Whats New OpenNMS 2019

Dr Craig Gallen, Director Entimoss Ltd (OpenNMS UK)  
Associate Lecturer Solent University

Craig Gallen

Email: craig.gallen@entimoss.com  
: cgallen@opennms.org  
: craig.gallen@solent.ac.uk

Mobile: +44 (0) 7789 938012
Contents

OpenNMS Project Overview

OpenNMS Functional Overview

Future directions
Converged Virtualised Services

End user Services (Apps) are a mash-up of web services accessed through standard and proprietary protocols;
- HTTP, REST, SOAP, JSON, RSS,
- Open Data / RDF etc.
- ‘Internet of things’

Services hosted in ‘Cloud’ designed to scale through addition of VM resources
- ‘cloud bursting’
- ‘cloud brokering’

Underlying physical infrastructure
- Commodity hardware
- Geographical Diversity
- Rapid Churn
- Network Connectivity
Moving to Virtualised Networks

You May Have Heard Of

- **Software defined Networking**
  - Research / Data Centre
  - Open Flow

- **Network Functions Virtualisation**
  - Service providers – ETSI

- **TM Forum ZOOM**
  - Zero-touch Orchestration, Operations and Management (ZOOM)

- **ETSI’s vision for Network Functions Virtualisation**
OSGi – facilitates integration into Open Daylight SDN/SFV controller

LEGEND

- OVSDB: Open vSwitch Database Protocol
- PCEP: Path Computation Element Communication Protocol
- PCMM: Packet Cable MultiMedia
- Plugin2OC: Plug In OpenContrail
- SDNI: SDN Interface (Cross-Controller Federation)
- SFC: Service Function Chaining
- SNBI: Secure Network Bypassing Infrastructure
- SNMP: Simple Network Management Protocol
- TTP: Table Type Patterns
- VTN: Virtual Tenant Network

AAA: Authentication, Authorization & Accounting
AuthN: Authentication
BGP: Border Gateway Protocol
COPS: Common Open Policy Service
DLUX: OpenDaylight User Experience
DDoS: Distributed Denial Of Service
DOCSIS: Data Over Cable Service Interface Specification
FRM: Forwarding Rules Manager
GBP: Group Based Policy
LISP: Location/Identifier Separation Protocol

Controller Platform

Network Applications Orchestrations & Services

OpenDaylight APIs (REST)

Base Network Service Functions

- Topology Manager
- Stats Manager
- Switch Manager
- FRM
- Host Tracker

OpenStack Service

- VTN Manager
- OVSDB
- Neutron
- Plugin2OC
- LISP
- L2 Switch
- SNBI
- Service
- SDNI Aggregator

OpenStack Neutron

SDNI Wrapper

DDoS Protection

VPN Coordinator

OSGi – facilitates integration into Open Daylight SDN/SFV controller

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OpenNMS futures

INTERNET of THINGS
The OpenNMS Project

- **OpenNMS**
  - Open Network Management System
  - OpenNMS is the world's first Enterprise and Carrier grade network management platform developed under the open source model.

- **Technology**
  - Written in Java
  - Packaged for Windows, Linux and most Unix distributions
  - Proven scalability
    - 300,000 data points every 5 minutes
    - Policy driven discovery of core nodes with 5000+ interfaces

- **Websites**
  - [www.opennms.org](http://www.opennms.org)
  - [http://sourceforge.net/projects/opennms/](http://sourceforge.net/projects/opennms/)
Proven Scalability

- Nearly 60,000 Devices on a Single Instance (Swisscom)
- 1.2 Million Data Points Every Five Minutes (New Edge)
- 32,000 Interfaces per Device (Wind)
- 2000 events/sec (SRNS)
- 3000 Remote Monitors (Papa Johns)
Wide community of commercial users

- Minnesota Children’s Hospital [http://www.childrensmn.org/](http://www.childrensmn.org/)
- Oregon State University [http://oregonstate.edu](http://oregonstate.edu)
- Permanente Medical Group [www.permante.net](http://www.permante.net)
- MySpace [www.myspace.com](http://www.myspace.com)
- Ocado [www.ocado.com](http://www.ocado.com)
- FreshDirect [http://www.freshdirect.com](http://www.freshdirect.com)
- BBC Monitoring [www.monitor.bbc.co.uk](http://www.monitor.bbc.co.uk)
- Rackspace [http://www.rackspace.com](http://www.rackspace.com)
- Wind Telecomunicazioni SpA (Italy) [http://www.wind.it](http://www.wind.it)
- BT [www.bt.co.uk](http://www.bt.co.uk)
- Airspeed [http://airspeed.ie/](http://airspeed.ie/)

And many more - 4000 downloads per week
Community and Governance

- **User community**
  - Guess is that the active user community is probable closer to 10,000 people.
  - Support customers; 100+ globally

- **Developer Community**
  - We have 35 developers with commit access

- **Assets**
  - Licence GPL
  - The IPR is owned by The OpenNMS Group, Inc.
  - OpenNMS Trademark owned by The OpenNMS Group

- **Governance**
  - The community is managed by The Order of the Green Polo. All active OGP members have a vote on the direction of the project.

- **Foundation**
  - The independent OpenNMS Europe foundation has been created to represent the interests of the user community and run the user conferences
  - [http://www.opennms.eu/](http://www.opennms.eu/)
Current Capabilities
Managing Virtualised Services

End user Services (Apps) are a mash-up of web services accessed through standard and proprietary protocols:
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Application Space

Access Network Cloud

URI

Virtualised Infrastructure And applications

Service 1

Service 2

Service 3

VM

Physical Infrastructure

Core Network Cloud
OpenNMS Problem Handling touch points

TM Forum Business Process Framework (eTOM)
Resource Data Collection at All Layers

- **Synthetic Transactions / Data Collection**
  - ICMP / HTTP / HTTPS
  - ReST / WS / XML
  - DHCP / DNS / FTP / LDAP / Radius
  - IMAP / POP3 / SMTP / NTP
  - JDBC / JSR160 (JMX) / WMS / WBEM
  - NSClient (Nagios Agent) / NRPE (Nagios Remote Plugin Executor)
  - SMB / Citrix
  - SNMP / SSH / TCP

- **Virtualisation**
  - VMware integration
  - Open Stack (being developed)

- **Service & Network discovery**
  - VMware integration
  - Policy driven Layer 2 network discovery

- **Remote Pollers**
  - Remotely monitor services from multiple locations
Presentation supports Service Provider Business Processes

- **Service / Resource Problem management**
- **Event Collection**
  - OpenNMS can record all event occurrences
- **Alarm Correlation**
  - Data base automatons
  - Jboss Rules correlation engine for more sophisticated down stream alarm suppressing.
- **User Notifications and scheduled escalation**
  - Notification escalation mechanism between users.
- **Trouble ticket integration**
  - RT and OTRS, Remedy, Jira etc.

- **Customer view**
  - Customer specific dashboards / Wallboards

- **Business Intelligence Reports**
  - Operations / Customer / SLA reports
OpenNMS Performance touch points

TM Forum Business Process Framework (eTOM)
Current OpenNMS Performance Mgt

- **Polled Data collection**
  - Multiple sources
  - Regular collection
  - Low cost and highly scalable

- **Visualisation**
  - Per interface or per node – not network wide

- **Threshold Alerting**
  - Binary thresholds
  - How do we track over time
  - How do we predict problems

- **Reports - Jasper**
  - Some calculation capability
  - Difficult to write and change – particularly with RRD data sources

- **Cassandra**
  - RRD moving to Cassandra

- **Do performance measures drive the work on the NOC**
  - Probably not…
New User Dash / Wall Board (Release 1.13+)

Rotating Wallboard display

(Boost priority for unacknowledged problems)
Maps & Topology

- **Geographical node map** (using Google maps or Open Streetmap)

- **STUI Semantic Topology UI**
- Allows users to semantically navigate between related nodes to diagnose problems
- **Node relations are automatically discovered**
ReST API & tools to create your own dashboard

OpenNMS can work as a backend data collection engine for your own portal / UI or for integration with other systems

ReST API
- Performance Data
- Alarms / Situations
- Entities

OpenNMS Core

Grafana Dashboard Code;
https://github.com/j-white/grafana-opennms-plugin/tree/master/opennms
Business Service Monitoring

• Now able to model complete services and relationships between processes
OpenNMS Compass

An OpenNMS Mobile App by The OpenNMS Group, Inc.

Download on the App Store

Get it on Google Play

About OpenNMS® Compass

OpenNMS Compass is a modern mobile iOS and Android client for OpenNMS® Horizon™ and OpenNMS® Meridian™ servers.

It provides a simple dashboard for viewing outage and alarm data, node details, and more.

Features

Outage and Alarm Dashboard

At a glance, you can see a summary of any current outages and services with pending problems. One tap will take you to a more detailed view of outages or alarms.

On supported systems*, surveillance categories are also displayed, giving you quick access to availability just like your OpenNMS® Horizon™ or OpenNMS® Meridian™ server UI.
Contents

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OpenNMS Functional Overview

Future directions
• plugin architecture
Current Core System

Grafana / Helm / Kibana
Data Visualisation

Current OpenNMS Core System

- OpenNMS Daemon
- OpenNMS Web Container
- OpenNMS Web App
- Plugin Manager
- OpenNMS OSGi API
- Karaf / OSGi Container/Bridge
- OpenNMS Web Container

Performance Persistence
- Cassandra
- RRD

Configuration / Event Persistence
- Postgres
- Elastic
Target System - Sentinel

Grafana / Helm / Kibana
Data Visualisation

- Functions determined by which modules run in container
- Containers Manager by kubernetes
- Configuration Persisted separately

Kubernetes or similar

- Performance Persistence
  - Cassandra
  - RRD

- Configuration / Event Persistence
  - Postgres
  - Elastic

(We are also investigating alternative cloud persistence strategies)
Sentinel

- sentinel allows distributed OpenNMS connected through kafka
Roadmap to OpenNMS as a Service

OaaS Roadmap

**Minion**
**Horizon 19**
Enables monitoring from the Cloud and eliminates complexities with VPNs and duplicate IPs in private IP networks.

**Helm**
**Horizon 21**
APIv2 for OaaS Console

**Drift**
**Horizon 22**
Network Traffic Analysis and DeepDive Tool

**Sextant**
**Horizon 24**
Spatial Temporal Correlation

**ElasticSearch**
**Horizon 20**
Big Data Forensics Storage

**Streams**
**Horizon 21.1.0**
Support for OaaS Timeline, Realtime Analytics, and OEM Integration

**Sentinel**
**Horizon 23**
Horizontal Cloud Scalability

**OaaS**
**Horizon 25**
OpenNMS as a Service Beta
Roadmap Details

- **Minion**
  - Karaf OSGi based remote polling and data collection which can be offered on stand alone hardware or embedded in a cloud environment. We are integrating this with hardware provided by Netgate which also hosts the pfSense firewall. This introduced both distribution and scalability to OpenMMS and the ability to control other applications hosted in Karaf remotely.

- **Elastic search**
  - Improve the ability to use Elastic search to store events alarms and streaming telemetry data (Netflow etc). In combination with Cassandra, this makes our back end data storage highly scalable and searchable.

- **Helm**
  - Grafana based dashboard plugin which allows multiple OpenNMS systems or partitioned views to be displayed on a single dashboard of fault and performance data. This uses the OpenNMS ReST API.
• **Streams**
  — Remote (minion based) streaming telemetry data collectors.

• **Drift**
  — Collecting Netflow, JFlow, SFlow, and streaming telemetry. Advanced visualisation and data analytics of performance data.

• **Sentinel**
  — Sentinel is completion of the re-packaging all of the OpenNMS daemons as Karaf (OSGi) hosted services. This allows OpenNMS components to be deployed as highly scalable micro services in docker containers.
  — Demonstrated key components architecture using Kubernetes and Amazon containers at the Redhat Developers conference.
  — Currently targeted at commercial cloud providers (e.g. AWS) but offers an opportunity to explore deploying OpenNMS as an NFV in an architecture such as ONAP if we find a service provider partner.
  — publishing of inventory, faults, and performance metrics to Kafka topic for Sentinel and other integrations.

• **ALEC Architecture for learning enabled correlation**
  — Advanced correlation and AI based fault and performance analytics.

• **OoaS - OpenNMS as a service**
  — Fully cloud deployable multi-tenanted network management solution with remote appliances which can be deployed to users physical sites for data collection.
Immediate Releases

- **OIA OpenNMS Integration Architecture**
  - OSGI plugin architecture and stable api

- **Helm - Grafana**
  - Performance, Events, Correlated alarms

- **ALEC – correlation**
  - correlation api; time / topology based correlation / machine learning (tensor flow)

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![OpenNMS Horizon Diagram](image-url)

- **Helm 2.0**
  - 7/15

- **Horizon Z3**
  - 10/25

- **Helm 3.0**
  - 2/20

- **Horizon 24**
  - 4/25

**OpenNMS Horizon**

- **Sentinel**
- **OIA**
- **OCE / ALEC**
- **Drift 2**

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ALEC Architecture for learning enabled correlation

Lifecycle and Correlation
ALEK Distributed install

Dashboard

Heim

REST

PostgreSQL

Inventory & State

Sentinel

OCE

Sentinel

OCE

Offload OCE from core and run in HA

OpenNMS

Core

REST

Elasticsearch

Event & Alarm History

ZooKeeper

Distributed synchronization

Kafka

Bus

Minion

SNMP, Syslog, ...

Monitored Elements
OpenDaylight integration

- xx
OpenNMS IoT

1. A solution for IoT Systems Monitoring
   - Already monitoring large IoT Systems
     - Sensus – wireless IoT networks in UK

2. OpenNMS as a Platform for IoT Applications

- Big Data IoT
- 11M smart electric/gas meters UK
- 100,000 Smart Water Meters London (Thames Water)

- Long Tail of Applications with a relatively small numbers of sensors

OpenNMS could find a role in the long tail of applications proven and (relatively) simple to deploy solution
Case Study – Monitoring Tailings

- Herb Garcea Insitu Systems, Inc.
- www.insitusys.com

Mine tailings

- are the ore waste of mines, and are typically a mud-like material. Worldwide, the storage and handling of tailings is a major environmental issue. Many tailings are toxic and must be kept perpetually isolated from the environment.
- https://www.nps.gov/articles/aps-v13-i2-c8.htm
Case Study
Southampton Air Pollution Monitoring

- The UK’s number one cruise port, which welcomes 1.7m passengers
- Each ship up to 6000 passenger and crew
- Ship turn around 1-2 days
- Increasing problem of air pollution due to generators running while ships in port

- www.climateconversations.org.uk
- Nesta funded project managed by
- Mandi Bissett

- opennms.computenodes.net/grafana
Joining the OpenNMS Community

- Download and test latest OpenNMS Horizon 17+
- Try against your network
  - Large scale data centre time series data
- Research partners – labs / universities
- Give it a go
  - http://opennms.org – Project site
  - http://opennms.co.uk – UK / Ireland specific information
  - Linkedin OpenNMS group
Q&A