LAYER 2 WHOLESALE SERVICES FOR THE NBN

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Agenda

National Broadband Network: Design Requirements

- **NBN Primary Goal: to transport layer 2 frames from subscribers to retail service providers**

- **Technical Requirements**
    - **Scalable:** must scale to support the entire population
    - **Automated:** to reduce costs and speed provisioning
    - **Multicast-enabled:** to support next-generation services
    - **Standards-based:** to ensure interoperability, reduce costs, and speed introduction of new services

- **"Intelligent Wholesale"**

Reference Terms: NBN Logical Topology

Agenda

1   NBN: Design Requirements / Topology Overview

2   Layer 2 Wholesale Service Design for NBN

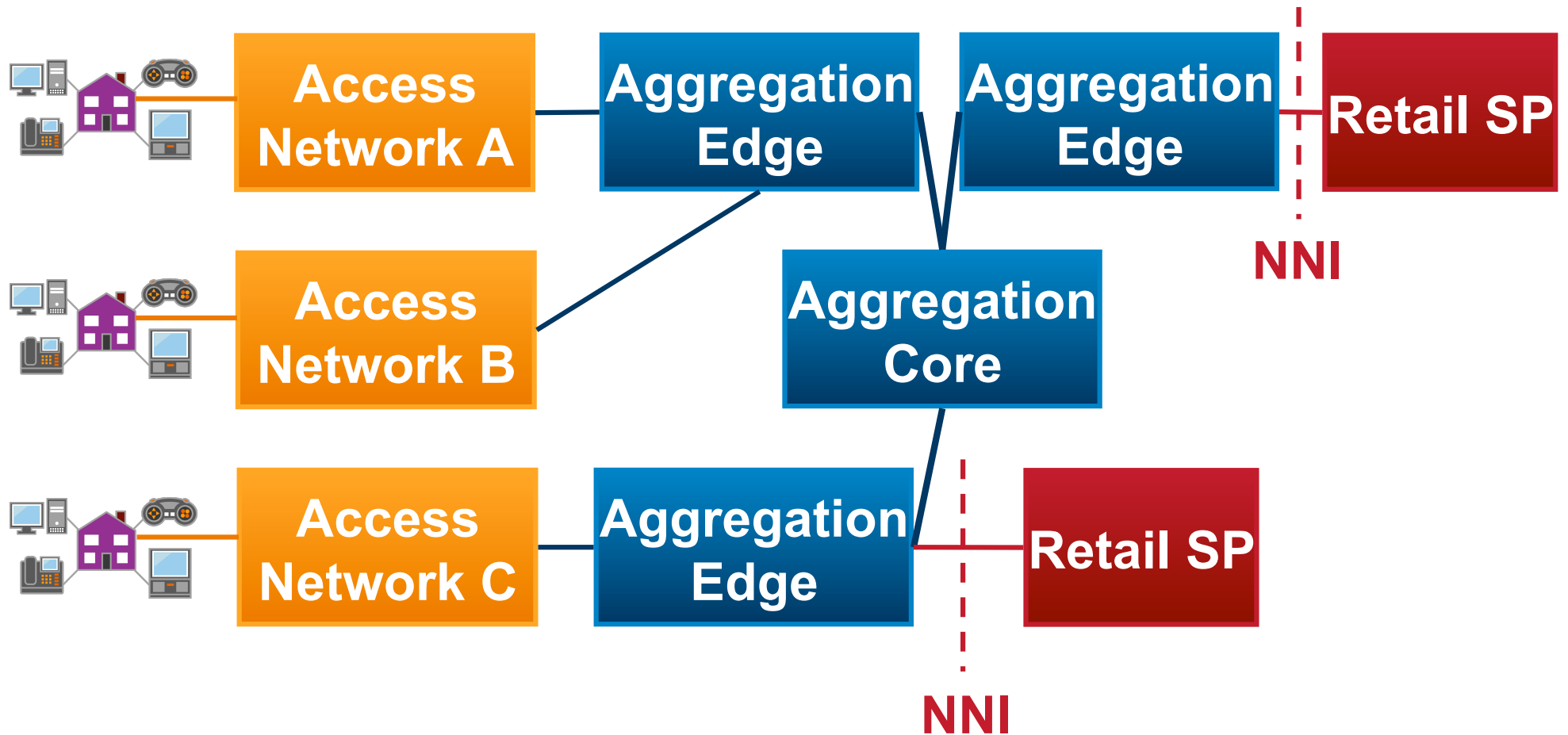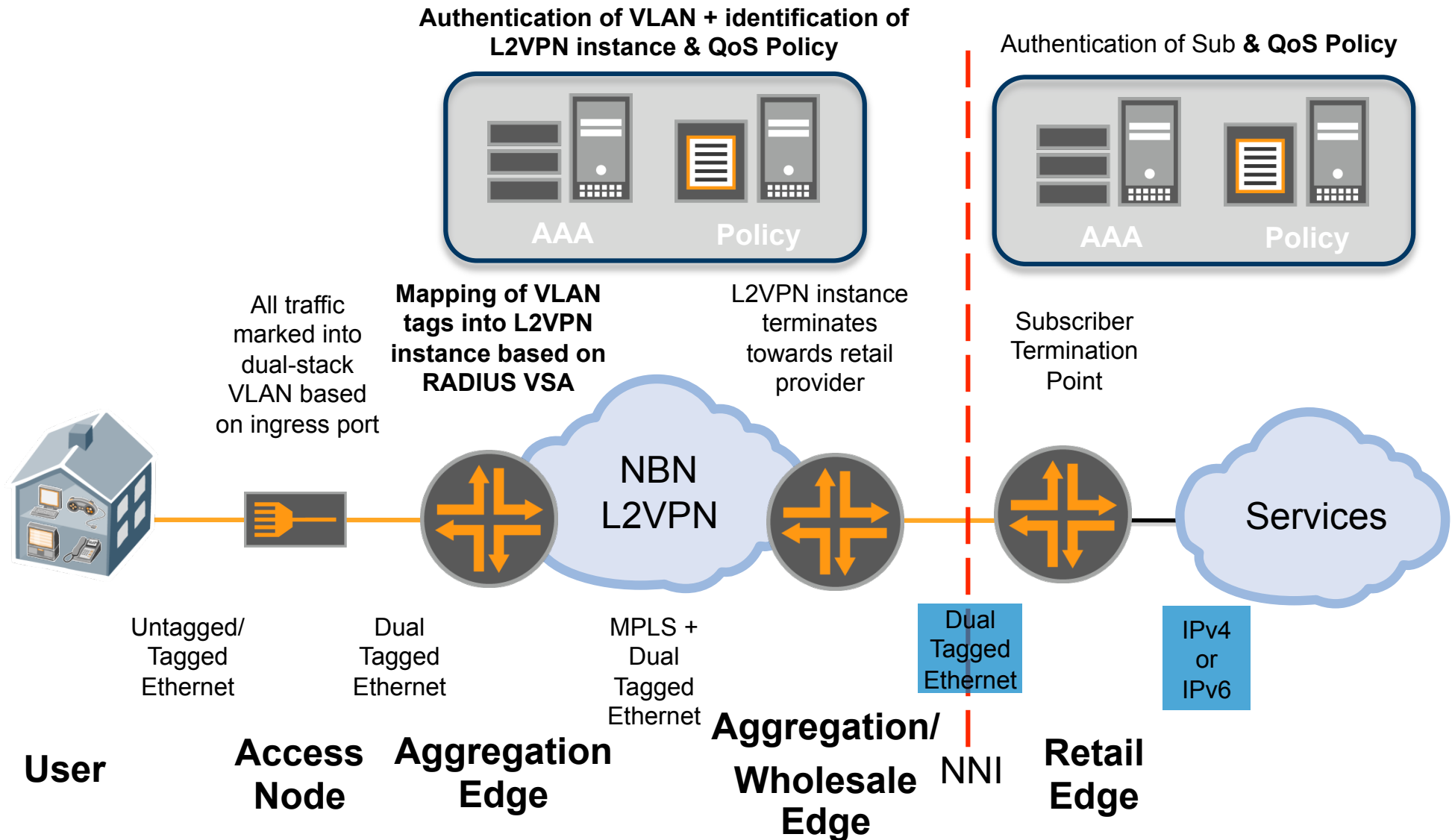**3**   Characteristics of the Design

4   Broadband Forum Work

5   Summary: Intelligent Wholesale in the NBN

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Layer 2 Wholesale Service Model for the NBN

- **Network characteristics:**
  - IP/MPLS underlying network
    - Entire country could have single IGP
  - MPLS layer 2 pseudowires provide pathway from Aggregation Edge to Retail Service Provider
  - Aggregation Edge selects appropriate pseudowire automatically on receipt of first frame per customer
    - RADIUS (or Diameter) authentication selects pseudowire

- **Subscriber characteristics**
  - Each subscriber identified by SVLAN, CVLAN pair (stacked VLANs)
    - VLAN numbering is unique within an "area"
 - *Any* higher-layer protocol can be used by the subscriber

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Subscriber & Network Detail

Authentication of VLAN + identification of L2VPN instance & QoS Policy

Authentication of Sub **& QoS Policy**

AAA   Policy

AAA   Policy

All traffic marked into dual-stack VLAN based on ingress port

Mapping of VLAN tags into L2VPN instance based on RADIUS VSA

L2VPN instance terminates towards retail provider

Subscriber Termination Point

NBN L2VPN

Services

Untagged/ Tagged Ethernet

Dual Tagged Ethernet

MPLS + Dual Tagged Ethernet

Dual Tagged Ethernet

IPv4 or IPv6

User

Access Node

Aggregation Edge

Aggregation/ Wholesale Edge

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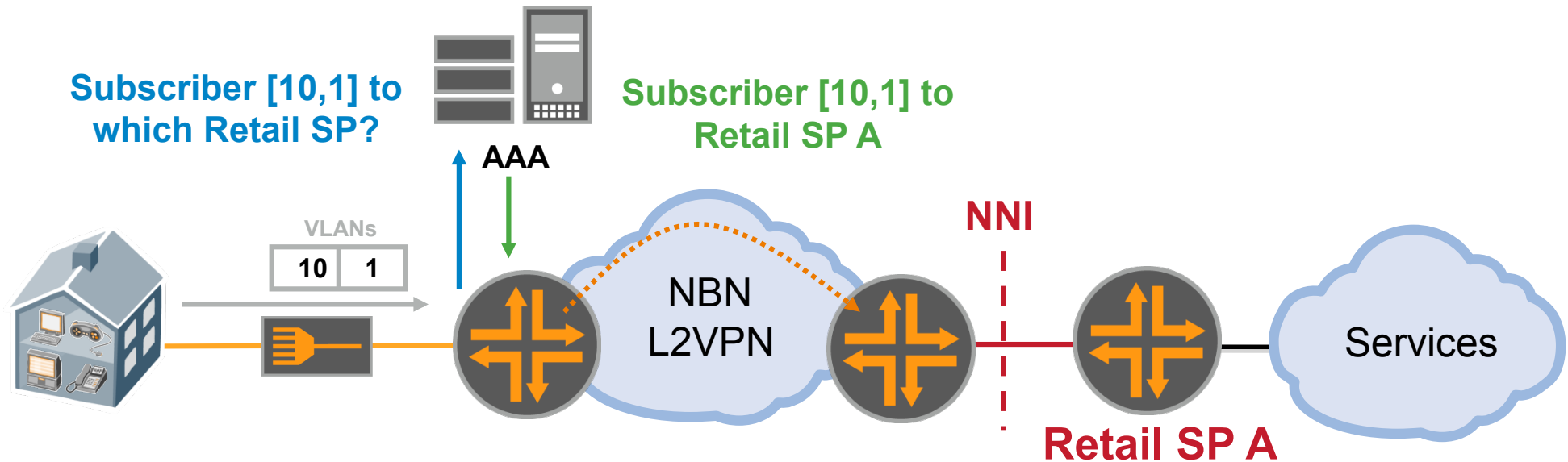**Retail Edge**

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Scalability of the Layer 2 Wholesale Design

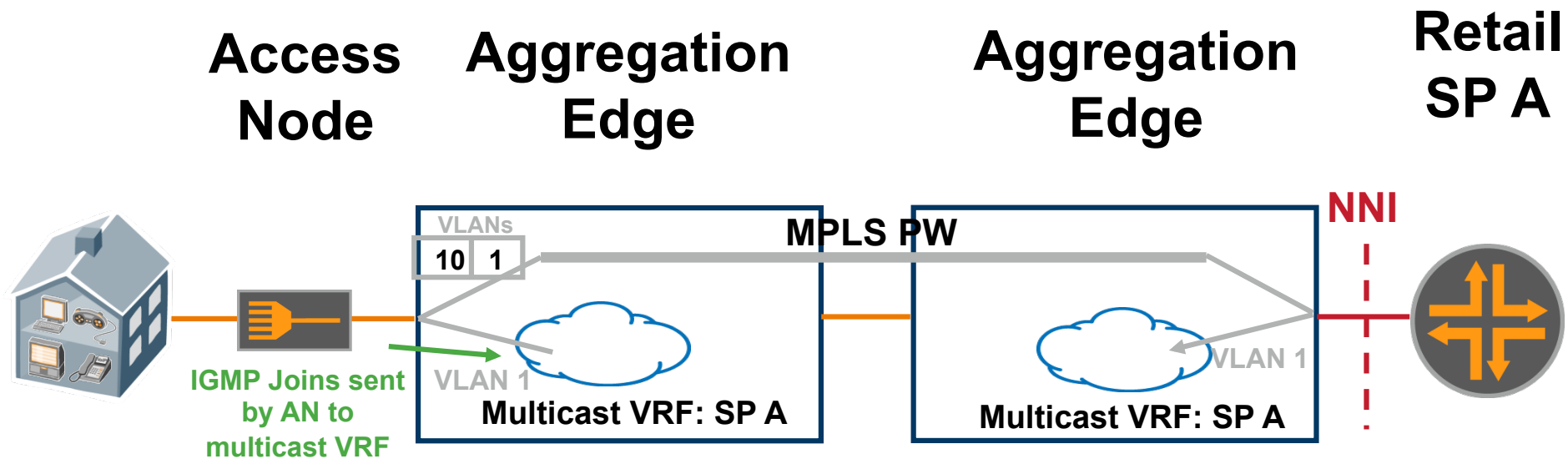**NBN**   **Aggregation Edge**   **Retail SPs**

NNI
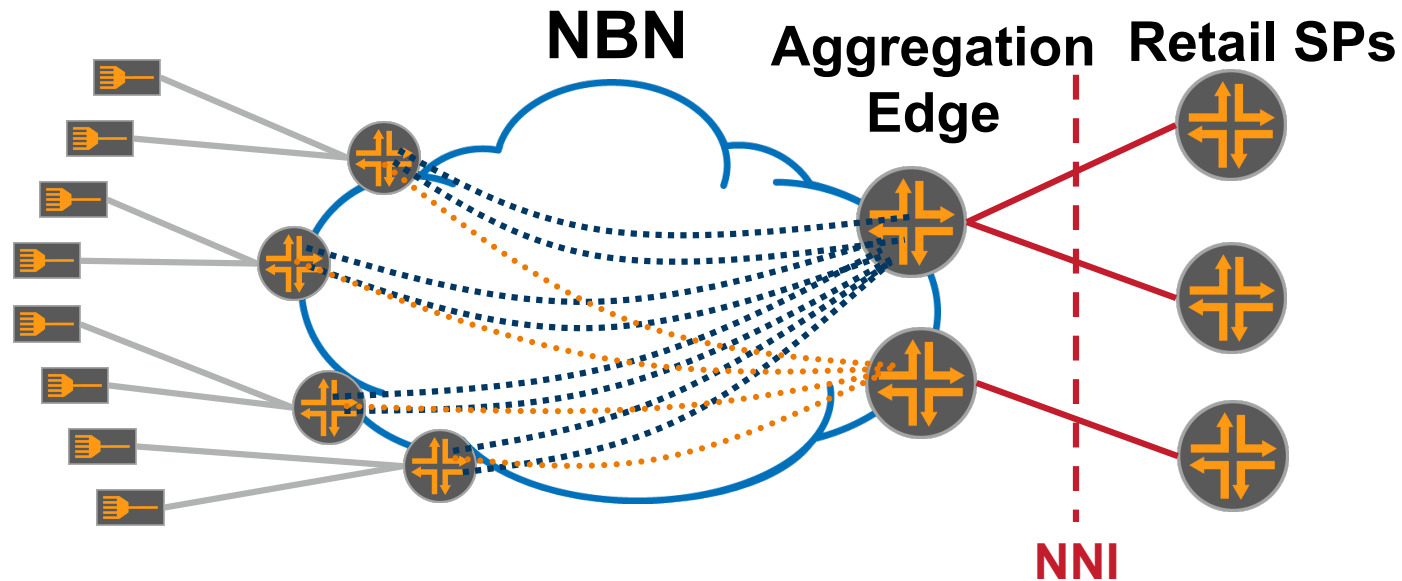
- **Pseudowires: 1 per Aggregation Node per Retail Service Provider**
  - **Same scaling property as L2TP has**

- **No MAC address learning by the NBN**
  - **Also mitigates many security concerns**

- **Dual VLAN tag scales to 4096^2 (~16M)**
  - **Confined to area, such as metro or state**

Automation of the Layer 2 Wholesale Design

Subscriber [10,1] to
which Retail SP?

AAA

Subscriber [10,1] to
Retail SP A

VLANs

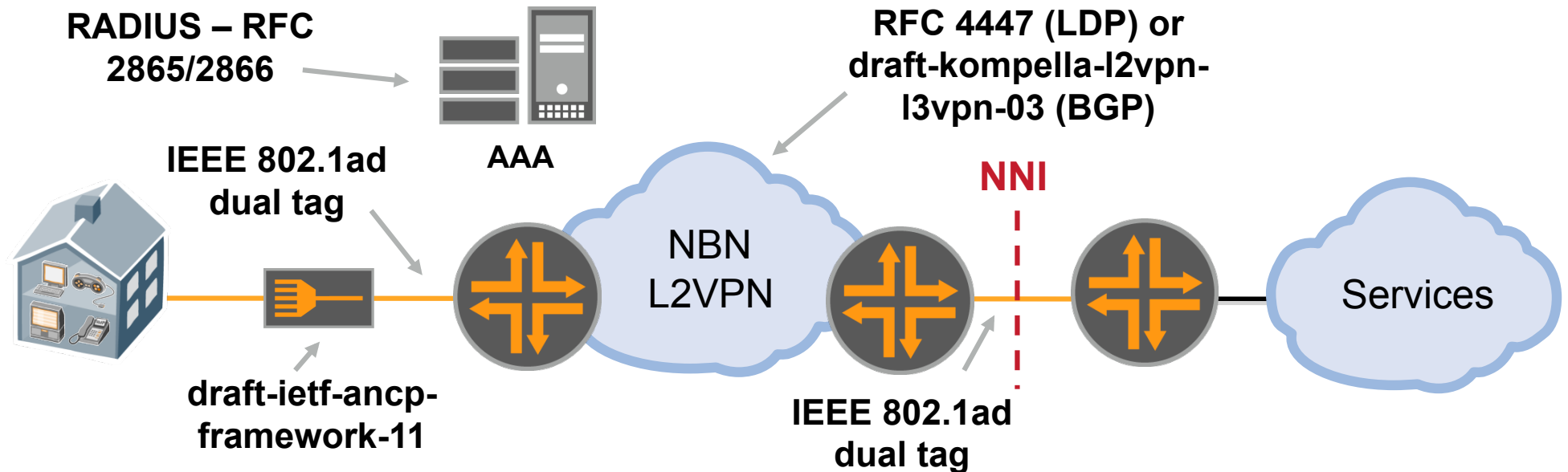| 10 | 1 |

NBN
L2VPN

NNI

Retail SP A

Services

- **Subscriber:Retail SP relationship stored in a database**

- **Upon subscriber connection to the NBN, or on change of authorization (RADIUS CoA), subscriber is automatically connected to the correct retail service provider**

- **No subscriber knowledge statically kept in the network**

- **Existing connections could even be torn down (CoA) if Retail SP:Subscriber relationship were changed**

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Multicast Support in the Layer 2 Wholesale Design

- **Separate multicast VRF/VLAN per Retail SP carried on NBN**
  - P2MP LSPs *may* be used for transport efficiency

- **ANCP used to signal subscriber's multicast VLAN to Access Node**

- **Access Node snoops/proxies IGMP join messages, relays to Aggregation Edge on appropriate multicast VLAN**

Standards-Based Protocols in the Layer 2 Wholesale Design

RADIUS – RFC 2865/2866

AAA

IEEE 802.1ad dual tag

RFC 4447 (LDP) or draft-kompella-l2vpn-l3vpn-03 (BGP)

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NBN L2VPN

Services

draft-ietf-ancp-framework-11

IEEE 802.1ad dual tag

- **Solution is standards-based for interoperability**

- **Hand-off to retail service provider is 802.1ad dual-tagged Ethernet frames, already supported by most equipment**

- **MPLS/IP NBN core based on multiple RFC'd protocols (OSPF, ISIS, MPLS, LDP, RSVP, BGP, etc.)**

- **Multicast within NBN handled by draft-ietf-l3vpn-2547bis-mcast-08, for example**

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Broadband Forum Standards Update

- **Juniper Networks in Australia has been advancing the Layer 2 Wholesale model in the Broadband Forum (formerly DSL Forum)**
  - Submissions bbf2008.931.03 and bbf2009.131.00 outline in more detail the concepts here

- **Forum WT-145 is incorporating this work**

- **Standards based on concepts developed in TR-101 (Ethernet-based DSL aggregation)**

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Intelligent Wholesale in the NBN

- **Layer 2 services between subscribers and retail service providers**

- **A high-level blueprint for the NBN which offers**
  - **Scalability:** requires only one pseudowire per aggregation node/retail service provider
  - **Automation:** subscribers automatically placed into correct pseudowire through RADIUS
  - **Multicast support:** through the use of separate multicast VRFs/VLANs per retail SP
  - **Standards-based:** on various IETF and IEEE standards, as well as Broadband Forum ongoing work

- **Cost reduction, provisioning speeds, interoperability, fast service deployment**

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THANK YOU