

Routing in the Future Internet

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Institute of Computer Science
University of the Republic (UdelaR)

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Department of Computer Architecture
Technical University of Catalonia (UPC), Spain



Institute of Computer Science
University of the Republic (UdelaR), Uruguay

- 1 Intradomain aspects
 - **A look inside carrier-grade networks, their management planes, and the desired convergence of IP and OTNs**

Management Planes: A practical look into the desired convergence of IP and OTN

A look into IP and OTN convergence...

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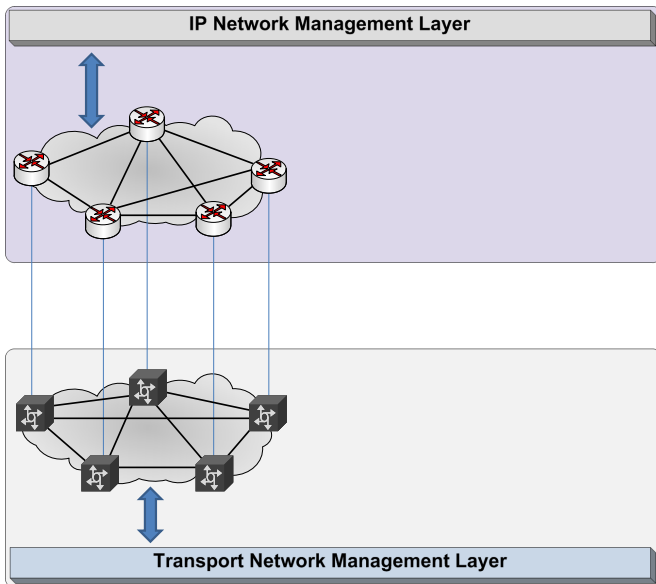
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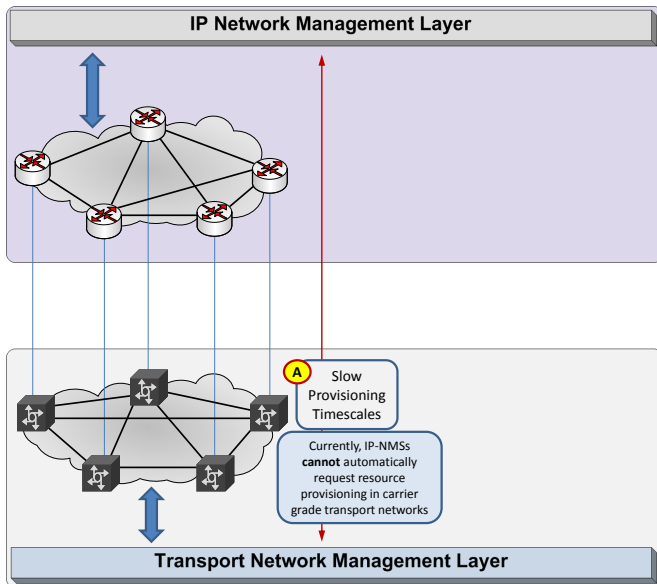
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 - ⊗ Overall...**two isolated management ecosystems**

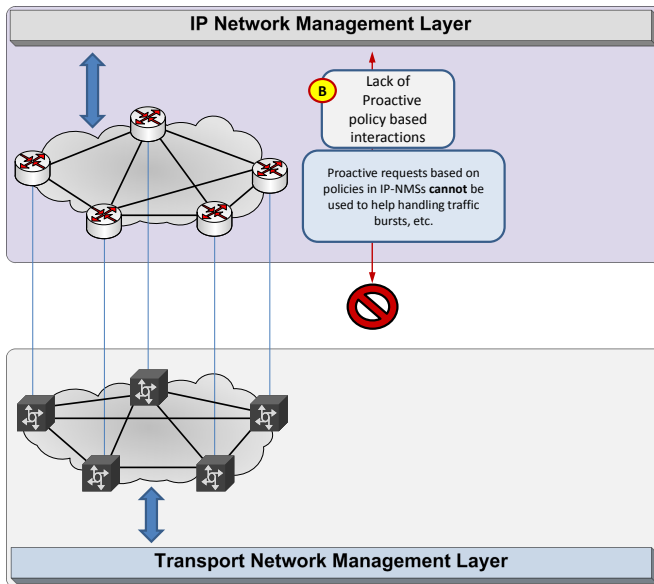
Management Limitations in Multi-layer Networks



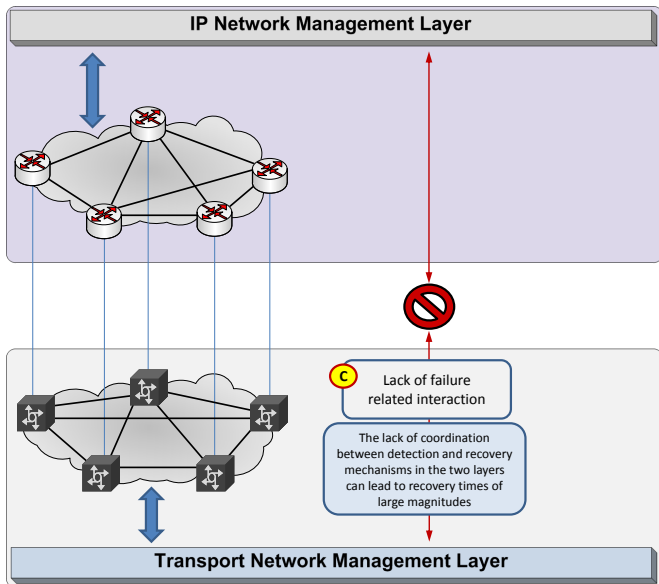
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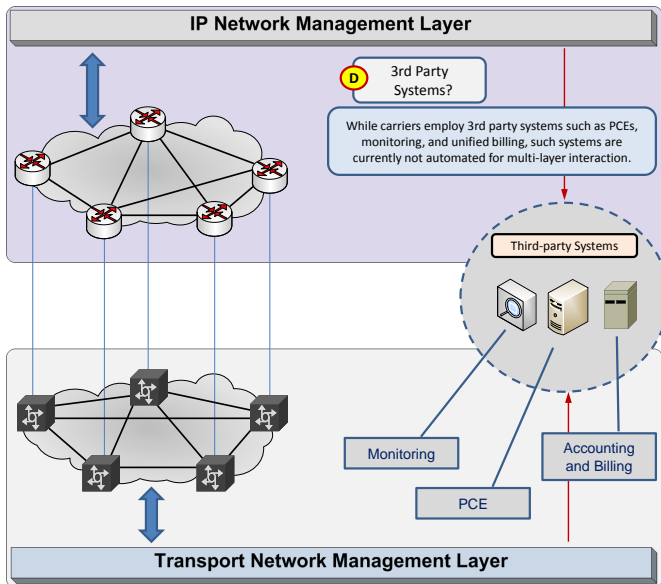
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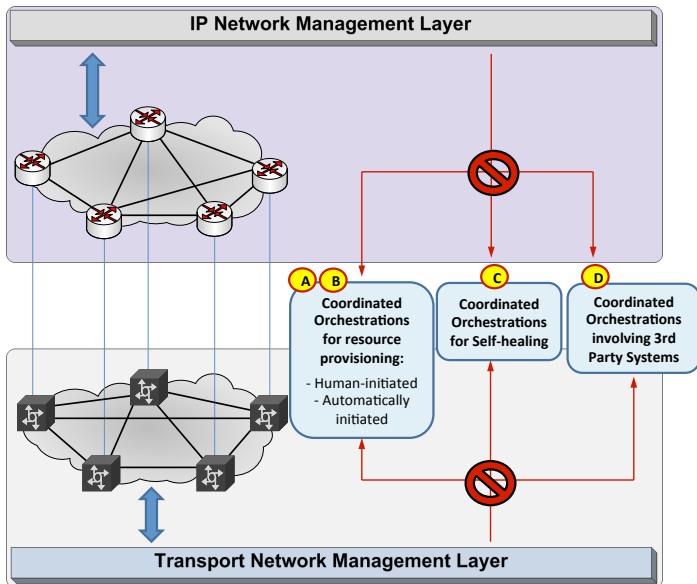
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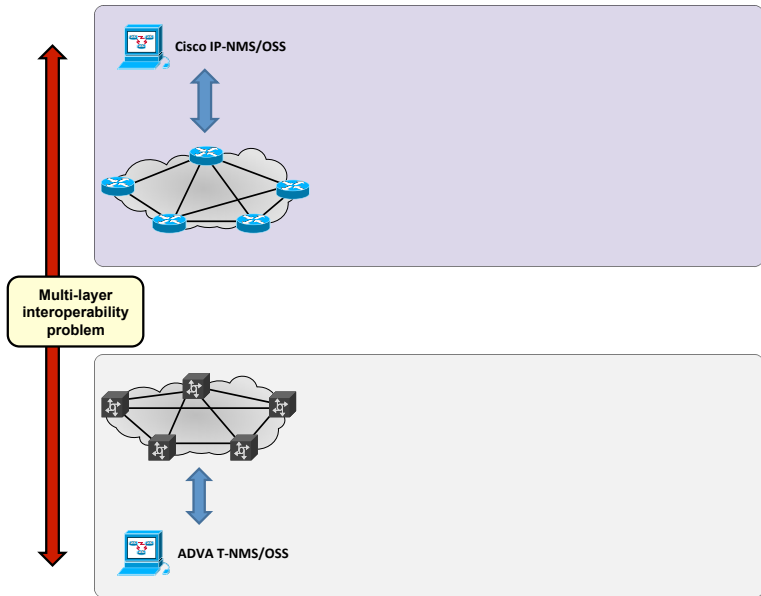
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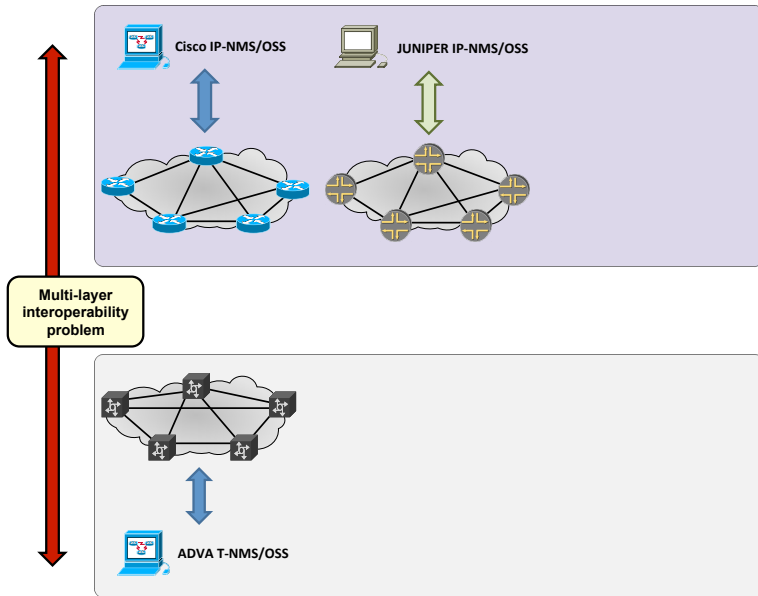
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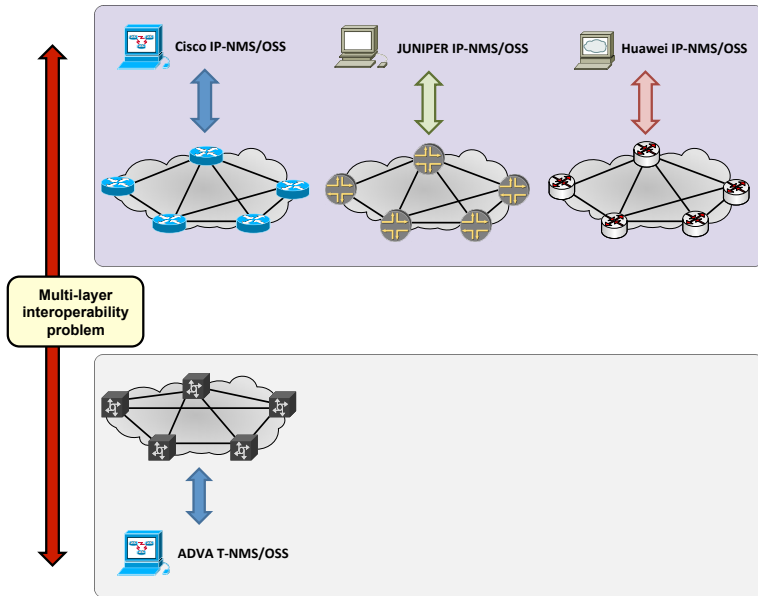
Interoperability Problems in Multi-vendor Settings



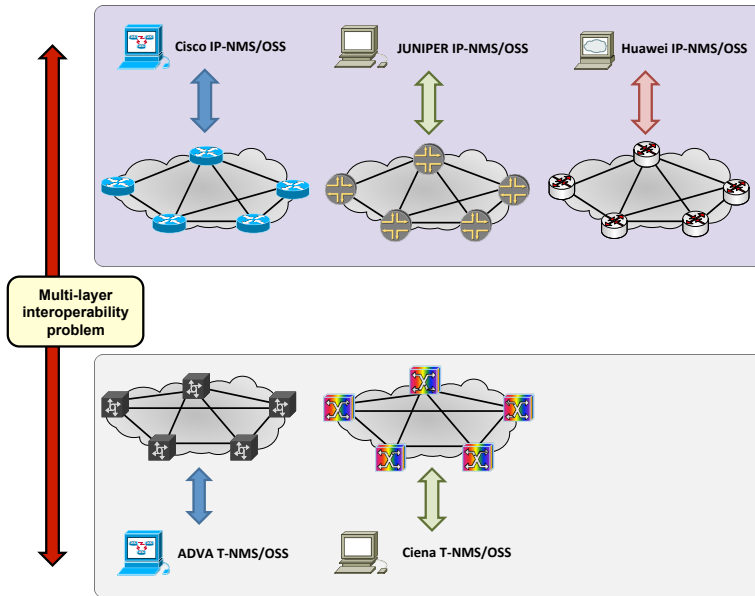
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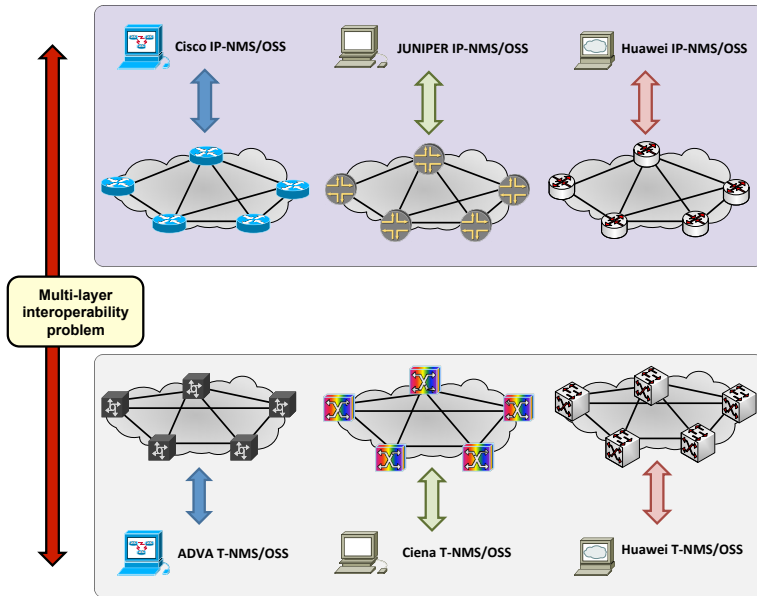
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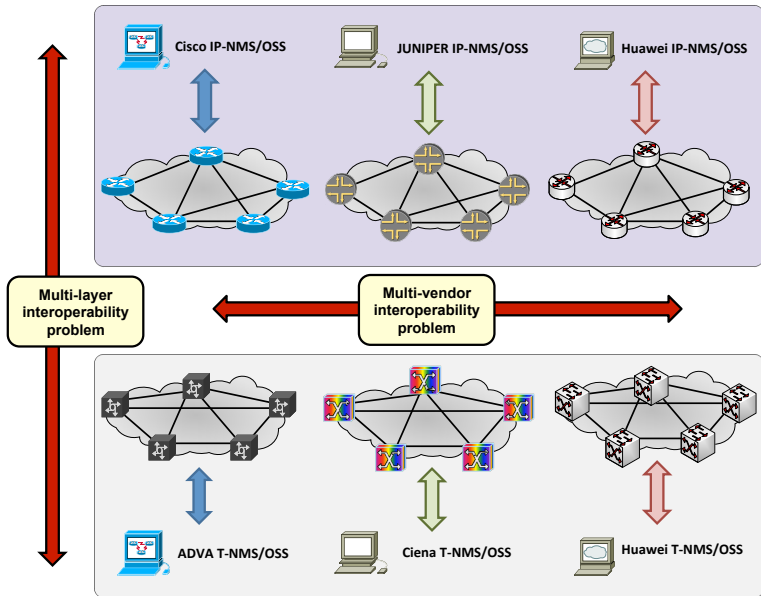
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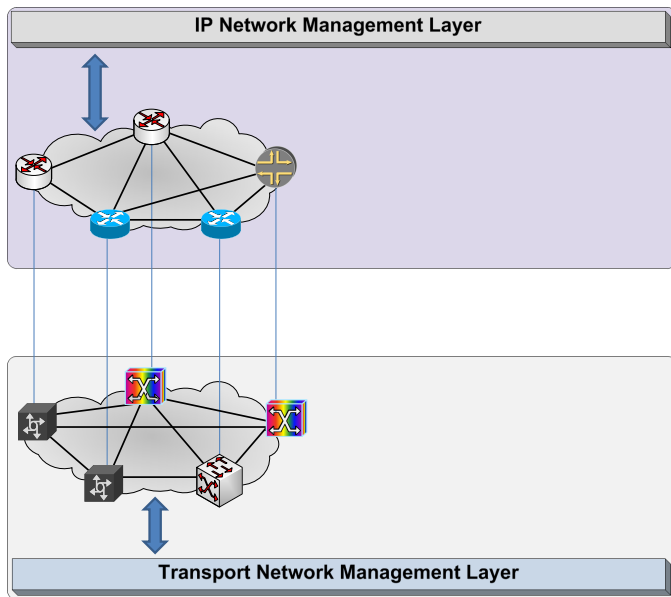
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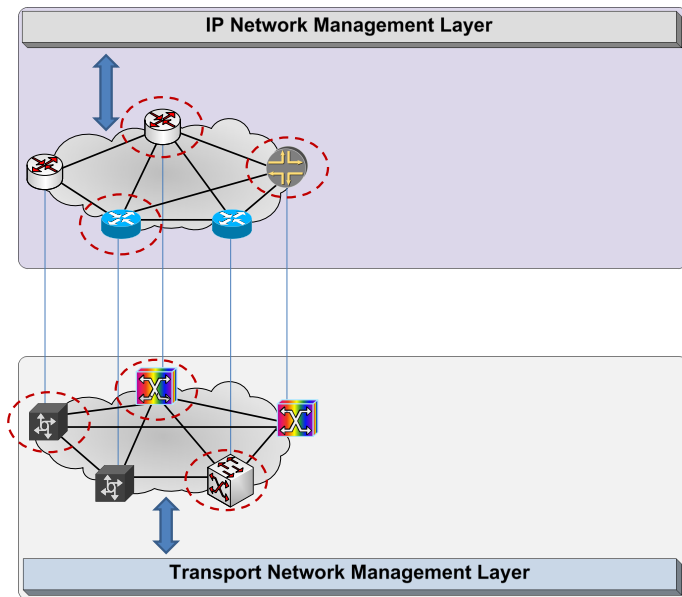
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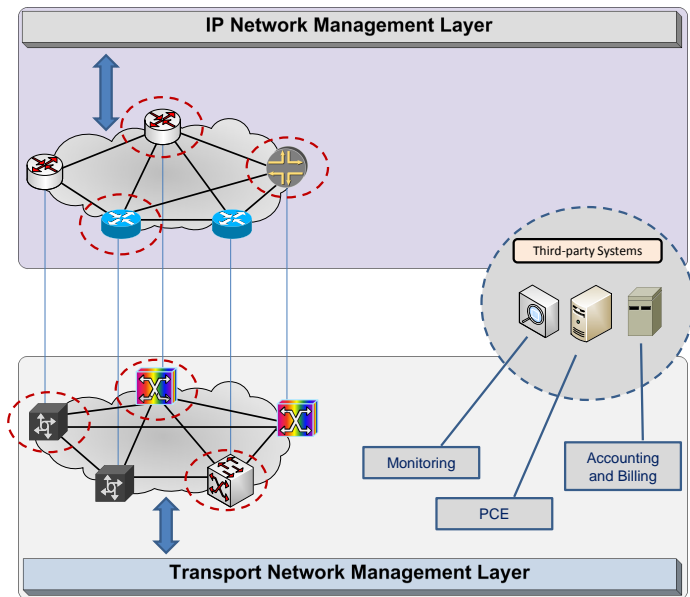
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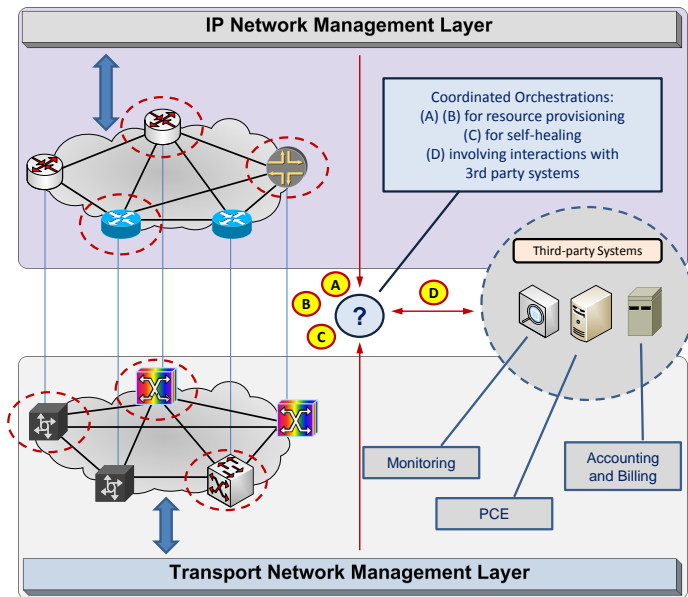
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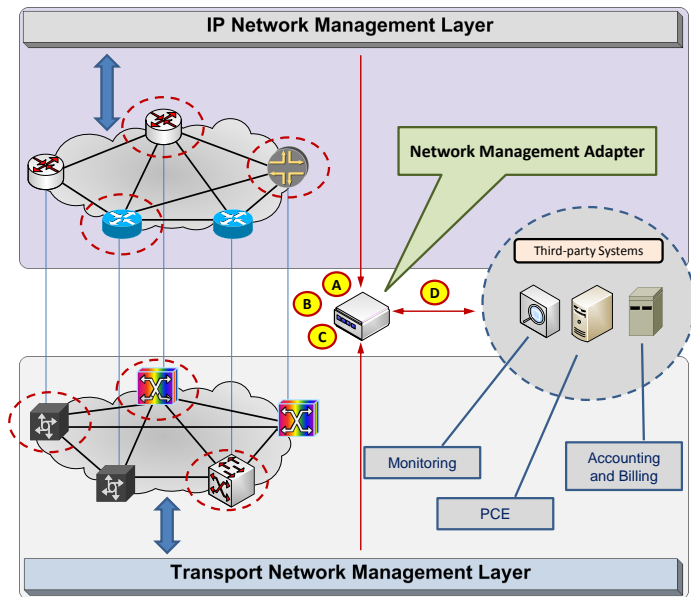
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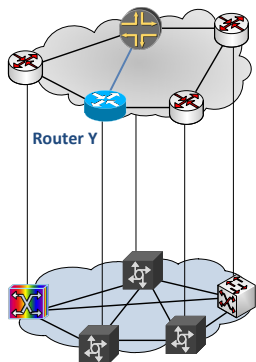
In Summary...



C1) A Network Management Adapter



C2) Semantic Adaptation



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Help command set
for router model X

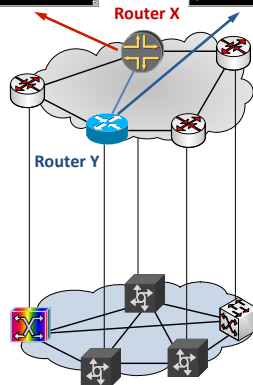
```
Cisco IOS XR R1 (config)# show run
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Help for 'show run' command:
  show run [?|-] [action] [ifname] [if-type] [if-num] [if-unit]
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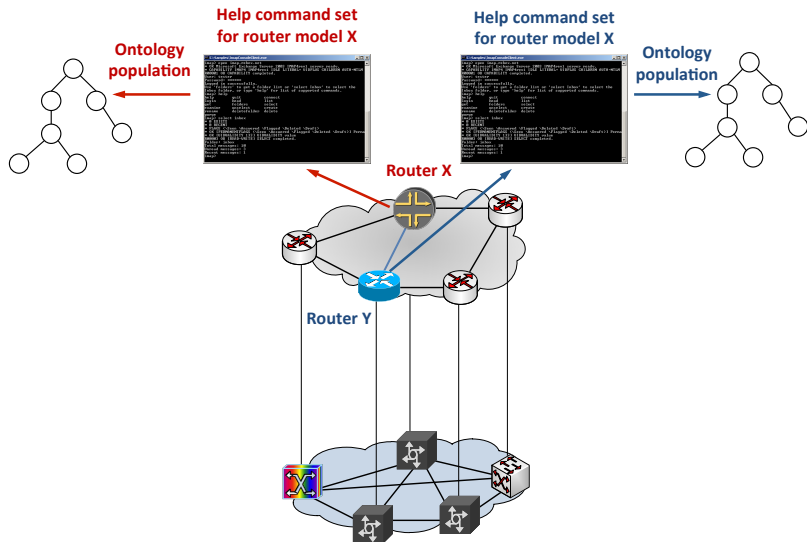
Help command set
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```
Cisco IOS XR R2 (config)# show run
Cisco IOS XR R2 (config)# help

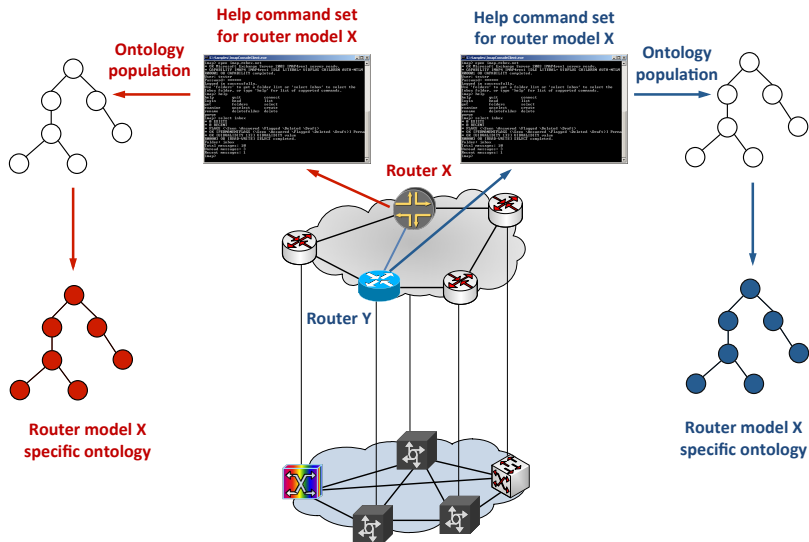
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C2) Semantic Adaptation

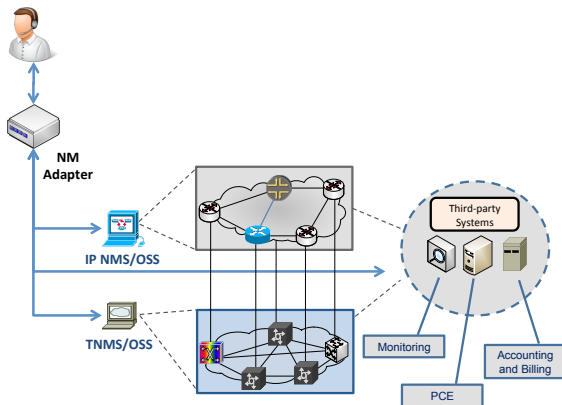


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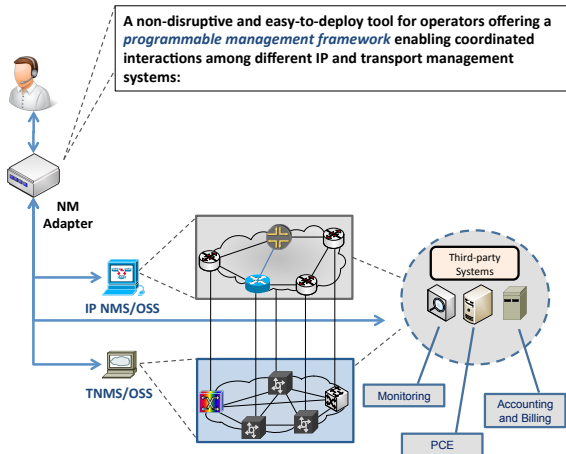
C3) A Programmable Management Framework

- Enabling coordinated operations in a programmable fashion



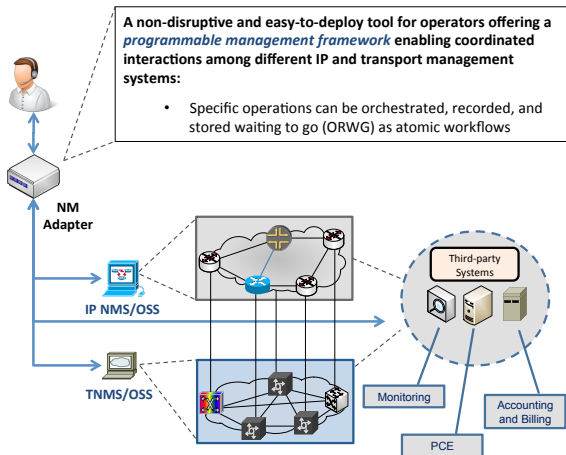
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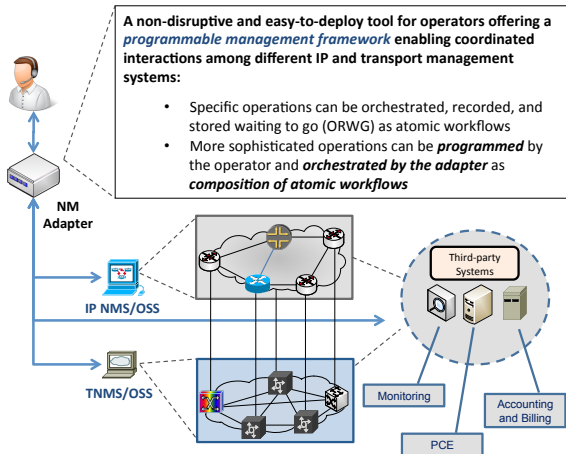
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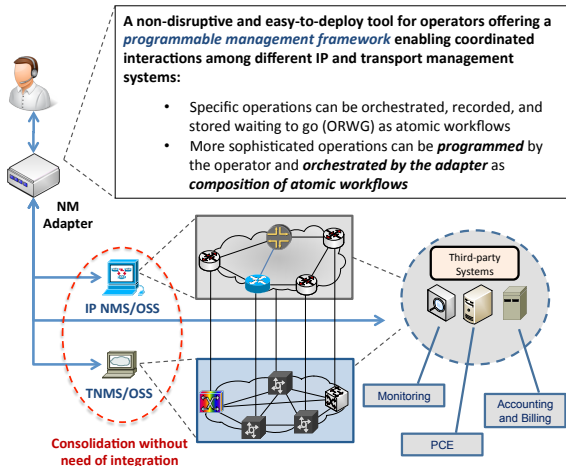
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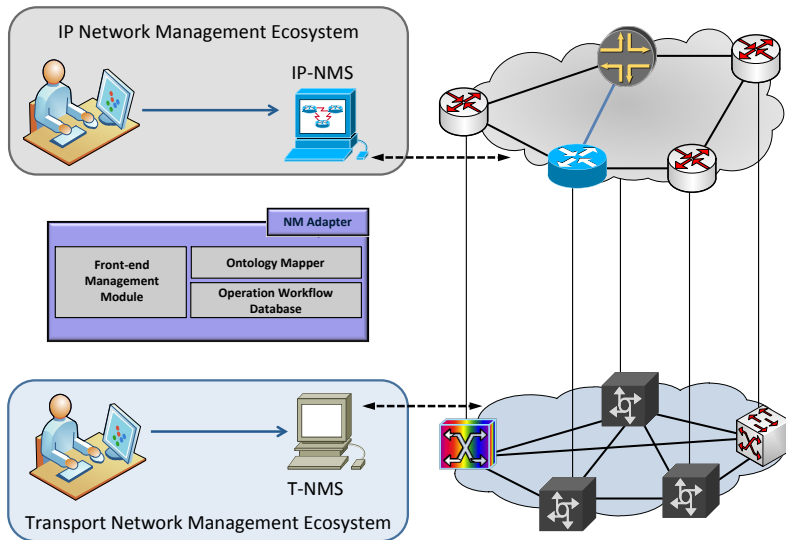


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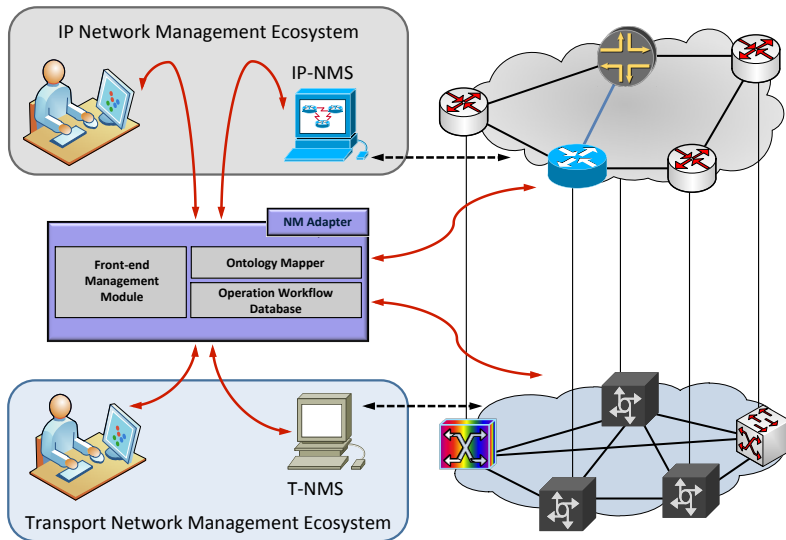
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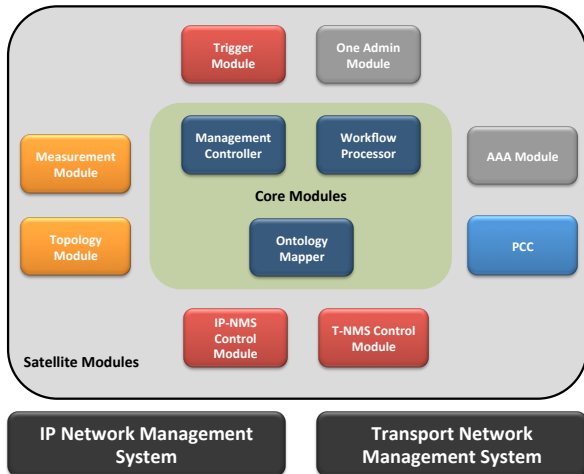
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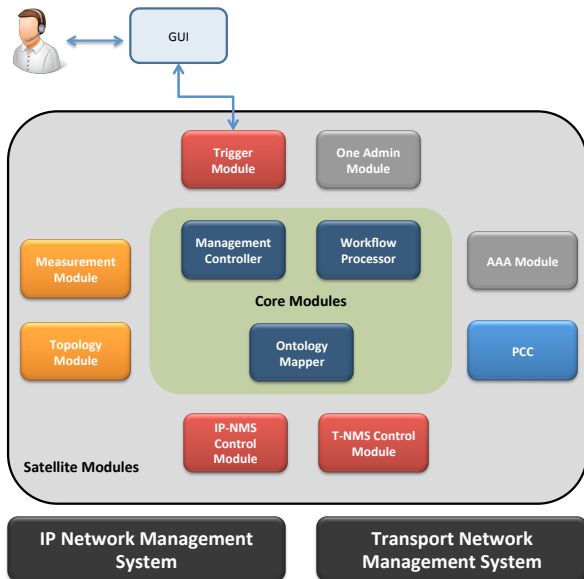
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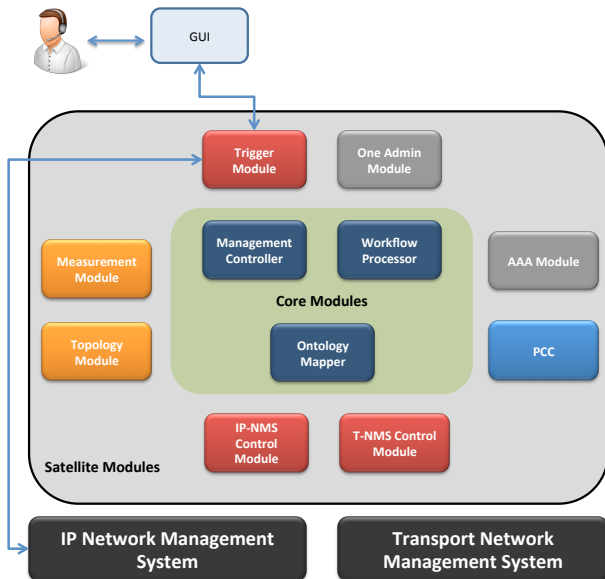
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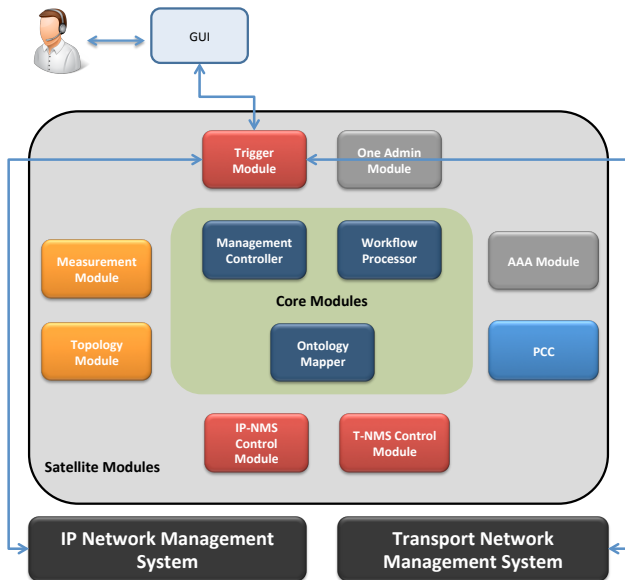
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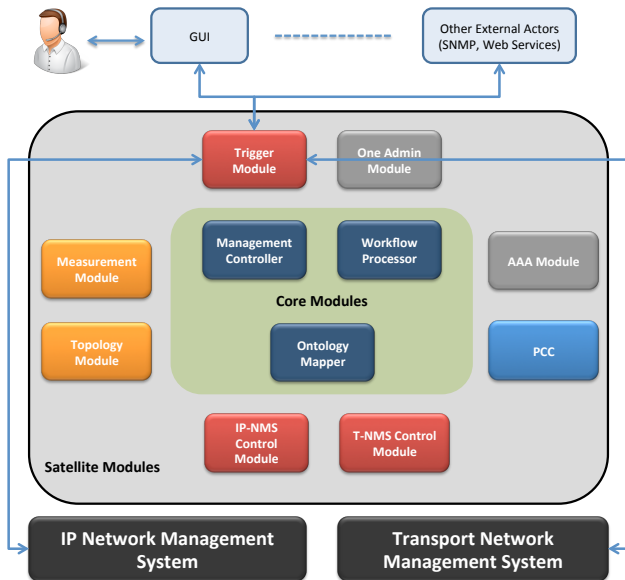
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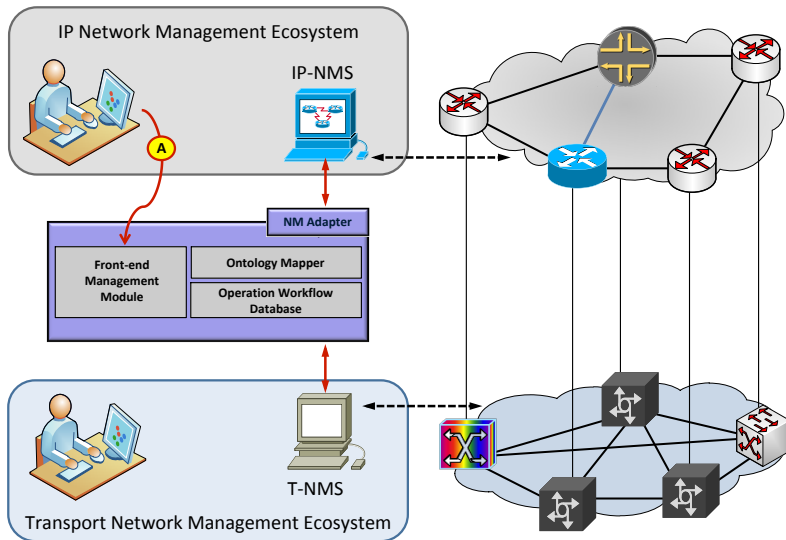
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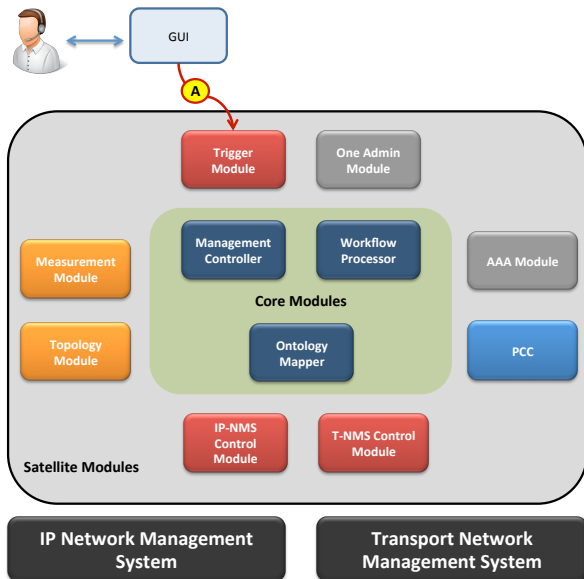
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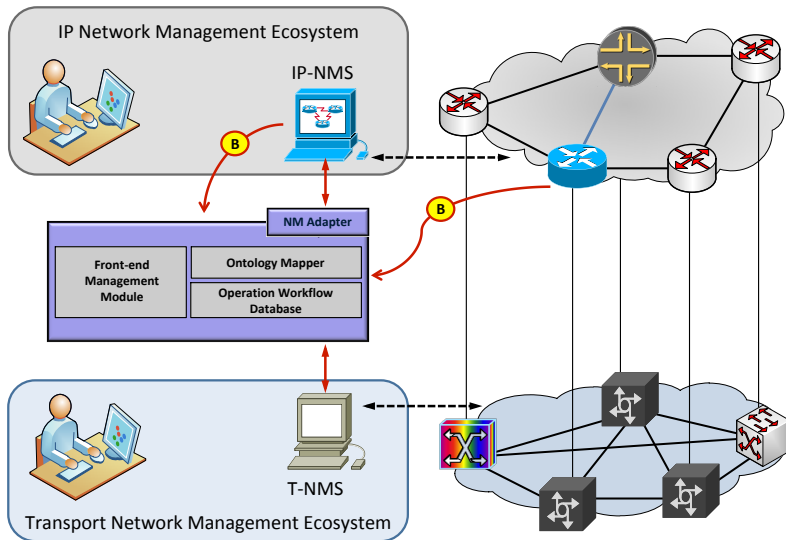
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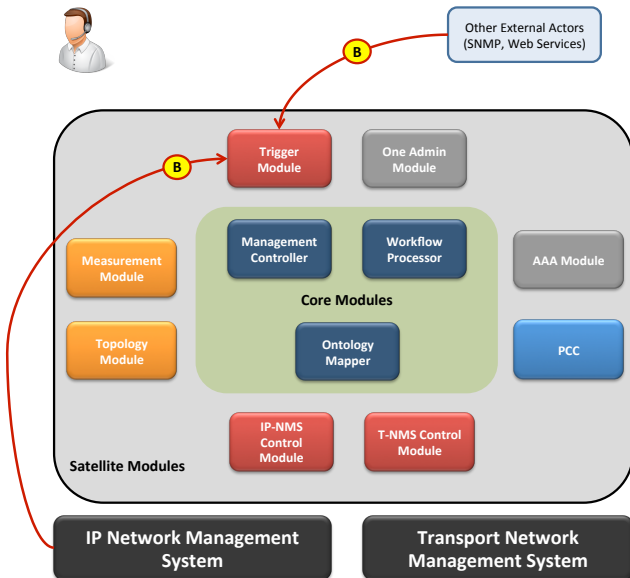
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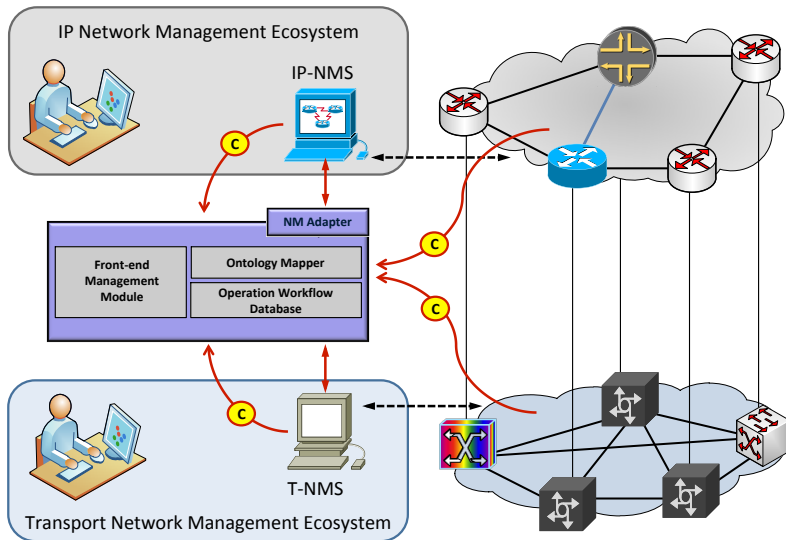
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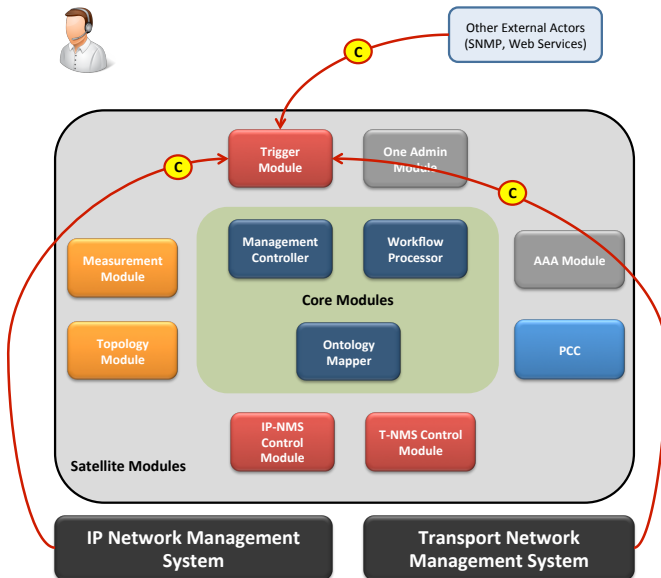
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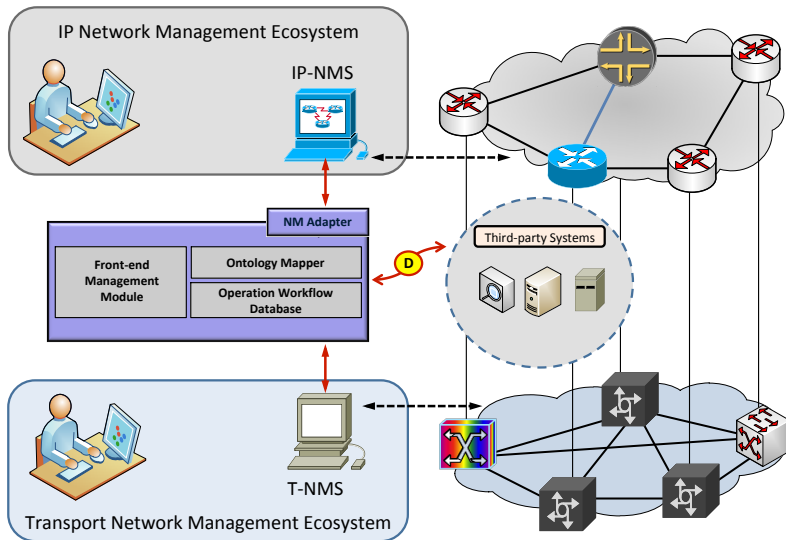
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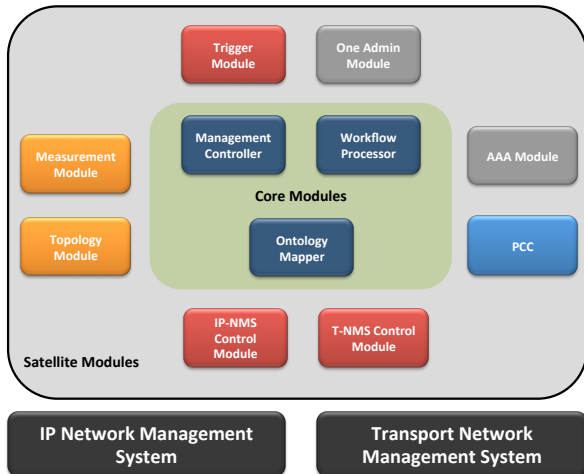
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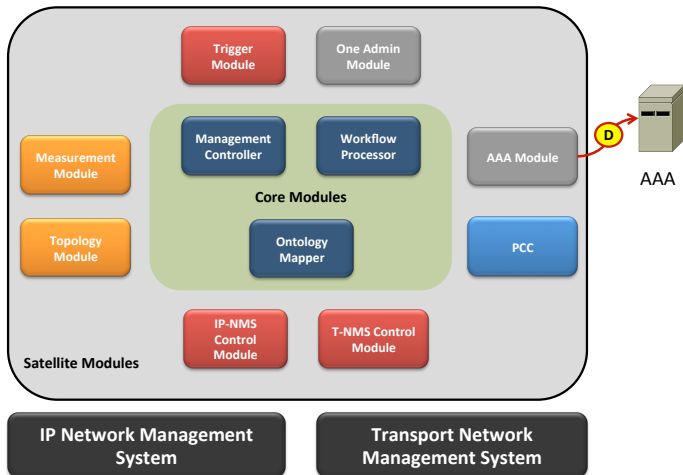
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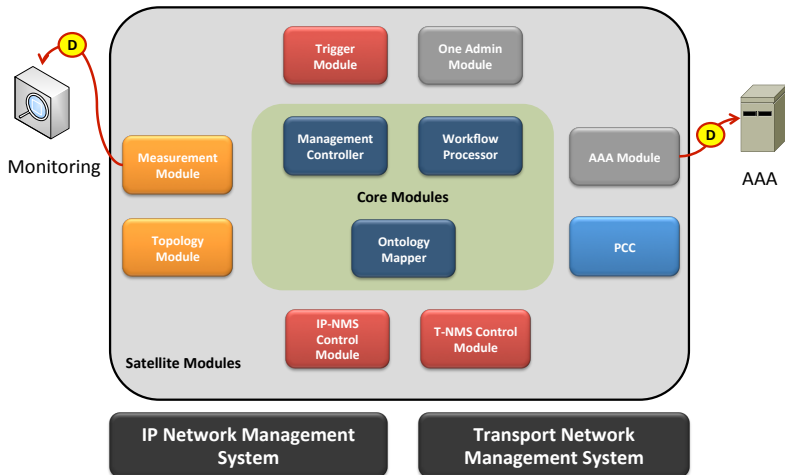
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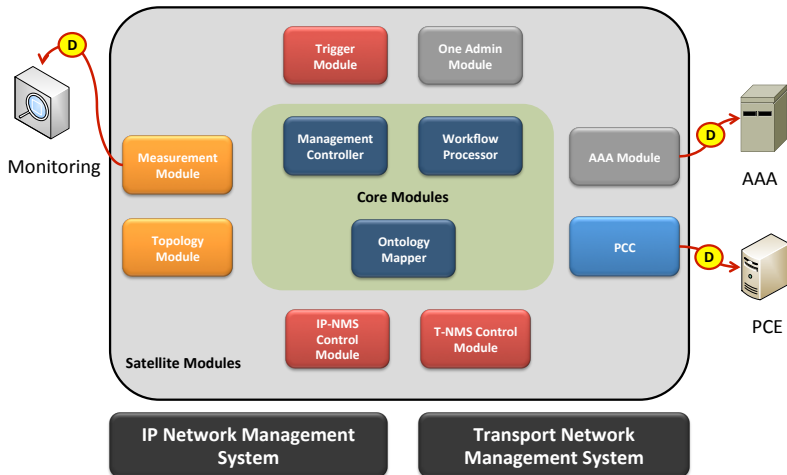
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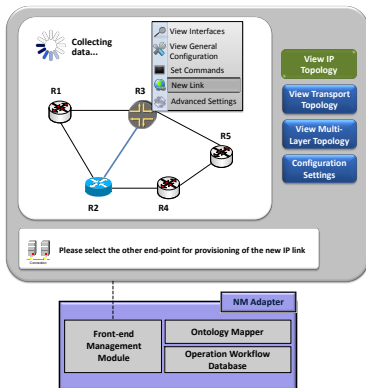
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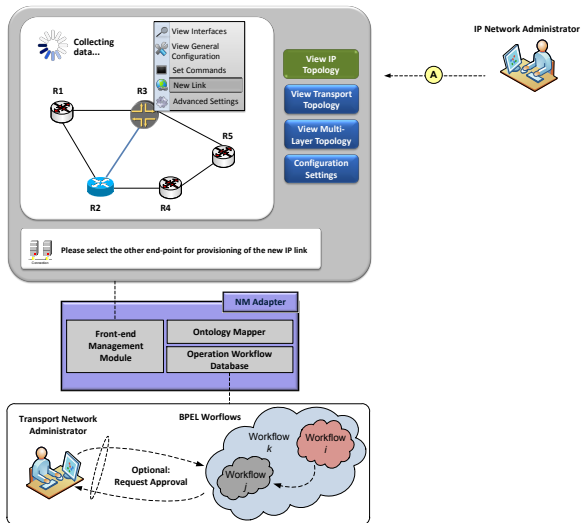
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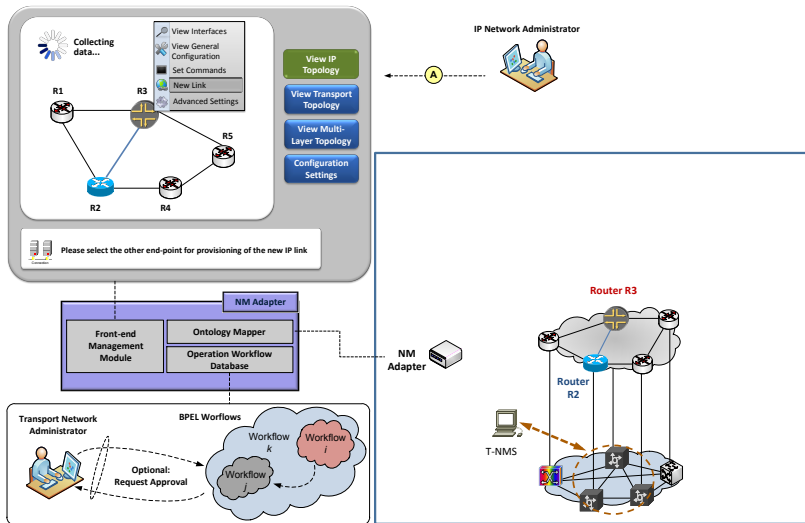
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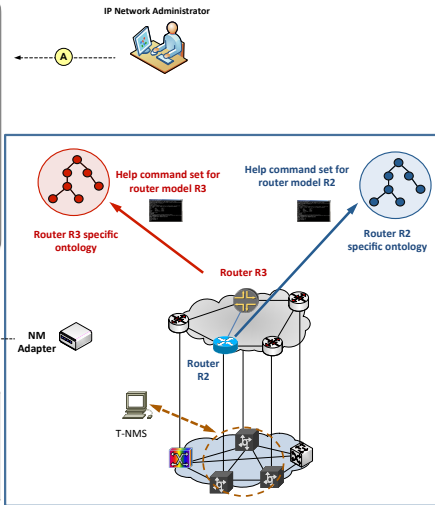
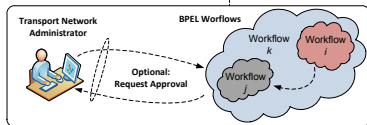
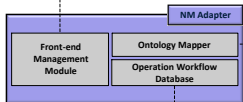
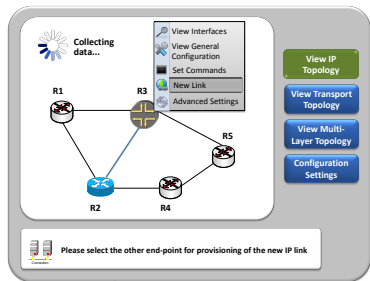
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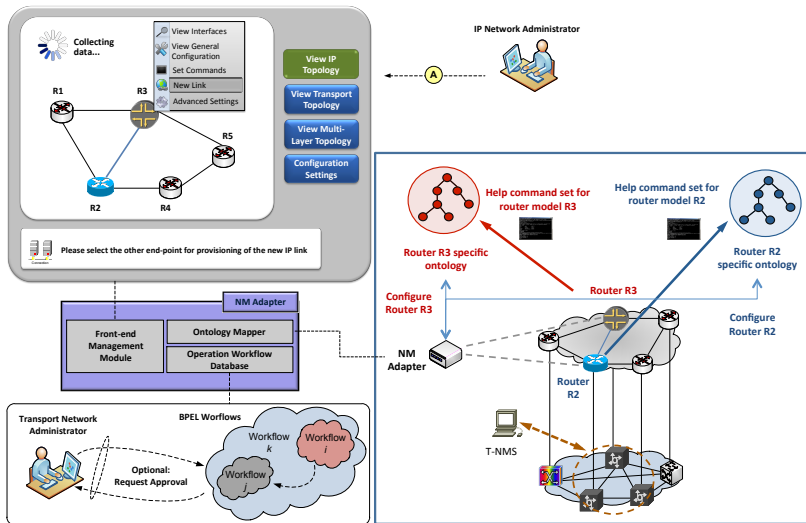
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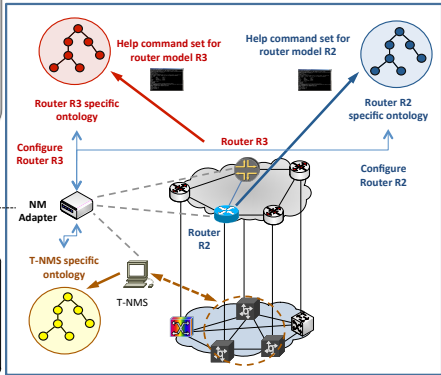
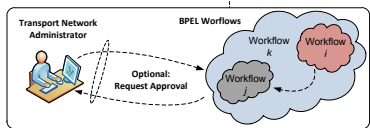
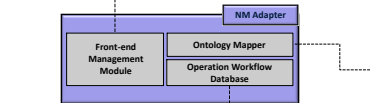
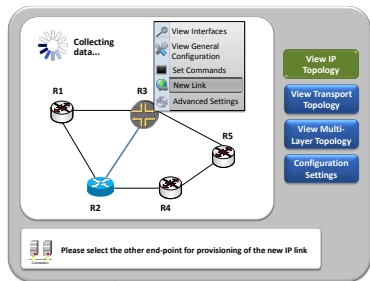
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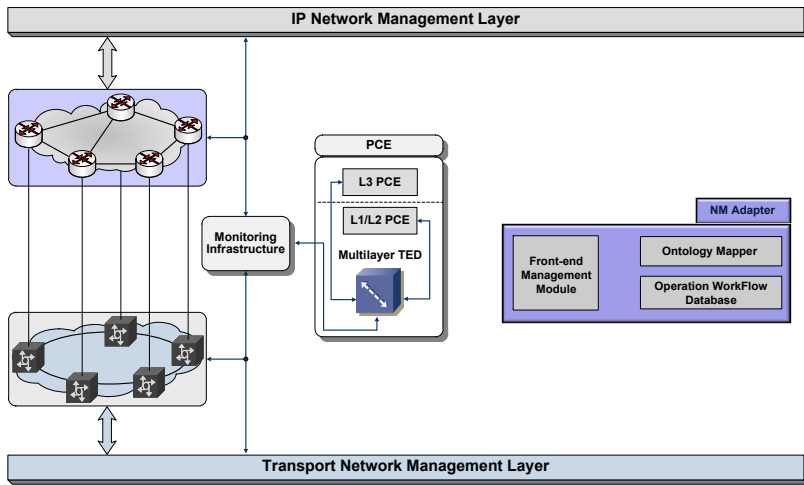
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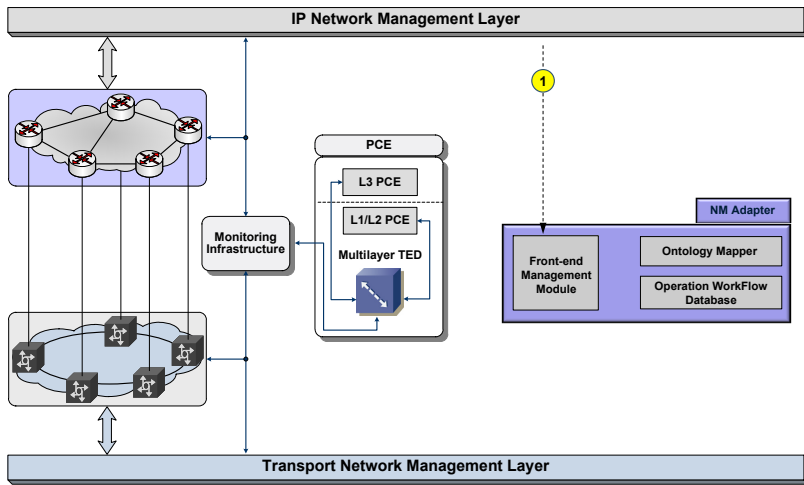
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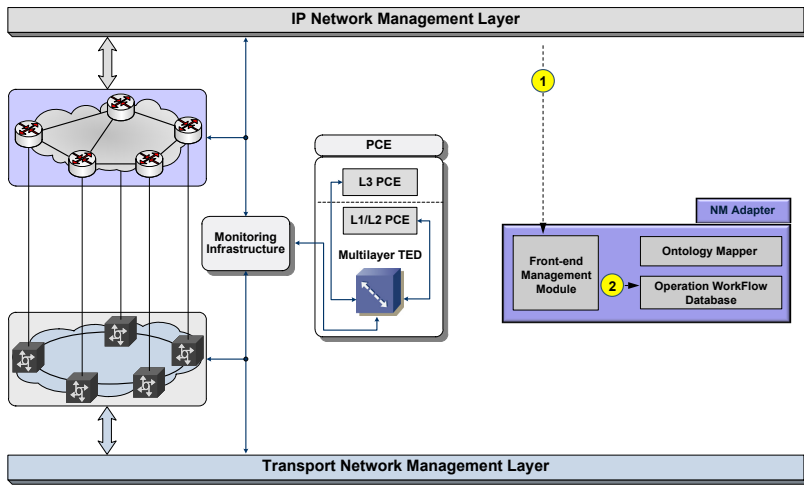
Coordinated Provisioning (Human-initiated case)



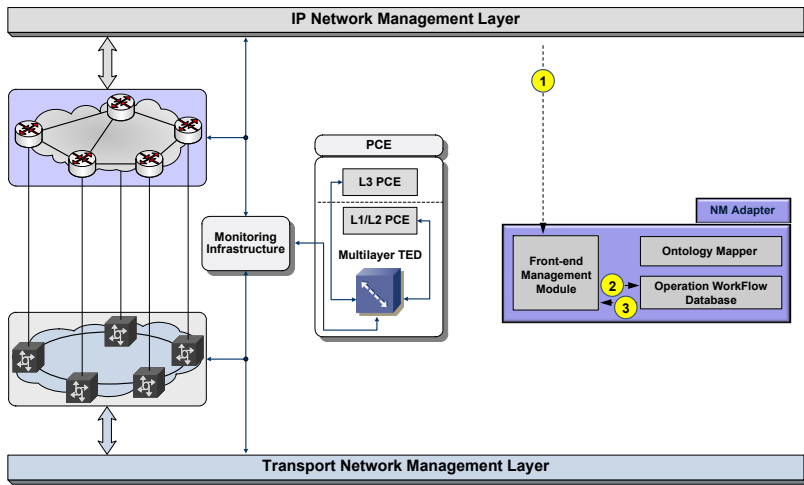
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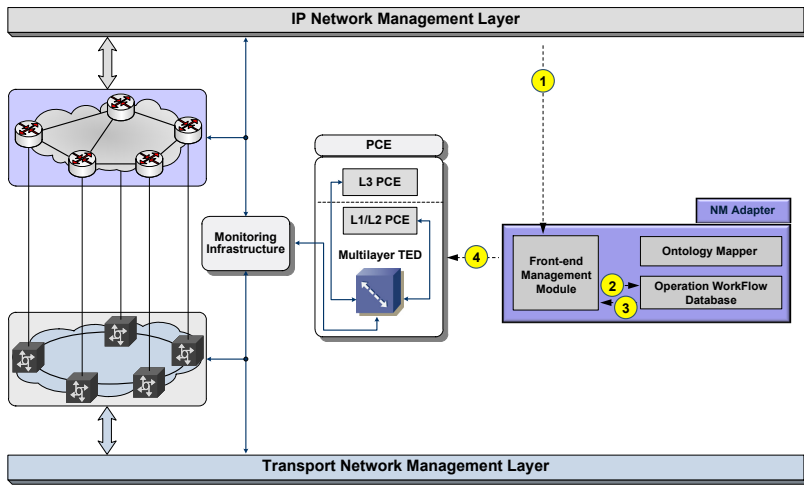
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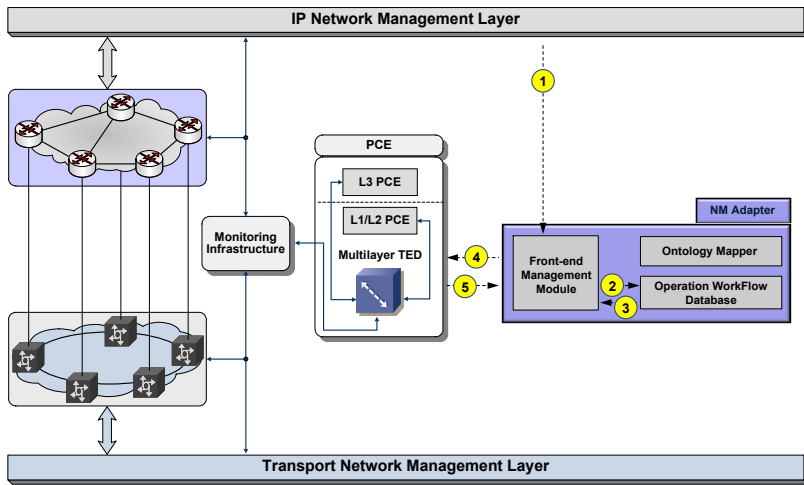
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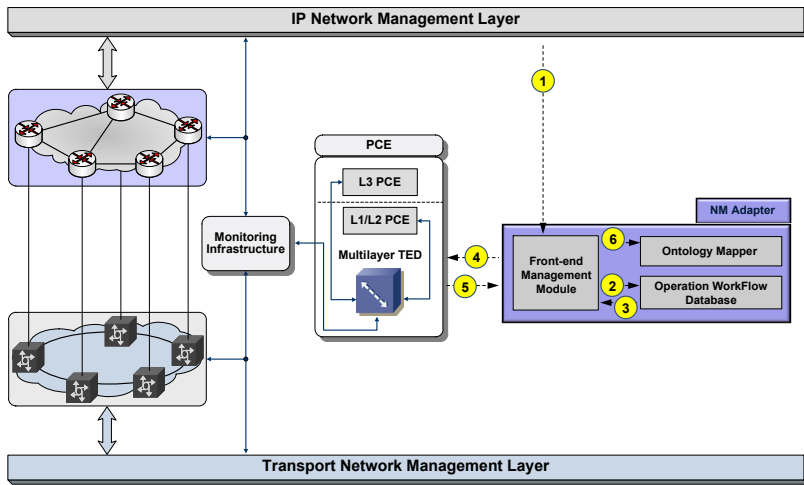
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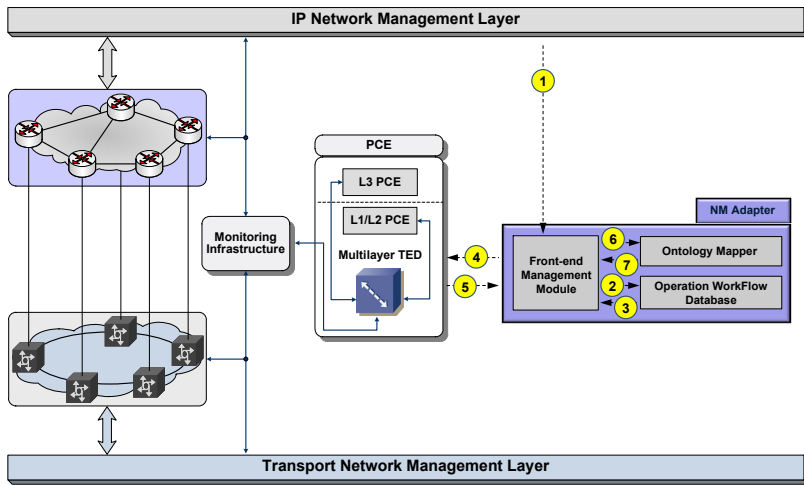
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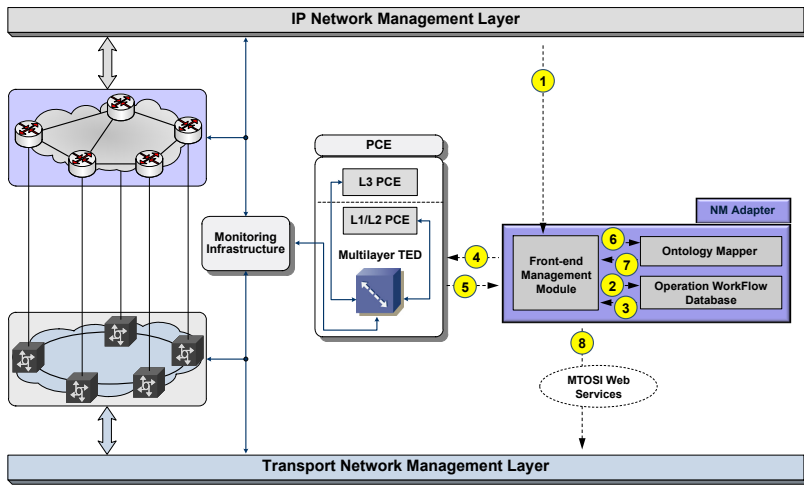
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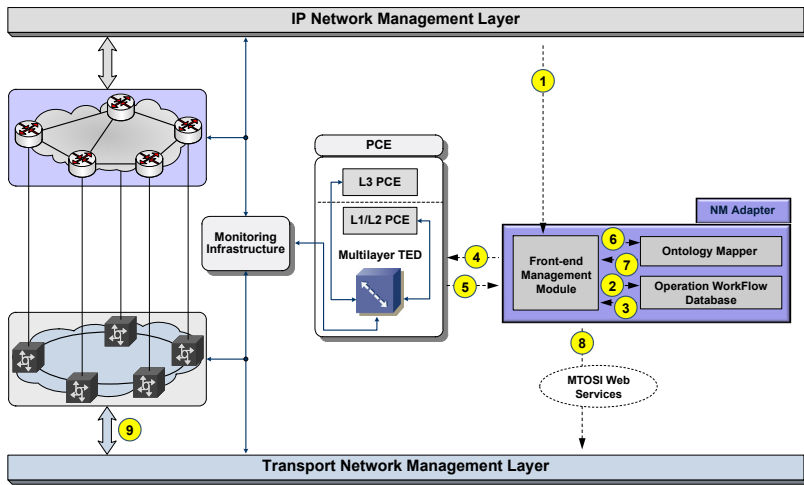
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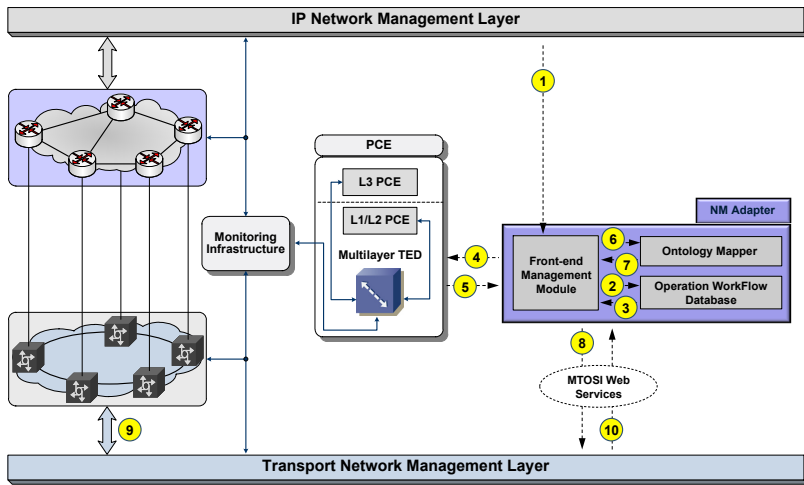
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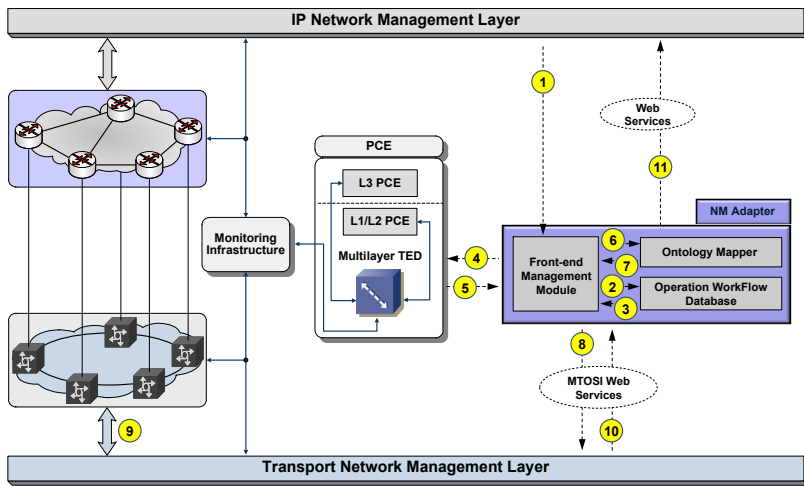
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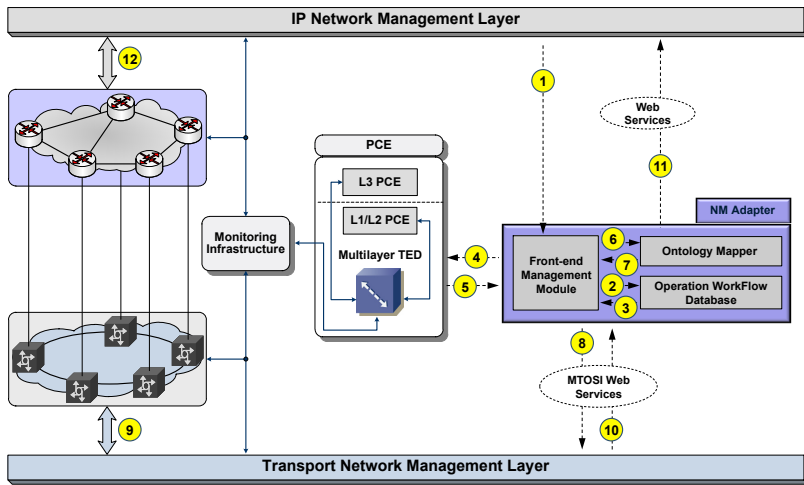
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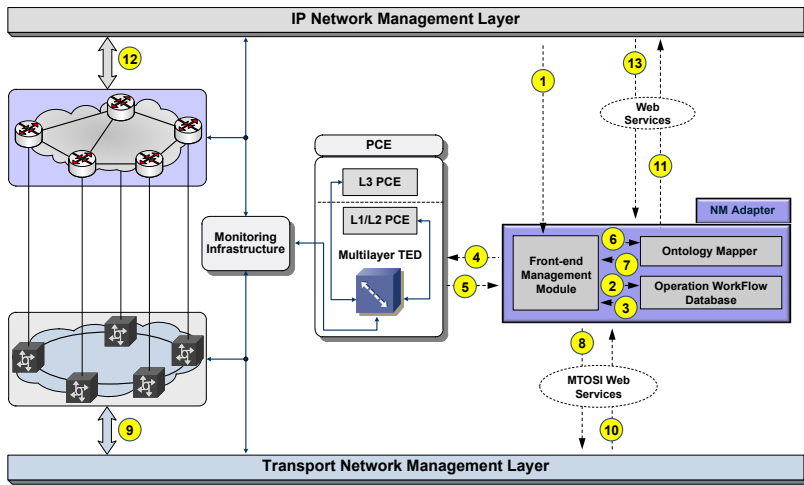
Coordinated Provisioning (Human-initiated case)



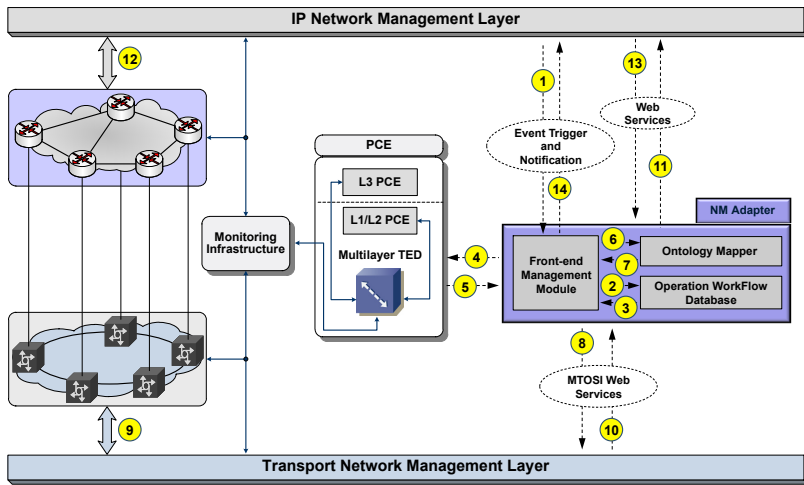
Coordinated Provisioning (Human-initiated case)



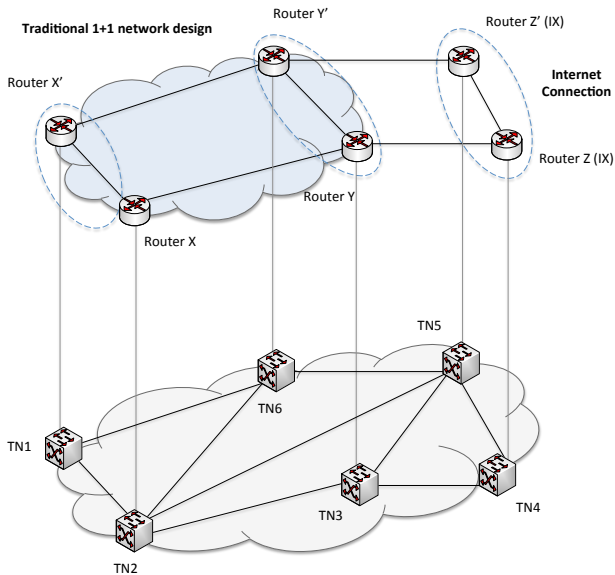
Coordinated Provisioning (Human-initiated case)



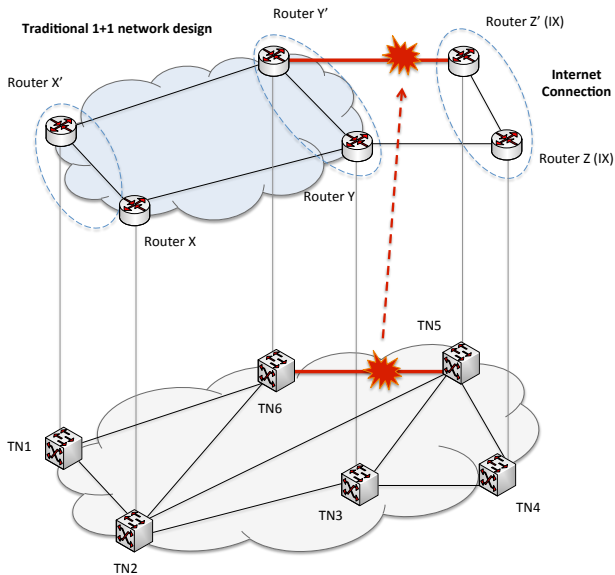
Coordinated Provisioning (Human-initiated case)



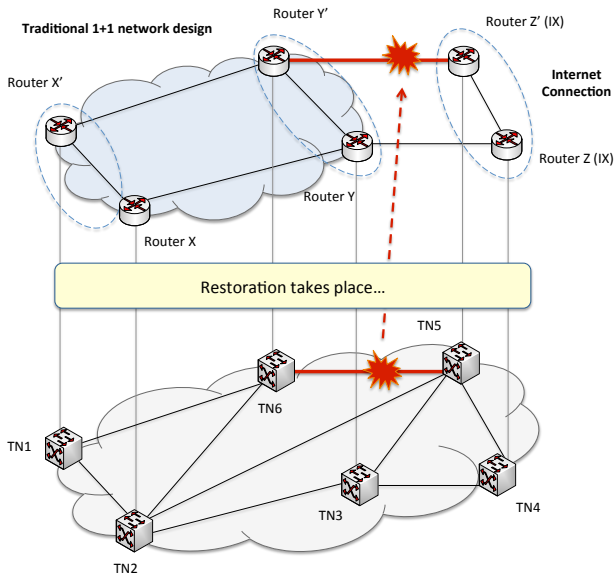
Coordinated Self-healing



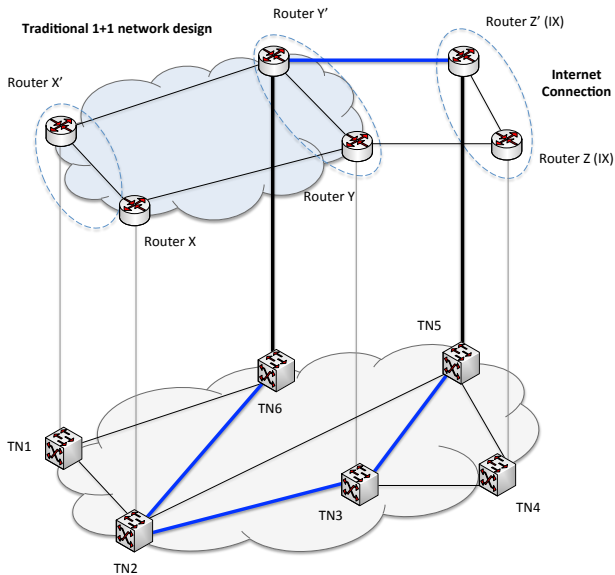
Coordinated Self-healing



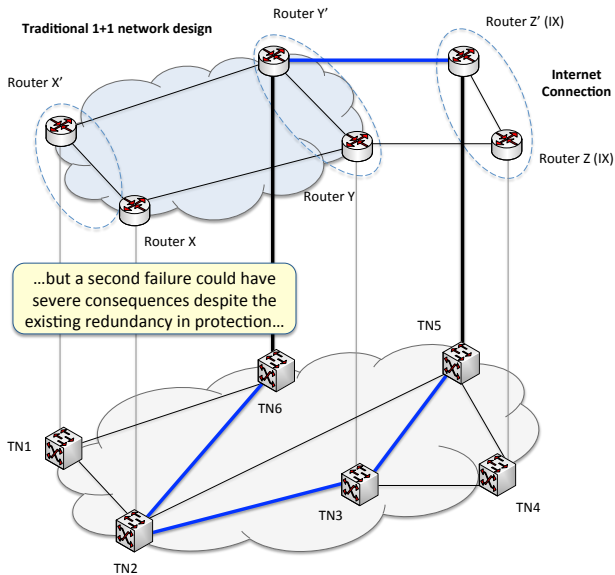
Coordinated Self-healing



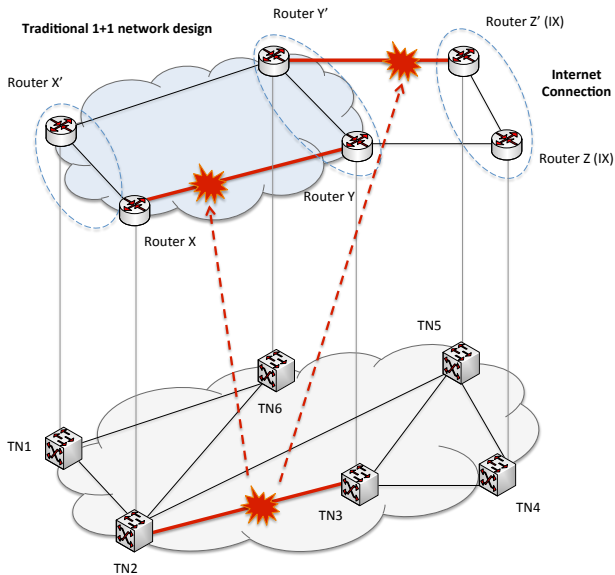
Coordinated Self-healing



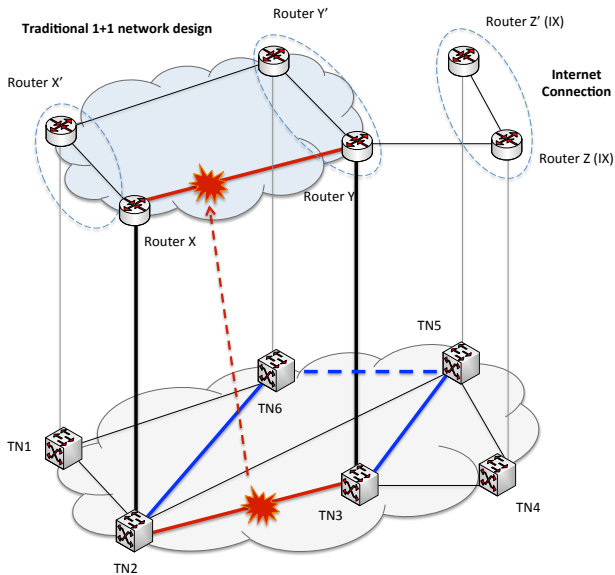
Coordinated Self-healing



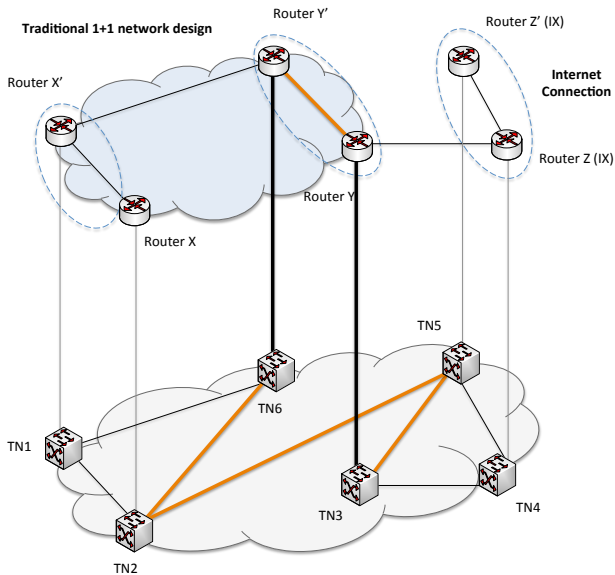
Coordinated Self-healing



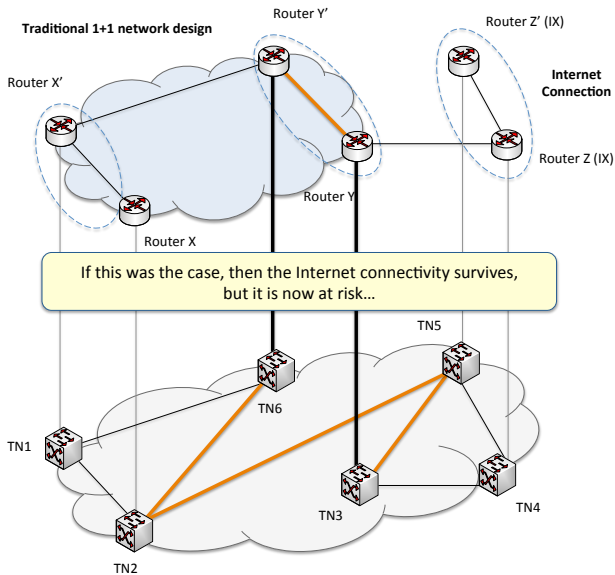
Coordinated Self-healing



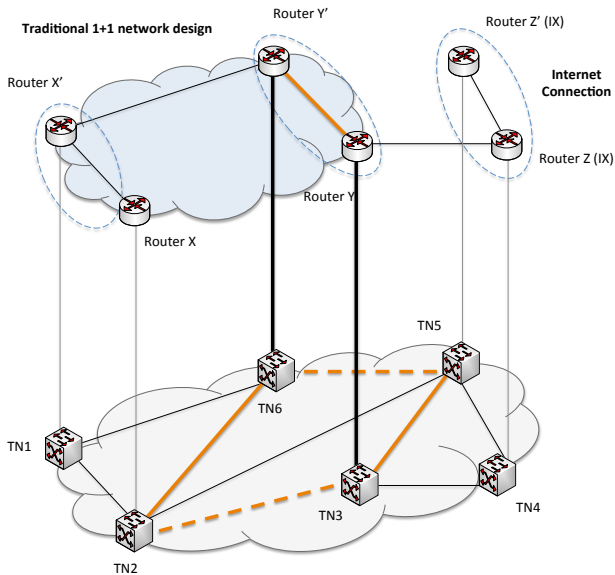
Coordinated Self-healing



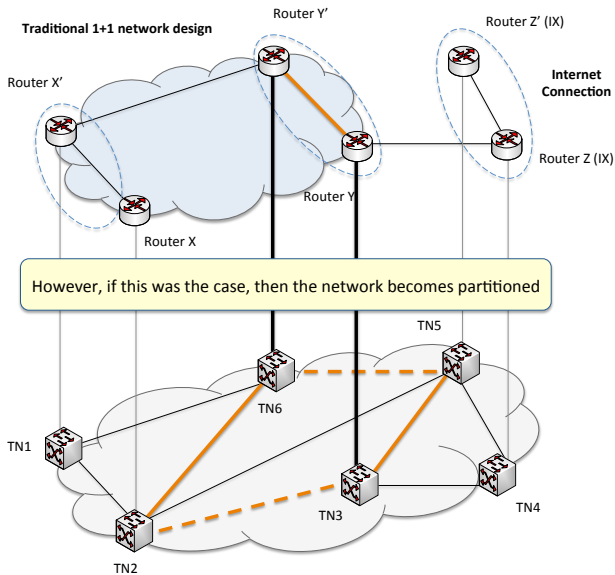
Coordinated Self-healing



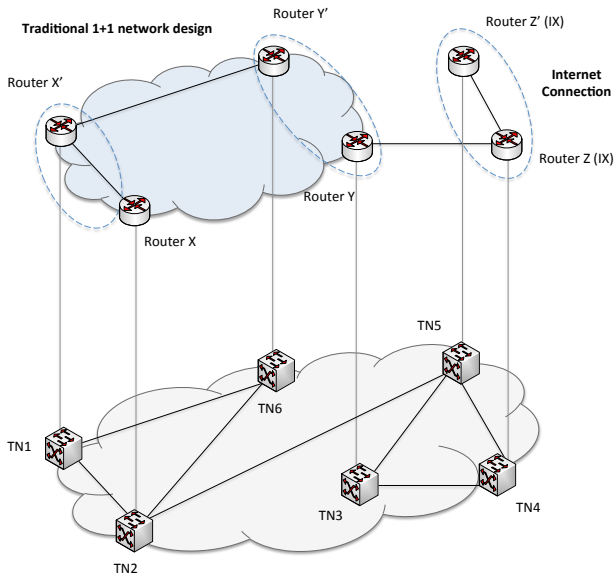
Coordinated Self-healing



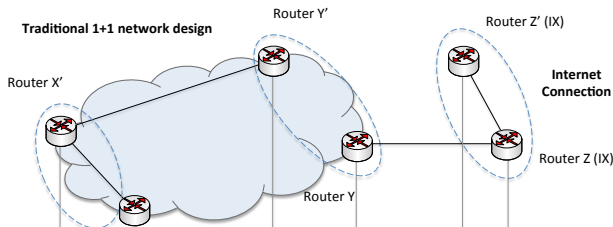
Coordinated Self-healing



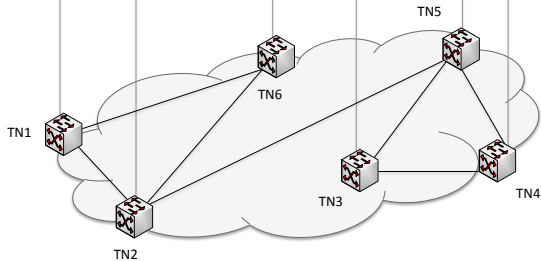
Coordinated Self-healing



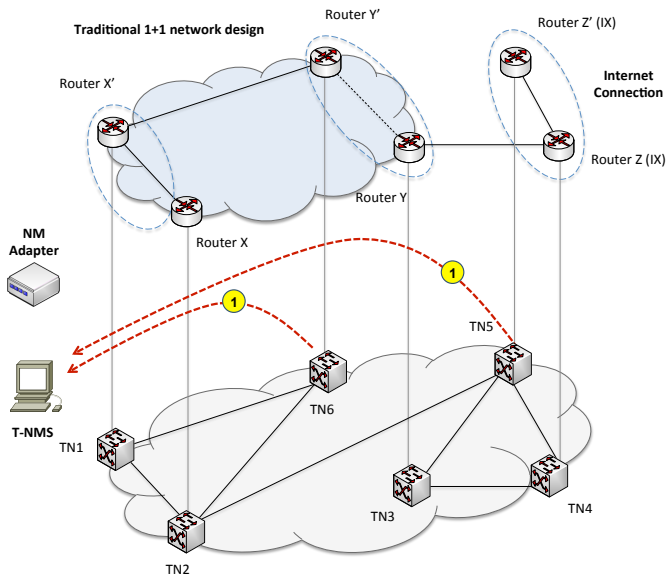
Coordinated Self-healing



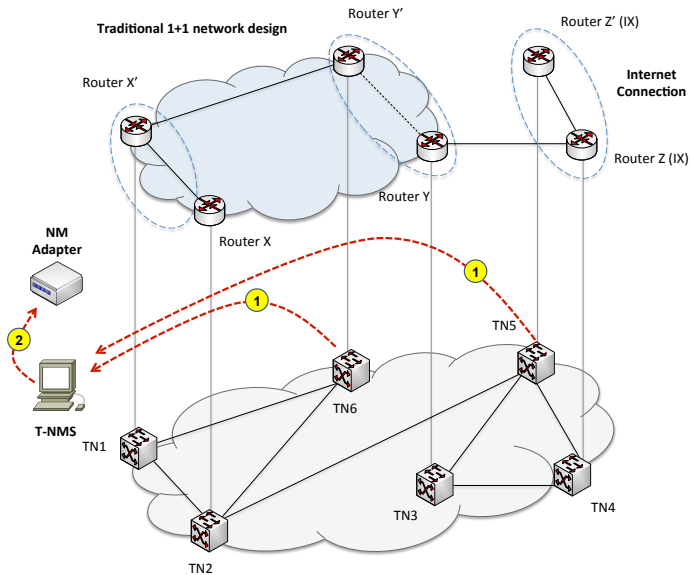
In practice, this might not necessarily be the result of inadequate planning, but rather of the fact that the provider can't always cope with **all possible combinations of double failures**



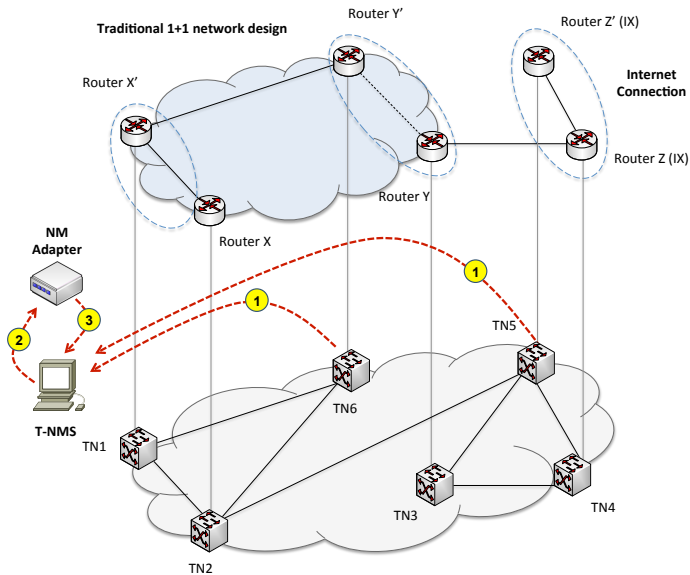
Coordinated Self-healing



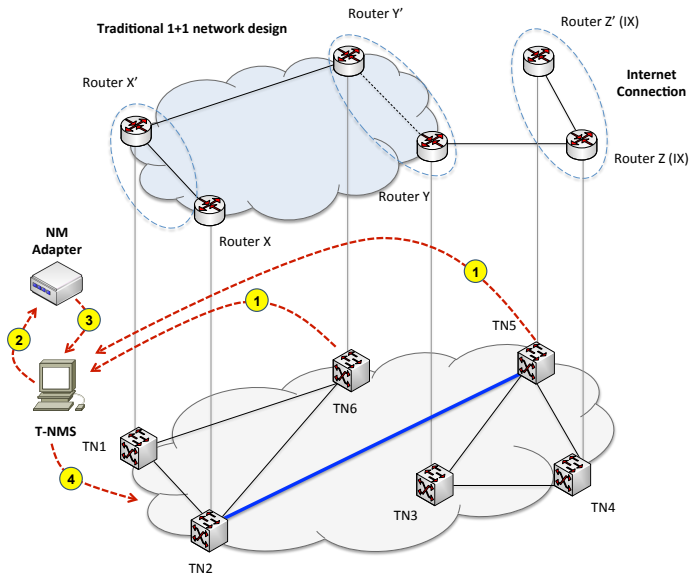
Coordinated Self-healing



Coordinated Self-healing



Coordinated Self-healing



Coordinated Self-healing

