IP-optical Networking for High Performance Network Virtualization

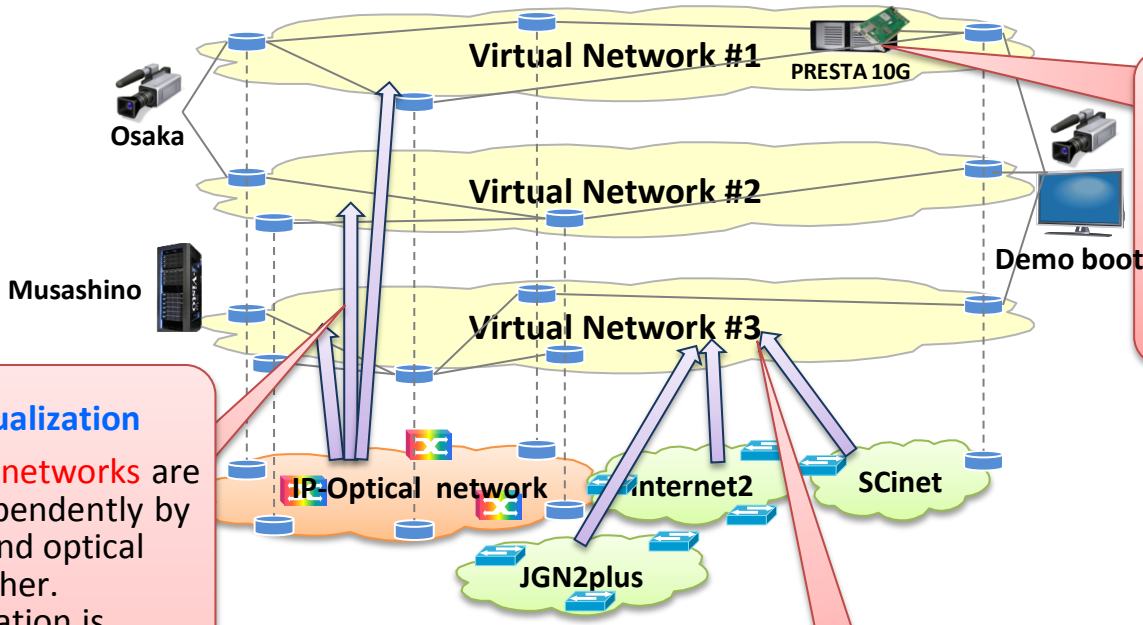
NTT laboratories, Japan

SC10　booth #1521

November 2010

Demonstration contents

We are demonstrating, as leading techniques in network virtualization field, a construction and optimization of multiple dedicated virtual networks upon a shared or several physical networks.

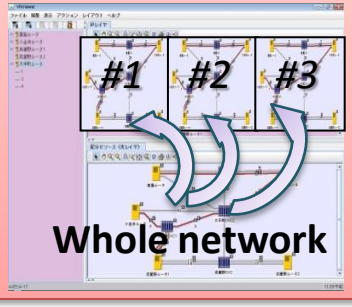


(3) micro-burst-aware VNT reconfiguration

- Info. is collected by high resolution monitoring system PRESTA10G
- Video degradation triggers topology changes.

(1) Network virtualization

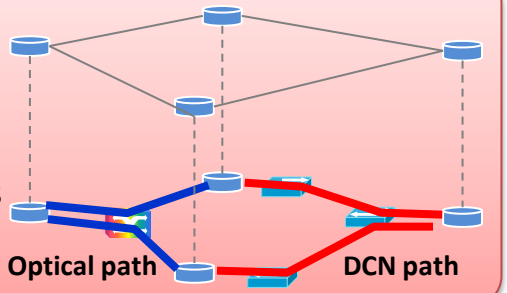
- Several virtual networks are operated independently by controlling IP and optical networks together.
- Resource allocation is dynamically optimized.



(2) Multi-domain virtual network

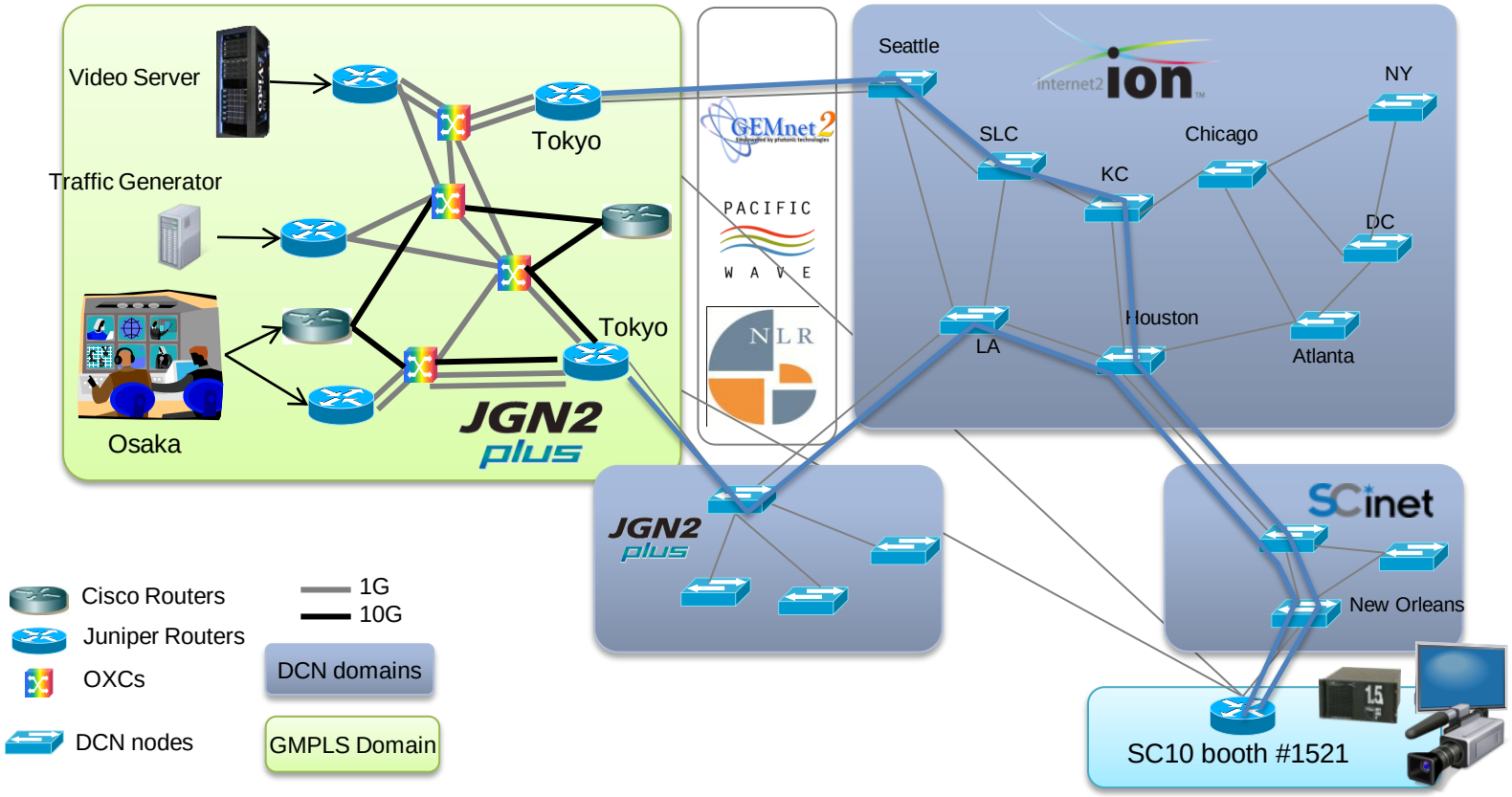
- Path is set-up in DCN domains using DCN signaling.
- A virtual network consists of DCN paths

DCN: Dynamic Circuit Network



Demonstration network

- **North America**
  - Static circuits: Pacific Wave, National Lambda Rail (NLR), SCinet
  - Dynamic paths: Internet2 ION (DCN service), SCinet (DCN service)
- **Japan**
  - GMPLS network with multi-vendor routers and OXCs



(1) Network virtualization

- **What is "network virtualization" ?**
  - A technology to construct multiple dedicated virtual networks operated independently upon a shared physical network.
- **Purposes**
  - Saves CAPEX by sharing physical network
  - Quick to launch network services
  - Flexible reaction against demand fluctuation
- **Novelty**
  - Existing virtual network techniques support only packet level such as IP and VLAN, and the networks share circuit bandwidth, which makes it difficult to operate each service independently and avoid traffic conflicts among them. ➔ Our technique makes virtual networks being isolated in an optical layer.
- **Features**

1. Control of optical paths and IP together
   - IP router pairs are connected by optical paths, and their combination constructs IP networks.

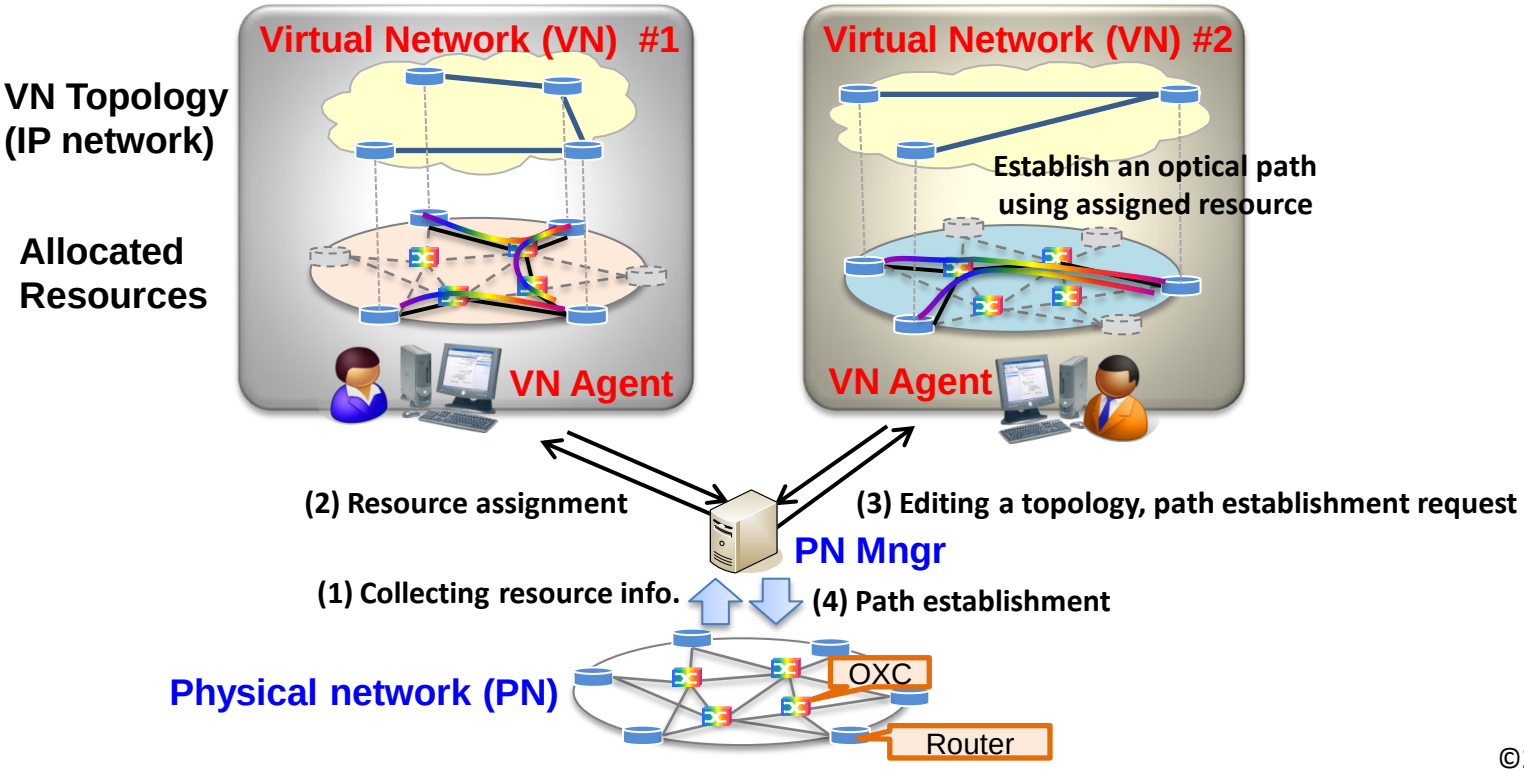
- **Quick to launch network services**
- **Avoid traffic conflicts and operate independently**

2. Resource management model
   - 【Operator】Set right to use resource
   - 【Virtual network】Given right to use resource
     After a resource assignment, paths are set.

- **Avoid resource competition**
- **Enable flexible resource reassignment**

(1) Network virtualization – system architecture

- Architecture separating **physical network management** (PN Mngr: setting nodes) and **virtual network management** (VN Agnt: network construction by users).
  - **Physical network management (PNMngr)**
    - Collecting physical network resource information and setting right to access
    - Order routers to establish paths
  - **Virtual network management (VNAgnt)**
    - Path/Topology edit using user-friendly GUI
    - Computation of optimized routers and topologies



(1) Network virtualization – resource management model

【Operator】Setting right to use resource

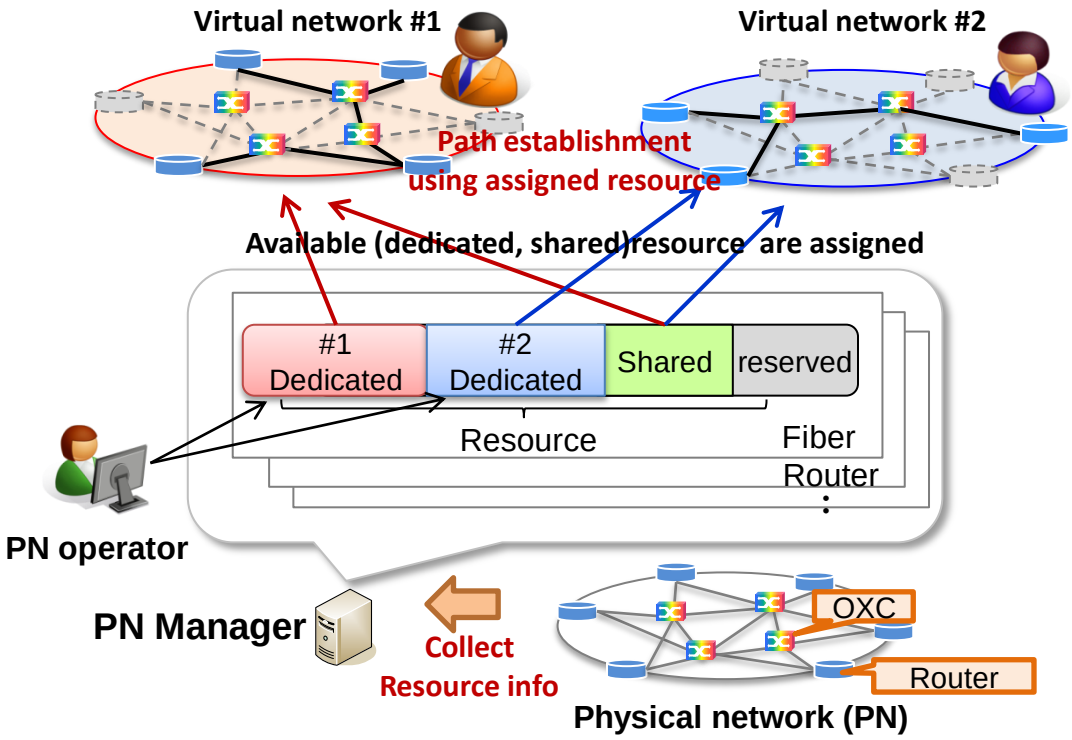
– No right (reserved) ⇔ right for only one virtual network (dedicated) ⇔ right for several virtual networks(shared)

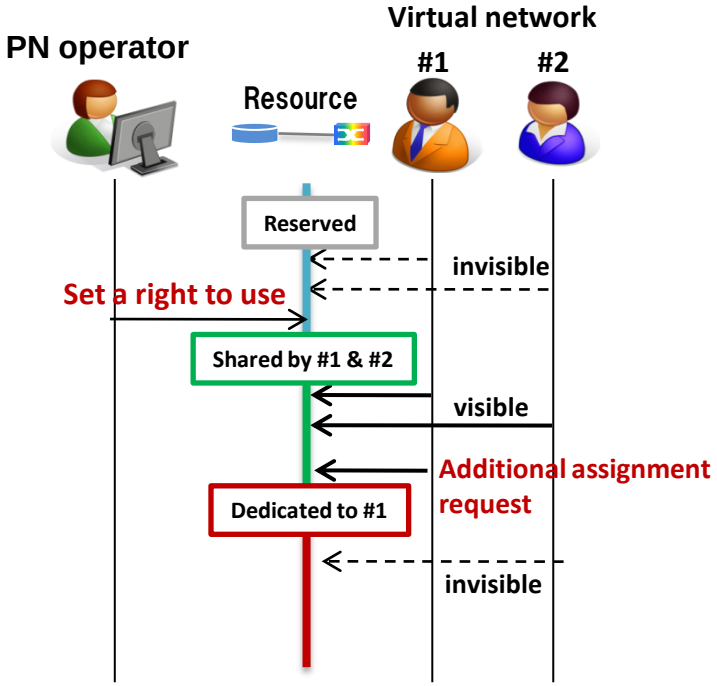
【Virtual network】Establish optical paths using available assigned network resource.

– Check unassigned resource

– Additional resource assignment

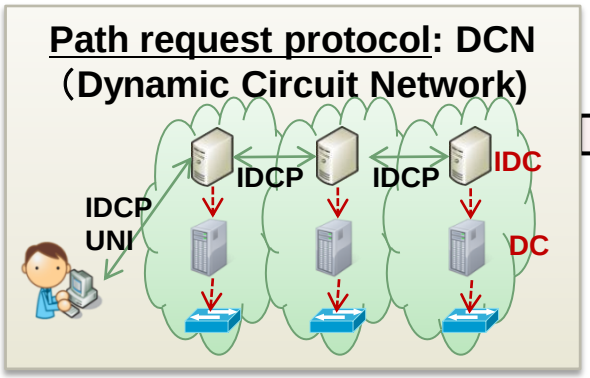
– Return resource

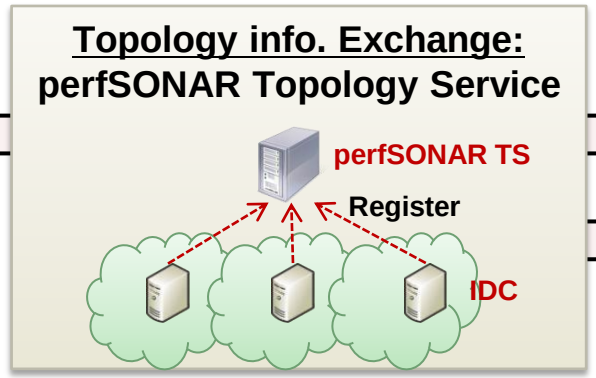


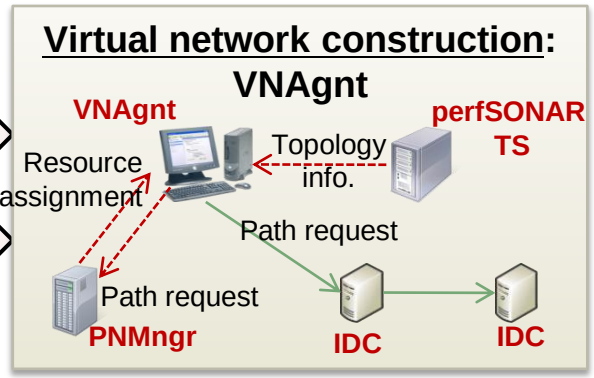


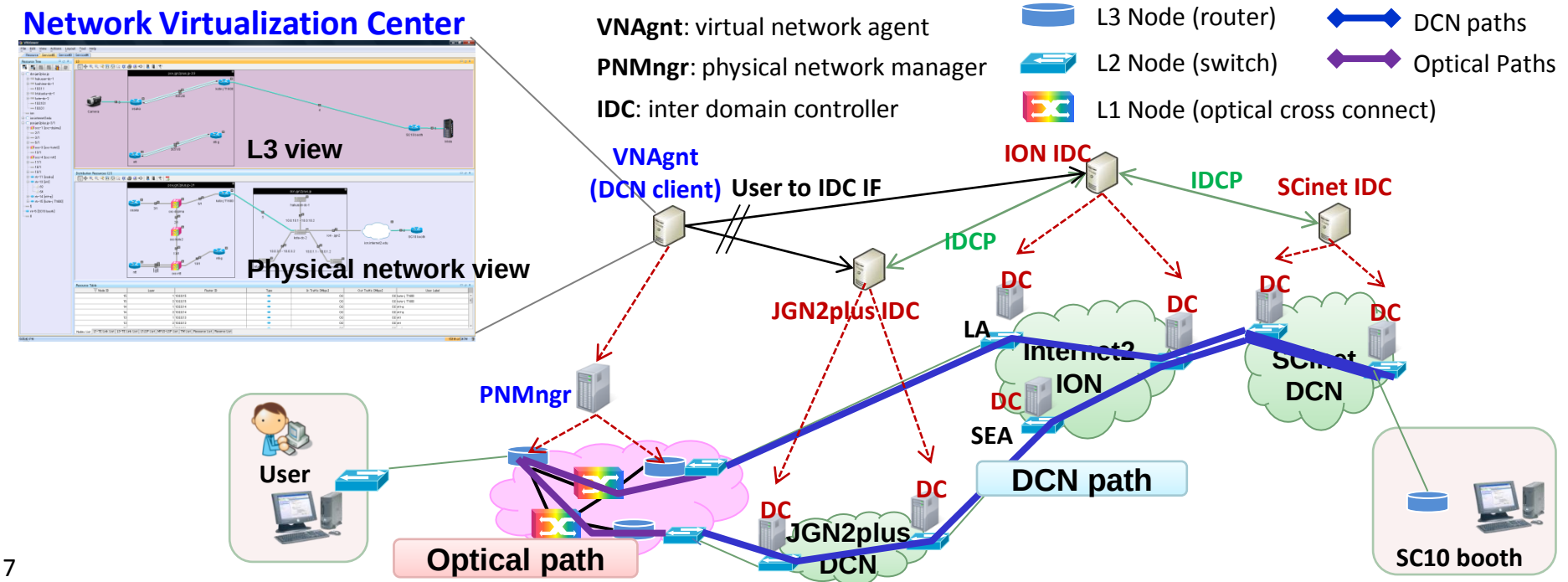
(2) Multi-domain network virtualization using DCN path resource

Construct multi-carrier inter-domain wide virtual IP topologies by establishing L1/L2 paths between routers using GMPLS and DCN, and using these paths as IP links.



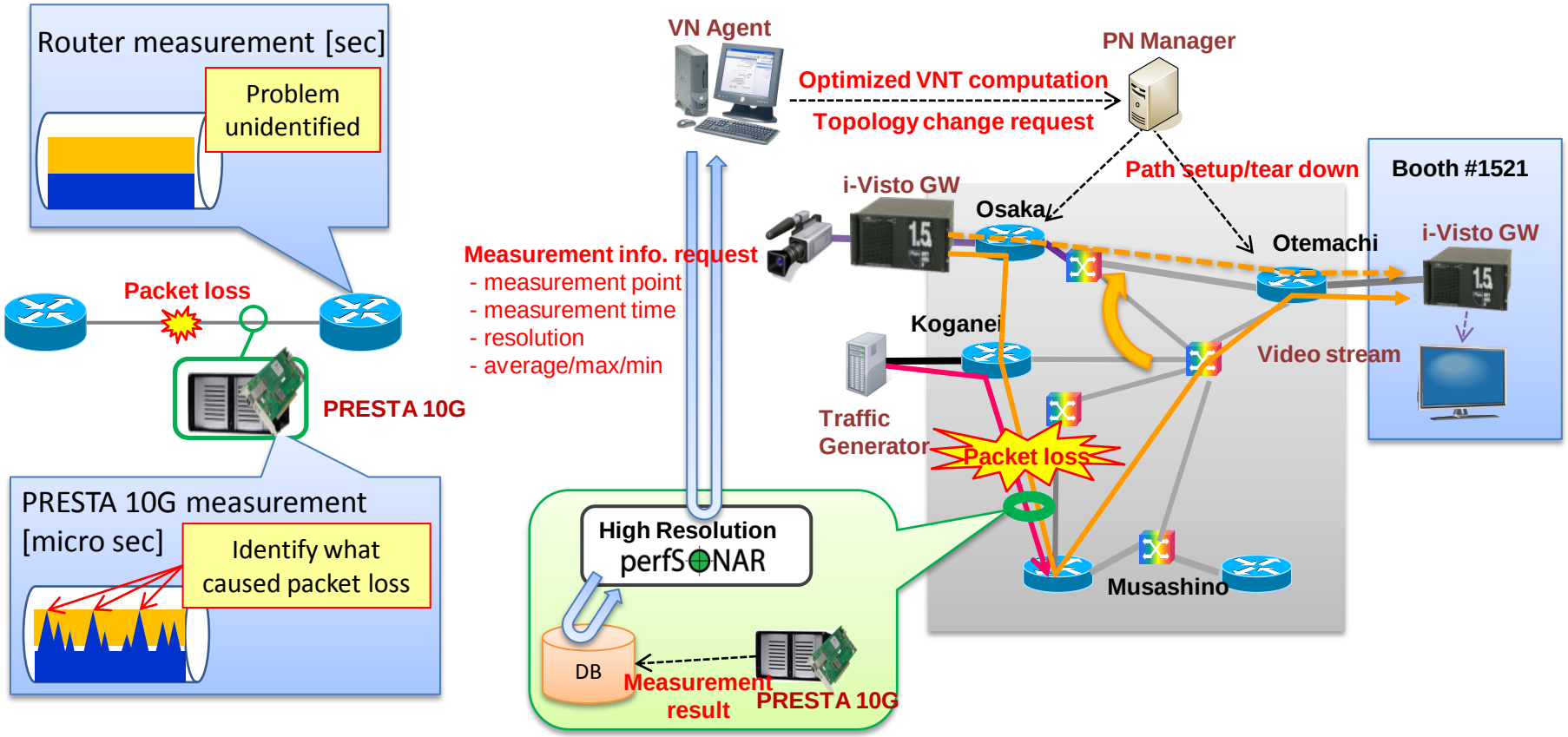






(3) Virtual network topology reconfiguration considering high-accuracy traffic micro-burst measurement

- Virtual network topology is easily reconfigured by changing optical path setting
  ➔ traffic-fluctuation-aware topology optimization
  - Existing measurement technique: **sec. order** router counter
  - PRESTA 10G measurement result figures out burst traffic by high-accuracy **micro-sec-order** measurement
- perfSONAR: A framework to exchange monitoring information among domains, becoming the standard at Internet2
  - NTT are proposing an interface specification to collect high-resolution measurement information



Thank you

Small demo: anytime!

Big demo: 10:30, 12:30, 16:30 @ booth1521 !!

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