

OpenNMS Release Notes

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What's New in OpenNMS Horizon 24

System Requirements

- **Java 8 through 11:** OpenNMS Horizon 24 requires at least Java 8 as the runtime environment and now supports running on JDK 11 as well. To run Horizon 24, we recommend the most recent version of Oracle JDK 8 for your platform, or the latest OpenJDK 11.
- **PostgreSQL 9 or higher:** Horizon 24 requires Any supported version PostgreSQL 9 or higher. As of this writing, PostgreSQL 9.3 is the earliest version under active support, but OpenNMS is known to work with at least PostgreSQL 9.1 and up.

Breaking Changes

Package Dependencies

The dependencies for the OpenNMS packages have changed such that the JDK is no longer a hard dependency of the `opennms-core` (RPM) or `libopennms-java` and `libopennmsdeps-java` (Debian/Ubuntu). This allows you to install OpenNMS without package management forcing an install of a particular JDK, if you wish to run an alternate JDK or a JDK installed from tarball rather than packaging.

The `opennms` packages are a convenience wrapper that depend on a JDK for runtime to give you a simple starting point if you don't care which JDK you use.

Karaf Container

The embedded Karaf has been upgraded to 4.2.

This changes the default `users.properties` file. Ensure that the `admingroup` in `${OPENNMS_HOME}/etc/users.properties` contains the role `ssh`. You can use the [new default users.properties file](#) for comparison.

Other notable Karaf and OSGi-related changes include:

- We now support [adding OSGi-capable code at runtime](#) by putting a `.kar` file in the `deploy/` directory and adding relevant features to boot files in `etc/featuresBoot.d/`.
- The usage of `config:edit` has changed in some cases. This affects all configuration edits, where the configuration contains a `-`, e.g. `org.opennms.features.telemetry.listeners-udp-50003`. If you are using Minion or Sentinel, you will most likely be affected (e.g. for Telemetry Listeners/Adapters).

For example, this set of configuration commands:

```
config:edit org.opennms.features.telemetry.listeners-udp-50003
config:property-set key value
config:update
```

...should now be written as:

```
config:edit --alias udp-50003 --factory org.opennms.features.telemetry.listeners
config:property-set key value
config:update
```

Flows

Flows Grouped By Conversation

Flows are now grouped by conversations using applications instead of ports. This changes the way statistics about flows are presented and grouped.

Thus, the elasticsearch storage has changed and old data must be converted to the new format. To adopt existing flows, the following command can be used (please be aware that this can take a long time and put your CPU and disk under high stress):

```
curl -v -X POST -H 'Content-Type: application/json'
"http://${ES_HOST}:${ES_PORT}/netflow-*/_update_by_query?refresh=true" -d @- << EOF
{
  "script": {
    "lang": "painless",
    "source": "ctx._source['netflow.convo_key'] = '[' + ctx._source['location'] +
'\",' + ctx._source['netflow.protocol'] + ',\'' +
((Objects.compare(ctx._source['netflow.src_addr'], ctx._source['netflow.src_addr'],
String::compareTo) < 0) ? ctx._source['netflow.src_addr'] :
ctx._source['netflow.dst_addr']) + '\",' +
((Objects.compare(ctx._source['netflow.src_addr'], ctx._source['netflow.src_addr'],
String::compareTo) < 0) ? ctx._source['netflow.dst_addr'] :
ctx._source['netflow.src_addr']) + '\",' + ((ctx._source['netflow.application'] !=
null) ? ('\'' + ctx._source['netflow.application'] + '\') : 'null') + ']'
  },
  "query": {
    "match_all": {}
  }
}
EOF
```

Telemetryd Configuration Format Change

Since we have added support for more dynamic telemetryd configurations to support more complex listeners and adapters, the configuration format for telemetryd has changed.

The new configuration defines listeners containing parsers and queues containing adapters which are linked by the queues name.

For example, this old configuration:

```

<telemetryd-config>
  <protocol name="Netflow-5" description="Listener for Netflow 5 UDP packets"
  enabled="false">
    <listener name="Netflow-5-UDP-8877" class-
  name="org.opennms.netmgt.telemetry.listeners.udp.UdpListener">
      <parameter key="port" value="8877"/>
    </listener>

    <adapter name="Netflow-5-Parser" class-
  name="org.opennms.netmgt.telemetry.adapters.netflow.v5.Netflow5Adapter">
    </adapter>
  </protocol>
</telemetryd-config>

```

...should now be written as:

```

<telemetryd-config>
  <listener name="Netflow-5-UDP-8877" class-
  name="org.opennms.netmgt.telemetry.listeners.UdpListener" enabled="false">
    <parameter key="port" value="8877"/>

    <parser name="Netflow-5-Parser" class-
  name="org.opennms.netmgt.telemetry.protocols.netflow.parser.Netflow5UdpParser"
  queue="Netflow-5" />
  </listener>

  <queue name="Netflow-5">
    <adapter name="Netflow-5-Adapter" class-
  name="org.opennms.netmgt.telemetry.protocols.netflow.adapter.netflow5.Netflow5Adapter"
  enabled="false">
    </adapter>
  </queue>
</telemetryd-config>

```

As you can see, the **listeners** become independent elements which contain **parsers** whereas the **protocols** are renamed to **queues**. Each parser must reference a queue by name to define which adapters are used to pick up the parsed data.

In addition, the listener configuration for minions has changed. The new minion configuration looks like the following and adapts the same set of structural changes:

```
admin@minion(> config:edit --alias Netflow-5-UDP-8877 --factory
org.opennms.features.telemetry.listeners
admin@minion(> config:property-set name Netflow-5-UDP-8877
admin@minion(> config:property-set class-name
org.opennms.netmgt.telemetry.listeners.UdpListener
admin@minion(> config:property-set parameters.port 8877
admin@minion(> config:property-set parser.0.name Netflow-5-Parser
admin@minion(> config:property-set parser.0.queue Netflow-5
```

Plugins, Parsers, and Services

- **Cassandra JMX:** The `cassandra30x.xml` datacollection config for thread pool metrics has been modified to be of type `counter` rather than type `gauge`. If you are using RRD or JRobin storage, you will need to delete any `.jrb` or `.rrd` files with both `path_request` and `CurrentlyBlockedTasks` in their filename (eg, `org_apache_cassandra_metrics_type_ThreadPools_path_request_scope_MutationStage_name_CurrentlyBlockedTasks.jrb`).
- **Pollerd and Collectd:** Additional attributes for thread pool graphs have been added to the Pollerd and Collectd mbeans. If you are using `storeByGroup=true` with RRD or JRobin, you will need to delete the `OpenNMS_Name_Pollerd` and `OpenNMS_Name_Collectd` `.jrb` or `.rrd` files and let them be reinitialized. Newts and `storeByGroup=false` should be unaffected.
- **Dhcpd:** The `Dhcpd` plugin (and its configuration) was removed in favor of a Minion-capable implementation. The new `DhcpMonitor` options can be set in the `poller-configuration.xml` file.
- **Syslog:** The default parser used for Syslog messages has been switched from the `CustomSyslogParser` to the `RadixTreeSyslogParser`.
- **Plugins:** The `Plugin Manager` is no longer distributed with OpenNMS. Features or bundles should be installed via the Karaf Shell.

Removed from Horizon 24

- The Centric Trouble Ticketer plugin has been removed.
- The NCS-Alarm page and the NCS-Topology-Plugin have been removed. See issue [HZN-1422](#).
- The remote poller map has been removed.

Developer Considerations

- The `HttpService` can no longer be consumed. This will only affect custom implementations of HTTP Servlets and Resources, but only if they are exposed via `httpServices.register(...)`. If you need those, please expose the according services via the OSGi Service Registration. Refer to the [OSGi Http Whiteboard Specification](#) for more details.
- Exposing Servlets now follow the OSGi Specification. Refer to the [OSGi Http Whiteboard Specification](#) for more details.
- Properties to expose Vaadin Applications have changed:
 - `init.widgetset` becomes `servlet.init.widgetset`

- `alias` becomes `osgi.http.whiteboard.servlet.pattern`

New Features and Improvements

Correlation (ALEC, formerly OCE/Sextant)

The correlation feature introduced in Horizon 23 has been vastly improved and given a new name: ALEC (Architecture for Learning Enabled Correlation). Detailed documentation is available at [the ALEC site](#).

It has a ton of bugfixes, as well as a host of new features, including:

- Smart propagation of acknowledgements.
- Support for embedding directly in OpenNMS's Karaf.
- ML-guided alarm correlation using Tensorflow.
- APIs for user feedback training, including root cause (support for feedback will be a part of a future Helm release)
- The web UI has been updated to show and filter situations in the alarm browser, and outstanding situations show on the front page.

Events and Alarms

- The event correlator now supports a `default` parameter on `<assignment>` tags as a fallback when a value cannot be generated.
- Event XML files now support an optional `<priority>` tag to allow easier customization/overriding of default events.
- Syslogd can now be optionally configured to include the raw syslog message in resulting events as a parameter.

Datacollection, Thresholding, and Reporting

- `ssCpuRawSteal`, `ssCpuRawGuest`, `ssCpuRawGuestNice`, and `ssCpuNumCpus` are now supported from Net-SNMP agents version 5.7.3 and higher.
- A number of new views have been added to the database to facilitate SQL-based reporting:
 - `node_categories`: Nodes with categories
 - `node_alarms`: Alarm status from nodes and allow filtering on categories
 - `node_outages`: Outages of nodes and allow filtering on categories
 - `node_ip_services`: Denormalise Nodes and IP services
- **SnmCollectorNG**: An alternative to the `SnmCollector` has been added which implements the internal `CollectionSet` APIs and is meant to eventually replace the existing `SnmCollector`.

Karaf Command Line

A number of Karaf commands have been added or updated:

- `enlinkd:generate-topology`: generates a test topology
- `enlinkd:delete-topology`: delete generated topology
- `events:show-event-config`: dumps events to XML (including those read from `eventconf.xml` as well as OSGi plugins that provide event configuration)
- `kafka-producer:push-topology-edges`: push topology edges to a Kafka topic
- `meta:test`: test a node/interface metadata query

Node and Interface Metadata

There is now experimental support for associating arbitrary metadata with nodes and interfaces. A full user-facing interface to configuring metadata in the provisioning UI should be available by Horizon 25.

In this release, there is no default metadata being collected, but there is a ReST interface to manipulate metadata, and metadata can be assigned to nodes and interfaces in requisitions.

For details on using the metadata APIs, see [the Admin Guide](#) and [the Developer Guide](#).

Provisioning

A new adapter (`WsManAssetProvisioningAdapter`) has been added which can update asset information during provisioning based on WS-Man data. (Note: It does not currently support running on Minions.)

ReST

- **Measurements**: Resource metadata is now returned along with measurements results.
- **Topology**: User Defined Links (`/opennms/api/v2/userdefinedlinks`)

Support was added for user defined links (UDLs) in the Enhanced Linkd topology. Users may now programitically (using the REST API) create "manual" links between node and have them appear in the topology UI.

Topology and Business Services

- Enlinkd and other topology information have been refactored into a more generalized graph service that also includes other information like ALEC alarm and situation topology. This also means that topology data can be sent to Kafka alongside nodes, events, and alarms.
- **Performance**: Huge improvements have been made to performance in Enhanced Linkd, including responsiveness of the Topology web UI.
- **BSM**: Applications can now be added as an edge to a Business Service. This allows you to aggregate IP services.

Web UI

The web UI has gone through a major refresh. The HTML has been simplified, the UI wastes less space, and the login page features a fancy new look featuring our mascot, Ulf. ;)

- **Notifications:** Browser notifications are now supported in the Web UI. The browser notification can be added to a notification path and desktop notifications will pop-up for currently logged in users if a notice is delivered.
- **Sessions:** Browser session timeout is now disabled by default.

Geocoder Services

The *Geocoder Service_s* have been reworked and must be re-configured. The recommended way for this is to delete all `etc/org.opennms.features.geocoder*.cfg` files and Navigate the [Configure Geocoder Services](#) page from the Admin page and configure the `_Geocoder Service` of your choice.

Other Core Changes

Support was added for OpenTracing distributed tracing for RPC/Sink requests.

Developer APIs

A new API ("OpenNMS Integration API") has been introduced that presents a simplified interface to a number of integration points including subscribing to events and alarms, writing custom detectors and pollers, and more.

Changelog

Release 24.1.1

Release 24.1.1 is the latest stable release of OpenNMS. It contains bug fixes to WS-Man, the web UI, flows, and more as well as a few small enhancements.

For a high-level overview of what's changed in OpenNMS 24, see [What's New in OpenNMS 24](#).

The codename for 24.1.1 is *GLaDOS*.

Bug

- WsMan Asset Adapter config contains an invalid resourceUri (Issue [NMS-10682](#))
- WsMan Asset Adapter should handle WQL filters returning more than one result (Issue [NMS-10683](#))
- WS-Man datacollection fail with OpenJDK11 (Issue [NMS-10713](#))
- Angular requests do not handle 401 responses from the OpenNMS backend (Issue [NMS-10719](#))
- sFlow: Type mismatch of VLAN value (Issue [NMS-10775](#))
- Timeline missing for service names including slashes (Issue [NMS-12097](#))

- CME in ProxyFilter (Karaf Web Bridge) (Issue [NMS-12116](#))
- Remove hack from opennms-spring-extender to expose ServiceRegistry (Issue [NMS-12122](#))
- Installing Minion on Debian with OpenJDK 11 installed tries to install Oracle JDK 8 (Issue [NMS-12119](#))
- Opennms 24.1.0 on Ubuntu 19.04 won't install because of PostgreSQL 11 (Issue [NMS-12121](#))

Enhancement

- Increase logging clarity for flow processing (Issue [NMS-10723](#))
- Remove circleci build number as tags from container images (Issue [NMS-12098](#))
- Provide a mechanism to collect the count of objects collected by a wsman enumeration (Issue [NMS-12115](#))

Release 24.1.0

Release 24.1.0 is the latest stable release of OpenNMS. It contains a bunch of bug fixes and a few enhancements, including support for OpenTracing in the sink API and a rework of geocoding services.

For a high-level overview of what's changed in OpenNMS 24, see [What's New in OpenNMS 24](#).

The codename for 24.1.0 is [J.A.R.V.I.S.](#).

Bug

- Thresholds should work without restart when putting nodes into categories (Issue [NMS-9811](#))
- When editing a surveillance category from Admin flow, lists of nodes are not sorted by node label (Issue [NMS-10654](#))
- health:check command times out when a health check command gets stuck (Issue [NMS-10667](#))
- Vaadin bundles stuck intermittently stuck in "Waiting" state (Issue [NMS-10668](#))
- Table in "Manage Minions" page fails to load (Issue [NMS-10670](#))
- Default load threshold contains calculation error (Issue [NMS-10671](#))
- Can not delete node due to database table constraint (Issue [NMS-10674](#))
- Missing Indication of Sync Needed for Requisitions (Issue [NMS-10675](#))
- `.rpmnew`, `.rpmsave`, and `.dpkg-dist` files not erroring out properly (Issue [NMS-10676](#))
- Some config files should be marked `%config` (rather than `%config(noreplace)`) in RPMs (Issue [NMS-10677](#))
- Memory Leak on Drools while reloading config (Issue [NMS-10678](#))
- Node detail page renders with no content when invalid node ID specified (Issue [NMS-10679](#))
- Installing the opennms package installs Oracle JDK 8 instead of OpenJDK 11 on Ubuntu (Issue [NMS-10680](#))
- Apparent memory leak in JMX collector, possibly restricted to "weird" JMX transports (Issue [NMS-10681](#))

[NMS-10684](#))

- Install guide for Java versions is misleading (Issue [NMS-10688](#))
- Java configuration is ignored on Ubuntu/Debian (Issue [NMS-10693](#))
- CVE-2018-20433: XXE Vulnerability in c3p0 < 0.9.5.3 (Issue [NMS-10694](#))
- Memory leak in WS-Man (Issue [NMS-10696](#))
- EditInRequisitionIT flapping (Issue [NMS-10698](#))
- Jetty HTTPS selectors can become unresponsive following CancelledKeyException (Issue [NMS-10701](#))
- Reflected XSS vulnerability in notification/detail.jsp and outage/detail.htm (Issue [NMS-10707](#))

Enhancement

- Enable extraction of match groups from regex matches in Event.Mask.Varbind.Vbvalue (Issue [NMS-10626](#))
- Tag "root cause" alarm when providing feedback (Issue [HZN-1492](#))
- Rework the GeocoderService-Implementations (Issue [HZN-1520](#))
- Meta-Data Documentation Format Wrong (Issue [HZN-1557](#))
- Add OpenTracing support for Sink API (Issue [HZN-1558](#))

Release 24.0.0

Release 24.0.0 is the latest stable release of OpenNMS. It contains a large number of bug fixes and enhancements, most notably adding machine-learning-guided correlation of alarms, and many improvements to Netflow/IPFIX/sFlow support.

For a high-level overview of what's changed in OpenNMS 24, see [What's New in OpenNMS 24](#).

The codename for 24.0.0 is *Hal 9000*.

Epic

- Java 9 Support (Issue [HZN-1078](#))
- Enhanced Alarm Life Cycle and Service Layer (Issue [HZN-1317](#))
- Topology and model enhancements for correlation (Issue [HZN-1320](#))

Bug

- ROLE_PROVISION doesn't work on the UI when the ACL feature is enabled. (Issue [NMS-9786](#))
- Performance problems with the Topology Map on large networks (Issue [NMS-10369](#))
- Search on KSC Reports page in WebUI does not work (Issue [NMS-10416](#))
- Wrong data type for Cassandra Thread Pool performance metrics (Issue [NMS-10420](#))
- broken xml code in foreign source/imports is not being detected (Issue [NMS-10426](#))

- Minion Status showing wrong in Manage Minions and service minion status out put is empty (Issue [NMS-10435](#))
- Use MoreObjects.ToStringHelper instead of Spring ToStringCreator (Issue [NMS-10455](#))
- Alarm list pagination broken with situations (Issue [NMS-10461](#))
- Wrong time in 'last' column for related alarms when viewing situation details (Issue [NMS-10462](#))
- Cleared situations show up on home page (Issue [NMS-10463](#))
- Track (flow) conversations by application instead of src/dst port (Issue [NMS-10497](#))
- Health Check should not fail for JMS connectivity if Kafka is enabled both for RPC/Sink (Issue [NMS-10499](#))
- Node page very slow to load for nodes with more than 1000 events (Issue [NMS-10506](#))
- Situation Severity is not adjusted downward as related alarms clear (Issue [NMS-10522](#))
- Cross-Site Scripting: Reflected (Issue [NMS-10546](#))
- Cross-Frame Scripting (Issue [NMS-10547](#))
- Typo in Northbound registerNorthnounders method (Issue [NMS-10549](#))
- JDBC via Minion fails to find 3rd party classes (Issue [NMS-10559](#))
- Not able to install sentinel-core feature on sentinel container (Issue [NMS-10561](#))
- add `runjava` unit tests for detecting the correct java in a range (Issue [NMS-10565](#))
- Browser crashes when browser notifications are enabled and OpenNMS gets unreachable (Issue [NMS-10567](#))
- Leaking logs from HELM performance data source requests to OpenNMS standard out (Issue [NMS-10568](#))
- Tables do not space columns out correctly (col-* is no longer supported) (Issue [NMS-10569](#))
- Alarm details page has problem with footer (Issue [NMS-10570](#))
- The categories card on the node details page has no spacing above the bottom border (Issue [NMS-10571](#))
- Appears to be extra whitespace above bottom border on cards in the Admin page (Issue [NMS-10572](#))
- The table on the Node list page has no cell borders (Issue [NMS-10573](#))
- Severity tables do not show cell border (Issue [NMS-10574](#))
- KSC Create Custom Graph Prefabricated Report selection is too small and wraps (Issue [NMS-10575](#))
- Documentation has not addressed refactoring of Single-Port flow listener (Issue [NMS-10576](#))
- Start with the start script throws bad substitution error (Issue [NMS-10579](#))
- Stop gracefully when running in container environment (Issue [NMS-10581](#))
- LazyInitializationException when using ticketing and alarm history in Elastic (Issue [NMS-10594](#))
- `@PreserveOnRefresh` not working for embedded Vaadin UIs (Issue [NMS-10601](#))

- Incorrect date formatting in send-event.py (Issue [NMS-10602](#))
- Fix ack Event Supporting AckAction (Issue [NMS-10603](#))
- The MIB Compiler is unable to parse certain MIBs (Issue [NMS-10609](#))
- Button arrangement on alarm detail page is broken (Issue [NMS-10612](#))
- Sticky and Journal Memo icons look out of place (Issue [NMS-10613](#))
- Alarm Details page is not rendering related alarms and parent situations correctly (Issue [NMS-10614](#))
- Notification switcher is broken (Issue [NMS-10615](#))
- Init script errors when starting Sentinel on RHEL 6.6 (Issue [NMS-10619](#))
- KSC resource selection is not shown/visualized (Issue [NMS-10623](#))
- Errors in Minion startup script (Issue [NMS-10625](#))
- Configuration directives in /etc/sysconfig/sentinel are not being applied (Issue [NMS-10631](#))
- The navigation sidebar on the resource graph page is not working after the Bootstrap 4 changes (Issue [NMS-10632](#))
- Allow Java 8-11 by default (Issue [NMS-10638](#))
- OpenNMS Horizon installs OpenJDK 1.8.0 even OpenJDK 11 is already installed (Issue [NMS-10639](#))
- DNSResolutionMonitor incorrectly sets port number (Issue [NMS-10642](#))
- The evaluation layer that helps sizing Cassandra is broken (Issue [NMS-10646](#))
- ArrayIndexOutOfBoundsException during error handling in SNMP MIB Compiler (Issue [NMS-10647](#))
- Vaadin geographical maps broke in Chrome (Issue [NMS-10650](#))
- logging methods have incorrect number of arguments. (Issue [NMS-10651](#))
- When editing a surveillance category from Admin flow, lists of nodes are not sorted by node label (Issue [NMS-10654](#))
- bin/runjava tries to evaluate an empty value as a candidate JVM pathname (Issue [NMS-10663](#))
- Karaf shell history thrown out with bathwater on upgrade (Issue [NMS-10664](#))
- "Change Icon" In Topology Map Fails (Issue [HZN-1333](#))
- Situation model - prevent cyclic graphs (Issue [HZN-1398](#))
- Prevent alarms from being correlated again after being removed from a situation (Issue [HZN-1400](#))
- Older Alarms will Not Un-Acknowledge Situations (Issue [HZN-1426](#))
- Clearing a situation should clear all the related alarms (Issue [HZN-1439](#))
- Telemetry UdpListener - False Positive Log Message Condition (Issue [HZN-1480](#))
- Templates are dropped if intermixed with data in wrong order (Issue [HZN-1484](#))
- Minion - RPM Upgrade does not clear out .m2 local directory (Issue [HZN-1485](#))

- ON DELETE CASCADE missing in Metadata database changelog (Issue [HZN-1499](#))
- Webapp fails to start on Java 9 (Issue [HZN-1500](#))
- Related alarms are not deleted from situations (Issue [HZN-1503](#))
- Meta-data gets deleted when requisition is modified in UI (Issue [HZN-1511](#))
- Random compilation failures in opennms-base-assembly (Issue [HZN-1533](#))

Enhancement

- Update to Vaadin to version 8.5.2 (Issue [NMS-7797](#))
- "Event text contains" should search beyond eventlogmsg (Issue [NMS-8444](#))
- Create Topology Service Updates in enlinkd (Issue [NMS-9273](#))
- DHCP monitoring issue (Issue [NMS-9806](#))
- Alarm Clear Trigger query language performance improvement (Issue [NMS-9893](#))
- Extend system statistic metrics from UCD SNMP agents (Issue [NMS-10159](#))
- Improve Collectd and Pollerd's ThreadPool graphs (Issue [NMS-10357](#))
- Enlinkd and Topologies under features (Issue [NMS-10375](#))
- Support provisioning asset information via wsman (Issue [NMS-10404](#))
- Allow Applications to be added as an edge to a Business Service (Issue [NMS-10405](#))
- Add SQL views to simplify SQL based reporting (Issue [NMS-10418](#))
- Handle Flapping Tests in Bamboo More Gracefully (Issue [NMS-10424](#))
- Remove RemotePollerMap (Issue [NMS-10440](#))
- Enhance onms-topology-generator to support isi, ospf, lldp protocols (Issue [NMS-10444](#))
- Use the DaemonService to reload a daemon instead of the DaemonNameEnum (Issue [NMS-10449](#))
- Measure and improve performance of Interface loading and mapping (Issue [NMS-10459](#))
- Event configuration should be able to match event parameters by key & value (Issue [NMS-10465](#))
- Use a utility function instead of Integer.getInteger (Issue [NMS-10477](#))
- Measure and improve performance of Cdp/Lldp/IsIsElement loading (Issue [NMS-10487](#))
- linkDown alarms are not generated for unknown ifIndex values (Issue [NMS-10495](#))
- Update flow classification rules to match either the src or dst ports (Issue [NMS-10496](#))
- Make sure toString methods are implemented in a consistent way (Issue [NMS-10500](#))
- Create Application Icon for BSM Topology (Issue [NMS-10502](#))
- DhcpMonitor does not work on Minion (Issue [NMS-10504](#))
- Add karaf logging configuration for Minion/Sentinel (Issue [NMS-10505](#))
- Disable session timeout by default (Issue [NMS-10511](#))
- refactor/clean up `opennms` script (Issue [NMS-10518](#))

- Remove unused Topology Plugin "org.opennms.features.topology.plugins.ssh" (Issue [NMS-10527](#))
- Make Topology Creator as Karaf command available (Issue [NMS-10533](#))
- Upgrade to Karaf 4.2.3 (Issue [NMS-10539](#))
- Upgrade PostgreSQL JDBC driver to 42.x (Issue [NMS-10543](#))
- Upgrade liquibase to 3.x (Issue [NMS-10557](#))
- Update default Syslog parser to use the RadixTreeSyslogParser (Issue [NMS-10566](#))
- Add node/interface/service details as scopes to Meta-DSL (Issue [NMS-10598](#))
- Improve test coverage of SNMPv3 traps and informs (Issue [NMS-10630](#))
- Allow the "step" (or interval) to be referenced from a Measurement API expression (Issue [NMS-10633](#))
- IFTTT feature should also support BSM alarms (Issue [NMS-10640](#))
- add `isAcknowledged` to the alarm model for the rest interface (Issue [NMS-10653](#))
- remove centric troubleticket plugin (Issue [NMS-10656](#))
- Support Browser Notification API (Issue [HZN-956](#))
- Upgrade the maven-war-plugin (Issue [HZN-1231](#))
- Netflow - Support multiple protocols with a single UDP port (Issue [HZN-1270](#))
- Forward enlinkd link data via Kafka (Issue [HZN-1393](#))
- UI enhancements for handling Situations (Issue [HZN-1394](#))
- The alarm_situations table should contain a timestamp (Issue [HZN-1397](#))
- Ticketing support for situations (Issue [HZN-1404](#))
- Increment Severity of Situations (Issue [HZN-1417](#))
- OpenNMS Integration API (Issue [HZN-1418](#))
- Add support for prioritizing the event definitions (Issue [HZN-1419](#))
- Index alarms and alarm history in Elasticsearch (Issue [HZN-1420](#))
- Remove NCS components and tables from source (Issue [HZN-1422](#))
- Migrate bootstrap 3 to bootstrap 4 and revert custom stylings (Issue [HZN-1423](#))
- Refactor alarmd scenario & test driver so that it can be used by other modules (Issue [HZN-1429](#))
- Update OpennmsKafkaProducer to handle alarm feedback (Issue [HZN-1431](#))
- Update OCE OpennmsDatasource to subscribe to alarm feedback topic (Issue [HZN-1432](#))
- Update integration api to handle alarm feedback without Kafka (Issue [HZN-1433](#))
- Remove feedback submission actions from Opennms so that OCE is the authoritative source of situation changes (Issue [HZN-1435](#))
- Packaging OpenNMS plugins (Issue [HZN-1436](#))
- Create tool to audit syslog message parsing (Issue [HZN-1440](#))
- Send inventory to OCE without Kafka using integration API (Issue [HZN-1441](#))

- Update the SnmpCollector to use the CollectionSetBuilder (Issue [HZN-1442](#))
- Improve performance of DroolsAlarmContext alarm snapshot handling (Issue [HZN-1449](#))
- Prevent CME in OSGI service binding (Issue [HZN-1451](#))
- POC of a Graph Service which tackles all existing issues with the current Topology approach + allows exposing graphs via Rest (Issue [HZN-1452](#))
- Update startup script to bootstrap with Java 9+ (Issue [HZN-1455](#))
- Use mapstruct for mapping to protobuf objects in the kafka producer (Issue [HZN-1459](#))
- Add option to syslogd to include the raw syslog message as a parameter in the generated event (Issue [HZN-1460](#))
- View event configuration definitions from the Karaf shell (Issue [HZN-1461](#))
- Upgrade Elasticsearch test server to use v6.5.x (Issue [HZN-1467](#))
- Remove features-maven-plugin from the build (Issue [HZN-1468](#))
- Leverage new topology generator to test the LinkdTopologyProvider (Issue [HZN-1469](#))
- Node Meta-Data / KVP Support (Issue [HZN-1474](#))
- Extend topology generator and test suite to support bridge topology (Issue [HZN-1475](#))
- Upgrade CXF to 3.2.x or greater (Issue [HZN-1478](#))
- Enable instant refresh in topology generator based on the recent changes in the topology code (Issue [HZN-1479](#))
- Show managed object type and instance on alarm details page (Issue [HZN-1481](#))
- Update the topology generator so that topology is sent to the TopologyDAO (Issue [HZN-1482](#))
- Update topology code to make the topology that is sent via Kafka more convenient for consumption (Issue [HZN-1483](#))
- Maximum number of services in node details page should be configurable (Issue [HZN-1487](#))
- Use node category membership in Drools rules for alarms (Issue [HZN-1489](#))
- User defined links (Issue [HZN-1498](#))
- Enhance RadixTreeSyslogParser to ignore specific characters (Issue [HZN-1504](#))
- Remove PluginManager (Issue [HZN-1506](#))
- Remove unused indexNew.jsp files (Issue [HZN-1512](#))
- circleci packaging strategy (Issue [HZN-1513](#))
- Add OpenTracing support for Camel (JMS) RPC (Issue [HZN-1516](#))
- Add ability to provide custom tags to OpenTracing by RPC Modules (Issue [HZN-1519](#))
- Wrap Sink Message in Protobuf (Issue [HZN-1529](#))