

# Enhanced Virtual Private Networks (VPN+)

draft-dong-teas-enhanced-vpn-00

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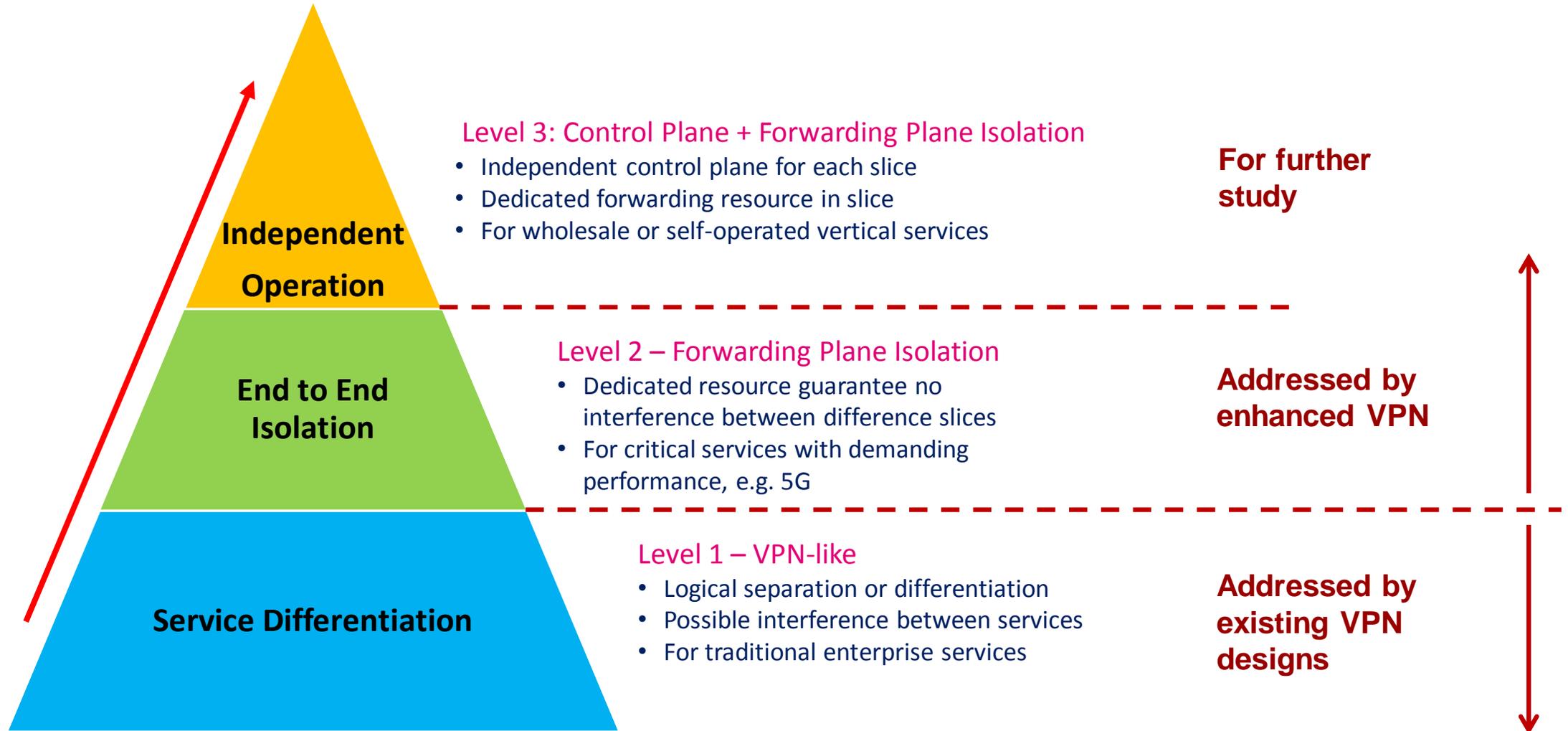
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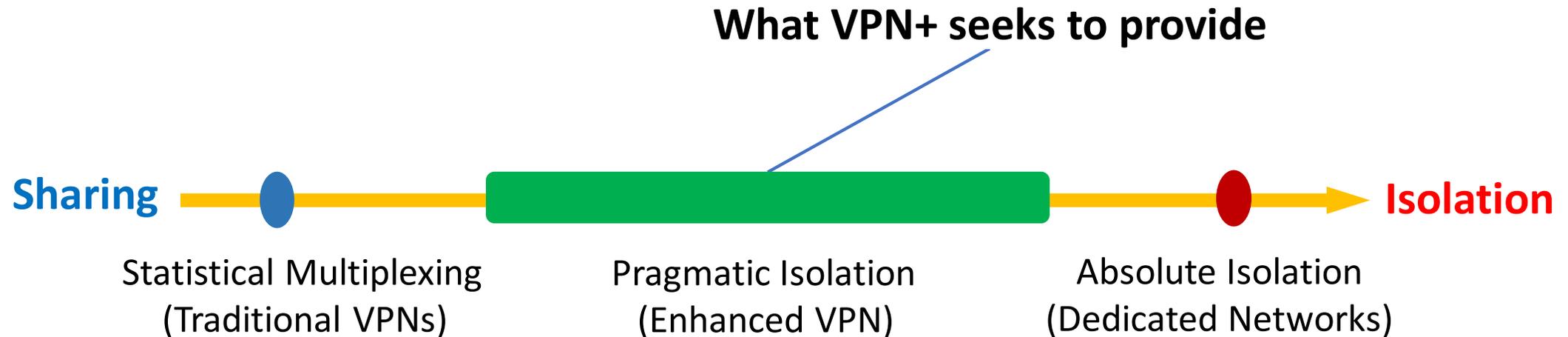
# Purpose and Scope of This Draft

- To describe the enhancements needed to VPNs to support the requirements of new services, particularly in 5G scenario such as network slicing.
  - Design of an enhanced data-plane
  - Hard and Soft isolation
  - Determinism of packet loss and packet delay
  - Protocols in the underlay and the overlay of the enhanced VPN
  - Seamless integration of physical n/w, virtual n/w & service functions
  - Simple creation, deletion & modification
  - Monitor and instrumentation requirements

# Service Requirement Model



# Spectrum of Resource Isolation



Resource = Any network resource:

Link, Bandwidth, Buffer, Forwarder/NPU, Queue, CPU, memory etc.

# Spectrum of Performance Requirements

- As a guide to understanding the design requirements we can consider four service types:

- Best effort

————— Current VPNs do this

- Assured bandwidth

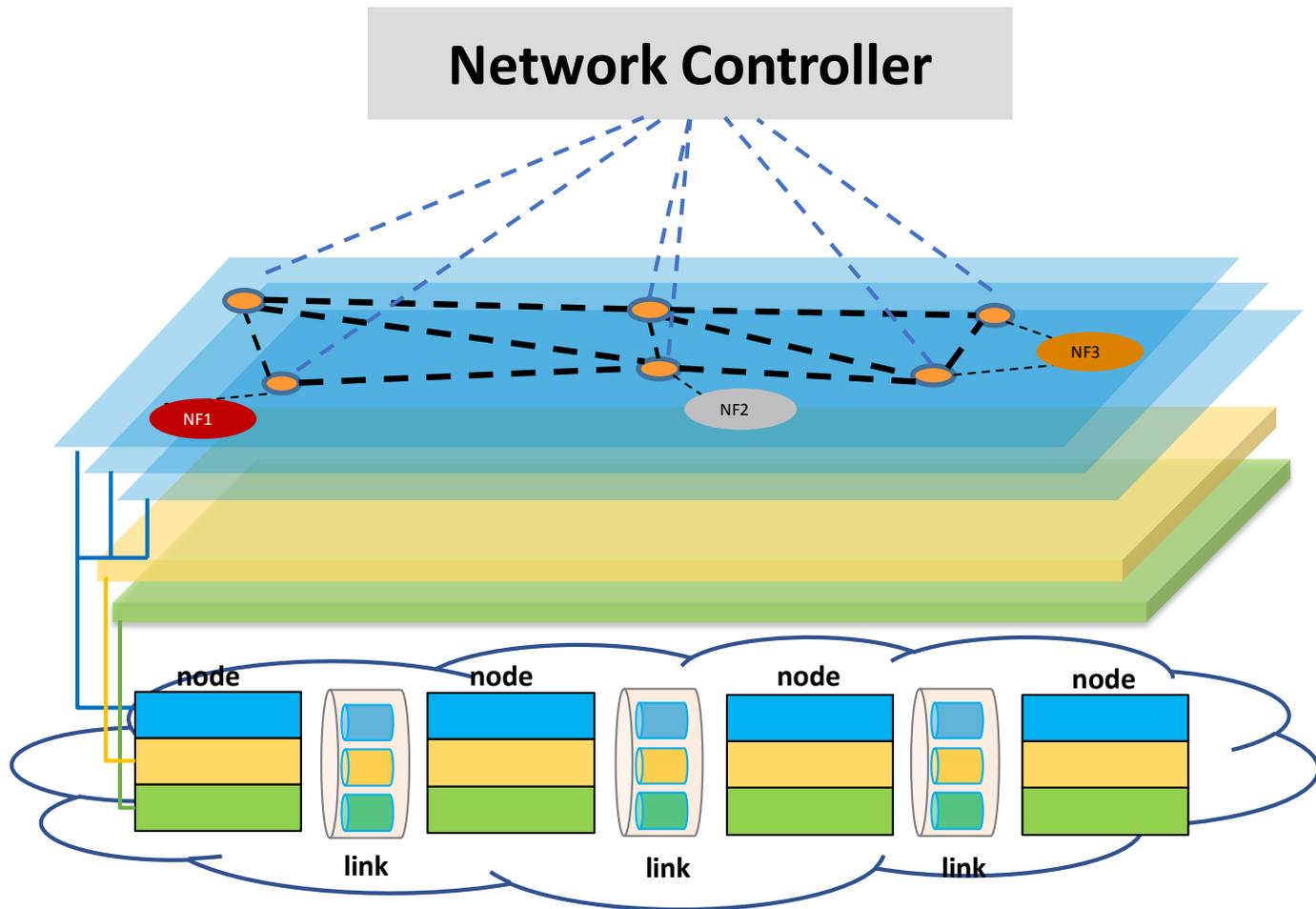
————— Scalability concerns with VPNs

- Guaranteed latency

- Enhanced delivery

————— Not yet integrated with VPNs

# Architecture of Enhanced VPN



Control & Management  
(Flexibility, scalability)



Virtual Networks  
with guaranteed resources  
(overlay & underlay integration)



Enhanced data plane  
(Resource partition & reservation)

# Candidate Technologies

## Enhanced Underlay

- Flexible Ethernet
- Time Sensitive Networks
- Enhanced Queuing & QoS
- Dedicated Nodal Resources

## Network Layer

- MPLS
- RSVP-TE
- MPLS-SR\*
- SRv6\*
- Deterministic Networking

\* Promising but needs enhancement

# Candidate Technologies (cont.)

- The control plane needs to be a hybrid taking the best of distributed and centralized control.

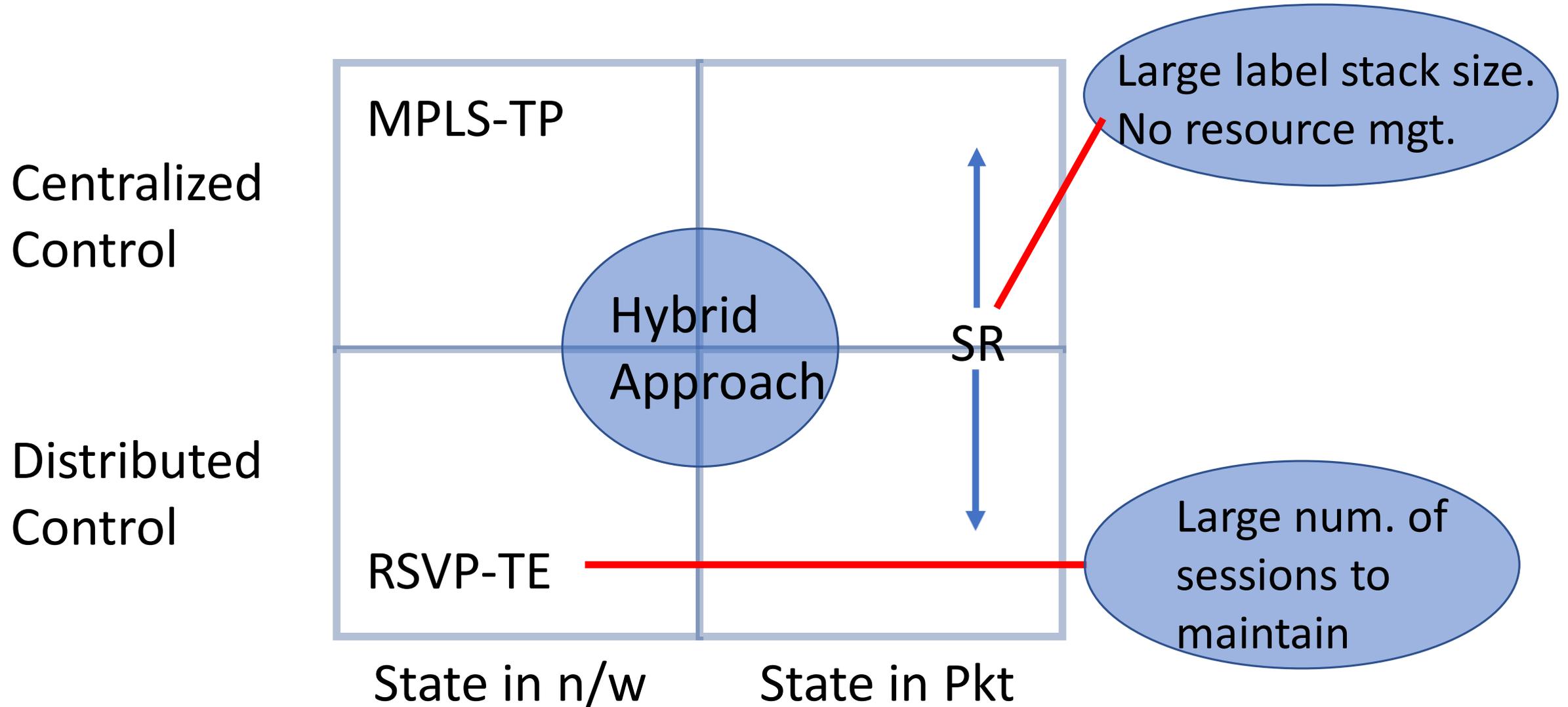
## Distributed

- IGP
- BGP
- VPN signalling

## Centralized

- L3SM/L2SM
- ACTN
- PCEP
- BGP-LS

# Scalability Considerations



# IETF Related Work

- draft-dong-spring-sr-for-enhanced-vpn-01
  - Describes the Segment Routing specific aspects of VPN+.
- draft-dong-lsr-sr-enhanced-vpn-00
  - Describes the Link State Routing Protocol enhancements needed.
- draft-ietf-detnet-architecture-06
  - Describes the architecture of one of the underpins for VPN+
- draft-ietf-detnet-dp-sol-mpls-00
  - Describes how to build a deterministic MPLS network.
- draft-lee-rtgwg-actn-applicability-enhanced-vpn-03
  - Describes the applicability of ACTN to enhanced VPN

# IETF Related Work (cont.)

- draft-arkko-arch-virtualization-01
  - A study of virtualization techniques.
- draft-ali-spring-network-slicing-building-blocks-00
  - Provides a catalogue of existing SR technologies that may be used to provide some aspects of network slicing.
  - VPN+ aims to enhance SR by adding support for resource isolation and determinism

# Next Steps

- Under its previous name (draft-bryant-rtgwg-enhanced-vpn) this has been discussed widely at a number of IETF meetings.
- The consensus seems to be that this is useful work which belongs in TEAS.
- The authors therefore request that the TEAS chairs initiate the WG adoption process on this draft.

Feedback and contributions  
welcome.

Questions?