

SDN-NFV in Transport

Simplification | Automation | Innovation

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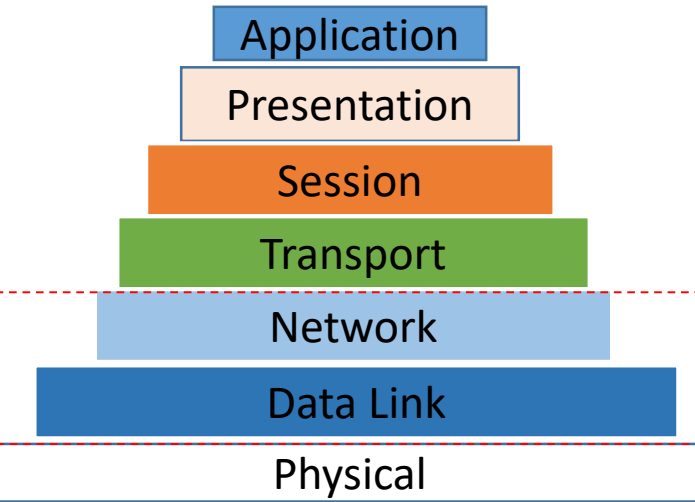
Summary - Current Trends and Future Directions for SDN/NFV

- AS bandwidth availability increases SDN/NFV helps in Network Transformation
- SDN and the Changing Face of Enterprise Networks
- Cutting Time to market or Cutting OPEX
- State of SDN and NFV — Hype or Reality?
- Telco's operational requirement for Network Virtualization & SDN
- How can operators transform and modernize their networks to deliver new services
- Importance of NFV & SDN to 5G Strategies
- NFV as a Platform for Open Innovation
- How service providers leverage NFV to differentiate and accelerate their managed SD-WAN and Security offerings

Difference and Correlation between SDN and NFV

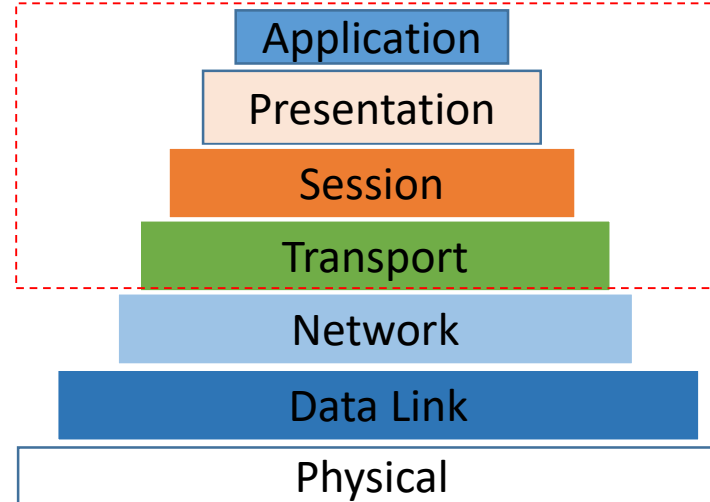
Applicability

SDN



- **OSI Layer 2-3**
- Optimize network infrastructure such as Ethernet switches, routers, transport optics

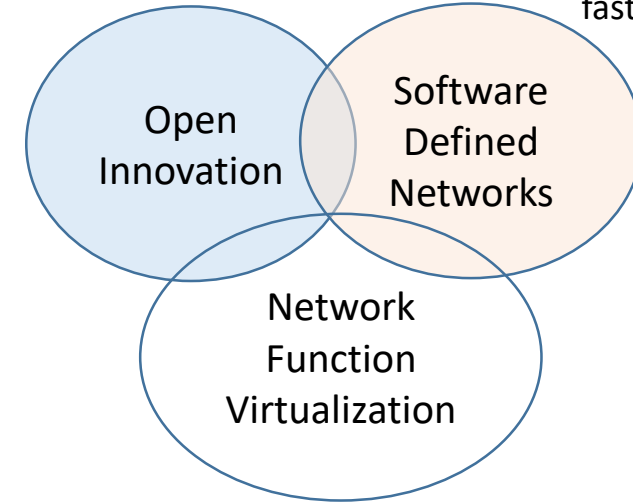
NFV



- **OSI Layer 4-7**
- Optimize deployment of network functions such as load balancer, firewall, WAN optimization controller, DPI etc.

Creates competitive supply of innovative applications by third parties

Creates Network abstractions to enable faster innovation



Reduced Capex, Opex, Space & Power Consumption

Correlation between SDN and NFV

Difference between SDN and NFV

SDN/NFV are considered as two keys to re-architect transmission network

1. SDN is used to provide automation, including zero-touch service provision, automatic path establishment, network optimization, intelligent maintenance etc.
2. NFV is used for provide virtual network functions instead of dedicated service elements, eg. vBNG, vCPE, vEPC

NFV & Automation Global Deployments

Mobile Core Services

Charging, Policy, Internal Functions, etc.
→ PCRF, DPI, SDN, OCS, OFCS, HSS, DNS, NAT,
DHCP, Radius, FW, LB, Orchestration

Consumer Services

VoLTE, WiFi Calling, RCS, WebRTC
→ vIMS, vTAS, vSBC

Wholesale

IoT, MVNO Services
→ vEPC

Enterprise

Network on Demand
Virtual Managed Services
→ SD-WAN,
SD- Transport, SD-VPN, DC-DC
vE-CPE, vPE, vCE, vFW, vRouter, vWAN, vSBC

Telco Transformation Examples

- The most active is the category of “Business” where Finance prioritizes investment in what Makes Money
- Where risk profile is limited to that business customer, with use cases like SD-WAN and vCPE most active.
- Transformations with least business risk- vEPC
- Forward looking- Whole sale, consumer value added services e.g. connected car and other IOT based services

NFV- Current Adoption Challenges

Limited scope for Transport Optics

Skill development- apparently this is the most impending road block

NFVI/VNF performance characterization- Who's responsible??

**Difficulty in MANO integration/interface with existing and new systems
- The industry is still much fragmented**

VNF Build, Licensing/Subscription & Interoperability

Siloed approach to solve common business objectives- IT, Operations and Planning

Use cases of SDN in Transport Networks

OVPN - Optical Private Network



Flexible: Multi-use of one network, sharing facilities, flexible resource allocation, enabling new network construction and sales modes, short ROI.



Decentralized domain + open NBI enabling hierarchical self-management and operation, transfer operator OPEX



High security: OTN Optical-layer and electrical-layer channels are isolated from each other, ensures high service security.



Complete resource survey online, obtain network capabilities in real time, and implement precise capacity expansion.



Template-based service provisioning and rich service routing policies,



The service model is simplified, the northbound interconnection complexity is reduced, and service innovation is accelerated.

E2E One-Stop Service Provisioning

Use cases of SDN in Transport Networks continued..

OTN CPE Plug & Play, Simply The Operation

- CPE plug and play, installation and configuration time-consuming, hourly completion.
- Only one site-visiting by hardware deployment engineer, no site-visiting by software commissioning engineers.

SLA Assurance for Private Line: Visible, Predictable, Traceable

- Simplified 3-layers service model, 50% workload reduced.
- Configuration templates based service provisioning, with rich service routing policy.
- Standard NBI for fast integration, E2E fast provisioning

Online Survivability Evaluation to Identify Bottlenecks



The network-wide link resource information is automatically obtained and analysis tasks are performed automatically in one-click or scheduled mode.



The evaluation is real-time, efficient, and accurate.

Use cases of SDN in Transport Networks continued..

Optical Network Health Visualization, Real-time Health View

- Health and trends of fiber/OCh can be seen in real time.
- Traceable historical reliability of fiber based on probability analysis of fiber interruption and intermittent disconnection.

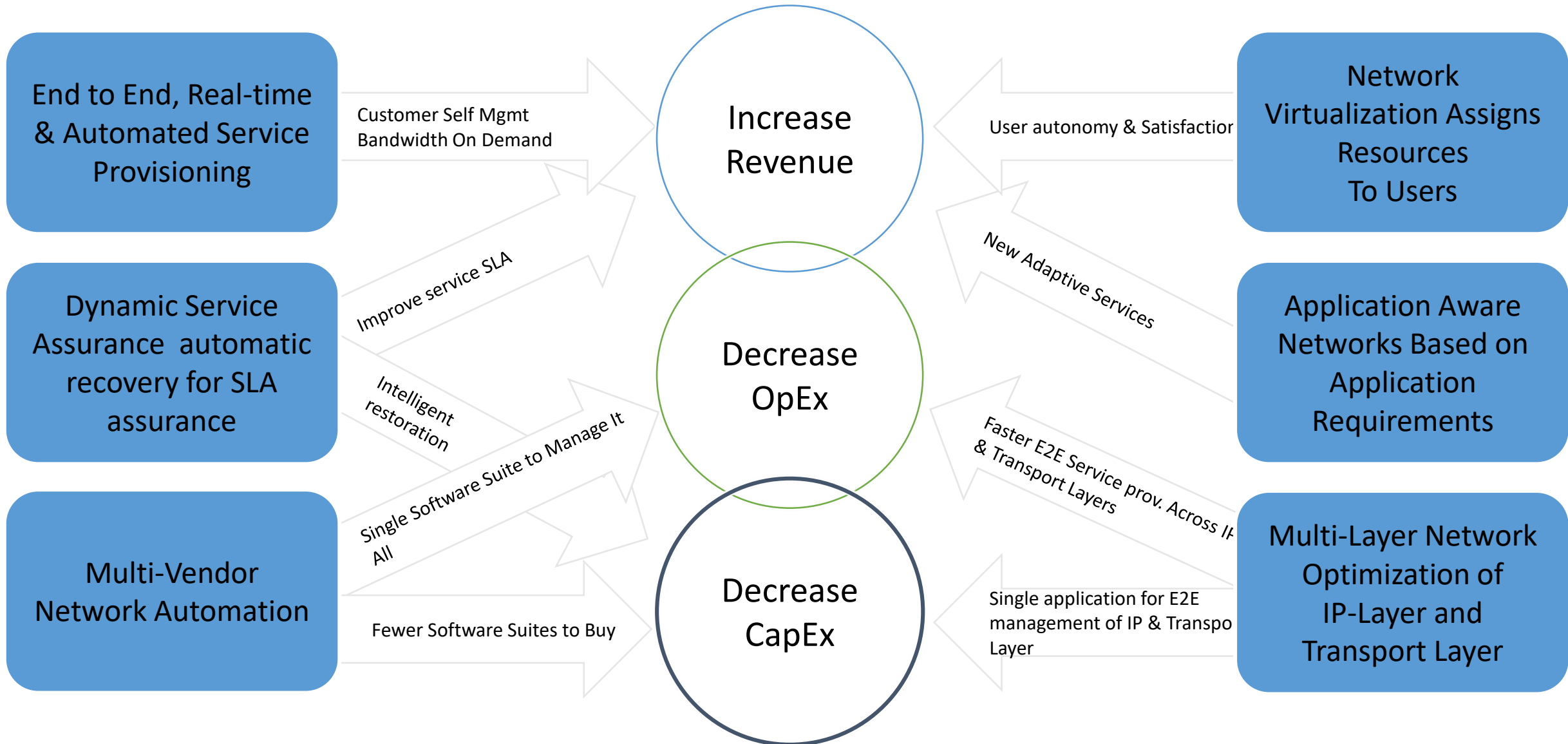
Optical Network Health Prediction, Enable Proactive O&M

- 90% Accuracy , gradual degradation predictable in advance(days to months)
- Proactive maintenance based on optical network health prediction , reduce compensation for failure due to fiber degradation 90%.
- Fiber troubleshooting costs reduced by 20%

Network Resource Assurance

- All network resource is visualized
- Real-time synchronization of planning data with live & engineering data
- AI based Network-wide & site capacity prediction.
- Reasonable budget-making.

Summary: Promises for Telcos



Challenges to overcome: Transport SDN

- ❖ Openness & Interoperability
 - ❖ Open-Source ? Still coupled with hardware
 - ❖ All vendors still propose own SDN Controllers
- ❖ Brownfield- Phase wise plan required to support
 - ❖ both legacy and new equipment
 - ❖ Control plane (e.g. ASON) and non-Control plane based technologies (MPLS TP etc.)
- ❖ Lack of viable business case for SDN deployment
 - ❖ Benefits to be quantified for Capex and Opex optimizations
- ❖ Interlayer & Inter-technology optimization
 - ❖ IP & Optical
 - ❖ MPLS TP & L3
- ❖ Real-time analytics and network prediction for proactive capacity planning
- ❖ Quick deployment of below use cases required:
 - Resource virtualization and OVPN, Online survivability analysis, BOD, Latency map, rerouting based on latency policy, IP + Optical synergy and multi domain scenarios

Thank You