

All-Photonics Network (APN) Common Infrastructure Technology

- ◆ Project: All-Photonics Network Common Infrastructure Technology
 - ~ Control Technologies and Equipment Configuration Technologies for Interconnection of All-Photonics Networks among Multiple Operators ~
- ◆ Project members: NTT, KDDI, Fujitsu, NEC, Rakuten Mobile
- ◆ Project duration: From December 2024 for up to 5 years.

Project overview

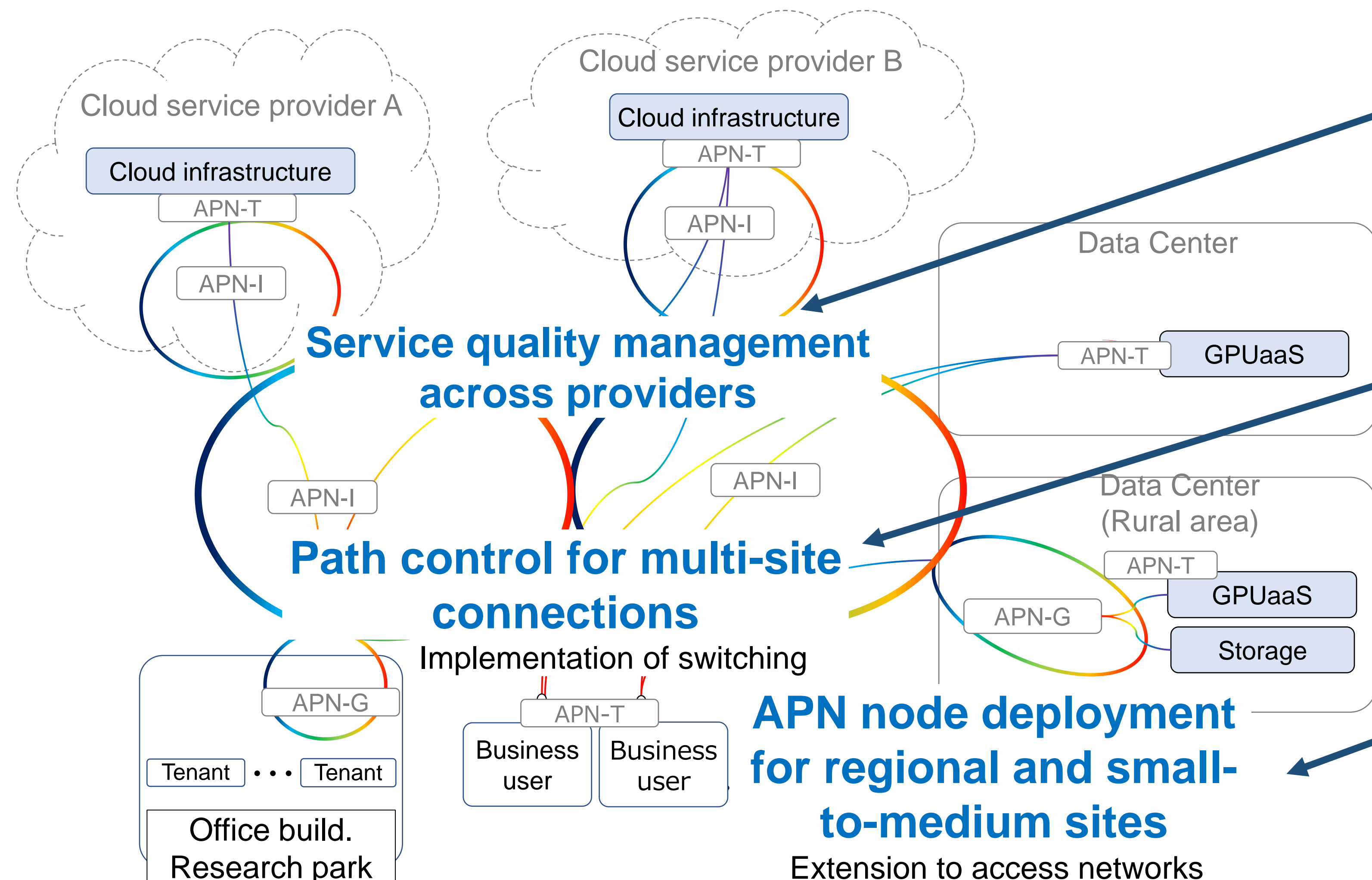
This research result was obtained from the commissioned research No. JPJ012368C09001 by NICT, Japan.

■ R&D Item 1. Formulation of the Overall Architecture for All-Photonics Networks

Develop an overall architecture for network interconnection spanning multiple operators.

Establish a comprehensive architecture that defines the required functions for all-photonics networks and optimal equipment configurations.

■ R&D Item 2. All-Photonics Network Common Infrastructure



(a) Photonic Network Federation

Enable cooperation among multiple operators' APNs to ensure fault tolerance and service quality.

➔ Realize an APN network that traverses multiple operators.

(b) Subchannel Circuit eXchange

Achieve communication according to user demands through logical circuit multiplexing layers over optical paths.

➔ Enable simultaneous use and flexible switching among multiple user clouds and data centers.

(c) Distributed ROADM

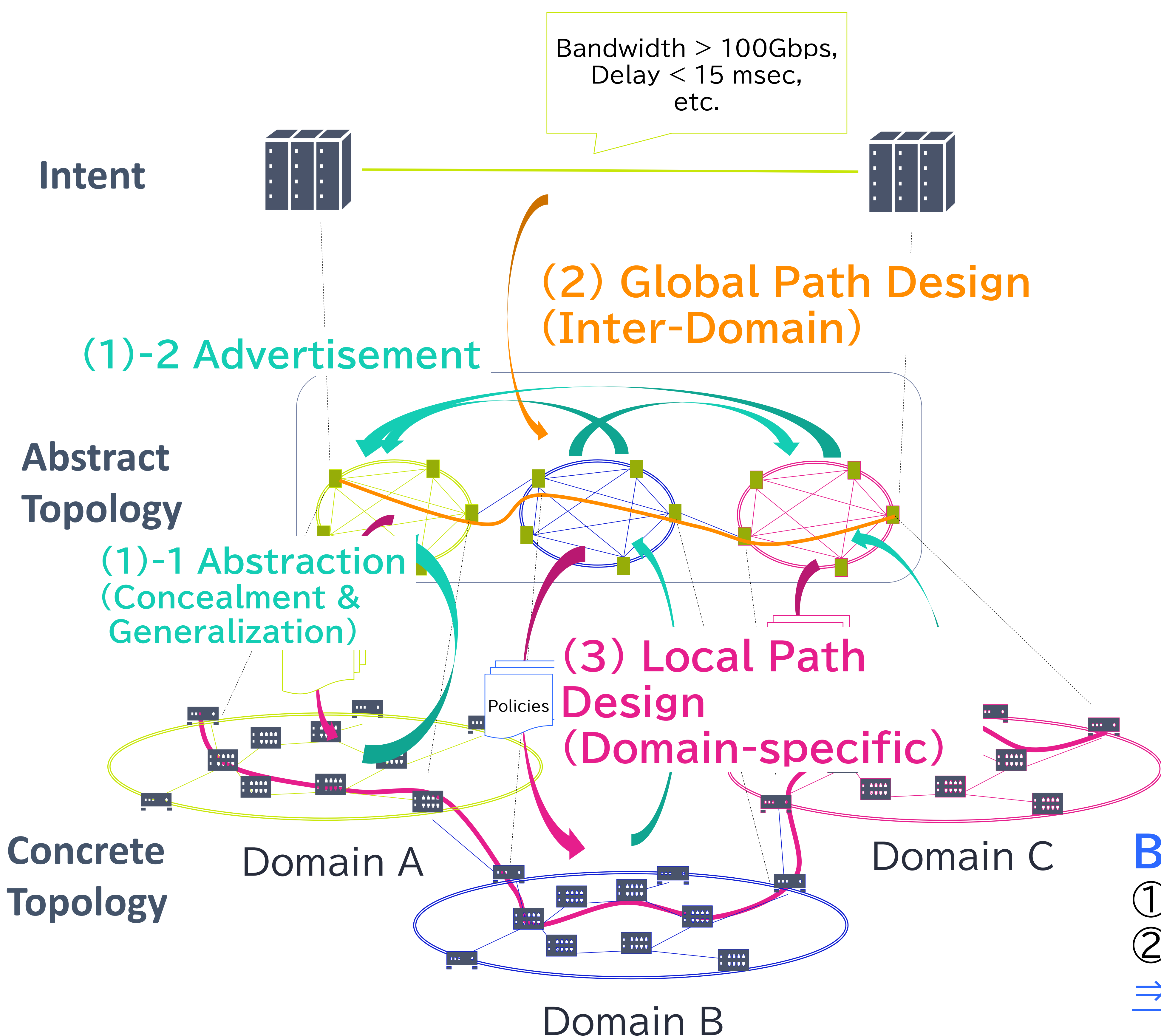
Develop APN nodes deployable to regional data centers and small- to medium-sized sites by applying high-density implementation and low power consumption technologies.

➔ Expand APN user base by reducing equipment footprint.

Two-Tier Path Design: A Proposal for Efficient optical path design across domains

Photonic Network Federation needs **Efficient optical path design across different domains**
→ Trying to achieve this by addressing the following two challenges with **the concept of Two-Tier Path Design**.

- ① Complexity in Considering Policies across multiple domain
- ② Restricted Information Sharing on physical network architecture



(1) Abstraction, Advertisement

Abstracting Concrete Topology using general metrics and Advertising Abstract Topology across domains

(2) Global Path Design

Inter-Domain path design in Aggregated Abstract Topology that fulfill Intent, using generalized metrics

(3) Local Path Design

Domain-specific path design in Concrete Topology based on Global Path Design results, considering the policies and physical devices and their interconnections

Benefits

- ① Simplify Policy Consideration
 - ② Keep physical network information Confidentiality
- ⇒ **Realize Efficient optical path design across domains**