A Management Model for the Network Virtualization Platform to Provide Network Programmability

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Outline

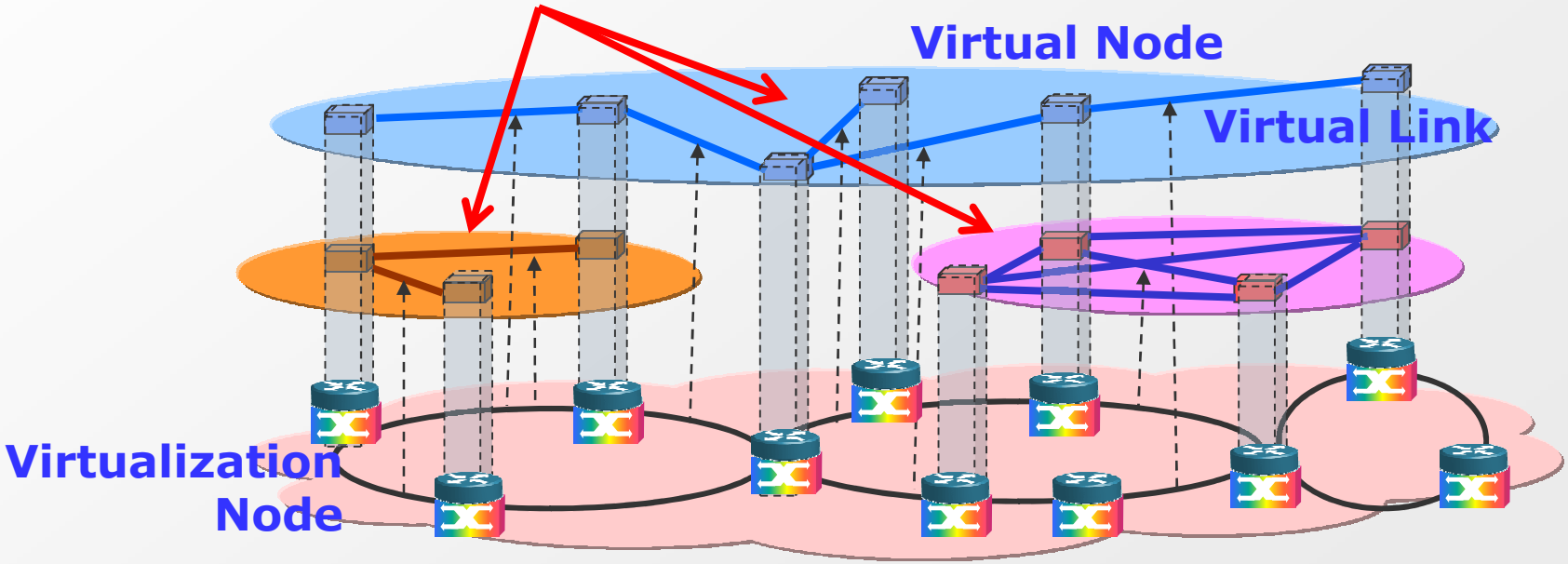
- Sections
  - 1 : About our “Network Virtualization”
  - 2 : “6 Planes Architecture”
  - 3 : Relationship with transport networks
  - 4 : Conclusion

- In this research, we propose “6 planes architecture” and IF between NMS for the Network Virtualization Platform to provide programmable logical/virtual networks.

Network Virtualization

- "Network Virtualization" provides assembled and isolated logical/virtual networks on shared network resources for individual network services by abstracting physical network resources.
- It also achieves isolation for individual network services.

Logical/virtual networks for each network service by Network Virtualization (Slice)



Why "Network Virtualization"

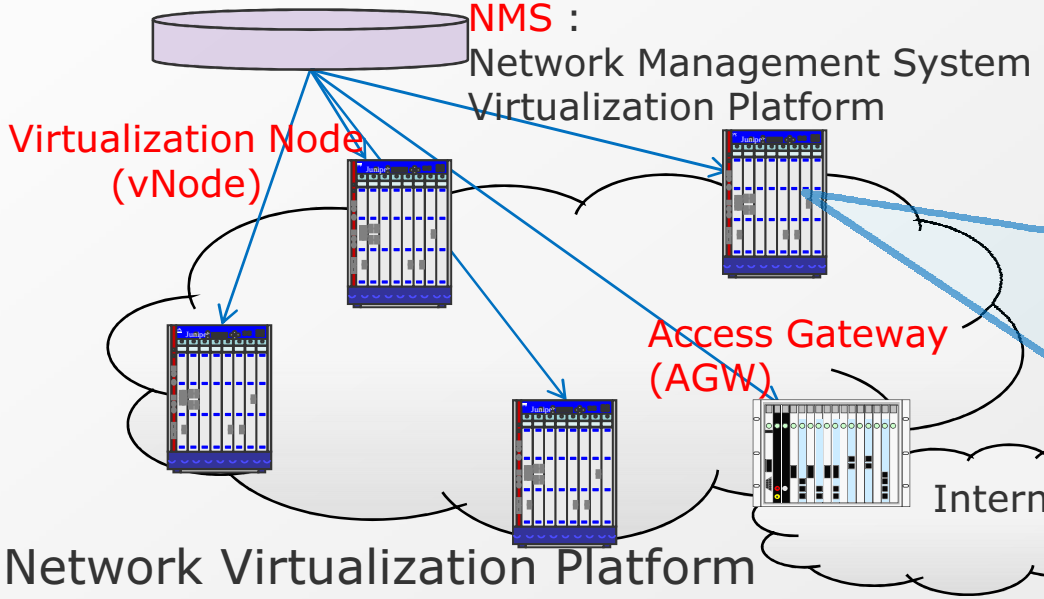
- With the diversification of network applications, network infrastructure is expected be more flexible to adapt dynamic creation of various network services.
- We conduct research and development on innovative management technologies for the network virtualization platform.
  - which assembles isolated logical (virtual) networks, "Slice"s on shared network resources for individual network services.
- However, it is a new aspect for management system that Slices are created dynamically and provided to a service provider.

vNode Research

* NICT : National Institute of Information and Communications Technology

- We take part in the NICT commissioned research
  - which attaches weight to in-network-processing to provide programmability
  - and components for virtual nodes and virtual links are separated and evolved individually.

Our Model for Network Virtualization



Components of vNode

VNM : manage and control Programmers and Redirectors (EMSs)

Programmer : create virtual nodes for protocol processing in each Slice

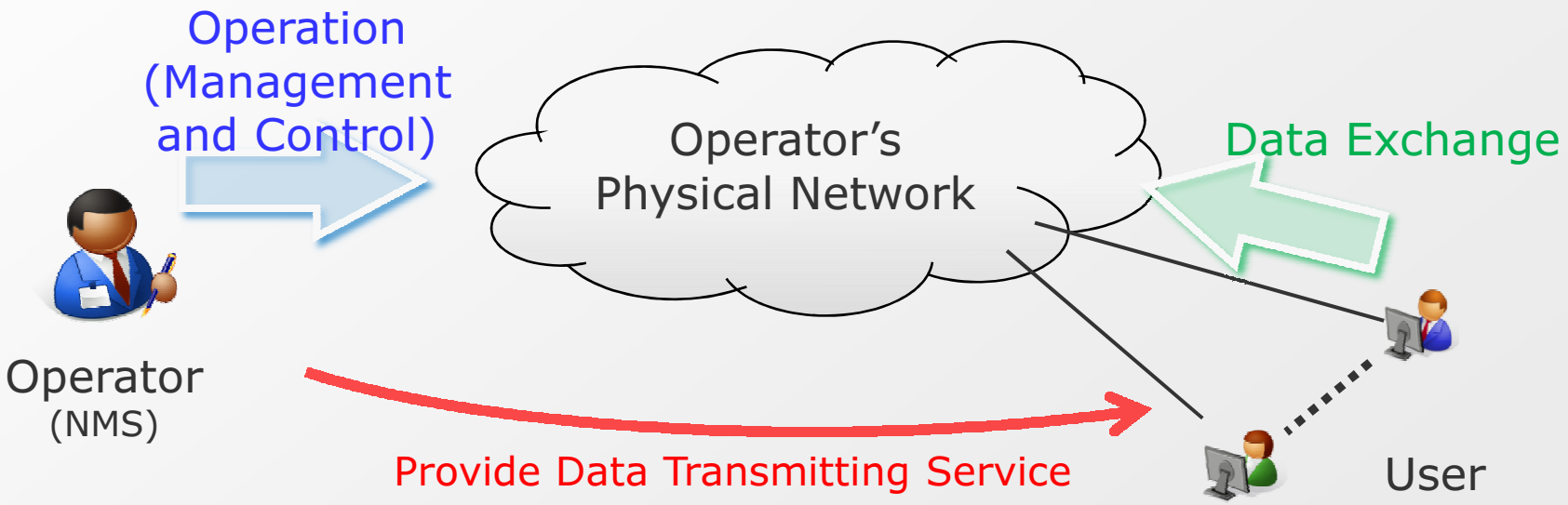
Redirector : create virtual links to transmit data in each Slice

User

* NMS : Network Management System
* EMS : Element Management System

Roles on Traditional Networks

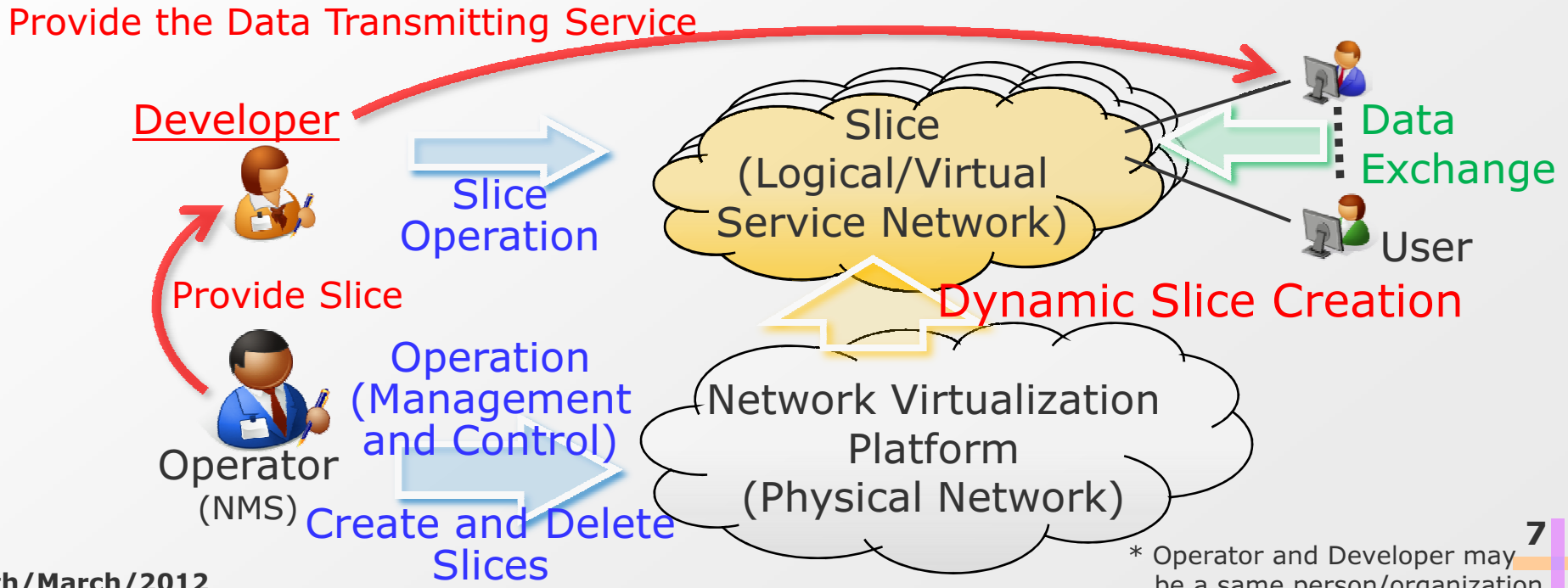
- Roles on traditional carrier networks
  - Operator : Administrator of physical networks (Carrier corp. and its NMS)
  - User : user who transmits data over the Operator's network



* NMS : Network Management System

The New Role

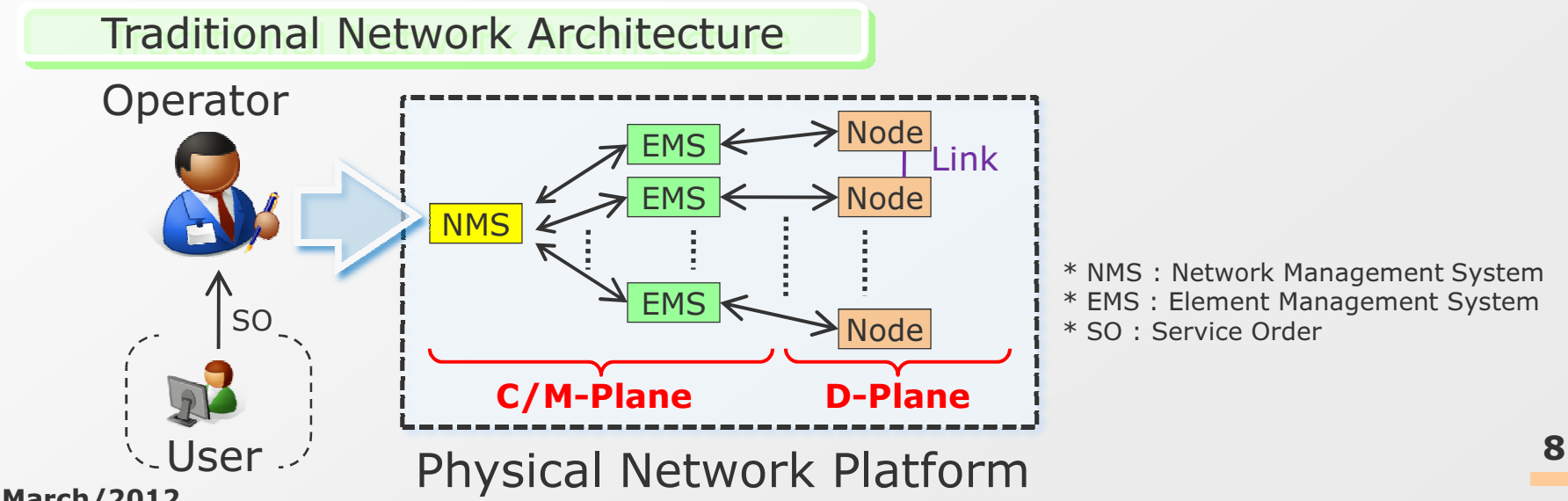
- Suppose one new role.
  - Operator : an administrator of physical networks
    - who creates, deletes and monitors Slices
  - Developer : an operator of Slices and provider of network services over Slices
  - User : a user who transmits data over Slices



* Operator and Developer may be a same person/organization

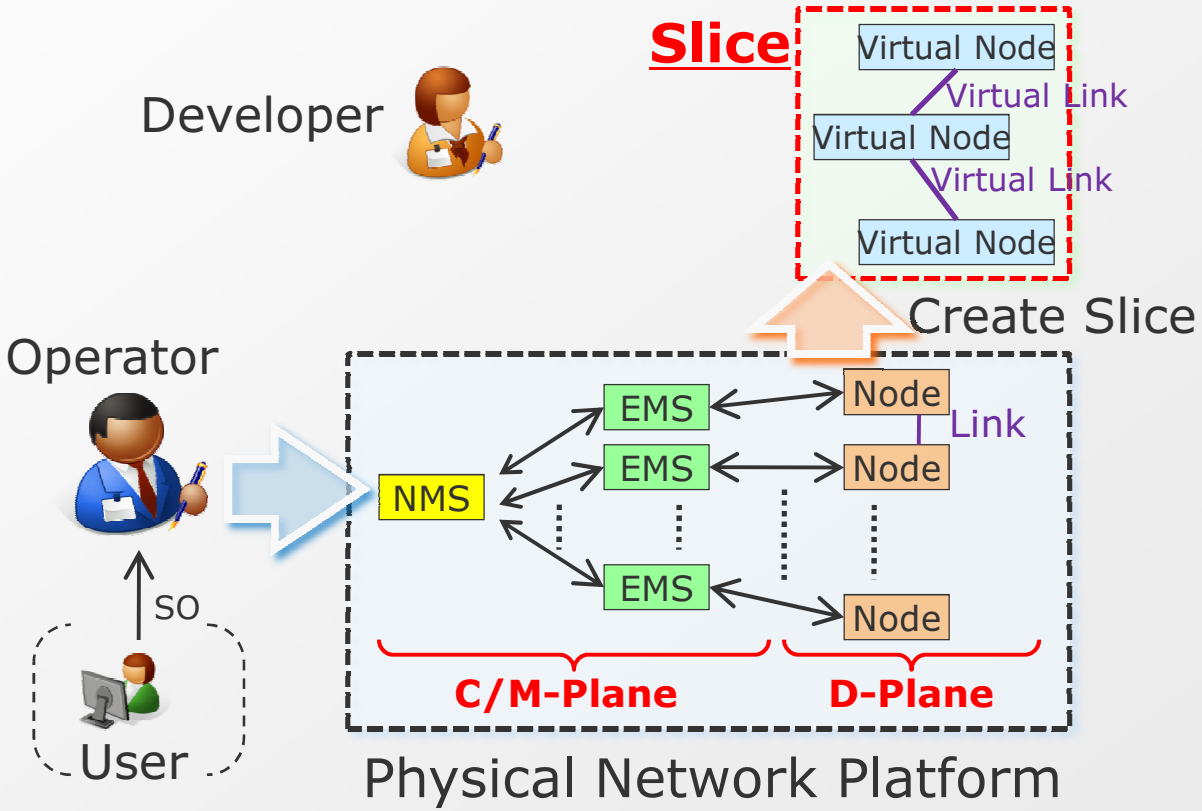
6 Planes Architecture

- Suppose
  - 1. Existence of the new role "Developer"
  - 2. Developer's operating their own Slices
- We propose "6 Planes Architecture", "3 more planes" in addition to traditional 3 planes.
  - Traditional 3 planes are D(data)-Plane, C(control)-Plane and M(management)-Plane



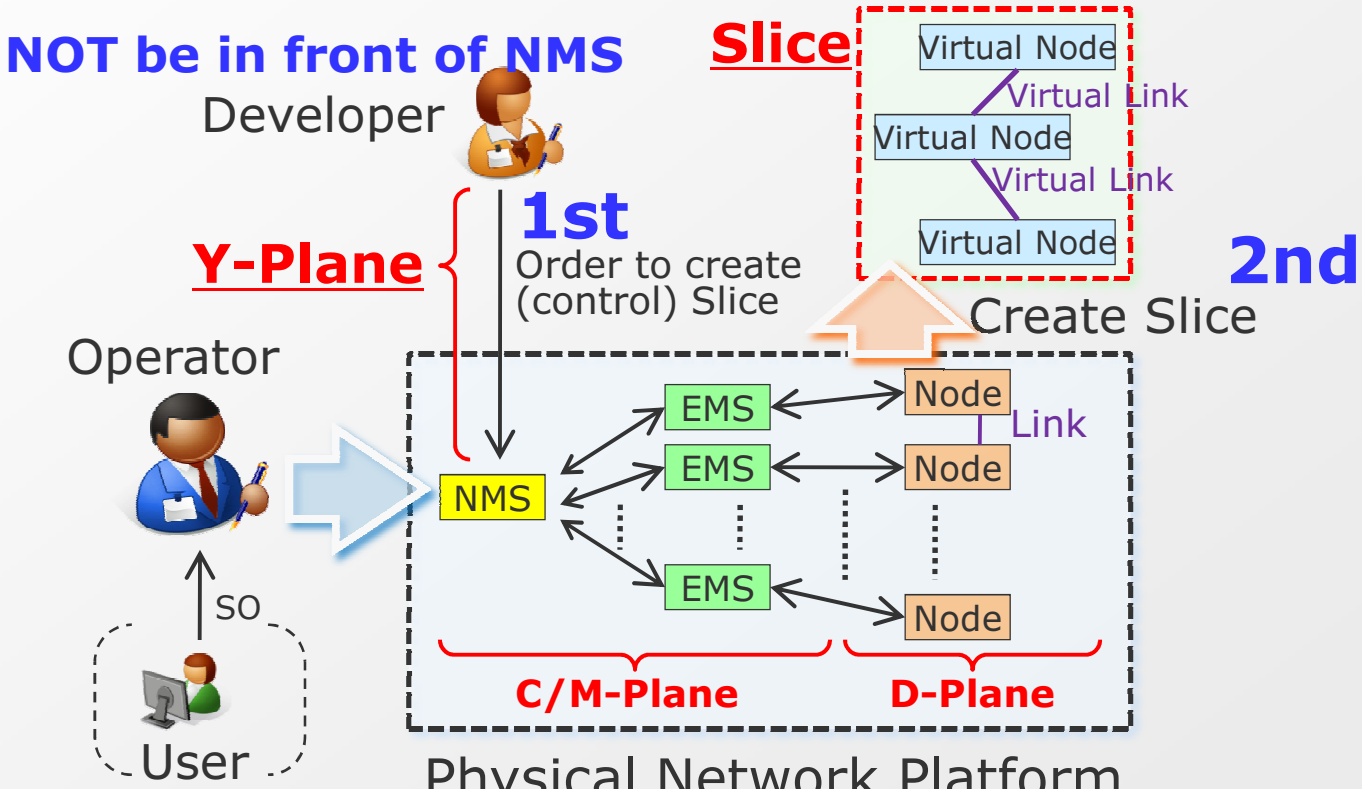
1st of "3 more planes"

- "Slice" : the logical network for Developers
  - A slice is an isolated and developer specific network for each developer.
  - A slice can be presented as "D-plane for Developer".



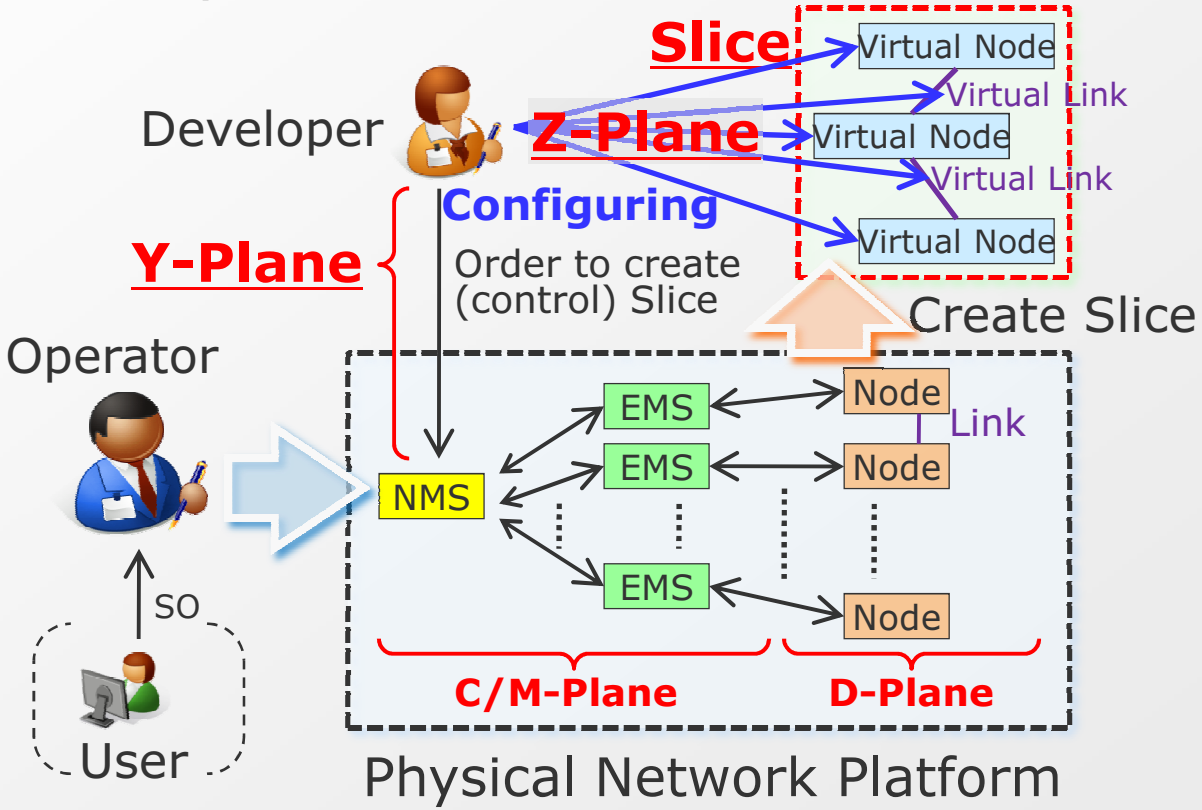
2nd of "3 more planes"

- Steps for Developer to use Slice
  - **1st** A Developer orders the creation of a Slice to NMS
  - **2nd** NMS creates the Slice by controlling the physical network platform throughout C/M-Plane
- "Y-Plane" : the interface for a Developer's order



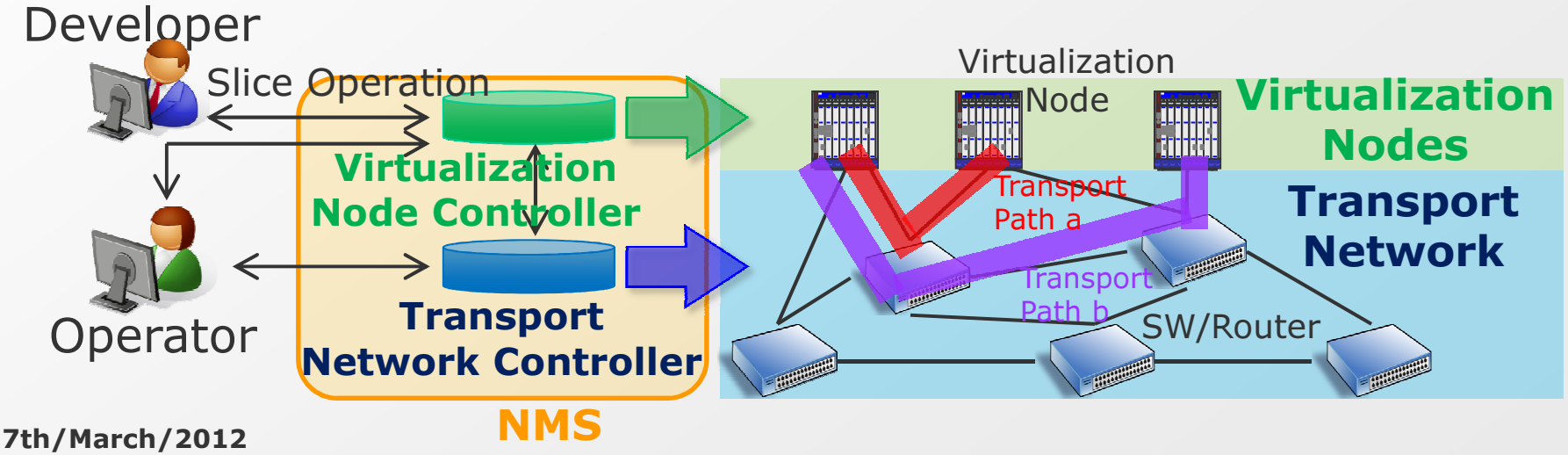
3rd of "3 more planes"

- "Z-Plane" : the interface for a Developer to customize (configure) his/her Slices
  - to change characteristics of Slice elements
  - Z-Plane can be presented as "M/C-Plane for Developers".



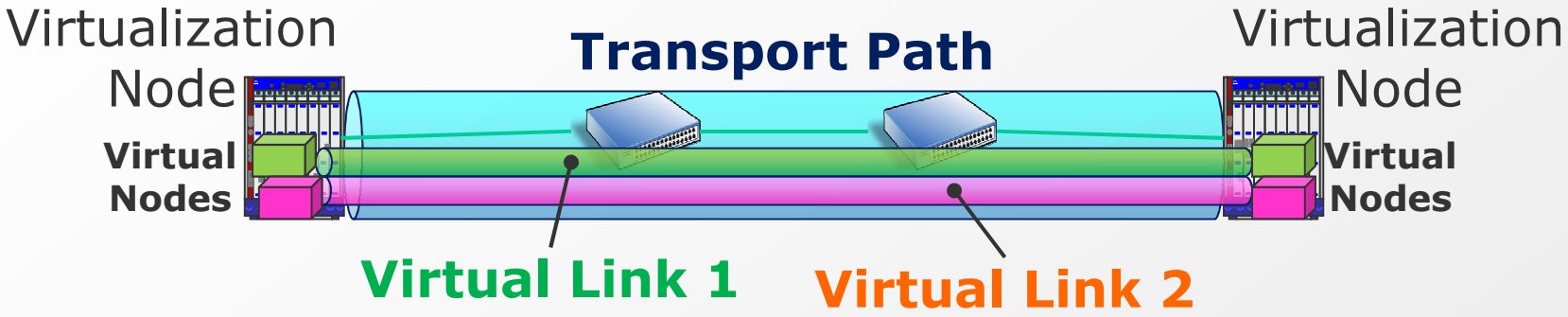
Transport Network

- In order to deploy network virtualization services on real networks, virtualization nodes should be connected to the transport network.
  - Transport networks (core networks) : carry packets/frames regardless of network services they are supporting.
- Transport networks provide the connectivity /reach-ability between virtualization nodes.
  - Connectivity / reach-ability : Transport Paths



Transport Paths and Virtual Links

- Virtual links in a Slice are created over transport paths.

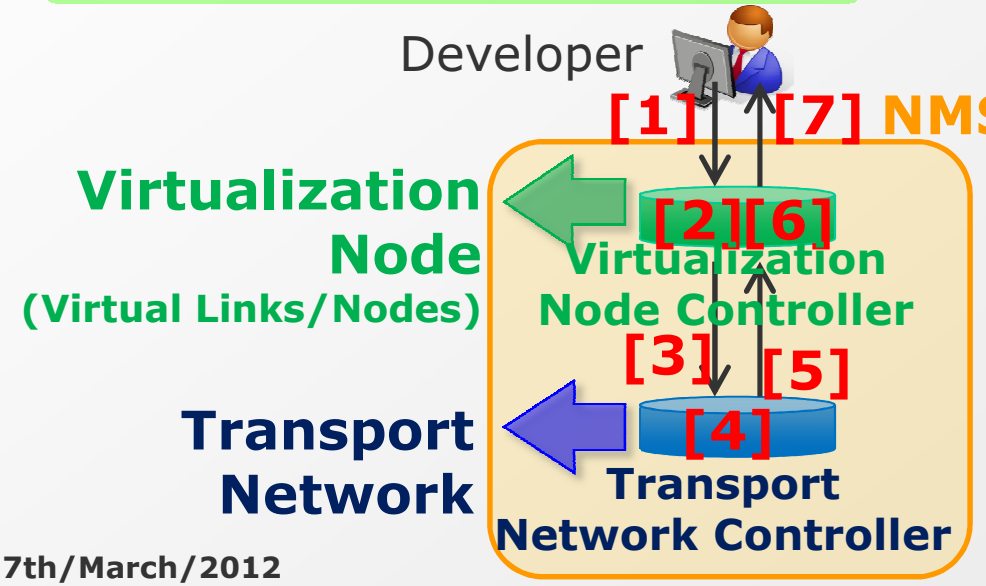


- However, from a Developer's view, virtual links behave as physical links.
  Virtual links are expected to achieve high QoS provisioning.
- That is true for transport paths which hold virtual links within them.

Dynamic Creation

- Transport Paths should be created dynamically with the satisfying QoS to support the QoS requirement of virtual links.
- Management systems (controllers) of virtualization nodes and transport network have to support the communication IF to inform the QoS requirements.

Steps to create virtual links



[1] Order to create Slice including virtual links
[2] Calculate necessary Transport Paths and their quality to satisfy the ordered quality of virtual links
[3] Order to create Transport Paths
[4] Create ordered Transport Paths
[5] Inform results of Transport Paths creation
[6] Create virtual links on them
[7] Inform results of Slice creation

Conclusion

- Pursuing network virtualization technologies, we studied
  - a network management model considering the existence of Developers : 6 Planes Architecture
  - the connection and IF with transport network to deploy.
- Thank you for NICT and members of the commissioned research.
  - This research was executed under the Commissioned Research of National Institute of Information and Communications Technology (NICT)
- Thank you for your attention!