# Concept, overview and use case of Multi Service Fabric
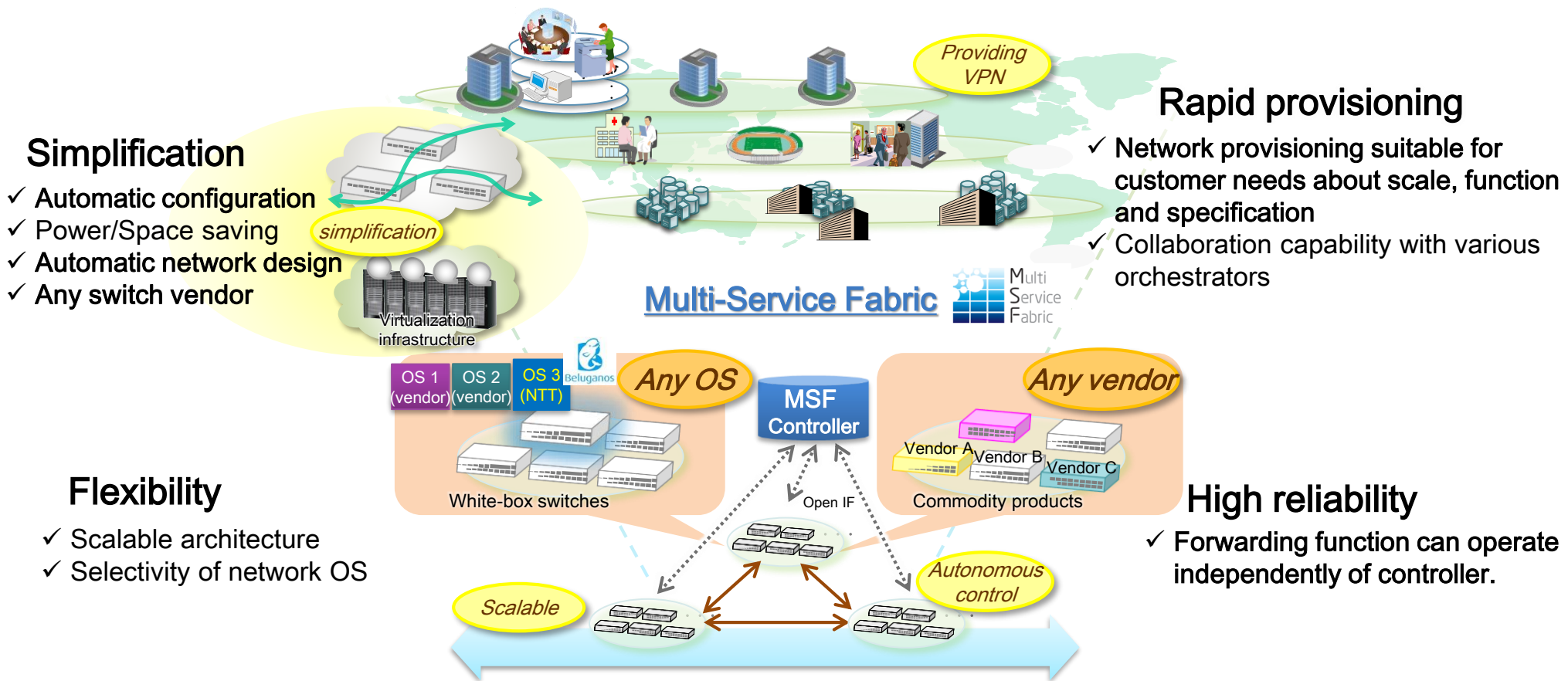
Dec. 2018

Image of adapting SDN & NFV to IP transport

◆ SDN/NFV architecture enables transport functions of high-performance router by commodity switches, which provides flexible resource allocation and network scale in/out.

◆ Switches are managed by external controllers pushed out from vendor specified box.

◆ Specific service functions are provided by servers in cloud.
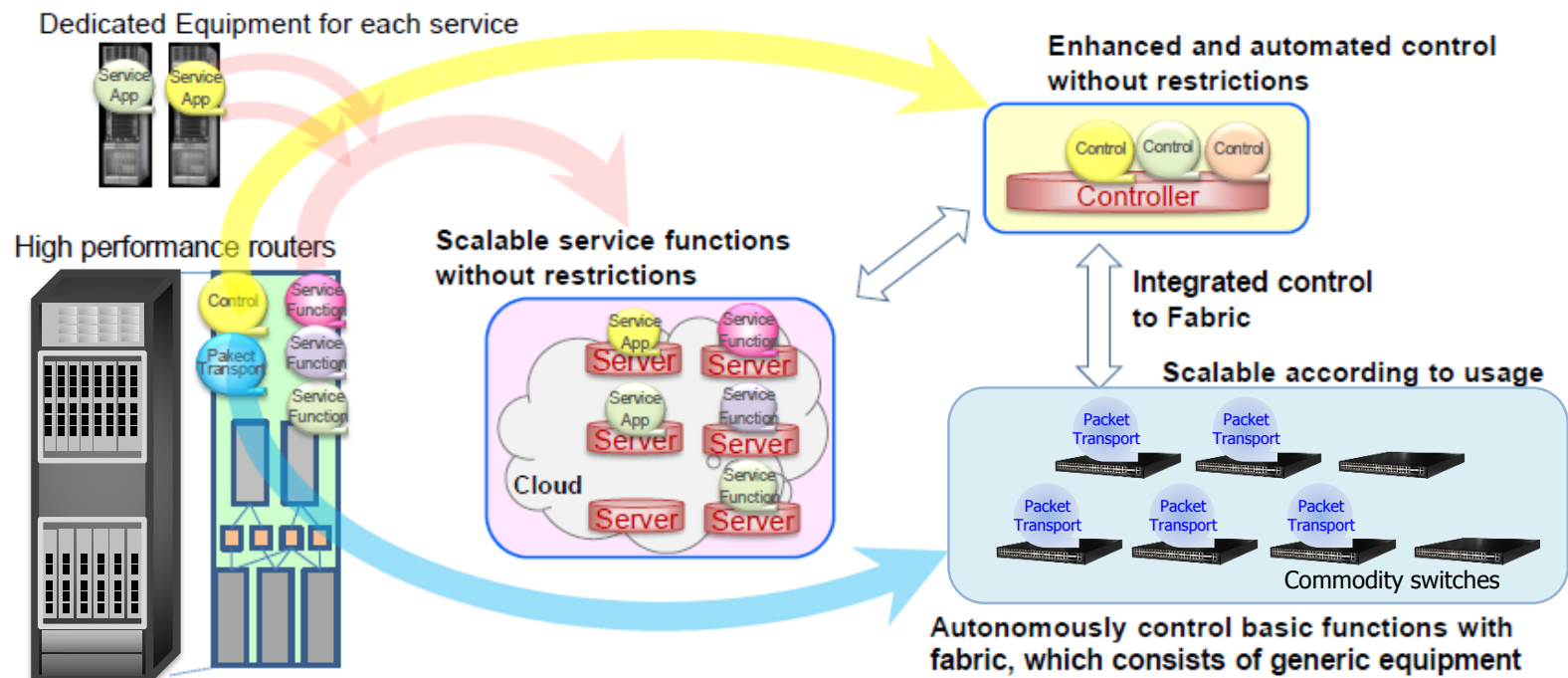
Concept of MSF project

◆ Multi Service Fabric (MSF) is novel network architecture that use commodity products including white-box switch.

◆ MSF ensures high reliability and provides flexible logical network.

Simplification
- ✓ Automatic configuration
- ✓ Power/Space saving
- ✓ Automatic network design
- ✓ Any switch vendor

Rapid provisioning
- ✓ Network provisioning suitable for customer needs about scale, function and specification
- ✓ Collaboration capability with various orchestrators

Flexibility
- ✓ Scalable architecture
- ✓ Selectivity of network OS

High reliability
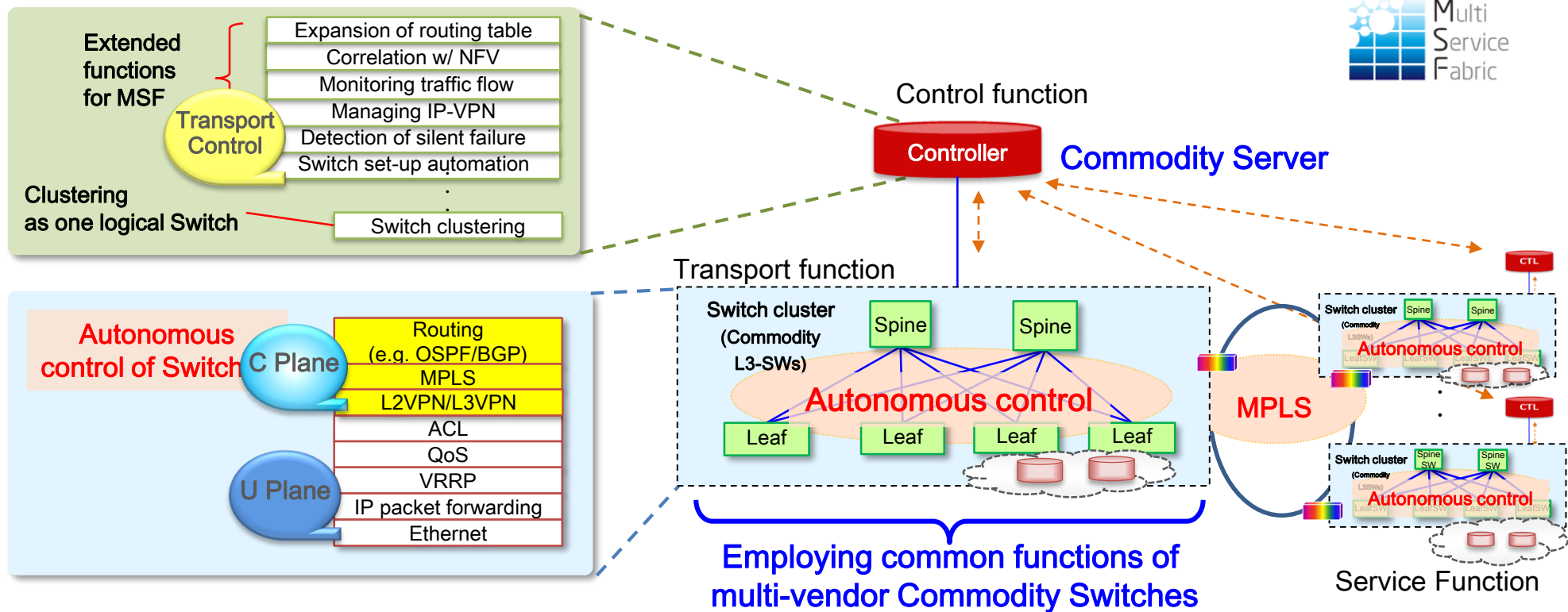- ✓ Forwarding function can operate independently of controller.

Overview

◆ Transport function is composed with commodity switches and can be covered from single-location to multi-locations.

◆ The MSF controller consists of single-cluster controllers and the Multi-Fabric Controller that manages multiple clusters.

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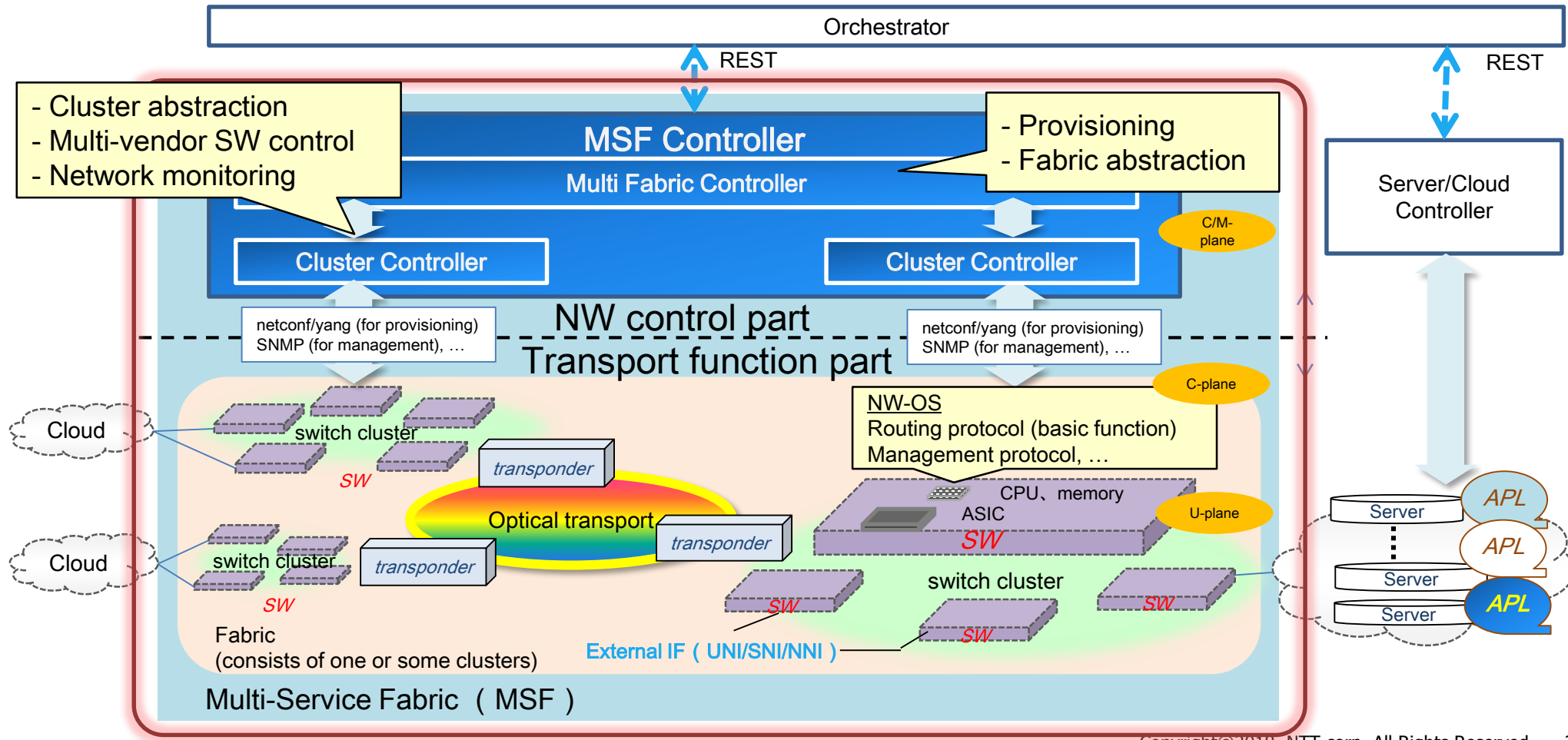
Functions

◆ Centralized: management and abstraction of the network done by the controller
◆ Distributed/Autonomous: routing is done among the switches.

Extended functions for MSF
- Expansion of routing table
- Correlation w/ NFV
- Monitoring traffic flow
- Managing IP-VPN
- Detection of silent failure
- Switch set-up automation

Transport Control

Clustering as one logical Switch
- Switch clustering

Autonomous control of Switch

C Plane
- Routing (e.g. OSPF/BGP)
- MPLS
- L2VPN/L3VPN
- ACL
- QoS
- VRRP

U Plane
- IP packet forwarding
- Ethernet

Multi Service Fabric

Control function

Controller   Commodity Server

Transport function

Switch cluster (Commodity L3-SWs)

Spine   Spine

Autonomous control

Leaf   Leaf   Leaf   Leaf

MPLS

Employing common functions of multi-vendor Commodity Switches

CTL

Switch cluster (Commodity L3SWs)

Spine   Spine

Autonomous control

LeafSW LeafSW LeafSW

CTL

Switch cluster (Commodity L3SWs)

Spine SW   Spine SW

Autonomous control

LeafSW LeafSW LeafSW LeafSW

Service Function

MSF Challenge 1: Utilization of commodity switch

[Conventional]
Different appliance products for each requirement

Router — Device management / Routing & Forwarding

Server — Device management / Service function
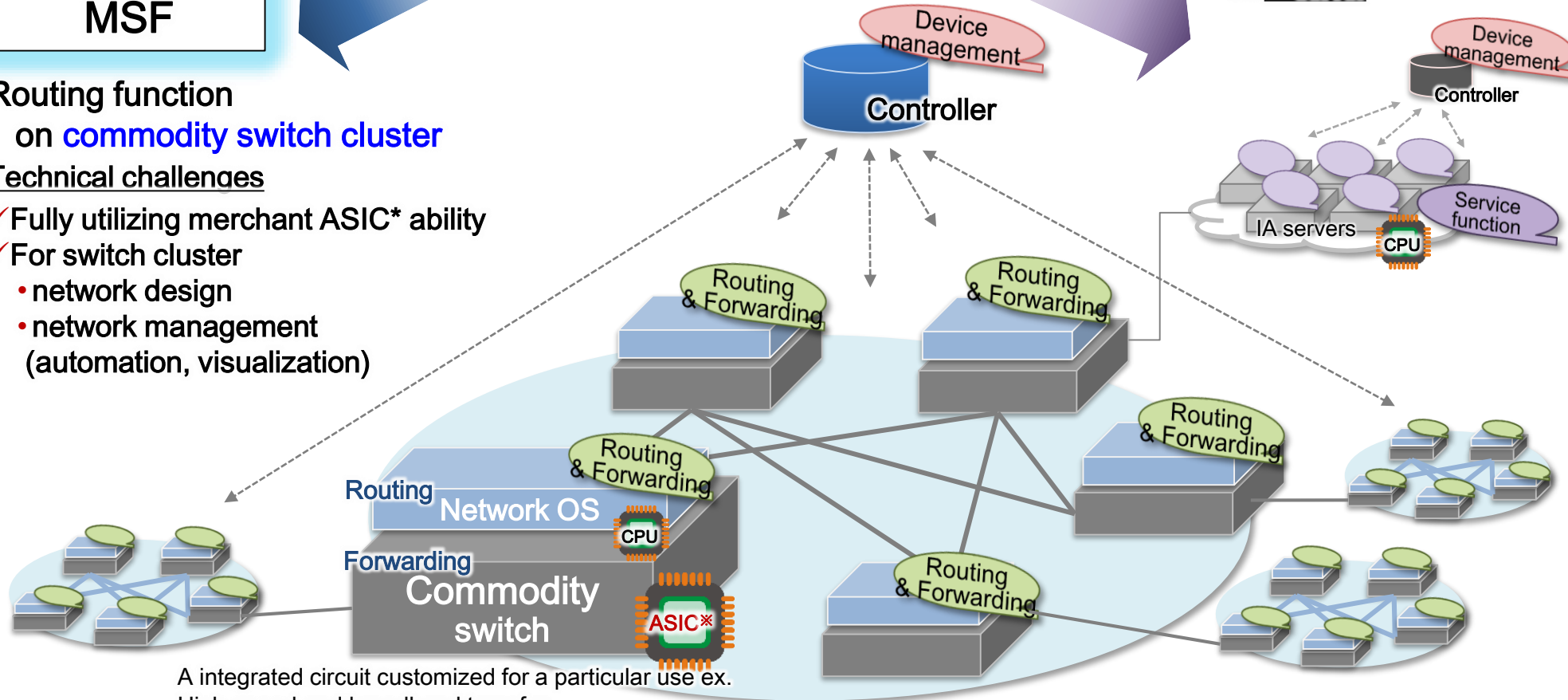
NFV
- Service function as a software on IA server
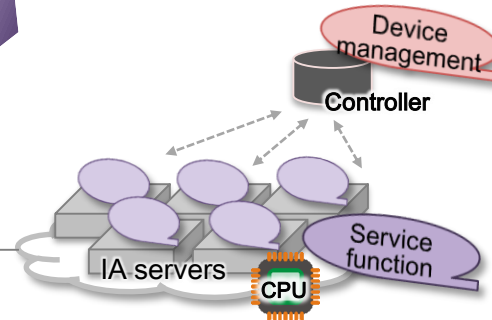
MSF

Routing function
on commodity switch cluster

Technical challenges
- ✓Fully utilizing merchant ASIC* ability
- ✓For switch cluster
  - network design
  - network management
    (automation, visualization)

Controller — Device management

IA servers — Service function / CPU

Controller — Device management

Routing & Forwarding

Routing
Network OS   CPU

Forwarding
Commodity switch   ASIC※

A integrated circuit customized for a particular use ex.
High-speed and broadband transfer

MSF Challenge 2: Utilization of white-box switch

◆ MSF can handle network function flexibly by a combination of white-box switch and network OS*.

*Network OS (NOS): a software which control forwarding function on switch

◆ Technical challenge is extension to carrier grade network performance.
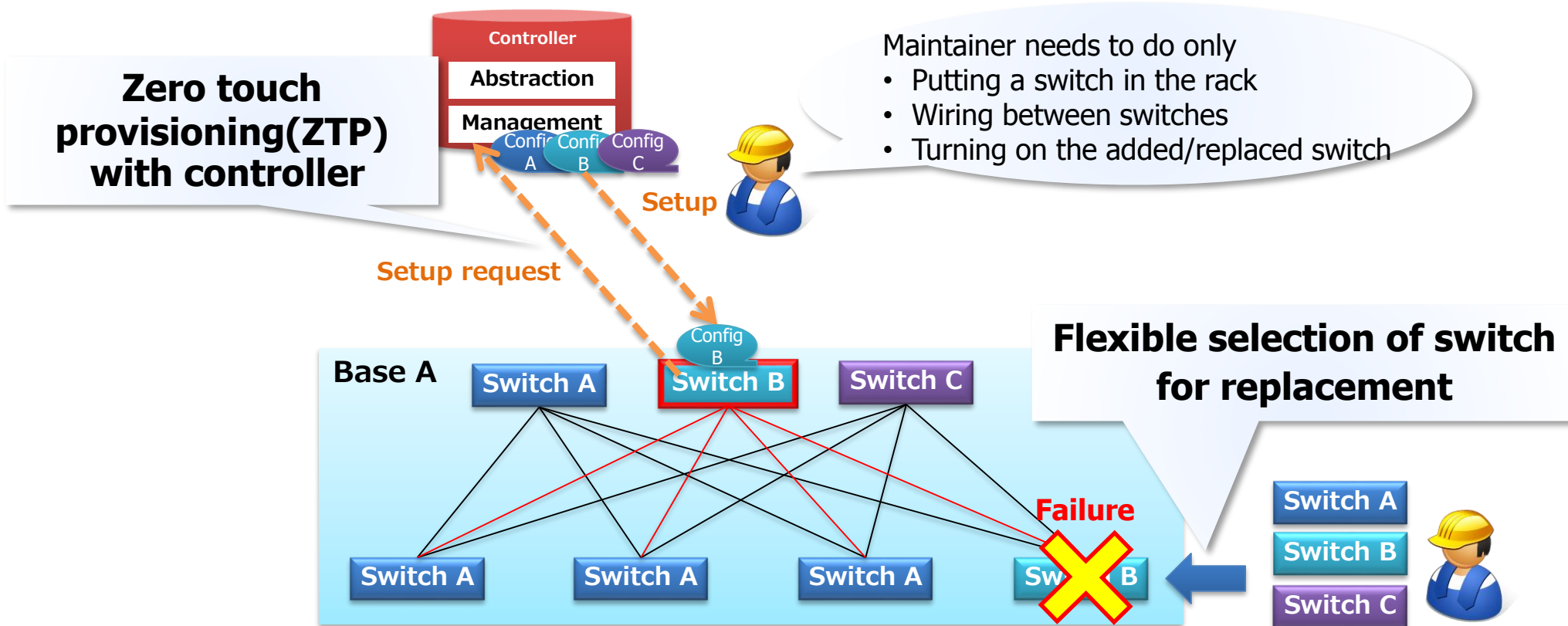
We can adopt arbitrary network OS.

Routing (NOS)
Vendor A

Routing (NOS)
Vendor B

Routing (NOS)
NTT

Beluganos

Hardware with ASIC
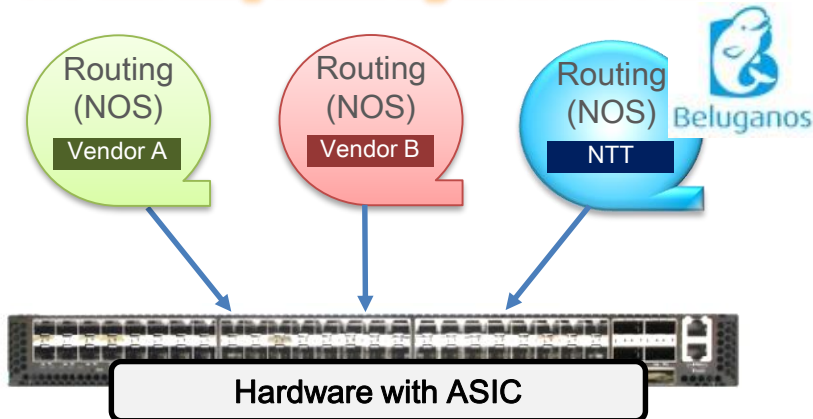
Benefits of white-box switch

➢ Development of NOS and hardware separately.
  (Hardware update independent of NOS.)

➢ Expansion of compatible device for cost reduction.

➢ Extensibility of original function.

MSF Challenge 3: Easy maintenance

◆ Connection between switches consists of standard Ethernet link and standard routing protocols.

◆ Maintainers do not need to know knowledge depending on vender products.

◆ Controller has functions for assistance of switch replacement and addition.

Zero touch provisioning(ZTP) with controller

Controller
Abstraction
Management
Config A Config B Config C

Setup

Maintainer needs to do only
• Putting a switch in the rack
• Wiring between switches
• Turning on the added/replaced switch

Setup request

Config B

Base A

Switch A   Switch B   Switch C

Flexible selection of switch for replacement

Switch A   Switch A   Switch A   **Failure** Sw B

Switch A
Switch B
Switch C

Use case

◆ Used in various networks to make easy operation by zero-touch provisioning and network abstraction, and CAPEX reduction

1. Replace high performance routers to switch fabrics
2. Provide various services with the common infrastructure by virtual network slicing
3. Provide Enterprise Services by L2/L3 (MPLS) VPN
4. Construct data center by switch fabric