**3GPP TSG-SA5 Meeting #140-eS5-216180**

**e-meeting, 15 - 24 November 2021**

**Source: Huawei**

**Title: 28.819 Describe ETSI NFV testing framework**

**Document for: Approval**

**Agenda Item: 6.5.5**

# 1 Decision/action requested

***For approval***

# 2 References

[1] 3GPP TR 28.819 V0.3.0 Management and orchestration; Study on continuous integration continuous delivery support for 3GPP NFs

# 3 Rationale

This contribution adds background information on the architectural framework defined by ETSI for CICD.

# 4 Detailed proposal

This contribution proposes to make the following changes in [1].

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| **1st change** |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] NGMN – “Continuous Delivery in Telecommunication Network Environments” Version 1, 2019

[3] 3GPP TS 28.530: 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Management and orchestration; Concepts, use cases and requirements

[4] ETSI GR NFV-TST 006 v1.1.1 (2020-01): “Network Functions Virtualisation (NFV); Testing; Report on CICD and DevOps”.

[x] ETSI GR NFV-TST 011 v1.1.1 (2019-03): “Network Functions Virtualisation (NFV); Testing; Test Domain and Description Language Recommendations”.

[y] ETSI GR NFV-TST 002 v1.1.1 (2016-10): “Network Functions Virtualisation (NFV); Testing Methodology; Report on NFV Interoperability Testing Methodology”.

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| **2nd change** |

## 4.1 ETSI-TST

The ETSI GR NFV-TST 006 [4] provides guidance and recommendations on how to leverage DevOps and CI/CD techniques across the boundary from VNF provider to service provider, or any combination of developer, installation and operational entities. The goal of the ETSI report is to establish a DevOps Joint Pipeline between VNF provider to service provider.

1. Exploring use cases
   * Single vendor to single operator: This scenario can be understood as splitting the CICD process of a single product into different organizations. Development, building, and testing are in the vendor part, and deployment and operation are in the operator part. And analysed the delivery and feedback method between the two organizations.
   * Multiple vendors to single operator: This scenario analyses the interval of delivery by multiple vendors and the timing of integration of multiple vendor products in the Operator part, and points out that the integrated test is not on a component but on the combined integrated VNF or NS.
   * Based on the analysis of use cases, two components of the DevOps process are recommended:

DevOps server: Stage and operate for the operator part of DevOps process.

Data handling component: Used to process sensitive information in feedback data to the vendor.

1. Defining the test steps in the DevOps process:
   * Step 1: Test Definition
   * Step 2: Code/VNF Package Shipment
   * Step 3: Automated Test Execution
   * Step 4: Moving to Production
   * Step 5: Collecting operational data
2. Providing recommendations on implementations
   * Test code/test function/description included in VNF Package

VNF package is recommended to contain a testing section with various information concerning testing and DevOps. VNF Package is recommended to include a description of the acceptance test, the test code, and a framework or test VNF that automates the execution of the test code.

* + Implementation of automated test execution

Option 1: Package the test function that automates the test execution as part of the VNF Package: for example, as test VNFC.

Option 2: Implement the test function that automates the test execution as separate test VNF: for example, a test Network Service consists of test VNFs and the VNF under test.

* + Test feedback to VNF vendor

It is recommended that a requirement be specified for the VNF to be capable to provide the information as feedback data.

It is recommended that a requirement be specified for the OSS to be capable to receive the feedback from the VNF

Besides, there is a revision version of TST 006(TST006ed121) which is still working in progress now. This revision will extend the scope of the report to analyse and provide recommendations on how to enhance the support for joint delivery pipeline, including:

1. Defining the key components in the DevOps process
   * DevOps server：Analyse which specific NFV components are involved in related operations of DevOps server, and discuss related requirements for NFV MANO APIs.
   * Test Framework: Analyse which specific NFV components are involved in related operations of Test Framework, and discuss related requirements for NFV MANO APIs.
2. Analyze implementation of automated test execution
   * Leverage a standard test case description file which will be defined in NFV TST013 Spec, Test Frame work will parse this machine-readable file to obtain information for automated test execution.
3. Defining the CI-CD process in more detail based on the above analysis.

ETSI NFV has described a general framework to be used in CICD, with the following major components:

* As described in ETSI GR NFV-TST 006 [4], DevOps server is responsible for pre-checks of the NFVI, triggering the different testing phases, evaluating the testing phases, post event health checks of the VNF(s), sending feedback to the VNF Provider.
* As described in ETSI GR NFV-TST 011 [x], a Test Execution Platform is responsible for managing the execution of test cases and managing all resources outside the System Under Test.
* As described in ETSI GR NFV-TST 002 [y], the System Under Test includes the Virtual Network Functions, the NFV Infrastructure, and the associated management/orchestration and descriptors.

As introduced above, there are already some related works in ETSI. So, it is helpful to use the results of the above ETSI GRs in this 3GPP study.

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| **3rd change** |

# 7. Proposed Process for Multi-Vendor CI-CD

## 7.1 Proposed alternative process 1

NF Delivery Server

(Vendor or Operator Domain)

Operator CD-CD System

Test Management System

Test Resources

(Traffic generators/probes)

3GPP Management System

3GPP Network

Software Inventory

Vendor

1. Subscribe

2. Delivery

3. Notification

4. Begin test

5. Deployment info

6. Provision

8. Begin test

13. Result

12. Alarms and measurements

7. Provision

11. Alarms and measurements

9. Traffic

10. Measurements

14. Report

16. Publish

15. Feedback

17. Upgrade

18. New NF

19. Alarms and measurements

Figure 7.1-1 Overall testing process for newly delivered NF

The overall CI-CD and testing process for a 3GPP system looks like that shown in Figure 7.1-1. The salient steps in the process are as follows

* + - 1. The Operator CI-CD System subscribes to receive notifications for newly delivered NF to the appropriate delivery server identified in prior business agreements with each vendor.
      2. The NF is delivered to the (operator or vendor owned) delivery server. In case of multiple vendors multiple such delivery servers may exist.
      3. This NF delivery server sends a notification to the Operator CI-CD System that a new NF is now available at the delivery location.
      4. The Operator CI-CD System requests the Test Management System to perform the unit, acceptance, integration, and system tests on the new NF.
      5. The Test Management System may ask 3GPP Management System for information on how the previous version of the NF is deployed, to help decide on the relevant tests for the deployment.
      6. The Test Management System requests the 3GPP Management System to provision a network or subnetwork which contains the new NF.
      7. The 3GPP Management System provisions the 3GPP Network.
      8. The Test Management System begins test traffic.
      9. The Test Resources simulate traffic to/from the 3GPP Network. Note that test traffic may incorporate live traffic, but the operator must evaluate the risk of exposing customers to the NF during testing.
      10. The Test Resources probe the 3GPP network and collect measurements.
      11. The 3GPP Network sends alarms and measurements to the 3GPP Management System.
      12. The 3GPP Management System sends alarms and measurements to the Test Management System.
      13. The Test Resources send measurements to the Test Management System.
      14. The Test Management System evaluates the alarms and measurements to create a Test Report, which is sent to the Operator CI-CD System. Not shown in the above figure, Test Management System removes the provisioned network and the test resources.
      15. The Operator CI-CD System may send feedback to the NF vendor, especially if tests failed.
      16. If the tests were successful, the Operator CI-CD System publishes the new NF to the Software Inventory. Note that the Operator CI-CD System uses many factors to decide whether to publish, not only the result of testing.
      17. The Operator CI-CD System requests the 3GPP Management System to upgrade to the new NF.
      18. The 3GPP Management System fetches the new NF and upgrades to new NF.
      19. To monitor the operational behaviour of the NF, 3GPP Management System sends alarms and measurements relevant to the NF to the Operator CI-CD System.

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| **End of changes** |