Proposal for Deployment of International Multi-Layer Network

- TransPAC2 Update -

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Network Engineering Workshop
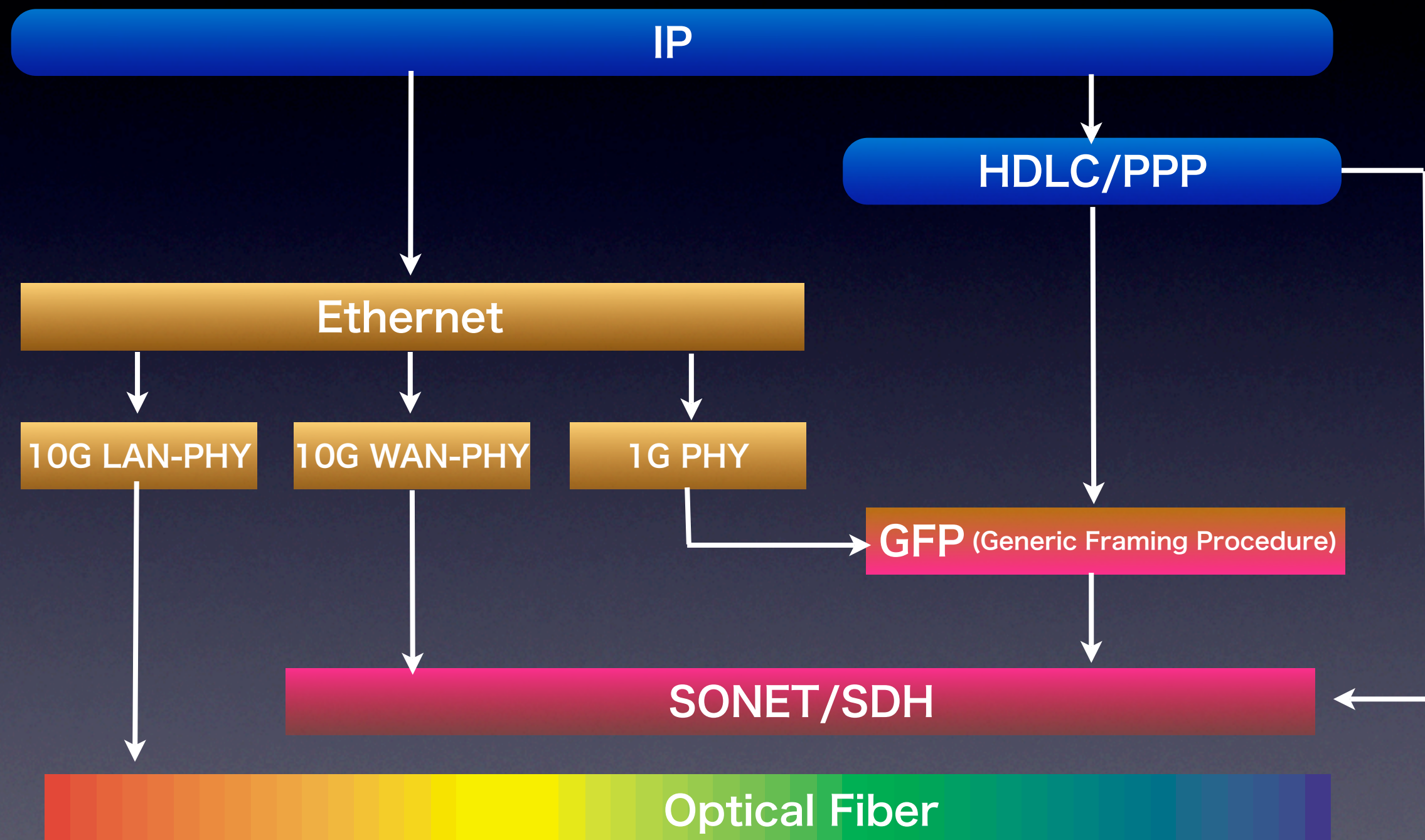APAN26 New Zealand Meeting
7th Aug. 2008

Need for Multi-Layer/Hybrid Network

- R&E application has been diversified into multiple types in recent years

- But, Layer3 routing technology has been not changed

- Would you say that current Layer3 routing is best technology for applications?

- In such situation, international lower-layer network such as GLIF has emerged

- In addition, the emergence of DCN heighten the need for lower-layer network over multi-domains

- Using multi-Layer network technology could help us design a network suitable for each application

Optical - Ethernet - Packet Multi-Layer

Packet

Optical

IP

HDLC/PPP

Ethernet

10G LAN-PHY

10G WAN-PHY

1G PHY

GFP (Generic Framing Procedure)
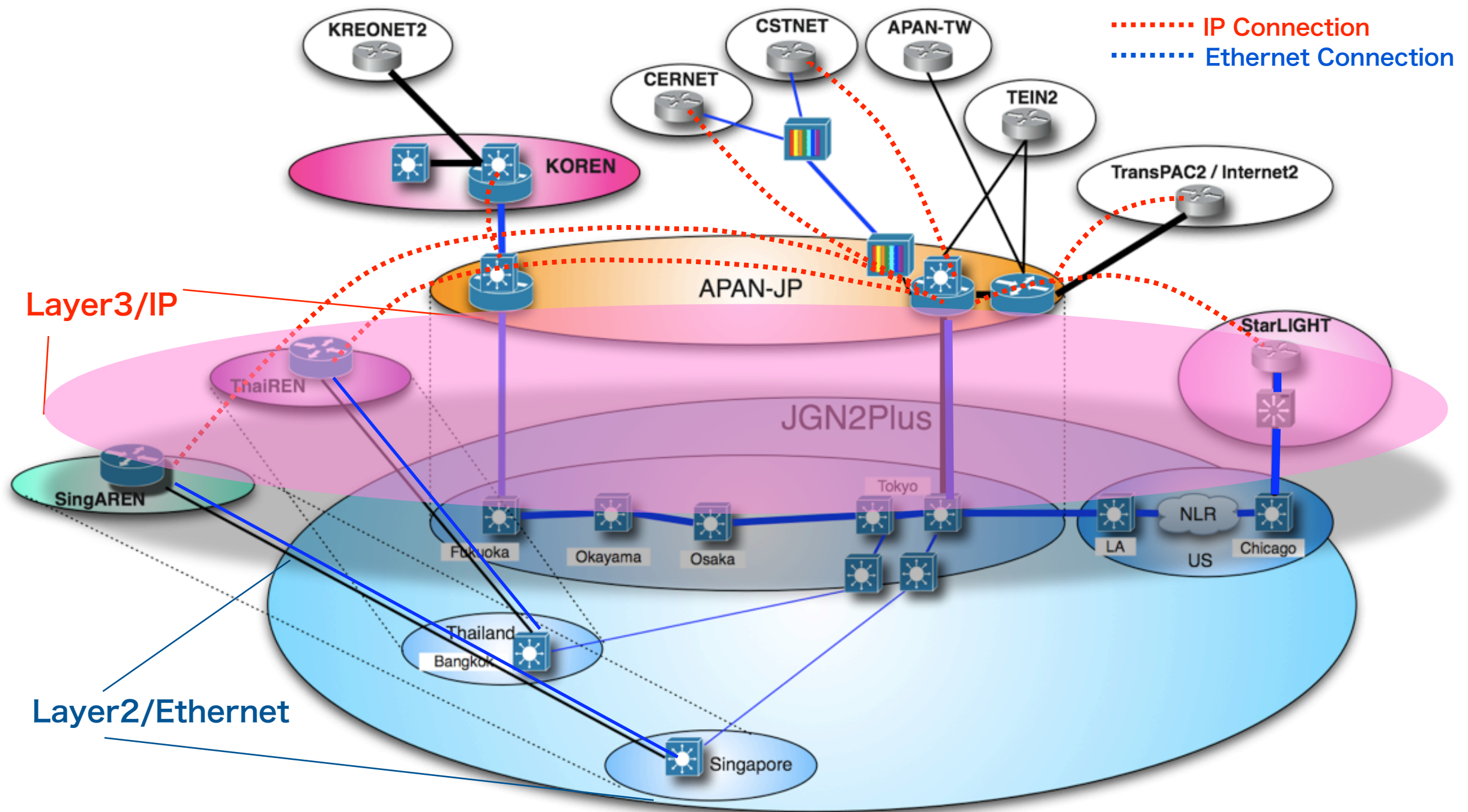
SONET/SDH

Optical Fiber

Multi-Layer/Hybrid Network

- Internet2(US), GEANT2(EU), KOREN(KR), SINET3(JP), and other R&E networks, has introduced multi-Layer network and has started operation.
- Provide flexible networks to meet user demand.
- Aim to provide communication capability that is service-oriented: DCN, bandwidth on demand.
- But there is no R&E network providing international fully multi-Layered connection with Japan.
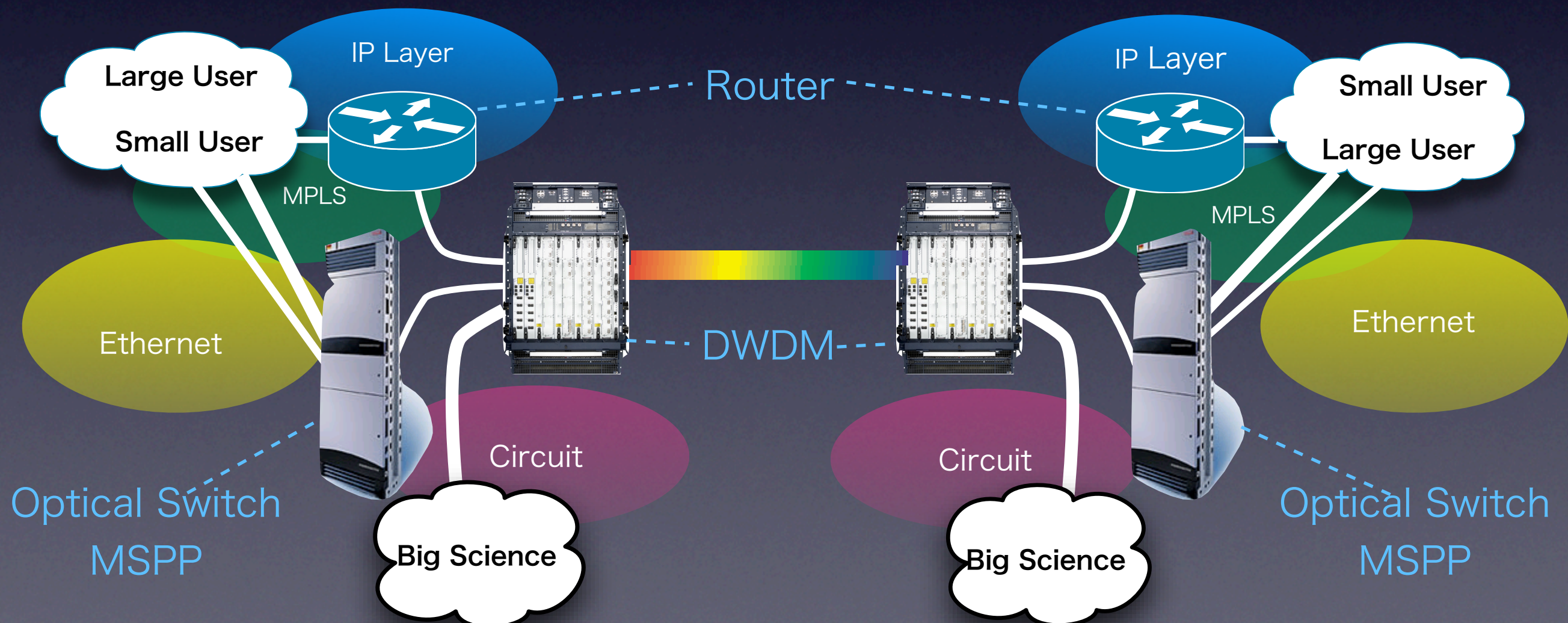
# APAN-JP L2/L3 network over JGN2plus/APII/TransPAC2

Options of International Low-Layer Connection

- Most "popular" international circuit is SONET/SDH
- Create the Multi-layer/Hybrid Network over SONET/SDH circuit

Layer-1 switch with SONET/SDH

- It's effective in high-speed circuits over OC-12, OC48

- Appearance of a MSPP(Multi-service Provisioning Platform) equipment and GFP mapping technology enable us to translate SONET/SDH to ethernet more effectivity

- Dedicated circuit
- Tough to obtain specific circuit
- CERNET/CSTNET
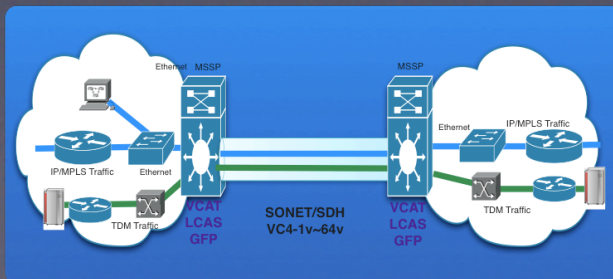
MPLS over POS

- Provide ethernet connectivity by L2VPN/MPLS function on edge router

- It's effective in low-speed circuits

- Depend on methods of router vender
  - Juniper CCC/Martini/Kompella or Cisco Martini

- Shared Link
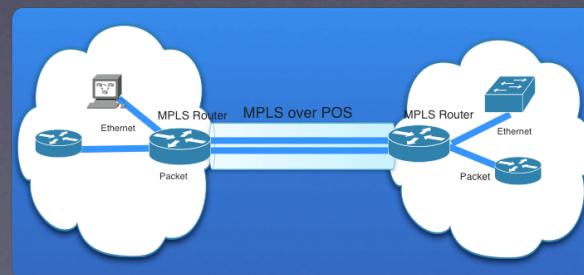
10G WAN-PHY

- OC-192 SONET circuit provide ethernet connection by 10GigE-WANPHY

- Set up L2/L3 multi-layer network on the 10GigE-WANPHY

- Available switch is limited

- Shared Link
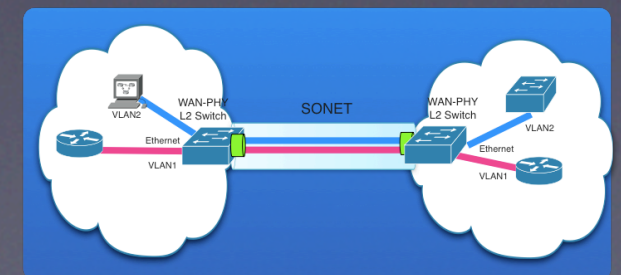
Layer-1 LightPath
## - Examination Items of SONET/SDH -

- SONET/SDH circuit must be subdivided to VC3(50M) - VC4 (155M) units for providing dedicated bandwidth guaranteed circuit service

- Or, utilize a "Clear Channel" technology which enable to transmit H1/H2 byte in a SONET line over head

- You have to request such a circuit specification to an international circuit carrier
  - Do not Concatenate! We concatenate the circuit ourselves by VCAT(Virtual Concatenation)!

- Provide the GigE lightpath under SONET/SDH via VCAT & GFP mapping on MSPP

- It might be a good method for reducing the cost due to expensive POS Router Interface

- It seems that still have difficulty operating such a particular circuit and providing from international carrier in Asian region

VC4
VC4
VC4
VC4

STM16

VC4

VC4-7v = 1.05G -> 1GigE

VCAT + GFP Mapping

Inter-domain/AS L2VPN/MPLS
- Effectivity -

- Provide point-to-point ethernet connection over LSP which is made by MPLS technology on IP/Layer-3 network

- A good solution for APAN region, there are few high-speed circuit such as OC-48 or OC-192

- Juniper, Cisco, and other vendors is supporting L2VPN/MPLS (Kompella/Martini/CCC)

- Set up MPLS connection statically out of consideration of dynamic routing/protection
  - Routing among multi-domain is carried out by IDC(inter-domain controller)s of DCN over L2VPN/MPLS path

- Get results of the interoperability of inter-domain MPLS over inter-AS

- Challenge to hard operation and accumulate the operation know-how

IDC   IDC   IDC

DCN network

L2VPN/MPLS network
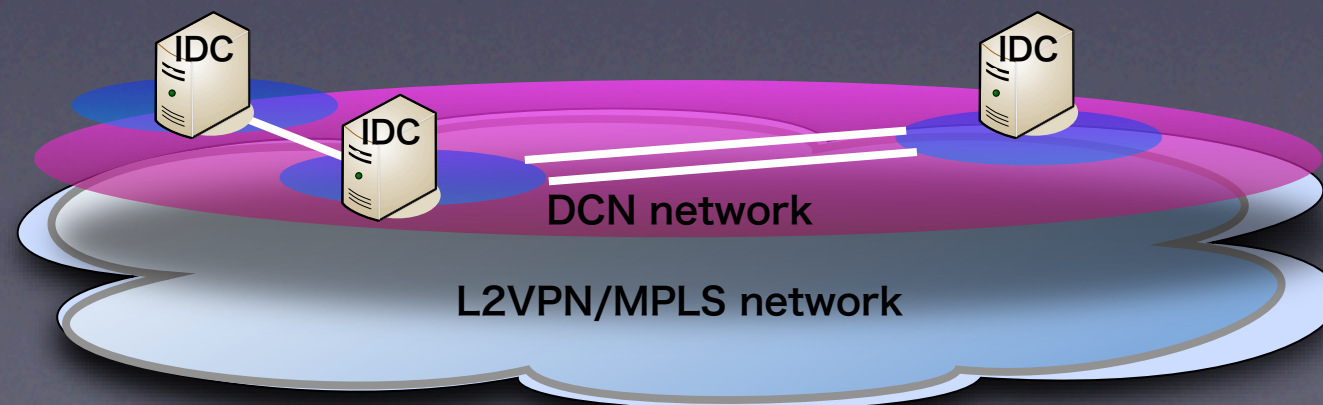
Current Status and Future Possibility

- Ethernet connection with Layer-1 switch with SONET/SDH
  - CERNET
  - CSTNET
  - TEIN2-HK

- Ethernet connection with 10G WAN-PHY
  - KOREN

- MPLS over POS
  - TransPAC2
  - APAN-TW
  - TEIN2-POPs
  - ASTI

    Network are complete for the DCN connection
    Coming Soon!!
    Suggestion

Summary

- Multi-layer/Hybrid networks are intended to provide a flexible mix of IP routed service and "lower layer services". And it can respond quickly to user/application requirements and requests to access both the IP routed and/or lower layer services.
    - Deterministic network performance, dedicated network resources, guaranteed network capacity, freedom to use protocols other than (congestion control friendly) TCP, privacy/security

- If we can deploy the "innovative" DCN service over lower layer network, we can establish user on-demand international path. It leads to the promotion of the international collaboration on R&E networks.

- This will require the international Inter-domain multi-layer networking. Though there are various options to make Inter-domain multi-layer network, it is still heavily dependent on specification of circuit provided international carrier.

- L2VPN/MPLS is a good solution to make multi-layer connection over current APAN network which has many low-speed circuits.

- APAN-JP/TransPAC2 will becomes one model, and progress the operation knowhow of L2VPN/MPLS between Inter-domain/inter-AS to APAN network.

Thank You!

For DCN connection with APAN-JP
Ask the APAN-JP NOC
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