ONUG NSV Working Group

ONUG/Ixia Test Plan for Top 10 Requirements

Monday, March 31, 2015

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Introduction

This document outlines a series of test cases to demonstrate support for the top 10 requirements from the ONUG Network Services Virtualization (NSV) working group white paper. The goal of the tests is to demonstrate support for each of the requirements. There is one test case per requirement. There is no negative testing apart from when the requirement itself requests it. There are no high-performance test cases either, since validating functionality is the main objective.

It is also not the purpose of the test cases to validate the functionality of the virtualized services themselves. For example, if a firewall is used as a service, policies shouldn't restrict the free flow of traffic. The requirements all have the virtualized infrastructure and management as targets, and not the specific virtualized functions themselves.

Some test cases are labeled "N/A." This is because it's not possible to demonstrate the requirement using test tools and/or traffic generators. These requirements are not addressed in this test plan.

Each test case contains the following sections:

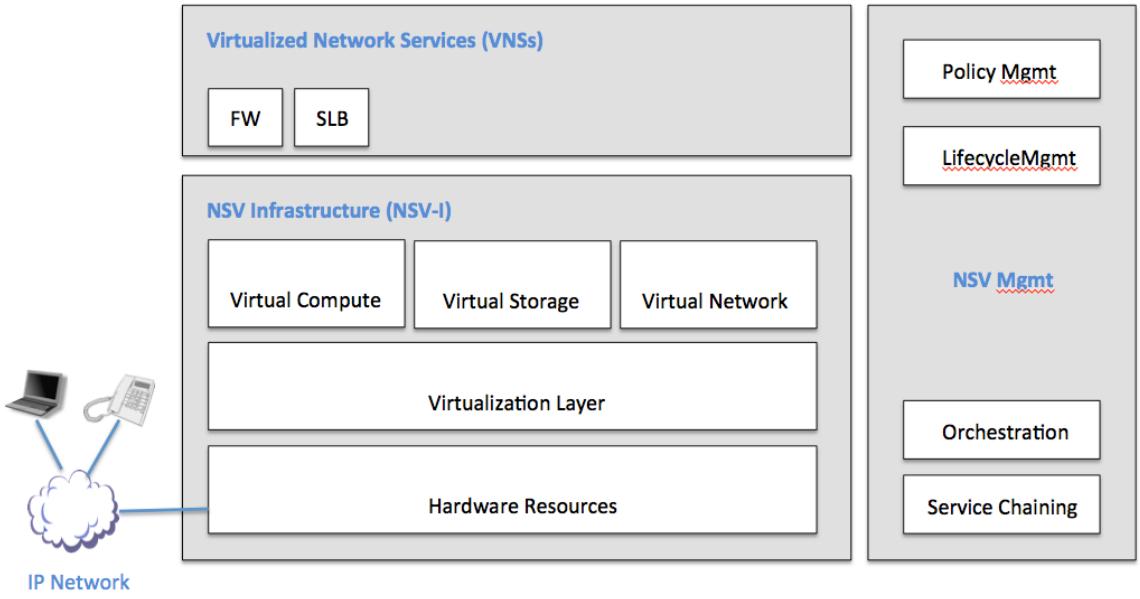
- Objective: to state the purpose of the test
- Test architecture: outlines the System Under Test (SUT) and the test tools to be used, and how they are networked.
- Prerequisites: a high-level description of the state of the SUT and the test tools before the test starts
- Simulate traffic and procedure: a description of the traffic to be used from the test tools and the procedure to be followed for the test
- Expected results: a high-level description of the behavior should the test succeed
- Validation conditions: the criteria for a pass or fail for the test case

The test tool to be used for this test plan is Ixia's IxLoad Virtual Edition (VE), described here:

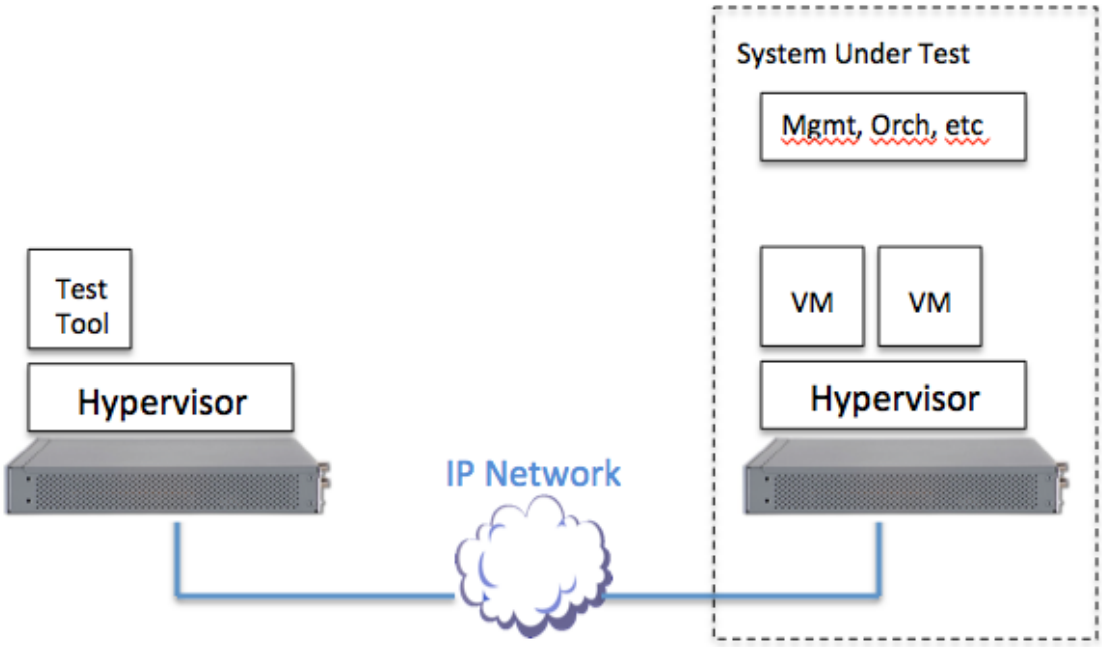
http://www.ixiacom.com/products/ixload
http://www.ixiacom.com/products/ixvm

Reference architecture

The logical system architecture is taken from the ONUG NSV working group white paper. It outlines the various components of a virtualized cloud platform allowing services to be virtualized.



A more specific architecture is shown below, which also includes the test tool. The test tool itself will also run in a virtualized environment, preferably on an independent NFV-I. The system under test will contain one or more virtualized services (shown in the diagram as “VM”), depending on the test objective.



Tests

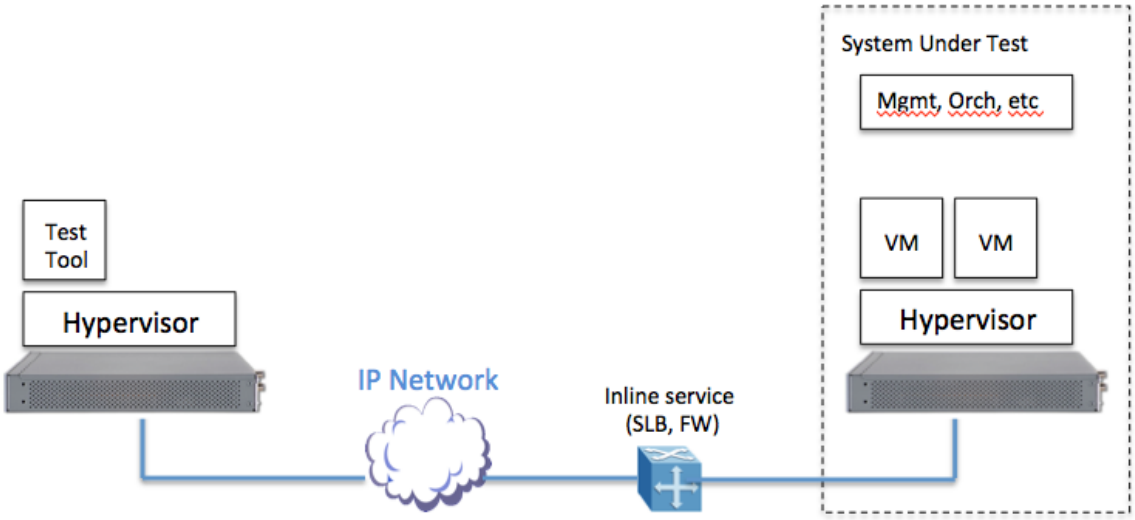
Requirement 1: Ability to co-exist with legacy network equipment and to work in a hybrid network composed of classical physical network services and virtualized network services

Test objective

Validate that the virtualized service runs correctly with a legacy service. In this case, the legacy service will be an inline physical (legacy) service, such as a firewall, while the virtualized service will also be an inline service in the path between client and web server. The test tool will perform stateful emulation of both the clients and the server.

Test architecture

The basic test architecture will be used, with only one virtualized service running on the system under test. The virtualized service must be an inline service. In addition, a physical network service, such as a firewall or a load balancer, will also act inline.



Prerequisites

- VM service configured as inline service
- Operating legacy inline service, allowing TCP port 80 traffic (http) to pass freely; traffic should flow through both the legacy inline service as well as the virtualized inline service, from simulated web client to simulated web server

Simulated traffic and procedure

- The test tool will simulate 100 hosts as clients, and also 1 web server; each client will generate http requests towards the server, with the VM under test being a part of the traffic path
- The simulated traffic used will be http traffic, at a low rate (50 kbps per subscriber)
- Start the traffic; run for 5 minutes with all 100 clients active
- Stop traffic

Expected results

All the traffic running between the clients and the server will be correctly received by the responding endpoints.

Validation conditions (Pass)

- The test tool reports less than 0.1% packet loss, or less than 0.1% TCP retransmissions or TCP resets

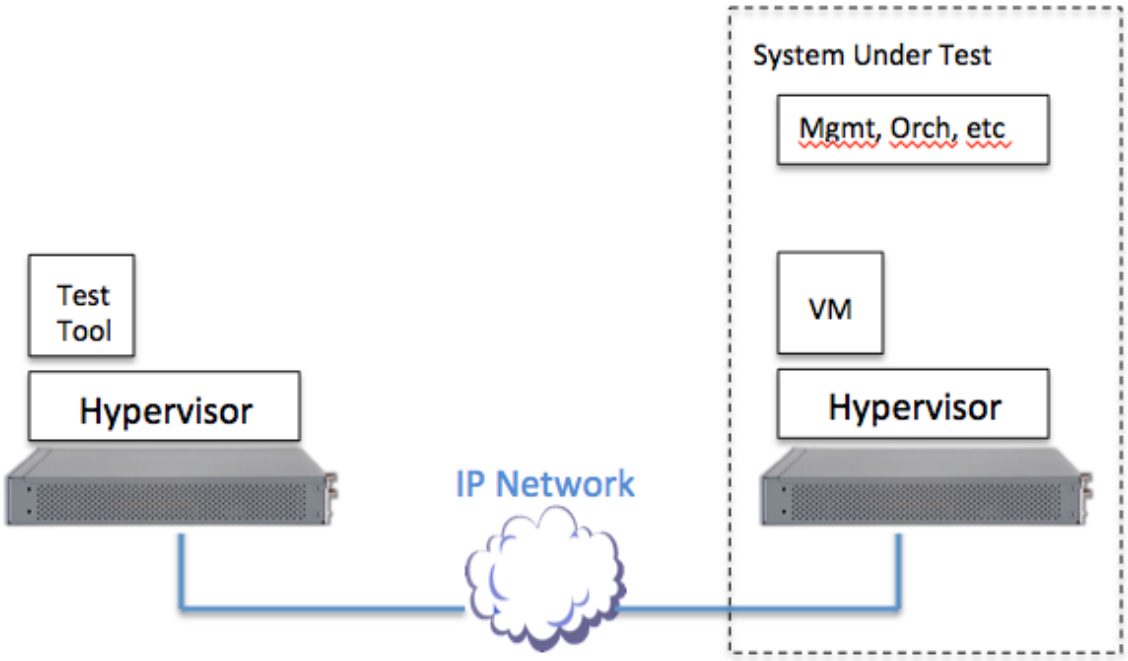
Requirement 2: Provide the capability to load, execute and move services across standard platforms from multiple vendors

Test objective

Validate that the virtualized service can be executed on two different virtualization platforms (hypervisor, HW, networking) by running the same test for both infrastructures. The test will be run using one virtualized service.

Test architecture

The basic test architecture will be used, with only one virtualized service running on the system under test.



Prerequisites

- Virtualized inline service deployed and operational, allowing TCP port 80 traffic (http) through

Simulated traffic and procedure

- The test tool will simulate 100 hosts as clients, and also 1 web server; each client will generate http requests towards the server, with the VM under test being a part of the traffic path

- The simulated traffic used will be http traffic, at a low rate (50 kbps per subscriber)
- Start the traffic; run for 5 minutes with all 100 clients active
- Stop traffic

Expected results

All the traffic running between the clients and the server will be correctly received by the responding endpoints.

Validation conditions (Pass)

- The test tool reports less than 0.1% packet loss, or less than 0.1% TCP retransmissions or TCP resets

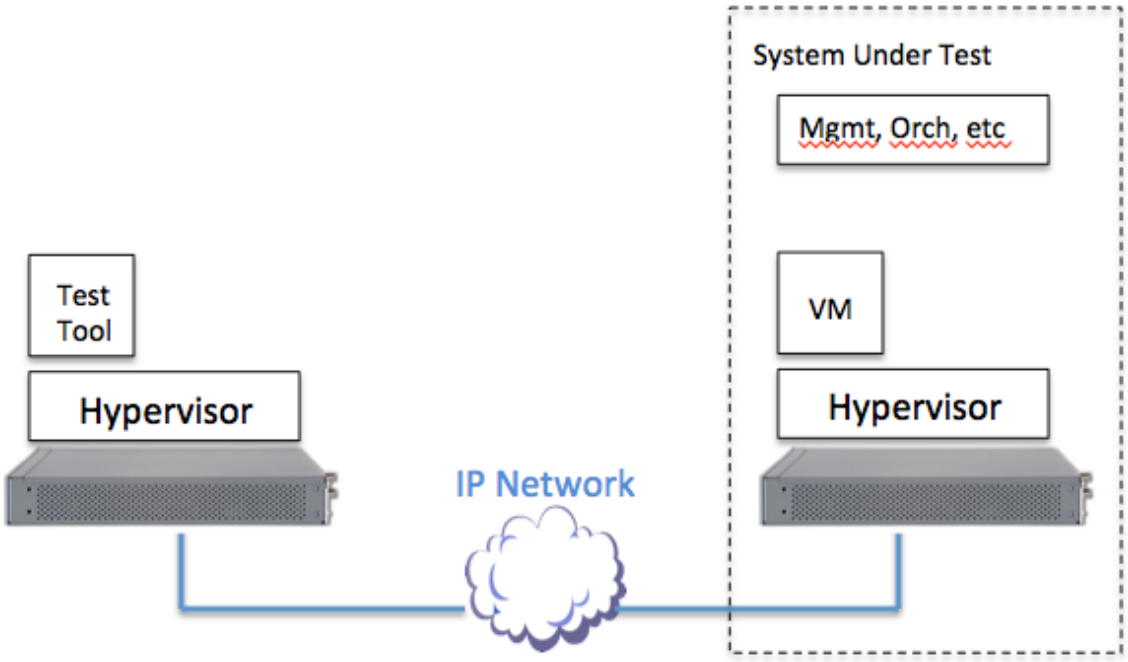
Requirement 3: Support an interface to decouple virtualized service instances from the underlying infrastructure

Test objective

Validate that the virtualized service can be executed on two different virtualization platforms (hypervisor, HW, networking) by running the same test for both infrastructures. The test will be run using one virtualized service.

Test architecture

The basic test architecture will be used, with only one virtualized service running on the system under test.



Prerequisites

- Virtualized service deployed and operational, allowing TCP port 80 traffic (http) through

Simulated traffic and procedure

- The test tool will simulate 100 hosts as clients, and also 1 web server; each client will generate http requests towards the server, with the VM under test being a part of the traffic path
- The simulated traffic used will be http traffic, at a low rate (50 kbps per subscriber)
- Start the traffic; run for 5 minutes with all 100 clients active
- Stop traffic

Expected results

All the traffic running between the clients and the server will be correctly received by the responding endpoints.

Validation conditions (Pass)

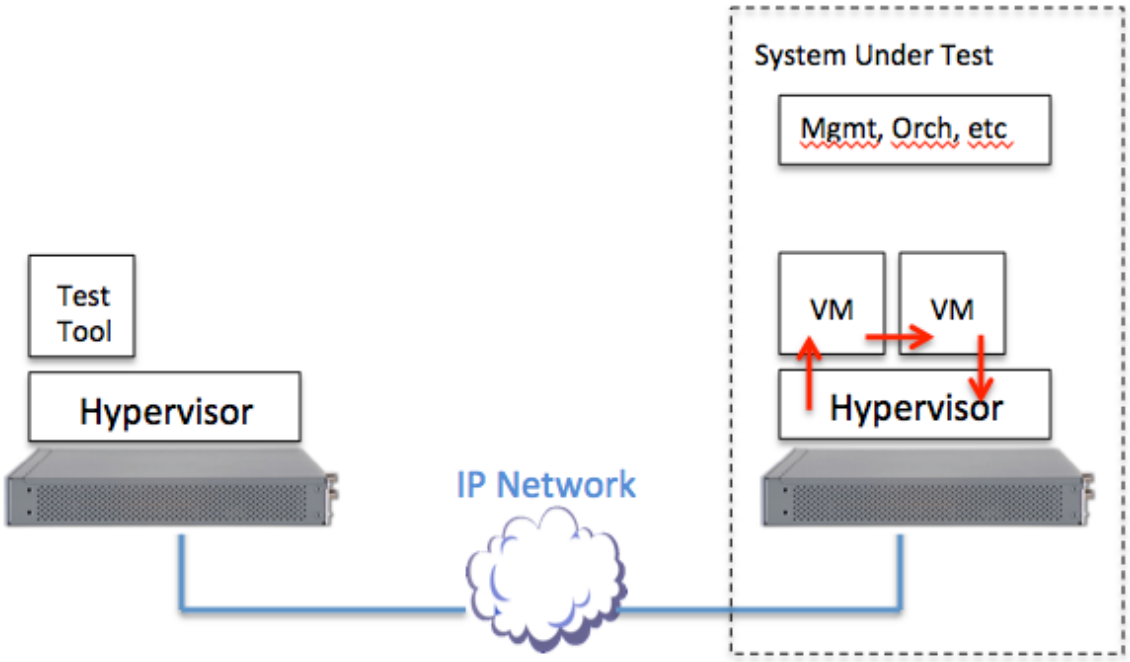
- The test tool reports less than 0.1% packet loss, or less than 0.1% TCP retransmissions or TCP resets

Requirement 4: Support the provisioning of forwarding paths between service nodes from multiple vendors

Test objective

To validate the correct operation of a forwarding path between 2 service nodes. The test tool will simulate both the web clients and a web server.

Test architecture



Prerequisites

- Forwarding graph established between the 2 virtualized services under test using administrative means
- Virtualized inline services deployed and operational, allowing TCP port 80 traffic (http) through; traffic should flow through both the virtualized inline services in the chain, from simulated web client to simulated web server

Simulated traffic and procedure

- The test tool will simulate 100 hosts as clients, and also 1 web server; each client will generate http requests towards the server, with the VM under test being a part of the traffic path
- The simulated traffic used will be http traffic, at a low rate (50 kbps per subscriber)
- Start the traffic; run for 5 minutes with all 100 clients active
- Stop traffic

Expected results

All the traffic running between the clients and the server will be correctly received by the responding endpoints.

Validation conditions (Pass)

- The test tool reports less than 0.1% packet loss, or less than 0.1% TCP retransmissions or TCP resets

Requirement 5: Provide the necessary mechanisms to allow virtualized network services to be scaled with SLA requirements via different supported mechanisms (e.g., on-demand scaling, automatic scaling, etc.)

Test objective

Demonstrate the scaling capabilities of the platform, with respect to one specific service. The test will be run using one virtualized service.

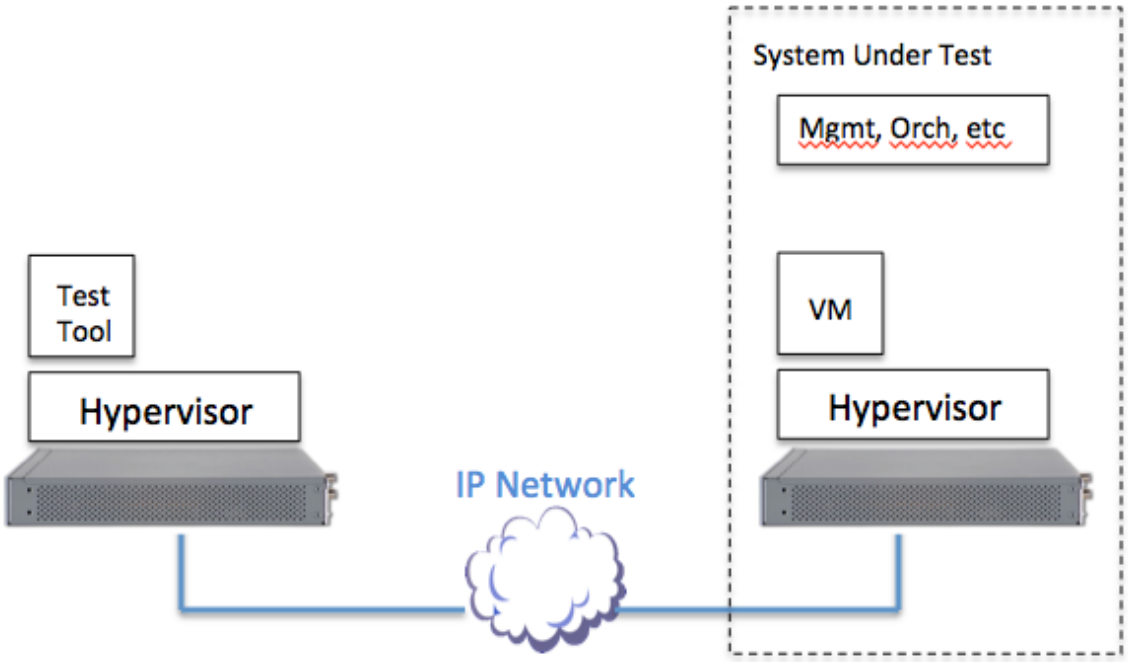
The strategy is to use traffic to trigger the automatic scale out functionality of the platform. The following traffic metrics can be used:

- Total throughput
- Amount of hosts
- Amount and/or rate of TCP transactions
- Amount and/or rate of http transactions

It is recommended to use the minimum amount of resources (CPU, memory, etc.) for the virtualized service under test, and run the first part of the traffic at maximum capacity (for whatever metric is chosen) – 10%. Afterwards, increase the traffic metric to maximum + 20% to trigger the scale out.

Test architecture

The basic test architecture will be used, with only one virtualized service running on the system under test.



Prerequisites

- Virtualized service deployed and operational, allowing TCP port 80 traffic (http) through
- Knowledge of the maximum capacity of the virtualized service, with respect to the choice of metric discussed in the test objective above
- Configure the test tool to generate traffic to achieve maximum – 10% of the chosen metric

Simulated traffic and procedure

- The test tool will simulate hosts as clients, and also 1 web server; each client will generate http requests towards the server, with the VM under test being a part of the traffic path
- The simulated traffic used will be http traffic
- The simulated traffic will use transactions that have a maximum TCP lifetime of 15s
- The amount of traffic will be designed to reach maximum capacity – 10%
- Start the traffic; run for 2 minutes with all clients active
- Increase the traffic load to reach the maximum capacity + 20%; the increase in the traffic intensity should be done gradually

- Run the traffic for 2 minutes.
- Stop traffic

Expected results

All the traffic running between the clients and the server will be correctly received by the responding endpoints. The capacity of the service should accommodate all the added subscribers. After the traffic level is reduced to maximum – 20%, the scale in should be observed.

Validation conditions (Pass)

- The test tool reports less than 0.1% packet loss, or less than 0.1% TCP retransmissions or TCP resets
- Validate that scale out occurred after traffic increase
- Validate that scale in occurred after traffic decrease to maximum – 20%

Requirement 6: Support open and standard APIs for all applicable functions provided to other authorized entities (e.g., CMS, service instances, 3rd parties, etc.)

Validation conditions (Pass)

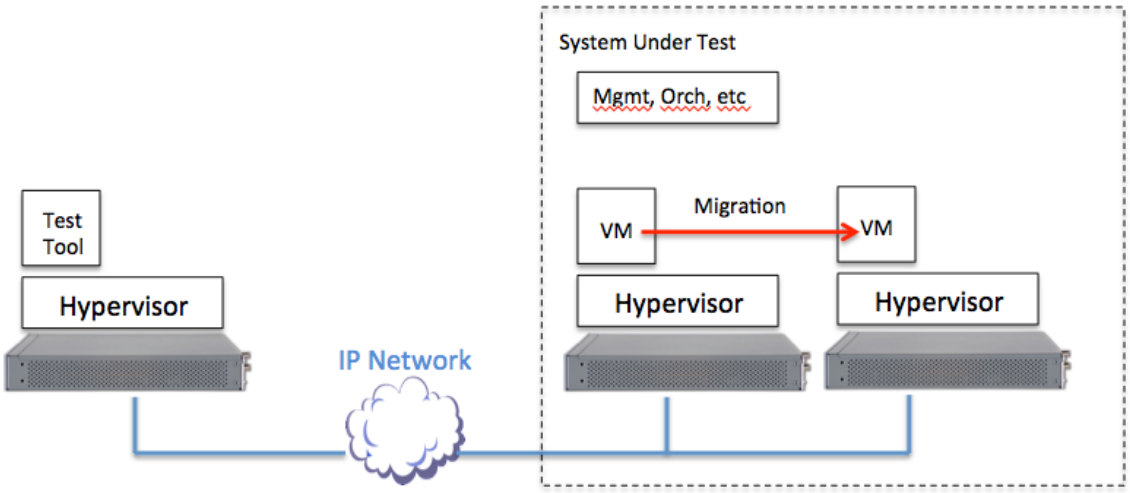
- Demonstrate that the concerned interfaces have documented, open APIs

Requirement 7: Support standard mechanisms to preserve system state, to preserve state integrity, and to replicate state between different platforms

Test objective

To demonstrate live VM mobility with minimal service disruption. Two independent NFV-I platforms to be used for this test, to demonstrate the mobility within the same data center.

Test architecture



Prerequisites

- Virtualized service deployed and operational, allowing TCP port 80 traffic (http) through

Simulated traffic and procedure

- The test tool will simulate 100 hosts as clients, and also 1 web server; each client will generate http requests towards the server, with the VM under test being a part of the traffic path
- The simulated traffic used will be http traffic, at a low rate (50 kbps per subscriber)
- Start the traffic; run for 2 minutes with all 100 clients active
- Using administrative means, execute the VM migration procedure, to move the active VM from one NFV-I platform to another
- Run traffic for a further 2 minutes
- Stop traffic

Expected results

The service will exhibit a momentary disruption during VM migration, exhibited by some TCP timeouts and possibly some TCP resets, but will stabilize and keep functioning normally afterwards.

Validation conditions (Pass)

- The test tool reports less than 0.1% packet loss, or less than 0.1% TCP retransmissions or TCP resets

- During the migration period, which should be less than 2s, TCP connections may be lost, but then re-established and continue running normally afterwards

Requirement 8: Provide mechanisms for the network operator to control and verify the configuration of the virtualized services and the elements that virtualize the hardware resource

Test objective

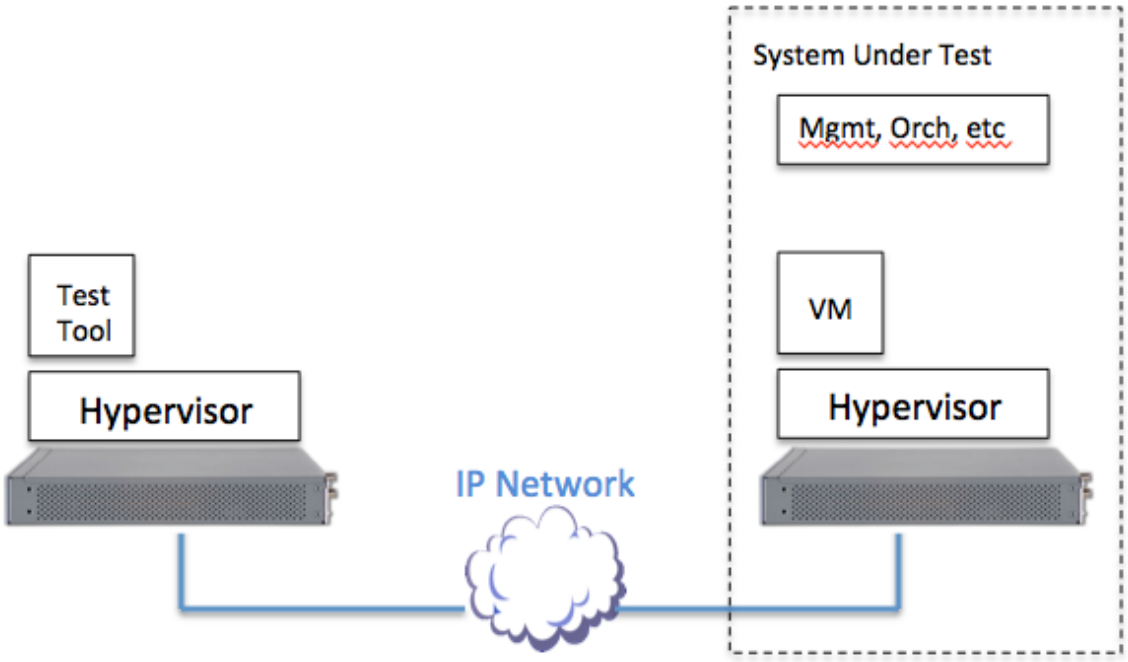
Validate that the platform has the management tools necessary to monitor and report the status of the all the elements of the system under test. The test will be run using one virtualized service. The traffic generation can be optional in this test since the objective is to demonstrate the ability to report configuration to the user.

Optional Test

Vendor may demonstrate compliance against a baseline or drift from a pre-configured baseline.

Test architecture

The basic test architecture will be used, with only one virtualized service running on the system under test.



Prerequisites

- Virtualized service deployed and operational, allowing TCP port 80 traffic (http) through

Simulated traffic and procedure

- The test tool will simulate 100 hosts as clients, and also 1 web server; each client will generate http requests towards the server, with the VM under test being a part of the traffic path
- The simulated traffic used will be http traffic, at a low rate (50 kbps per subscriber)
- Start the traffic; run with all 100 clients active
- Make a configuration change to the system (for example, configure a new forwarding path)
- Continue traffic for another 2 minutes
- Stop traffic

Expected results

All the traffic running between the clients and the server will be correctly received by the responding endpoints. The configuration reporting system will correctly report the system configuration change executed during the test.

Validation conditions (Pass)

- The test tool reports less than 0.1% packet loss, or less than 0.1% TCP retransmissions or TCP resets
- The management tool is able to successfully report the status of all
    - Running services (the VM under test)
    - The NFV-I
    - Any specific changes made to the configuration during the test

Requirement 9: Access to functionality via exposed APIs at all layers shall be protected using standard security mechanisms appropriate for that layer, wherever applicable, for authentication, authorization, data encryption, data confidentiality and data integrity

Validation conditions (Pass)

- Demonstrate that the concerned interfaces have APIs
- Demonstrate success and failure of authentication mechanisms for exposed APIs

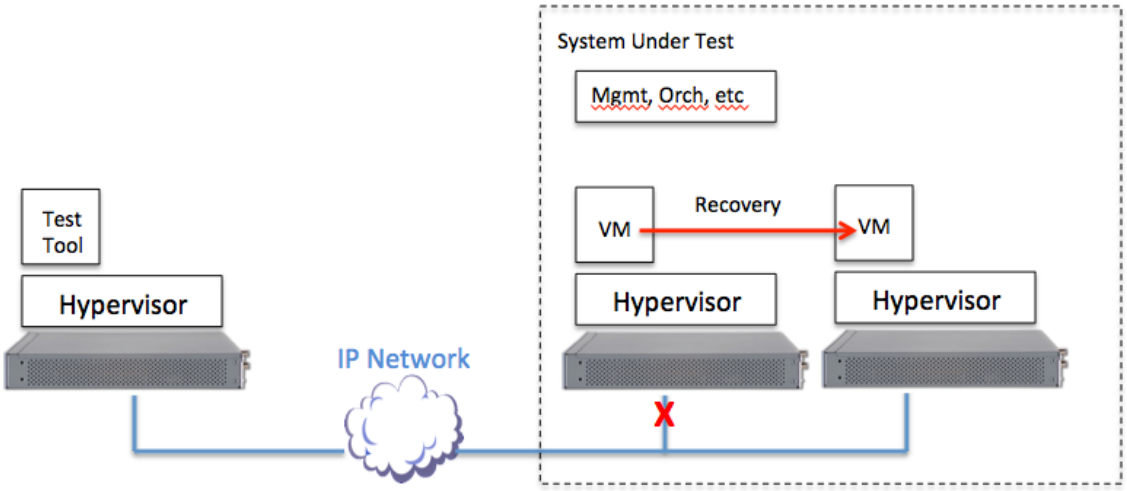
Requirement 10: Ability to detect the failure of service instance(s) and/or network reachability to that service instance(s) and take action in a way that meets the fault detection and remediation time objective of that service

Test objective

To demonstrate the fault detection and recovery mechanisms of platform with minimal service disruption. The simulated fault will be a physical disconnection of the NFV-I supporting the service from the network. Alternatively, if possible, the VM or virtualized service can be manually disabled in order to simulate the fault.

An assumption is made that the service under test is a high-priority service, to be restored as quickly as possible.

Test architecture



Prerequisites

- Virtualized service deployed and operational, allowing TCP port 80 traffic (http) through

Simulated traffic and procedure

- The test tool will simulate 100 hosts as clients, and also 1 web server; each client will generate http requests towards the server, with the VM under test being a part of the traffic path
- The simulated traffic used will be http traffic, at a low rate (50 kbps per subscriber)
- Start the traffic; run for 2 minutes with all 100 clients active
- Simulate a catastrophic network fault by disconnecting the NFV-I supporting the VM from the network (or disable the VM)
- Run traffic for a further 3 minutes
- Stop traffic

Expected results

The service will exhibit a disruption during VM migration, exhibited by some TCP timeouts and possibly some TCP resets, but will resume and keep functioning normally afterwards.

Validation conditions (Pass)

- The test tool reports less than 0.1% packet loss, or less than 0.1% TCP retransmissions or TCP resets

- During the migration period, which should be less than 20s, TCP connections may be lost, but then re-established and continue running normally afterwards