

# Falcon Release Feature List

## Deployments

- ONOS running production traffic in **AmLight**
- L2/L3 SDX ONOS app and ONOS deployment in **AARNET with CSIRO**
- ONOS/SDN-IP has been deployed in **KREONET with KISTI**
- SDN-IP and SDX-L2 deployed in **GEANT** with **CNIT** collaboration
- New link between **GEANT** (Prague - EU) and **AmLight** (Sao Paulo - BRA)
- Deployed VPLS on **AmLight**, together with SDN-IP
- New link between **AmLight** and **KREONET**
- ONOS deployment in Taiwan - **NCTU**
  - Connection between **AmLight** and Taiwan
  - Connection between Taiwan and **KREONET**
- ONOS deployment in EU with **GARR**
- Connection between **KREONET** and **AmLight**

## Distribution Support

- **ONF** and **ON.Lab** have completed the integration of ONOS into the 2nd release of Atrium (<https://github.com/onfsdn/atrium-docs/wiki>).
- **Huawei** completed the integration of ONOS into OPNFV Brahma Putra
  - Additional OpenStack routing and switching support
  - Extended SFC with load balancing feature and enhancements to SFC bundling within the VTN application
  - to store multiple similar SFs within a SF group and using this information for load balancing within the SFs.
- Installers, testing
- SONA improvements from **SK Telecom and ATTO**
  - L3 Routing feature (Router, pNAT, Floating IP, ICMP Handler)
  - SecurityGroup feature of Openstack

## Security Mode ONOS

- **KAIST** has added automatic application security policy extraction that uses static analysis techniques

# Applications

- VPLS application - allows creation of multi-point broadcast overlay networks based on VLAN. A fundamental need for most research and education networks
- Initial release of Yang to Java translator by **Huawei**: YANG is a data modeling language used to model configuration & state data. YANG is a one way to represent the interface and behavior semantics (of device/controller/component). The YANG modeled interfaces need to be implemented by corresponding application / component. There are 2 parts in implementing the interface: a) the syntax/symantics processing of the request/response being exchanged. b) the business logic to compute the request. This feature abstracts the applications from syntactical processing of information encoding with the external world. It provides a framework in which the applications only need to implement the business logic. It seamlessly supports any interface language like REST, NETCONF etc. YANG Utils which is a basic building block to achieve this goal is developed as a part F release. These UTILS provide following:
  - 1) Abstracting Syntax information from model.
  - 2) Translator tool for auto-generation of JAVA corresponding to a given YANG.
  - 3) Metadata Generation (Input for NBI & SBI Automation)
- **FNLab/BUPT** troubleshooting application
  - Routing Loop Detection
  - Routing Blackhole Tracking
- **POSTECH** provided
  - RRD based MetricsDatabase. This is a round robin database (RRD) stores various metric values. The database stores daily data points, and granularity is up to 1 minute.
  - **Control metrics monitoring service**. This service is for monitoring various control metrics that include control message, CPU load, memory usage, disk I/O, etc.
- **Huawei** contributed a BGP Flowspec implementation: BGP Flow specification specifies procedures for the distribution of flow specification rules via BGP and defines the procedure to encode flow specification rules as BGP NLRI which can be used in any application. BGP flow specification feature is required to handle scenarios such as
  - Packet filtering in order to mitigate (distributed) denial of service attacks.
  - Network optimization by applying flow rule with various flow types.A REST interface is implemented to push flow specification rules to networking devices using the BGP ONOS southbound interface. Flow specification rules support multi-value flow types with logical conditions as specified in RFC 5575.
- **Create-Net** and **TATA** collaboration on ONOS peering improvements

## GUI/CLI

- UI introduction video
- Augmented TableModel with annotations
- Secondary sort capability in tables
- Meter table GUI view
- Driver Matrix view (drivers vs. behaviours) to help visualize supported device control capabilities.
- Topology View:
  - “Reset Node Locations” command (‘X’ keystroke) added
  - Topology Overlay selection with F1, F2, F3... keystrokes
- Application View:
  - Confirmation dialog added for application activate/deactivate/uninstall
  - Application Model enhancements supported
    - columns added for additional application attributes
    - details panel displayed when application row selected
  - applications can now define custom icon and URL for documentation
- Dialog Service:
  - Enter and Escape keys bound to OK and Cancel buttons
- **POSTECH** provided
  - Extended application properties for supporting customized icon in application view. This feature extends application properties to have URL, category, icon, long description, etc. With this feature, application developers can customize their own application icons.
  - Augmented table model for supporting annotation. This feature augments table model properties, allow web developer to specify various meta information of table model as a form of annotation.

## Northbound Interface

- New REST APIs for GroupTable, MeterTable, FlowObjectives from **POSTECH**
- Intents: **Fujitsu** provide Resource reservation support for “continuous” resources (bandwidth)
- Intents subsystem integrated with Flow Objectives (partial, not all intent types)

## Core

- dynamic cluster scaling
- enhancements making it easier to add new distributed primitives

- from **Ciena**, the device key subsystem, and integration of the device key id into the BasicDeviceConfig
- Added ability to dynamically extend the core data model and allow alternate projections of core topology entities, e.g. devices, ports, links, hosts.
- Support for more context when looking at state change notifications
- From **POSTECH**: Control message subsystem which provides control message statistics that includes number of control packet, message volume, etc.
- Introduced Regions as a basis for controlling affinity of controller nodes to geographical regions and for upcoming topology view enhancements.
- Introduced device key subsystem to allow coordinated management of keys (SSL, user/password, community-name) required for securing control interactions with network devices.

## Southbound Interface

- **Huawei** and **Cognizant** implemented OSPF southbound protocol support. Plug-in collects the topology information of the legacy network. This topology information can be used by other applications like PCE. Major features supported are OSPFv2 specification (RFC 2328), and the OSPF Traffic Engineering (TE) extension (RFC3630)
- OSPF SBI is also integrated to the IP Topology (same as BGP-LS).
- REST southbound support
  - Protocol and provider to discover and configure devices that provide REST interaction capability
  - Support for REST CRUD operations and non-standard PATCH operation
  - HTTP and HTTPS protocol capabilities, with and without password login
- SNMP provider from **BTI**
- Drivers folder has been significantly redesigned
  - each driver family has his own module and is treated as an ONOS app.
  - drivers can be dynamically loaded on an as-needed basis.  
apps="org.onosproject.drivers.netconf" in app.xml
  - default drivers is now the default folder but the module maintains onos-drivers artifact-id for retro-compatibility
  - base for future separation from base-drivers and device-family specific drivers.
- Driver based fallback providers making deployment much easier
- Device provider testing for **OPLink** (OpenFlow), **Ciena** (REST), **Fujitsu** (NETCONF), **Lumentum** (SNMP)
- Multiple inheritance between drivers
- OVSDB now supports setting and deleting a port on a specific bridge.
- Multicast support for CORD from **DirectTV**
- NETCONF improvements

- device's session stream handling: allows device notification and listeners for events
- Async communication is supported via usage of Completable Future based on request and reply messageID
- Abstracted communication with device in separate thread
- Capability to listen for device generated messages and events ( like alarms, notifications ).
- Added Capability to provision ports for a device via a behavior in the provider.
- Improved IPv6 test suite from **Criterion Networks**
- Improved NETCONF test suite from **Happiest Minds**

## PoC and Field Trial Support

### Residential CORD

- ONS demo support (infrastructure development, application development, software and hardware integration by **AT&T, Ciena, Accton/Edge-Core, Akamai, Broadcom, Celestica, ONF, PMC Sierra, Tech Mahindra**) - full details to be announced and demonstrated at ONS

### Mobile CORD

- ONS demo support (infrastructure development, application development, software and hardware integration by **AT&T, SK Telecom, Verizon, Radisys, Cavium, NEC/NetCracker, AirHop, Cobham Wireless**) - full details to be announced and demonstrated at ONS

### Enterprise CORD

- ONS demo support (infrastructure development, application development, software and hardware integration by **NTT, Calient, Cavium, Ciena, Fujitsu, Huawei, Lumentum, NEC, Oplink**) - full details to be announced and demonstrated at ONS

### CORD Analytics

- ONS demo support (infrastructure development, application development, software and hardware integration by **AT&T, Ericsson**) - full details to be announced and demonstrated at ONS, but here are some highlights
  - Openstack Ceilometer as a scalable, multi-tenant service in XOS

- Support for Kafka and UDP based Publish/Subscribe interface over Openstack Ceilometer in addition to existing Query based interface
- "sFlow Collection" as a scalable, multi-tenant service in XOS
- Service level metrics and event collection for CORD services such as vSG, vOLT and ONOS
- Analytic applications such as "XOS Monitoring dashboard", "XOS-service-auto-scale" and "XOS Residential Subscriber Troubleshooting Portal" are implemented on top of this XOS monitoring platform
- InMon Corp's sFlow analytics applications are verified on top of this platform
- Integration of XOS monitoring platform with real time analytics applications from 3rd party vendors is targeted for Open Networking Summit 2016

## Other PoCs

- **NTT Communications, China Unicom, AT&T, Huawei, Fujitsu NEC, Adara** have been contributing toward IP-Optical and transport SDN use cases.

## Test Improvements

- Production testbed: qualified new Karaf and Maven version
- Continuous Hours of Operation: Improvements to robustness of tests
- HA testbed improvements

## Other ONS demos

- China Unicom has been active with preparing with partners and collaborators in several demonstrations for ONS.