ONF, ONOS and CORD

Slides Link:
https://goo.gl/EBQ6R7

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ONOS provides
a **flexible** and **extensible** API
with **multiple layers of abstraction**
for both **network programming** and
configuration.

Key Northbound Abstractions

- **Network Graph**
  - Directed, cyclic graph comprising of infrastructure devices, infrastructure links and end-station hosts

- **Flow Objective**
  - Device-centric abstraction for programming data-plane flows in version and vendor-independent manner
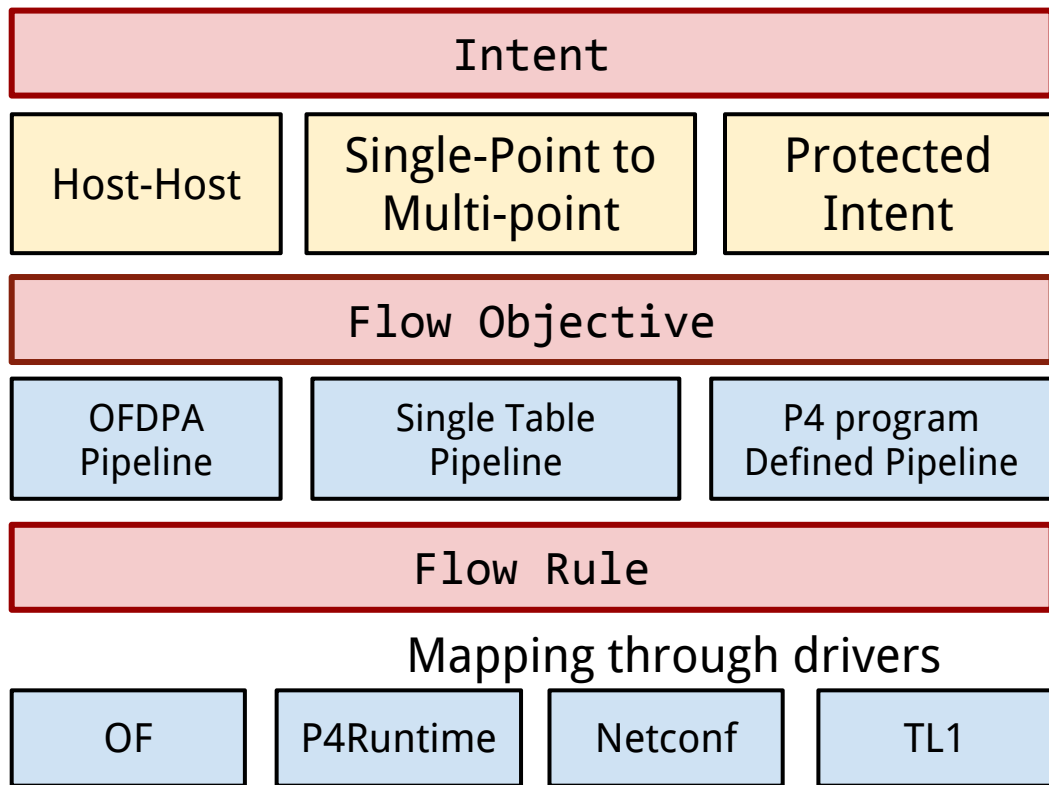
- **Intent**
  - Network-centric abstraction for programming data-plane in topology-independent manner
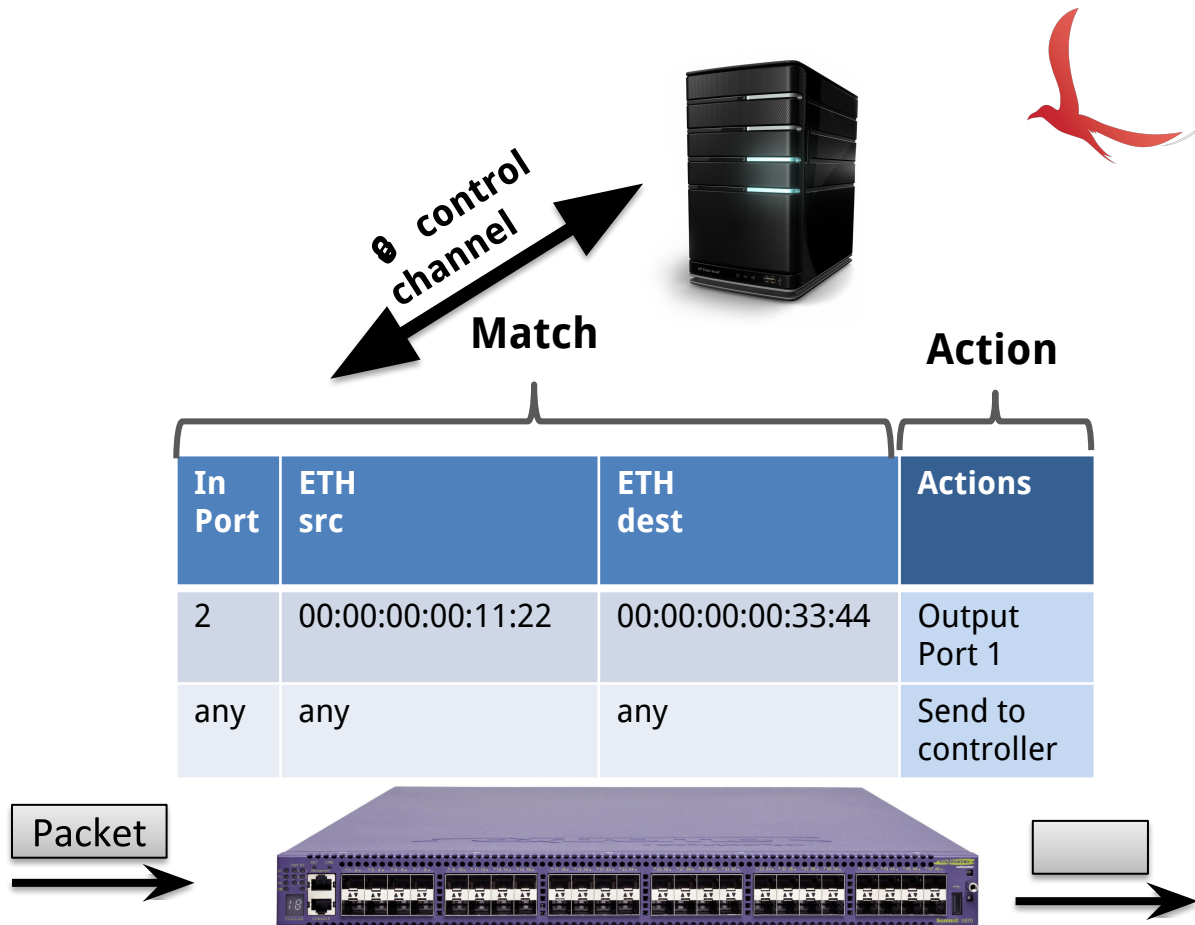
Network Programming

Abstract to concrete

Intent		
Host-Host	Single-Point to Multi-point	Protected Intent

Flow Objective		
OFDPA Pipeline	Single Table Pipeline	P4 program Defined Pipeline

Flow Rule			

Mapping through drivers

OF	P4Runtime	Netconf	TL1

Flow Rule

```
"match": {
  {
    "port": 2,
    "type": "IN_PORT"
  },
  {
    "mac": "00:00:00:00:11:22",
    "type": "ETH_SRC"
  },
  {
    "mac": "00:00:00:00:33:44",
    "type": "ETH_DST"
  }
},
"action": {
    "port": 1,
    "type": "OUTPUT"
}
```

control channel

Match   **Action**

In Port	ETH src	ETH dest	Actions
2	00:00:00:00:11:22	00:00:00:00:33:44	Output Port 1
any	any	any	Send to controller

Packet

5

Flow Objectives

Flow Objective Summary

- *Flow Objective:* **abstraction** for applications to be **pipeline unaware** while **benefiting** from multi-table architectures
- **Enable app portability**
  - **interoperability** between different type of pipelines coexisting in heterogenous networks.
  - Support for a **new pipeline** is achieved through a **new pipeliner behaviour** in a driver. The new pipeline is then **programmable from all existing applications.**
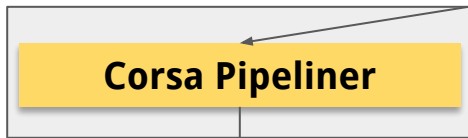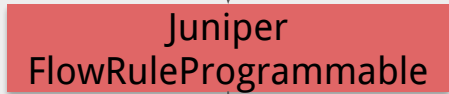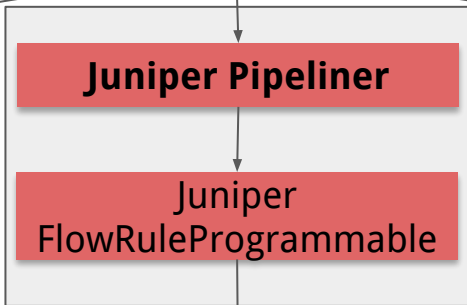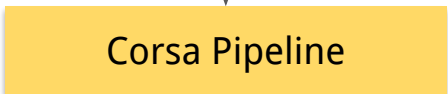
Flow Objective Architecture

Device driver is used to translate objectives to the specific flow rules for a given device and pipeline
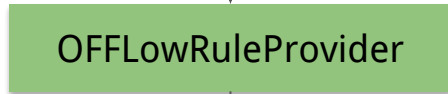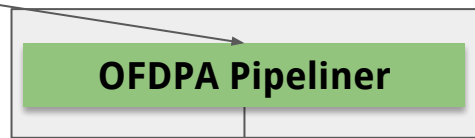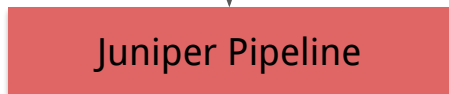
Flow Objective example

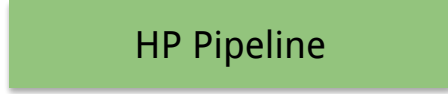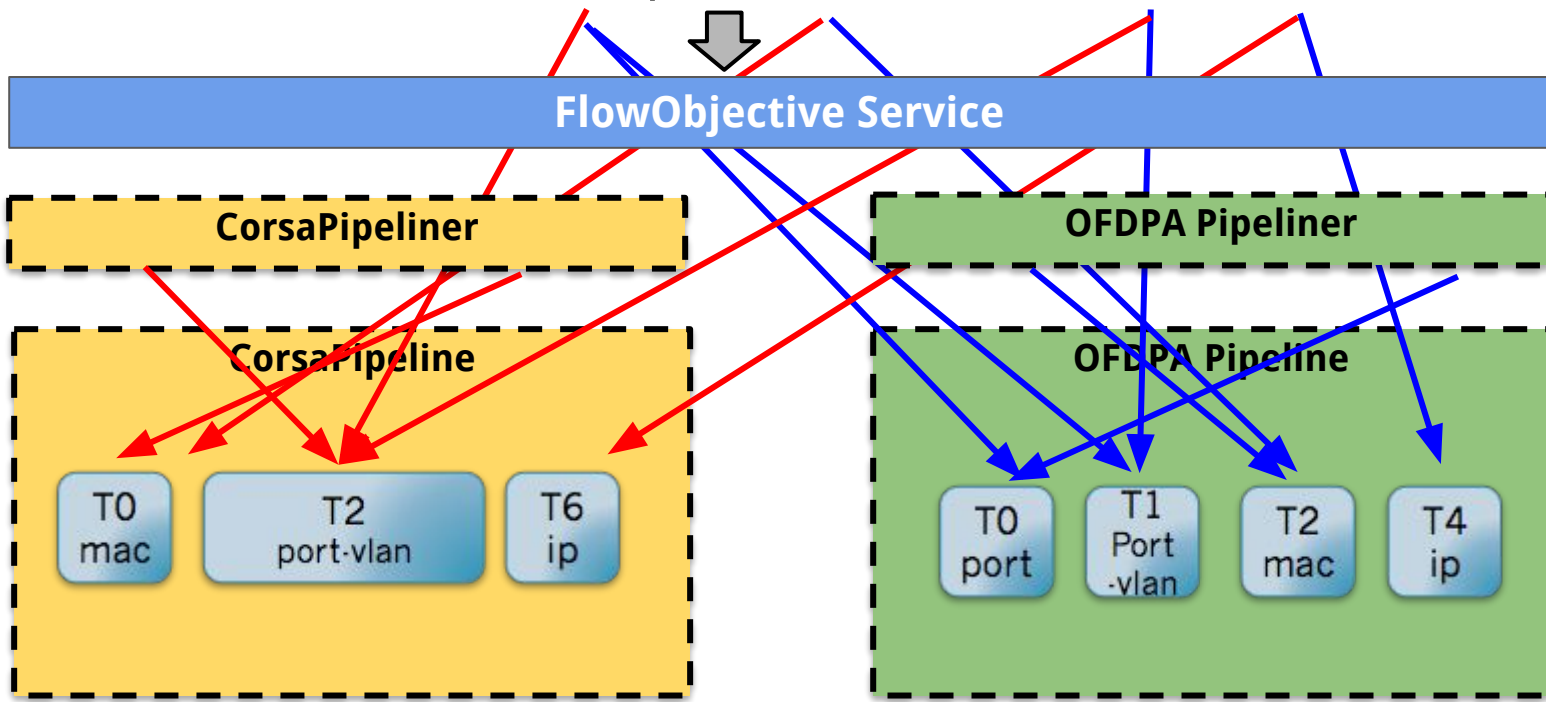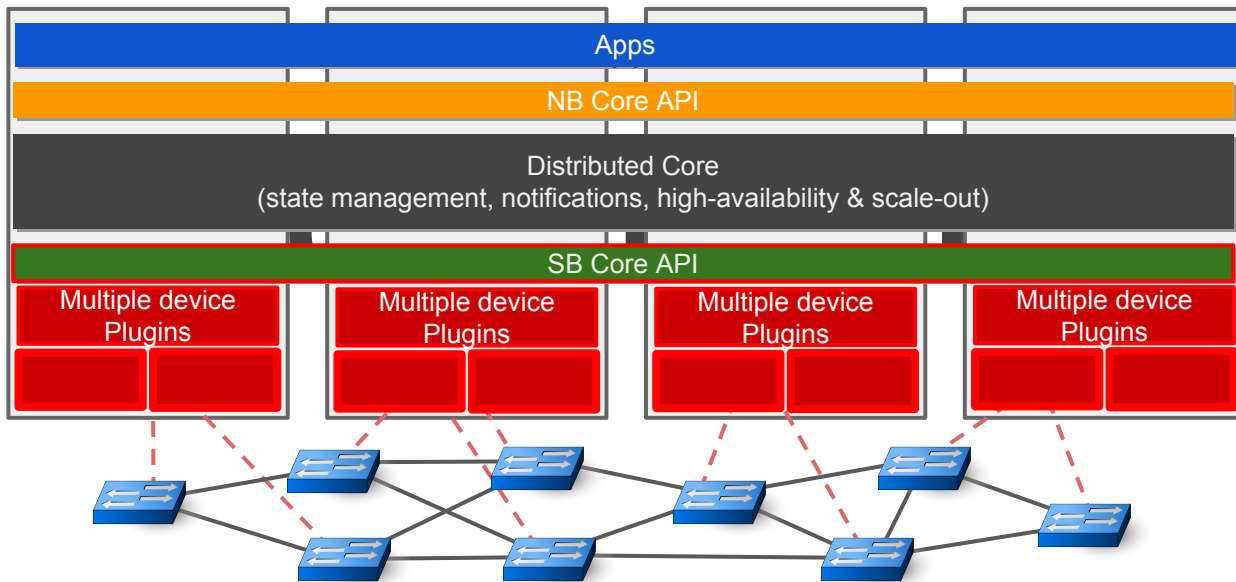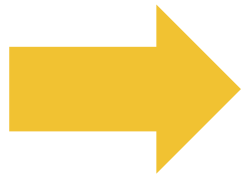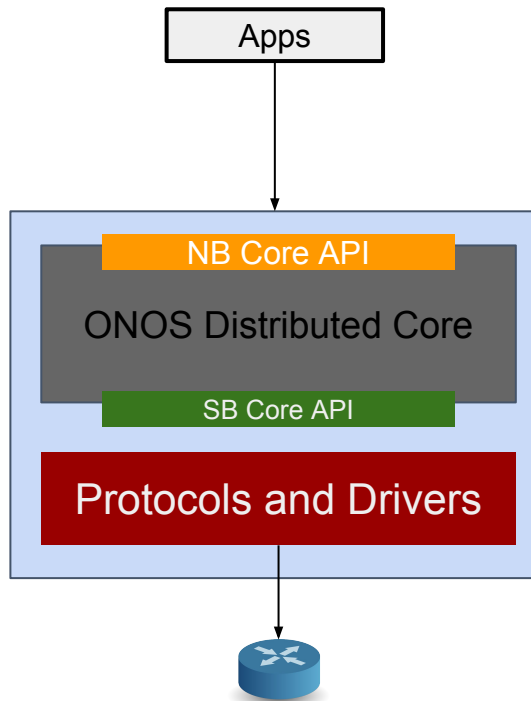Peering Router   Match on Switch port, MAC address, VLAN, IP

Southbound

Southbound overview

Southbound protocols:

- OpenFlow 1.0-1.5
- OVSDB
- NETCONF + YANG
- SNMP
- P4 → P4Runtime
- BGP, ISIS, OSPF
- PCEP
- REST
- LISP

Apps

NB Core API

ONOS Distributed Core

SB Core API

Protocols and Drivers

ONOS Drivers

Driver

- On-demand activation
- Define device's capabilities
- Encapsulate specific logic and code

```
<driver name="default "manufacturer="ON.Lab"
        hwVersion="0.0.1" swVersion="0.0.1">
        <behaviour api=InterfacePath
                impl=ImpementationPath />
</driver>
```
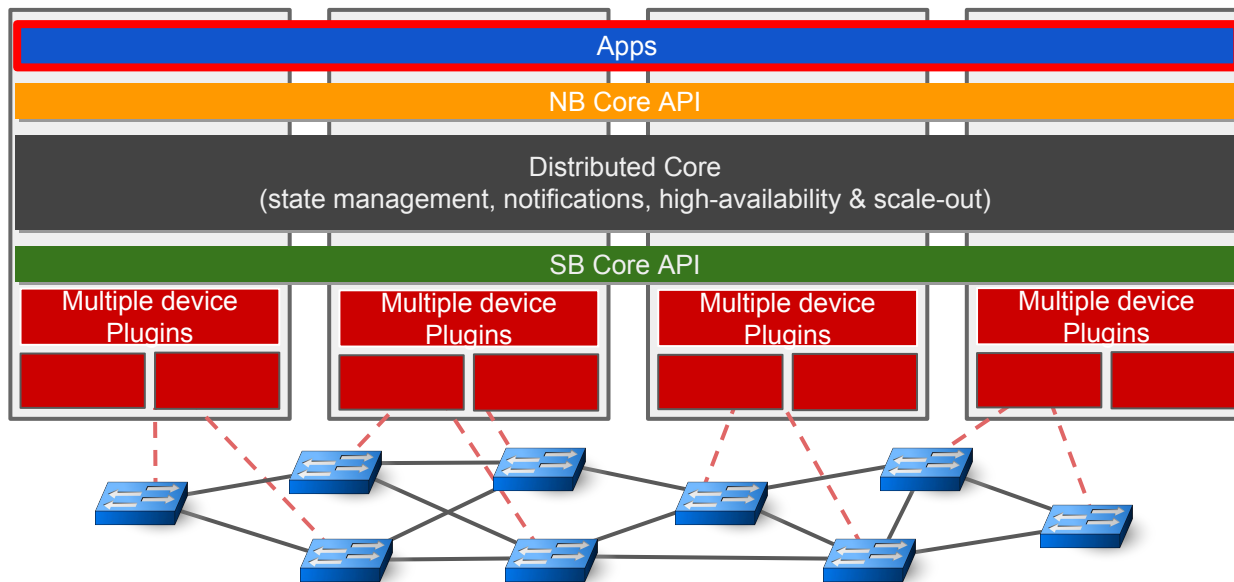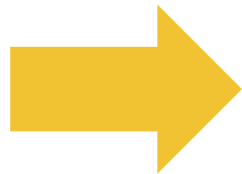
Goals of ONOS southbound:

- Abstractions, modularity, interoperability
- Live use of new devices
- Customization without changing the core
- Hidden complexity to upper layers

Applications

What are ONOS applications ?

ONOS applications:
- Interact with the northbound Java or REST interface
- Device and protocol agnostic
- Augment ONOS though modularity
- Provide GUI, REST, CLI and distributed stores.
- Shape the network.

Add value to Controller Platform

Apps/Use Cases

Trellis and Segment Routing
- DC leaf-spine fabric

Optical Disaggregated Transport Network
- Control of optical devices
- OpenRoadm

P4
- Control of Data-Plane programmable switches
- INT, VNF Offloading, Fabric.P4

vRouter
- CORD virtual Router
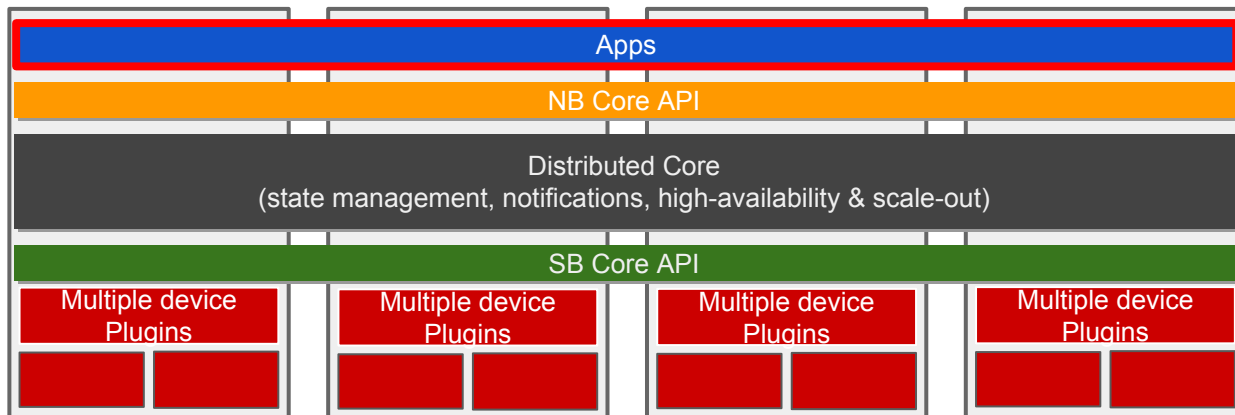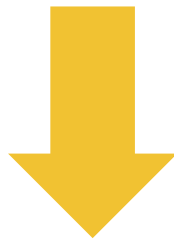
OpenStack Integration
- Sona Project

DHCP
- DHCP app
- DHCP relay

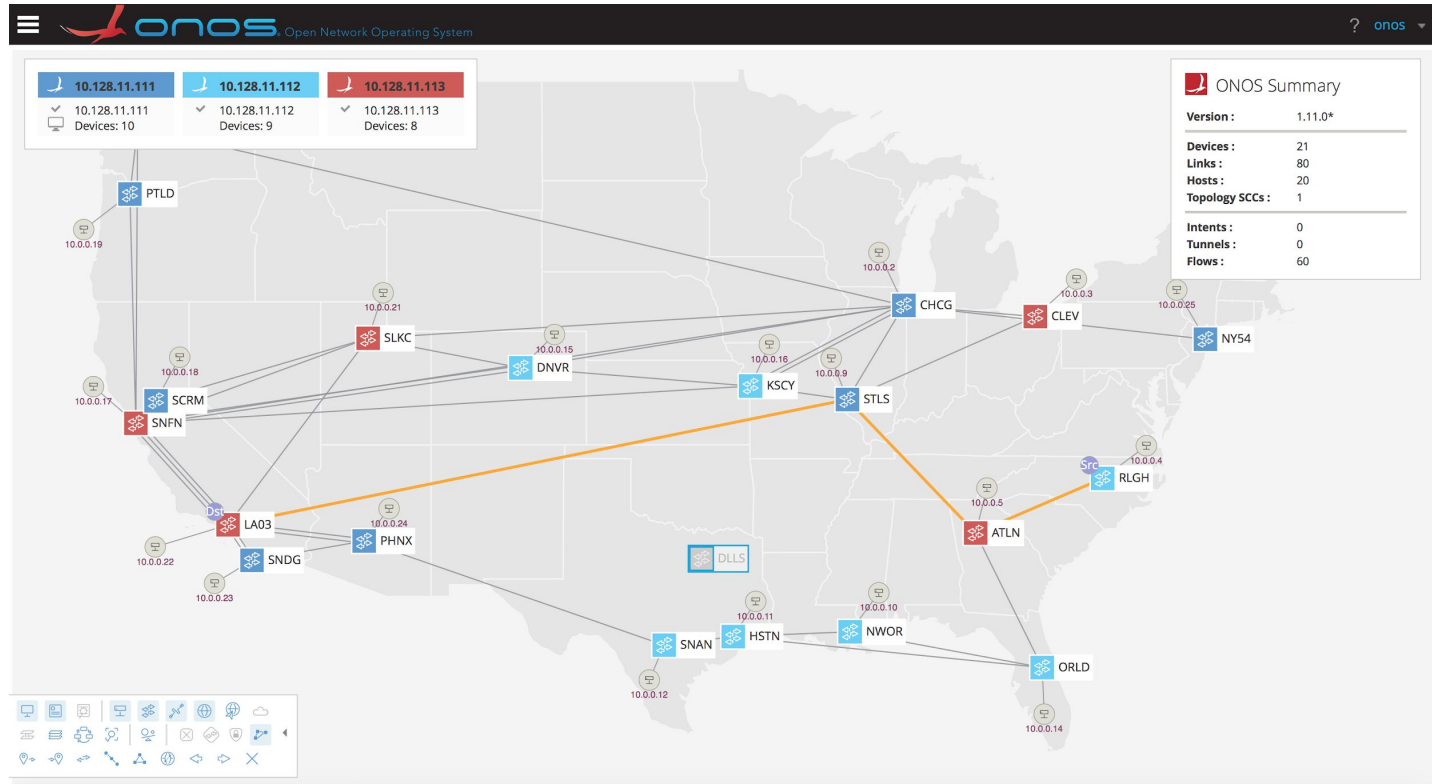**L2Monitoring and FaultManagement**

Air Traffic Control

Interact with ONOS

| Apps |
| NB Core API |
| Distributed Core (state management, notifications, high-availability & scale-out) |
| SB Core API |
| Multiple device Plugins |

Interact with ONOS: GUI
UI: <onos-ip>:8181/onos/ui

Interact with ONOS: CLI

$onos <controller_address>

Interact with ONOS: REST and GRPC

REST APIs: \<onos-ip>:8181/onos/v1/docs/

Northbound GRPC with protocol buffers (.proto) for ONOS network model

Tutorial

https://wiki.onosproject.org/display/ONOS/Basic+ONOS+Tutorial

ONOS takeaways

- **Production ready SDN controller**
- **Distributed core** for high availability
- Modular, Clean and extensible architecture
- **High Performance**
- **Scalability** of the cluster
- **Extensive suite of applications** that can suit your need
- **Easy to use** through CLI, GUI and REST API
- Drivers and protocol Subsystem to support **different devices and makers**
- Control of **networks** made of **heterogeneous** devices
- **Simplifies network control and management**
- **Open source**
- **Great community**

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Further reading (ONOS)

ONOS website:

http://onosproject.org

Tutorials, documentation and general reading at:

https://wiki.onosproject.org/

ONOS is on Github at:

https://github.com/opennetworkinglab/onos

Screencasts:

https://wiki.onosproject.org/display/ONOS/Screencasts

Community

Key initiatives

- **ONOS / CORD Brigades**
  - leveraging the community to ship features of the ONOS/CORD roadmaps
- **ONOS/CORD Ambassadors**
  - a program to help push leadership to the edges of the community
- **Collaborations**
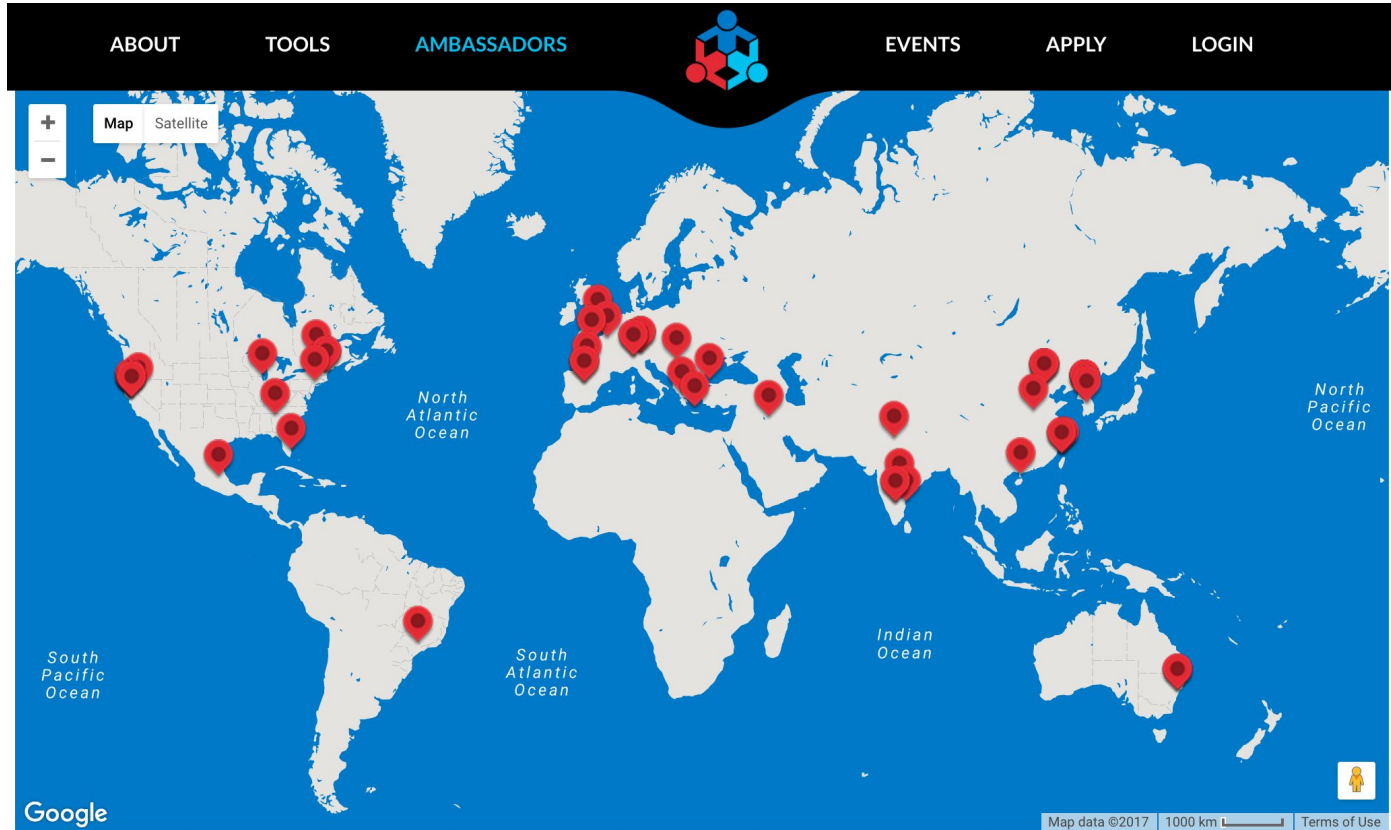 - Politecnico of Milan is an official ONF collaborator

Brigades

Small teams created around specific features that we want to ship in upcoming versions of ONOS and CORD

Ambassadors Program

Ambassadors Program

- A program designed to empower anyone who is passionate and knowledgeable about ONOS/CORD, who wants to promote the ONOS/CORD project in their region and build a strong local community around it.

- The program provides a simple framework and a specific set of tools to help Ambassadors

  - organize and/or attend events

  - recruit and mentor new contributors

  - support your local community.

Ambassadors Program

https://ambassadors.onlab.us

Andrea: andrea@opennetworking.org

Thanks
for hosting and organizing

Software Defined Transformation of Service Provider Networks

Join the journey @ onosproject.org