2013 ONS Tutorial 2: SDN Market Opportunities

WAN & CARRIER

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OPEN NETWORKING FOUNDATION

Agenda

In the abstract

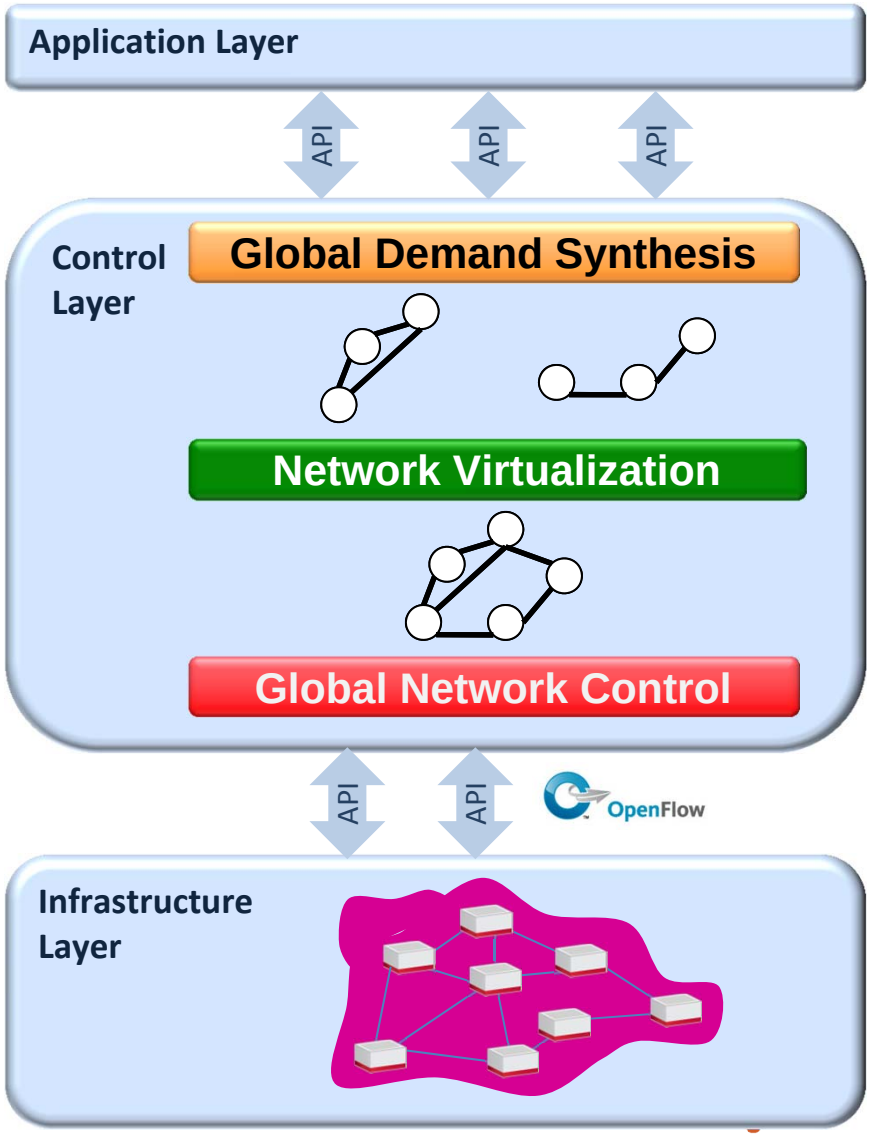
- SDN: essential features
- Benefits to carriers: generic view

In the concrete

- Colt's SDN vision, attack points

SDN: essential features

- Abstraction and layering
- Global “views”
  - Application demands
  - Fabric resources
- Virtualization
- Openness – common interfaces across vendors of SW and HW
- Automation
- Straightforward integration with cloud orchestration systems
- Better ability to leverage policy & analytics
- Etc.



SDN benefits to carriers: generic view

Optimization

- Network utilization
- Service performance
- Operations

Monetization

- Service innovation
- Service pricing

Optimization: network utilization

Pre-SDN challenges

- **Static capacity among switches/routers**
- **Sized for pair-wise peaks**
- **Autonomous re-routes by routers upstream of failures**
- **Typically <40% utilization (over-provisioning)**

Improvements with SDN

- **Global view of network demands, fabric resources**
- **Compute best explicit placement of all flows, dynamically**
- **Deterministic protection behavior requires less protection bandwidth**

SDN impacts

- **Higher utilization & faster "convergence"**
- **Higher quality with fewer resources**
- **Potentially >90% utilization**

Example use cases

- **Performance-on-Demand (PoD) – e.g., NaaS**
- **Efficient multi-layer traffic engineering**
- **Fixed access utilization**

Optimization: service performance

Pre-SDN challenges

- **Content/application service layer and networks are silos**
- **Network domains are silos (e.g., mobile, WiFi, fixed broadband)**
- **Poor and/or under-utilized resources**

Improvements with SDN

- **Global view of view network fabric – with abstraction provided to application/service layer (e.g. orchestration software)**
- **Conjointly choose optimal nexus of resources**
- **Push explicit routes and/or re-allocate bandwidth**

SDN impacts

- **Higher quality with fewer resources**
- **Converged, multi-technology service-delivery fabric**
- **Optimize total "system" – for QoS, power, utilization, etc**

Example use cases

- **Network-aware server load balancing**
- **Mobile-WiFi offload (or n-casting)**
- **Traffic steering for mobile QoE management**

Optimization: operations

Pre-SDN challenges

- **Manual operations processes**
- **Manage a bunch of boxes**
- **Different NE vendors means multiple flavors & layers of heterogeneity**
- **Distributed service intelligence in multiple NE types, from different vendors**

Improvements with SDN

- **Leverage automation**
- **Manage a fabric (abstraction of a bunch of boxes)**
- **3 horizontal layers stably separated, leveraging abstraction**
- **Common modular control, management, service apps**

SDN impacts

- **Accelerated time-to-market & revenues**
- **Streamlined regression testing**
- **Scale network, services and revenue with sub-linear cost**

Example use cases

- **Logically-centralized upgrades, feature/service additions**
- **High-fidelity simulation, straightforward push to production**

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Monetization

Pre-SDN challenges

- **Slow & costly service innovation, deployment**
- **Static, one-size-fits all service pricing**

Improvements with SDN

- **Apps stably/portably developed, centrally-"loaded", available everywhere**
- **On-demand service mass-customization – functionally supported**
- **On-demand service mass-customization – optimally priced**

SDN impacts

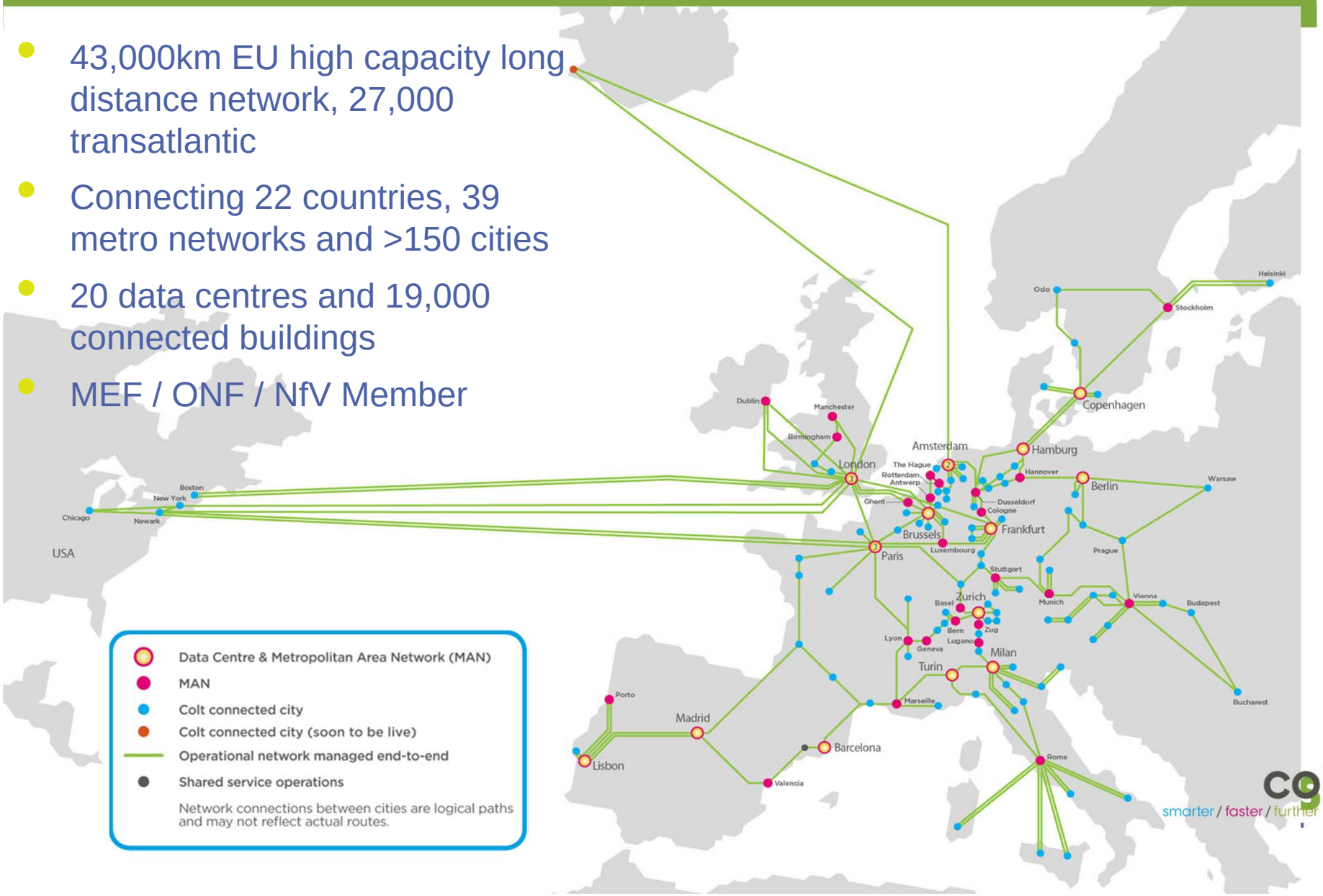
- **Reduced cost, higher velocity, eco-system basis for service innovation**
- **Better matching of network supply & user/application demand … maximized economic utility**

Example use cases

- **Performance-on-Demand – e.g., NaaS**
- **Bandwidth exchanges**
- **Content supplier, consumer QoS-for-pay (i.e., "net preferentiality")**

Colt – Europe's Information Delivery Platform

- 43,000km EU high capacity long distance network, 27,000 transatlantic
- Connecting 22 countries, 39 metro networks and >150 cities
- 20 data centres and 19,000 connected buildings
- MEF / ONF / NfV Member



colt
smarter / faster / further

IT & network integration – Colt's SDN vision

The integration of the network and IT platforms from the service, technology, system and process point of view to deliver an end to end integrated customer experience (the Information Delivery Platform).

Network automation, virtualisation, elasticity and rapid innovation

IT & network integration – Colt's SDN vision

Network automation, virtualisation, elasticity and rapid innovation

- A set of technical solutions
  - to programmatically orchestrate the network
  - to treat the network as a pool of resources
  - to move network functions to the cloud
  - to flex single or multiple parts of the network
  - to direct traffic to specific locations
  - to prioritize traffic intelligently (real time feedback)

Colt's SDN projects

Colt Projects
CCN: Cloud Centric Network
NLI: Network Layer Integration
Mod MSP: Modular Multi Vendor Carrier Ethernet

DC fabric & network virtualisation (CCN)

DC fabric

- OpenFlow DC Fabric evaluation

DC network virtualisation:

- Virtual Network decoupled from physical hardware.
- VMs unrestricted placement & mobility.
- Dynamic network policies.
- Address Space virtualisation (VLAN/MAC).
- Network Virtual Services APIs
- Network Automation (APIs & orchestration)

L3 CPE virtualisation (NLI)

L3 CPE router virtualisation:

- virtualisation of the L3 CPE functionality (Internet access / IPVPN) in the cloud

WAN SDN (NLI / Mod MSP)

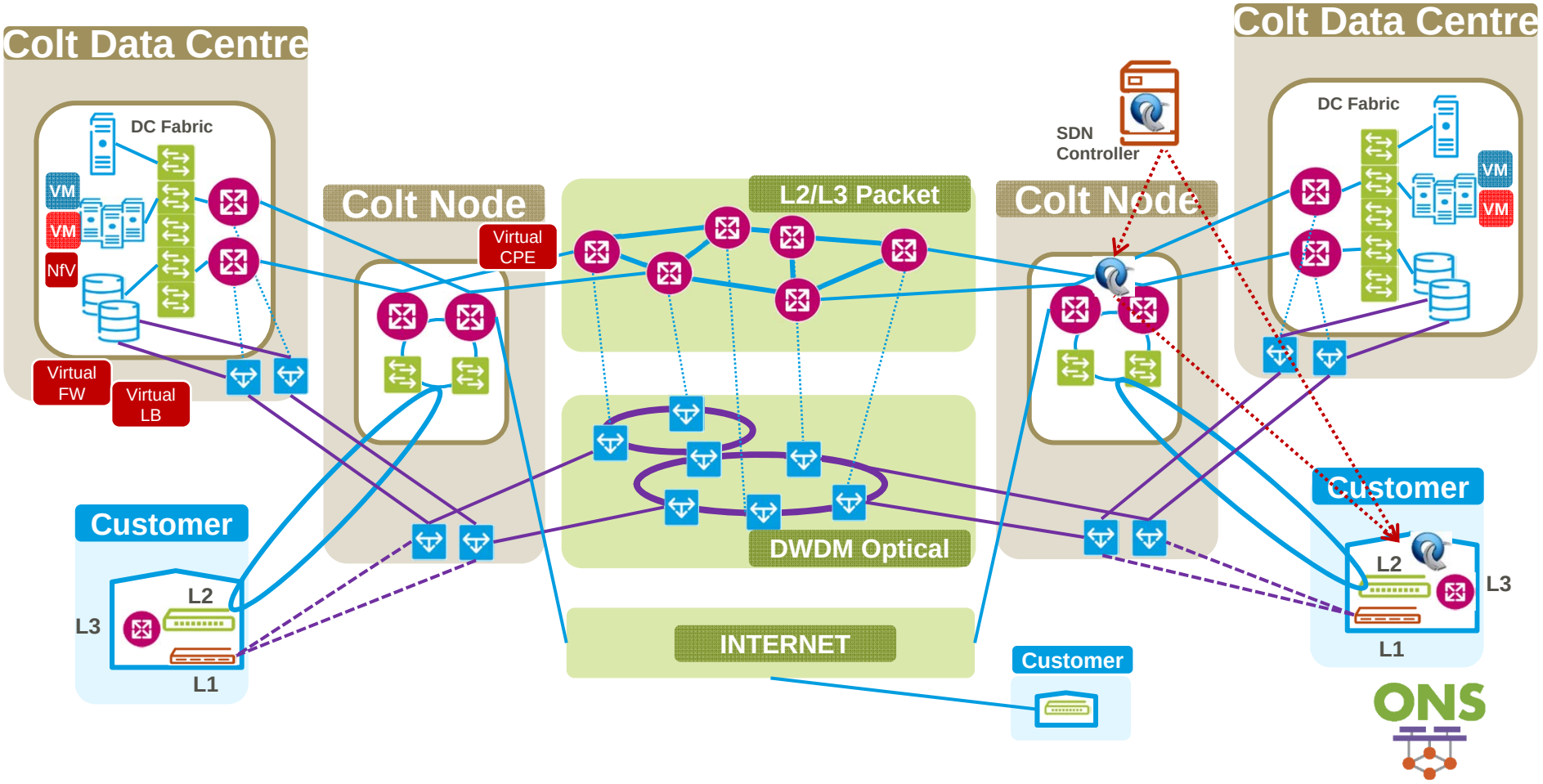
WAN SDN network (optical/Ethernet/IP):

- WAN network virtualisation & automation
- End-to-end unified network abstraction allowing for true technology layer & vendor integration.

L3 CPE virtualization

- Objective: avoid deploying a dedicated L3 CPE router by virtualizing its functionality - significant opex & capex savings
- Part of NLI (Network Layer Integration) project started in 2011
- Phase 1: L3 CPE virtualisation based on L3 PE functionality (both HW & SW)
  - Basic Internet Access launched
  - Work in progress: Internet Access with advanced features and IPVPN
  - 10 Mbps service (15% service cost reduction new site / 50% existing site)
- Phase 2a: cloud L3 virtual CPE
  - Virtualize the L3 CPE functionality in the cloud (... per NFV)
  - Other functions on the radar: FW, LB, WAN Optimisation
- Phase 2b: OpenFlow CPE (tentative)
  - Integrated CPE using OpenFlow. Carrier Ethernet CPE - simplified
  - Rich L3 CPE functionality delivered from the PE or from NFV

L3 CPE virtualization



WAN SDN

- DC Network virtualized, but WAN remains static, rigid and complex
- Next step (research mode) - to bring SDN to the WAN (L1/L2/L3) : WAN virtualization & automation
  - Flexible connectivity
  - Dynamic / on-demand connectivity attributes (BW, QoS profile)
  - WAN network abstraction (multi-vendor, multi-layer)
  - In-life service-type change
- Colt interested in both DC and non-DC WAN scenarios
  - Cloud inter-DC (data & storage)
  - Enterprise to DC (public / private Cloud)
  - Enterprise to enterprise optical & Carrier Ethernet VPN
- WAN SDN overlay solutions - current preferred approach
  - SDN agents in WAN network devices: standard API for configuration, monitoring & provisioning (OpenFlow & potentially other protocols as well, XMPP, JSON, etc)
  - Alternative: SDN agent at the OSS layer (controller)
  - Existing transport control planes available (RSVP-TE, GMPLS, etc.) for overlay solutions
  - A mixed set of models (overlay/hybrid/OSS-based) ... to be analyzed

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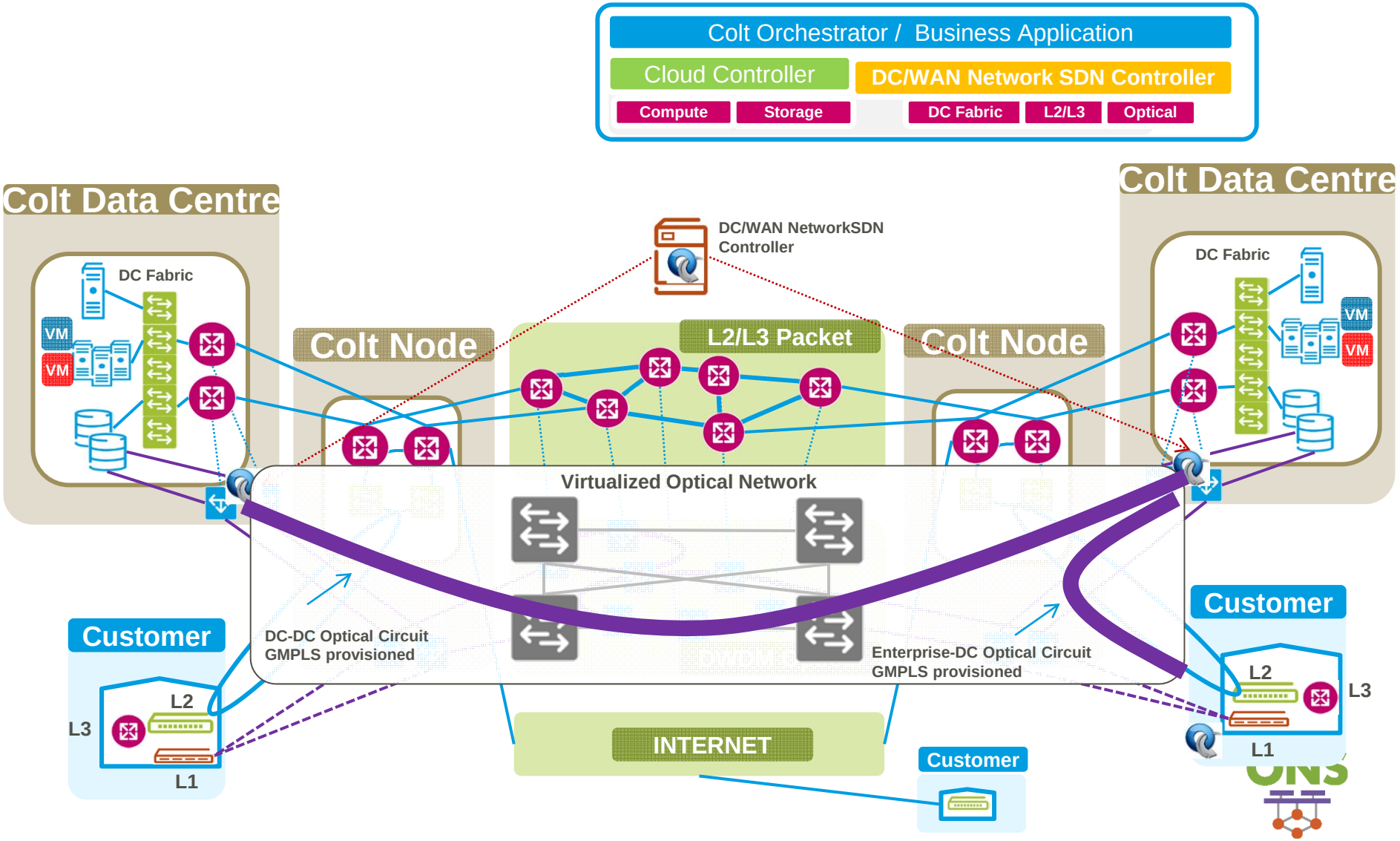
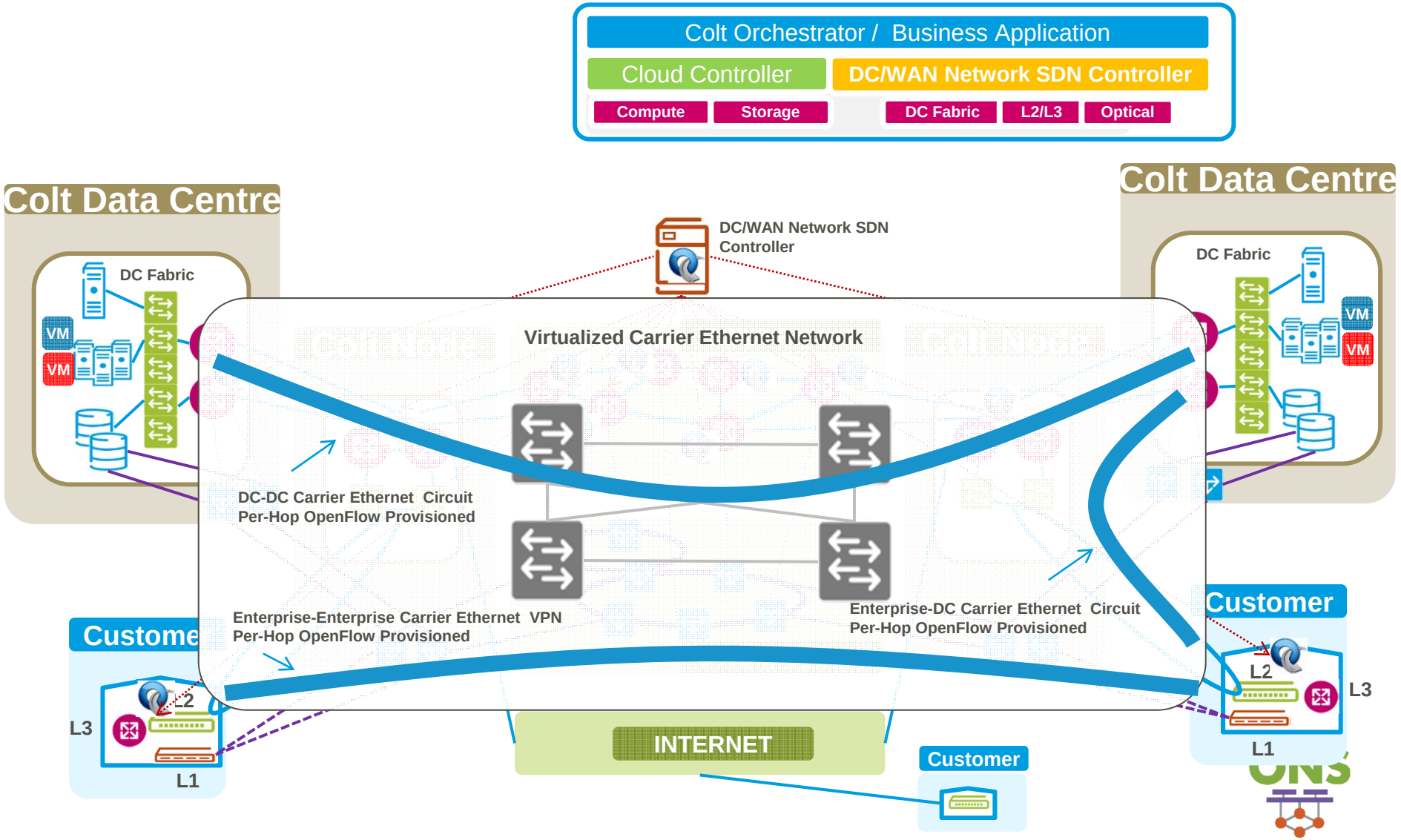
WAN SDN


Colt Orchestrator / Business Application
Cloud Controller
DC/WAN Network SDN Controller
Compute
Storage
DC Fabric
L2/L3
Optical
Colt Data Centre
DC Fabric
VM
VM
DC/WAN NetworkSDN Controller
Colt Node
L2/L3 Packet
Colt Node
Colt Data Centre
DC Fabric
VM
VM
Virtualized Optical Network
DC-DC Optical Circuit GMPLS provisioned
Enterprise-DC Optical Circuit GMPLS provisioned
Customer
L2
L3
L1
INTERNET
Customer
Customer
L2
L3
L1

WAN SDN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DC/WAN Network SDN Controller
Virtualized Carrier Ethernet Network
DC-DC Carrier Ethernet Circuit
Per-Hop OpenFlow Provisioned
Enterprise-Enterprise Carrier Ethernet VPN
Per-Hop OpenFlow Provisioned
Enterprise-DC Carrier Ethernet Circuit
Per-Hop OpenFlow Provisioned
Colt Data Centre
DC Fabric
VM
VM
Customer
L2
L3
L1
Customer
L3
L2
L1
INTERNET
Customer

Go forth and conquer

Carriers! SDN will enable you to:

- **More cost-effectively scale your networks, & network operations:**
  - **Network utilization optimization**
  - **Service performance optimization**
  - **Operations optimization**

- **Better monetize your network investments:**
  - **Create new & differentiated service offerings more quickly, more economically**
  - **Better optimize service pricing for improved revenue & return on investment**

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Thank You

WAN SDN

1. Customer orders Cloud service (IaaS)
2. VM Motion invoked
3. Private Cloud