

# Deterministic VPN

draft-chen-detnet-det-vpn-00

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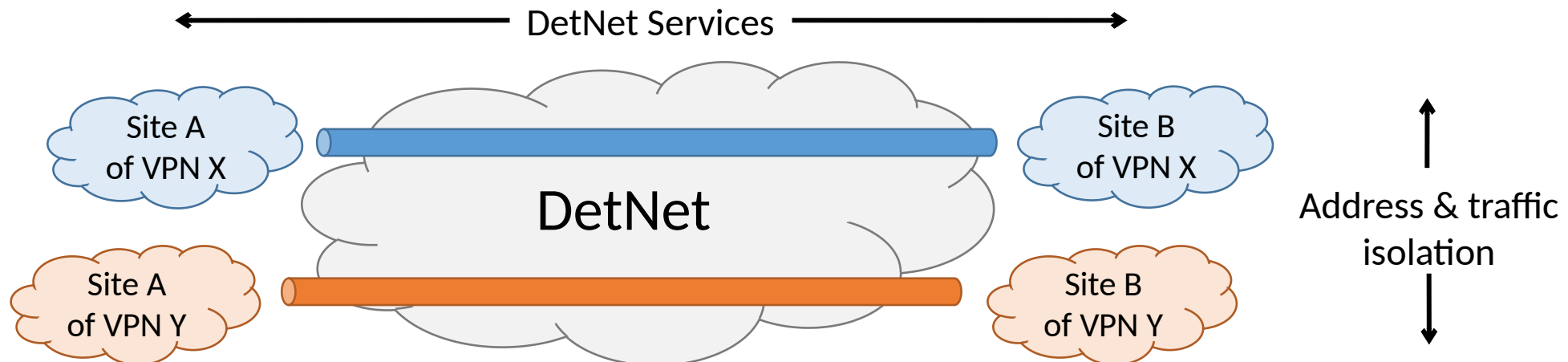
2019.3

# Motivations of The Draft

- It would be COMMON that DetNet services and L2/L3 VPNs are integrated together in real-world deployments
- Such integration MAY raise novel requirements to current protocols
- This draft aims to initiate discussions on such requirements and corresponding protocol extensions

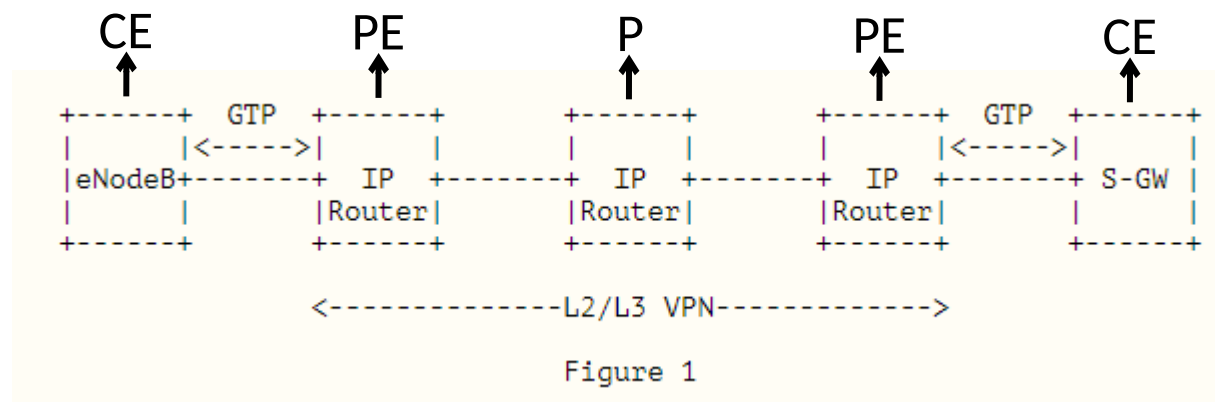
# DetNet-VPN Integration

- **DetNet recap:** bounded end-to-end latency, ultra-low data loss rate ...
- **VPN recap:** isolation of L2/L3 addresses and traffic ...
- **DetNet-VPN integration:** provide bounded end-to-end latency and ultra-low data loss rate from C E to CE, and isolate L2/L3 addresses and traffic simultaneously, which are useful in:
  - Mobile backhaul networks
  - Enterprise private networks (especially TSN networks)



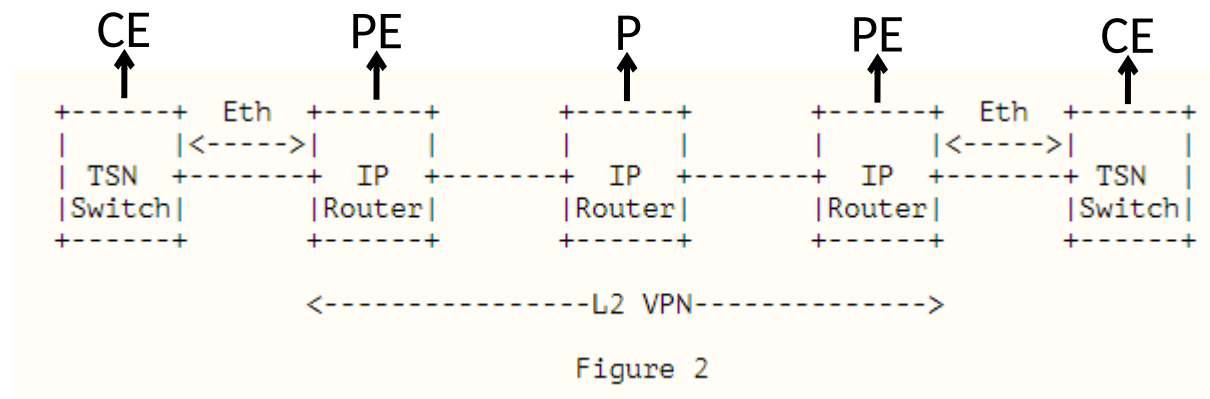
# Mobile Backhaul Networks

- Why VPN:
  - Traffic isolation for different QoSes (e.g., voice traffic and data traffic)
  - Mobile operators may rent third-part ISPs' networks to carry their traffic (i.e., address isolation is needed)
- Why DetNet:
  - Best-effort IP/MPLS forwarding provides poor QoS performance
  - There are many TDM-based sessions in mobile networks (i.e., E1), unbounded-jitter transmission hurts them more seriously



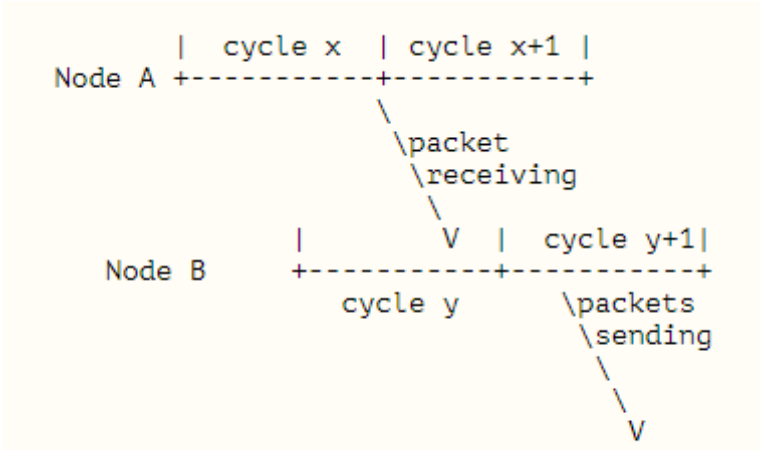
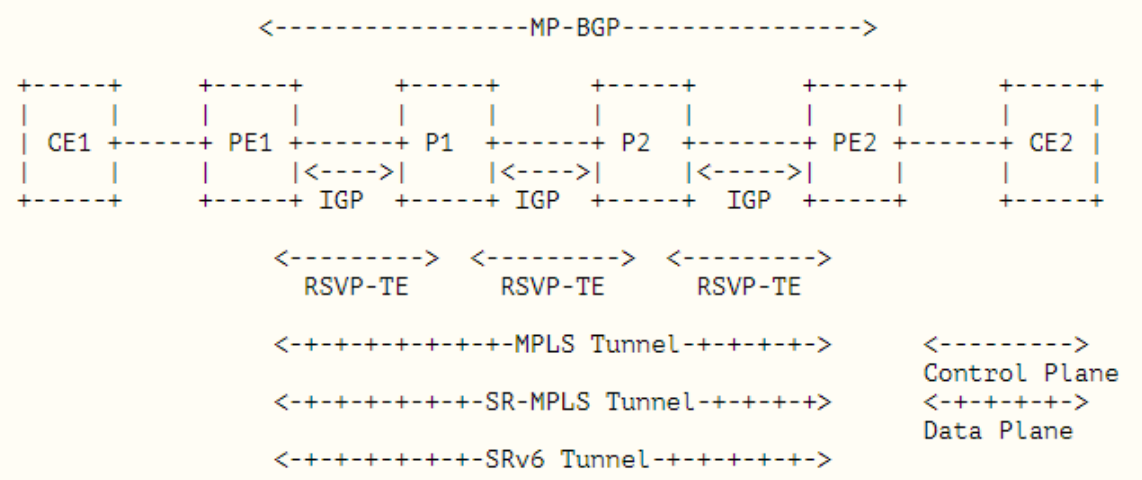
# Enterprise Private Networks (especially TSN networks)

- Why VPN:
  - ISP should provide address and traffic isolation for different enterprises
- Why DetNet:
  - Provide SLAs for enterprise's traffic, especially an enterprise aims to inter-connect its two TSN networks by using ISP's network
- 5GLAN for TSN is one of those scenarios



# Deterministic VPN

- Target: 1) address/traffic isolation; 2) CE-to-CE bounded latency and ultra-low data loss rate
- To achieve 1): reuse existing technologies, e.g., BGP/MPLS IP VPN, E-VPN, SR-MPLS VPN, SRv6 VPN, ...
- To achieve 2):
  - Each interface of PE and P nodes has three cyclic scheduled queues
  - To support long link propagation delay, all nodes SHOULD maintain frequency synchronization instead of time synchronization
  - All packets sent from the upstream router in a specific cycle MUST be sent by the downstream router within another (one) specific cycle, thus achieving bounded latency
  - A data plane mechanism is needed to indicate which upstream node's cycle a packet belongs to



# (Possible) Protocol Extensions

- **Data plane:**
  - **LSP Tunnel:** require multiple MPLS labels per LSP to achieve bounded latency, please refer to [draft-chen-mpls-cqf-lsp-dp-00] for more details
  - **SR-MPLS Tunnel:** require multiple SIDs per node/adjacency to support bounded latency
  - **SRv6 Tunnel:** require new type(s) of End SIDs to support bounded latency
- **Control plane:**
  - **MP-BGP:** to advertise VPN routes, require new BGP path attributes for DetNet-VPN descriptions
  - **RSVP-TE:** to support multiple-labels allocation and signaling (per LSP)
  - **IGP:** to advertise DetNet related SR-MPLS/SRv6 SIDs

	LSP Tunnel	SR-MPLS Tunnel	SRv6 Tunnel
MP-BGP	√	√	√
RSVP-TE	√		
IGP		√	√

√: Need extensions

# Next Steps

- Suggestions and comments on this work are highly needed ...
- We will define corresponding protocol extensions in separate documents



**Thank You!**