
TOMORROW
starts here.

Data Centre Interconnect with Overlay Transport Virtualisation

BRKDCT-2049

Mitch Roberts

Systems Engineer

#clmel

Cisco live!

OTV – Overlay Transport Virtualisation

Simplifying Data Centre Interconnect

Any Workload

Anytime

Anywhere

Session Objectives

- The main goals of this session are:
- This session features a detailed analysis of the architectural aspects and deployment benefits behind OTV
- The attendees will learn how OTV is aimed at providing Layer 2 connectivity beyond the Layer 3 boundary while maintaining the failure containment and operational simplicity that the Layer 3 boundary provides
- The attendees will get a deep knowledge of how the OTV control-plane and data-plane work to provide the VLAN extension

Session Non-objectives

- This session does not include:
- In depth discussion of Path Optimisation technologies (DNS, LISP, etc.)
- Storage extension considerations associated to DCI deployments
- Workload mobility application specific deployment considerations
- In depth discussion Multicast

Please Visit – Great Content + Vods

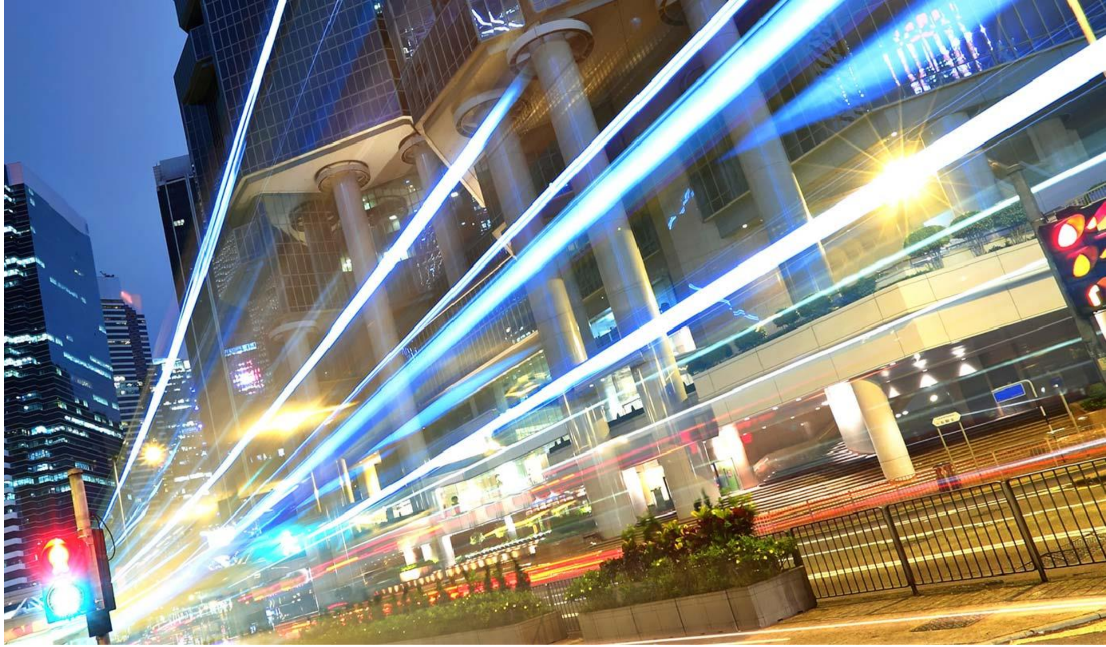
- http://www.ciscolive.com/global/

Related Cisco Live Events

Session-ID	Session Name
BRKDCT-2334	Real World Data Centre Deployments and Best Practices
BRKDCT-2615	How to Achieve True Active-Active Data Centre Infrastructures
BRKDCT-2218	Small to Medium Data Centre Designs
BRKRST-1601	Fast Track to Fast-IT – A Practical Approach

Agenda

- Distributed Data Centres: Goals and Challenges
- OTV Architecture Principles
- OTV Design Considerations & New Features



Distributed Data Centres Goals

- Ensure business continuity
- Distributed applications
- Seamless workload mobility
- Maximise compute resources

Data Centre Interconnect

Traditional Layer 2 Extensions

Ethernet

- VSS & vPC or FabricPath
  - Applies easily for dual site interconnection
  - Over dark fibre or protected D-WDM
  - Easy crypto using end-to-end 802.1AE

IP

- OTV – Overlay Transport Virtualisation
  - MAC in IP

MPLS

- EoMPLS & VPLS & A-VPLS & H-VPLS
  - PE style
  - Multi-tenants
  - Most deployed today

Challenges in Traditional Layer 2 VPNs

Flooding Behaviour

- Unknown Unicast for MAC propagation
- Unicast Flooding reaches all sites

Pseudo-wire Maintenance

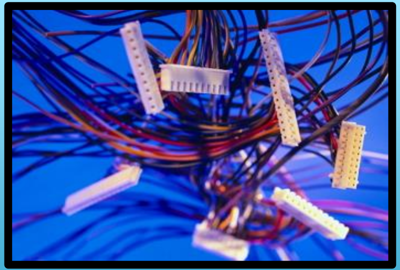
- Full mesh of Pseudo-wire is complex
- Head-End replication is a common problem

Multi-Homing

- Requires additional Protocols & extends STP
- Malfunctions impacts multiple sites

Technology Pillars

No Pseudo-Wire State Maintenance



Optimal Multicast Replication

Dynamic Encapsulation

Multipoint Connectivity

Point-to-Cloud Model

Preserve Failure Boundary

Built-in Loop Prevention

Protocol Learning

Automated Multi-Homing

Site Independence

Cisco live!

OTV – Overlay Transport Virtualisation

Simplifying Data Centre Interconnect

Any Workload

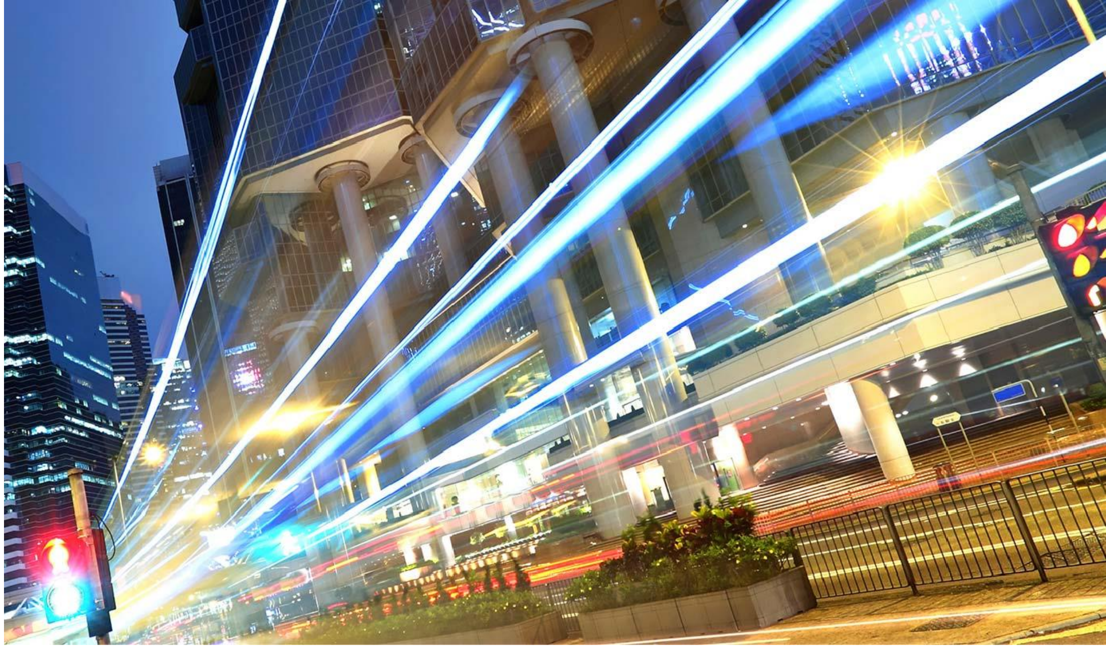
Anytime

Anywhere

- **Nexus 7000** First platform to support OTV (since 5.0 NXOS Release)
- **ASR 1000** Now also supporting OTV (since 3.5 XE Release)

Agenda

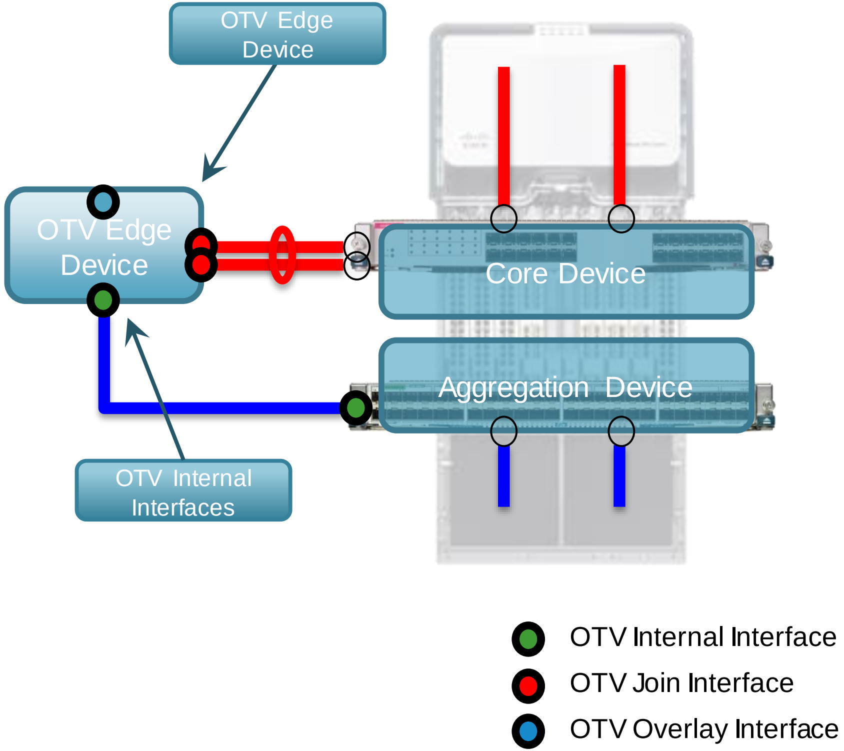
- Distributed Data Centres: Goals and Challenges
- OTV Architecture
  - Terminology
  - Control Plane and Data Plane
  - Failure Isolation
  - Multi-homing
  - Mobility
  - L2 Multicast Forwarding
  - QoS and Scalability
  - Path Optimisation
- OTV Design Considerations & New Features



Terminology

OTV Devices and Interfaces

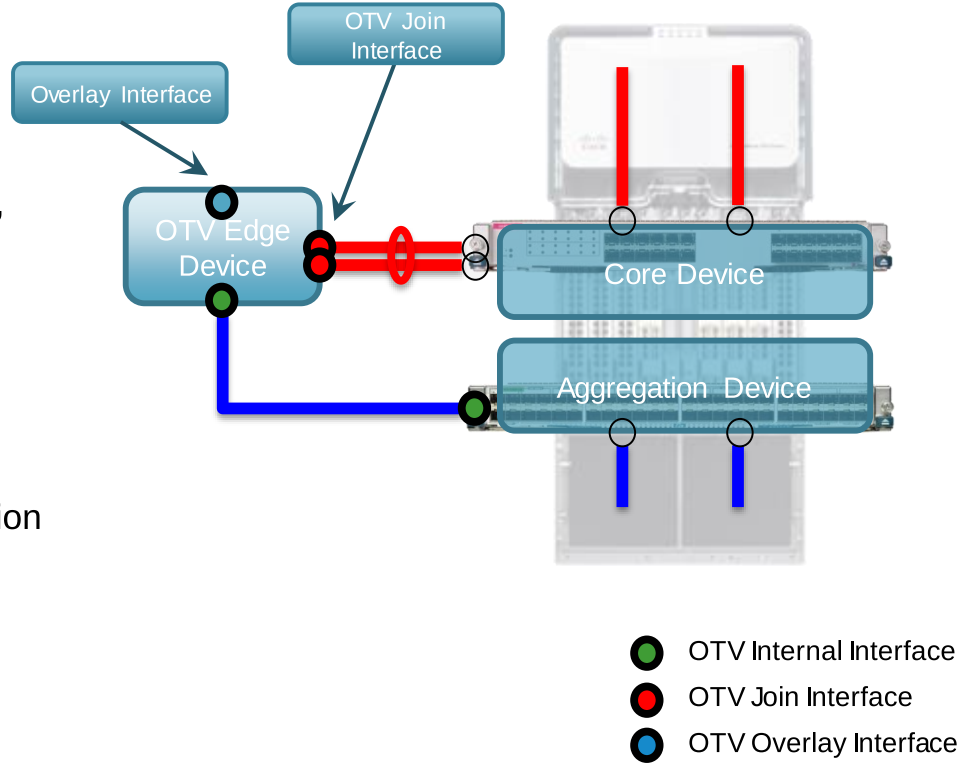
- Edge Device
  - Performs all OTV functionality
  - Usually located at the Aggregation Layer or at the Core Layer
  - Support for multiple OTV Edge Devices (multi-homing) in the same site
- Internal Interface
  - Site facing Interfaces of the Edge Devices
  - Carry VLANs extended through OTV
  - Regular Layer 2 interfaces
  - No OTV configuration required
  - Supports IPv4 & IPv6



Terminology

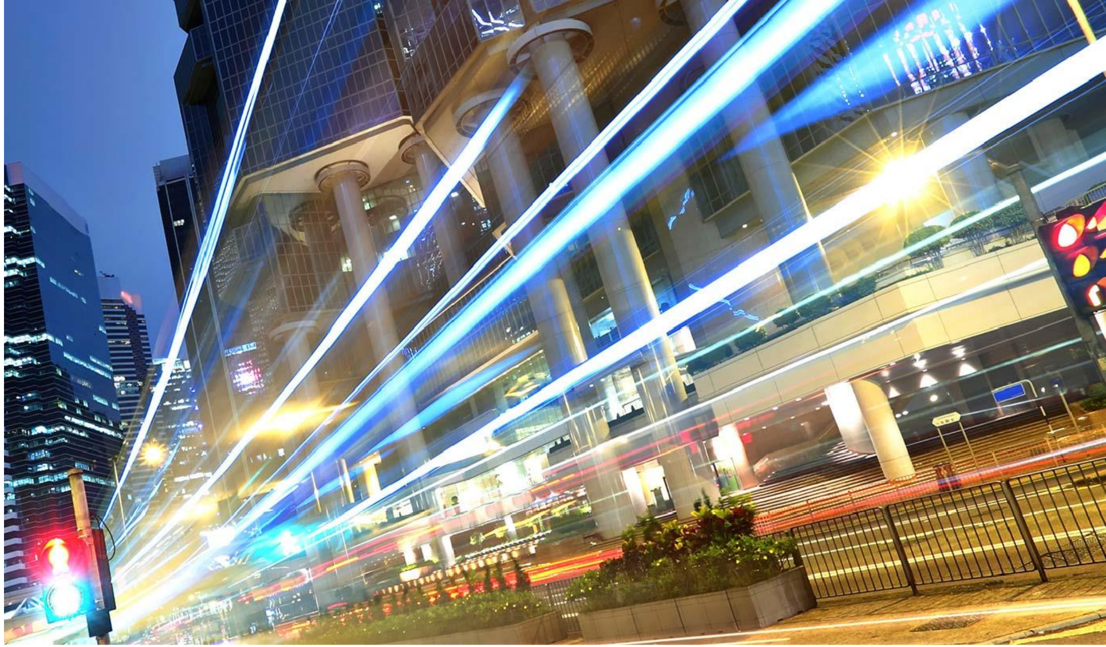
OTV Devices and Interfaces

- Join Interface
  - One of the uplink of the Edge Device
  - Point-to-point routed interface (physical interface, sub-interface or port-channel supported)
  - Used to physically "join" the Overlay network
  - No OTV specific configuration required
  - IPv4 only
- Overlay Interface
  - **Virtual** interface with most of the OTV configuration
  - Logical multi-access multicast-capable interface
  - Encapsulates Layer 2 frames in IP unicast or multicast



Agenda

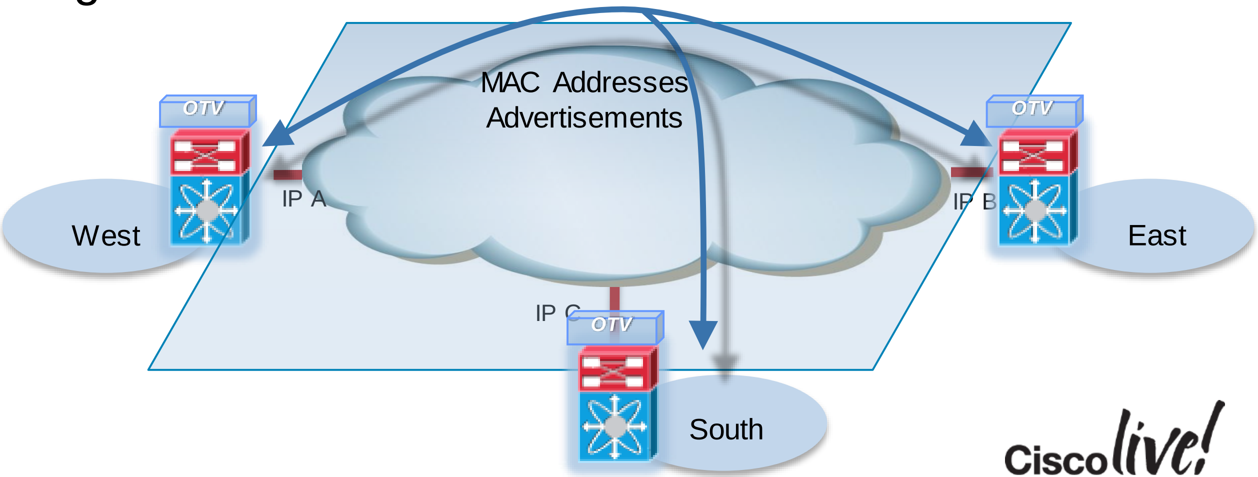
- Distributed Data Centres: Goals and Challenges
- OTV Architecture Principles
  - Terminology
  - Control Plane and Data Plane
  - Failure Isolation
  - Multi-homing
  - Mobility
  - L2 Multicast Forwarding
  - QoS and Scalability
  - Path Optimisation
- OTV Design Considerations & New Features



OTV Control Plane

Building the MAC Tables

- **No unknown unicast flooding (selective unicast flooding in 6.2)**
- **Control Plane Learning with proactive MAC advertisement**
- Background process with no specific configuration
- IS-IS used between OTV Edge Devices



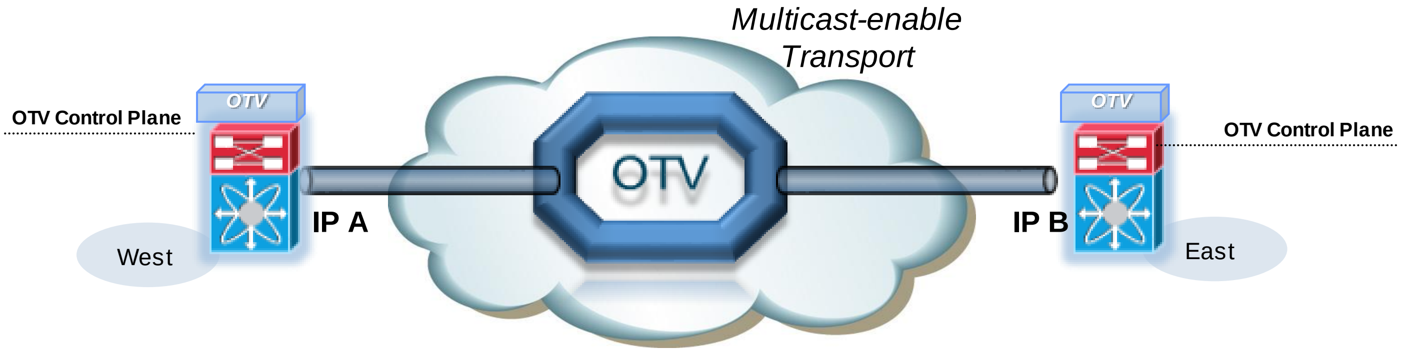
OTV Control Plane

Neighbour Discovery and Adjacency Formation

- Before any MAC address can be advertised the OTV Edge Devices must:
  - Discover each other
  - Build a neighbour relationship with each other
- Neighbour Relationship built over a transport infrastructure:
  - Multicast-enabled (all shipping releases)
  - Unicast-only (from NX-OS release 5.2 & IOS-XE 3.9)

OTV Control Plane

Neighbour Discovery (over Multicast Transport)



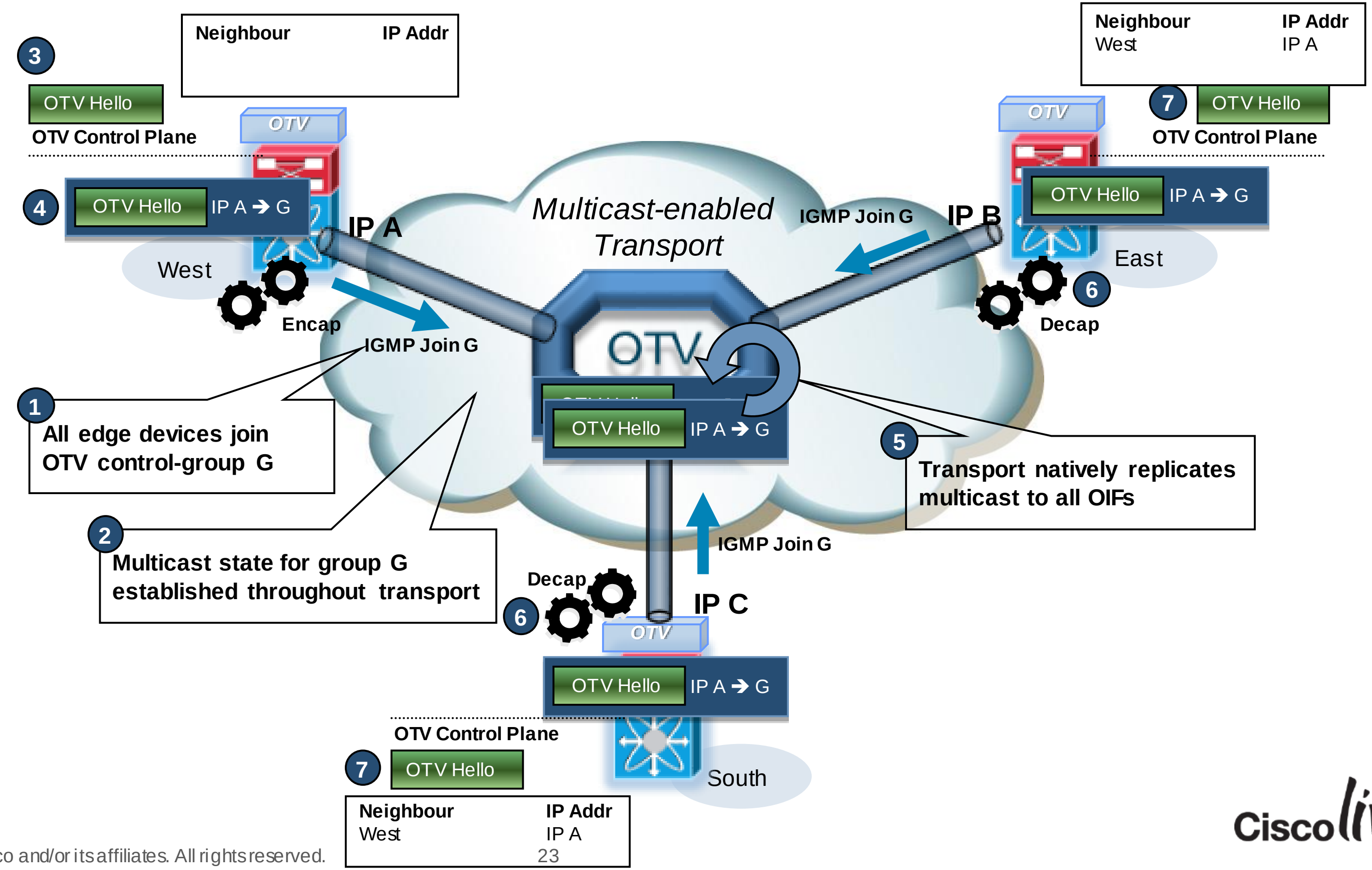
Mechanism

- Edge Devices (EDs) join an multicast group in the transport, as they were hosts (no PIM on EDs)
- OTV hellos and updates are encapsulated in the multicast group

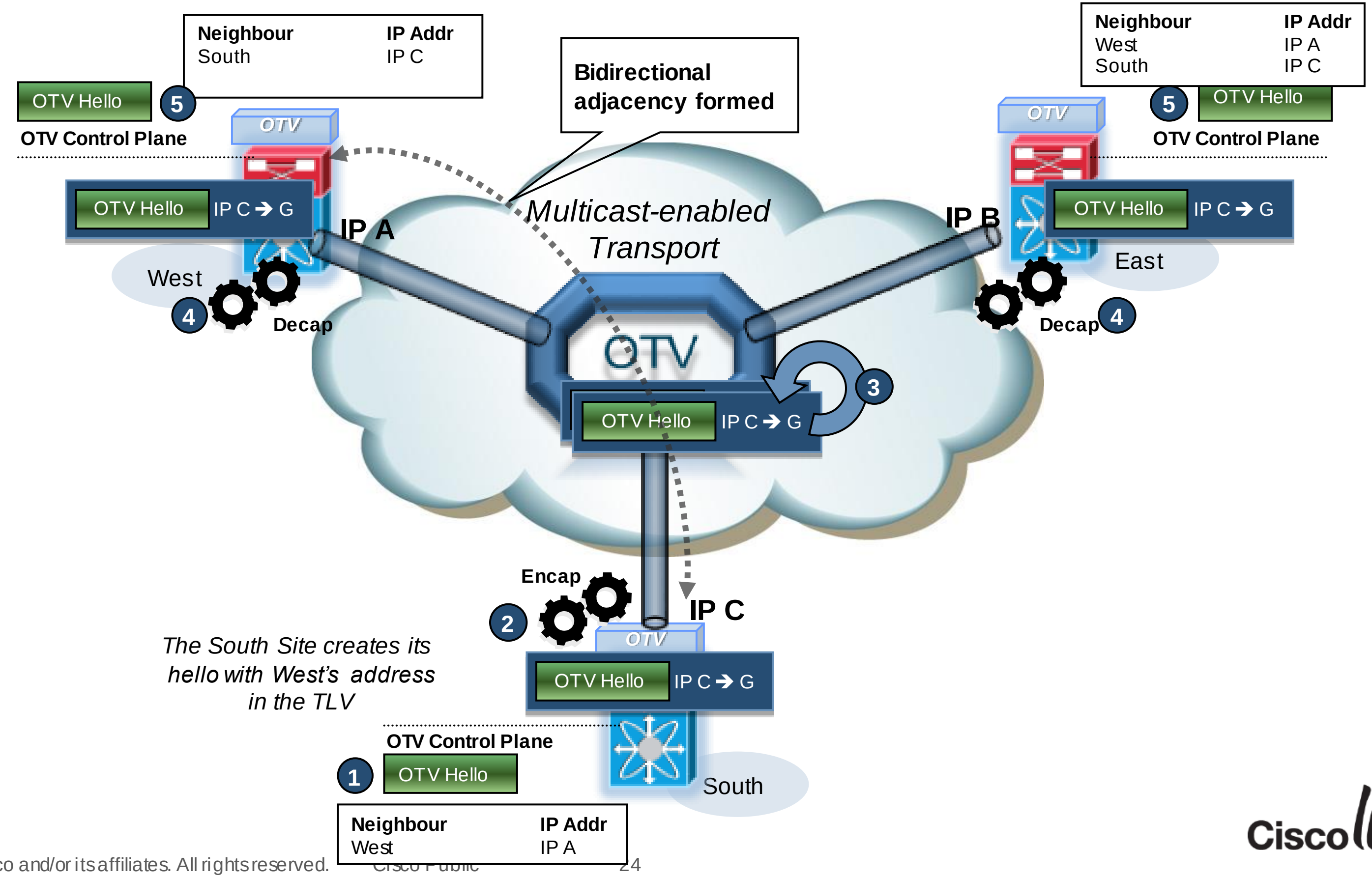
End Result

- Adjacencies are maintained over the multicast group
- A single update reaches all neighbours

OTV Control Plane (Multicast Transport)

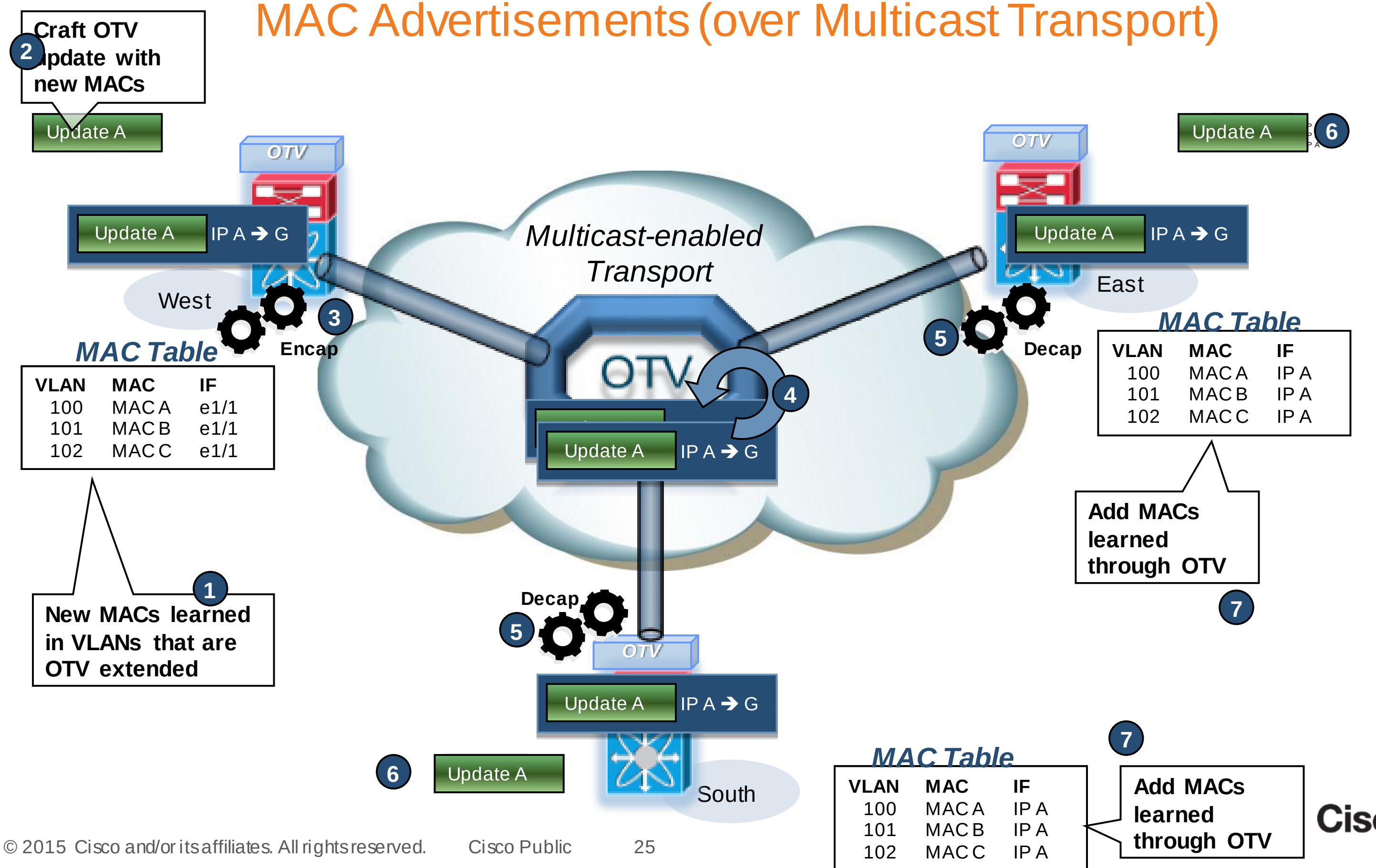


OTV Control Plane (Multicast Transport)



OTV Control Plane

MAC Advertisements (over Multicast Transport)



Multicast Transport

OTV Control and Data Plane over Multicast Transport

For Your Reference

- Use a High-Available Multicast Rendez-Vous Point (RP) configuration
  - PIM Anycast (RFC4610) or MSDP (Multicast Source Discovery Protocol)
- Requirements to Control Plane
  - PIM Any-Source-Multicast (ASM) Sparse-Mode
- Requirements to Data Plane
  - PIM Source-Specific-Multicast (SSM) or BiDir

Example:
Multicast for OTV on Nexus 7000

```
feature pim
!
interface loopback 0
 ip pim spare-mode
 ip address 192.168.1.100/32
!
interface loopback 1
 ip pim sparse-mode
 ip address 10.254.254.n1-x/32
!
ip pim rp-address 192.168.1.100 group-list 239.1.1.1
ip pim anycast-rp 192.168.1.100 10.254.254.n1
ip pim anycast-rp 192.168.1.100 10.254.254.n2
ip pim ssm range 232.239.1.0/24
!
interface port-channel1
# This Interface peers with the OTV Join Interface
 ip igmp version3
```

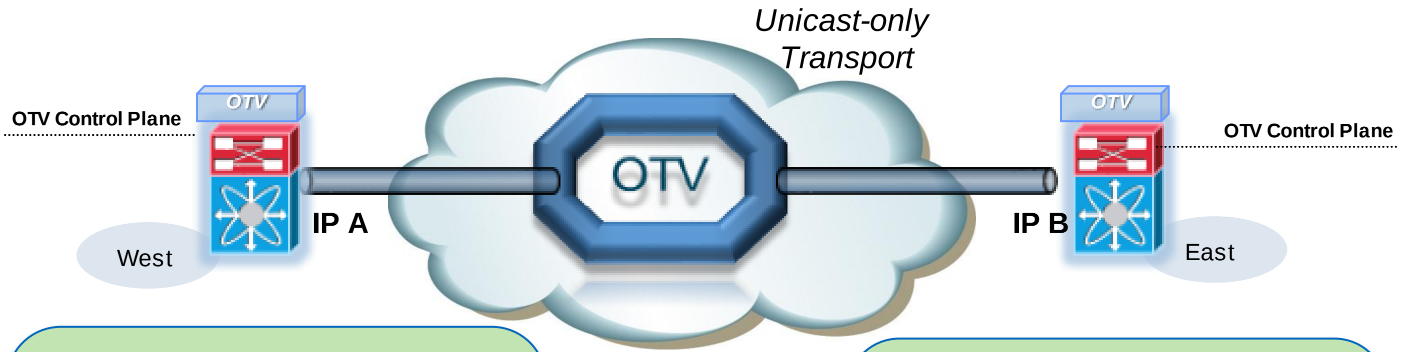
** "n" in the last Octet reflects a unique IP address per Router joining the PIM Anycast Group*

Release 5.2 and above

OTV Control Plane

Neighbour Discovery (Unicast-only Transport)

- Ideal for connecting a small number of sites
- With a higher number of sites a multicast transport is the best choice



Mechanism

- Edge Devices (EDs) register with an *"Adjacency Server"* ED
- EDs receive a full list of Neighbours (oNL) from the *AS*
- OTV hellos and updates are encapsulated in IP and ***unicast*** to each neighbour

End Result

- Neighbour Discovery is automated by the *"Adjacency Server"*
- All signalling must be replicated for each neighbour
- Data traffic must also be replicated at the head-end

OTV Control Plane

CLI Verification

For Your Reference

- Establishment of control plane adjacencies between OTV Edge Devices (multicast or unicast transport):

```
dc1-agg-7k1# show otv adjacency

Overlay Adjacency database
Overlay-Interface Overlay100   :
Hostname        System-ID        Dest Addr     Up Time     Adj-State
dc2-agg-7k1     001b.54c2.efc2   20.11.23.2    15:08:53    UP
dc1-agg-7k2     001b.54c2.e1c3   20.12.23.2    15:43:27    UP
dc2-agg-7k2     001b.54c2.e142   20.22.23.2    14:49:11    UP
```

- Unicast MAC reachability information:

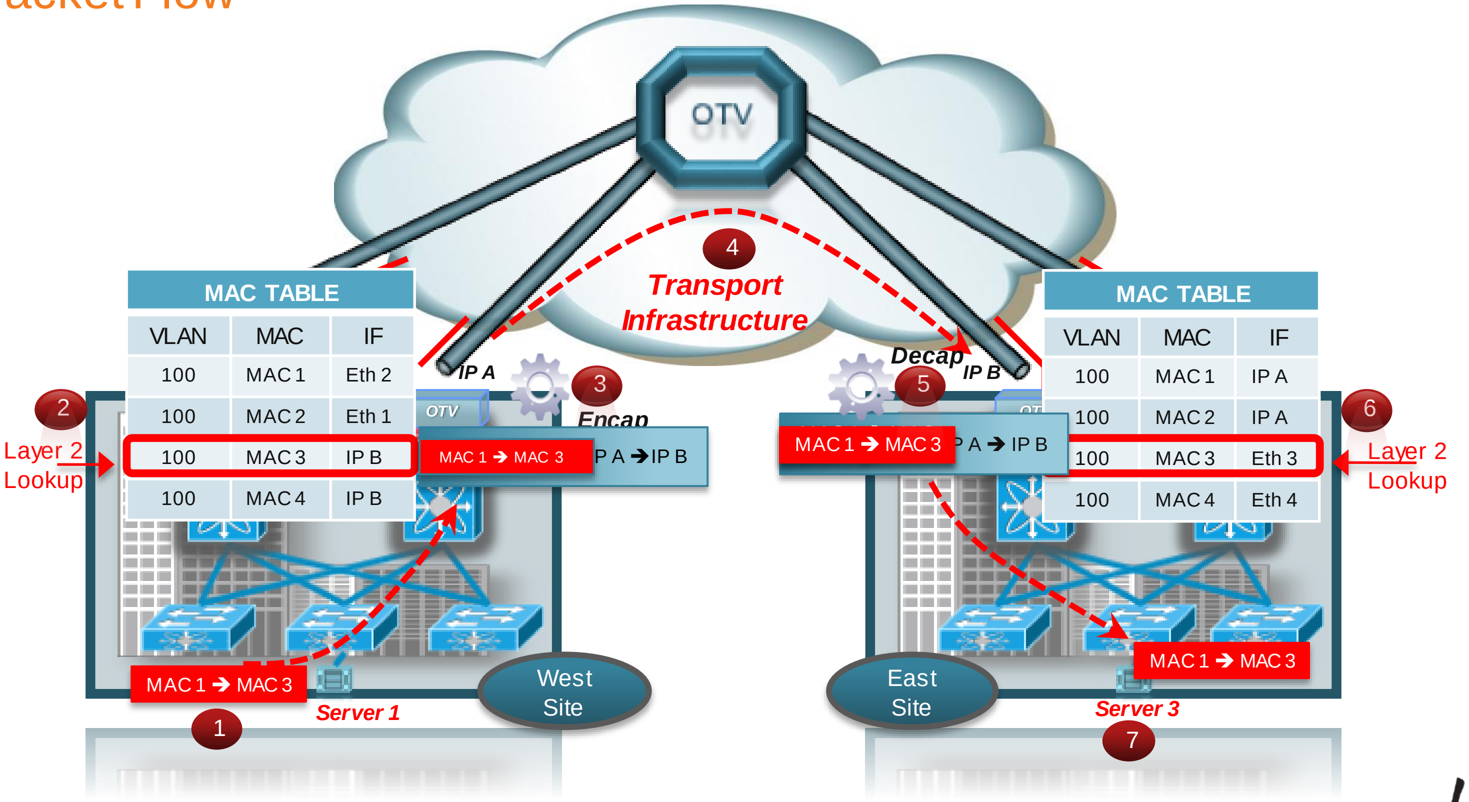
```
dc1-agg-7k1# show otv route
OTV Unicast MAC Routing Table For Overlay100
VLAN MAC-Address      Metric  Uptime    Owner      Next-hop(s)
---- -------------- ------ -------- --------- -----------
2001 0000.0c07.ac01   1       3d15h     site       Ethernet1/1
2001 0000.1641.d70e   1       3d15h     site       Ethernet1/2
2001 0000.49f3.88ff   42      2d22h     overlay    dc2-agg-7k1
2001 0000.49f3.8900   42      2d22h     overlay    dc2-agg-7k2
```

Local Site MAC

Remote Site MAC

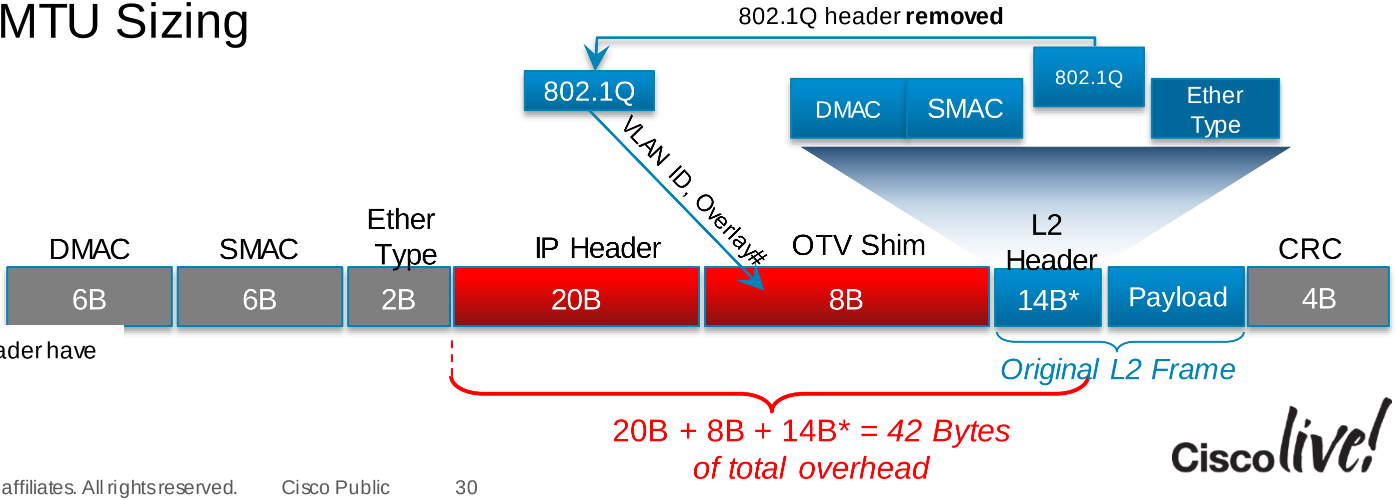
OTV Data Plane

Inter-Site Packet Flow



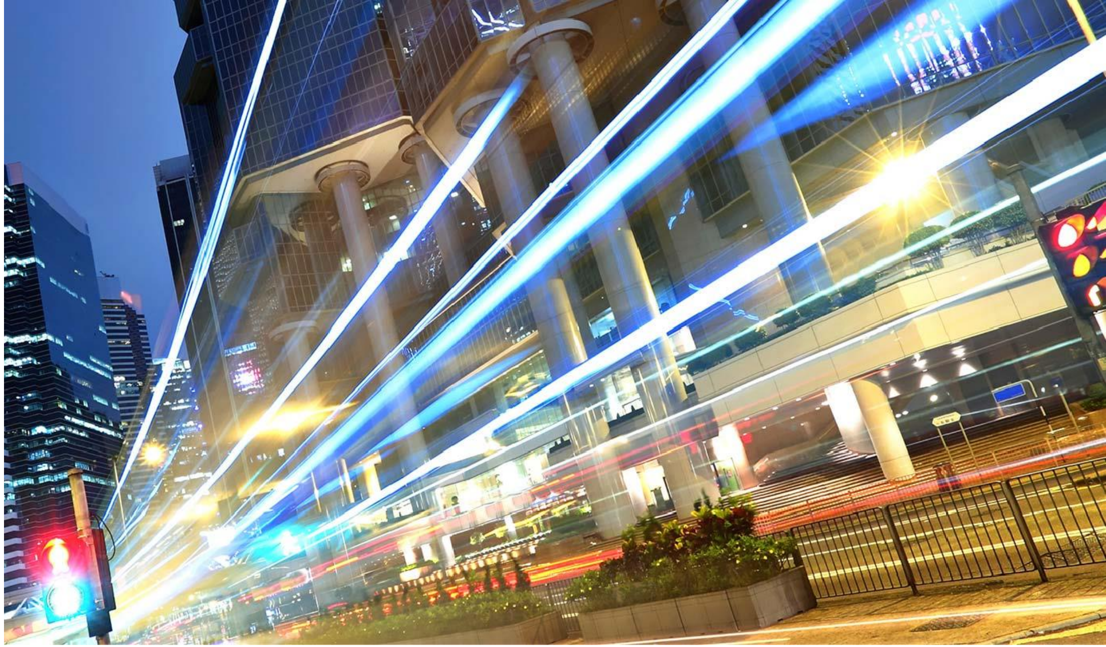
OTV Data Plane
Encapsulation

- **42 Bytes** overhead to the packet IP MTU size (IPv4 packet)
  - Outer IP + OTV Shim - Original L2 Header (w/out the .1Q header)
- 802.1Q header is **removed** and the VLAN field copied over to the OTV shim header
- Outer OTV shim header contains VLAN, overlay number, etc.
- Consider Jumbo MTU Sizing



* The 4 Bytes of .1Q header have already been removed

Agenda

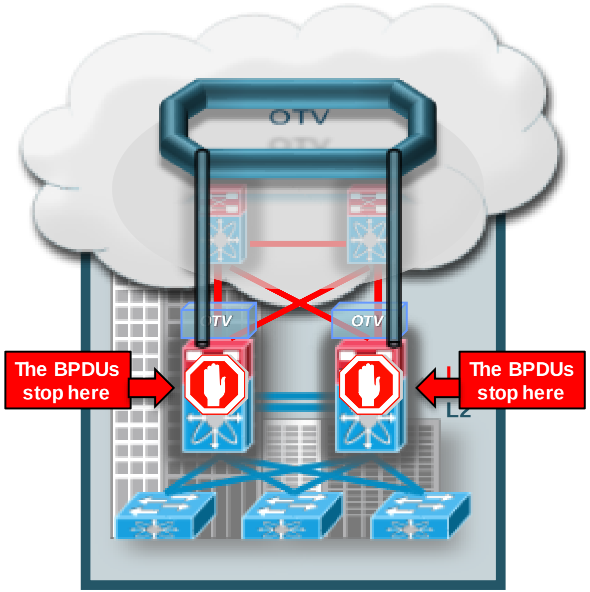


- Distributed Data Centres: Goals and Challenges
- OTV Architecture Principles
  - Terminology
  - Control Plane and Data Plane
  - Failure Isolation
  - Multi-homing
  - Mobility
  - L2 Multicast Forwarding
  - QoS and Scalability
  - Path Optimisation
- OTV Design Considerations & New Features

Spanning-Tree and OTV

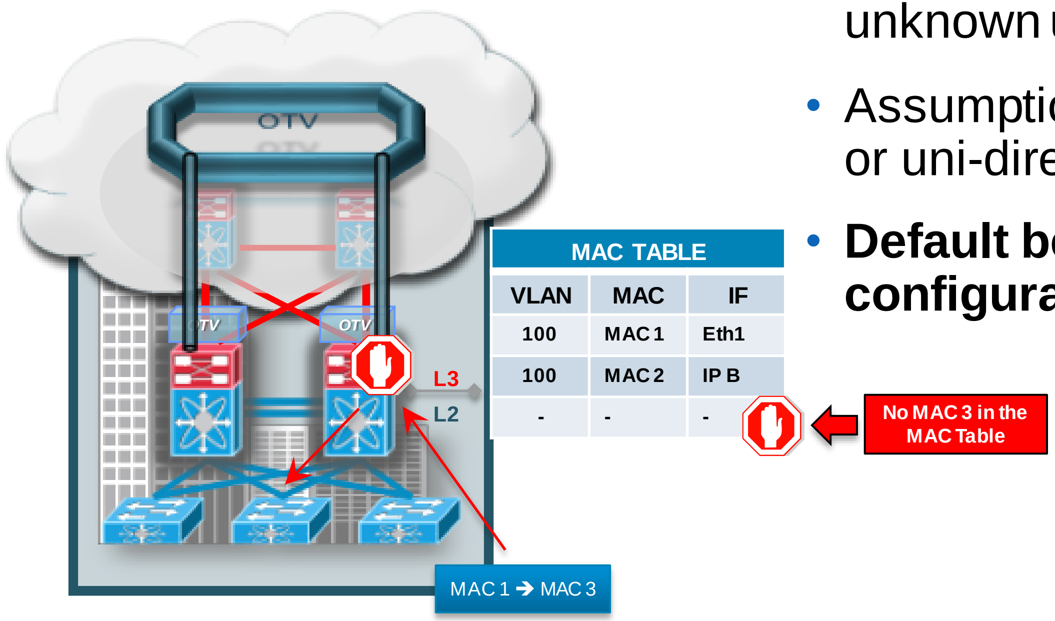
Site Independence

- Site transparency: no changes to the STP topology
- Total isolation of the STP domain
- **Default behaviour: no configuration is required**
- BPDUs sent and received ONLY on Internal Interfaces



Unknown Unicast and OTV

No Longer Unknown Unicast Storms Across the DCI



MAC TABLE

VLAN	MAC	IF
100	MAC 1	Eth1
100	MAC 2	IP B
-	-	-

- No requirements to forward unknown unicast frames
- Assumption: end-host are not silent or uni-directional
- **Default behaviour: no configuration is required**

New Release 6.2

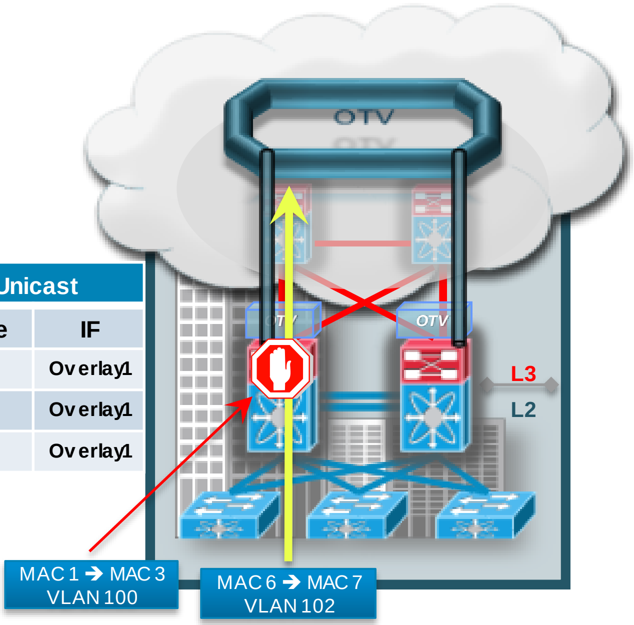
Unknown Unicast and OTV

Selective Unicast Flooding

- Some Application requirement to forward unknown unicast frames
- Selective Unicast Flooding can be enabled per mac address
- **Default behaviour: no unknown unicast forwarding**

Enable Flooding for MAC .0101

Unknown Unicast		
MAC	State	IF
.0000	Blk	Overlay1
.0101	Blk	Overlay1
.1111	Fwd	Overlay1




```
OTV-a # conf
Enter configuration commands, one per line. End with
CNTL/Z
OTV-a(config)# otv flood mac 0000.2102.1111 vlan 172
```

New:
Release 6.1

Controlling ARP Traffic

ARP Neighbour-Discovery (ND) Cache

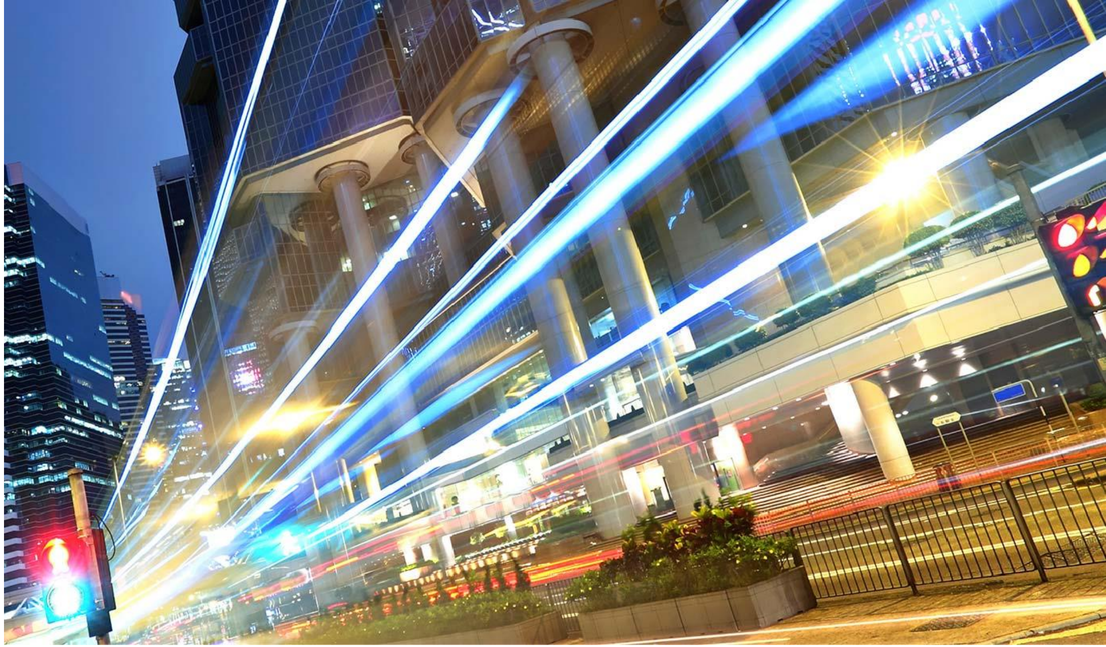
- ARP cache maintained in Edge Device by snooping ARP replies
- First ARP request is broadcasted to all sites. Subsequent ARP requests are replied by local Edge Device
- Timeout can be adjusted (as per NX-OS 6.1(1))
- Drastic reduction of ARP traffic on DCI
- ARP spoofing can be disabled
- IPv4 only feature
- **Default behaviour: no configuration is required**

```
OTV-a(config)# interface overlay 1
OTV-a(config-if-overlay)# no otv surpress-arp-nd

# Allows ARP requests over an overlay network and
disables ARP caching on edge devices. This command
does not support IPv6.
```

```
OTV-a(config)# interface overlay 1
OTV-a(config-if-overlay)# otv arp-nd timeout 70

# Configures the time, in seconds, that an entry
remains in the ARP-ND cache.
The time is in seconds varying from 60 to 86400. The
default timeout value is 480 seconds.
```


Agenda

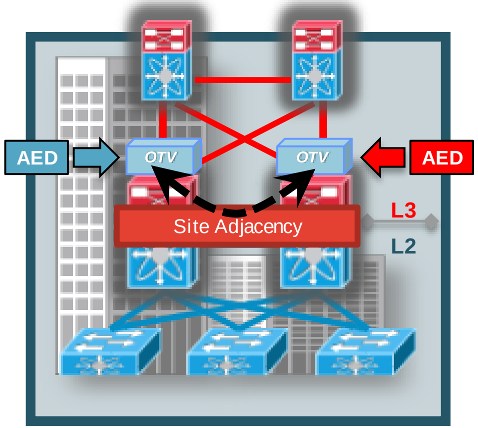
- Distributed Data Centres: Goals and Challenges
- OTV Architecture Principles
  - Terminology
  - Control Plane and Data Plane
  - Failure Isolation
  - Multi-homing
  - Mobility
  - L2 Multicast Forwarding
  - QoS and Scalability
  - Path Optimisation
- OTV Design Considerations & New Features



OTV Multi-homing

Fully Automated Multi-homing

- **No additional protocols required (i.e. BGP)**
- **OTV site-vlan** used to discover OTV neighbour in the same site
- **Authoritative Edge Device (AED)** Election takes place
- Extended VLANs are split across the AEDs
- The AED is responsible for:
  - MAC address advertisement for its VLANs
  - Forwarding its VLANs' traffic inside and outside the site



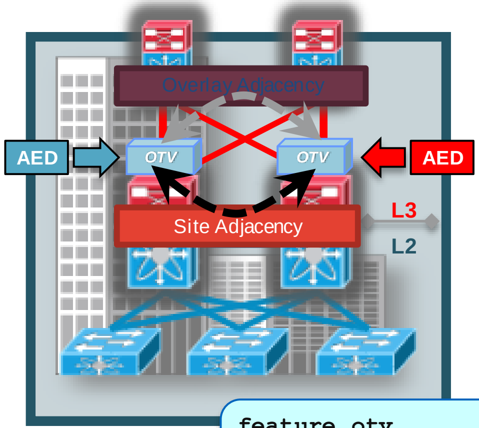
Site Adjacency used for AED election

Release 5.2 and above

Hardened Multi-homing

Introducing OTV Site-identifier

- Same site devices must use common site-identifier
- Site-id information is included in the control plane
- Makes OTV multi-homing more robust and resilient
  - Site Adjacency and Overlay Adjacency are now both leveraged for AED election
- An overlay will not come up until a site-id is configured
  - Site and Overlay Adjacency are both leveraged for AED election




```
feature otv
otv site-identifier 0x1
otv site-vlan 99
```


OTV Multi-homing
VLANs Split across AEDs

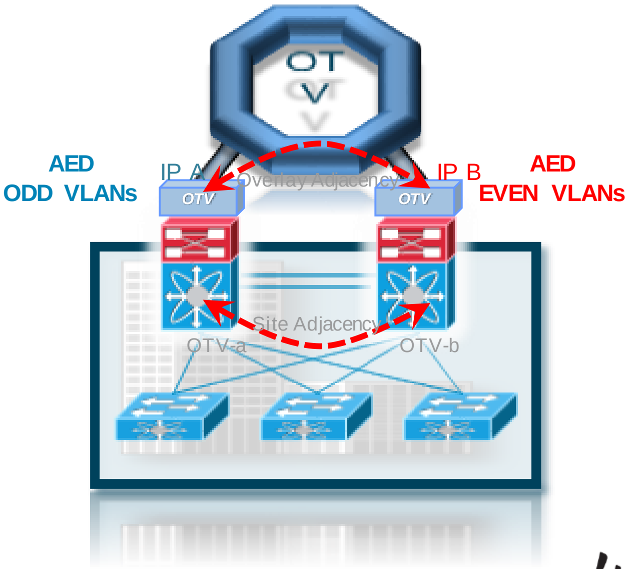
- Automated and deterministic algorithm
- In a dual-homed site:
  - Lower IS-IS System-ID (Ordinal 0) = EVEN VLANs
  - Higher IS-IS System-ID (Ordinal 1) = ODD VLANs

```
OTV-a# show otv vlan

OTV Extended VLANs and Edge Device State Information (* - AED)

VLAN   Auth. Edge Device     Vlan State          Overlay
----   ------------------    ----------          -------
 100   East-b                inactive(Non AED)   Overlay100
 101*  East-a                active              Overlay100
 102   East-b                inactive(Non AED)   Overlay100
```

```
OTV-b# show otv vlan

OTV Extended VLANs and Edge Device State Information (* - AED)

VLAN   Auth. Edge Device     Vlan State          Overlay
----   ------------------    ----------          -------
 100*  East-b                active              Overlay100
 101   East-a                inactive(Non AED)   Overlay100
 102*  East-b                active              Overlay100
```

Remote OTV Device MAC Table

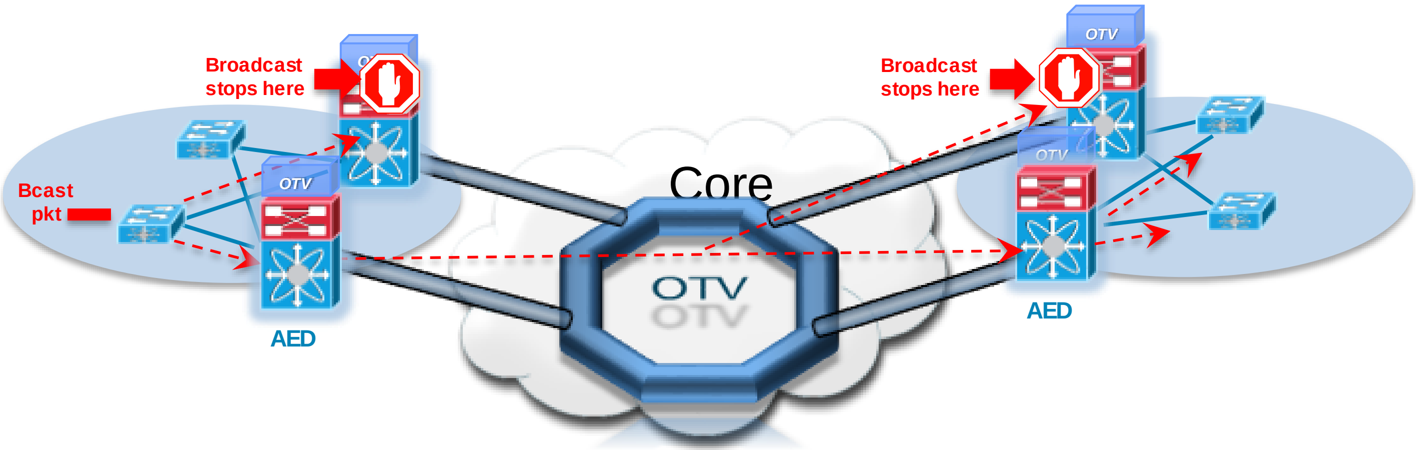
VLAN	MAC	IF
100	MAC 1	IP A
101	MAC 2	IP B



OTV Multi-homing

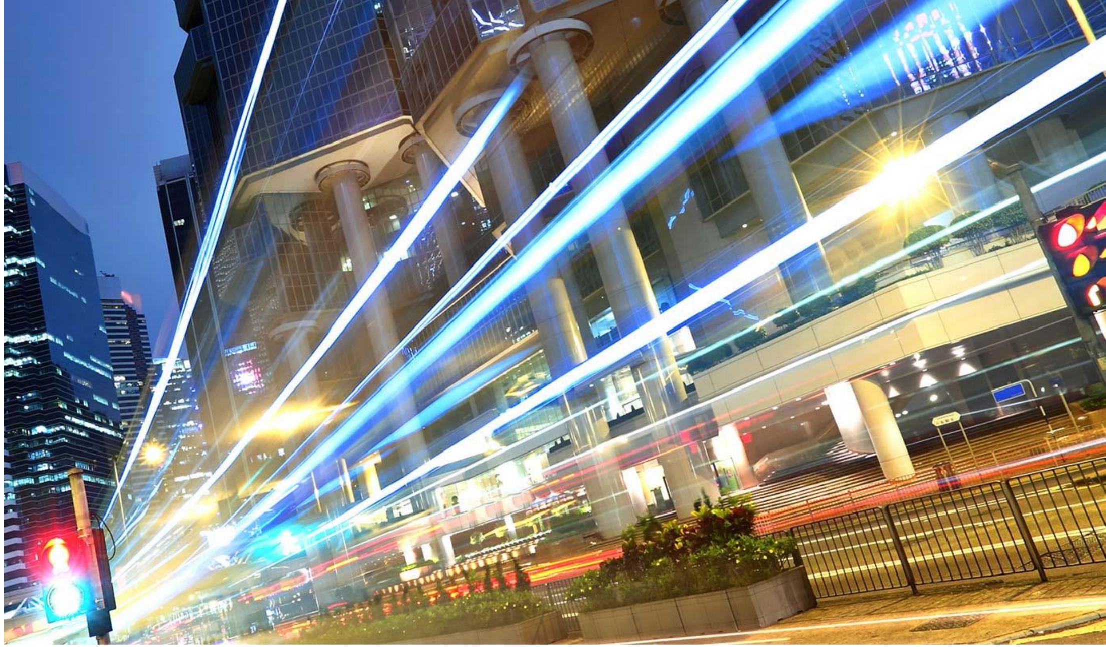
AED and Broadcast Handling

1. Broadcast reaches all the Edge Devices within the site
2. Only the AED forwards the traffic to the Overlay
3. All the Edge Devices at the other sites receive the broadcast
4. At the remote sites only the AEDs forward it into the site



Agenda

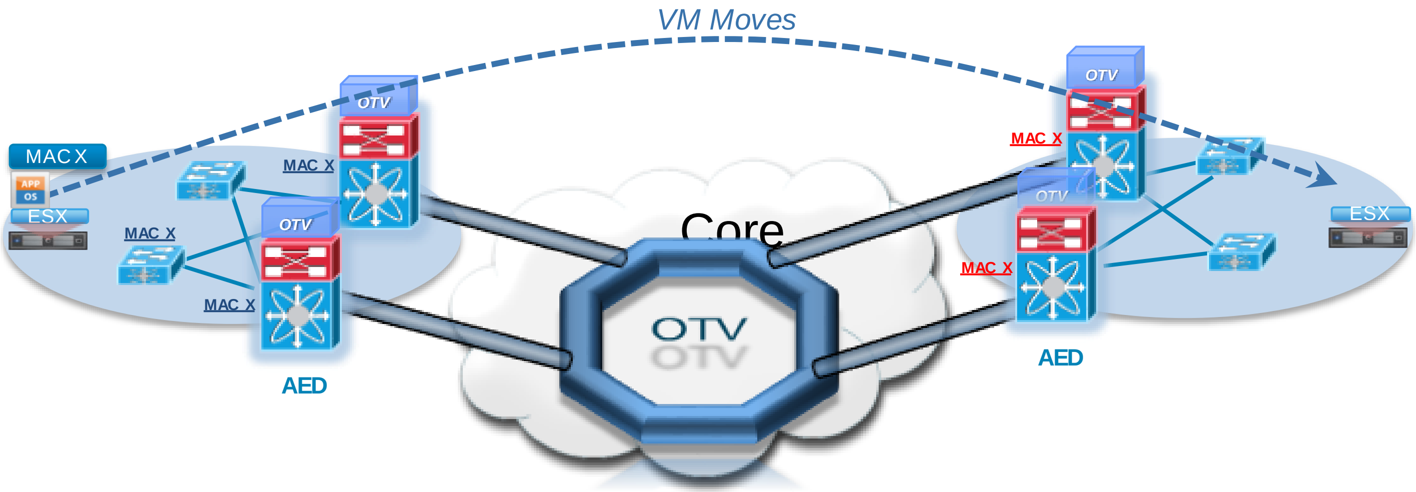
- Distributed Data Centres: Goals and Challenges
- OTV Architecture Principles
  – Terminology
  – Control Plane and Data Plane
  – Failure Isolation
  – Multi-homing
  – Mobility
  – L2 Multicast Forwarding
  – QoS and Scalability
  – Path Optimisation
- OTV Design Considerations & New Features



OTV and MAC Mobility

MAC Moving and OTV Updates (1)

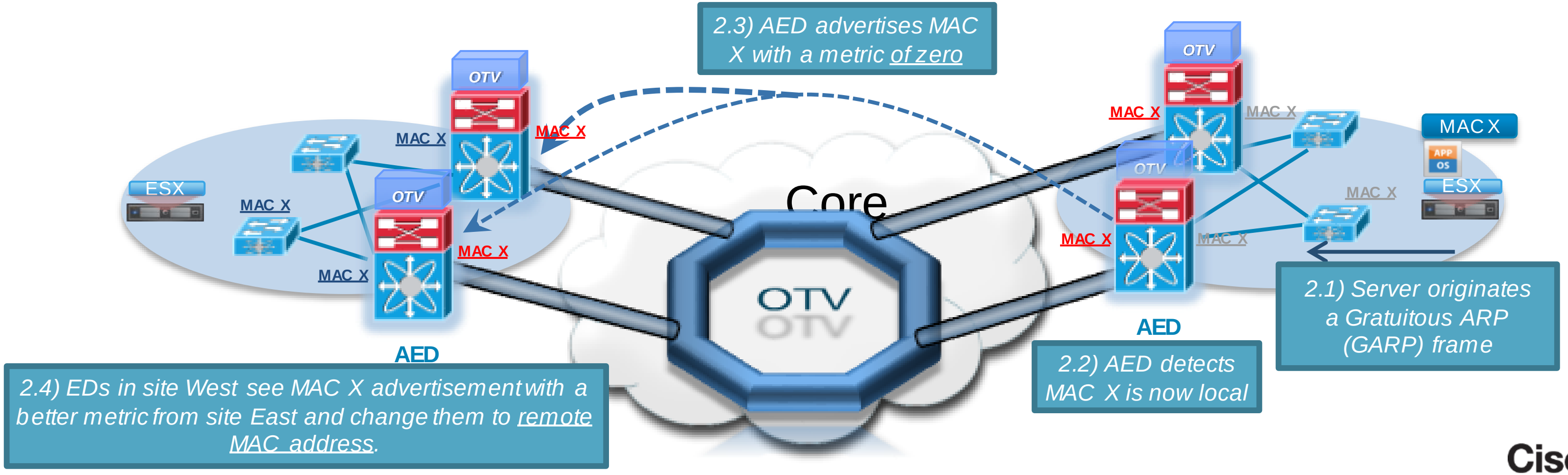
1. Workload moved between Data Centre sites



OTV and MAC Mobility

MAC Moving and OTV Updates (2)

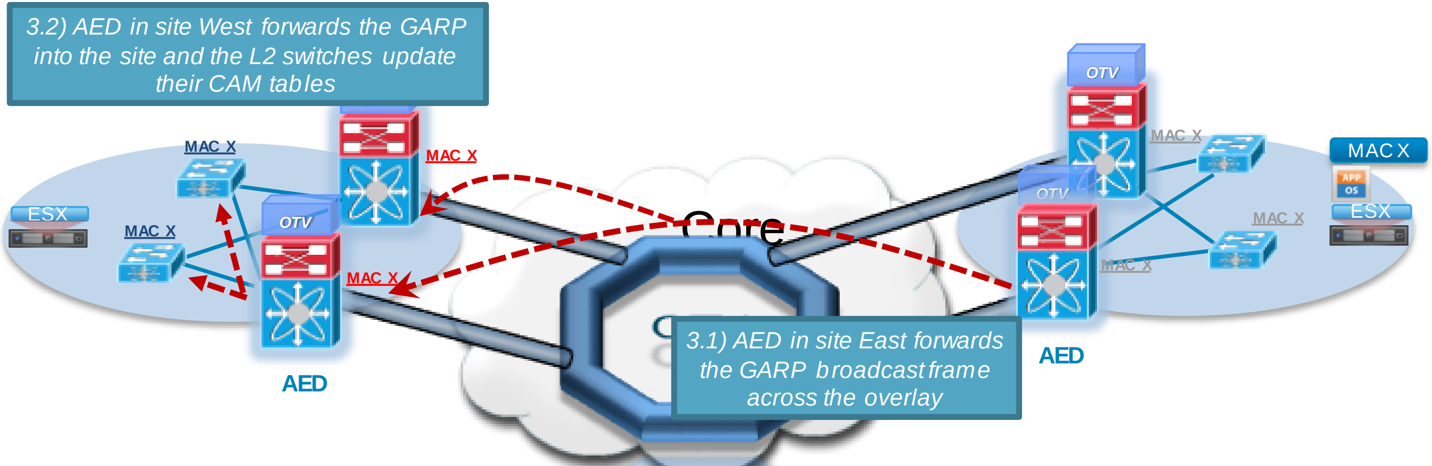
1. Workload moved between Data Centre sites
2. Workload is detected in East DC and OTV control plane is triggered



OTV and MAC Mobility

MAC Moving and OTV Updates (3)

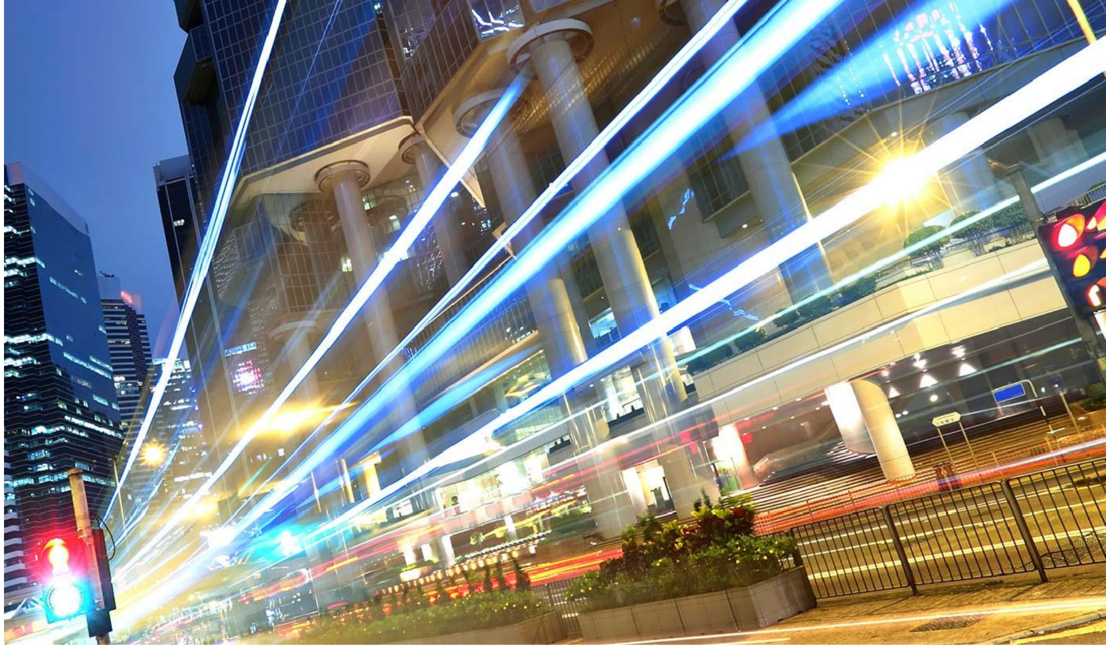
1. Workload moved between Data Centre sites
2. Workload is detected in East DC and OTV control plane is triggered
3. East to West OTV data plane traffic allows to update the MAC tables of the L2 devices in West Site



Note: GARP is used as example traffic, same behaviour is achieved with any other L2 broadcast frames exchanged

Agenda

- Distributed Data Centres: Goals and Challenges
- OTV Architecture Principles
  - Terminology
  - Control Plane and Data Plane
  - Failure Isolation
  - Multi-homing
  - Mobility
  - L2 Multicast Forwarding
  - QoS and Scalability
  - Path Optimisation
- OTV Design Considerations & New Features



L2 Multicast Traffic Between Sites

Multicast Enabled Transport

- OTV can leverage the multicast support available in the transport network to **optimise** the delivery of the multicast traffic for the VLANs stretched across sites
- Three steps:
  1. **Automated mapping** of the sites' multicast groups to a **range of multicast groups** in the transport network
  2. Creation of the Multicast state information at the OTV Edge Devices
  3. Sites' Multicast traffic delivered over the Overlay

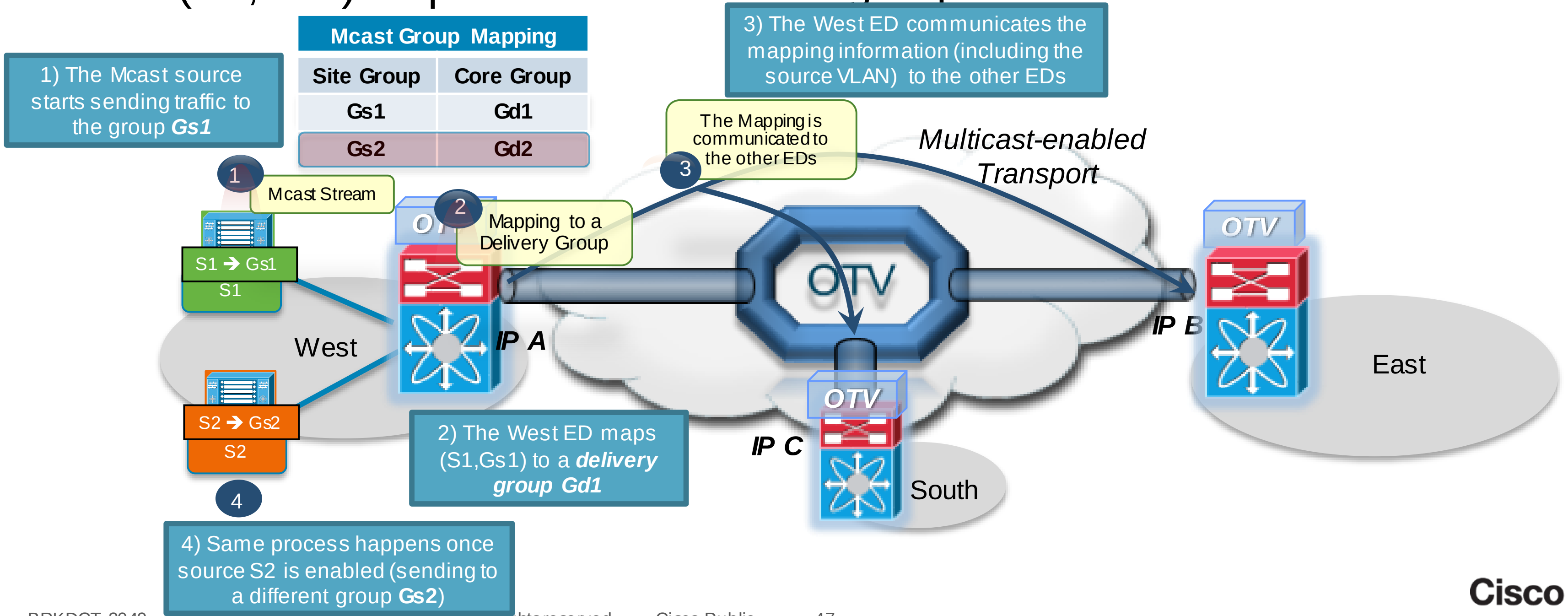
L2 Multicast with Multicast Transport

Step 1 – Mapping of the Site Multicast Group

- The site multicast groups are mapped to a SSM group range in the core
- Each (S1,Gs1) maps to a different SSM group in round-robin fashion

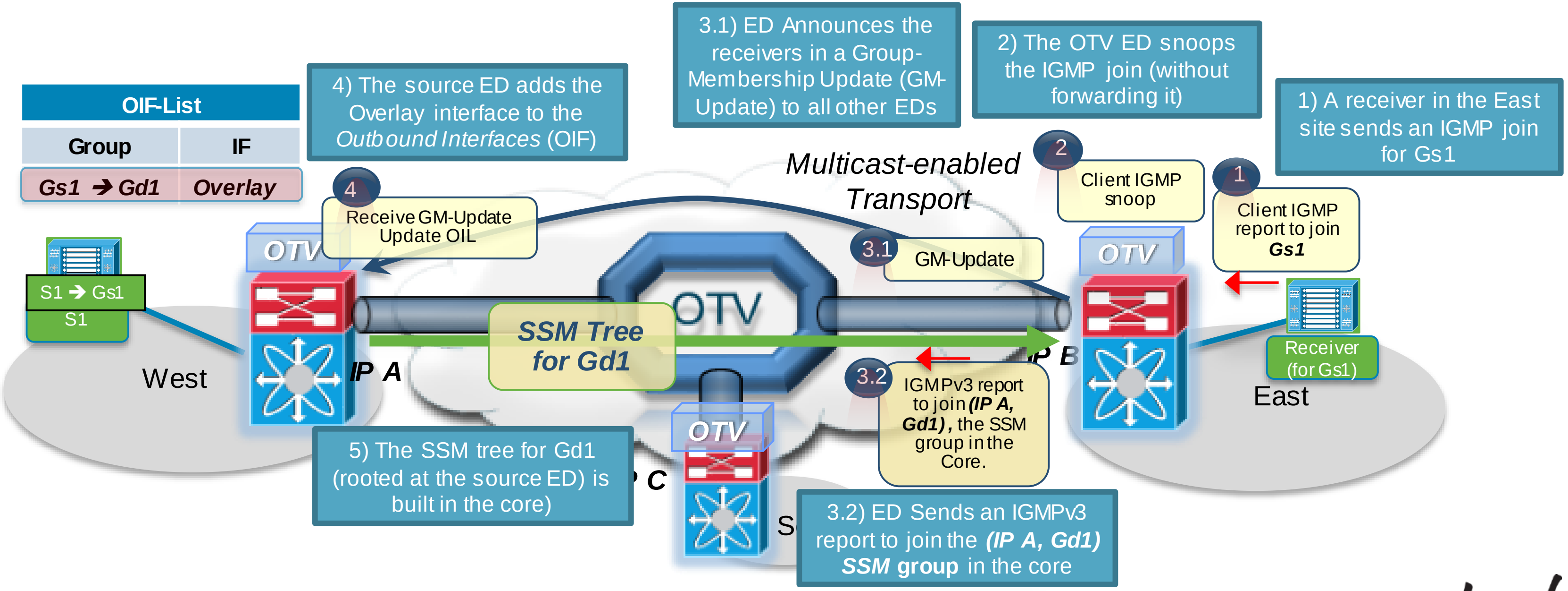
Mcast Group Mapping

Site Group	Core Group
Gs1	Gd1
Gs2	Gd2



L2 Multicast with Multicast Transport

Step 2 – Multicast State Creation

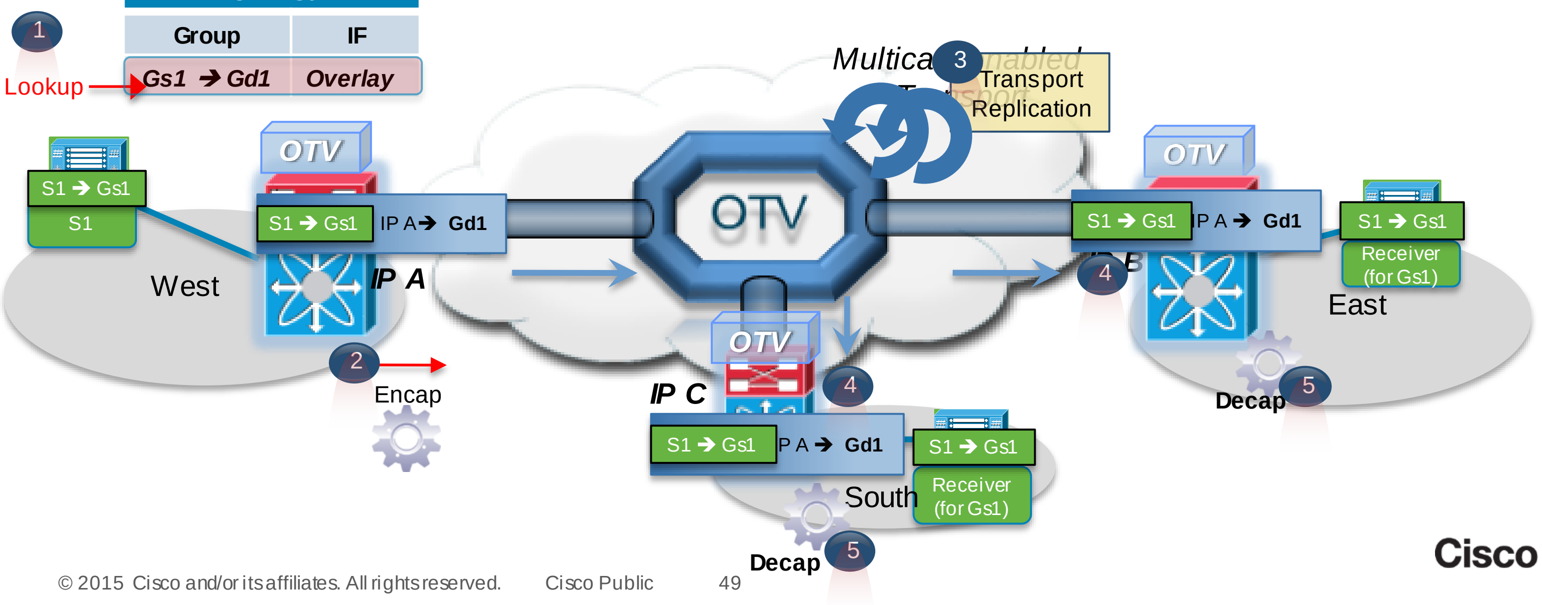


It is important to clarify that the edge devices join the core multicast groups as hosts, not as routers!

L2 Multicast with Multicast Transport

Step 3 – Multicast Packet Flow

OIF-List	
Group	IF
Gs1 ➔ Gd1	*Overlay*



L2 Multicast with Multicast Transport

Multicast Groups in the Core

OTV can leverage the benefits of a multicast-enabled transport for both control and data planes. The following summarises the requirements for a multicast transport:

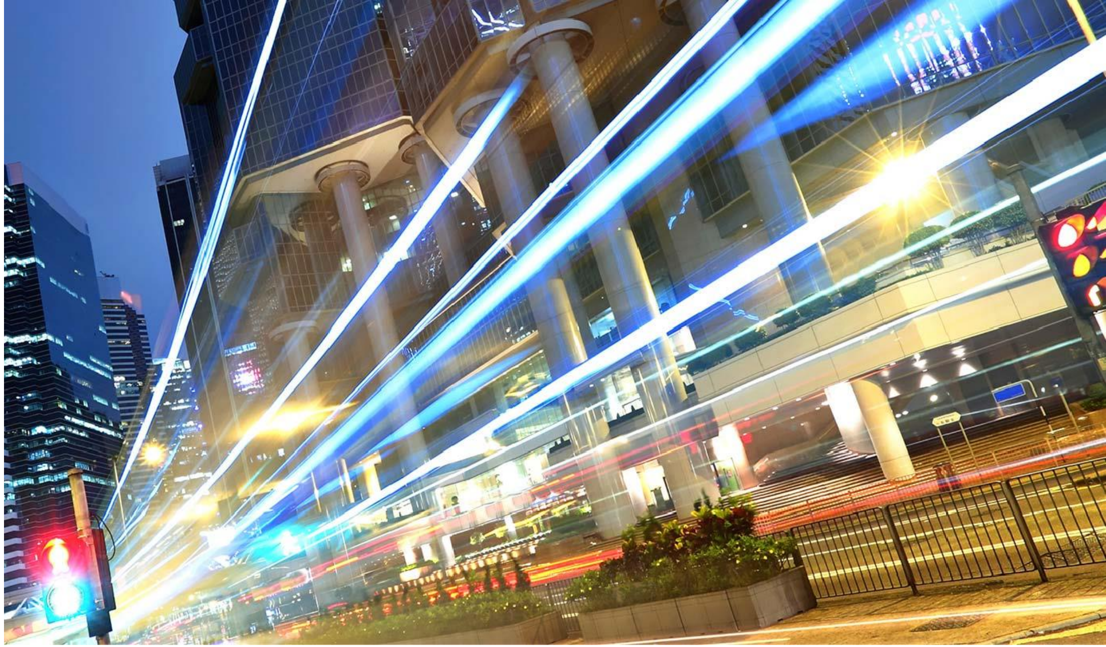
- **Control group** – Single PIM-SM or PIM-Bidir group used to form adjacencies and exchange MAC reachability information
- **Data groups** – Range of SSM groups used to carry multicast data traffic generated by the sites

```
interface Overlay100
  otv join-interface e1/1
  otv control-group 239.1.1.1
  otv data-group 232.192.1.0/24
  otv extend-vlan 100-150
```

The right number of SSM groups to be used depends on a tradeoff between the amount of multicast state to be maintained in the core and the optimisation of Layer 2 multicast traffic delivery

Agenda

- Distributed Data Centres: Goals and Challenges
- OTV Architecture Principles
  – Terminology
  – Control Plane and Data Plane
  – Failure Isolation
  – Multi-homing
  – Mobility
  – L2 Multicast Forwarding
  – QoS and Scalability
  – Path Optimisation
- OTV Design Considerations & New Features

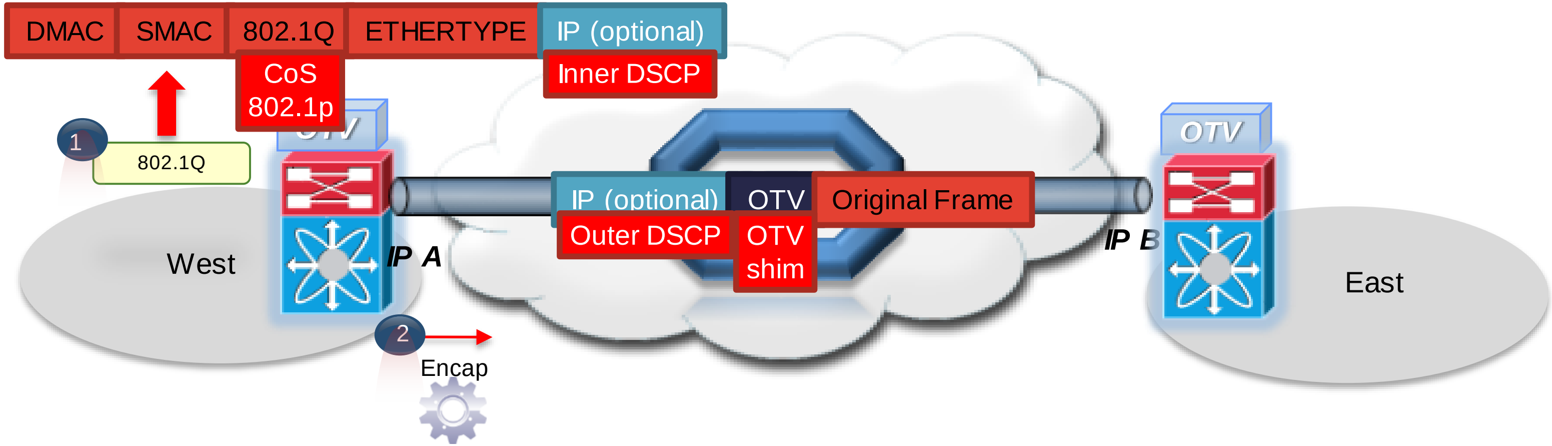


Release 5.2 and above

QoS and OTV

Marking on Encapsulation

- On Encapsulation
  - CoS bits (802.1p) copied to the OTV shim header
  - If IP traffic: The original (inner) DSCP value is also copied to “outer” DSCP

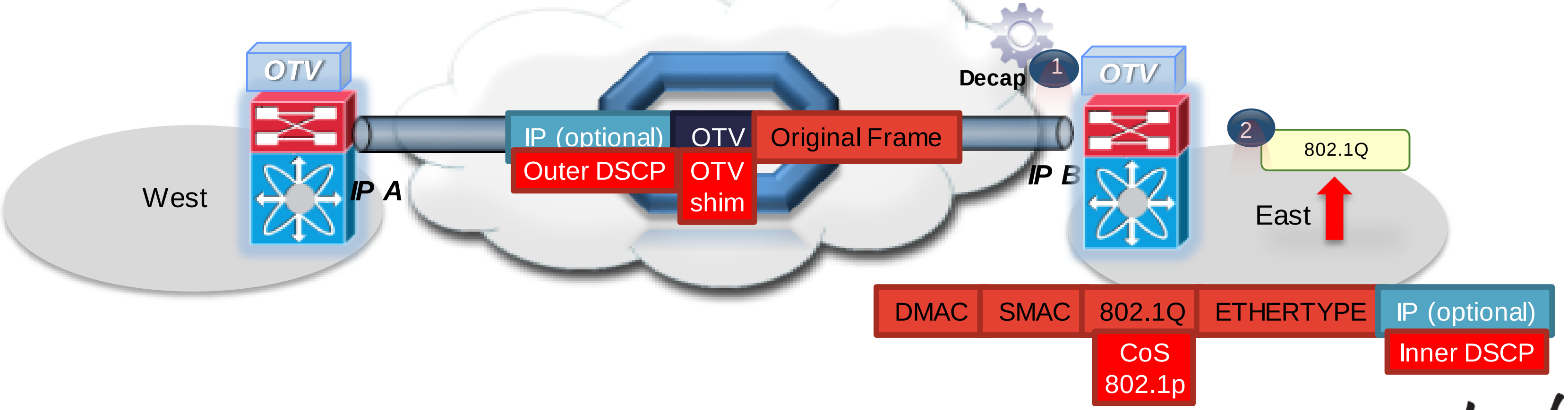


Release 5.2 and above

QoS and OTV

Marking on De-capsulation

- On De-capsulation
  - CoS value is recovered from the OTV shim and added to the 802.1Q header
- Original CoS and DSCP are both preserved
- OTV Control Traffic is statically marked at CoS = 6/DSCP = 48



Release 6.2

OTV Scalability

Current and Future Supported Values

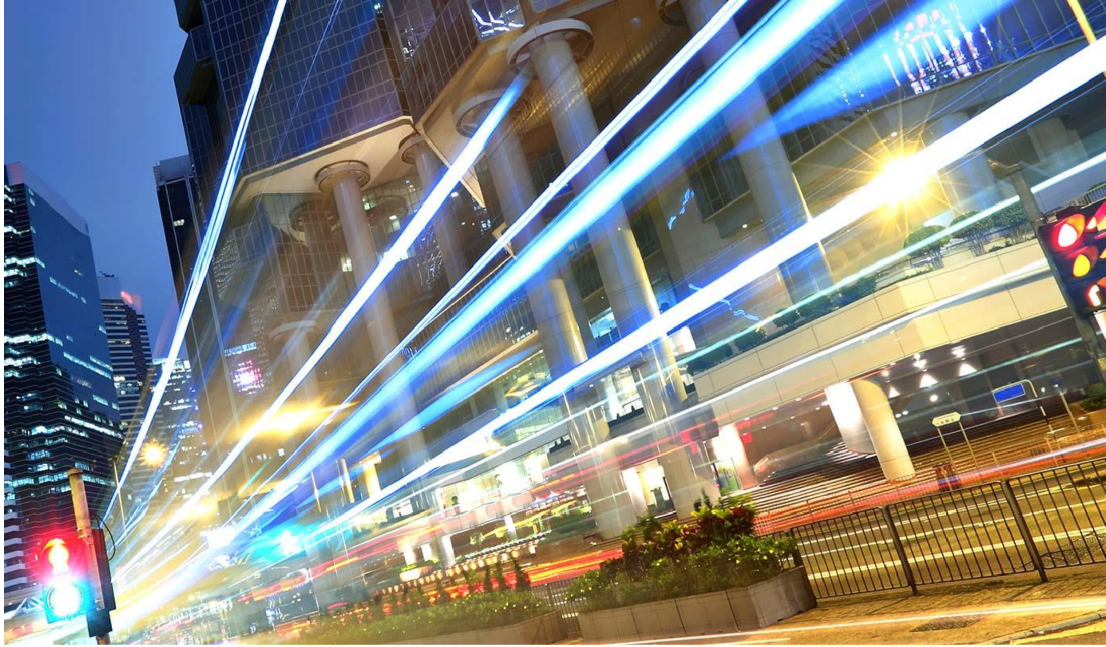
For Your Reference

	Sites	OTV extended VLANs	MAC addresses across all the extended VLANs	Multicast Data Groups
	+2	580%	100%	100%
NX-OS 6.2	8*	1500	32k	4000
NX-OS 5.2	6*	256	16k	2000

* *two ED per Site*

Agenda

- Distributed Data Centres: Goals and Challenges
- OTV Architecture Principles
  – Terminology
  – Control Plane and Data Plane
  – Failure Isolation
  – Multi-homing
  – Mobility
  – L2 Multicast Forwarding
  – QoS and Scalability
  – Path Optimisation
- OTV Design Considerations & New Features



Path Optimisation

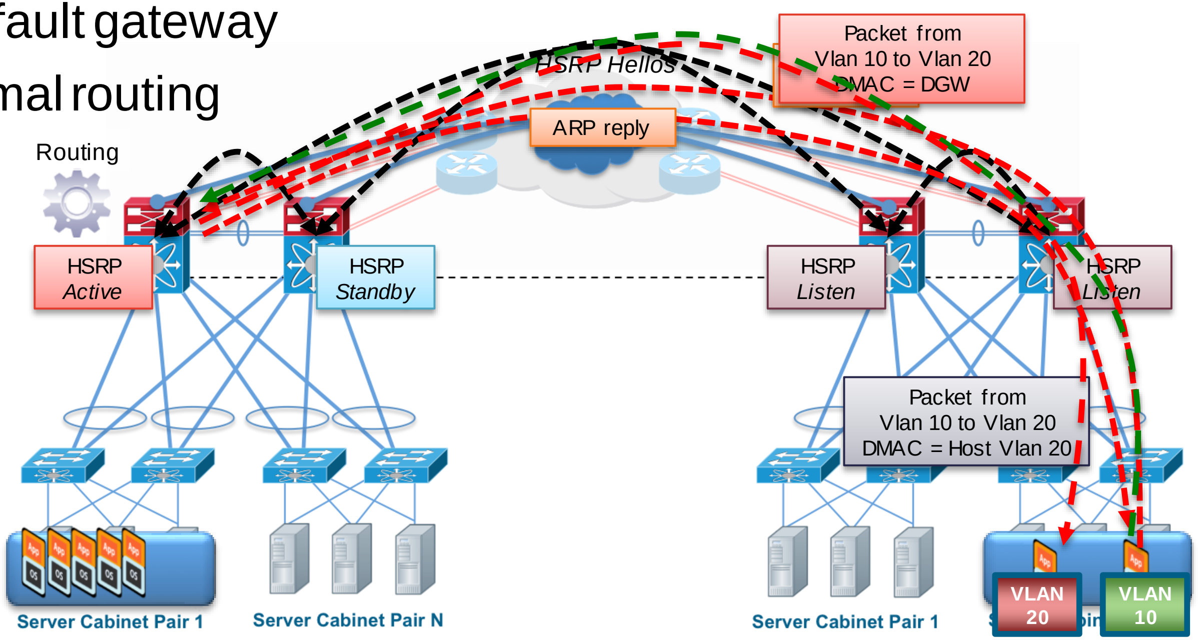
Egress Routing Optimisation

Hot Potato Routing

Path Optimisation

Egress Routing with LAN Extension

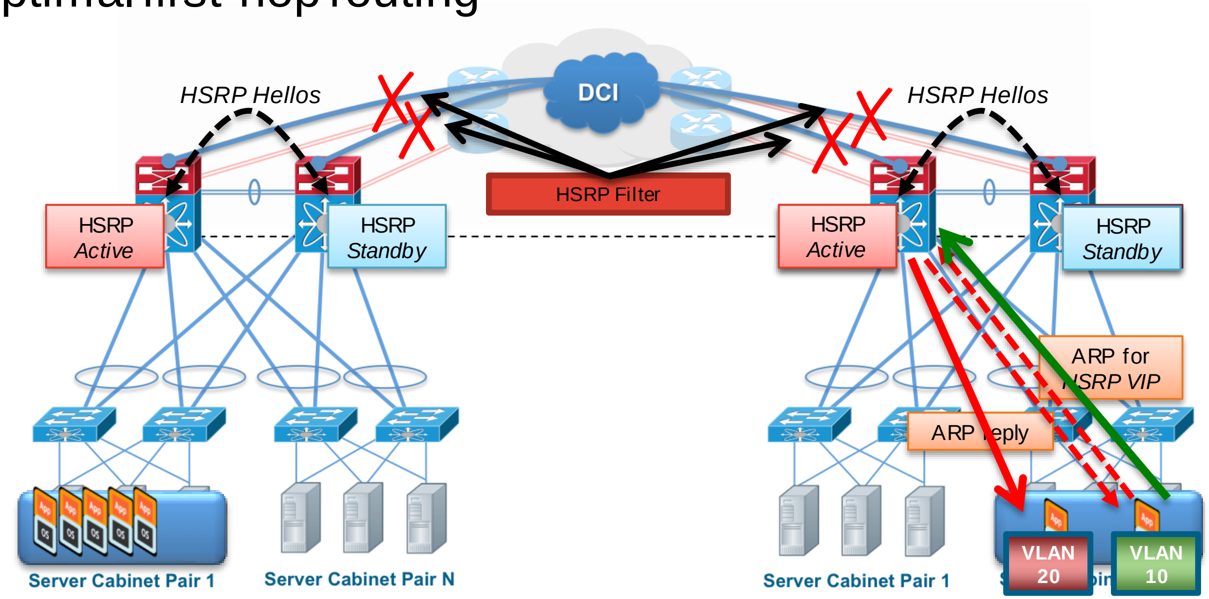
- Extended VLANs typically have associated HSRP groups
- By default, only one HSRP router elected active, with all servers pointing to HSRP VIP as default gateway
- **Result**: sub-optimal routing



Egress Routing Localisation

FHRP Filtering Solution

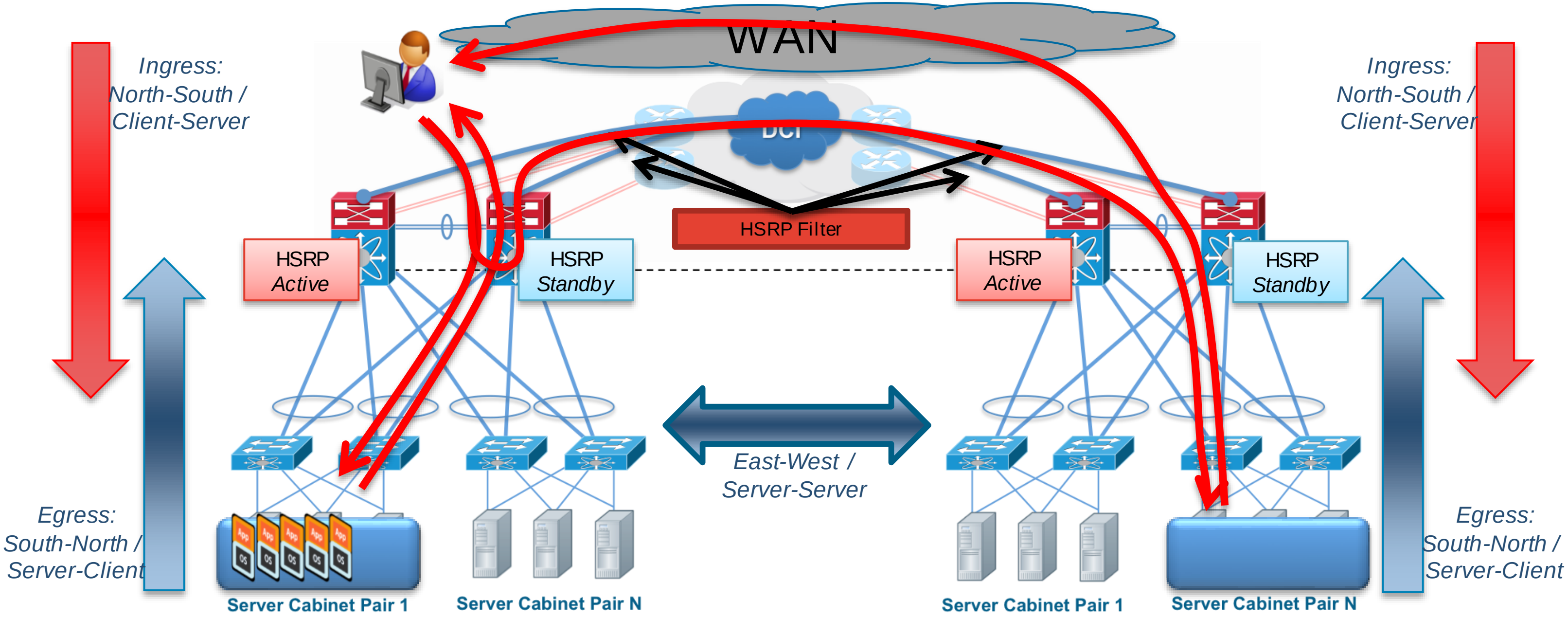
- Filter FHRP with combination of VACL and MAC route filter
- **Result: Still have one HSRP group with one VIP**, but now have active router at each site for optimal first-hop routing



Path Optimisation

Optimal Routing Challenges

- Layer 2 extensions represent a challenge for optimal routing
- Challenging placement of gateway and advertisement of routing prefix/subnet

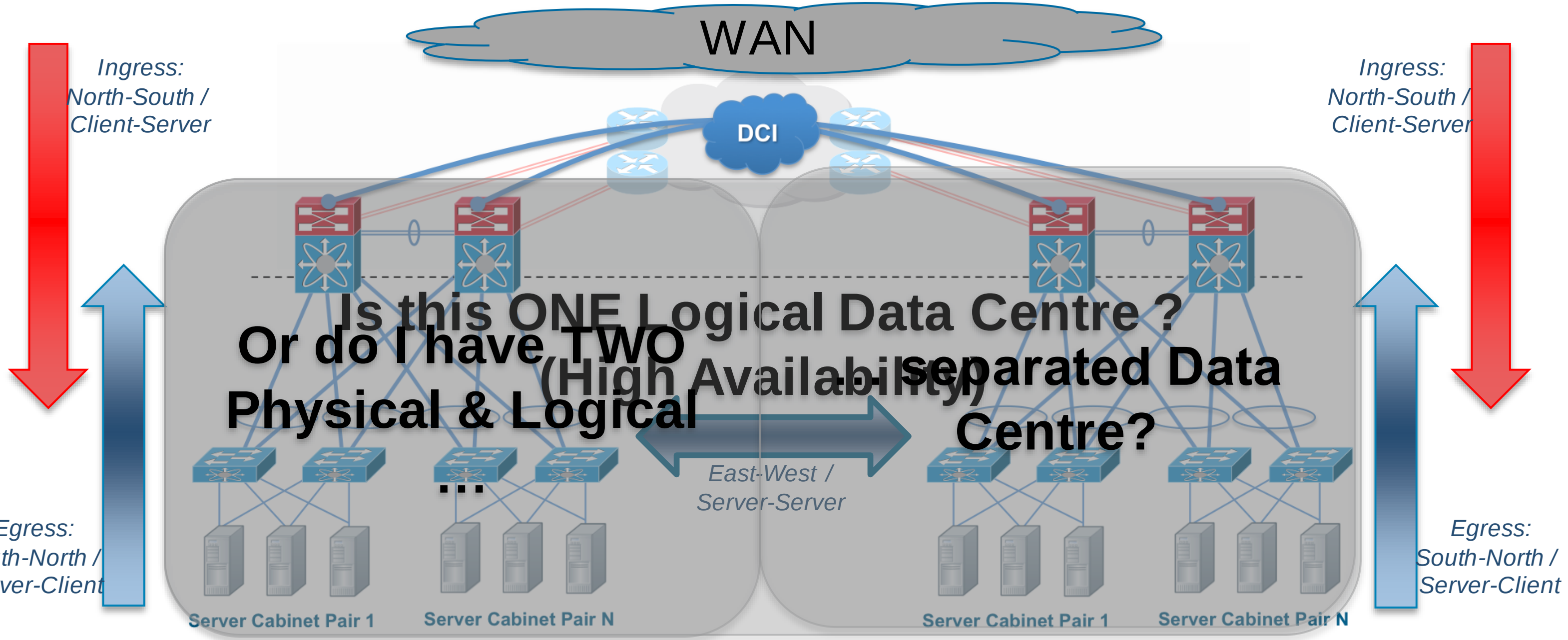


Path Optimisation

Is it relevant to my Data Centre model?

For Your Reference

- Logical Data Centre or Physical Data Centre?
- High Availability or Disaster Recovery?

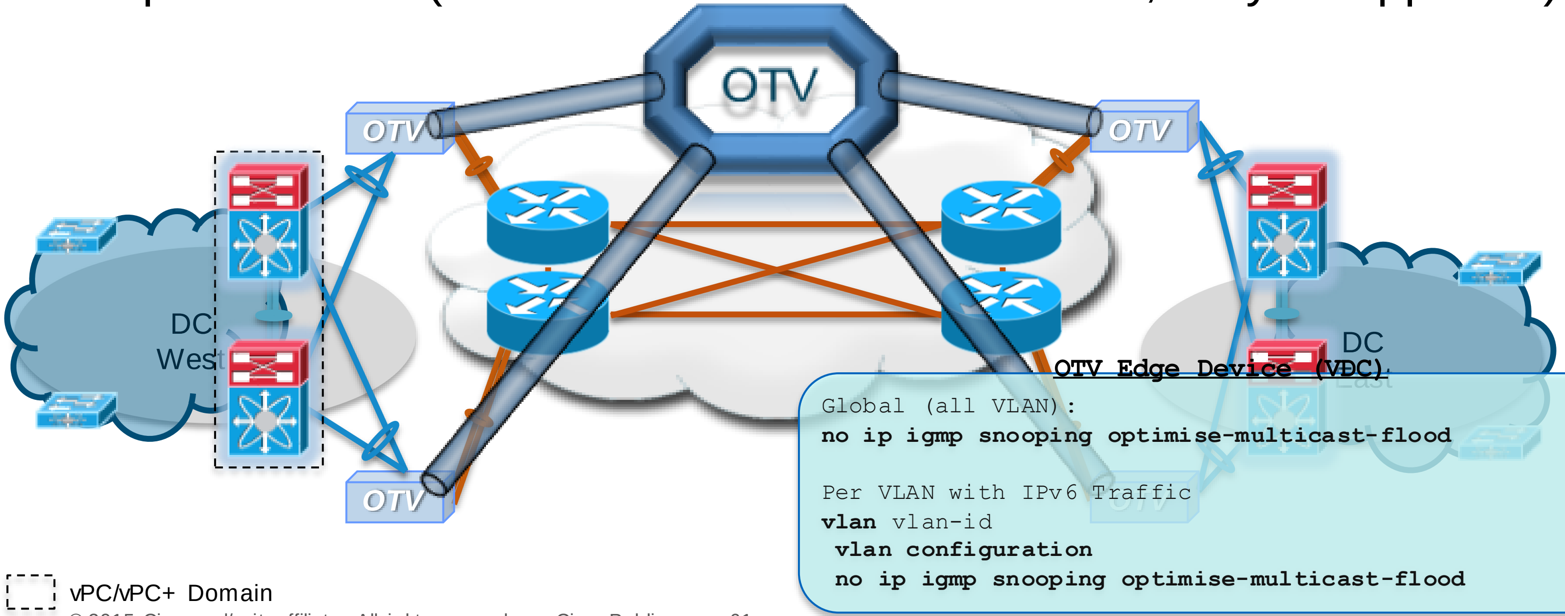


Release 5.2 and above

Specific Use-Case
IPv6 and OTV

For Your Reference

- IPv6 Unicast Forwarding and Multicast Flooding supported across OTV
  - Requires to disable optimised multicast forwarding (OMF) in IGMP snooping on OTV ED
- IPv6 Transport Network (Join Interface & Source Interface, not yet supported)



OTV Edge Device (VDC)

```
Global (all VLAN):
no ip igmp snooping optimise-multicast-flood

Per VLAN with IPv6 Traffic
vlan vlan-id
 vlan configuration
 no ip igmp snooping optimise-multicast-flood
```

Ingress Routing Localisation

Possible Solutions

Challenge

- Subnets are spread across locations
- Subnet information in the routing tables is not specific enough
- Routing doesn't know if a server has moved between locations
- Traffic may be sent to the location where the application is not available

Options

- DNS Based
- Route Injection
- LISP – Locator/ID Separation Protocol

For more details on LISP and OTV Deployment see: BRKDCT-2131

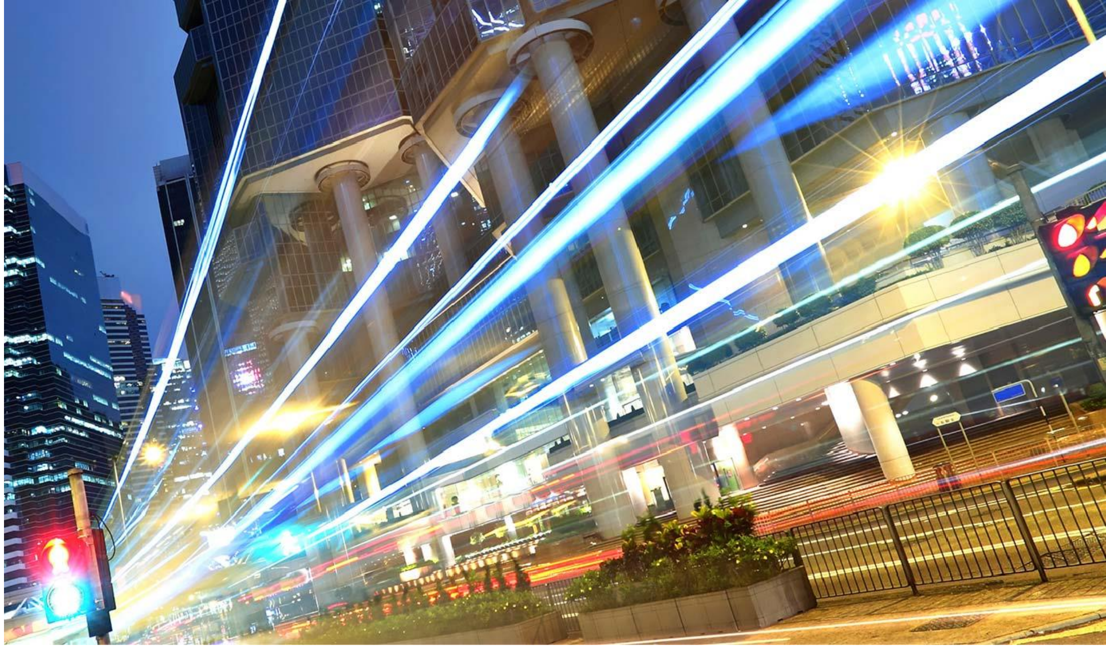
OTV – Overlay Transport Virtualisation

Simplifying Data Centre Interconnect

Any Workload	Anytime	Anywhere
		

Agenda

- Distributed Data Centres: Goals and Challenges
- OTV Architecture Principles
- OTV Design Considerations & New Features



OTV Support

ASR1000

For Your Reference

- OTV has been introduced in IOS XE 3.5 (Nov 2011)
- To use OTV on ASR1000, you require:
  - Advance Enterprise Image or Advance IP Service + OTV feature license
- ASR1k <-> N7k Inter-Site Interoperability has been tested
  - No ASR1k <-> N7k Multihoming Support (Intra-Site Interoperability)
- OTV on ASR1000 Use Cases are:
  - Legacy Deployments – where DC may still be Catalyst based
  - New Small Data Centre and/or Disaster Recovery Sites – where Main DC is equipped with Nexus 7000
  - OTV with Layer-3 Encryption – where MACSec is no option for Inter-DC Encryption

OTV Support

ASR 1000

For Your Reference

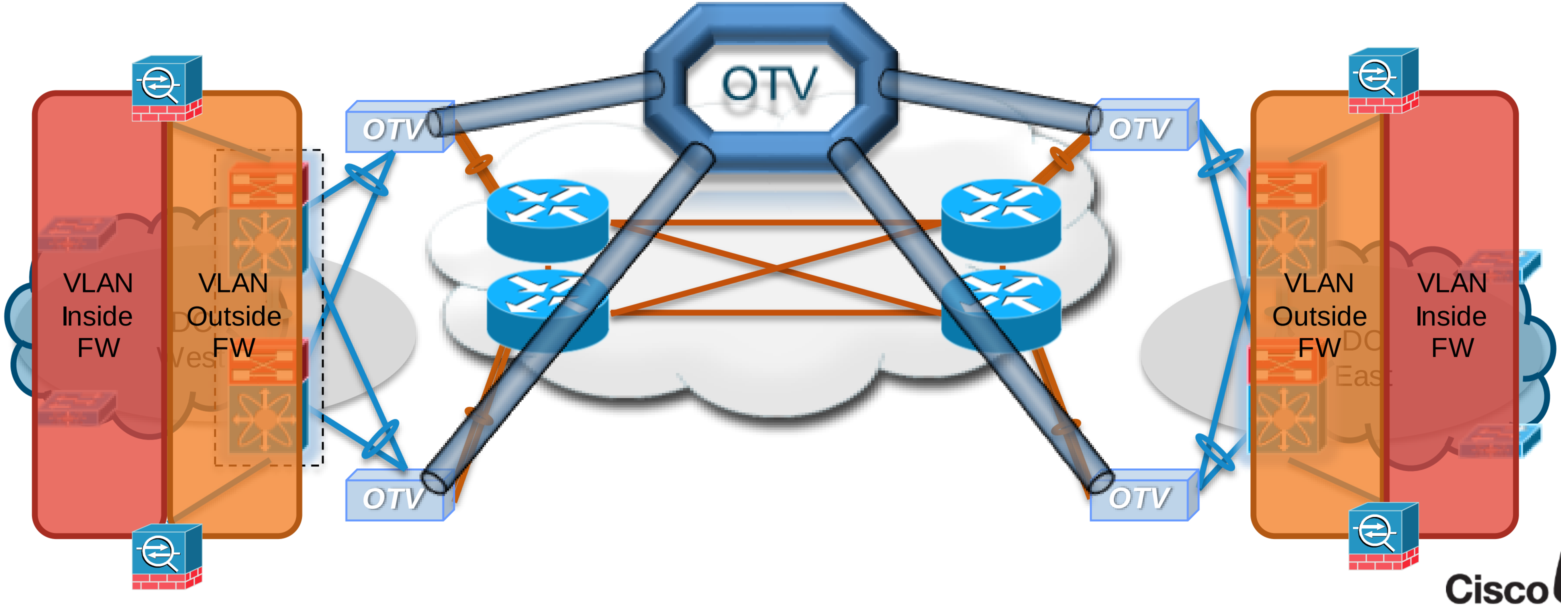
- New Features for IOS-XE 3.9
  - OTV Adjacency Server (unicast)
  - OTV with LISP ESM
  - RPVST STP Support
- New Features for IOS-XE 3.10
  - Portchannel for join interface
  - VRF Aware
  - Subinterface for join interface
  - Layer 2 portchannel

Specific Use-Case

Transparent Firewall and extended Inside & Outside VLANs

For Your Reference

- Transparent/Bridged Firewall is separating OTV extended VLANs
- OTV is sharing the same MAC address per Edge-Device



Cisco live!

Specific Use-Case

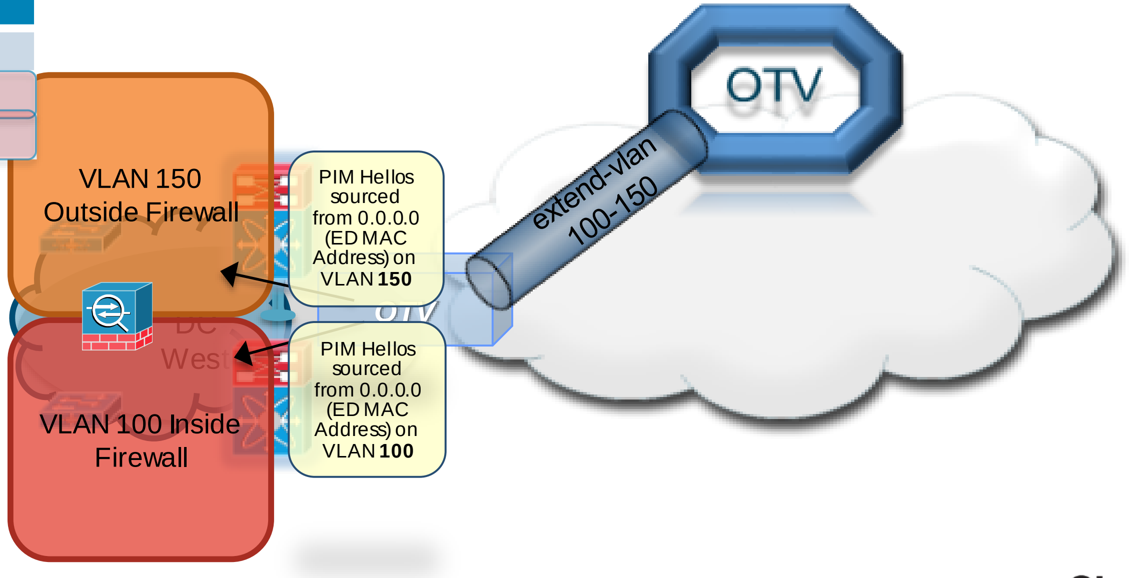
Transparent Firewall and extended Inside & Outside VLANs

For Your Reference

- OTV is sending PIM hellos with source of 0.0.0.0 destination 224.0.0.13
- Hello is sourced from OTV Edge Device (VDC) MAC Address

Firewall MAC Table

MAC	VLAN	Zone
OTV ED	*100*	*Inside*
OTV ED	*150*	*Outside*



OTV compared to FabricPath

Is FabricPath a valid Solution to replace OTV

- OTV is purpose build for Data Centre Interconnects
  - Cisco Validated Designs (CVDs)
  - Specific Data Centre Interconnect features
- On Data Centre Interconnect, FabricPath is NOT so Plug and Play
  - No specific DCI functions
  - Designs gotchas but do not impact all customers
  - Multidestination Trees capacity planning is key
- FabricPath can be a valid Data Centre Interconnect solution when:
  - Short distances between Data Centres
  - Multicast is not massively used
  - If you know and accept where your Traffic Flows (Multidestination Trees)

OTV compared to FabricPath

For Your Reference

- Yes, but Data Centre Interconnect is NOT LAN Switching
- Customer's constraints/needs are unique
- Scoping is based on
  - Application Involved
  - Number of DC sites, meshing, distances, bandwidth requirements
  - Customer Perception
  - Traffic Flows (Unicast, Multicast & Flooding)

	Operations Simplicity	Failure Isolation	Transport Failure Detection	3+ Sites Optimisation	High Availability	L2 Functions	L3 Unicast Functions	Multicast Functions	Scalability
OTV	✓	✓✓	✓	✓✓	✓	✓✓	✓✓	✓✓	✓
FabricPath	✓✓	✗	✗	✓	✓	✓	✓	✓	✓
Stacking	✓	✓	✗	✗	✗	✓	✓	✓	✗
VSS	✓	✓	✗	✗	✓	✓	✓	✓	✓
vPC	✓	✓	✗	✗	✓	✓	✗	✗	✓

New
Release 6.2

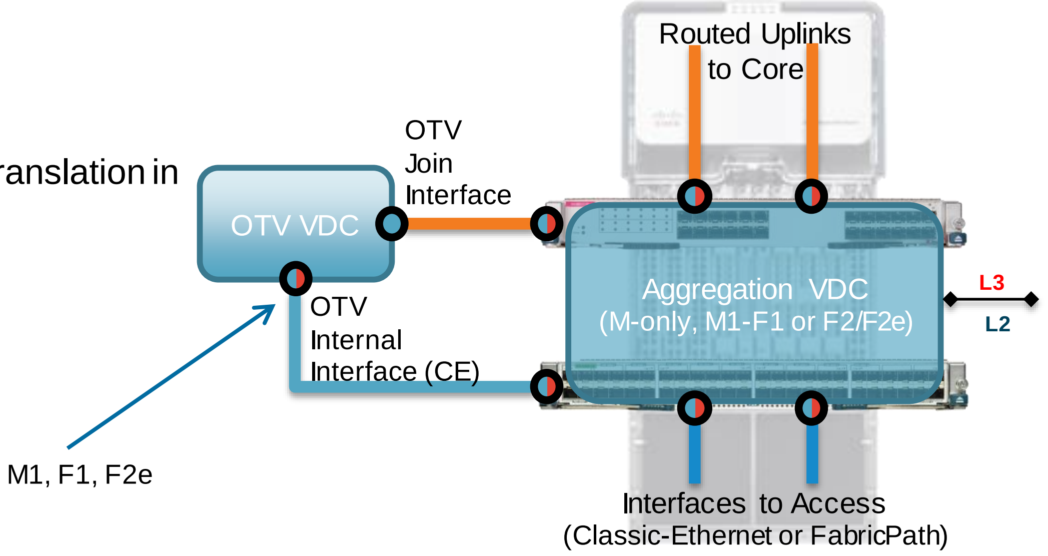
New Feature for OTV in NX-OS 6.2

Nexus 7000 Hardware Support

- F3 Support for OTV in 6.2(6)
  - Enable OTV on Nexus 7700 Series
  - No Tunnel Depolarisation or VLAN Translation in 6.2(6) on F3

Join-Interface

Internal Interface	M1	M2	F3
M1	✓	✓	
M2	✓	✓	✓
F1	✓	✓	
F2e	✓	✓	
F3		✓	✓



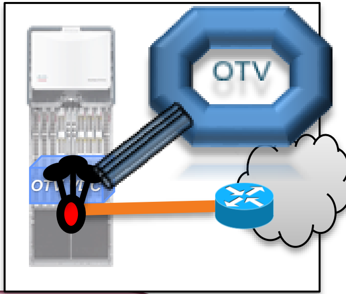
- F1 and F2e support for OTV internal Interface
  - F1 and F2e linecards have the ability to be internal interfaces

M-Series interface

F/M-Series interface

Release 6.2(6)

New Features for OTV
Tunnel Depolarisation & Secondary IP



- Secondary IP command introduced
  - Configured within interface, not OTV interface
- Introduction of multiple IPs results in tunnel depolarisation

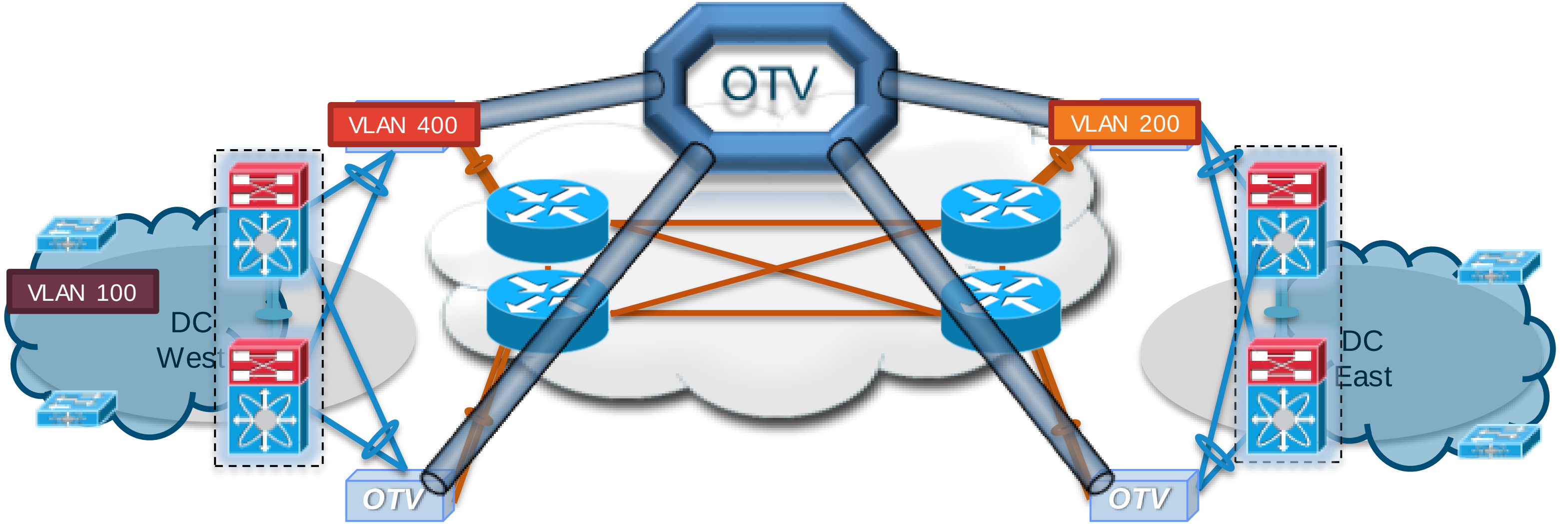
```
OTV-a(config-if)# ip address 2.100.11.1/24 secondary
Disabling IP Redirects on port-channel11 :secondary address
configured.
OTV-a(config-if)# sh run int po11

!Command: show running-config interface port-channel11
!Time: Wed Mar 27 23:05:21 2013

version 6.2(2)

interface port-channel11
  no ip redirects
  ip address 2.100.11.100/24
  ip address 2.100.11.1/24 secondary
  ip ospf network point-to-point
  ip router ospf 1 area 0.0.0.0
  ip igmp version 3
```

```
OTV-a (config-if)# sh otv

OTV Overlay Information
Site Identifier 0000.0000.0011

Overlay interface Overlay1

 VPN name              : Overlay1
 VPN state             : UP
 Extended vlans        : 25-50 72-227 (Total:182)
 Control group         : 224.1.1.0
 Data group range(s)   : 232.1.0.0/24
 Broadcast group       : 224.1.1.0
 Join interface(s)     : Po11 (2.100.11.100)
    Secondary IP Addresses: : 2.100.11.1
 Site vlan             : 1 (up)
 AED-Capable           : Yes1
 Capability            : Multicast-Reachable
```

New Features for OTV

VLAN Translation: Translation through transit VLAN

- When a different VLAN is used at multiple sites
- Usually for 3 or more sites



Release 6.2

New Features for OTV

VLAN Translation: Translation through transit VLAN

For Your Reference

```
OTV-a(config)# int overlay1
OTV-a(config-if-overlay)# otv vlan mapping 100 to 400

OTV-a(config-if-overlay)# sh run int overlay1

!Command: show running-config interface Overlay1
!Time: Fri Mar 29 19:01:04 2013

version 6.2(2)

interface Overlay1
  otv isis hello-multiplier 9
  otv join-interface port-channel11
  otv control-group 224.1.1.0
  otv data-group 232.1.0.0/24
  otv extend-vlan 25-50, 72-497
  otv vlan mapping  100 to 400
  no shutdown

OTV-a(config-if-overlay)# sh otv vlan-mapping
Original VLAN -> Translated VLAN
--------------------------------
           100 -> 400
```

```
OTV-B(config)# int overlay1
OTV-B(config-if-overlay)# otv vlan mapping 200 to 400
OTV-B(config-if-overlay)# sh run int overlay1

!Command: show running-config interface Overlay1
!Time: Fri Mar 29 19:02:29 2013

version 6.2(2)

interface Overlay1
  otv isis hello-multiplier 9
  otv join-interface port-channel21
  otv control-group 224.1.1.0
  otv data-group 232.1.0.0/24
  otv extend-vlan 25-50, 72-497
  otv vlan mapping  200 to 400
  no shutdown

OTV-B(config-if-overlay)# sh otv vlan-mapping
Original VLAN -> Translated VLAN
--------------------------------
          200 -> 400
```


New
Release 6.2

OTV Convergence

Small and Large Scale Targets (Extreme Failures)

Large Scale	Small Scale
<30sec	<10sec
↓	↓
< 10sec	<5sec

Cisco live!

Challenges in Traditional Layer 2 VPNs

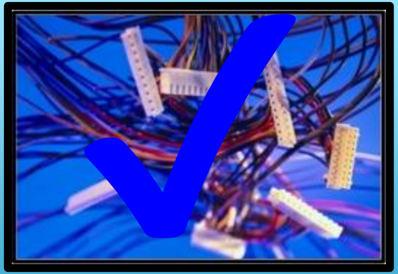
Solved by OTV

Flooding Behaviour

Control-Plane Based Learning

- Unknown Unicast for MAC propagation
- Unicast Flooding reaches all sites

Pseudo-wire Maintenance



Dynamic Encapsulation

- Full mesh of Pseudo-wire is complex
- Head-End replication is a common problem

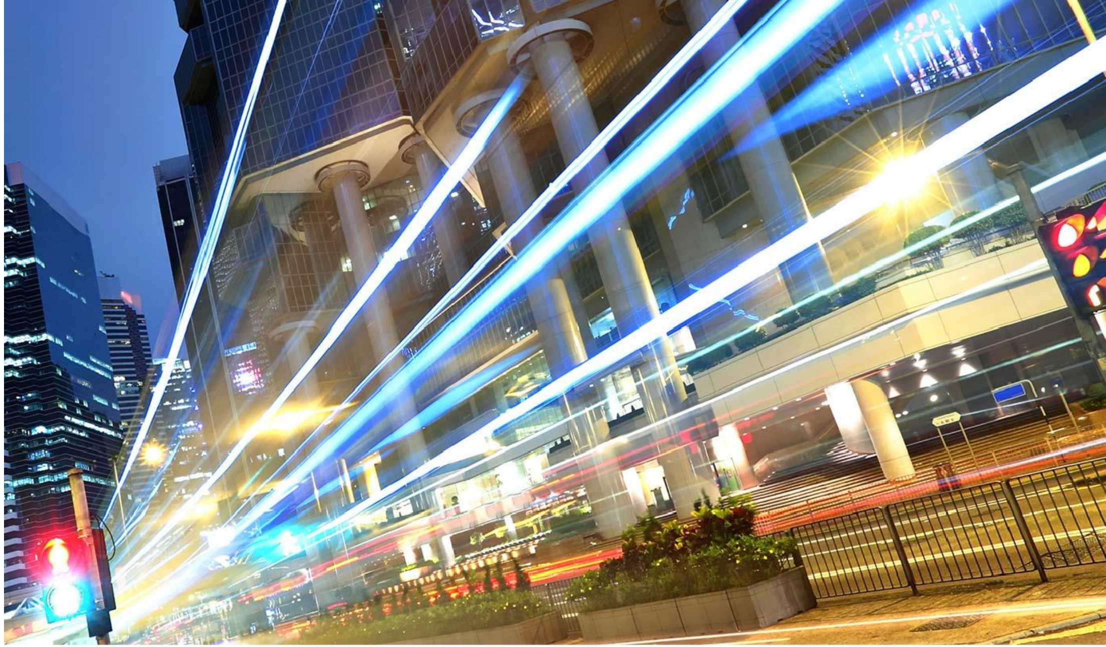
Multi-Homing

Native Automated Multi-Homing

- Requires additional Protocols & extends STP
- Malfunctions impacts multiple sites

Agenda

- Distributed Data Centres: Goals and Challenges
- OTV Architecture Principles
- OTV Design Considerations & New Features



OTV – Overlay Transport Virtualisation

Simplifying Data Centre Interconnect

Any Workload

Anytime

Anywhere

Where can OTV help YOU simplify Data Centre Interconnects?

Participate in the “My Favorite Speaker” Contest

Promote Your Favorite Speaker and You Could be a Winner

- Promote your favorite speaker through Twitter and you could win $200 of Cisco Press products (@CiscoPress)

- You can submit an entry for more than one of your “favorite” speakers
- Don’t forget to follow @CiscoLive and @CiscoPress
- View the official rules at http://bit.ly/CLUSwin

Continue Your Education

- Demos in the Cisco Campus
- Walk-in Self-Paced Labs
- Meet the Expert 1:1 meetings

Q & A

Complete Your Online Session Evaluation

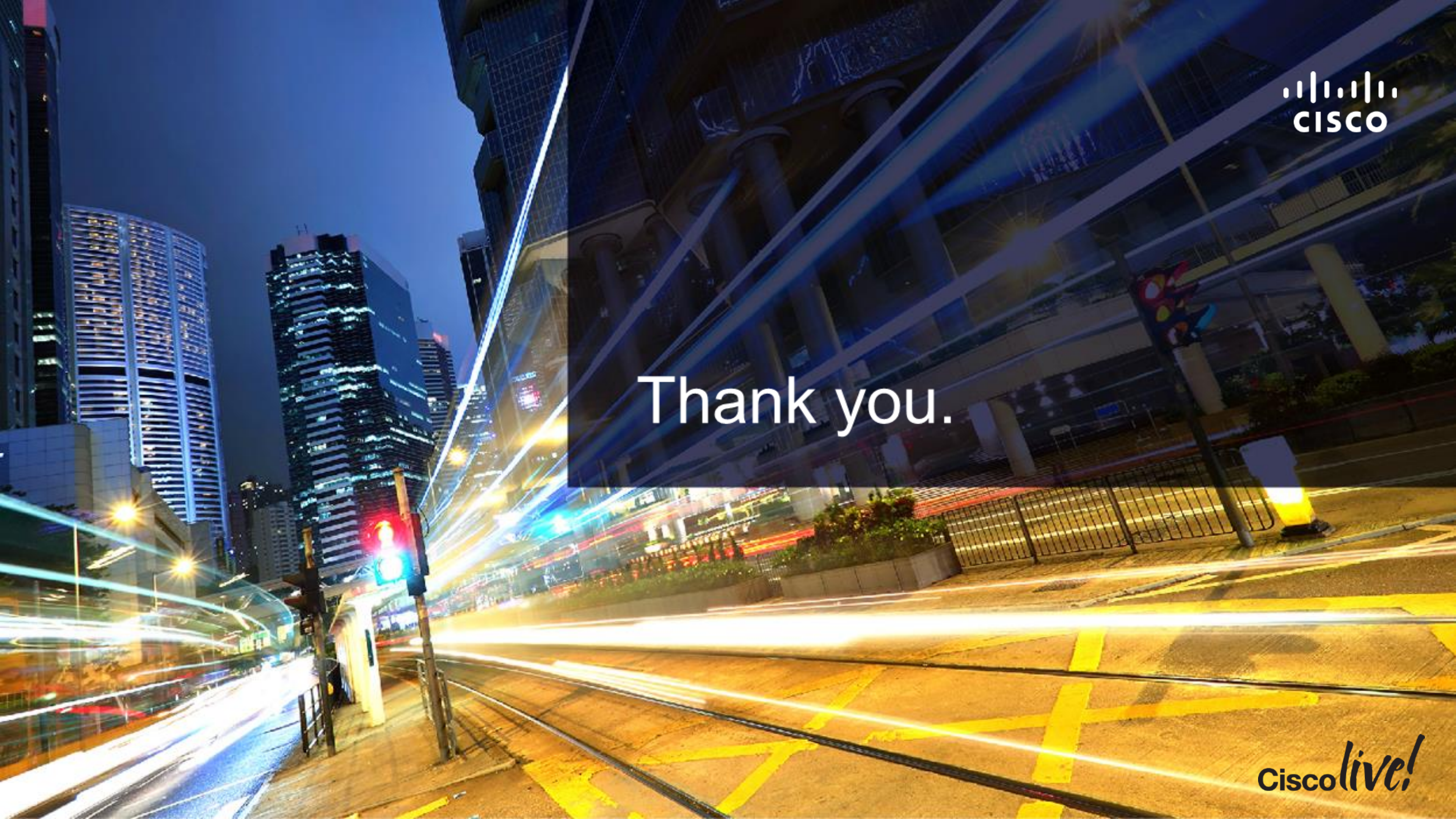
Give us your feedback and receive a Cisco Live 2015 T-Shirt!

Complete your Overall Event Survey and 5 Session Evaluations.

- Directly from your mobile device on the Cisco Live Mobile App
- By visiting the Cisco Live Mobile Site http://showcase.genie-connect.com/clmelbourne2015
- Visit any Cisco Live Internet Station located throughout the venue

T-Shirts can be collected in the World of Solutions on Friday 20 March 12:00pm - 2:00pm

Learn online with Cisco Live!
Visit us online after the conference for full access to session videos and presentations. www.CiscoLiveAPAC.com



Thank you.

cisco