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**Accelerating Optical Wave Order-to-Provisioning
Time by 90% Using SDN Orchestrator**

Credits

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Current State of Provisioning of Optical Wave Services for Wholesale and Enterprise Customers

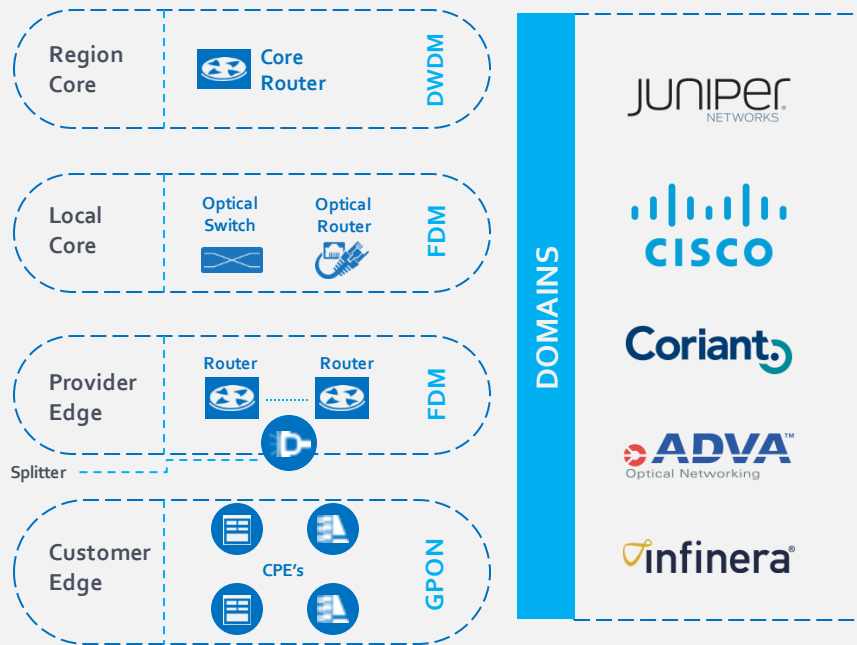
Current Provisioning Scenario

Multiple domains - access, core and aggregation

Multi-vendor/multi-domain ecosystem

Inter-carrier configurations

Demand-based service provisioning and activation



Challenges faced in optical provisioning:

- Multiple domains/touch-points and vendors systems
- Delays in communication and approvals at each touch-points
- Assessment and allocation of resources for provisioning is difficult
- Added cost and loss of resources
- Higher time to market
- Diminishing customer experience due to delays in service configuration

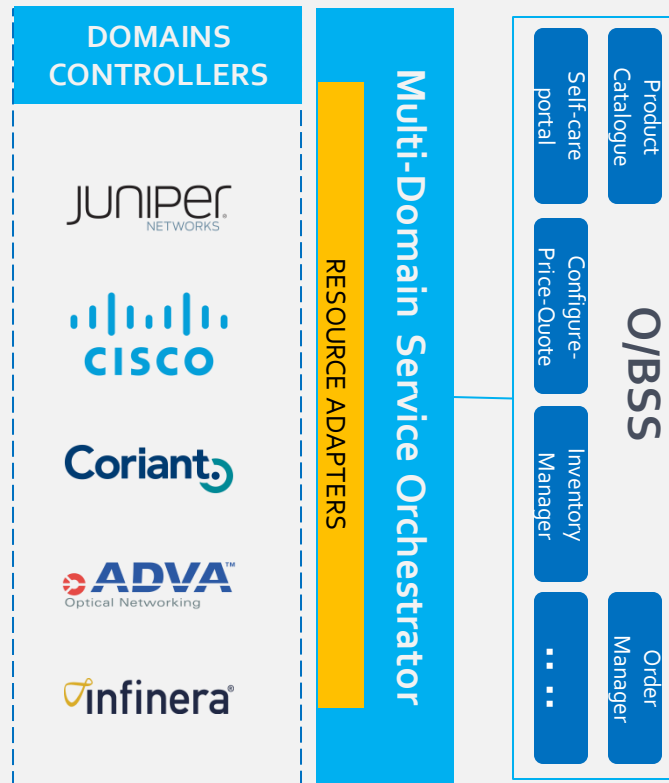
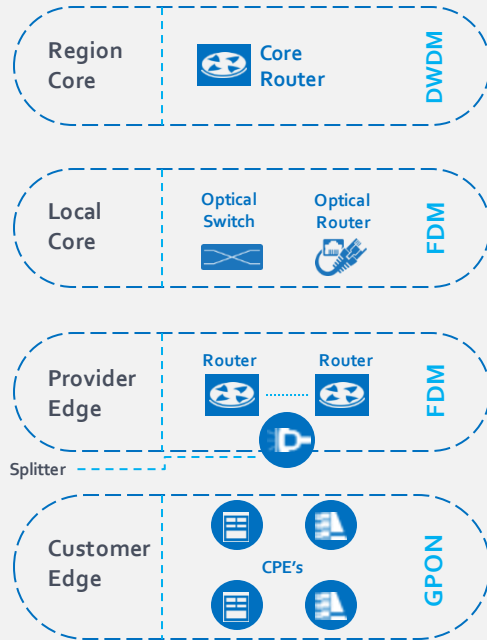
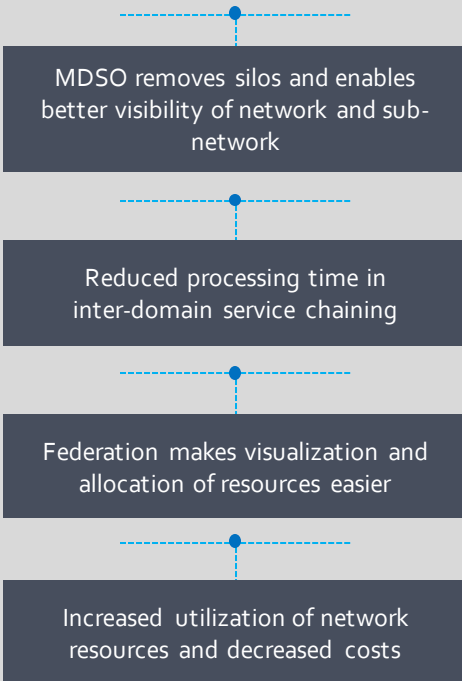
Optical-wave service provisioning may take up to 45 days due to involvement of multiple network domains and layers

This insight focusses on SDN enabled provisioning for accelerating the Order-To-Provision cycle to minutes!



SDN - Multi-Domain Service Orchestration (MDSO): Solution to Achieve Touch-free Provisioning

Provisioning Scenario Under MDSO



Key Considerations to Achieve Touch-free Provisioning



Inter-carrier agreements and pre-provisioning:

In order to be ready to provision a service in any particular geography, it is important to have inter-carrier agreements in place for edge to edge configuration.



Consolidated view and integration with order management & inventory management system:

Unification of granular network level data starting from network, sub-network up to network element level for accurate network visibility.



Resource Adaptors (RA):

- Resource Adaptors are required for seamless integration of disparate multi-vendor network domains with the MDSO Layer using open APIs. These software plugins are developed to incorporate automation engines and mechanisms for a software programmable network
- Resource adaptors convert network resource/ domain specific information into management and orchestration (MANO) understandable format.



Traffic engineering refinement:

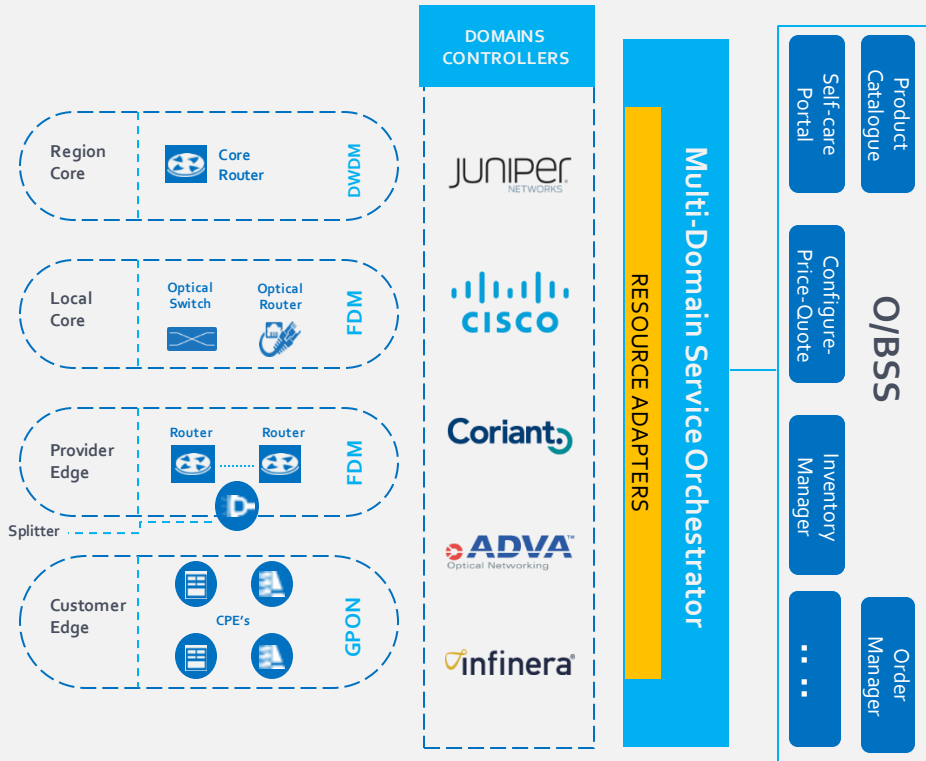
Effective traffic engineering refinement (TER) methodology enables dynamic inter-domain provisioning of network paths/routes. TER helps in provisioning and configuration of network services based on:

- Optimum path selection based on minimum latency and hops
- Policy based on abstraction of IP/optical networks
- Path across multi-network vendors
- Global-view of networks and network elements
- Programmable network processors
- Traffic grooming methodology like Classifier, Mapper, Label etc.
- Optimized nodes/elements
- Provisioning based on constraints like quality of service, class of service, jitter etc.

This insight focuses on developing resource adaptors and implementing effective traffic engineering refinement (TER) to enable touch-free provisioning!



Implementing the RA (Resource Adapter) architecture is the key to enabling configuration management and provisioning capabilities for multi-vendor, multi-equipment type, dynamic networks environment of CSPs from one software interface

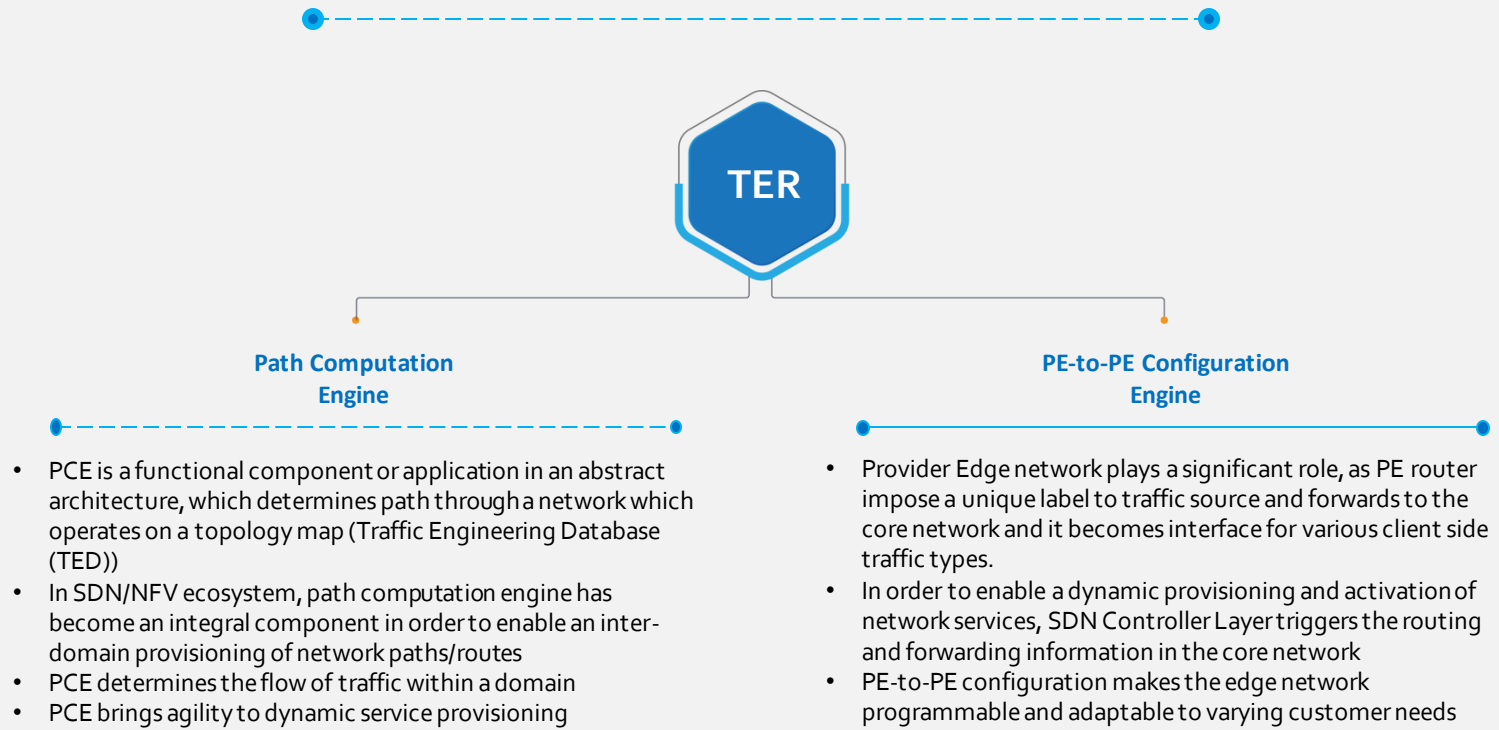


In SDN/NFV ecosystem, resource adapters (RA) need to be designed to enable seamless integration/ on-boarding of multi vendor domains on to the SDN MDSO.

Resource adapters are developed over standard interfaces like – REST, NETCONF, CLI and OpenFlow which help in establishing connection between north-bound and south-bound components.

Resource Adapters enable the automation of network service configuration using industry standard data modeling platforms

Two major components to achieve TER are path computation engine (PCE) and PE-to-PE configuration engine.

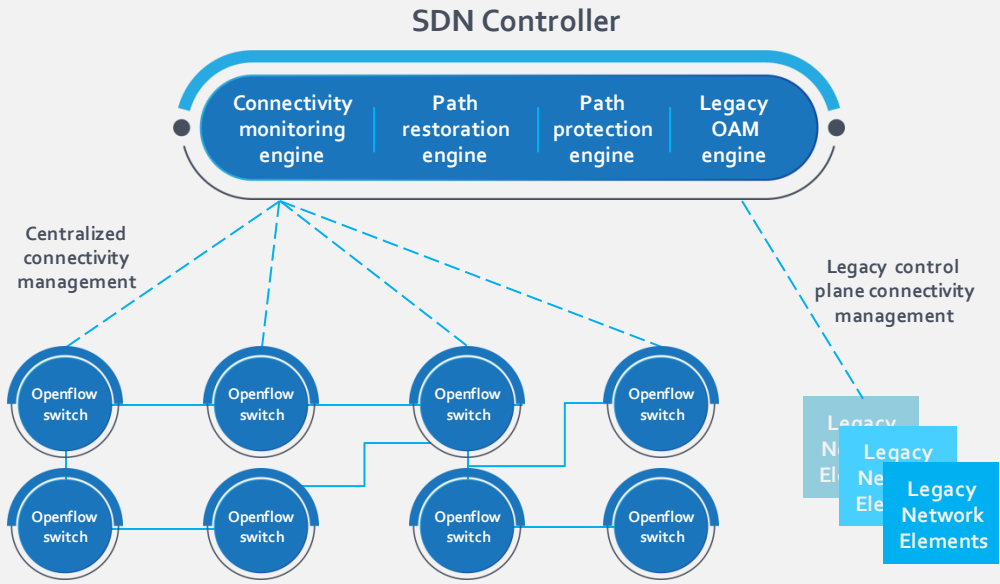


- End-to-end LSPs
- A segment or fragment of an LSP
- Forwarding instruction on a single node

Levels of provisioning

- As an SDN controller component
- Orchestrator to controller component

Layers at which PCE may reside in SDN



- **Inter-Domain Routing:** Allows secure, dynamic, optimal, and private inter-area and inter-domain traffic engineering path setup
- **Customizable Path Computation:** Provide open software APIs, to allow operators to customize or replace routing algorithms
- **Improved Price/Performance Ratio:** A centralised path computation engine reduces the cost associated with proprietary hardware
- **Simplified Operations for Path Computation:** Modifying or upgrading path computation policy no longer requires a change to all NEs in the network with the cost, time lag and instability that is involved in such a process

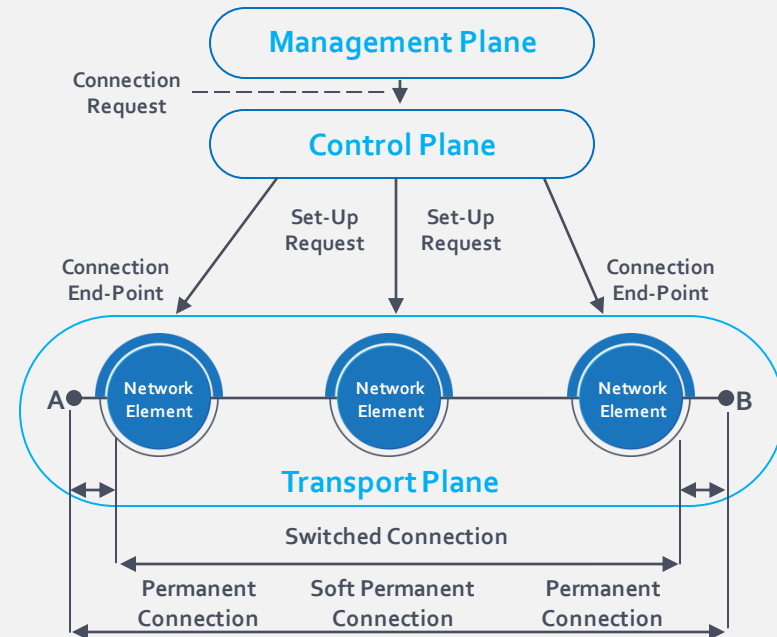
Benefits of implementing PCE capability in RAs

- Configuration for forwarding details for each interface used for client traffic
- Depending upon PE-CE routing protocol, configure required routing protocol
- Configure border gateways for between all PE routers
- Declare different neighbors
- Redistribute the static routing
- Redistribute connected routing information

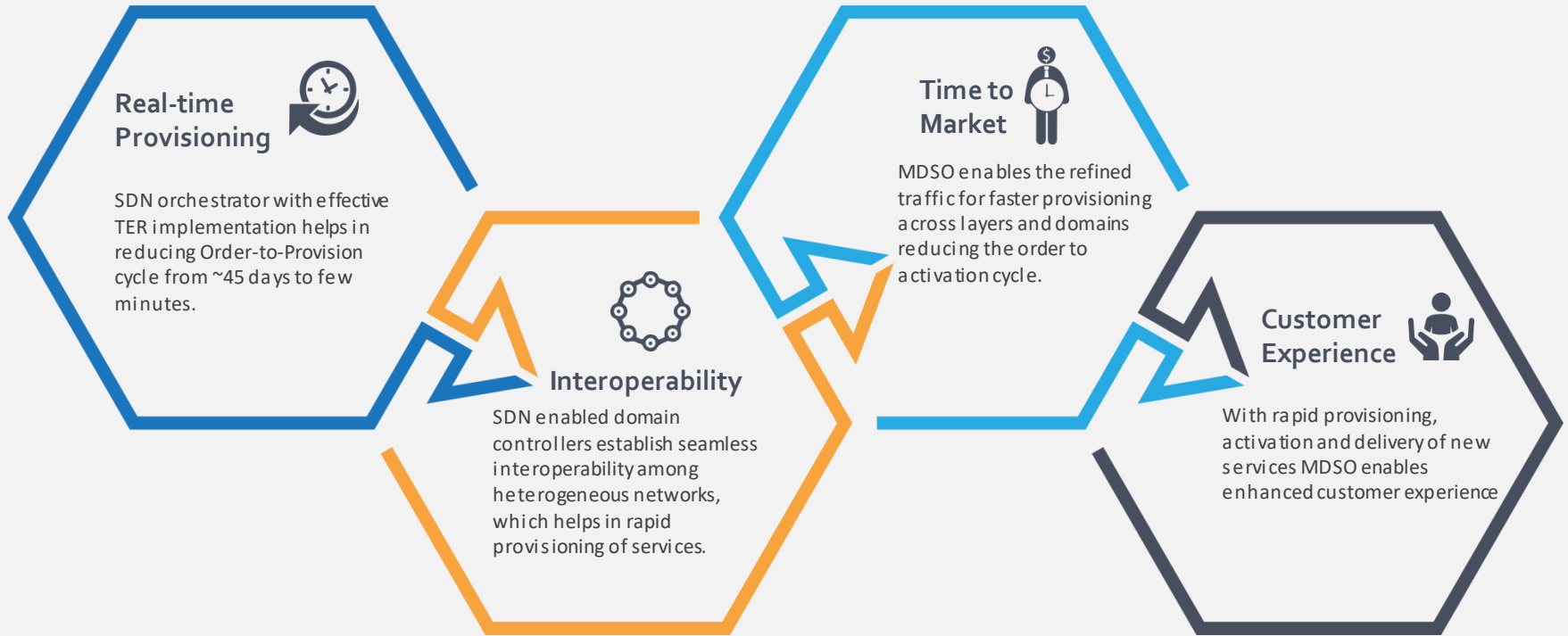
Configuration

- Keeping the edges pre-provisioned to adapt to dynamic service requests and traffic
- Simplifies the configuration at the customer edge reducing the truck loads

Benefits of implementing PE-to-PE capability in RAs



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THANK YOU!

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