ETNA Inter Domain Transport

Hayim Porat – Ethos Networks

05/09

Motivation

Inter carrier (inter Domain) service provisioning automation is gaining place in carrier packet transport

Ethos Networks with NSN, BT,BGU & TKK are developing a solution for inter carrier Ethernet transport under the FP7 European research programs

Overview (1)

ETNA enables automatic inter domain transport services

The services are Ethernet services as defined by the MEF

- PtP
- PtMP
- MPtMP

ETNA emphasizes and analyses the case of Inter Carrier, i.e. different domains operated by different carriers

Examples:

- International VPN service
- Leased Lines between Pan-European POPs

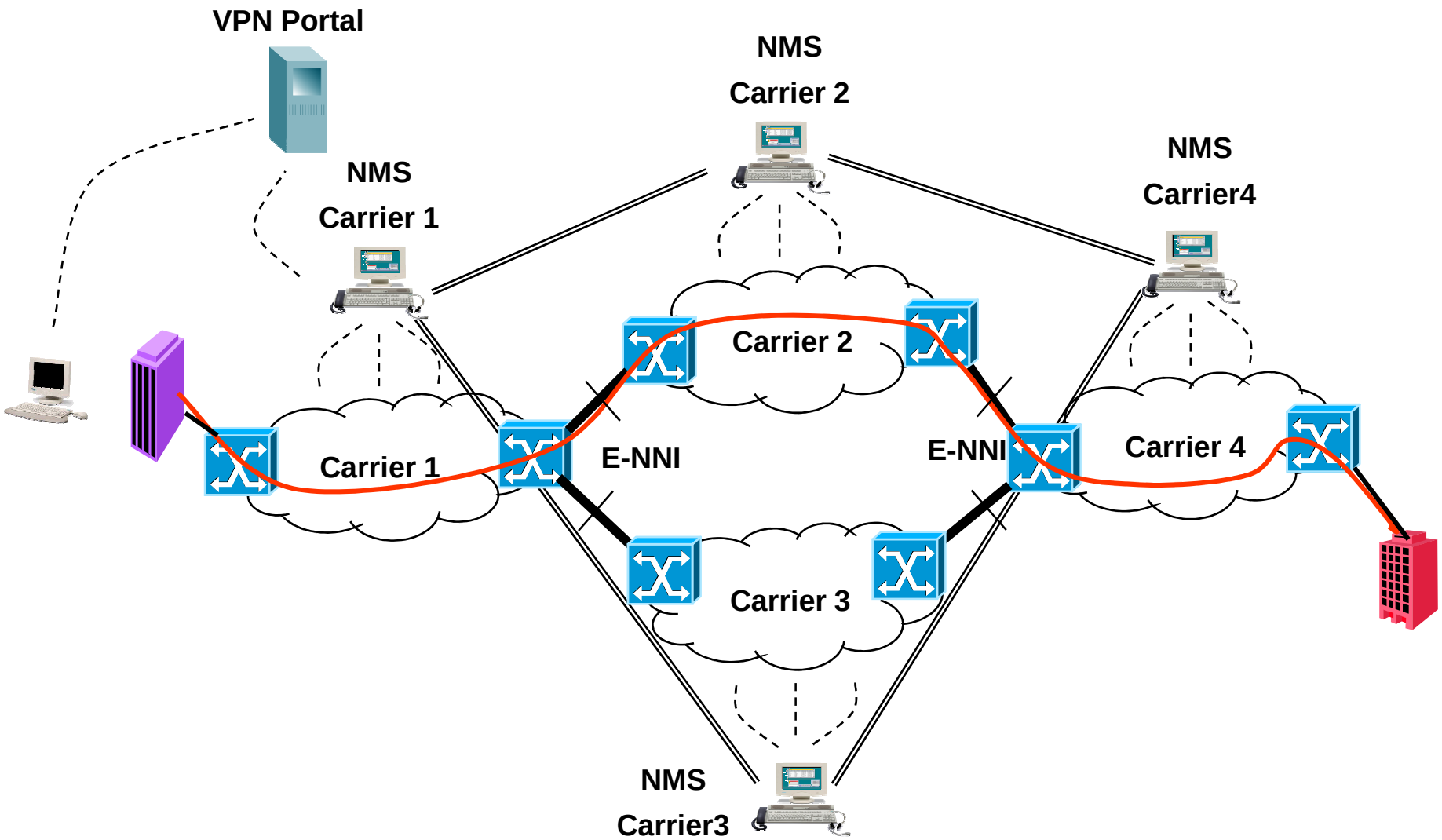
Overview (2)

Today, setting up or changing a transport service (e.g. ELINE) that traverses multiple carriers takes a long time and requires man to man communication and manual setting. ETNA shortens the service setup period and decreases the OPEX involved in inter carrier transport

Different Transport Technologies

- There are several Packet Transport technologies deployed e.g. PBB, PBB-TE, MPLS-TP, L2 MPLS
- ETNA method works for mixed technology environment

Inter Carrier Transport



Etna Inter Carrier Transport Ingredients

Exchanging of service offers including:

- Price
- Service attributes (delay, jitter, frame loss)

Selection of the optimal service for the customer by considering price and customer demand

Inter carrier signaling for path creation

Customer - provider interface via VPN portal

- Service request
- Service quotation
- Service monitoring

Inter domain Definitions

Global addressing for inter carrier transport network

Addressing Scheme

Business Aspects in Inter Carrier Transport

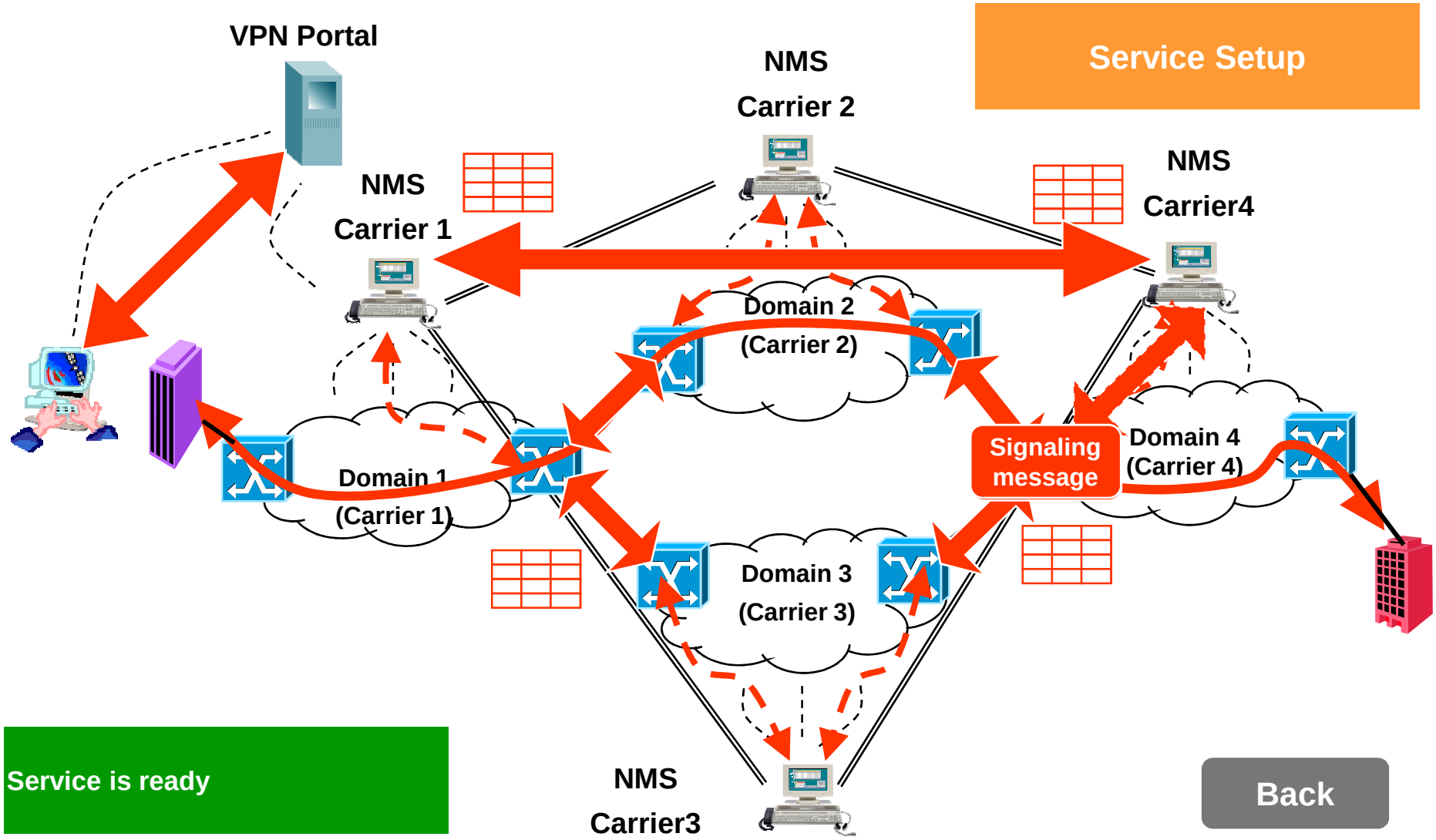
- Form the business perspective, WP2 analyzed the peering models, which were considered as the major architecture influencing element

- The peering models for inter carrier transport are:
  1. **Adjacent Peering:** In adjacent peering, carrier has business partnership only with its adjacent carriers
  2. **Alliance Peering:** In alliance peering, inter carrier service can be setup between carriers that are members in the alliance. The business partnership is between all the members (including carriers that are not adjacent)
  3. **Hybrid peering:** Hybrid peering is a combination between Adjacent Peering and Alliance Peering
  4. **Ethernet Exchange peering:** Similar to a VOIP peering point or an IP exchange, this would be a place where carrier networks intersect, and where Ethernet services could be handed off from one operator to another.
  5. **Neutral Exchange Peering:** the Neutral Exchange is a central market place for transport services, each carrier publishes its offers and prices in the exchange, and the retail provider can choose and buy the appropriate services

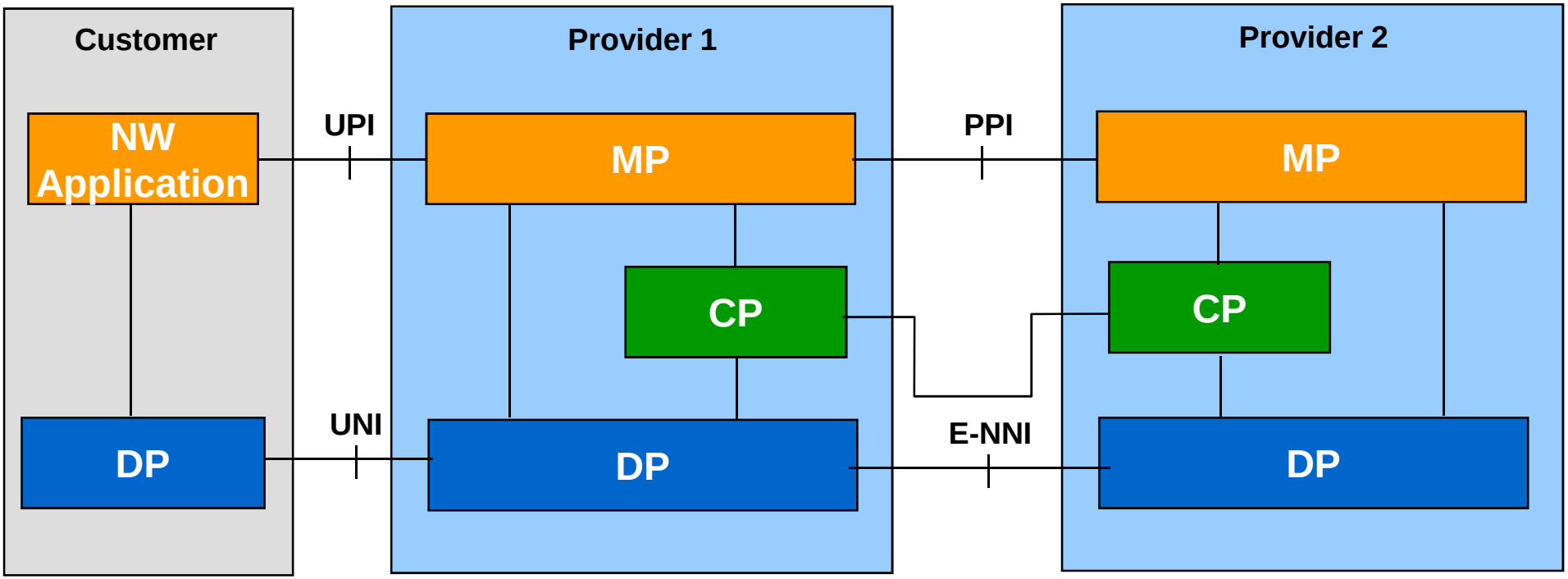
Inter Domain Transport Architecture Planes

Management Plane	•Inter Domain Topology discovery (How the domains are connected each other) •Template publishing (i.e. service offering) •Calculating the Domain Chain according to the templates (Domain Chain describes the reachability to the far end network provider)
Control Plane	•Neighbor discovery (by ETNA E-NNI control protocol) •Path setup/teardown by inter domain and intra domain signaling •OAM
Data Plane	•Inter domain data exchange over E-NNI (with ETNA extensions) •Intra domain: according to the domain technology

Inter Carrier Transport Process Overview Animation



ETNA Interface Model



UPI = User Provider Interface

UNI = User Network Interface (according to the MEF)

PPI = Provider Provider Interface

E-NNI = External Network Network Interface (according to the MEF)

VPN Portal

VPN Portal (provided by the CRM system) is a service portal that provides the customer diversity of services like:

- Request a VPN service
- Get quotation for a VPN service. The customer specifies the required service and gets the price (today this process involves man to man communication and takes days)
- Managing the service (e.g. BW changing)
- Monitoring the service (e.g. performance, usage, billing, failures)

ETNA Architecture Achievements (1)

Definition of peering models for Inter carrier transport network

Outline E-NNI extensions:

- Data plane definition based on 802.1ah packet format
- E-NNI registration protocol for adjacency discovery and inter carrier signaling

Algorithm for computation of domain chain for inter carrier services

Outline inter domain signaling for path creation

ETNA Architecture Achievements (2)

Definition of service templates for

- Transit service
- Access service
- PtMP
- MPtMP

OAM for inter carrier transport

Protection options for inter carrier transport

QoS in inter carrier transport

Technical Details

Definitions (1)

Customer: The Customer is the consumer of a service provided by an Administrative Owner

Administrative Owner (AO): The Administrative Owner is a Service Provider that offers services for retail to the customers. The Administrative Owner is responsible for composing and setup the service, and managing all aspects of the Service, which may involve one or more Service Providers.

- **Independent AO:** Independent Administrative Owner is a Service Provider that does not have network infrastructure; As AO it composes and offers services to the customers, and managing all aspects of the Service, which may involve one or more Service Providers.

Element Owner (EO): An Element Owner is a service provider who may participate in the delivery of a service by provide a segment (or segments) of the service, based upon the capabilities described by the corresponding Element(s). The Element Owner publishes its services with their attributes and prices by service templates

Domain: A domain is considered to be any collection of network elements within a common realm of address space, path computation and network management, different domain may be operated by different carriers.

Definitions (2)

Domains are operated by an element owner.

- **Origin Domain:** Origin domain is an access domain that the customer requesting a service is connected to. Origin domain initiates the service setup process. PtP service spans between origin domain and target domain
- **Target Domain:** Target domain is an access domain that is operated by an EO. Target domain is the end point domain of a service that is initiated by the origin domain. PtP service spans between origin domain and target domain
- **Access Domain:** Access domain is a domain that connects the customer to the network and is operated by an EO.

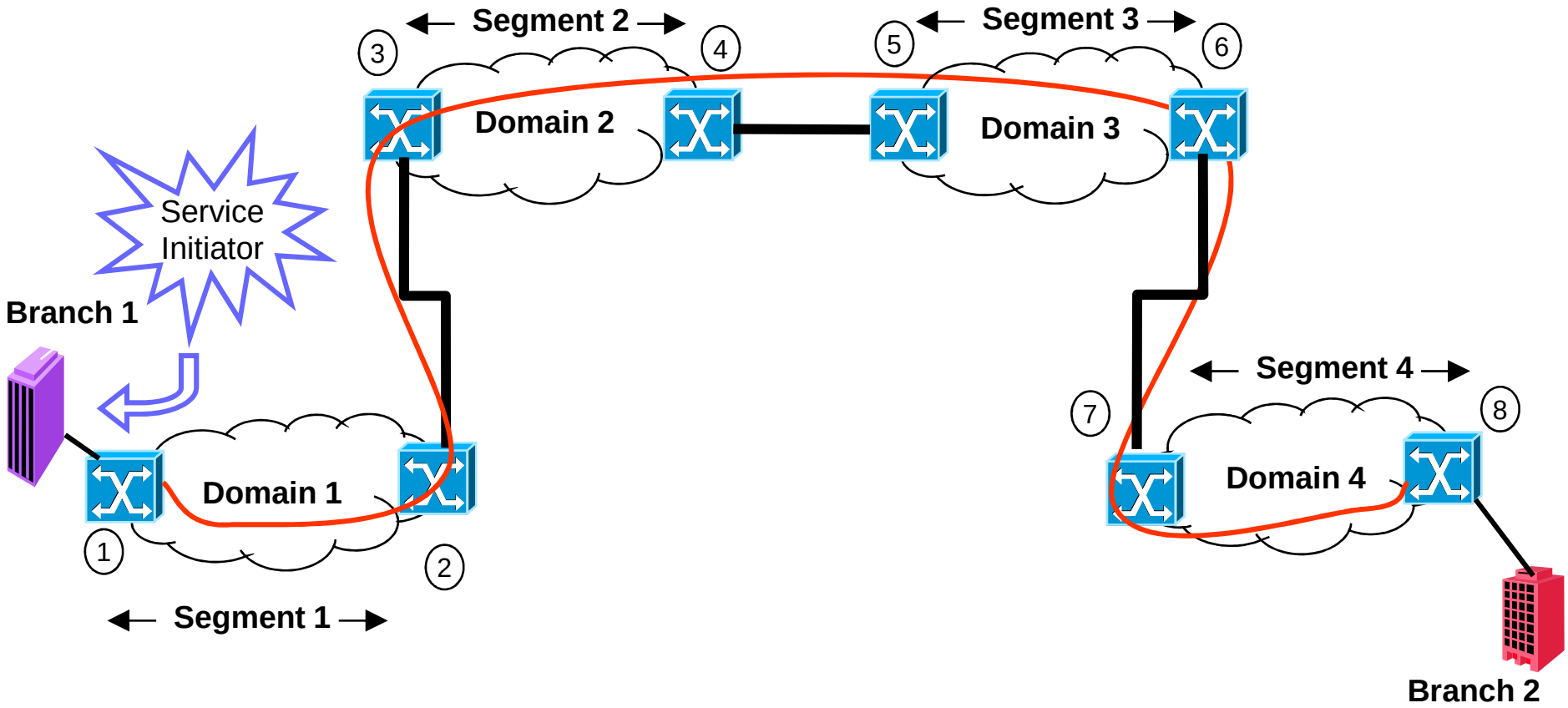
Inter Domain Bridge (IDB): IDB is a domain-border bridge, providing the communication between the domains. The IDB interfaces are termed as connection points in this chapter. IDBs have special roles in inter domain transport

Access Bridge (AB): AB is a domain-access bridge, providing the communication between the hosts, customer premises Ethernet networks, and the domain's demarcation point. These interfaces are termed access points in this chapter.

Template: Templates describe services that are provided by EOs. The templates contain the services' attributes and their prices. Templates are published by the EOs to all AOs. The AOs build services by choosing segments according to the templates.

Back

Adjacent /Alliance Peering



Note: **Each domain operated by different carrier**

Adjacent Peering

Service creation process

1. Carrier 1 chooses the appropriate adjacent carrier for reaching the final destination (carrier 2 in our example), it charges the customer for the entire service and pays carrier 2 for segments 2, 3, and 4
2. Carrier 2 chooses the appropriate adjacent carrier for reaching the final destination (carrier 3 in our example), it charges carrier 1 for segments 2, 3, and 4, and pays carrier 3 for segments 3, and 4
3. Carrier 3 chooses the appropriate adjacent carrier for reaching the final destination (carrier 4 in our example), it charges carrier 2 for segments 3, and 4, and pays carrier 4 for segment 4
4. Carrier 4 connects the final destination (branch 2 in our example), it charges carrier 3 for segments 4

Alliance Peering

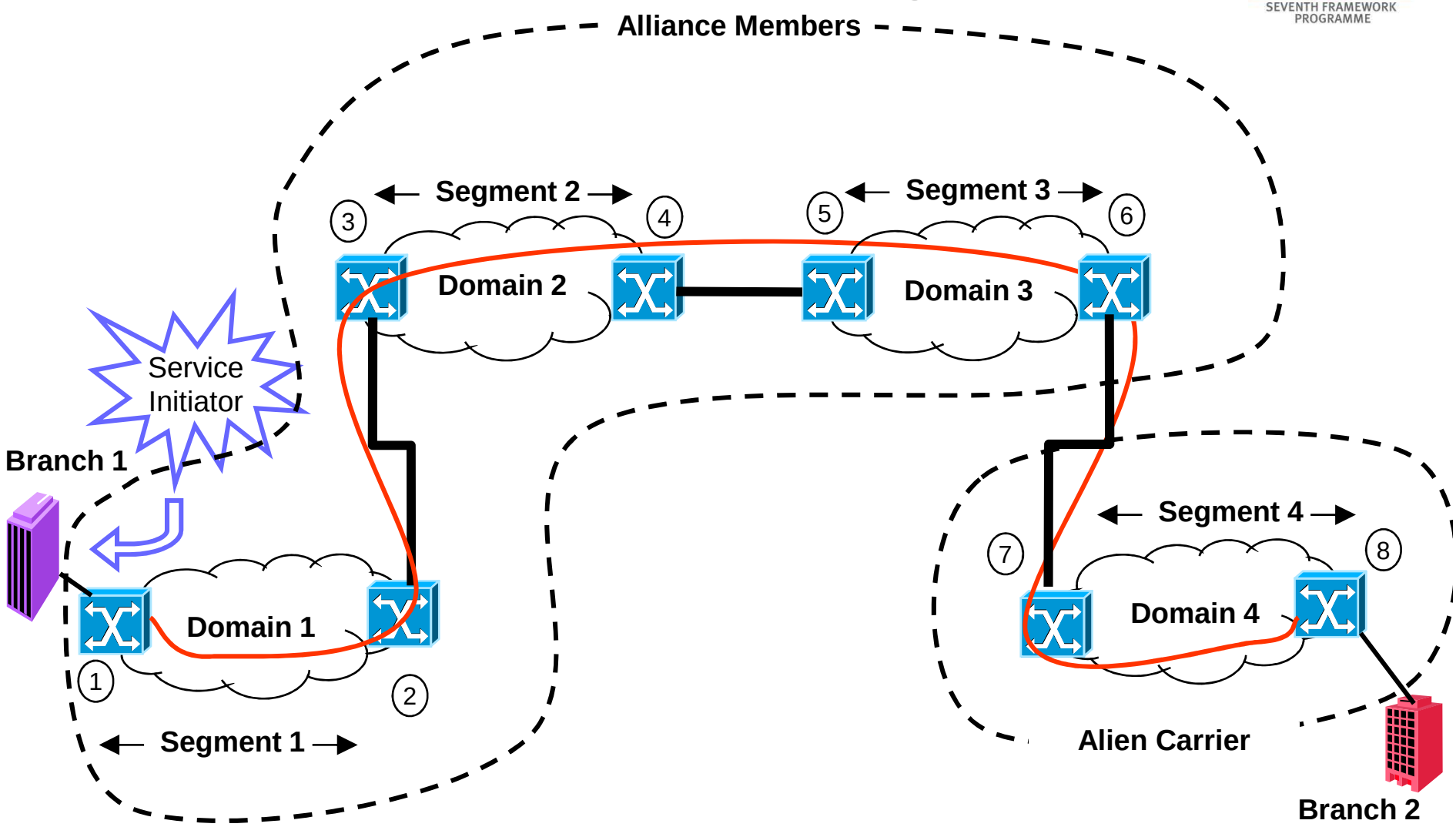
Service creation process

1. Carrier 1 chooses the appropriate segments to compose the service based on routing and business considerations, carrier 1 charges the customer for the service
2. Carrier 2 charges carrier 1 for segment 2, the price is according bilateral agreement between carrier 1 and carrier 2.
3. Carrier 3 charges carrier 1 for segment 3, the price is according bilateral agreement between carrier 1 and carrier 3.
4. Carrier 4 charges carrier 1 for segment 4, the price is according bilateral agreement between carrier 1 and carrier 4.

Alliance peering allows carriers that are not adjacent to have business partnership and have mutual agreements such as special pricing etc., hence some service templates can be offered exclusively to certain carrier(s).

Back

Hybrid Peering



Note: **Each domain operated by different carrier**

Hybrid Peering

Hybrid peering is a combination of alliance and adjacent peering.

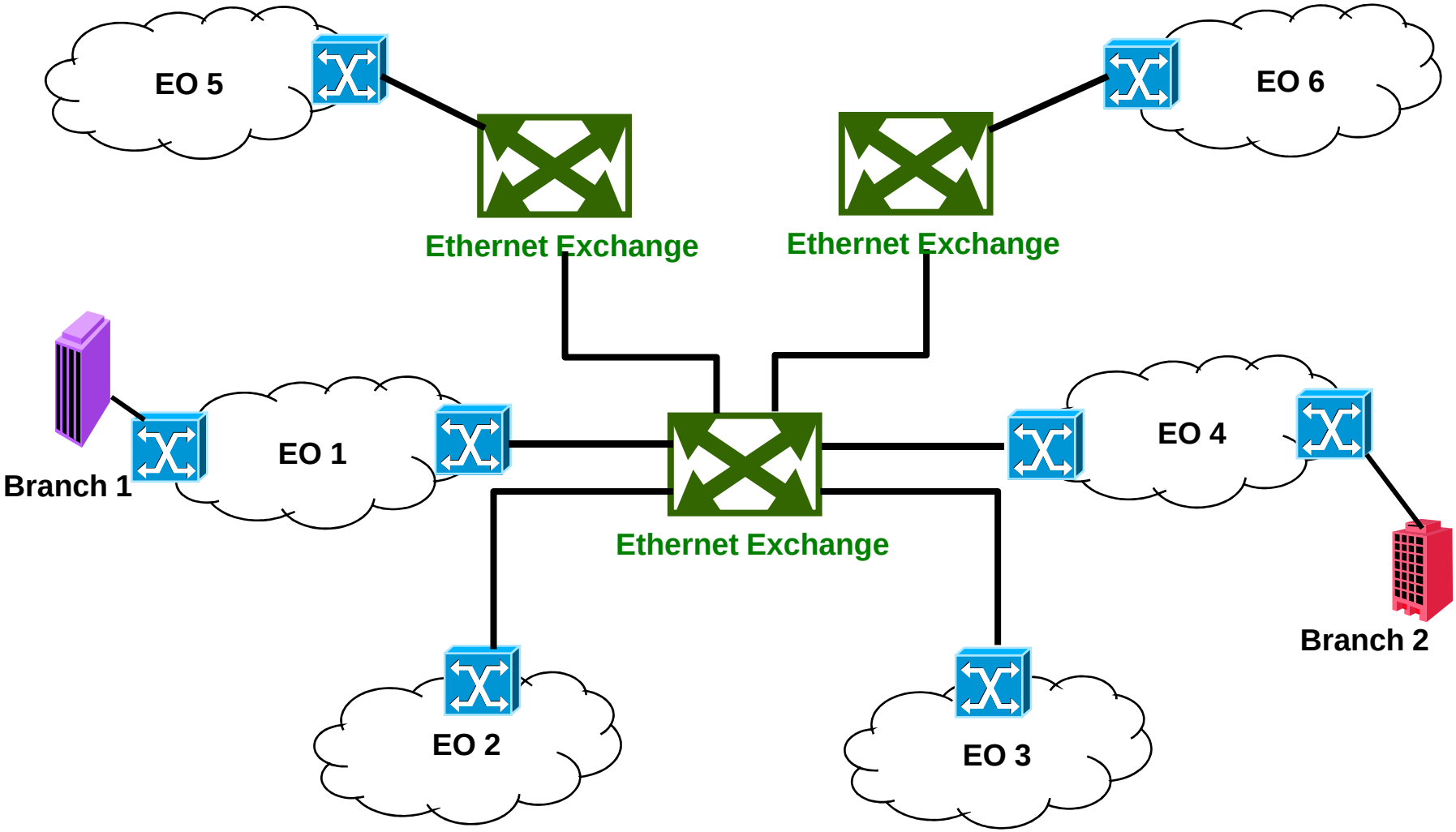
A member in the alliance serves as a proxy to alien carrier which has business partnership with that member.

Service creation process

1. Carrier 1 chooses the appropriate segments provided by the alliance members to compose the service based on routing and business considerations, carrier 1 charges the customer for the service
2. Carrier 2 charges carrier 1 for segment 2, the price is according to a bilateral agreement between carrier 1 and carrier 2.
3. Carrier 3 charges carrier 1 for segment 3, and segment 4, the price is according to the bilateral agreement between carrier 1 and carrier 3, and the bilateral agreement between carrier 3 and carrier4.
4. Carrier 4 charges carrier 3 for segment 4, the price is according to a bilateral agreement between carrier 3 and carrier 4.

Back

Ethernet Exchange



Ethernet Exchange

Ethernet exchange is promoted by MEF following the same principals as with IP

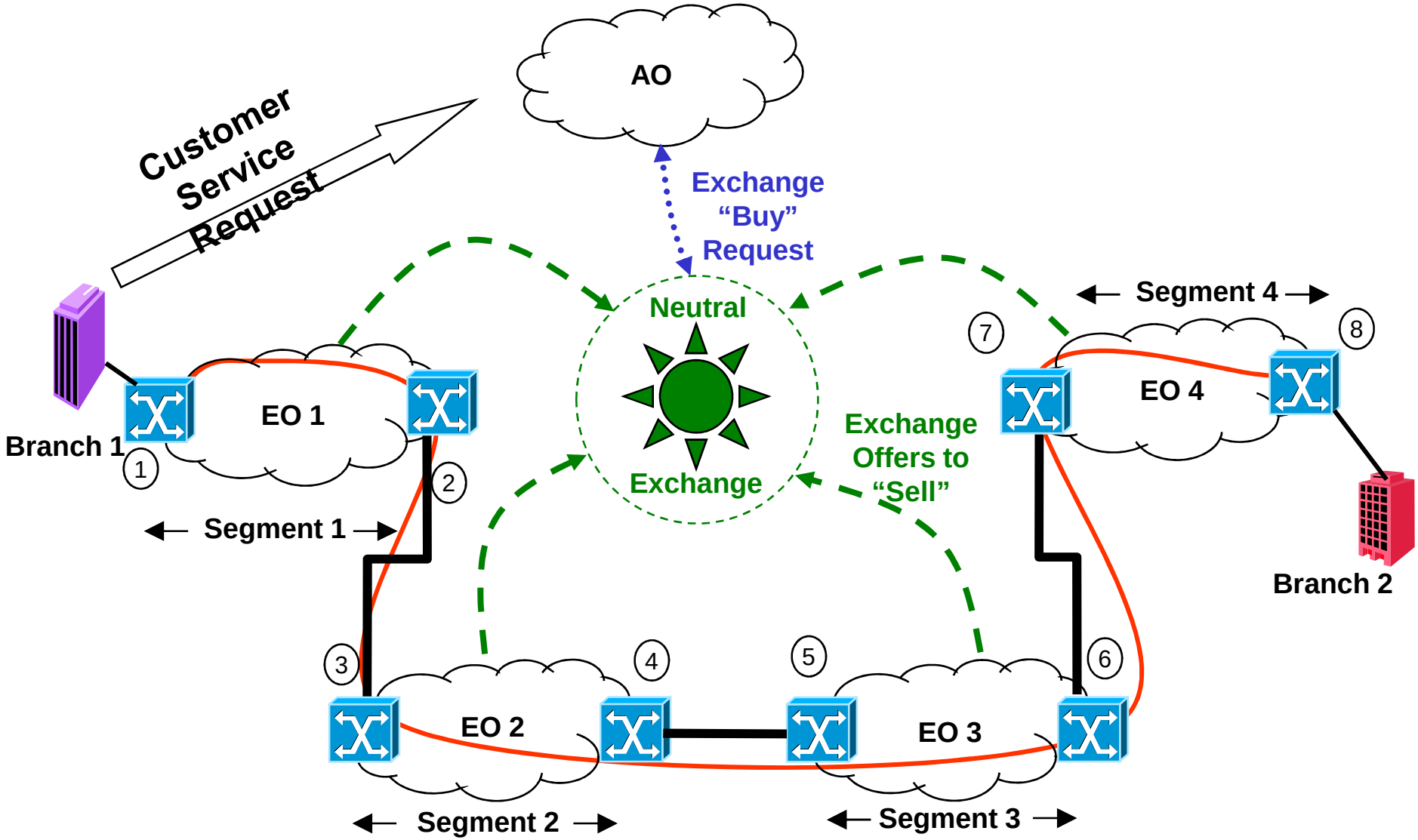
The exchange would be a neutral entity funded by the carriers involved

Ethernet Exchange offers two major modes of interconnection:

- **Bilateral** is the traditional model of two operators bilaterally writing an interconnection contract prior to setting up a connection
- **Multilateral** is a mode that the Ethernet Exchange provider takes care of both handling the contract and connectivity set-up on behalf of the operators. Therefore the multilateral option, which allows an operator to open multiple connections by making a single contract and single technical connection with the Ethernet Exchange makes interconnection deployment easier and faster.

Back

Neutral Exchange Peering



Neutral Exchange Peering

The inter carrier services span EOs that trade with AOs via a neutral exchange

AOs have transparent visibility of the price, infrastructure capabilities etc. of the EOs

All EOs submit standard templates defined by the exchange which describe the service capabilities that they offer and their border peering points with neighboring EOs.

The AO has visibility, via the exchange, of all offered segments which could constitute the full end-to-end service. It chooses the segments according to routing and business considerations.

On some segments individual EOs may compete with similar service offerings. This model promotes market efficiency through price transparency and competition.

The Customer pays the AO for the end-to-end service; The AO, in turn, pays each EO for the segments that are used according to the agreed price.

It is assumed that the physical connectivity between the segments is already in place.

Back

Addressing Scheme: GUID Concepts

In order to enable global connectivity there is a need for a Global Unique Identification (GUID).

GUID is technology independent (ETNA is technology independent)

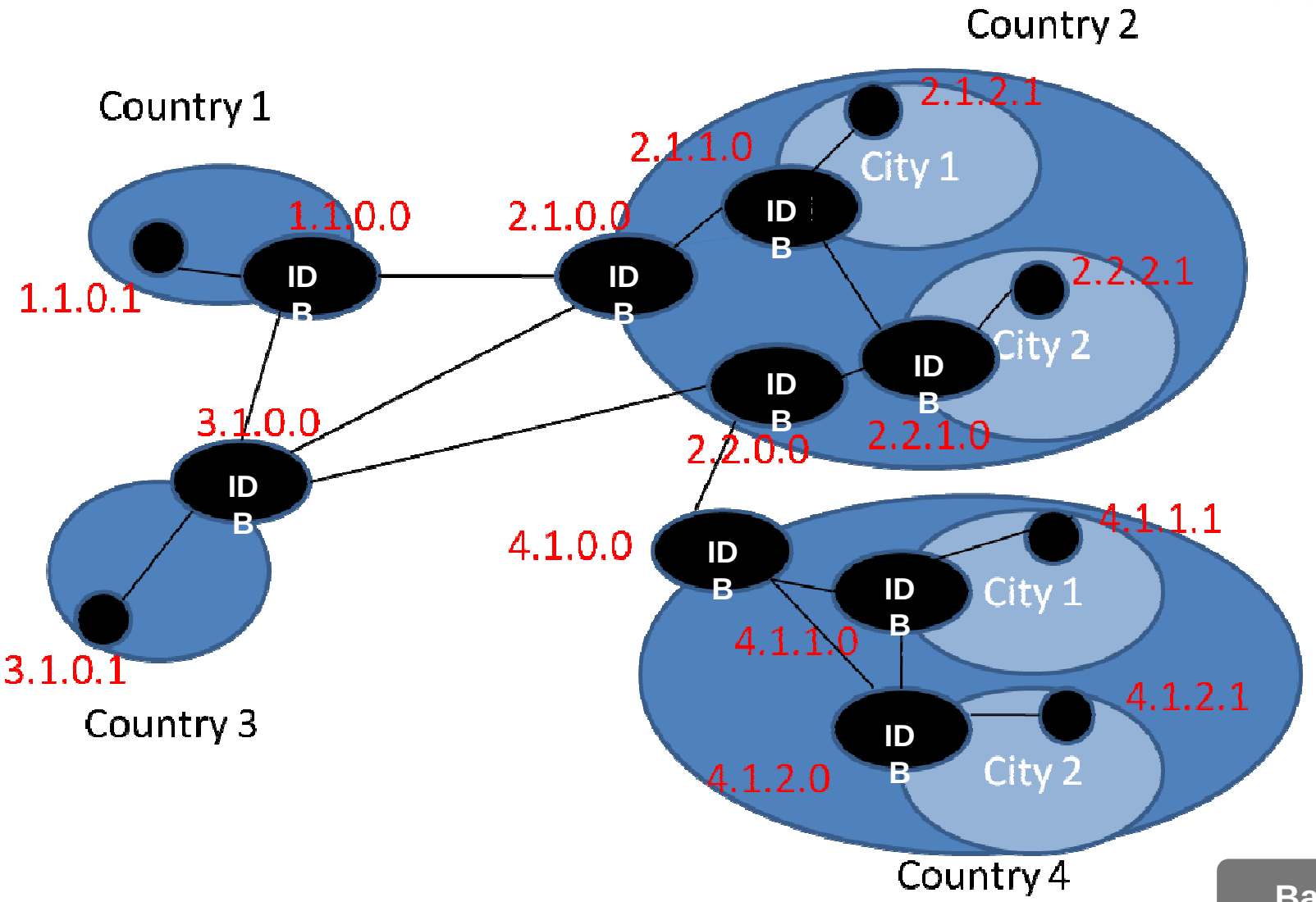
GUID have global and hierarchical meaning.

Hierarchical GUID simplifies forwarding tables.

The advantages over the existing addres scheme

- IP addresses are unique and hierarchical but there is no private (Global) IP range so there is no way to distinguish between IP addresses belonging to private inter carrier networks and those belonging to the Internet
- MPLS and MAC addresses are neither unique nor hierarchical.

Addressing Scheme



Back