ODL NIC Tutorial: The basic Operations for NIC using Intents – How to start contributing

Demo using Intents for Blocking, Allow and QoS Attribute Mapping

Yrineu Rodrigues (Independent contributor)

Agenda

- Intent concept and NIC overview
- NIC modules and interaction
- Allowing using Intent
- Blocking using Intent
- QoS Attribute mapping using Intent
- How to start contributing

Network Intent Composition:Main

This Network Intent Composition project will enable the controller to manage and direct network services and network resources based on describing the "Intent" for network behaviors and network policies. Intents are described to the controller through a new NorthBound Interface, which provides generalized and abstracted policy semantics instead of Openflow-like flow rules. The Intent based NBI allows for a descriptive way to get what is desired from the infrastructure, unlike the current SDN interfaces which are based on describing how to provide different services. This NBI will accommodate orchestration services and network and business oriented SDN applications, including OpenStack Neutron, Service Function Chaining, and Group Based Policy. The Network Intent Composition function will use existing OpenDaylight Network Service Functions and Southbound Plugins to control both virtual and physical network devices. The Network Intent Composer will be designed to be protocol agnostic such that any control protocol can be used such as Openflow, OVSDB, I2RS, Netconf, SNMP etc.

Contents

[hide]

Network Intent Composition (NIC) Facts

Project Creation Date: January 22nd, 2015
Lifecycle State: Incubation
Primary Contact: Yrineu Rodrigues - yfrfelipe@gmail.com
Project Lead: Yrineu Rodrigues - yfrfelipe@gmail.com
Committers:

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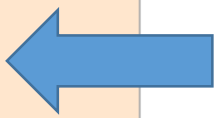
IRC: freenode.net #opendaylight-nic
Mailing List: nic-dev@lists.opendaylight.org
Archives: mailing list archives
Meetings: Friday 3:30PM PT, Webex
Repository: git clone https://git.opendaylight.org/gerrit/p/nic
Jenkins: jenkins silo
Gerrit Patches: code patches/reviews
Bugs:

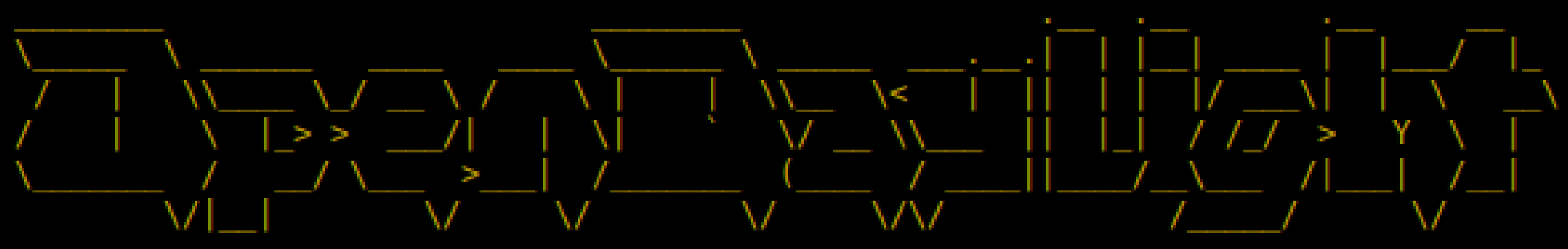
- open bugs
- components
- report a bug



Configure your environment

- Execute the `odl-summit-nic.ova`
- Into `/home/intent/nic` change to branch stable/beryllium-sr2
  - git checkout stable/beryllium-sr2
  - Execute: mvn clean install –Dmaven.test.skip=true –DskipTests -U
- Execute the NIC
  - Go to `/home/intent/nic/distribution/target/bin
  - Execute ./karaf
  - karaf> feature:install odl-nic-core-mdsal odl-nic-console odl-nic-listeners

```
yrineu@yrineu:~/project/nic/distribution/target/assembly/bin (beryllium)$ ./karaf clean
karaf: Ignoring predefined value for KARAF_HOME
karaf: JAVA_HOME not set; results may vary
OpenJDK 64-Bit Server VM warning: ignoring option MaxPermSize=512m; support was removed in 8.0
```



```
Hit '<tab>' for a list of available commands
and '[cmd] --help' for help on a specific command.
Hit '<ctrl-d>' or type 'system:shutdown' or 'logout' to shutdown OpenDaylight.

opendaylight-user@root>feature:install odl-nic-core-mdsal odl-nic-console odl-nic-listeners
```

Configure your environment

- Execute the mininet
  - sudo mn –topo single,3 –mac –controller remote –switch ovsk,protocols=OpenFlow13

Intent

- What not How!
- "...SDN controller becomes the intelligence that translates what is needed into specific protocols, interfaces, vendor-specific features, etc. This approach allows the description to be portable across multiple infrastructure implementations..." (LENROW, David)
- "Allow all traffic from Finance to Admin"
- "Block all traffic from Finance to Admin"

NIC

- The Network Intent Composition project enables the controller to **manage** and **direct network services** and resources based on describing the "Intent" for network behaviors and policies.
- Through a **NorthBound interface** providing abstracted policy semantics instaead OpenFlow-like rules.

NIC, how it works...

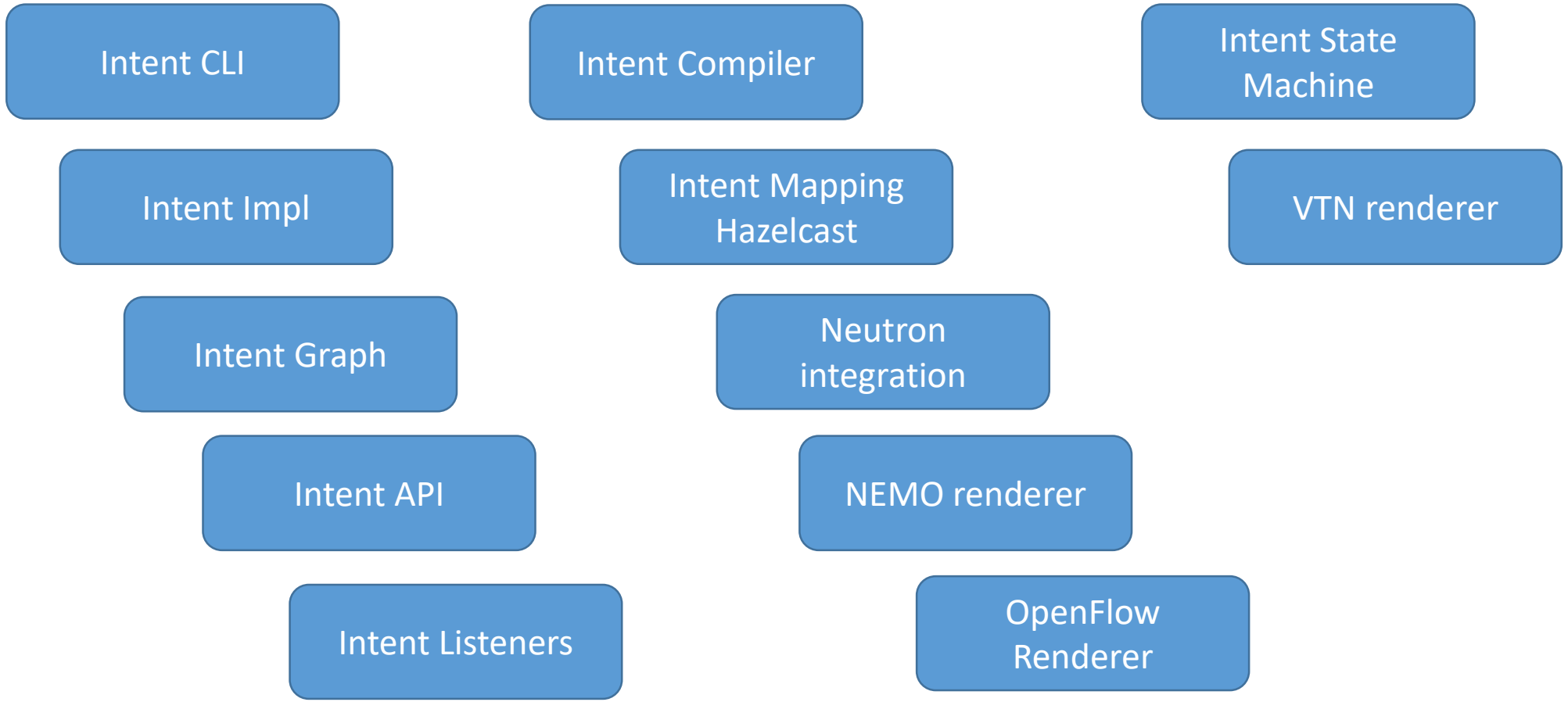
- The core is the Intent model wich specifies the details of the **desired network state**.
- The NIC transforms this desired state to the resources under the control of ODL.
- Orchestration services and network business SDN applications (OpenStack Neutron, Service Function Chaining and Group Based Policy)

NIC, how it works...

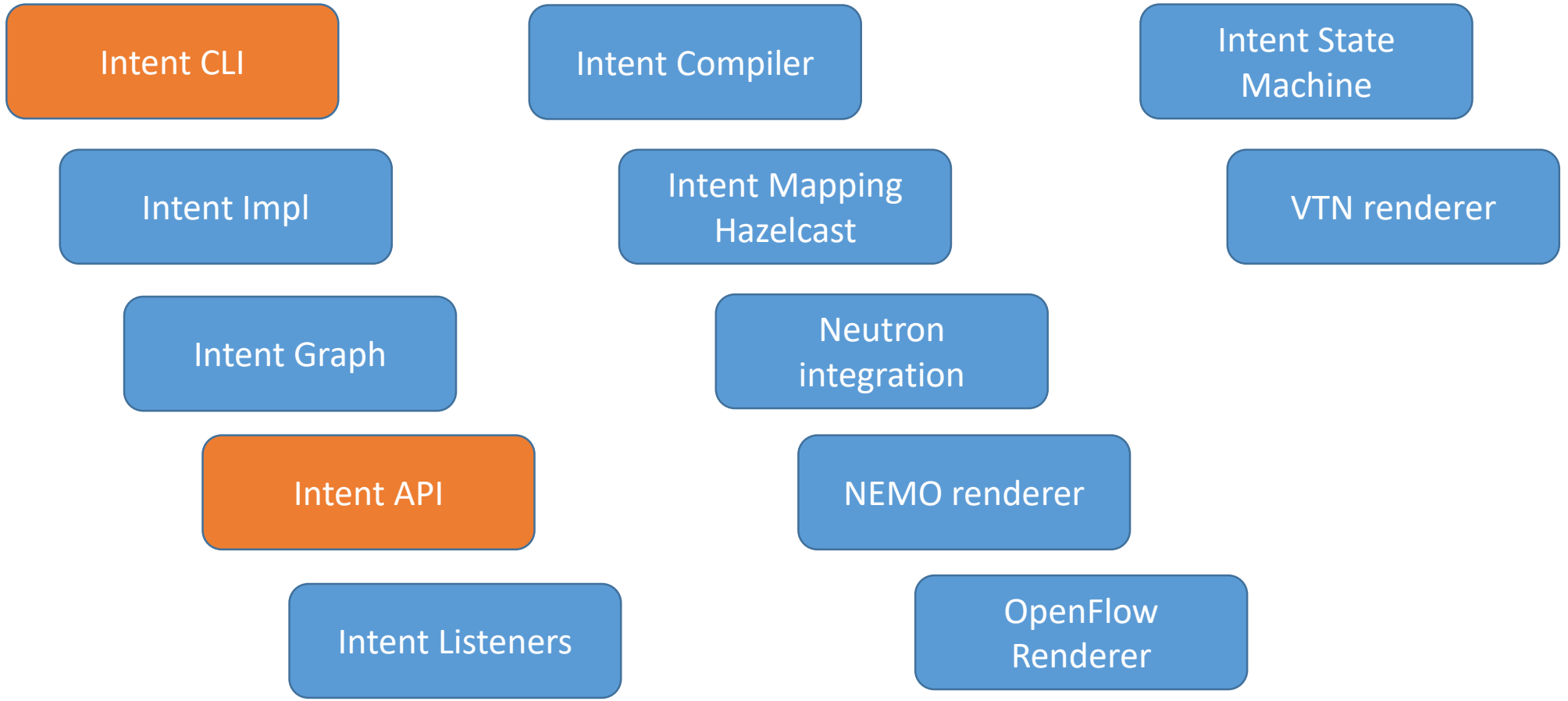
- On Boron release the NIC project has **multiple renderers**
- For Boron release, simultaneous renderes will **not be** supported.
- For Boron release, only "REDIRECT", " ALLOW" and "BLOCK" actions are supported.
- Allow: Indicates that traffic can flow between source and destination end points.
- Block: Prevents that flow between source and destination.
- Redirect: Create a mirroring action

NIC modules

NIC modules


Intent CLI
Intent Compiler
Intent State Machine
Intent Impl
Intent Mapping Hazelcast
VTN renderer
Intent Graph
Neutron integration
Intent API
NEMO renderer
Intent Listeners
OpenFlow Renderer

NIC modules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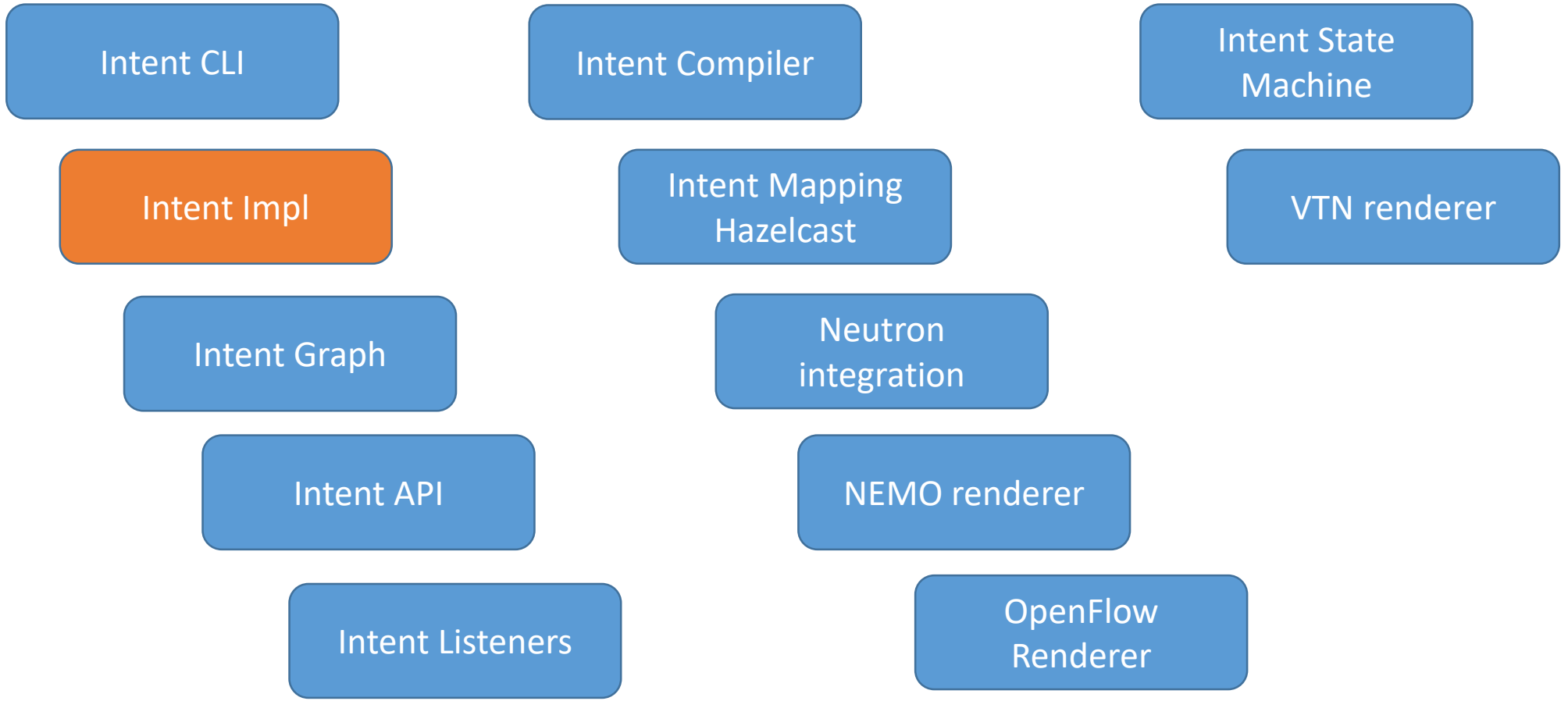
NIC modules – Intent CLI

- Provide a Command-line interface integrated with the Karaf CLI to create Intents
- Uses the structures generated using the YANG models defined on 'intent-api' module
- Extract all needded information to create the Intent objects created and send to 'intent-impl'
- Can extract information provided by a previously mapped endpoints

NIC modules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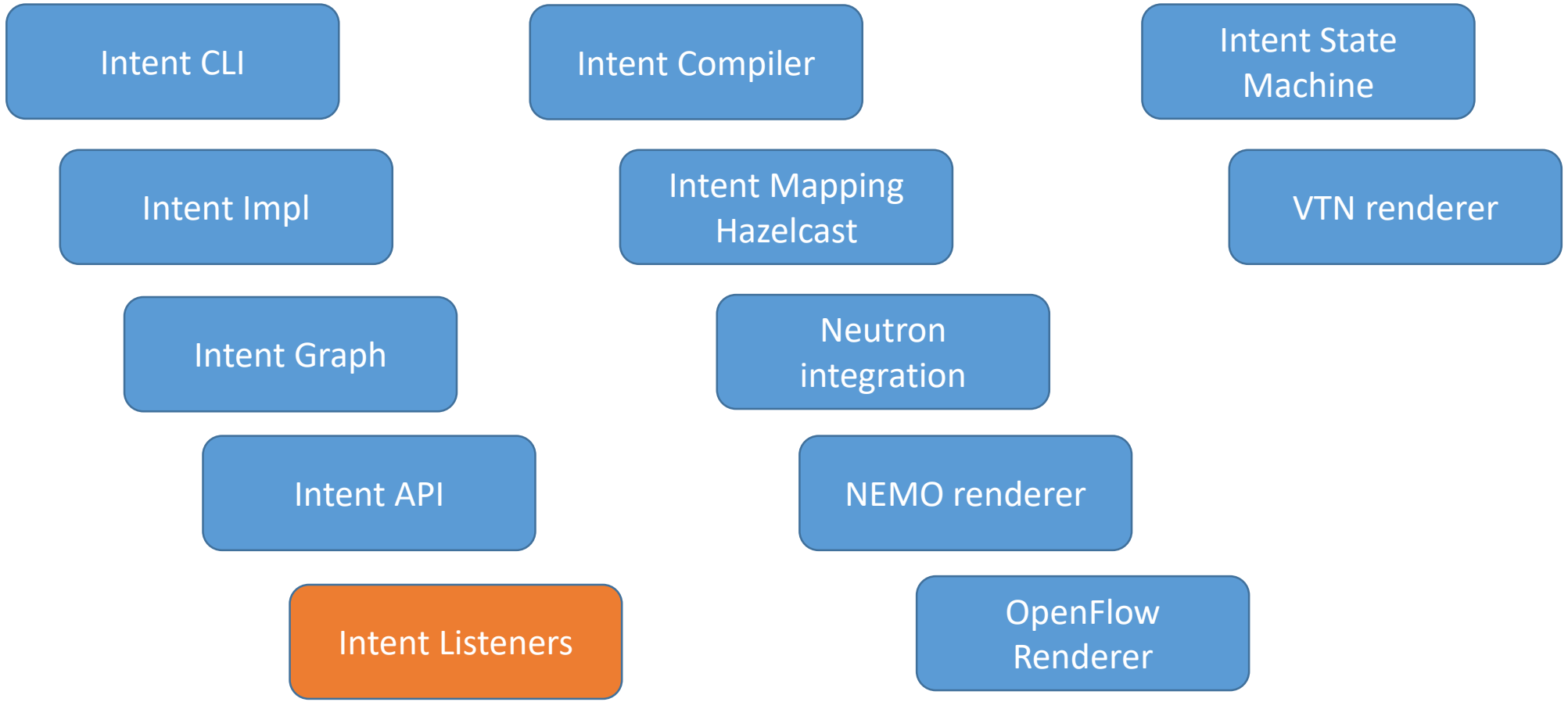
NIC Modules – Intent impl

- Connection with MD-SAL
- Receive the Intet object created by 'intent-cli'
- Send the Intent to MD-SAL to be stored

NIC modules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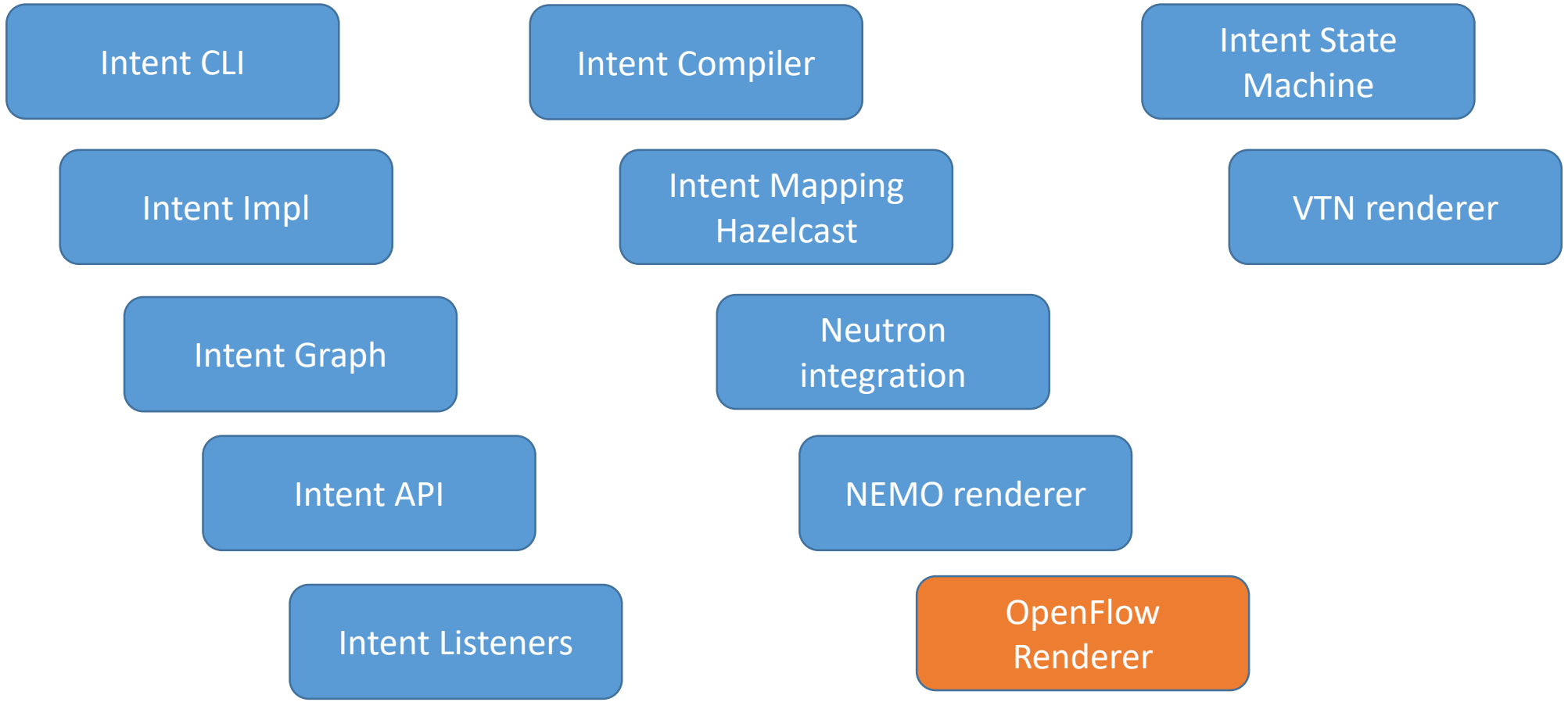
NIC Modules – Intent listeners

- Listener of events sent by MD-SAL
- Listen Intent events and Network events

NIC modules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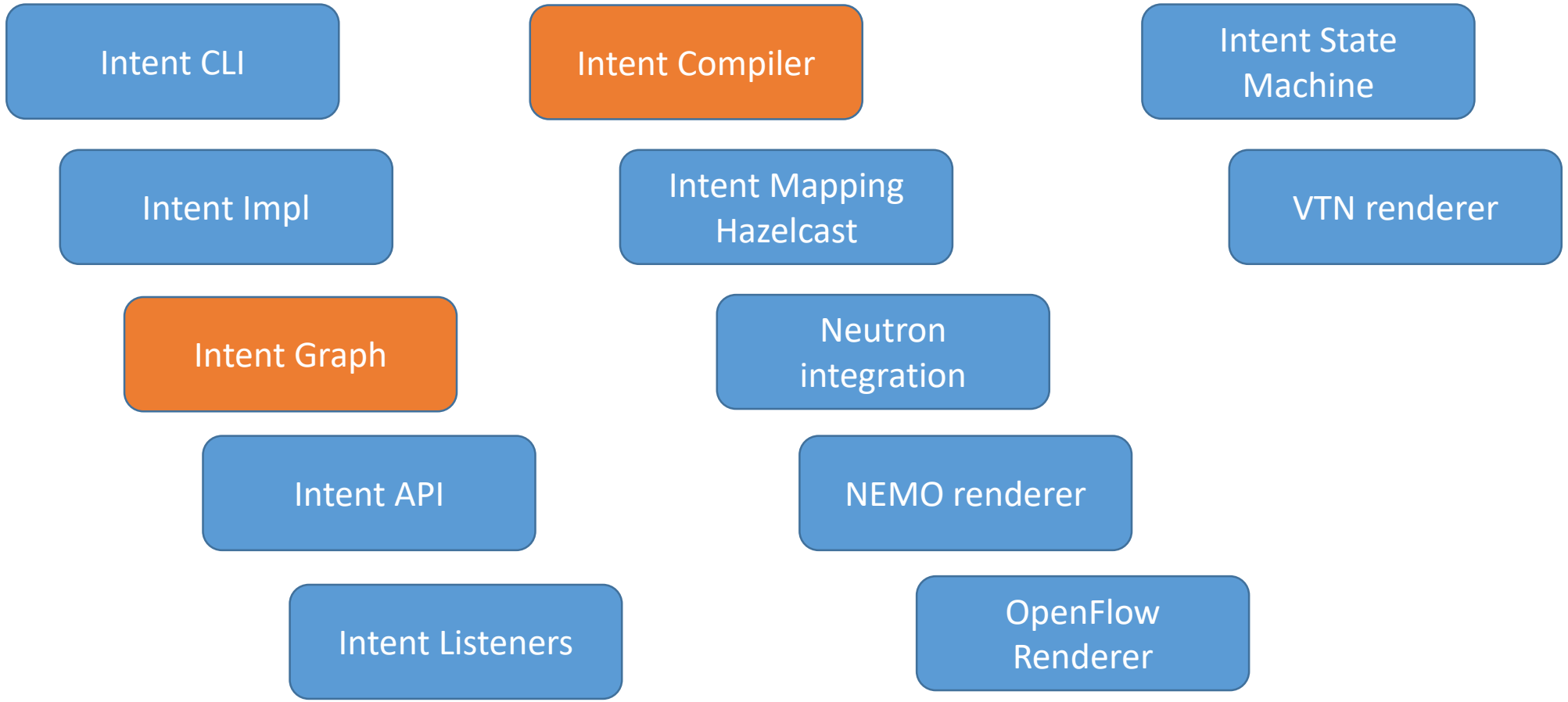
NIC Modules – OpenFlow renderer

- Responsible for translate intents in OpenFlow rules
- Send rules to the switches
- Firewall(,Allow and Block), QoS and Redirection

NIC modules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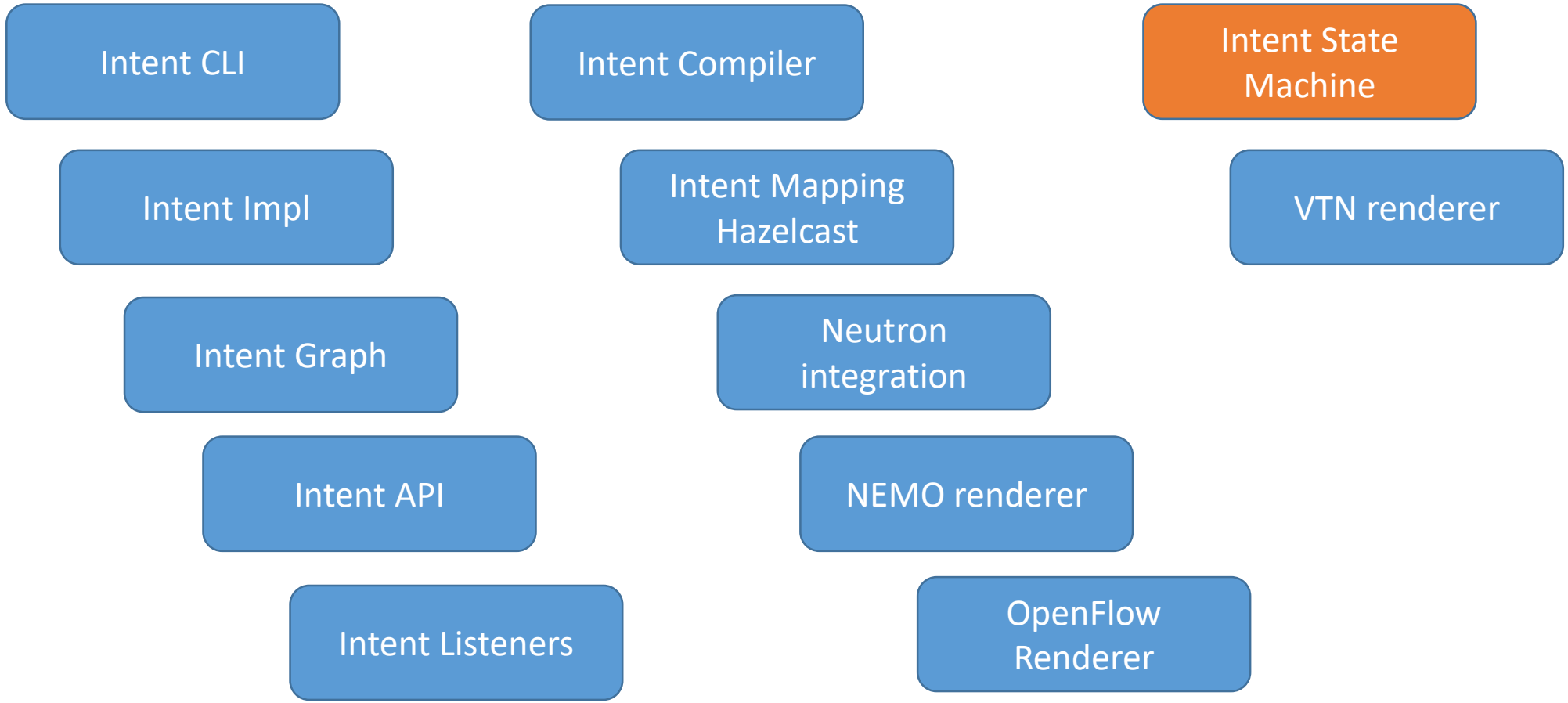
NIC Modules – Intent Graph

- Responsible for conflict resolution
- "BLOCK" aways wins
- Different clients can create intents for with different actions for the same endpoints

NIC modules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NIC Modules – Intent State Machine

- Keep the track of all intents created
- Useful to avoid unnecessary flows under switches
- Create transactions for state changes of each Intent

Remember: *Anything that can go wrong, will go wrong*. (Murphy's law)

DEMO!

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Demo

- Start the karaf
  - ./karaf
- Install NIC features
  - karaf> feature:install odl-nic-core-mdsal odl-nic-console odl-nic-listeners
- Configure the OpenVSwitch
- Create an Intent to allow bidirectional traffic

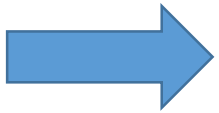
Demo – OVS Configuration

- To connect host machine with virtual machine
  - Sudo ovs-vsctl add-br summit
  - Sudo ovs-vsctl set Bridge summit protocols=OpenFlow13
  - Sudo set-controller summit tcp:<your_controller_ip>:6633
  - Sudo ovs-vsctl add-port summit port1
  - Sudo ip tuntap add mode tap port1
  - Sudo ifconfig port1 up
  - Ifconfig summit 10.0.0.2/16

  - Sudo ovs-vsctl add-port summit eth0
  - Sudo ifconfig eth0 0

```
yrineu@yrineu:~/summit $ ifconfig
eth0      Link encap:Ethernet  HWaddr e0:db:55:a4:be:97
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
          Interrupt:17


lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:151630 errors:0 dropped:0 overruns:0 frame:0
          TX packets:151630 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:22422593 (22.4 MB)  TX bytes:22422593 (22.4 MB)
```



```
yrineu@yrineu:~/summit $ ifconfig
eth0   Link encap:Ethernet  HWaddr e0:db:55:a4:be:97
       UP BROADCAST MULTICAST  MTU:1500  Metric:1
       RX packets:0 errors:0 dropped:0 overruns:0 frame:0
       TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:1000
       RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
       Interrupt:17

port1  Link encap:Ethernet  HWaddr 1e:e3:91:87:c9:32
       UP BROADCAST MULTICAST  MTU:1500  Metric:1
       RX packets:0 errors:0 dropped:0 overruns:0 frame:0
       TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:500
       RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

summit    Link encap:Ethernet  HWaddr e0:db:55:a4:be:97
       inet addr:10.0.0.2  Bcast:10.0.255.255  Mask:255.255.0.0
       inet6 addr: fe80::e2db:55ff:fea4:be97/64 Scope:Link
       UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
       RX packets:0 errors:0 dropped:0 overruns:0 frame:0
       TX packets:55 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:0
       RX bytes:0 (0.0 B)  TX bytes:8494 (8.4 KB)
```

```
yrineu@yrineu:~/summit $ sudo ovs-vsctl show
1f26d7ad-ab68-47e2-838f-c2cafa4e8352
  Bridge summit
    Controller "tcp:127.0.0.1:6633"
      is_connected: true
    Port "eth0"
      Interface "eth0"
    Port "port1"
      Interface "port1"
    Port summit
      Interface summit
        type: internal
```

The future of NIC and you…

Boards | Trello | Yrineu Rodrigues

OpenDaylight NIC

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Backlog

Make sure items here are well described and unique. User Stories: https://wiki.opendaylight.org/view/Network_Intent_Composition:Boron_Planning

1

#19: Create Intent State Machine demo for ODLSummit

3/4 | Aug 13

#9883: Intent state-machine

8 | 2 | 7/10

#16: Integrate Intent Graph with OFRenderer

2 | 0/5

#4: Maven archetype for actions

Add a card...

To Do

Legend: Green - UI; Red - New functionality; Blue - Code coverage

1

#1: Create a design proposal for integration between DLUX and NIC

#11: New parser on the javascript side

Add a card...

Doing

Items currently in progress

#20: Investigate how to remove the dependency between Intent-listeners and Renderers

1 | 0/3 | AP

#18: Unit test coverage for current NIC branch

3 | 3/10

Add a card...

Under Review/Testing

Items on gerrit right now

#18.2 Unit test coverage for current NIC branch

1

#21: Create module Intent-Common

1

Testing the VPN intents MPLS

1

Add a card...

Issues / bugs

Don't forget to add the link to the bu tracking system

Build failure due to OFP YANG mod change.

Add a card...

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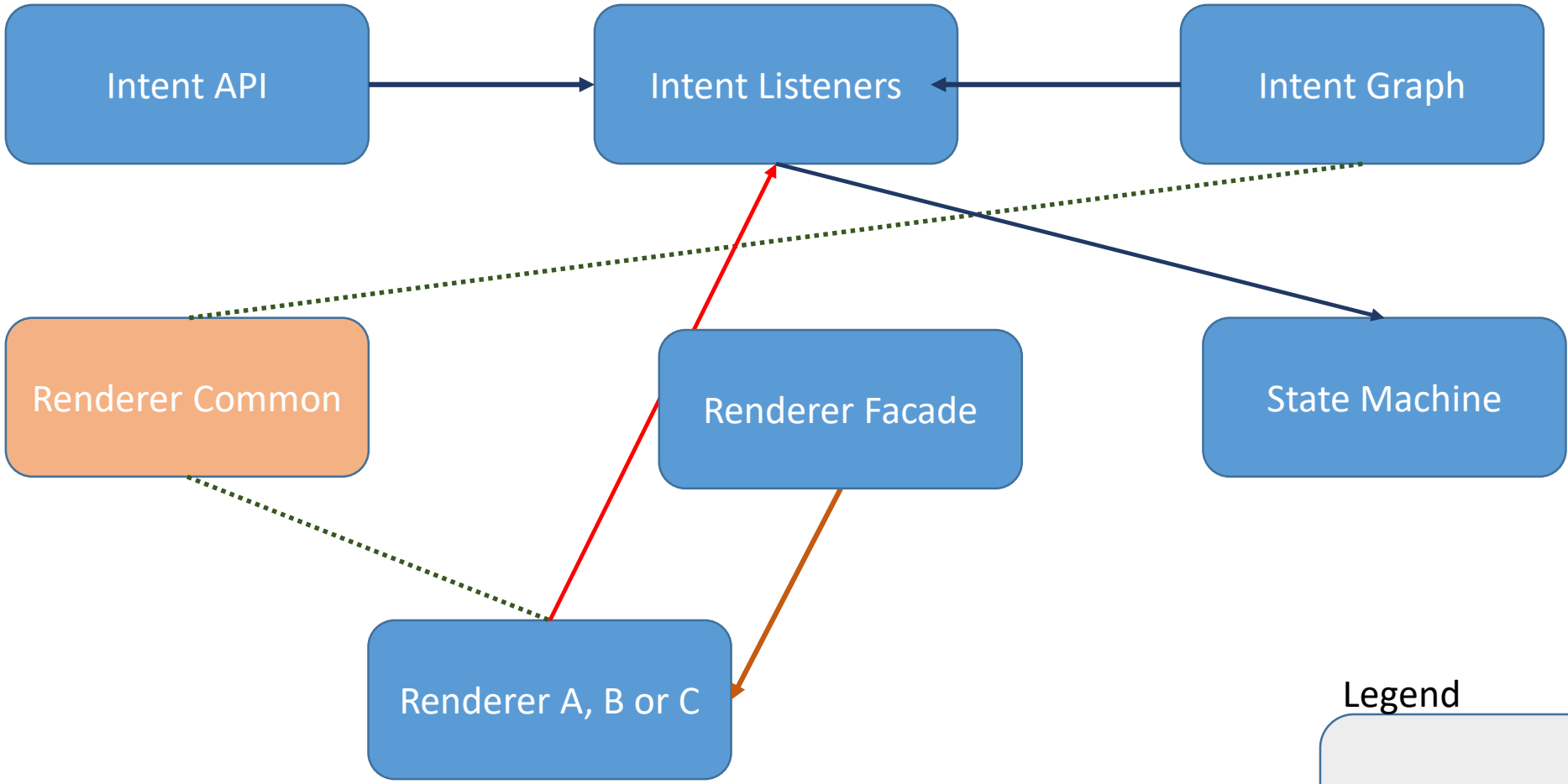
Next steps

- Increase code coverage
- Change current design for flexibility
- Integrate Intent State Machine with Intent Graph
- Integrate Intent Graph with Intent Listeners

Design proposal



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Muito obrigado!! =)

THANK YOU!! =)

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