

# ONOS Use Cases

Tom Tofigh

AT&T

# NFaaS in Central Office

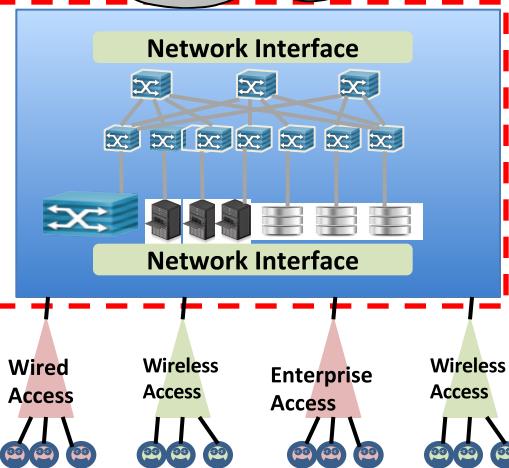
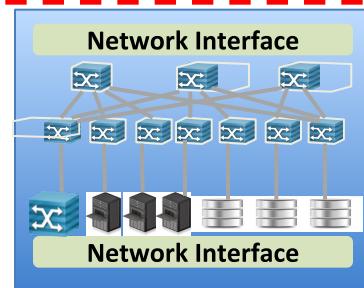
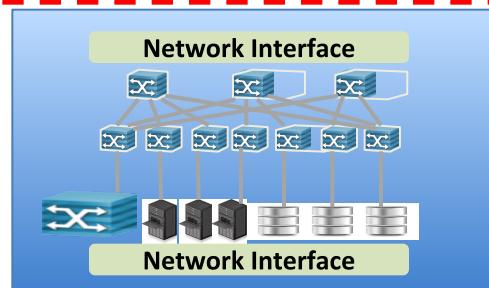
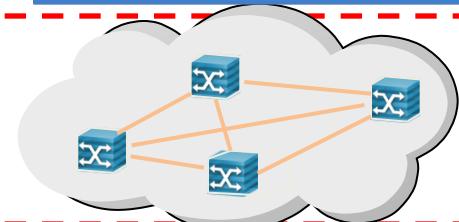
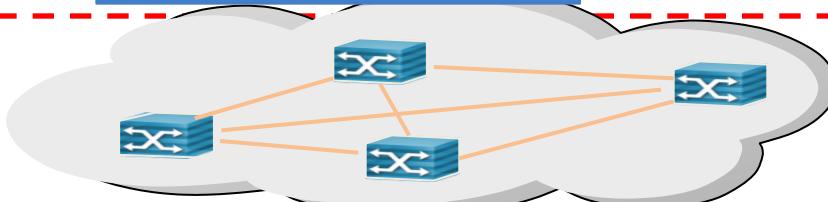
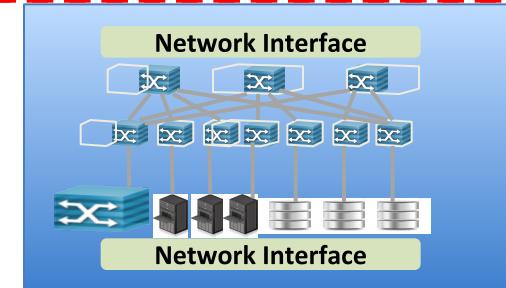
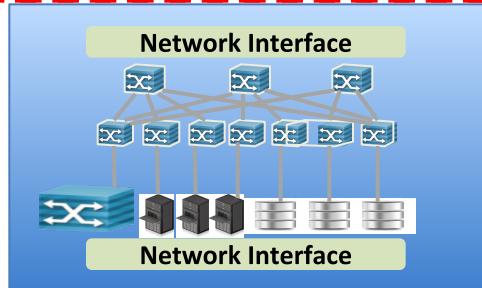
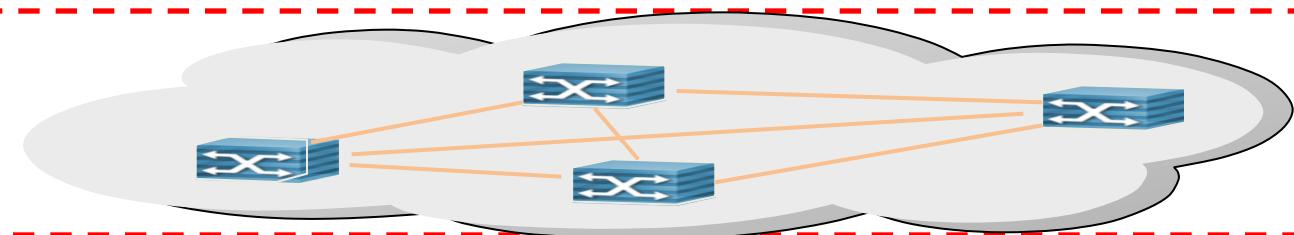
Core  
Packet-Optical

PoP  
Built like a  
Data Center

Metro  
Packet-Optical

NFaaS in Central  
Office  
Built like a  
Data Center

Access



Service Providers are also keen on solving scaling, migration issues with SDN and introducing SDN control in their WAN networks.

We built two other use cases based on these requirements:

- SDN-IP
- SDN-based WAN control with segment routing

# ONOS Service Provider Use Cases

## Multi-layer SDN

control of  
Packet-optical



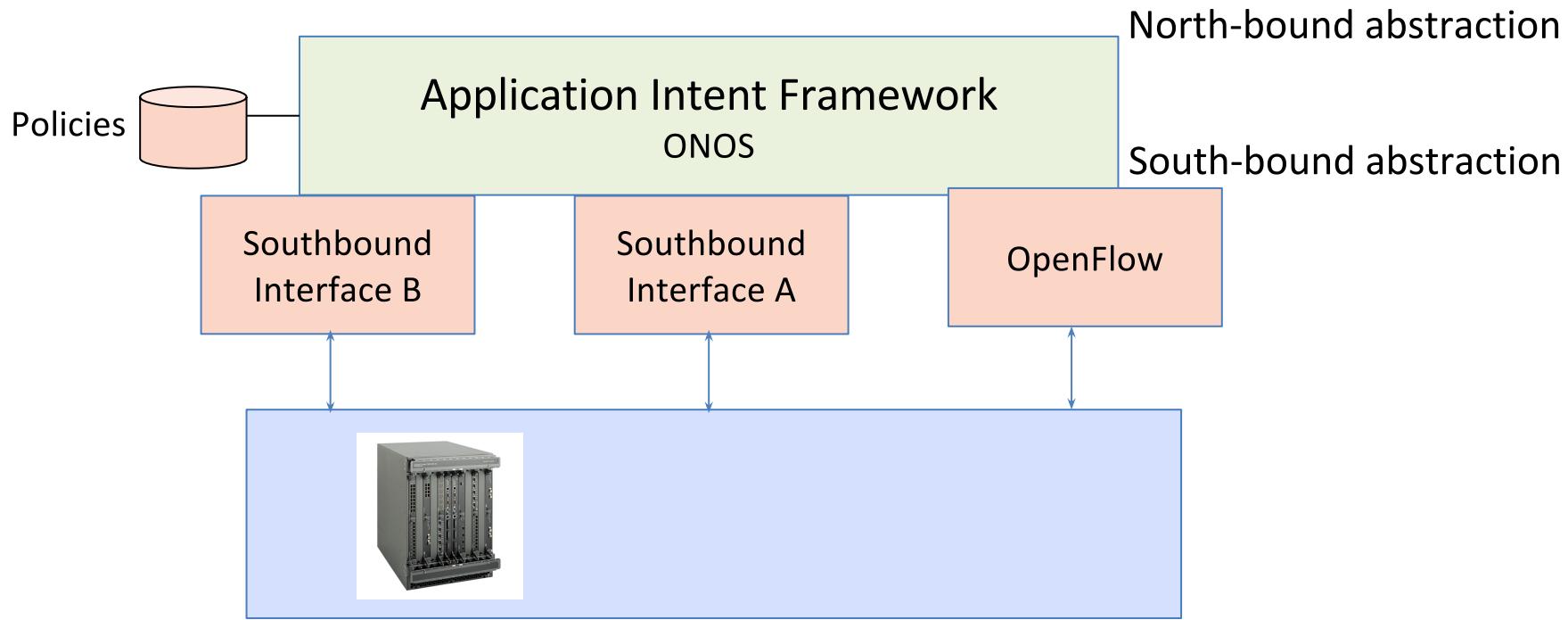
## SDN-IP



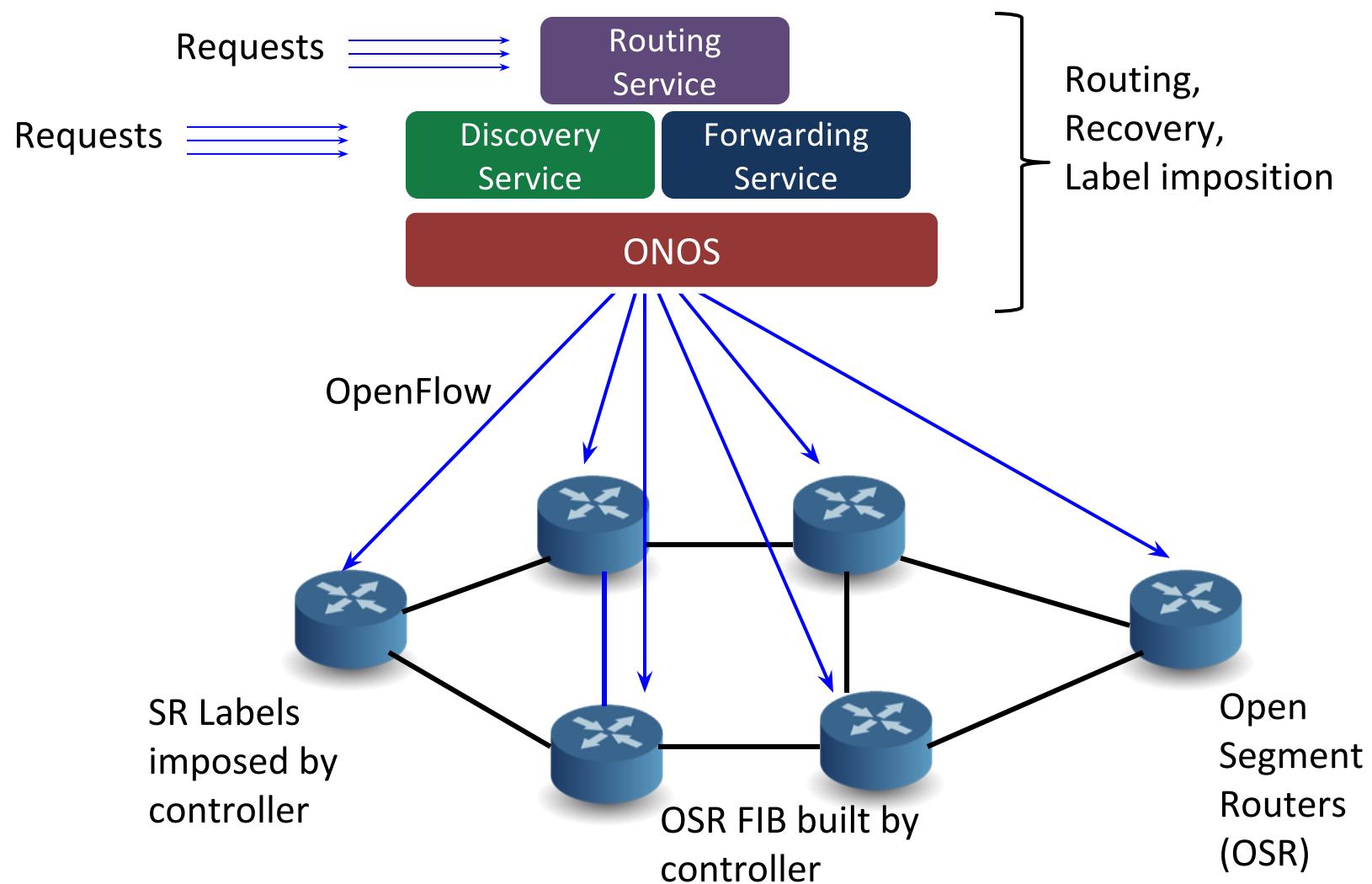
## Segment Routing



## NFaaS in CO



# SDN based WAN Control with Segment routing

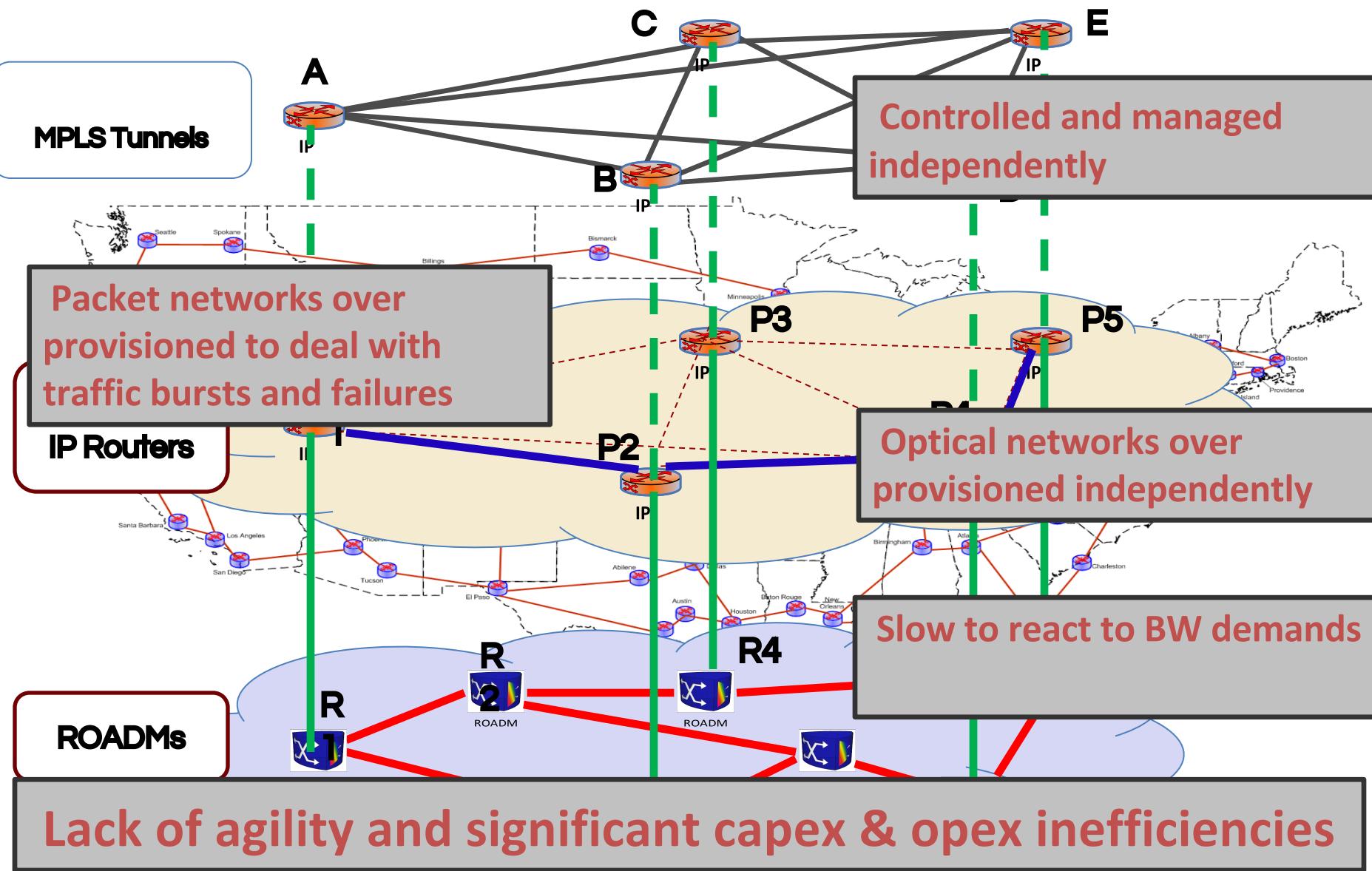


This use case has been developed in collaboration with ONF.

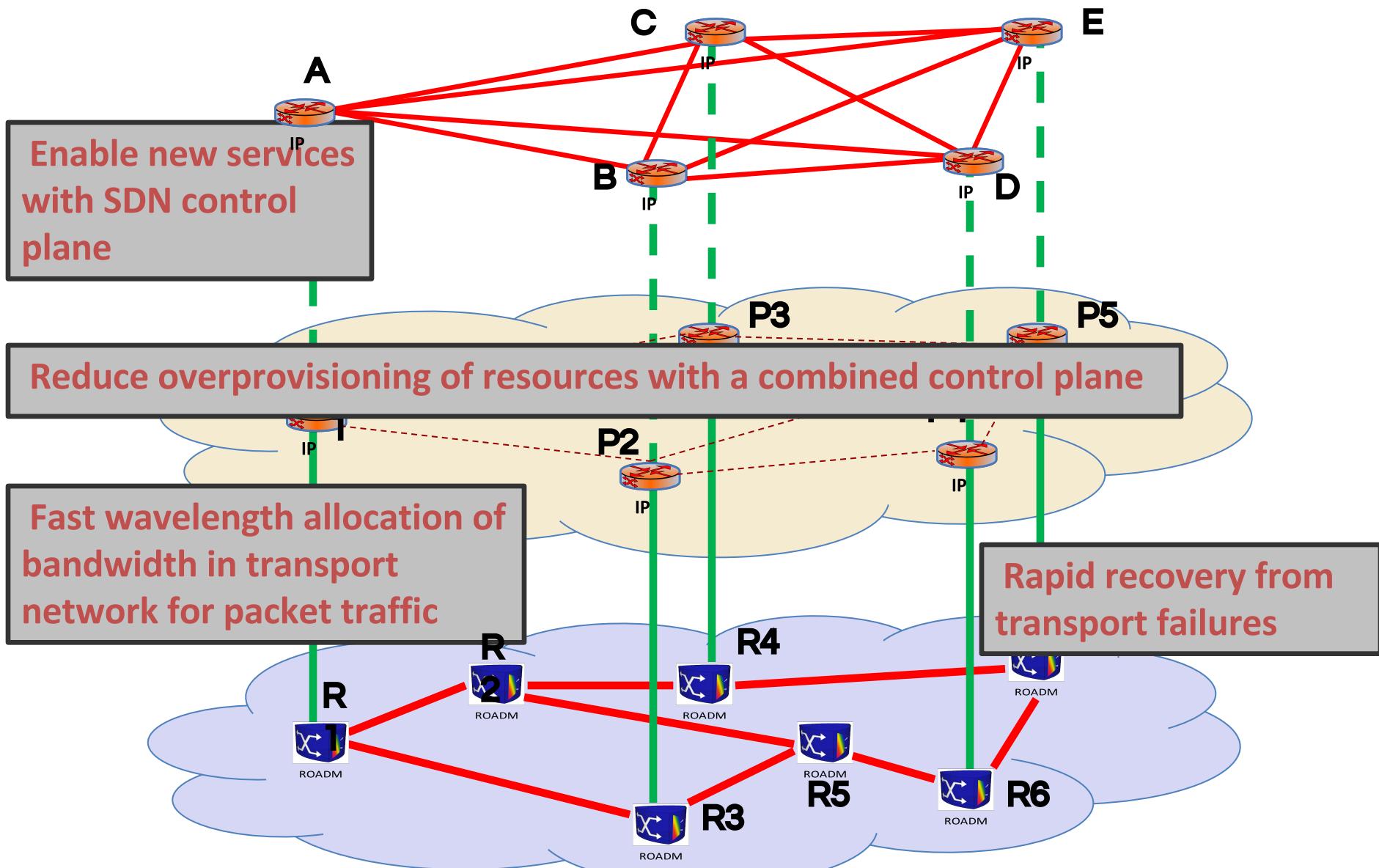
# SDN Control of Multi Layer Networks: Packet Optical

Praseed Balakrishnan  
Fujitsu Network Communication

# Todays Multi-Layer Network: Without Converged Control Plane



# With Converged Control Plane



# Potential Use Cases

- Inter Data Center BW on Demand
- Optimization
  - Traffic engineering
  - Defragmentation
- Restoration strategies

# Our Goal

Demonstrate SDN control of packet optical networks using ONOS

- Add support for multi-layer networks in ONOS
- Write core functions to control multi-layer networks
- Demonstrate a couple of app scenarios

**Target Use Case:** Prototype BW on Demand using ONOS

- Multi layer topology and resource utilization
- Multi layer Packet and Optical layer control
- Handling of optical layer failures

# New Functionality Needed

- Converged multi layer view
  - Enables multi-layer PCE
- Multi-layer aware service APIs
- Southbound abstraction for multi-layer
- Listening and reacting to failure
- Northbound APIs

# Implementation on ONOS

## ONOS GUI:

- Visualization of Intents
- Visualization of Topology
- Portal Calendaring APP

## Topology:

- Multi layer abstraction
- Resource Utilization

## Intents:

- Path Computation
- Reservation and Resource Management
- Path Re-compute on Failure events

## SB API

- Discovery
- OF using experimenter messages

Packet - OVS  
Optical Emulator (LINC-OE)

Apps

NB (Consumer) API

Core

(Device, Host, Link, Topology, Path, Flow, Packet + Intent, Network, ...)

SB (Provider) API

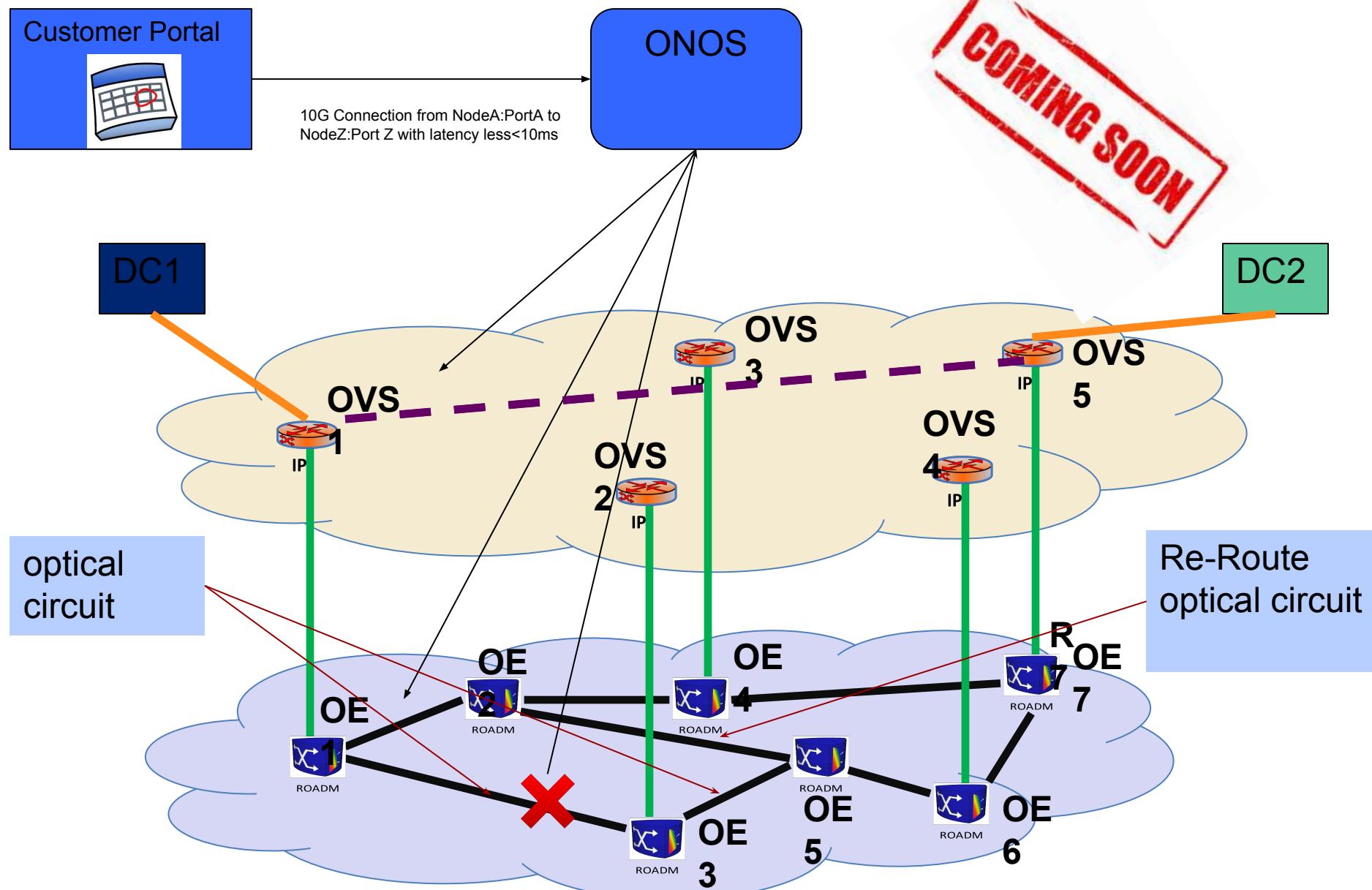
Providers

(Device, Host, Link, Flow, Packet)

Protocols

Network Elements

# Planned BW of Demand Demo



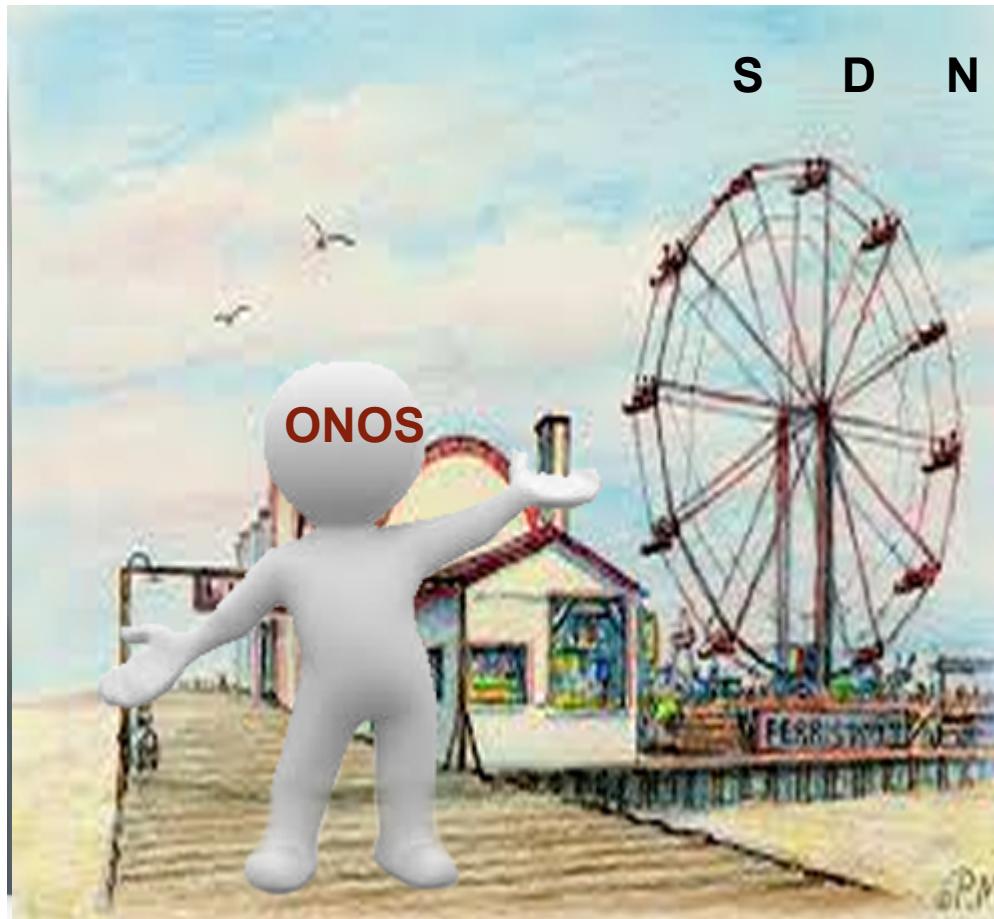
# Seamless Interworking of SDN and IP

Luca Prete

ON.Lab

# ONOS and SDN-IP

ON.LAB



**ONOS** used to be confined in his wonderful world, but  
**wasn't able to communicate with the outside**

# ONOS and SDN-IP

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One day, **SDN-IP came and gave the ability to ONOS to speak to the rest of the world.** ONOS was finally free!

# ONOS and SDN-IP

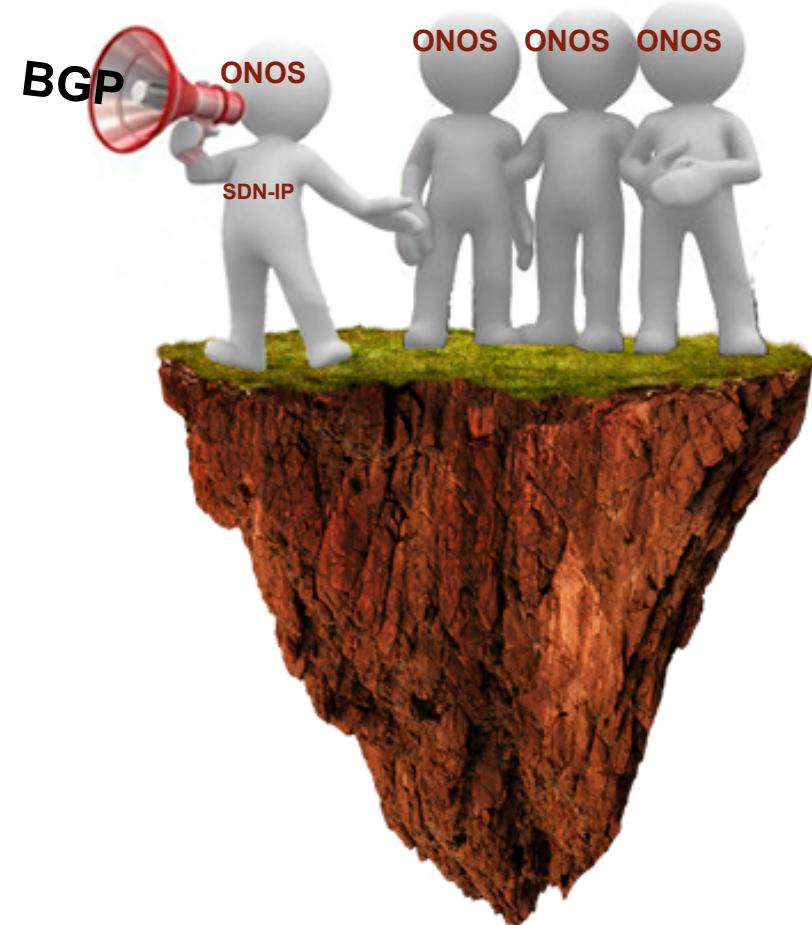
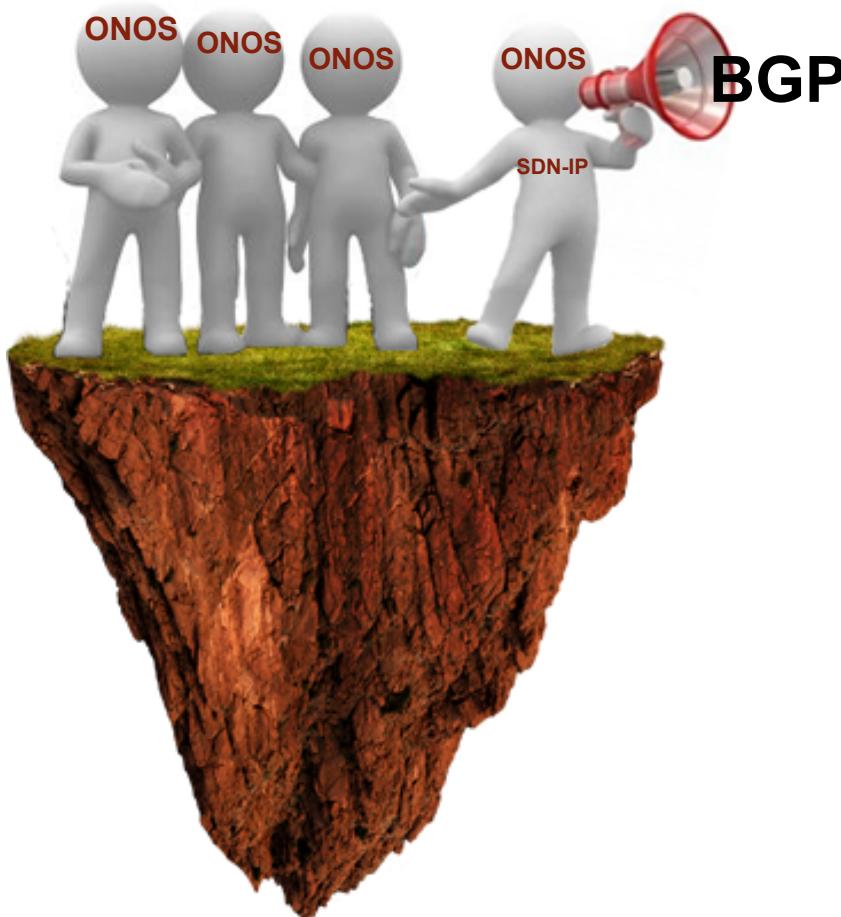
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**ONOS started to communicate** with IP components similar to it, speaking a widely used old language, called **BGP**.

# ONOS and SDN-IP

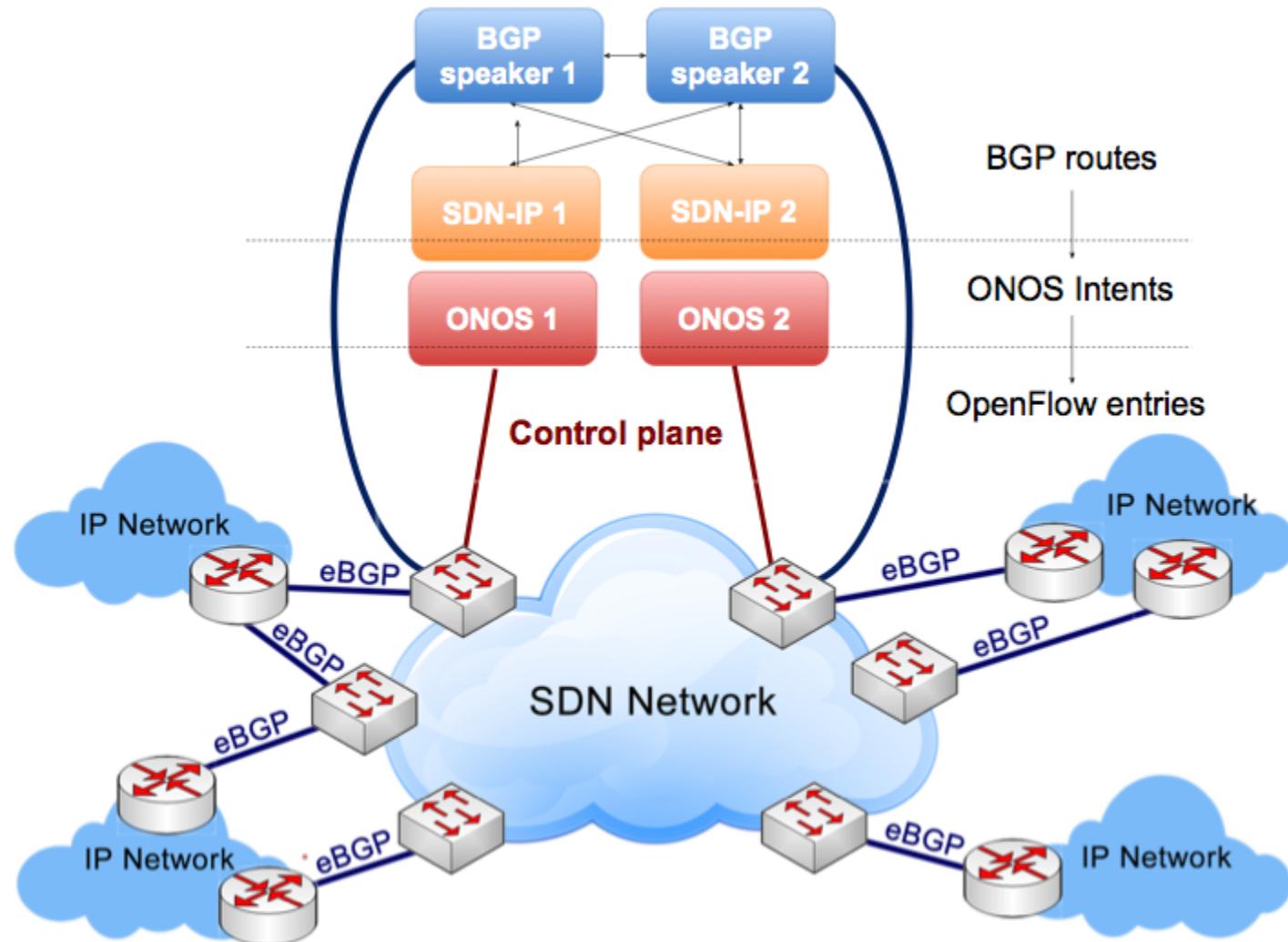
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**ONOS “Clusters” started also to “peer” together to be more efficient and scalable using BGP**

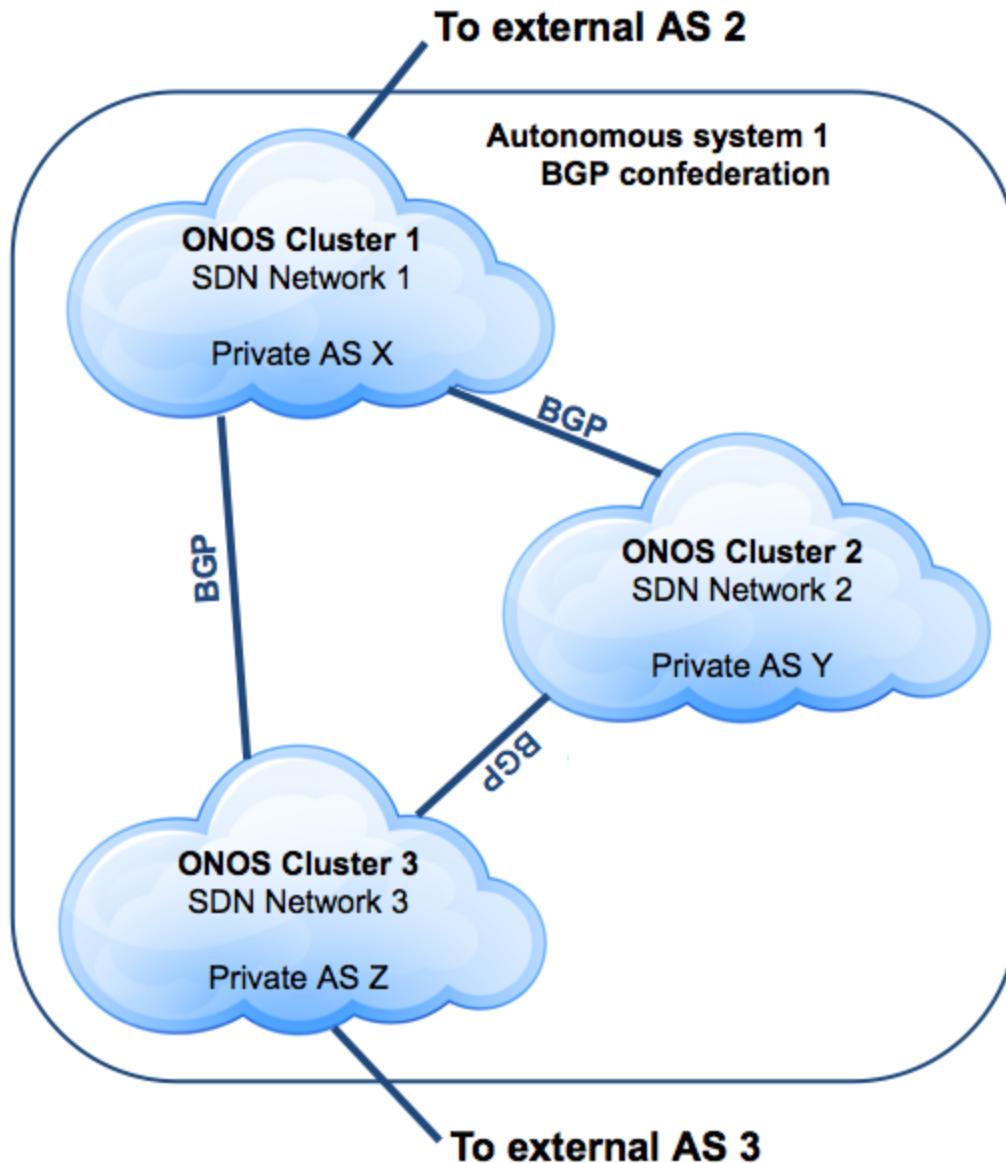
# SDN-IP for external networks

ON.LAB



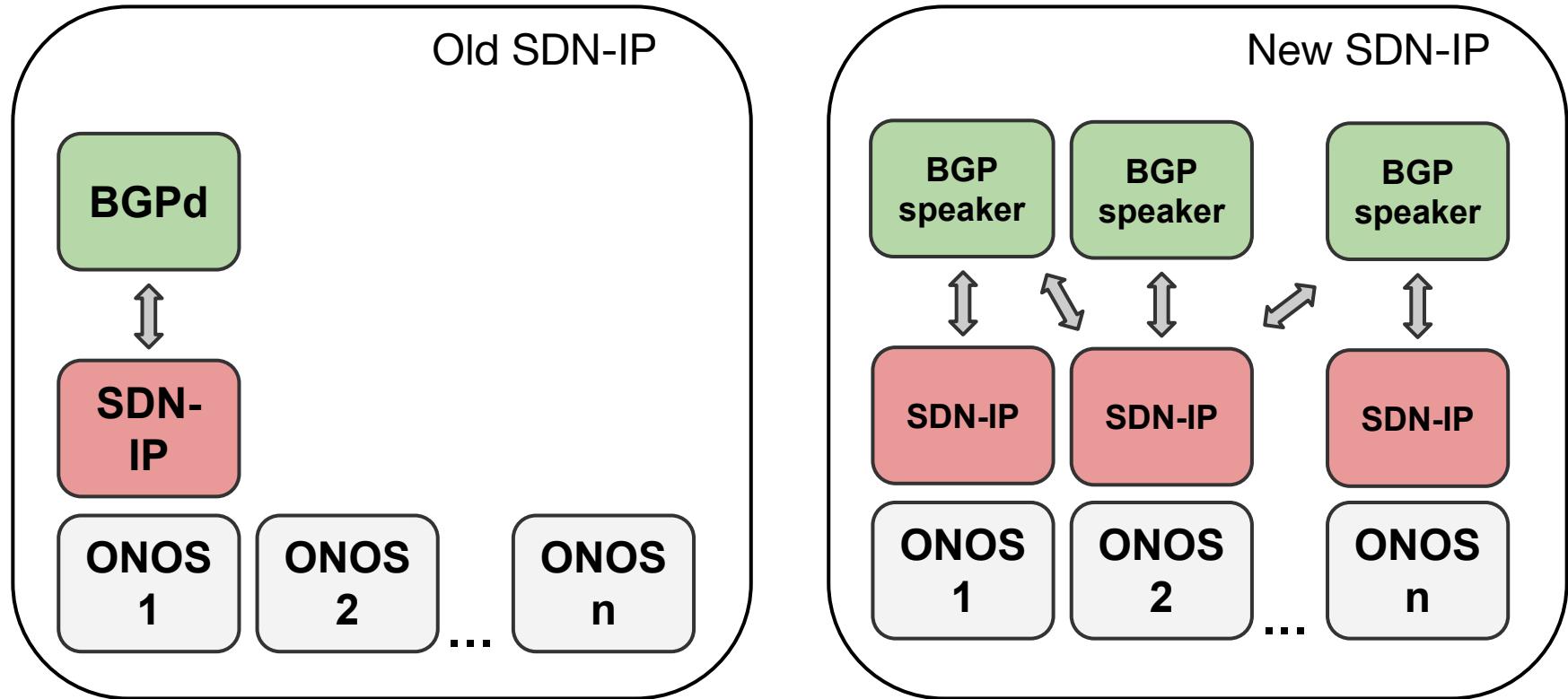
# SDN-IP to connect ONOS clusters

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# What has changed from last ONRC?

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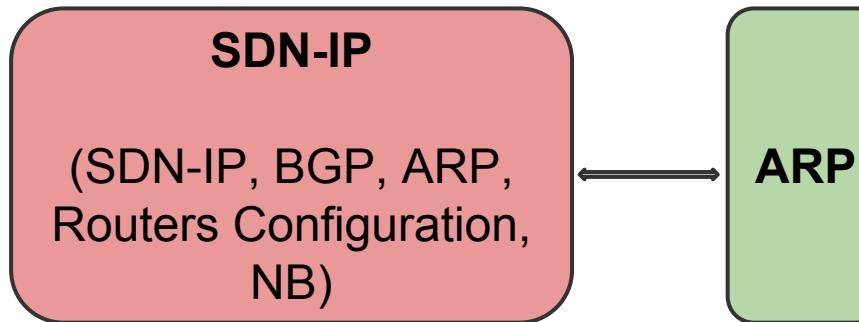


- Single-instance
- No SDN-IP Application HA
- Able to speak with a single, dedicated BGP speaker
- Stateless protocol (dedicated REST API)

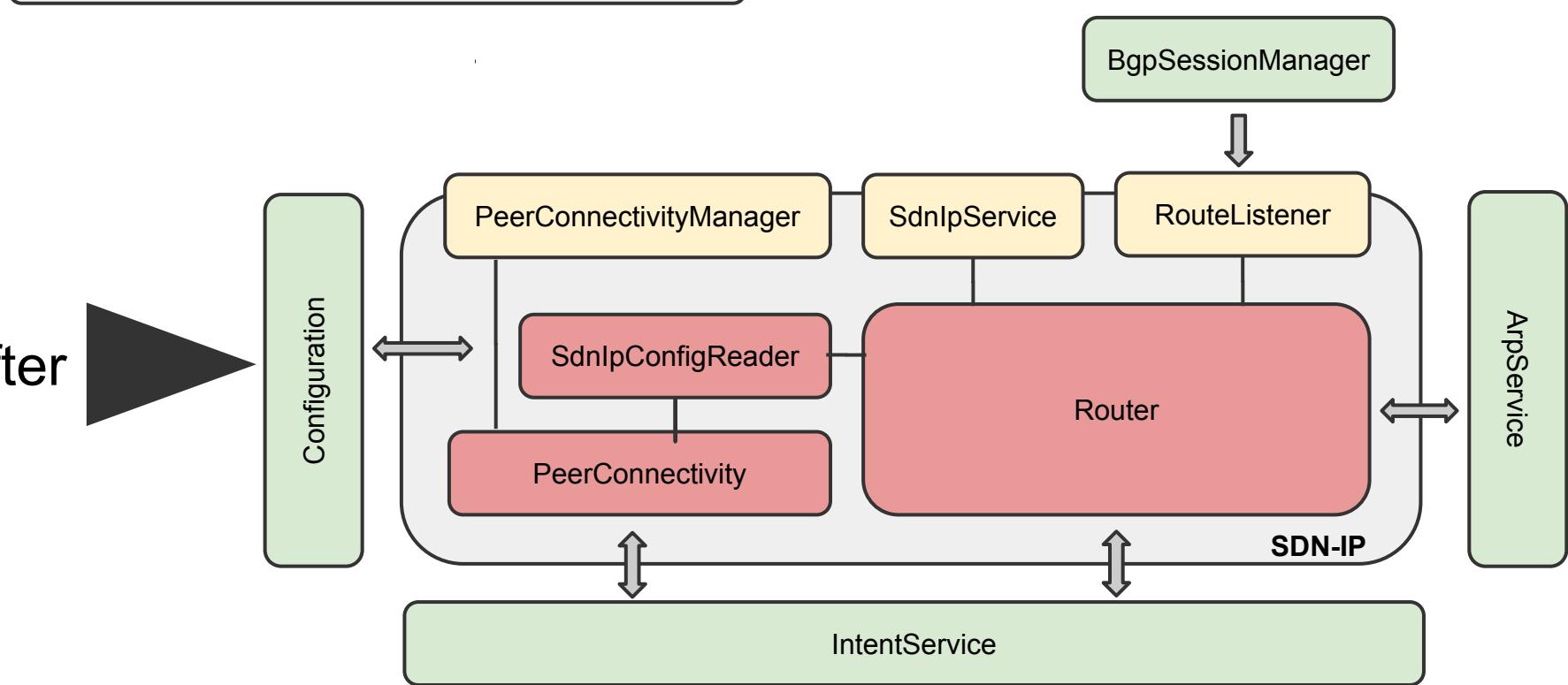
- Multi-instance
- SDN-IP Application HA
- Able to speak with generic iBGP speakers
- Stateful protocol (iBGP)

# What has changed from last ONRC?

ON.LAB



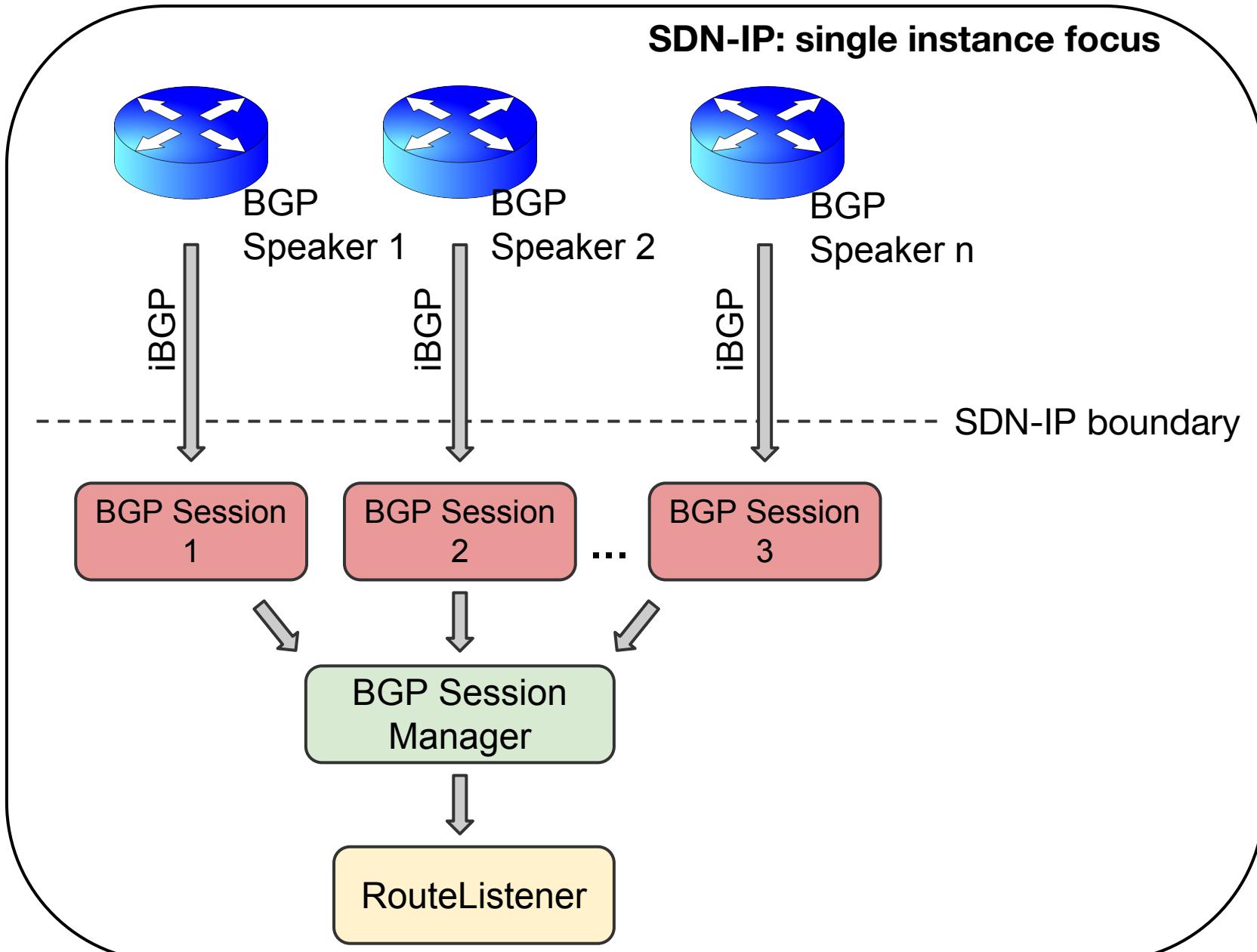
Before



After

# BGP architecture

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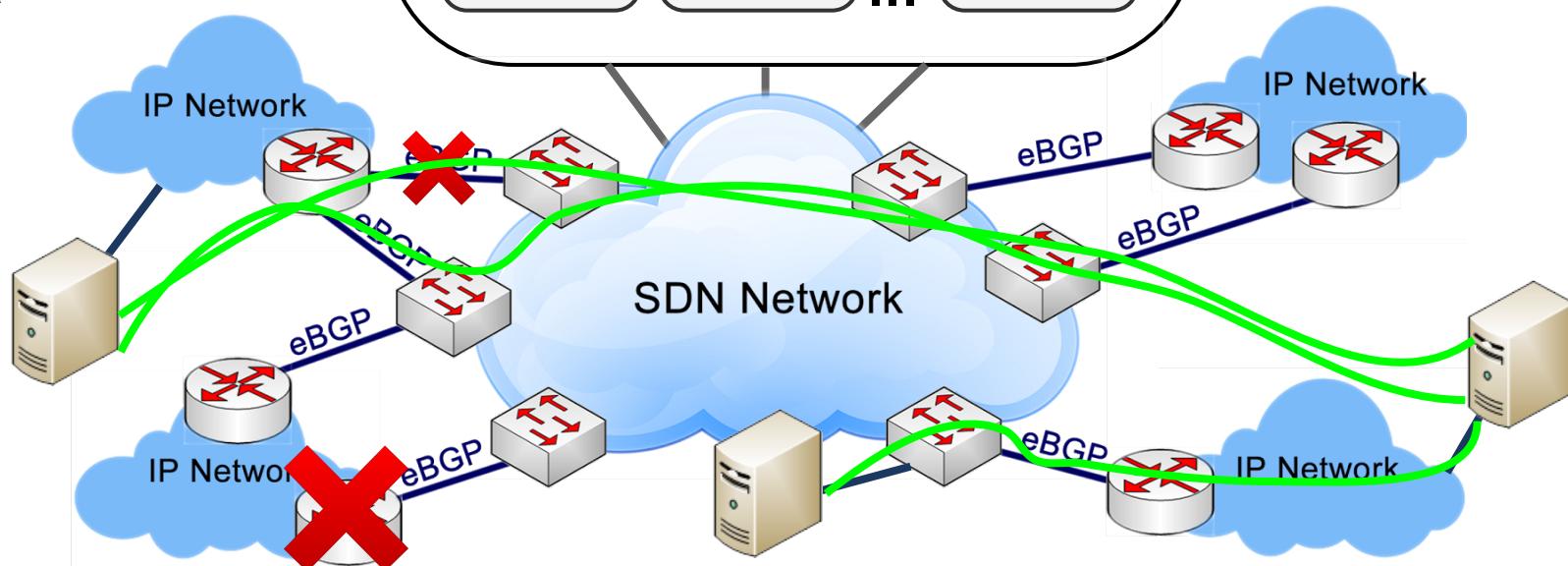
# Demo on December 5th?

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Communication  
between SDN  
network and  
external network

ONOS/SDN-IP HA

External BGP  
router/connection  
HA

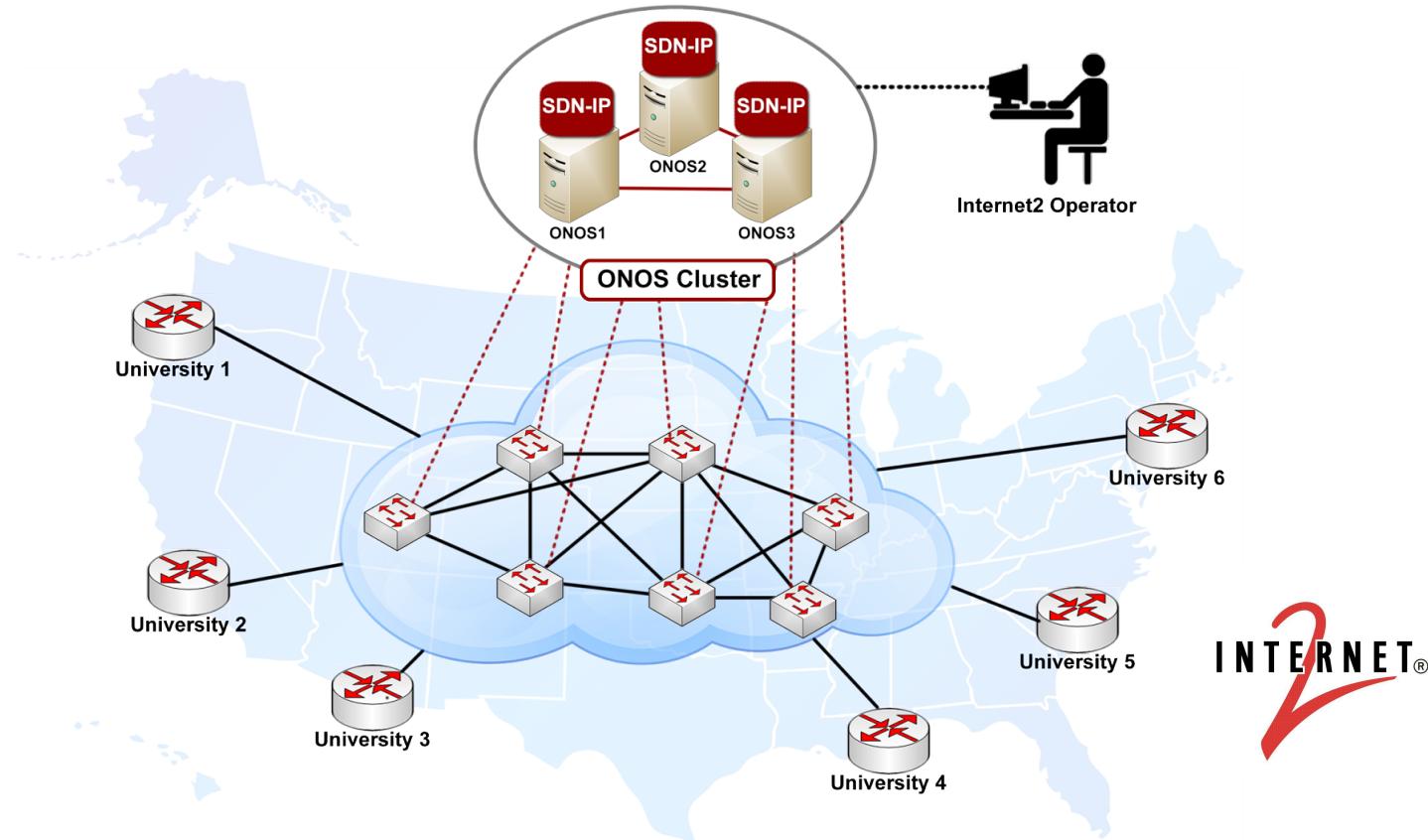


Communication  
between external  
networks

BGP speaker HA

# Planned Internet2 deployment

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- **Provide L3 connectivity between 6 universities around US**
  - SDN switches in the core
  - ONOS and SDN-IP will control the network
- Universities will advertise through a BGP peer a /32 network to the SDN-IP application
- SDN-IP and ONOS will translate routes into “intents”

