Open Source and 5G

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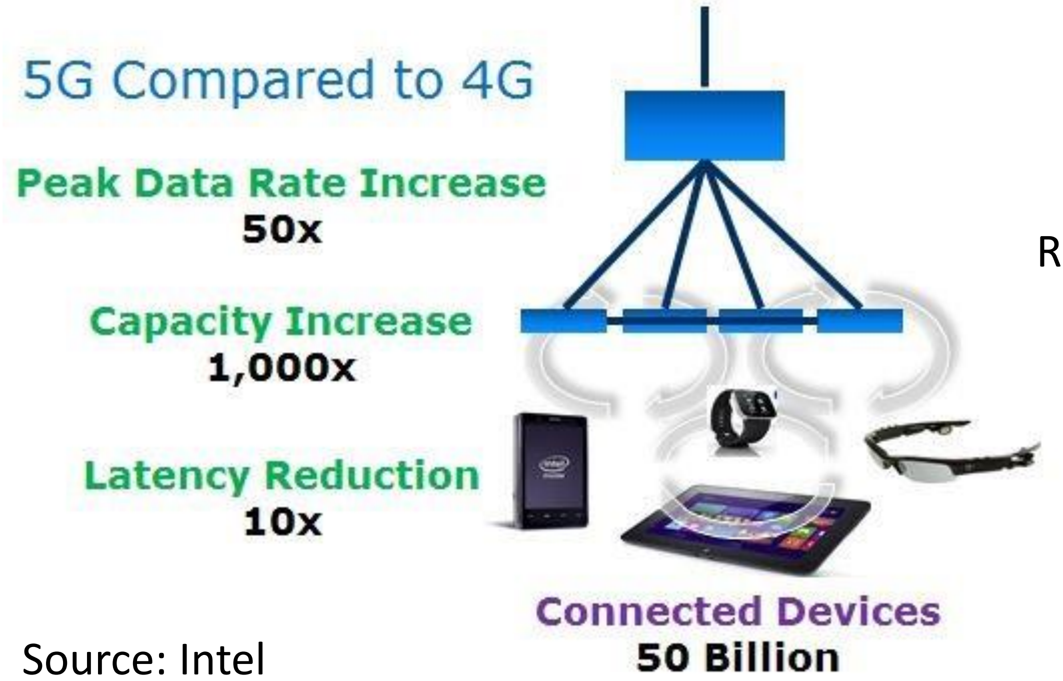
Agenda

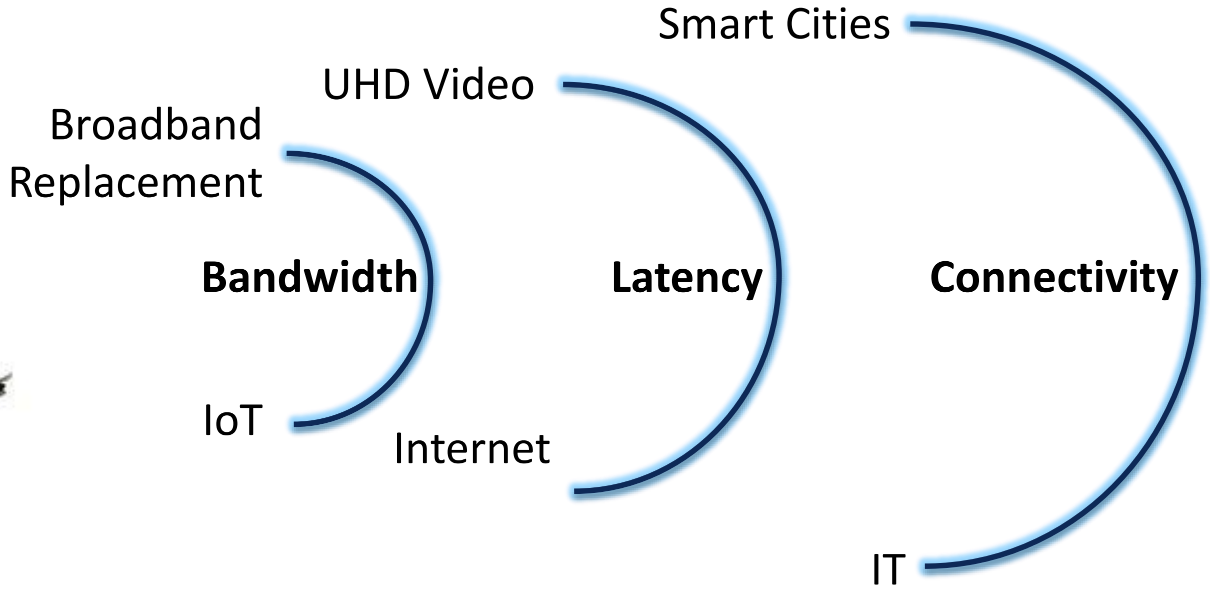
- Why Open Source?
- Open Source & 5G
- Open Orchestration
- Open Control
- Why The Linux Foundation?

TELENOR RESEARCH ON TELCO
TRENDS
2016
SOFTWARE IS EATING THE NETWORKS
PAGE 5
SERVICE DESIGN – CUSTOMERS WILL 'CO-CREATE' SERVICES
PAGE 3
LOW POWER WIDE AREA TECHNOLOGIES WILL ENABLE A LOT OF NEW IOT SERVICES
PAGE 4
MACHINES WILL UNDERSTAND MORE DIGITAL CONTENT
PAGE 6
LEVELING OUT THE PLAYING FIELD IN THE DIGITAL ECONOMY
PAGE 7
DATA FOR SOCIAL GOOD
PAGE 7

5G = Disruption


5G Compared to 4G
Peak Data Rate Increase
50x
Capacity Increase
1,000x
Latency Reduction
10x
Connected Devices
50 Billion

Source: Intel



Bandwidth

Broadband Replacement

IoT

Latency

UHD Video

Internet

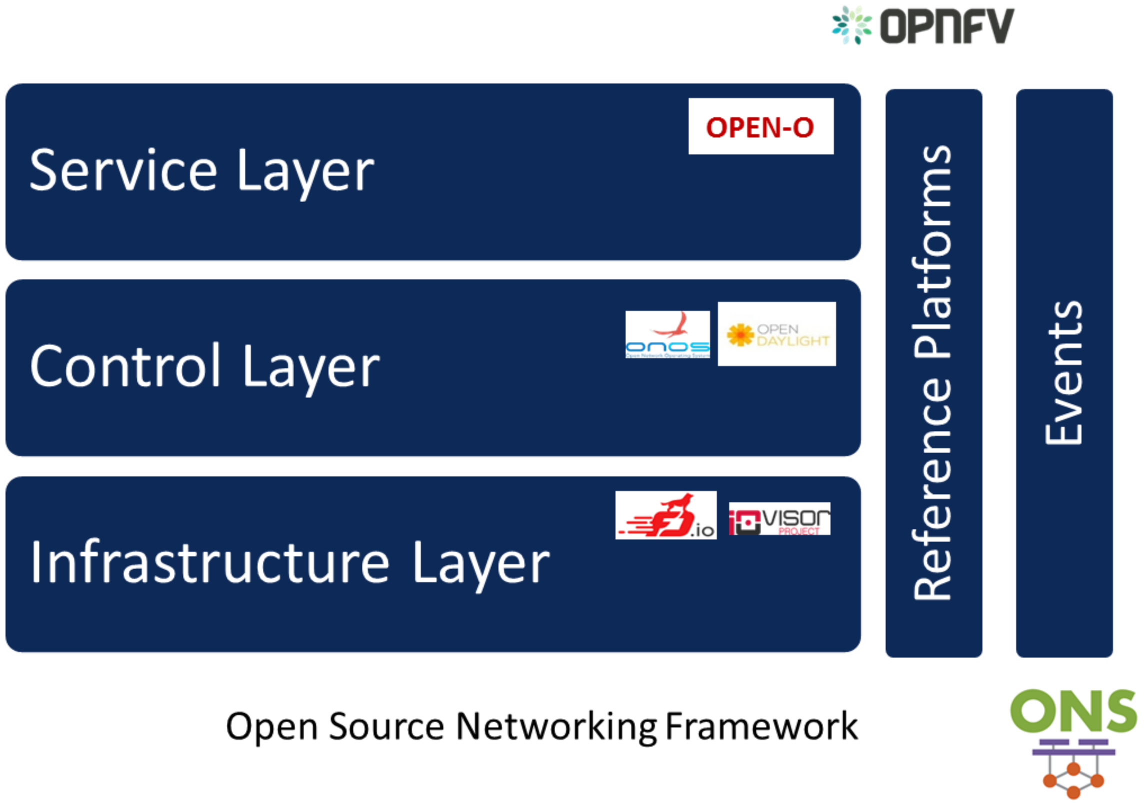
Connectivity

Smart Cities

IT

Disruption = Open Source Networking

- Commonality
- Integration
- The Platform vs The Component
- Collaboration-Among/Across Projects


OPNFV
OPEN-O
ONOS
OPEN DAYLIGHT
FD.io
IOVISOR PROJECT
ONS

Service Layer

Control Layer

Infrastructure Layer

Reference Platforms

Events

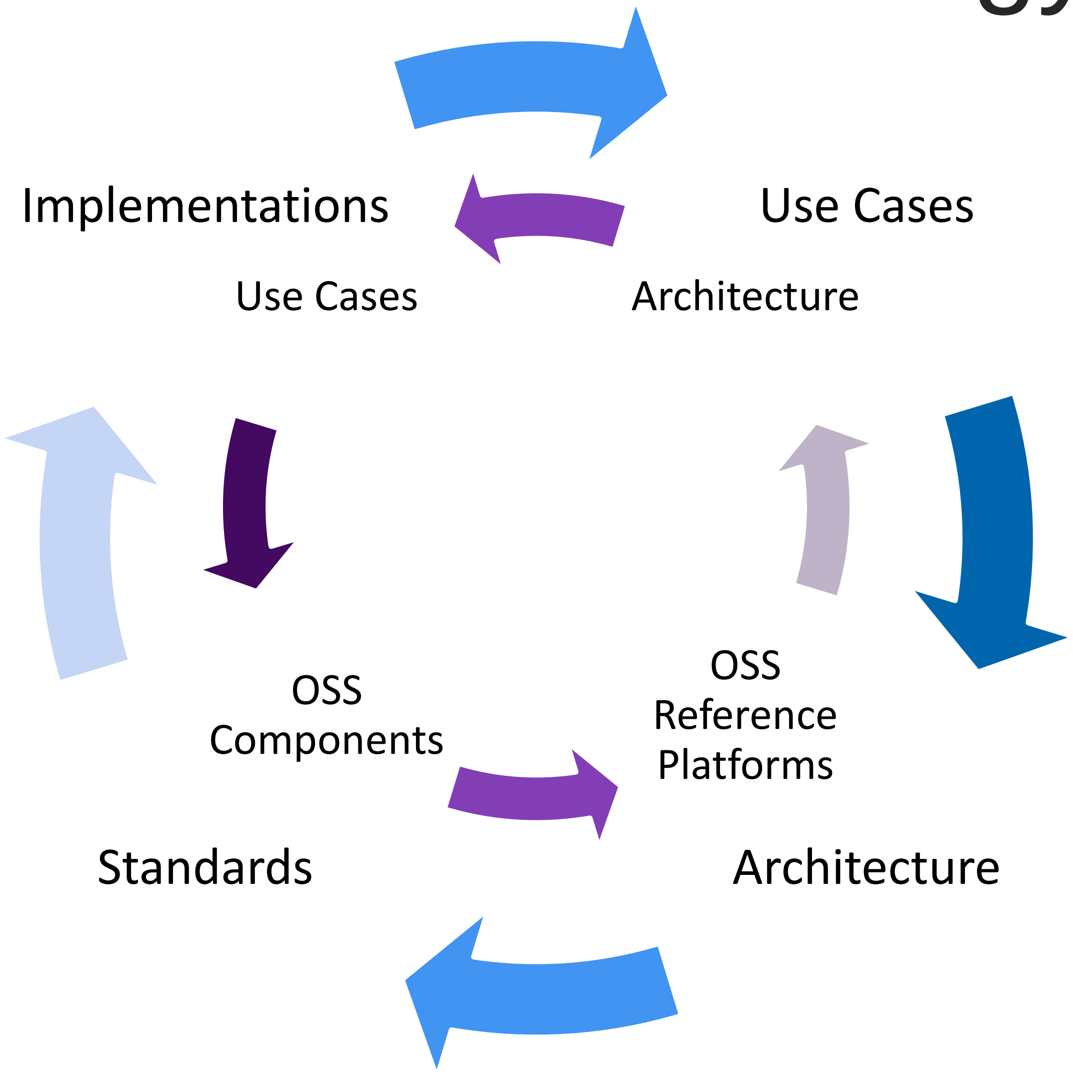
Open Source Networking Framework

OSN Benefits for 5G

- **Operators**
  - Encourage community innovation and collaboration
  - Avoid vendor lock-in
  - Improve quality and security
  - Vendor collaboration
  - Contribute to the community

- **Vendors**
  - Free up resources to pursue value-added products/services
  - Operators demand it
  - Improve quality and security
  - Address multiple operator's needs
  - Contribute to the community

The New Technology Adoption Lifecycle



Implementations

Use Cases

Use Cases

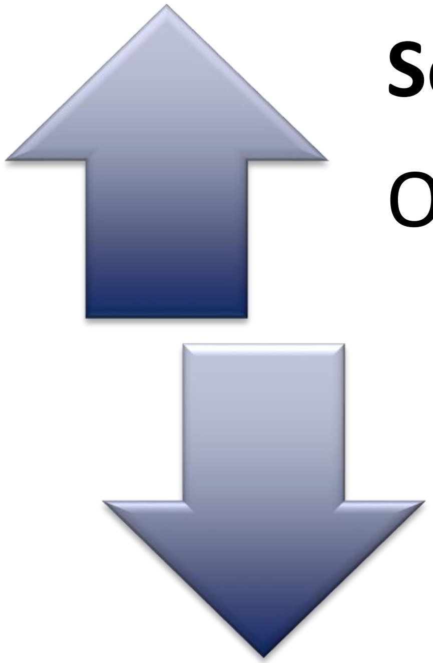
Architecture

OSS
Components

OSS
Reference
Platforms

Standards

Architecture



Software

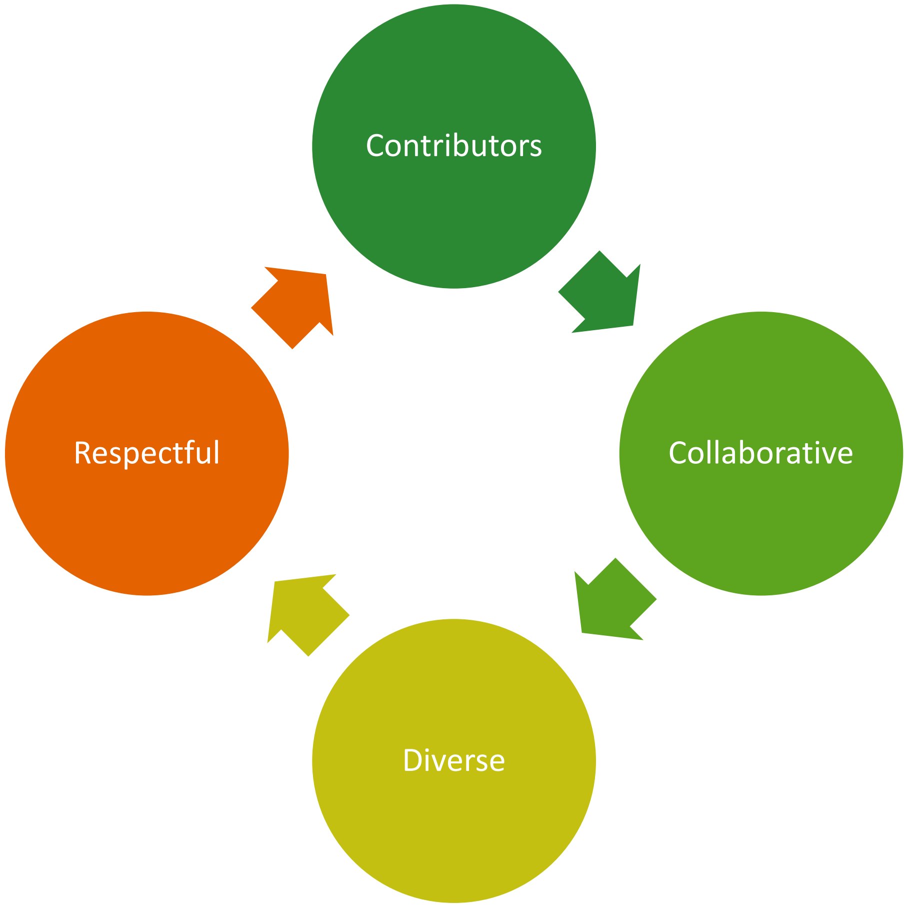
Open Source

Hardware

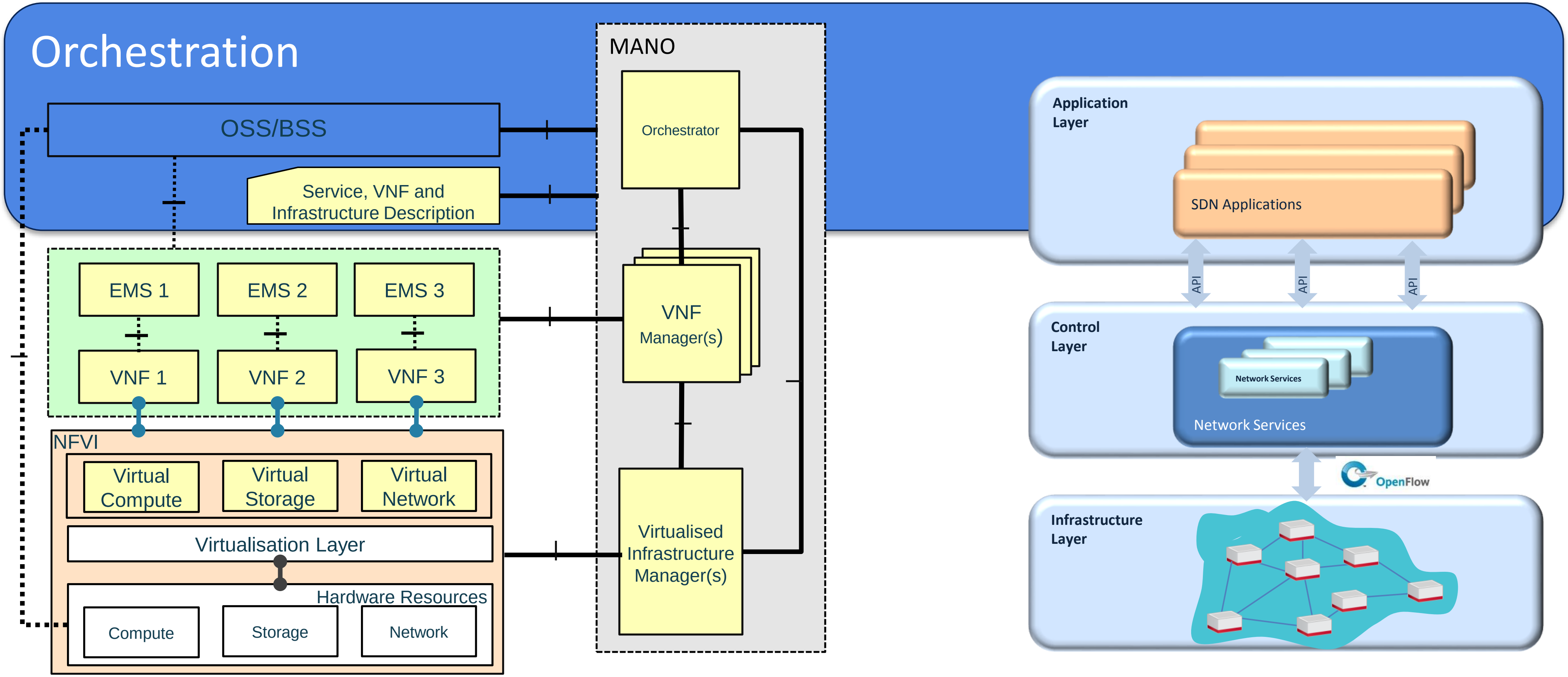
Standards

Telecom-grade Open Source

People	Regional	Global
Leadership	Single Source	Neutral
Priorities	Dev-Centric	Balanced
Style	Hype	Understated


Contributors
Collaborative
Diverse
Respectful

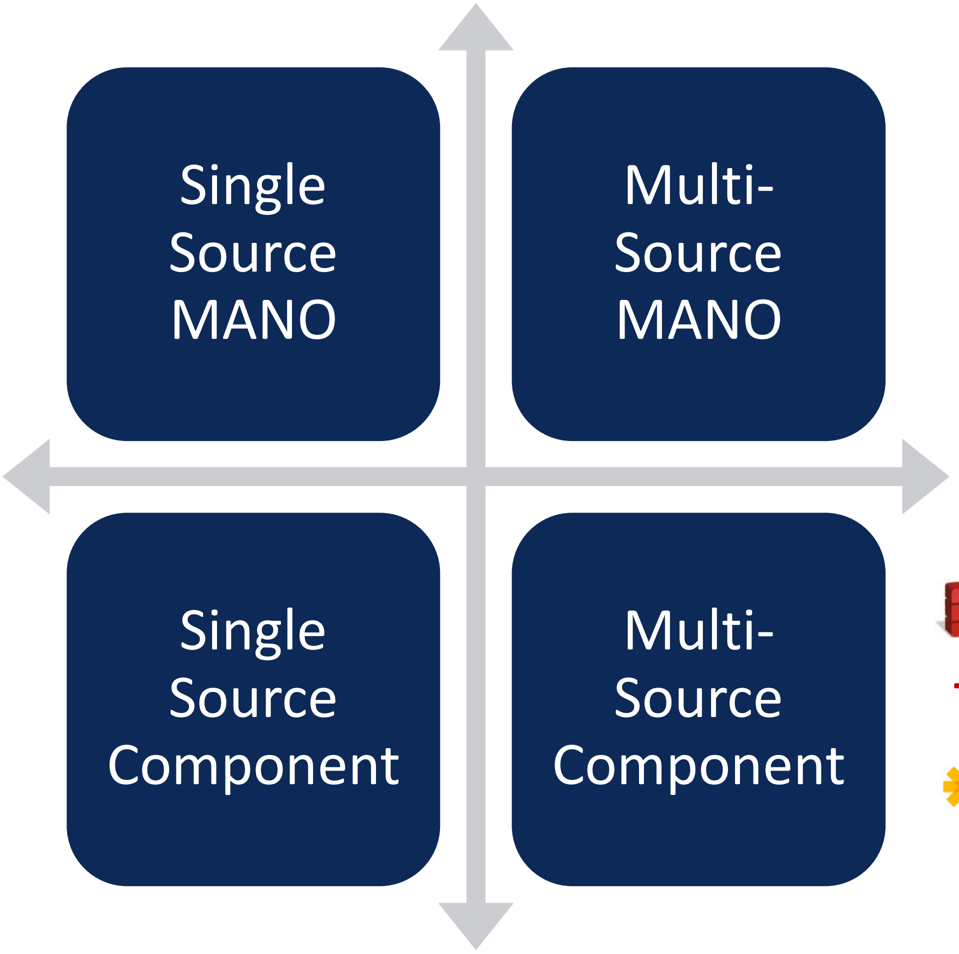
Bridging the Gap


Orchestration
OSS/BSS
Service, VNF and Infrastructure Description
MANO
Orchestrator
VNF Manager(s)
Virtualised Infrastructure Manager(s)
EMS 1
EMS 2
EMS 3
VNF 1
VNF 2
VNF 3
NFVI
Virtual Compute
Virtual Storage
Virtual Network
Virtualisation Layer
Hardware Resources
Compute
Storage
Network
Application Layer
SDN Applications
API
API
API
Control Layer
Network Services
Network Services
OpenFlow
Infrastructure Layer

ETSI NFV Architectural Framework

ONF SDN Architecture

Open Source Orchestration Landscape



More Functionality

Single Source MANO

Multi-Source MANO

Single Source

Multi-Source

Single Source Component

Multi-Source Component

Less Functionality

redhat

ManageIQ

Fraunhofer FOKUS

OPEN BATON

OPEN-O

THE LINUX FOUNDATION

Open Source MANO

ETSI World Class Standards

AND:
Information Model
Modeling Languages
Tools
APIs
Etc.

CANONICAL

juju

Telefónica

openmano

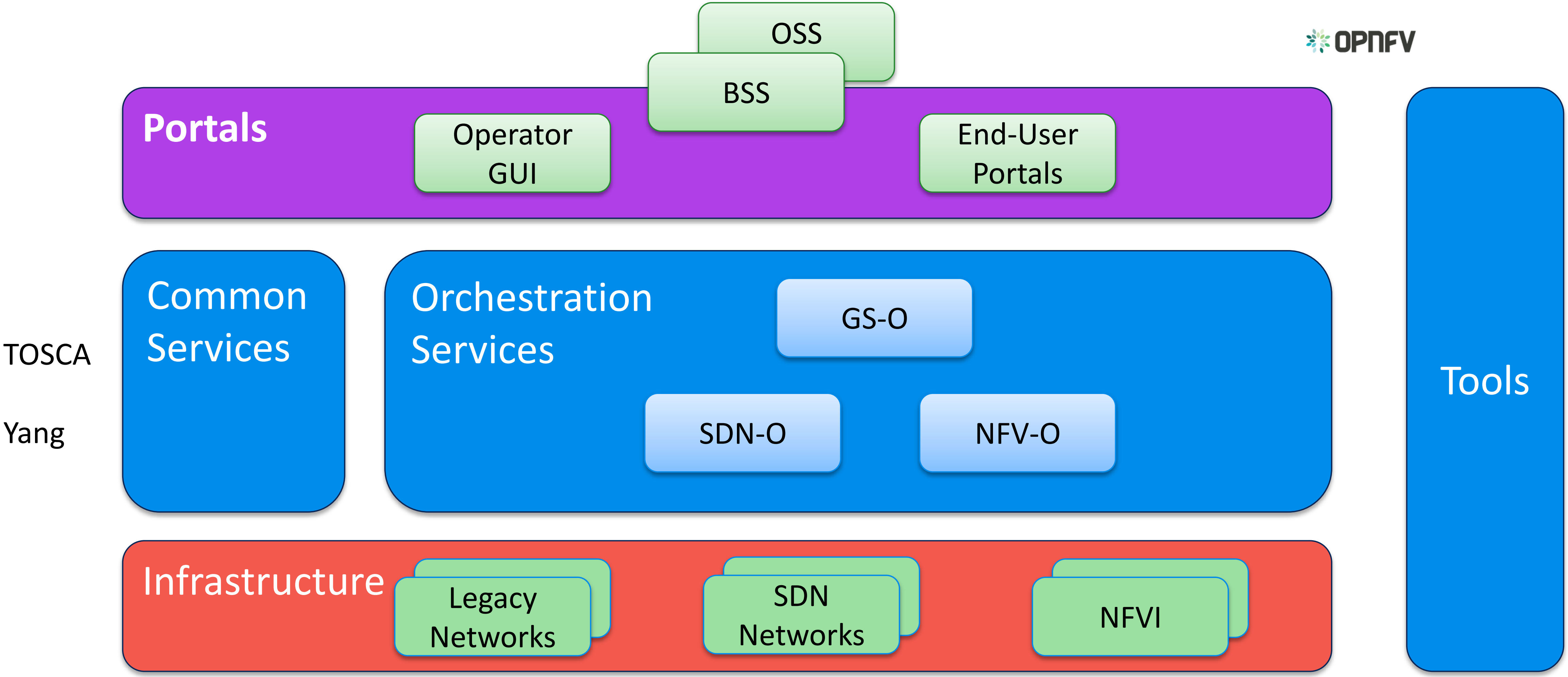
openstack CLOUD SOFTWARE

Tacker

OPEN DAYLIGHT

onos Open Network Operating System

OPEN-O Architecture (subject to change)


OSS
BSS
Portals
Operator GUI
End-User Portals
TOSCA
Yang
Common Services
Orchestration Services
GS-O
SDN-O
NFV-O
Tools
Infrastructure
Legacy Networks
SDN Networks
NFVI

ON.LAB Community

ON.LAB

Architecture
Core Engineering
Leadership

SERVICE PROVIDER
PARTNERS

Validate the
Vision

VENDOR
PARTNERS

Implement the
Vision

COLLABORATORS

50+ Companies

Community
Innovation
Impact

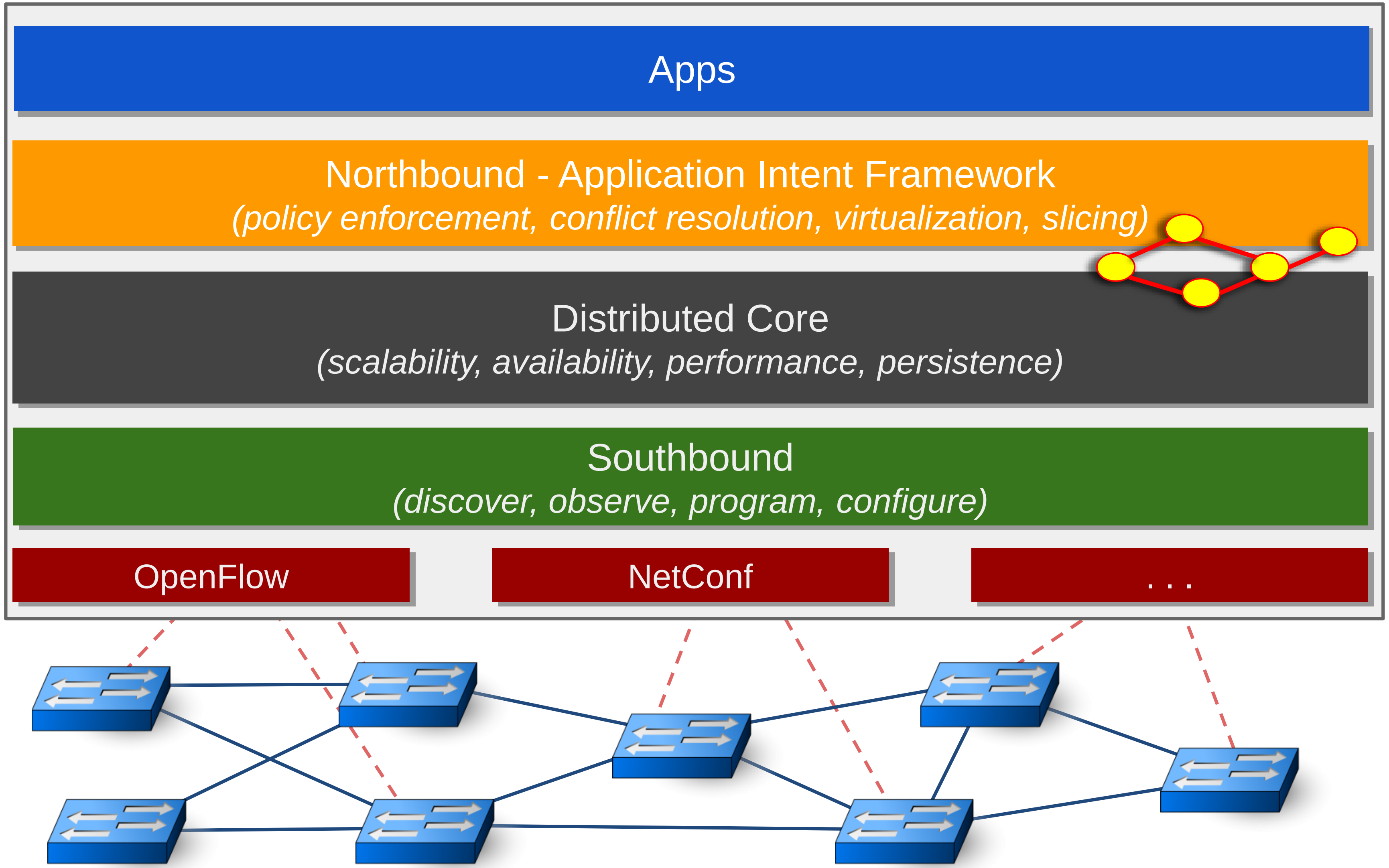
VOLUNTEERS

ONOS Architecture Tiers

Northbound Abstraction:
- network graph
- application intents
- virtualization & slicing

Core:
- distributed
- protocol independent

Southbound Abstraction:
- generalized OpenFlow
- pluggable & extensible



Apps

Northbound - Application Intent Framework

(policy enforcement, conflict resolution, virtualization, slicing)

Distributed Core

(scalability, availability, performance, persistence)

Southbound

(discover, observe, program, configure)

OpenFlow

NetConf

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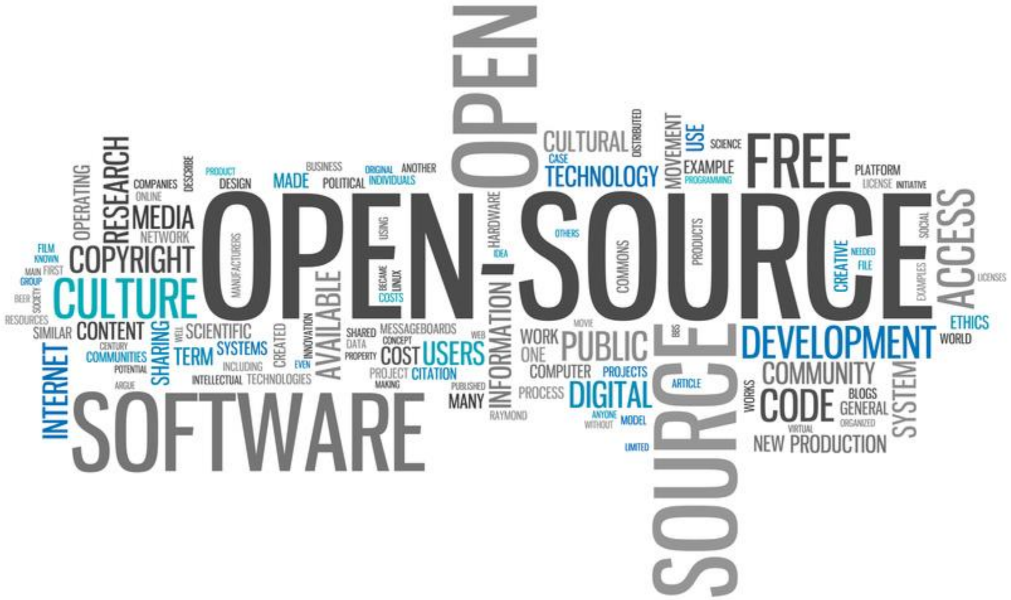
Why The Linux Foundation?

- Experience
- Community & Collaboration
- Neutrality
- Best Practices
- Infrastructure
- Presence


OPEN-SOURCE
OPEN
SOURCE
SOFTWARE
FREE
CULTURE
COPYRIGHT
MEDIA
RESEARCH
DEVELOPMENT
COMMUNITY
CODE
DIGITAL
PUBLIC
ACCESS
TECHNOLOGY
CULTURAL
INFORMATION
AVAILABLE
INTERNET
CONTENT
USERS
COST
SYSTEMS
TERM
SHARING
SCIENTIFIC
SYSTEM
CREATIVE
ETHICS
NEW PRODUCTION
MOVEMENT
USE
EXAMPLE
PLATFORM

谢谢

Thank You

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