SDN/NFV and Open Networking Ecosystem - 1

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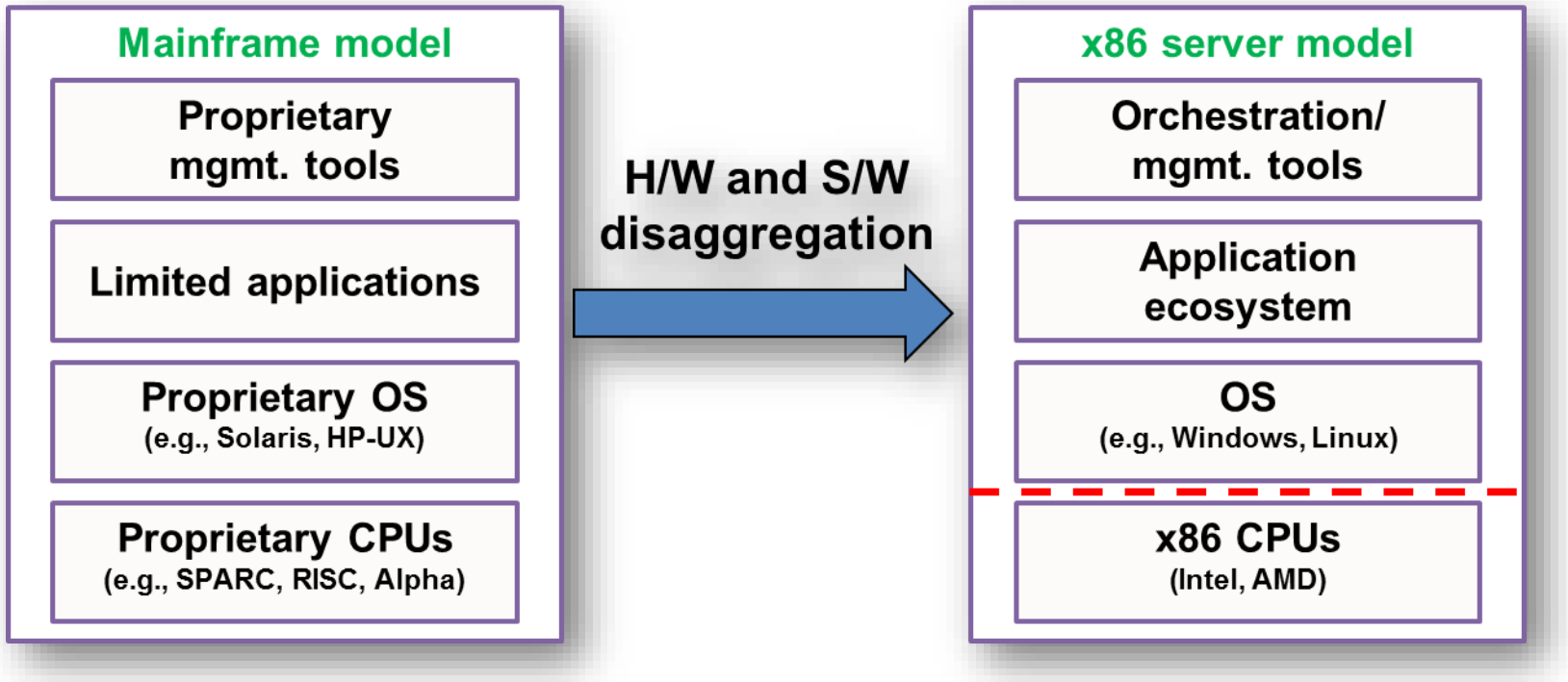
Motivation for SDN/NFV (1/2)

❖ Comparison to the Compute Paradigm

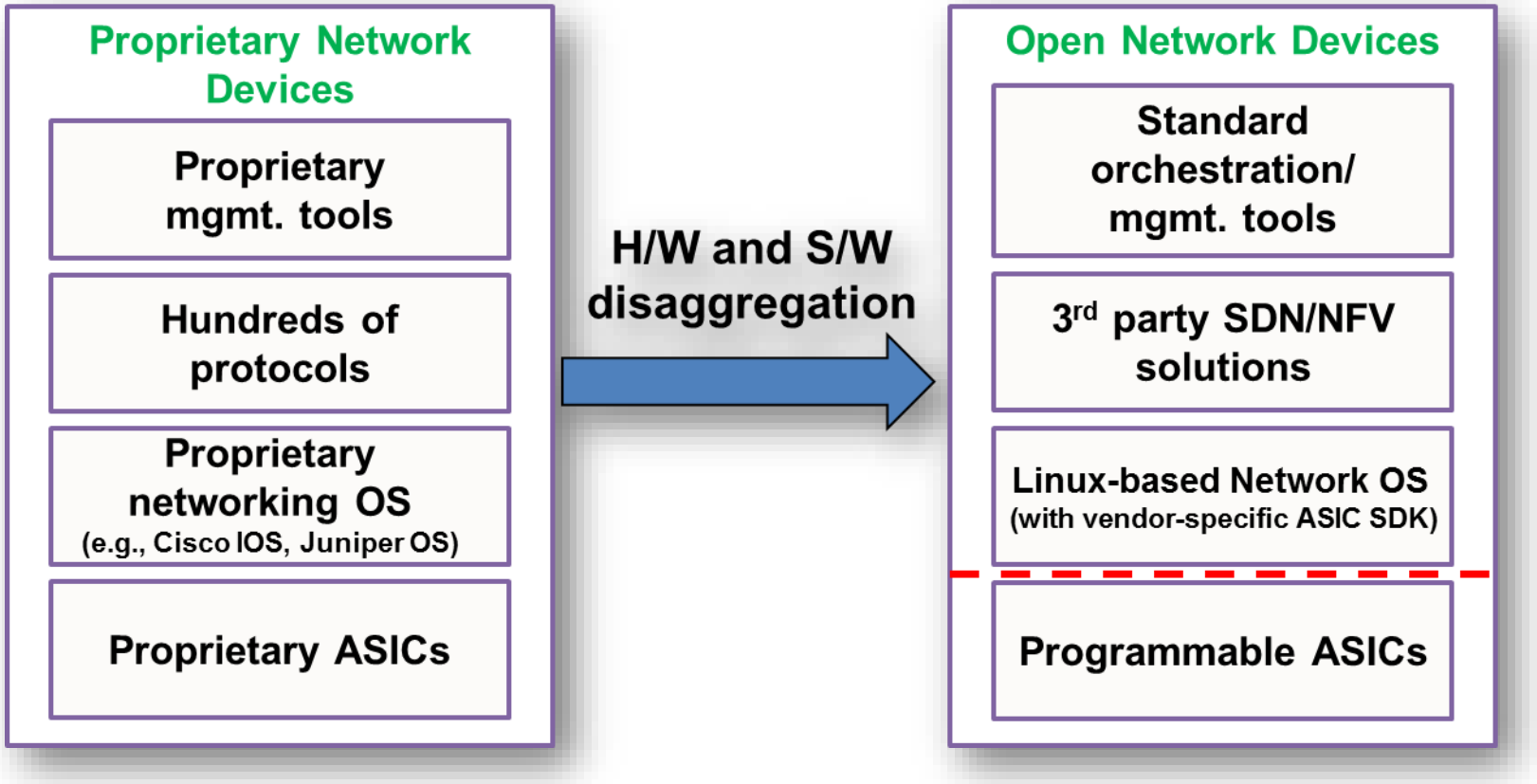
- Compute paradigm for the past few decades
- Benefits
  - Open/flexible choices and cost-effective solutions for customers
  - Rapid innovation (CPU, OS, Applications)
  - Rich ecosystem



Motivation for SDN/NFV (1/2)

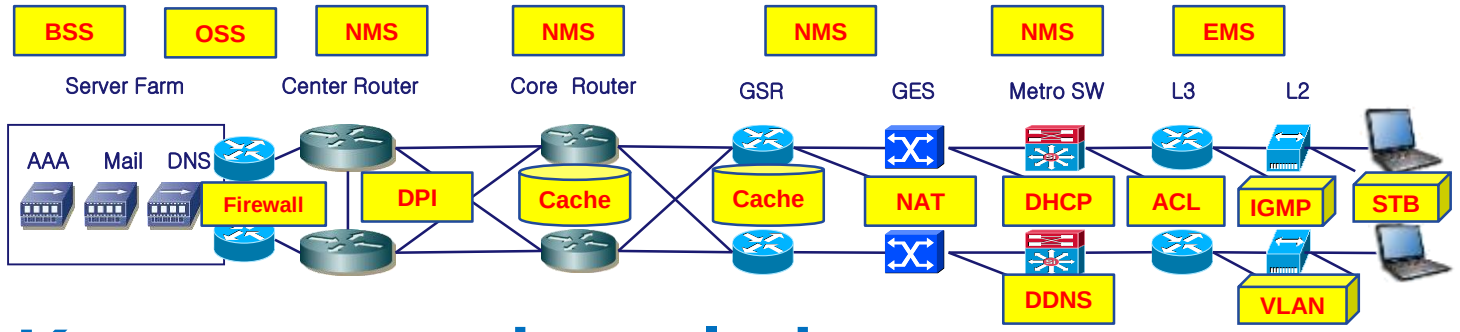
❖ Comparison to the Compute Paradigm

- **SDN/NFV is changing the paradigm in networking area**

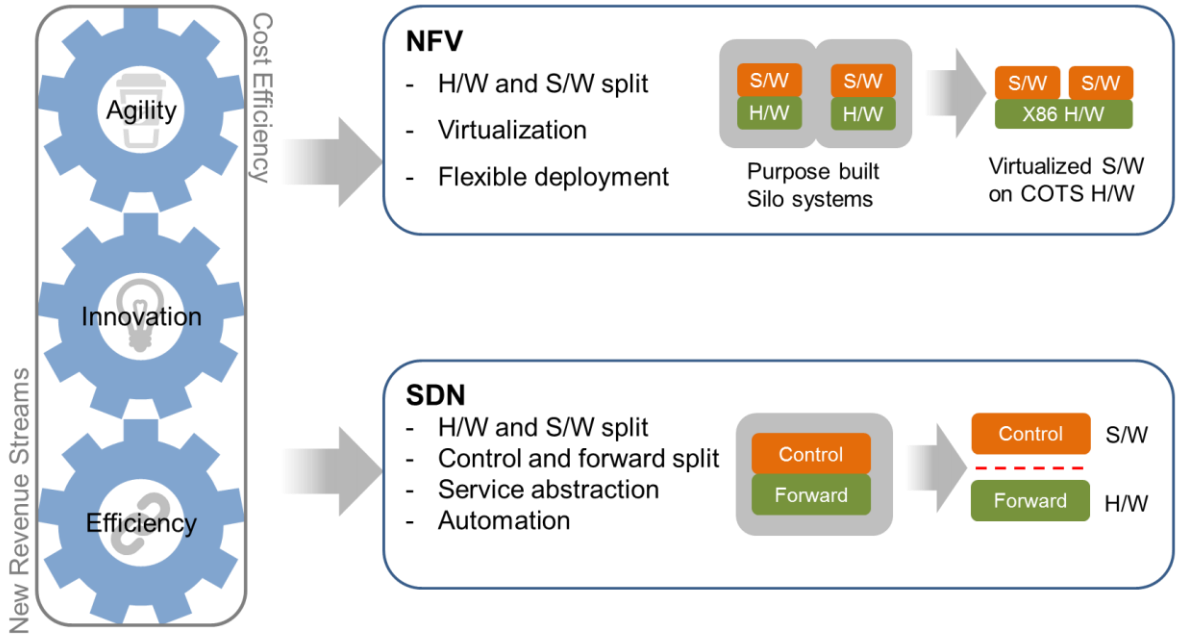


SDN/NFV

❖ Legacy Network



❖ SDN/NFV – Key to network evolution



Source : Ericsson-LG, 2016

SDN

❖ Software Defined Networking (SDN)

- Separates the control plane from the data plane
- Provides centralized management and authority (SDN controller)

❖ OpenFlow (OF)

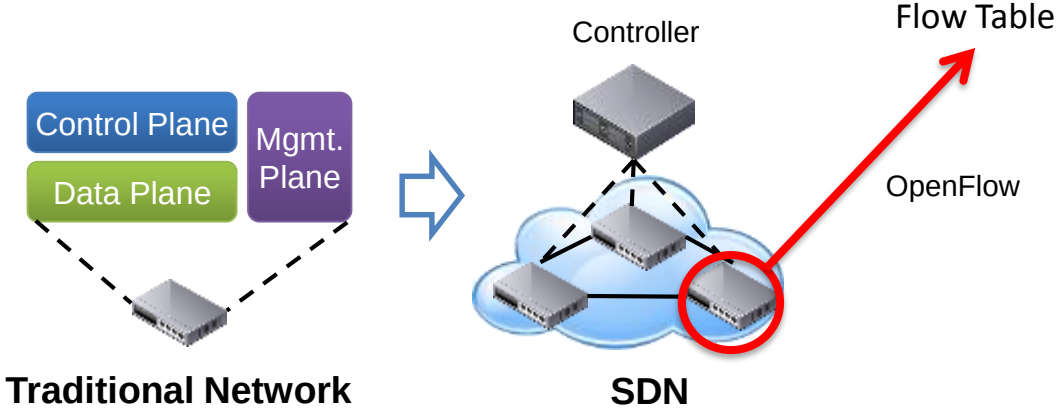
- The *de facto* standard protocol to communicate between control & data planes
- Providing remote administration of forwarding tables of switches
- Current SDN technologies are heavily depending on OF

❖ Benefits of SDN

- Programmability
- Agility
- Flexibility
- CAPEX/OPEX saving
- Vendor neutrality

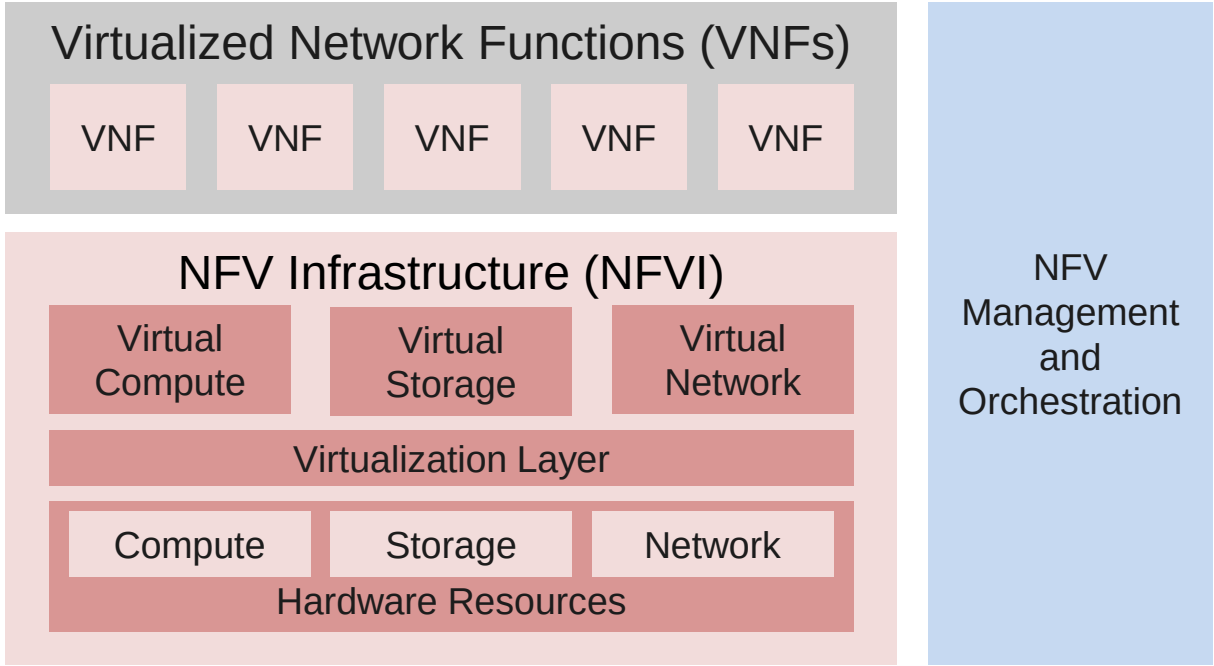
Flow Entry	Match Field	Counter	Action
1	Dst IP: 10.0.1.2	22	Port 3
2	Dst TCP/UDP Port: 80	14	Drop
...	...	...	...

Flow Table



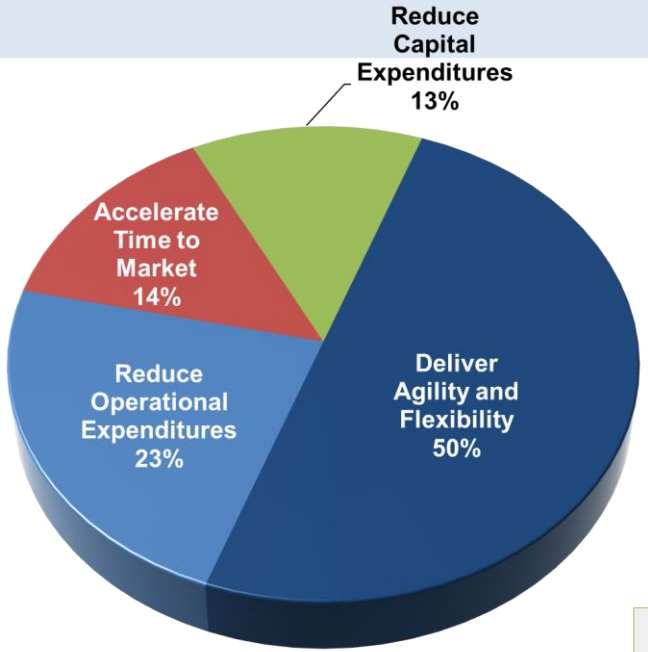
❖ Network Function Virtualization (NFV)

- Leveraging standard IT virtualization technology to consolidate many network equipment types to reduce cost and improve flexibility, operability, and maintainability



High-level NFV Framework (ETSI NFV ISG)

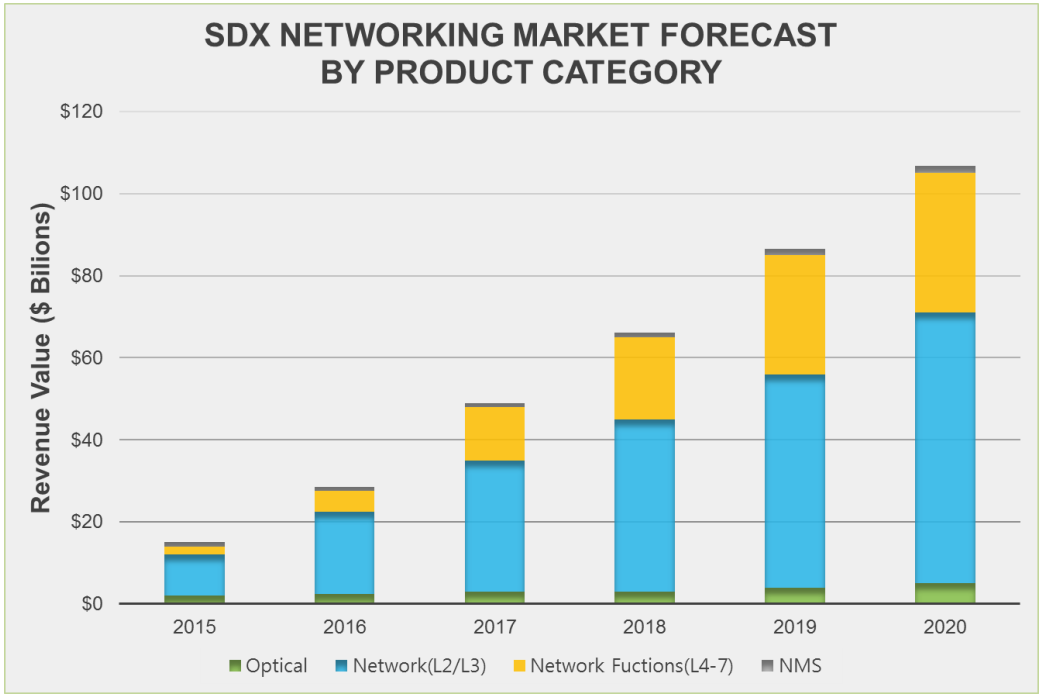
SDN/NFV



Source: SDx Central, 2016

Major NFV Drivers

SDN/NFV Market Revernue Forecast

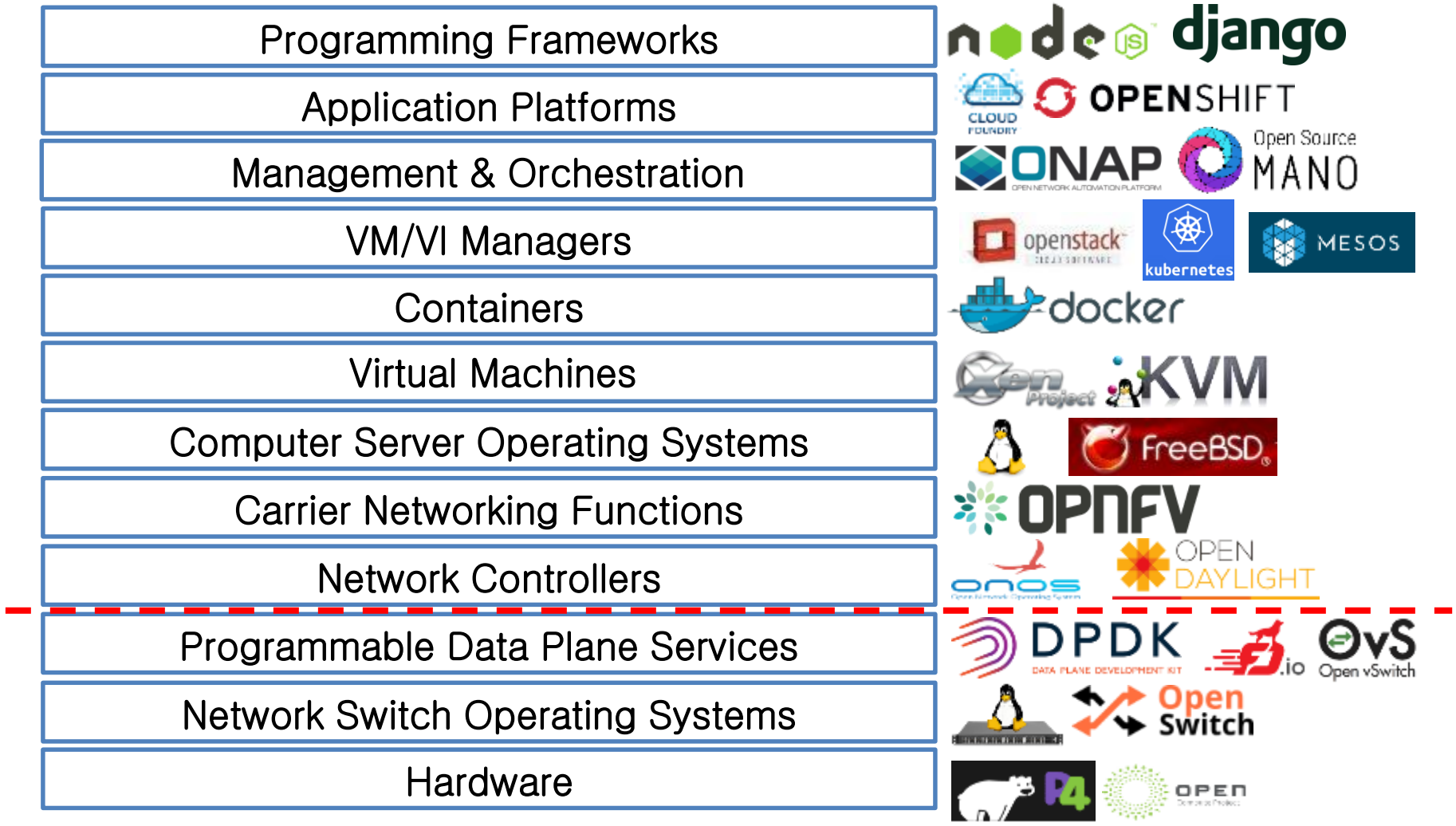


Source: SDx Central, 2016

Open Networking Ecosystem

Challenges for Telcos

❖ Open Networking Reference Model



Source: Huawei

Open Networking Ecosystem

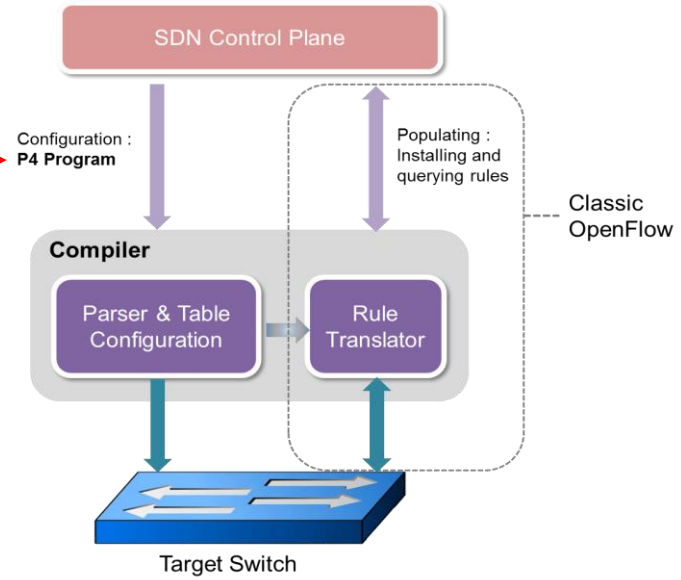
❖ Hardware

- **P4** (programming protocol-independent packet processors)
  - Declarative language for telling forwarding-plane devices (switches, NICs, firewalls, filters, etc) how to process packets
  - Characteristics
    - Protocol Independency
    - Target Independency
    - Field Re-configurability
  - Members

BAREFOOT NETWORKS, CAVIUM, at&t, BROADCOM, BROCADE, CISCO, COMCAST, DELL, Hewlett Packard Enterprise, HUAWEI, intel, JUNIPER NETWORKS, kt, MARVELL, Mellanox TECHNOLOGIES, Microsoft, SK telecom, vmware

```
table routing {
    reads {
        ipv4.dstAddr : lpm;
    }
    actions {
        do_drop;
        route_ipv4;
    }
    size: 2048;
}

control ingress {
    apply(routing);
}
```



Open Networking Ecosystem

❖ Hardware

▪ OCP (Open Compute Project)

- Redesign hardware technology to efficiently support the growing demands on compute & network infrastructure
- Break open the black box of proprietary IT infrastructure to achieve greater choice, customization, and cost savings
- Projects
  - Data Center
  - Certification
  - Hardware Management
  - Networking
  - Open Rack
  - Server Design
  - Storage

- Members