International Telecommunication Union

Identification and Specification of NGN Service and Control Requirements

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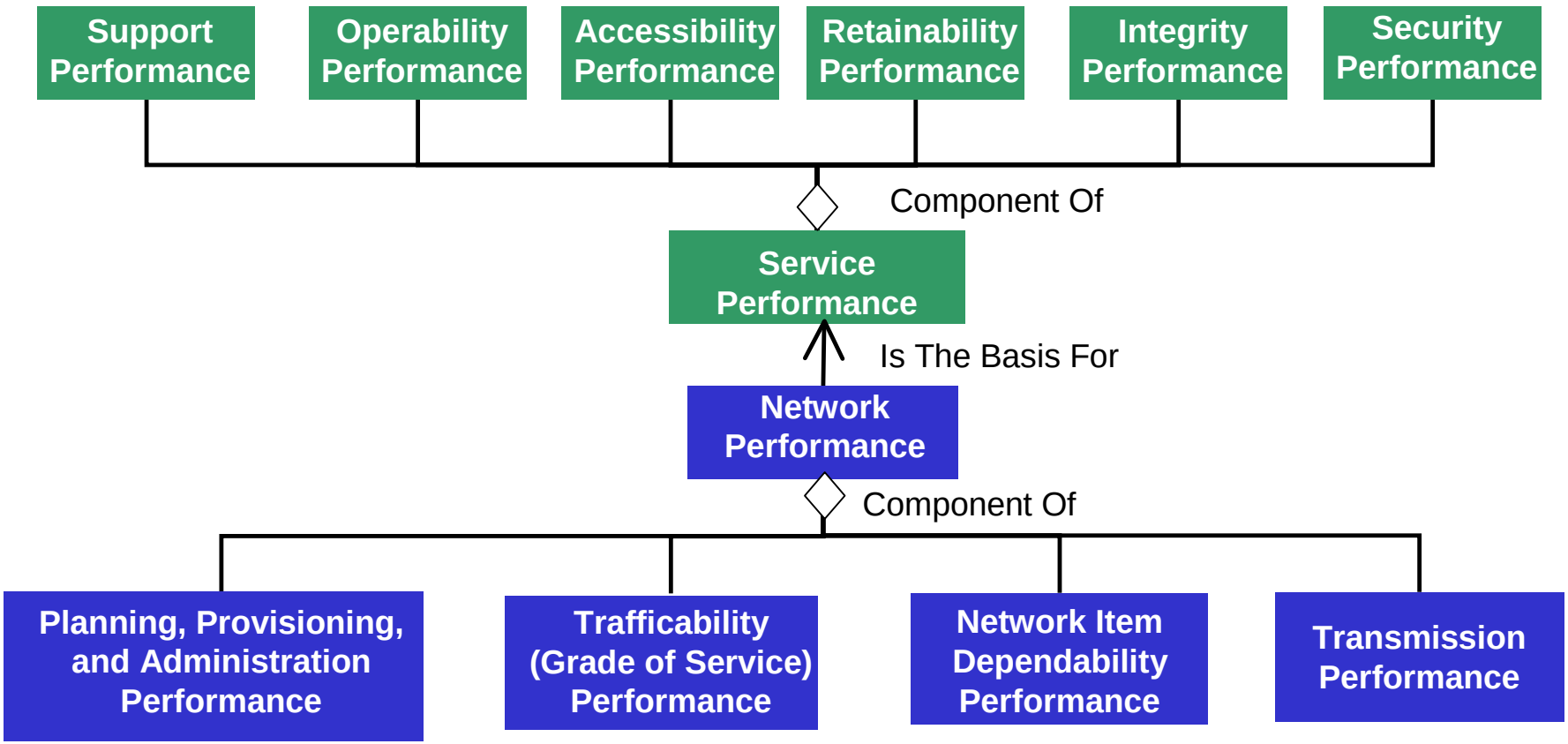
Overview

- Performance of Services and Networks
- Physical Views of Networks
- Service Information Flows
- OSI and G.805 Layers
- Interesting Time Scales
- Issues and Questions

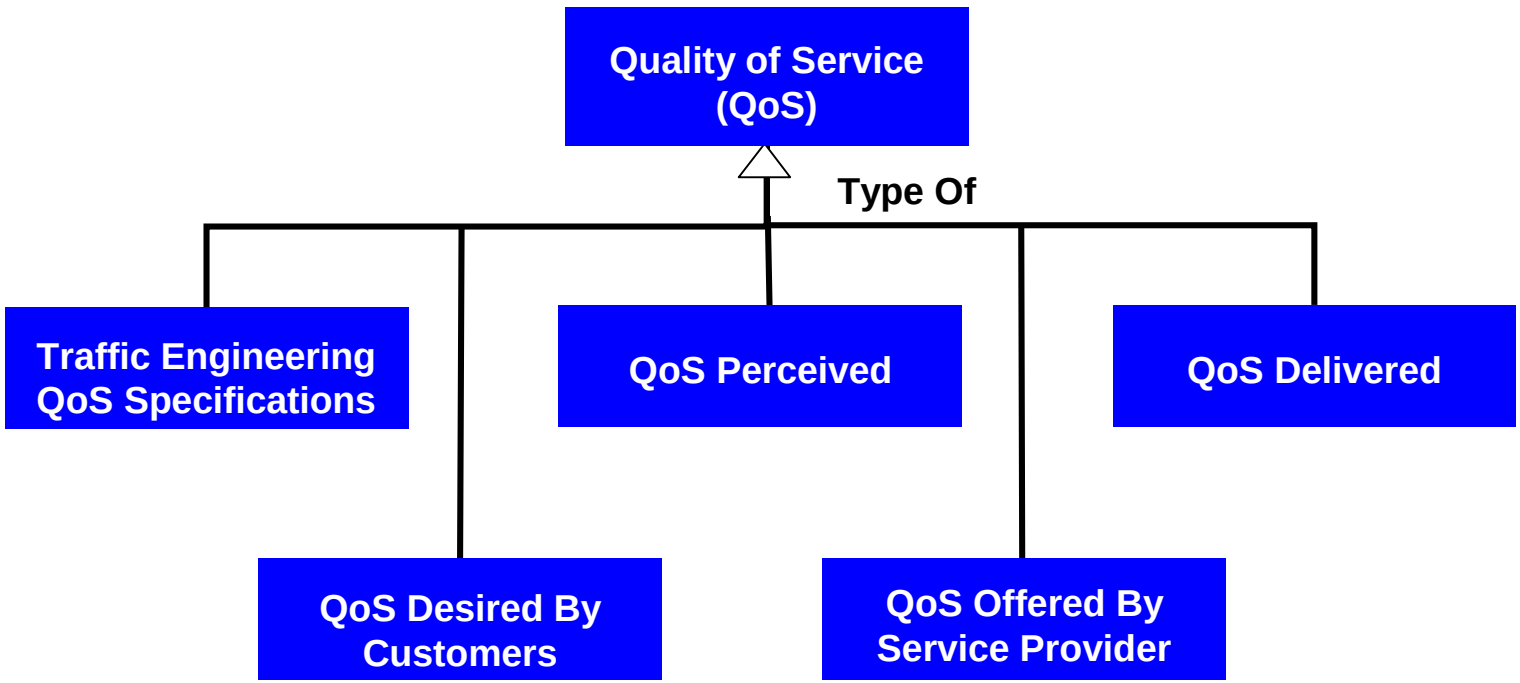
Service Performance verses Network Performance

- A Service Provider focuses on Service Resources
- A Service Customer focuses on Service Performance

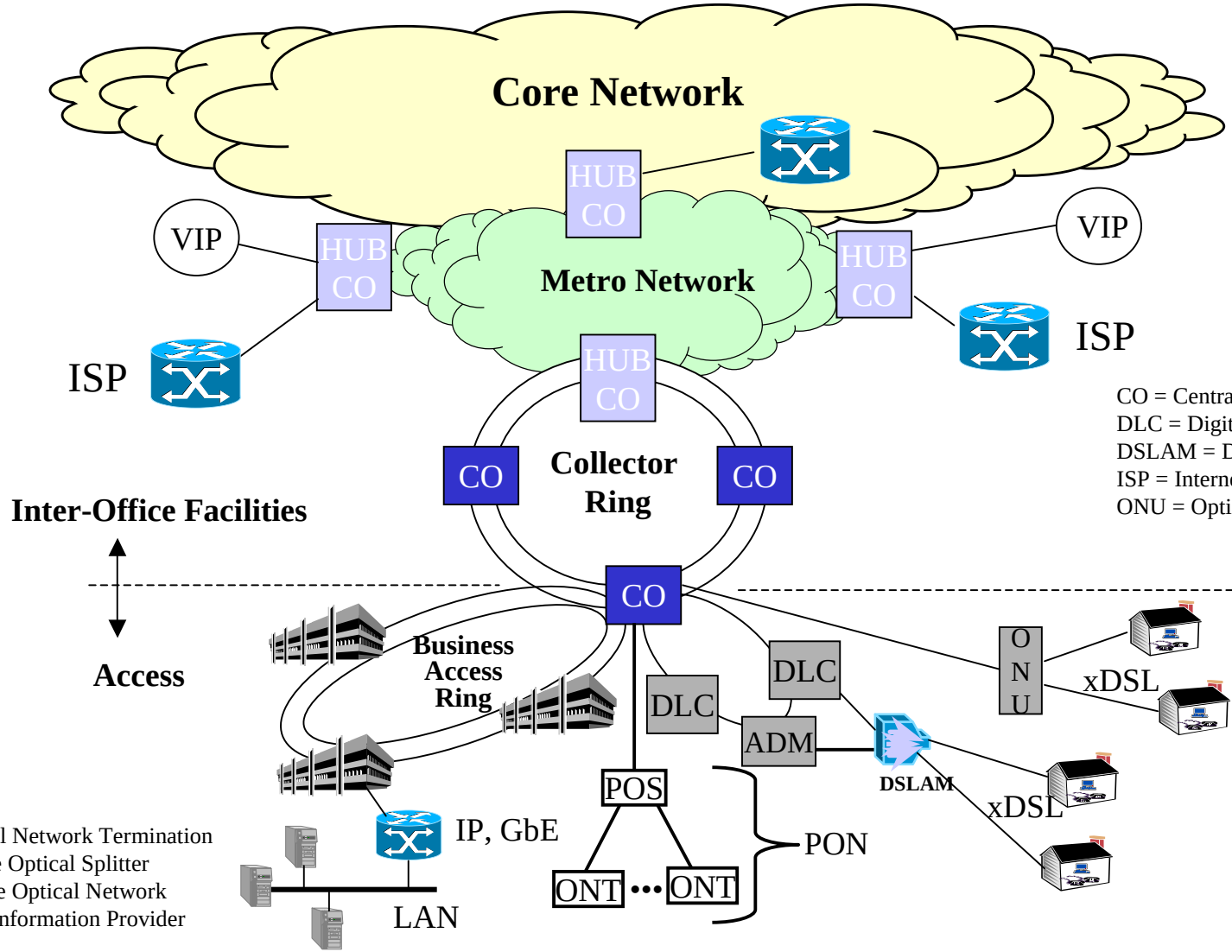


Views of Quality of Service

- QoS is the degree of conformance of the service delivered to a user by a provider in accordance with an agreement, e.g., an SLA



Physical Network Topology



CO = Central Office
DLC = Digital Loop Carrier
DSLAM = DSL Access Multiplexer
ISP = Internet Service Provider
ONU = Optical Network Unit

ONT = Optical Network Termination
POS = Passive Optical Splitter
PON = Passive Optical Network
VIP = Video Information Provider

Domains of Applicability

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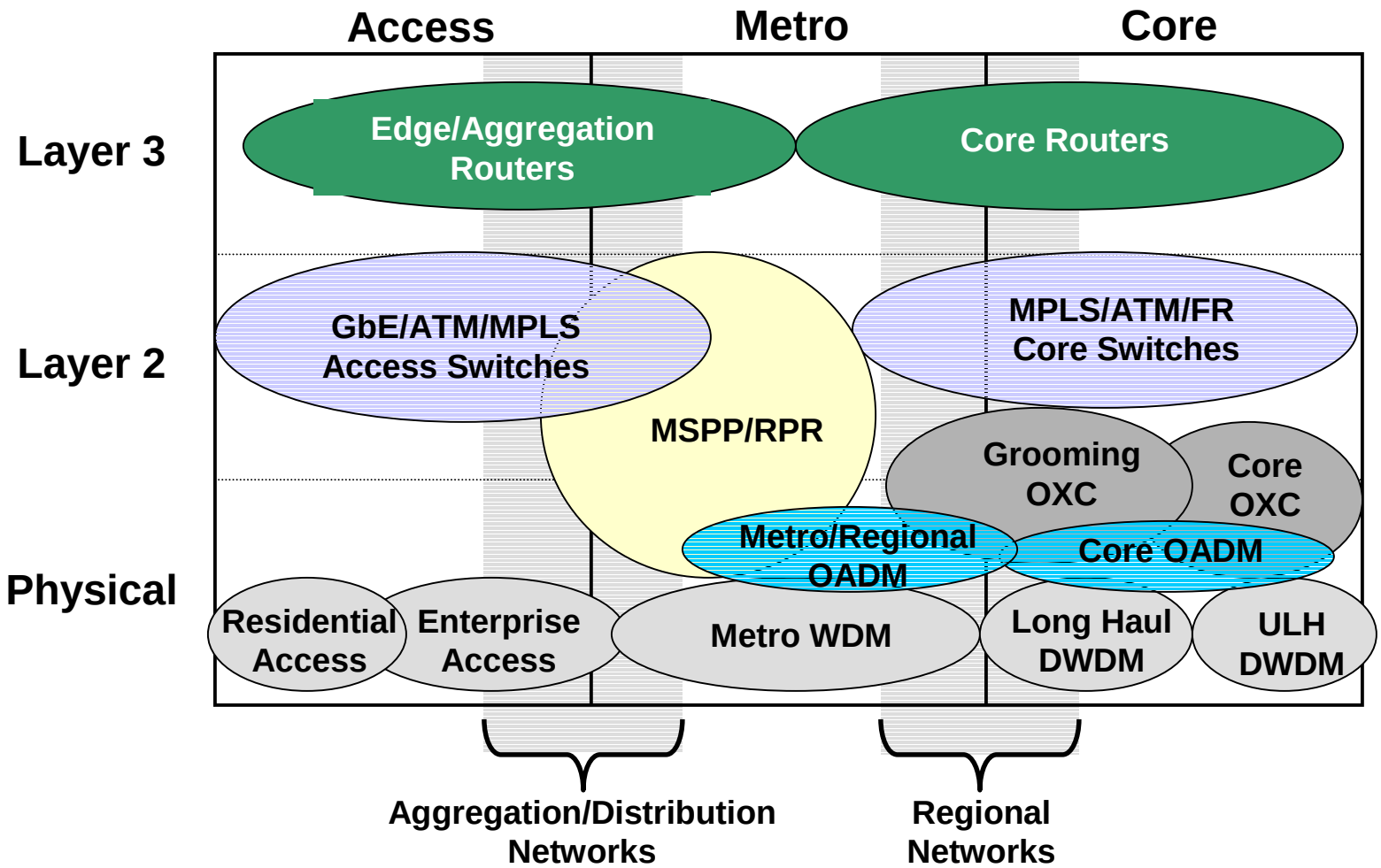
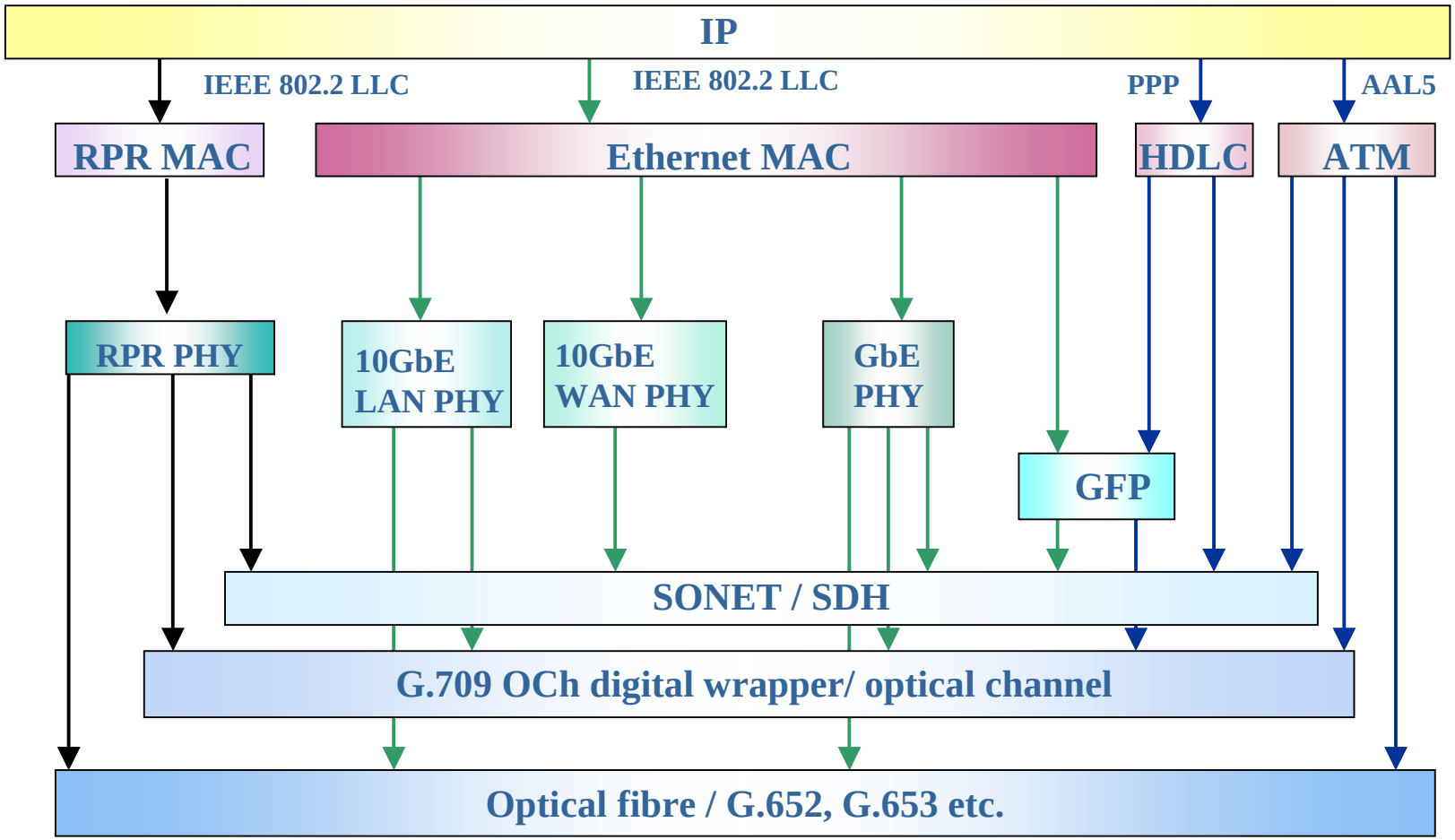


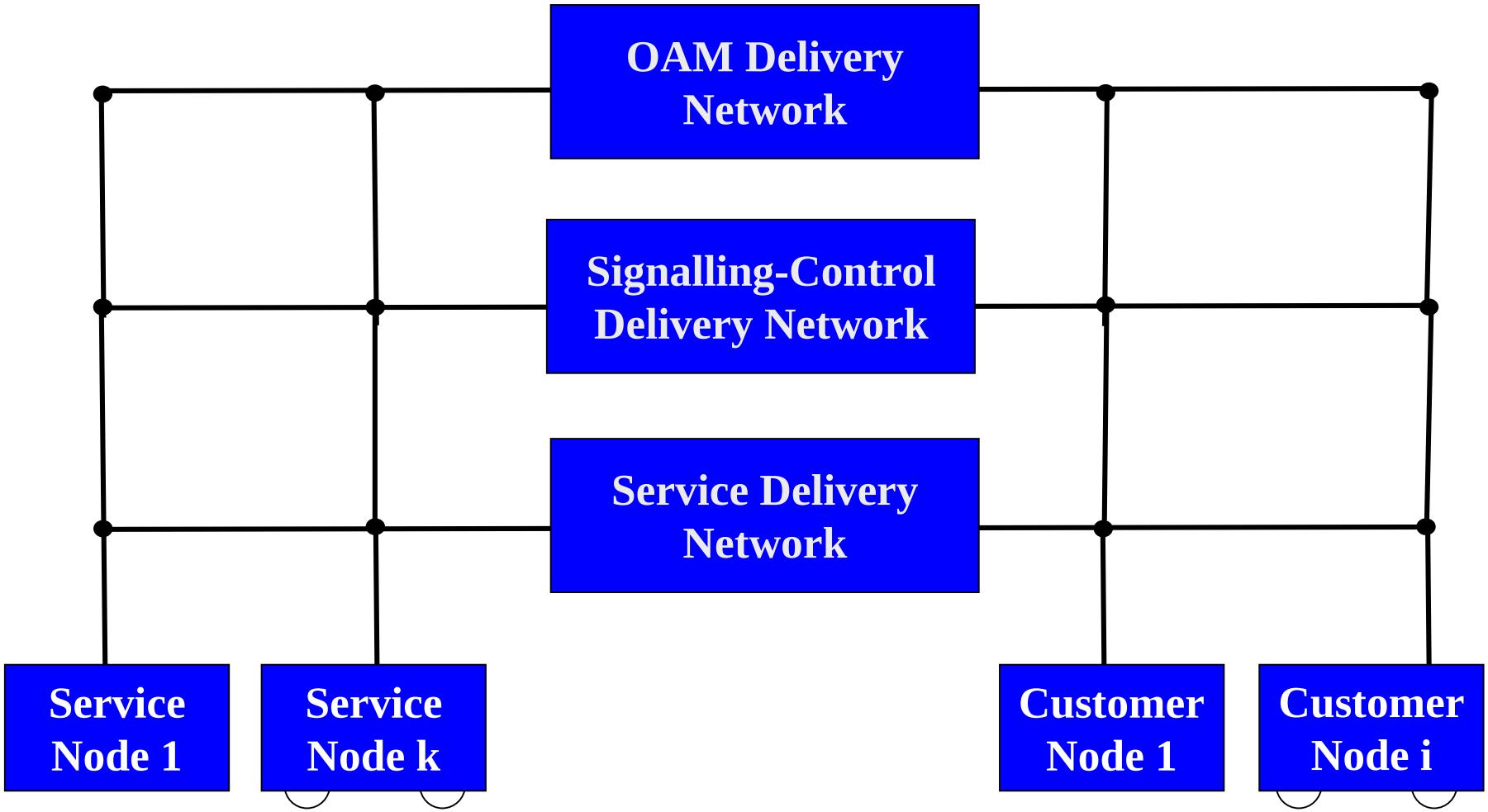
MSPP = Multi-service Provisioning Platform
OADM = Optical Add-drop Multiplexer
OXC = Optical Cross-connect

RPR = Resilient Packet Ring
ULH = Ultra-long Haul

Typical IP (and beyond) Encapsulations



Service Related Information Flows



Multi-Administrative Domain Services

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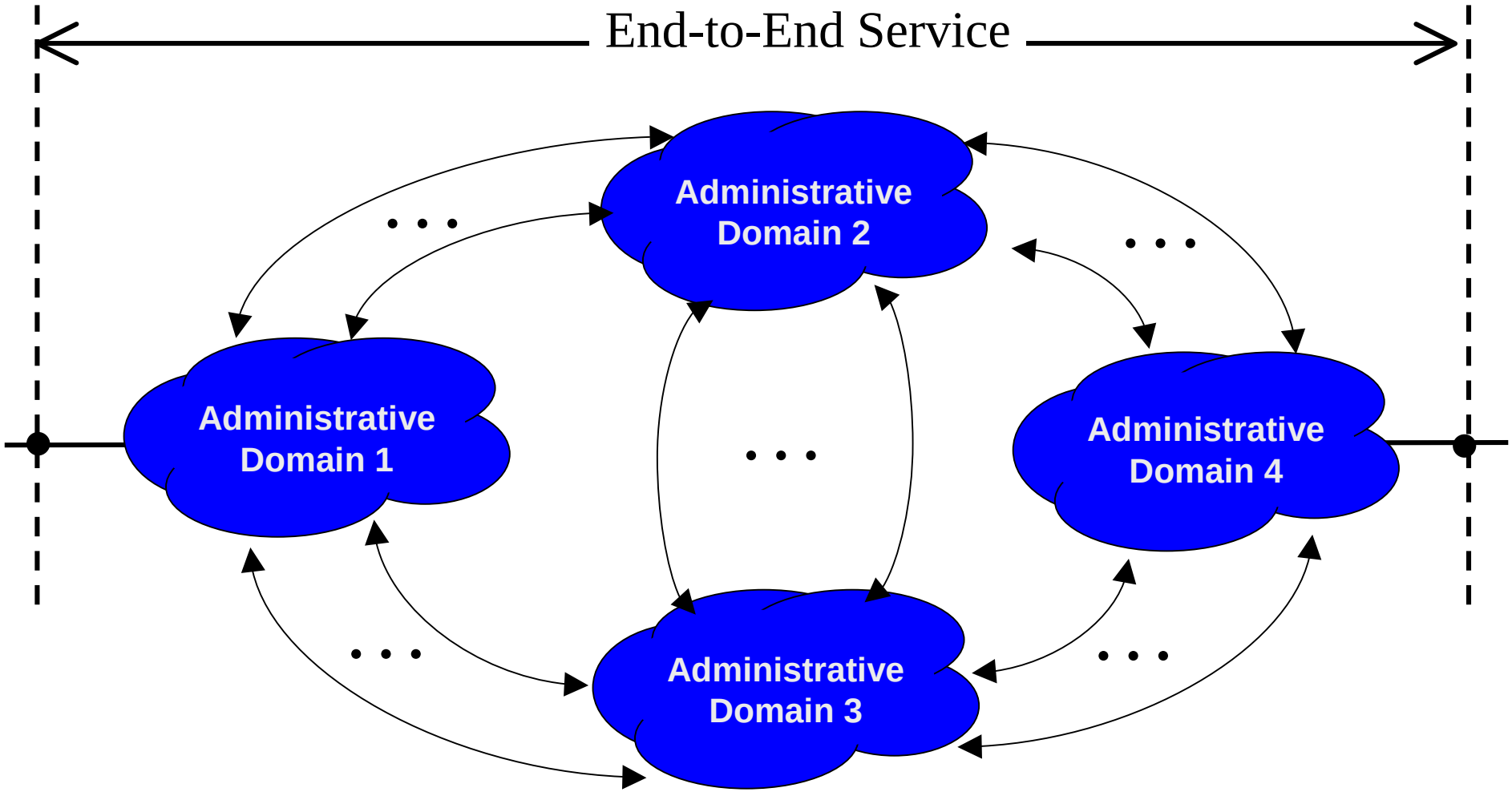
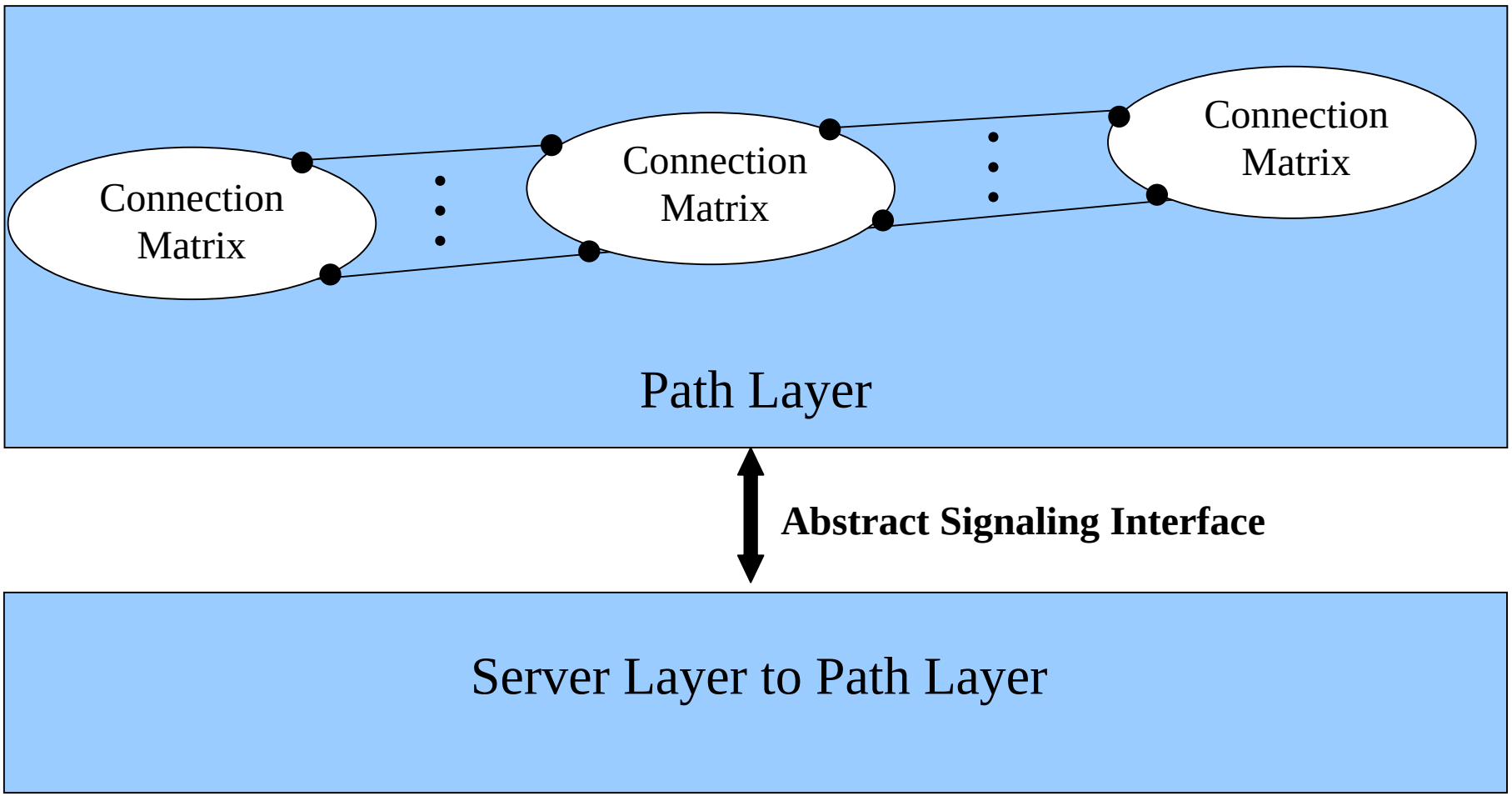
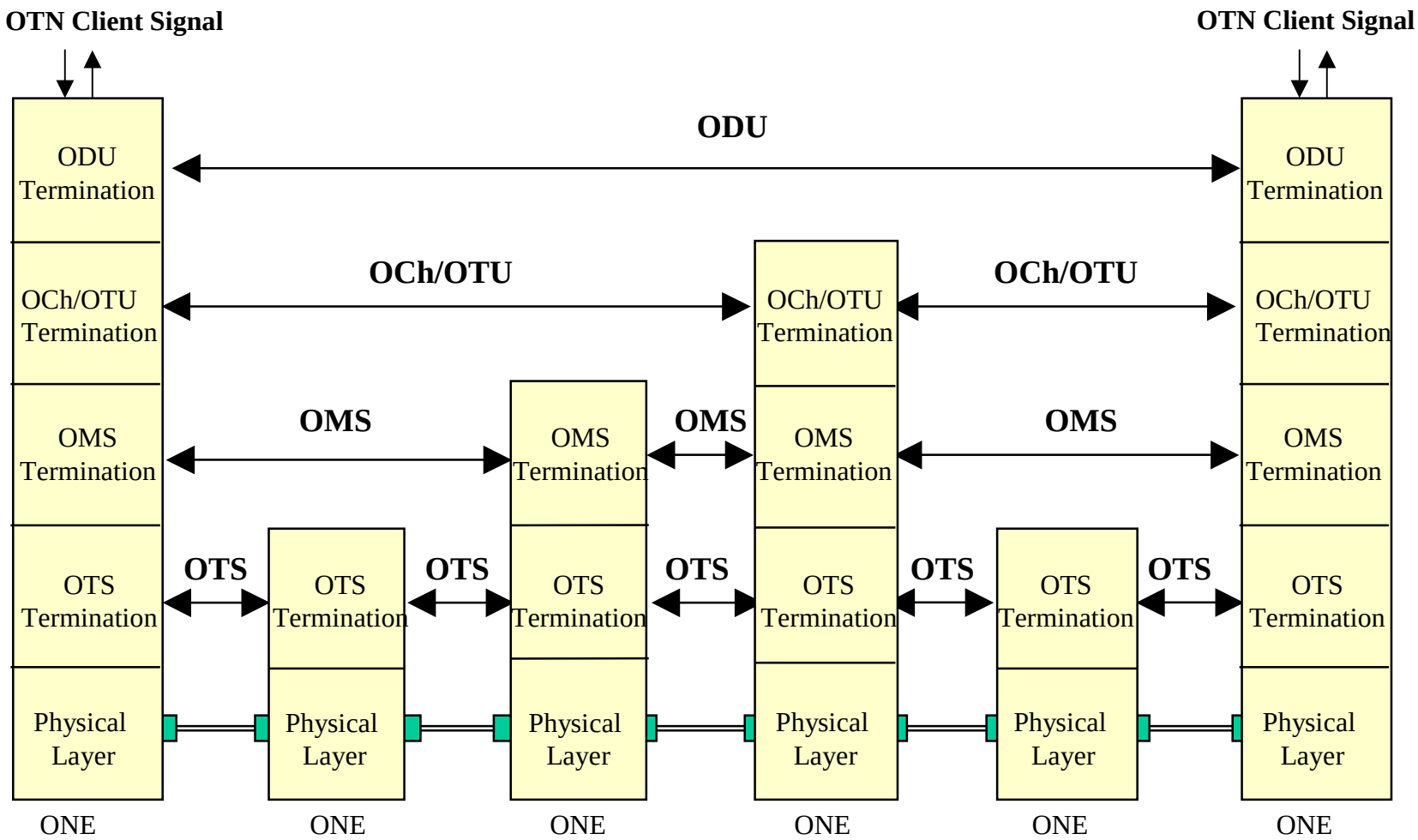


Connection Set-Up in Layer 1

Signaling for given path layer is understood



Physical View Of A Linear OTN



ONE = Optical Network Element

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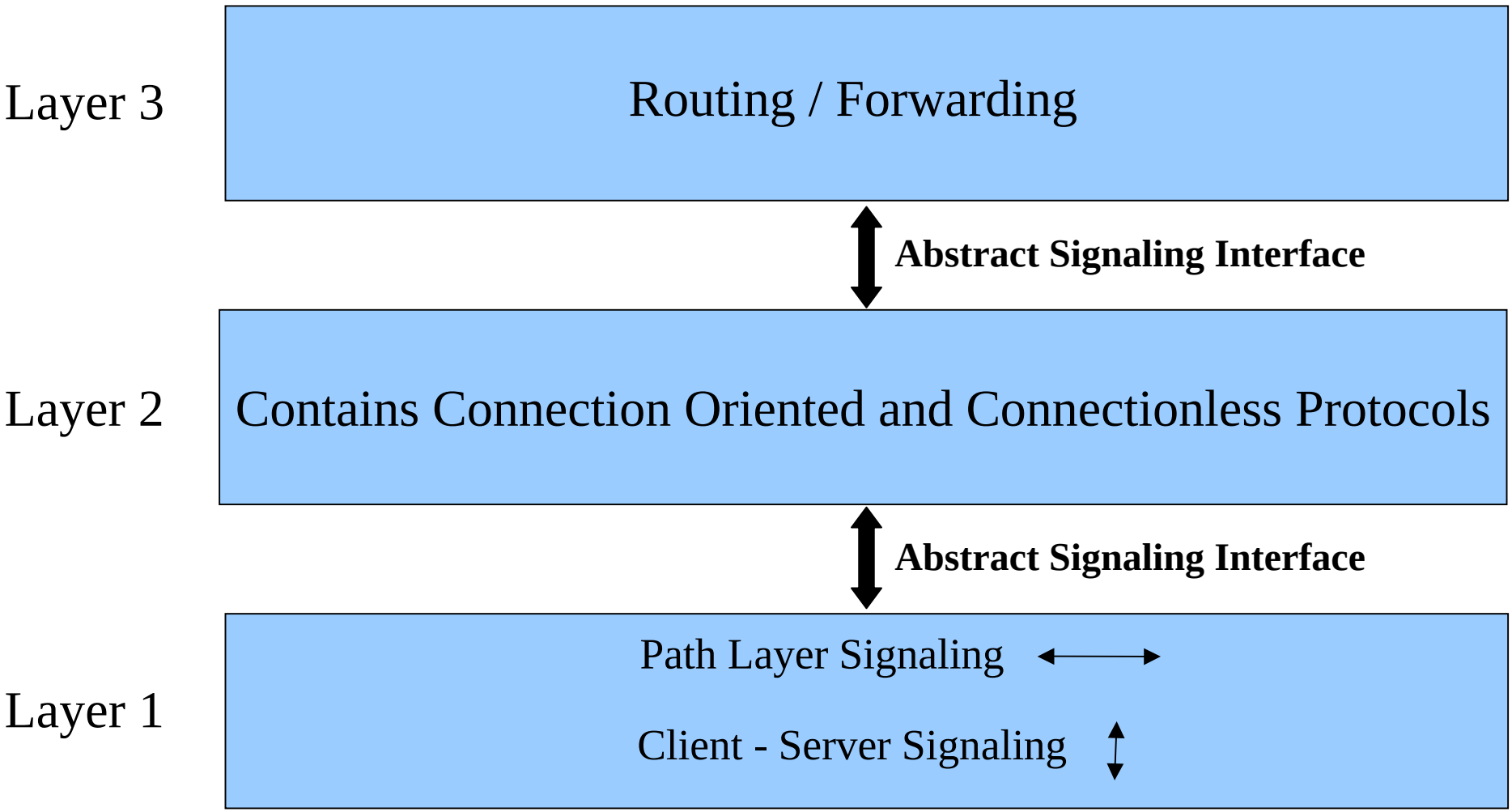
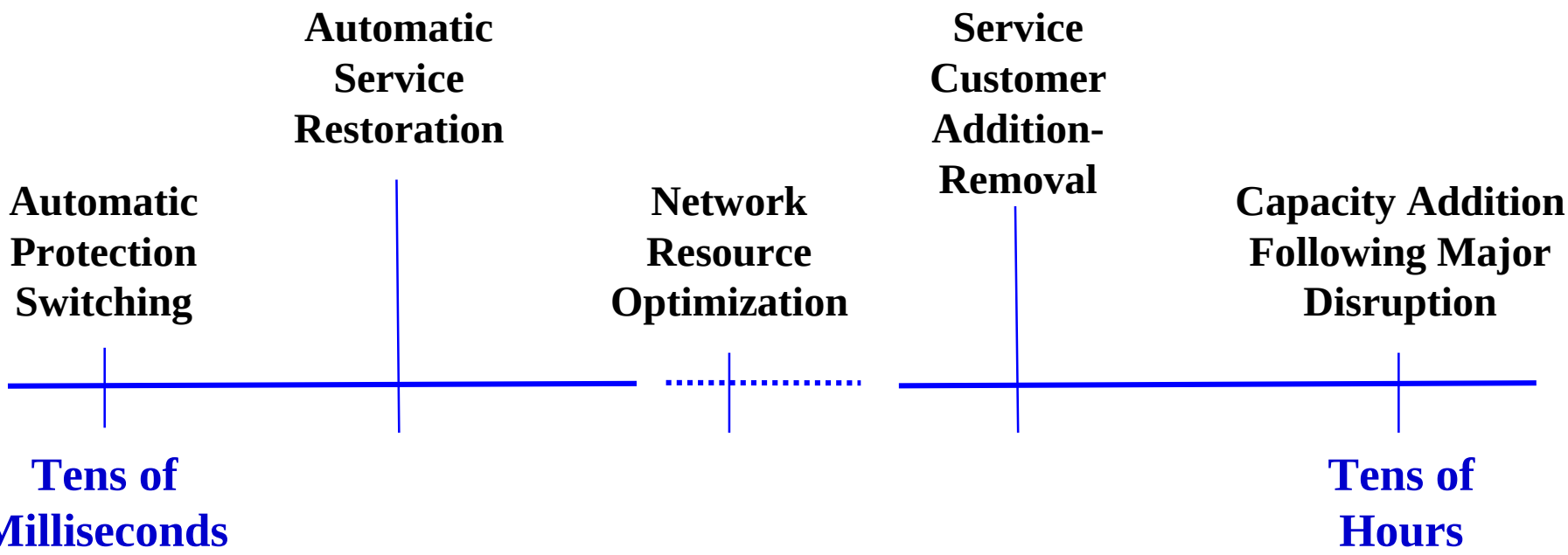
IP/OTN Performance

- Both technologies support unique performance mechanisms with IP predominately uni-directional and OTN bi-directional.
- Depending on the OTN survivability mechanisms, the IP layer may assume OTN performance to be predictable.
- Survivability speeds within the OTN may interact with IP routing convergence.
- IP routers as ASON clients, may change OTN performance characteristics, e.g., error rates, bandwidth, and link creation.
- End-to-end IP client performance will require consideration of both the IP layer and the OTN layers.

Signaling within and between Layers



Time Scales for Typical Events



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Issues and Questions

- Traditional performance allocation is horizontal, i.e. hypothetical reference networks. Is a vertical allocation needed?
- Is there a calculus for aggregating performance metrics across layers
- If a capability can be supported at multiple layers, how should these capabilities be coordinated?
- Some layer characteristics change with time due to technology advances. Is there a need for a family of layer characterization templates?
- Are there a set of principles for allocating performance functions to layers based on characteristics?
- Clients can use numerous server layers. Is there a generic inter-layer signalling model needed?

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Back-Up Slides

The Optical Transport Network

- The Optical Transport Network (OTN)
  - Is specified primarily in G.872, G.709, G.798, G.959.1, and G.874,
  - Is currently limited to the transport of digital signals
  - Provides transport, multiplexing, routing, supervision and survivability of client signals
- It is composed of the following digital layers:
  - Optical Channel Data Unit (ODU), Path and Tandem Connection
  - Optical Channel Transport Unit (OTU)
- It is composed of the following photonic layers:
  - Optical Channel (OCh) Layer, OCh Reduced (OChr)
  - Optical Multiplex Section (OMS) Layer
  - Optical Transmission Section (OTS) Layer
  - Optical Physical Section (OPS) Layer

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OTN Survivability Mechanisms

- The two fundamental survivability mechanisms supported in the OTN are protection and restoration schemes.
- Protection schemes are:
  - Autonomous and make use of pre-established backup resources
  - Optical Multiplex Section (OMS) resilience - all channels in a fiber (or fiber bundle) protected as a whole,
  - Optical Channel (OCh) resilience - each optical channel is protected individually.
- Restoration schemes are:
  - Reactive and make use of dynamically identified backup,
  - Management system or signalling system based,
  - Require network state information.

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References

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- E.490.1, *Overview Of Recommendations On Traffic Engineering*
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- E.801, *Framework For Service Quality Agreement*
- E.860, *Framework For A Service Level Agreement*
- G.709, *Network Node Interface For The Optical Transport Network (OTN)*
- G.798, *Characteristics of Optical Transport Network Hierarchy Equipment Functional Blocks*
- G.805, *Generic Functional Architecture Of Transport Networks*
- G.806, *Characteristics of Transport Equipment - Description Methodology and Generic Functionality*

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- G.874, *Management Aspects Of Optical Transport Network Elements*
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- G.7041, *Generic Framing Procedure*
- G.7710, *Common Equipment Management Function Requirements*
- G.7712, *Architecture And Specification Of Data Communication Network*
- G.7713, *Distributed Call and Connection Management*
- G.7713.1, *Distributed Call and Connection Management (DCM) Based on PNNI*

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- G.7713.2, *DCM Signalling Mechanism Using GMPLS RSVP-TE*
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- M.20, *Maintenance Philosophy for Telecommunications Networks*
- M.3010, *Principles For A Telecommunications Management Network*
- X.700, *Management Framework for Open Systems Interconnection (OSI) for CCITT Applications*
- Y.1271, *Framework(s) on Network Requirements and Capabilities to Support Emergency Communications Over Evolving Circuit Switched and Packet Switched Networks*