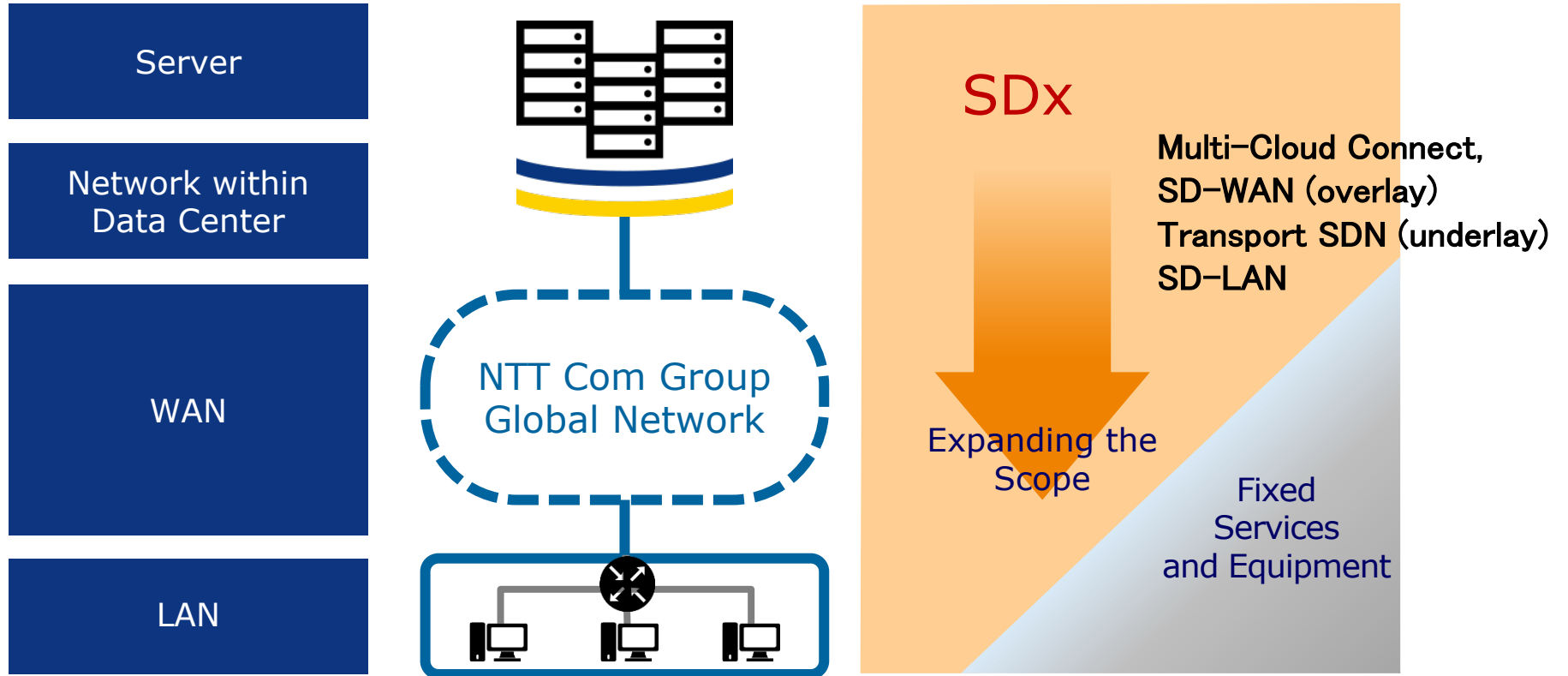**NTT** Communications

Transform. Transcend.

Trends and Challenges for SDN and NFV
-- From a Carrier Perspective
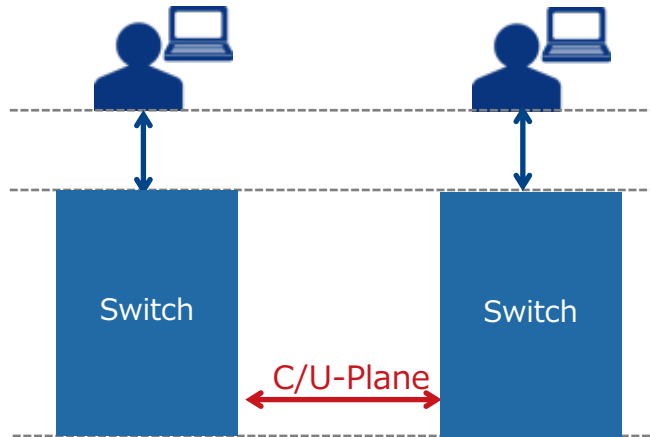
Wenyu Shen

NTT Communications

Transform your business, transcend expectations with our technologically advanced solutions.

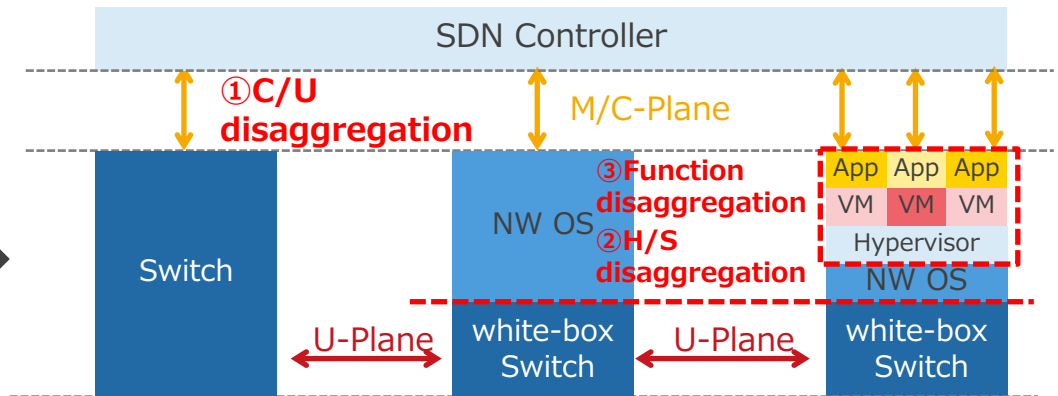# Software Defined Networking (SDN) Expanding Everywhere

Server

Network within
Data Center

WAN

LAN

NTT Com Group
Global Network

SDx

Multi-Cloud Connect,
SD-WAN (overlay)
Transport SDN (underlay)
SD-LAN

Expanding the
Scope

Fixed
Services
and Equipment

2

SDN Triggering Disaggregation

All-in-one

Disaggregation

SDN Controller

①**C/U disaggregation**

M/C-Plane

NW OS

③**Function disaggregation**

②**H/S disaggregation**

App App App

VM VM VM

Hypervisor

NW OS

Switch

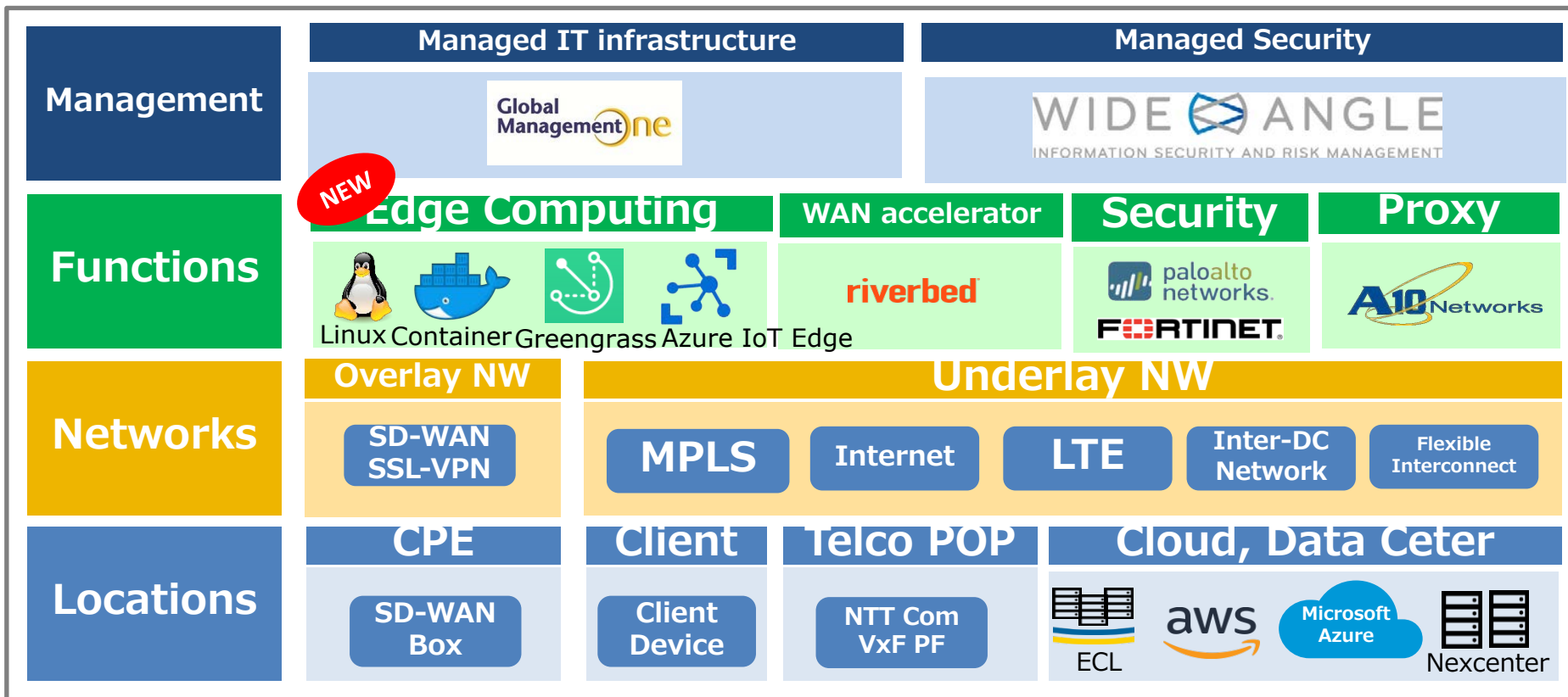Switch

Switch

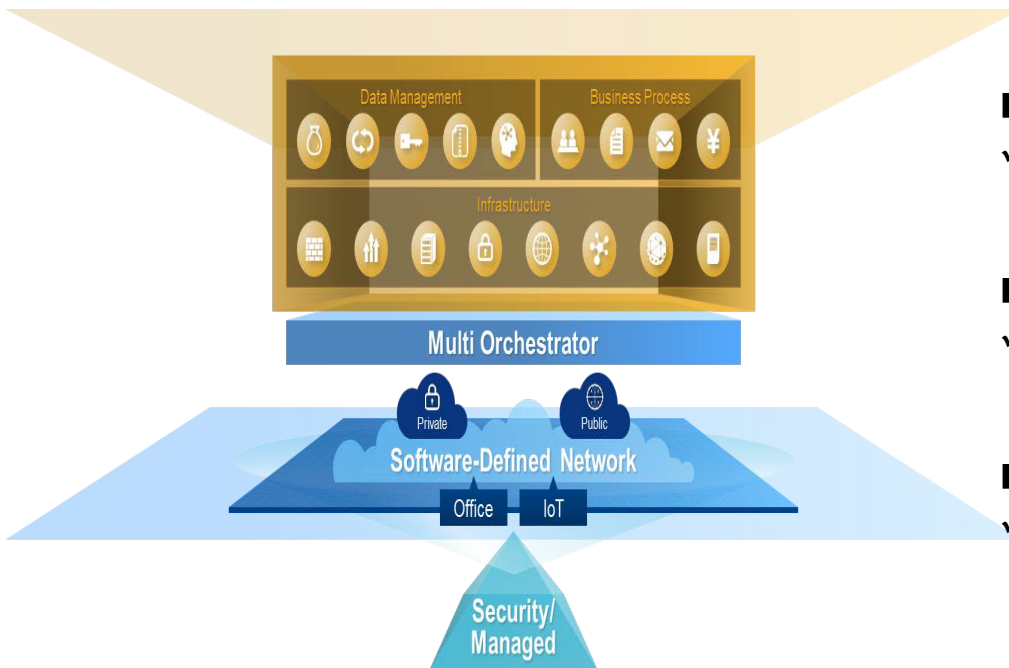white-box Switch

white-box Switch

C/U-Plane

U-Plane

U-Plane

× : Huge OPEX caused by customized system and manual configuration
× : Development heavily dependent on Vendors
× : Vendor lock-in

○ : Reducing OPEX via centralized management and automation
○ : User-centric development
○ : Vendor-free

3

Hybrid IT, Edge, Cloud Native

Management	Managed IT infrastructure	Managed Security
	Global ManagementOne	WIDE ANGLE INFORMATION SECURITY AND RISK MANAGEMENT

NEW

Functions	Edge Computing				WAN accelerator	Security	Proxy
	Linux	Container	Greengrass	Azure IoT Edge	riverbed	paloalto networks / FORTINET	A10 Networks

Networks	Overlay NW	Underlay NW				
	SD-WAN SSL-VPN	MPLS	Internet	LTE	Inter-DC Network	Flexible Interconnect

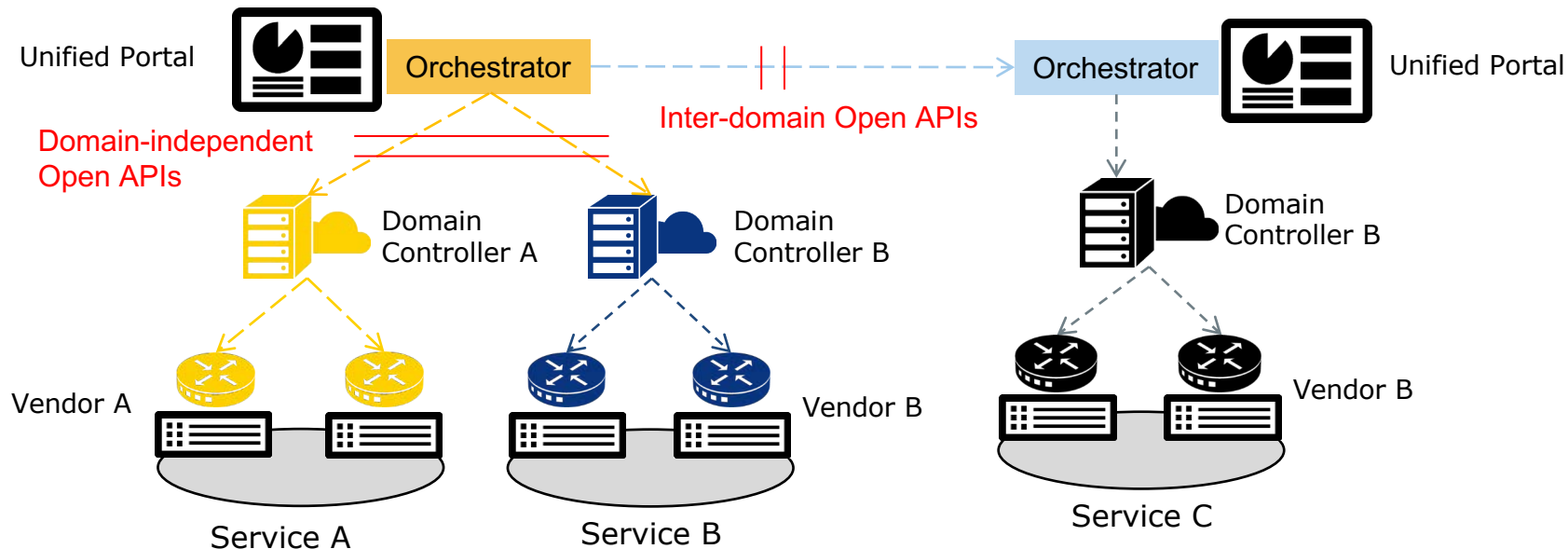| Locations	CPE	Client	Telco POP	Cloud, Data Ceter
	SD-WAN Box	Client Device	NTT Com VxF PF	ECL / aws / Microsoft Azure / Nexcenter

Challenge 1: Multi-Service Orchestration

- ■ Network orchestration
  - ✓ SD-WAN, SSL-VPN, MPLS, LTE, Multi-cloud connect

- ■ Location orchestration
  - ✓ On-demand function deployment on cloud, network edge and CPE

- ■ Function orchestration
  - ✓ Network functions, IoT functions, upper layer functions including data management and business process

A unified data distribution platform that supports data collection, data processing and data utilization!

Challenge 2: Standardization

Unified Portal — **Orchestrator**

Inter-domain Open APIs

Domain-independent Open APIs

Orchestrator — **Unified Portal**

Domain Controller A

Domain Controller B

Domain Controller B

Vendor A

Vendor B

Vendor B

Service A
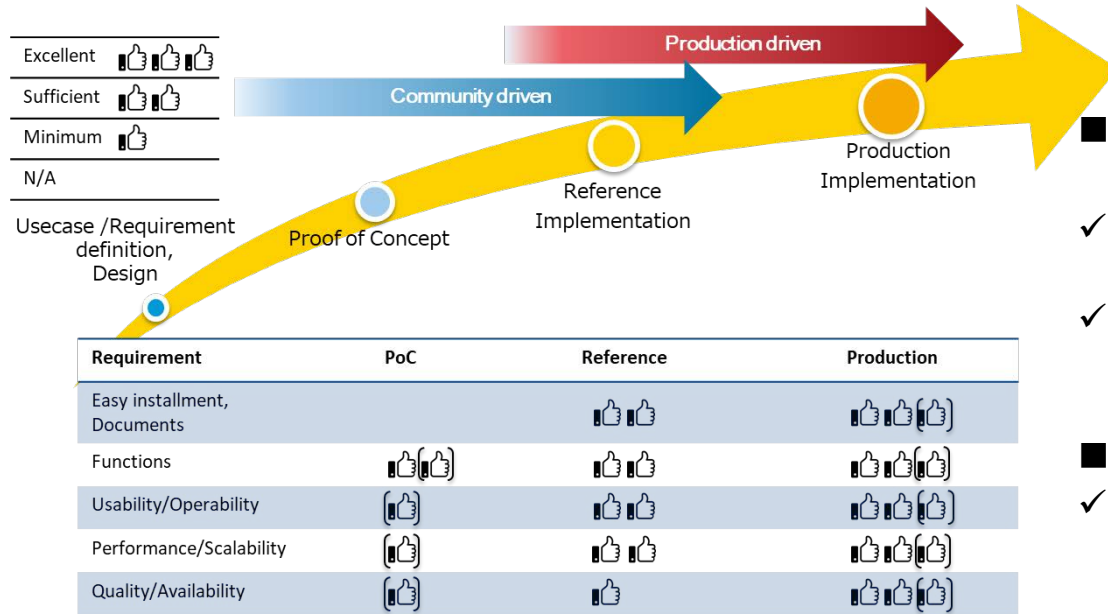
Service B

Service C

- ■ Domain-independent APIs
  - ✓ Hide domain-specific details
  - ✓ Facilitate adding new technologies and solutions

- ■ Inter-domain Open APIs
  - ✓ Accelerating end-to-end services deployment
  - ✓ Realization of global service orchestration

Standardization to reduce CAPEX and OPEX!
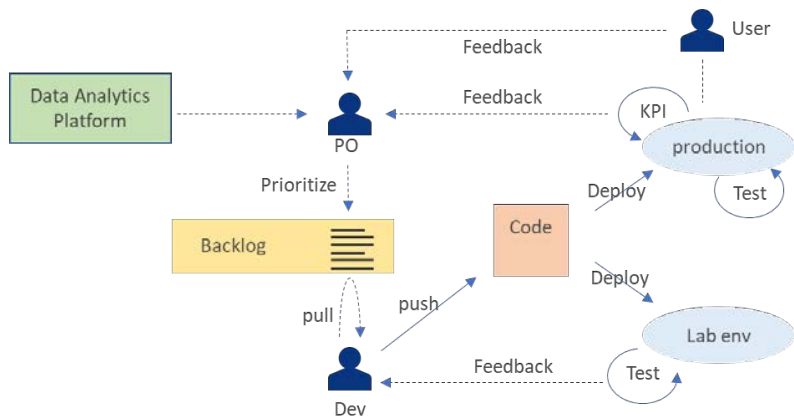
6

Challenge 3: Open Source Development

- Expectation on Maturity Level Enhancement
  - ✓ Enhancement on functions, usability, operability, performance, quality…
  - ✓ From community activities to production deployment

- Expectation on Integrated Solutions
  - ✓ Existing communities are focused on each specific target

Large deployment of Open Source to achieve customizability, faster time to market, and interoperability
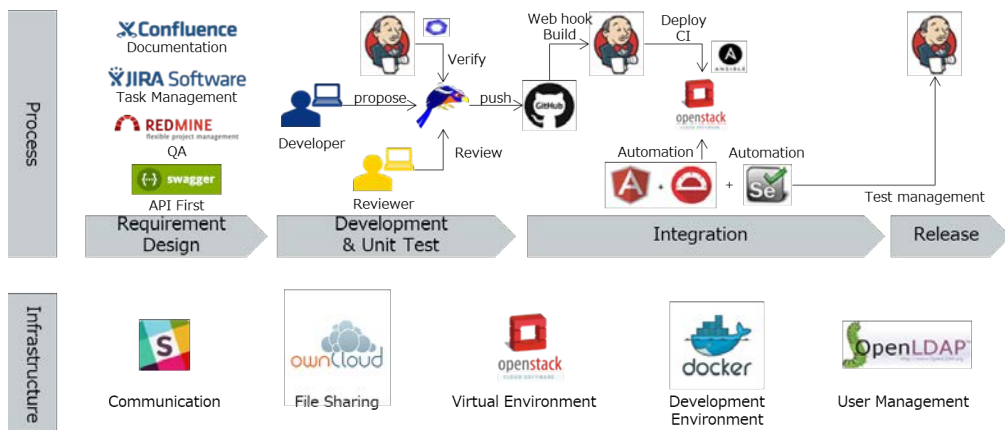
Challenge 4: In-House Development

Development Process

Development Tool

- ■ New style of development process
- ✓ Agile function addition according to user's priority
- ✓ Dev & Ops members in one team
- ✓ Deploy automation, test automation

- ■ New development tools
- ✓ Utilization of virtual environment
- ✓ Utilization of SaaS
- ✓ Utilization of CI tools

Change the existing development style to speed up the in-house development!