NTT's Use-cases and Plans for Stratum
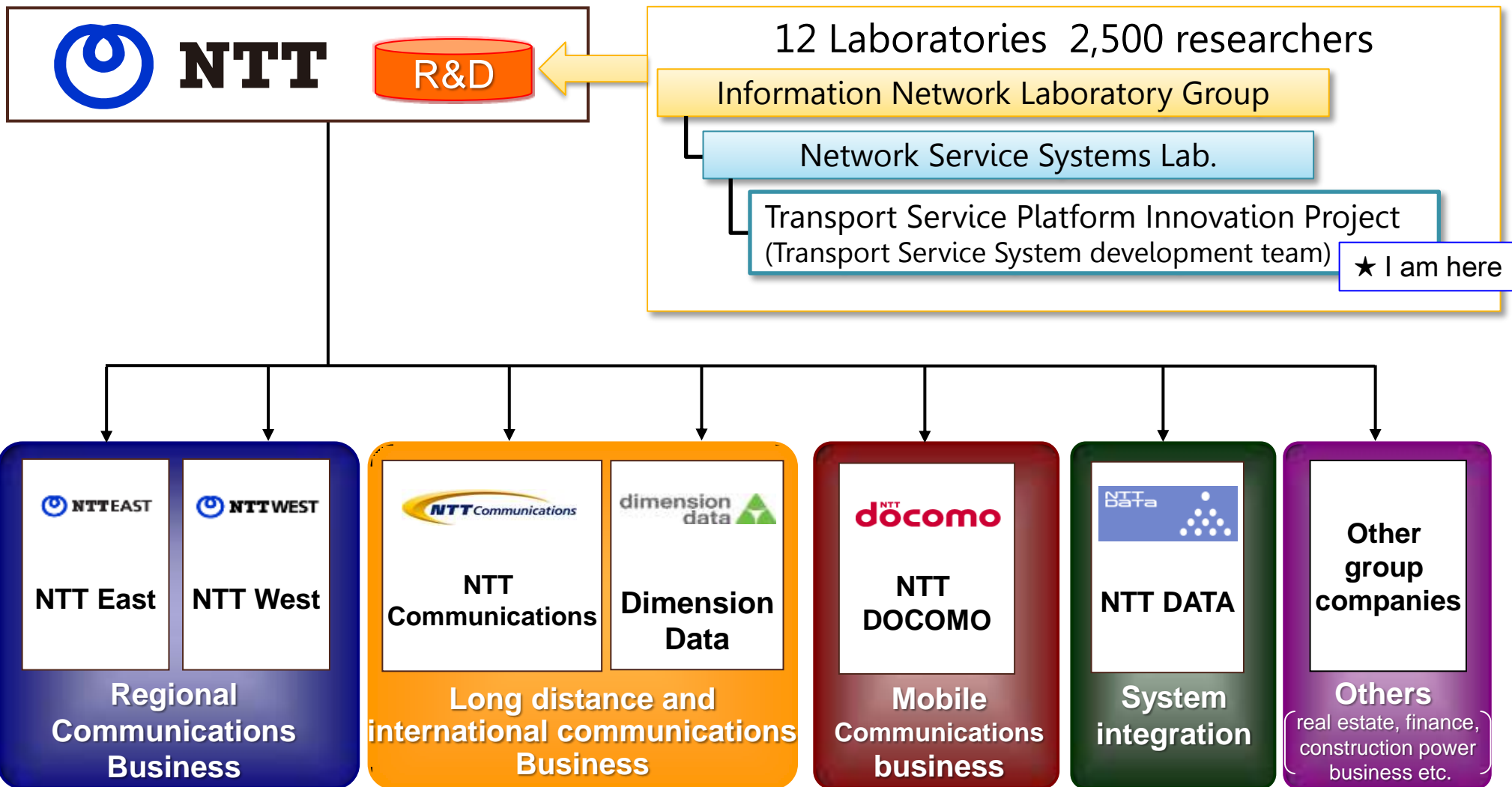
April 19th-20th, 2018

NTT Network Service Systems Labs.
Satoshi Nishiyama

NTT Group

NTT Group Holding Company

NTT R&D

12 Laboratories 2,500 researchers

Information Network Laboratory Group

Network Service Systems Lab.

Transport Service Platform Innovation Project
(Transport Service System development team)

★ I am here

NTT EAST	NTT WEST
NTT East	**NTT West**

Regional Communications Business

NTT Communications	dimension data
NTT Communications	**Dimension Data**

Long distance and international communications Business

docomo
NTT DOCOMO

Mobile Communications business

NTT DATA
NTT DATA

System integration

Other group companies

Others
real estate, finance, construction power business etc.

Agenda

- **Vision of NTT Laboratories for Stratum**
- **Stratum Use-cases**
  - Thin-model cases
  - Thick-model cases
- **Current Plan for testing and demonstrating Stratum**
  - Lab-Testing plan
    - Use-case feasibility on Stratum
    - Interoperability test with Stratum and Smart-NIC
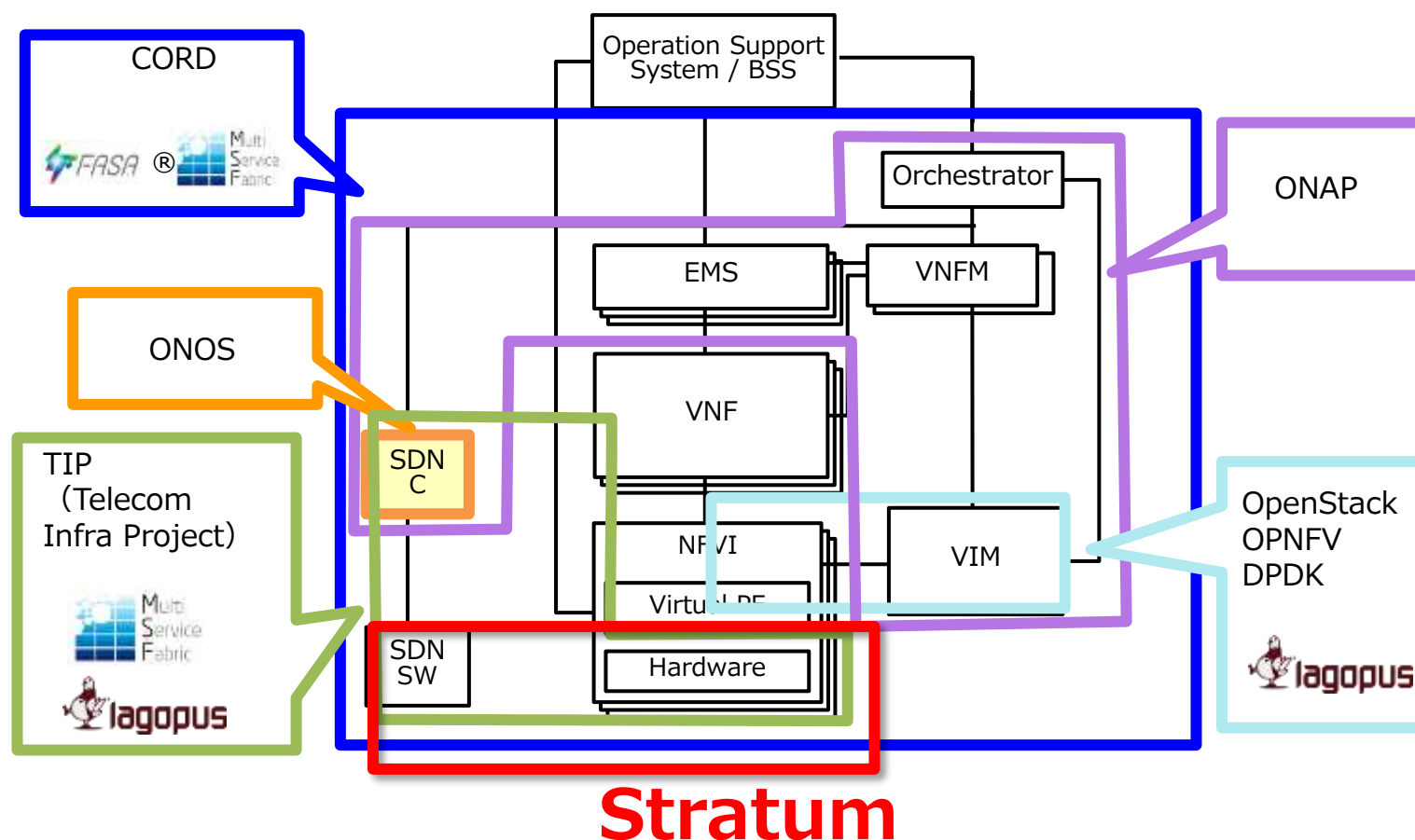
NTT's Network R&D Vision

- **Development transformation for Network systems with open community**
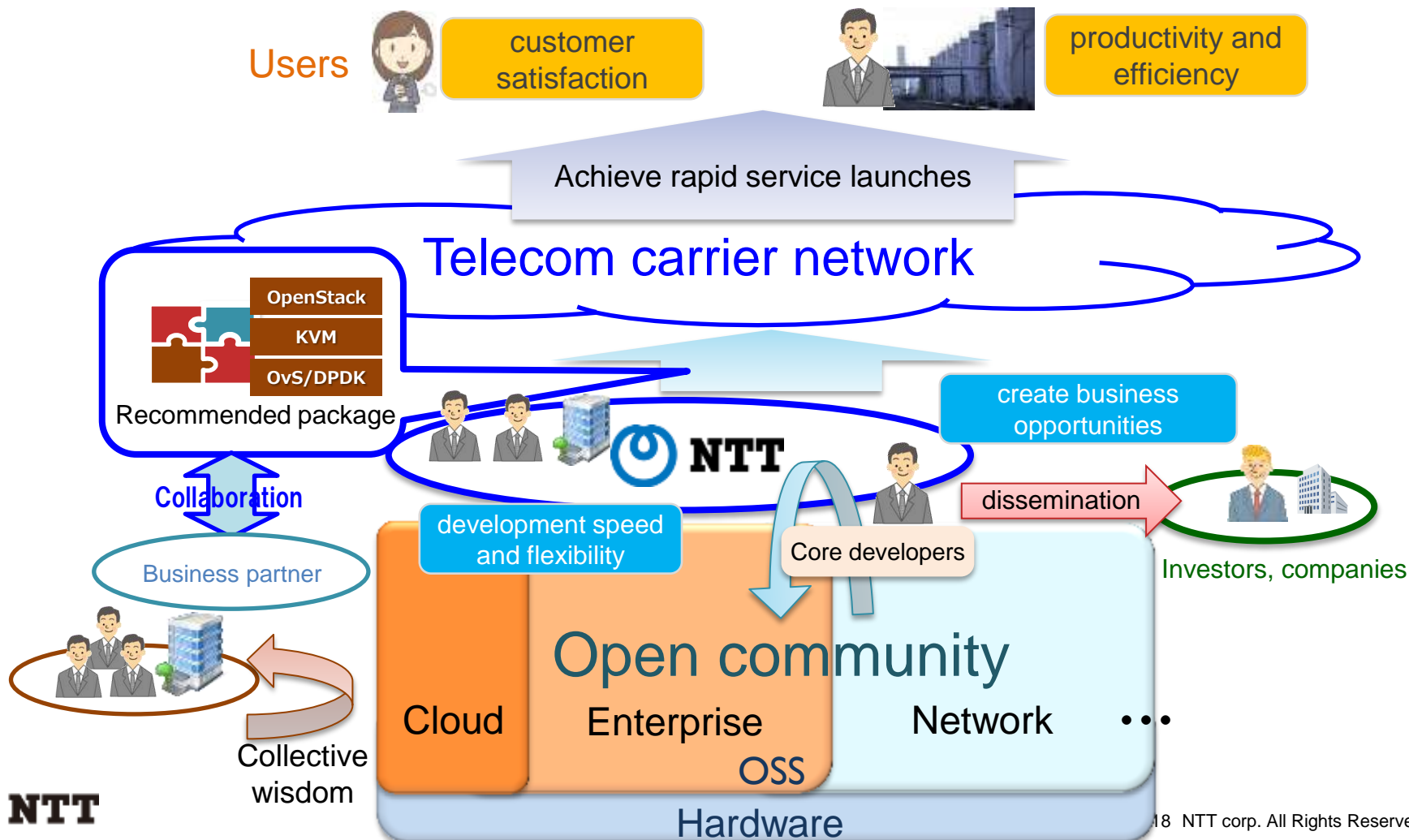
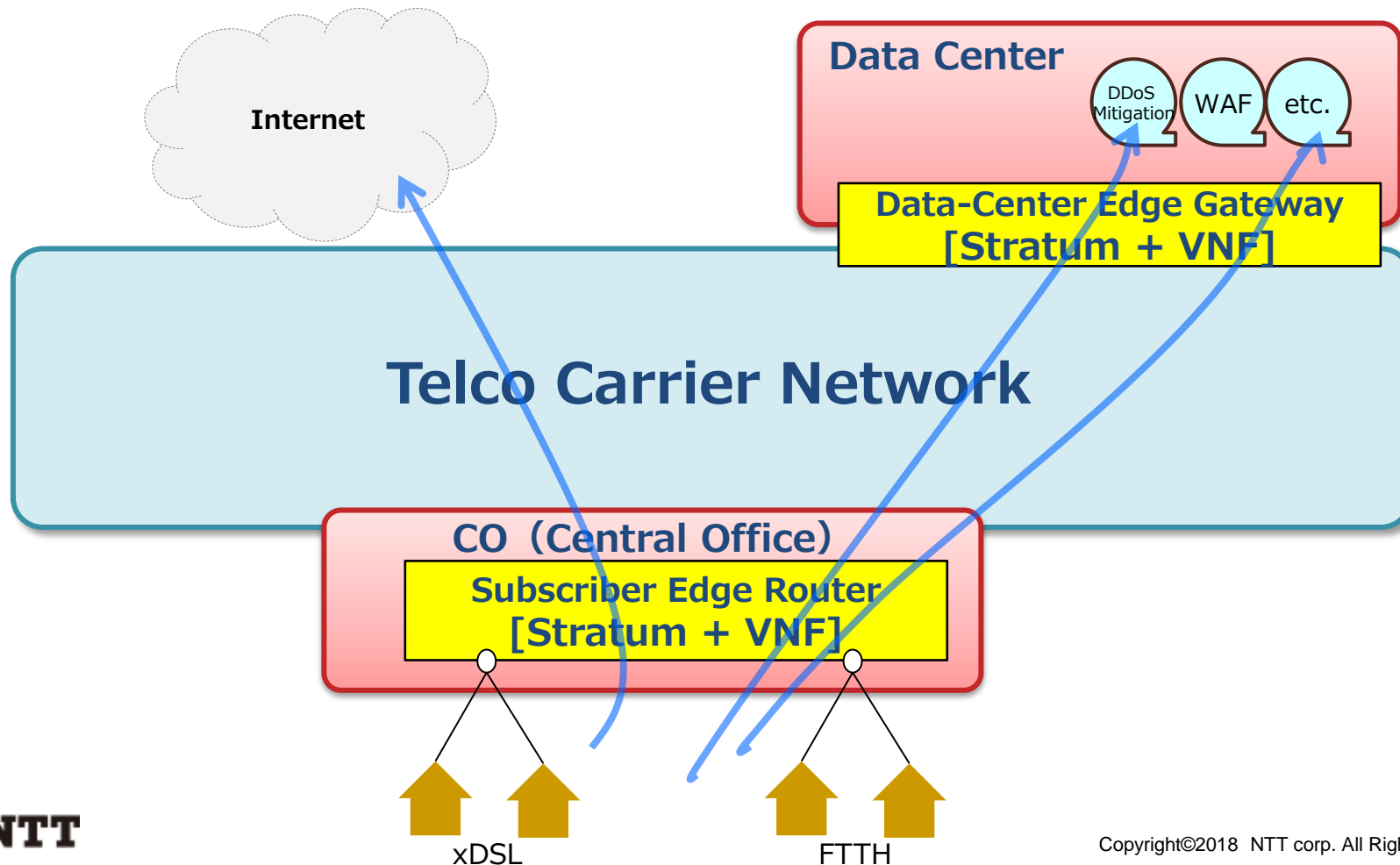# Network service on open-source software

- **Enhance network-service flexibility with open-source**
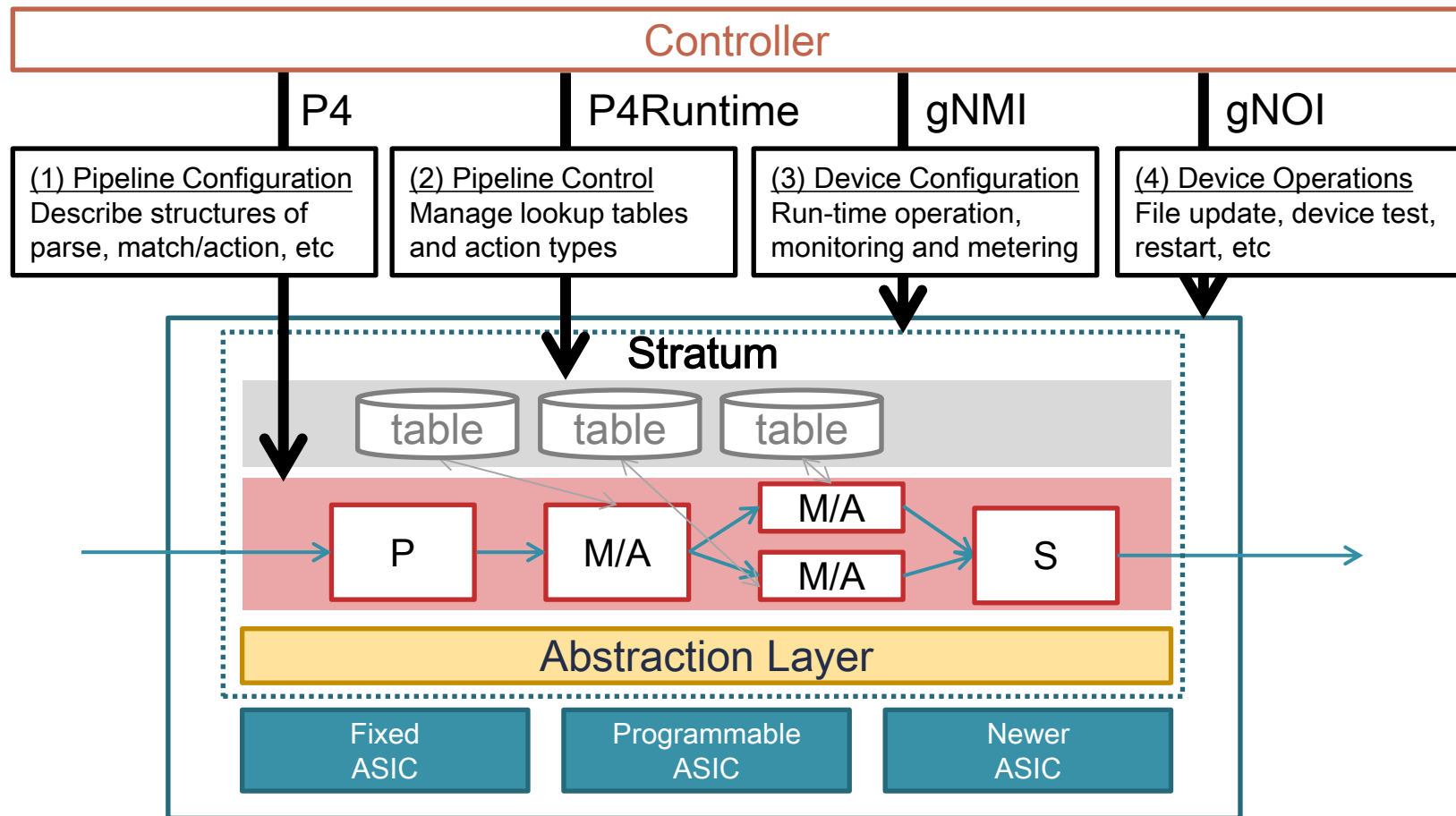
Stratum on Telco Carrier Networks

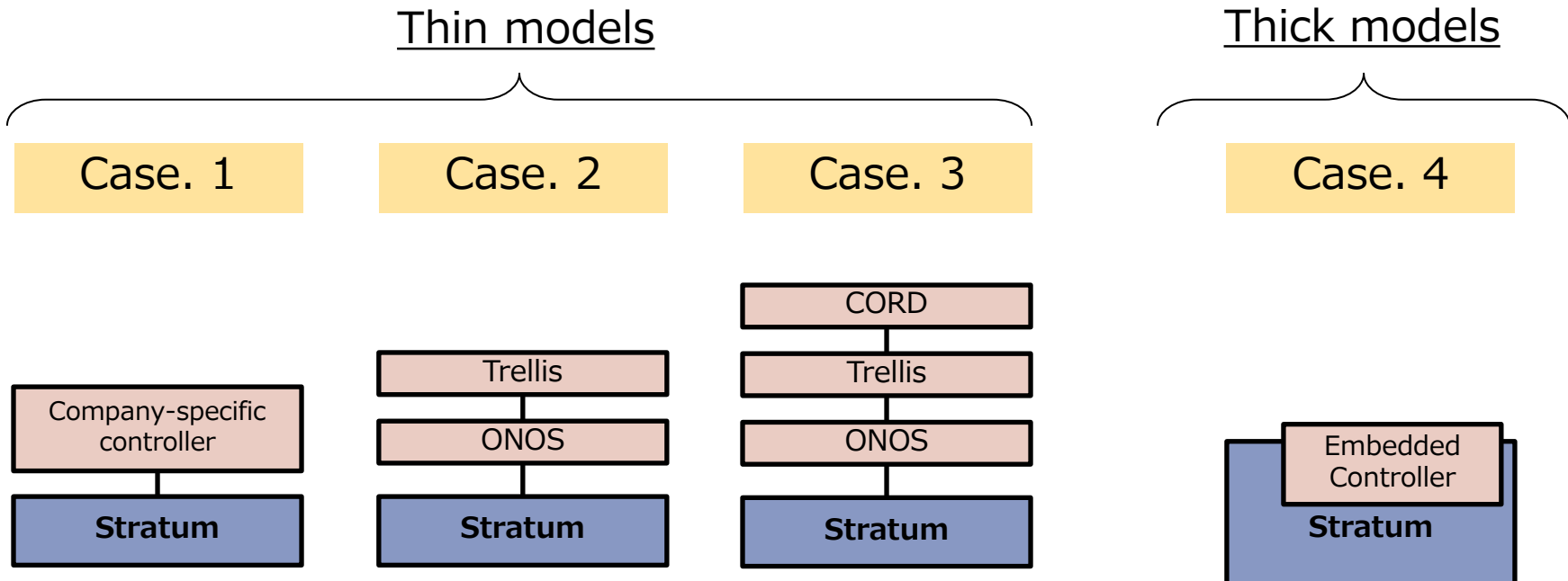- **Future carrier networks require programmability for Subscriber Edge and Data-Center Edge**

Stratum overview

- **Stratum integrates pipeline definition/control and lifecycle management**

Stratum Use-cases

- **Stratum has 4 use-cases to integrate control plane**
- **NTT expects both of Thin/Thick models**

Thin models

Thick models

| Case. 1 | Case. 2 | Case. 3 | Case. 4 |

```
                                    CORD
                    Trellis         Trellis
Company-specific
   controller        ONOS            ONOS          Embedded
                                                   Controller
   Stratum          Stratum         Stratum         Stratum
```

Stratum Use-cases in NTT Labs.

Thin Model

1. Service Chaining and Scaling Edge Gateway
2. DDoS Detection and Steering Function

Thick Model

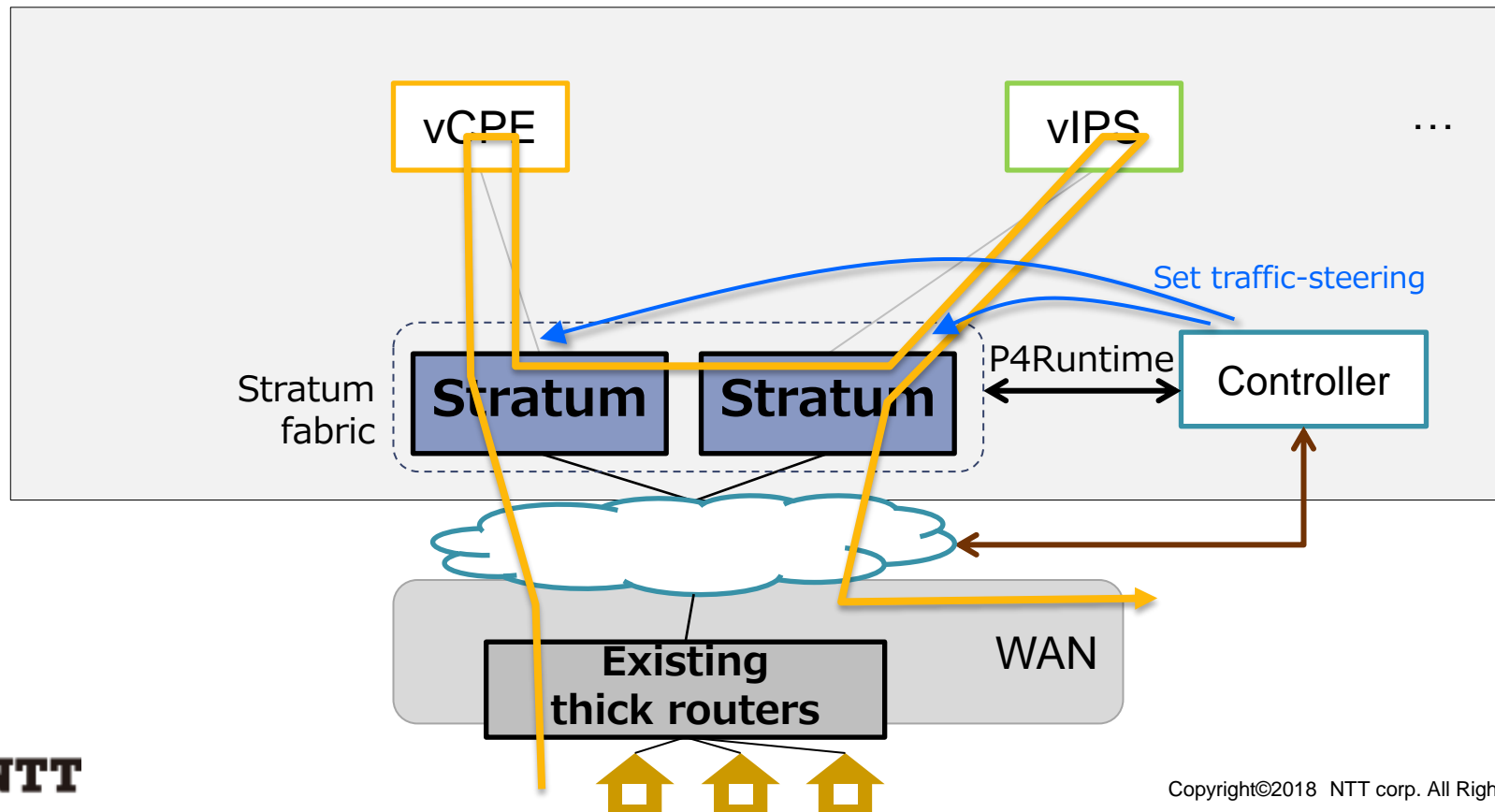3. Service Edge Router on Fixed Networks
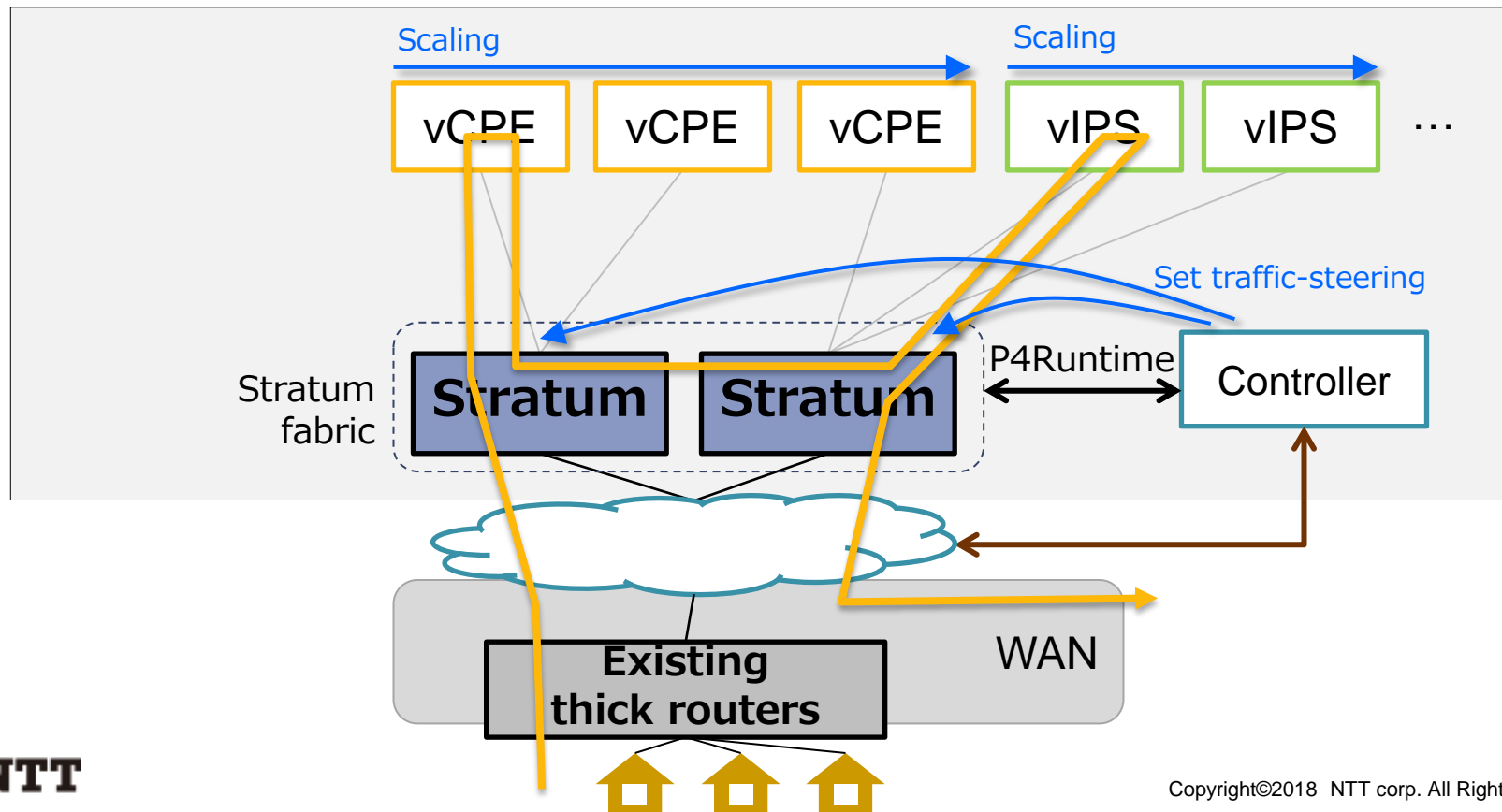4. Legacy Function Migration

Service Chaining and Scaling Edge Gateway

- **Flexible service function chaining**
- **Auto chaining/scaling**
- **In-band telemetry between VNFs**

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Service Chaining and Scaling Edge Gateway

- **Flexible service function chaining**
- **Auto chaining/scaling**
- **In-band telemetry between VNFs**
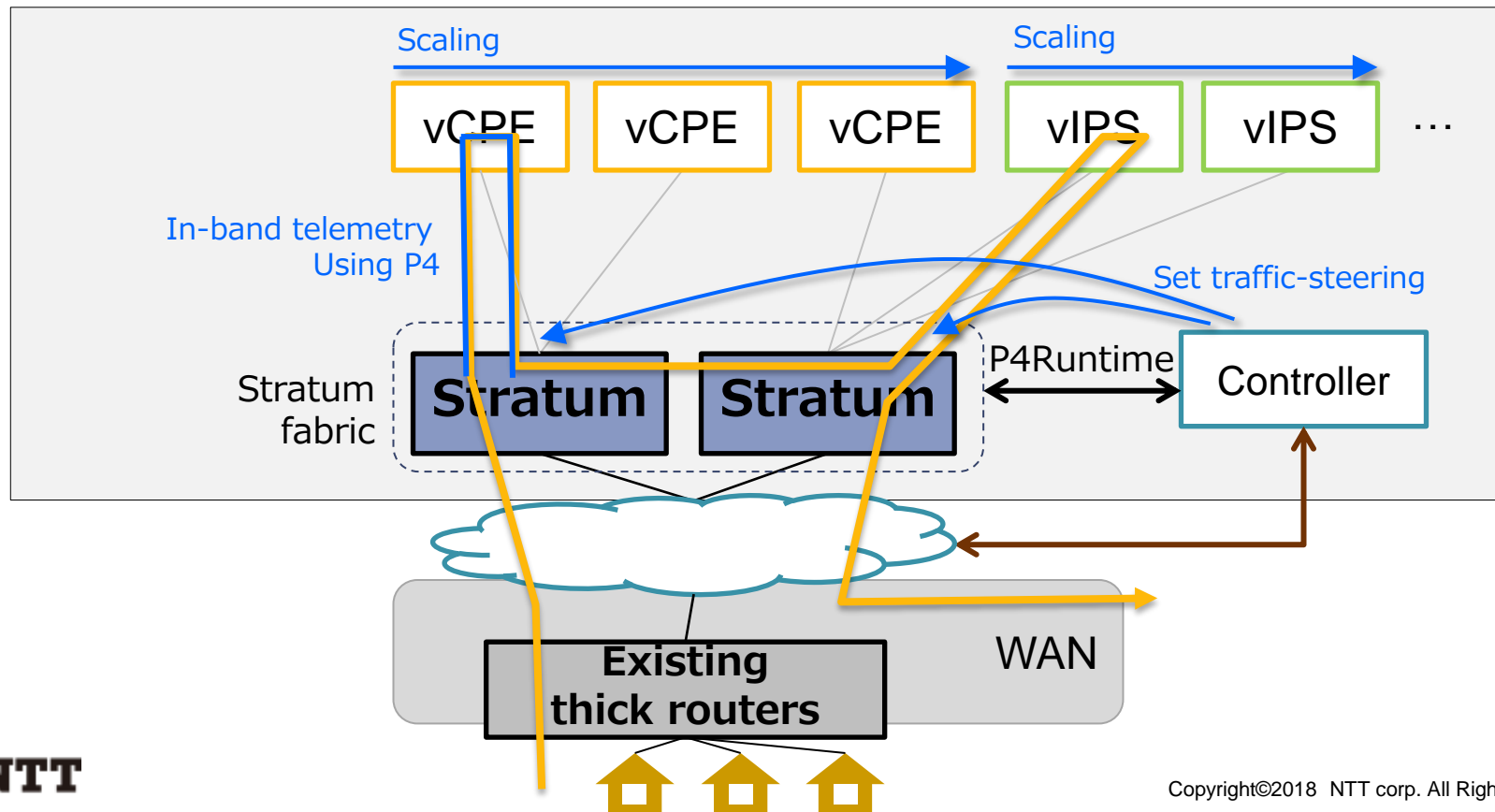
Service Chaining and Scaling Edge Gateway

- **Flexible service function chaining**
- **Auto chaining/scaling**
- **In-band telemetry between VNFs**
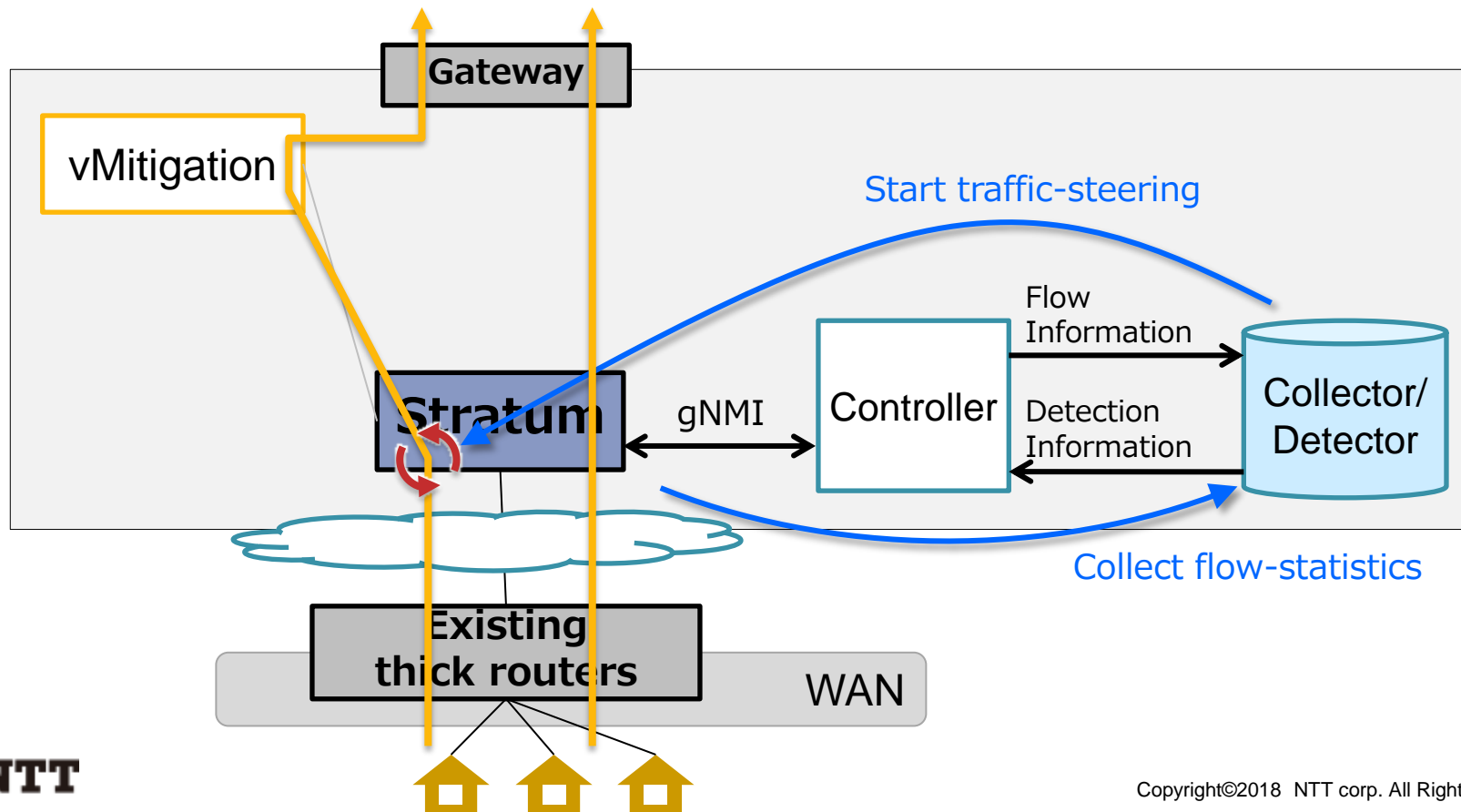
Service Chaining and Scaling Edge Gateway

- **Flexible service function chaining**
- **Auto chaining/scaling**
- **In-band telemetry between VNFs**

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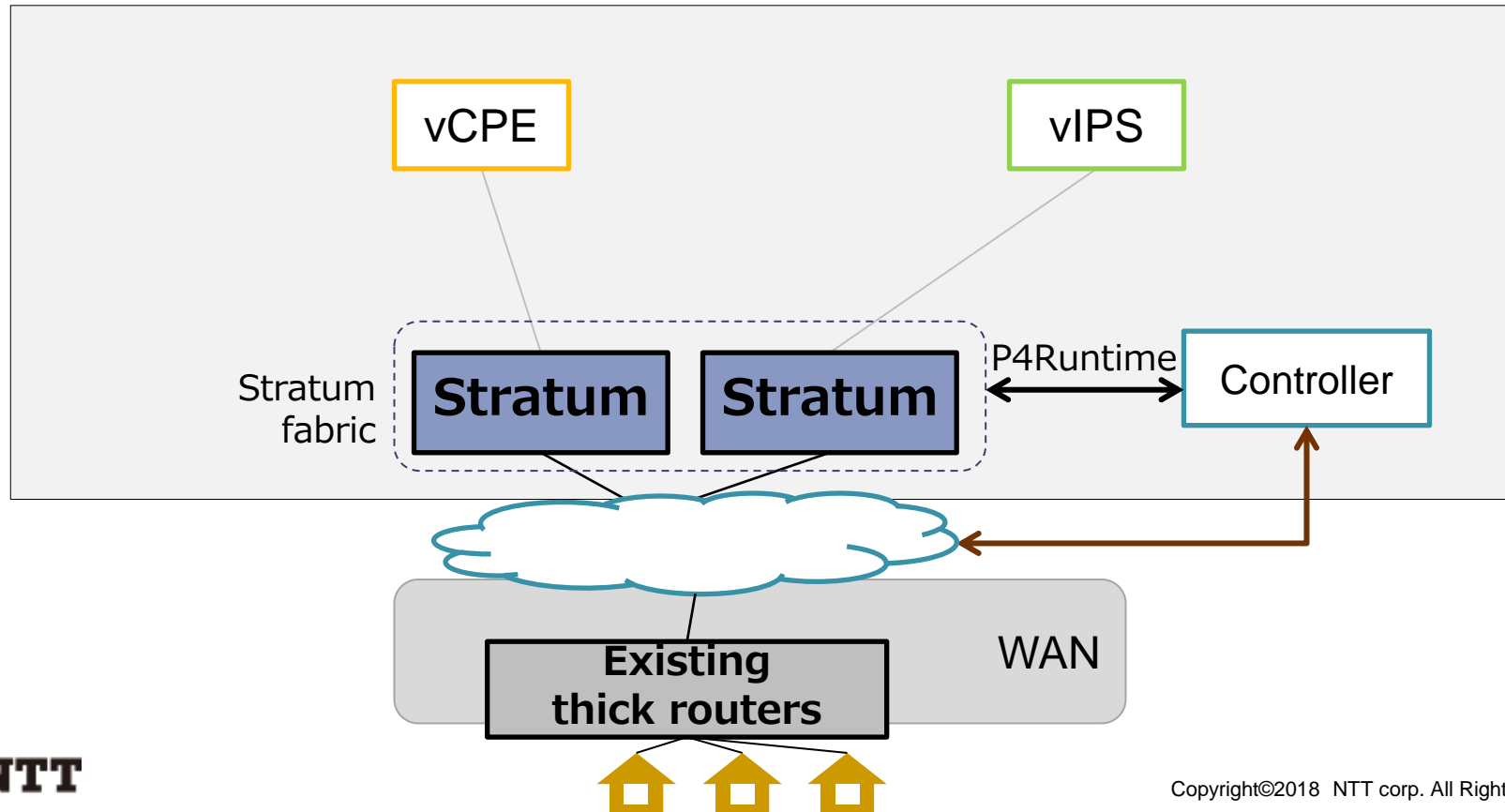
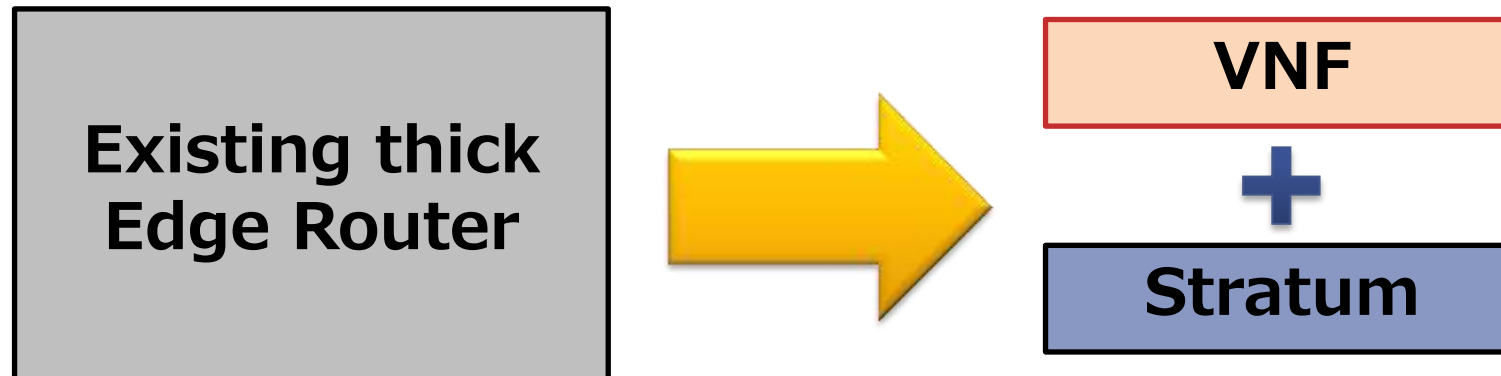# DDoS Detection and Steering Function

- **Collect flow-statistics from stratum switches**
- **Steering traffic to mitigation function when collector detects flow burst**
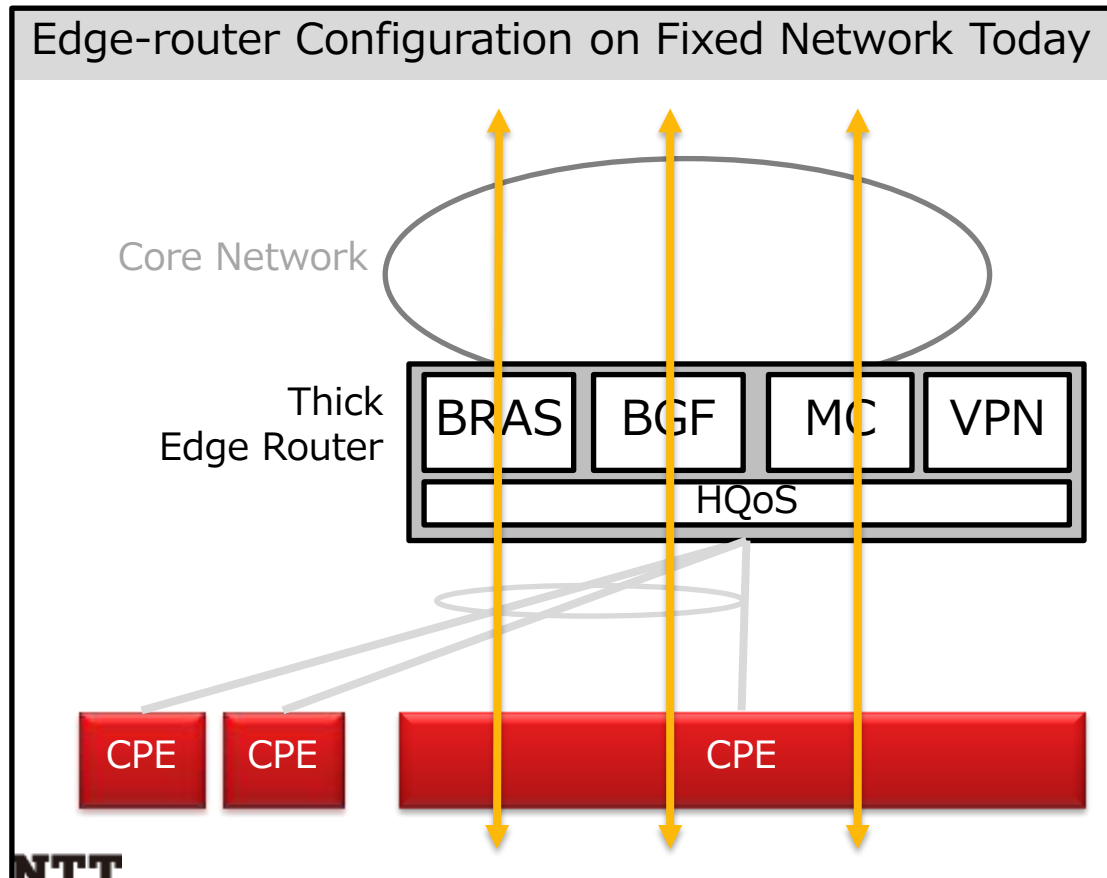
Edge Router on Fixed Networks

- **There are thousands of NTT buildings that has the edge-router(s)**
- **Can edge-routers be replaced by Stratum?**

Existing thick Edge Router ➡️ **VNF** + **Stratum**

Today's Service Edge Router

- **Edge-router contains service functions (BRAS/BGF/Video-Multicast/VPN-GW…) and Hierarchal QoS function**

Edge-router Configuration on Fixed Network Today

Core Network

Thick Edge Router | BRAS | BGF | MC | VPN

HQoS

CPE   CPE   CPE

Service Functions

BRAS:
- PPPoE termination
- AAA(Radius)

BGF:
- NAPT
- Flow-based shaping
- Diffserv

MC(Video Multicast):
- PIM/MLD
- IP Multicast

VPN-GW
- Tunnel termination
- Dynamic routing
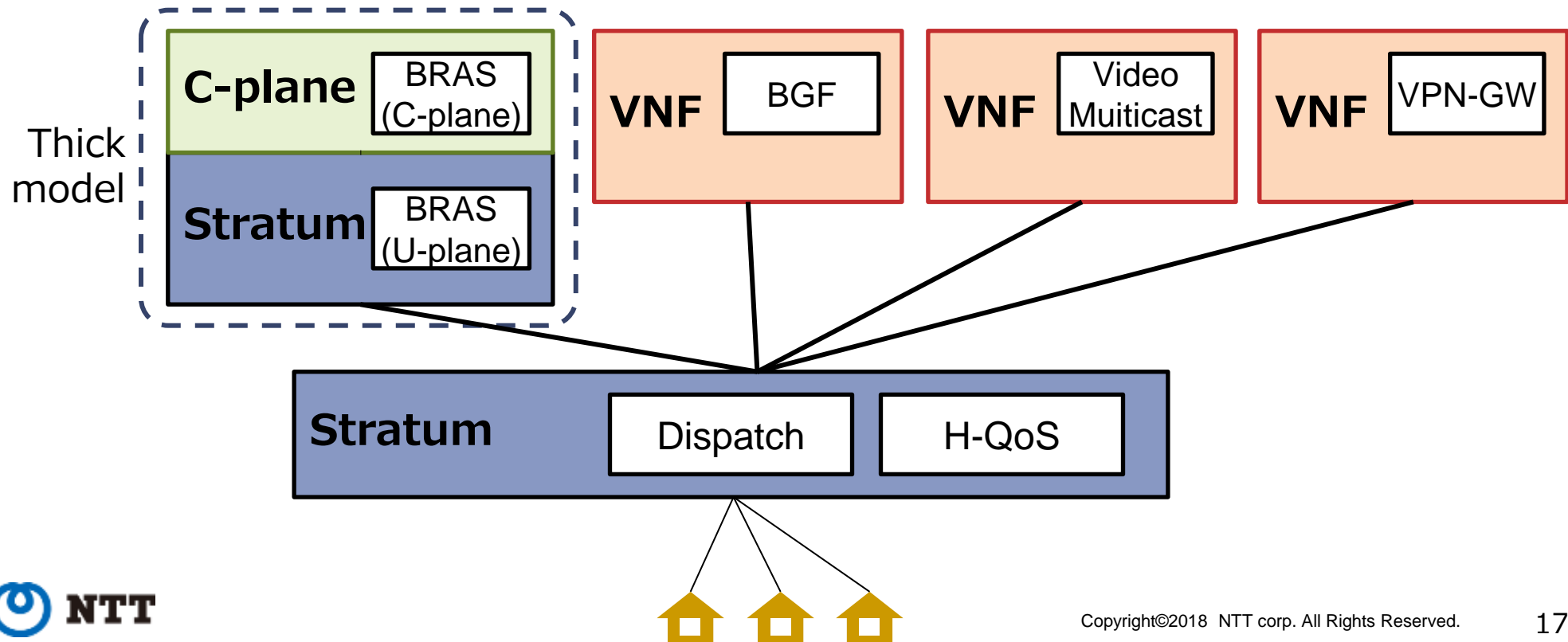
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Edge-router using Stratum

- **Architecture:**
  - Dispatch and Service/User-oriented QoS on Stratum
  - Accelerating U-plane function for each services
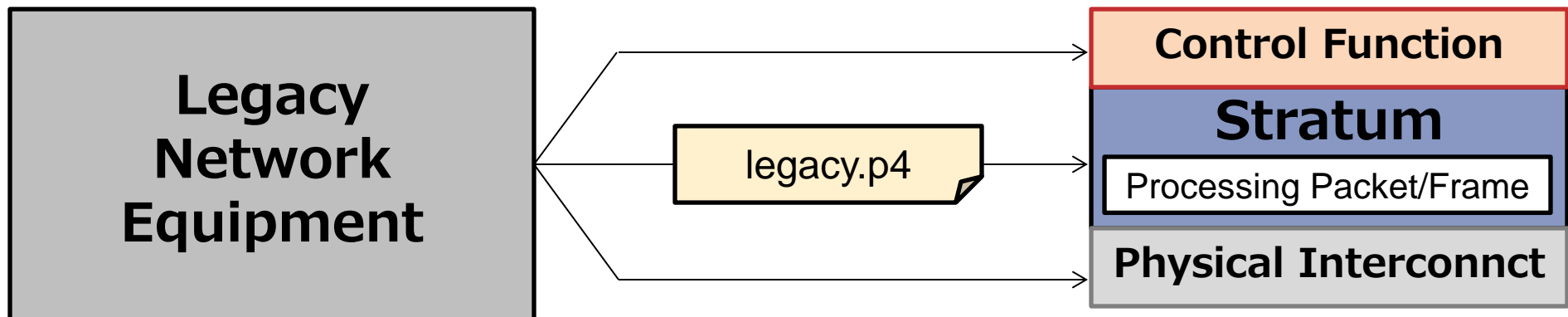- **Challenges/Issues**
  - Feasibility of Dispatch/HQoS on switch-chip
  - …

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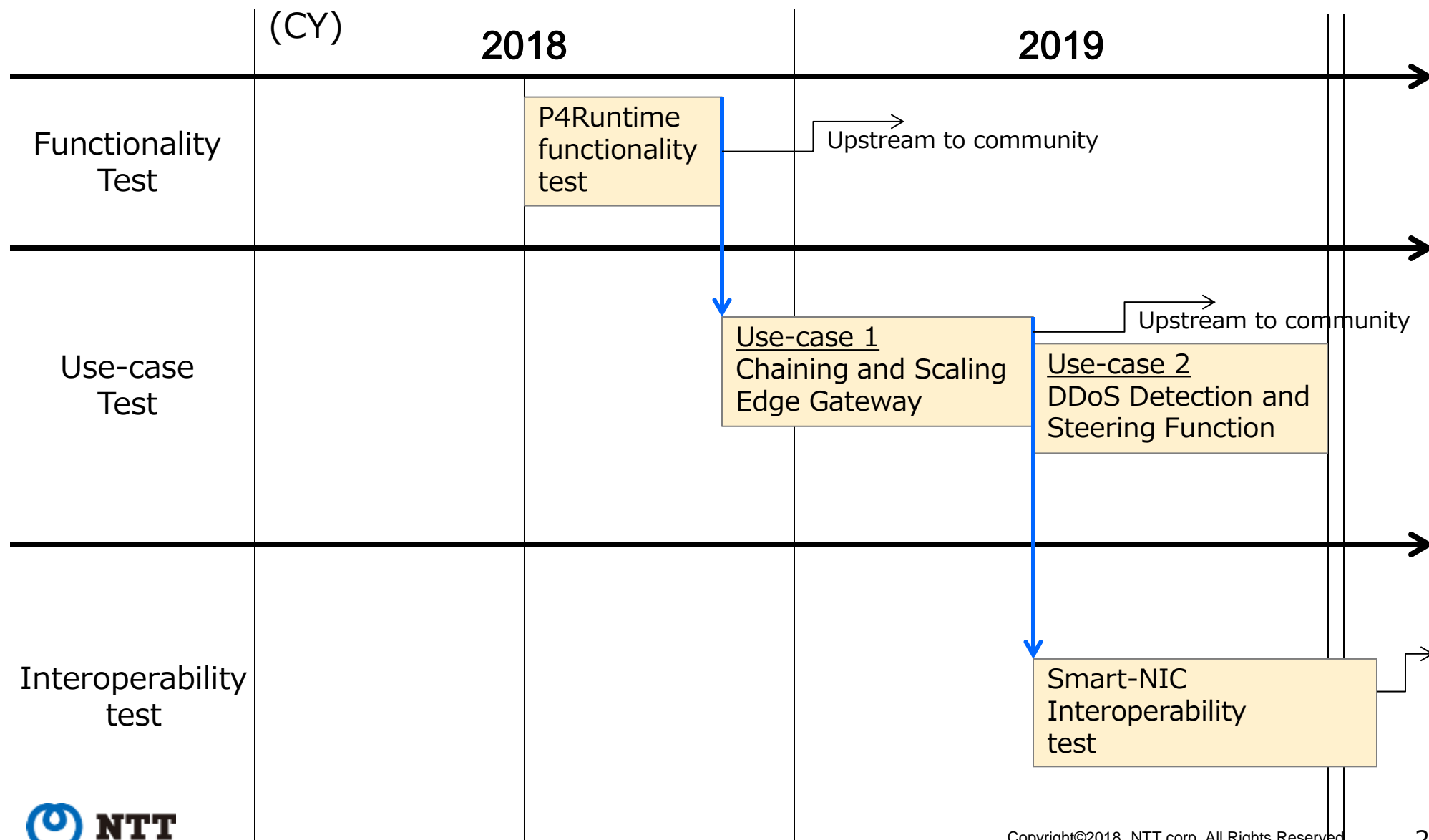# Legacy function migration

- **There are many "legacy" services provided form telco carrier operators**
  - Non-IP Protocol
  - 10years old, 20years old, and more
  - Special(dedicated) interfaces
- **Necessity to replace old equipment without changing interfaces and providing functions**

Current Plan for testing and demonstrating Stratum

Lab Testing Timeline (under planning)

(CY)

	2018	2019
Functionality Test	P4Runtime functionality test	Upstream to community
Use-case Test	Use-case 1 Chaining and Scaling Edge Gateway	Use-case 2 DDoS Detection and Steering Function — Upstream to community
Interoperability test		Smart-NIC Interoperability test

NTT

Innovative R&D by NTT

P4Runtime functionality test

- **P4Runtime L2/L3/ACL Functionality test with ONOS or some gRPC Implementation**

Physical Server

P4Runtime Controller
(e.g. ONOS)

L2/L3/ACL Settings

Physical Switch
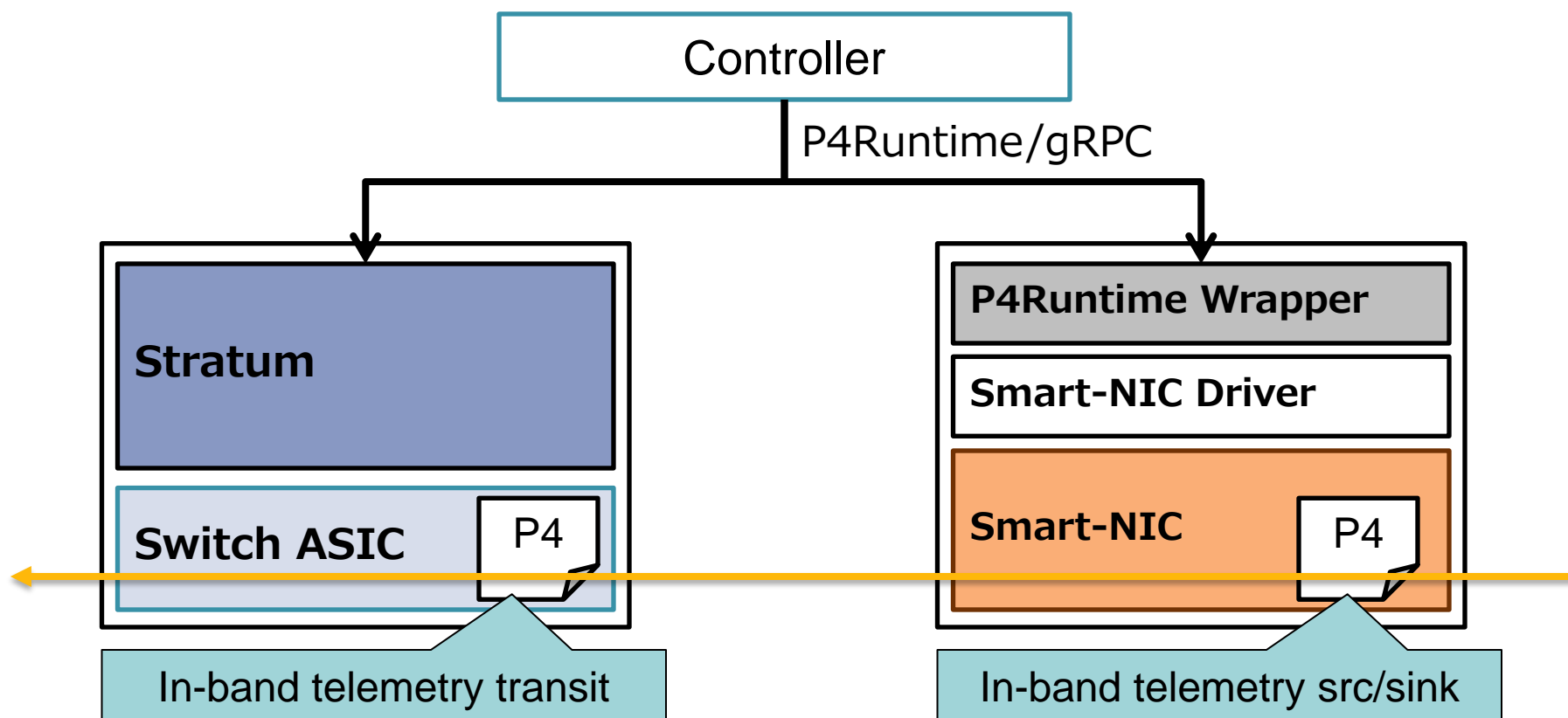
Stratum

Switch ASIC

Traffic Generator
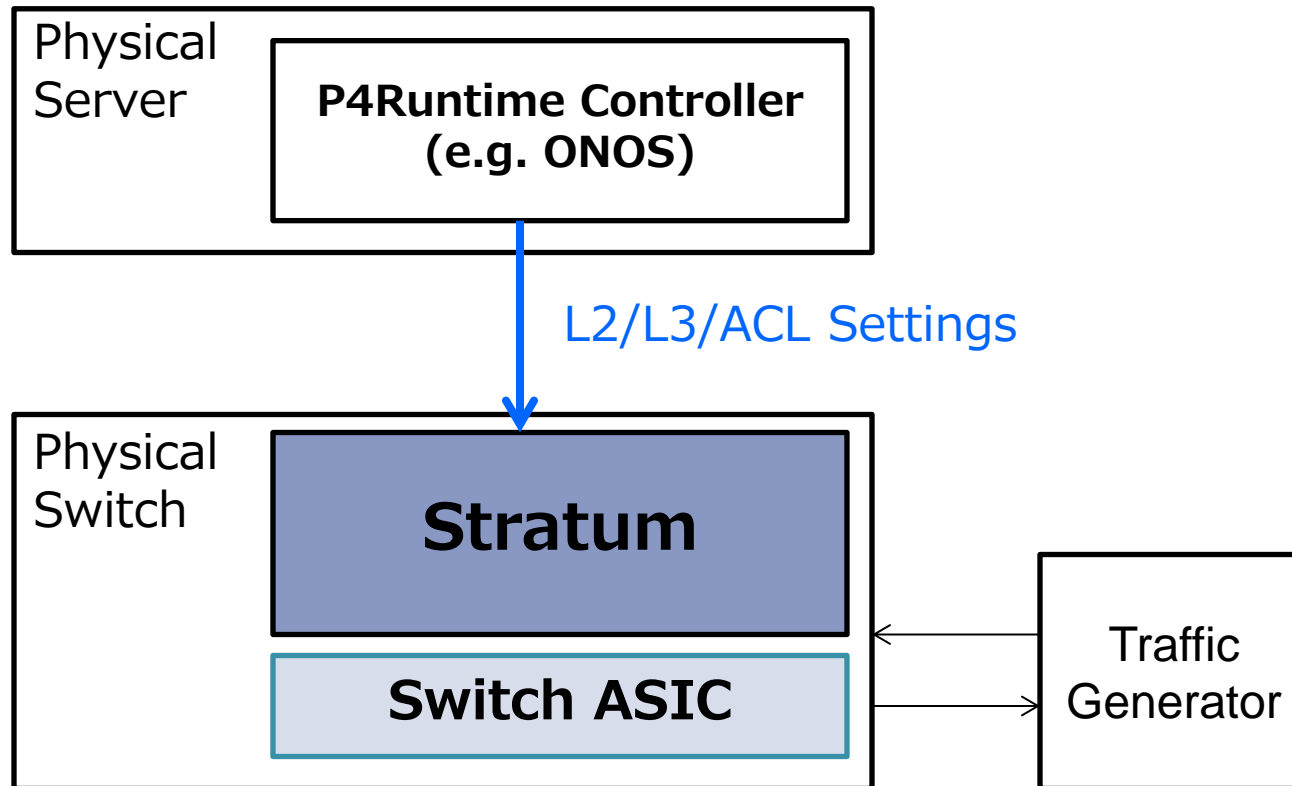
Use-case test

- **Integrating VNFs and Stratum**
- **Verify P4Runtime feasibility and P4 switches**
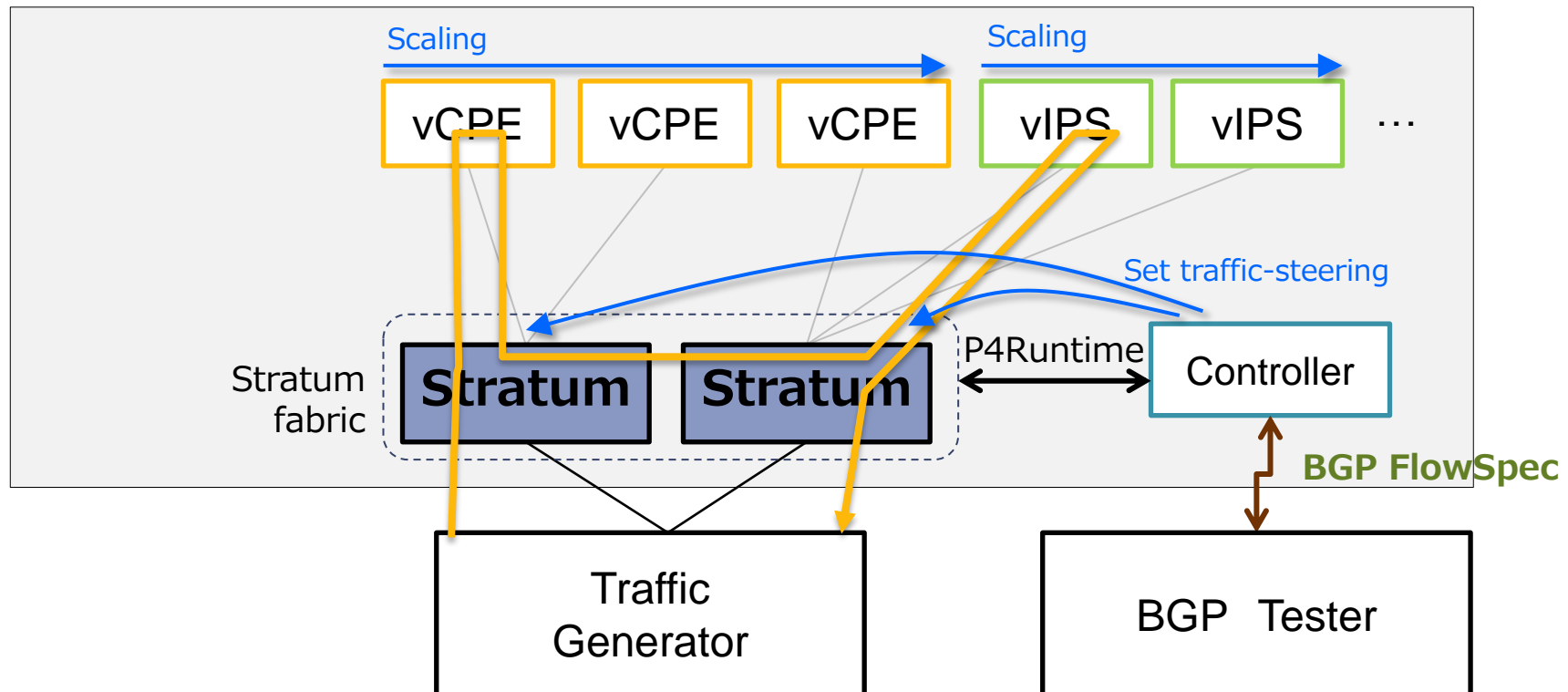
Interoperability test

- **Integrating Stratum and Smart-NIC**
- **Verify P4switch-P4NIC interoperability**

```
                        ┌─────────────────┐
                        │   Controller    │
                        └─────────────────┘
                              P4Runtime/gRPC
```

Stratum	P4Runtime Wrapper
	Smart-NIC Driver
Switch ASIC — P4	Smart-NIC — P4

In-band telemetry transit

In-band telemetry src/sink

Conclusion and future-plan

- **Stratum project may be applicable to many NTT network use-cases**
- **Stratum is ongoing now. We would like to contribute to stratum with lab-testing and trials**