Multi-domain Network Virtualization

draft-bernardos-nfvrg-multidomain-02

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Rationale

• Network Function Virtualization has not been yet addressed in scenarios where multiple administrative domains are involved
  - Pure infrastructure scenario: usage of network, computing and storage resources of different administrative domains
  - More complex scenario: operation of network functions instantiated in different administrative domains
• Goal: to permit programmability, flexibility and automation, but also agile contracting of services (including VNFs)
  - Significant reduction of the time for provisioning when invoking and settling of services exceeding the border of a single administrative domain
NFV reference framework

- Multi-domain interfaces not present in original ETSI NFV architecture
- A “VNF composition across multiple administrative domains” Use Case recently approved to be included in the NFV001 use cases document
- IFA028 Work Item on multi-domain has also recently started
Multi-domain Problem Statement

• Availability of different infrastructure environments pertaining to distinct administrative domains
  o In consequence, being operated and managed by distinct providers
• There are no established mechanisms for providing access to multi-domain environments in an standardized way
  o E.g., to facilitate portability among NFVI PoPs independently of the owner of such infrastructure
  o A solution is needed to deal with both multi-operator and (single operator) multi-domain problem
Architecture proposition
(hierarchical, work-in-progress)
Virtualization and Control for Multi-Provider Multi-Domain

- Multi-domain different from single-domain
  - Single-domain:
    - The orchestrator is aware of the entire topology and resource availability within its domain
    - The orchestrator has complete control over the resources
  - Multi-domain:
    - Solutions required to enable the exchange of relevant information across orchestrators
    - This Exchange needs to be standardized
Virtualization and Control for Multi-Provider Multi-Domain

- Multi-provider orchestrator (MPO) exposes 3 interfaces:
  - IF1 to the tenant
  - IF2 to other multi-provider orchestrators
  - IF3 to individual domain orchestrators
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Functional split of MPO Interfaces

Foreseen functional needs
• -S → Service request
• -C → Catalogues
• -F → Life cycle management
• -RT → Resource/Topology
• -RC → Resource/Control
• -Mon → Monitoring

New functional needs could be identified through on-going work
Interface specification

• IF1
  – IF1-S: MPO exposes a northbound sub-interface through which a customer sends the initial request for services
    • It handles command and control functions to instantiate network services. Such functions include requesting the instantiation and interconnection of Network Functions (NFs)
  – IF1-C: used to expose available services to customers

• IF2
  – IF2-S: perform similar operations than IF1-s, between MPOs of different administrative domains
  – IF1-C: used to expose available services to other MPOs
  – IF2-R: used to keep an updated global view of the underlying infrastructure topology exposed by domain orchestrators
Interface specification (cont’d)

• IF2 (cont’d)
  – IF2-S: perform similar operations than IF1-S, between MPOs of different administrative domains
  – IF1-C: used to expose available services to other MPOs
  – IF2-R: used to keep an updated global view of the underlying infrastructure topology exposed by domain orchestrators
  – Resource orchestration related interfaces:
    • IF2-RC: resource control
    • IF2-RT: resource topology
    • IF2-Rmon: resource monitoring

• IF3
  – IF3-R, IF3-RC, IF3-RT and IF3-Rmon: analogous to IF2-* but between the MPO and underlying domain orchestrators
Next steps

• Validate the architecture by implementation and experimentation
  – 5GEx PoCs and Sandbox
  – Prototyped MPO to be available as Open Source

• Continue evolving the architecture definition
  – Updates to interface (IF1, IF2, IF3) specification

• Gather feedback from the group

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Multi-domain arch approaches: ETSI NFV

Infrastructure provided using multiple administrative domains.
From: ETSI GS NFV-IFA 009 V1.1.1 (2016-07)
Multi-domain arch approaches: ETSI NFV

Network services provided using multiple administrative domains.
From: ETSI GS NFV-IFA 009 V1.1.1 (2016-07)
Multi-domain approaches

• Hierarchical
  o The provider facing the customer as a single entry point for the service request will maintain relationships with other providers in order to complete the service.
  o The Entry-Point Provider (EPP) will produce the service split among parties, ensuring adequate levels of coordination to offer the service as provided by a single domain to the customer.

• Cascading
  o The EPP partially satisfies the service request but complements the service by using resources external to its own domain.
  o The EPP will trade such resources with some other provider's offering capabilities at disposal of external domains.
Hierarchical

Requesting Party

Entry-Point Provider

Blue Provider

Green Provider

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Cascading

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