

# Applicability of ACTN to Network Slicing

[draft-king-teas-applicability-actn-slicing-01](#)

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# What do we mean by Network Slicing?

- *“A transport network slice construct provides an end-to-end logical network, often with compute functions and utilising shared underlying (physical or virtual) network resources. This logical network is separated from other, often concurrent, logical networks each with independent control and management, and each of which can be created or modified on demand.”*
  - *Definition provided in “Applicability of Abstraction and Control of Traffic Engineered Networks (ACTN) to Network Slicing”*
  - <https://tools.ietf.org/html/draft-king-teas-applicability-actn-slicing>
- Essentially network slicing (in the context of ACTN) provides **Traffic Engineered** connectivity and function to serve customers with a wide variety of different service needs, which may include:
  - Latency, reliability, capacity, and service function specific capabilities

# ACTN Requirements for Network Slicing

- Requirements for Network Slicing
  - **Resource Slicing:** provide a flexible range of services both by partitioning (slicing) the available network resources and provide specific Service Functions with correct chaining logic
  - **Network and Function Virtualization:** The resources to be virtualized can be physical or already virtualized, supporting a recursive pattern with different abstraction layers
  - **Resource Isolation:** operate concurrent network slices across a common shared underlying infrastructure
    - **Performance:** Each slice is defined to meet specific service requirements, usually expressed in the form of Key Performance Indicators (KPIs)
    - **Security:** Attacks or faults occurring in one slice must not have an impact on other slices, or customer flows are not only isolated on network edge, but multiple customer traffic is not mixed across the core of the network
    - **Management:** Each slice must be independently viewed, utilised and managed as a separate network
  - **Control and Orchestration:** Orchestration is the overriding control method for network slicing
    - **Multi-domain Orchestration:** Managing connectivity setup of the transport service, across multiple administrative domains;
    - **End-to-end Orchestration:** Combining resources for an "end-to-end service (e.g., transport connectivity with firewalling and guaranteed bandwidth and minimum delay for premium radio users (spanning multiple domains)).

# Achieving Network Slicing using ACTN

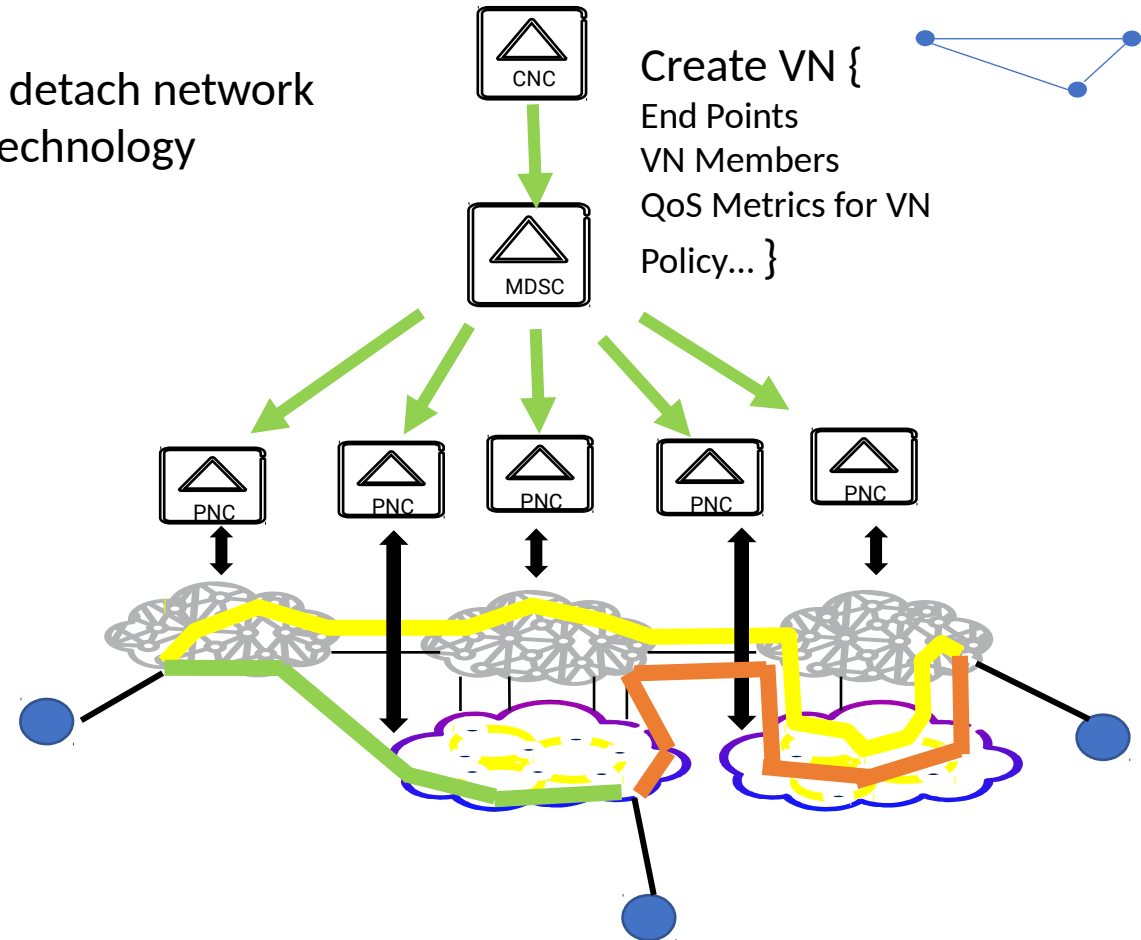
- **The Abstraction and Control of Traffic Engineered Networks (ACTN) defines an SDN-based architecture**

- Uses concepts of network and service abstraction to detach network and service control from the underlying data plane technology

- **A Virtual Network (VN) is a customer view of the TE network**

- Depending on the agreement between client and provider various VN Services (VNS) operations and VNS types

- **Type 1** VNS refers to VNS in which customer is allowed to create and operate a VNS
- **Type 2a** VNS, once the VN is statically created at service configuration time, the customer is not allowed to change the topology (i.e., adding or deleting abstract nodes/links)
- **Type 2b** VNS is the same as Type 2a VNS except that the customer is allowed to change topology dynamically from the initial topology created at service configuration time



# What are the key Network Slicing use Cases for ACTN?

- Mobile Virtual Network Operations
  - “Create virtual connects supporting mobile operators in viewing, managing and operating multi-domains of many dimensions (e.g., radio access, backhaul transport, mobile DC edge, mobile DC core)”
    - [draft-shin-actn-mvno-multi-domain](#) J. Shin, R. Hwang, J. Lee – SK Telecom
    - [draft-cheng-actn-ptn-requirements](#) W. Cheng – CMCC, Y. Xu and G. Zhang – CATR
- Other Use Cases include:
  - Packet Optical Integration (POI) Use Cases for Abstraction and Control of TE Networks (ACTN)
    - [draft-dhody-actn-poi-use-case](#)
  - ACTN Use Case for Multi-domain Data Center Interconnect
    - [draft-fang-actn-multidomain-dci](#)
  - E2E network services in multiple vendor domain transport networks
    - [draft-lee-teas-actn-connectivity-multi-domain](#)
  - Multi Tenant VNO
    - [draft-kumaki-teas-actn-multitenant-vno](#)
  - Virtual Network Operation for Multiple Domains in a Single Operator Network
    - [draft-lopez-actn-vno-multidomains](#)

# What IETF work is in progress?

- Requirements for Abstraction and Control of TE Networks
  - <https://tools.ietf.org/html/draft-ietf-teas-actn-requirements>
- Framework and control of ACTN resources
  - <https://tools.ietf.org/html/draft-ietf-teas-actn-framework>
- Abstraction and Control of TE Networks (ACTN) Abstraction Methods
  - <https://tools.ietf.org/html/draft-lee-teas-actn-abstraction>
- Information Model for Abstraction and Control of TE Networks (ACTN)
  - <https://tools.ietf.org/html/draft-ietf-teas-actn-info-model>
- A YANG Data Model for ACTN VN Operation
  - <https://tools.ietf.org/html/draft-lee-teas-actn-vn-yang>
- YANG models for ACTN TE Performance Monitoring Telemetry and Network Autonomics
  - <https://tools.ietf.org/html/draft-lee-teas-actn-pm-telemetry-autonomics>

# What additional IETF work might be needed?

- VNS Security and Isolation
  - Secure slicing and isolation of resources
    - Consumers will expect and require that there is no risk of leakage of data from one slice to another
    - No transfer of knowledge of the structure or even existence of other slices, and that changes to one slice (under the control of one consumer) should not have detrimental effects on the operation of other slices
  - Policy control of slices
    - Managing who and how the VNS creation and modification will be achieved, and also the scope of slice setup and possible modifications/re-optimizations
- Requesting compute, storage and function resources during VNS setup
  - Including VNF type, size, location and ensuring correct service chains
  - The only technical work would be additional YANG models