CISCO The bridge to possible

Cisco SD-Access – Connecting Multiple Sites in a Single Fabric Domain

Scott Hodgdon, Technical Marketing Engineer technical Leader

CISCO Live!

BRKENS-2815

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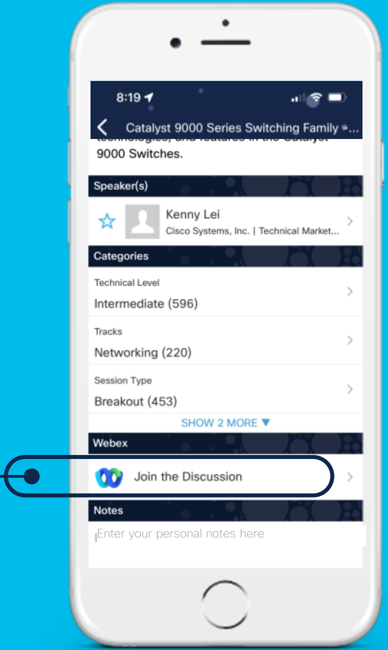

8:19

Catalyst 9000 Series Switching Family •...

9000 Switches.

Speaker(s)

☆ Kenny Lei
Cisco Systems, Inc. | Technical Market...

Categories

Technical Level
Intermediate (596)

Tracks
Networking (220)

Session Type
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Notes

Enter your personal notes here

Who is Scott ?

Personal

- Based in Raleigh, NC (US)
- 22-year-old daughter in university (she's smarter than I)

Career

- 22 years as a Technical Marketing Engineer
- 13 Years focused on just Catalyst 6K Family
- 15+ years as a Cisco Live Speaker
- 10 years as Cisco Live Session Group Manager for US and EMEA
- 2 Years as a Cisco Partner SE
- 2 Years Lead Network Engineer for 15-site Health Care network in North Carolina
- No formal technology schooling … I have a Business Degree with a Finance Concentration

Current Focus

- Cisco SDA Network Design and Partner Enablement

Agenda

Cisco SD-Access Basic Concepts

Cisco SD-Access Transit Types

- IP as Transit/Peer Network
- SD-Access as Transit

Cisco SD-Access Policy across Distributed Campus

SD-Access Transit LISP Pub/Sub

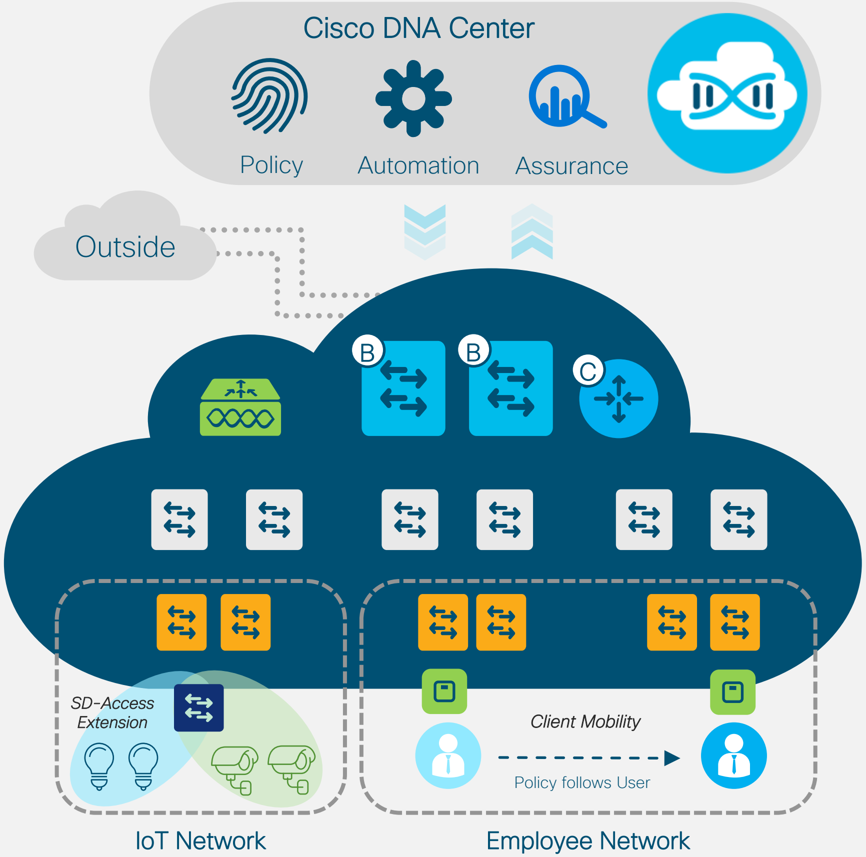
- Registration
- Packet Walk
- Remote Internet
- Backup Internet

SD-Access Basic Concepts

RECAP

Cisco Software Defined Access

The Foundation for Cisco's Intent Based Network



One Automated Network Fabric

Single fabric for Wired and Wireless with full automation

Identity-Based Policy and Segmentation

Policy definition decoupled from VLAN and IP address

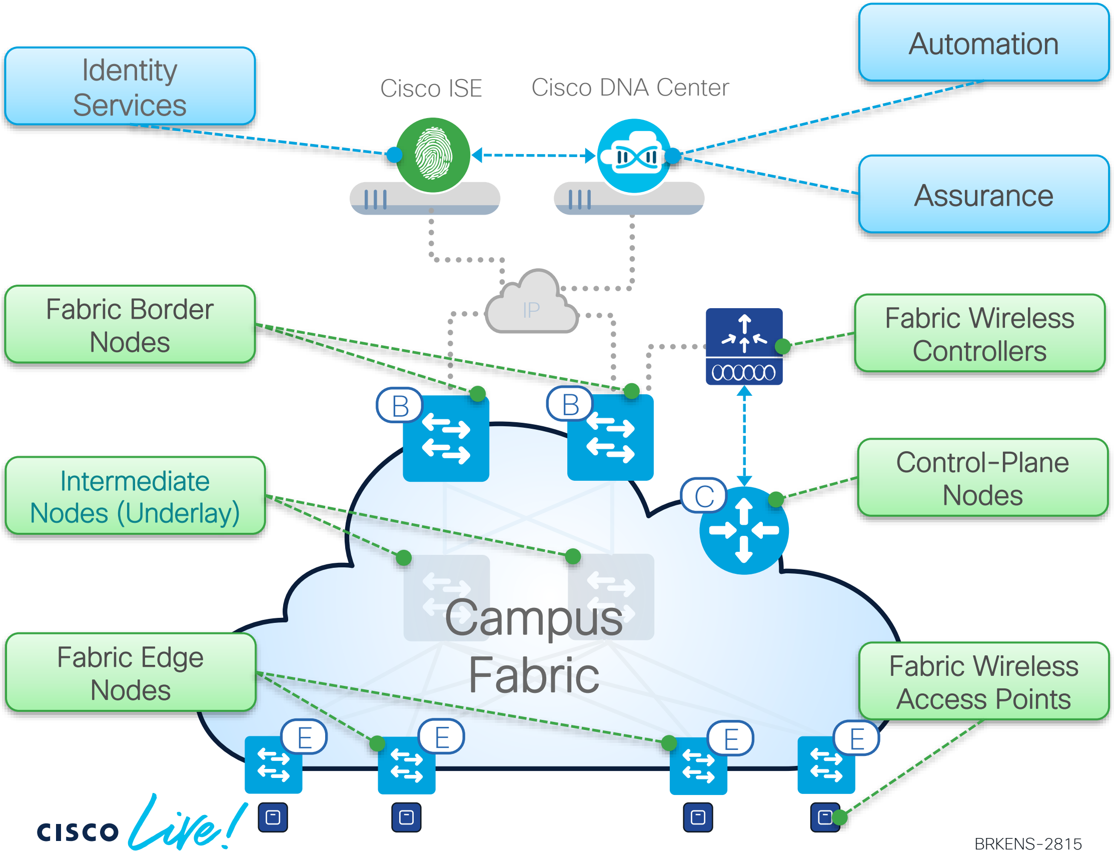
AI-Driven Insights and Telemetry

Analytics and visibility into User and Application experience

RECAP

Cisco SD-Access

Fabric Roles and Terminology



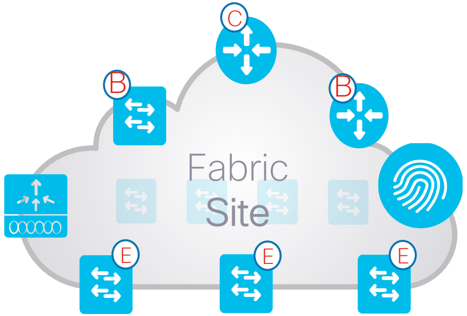
- Network Automation – Simple GUI and APIs for intent-based Automation of wired and wireless fabric devices
- Network Assurance – Data Collectors analyze Endpoint to Application flows and monitor fabric network status
- Identity Services – NAC & ID Services (e.g. ISE) for dynamic Endpoint to Group mapping and Policy definition

- Control-Plane Nodes – Map System that manages Endpoint to Device relationships
- Fabric Border Nodes – A fabric device (e.g. Core) that connects External L3 network(s) to the SD-Access fabric
- Fabric Edge Nodes – A fabric device (e.g. Access or Distribution) that connects Wired Endpoints to the SD-Access fabric
- Fabric Wireless Controller – A fabric device (WLC) that connects Fabric APs and Wireless Endpoints to the SD-Access fabric

Fabric Sites:
Single or Multiple

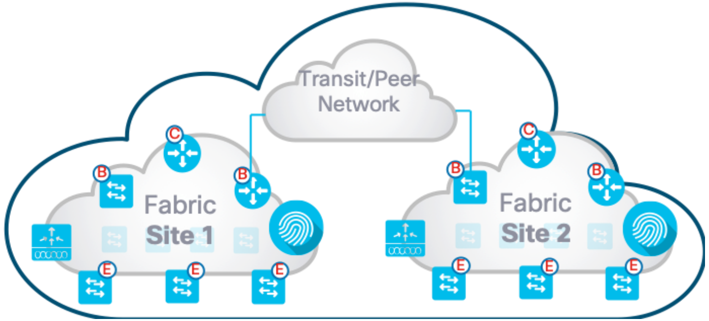
Fabric Sites : Single vs Multiple

Single Site



- Includes CP,B,FE, Fabric WLC and ISE PSN
- Benefits
  - Scalability
  - Resiliency
  - Survivability
- Fabric Site may cover a single physical location, multiple locations, or just a subset of a location

Multiple Sites



- Includes One or more Fabric sites with Transit network (IP or SD-Access)
- Managed by Single DNAC cluster
- End to End Segmentation between Fabric Sites needs to be considered

Cisco DNAC System Scale

Rel:2.3.3.x

Parameters	DN2-HW-APL	DN2-HW-APL-L	DN2-HW-APL-XL
No of Devices (Switch/Router/WLC)	1000	2000	5000 / 10,000*
No of Access Points	4000	6000	12000
No of Endpoints (Concurrent)	25,000	40,000	100,000 / 300,000*
No of Endpoints (Transient)	75,000	120,000	250,000 / 750,000*
No of endpoints – wired: wireless ratio	Any	Any	Any
No of Fabric Sites	500	1000	2000
No of Virtual Networks per Fabric Site	64/Site	64/site	256/site
No of Fabric Devices per Fabric/site	500/site	600/site	1200/site
No if IP Pools	100/site	300/site	1000/site

* With 3-Node Cluster

Cisco SD-Access Transit Types

Transit/Peer Network Types

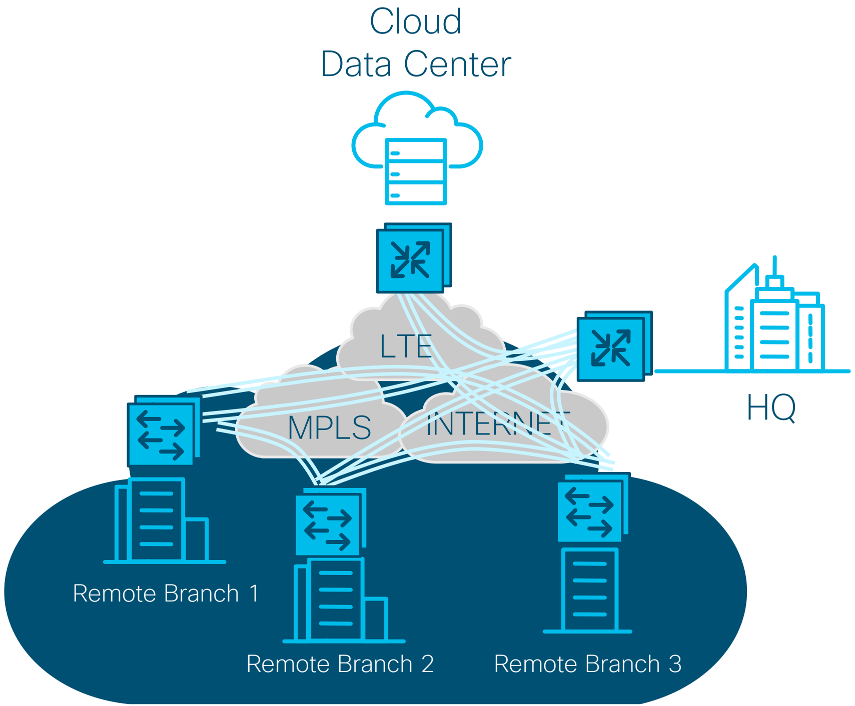
Transit/Peer Network type include

- IP-Based Transit – Leverages a traditional IP-based (VRF-LITE, MPLS) network, which requires remapping of VRFs and SGTs between sites.

- Cisco SD-Access Transit - Enables a native Cisco SD-Access (VXLAN,SGT) fabric, with Transit Control Plane Nodes for inter-site communication.

Transit Connectivity

Why IP Based Transit?



✓ Customers already using existing WAN or have adopted SD-WAN

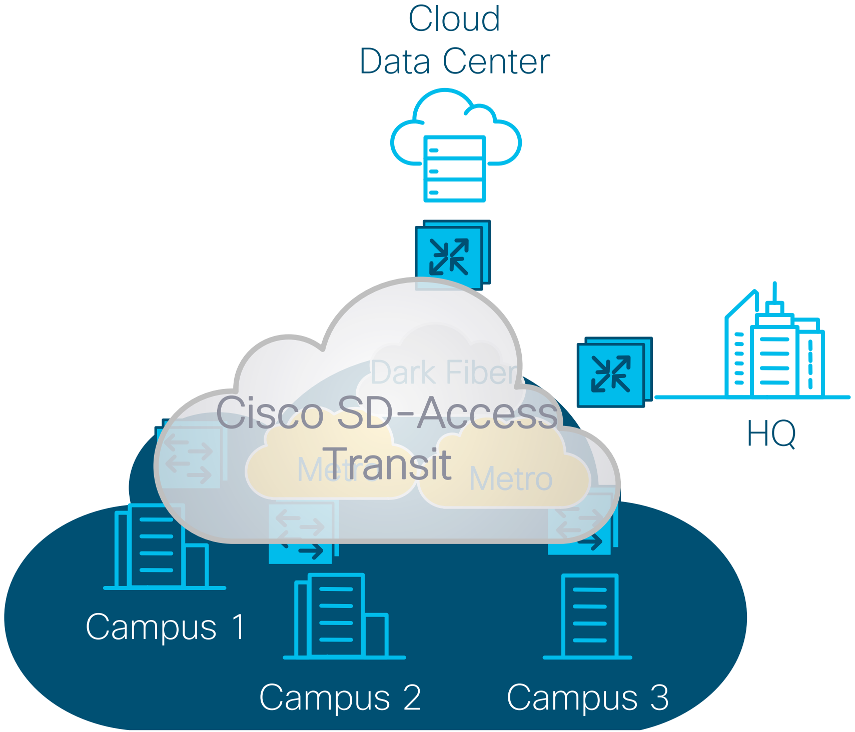
✓ Unable to carry VXLAN header in WAN

Typical use cases

- Internet Handoff
- P2P IPSEC encryption
- Policy Based Routing
- WAN Accelerators
- Traffic engineering
- Mobile Backhaul LTE

Cisco SD-Access Multi-Site Fabric

When to use Cisco SD-Access Transit? – Distributed Campus/Metro Deployments



✓ Higher MTU support

Typical use cases

- Native unified policy across the locations and end-to-end segmentation using VNs and SGTs
- Smaller and Isolated fault domains
- Resiliency and Scalability

IP as Transit/Peer Network

IP Transit / Peer Network

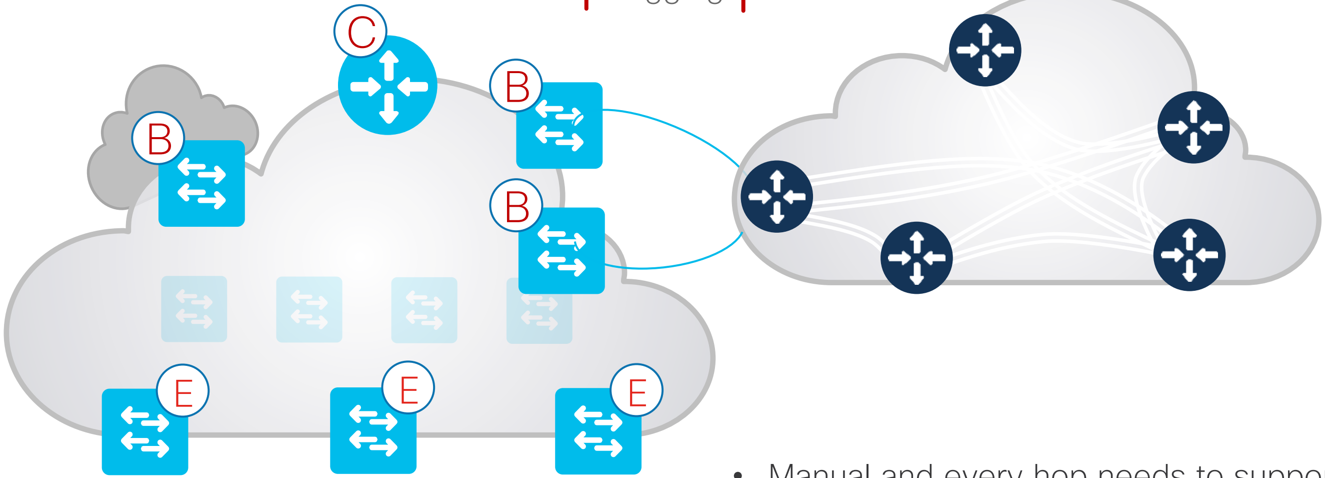
Network Plane Analysis Perspectives

1. Control-Plane: How routes / prefixes are communicated
2. Data-Plane: Which encapsulation method is used to carry data
3. Policy Plane: How group and segmentation information is communicated
4. Management Plane: How Management Infrastructure is Integrated

Communicating to Peer Network – IP

Control/Data/Policy Plane

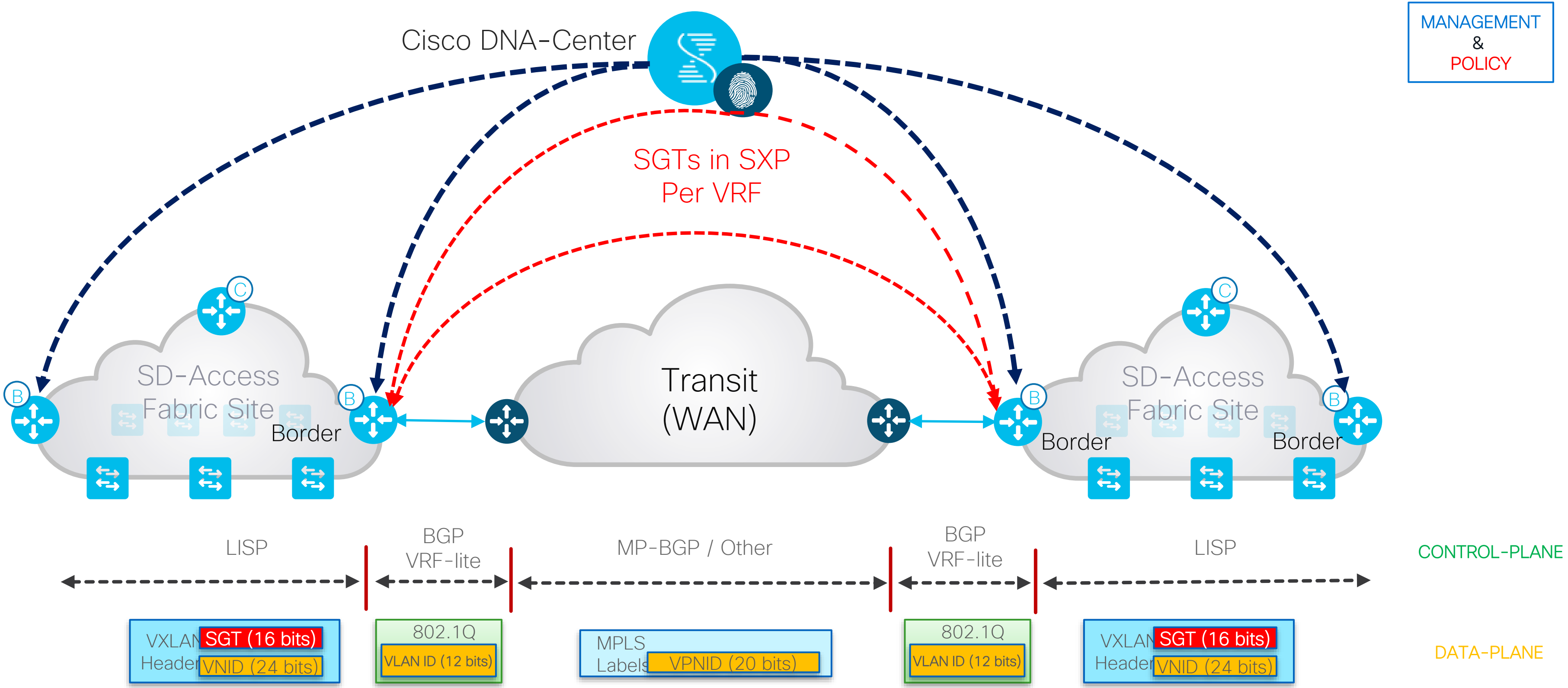
CONTROL-PLANE	LISP	eBGP	External Domain(BGP/IGP)
DATA-PLANE	VXLAN	VRF-LITE	External Domain(IP/MPLS/VXLAN
POLICY-PLANE	SGT in VXLAN	SGT* Tagging	External Domain (IP ACL/SGT)



- Manual and every hop needs to support SGT propagation

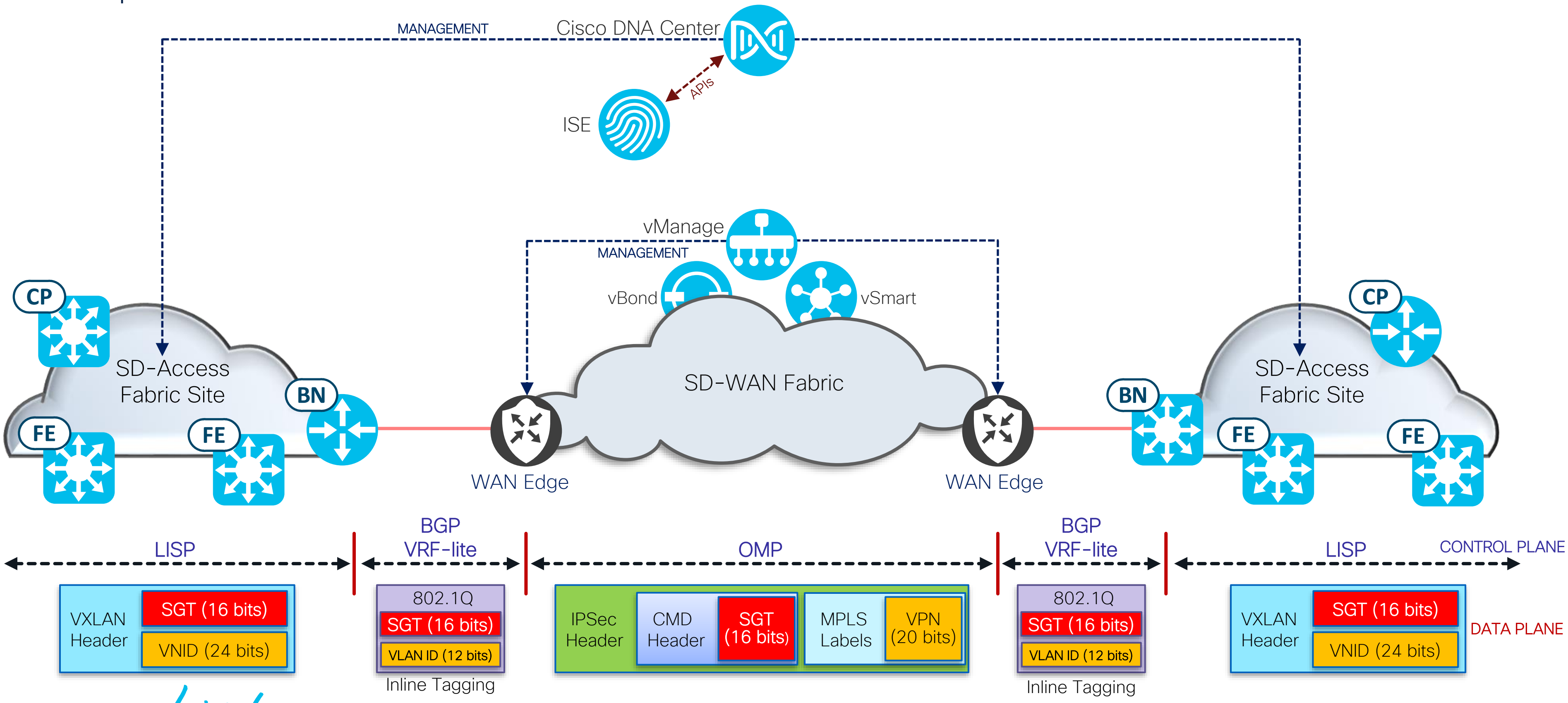
Inter-Connecting Fabrics/Sites

IP-Based WAN



Inter-Connecting Fabrics/Sites

Viptella SD-WAN



MANAGEMENT

Cisco DNA Center

APIs

ISE

vManage

MANAGEMENT

vBond

vSmart

CP

SD-Access Fabric Site

BN

FE

FE

SD-WAN Fabric

WAN Edge

WAN Edge

BN

CP

SD-Access Fabric Site

FE

FE

LISP

BGP VRF-lite

OMP

BGP VRF-lite

LISP

CONTROL PLANE

VXLAN Header | SGT (16 bits) | VNID (24 bits)

802.1Q | SGT (16 bits) | VLAN ID (12 bits)

Inline Tagging

IPSec Header | CMD Header | SGT (16 bits) | MPLS Labels | VPN (20 bits)

802.1Q | SGT (16 bits) | VLAN ID (12 bits)

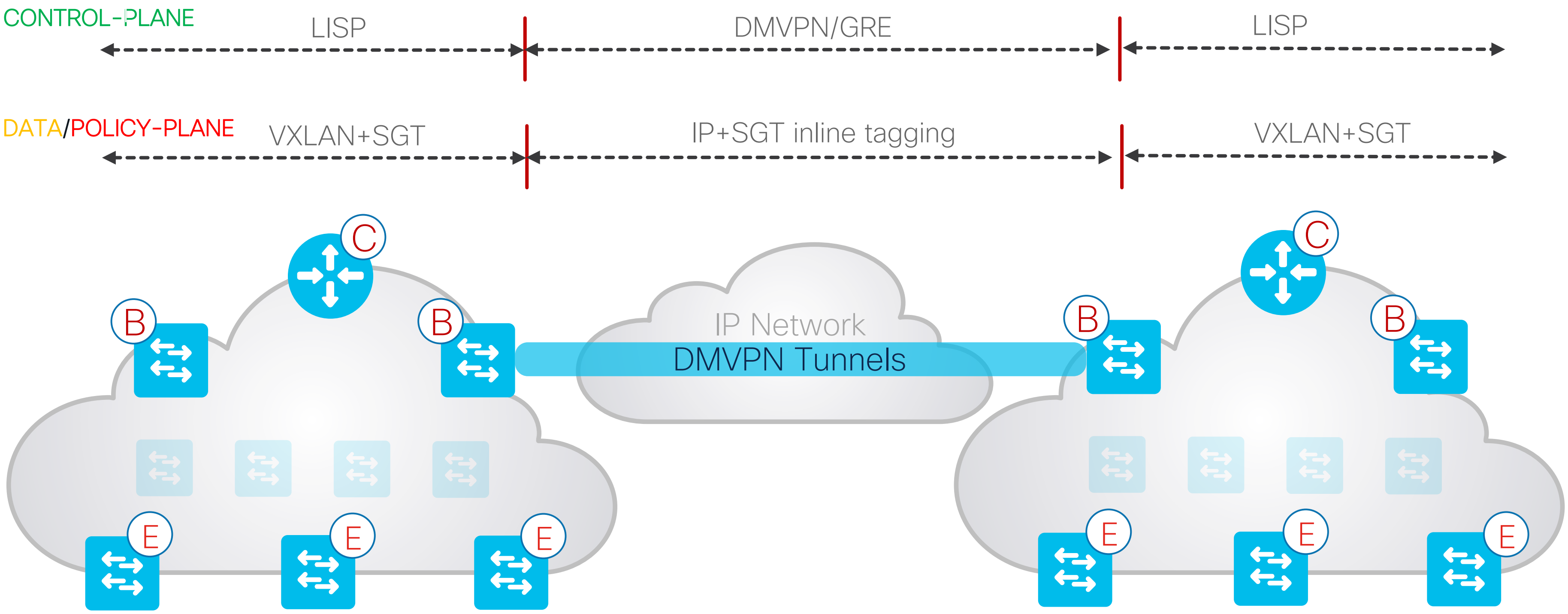
Inline Tagging

VXLAN Header | SGT (16 bits) | VNID (24 bits)

DATA PLANE

Inter-Connecting Fabrics/Sites

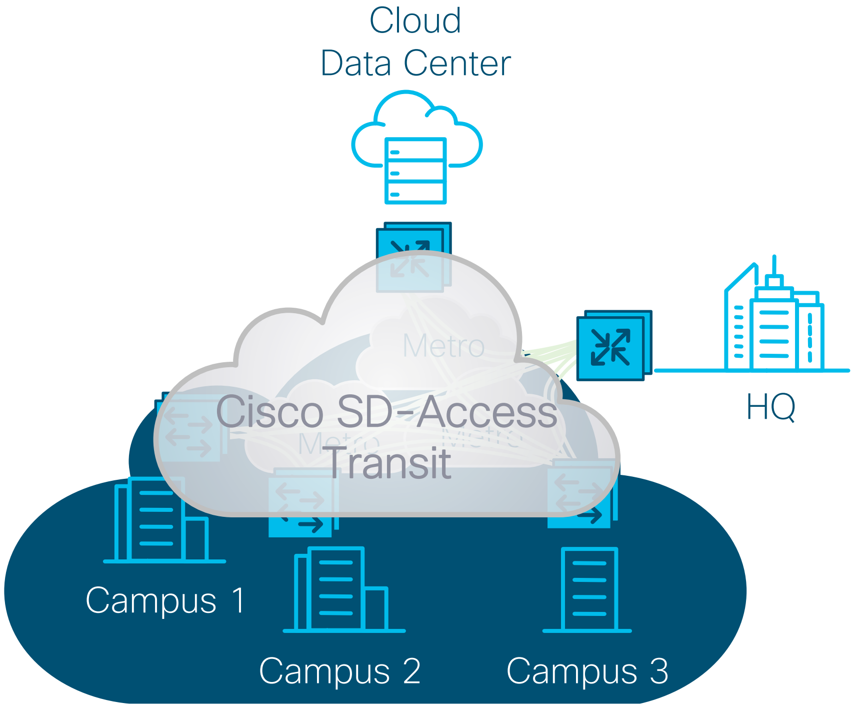
DMVPN



SD-Access as Transit

Cisco SD-Access Transit Multi-Site

Consistent Segmentation and Policy across sites

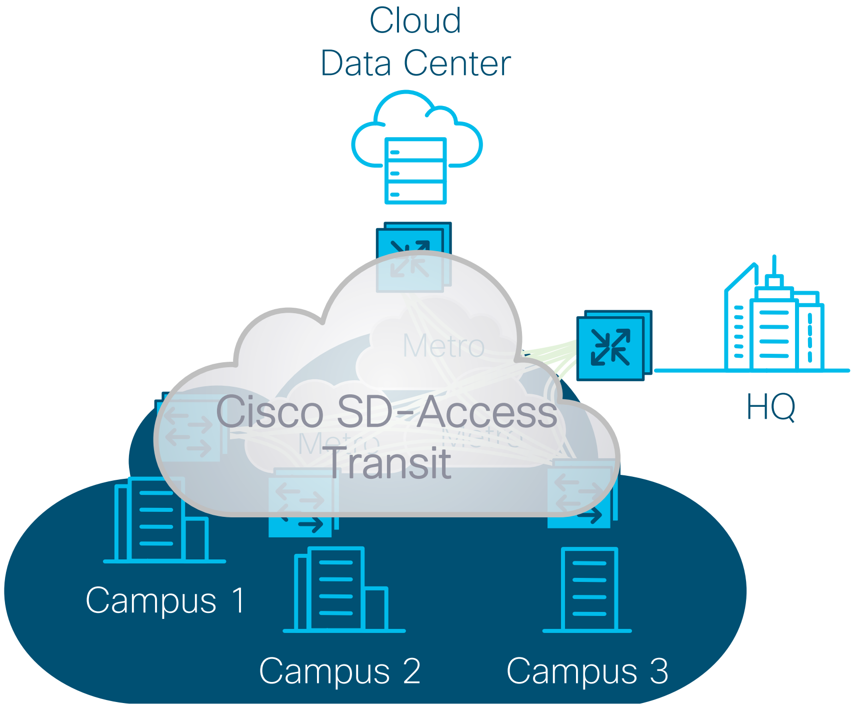


Cisco SD-Access Transit Multi-Site Advantages:

- End-to-end Segmentation and policy
- Smaller or isolated Failure Domains
- Horizontally scaled networks
- Single view of Entire Network
- Elimination of Per Deviceat every site*

Cisco SD-Access Multi-Site

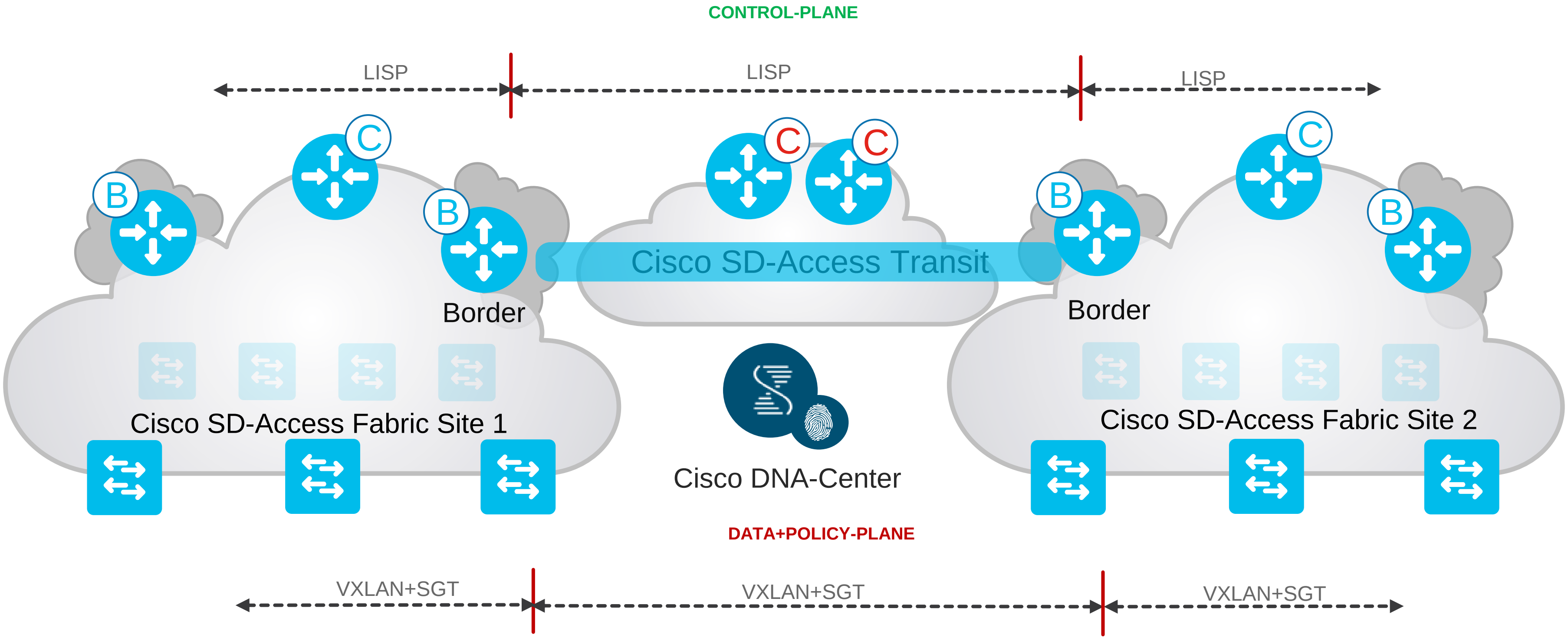
Key Considerations



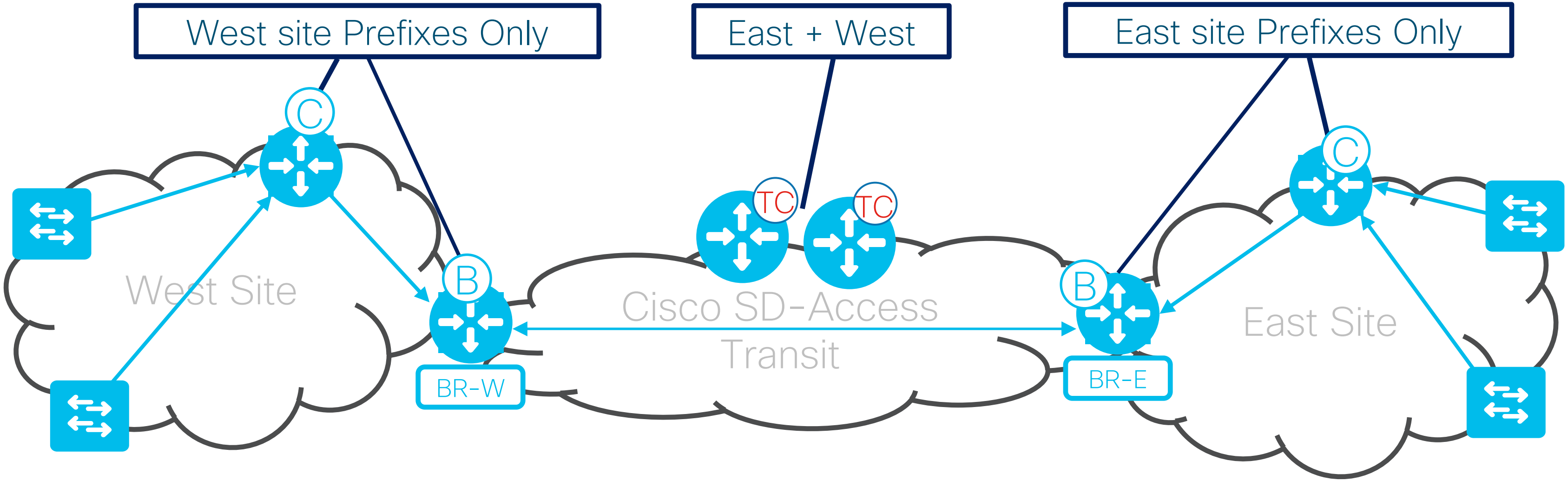
Cisco SD-Access Transit Multi-Site Key Considerations:

- ➢ Should accommodate the MTU setting used for SD-Access in the campus network

Cisco SD-Access Multi-Site - SD-Access Transit



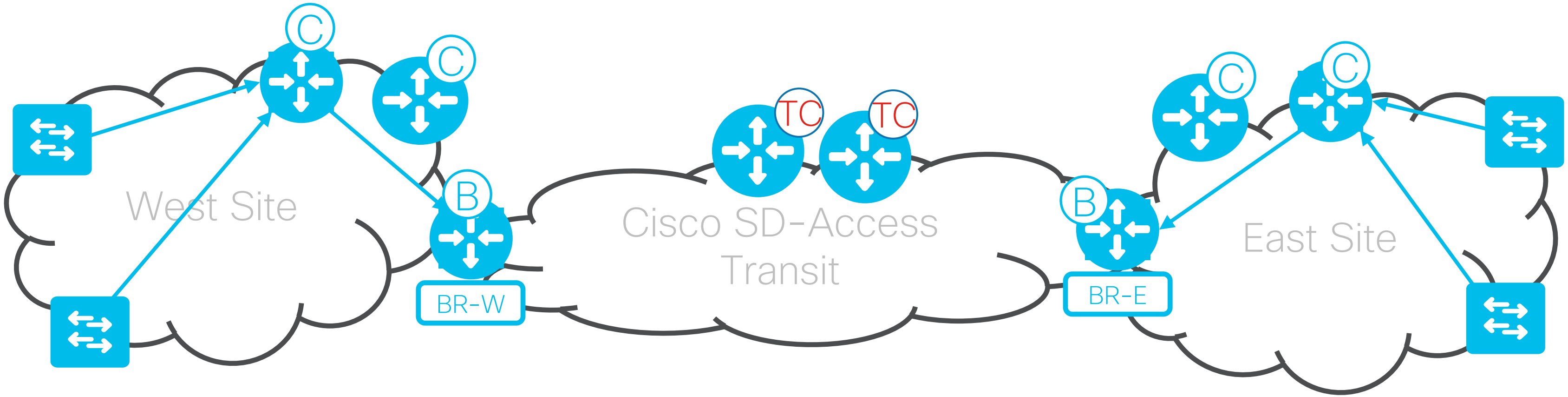
Cisco SD-Access Transit Control Plane for Global Scale



- Each site only maintains state for in-site end-points.
- Off site traffic follows default to transit.
- Survivability, each site is a fully autonomous resiliency domain
- Each Site has its own unique subnets

Cisco SD-Access Multi-Site

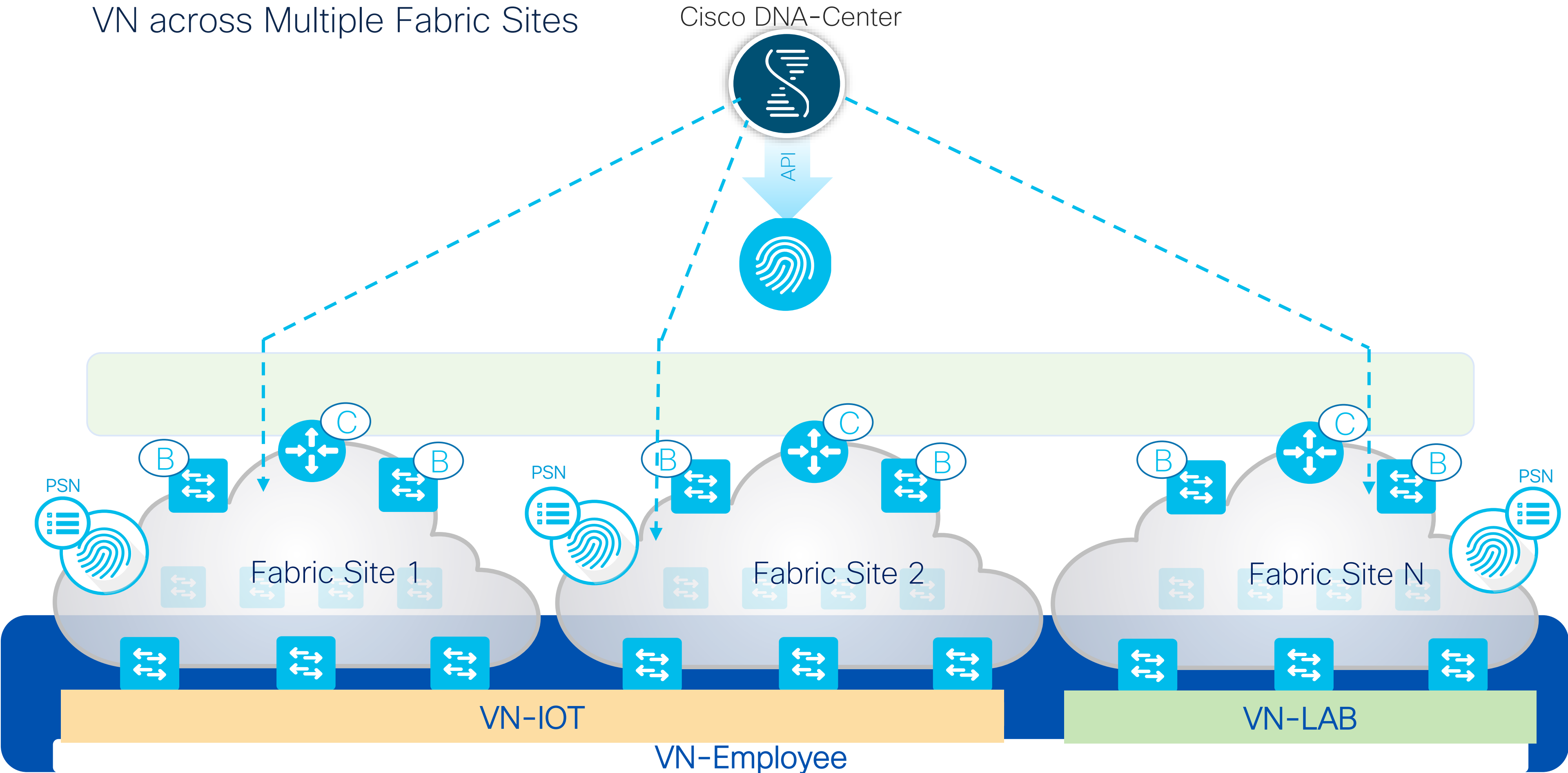
Transit Control Plane Deployment Location



- ➢ Device must be dedicated to the transit control plane node role.
- ➢ Doesn’t have to be physically deployed in Transit Area
- ➢ Ideally, device should not be in the data forwarding (transit path) between sites.
- ➢ Requires IP connectivity in the underlay from site borders at all fabric sites
- ➢ Deploy 2 Transit Control Plane nodes for redundancy and load balancing.

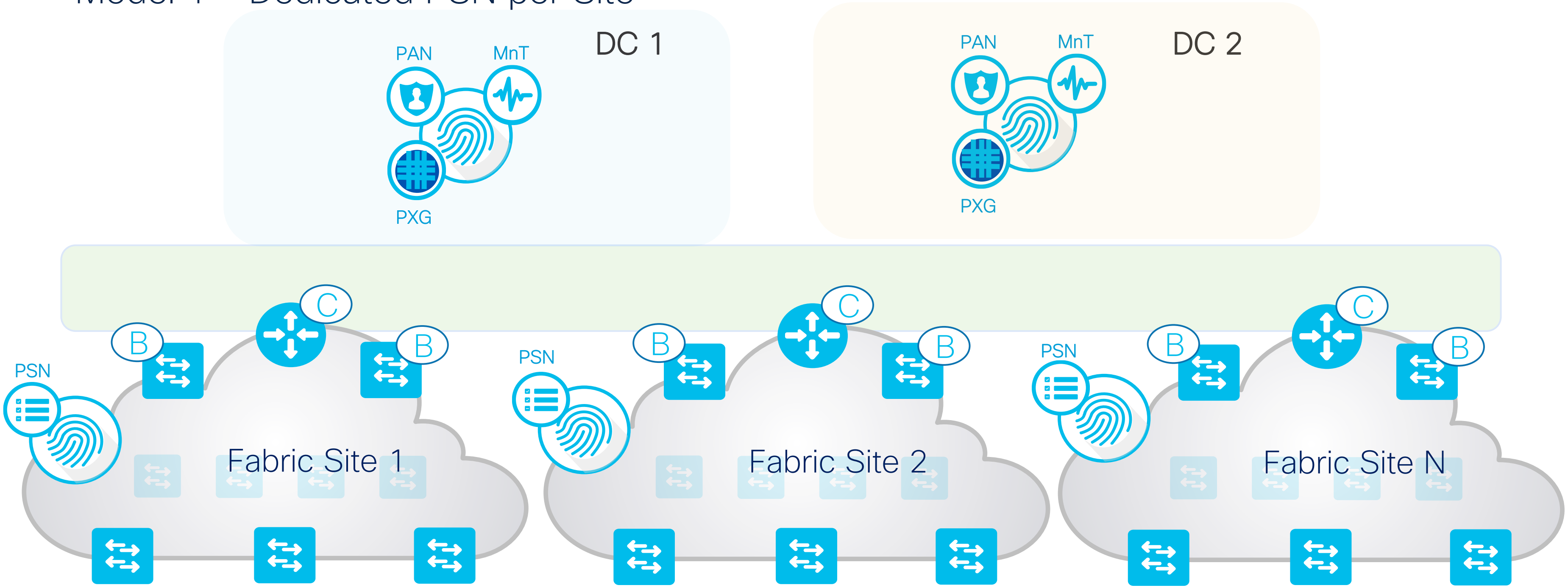
Cisco SD-Access Multi-Site

VN across Multiple Fabric Sites



ISE Distributed Deployment

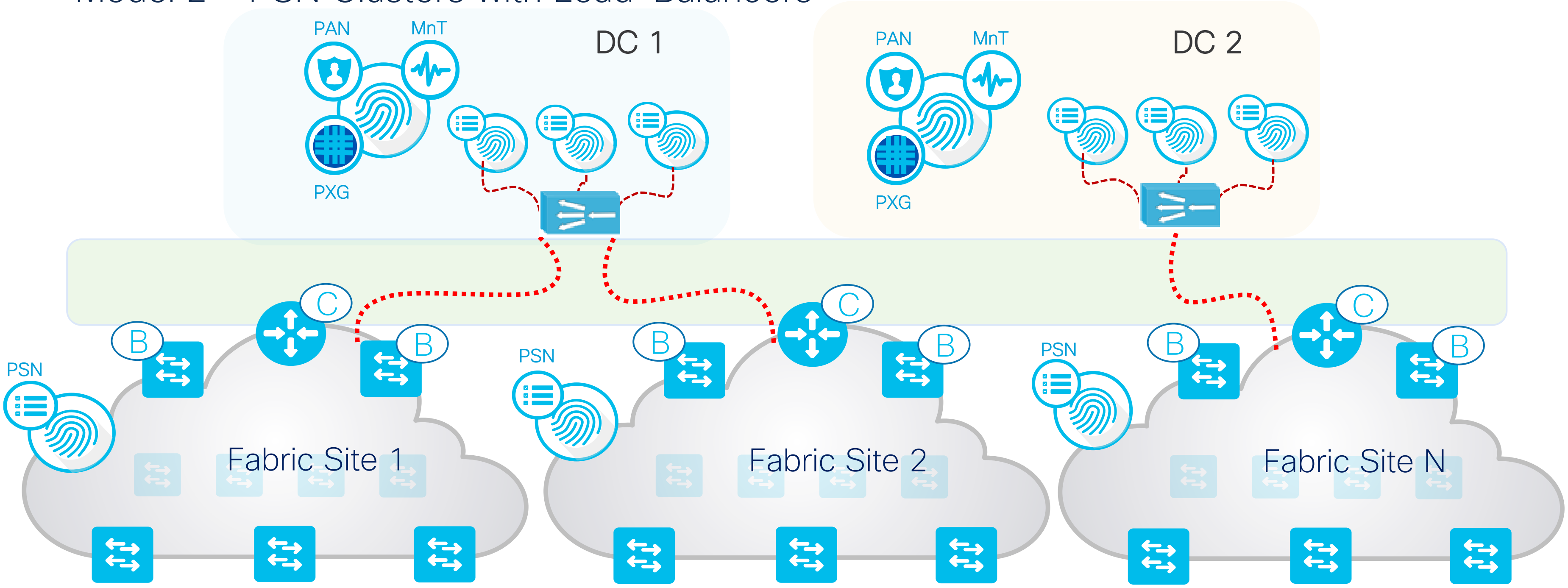
Model 1 - Dedicated PSN per Site



- PSN Nodes dedicated to every site
- Maximum of 2 PSN's per site
- PAN's are centralized in Data Center

ISE Distributed Deployment

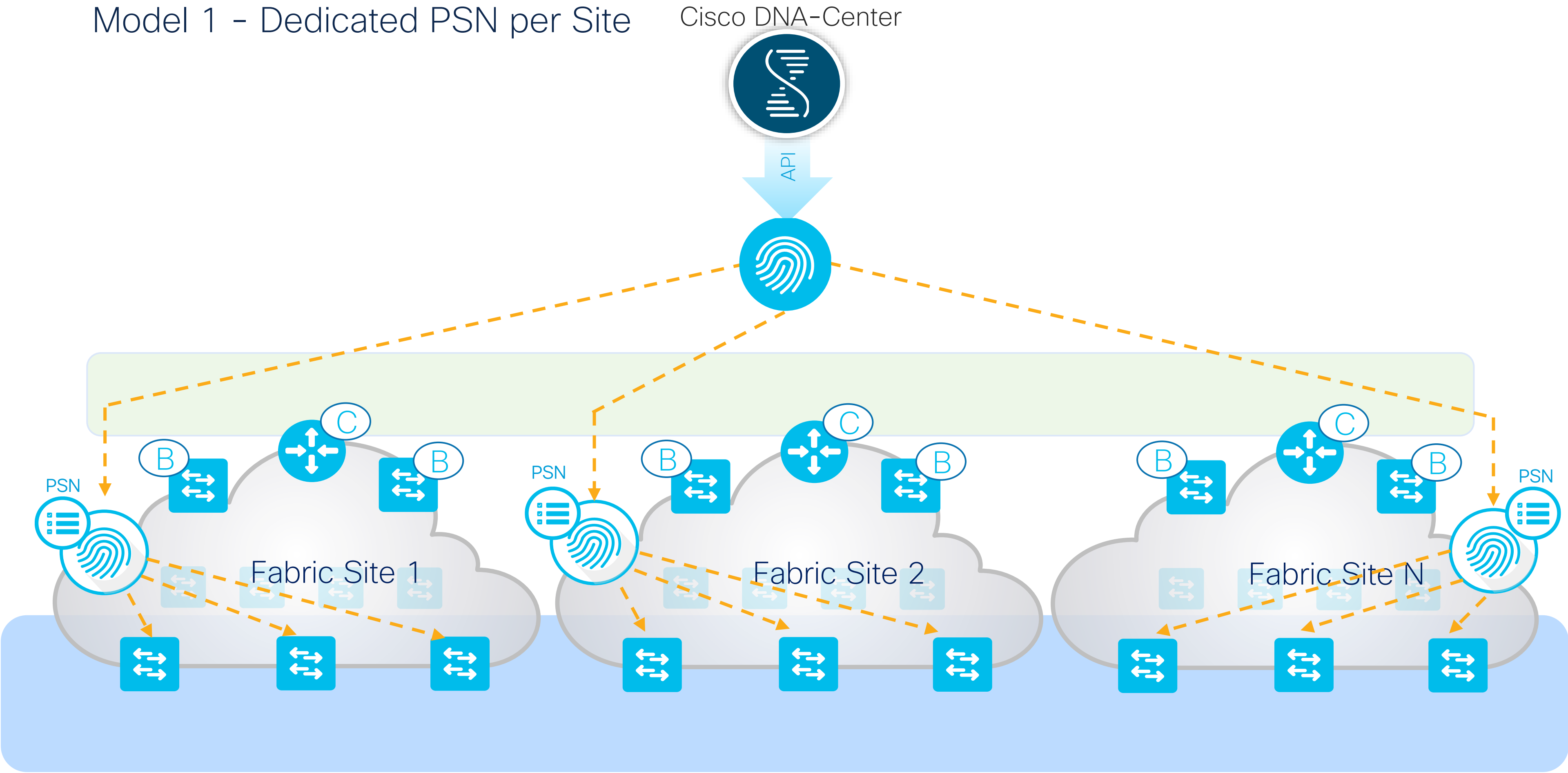
Model 2 - PSN Clusters with Load-Balancers



- PSN's are behind a dedicated Load Balancer
- DNAC site settings point to Load Balancer IP

ISE Distributed Deployment

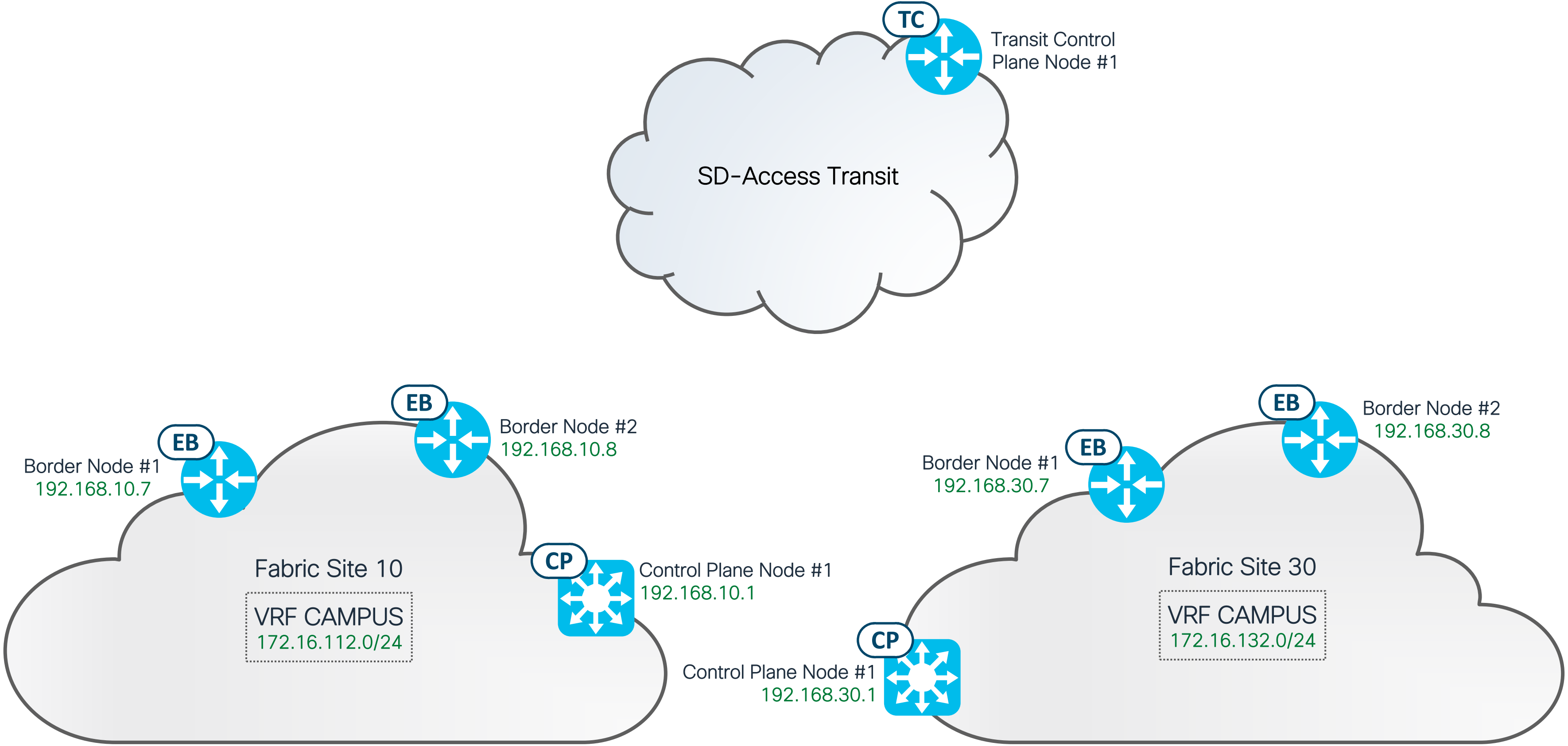
Model 1 - Dedicated PSN per Site



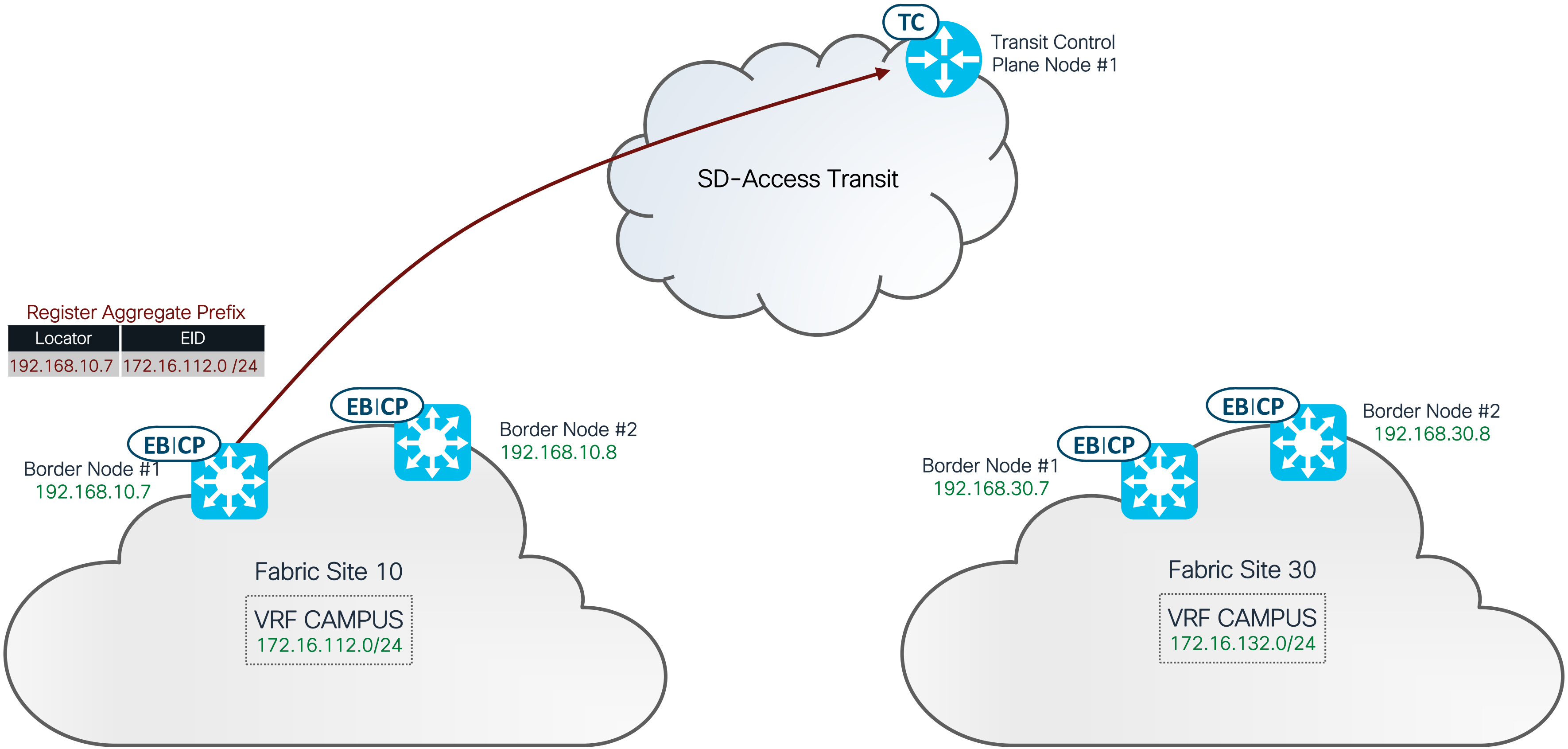
SD-Access Transit LISP Pub/Sub Registration

LISP Pub/Sub Registration and Publication in SD-Access Transit

Simplified Topology For this Section



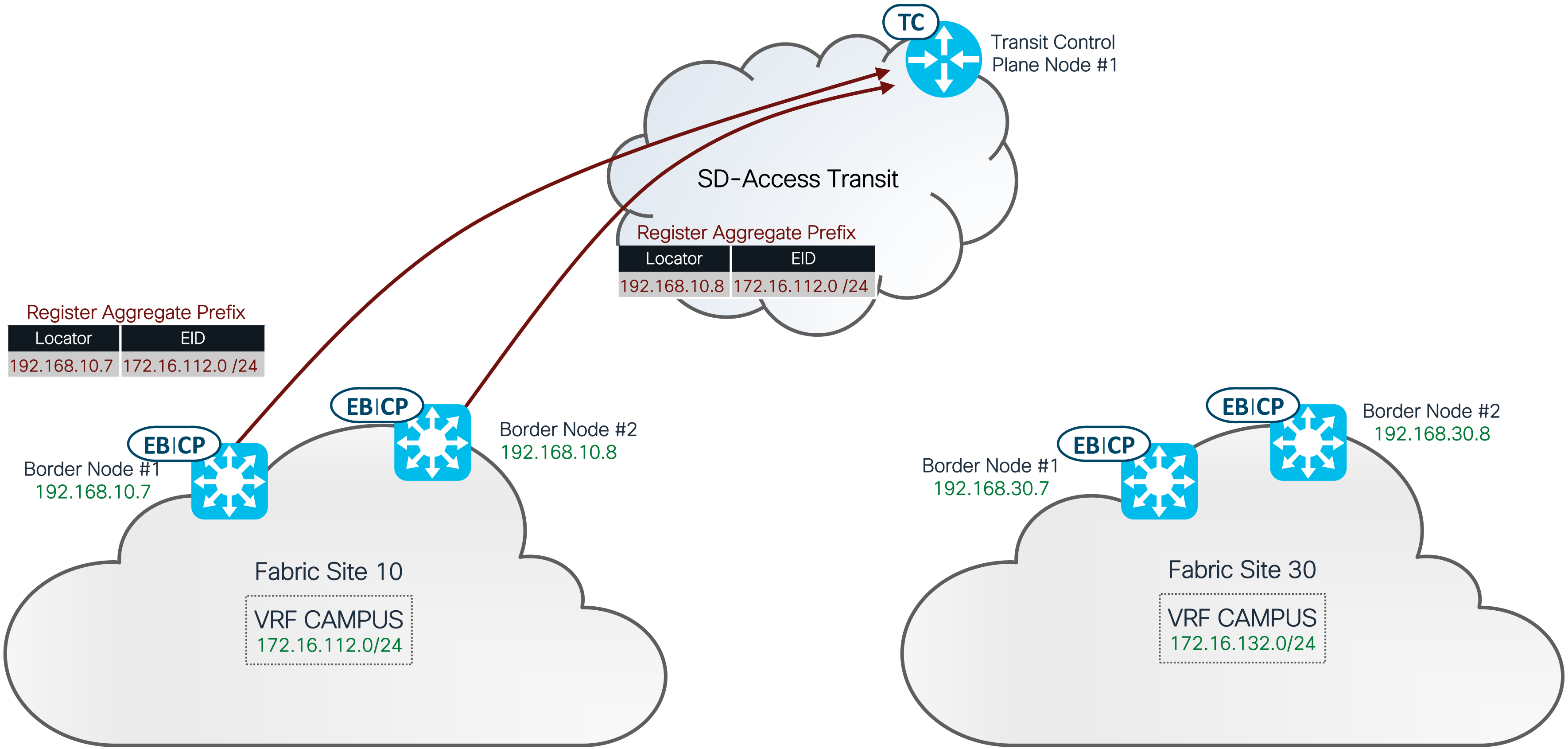
LISP Pub/Sub Registration and Publication in SD-Access Transit



Register Aggregate Prefix

Locator	EID
192.168.10.7	172.16.112.0 /24

LISP Pub/Sub Registration and Publication in SD-Access Transit



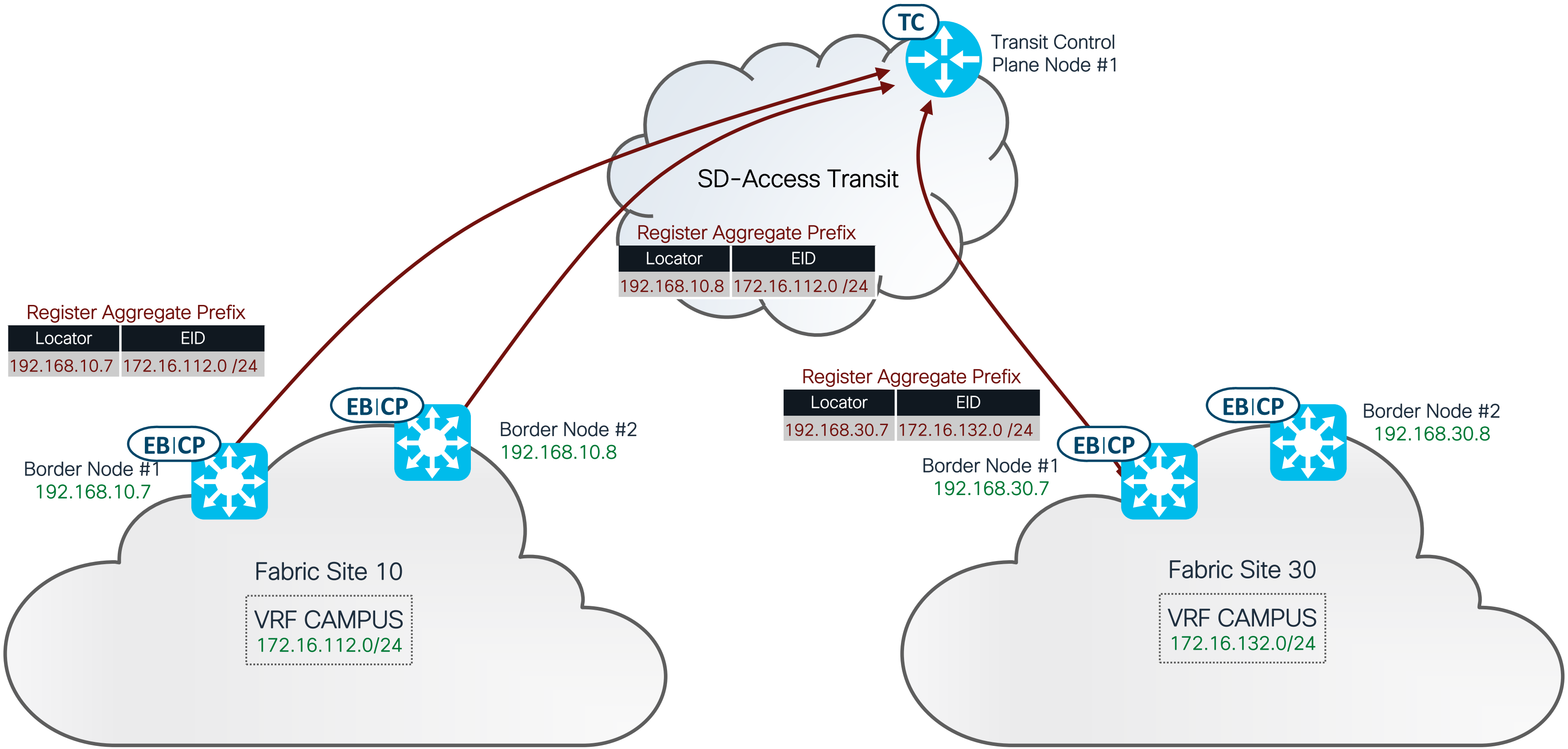
Register Aggregate Prefix

Locator	EID
192.168.10.7	172.16.112.0 /24

Register Aggregate Prefix

Locator	EID
192.168.10.8	172.16.112.0 /24

LISP Pub/Sub Registration and Publication in SD-Access Transit



Register Aggregate Prefix

Locator	EID
192.168.10.7	172.16.112.0 /24

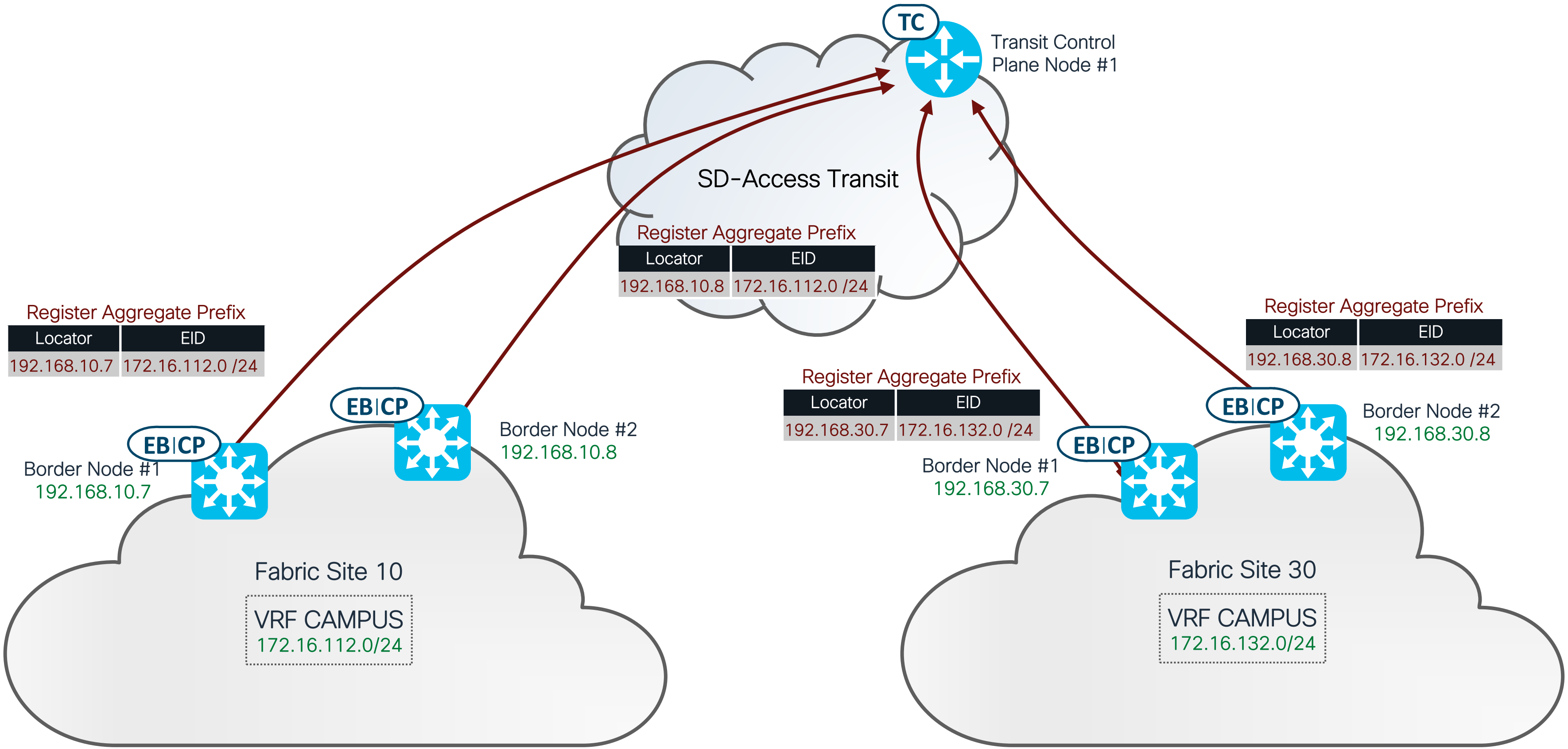
Register Aggregate Prefix

Locator	EID
192.168.10.8	172.16.112.0 /24

Register Aggregate Prefix

Locator	EID
192.168.30.7	172.16.132.0 /24

LISP Pub/Sub Registration and Publication in SD-Access Transit



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Register Aggregate Prefix

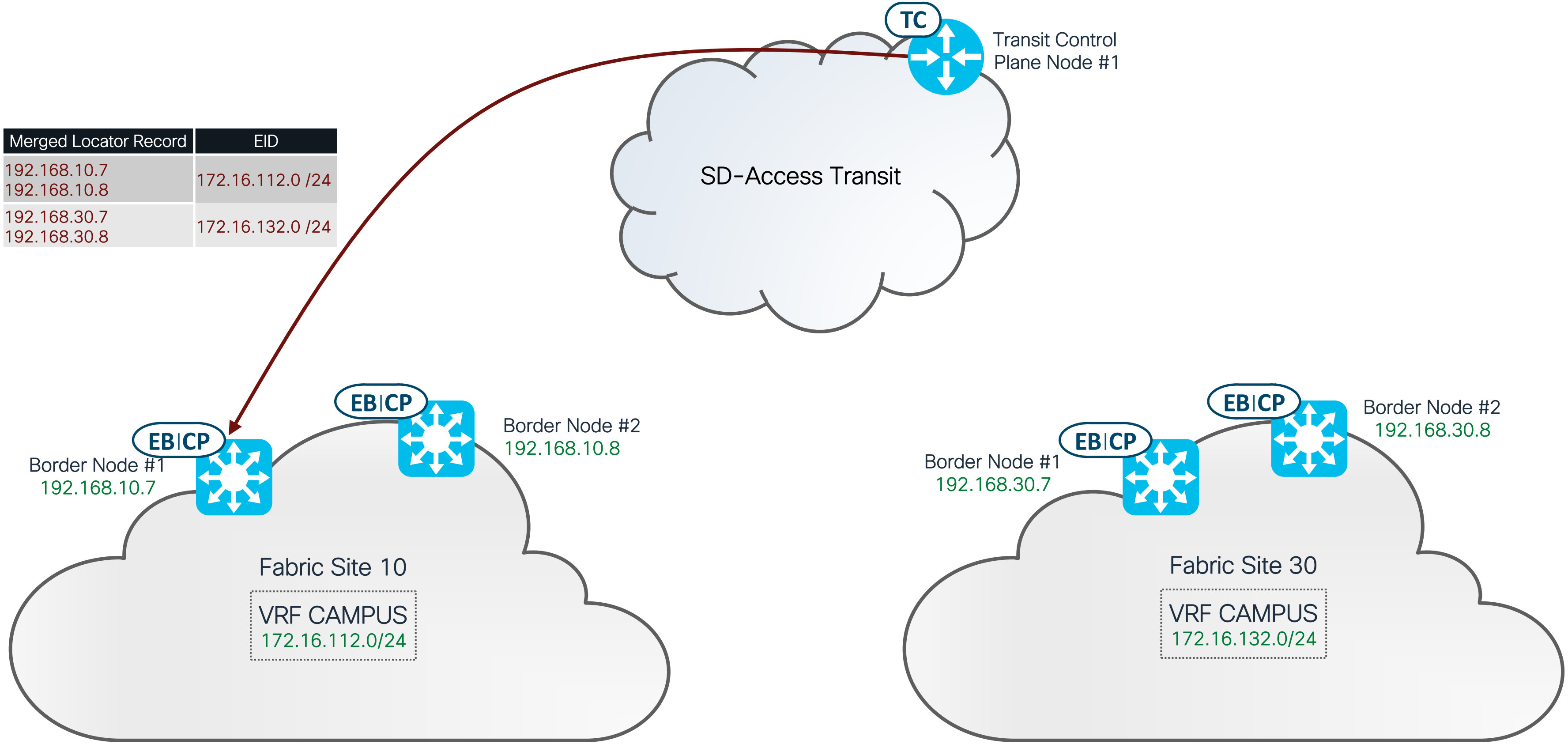
Locator	EID
192.168.30.7	172.16.132.0 /24

Register Aggregate Prefix

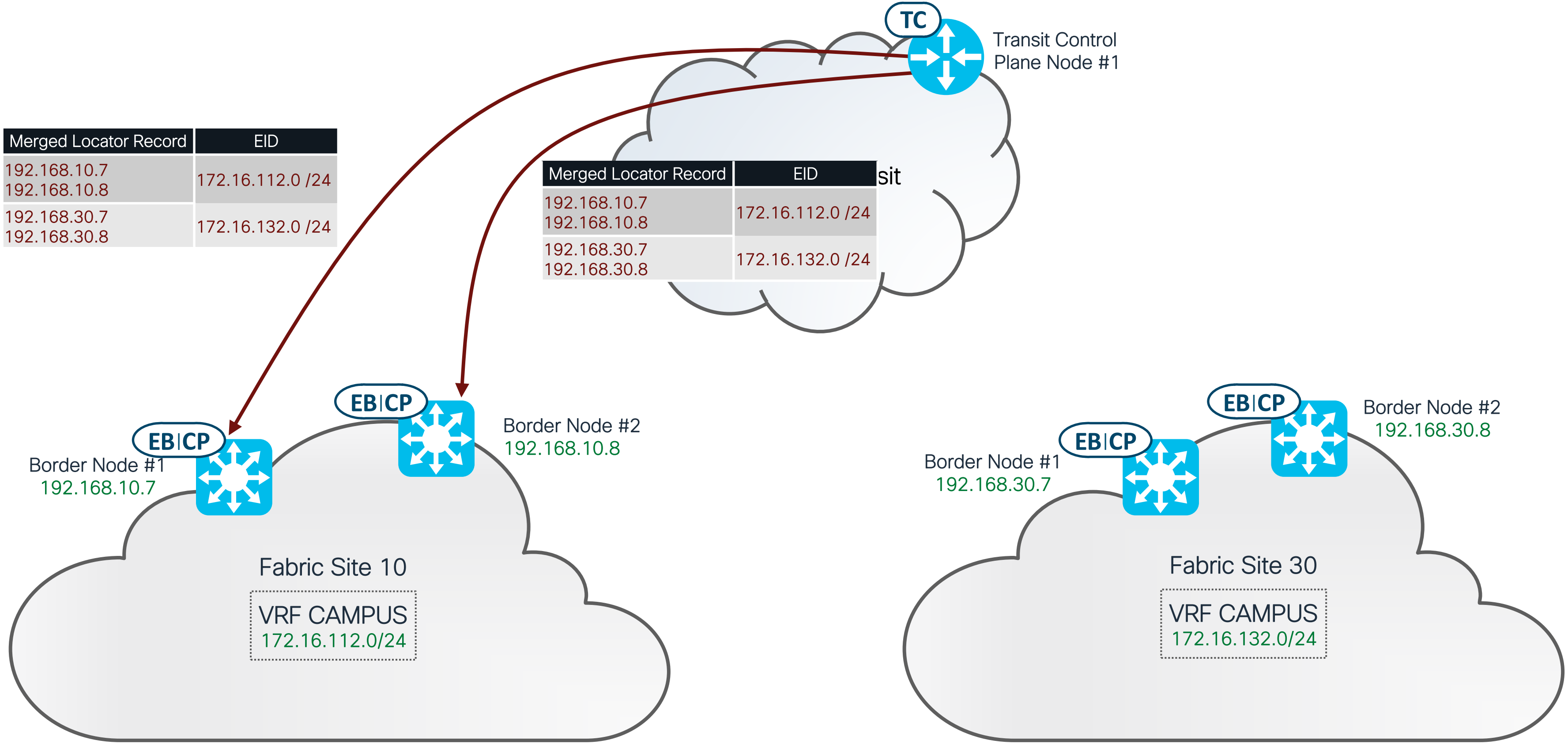
Locator	EID
192.168.30.8	172.16.132.0 /24

LISP Pub/Sub Registration and Publication in SD-Access Transit

Merged Locator Record	EID
192.168.10.7 192.168.10.8	172.16.112.0 /24
192.168.30.7 192.168.30.8	172.16.132.0 /24



LISP Pub/Sub Registration and Publication in SD-Access Transit



Merged Locator Record	EID
192.168.10.7 192.168.10.8	172.16.112.0 /24
192.168.30.7 192.168.30.8	172.16.132.0 /24

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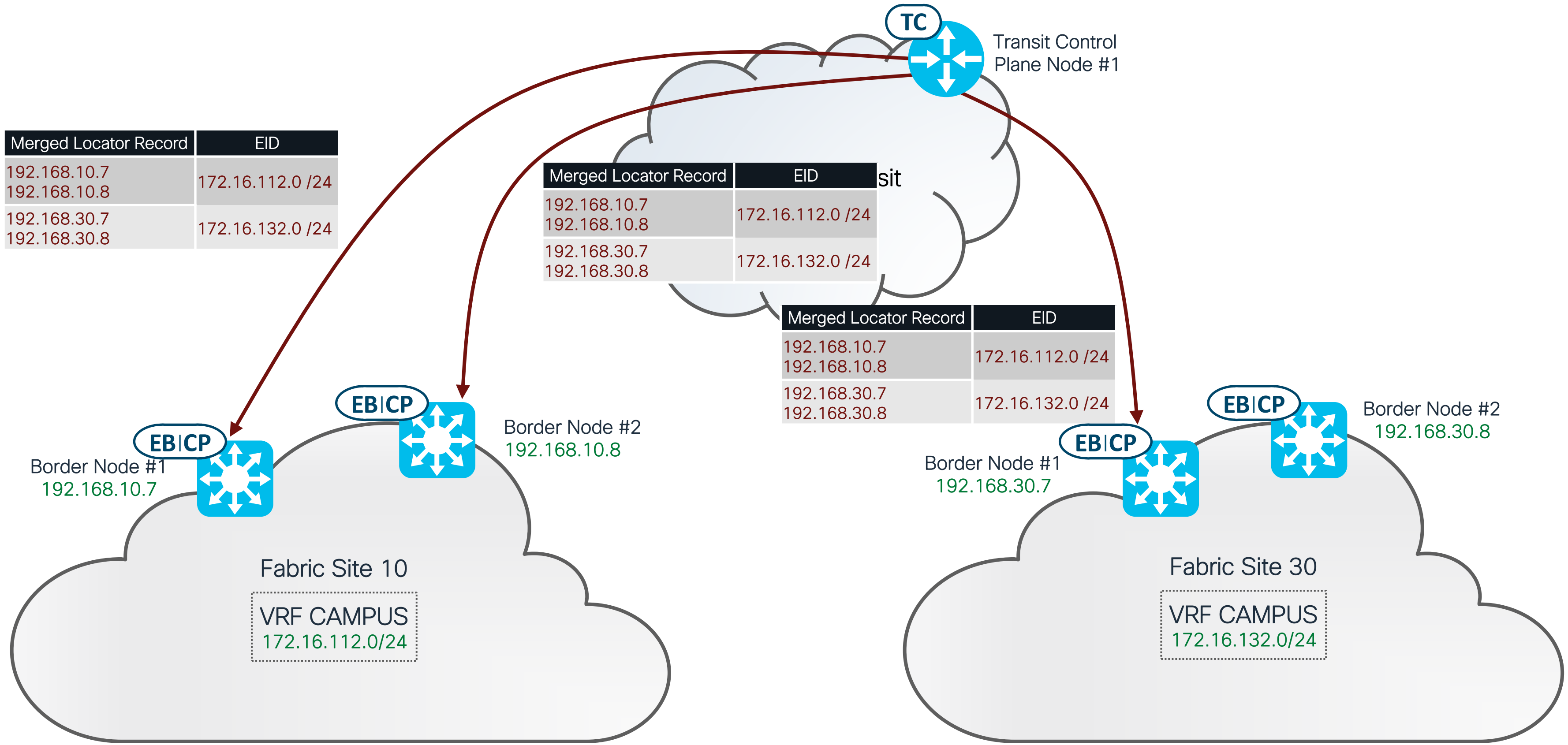
LISP Pub/Sub Registration and Publication in SD-Access Transit



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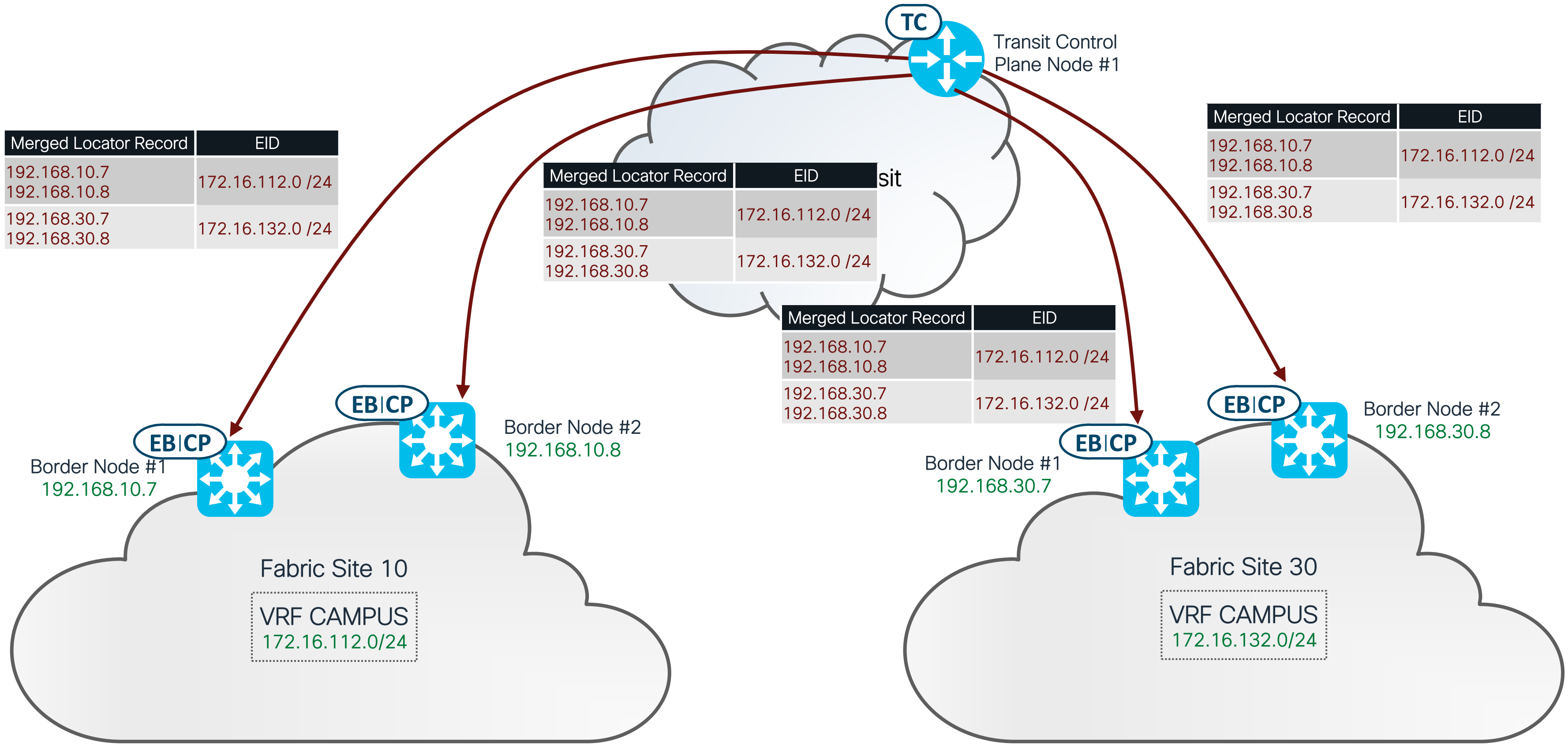

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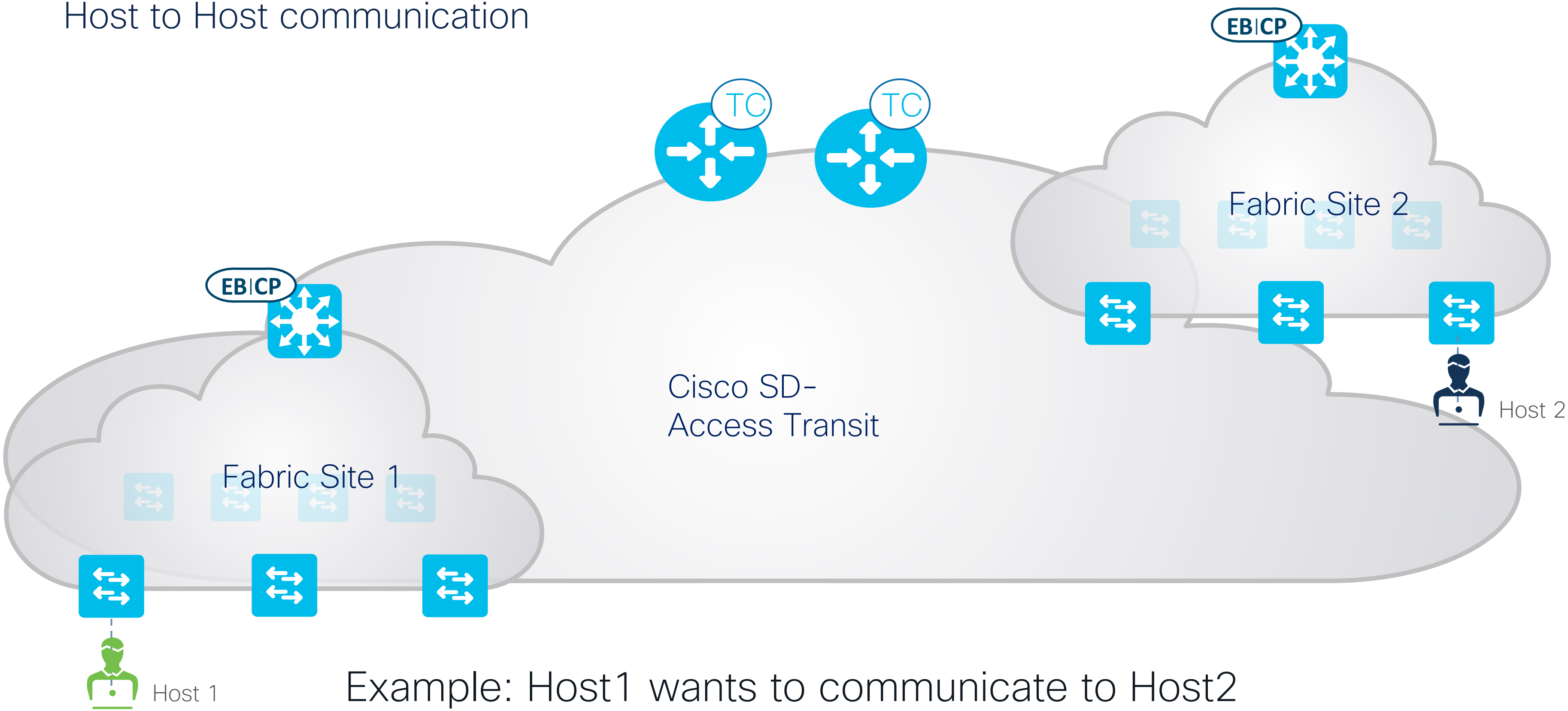
Merged Locator Record	EID
192.168.10.7 192.168.10.8	172.16.112.0 /24
192.168.30.7 192.168.30.8	172.16.132.0 /24

SD-Access Transit Packet Walk with LISP Pub/Sub

SD-Access Transit Forwarding with LISP Pub/Sub

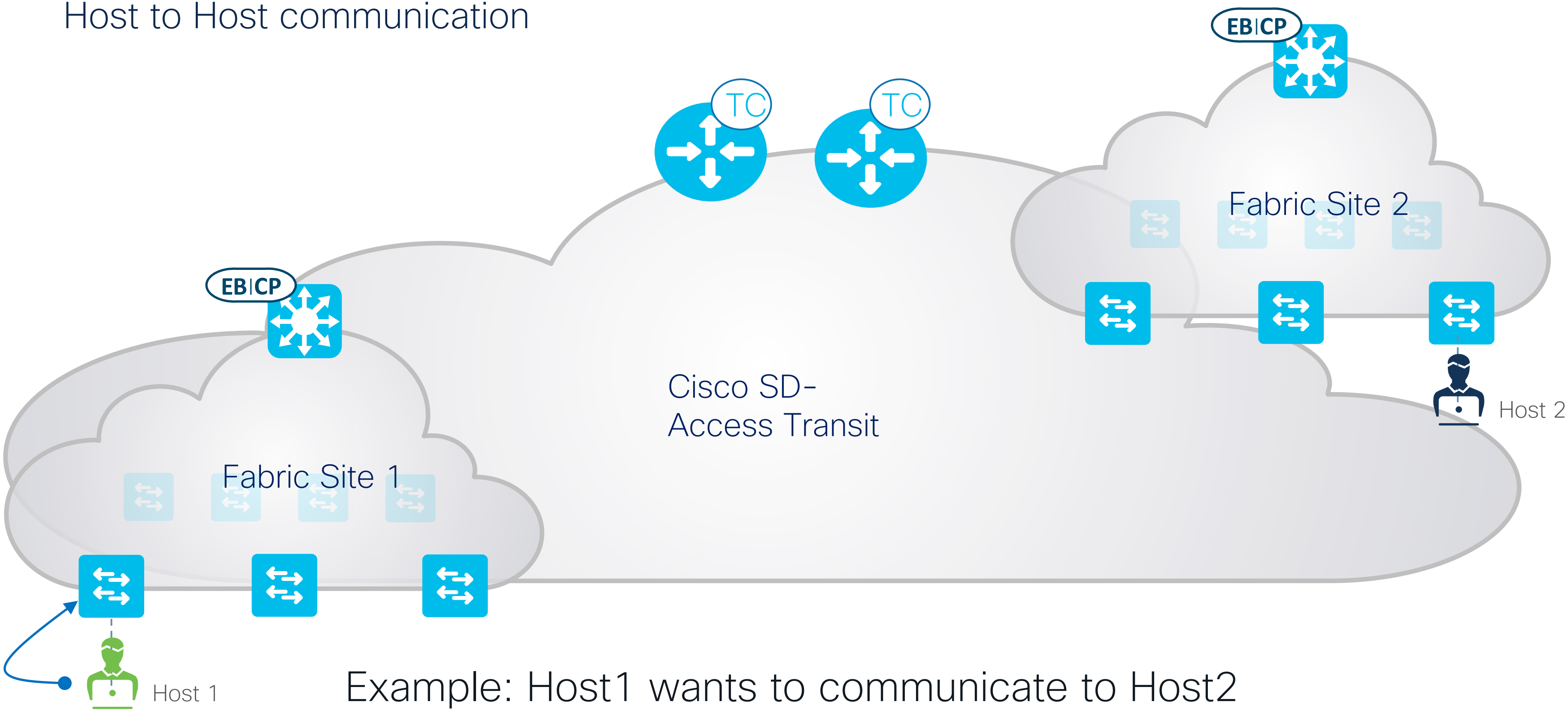
Host to Host communication



Example: Host1 wants to communicate to Host2

SD-Access Transit Forwarding with LISP Pub/Sub

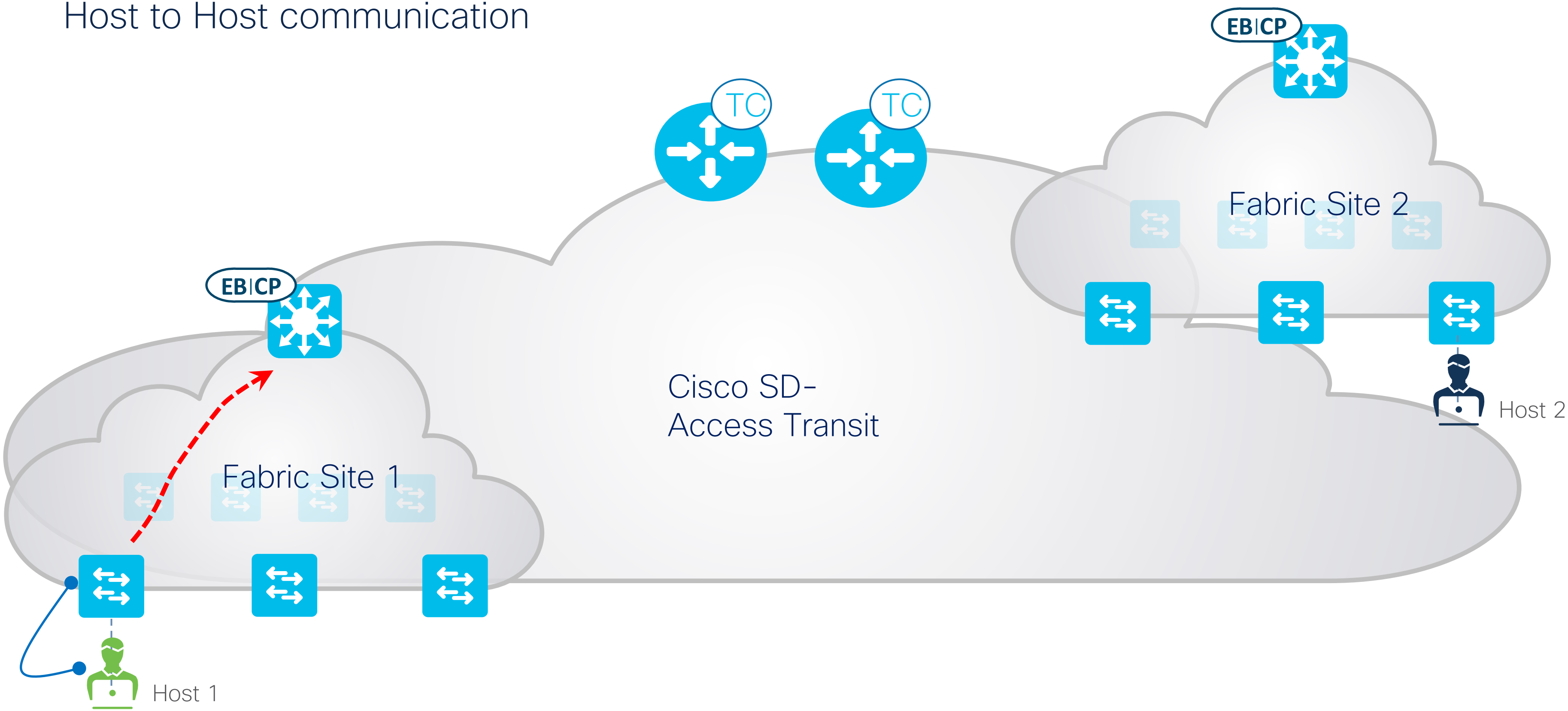
Host to Host communication



Example: Host1 wants to communicate to Host2

SD-Access Transit Forwarding with LISP Pub/Sub

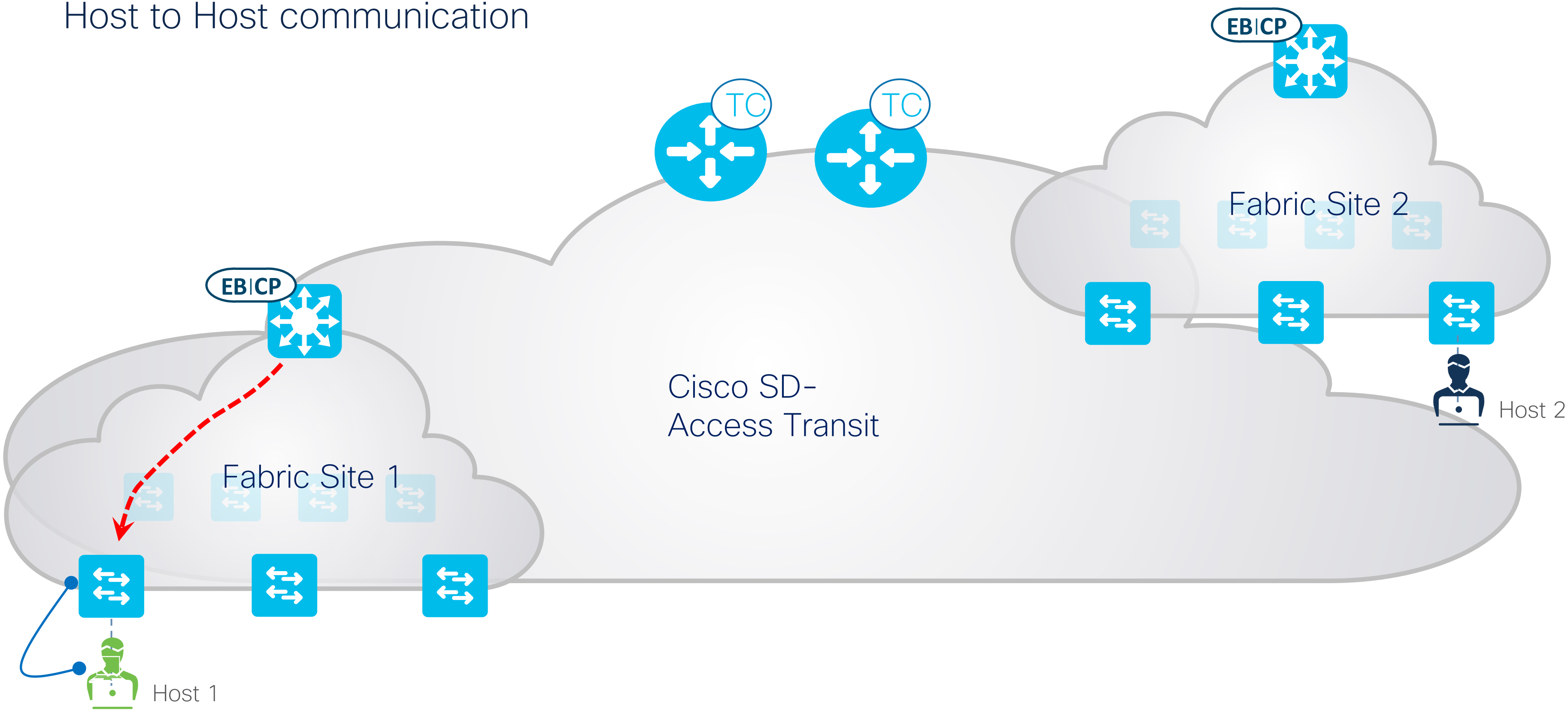
Host to Host communication



Edge Node in Fabric Site 1 sends a map-request to local Control Plane Node for host 2 IP in Fabric Site 2

SD-Access Transit Forwarding with LISP Pub/Sub

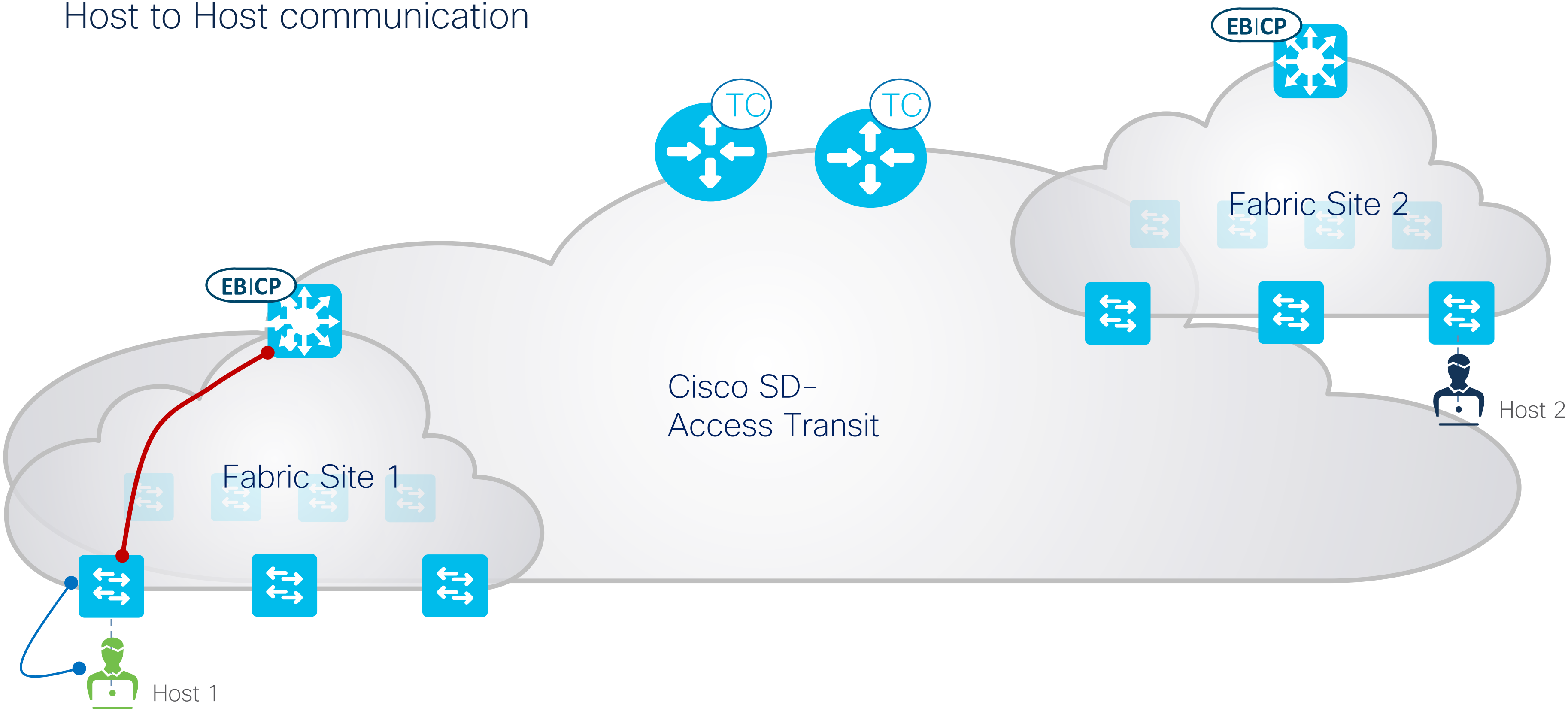
Host to Host communication



Fabric Control Plane Node in Fabric Site 1 sends a Negative map-reply(NMR) informing the Edge Node that it does not have information about Host 2

SD-Access Transit Forwarding with LISP Pub/Sub

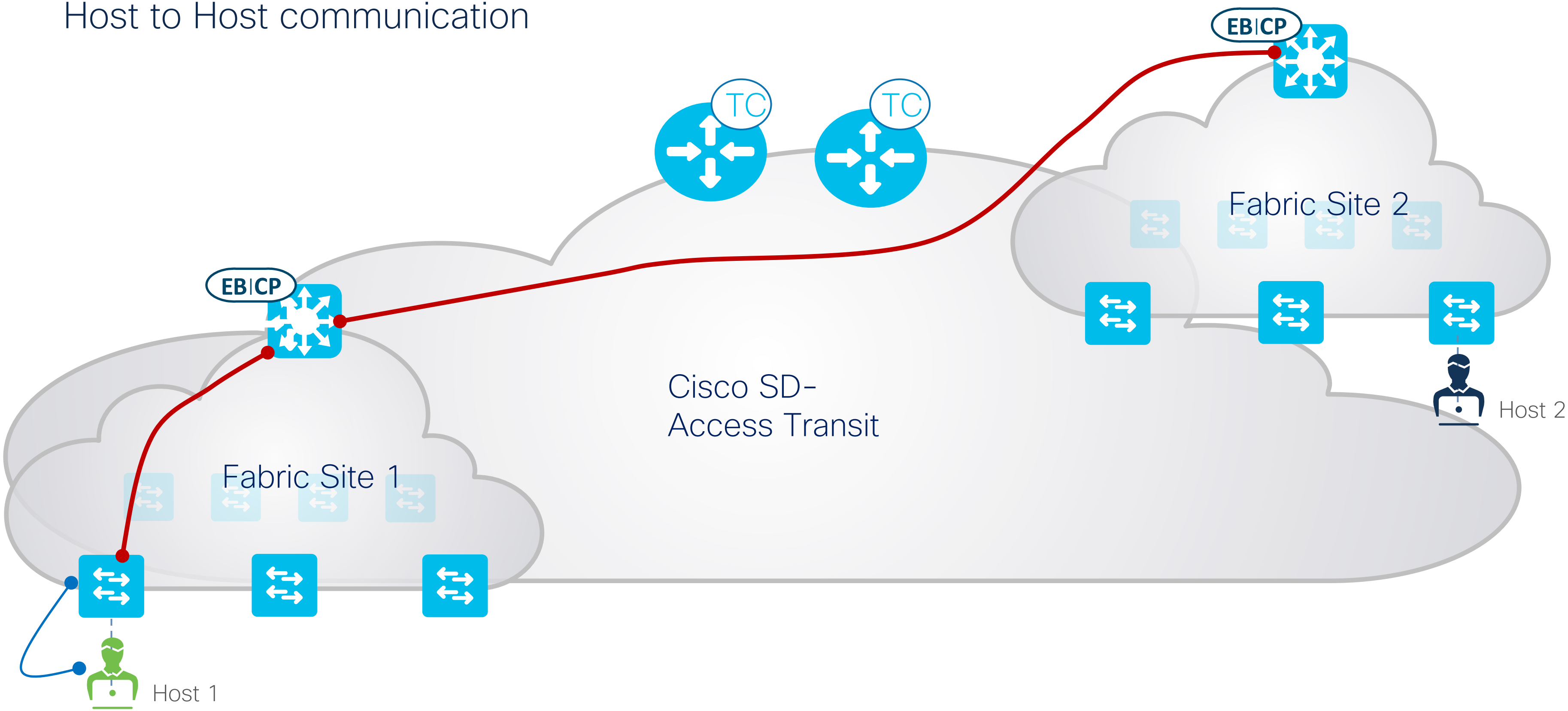
Host to Host communication



Traffic is VxLAN encapsulated from the Edge Node in Fabric Site 1 to the Site-local Border Node.

SD-Access Transit Forwarding with LISP Pub/Sub

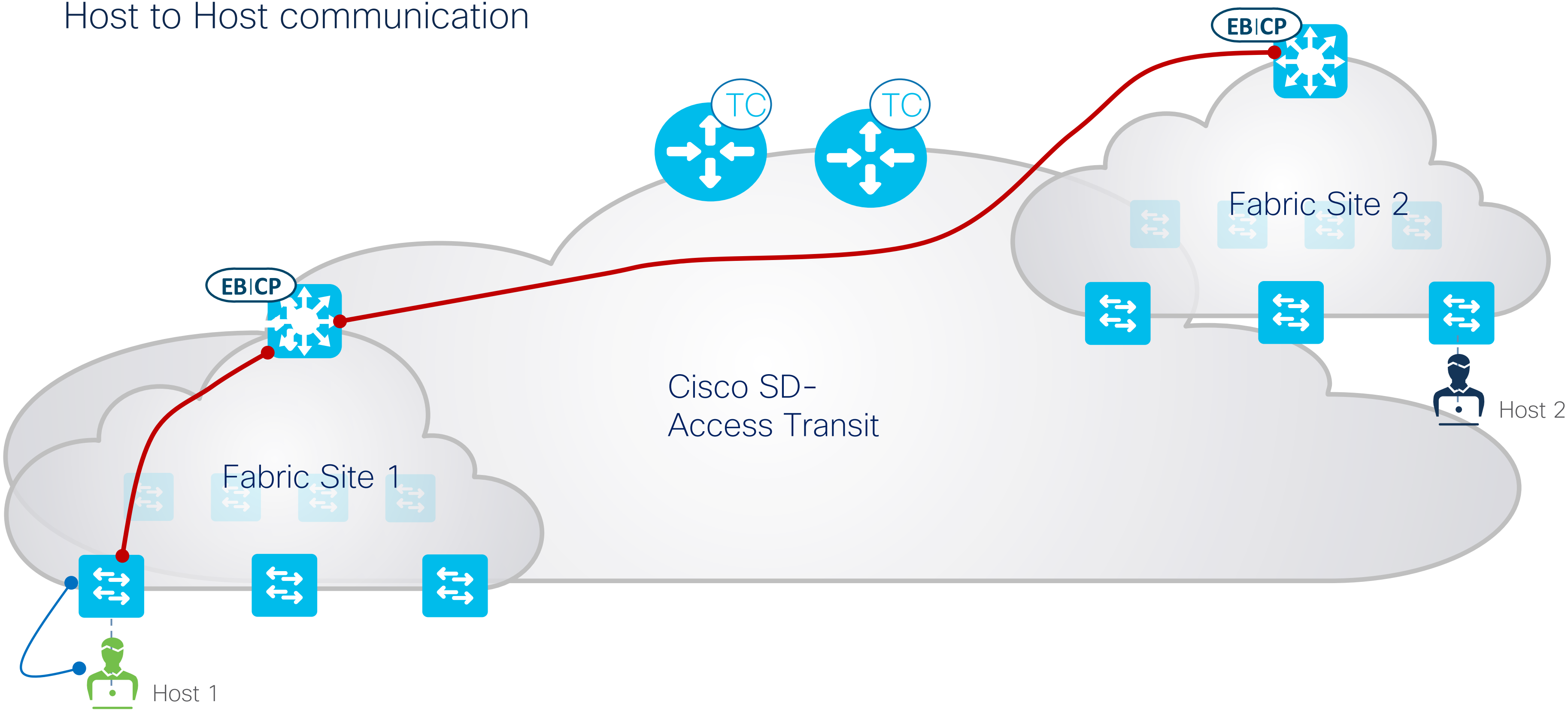
Host to Host communication



Traffic is forwarded from the Border Node in Fabric Site 1 to Fabric Site 2 using VXLAN encapsulation with SGT tags encoded.

SD-Access Transit Forwarding with LISP Pub/Sub

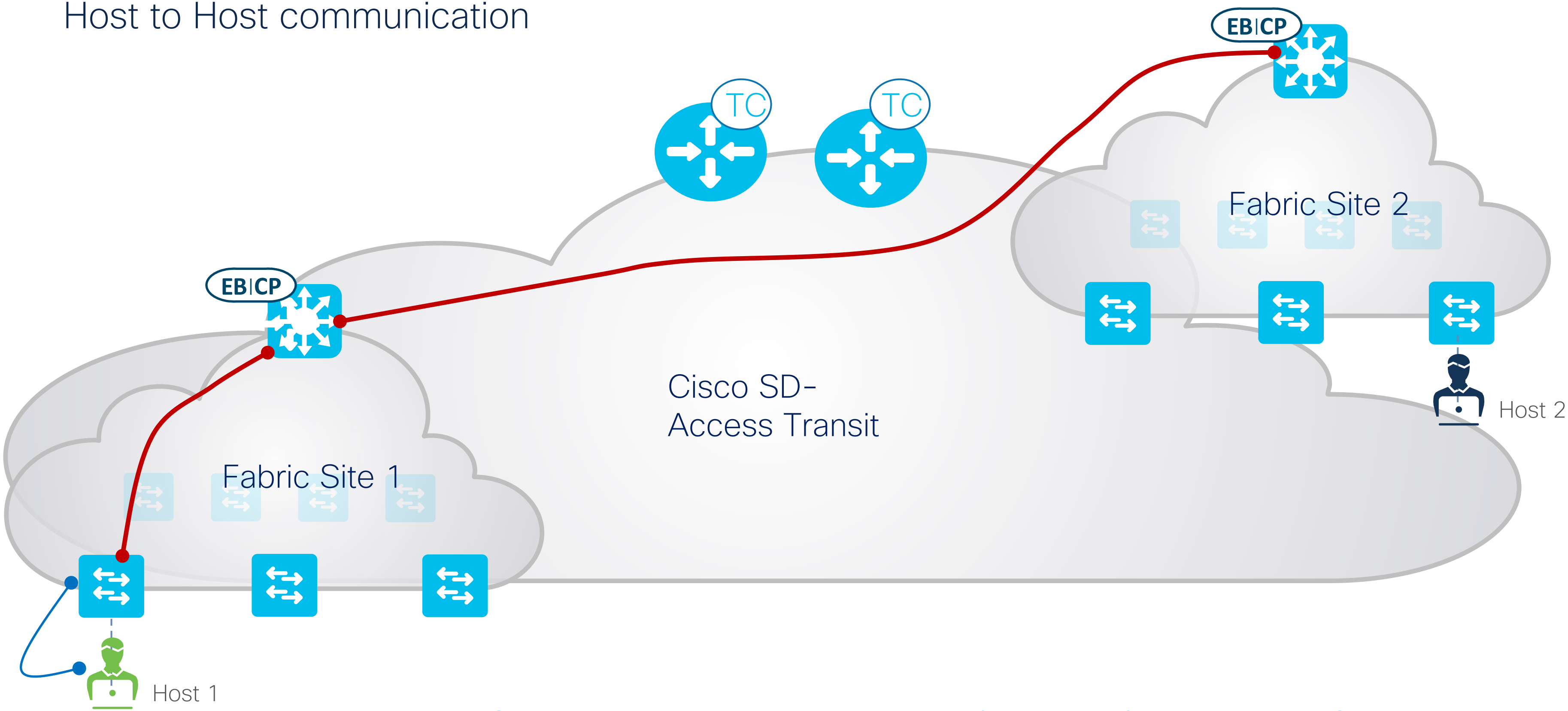
Host to Host communication



The Border Node in Fabric Site 2 will query the local Control Plane Node for the destination host.

SD-Access Transit Forwarding with LISP Pub/Sub

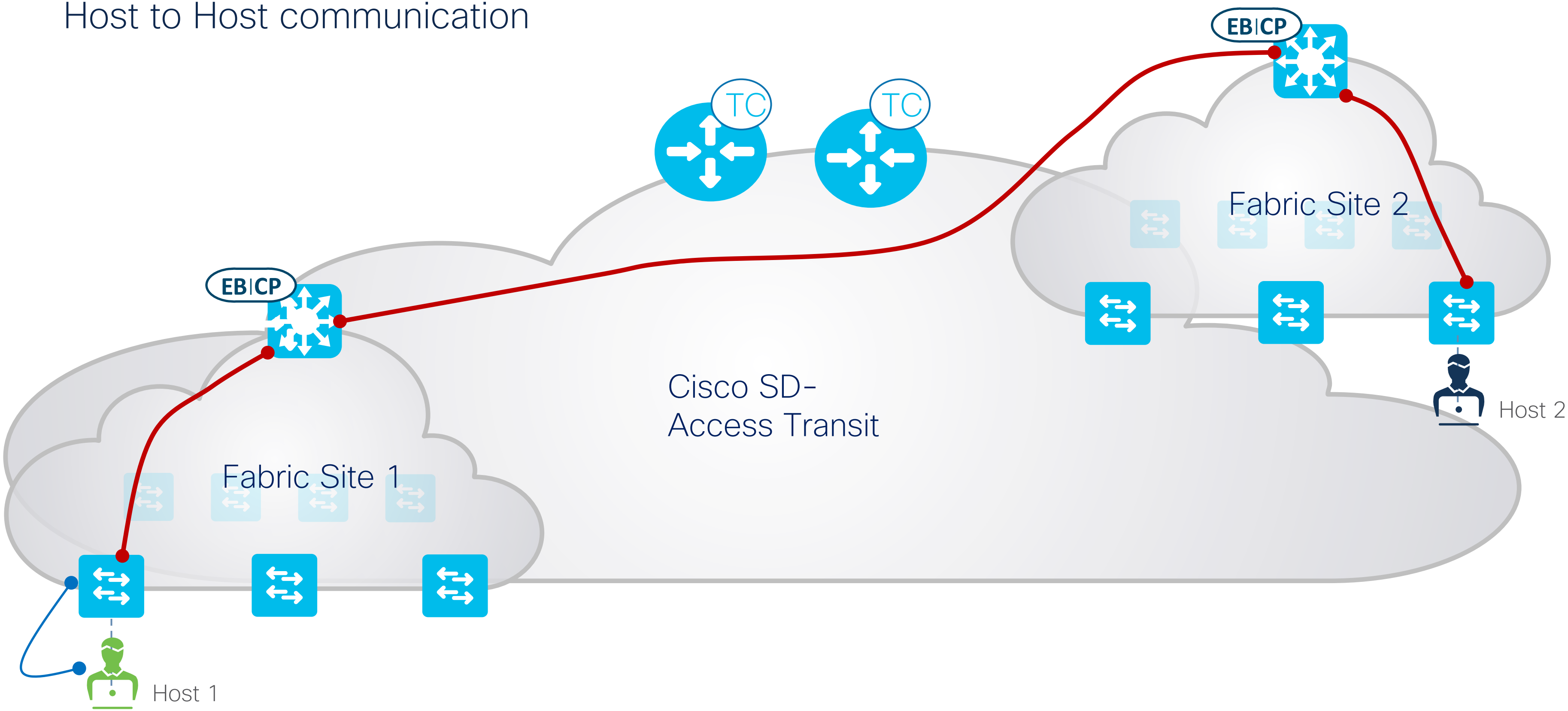
Host to Host communication



The Border Node in Fabric Site 2 will receive the mapping information from the local Control Plane Node with the destination address of the Edge Node in Fabric Site 2

SD-Access Transit Forwarding with LISP Pub/Sub

Host to Host communication

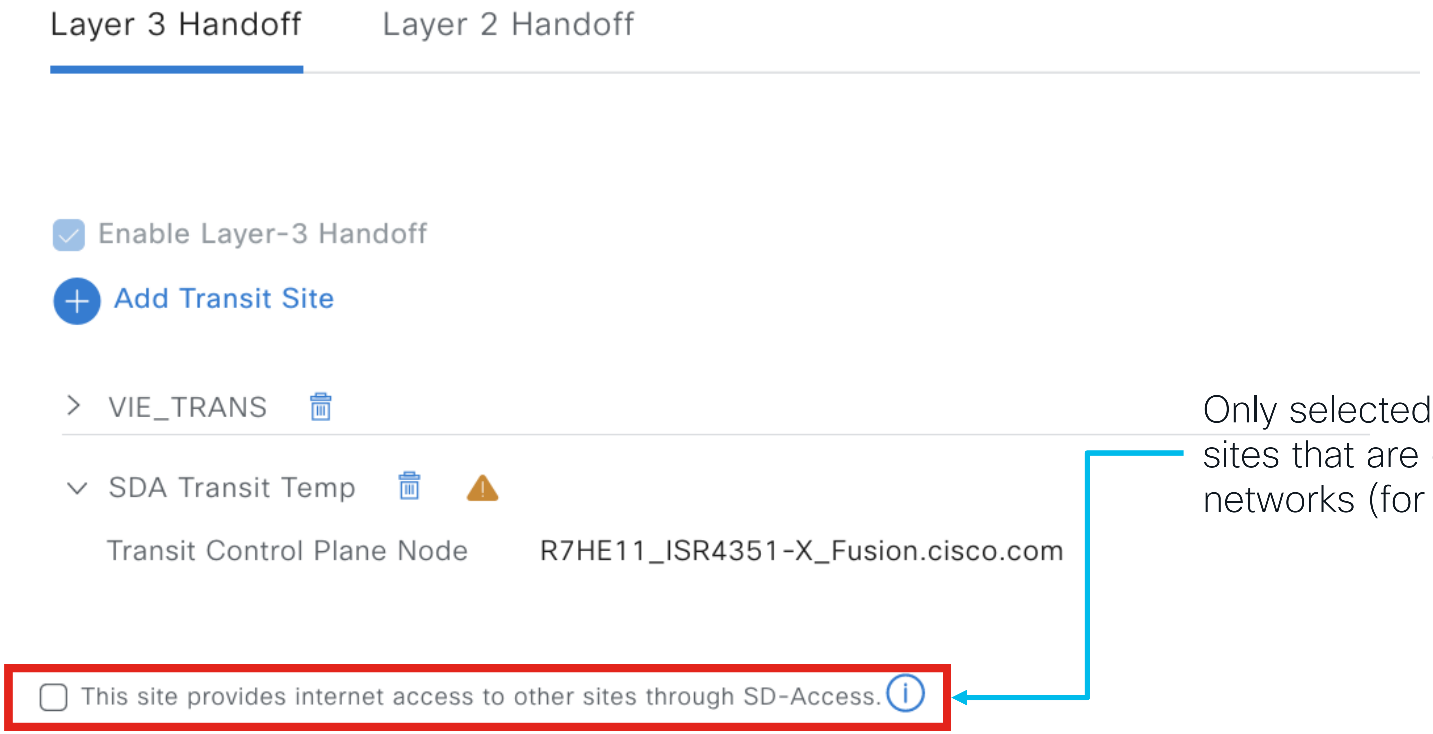


Traffic is forwarded from fabric border node in fabric site 2 to the fabric edge node in fabric site 2 using VXLAN encap with SGT tags encoded

SD-Access Transit Remote Internet with LISP Pub/Sub

SD-Access Transit Remote Internet with LISP Pub/Sub

Designating the Border(s) Connected to the Internet



Layer 3 Handoff | Layer 2 Handoff

☑ Enable Layer-3 Handoff

⊕ Add Transit Site

> VIE_TRANS

⌄ SDA Transit Temp

Transit Control Plane Node R7HE11_ISR4351-X_Fusion.cisco.com

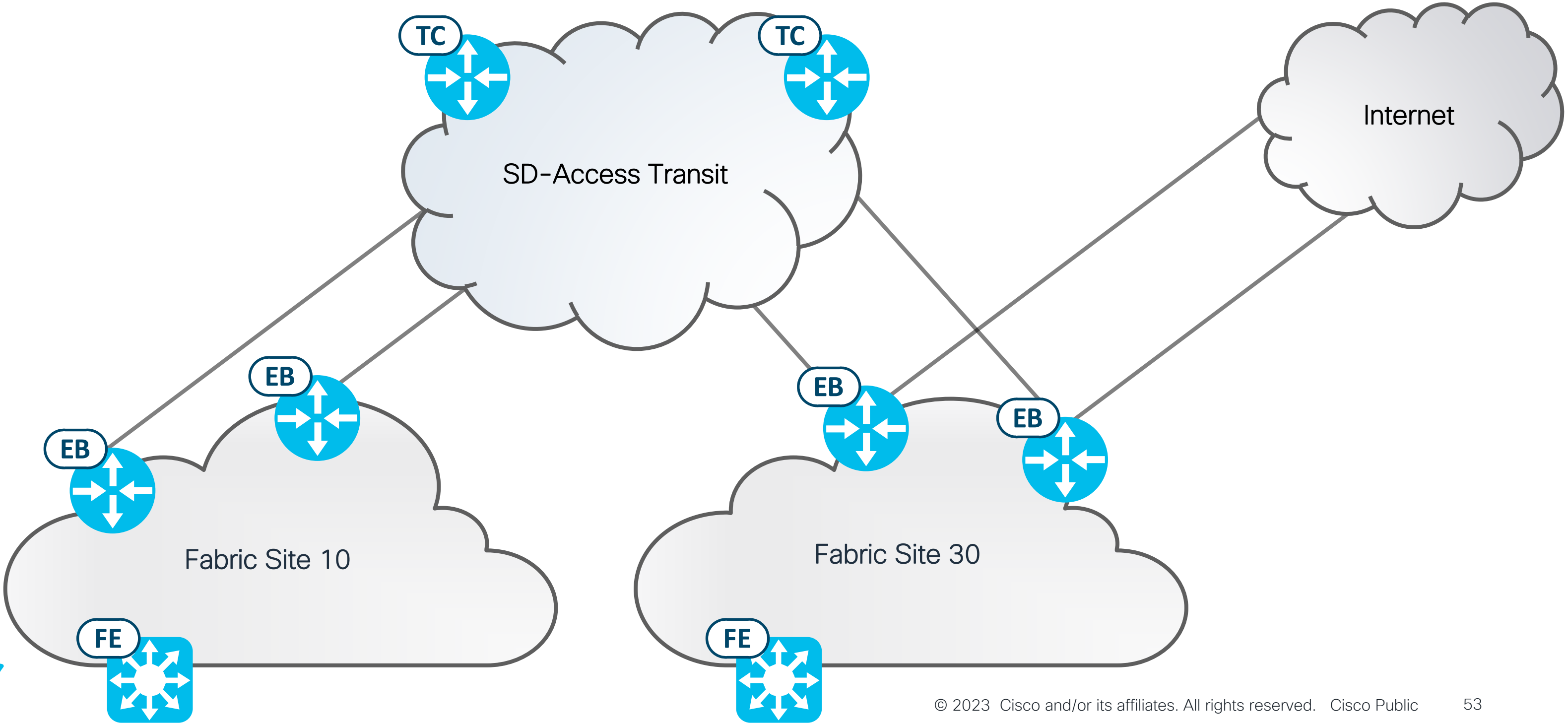
□ This site provides internet access to other sites through SD-Access. ⓘ

Only selected for SD-Access Transit sites that are connected to unknown networks (for example, Internet)

SD-Access Transit Remote Internet with LISP Pub/Sub

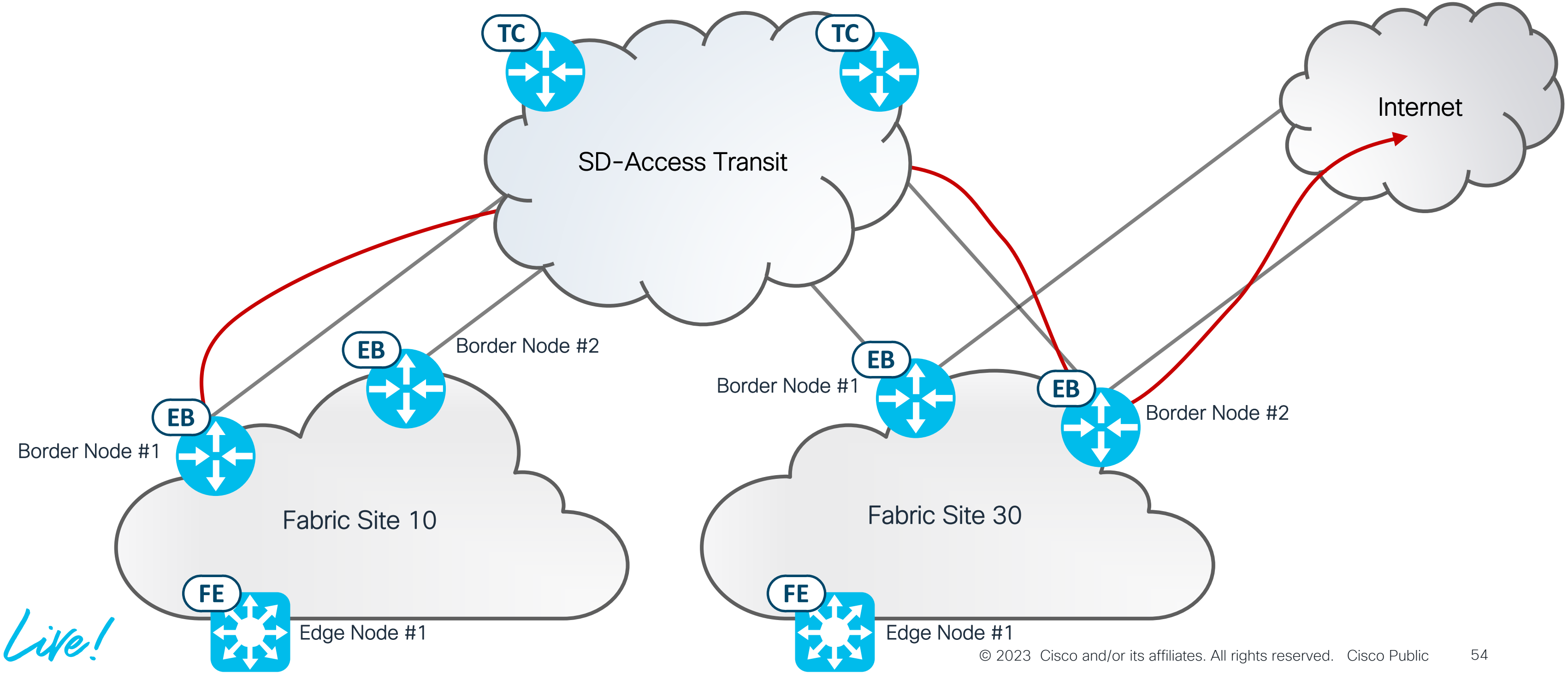
Topology and Description

- Two Fabric Sites connected to an SD-Access Transit.
- Fabric Site 30 local Internet.
- Fabric Site 30 is sharing Internet access with the deployment.



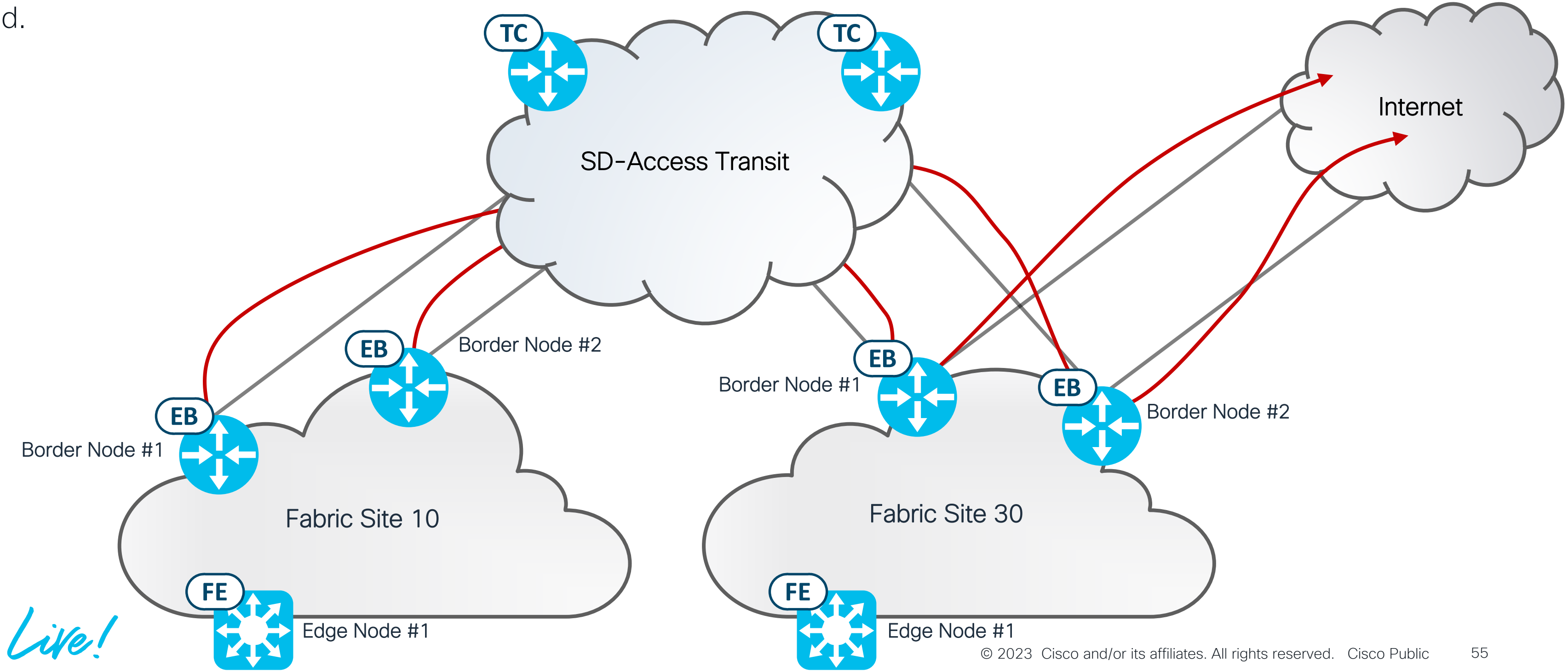
LISP Remote Internet with Border Convergence

- Border Node #1 uses Internet available through Fabric Site 30. Either of the Border Nodes in Fabric Site 30 will be used.



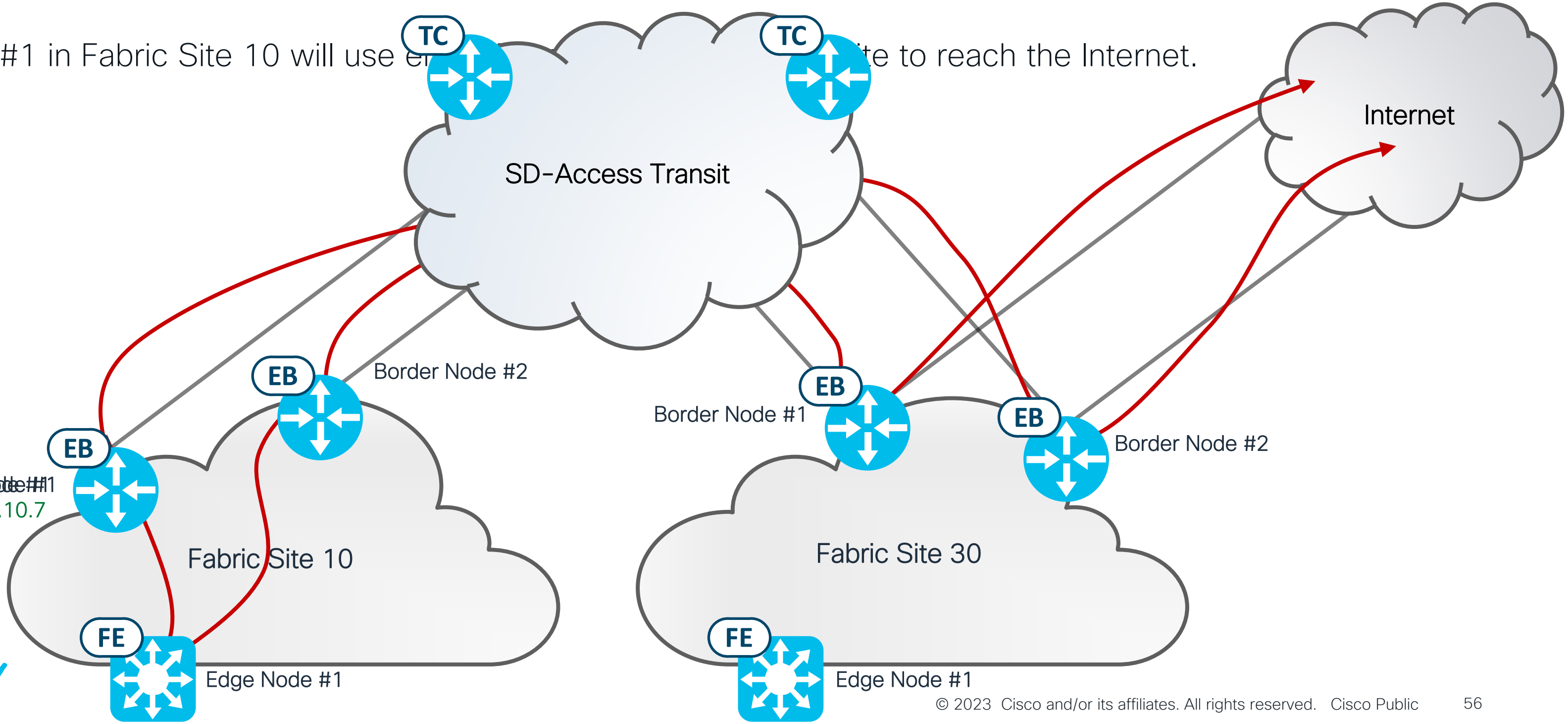
LISP Remote Internet with Border Convergence

- Border Node #1 uses Internet available through Fabric Site 30. Either of the Border Nodes in Fabric Site 30 will be used.
- Border Node #2 uses Internet available through Fabric Site 30. Either of the Border Nodes in Fabric Site 30 will be used.



LISP Remote Internet with Border Convergence

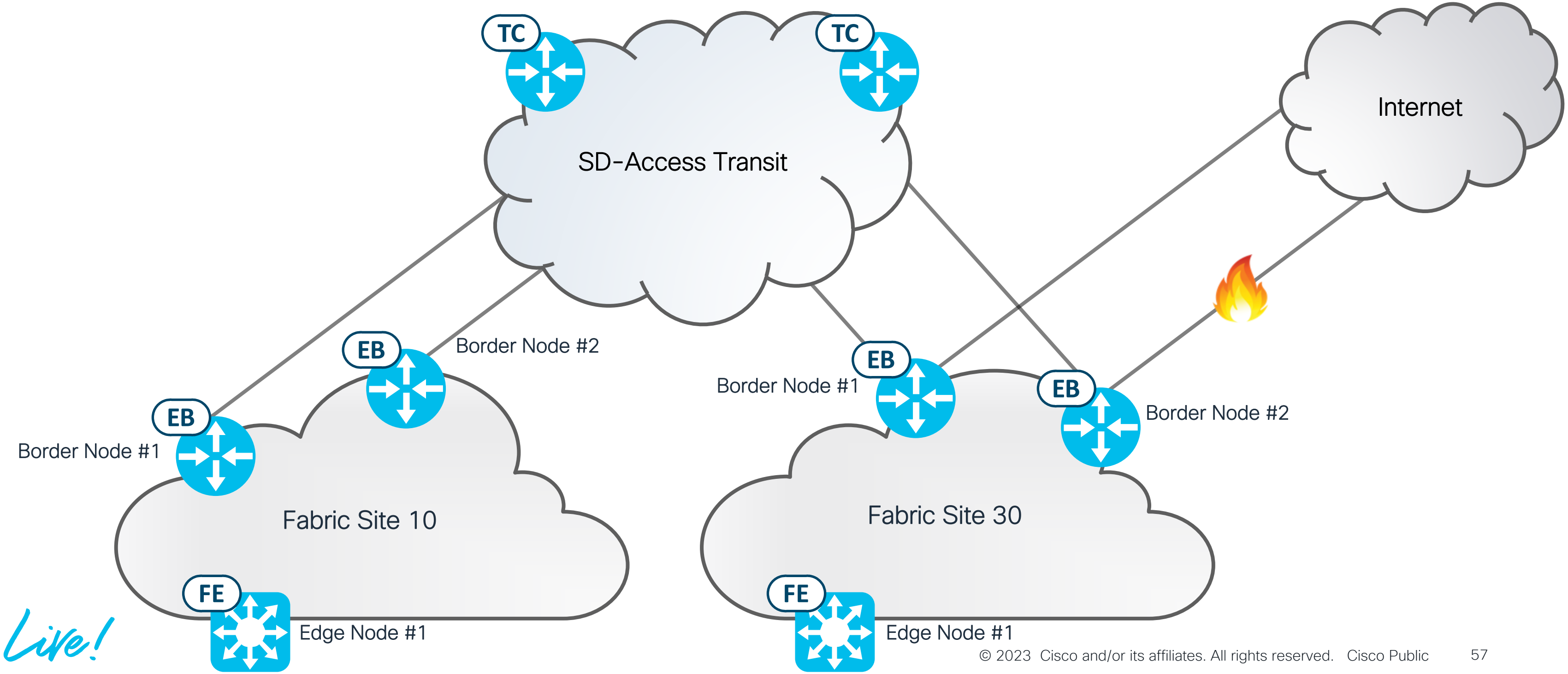
- Border Node #1 uses Internet available through Fabric Site 30. Either of the Border Nodes in Fabric Site 30 will be used.
- Border Node #2 uses Internet available through Fabric Site 30. Either of the Border Node in Fabric Site 30 will be used.
- Edge Node #1 in Fabric Site 10 will use ei te to reach the Internet.



cisco Live!

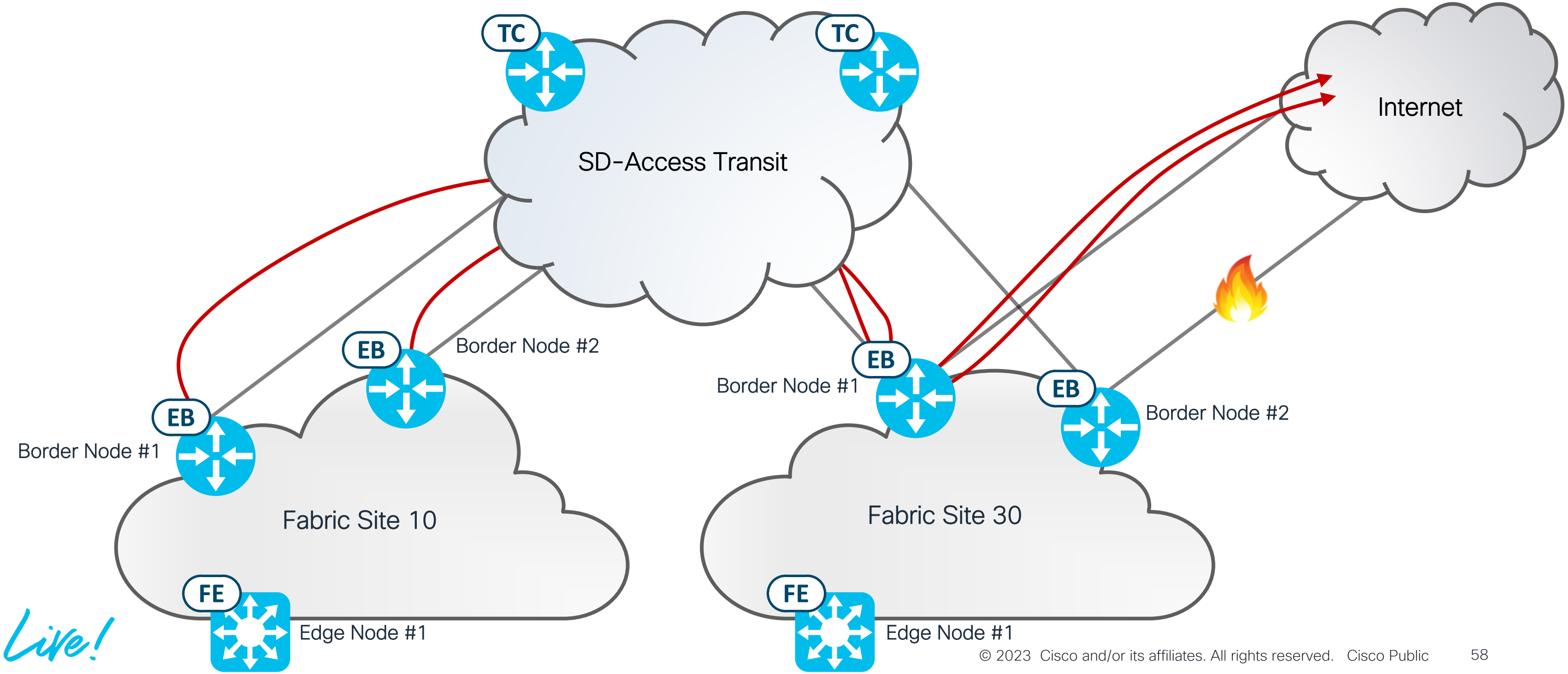
LISP Remote Internet with Border Convergence

- Border Node #2 in Fabric Site 30 loses the default route.



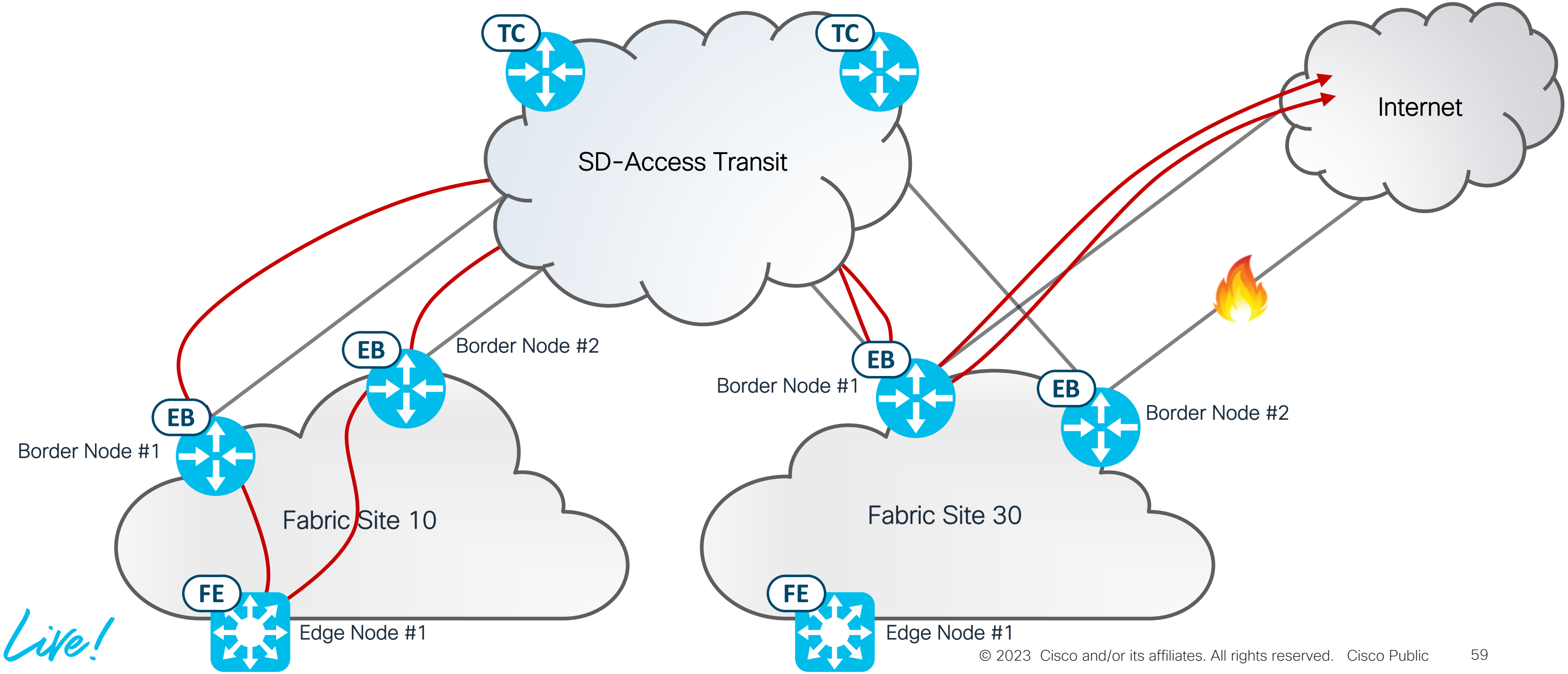
LISP Remote Internet with Border Convergence

- Both Border Nodes in Fabric Site 10 will use Border Node #1 in Fabric Site 30 to reach the Internet.



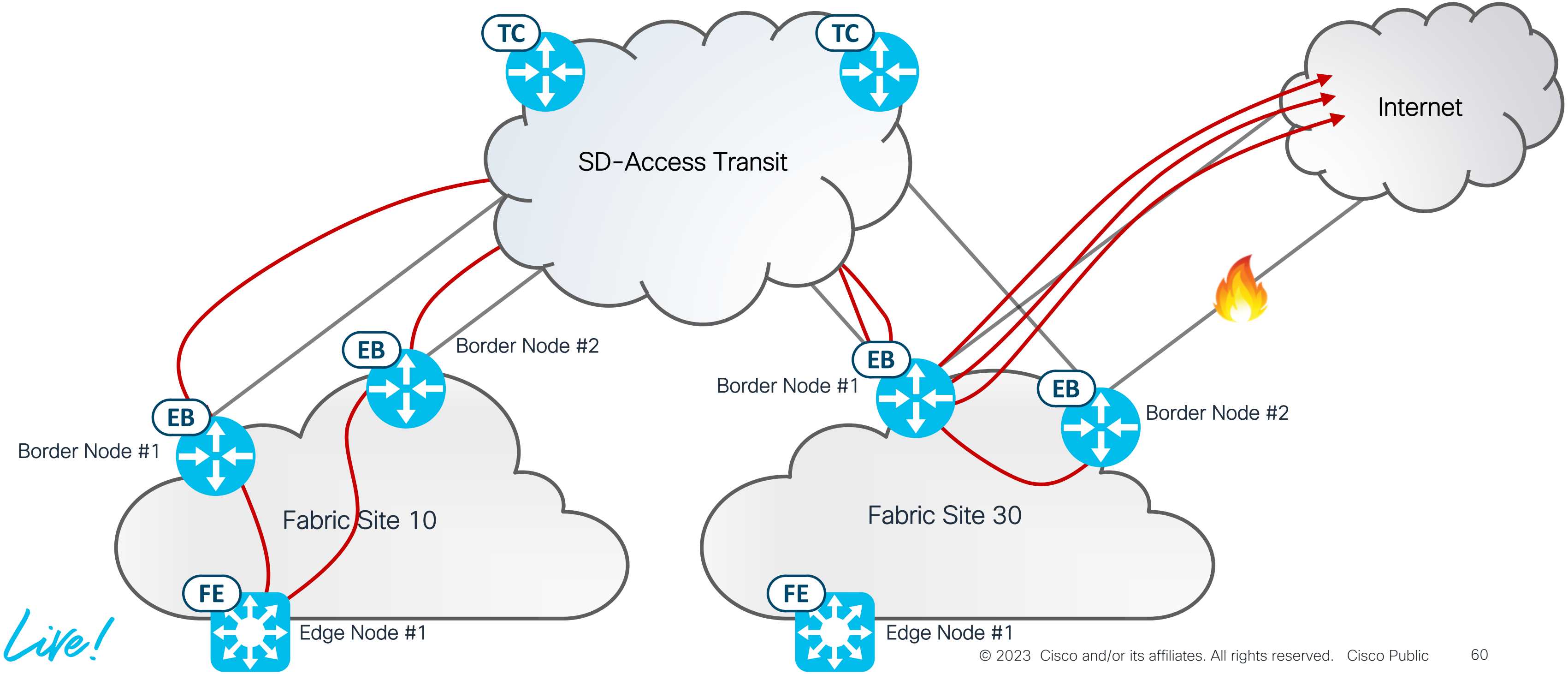
LISP Remote Internet with Border Convergence

- Edge Node #1 in Fabric Site 10 will continue to use either site-local Border Node to reach the Internet.



LISP Remote Internet with Border Convergence

- Border Node #2 in Fabric Site 30 will use Border Node #1 in Fabric Site 30 to reach the Internet.

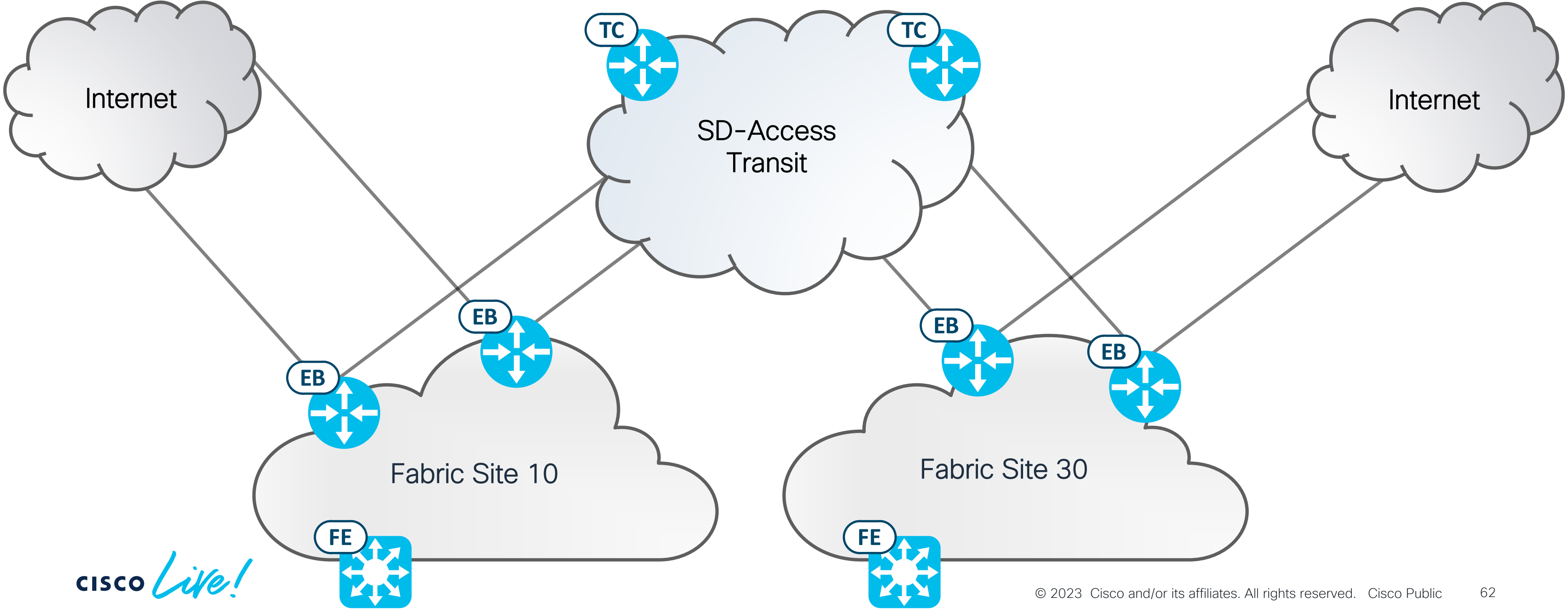


SD-Access Transit Backup Internet Access with LISP Pub/Sub

LISP Backup Internet with Border Convergence

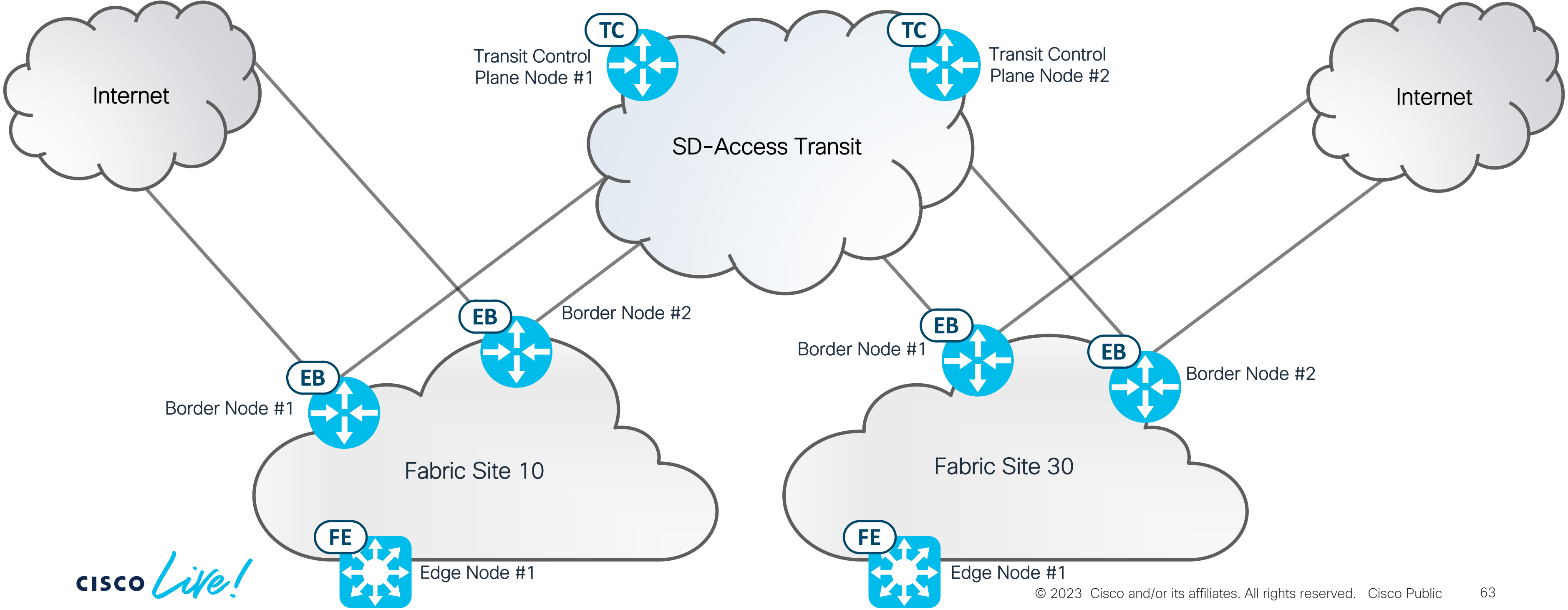
Topology and Description

- Two Fabric Sites connected to an SD-Access Transit.
- Both Fabric Sites have local Internet.
- Both Sites are sharing Internet access.



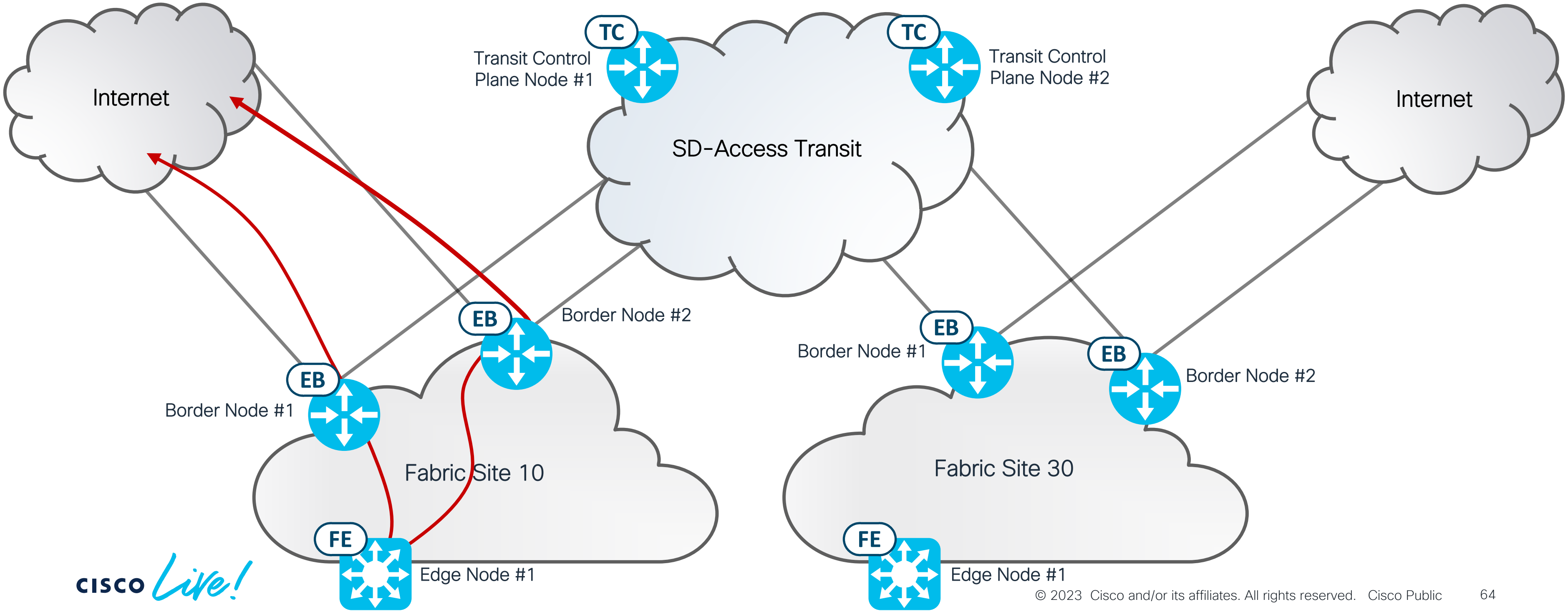
LISP Backup Internet with Border Convergence

- Two Fabric Sites connected to an SD-Access Transit.
- Both Fabric Sites have local Internet.
- Both Sites are sharing Internet access.



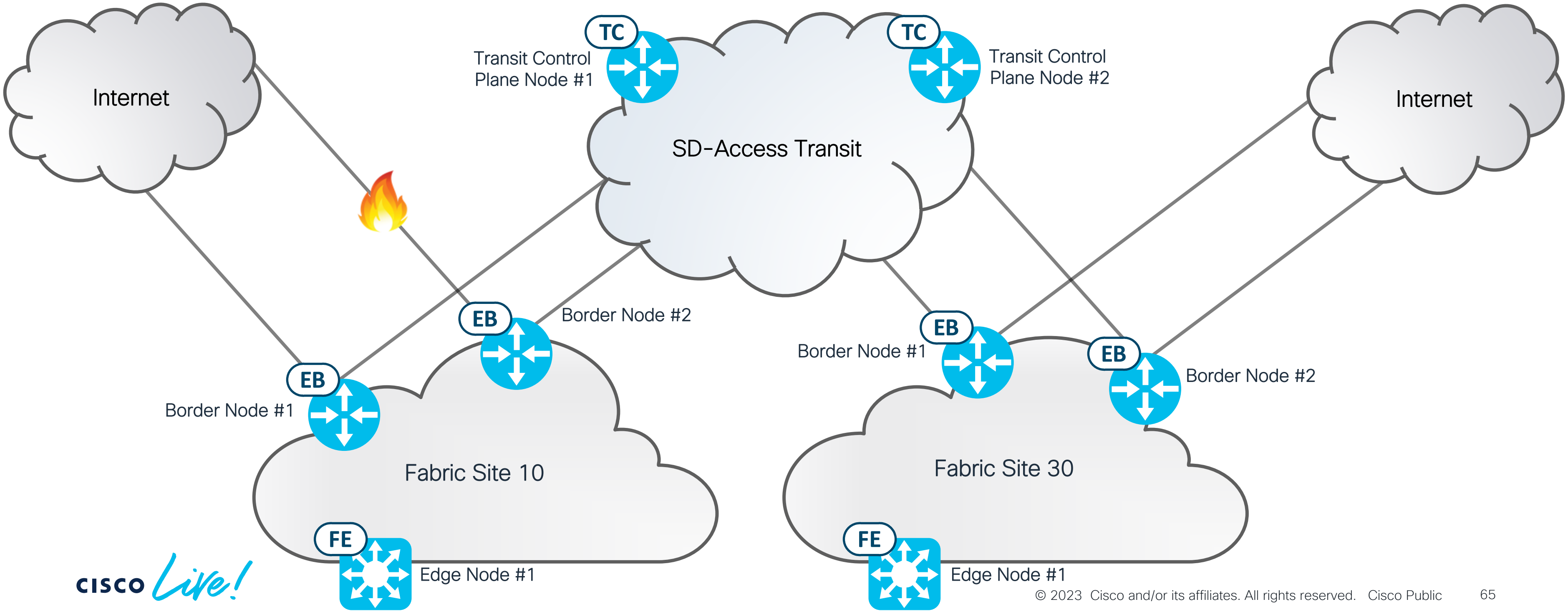
LISP Backup Internet with Border Convergence

- Edge Node #1 will initially use either site-local Border Node to reach the Internet.



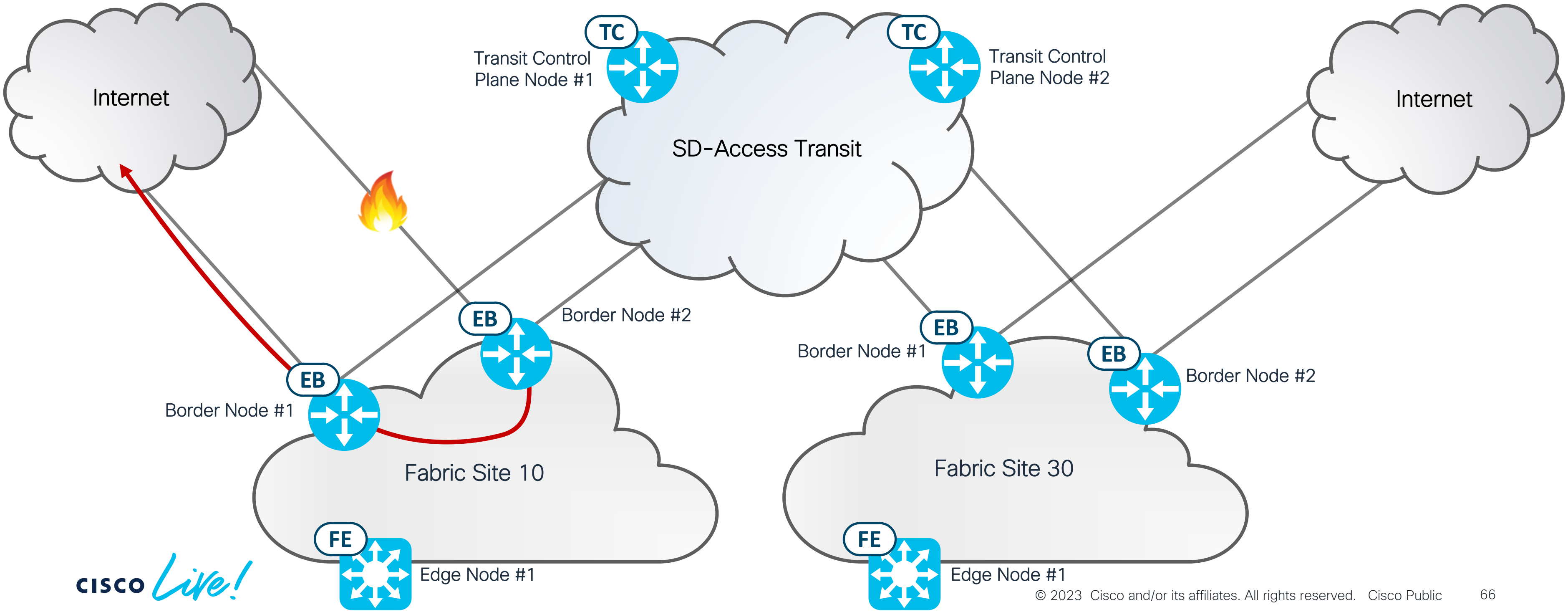
LISP Backup Internet with Border Convergence

- Border Node #2 in Fabric Site 10 loses the default route.



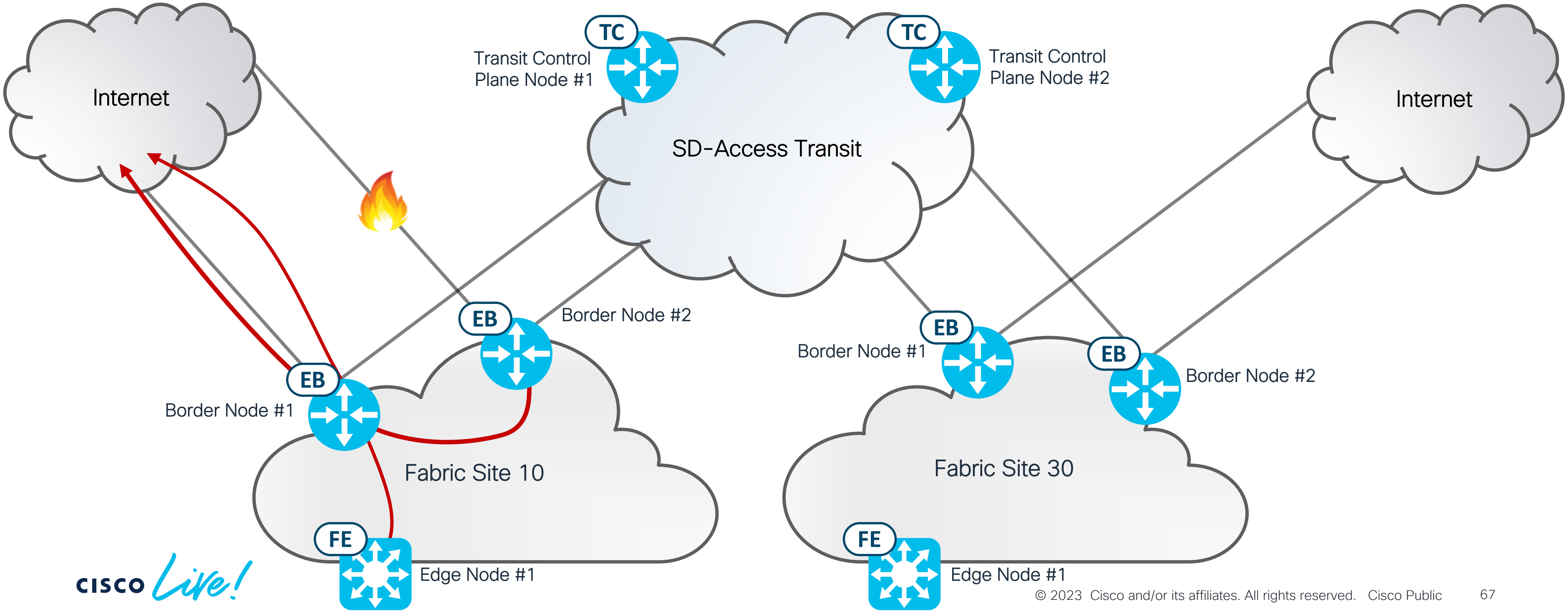
LISP Backup Internet with Border Convergence

- Border Node #2 will use Border Node #1 in Fabric Site 10 to reach the Internet.



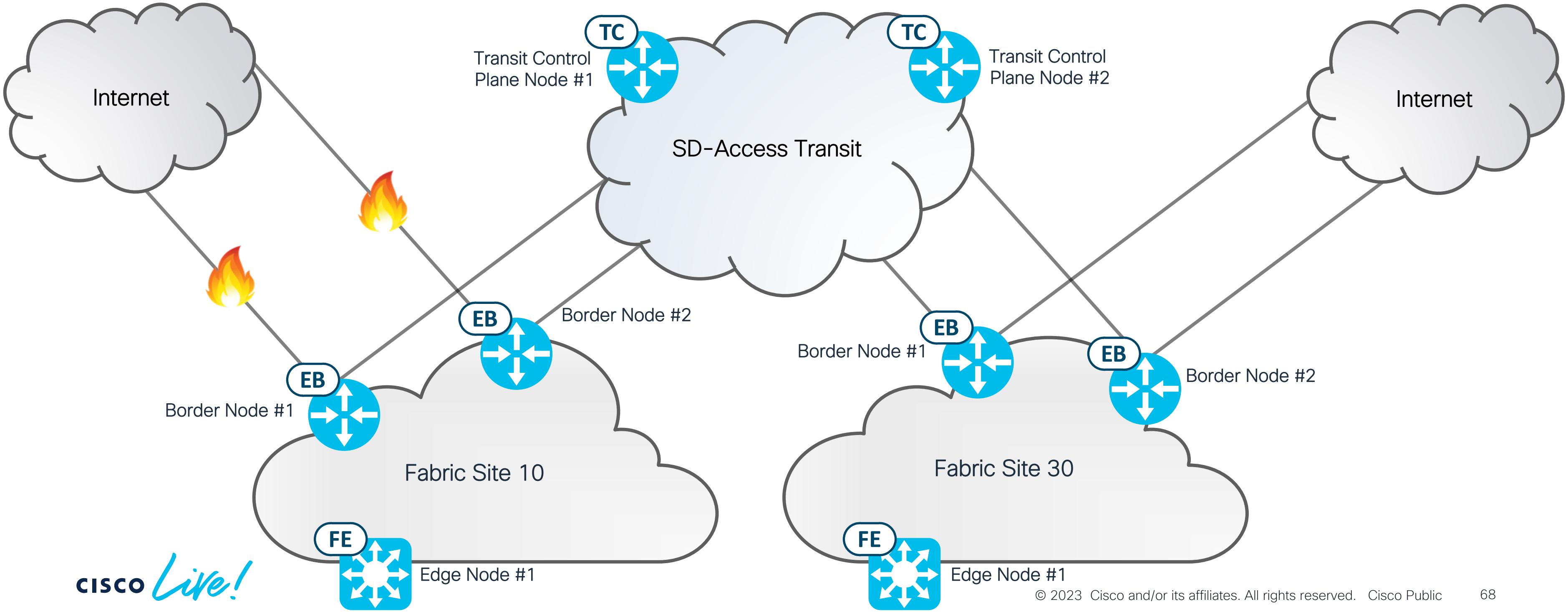
LISP Backup Internet with Border Convergence

- Edge Node #1 will only use Border Node #1 in in Fabric Site 10 to reach the Internet.



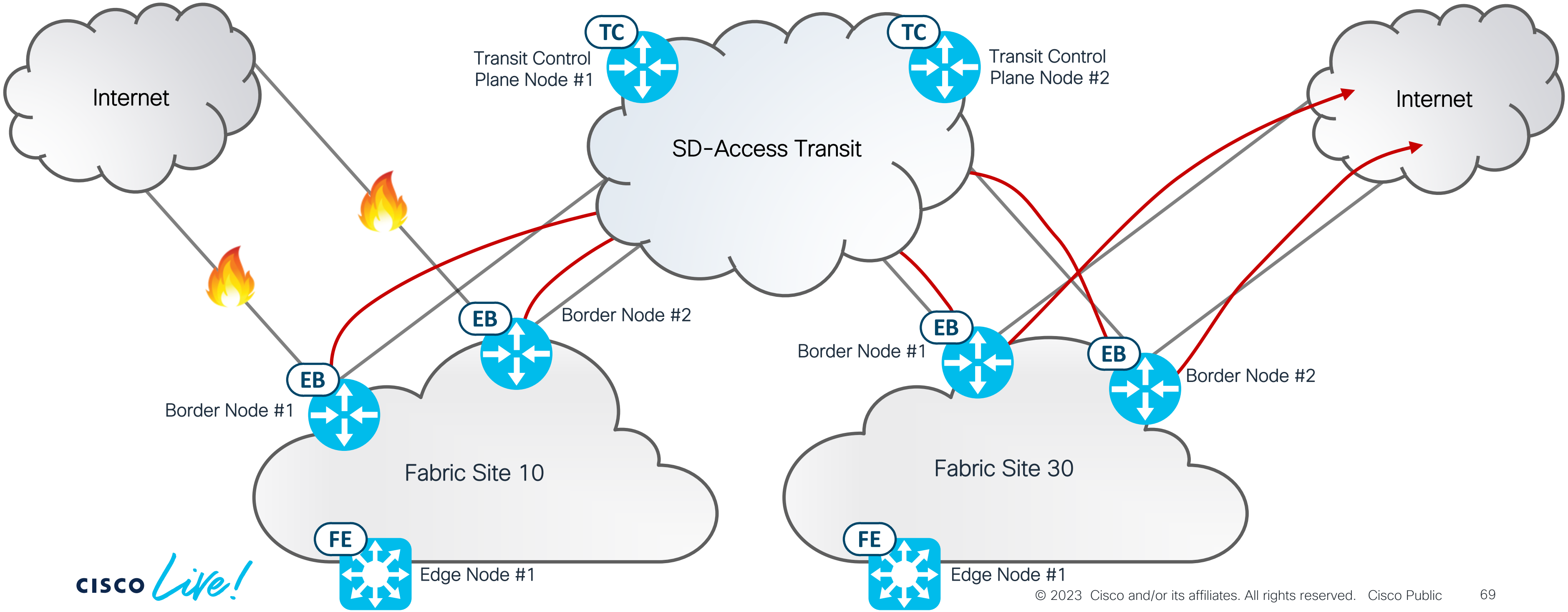
LISP Backup Internet with Border Convergence

- Border Node #2 in Fabric Site 10 loses the default route.
- Border Node #1 in Fabric Site 10 also loses the default route.



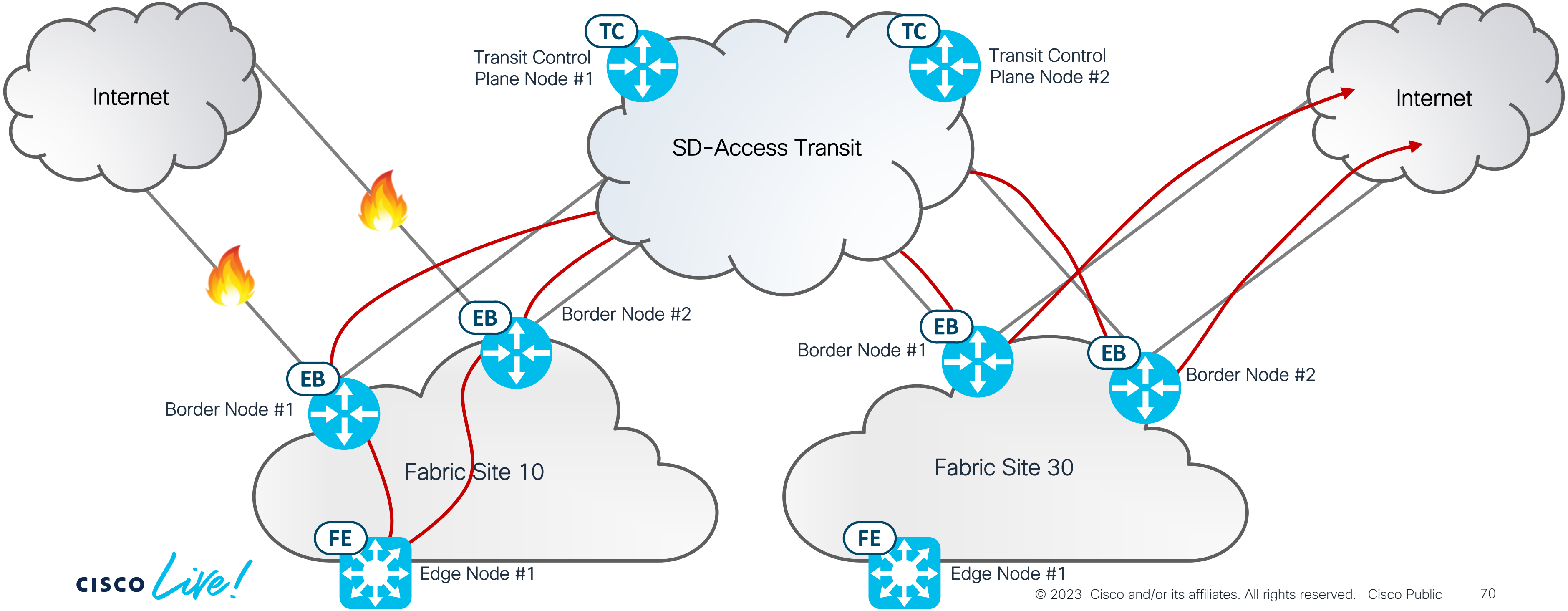
LISP Backup Internet with Border Convergence

- The Border Nodes in Fabric Site 10 will use the Border Nodes in Site 30 for Internet Access.
- Either of the Border Nodes in Fabric Site 30 will be used.



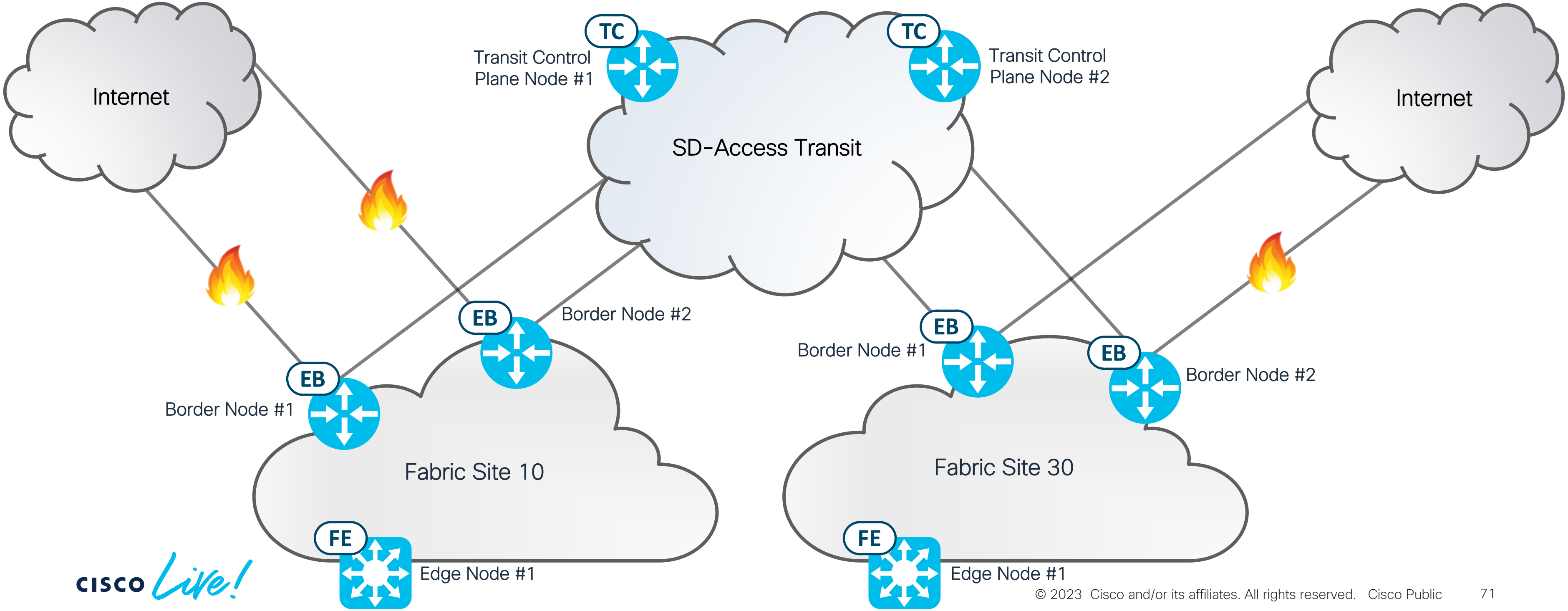
LISP Backup Internet with Border Convergence

- Edge Node #1 in Fabric Site 10 will both site-local Border Nodes for Internet Access.



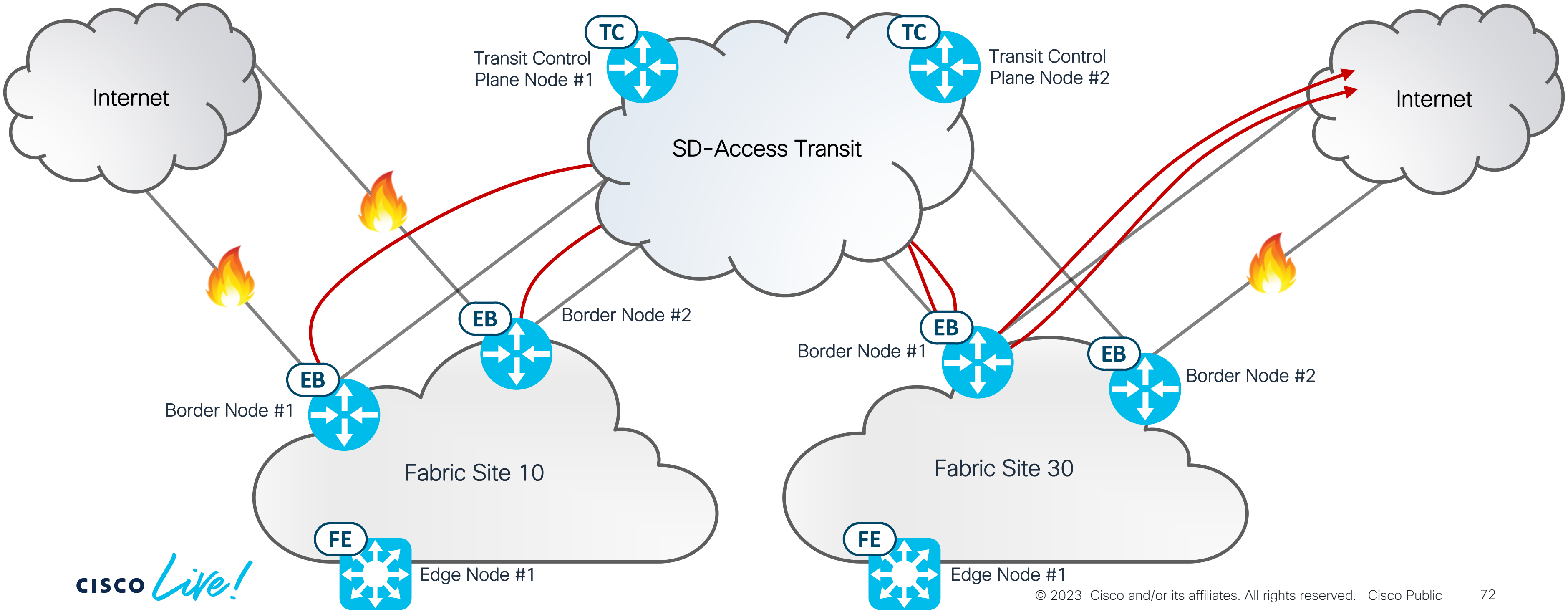
LISP Backup Internet with Border Convergence

- Border Node #2 in Fabric Site 30 loses the default route.



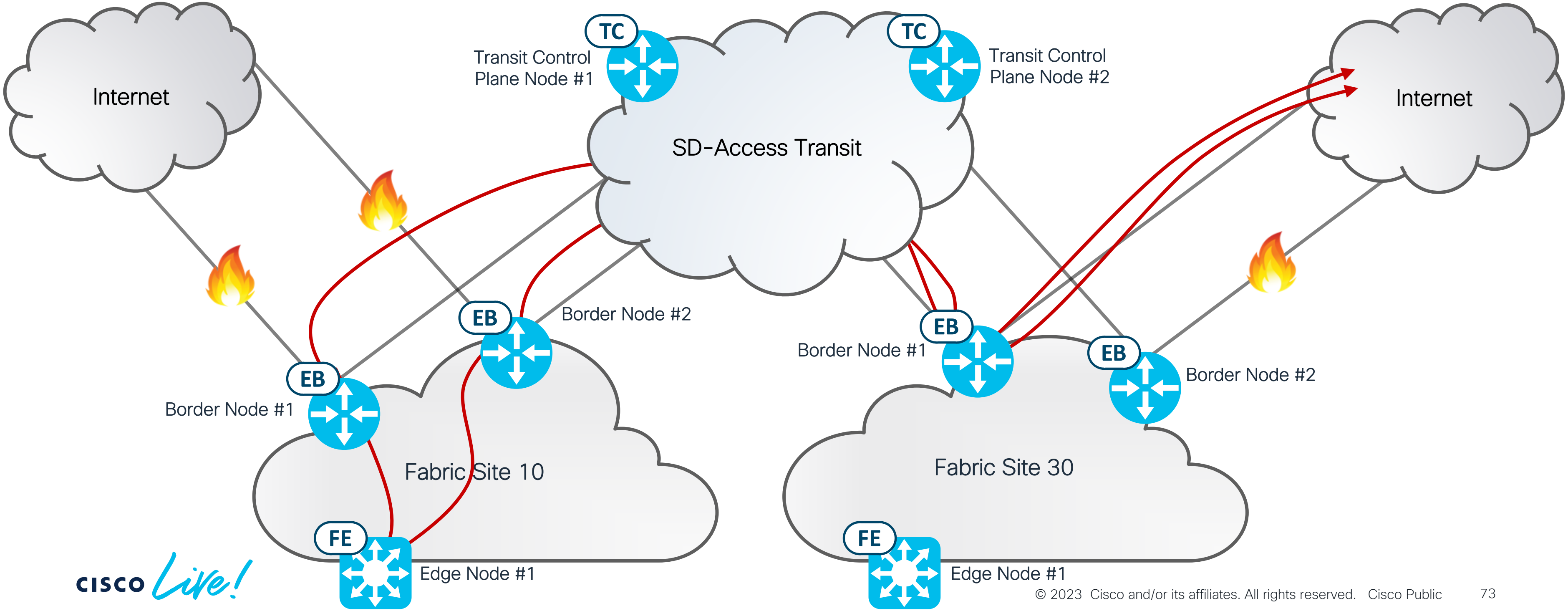
LISP Backup Internet with Border Convergence

- Border Nodes in Fabric Site 10 will use Border Node #1 in Fabric Site 30 to reach the Internet.



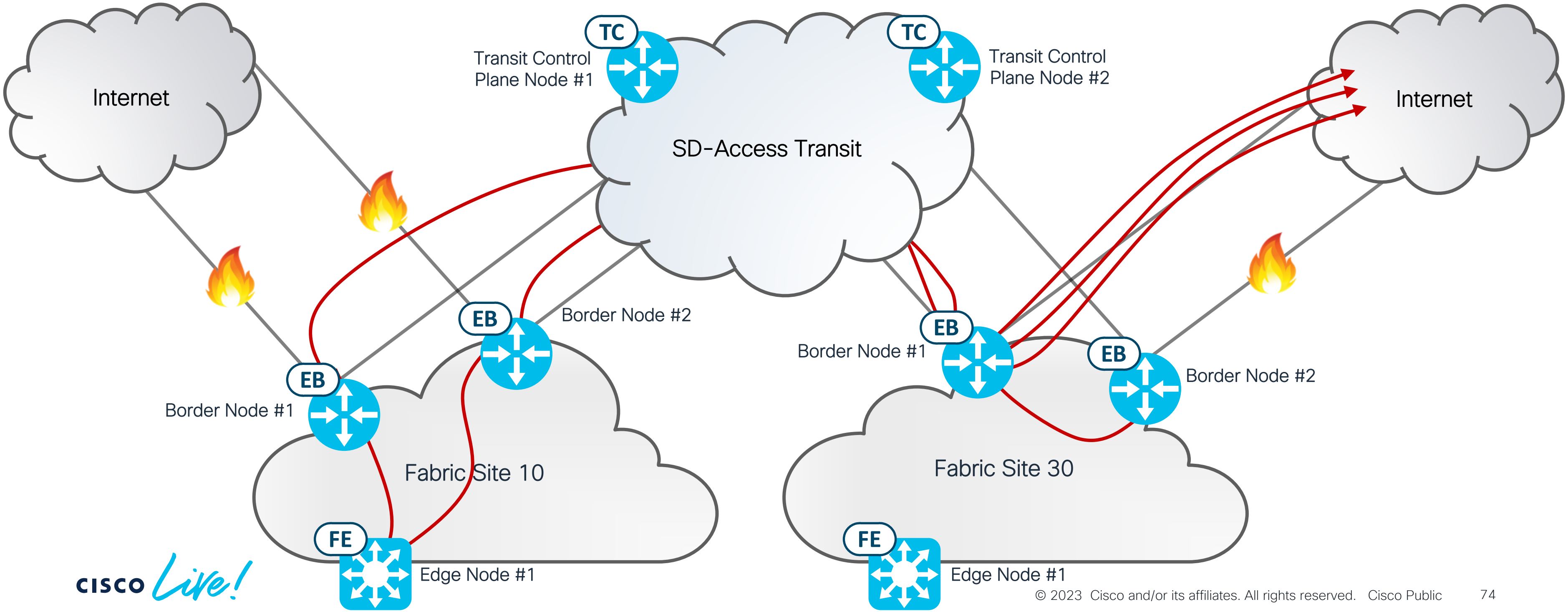
LISP Backup Internet with Border Convergence

- Edge Node #1 in Fabric Site 10 will continue to use either site-local Border Node to reach the Internet.



LISP Backup Internet with Border Convergence

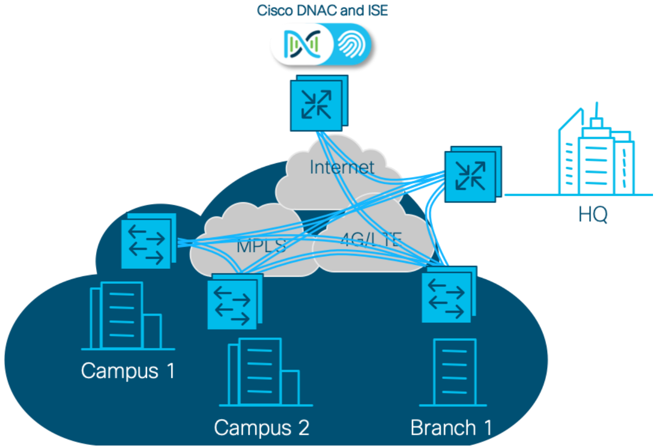
- Border Node #2 in Fabric Site 30 will use Border Node #1 in Fabric Site 30 to reach the Internet.

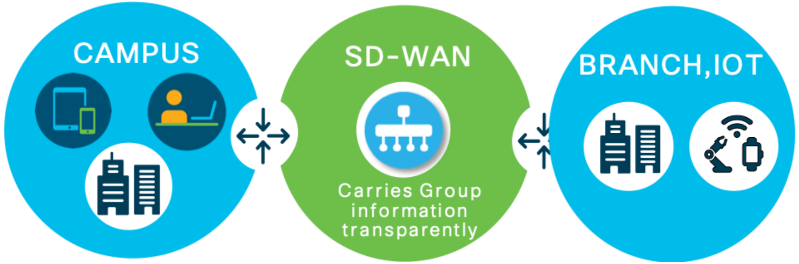


Summary

Summary

Cisco SD-Access Multi-Site fabric





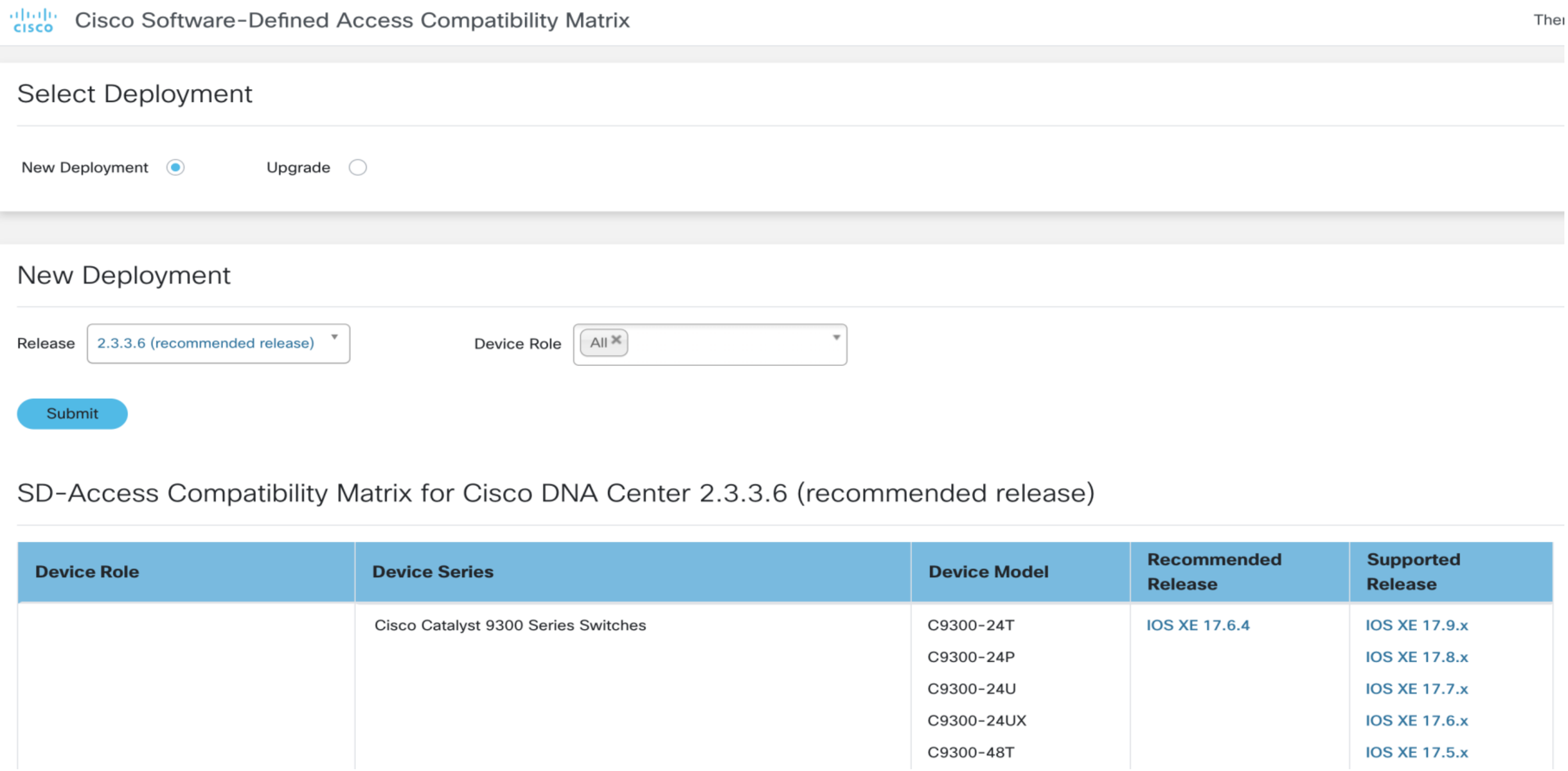
- ✓ Automated Inter-Site Connectivity
- ✓ E2E Segmentation, Policy and Assurance
- ✓ Flexible and Scalable

- ✓ LISP Pub/Sub Enhanced Capabilities
- ✓ Flexible Group to VPN Mapping
- ✓ Flexible WAN options

For more details: cs.co/sda-compatibility-matrix

SD-Access Support

Digital Platforms for your Cisco Digital Network Architecture



Cisco Software-Defined Access Compatibility Matrix

Thei

Select Deployment

New Deployment ● Upgrade ○

New Deployment

Release: 2.3.3.6 (recommended release)

Device Role: All ×

SD-Access Compatibility Matrix for Cisco DNA Center 2.3.3.6 (recommended release)

Device Role	Device Series	Device Model	Recommended Release	Supported Release
	Cisco Catalyst 9300 Series Switches	C9300-24T C9300-24P C9300-24U C9300-24UX C9300-48T	IOS XE 17.6.4	IOS XE 17.9.x IOS XE 17.8.x IOS XE 17.7.x IOS XE 17.6.x IOS XE 17.5.x

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Thank you

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