ACTN Requirements

http://datatracker.ietf.org/doc/draft-ietf-teas-actn-requirements/

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Status Update

- Changed the draft name to: http://datatracker.ietf.org/doc/draft-ietf-teas-actn-requirements/

- ACTN Stands for Abstraction and Control of **Traffic Engineered (TE)** Networks.

- Definition/Scope of Work added in Introduction Section.

ACTN Definition

ACTN refers to the set of virtual network operations needed to orchestrate, control and manage large-scale multi-domain TE networks so as to facilitate network programmability, automation, efficient resource sharing, and end-to-end virtual service aware connectivity and network function virtualization services.

ACTN Operations

- Abstraction and coordination of underlying network resources to higher-layer applications and customers, independent of how these resources are managed or controlled, so that these higher-layer entities can dynamically control virtual networks. Where control includes creating, modifying, monitoring, and deleting virtual networks.

- Multi-domain and multi-tenant virtual network operations via hierarchical abstraction of TE domains that facilitates multi-administration, multi-vendor, and multi-technology networks as a single virtualized network. This is achieved by presenting the network domain as an abstracted topology to the customers via open and programmable interfaces. Which allows for the recursion of controllers in a customer-provider relationship.

- Orchestration of end-to-end virtual network services and applications via allocation of network resources to meet specific service, application and customer requirements.

- Adaptation of customer requests (made on virtual resources) to the physical network resources performing the necessary mapping, translation, isolation and, policy that allows conveying, managing and enforcing customer policies with respect to the services by the network to said customer.

- Provision of a computation scheme and virtual control capability via a data model to customers who request virtual network services. Note that these customers could, themselves, be service providers

ACTN Solution Scope

ACTN solutions will build on, and extend, existing TE constructs and TE mechanisms wherever possible and appropriate. Support for controller-based approaches is specifically included in the possible solution set.

Organization of Draft

1. High-level requirements referenced by use-cases:

2. Use-case summary

3. Categorized requirements into two categories: (i) service-specific; (ii) network-related.

4. Each requirement identified with what can be done with existing TE construct/mechanism, what need to be extended, etc.

1. Requirement 1: Single Virtualized Network Topology

Ability to build virtual network operation infrastructure based
on multi-layer, multi-domain topology abstracted from multiple
physical network controllers (e.g., GMPLS, OpenFlow, PCE, NMS,
etc.)

Reference: [KLEE], [LOPEZ], [DHODY], [CHENG].

2. Requirement 2: Policy Enforcement

Ability to provide service requirement/policy (Between Customer
and Network) and mechanism to enforce service level agreement.

   - Endpoint selection policy, routing policy, time-related
   policy, etc.

Reference: [KLEE], [LOPEZ], [SHIN], [DHODY], [FANG].

3. Requirement 3: VN Query

Ability to request/respond VN Query (Can you give me VN(s)?)

- Request Input:
    - VN end-points (CE end)
    - VN Topology Service-specific Multi-Cost Objective Function
    - VN Topology diversity (e.g., VN1 and VN2 must be disjoint)
    - VN Topology type: path, graph
- Response includes VN topology
    - Exact
    - Potential

Reference: [KUMAKI], [FANG], [CHENG].

4. Requirement 4: VN Instantiate

Ability to request/confirm VN Instantiation

- VN instance ID

- VN end-points

- VN constraints requirement

    - Latency only, B/W guarantee, Latency and B/W guarantee together

- VN diversity

    - Node/Link disjoint from other VNs

- VN level diversity (e.g., VN1 and VN2 must be disjoint)

- VN type

    - Path (tunnel), Node/Links (graph)

- VN instance ID per service (unique id to identify VNs)

Reference: [KUMAKI], [FANG], [CHENG].

5. Requirement 5: Dynamic VN Control

Dynamic/On-demand VN Modification/Confirmation with feedback loop
to the customer

- Traffic monitoring and control policies sent to the network

- Network states based traffic optimization policies

- Utilization Monitoring (Frequency of report)

- Abstraction of Resource Topology reflecting these service-
  related parameters

Reference: [XU], [XU2], [DHODY], [CHENG].

6. Requirement 6: VN Lifecycle M&O

VN lifecycle management/operation

  – Instantiate

  – Delete

  – Modify

  – Update (VN level OAM Monitoring) under policy agreement

Reference: [FANG], [KUMAKI], [LOPEZ].

7. Requirement 7: VN Service Operation

Ability to setup and manage end-2-end service on the VN involving multi-domain, multi-layer, meeting constraints based on SLAs.

Reference: [LOPEZ], [KUMAKI], [CHENG], [DHODY], [FANG], [KLEE].

8. Requirement 8: Multi-destination Coordination

Coordination of multi-destination service requirement/policy to support dynamic applications such as VM migration, disaster recovery, load balancing, etc.

 – Service-policy primitives and its parameters

Reference: [FANG], [LOPEZ], [SHIN].

9. Requirement 9: Multi-domain & Multi-layer Coordination

Ability to Coordinate multi-domain and multi-layer path
computation and setup operation (network)

- Computes E2E path across multi-domain (based on abstract
  topology from each domain)

- Determines the domain sequence

- Request path signaling to each domain controller

- Find alternative path if any of the domain controllers cannot
  find its domain path

Reference: [CHENG], [DHODY], [KLEE], [LOPEZ], [SHIN], [SUZUKI].

10. Requirement 10: E2E Path Restoration

Ability to perform E2E Path Restoration Operation

- Intra-domain recovery

- Cross-domain recovery

Reference: [CHENG], [KLEE], [DHODY], [LOPEZ], [SHIN].

11. Requirement 11: Dynamicity of network control operations

The ACTN interfaces should support dynamicity nature of network control operations. This includes but not limited to the following:

- Real-time VN control (e.g., a fast recovery/reroute upon network failure).
- Fast convergence of abstracted topologies upon changes due to failure or reconfiguration across the network domain view, the multi-domain network view and the customer view.
- Large-scale VN operation (e.g., ability to query tens of thousands of nodes and connectivity) for time-sensitive applications.

Reference: [SHIN], [XU], [XU2], [KLEE], [KUMAKI], [SUZUKI].

12. Requirement 12: VN confidentiality/security

   - A VN customer MUST not control other customer's virtual
     network
   - A VN customer MUST not see any routing information (e.g. IGP
     database, TE database) on other customer's virtual network

Reference: [KUMAKI], [FANG], [LOPEZ]

Next Steps

- Stabilize.

- Provide input to ACTN info model and solutions works.