

VPN taxonomy

János Mohácsi
NIIF/HUNGARNET
tf-ngn meeting
April 2005

VPNs

- **Definition:** “the capability of both private and public networks to support a communication infrastructure connecting geographically dispersed sites where users can communicate among them as if they were in a private network” (RFC 2764)
- **VPNs can be implemented in many ways:**
 - Customer Premises Equipment (CPE) based solutions
 - Network based solutions
- **Motivation:** Need private communication networks for multiple sites => “private WANs”

Different VPN types

- Virtual Leased Lines/Virtual Private Wire Service (VPWS)
- Virtual Private Routed Networks (VPRNs)
- Virtual Private LAN Service (VPLSs)
- Virtual Private Dial Networks (VPDNs)

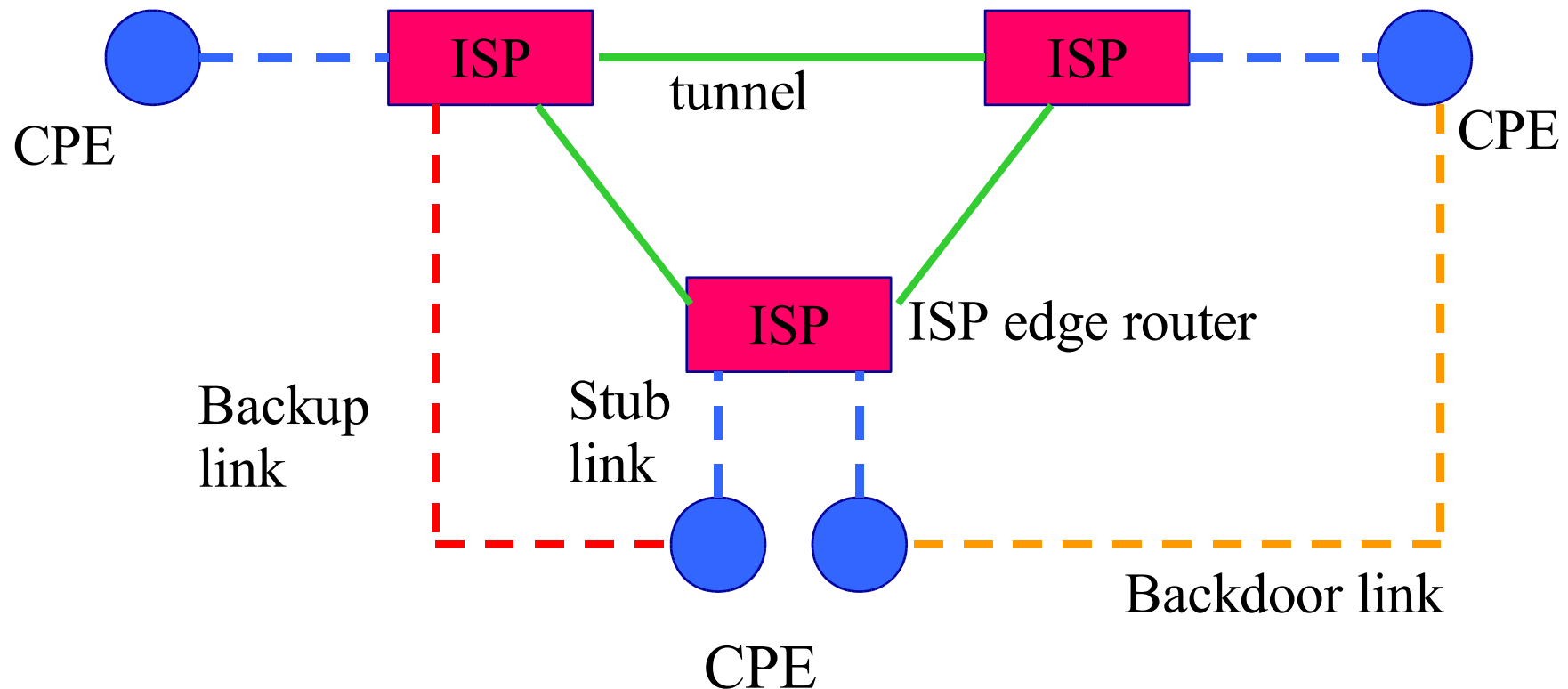
Type I: Virtual Leased Lines (VLLs)

– Virtual Private Wire Service

- VPWS = IP/MPLS tunnel forming a point-to-point link to emulate a physical leased line or dedicated connection.
- Require IP/MPLS tunneling mechanism
 - forwarding disjoint from the address fields of the encapsulated packets, allow opaque transport of frames as packet payload.
 - e.g. IP/IP, GRE tunnels, L2TP (PPP packets), MPLS, and IPSec

Type II: Virtual Private Routed Networks

- A VPRN emulates a multi-site wide area routed network over IP, consisting of
 - a mesh of IP tunnels btw ISP routers & routing capabilities
 - “stub” links connecting CPE routers to ISP routers

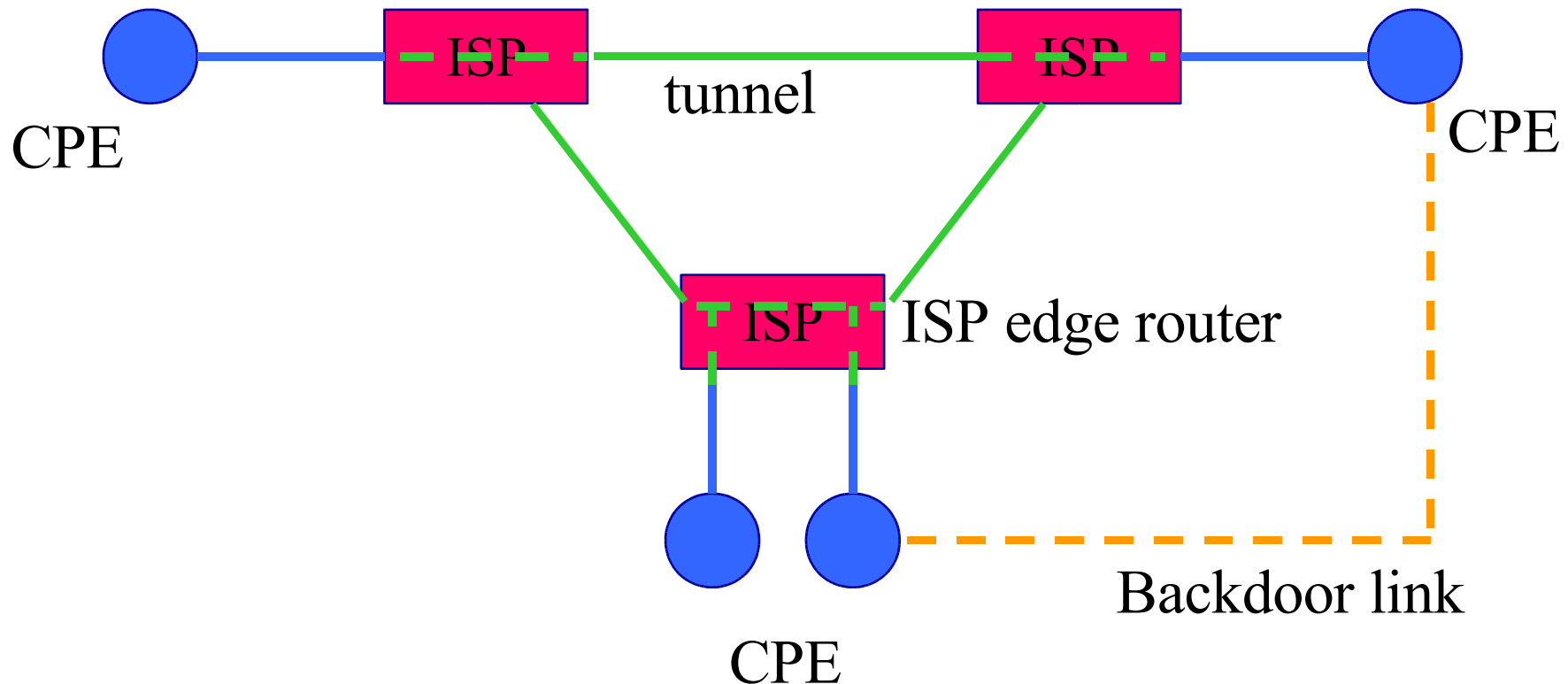


VPRNs /2

- Benefit: Configuration of the CPE router is simplified. ISP edge router appears to be a “neighbor” router.
- The burden of tunnel establishment, maintenance and routing is on ISPs. Forwarding is done at the network layer (Layer 3 or 2.5 MPLS).
- Each customer side CPE router is connected to an ISP edge router through one or more stub links
- Each VPRN supports only a single network layer protocol.

Type III: Virtual Private LAN Service

- A VPLS emulates a LAN segment over IP.
 - equivalent to VPRN, except now IP tunnels extend all the way to CPE routers, and ISP edge routers provide Link Layer bridging (layer 2 connectivity alone). VLAN or circuit level



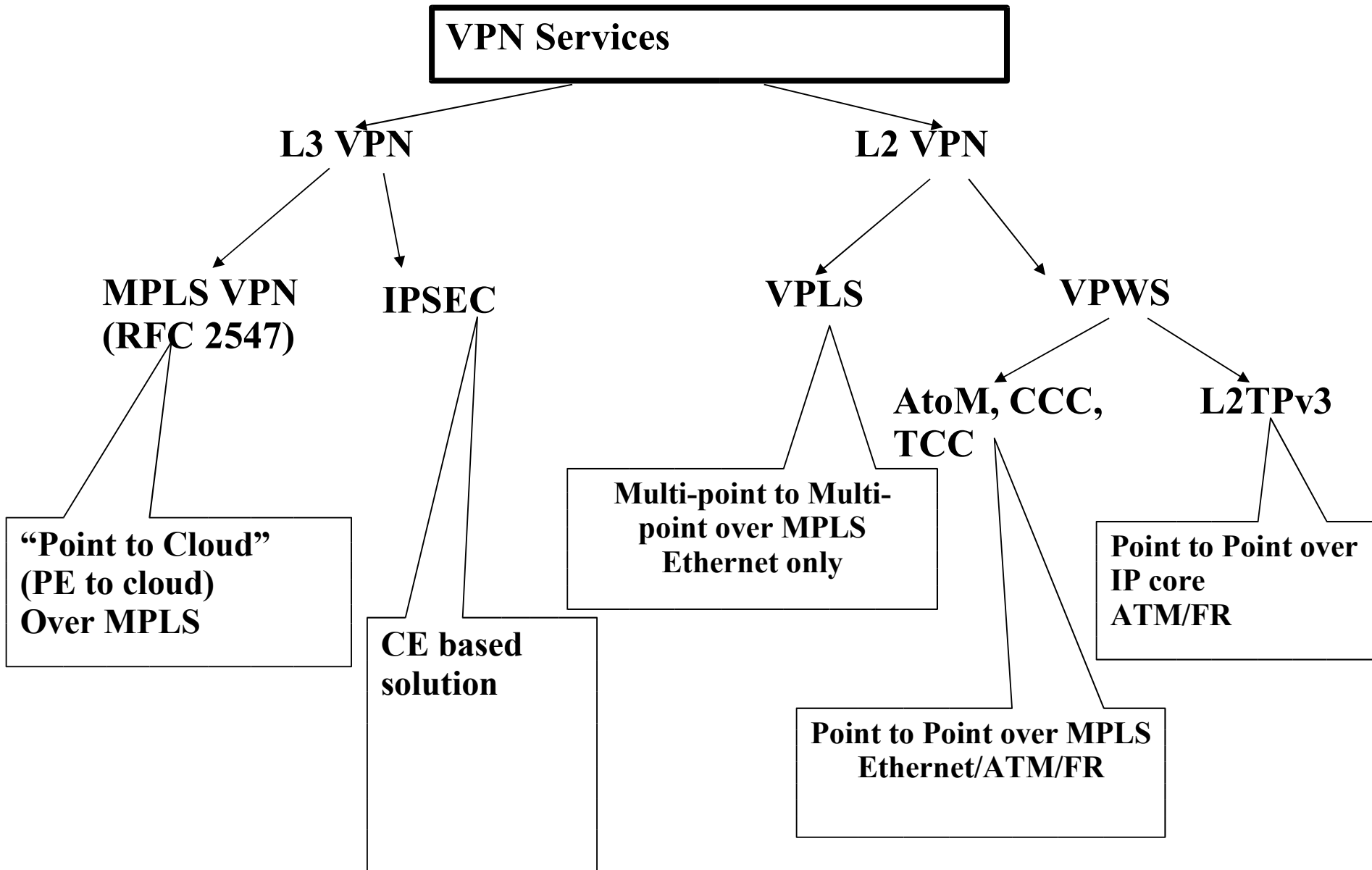
VPLS

- Very similar to VPRNs
- Unlike VPRNs, CPE nodes can either be bridges or routers
 - nature of CPE (bridge Vs router) impacts nature of encapsulation, addressing, forwarding and reachability protocols within the VPLS.
- Advantage: protocol transparency

Type IV: Virtual Private Dial Networks

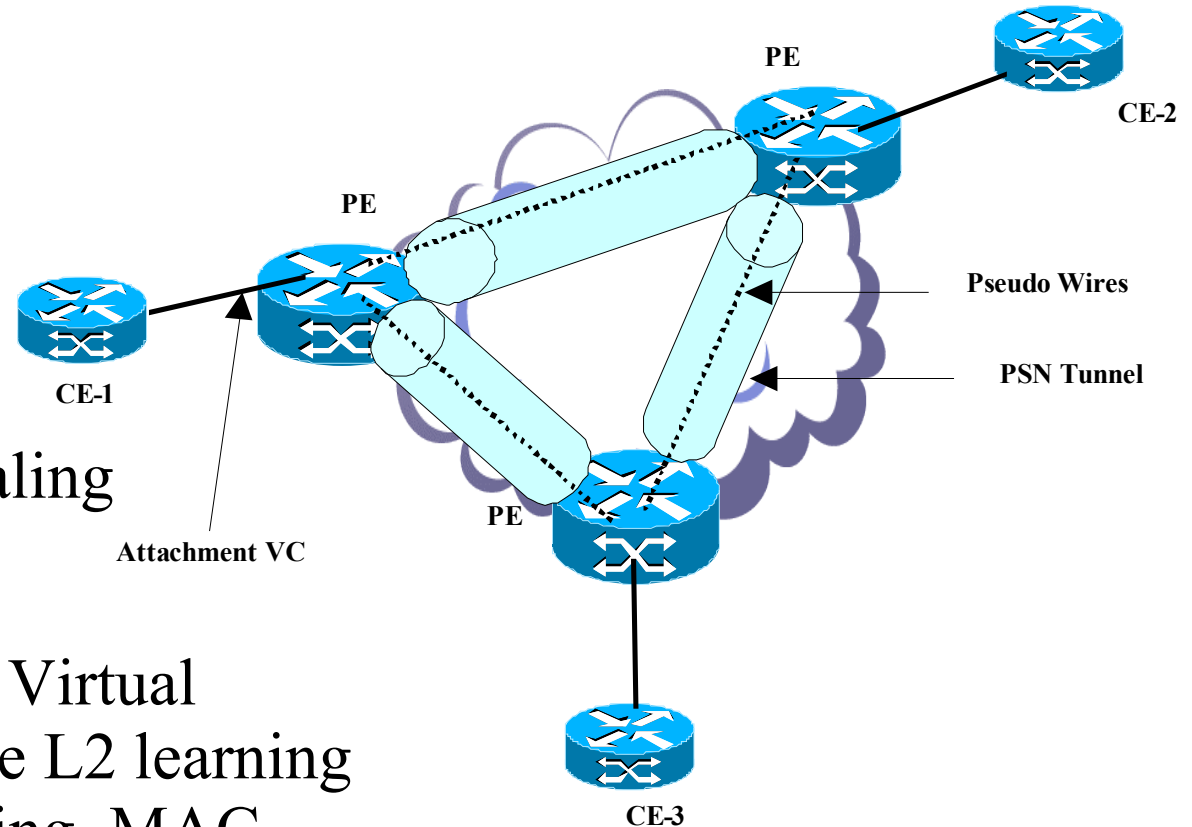
- A VPDN allows for remote users to connect on demand into remote sites through an ad-hoc tunnels.
 - E.g. PPP connections to network access server
- Strong binding btw a particular user and a central side requires authentication & security
- L2TP (Layer 2 Tunneling Protocol) allows user PPP sessions from L2TP access concentrator (LAC) to a remote L2TP network server (LNS)

VPN solutions



VPLS components

- Attachment Circuits
- Pseudo Wires
- PSN Tunnels
- End Point Discovery
 - manual/BGP/Radius
- Auto Configuration/signaling
 - Directed LDP/BGP
- Virtual Switch Instance / Virtual Forwarding Instance – like L2 learning bridge (flooding, forwarding, MAC learning/aging)
 - Running STP per VPLS instance
 - Loop prevention: split horizon + full mesh!



IETF L2VPN WG Status

After IETF 62

Ready to be published?

- Service Requirements for Layer-2 Provider Provisioned Virtual Private Networks
 - draft-ietf-l2vpn-requirements-04.txt
 - IESG review
- Framework for Layer 2 Virtual Private Networks (L2VPNs)
 - draft-ietf-l2vpn-l2-framework-05.txt
 - RFC Ed Queue

WG Last Call Done

- VPLS solutions
 - draft-ietf-l2vpn-vpls-bgp-03.txt
 - IDR review done
 - Minor PWE3 dependency
 - draft-ietf-l2vpn-vpls-ldp-06.txt
 - PWE3 dependency

WG Documents

- Several around for a while
 - IPv4 only L2VPN – cannot finalised until IPv6 and IS-IS not supported
 - draft-ietf-l2vpn-arp-mediation-01.txt
 - draft-ietf-l2vpn-ipls-01.txt
 - Different signaling proposals
 - draft-ietf-l2vpn-radius-pe-discovery-01.txt
 - draft-ietf-l2vpn-l2tp-radius-vpls-00.txt
 - draft-ietf-l2vpn-signaling-02.txt
- VPLS (LDP) Applicability Statement
 - draft-ietf-l2vpn-vpls-ldp-applic-00.txt

OAM drafts

- WG document
 - draft-ietf-l2vpn-oam-req-frmk-02.txt
- Solution documents
 - draft-aissaoui-l2vpn-vpws-iw-oam-02.txt
 - draft-stokes-vkompella-l2vpn-hvpls-oam-00.txt

Multicast VPLS

- draft-serbest-multicast-vpls-00.txt – PIM snooping
 - (updated version didn't get posted)
- draft-raggarwa-13vpn-mvpn-vpls-mcast-00.txt – where to replicate