

Applicability of Abstraction and Control of Traffic Engineered Networks (ACTN) to Enhanced VPN

draft-lee-rtgwg-actn-applicability-enhanced-vpn-03

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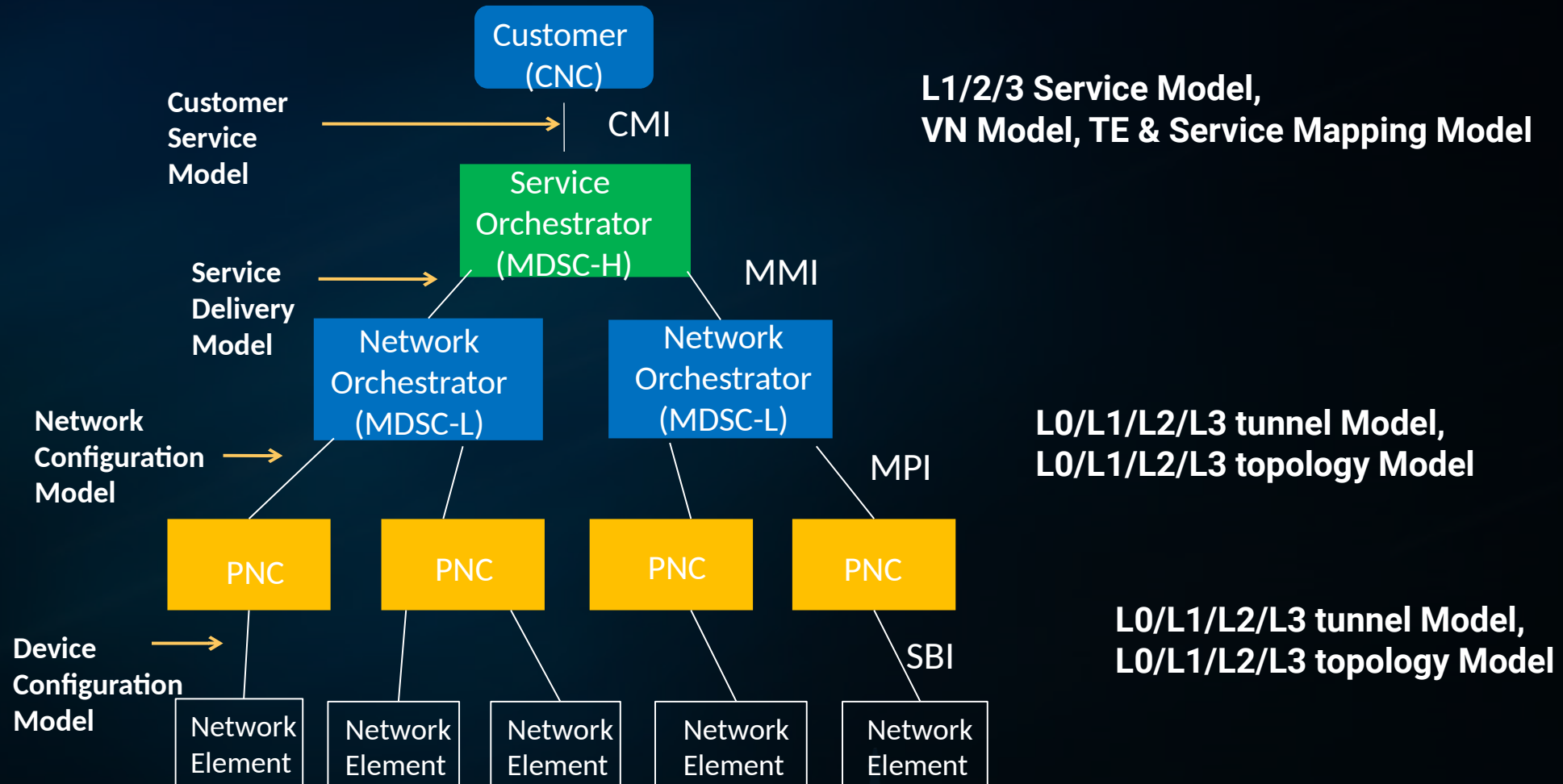
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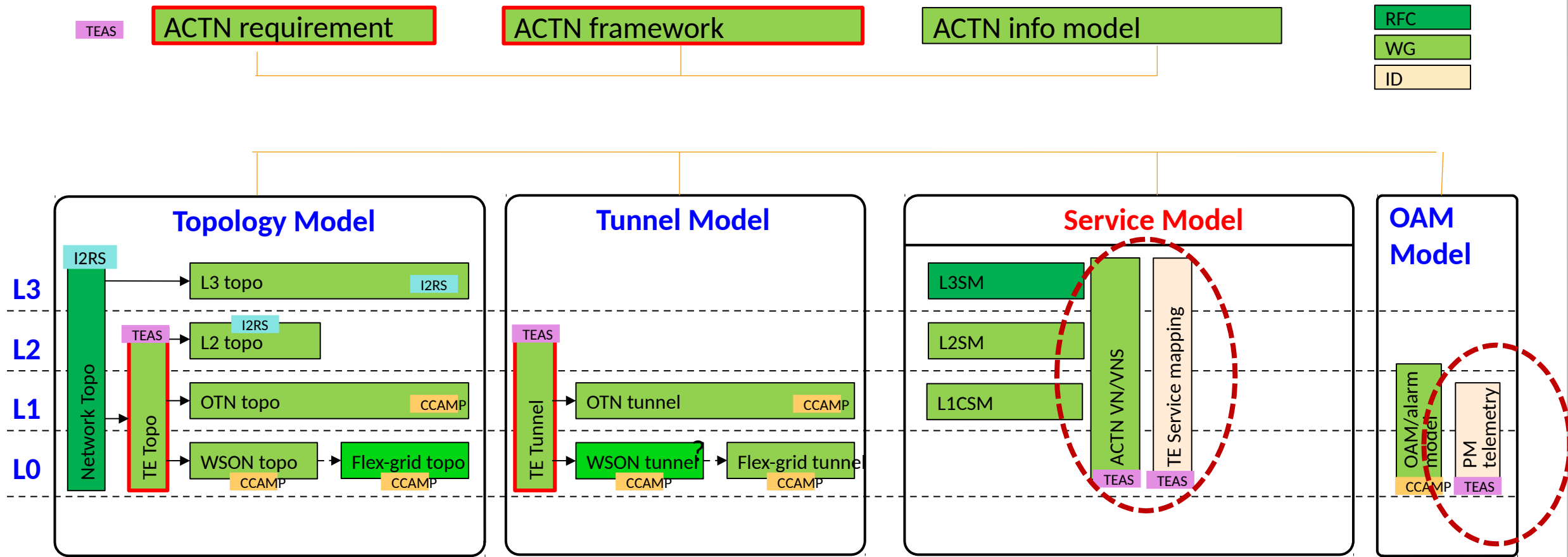
Enhanced VPN has the following key requirements

1. Isolation between VPNs
 - › Hard and soft isolation
2. Guaranteed Performance
 - › Low latency,
 - › Low packet drop,
3. Customized Control Plane
 - › Simple creation, deletion and modification of the services.
 - › Control over VPN
4. Seamless integration of both physical and virtual network and service functions

IETF YANG Models (Ref: RFC 8309)



IETF ACTN & YANG: Progress

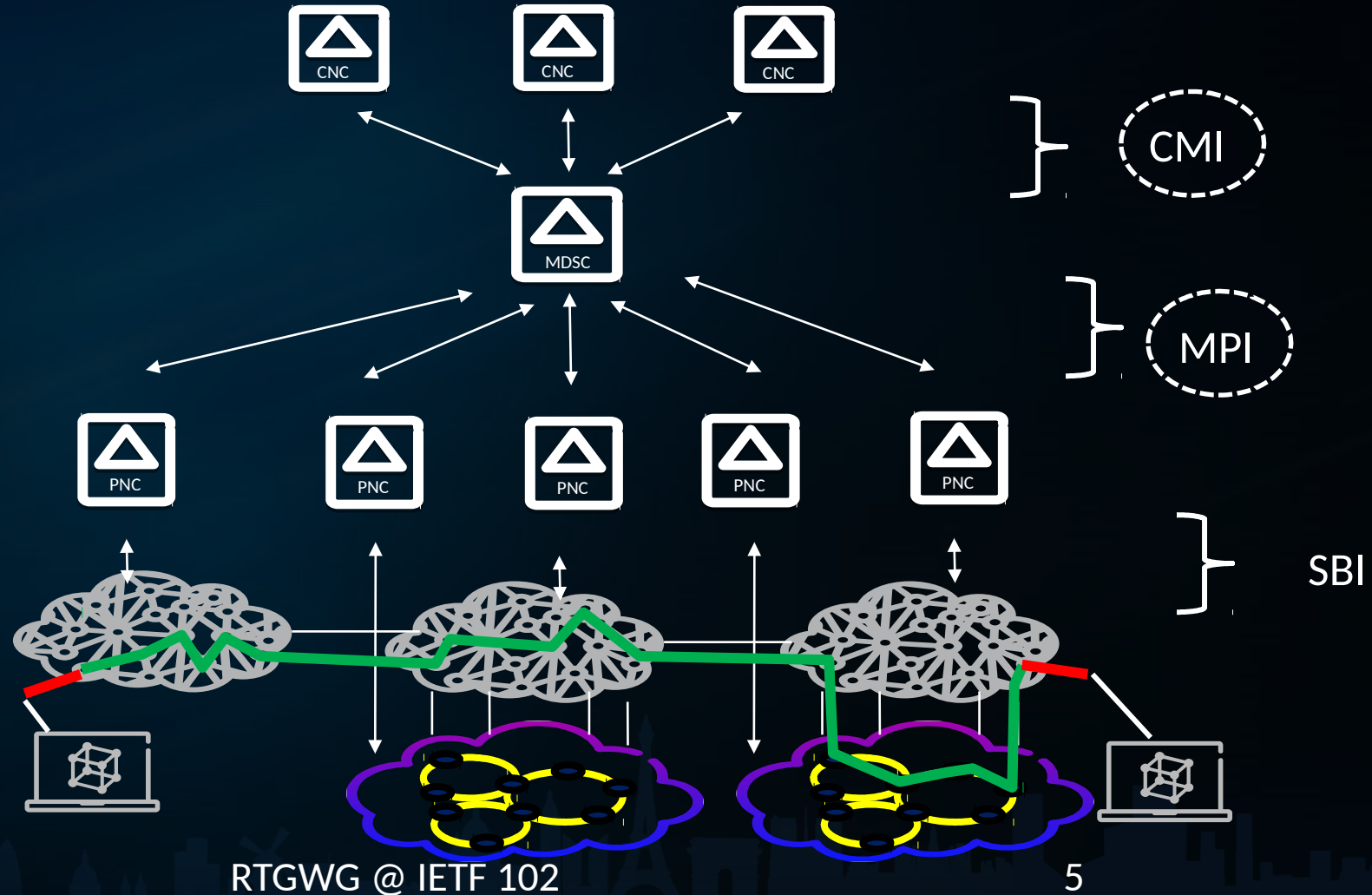


ACTN Reference Architecture

Customer Network
Controller

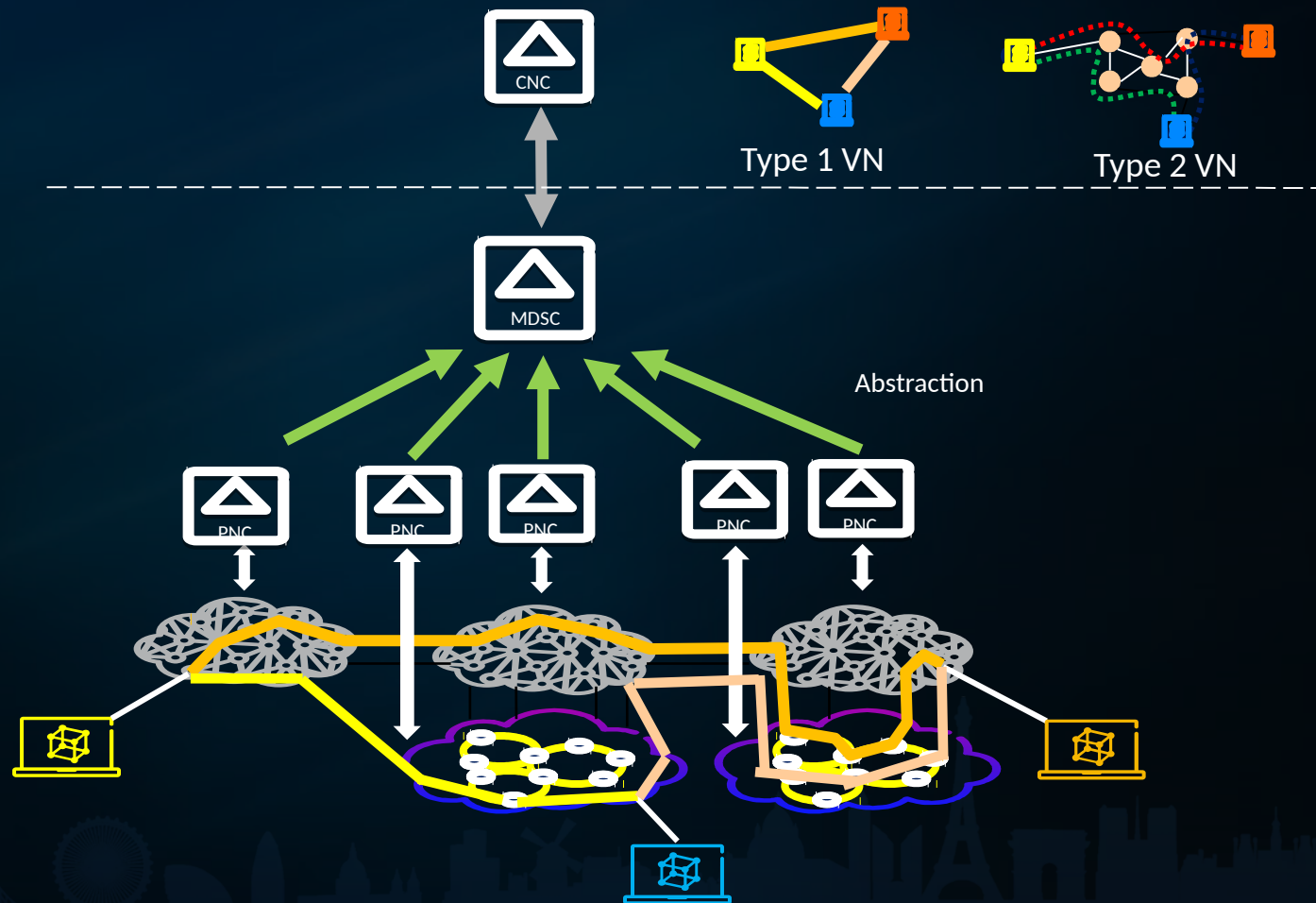
Multi-domain Service
Coordinator
(Orchestrator)

Provisioning Network
Controller
(Domain
Controller)



ACTN Architecture Principles: Virtual Network

Providing network virtualization services to customer so that customers can dynamically control and operate their own virtual network slices according to their own service intent, application requirements.



CNC (Customer Network Controller) can be Service Orchestrator, VNO Controller, Service Portal, etc.

ietf-actn-vn yang module

<https://tools.ietf.org/html/draft-ietf-teas-actn-vn-yang-03>

```
module: ietf-actn-vn
  +--rw actn
    +--rw ap
      | +--rw access-point-list* [access-point-id]
      |   +--rw access-point-id      uint32
      |   +--rw access-point-name?   string
      |   +--rw max-bandwidth?       te-types:te-bandwidth
      |   +--rw avl-bandwidth?       te-types:te-bandwidth
      |   +--rw vn-ap* [vn-ap-id]
      |     +--rw vn-ap-id           uint32
      |     +--rw vn?                -> /actn/vn/vn-list/vn-id
      |     +--rw abstract-node?     -> /nw:networks/network/node/tet:te-node-id
      |     +--rw ltp?               te-types:te-tp-id
    +--rw vn
      +--rw vn-list* [vn-id]
        +--rw vn-id                  uint32
        +--rw vn-name?               string
        +--rw vn-topology-id?        te-types:te-topology-id
        +--rw abstract-node?         -> /nw:networks/network/node/tet:te-node-id
        +--rw vn-member-list* [vn-member-id]
          | +--rw vn-member-id      uint32
          | +--rw src
          |   | +--rw src?           -> /actn/ap/access-point-list/access-point-id
          |   | +--rw src-vn-ap-id? -> /actn/ap/access-point-list/vn-ap/vn-ap-id
          |   | +--rw multi-src?     boolean {multi-src-dest}?
          |   +--rw dest
          |     | +--rw dest?        -> /actn/ap/access-point-list/access-point-id
          |     | +--rw dest-vn-ap-id? -> /actn/ap/access-point-list/vn-ap/vn-ap-id
          |     | +--rw multi-dest?   boolean {multi-src-dest}?
          |   +--rw connetivity-matrix-id? -> /nw:networks/network/node/tet:te-node-attributes/connectivity-matrices/connectivity-matrix/id
          |   +--ro oper-status?       identityref
          +--ro if-selected?           boolean {multi-src-dest}?
          +--rw admin-status?          identityref
          +--ro oper-status?           identityref
          +--rw vn-level-diversity?    vn-disjointness
```

Creation of VN id and linking to TE abstract node

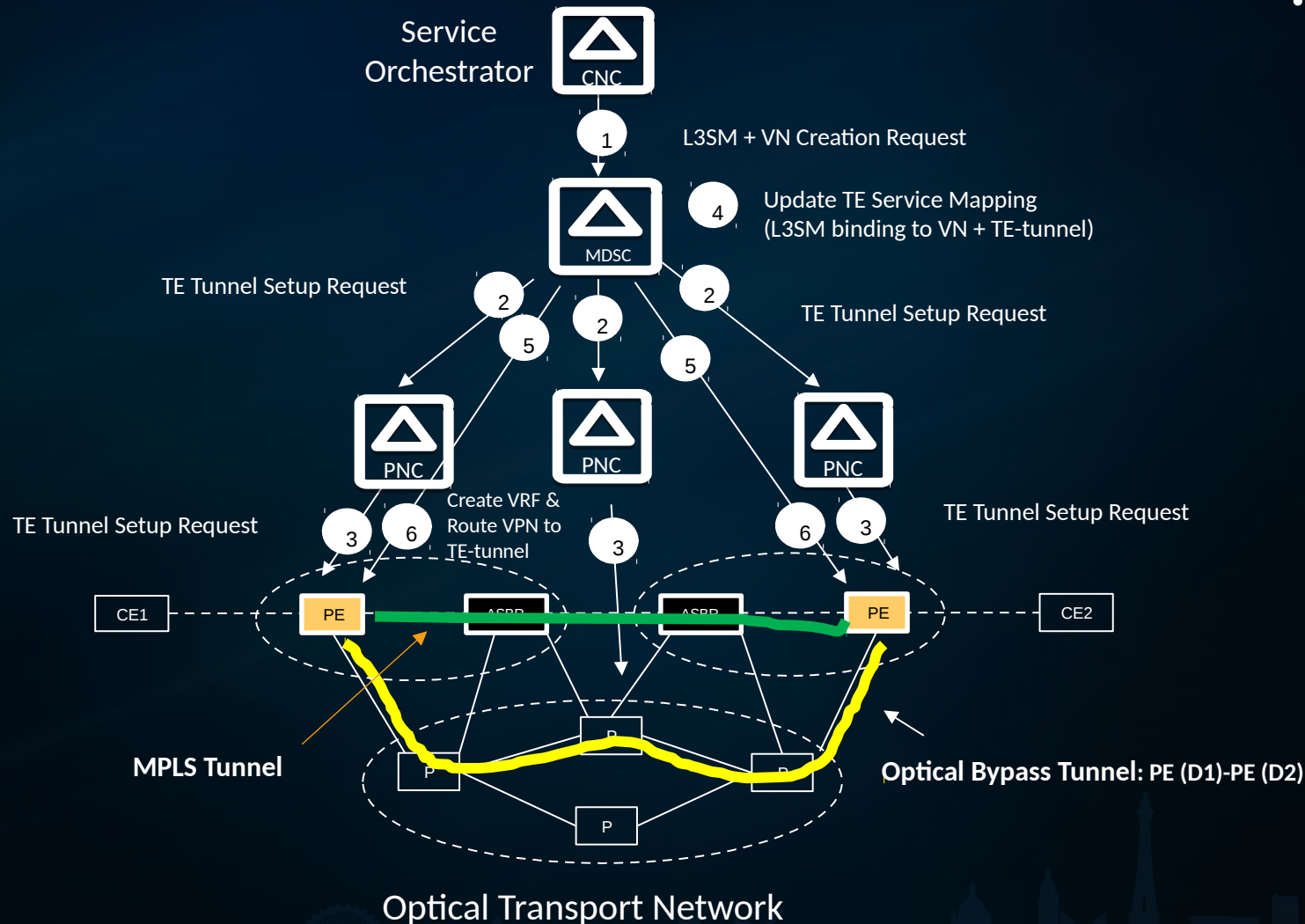
Linking to connectivity matrix of te topology to allow VN to configure type 2

TE VN+ Requirements

- From a customer perspective:
 - › Create dynamically their virtual network and operate it (create/modify/delete) without having to understand transport underlay details.
 - › Monitor KPI for their VN.
- From a provider perspective:
 - › Map and translate customer virtual network models (e.g., L1/2/3 VPN, VPN+) against TE constrained paths in transport network.
 - › Provision and manage end to end paths per VN instance.
 - › Monitor performance of slice at various levels: customer level, orchestration level and domain level.
 - › Provide deterministic performance guarantee for both latency and bandwidth (Hard Isolation).

TE & Service Mapping Model

<https://tools.ietf.org/html/draft-lee-teas-te-service-mapping-yang-08>



- VPN/TE Selection Policy
 - New VN/Tunnel Binding – Customer could request a VPN service with a new VN/Tunnel not shared with other existing services
 - Hard Isolation with deterministic characteristics
 - Hard Isolation: This is similar to the above case without deterministic characteristics.
 - Soft Isolation: Customer would request an VPN service using a set of MPLS-TE tunnel which cannot be shared with other VPN services.
- VN/Tunnel Sharing with existing VNs/Tunnels
 - resource multiplexing
 - resource partition
 - ultra resource partition
- VN/Tunnel Modify - This mode allows the modification of the properties of the existing VN/tunnel (e.g., bandwidth) when VN/Tunnel Selection Mode is applied.

ietf-te-service-mapping

<https://tools.ietf.org/html/draft-lee-teas-te-service-mapping-yang-08>

VPN/Tunnel Selection Policy

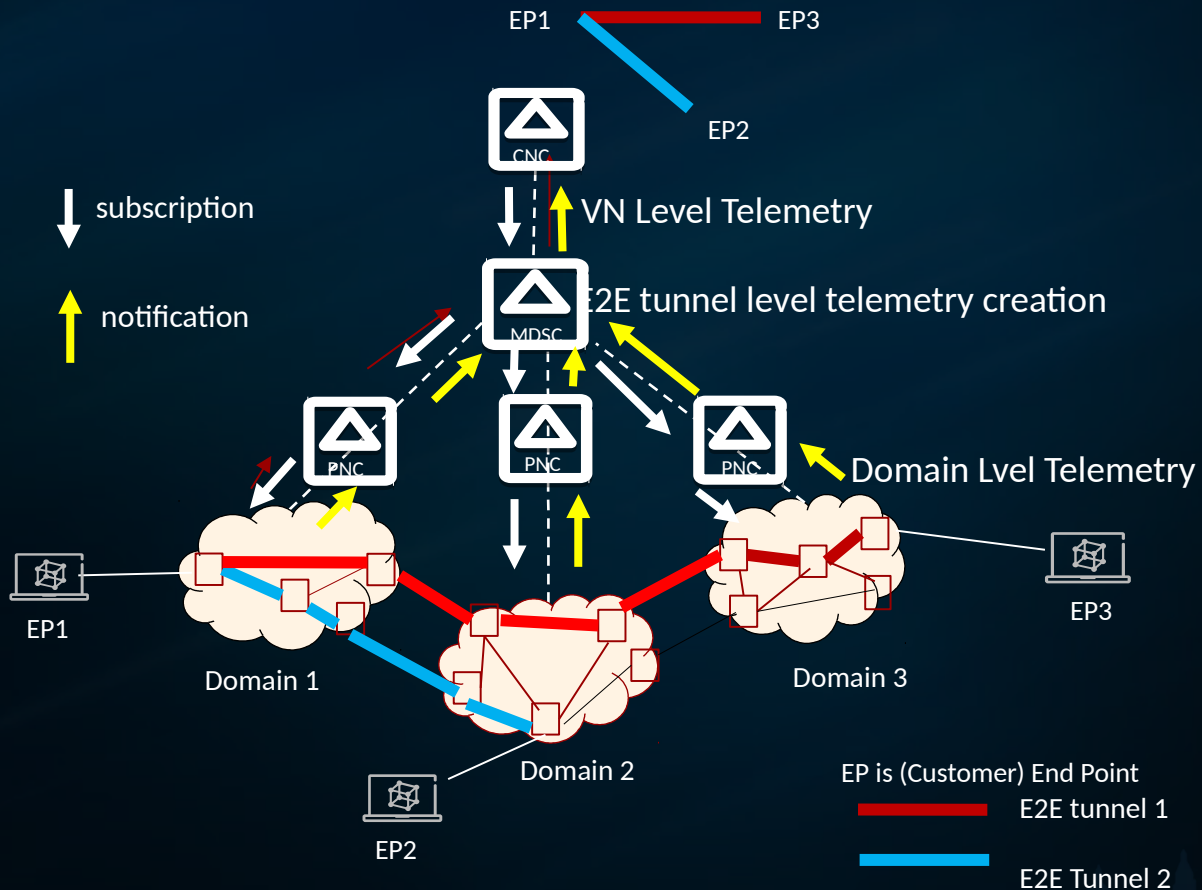
```
module: ietf-te-service-mapping
  +--rw te-service-mapping
    +--rw service-mapping
      | +--rw mapping-list* [map-id]
      | | +--rw map-id uint32
      | | +--rw map-type? map-type
      | | +--rw (service)?
      | | | +--:(l3vpn)
      | | | | +--rw l3vpn-ref? -> /l3:l3vpn-svc/vpn-services/vpn-service/vpn-id
      | | | | +--:(l2vpn)
      | | | | | +--rw l2vpn-ref? -> /l2:l2vpn-svc/vpn-services/vpn-service/vpn-id
      | | | | +--:(l1vpn)
      | | | | | +--rw l1vpn-ref? -> /l1:l1cs/service/service-list/subscriber-l1vc-id
      | | +--rw (te)?
      | | | +--:(actn-vn)
      | | | | +--rw actn-vn-ref? -> /vn:actn/vn/vn-list/vn-id
      | | | +--:(te-topo)
      | | | | +--rw vn-topology-id? te-types:te-topology-id
      | | | | +--rw abstract-node? -> /nw:networks/network/node/node-id
      | | | +--:(te-tunnel)
      | | | | +--rw te-tunnel-list* te:tunnel-ref
    +--rw site-mapping
      +--rw mapping-list* [map-id]
      +--rw map-id uint32
      +--rw (service)?
      | +--:(l3vpn)
      | | +--rw l3vpn-ref? -> /l3:l3vpn-svc/sites/site/site-id
      | +--:(l2vpn)
      | | +--rw l2vpn-ref? -> /l2:l2vpn-svc/sites/site/site-id
      | +--:(l1vpn)
      | | +--rw l1vpn-ref? -> /l1:l1cs/access/uni-list/UNI-ID
      +--rw (te)?
      | +--:(actn-vn)
      | | +--rw actn-vn-ref? -> /vn:actn/ap/access-point-list/access-point-id
      | +--:(te)
      | | +--rw ltp? te-types:te-tp-id
```

```
typedef map-type {
  type enumeration {
    enum "new-hard-isolation-deterministic" {
      description
        "The new VN/tunnels are binded to the service";
    }
    enum "new-hard-isolation" {
      description
        "The VPN service selects an existing tunnel with no
        modification";
    }
    enum "new-soft-isolation" {
      description
        "The VPN service selects an existing tunnel and
        allows to modify the properties of the tunnel (e.g., b/w) ";
    }
    enum "share" {
      description
        "share existing tunnel";
    }
    enum "modify" {
      description
        "The VPN service selects an existing tunnel and
        allows to modify the properties of the tunnel (e.g., b/w)";
    }
  }
  description
    "The map-type";
}
```

PM Telemetry & Network Autonomics

<https://tools.ietf.org/html/draft-lee-teas-actn-pm-telemetry-autonomics-07>

A Virtual network is created to load balance between two DCs.



- YANG PUSH mechanism for streaming KPI telemetry at various level:
 - VN
 - E2E Tunnel
 - Domain LSP/Link
- Autonomic traffic engineering scaling intent configuration mechanism on the VN/Tunnel/Link level.

ietf-te-kpi-telemetry model

<https://tools.ietf.org/html/draft-lee-teas-actn-pm-telemetry-autonomics-07>

```
module: ietf-te-kpi-telemetry
augment /te:te/tunnels/te:tunnel:
  +--rw te-scaling-intent
  |   +--rw scale-in-intent
  |   |   +--rw threshold-time?      uint32
  |   |   +--rw cooldown-time?      uint32
  |   |   +--rw scale-in-operation-type? scaling-criteria-operation
  |   |   +--rw scale-out-operation-type? scaling-criteria-operation
  |   |   +--rw scaling-condition* [performance-type]
  |   |       +--rw performance-type identityref
  |   |       +--rw te-telemetry-tunnel-ref? -> /te:te/tunnels/tunnel/name
  |   +--rw scale-out-intent
  |   |   +--rw threshold-time?      uint32
  |   |   +--rw cooldown-time?      uint32
  |   |   +--rw scale-in-operation-type? scaling-criteria-operation
  |   |   +--rw scale-out-operation-type? scaling-criteria-operation
  |   |   +--rw scaling-condition* [performance-type]
  |   |       +--rw performance-type identityref
  |   |       +--rw te-telemetry-tunnel-ref? -> /te:te/tunnels/tunnel/name
  +--ro te-telemetry
  |   +--ro id? string
  |   +--ro unidirectional-delay?      uint32
  |   +--ro unidirectional-min-delay?  uint32
  |   +--ro unidirectional-max-delay?  uint32
  |   +--ro unidirectional-delay-variation? uint32
  |   +--ro unidirectional-packet-loss? decimal64
  |   +--ro unidirectional-residual-bandwidth? rt-types:bandwidth-ieee-float32
  |   +--ro unidirectional-available-bandwidth? rt-types:bandwidth-ieee-float32
  |   +--ro unidirectional-utilized-bandwidth? rt-types:bandwidth-ieee-float32
  |   +--ro bidirectional-delay?      uint32
  |   +--ro bidirectional-min-delay?  uint32
  |   +--ro bidirectional-max-delay?  uint32
  |   +--ro bidirectional-delay-variation? uint32
  |   +--ro bidirectional-packet-loss? decimal64
  |   +--ro bidirectional-residual-bandwidth? rt-types:bandwidth-ieee-float32
  |   +--ro bidirectional-available-bandwidth? rt-types:bandwidth-ieee-float32
  |   +--ro bidirectional-utilized-bandwidth? rt-types:bandwidth-ieee-float32
  |   +--ro utilized-percentage?      uint8
  +--ro te-ref? -> /te:te/tunnels/tunnel/name
```

Auto scale mechanism programmable by the customer per tunnel/VN

Can subscribe PM parameters of interest per tunnel/VN

Recap: How VPN+ requirements fulfilled by ACTN with L2/3SM and TEAS models

- | | | |
|--|---|---|
| 1. Isolation between VPNs | → | L2/3SM + ACTN VN YANG & TE & Svc Mapping. |
| > Hard and soft isolation | | |
| 2. Guaranteed Performance | → | L2/3 SM + ACTN VN/TE-tunnels & PM Telemetry |
| > Low latency, | | |
| > Low packet drop, | | |
| 3. Customized Control Plane | → | ACTN VN + TE-topo connectivity matrix |
| > Simple creation, deletion and modification of the services. | | |
| > Control over VPN | | |
| 4. Seamless integration of both physical and virtual network and service functions | → | SF-enable topology model (TEAS) |

Next Steps

- Any comments/feedback?

Thank you !