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Cisco Connect

Riyadh, Saudi Arabia

April 29-30, 2014

TOMORROW starts here.

IP NGN Redefined - Cisco Evolved Programmable Network

Session ID 18PT

Istvan Kakonyi – Vertical Solutions Architect

Agenda

- Market Trends and Introduction
- Service Provider Transport Requirements
- Value Proposition of the Evolved Programmable Network
  - Simplification
  - Zero Touch Provisioning
  - Resiliency
  - Architecture Description
- SDN Enabled Architecture Evolution
- Q and A

Introduction , Market Trends and SP Transport Requirements

Evolving Services Create New Opportunities

IP Traffic

Global IP traffic will grow 3X to 1.4 zettabytes annually by 2017

Cloud

Global cloud traffic will grow 6X by 2016

Video

By 2017, the world will reach 3 trillion Internet video minutes per month

4G Mobile Adoption

4G will account for 45% of global mobile data traffic

M2M

Trillions of new “connected events” will occur over IP networks throughout the next decade

Service Provider Challenges

Kbps | Mbps | 10's GE | 100's GE | Tbps | Zettabyte Bandwidth

Increasing OPEX

Explosive BW Grow

Decreasing ARPU

0s | 10s | 100s | 1,000s | 10,000s | Increasing Device Scale

Cisco EPN Carrier Ethernet Infrastructure

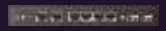
All in 1 infrastructure reduction

Cut down truck rolls by up to 75%

Service deployment down from months to minutes

Always Available

End to End Portfolio – Scale, Performance, Flexible form factors



ME 1200

Coming CY14

ME 4600

Coming CY14

ME 3800/3600/3400/2600

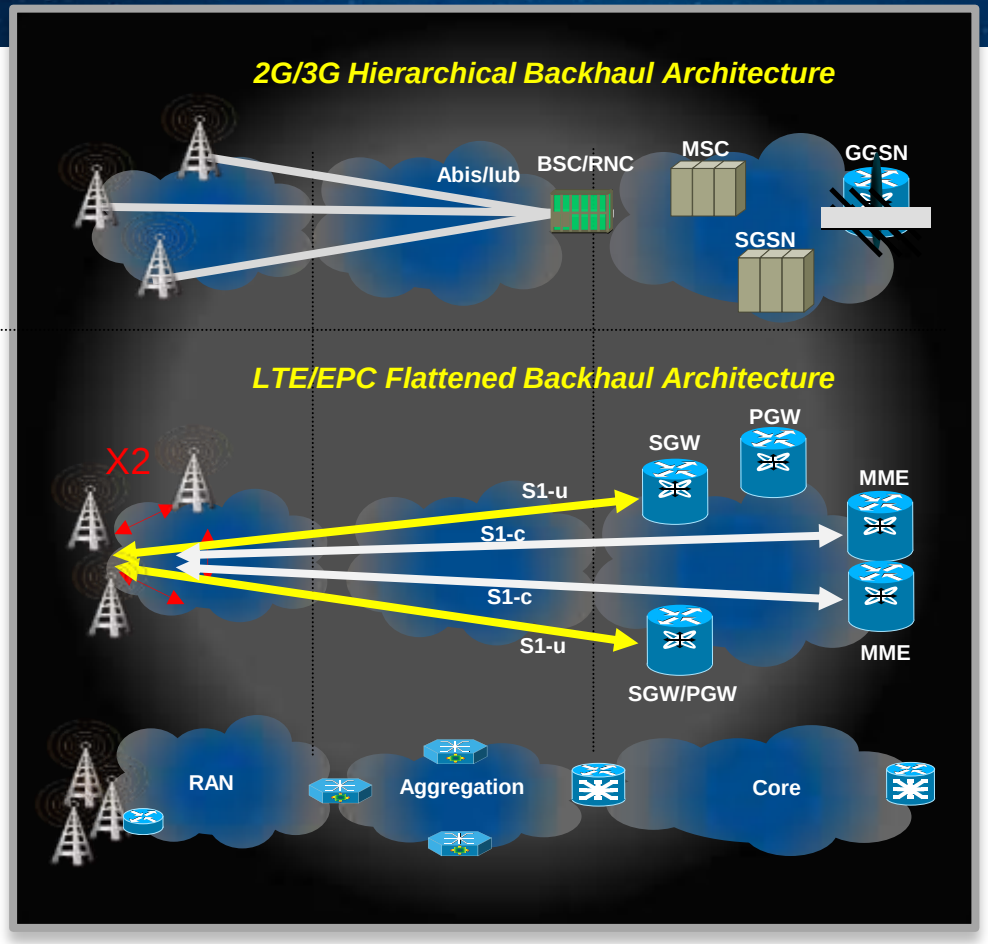
ASR 903/902

Coming CY14

ASR 9000 Family

Compelling Event of LTE

- Communications requirements are changing
- Old generations required hierarchical point to point
- New generation requires flat communications and high performance any to any connectivity



Value Proposition of the Evolved Programmable Network

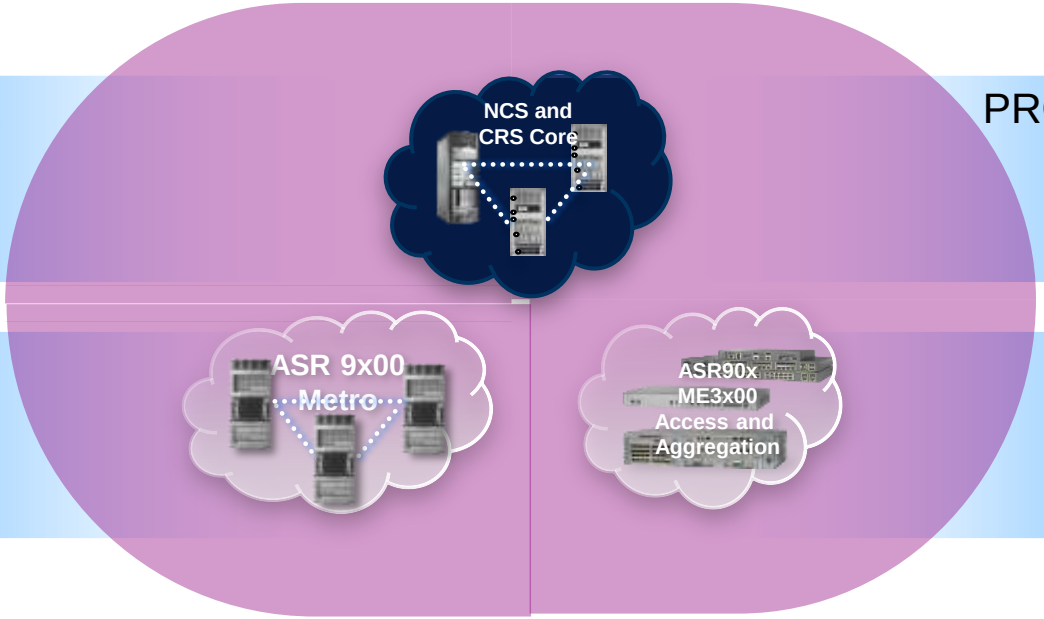
Carrier Ethernet EPN Foundation
What is different?

SIMPLE like L2

Zero Touch
Auto-Testing

PROGRAMMABLE

Agility, cross-layers efficiency



SCALABLE

Multi-dimensional multiservice scale HW Design

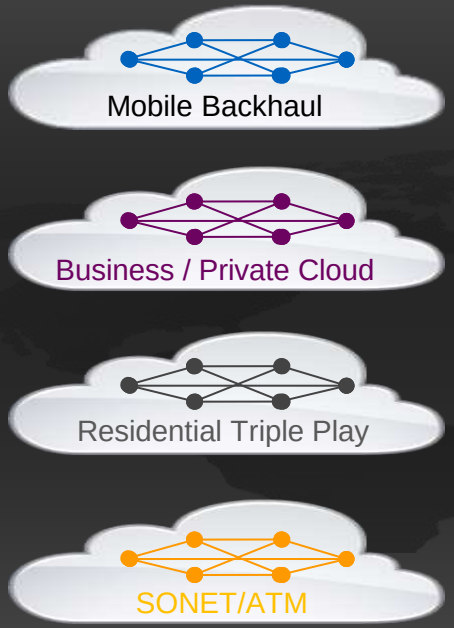
AVAILABLE

Plug&play 50ms resiliency

Converged Infrastructure Foundation: Unified MPLS

Converged infrastructure

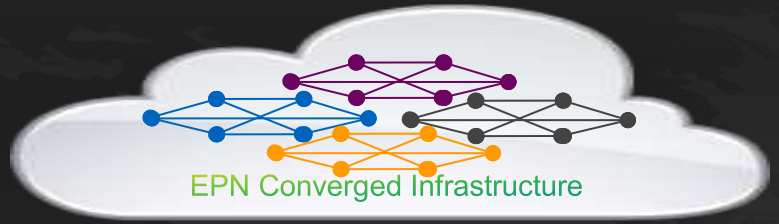
Increase profitability



Multiple underutilized networks
No integration between services
Different operational skill sets

Decoupled service and infrastructure

- One efficiently utilized network
- One operational model
- All services on single network



EPN convergence benefits

- Up to 70% capex savings
- Opex efficiency – one skill set
- Revenue opportunities – one access, multiple services

Converged infrastructure
What Cisco EPN does better?

Simple Convergent End-to-End Network Design

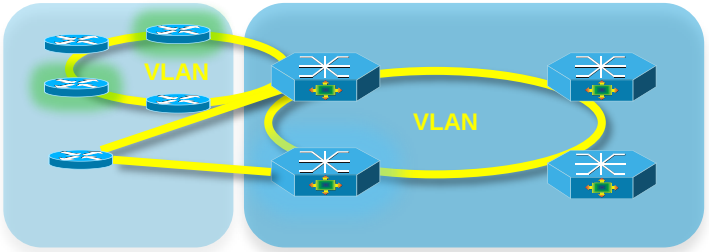
MPLS + BGP: common control and data plane
HW longevity: integrate with legacy, move to EPN without HW upgrades

Scalable, Resilient HW

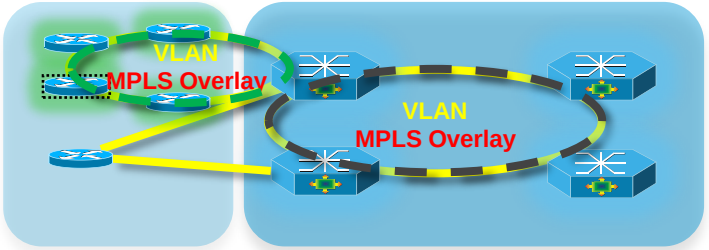
- M-D Scale: separate HW resource management per service
- High Density: 1G-100G density leadership
- 99.999% resiliency: system, SW, network level

Agile, Programmable

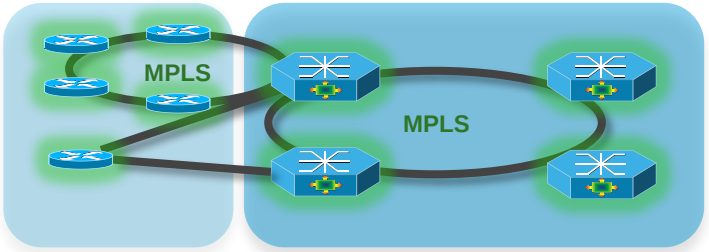
Seamless Migration
EPN CE integrates with Legacy



1 Deploy Cisco EPN devices in today architecture seamlessly:
- VLAN, QinQ
- STP/MST, G.8032, REP, MCLAG



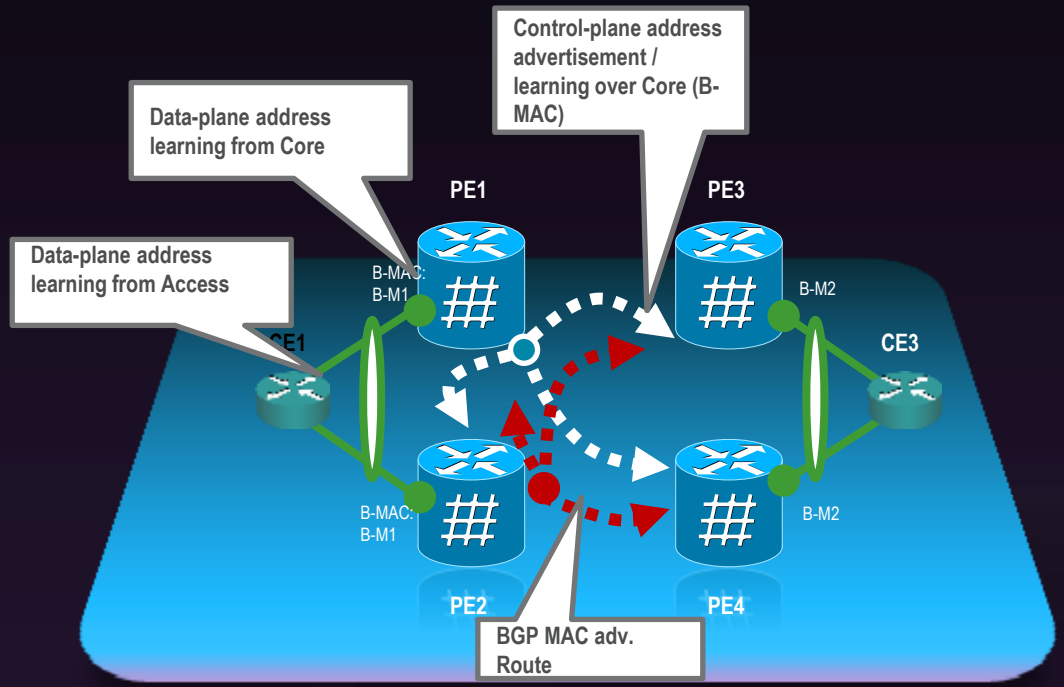
2 Progressively enable MPLS overlay
- Enable VLAN with MPLS
- Benefit from MPLS services: ELINE, CES, TDM, L3VPN



3 Benefit from end to end MPLS infrastructure
- Remove VLAN when all elements are MPLS enabled
- Benefit from rFLA 50ms resiliency, Auto-IP, Autonomic Networking

MPLS L2VPN Evolution: PBB-EVPN

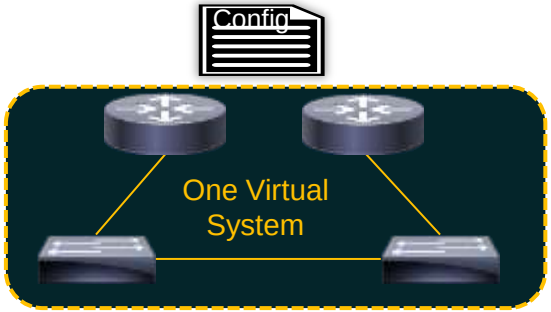
Powering DCI and NG-CE



- Simplified Operation: common data and control plane, MPLS + BGP
- Better Resource Utilization:
  - All-active Redundancy and Load Balancing
  - Optimal Path selection
- Always on: Fast Convergence
- High Scalability: MAC, VLAN, PW

Automate Device Deployment
Up to 70% OPEX savings

EPN with Plug&Play nV Satellite

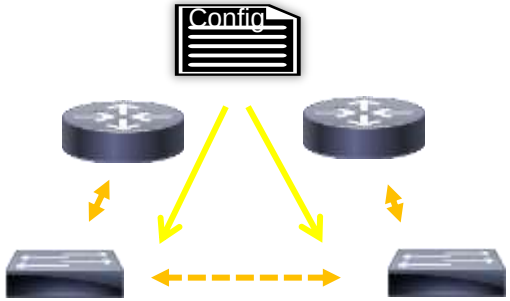


Auto-Discovery, Auto-Provisioning and Auto-resiliency

Simplicity

Weeks	Minutes
Downtime	Error Free
Complex	Plug&Play
Manual	Automated

EPN with Autonomic Network and Auto-IP

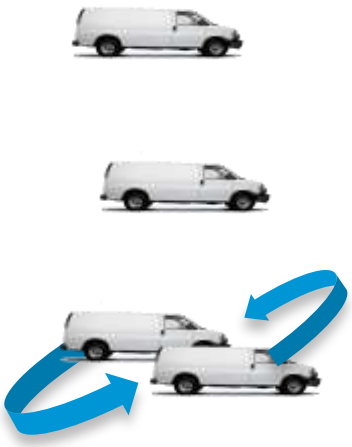


Auto-Discovery, Automatic Addressing and Secure Communication Channel

nV Satellite: Simplify Cell Site Router Activation

Today: 4-6 truck rolls to install a cell site router

- Router Physical Installation, Power, and Data Cabling
- Router Configuration
- EVC SLA Testing
- Ready for cut-over



nV Satellite: configuration and testing is done remotely.

- Router Physical Installation, Power, and Data Cabling
- Zero-Touch Router Boot and Configuration
- Integrated loopback for SLA Testing
- Ready for cut-over
- And much more: simple upgrades, single code, single configuration…

Steps to Simplify MPLS Turn-UP

Zero Touch Provisioning

Auto configuration and IP address assignment

Autonomic Network

Scalable and secured node insertion

Service Activation

Fast service turn-up and troubleshooting

Auto-IP

Self assigning IP address

1. Assign unique IP address to node being inserted
2. Neighboring nodes and inserted node negotiate physical link addresses
3. Connectivity established to the new node without manual intervention to existing nodes

Auto-IP

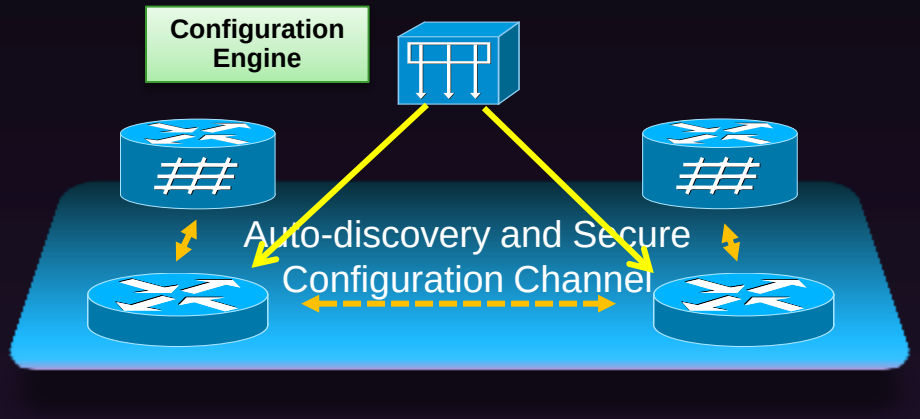
Autonomic Network

Service Activation

Easy node insertion and IP address assignment in L3 rings

Autonomic Network

Secured Discovery and Configuration



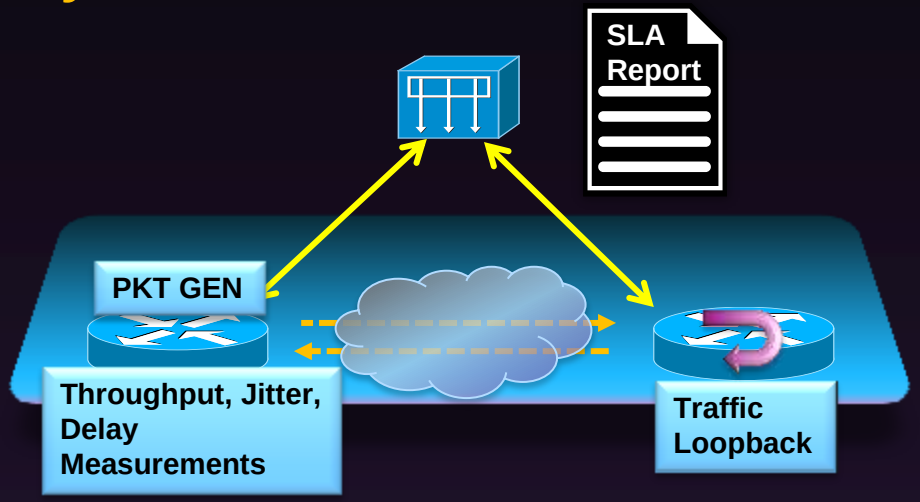
1. Device shipped from Cisco manufacturing to branch with no configuration
2. Device auto-discovered by neighbors and establishes secure configuration channel
3. Device receives Configuration Engine location and securely registers
4. Device downloads configurations from Configuration Engine

Auto-IP | **Autonomic Network** | Service Activation

Zero-touch access auto-configuration

Service Activation

Easy SLA verification



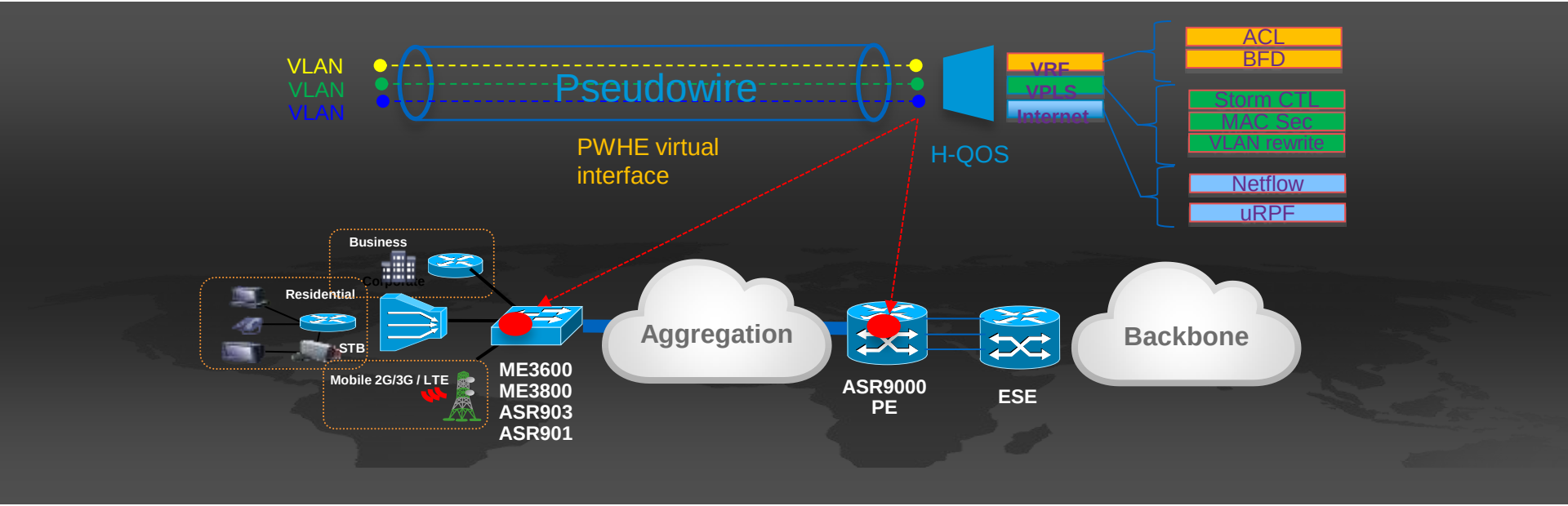
1. Traffic generation in network element eliminate need for extra test equipment
2. Ability to test end to end QoS for service assurance
3. Remote device send the traffic back to the source
4. Source measures throughput, jitter, and latency for SLA
5. Analytic and police engines collect data from nodes for more detailed analysis and take appropriate actions

Auto-IP | Autonomic Network | **Service Activation**

Service turn up and verification without need for extra equipment

Virtual Service Interface – Pseudowire HE

Any Service Anywhere



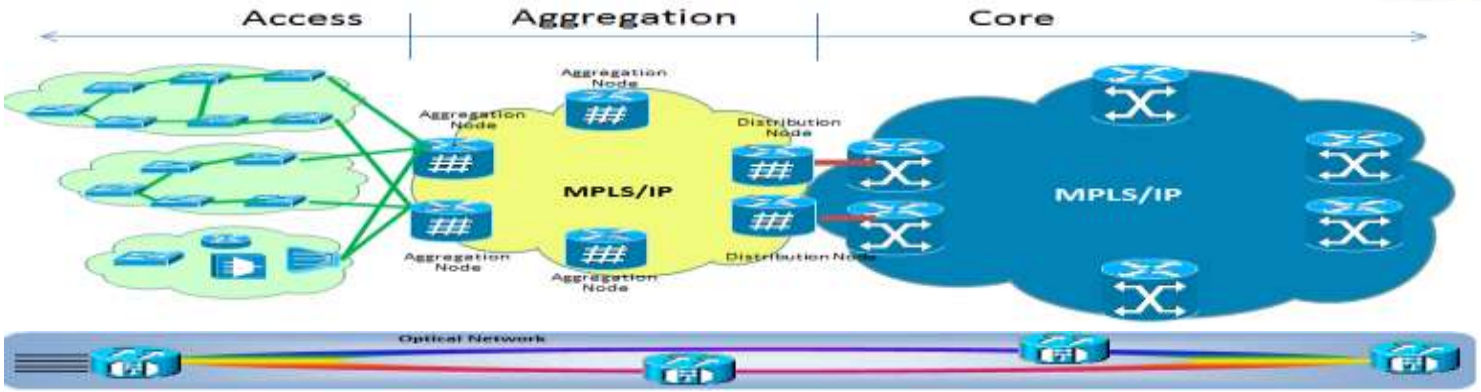
Simplified Operations for Access & Aggregation

Converged PE and ESER

Less Touch points and single service definition

EPN Transport Reference Architecture

Cisco Validated Design



MEF CE2.0 Services, L3 VPN, Multicast

L2 access, MPLS Access, nV Sat

- EPN Solution Brochure
- EPN System Design Guide
- Design and Implementation Guide

Agile: Deploy Services Faster

Slow time to market? where the time goes?

New Service Definition

Per Device Configuration Development

Interoperability testing

Per Box Physical infrastructure

Configuring E2E Service per Box

Activation Test and Troubleshooting

MEF CE 2.0 Services

EPN CVD Configurations

EPN CVD Test Results

Converged Physical Infrastructure

Flexible service enablement

PW-HE virtual interface

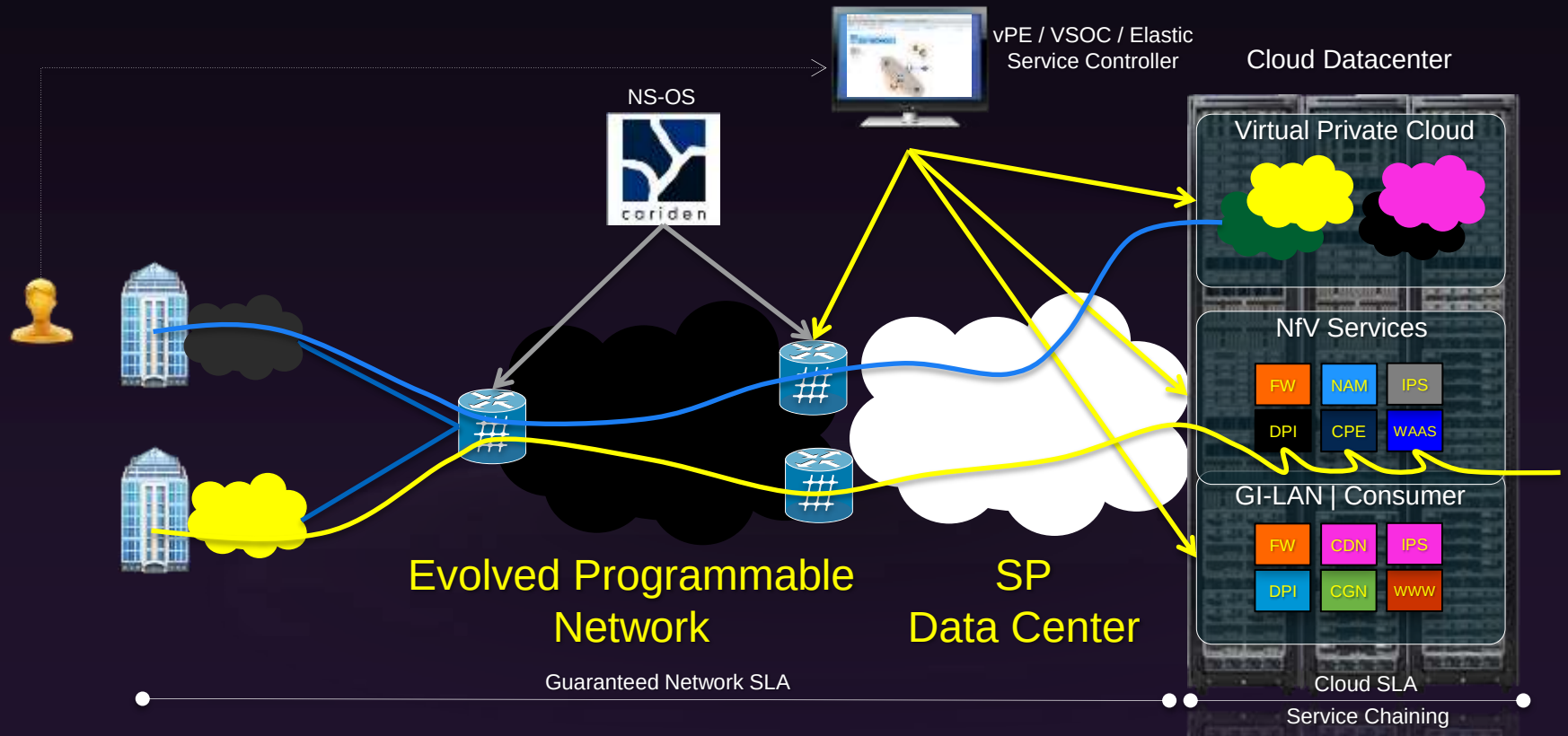
Integrated SAT

Reduce from months to minutes

Before

After: Cisco EPN

EPN Infrastructure Programmability
Increase profitability



Reduce downtime in your network
Profitability only with 24x7 networks

Downtime cost to your customer

$11,441* = cost of each computer and network downtime to businesses

Critical Applications on Cloud

Cloud and storage distribution make network reliability even more relevant

Access Everywhere

All networks are equally important. Customer access networks via wired Ethernet, WLAN or 3G/4G

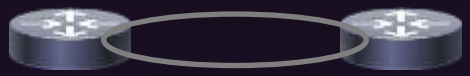
*Source: US Bureau of Labor Statistics – May 2007
**Source: Current Analysis, March 2012, With Network Dependence Critical, is downtime acceptable?

EPN Built-in Network High Availabili

Always on without compromising simplicity

	Simple	Multi-service	50ms	Cost
SONET/ SDH	✓	✗	✓	✗
Ethernet STP	●	✗	✗	✓
Ethernet G.8032	●	✗	✓	✓
MPLS-TE/ TP	✗	✓	✓	✓

EPN with Loop Free Alternate Resiliency

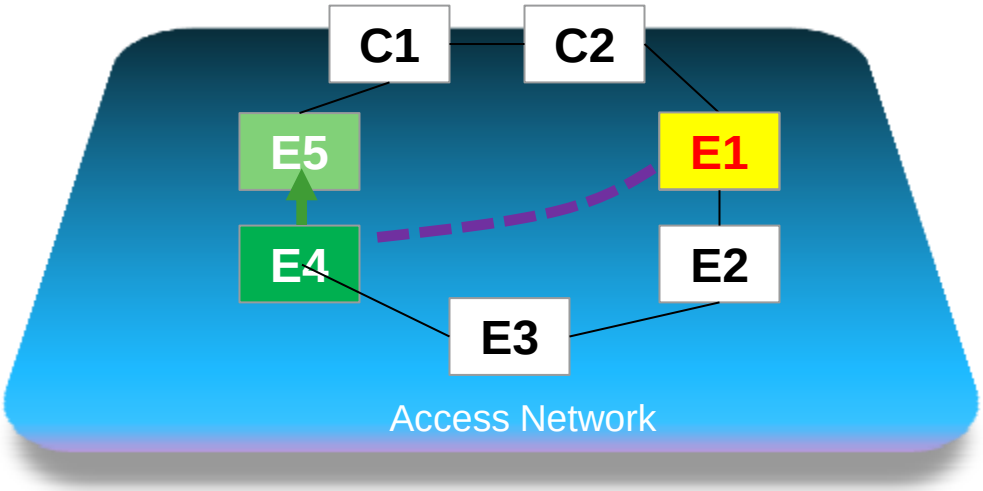


- ✓ 3 simple lines to enable
- ✓ Always ON with 50 ms convergence
- ✓ Multiservice, multi-topology

MPLS Access: Resiliency Simplified

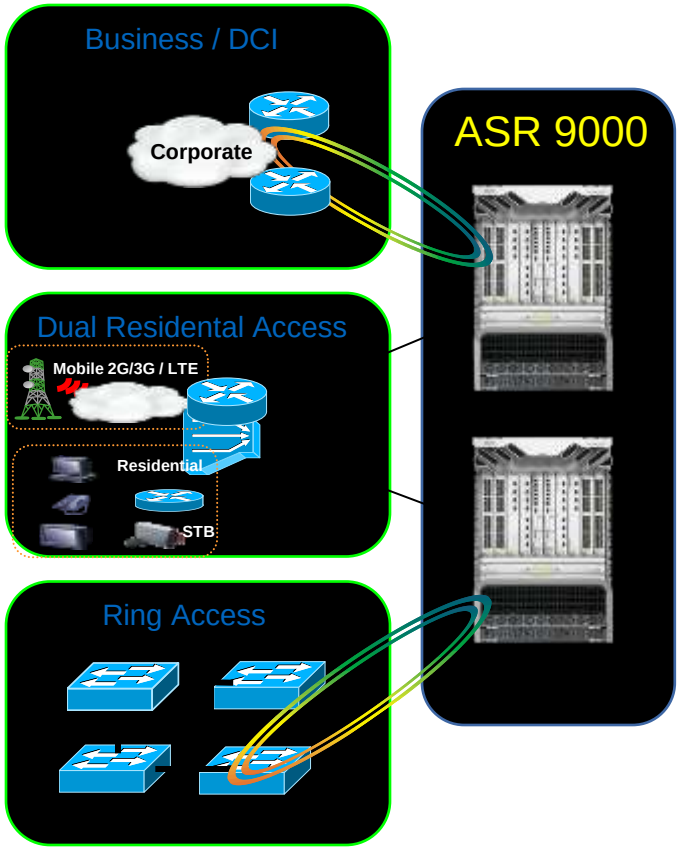
Remote LFA

- Operator Action: Enable R-LFA for a set of prefixes to protect
- rLFA Algorithm finds a PQ node, best alternate loop free path, and pre-installs secondary path/label for a prefix in HW
- Result: Local repair with 50ms convergence



Cisco ASR 9000 Carrier Ethernet Resiliency

HA solution for every network



Access Resiliency Mechanisms

LFA/rLFA, MPLS-TE/TP

G.8032, REP-AG

Performance Optimized MST-AG, PVST-AG, MST-AG, MST, RPVST

Feature Enabled LAG and MC-LAG

Node Resiliency Mechanisms

Protocol Inclusive NSF/NSR/SSO

In-Service SMU/ISSU

Fully Redundant Hardware

Core Resiliency Mechanisms

MPLS TE/FRR

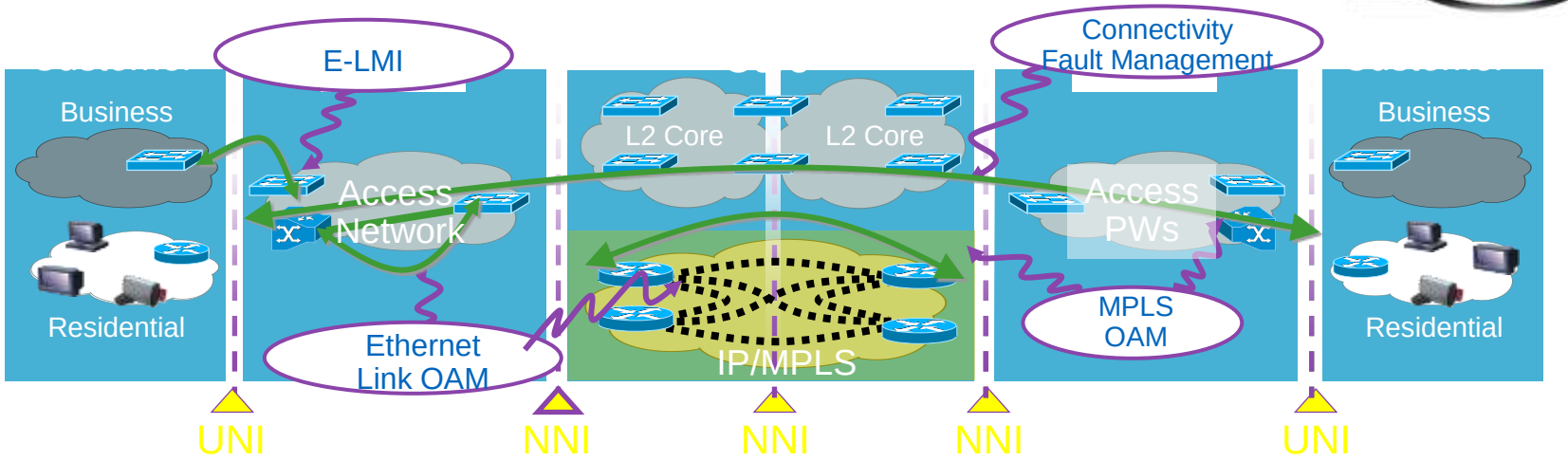
PW Redundancy w/ MAC withdrawal

MoFRR

Fast IGP Convergence/IP FRR

Cisco ASR 9000 Carrier Ethernet SLA Management at Glance

Ethernet OAM



Ethernet OAM

802.3ah Link OAM

ELMI

CFM 802.1ag /w Ethernet Fault Detection

Y.1731 Fault Management

Performance Monitoring

Y.1731 Delay Measurement

Y.1731 SLM and LMM

IP SLA

Interworking

CFM-ELMI

802.3ah-CFM

Prime Performance Management Integrated

Driving Innovation for Ethernet Transport
Improved Service Revenues, Reduced CapEx + OpEx Costs

nV

Virtualization in Edge and Access for Operational Simplicity

Plug&play infrastructure

PW-Head End

Virtual interface for any service anywhere

Deploy services faster

Activation Framework

Zero-touch provisioning and integrated testing

Reduce Truck Rolls

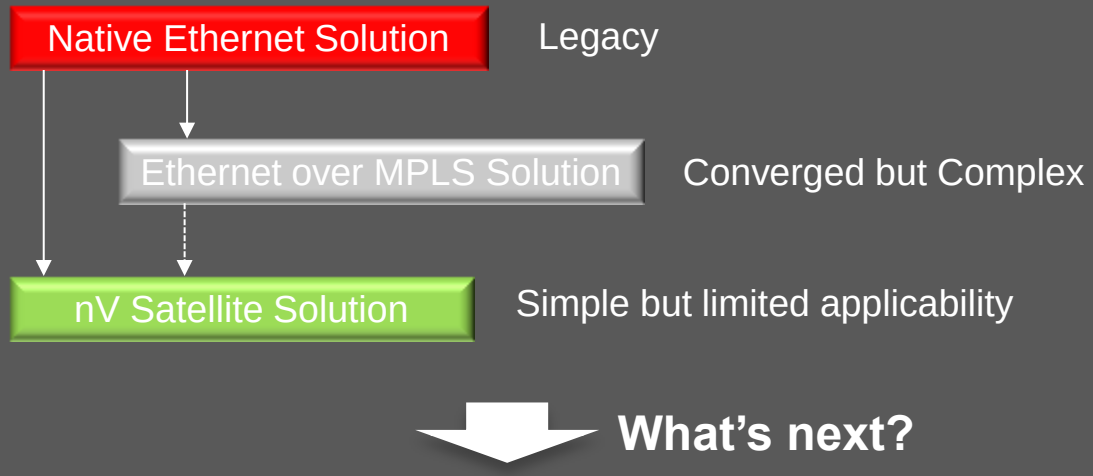
IP Fast Reroute

Scale and protect any topology with 50ms and minimal provisioning

Resilient and simple

SDN Enabled Architecture Evolution

The Evolution of EPN Transport (CE) Architecture



Simple, Agile, Programmable, Cloud Integrated

Architecture Evolution w SDN/NFV and Segment Routing

Network (Physical and Virtual Infrastructure)

Segment Routing (SR)

Forwarding state (segment) is established by IGP

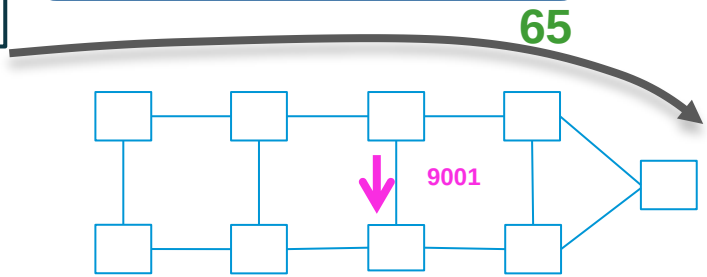
- **LDP and RSVP-TE are not required**

MPLS Dataplane is leveraged without any modification

push, swap and pop: all what we need

segment = label

A packet injected anywhere with top label 65 will reach Z

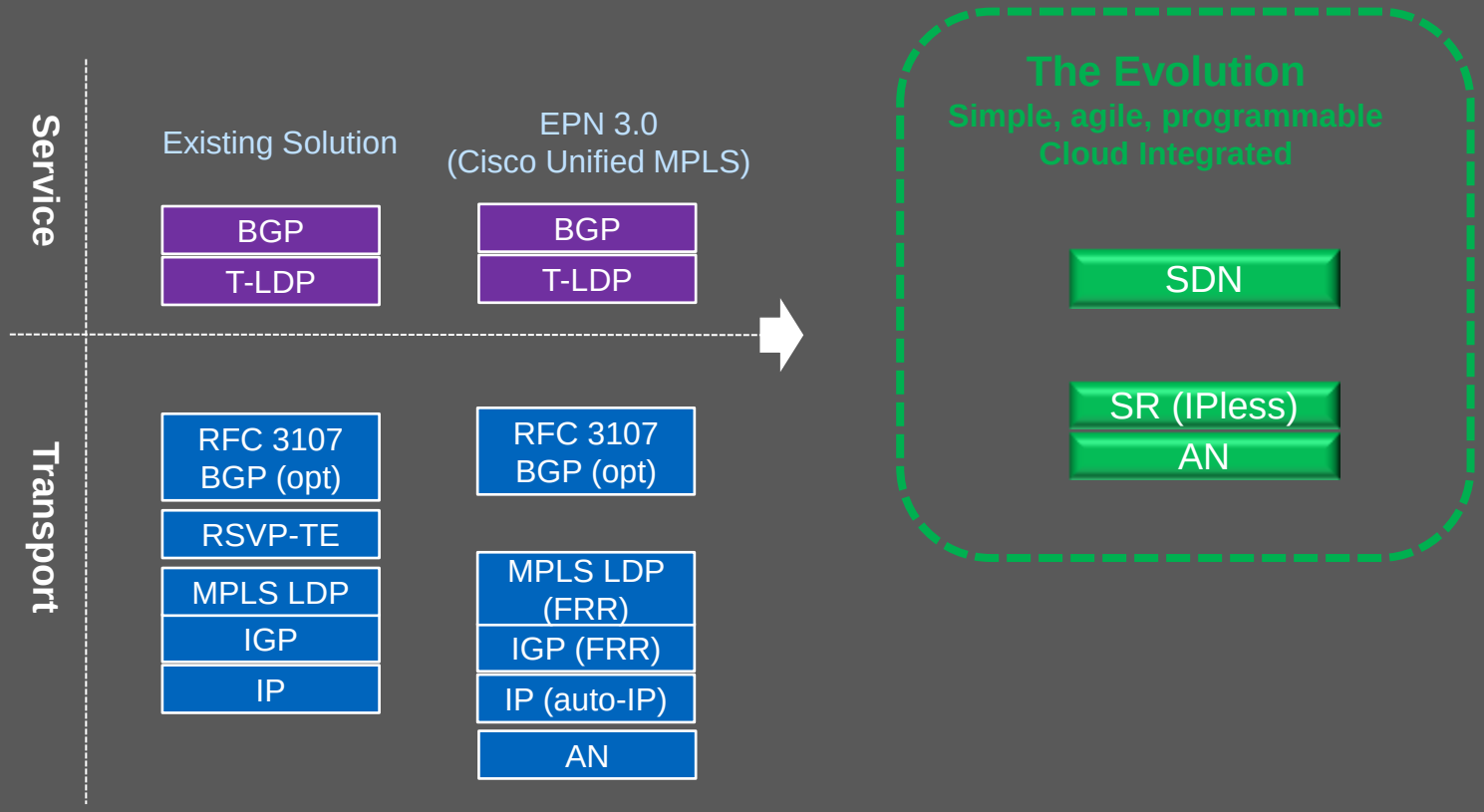


Nodal segment: Operator allocates a label from the SR registry to each node. For example Z is given label 65

Adjacency segment: Node automatically allocates a local label for each adjacency. For example Label 9001 allocated for adjacency O

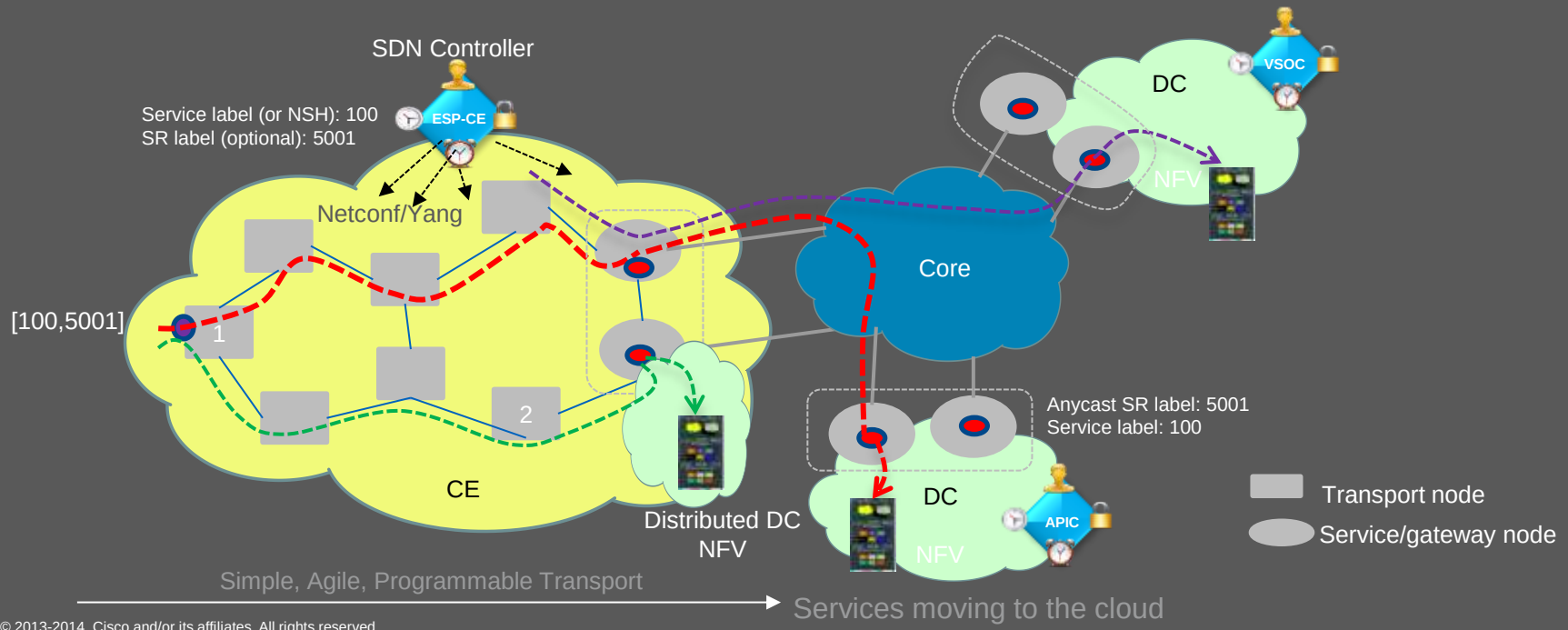
A packet injected at node C with label 9001 is forced through datalink CO

The Evolution …

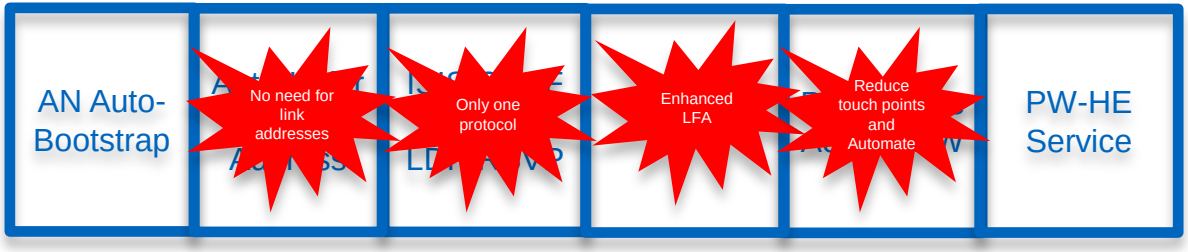


Vision of the EPN Transport (CE) Architecture Evolution

- **Autonomic Network (physical)**: secure, auto discovery, plug-n-play
- **Segment routing (transport)**: IPless, 50msec self-protected, Agile on-demand TE
- **SDN controller (service):** static service label (or NSH) with cloud integrated



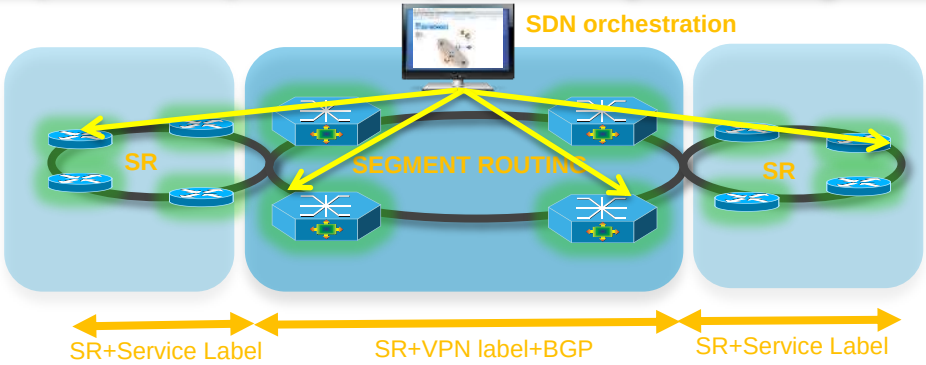
CE EPN Evolution to full Plug&Play
Segment Routing and SDN



All in One Protocol

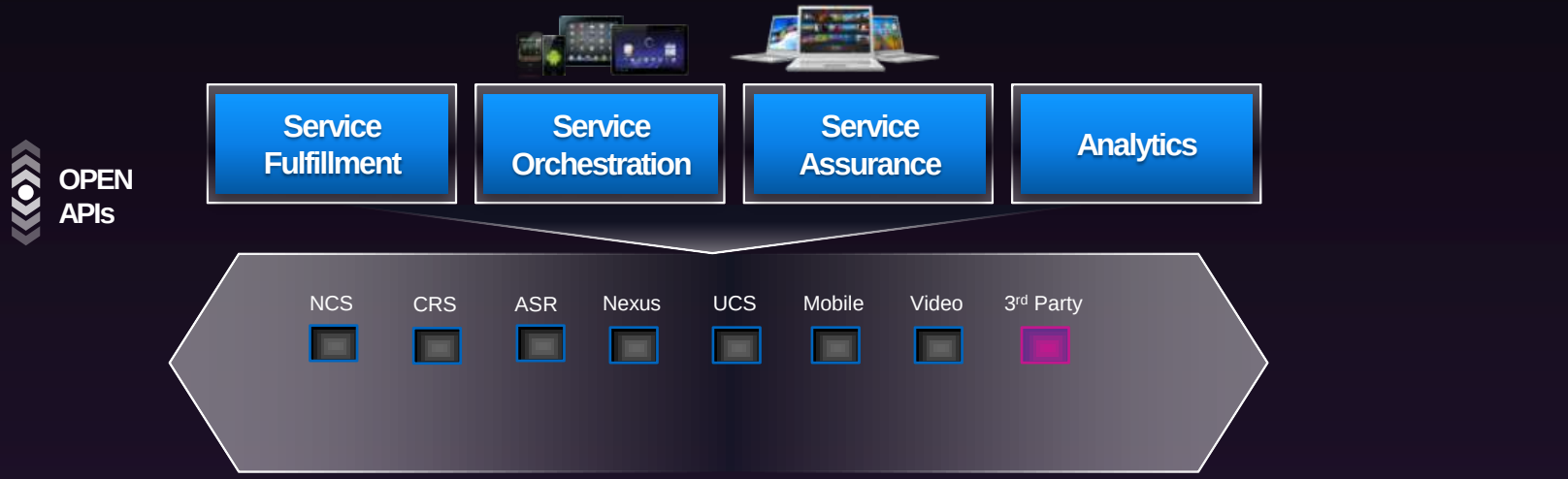
Unlimited Scale

Zero-Touch



Cisco Prime: A Comprehensive Tool Kit

End-to-End Service Fulfillment and Orchestration Across Evolved Programmable Network



Zero-Touch Service Fulfillment

Automated Service Orchestration

Integrated Service and Network Assurance

Cisco Unique Value

Accelerate Time-to-Market and Revenue

Simplify Operations and Cost of Ownership

Improve Customer Experience

Roadmap/Vision

MPLS Segment Routing	Simplify further Routing and MPLS infrastructure
Programmability/SDN	Streamline and Automate Services and Infrastructure
nV Offload: Mcast, Y.1731	Advanced nV Satellite functions
MPLS-TE QoS and Service Preference	Enhance Bandwidth management capability
Cisco Prime	End-to-end solution management portfolio

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