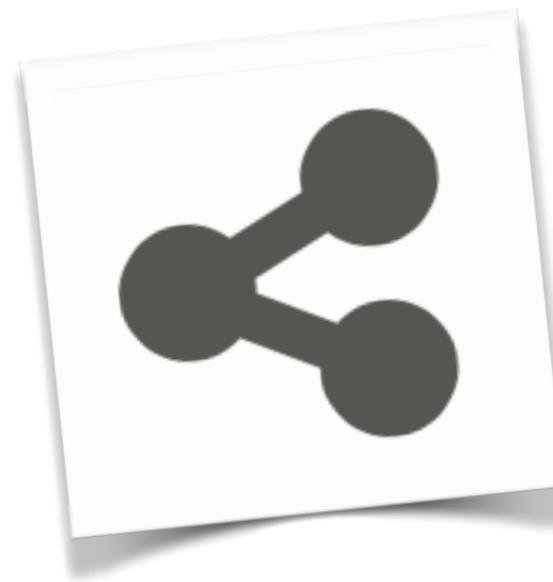
VMware Topology

Business Service Monitoring

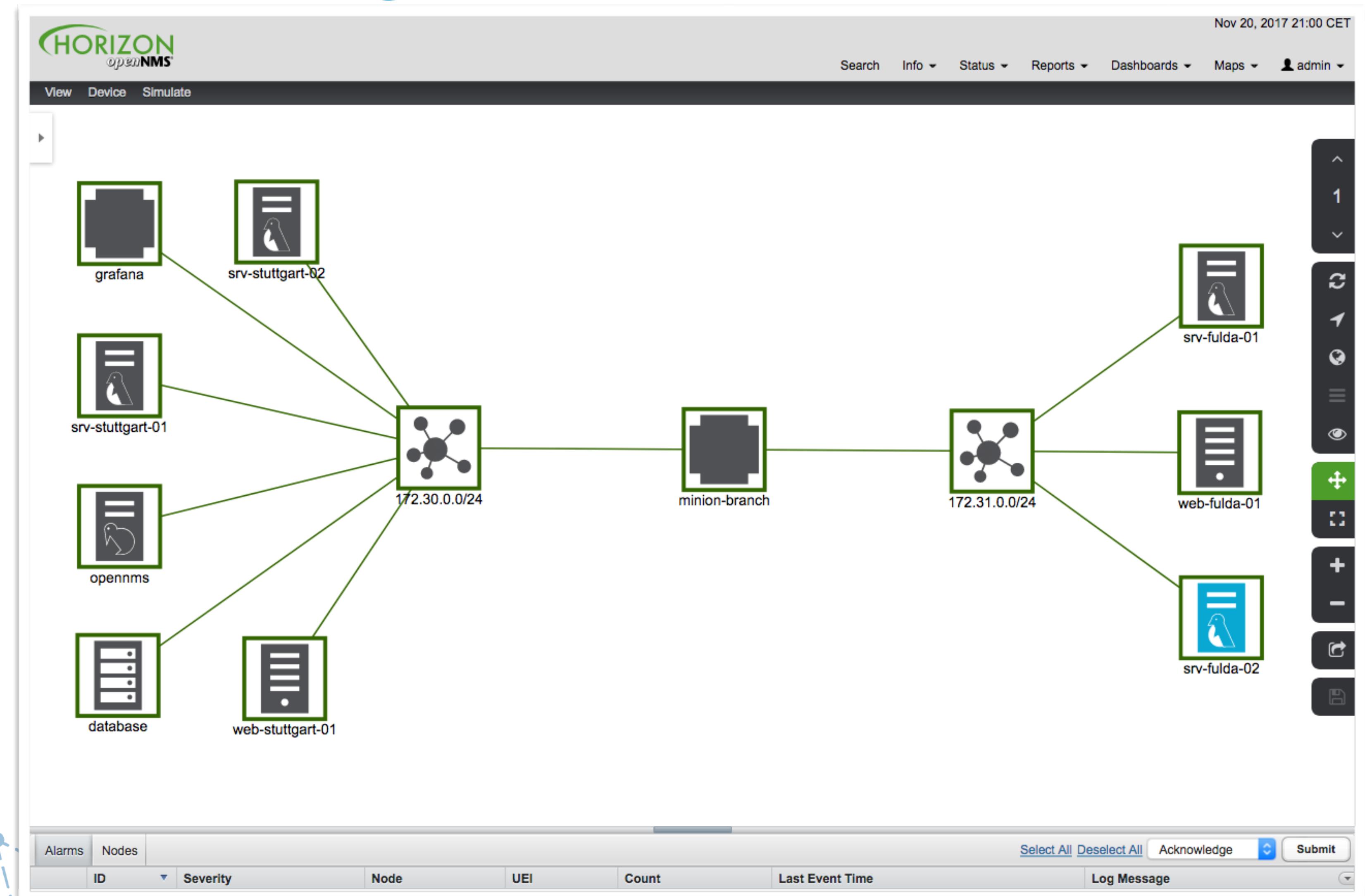
Logical Hierarchies based on Asset Information

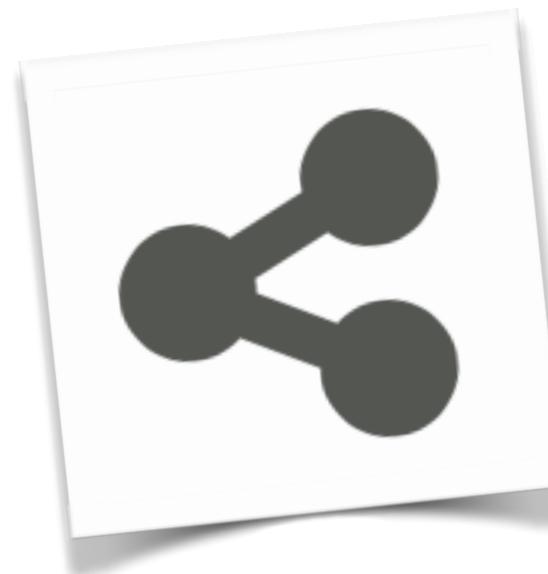
Described with GraphML



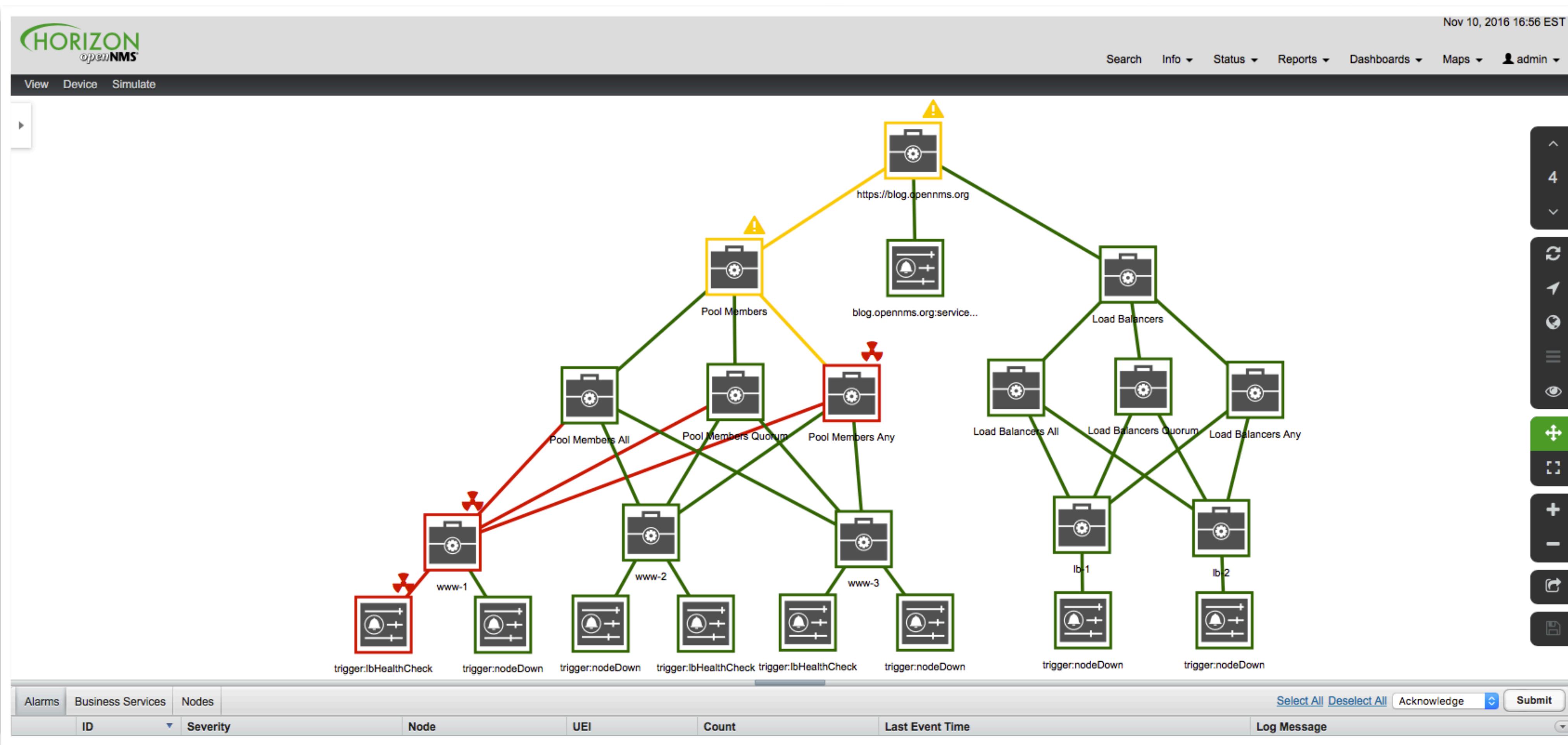


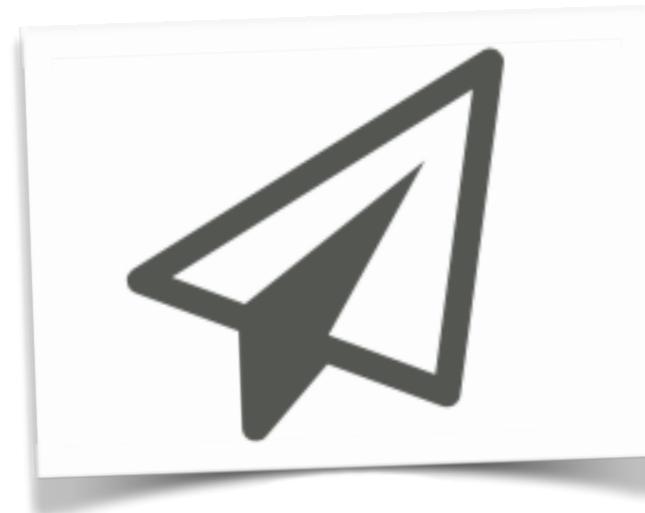
# Topology Framework



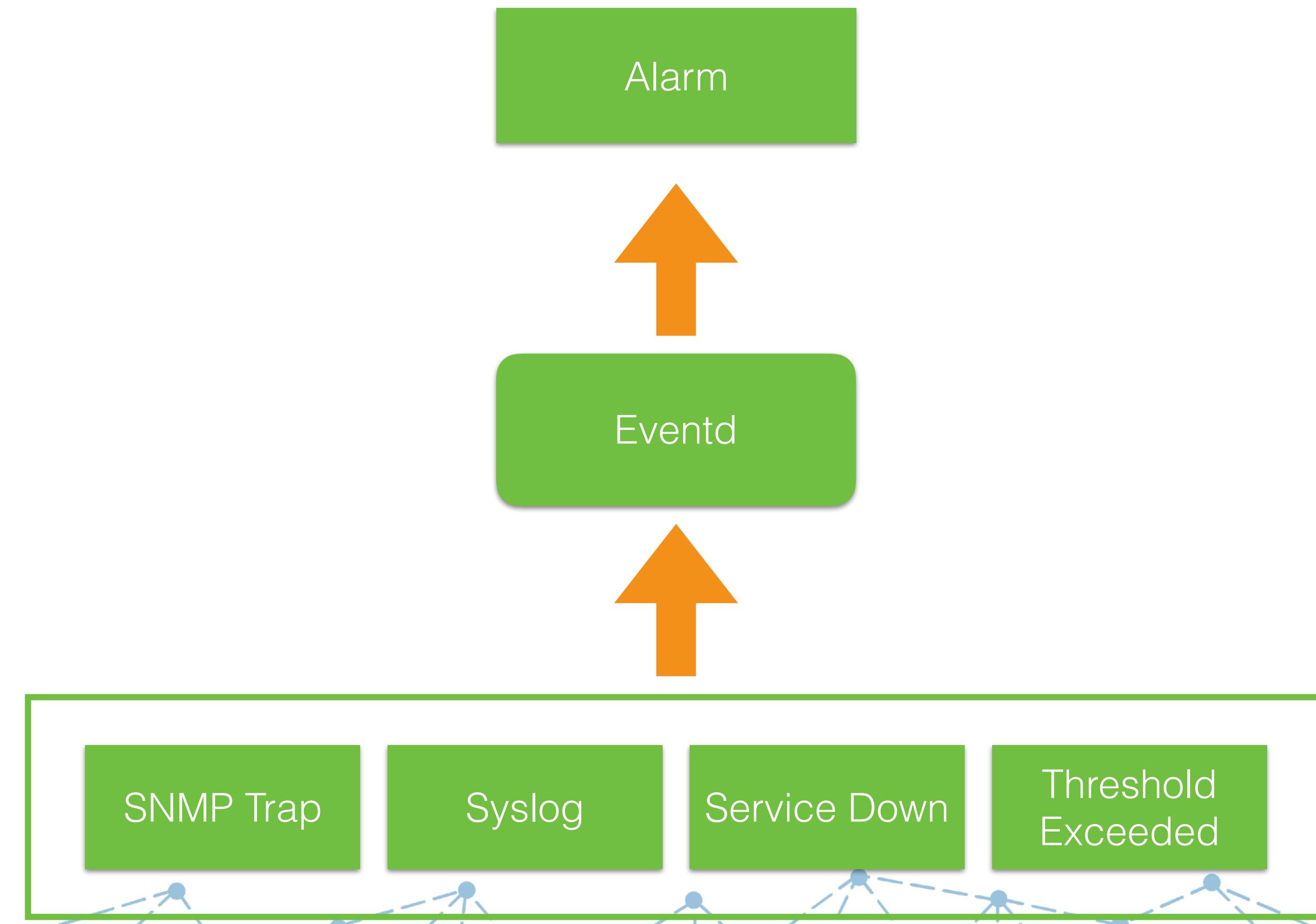


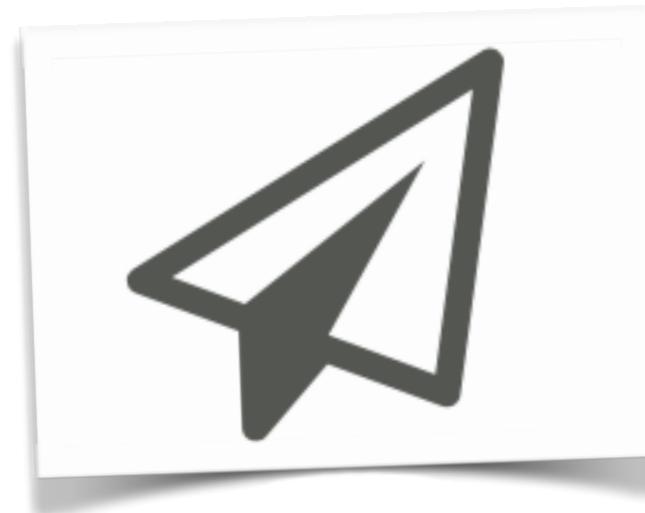
# Topology Framework



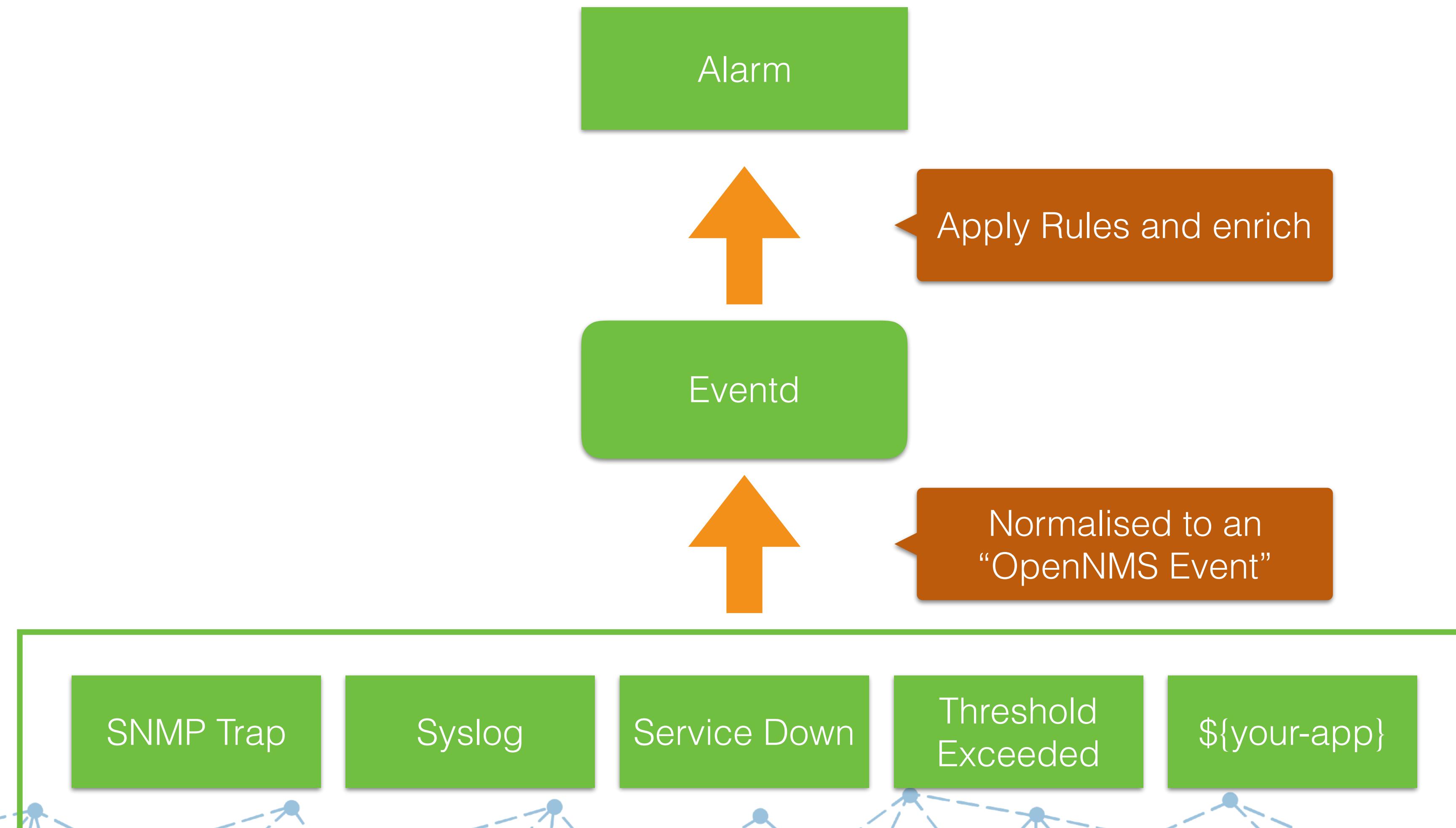


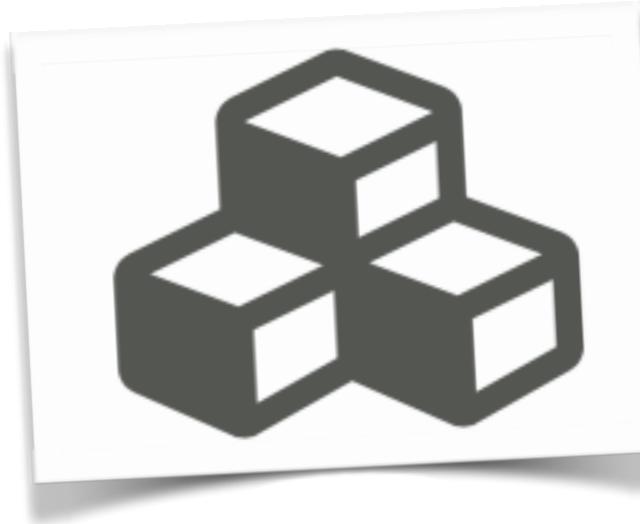
# Event Driven Architecture



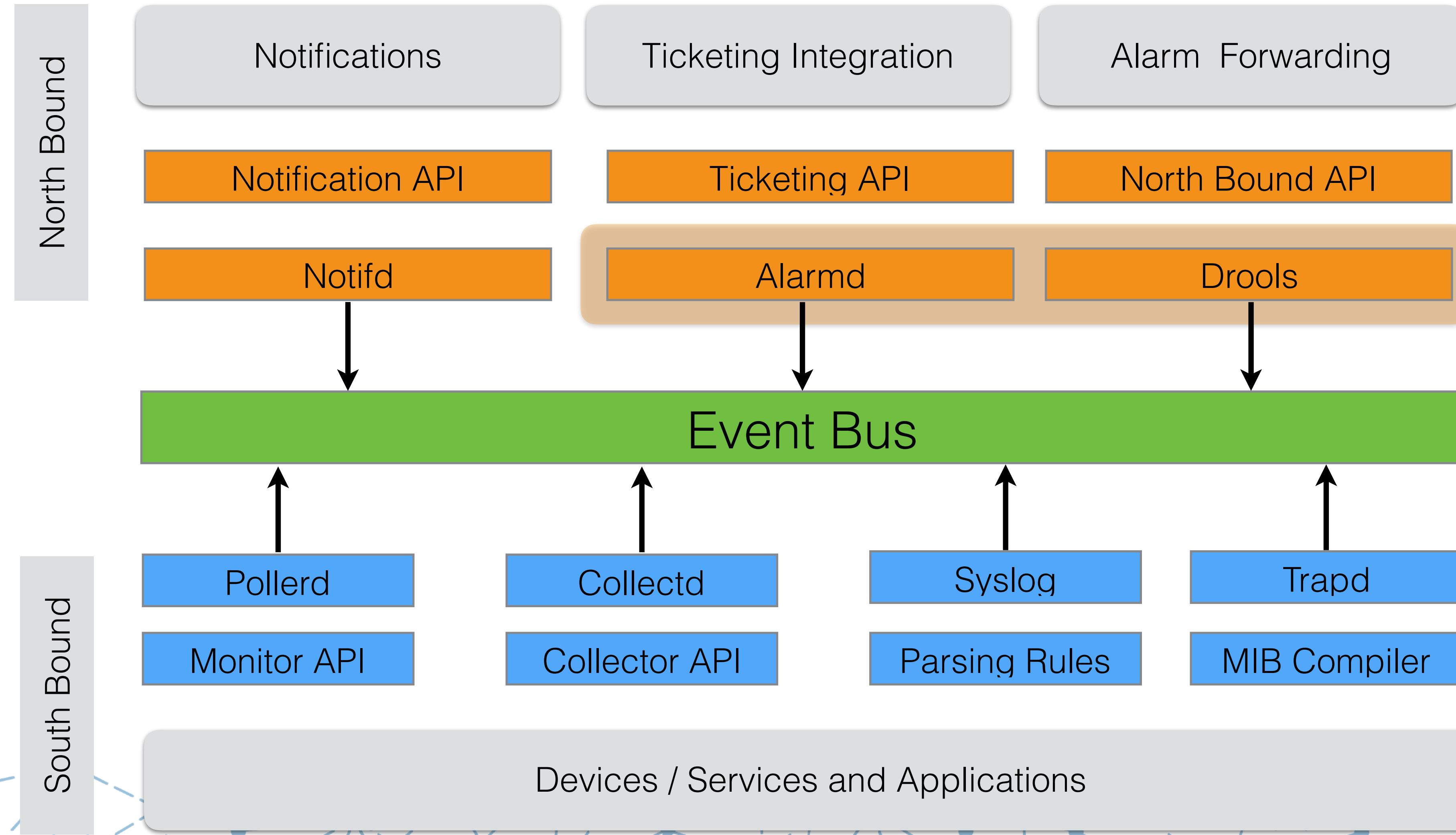


# Event Driven Architecture





# Integration



# OpenNMS in a Nutshell



Service Assurance



Performance



Topology Framework



Event Driven

REST API

Integration



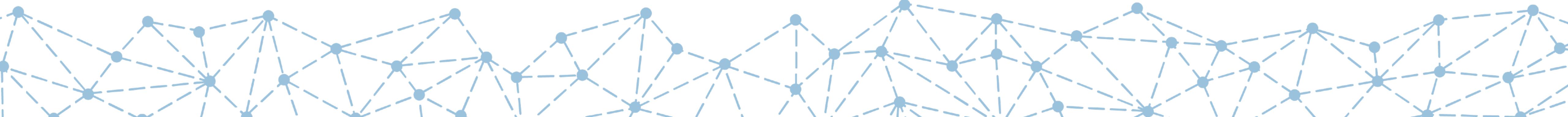
# Open Source und Business



- 100% Open Source - AGPLv3
- Innovations
- “Release Early, Release Often”
- Contribution License Agreement
- ~ 3 - 6 Monate Major Release
- *It's our Fedora in Red Hat speech*



- 100% Open Source - AGPLv3
- Long Term Support
- yearly subscription
- Feature Releases every year
- Selected feature subset from Horizon
- *It's our RHEL in Red Hat speech*



# Documentation

Screenshot of the OpenNMS documentation website (<https://docs.opennms.org>) showing the "Business Service Monitoring" section.

The page includes a Table of Contents on the left and the following content:

## 4. Business Service Monitoring

While OpenNMS detects issues in your network by device, interface or service, the *Business Service Monitoring (BSM)* takes it one step further. The *BSM* components allows you to monitor and model high level *Business Services (BS)* and helps quickly identify the most critical problems affecting these. With the *BSM* feature it is possible to model a high level *BS* context around the technical *Service Monitors* provided in *OpenNMS*. To indicate which *BS* is effected an *Operational Status* is calculated.

As an example, let's assume a company runs an online store. Customers enter through a login system, select items, place them in the shopping cart and checkout using a payment system. The whole service is provided by a few web servers and access data from databases. To monitor the status of the databases, a *SQL* service monitor on each database server is configured. For testing the web servers a *HTTP* service monitor is used for each of them. Covering the overall functionality a *Page Sequence Monitor (PSM)* is used to test the login, shop and payment workflow through the provided web portal. A possible representation of the whole system hierarchy is shown in figure [Example scenario for a web shop](#).

*Example scenario for a web shop*

```
graph TD; User1((User)) --> Login[Login]; User2((User)) --> Shop[Shop]; User3((User)) --> Payment[Payment]; Login --> PSMLogin[PSM :: Login]; Shop --> PSMShop[PSM :: Shop]; Payment --> PSMPayment[PSM :: Payment]; PSMLogin --> WebServer[Web Server]; PSMShop --> WebServer; PSMPayment --> WebServer; WebServer --> Web01[web01 :: HTTP]; WebServer --> Web02[web02 :: HTTP]; WebServer --> Web03[web03 :: HTTP]; WebServer --> Database[Database]; Database --> DB01[db01 :: SQL]; Database --> DB02[db02 :: SQL]
```

<https://docs.opennms.org>

Screenshot of the OpenNMS wiki (<https://wiki.opennms.org>) showing the "Main Page".

The page includes a sidebar on the left with links to Main Page, Releases, Other Downloads, SourceForge Project, Upcoming Events, Get Help, Get Involved, Get to Know Us, Tools, and footer links. The main content area features a "Welcome to the OpenNMS Wiki!" banner and a grid of eight cards with icons and titles: Installation & Upgrades, Tutorials, Documentation, Community, Monitoring Applications, Monitoring Devices, Tools, and Lab.

<https://wiki.opennms.org>

# Talk with people

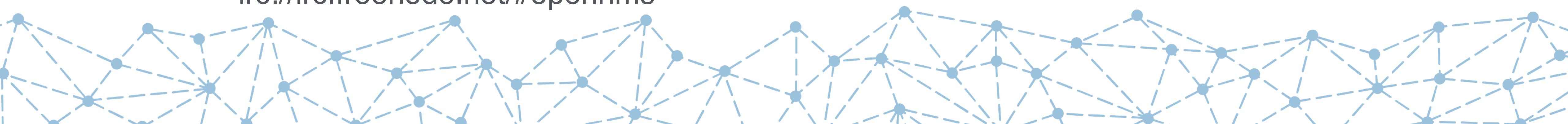
The screenshot shows a web-based chat interface for the 'OpenNMS Discussion' channel. The left sidebar lists various public and private channels. The main pane displays a conversation between users like 'trazomtg', 'indigo', and 'pioto' about configuration and source code availability. A message from 'indigo' links to a GitHub repository. The interface includes a search bar and a message input field.

<https://chat.opennms.com>

irc://irc.freenode.net/#opennms

The screenshot shows a mailing list interface for the 'opennms-discuss' list. The left sidebar shows navigation options like Mailboxes, VIPs, and Inbox. The main pane displays a thread from 'Michael Seibold' about Cassandra experience. Other messages from users like 'Dominic & Chris', 'JohnD Blackburn', and 'Ronald Roskens, Showers, Willia...' are shown. The interface includes a search bar and a 'See More' button.

[https://wiki.opennms.org/wiki/Mailing\\_lists](https://wiki.opennms.org/wiki/Mailing_lists)



# Project Updates

The screenshot shows the OpenNMS website with a navigation bar at the top featuring links for OpenNMS, Installation, Docs, Participate, Blog, and social media icons for GitHub, Twitter, YouTube, and a forum. A green "Live Demo" button is also present. Below the navigation is a large green header box containing the text "THIS WEEK IN OPENNMS". Underneath this, the breadcrumb navigation shows "OpenNMS > Blog > TWiO". A sub-header "THIS WEEK IN OPENNMS: NOVEMBER 13TH, 2017" is followed by a timestamp ("13, Nov"), author ("Benjamin Reed"), and tags ("twio, telemetryd, osgi, nx-os, elasticsearch, nexus, jest, asciibinder, enlinkd, osmc"). The main content area starts with a heading "It's time for This Week in OpenNMS!" followed by a paragraph about recent work on Telemetryd. Below this is a section titled "Github Project Updates" with a bulleted list: "Internals, APIs, and Documentation" with sub-points about OSGi bugs and contributions from Markus and Chandra. A "Continue Reading..." link is at the bottom. To the right of the main content are two sidebar sections: "SIMPLESEARCH" with a search bar and "POPULAR TAGS" listing various tags.

OpenNMS Installation Docs Participate Blog Live Demo

THIS WEEK IN OPENNMS

OpenNMS > Blog > TWiO

THIS WEEK IN OPENNMS: NOVEMBER 13TH, 2017

13, Nov Benjamin Reed twio, telemetryd, osgi, nx-os, elasticsearch, nexus, jest, asciibinder, enlinkd, osmc

It's time for This Week in OpenNMS!

Last week we did a lot of Telemetryd work and a few other bug fixes in preparation for the releases this Thursday.

## Github Project Updates

- Internals, APIs, and Documentation
  - Markus worked on the vaadin OSGi bug introduced in Horizon 20.
  - Chandra did mo...

Continue Reading...

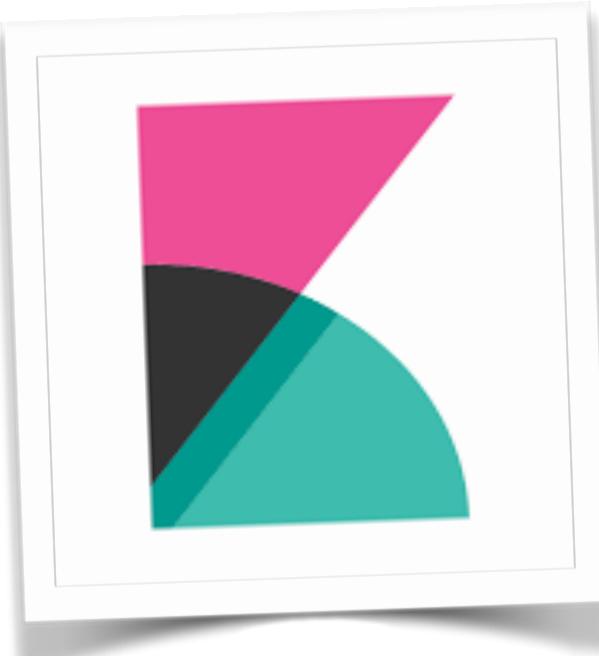
SIMPLESEARCH

Search...

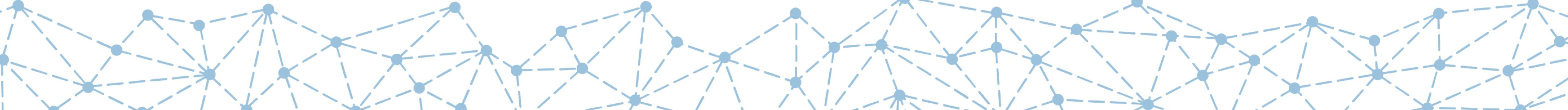
POPULAR TAGS

twio  
minion  
dev-jam  
training  
bsm  
rest  
osmc  
topology  
ohio linux fest  
snmp  
enlinkd  
topology maps  
svslog

- **This Week in OpenNMS**
- Current work in progress
- Upcoming events
- Weekly or bi-weekly
- <https://github.com/OpenNMS/twio-fodder>
- <https://www.opennms.org/en/blog/twio>
- Mail on [opennms-discuss](mailto:opennms-discuss@opennms.org) + [opennms-announce](mailto:opennms-announce@opennms.org)



Since OSMC 2016



# [github.com/OpenNMS/opennms](https://github.com/OpenNMS/opennms)

Contributors

+7 (68)

Commits

3882 (51307)

Accepted PRs

595 (1738)



[issues.opennms.org](https://issues.opennms.org)



Bug Issues Created **508**

Bug Issues Resolved **431**

Enhancement Created **364**

Enhancements Resolved **270**





Remote Agents

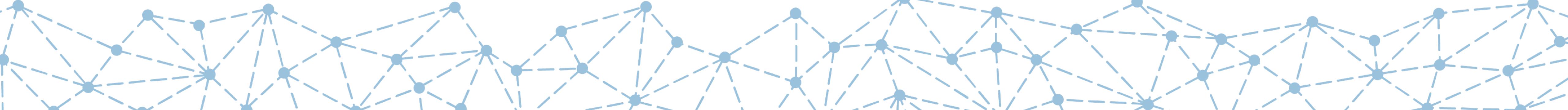
9

Horizon builds per month

20-35

Unit, Integration and  
Smoke Tests (21.0.2)

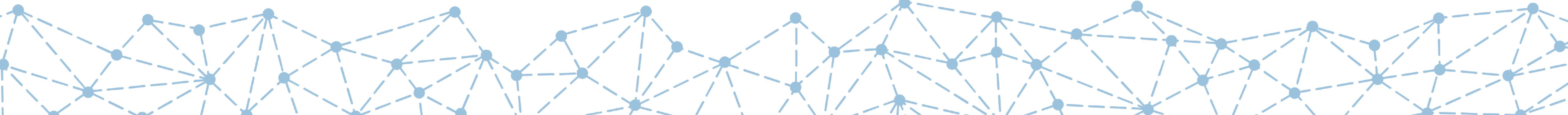
7156



[chat.opennms.org](https://chat.opennms.org)



Town Square	486
Discussion	324
Development	110
Compass	23





## Unique Installs

**14253**

## Monitored Nodes

**914 K**

## Monitored IP Interfaces

**563 K**

## Monitored Services

**947 K**

## Monitored Ports

**4.65 Mil**

## OpenNMS Versions

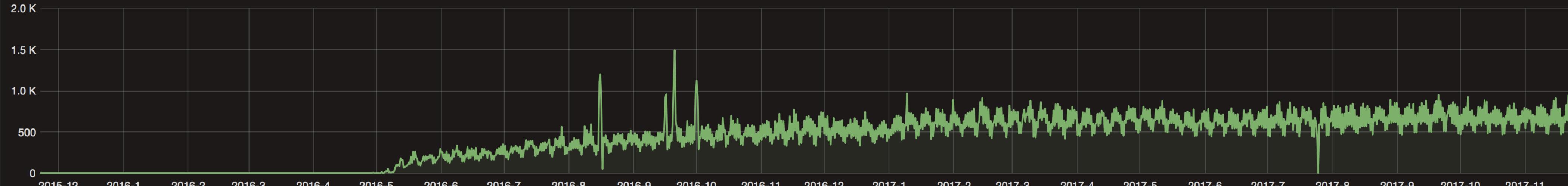
version ▾	Count
22.0.0	29.00
21.0.1	154.00
21.0.0	662.00
2017.1.2	1.00
2017.1.1	3.00
2017.1.0	6.00
2016.1.8	1.00
2016.1.6	2.00
2016.1.5	1.00
2016.1.4	8.00
2016.1.3	11.00

## OS Versions

osVersion	Count ▾
3.16.0-4-amd64	804.00
4.4.0-31-generic	709.00
6.1	565.00
3.10.0-327.el7.x86_64	518.00
10.0	491.00
6.3	487.00
3.10.0-514.el7.x86_64	413.00
4.4.0-62-generic	347.00
3.10.0-514.26.2.el7.x86_64	256.00
4.4.0-21-generic	227.00

1 2 3 4 5 6 7 8

## API Hits



+ ADD ROW

Home

**Nodes with Pending Problems**

There are no pending problems.

**Nodes with Outages**

There are no current outages

**Business Services with Pending Problems**

There are no pending problems.

**Applications with Pending Problems**

There are no pending problems.

**Help Improve OpenNMS**

Please opt-in to send anonymous OpenNMS usage statistics to [OpenNMS Statistics](#). This will help us improve your OpenNMS software and you can change this setting at anytime from the Admin menu.

**Show me what is being sent.**

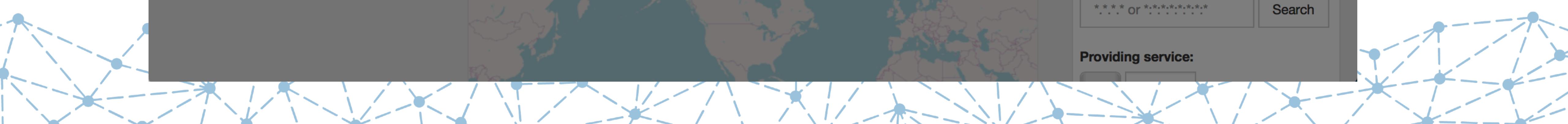
```
{  
    "alarms": 0,  
    "events": 72,  
    "ipInterfaces": 0,  
    "monitoredServices": 0,  
    "nodes": 0,  
    "nodesBySysOid": {},  
    "osArch": "amd64",  
    "osName": "Linux",  
    "osVersion": "4.9.60-linuxkit-aufs",  
    "packageName": "opennms",  
    "snmpInterfaces": 0,  
    "systemId": "4700d010-1882-41a4-95f3-dda510136b40",  
    "version": "21.0.1"  
}
```

**Opt-in****Opt-out**

Dashboards ▾ Maps ▾ admin ▾

**Notifications**

- You have no outstanding notices
- There are no outstanding notices
- On-Call Schedule

**Resource Graphs** Type the node label **KSC Reports** Type the KSC report name **Quick Search** Node ID: **Node label like:** **TCP/IP Address like:** \*.\*.\*.\* or \*.\*.\*.\*.\* **Providing service:**

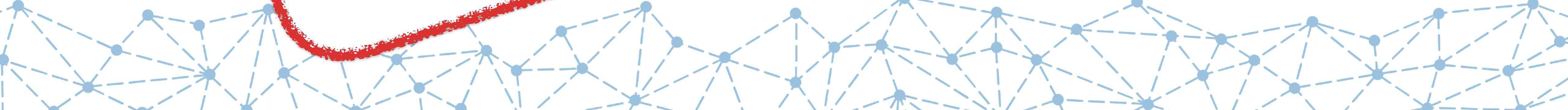
# DevJam 2017



- Unconference
- 5 Days - Concordia University
- Share and discuss ideas
- Proof-of-Concepts



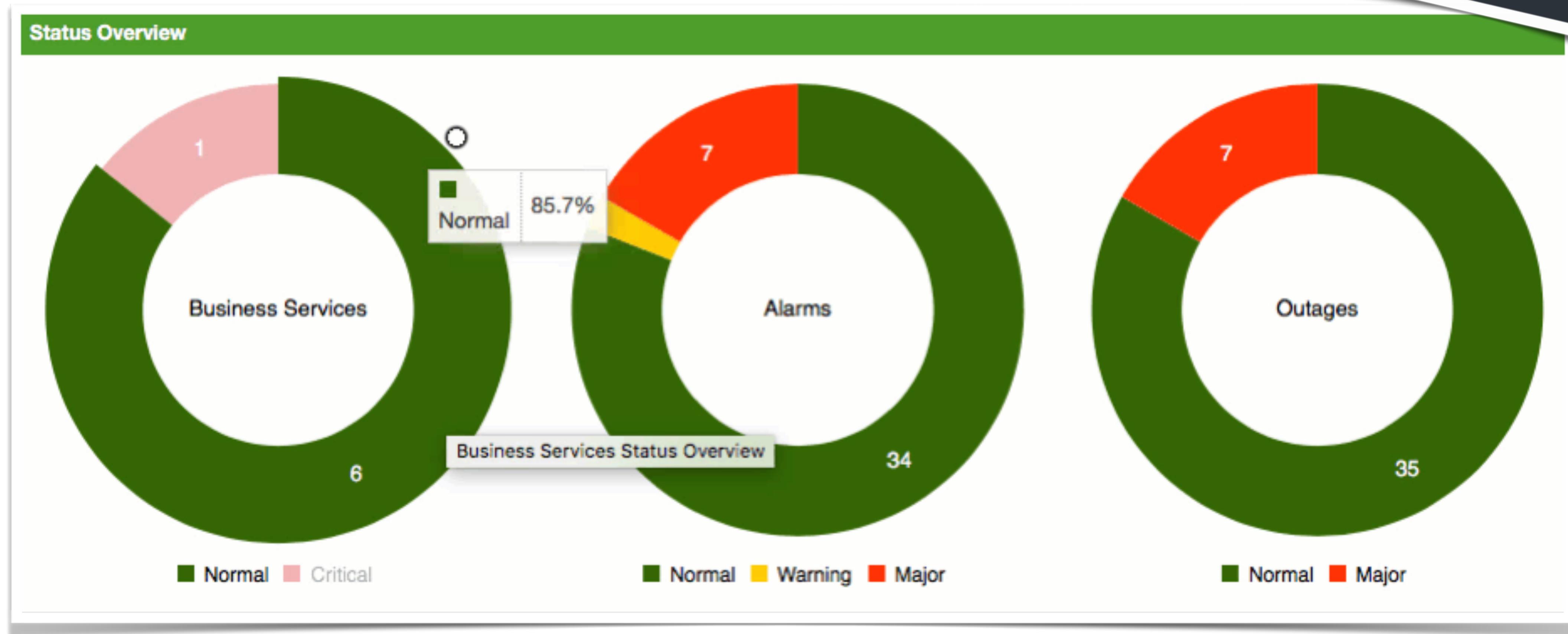
Rule #32

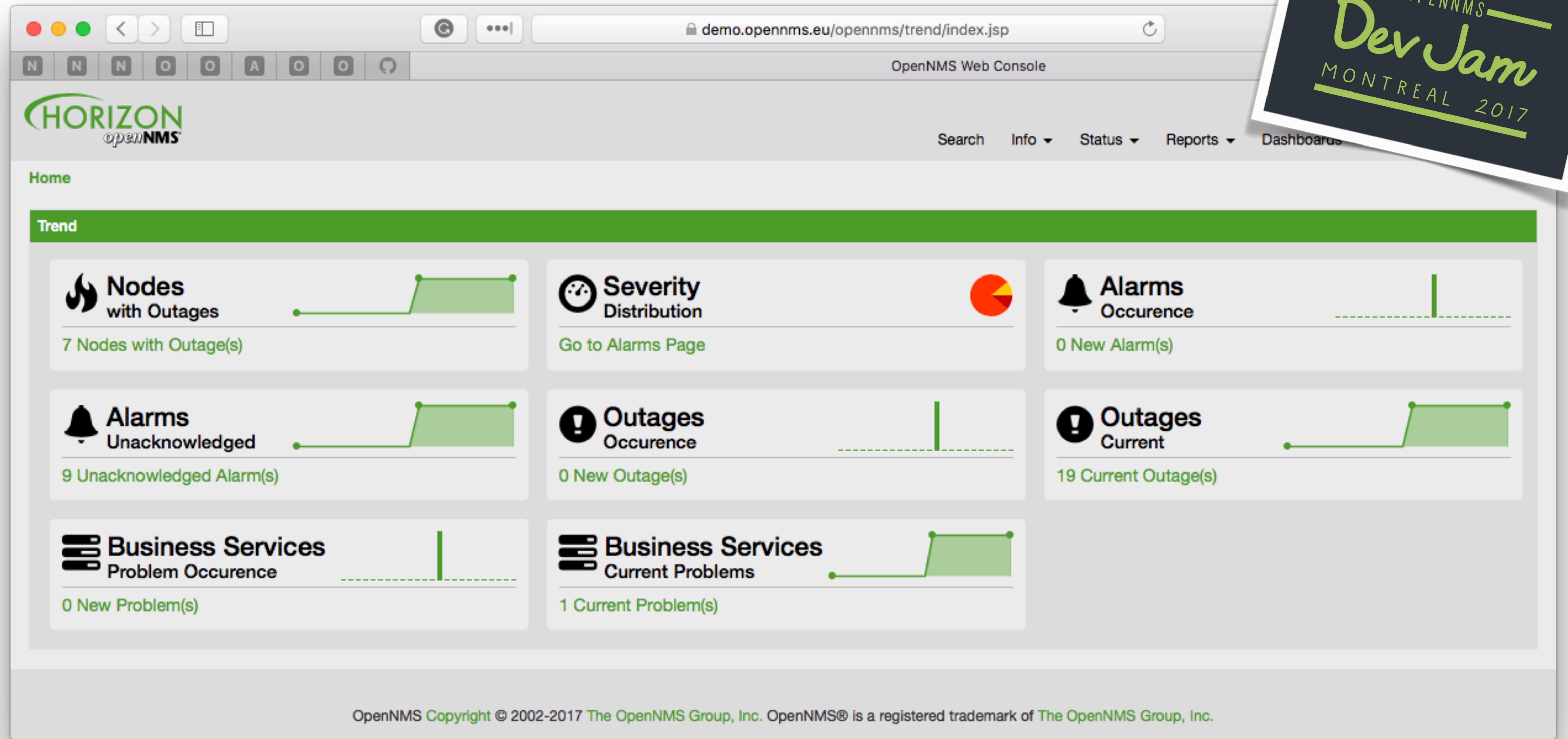


Rule #32  
enjoy the little  
things



# DevJam 2017



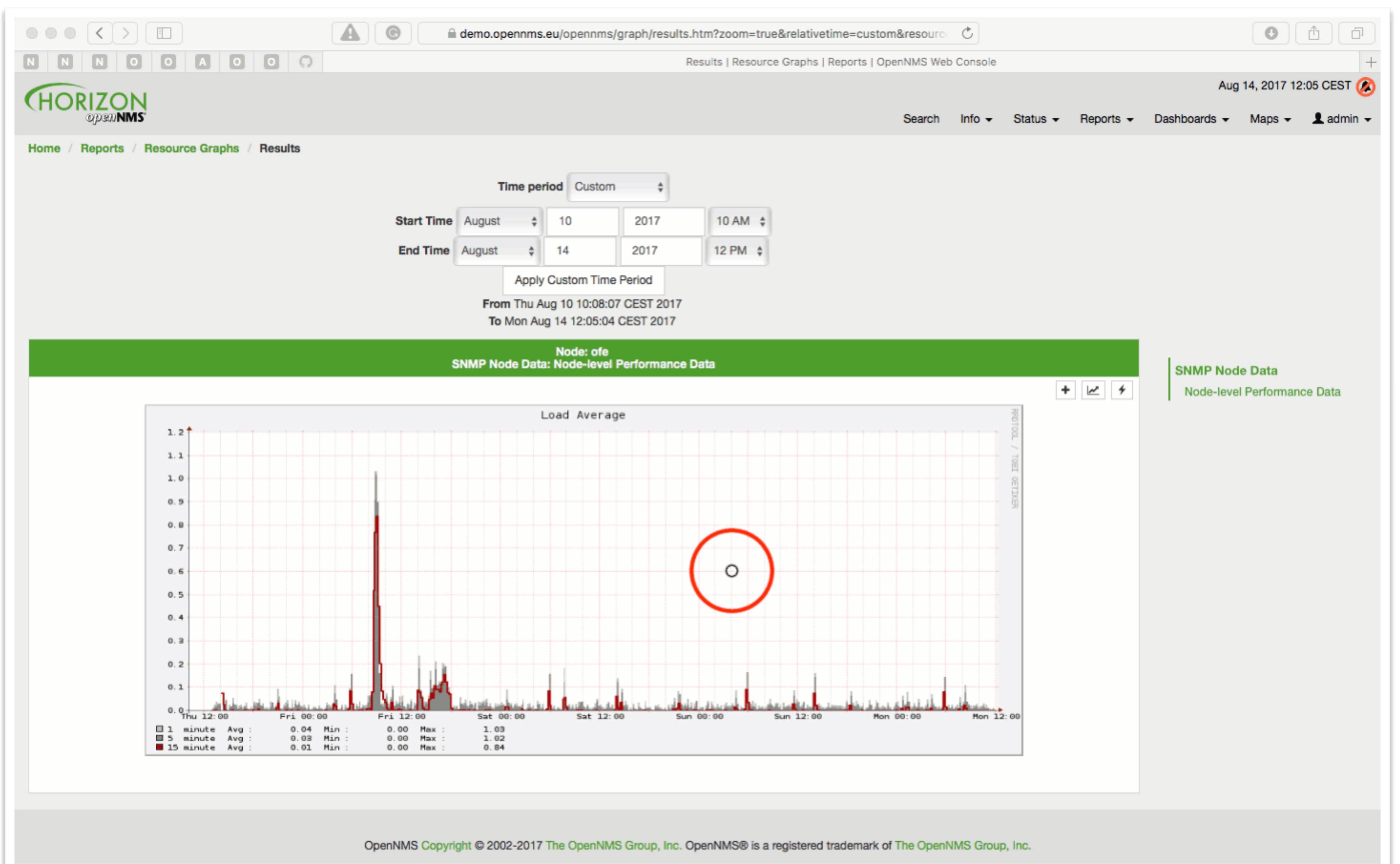


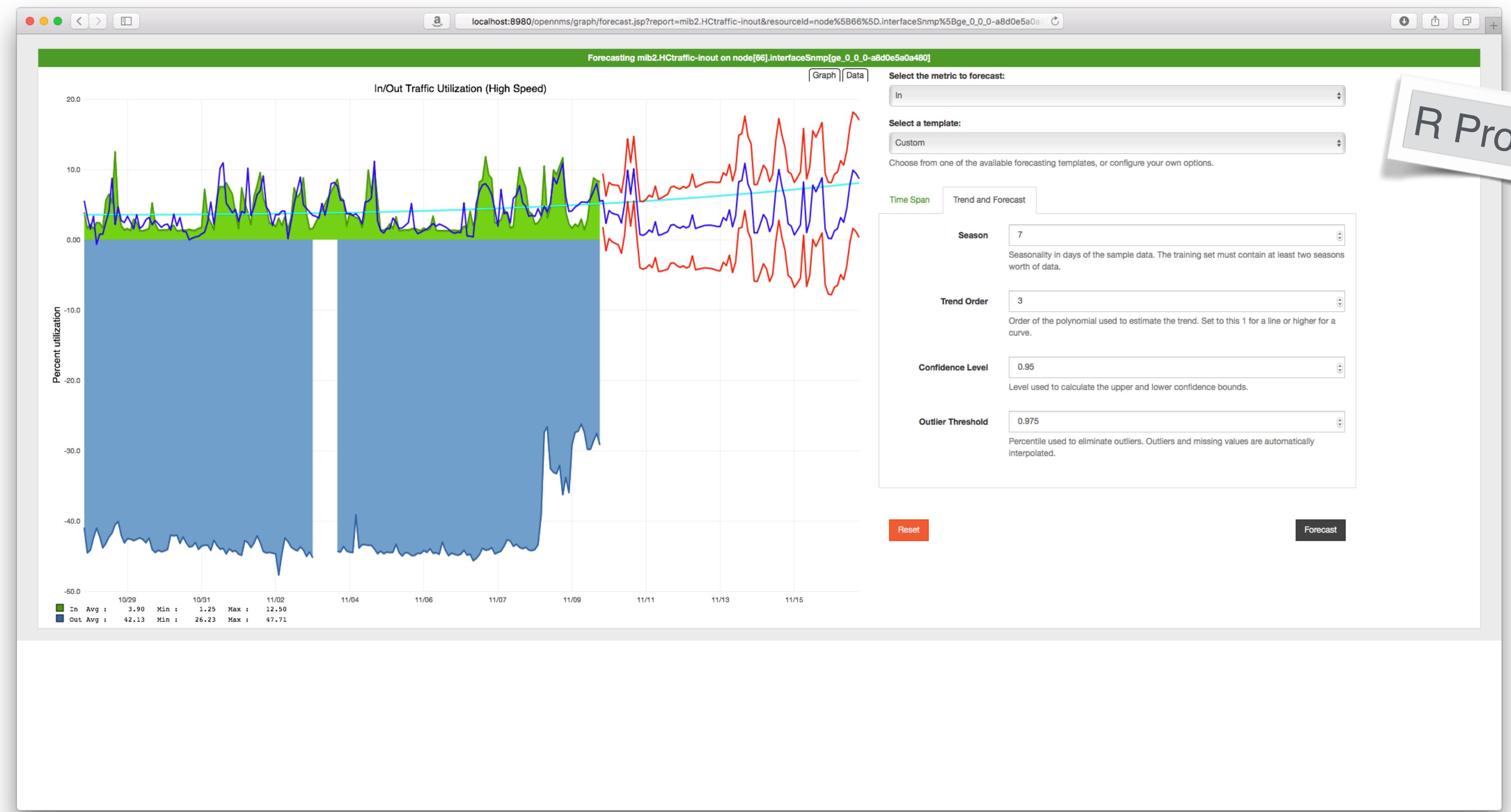
# IFTTT Integration

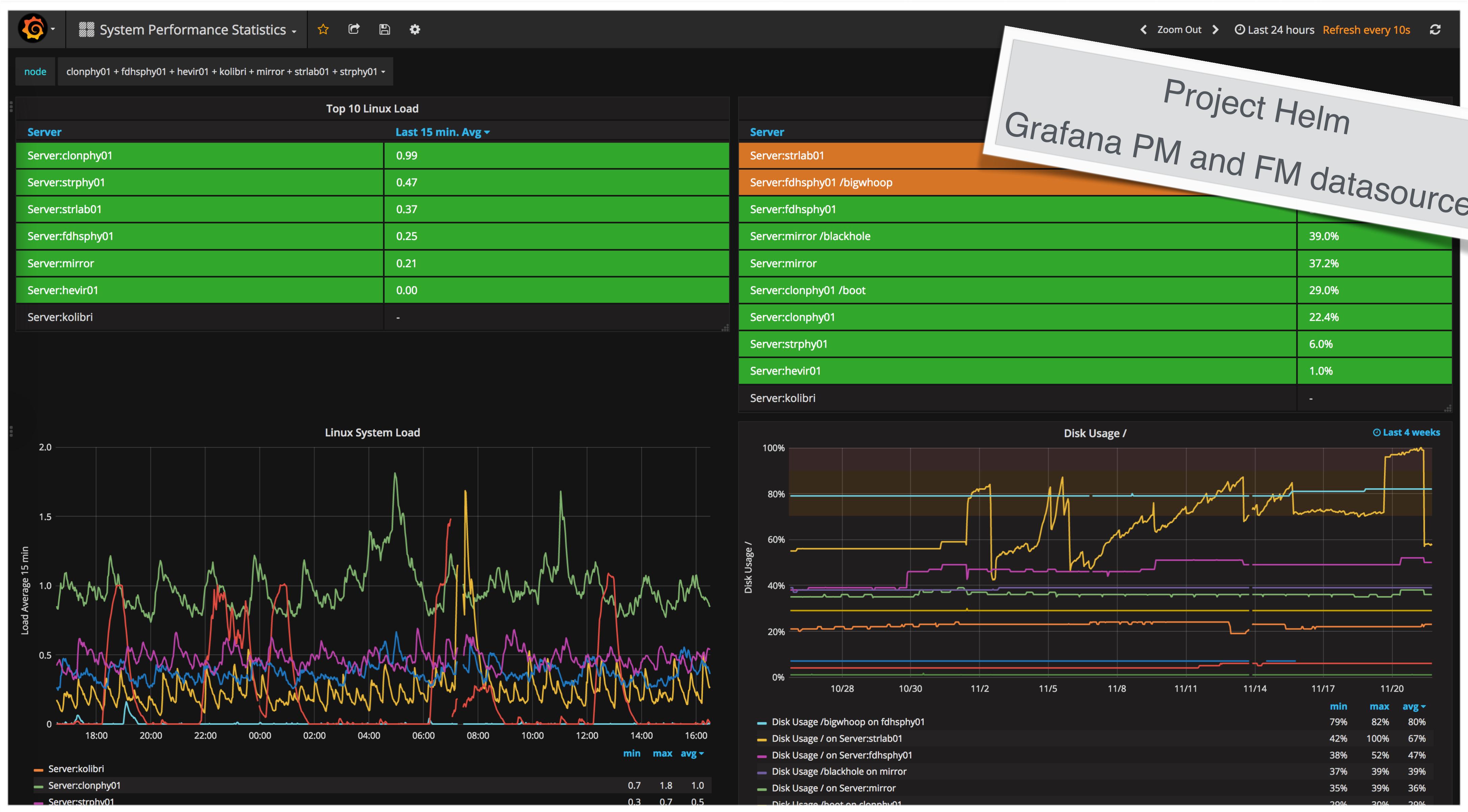
The collage illustrates several examples of IFTTT integration:

- IFTTT Dashboard:** Shows the IFTTT interface with sections for Discover, Search, My Applets, and Activity.
- IKEA Product Page:** Shows a LIFX FADO table lamp listed on the IKEA website.
- LIFX Applets:** Three applets created by LIFX:
  - LIFX lights turn orange when Nest detects motion on Halloween night.
  - LIFX turns orange when someone opens my doorbell on Halloween.
  - A new trigger or action is published.
- IKEA Product Page:** Shows a LIFX FADO table lamp listed on the IKEA website.
- LIFX Product Page:** Shows the LIFX A60 LED Light product page with various purchase options and a "Buy Now" button.
- DevJam Montreal 2017:** A photo of the DevJam Montreal 2017 logo.









Project Helm  
Grafana PM and FM datasources

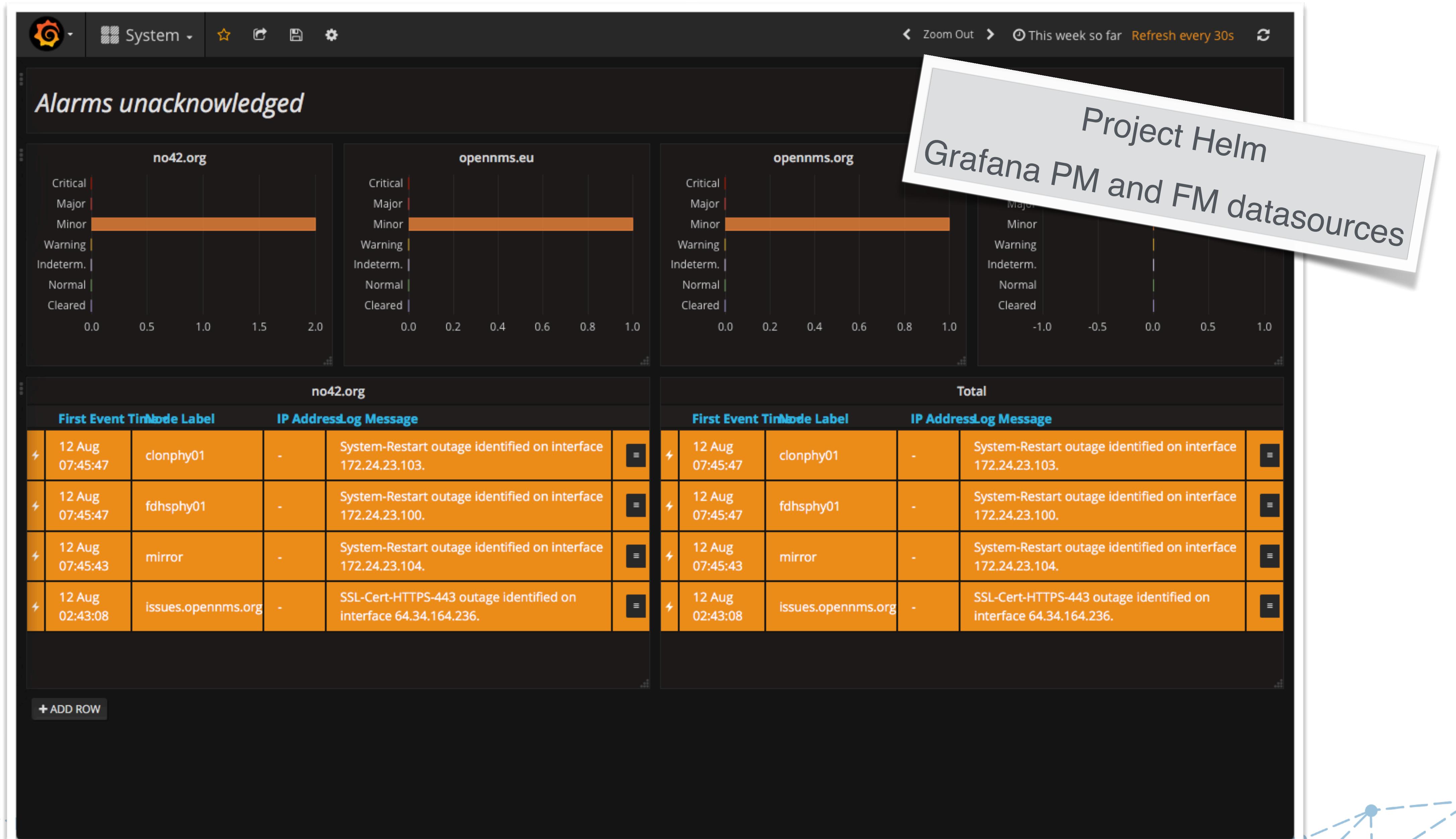
Search: query

Name	Description	Backend
Chomp	Strips leading and trailing rows that contain nothing but NaNs/null values.	Java
HoltWinters	Performs Holt-Winters forecasting.	R
Outlier	Removes outliers and replaces them with interpolated values.	Java
Trend	Fits a trend line or polynomial to a given column.	R
JEXL	Generic JEXL expression filter	Java
Percentile	Calculates percentiles	Java
Derivative	Calculates the derivative (rate of change) between rows.	Java

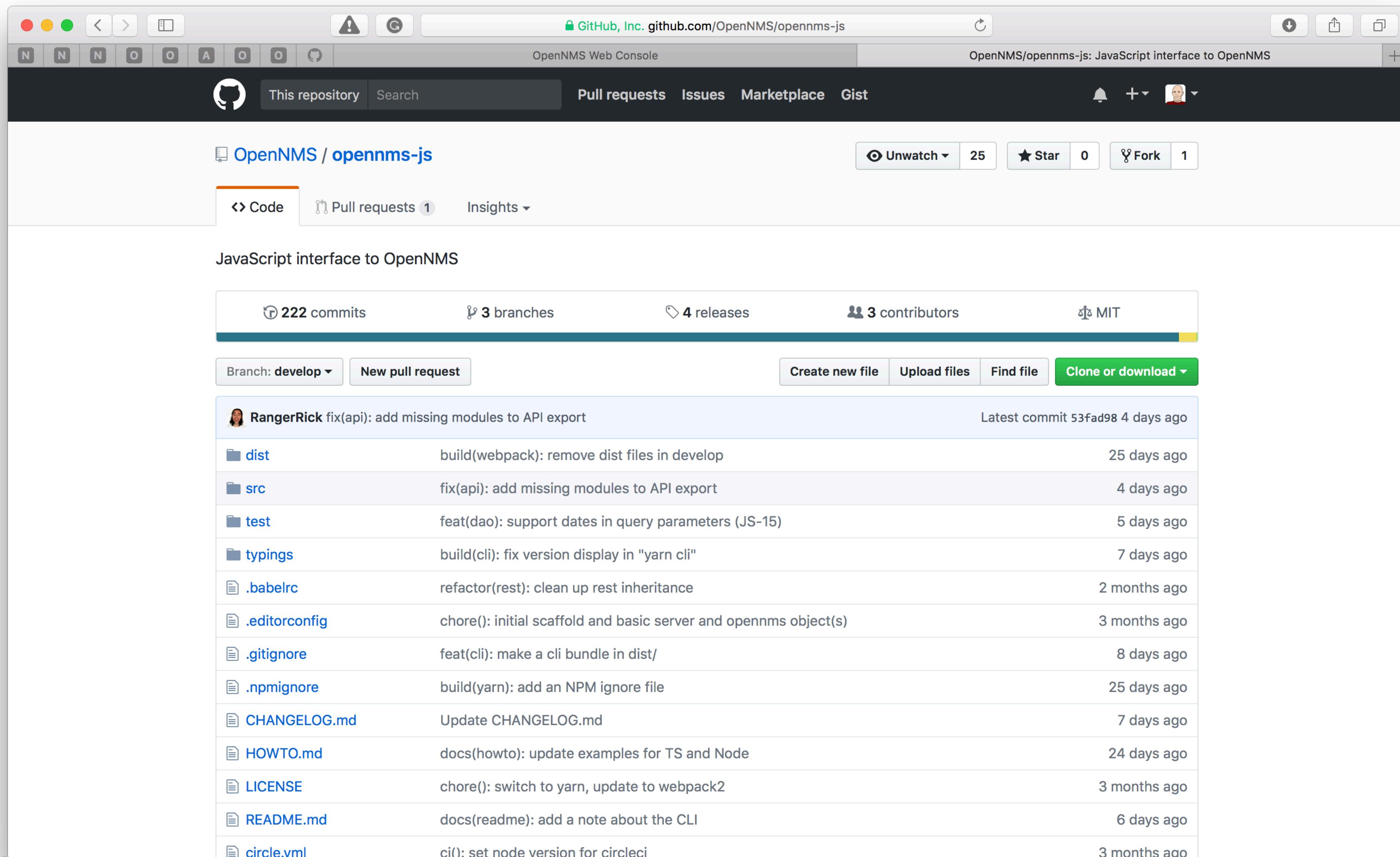
Showing 7 of 7 filters.

Cancel

Select



# OpenNMS JavaScript Library

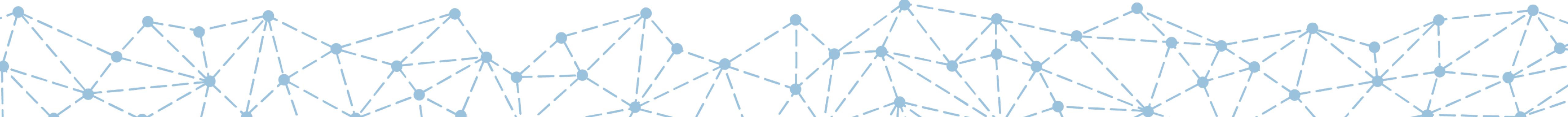


# OpenNMS JavaScript Library

```
▶ indigo@blinky ➤ ~/Desktop/docker-horizon-core-web/etc ➤ ↵master • ? ➤ opennms capabilities
OpenNMS Horizon 21.0.1 Capabilities:

Ack Alarms:          true
Api Version:         2
Graphs:              true
Outage Summaries:    true
Set Node Location:   true
Ticketer:             true

▶ indigo@blinky ➤ ~/Desktop/docker-horizon-core-web/etc ➤ ↵master • ?
```

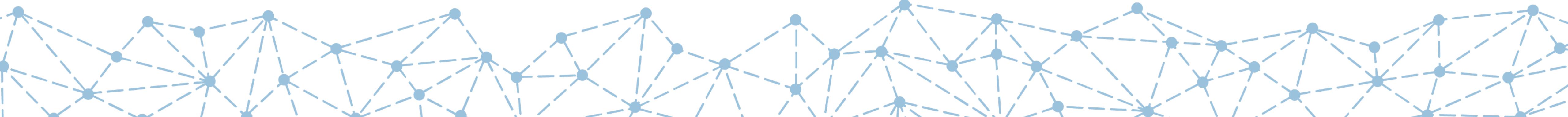
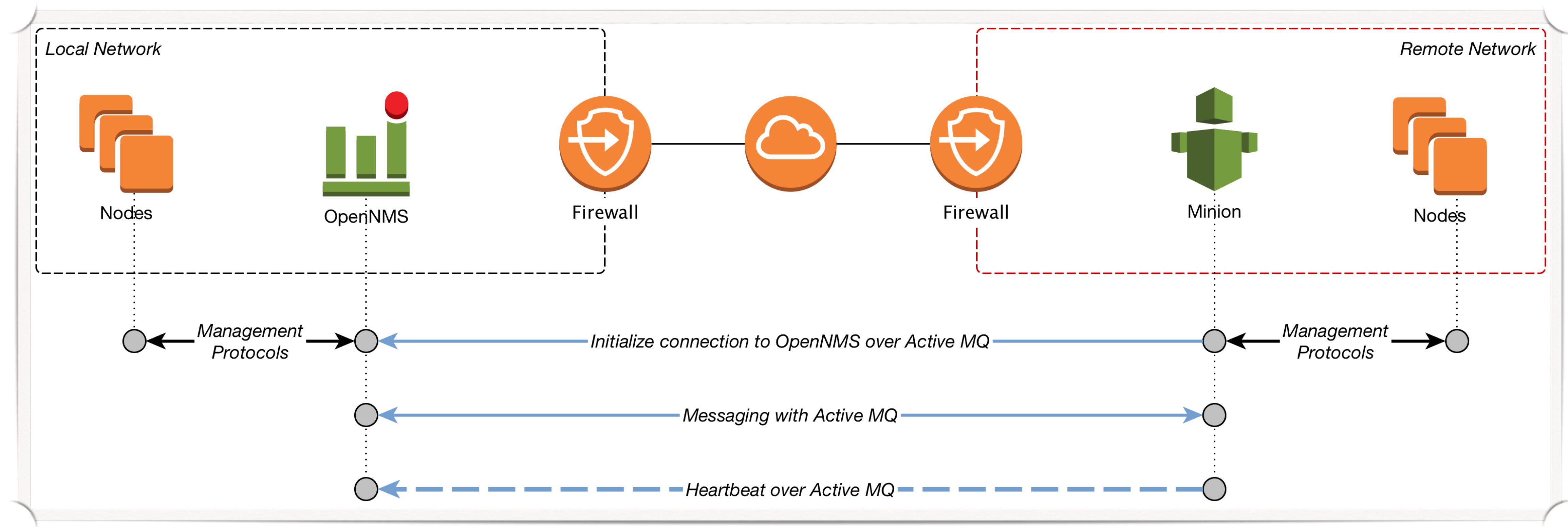


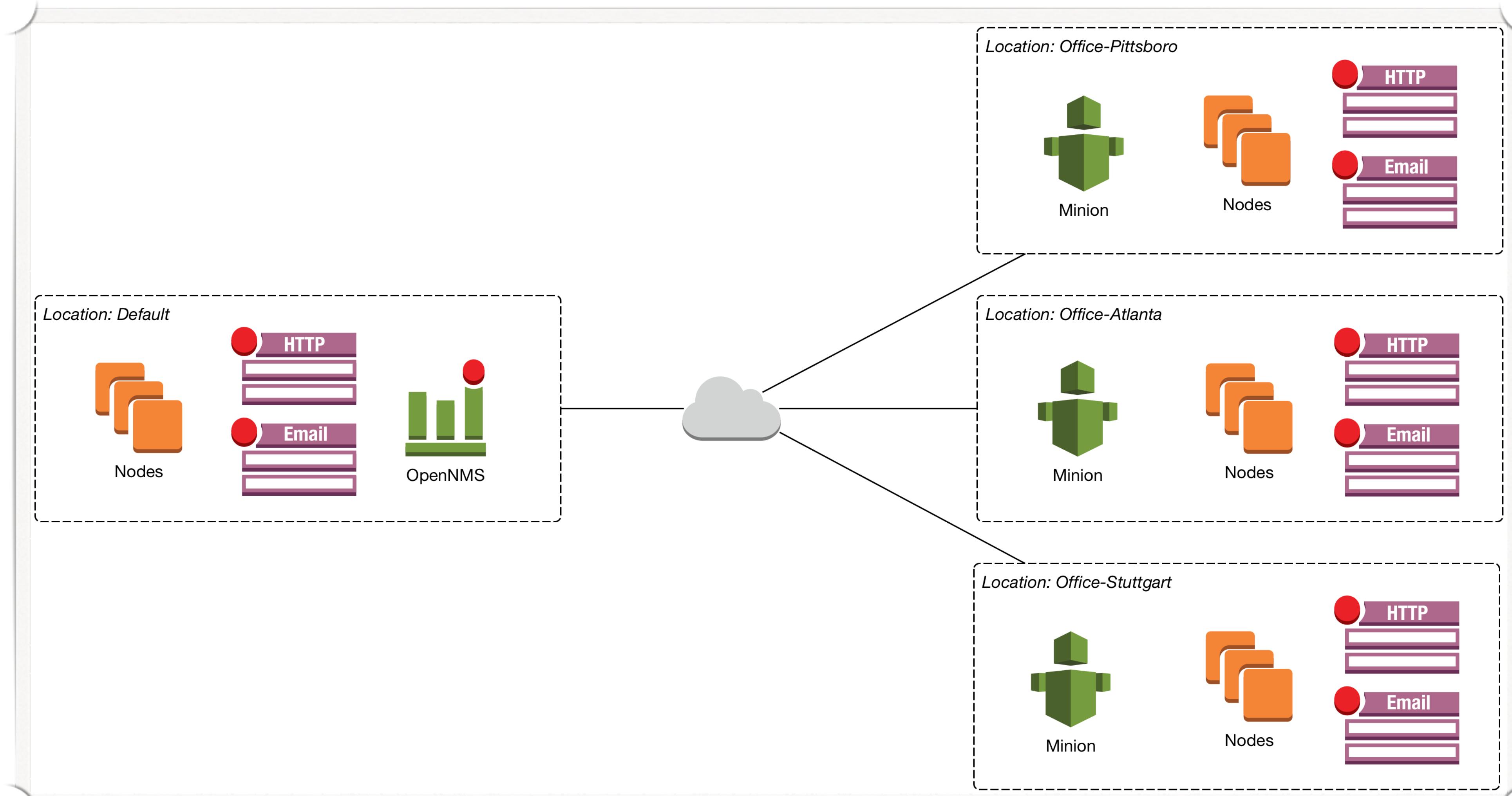
# OpenNMS JavaScript Library

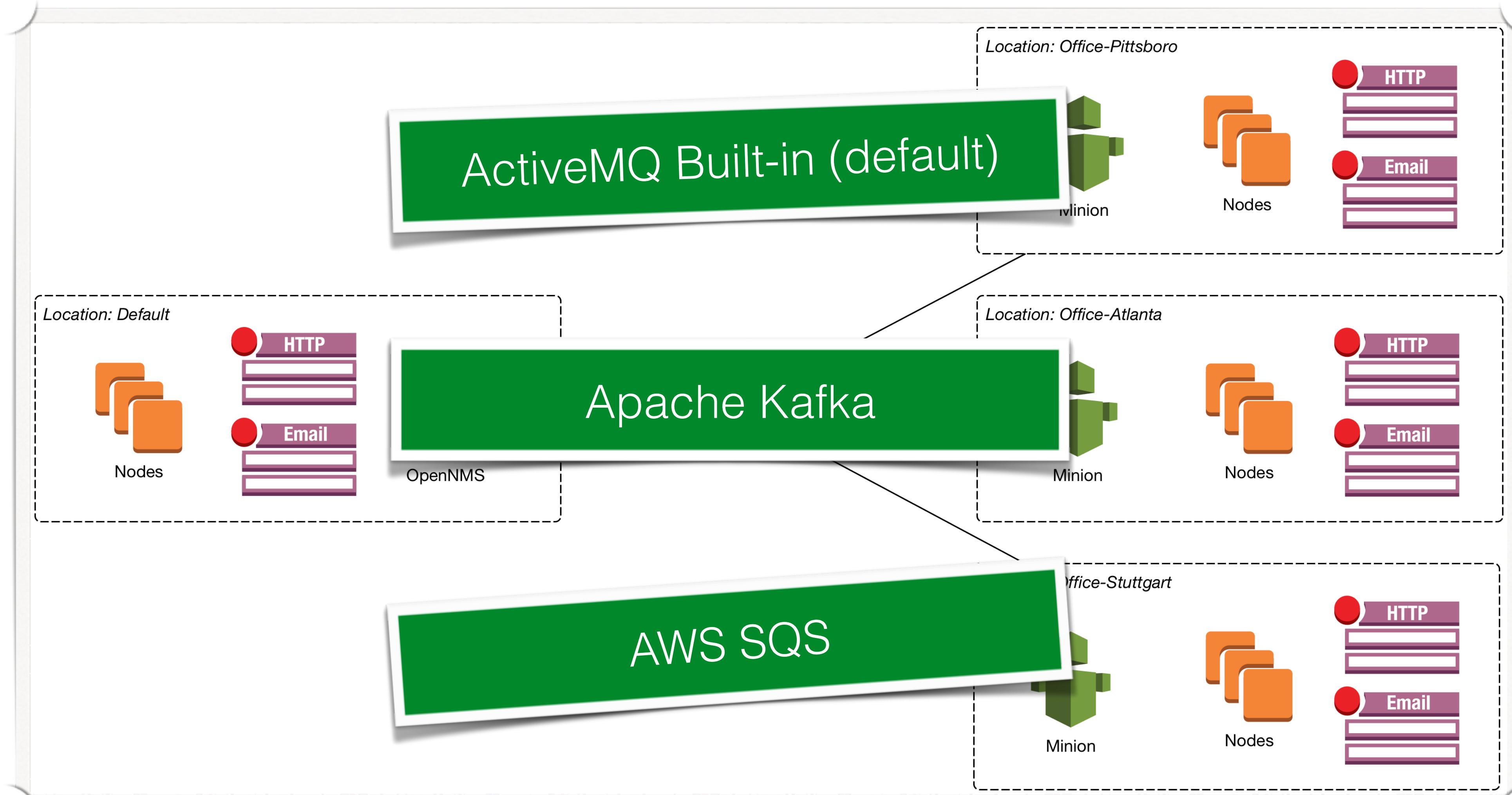
```
▶ indigo@blinky ➤ ~ opennms alarms ✓ ← 10005 ← 16:59:36
```

ID	Severity	Node	Count	Time	Log
282	MINOR	clonphy01	1	2017-08-12 07:47	System-Restart outage identified on interface 172...
281	MINOR	fdhsphy01	1	2017-08-12 07:47	System-Restart outage identified on interface 172...
280	MINOR	mirror	1	2017-08-12 07:43	System-Restart outage identified on interface 172...
273	MINOR	issues.opennms.org	1	2017-08-12 02:08	SSL-Cert-HTTPS-443 outage identified on interface...

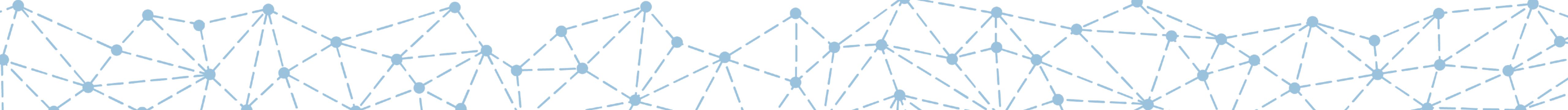








# Roadmap for 22



- > About
- > Release Notes
- > Installation
- > Development Environment
- > Operation
- > User Management
- ✓ Service Assurance
  - Introduction
  - Pollerd Configuration
  - Critical Service
  - Downtime Model
  - Path Outages**
  - Polling Packages
    - ▶ Monitors
- > Performance Management
- > Events
- > Alarms
- > Notifications
- > Provisioning
- > Business Service Monitoring
- > Topology Map
- > Enhanced Linkd
- > JMX Configuration Generator
- > Operations Board
- > Plugin Manager
- > Special Cases and Workarounds
- > ReST API

## Path Outages

An outage of a central core component can cause a lot of node outages and notifications. For this reason it is possible to define a *Critical Path*. The *Critical Path* has to be defined from the network perspective of the monitoring system. The following image shows a simple example how devices can be reached in a Layer 3 network topology.

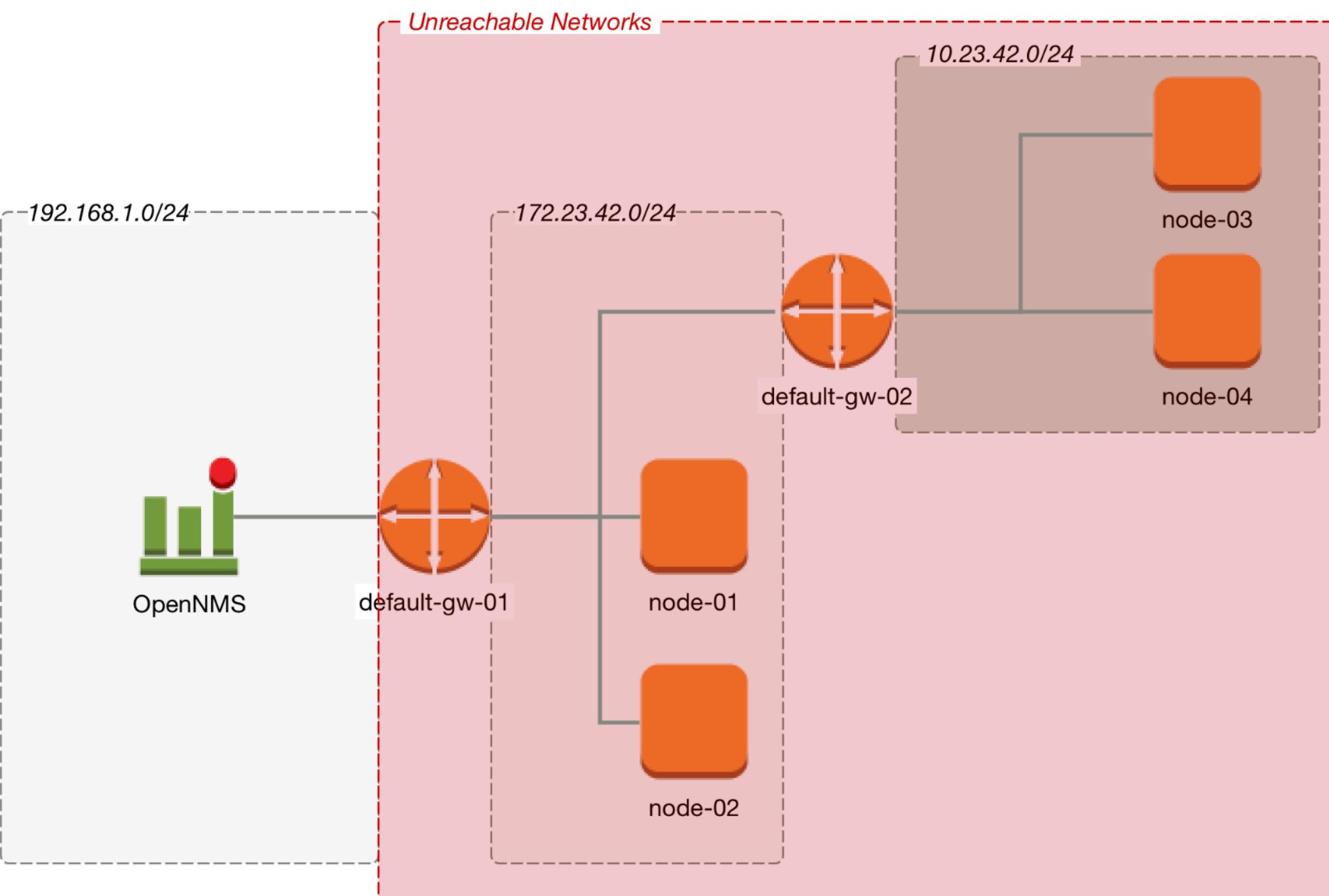


Figure 1. Path Outage example

In figure [Path Outage example](#) implies a network Layer 3 topology. From the perspective of the monitoring system, *default-gw-01* is on the *Critical Path* to two networks. In case *default-gw-01* is down, it is not possible to reach any node in the two networks behind *default-gw-01*. To guide a network administrator to the correct problem, *Notifications* to all other unreachable *Nodes* based on the *Critical Path* are suppressed. The administrator will get just one *Notification* for the *default-gw-01*.

This functionality is used to suppress *Notifications* based on the node depending on each other in the network path. The



Ascii**Binder**

# Project Drift

Horizon 21.0.2

Horizon 22.0.0

- Infrastructure to Support pushing Streaming Telemetry
- Support Junos Telemetry Interface (JTI)
- Netflow v5
- Support for Cisco NX-OS
- Netflow v9/IPFIX
- S-Flow
- at scale (3084 flow pkts/sec -> 92.520 flows/sec -> 100.000 fps)



# Project Drift

Horizon 21.0.2

Horizon 22.0.0

- Infrastructure to Support pushing Streaming Telemetry data
- Support Junos Telemetry Interface (JTI)
- Netflow v5
- Support for Cisco NX-OS
- Netflow v9/IPFIX
- S-Flow
- at scale (3084 flow pkts/sec -> 92.520 flows/sec -> 100.000 fps)



# Project Drift

Horizon 21.0.2

Horizon 22.0.0

Netflow Exporter

Netflow Exporter



# Junos Telemetry Interface

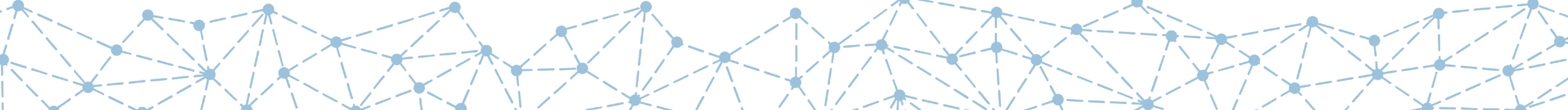
- Primary function performance monitoring
- Streaming data to a performance management system
- Measure trends, link and node utilisation
- Troubleshoot network congestion in realtime
- Stream duplicate data to two destinations for redundancy
- Collectors request by initiating a telemetry subscription is streamed periodically

[https://www.juniper.net/documentation/en\\_US/junos/information-products/pathway-pages/junos-telemetry-interface/junos-telemetry-interface.pdf](https://www.juniper.net/documentation/en_US/junos/information-products/pathway-pages/junos-telemetry-interface/junos-telemetry-interface.pdf)

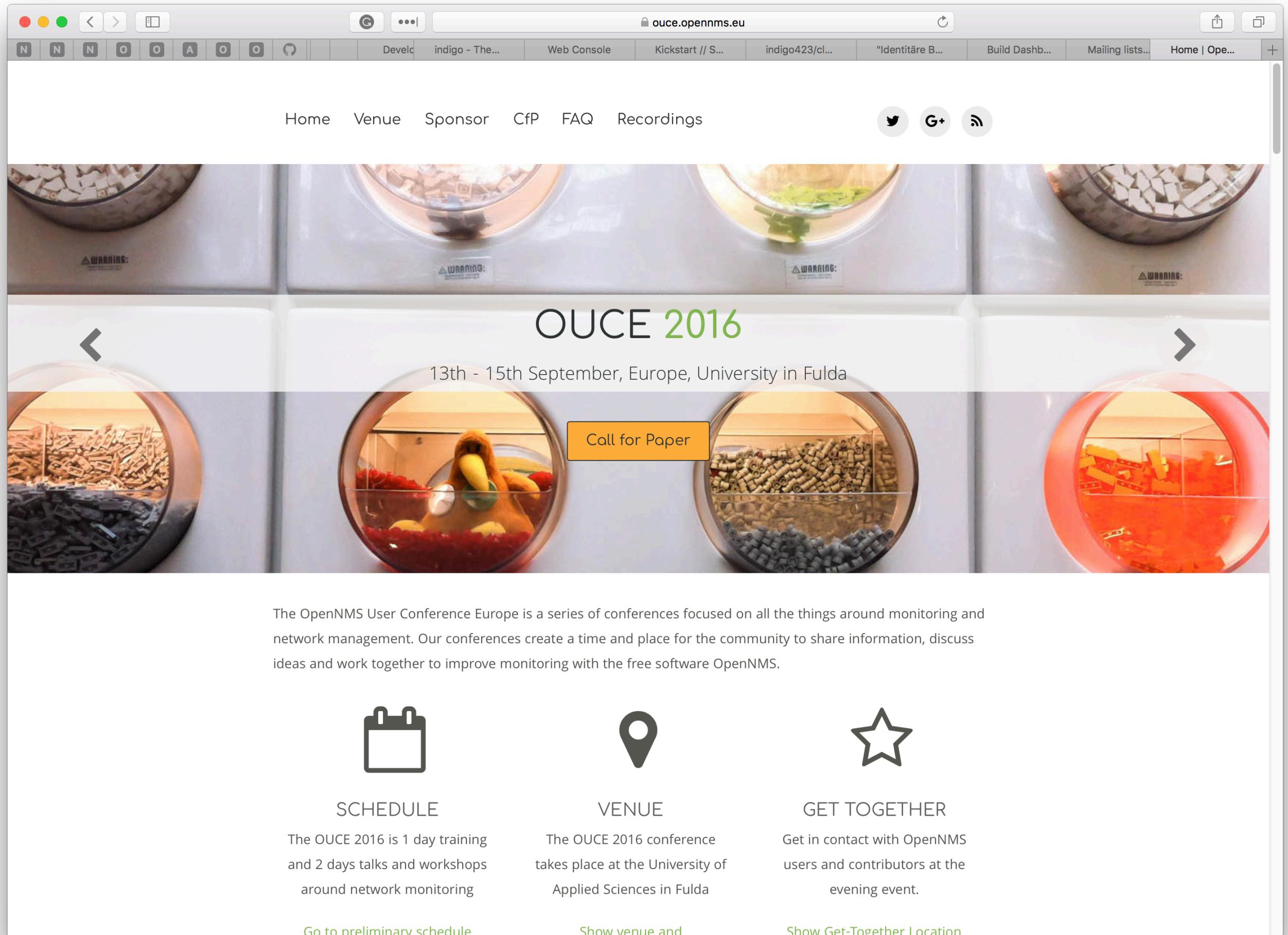


# Horizon 23++

- Verteilte Scheduler in Minion für Pollerd and Collectors
- Verbesserung Event und Alarmanalyse mit ElasticSearch und Kibana
- Stabilisierung ReST API und Versionierung
- Eventd auf AMQP migrieren --> Skalierbarkeit und Ausfallsicherheit



# Events



- User Conference Europe
- 2 Days + Training
- Workshops
- Organised by  
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