Discovery Mechanisms in the MANO Stack

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Outline

• Motivation

• Discovery mechanisms in ETSI MANO

• Or-Vi discovery
  – IPv6 based approach

• Conclusion and next steps
Motivation

• (Network) Virtualization is happening...

... but mostly limited to data-center environments
From “White paper Telefónica’s UNICA architecture strategy for network virtualization”, July 2017
Motivation: Edge/fog and dynamic envs.

• Different points of presence: central, regional, local/edge
• The (edge) virtualization substrate has been largely assumed to be fixed or stationary
  • But it is now being extended to scenarios where the edge computing substrate is on the move & distributed
  • This is referred to as the fog
• Mechanisms to **advertise, discover and register** virtualized fog resources are required
  • E.g.: The relationship between an NFVO and the resources it is capable to orchestrate through a VIM is statically defined according to current ETSI NFV specifications (IFA005)
  • Or-Vi interface does not include any discovery and automatic registration of (mobile) VIMs from a (mobile) NFV
Motivation: Edge/Fog

• The fog is composed by virtual resources on top of heterogeneous resources available at the edge and even further in the RAN and end-user devices
  • Virtual networking functions (VNFs) may execute anywhere in the fog – cloud continuum
Discovery mechanisms in NFV MANO

• Where do we need discovery functions?
Discovery mechanisms in NFV MANO

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Discovery mechanisms in NFV MANO

• **Multi-domain**: the interconnection of administrative domains implies that some information is to be shared. Two options:
  
  – **Configuration driven**: different functional blocks to be interconnected are statically configured with the necessary information
  
  – **Auto-discovery**: assumes the implementation of a discovery mechanism in the NFV-MANO functional blocks
Discovery mechanisms in NFV MANO

- **Multi-domain**: the interconnection of administrative domains implies that some information is to be shared. Two options:
  - **Configuration driven**: different functional blocks to be interconnected are statically configured with the necessary information
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Discovery mechanisms in NFV MANO

• Different requirements
  – Or-Or (e.g., between admin domains)
    • Exchange of relevant information across orchestrators (allowing discovery of resources and functions available at other domains)
  – Vi-Vnfm
    • Discovery for direct mode of operation
Discovery mechanisms in NFV MANO

– Or-Vi
  • When involving different domains, auto-discovery of the NFVO and the VIM is required
  • More about this in next slides

– Vi-Vi
  • Similar to Or-Vi (if SLPOC implemented by VIM)
Or-Vi discovery (of resources from an orchestrator)
Or-Vi discovery: mobile resources

Consumer of a service executed over virtual resources
Or-Vi discovery: mobile orchestrator

Consumer of a service executed over virtual resources

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**Or-Vi discovery: mobile orchestrator**

**Diagram:**

- **Human:** Consumer of a service executed over virtual resources.
- **Mobile device:** Connected to NFVI resources.
- **NFVO:** Orchestrator component.
- **VIM:** Virtual Infrastructure Manager.
- **VNF:** Virtual Network Function.
- **NFV platform:** Integration of NFVI, NFVO, VIM, and VNF components.

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Discovery Mechanisms in the MANO Stack
Or-Vi discovery: IPv6 based approach

• Assuming a mobile environment where resources come and go as they appear on a network (resulting from a device connecting/disconnecting)

• We (will) propose in [1] extensions to IETF IPv6 protocol between terminal and network (new ICMPv6 options) to discover and associate NFV resources

[1] draft-bernardos-nfverg-vim-discovery-01 (to be published)
Or-Vi discovery: IPv6 based approach

Terminal hosting virtual resources (NFVI) + VIM

IPv6 Router Solicitation (src: fe80::1234, dst: ff02::2)
[ND options:
- Available Virtualized Compute Resources: x86, 2 vCPUs, 1666MhZ
- Available Virtualized Storage Resources: 4 GB
- Available Virtualized Networking Resources: vxlan, 10Mbps
- Type of virtualization: full virtualization
- Power profile: battery powered, 100% charged
- URI of the VIM: http://terminal:9080/vim]

IPv6 Router Advertisement (src: fe80::210:20ff:fe30:4050, dst: fe80::1234)
[ND options:
- Prefix information: 2001:D88:1:2::/64
- Source link-layer address: 00:10:20:30:40:50]

VIM registration request

VIM registration response

VIM registered at NFVO
Conclusion and next steps

• Mechanisms for auto-discovery of NFV functional blocks are required
  – Not only in fog/edge dynamic environments,
  – also in generic multi-domain environments

• ETSI NFV already identified this need (IFA028)
  – IETF protocols might be used to provide a solution for certain scenarios (e.g., Or-Vi discovery of VIMs+resources hosted at mobile devices)

• Do we want to continue exploring this here?