

Benefits of Optical Packet Switching for Router by-Pass in Metro Networks

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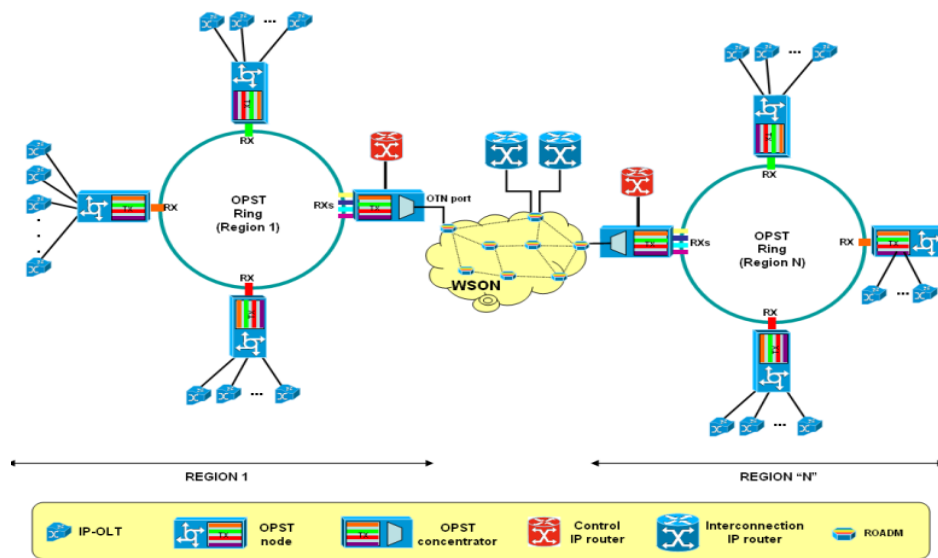
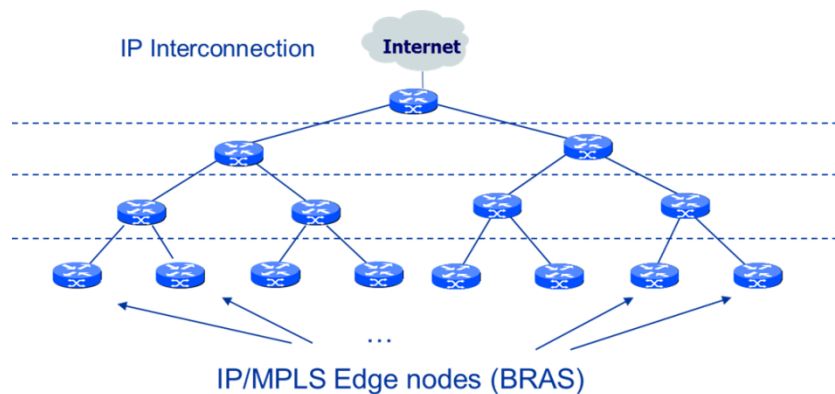
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Motivation, problem area

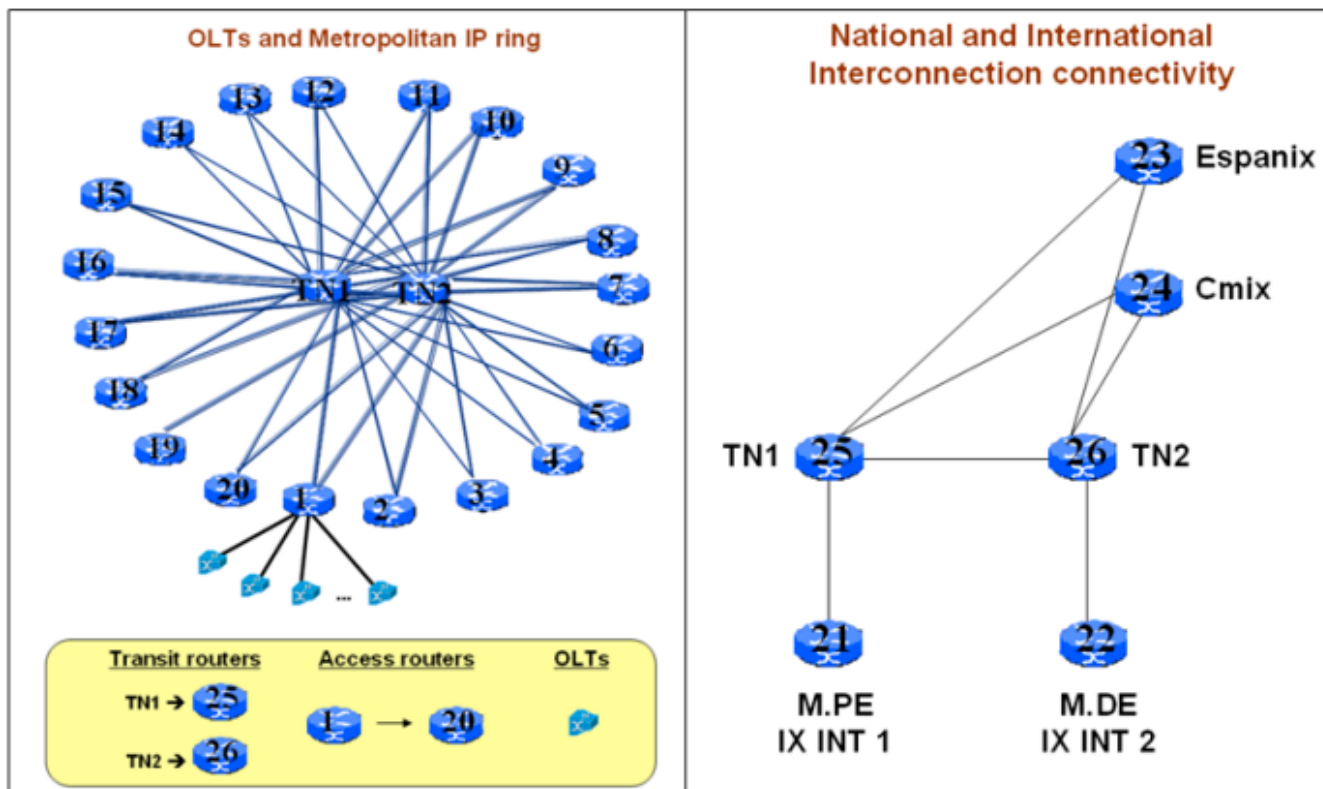
- Video **QoS is unpredictable** when delivered over today's Internet infrastructure
- One solution is to move the Video-on-Demand Content Distribution Network (CDN) closer to the user
- This complicates Metro Network design and drives a need to **use the optical layer more efficiently**

- The aim of this work is to compare the relative costs of the following 2 architectures for delivery of CDN services:
 - All-IP Metro Network (reference network)
 - A Metro Network built using OPST (Optical Packet Switch and Transport)

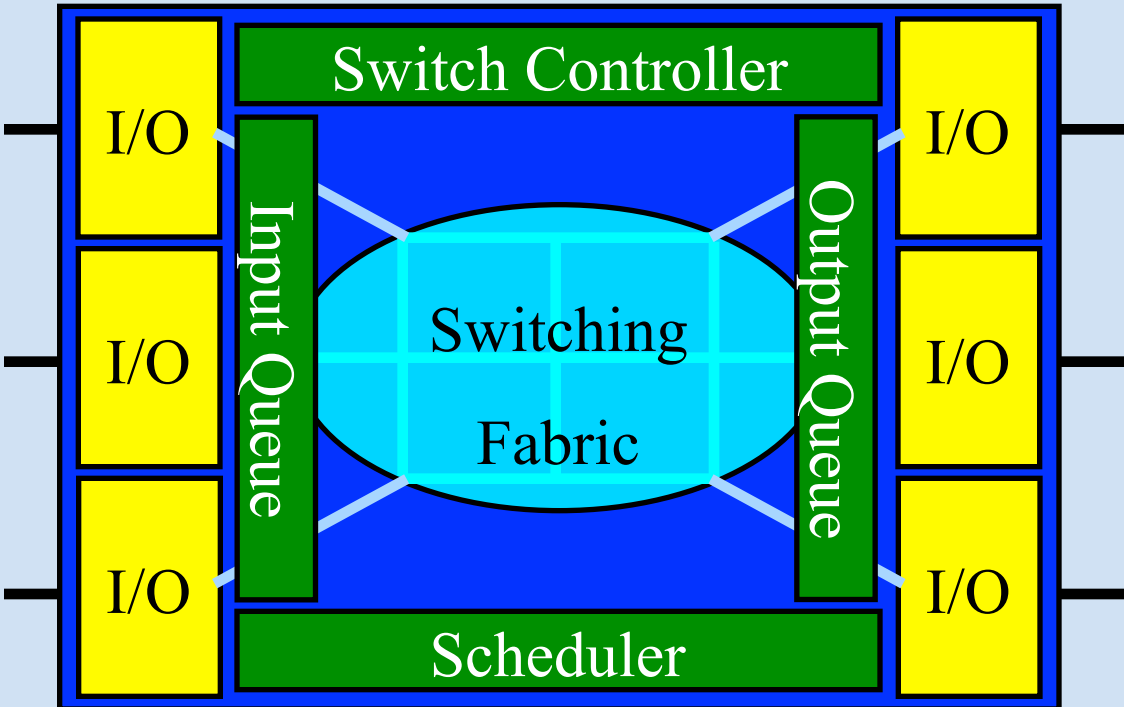


Research approach, Methodology

- The aim is to eliminate the Access Routers and reduce the port count for the Transit Routers by using Optical Packet Switching in the Metro Aggregation part of the network.

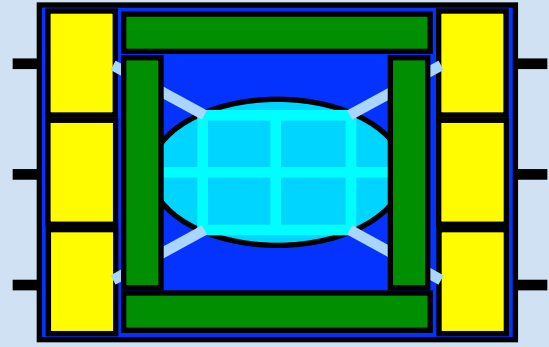


Standard Switch Today






-  Network Services
-  Switch Control
-  Silicon Switching Fabric

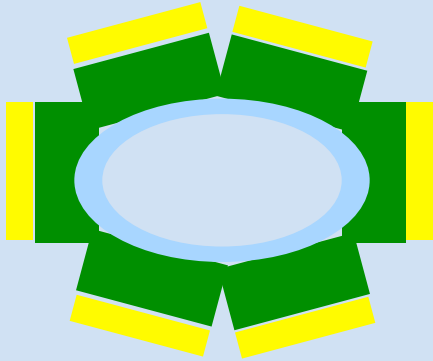
Objective: Distribute The Switch



Centralized Switch

-  Network Services
-  Switch Control
-  Silicon Switching Fabric

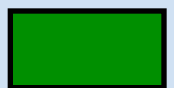
OPST Objective: Distribute The Switch



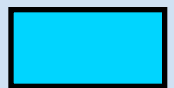
Centralized Switch



Network Services

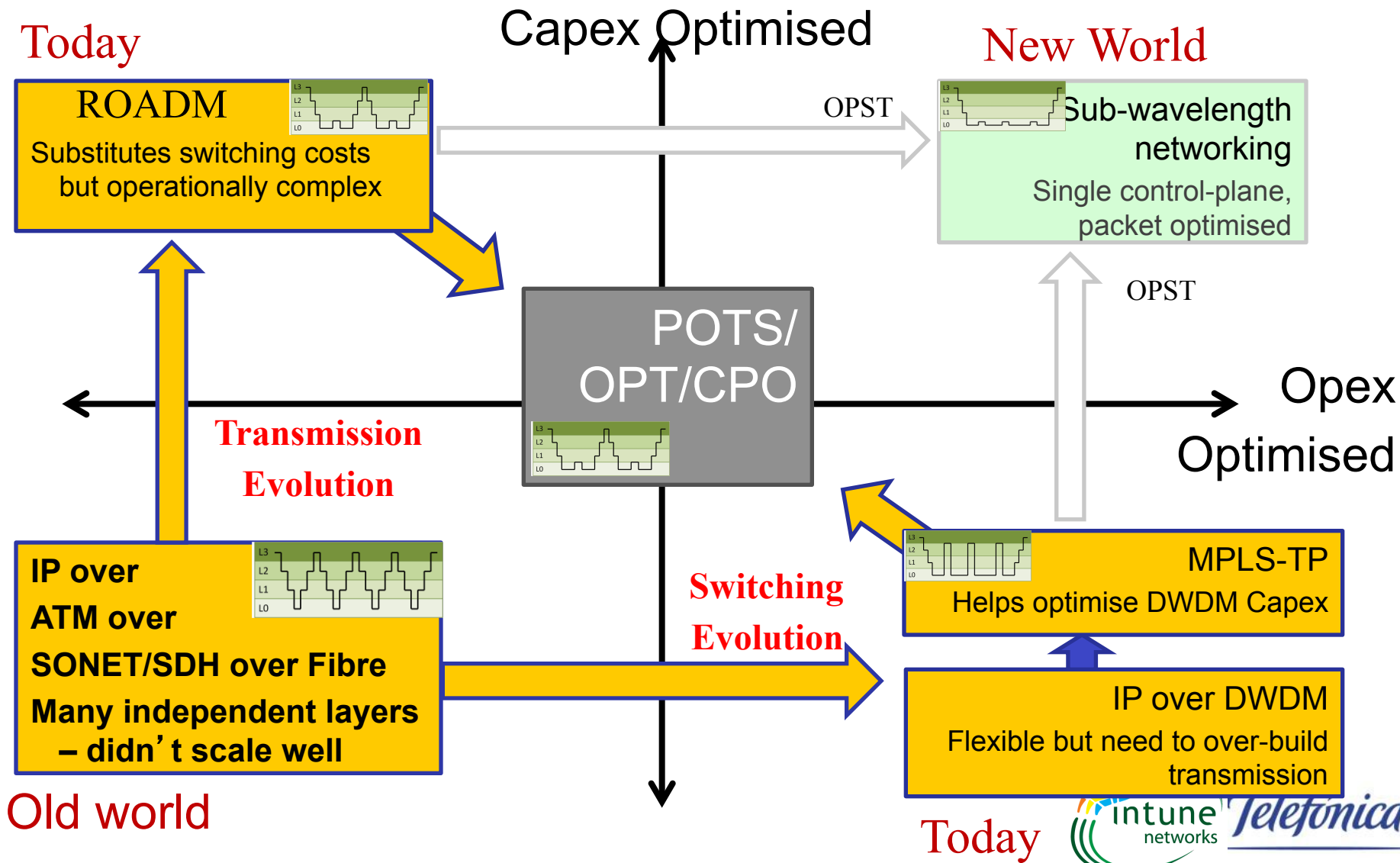


Switch Control

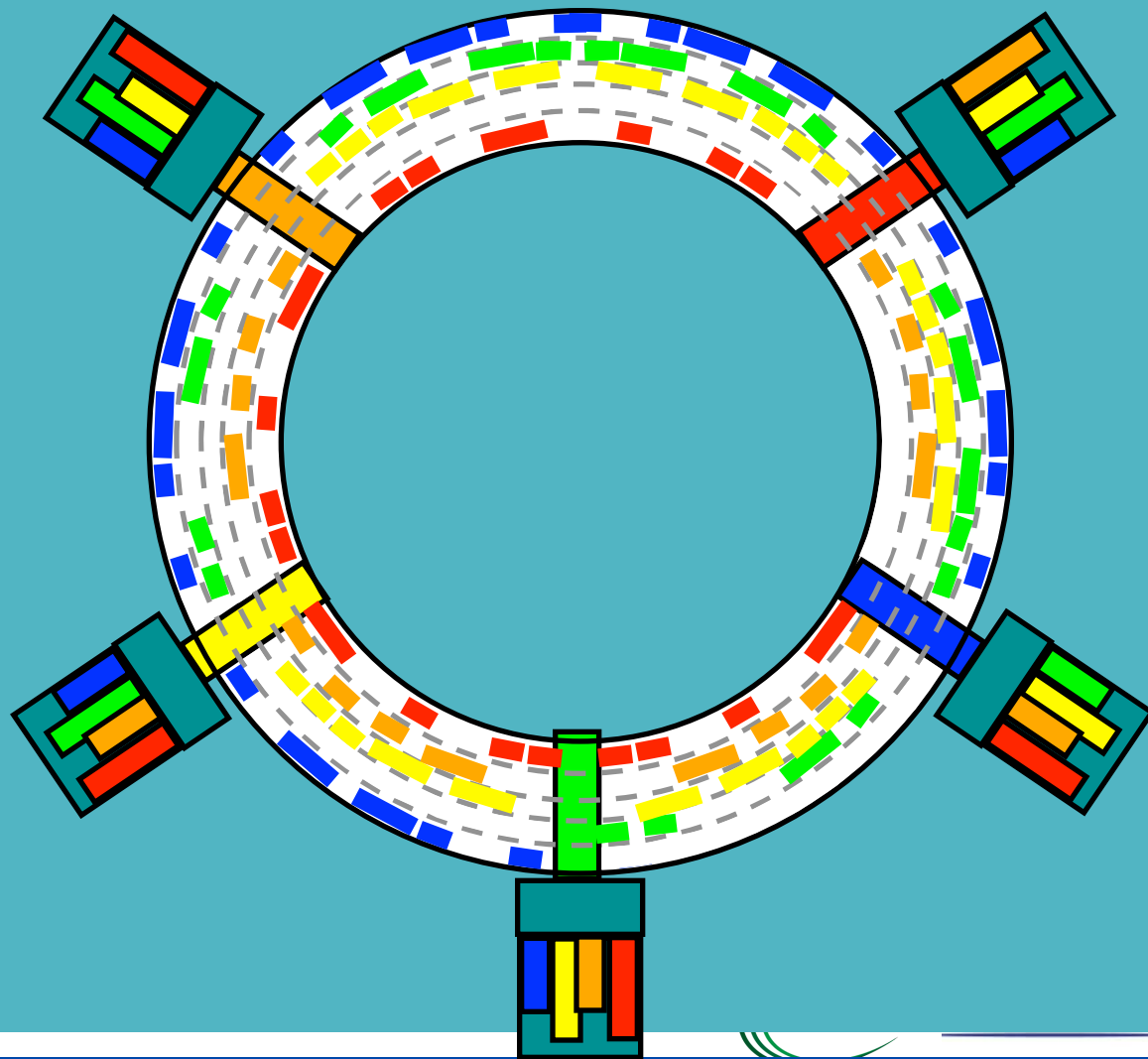


Silicon Switching Fabric

Optimisation has been attempted but distributed the switch optically optimises both capex and opex

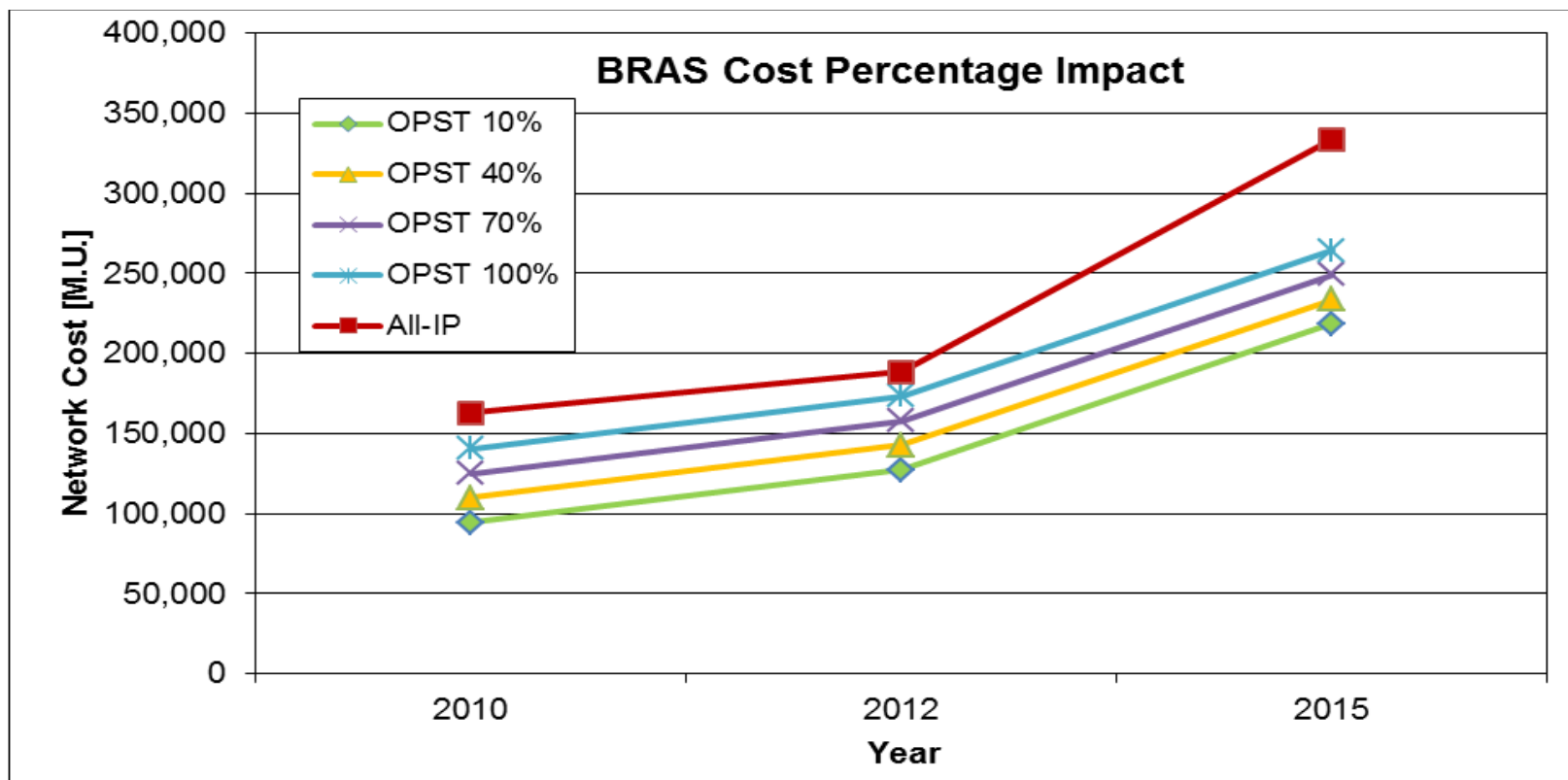


Simplified View of True Sub-Wavelength Switching



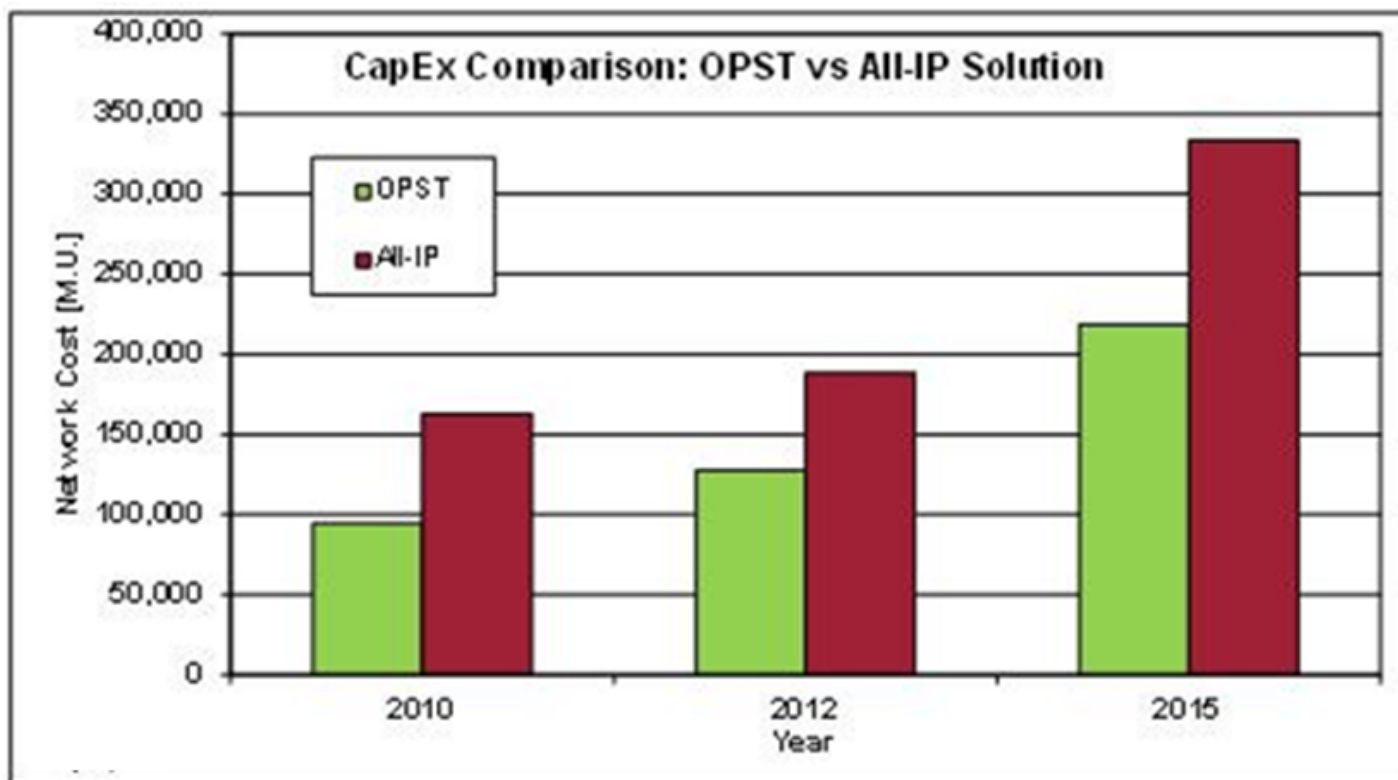
BRAS functionality cost impact when integrated into OLT

- To remove Access Routers, the BRAS function is moved to the OLT and this cost must be included in the comparison.



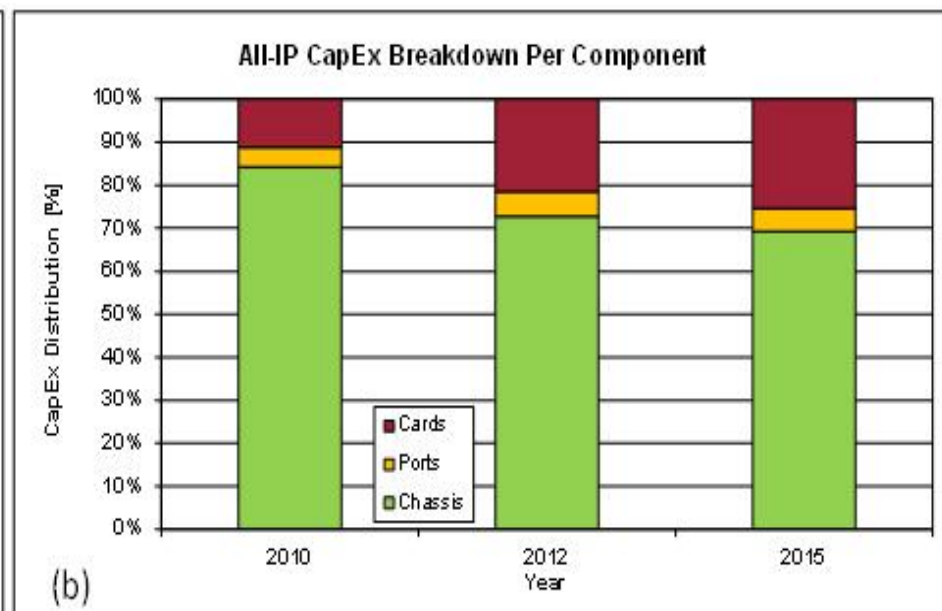
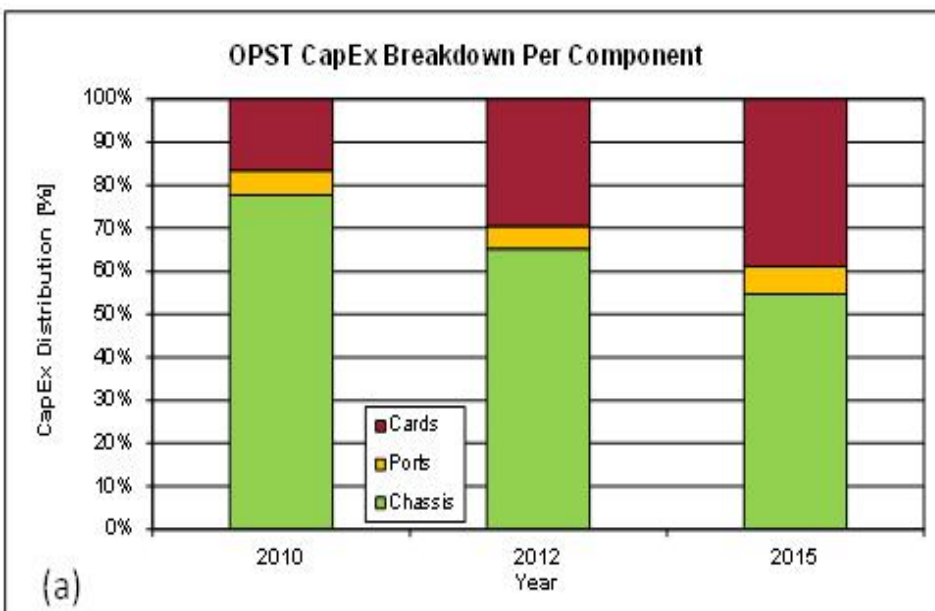
CapEx Comparison: OPST vs All-IP solution

- OPST yields savings of 42%, 32% and 35% for 2010, 2012 and 2015 respectively.



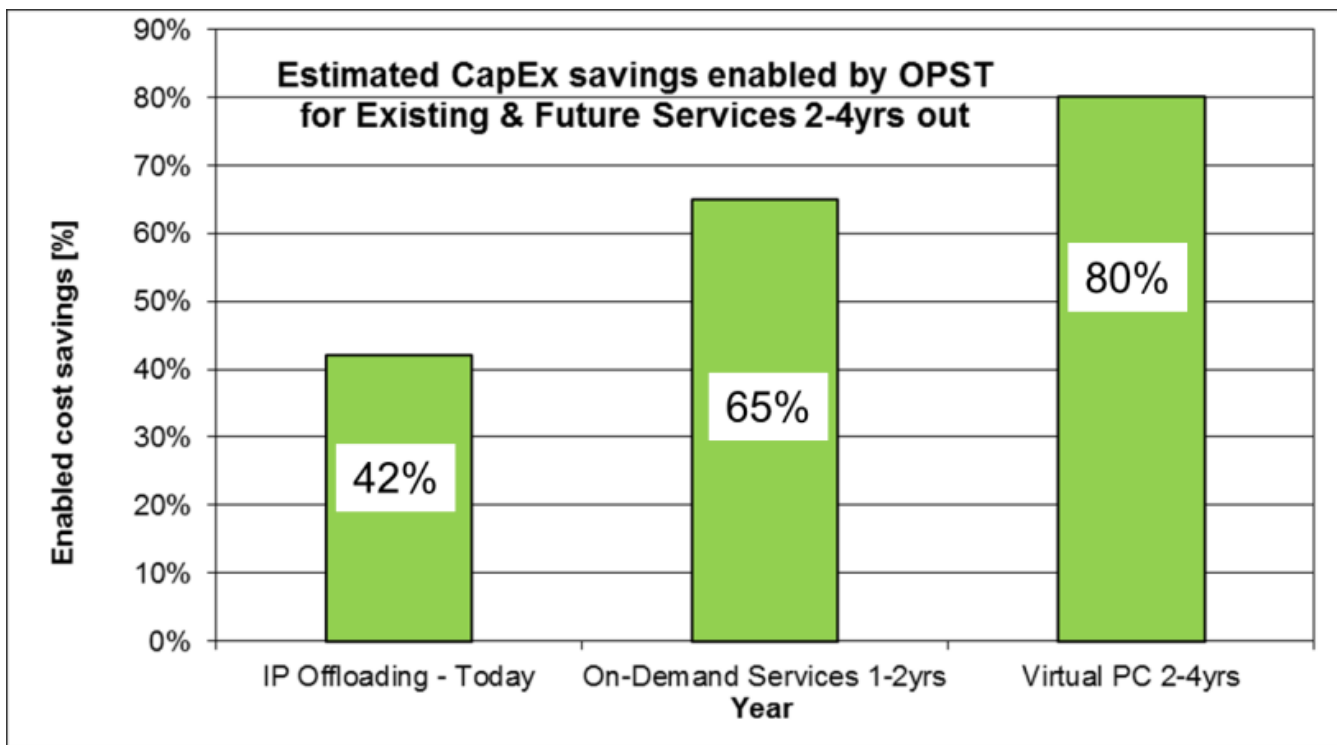
CapEx breakdown per component type: (a) OPST and (b) All-IP

- There are less chassis when you distribute the switching function using OPST as a percentage of overall components which simplifies the control plane requirements.



Additive OPST benefit quantifications

- The more services that are added to the Metro network, the greater the CapEx savings due to the ability for OPST to simplify the network operation and design (42-80%).



- Cost and complexity of scaled numbers of IP Routers is prohibitive when Content Distribution Networks are moved to the Metro.
- Pushing some switching, aggregation and grooming functions **down into the optical layer** is one solution.
- This study shows **32-42% CapEx savings** by using Optical Packet Switch and Transport (OPST) technology to replace an all-IP design.
- The result is less equipment and a simpler network design.
- Further benefits include lower power consumption and up to 80% lower costs when cloud services are added.