

# Open Networking Operating System

The platform and its deployments

## GTS Tech+Futures Workshop

Copenhagen - Oct, 20<sup>th</sup> 2015





# Agenda



- What's **ON.Lab**?
- What's **ONOS**? (architecture, use cases)
- **ONOS deployments**
- **During the workshop**
  - Technical dive-ins
  - Open discussion

# ON.Lab



“The Open Networking Lab was founded as a 501 (c) (3) non-profit to pursue our vision of what Software Defined Networking could be for the public good.”



**Nick McKeown**

KP, Mayfield, Sequoia  
Professor, Stanford



**Scott Shenker**

Professor, UC Berkeley  
Chief Scientist, ICSI



**Guru Parulkar**

Executive Director, ON.Lab,  
Executive Director ONRC  
Consulting Professor, Stanford



**Larry Peterson**

Robert Kahn Professor  
Princeton (Emeritus)

# What are known for?



- Mininet - network simulator
- OpenVirtex (OVX) – network virtualization
- **Open Networking Operating System (ONOS)**
- XOS – Orchestrating platform



# ONOS Community



## ON.LAB

ON.LAB

## SERVICE PROVIDER PARTNERS



## VENDOR PARTNERS



## COLLABORATORS



## COMMUNITY



# Weekly news



## **ON.Lab joins the Linux Foundation**

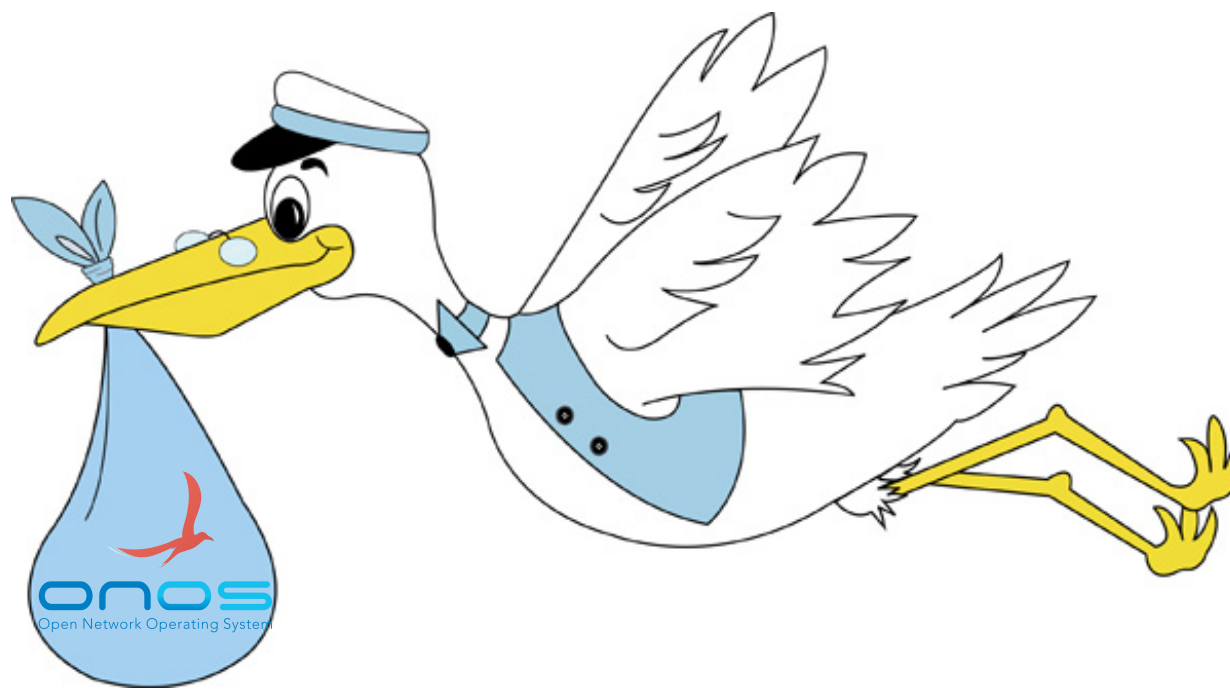
- Lead ONOS promotion and outreach to the global community
- Help administer the open source project as a part of the overall portfolio
- Provide guidance and counseling to ONOS project on open source structure & processes
- Drive curriculum for community training

## **David Boswell as the new Community Manager**

- Since forever helping big communities growing
- Experience: Mozilla, NASA, Obama Administration, ...







# ONOS mission

To produce the Open Source SDN Network Operating System  
that enables **Service Providers** to build  
real Software Defined Networks

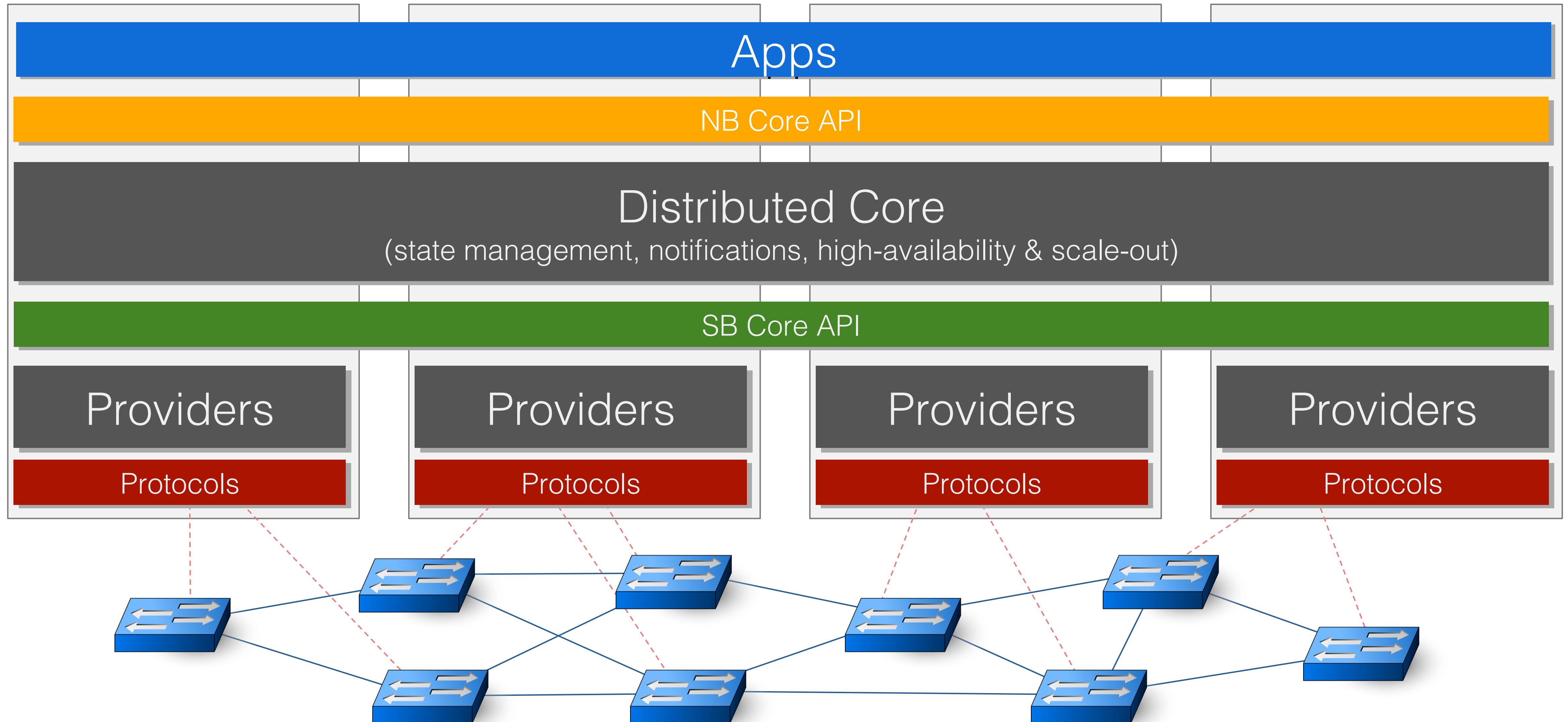
# ONOS for Service Providers



- Scalability, High Availability & Performance
- Northbound & Southbound Abstractions
- Modularity



# ONOS Distributed Architecture





# Use cases overview

- **SDN-IP** peering and **BGP** router
- Converged **packet-optical** network
- Central Offices Re-architected as Datacenter (**CORD**)
- **CORD Fabric** (Leaf-spine fabric supported by Segment routing)



# Goals and motivations

## Goals

- Create a global SDN network
- Let entities communicate at L3 without legacy routers in the network core

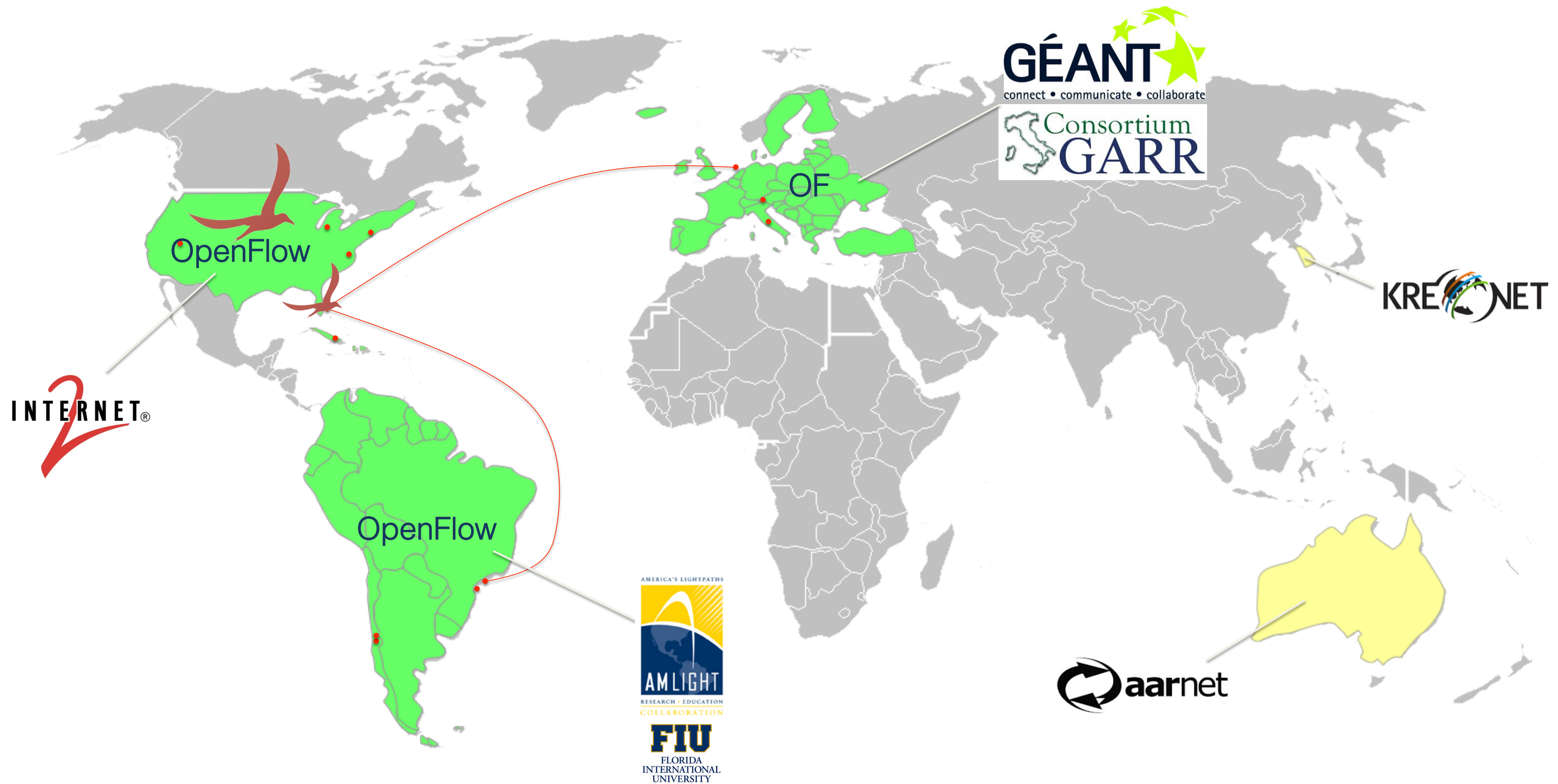
## Demonstrate that ONOS can work

- in real network scenarios
- providing high performance, HA and scalability

## Agile deployment model

- Improve partners network, improve ONOS
- Fundamental feedback from production translated into requirements

# SDN-IP as a global SDN deployment





# SDN-IP deployment on Internet2

## Network slice

39 OpenFlow switches, 5 universities connected, 2 international peerings

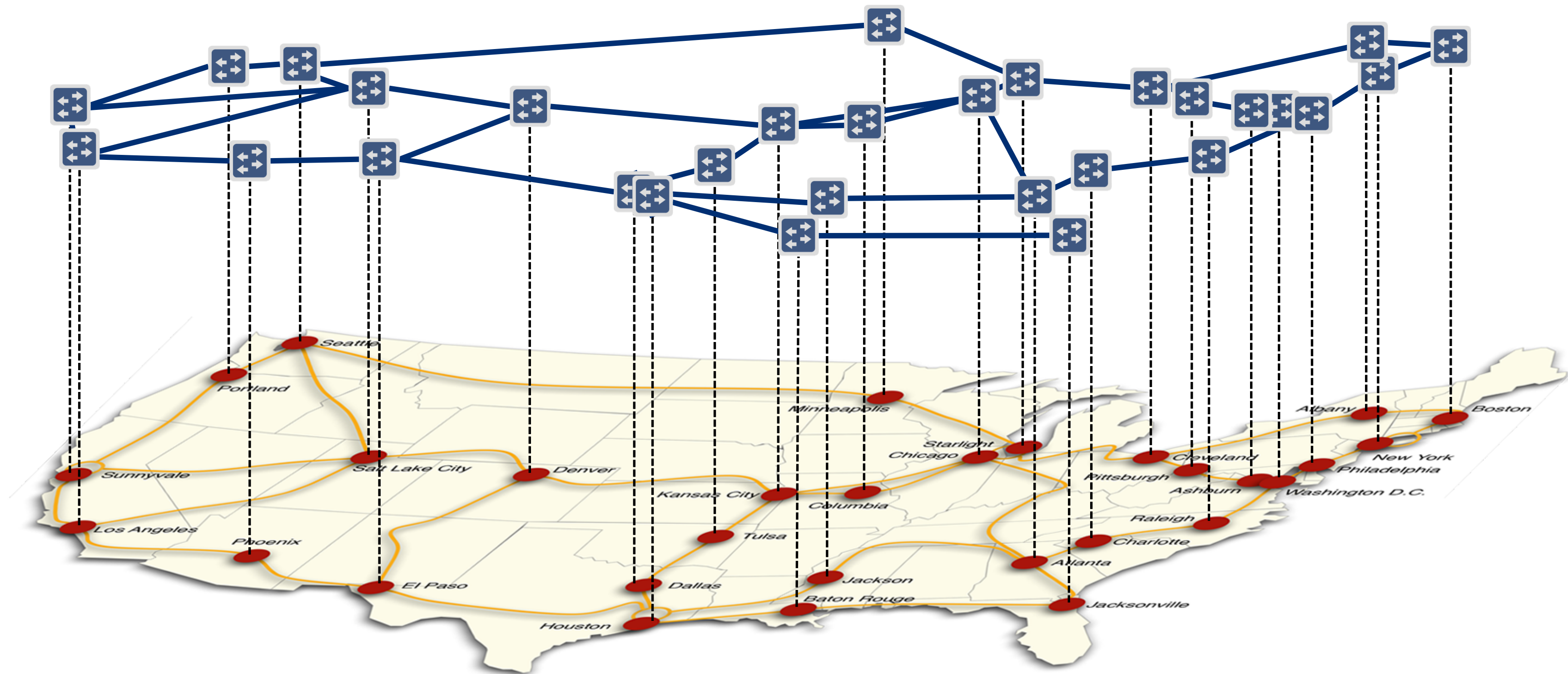


Flow Space Firewall  
Network slicing tool

AL2S network

Physical network

BROCADE  JUNIPER NETWORKS



# SDN-IP deployment on AmLight

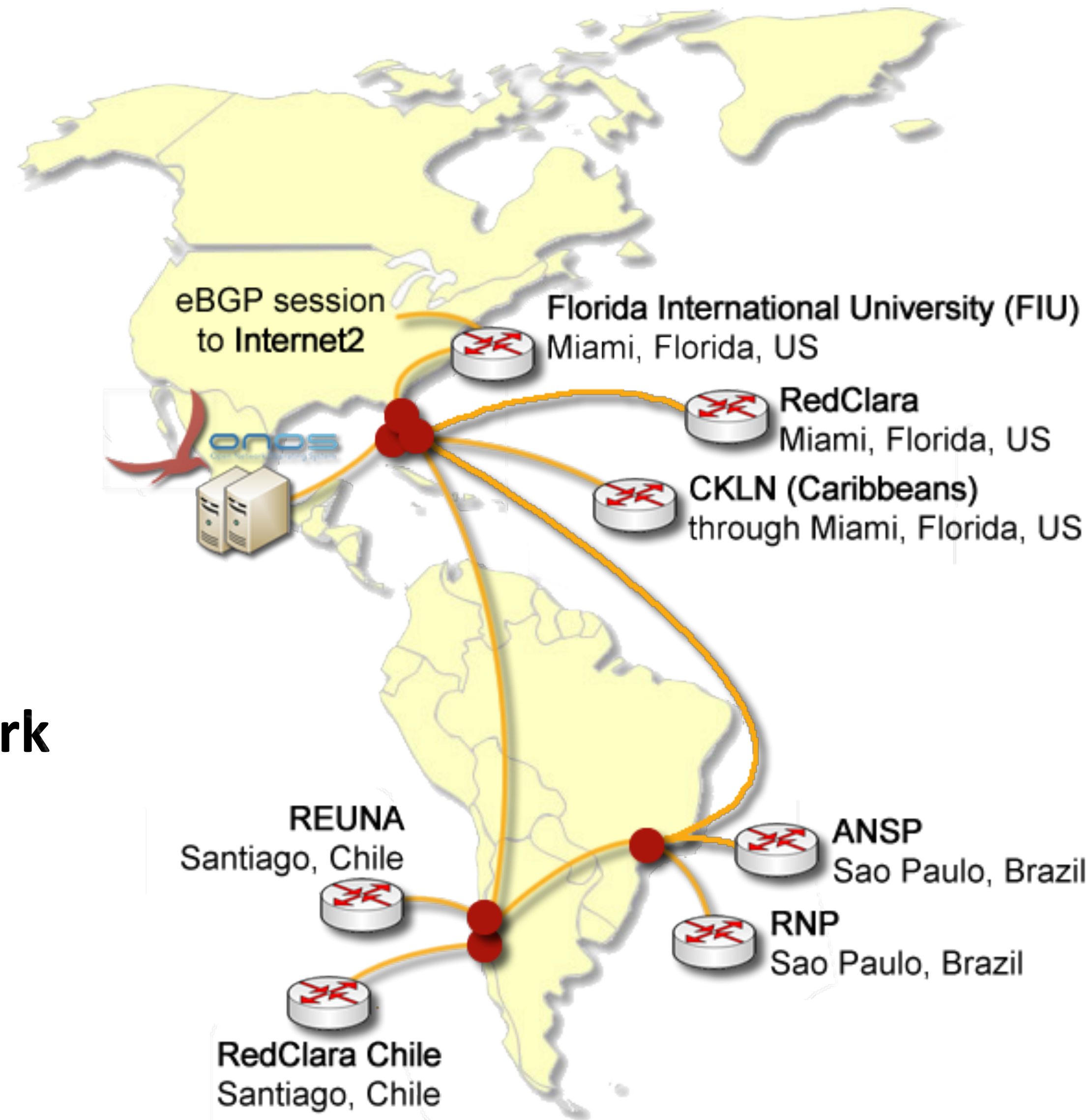
## Network slice



**Flow Space Firewall**  
Network slicing tool

**AMLIGHT/FIU OF network**  
Physical network

**BROCADE**  **JUNIPER**  
NETWORKS



5 OpenFlow switches

7 RENS connected

1 international peering



# SDN-IP deployment on GEANT (GTS) / GARR

## Network slice

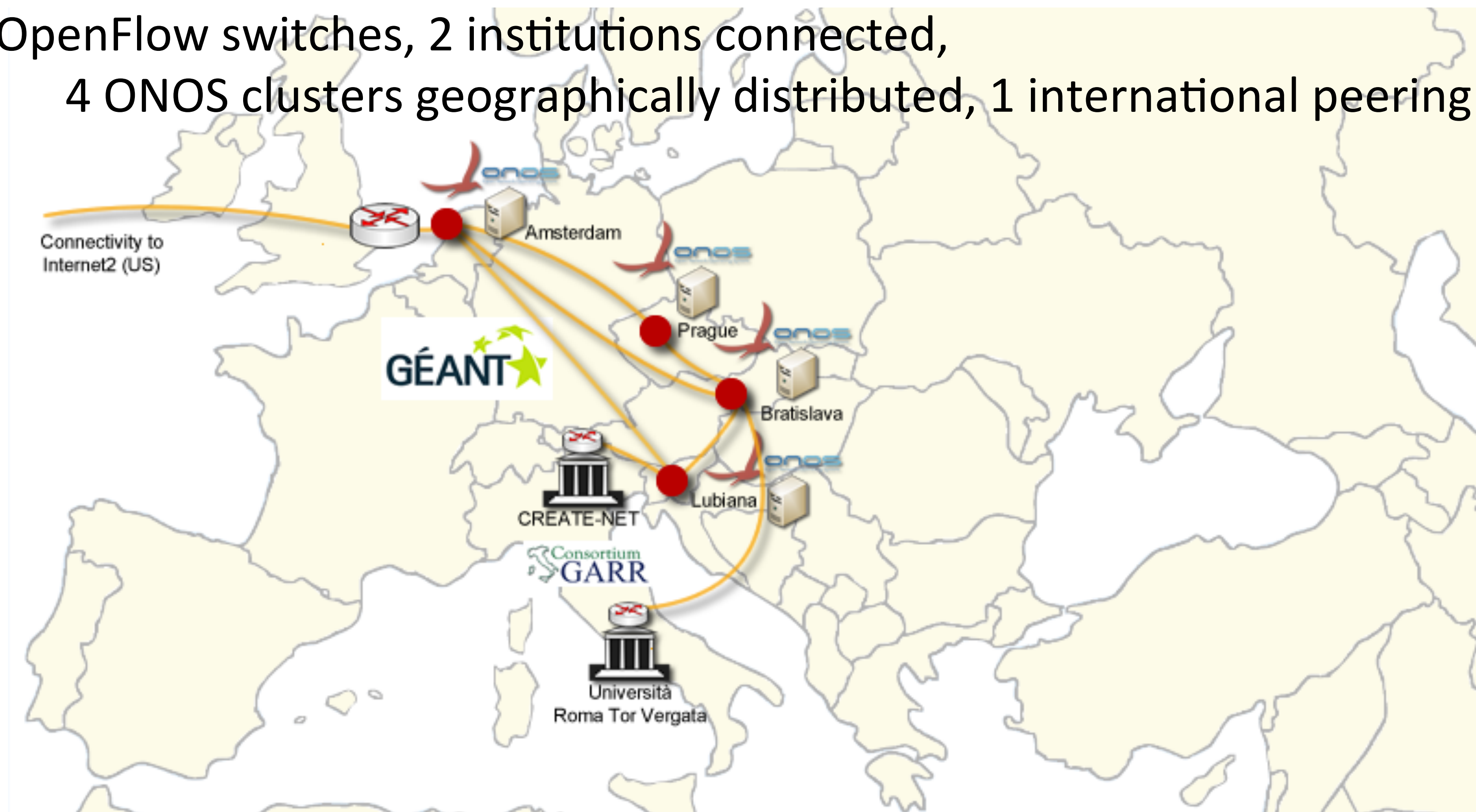


**GEANT Testbed Service**  
Network slicing tool

**GEANT OF network**  
Physical network

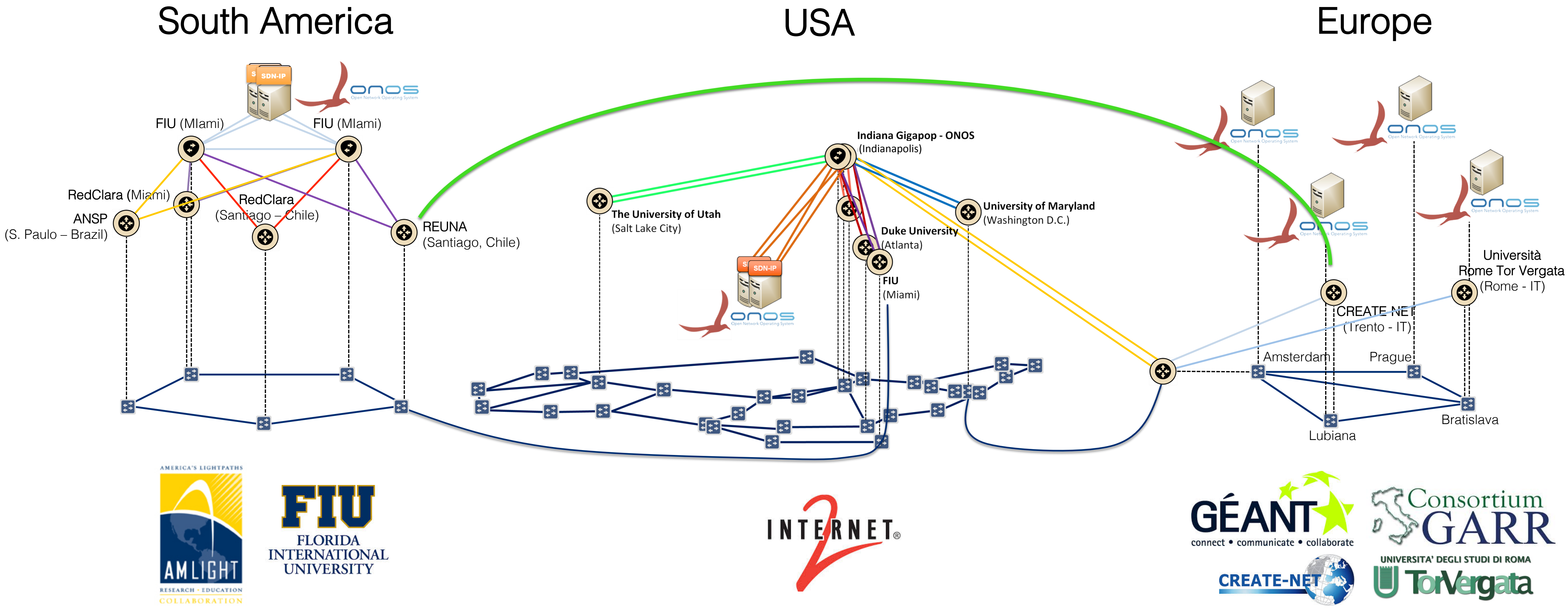


4 OpenFlow switches, 2 institutions connected,  
4 ONOS clusters geographically distributed, 1 international peering





# Global SDN deployment



# Conclusions

## Summary

- 50 OpenFlow switches, 14 institutions connected over 3 continents
- Cardinal (ONOS 1.3) deployment in progress
- Two ONOS applications have been validated: SDN-IP and ICONA

## Insights

- ONOS needs more features for production use
- Network operators need to use an agile process for deployment
- Vendors need to improve (re-think) OF support and guarantee resources isolation

## Future work

- Next deployment candidate is ONOS Drake
- WIP in KREONET-S and AARNET. More deployments coming
- Focus on stability, performances and scalability

# Conclusions



## **ONOS is out!**

- Significant community
- Focused on SP (Scalability, HA, performance)
- Compelling use-cases (CORD+)
- On-going Deployments

## **Right time to discuss and get involved**

- Want to know more about ONOS and its use-cases?
- Deployment best practices
- How to collaborate/partnering together





onos

Software Defined Transformation of Service Provider Networks

Join the journey @ [onosproject.org](https://onosproject.org)



**Under the hood**

# SDN-IP peering, a brief summary

## What is it?

- SDN-IP is an application running on top of **ONOS**

## Features

- It allows your SDN to **scale and connect to the rest of the Internet**
- You can **migrate** your existing network to SDN **incrementally**
- You can **scale** your SDN control plane

## Technology

- Exchanges routes peering with external routers (**BGP - vendor independent**)
- **HA** functionalities (both in data plane and control plane)



# SDN-IP architecture

