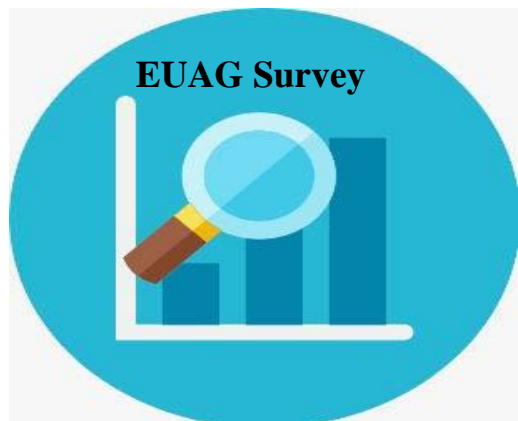


Exploration and Practice in Automated Testing

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LFN 2020 Oct Virtual Technical Meeting

Requirements for Test Automation from EUAG Survey

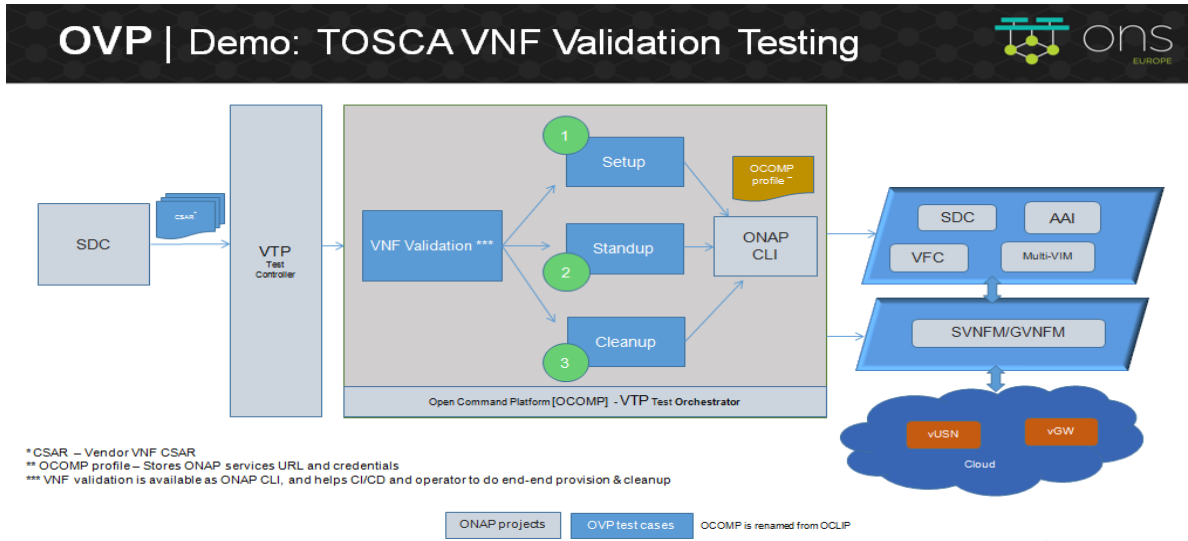


No	Requirements	priority	Requirements description
1	Test environment setup	highest	Leverage orchestration capability to deploy test environment automatically
2	Test environment configuration	highest	Automatic configuration of test environment, including SUT , test tools and other system
3	Test execution	high	Automatically execute test tasks/ cases/scripts/steps
4	Test tools/scripts integration	high	Test tools/test instruments integration from different vendors
5	Test design	medium	Provide a quick test service(topology) design composed of tested VNF/CNF and test environment
6	Test analysis	medium	Automatic analysis and tracking of test results
7	Test scoring and badge	medium	Automatic authentication of test objects
8	Cross-organization joint DevOps	High	Implement join DevOps pipeline between operator and provider to achieve agile delivery

Part 1: Exploration and Practice of Automated Testing in LFN

OVP VNF Compliance and Validation Testing with ONAP

TOSCA VNF Validation shown at 2019 ONS EU



Testing Automation DevOps shown at 2020 ONES NA

Demo: Role-based VNF Testing Workflow

SUT : Open source VNF - Openwrt
Test Instrument : Spirent virtual STCV

Step 1

Test Designer

Step 2

Test Case Developer

Step 3

Test Executor

```

    #!/bin/bash
    set -e
    # Create a new VNF instance
    vnf_create --url $URL --profile $PROFILE --name $NAME --description $DESCRIPTION
    # Wait for the VNF instance to be ready
    vnf_wait --url $URL --profile $PROFILE --name $NAME --description $DESCRIPTION
    # Run the test cases
    vnf_test --url $URL --profile $PROFILE --name $NAME --description $DESCRIPTION
    # Clean up the VNF instance
    vnf_delete --url $URL --profile $PROFILE --name $NAME --description $DESCRIPTION
  
```

#ONESummit | Hosted By THE LINUX FOUNDATION | OLF NETWORKING | OLF EDGE



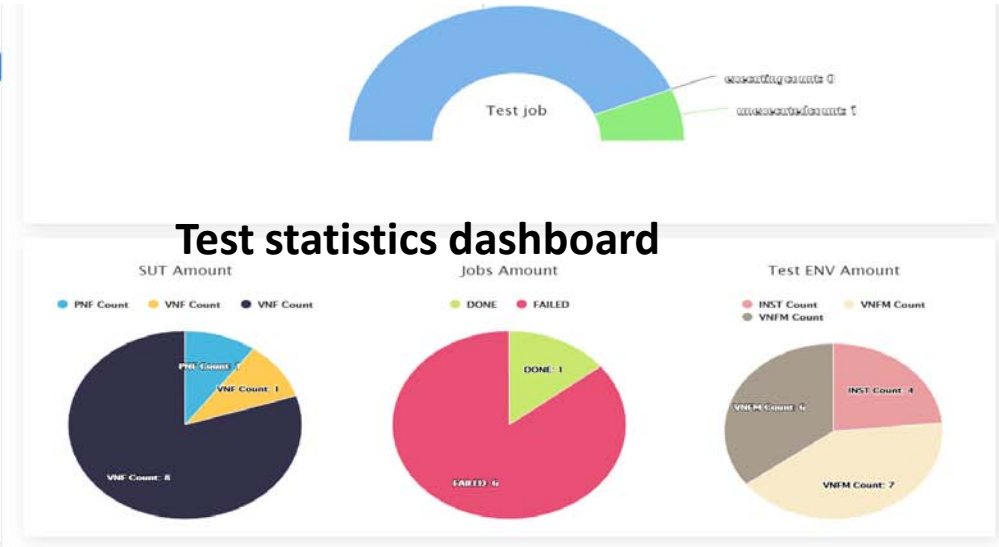
Test Management System in Testing Automation DevOps

Developing independent test management system to improve the usability of VTP test framework

Open Verification Platform

- Dashboard
- Test ENV MGT
- VIM/VNF ENV MGT
- Instrument MGS MGT
- Instrument Package MGT
- Test Object MGT
- Test SUT MGT
- Test Job MGT
- Test Spec MGT

Test statistics dashboard



SUT Amount

Category	Count
PNF Count	1
VNF Count	1
VNF Count	8

Jobs Amount

Status	Count
DONE	1
FAILED	4

Test ENV Amount

Category	Count
INST Count	4
VNF Count	7

Open Verification Platform

- Dashboard
- Test ENV MGT
- VIM/VNF ENV MGT
- Instrument MGS MGT
- Instrument Package MGT
- Test Object MGT
- Test SUT MGT
- Test Job MGT
- Test Spec MGT

Test case and specification management

ID	Name	Description	Status	Action
51	Demo-Spec	v1.0 VNF CMCC	2019-12-05	Edit Delete
50	DNS-SPEC	v1.0 VNF CMCC	2019-12-05	Edit Delete
2	OVP-Compliance-SPEC	V1.0 VNF CVC	2019-04-17	Edit Delete

csar-validate-r07879: The VNF Package MUST include all relevant playbooks to ONAP to be loaded on the Ansible Server.

csar-validate-r01123: The VNF Package Manifest file MUST contain: VNF package meta-data, a list of all artifacts (both internal and external) entry's including their respected URI's, an algorithm to calculate a digest and a digest result calculated on the content of each artifacts, as specified in ETSI GS NFV-SOL004. The VNF Package MUST include VNF Identification Data to uniquely identify the resource for a given VNF provider. The identification data must include: an identifier for the VNF, the name of the VNF as was given by the VNF provider, VNF description, VNF provider, and version.

Open Verification Platform

- Dashboard
- Test ENV MGT
- VIM/VNF ENV MGT
- Instrument MGS MGT
- Instrument Package MGT
- Test Object MGT
- Test SUT MGT
- Test Job MGT
- Test Spec MGT

Test Job Management

Create Test Job [All] [Select date]

ID	Test Specification	Created Time	Status	Action
411874564762189824	OVP-Compliance-SPEC	2020-01-07	●	Start Edit Delete Download More
401812960872955991	OVP-Compliance-SPEC	2019-12-10	●	Start Edit Delete Download More
401436077760135168	FW-SPEC	2019-12-09	●	Start Edit Delete Download More
401418577639063552	FW-SPEC	2019-12-09	●	Start Edit Delete Download More
4013787487463883360	OVP-Compliance-SPEC	2019-12-09	●	Start Edit Delete Download More

Open Verification Platform

- Dashboard
- Test ENV MGT
- VIM/VNF ENV MGT
- Instrument MGS MGT
- Instrument Package MGT
- Test Object MGT
- Test SUT MGT
- Test Job MGT
- Test Spec MGT

Test Result Show

Test Job Info


ID: 411874564762189824
 Job Name: Test-wl-03
 SUT Name: FW-OVP-SUT
 Job Description: Test-wl-03
 Test Specification: OVP-Compliance-SPEC
 Created Time: 2020-01-07
 Test Job Status: DC

Test Job Detail

Test-wl-03

- Case Name: csar-validate-r17652 ●
- Case Name: csar-validate ●
- Case Name: csar-validate-r23823 ●
- Case Name: csar-validate-r13390 ●
- Case Name: csar-validate-r51347 ●
- Case Name: csar-validate-r77707 ●
- Case Name: csar-validate-r04296 ●

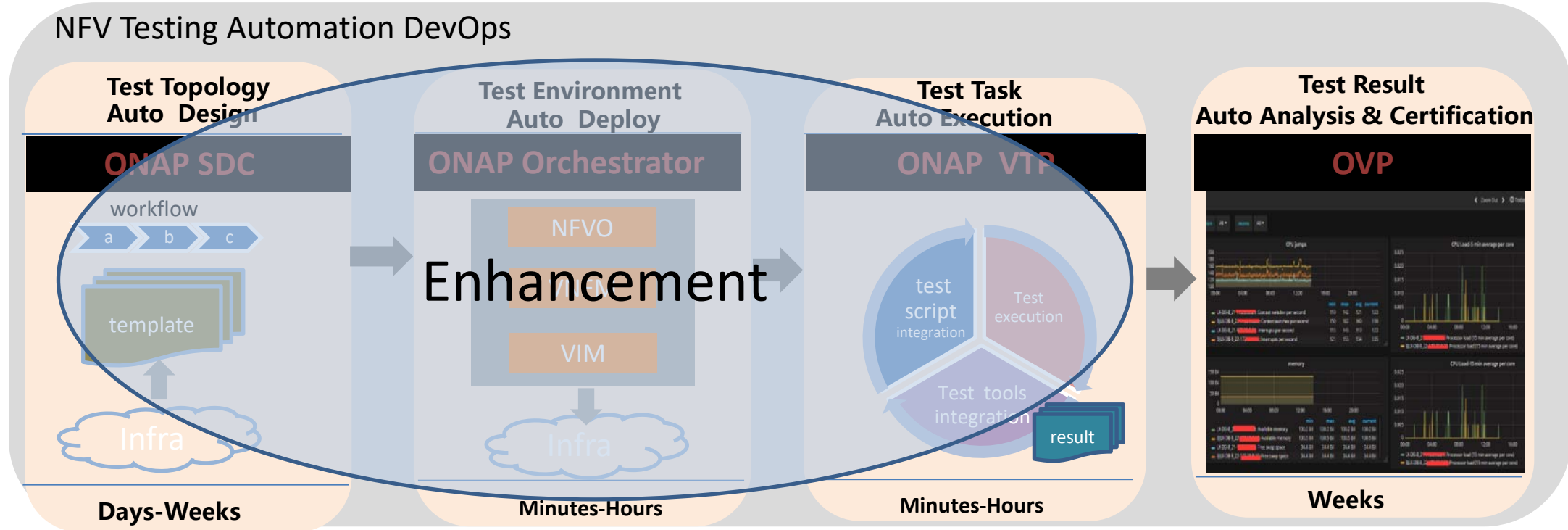
Test Case



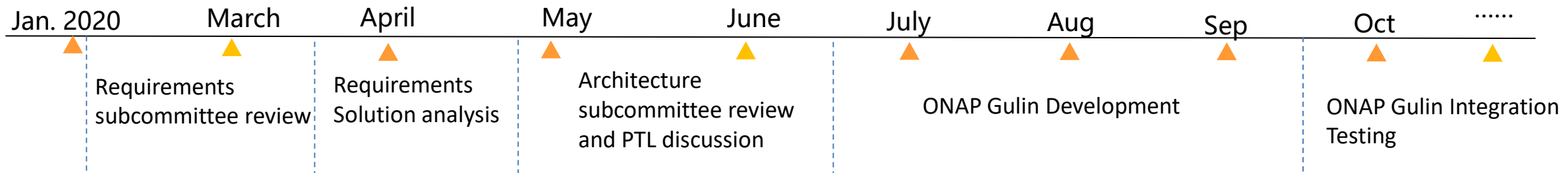
Testing Automation Requirements in ONAP Guilin Release

Goal : Provide common test platform through the augment of ONAP components to support VNF/CNF/Service automated testing.

<https://wiki.onap.org/display/DW/Guilin+release+-+functional+requirements+proposed+list>



TimeLine:



Delivery Status of Automated Testing Requirements

No	Requirements	priority	Implementation status	Notes
1	Test environment setup	highest	Done	Test env with VNFs and virtual test tools/instruments have been verified
2	Test environment configuration	highest	Partial	The images of VNFs and virtual test tools/instruments is customized, and specific configurations are encapsulated.
3	Test execution	high	Done	Test framework can locate and execute test cases correctly
4	Test tools/scripts integration	high	Done	Integrated with virtual instruments(Spirent stcv)/robot
5	Test design	medium	Done	Test topology with VNFs and virtual test tools/instruments have been verified
6	Test analysis	medium	Done	Test results can be automatically recorded and presented
7	Test scoring and badge	medium	Partial	The VNFs which pass the test can be uploaded to VNF market Test results need to be uploaded to OVP Portal automatically

Requirement 8

Cross-organization joint DevOps



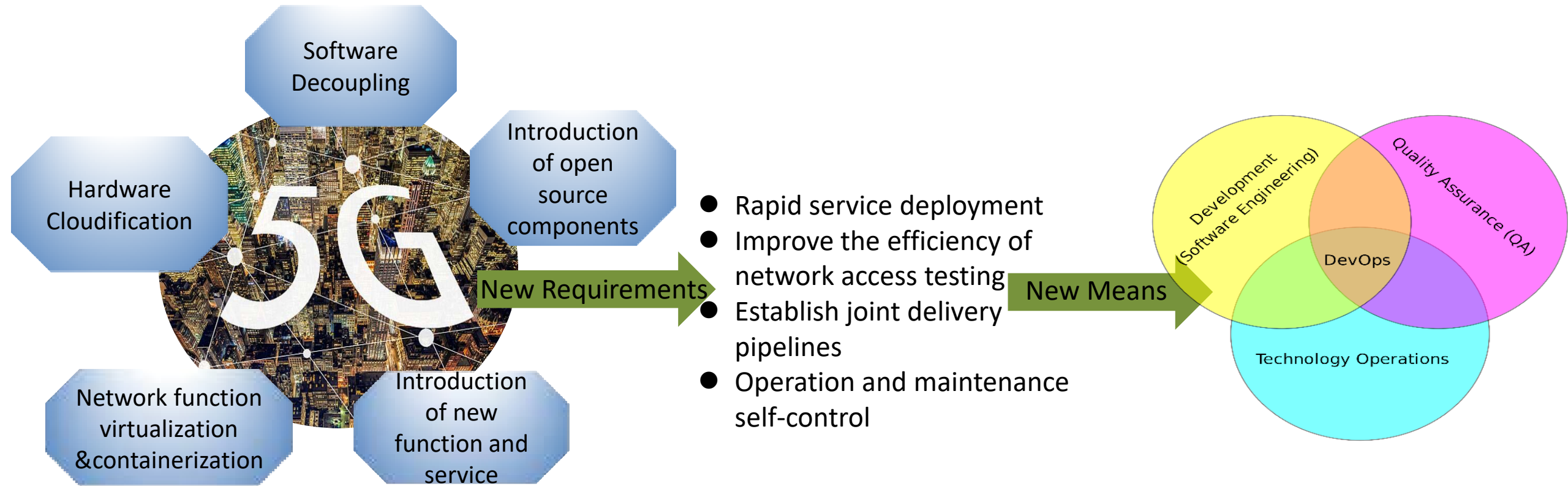
Functions need to be improved to cover more SUT(PNF/CNF/NS/Service) testing and certification

Part 2: Exploration and Efforts of Automated Testing in ETSI NFV

The Transformation of Operation & Maintenance in 5G

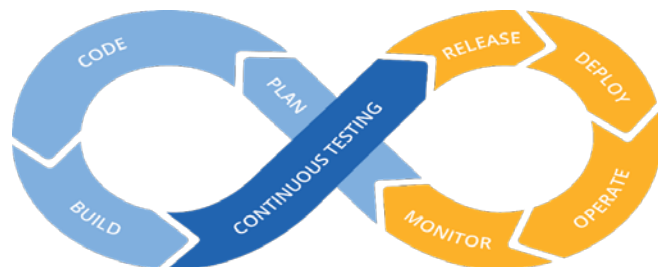
Traditional network construction is divided into four stages: planning, construction, maintenance, and optimization. Each stage requires cross-organization coordination, approval, manual statistics, and signature confirmation.

At least 6 months is required for the traditional network service to be on-boarded to the production network. The service online cycle is long, the labor cost is high, and the operation and maintenance are mostly dependent on vendors.

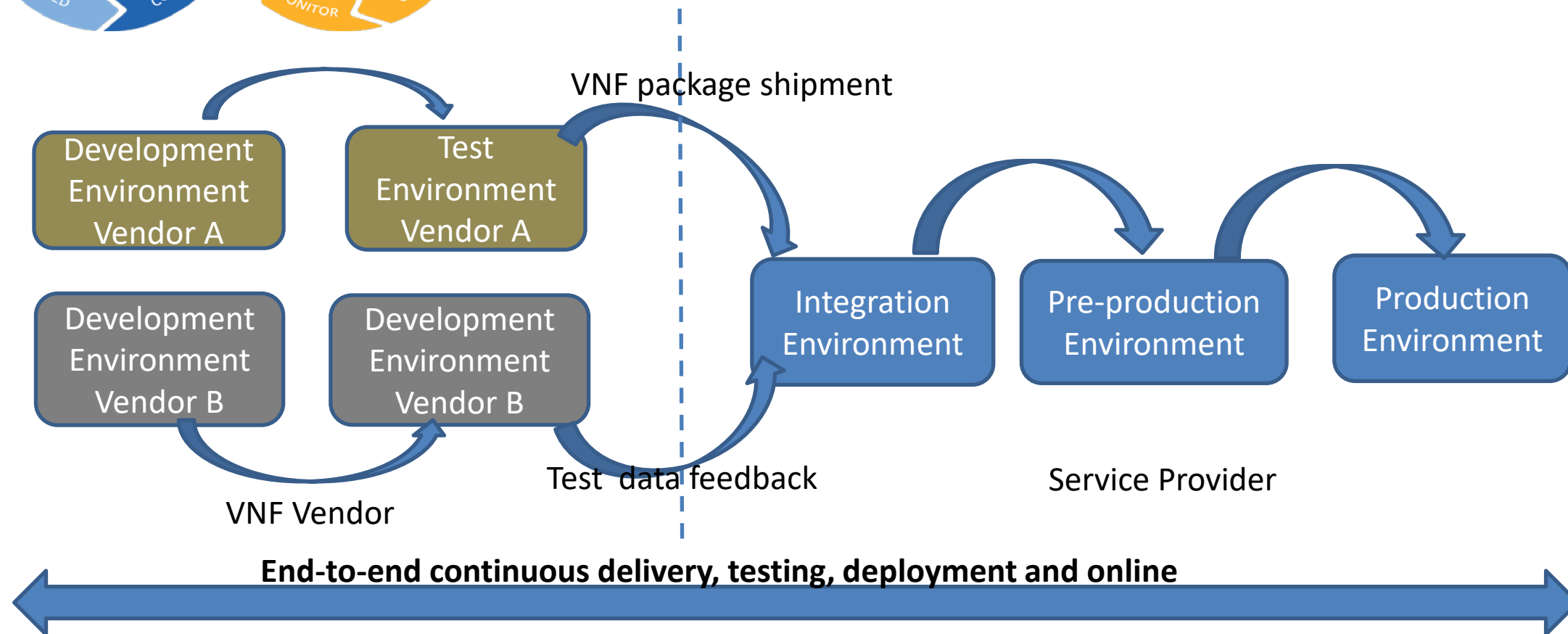


Joint CI/CD Pipeline in NFV Context

DevOps represents a cultural shift that stresses collaboration between the business, developers, and IT professionals. Software test automation can enhance these connections and help organizations achieve desired SDLC acceleration.



Establishing DevOps joint pipeline between NFV software provider and operator to achieve joint agile development and delivery is the trend of cooperation between provider and operator in future.



The GR proposes 4 recommended options for realizing cross-organizational joint Devops

Options	How to deploy test code	How to execute test code	Analysis
1. Self-triggered Test VNFC	Instantiation of VNFUT in test mode including Test VNFC(s). Test VNFC implements the test function.	Test VNFC(s) automatically starts and executes the acceptance test code on deployment; Or the MANO interface should support the trigger of test execution.	The test execution is completely inside the test VNFC implemented by the vendor, and the VNF Operator cannot directly monitor the test results; The deployment of the VNF is divided into test mode and normal mode, which is distinguishing the SUT in real operating environment and the test environment, which may require additional processing.
2. Self-triggered Test VNF	Instantiation the Test NS consists of Test VNF(s) and VNFUT; Test VNF implements the test function.	Test VNF(s) automatically starts and executes the acceptance test code on deployment; Or the MANO interface should support the trigger of test execution.	The test execution is completely inside the test VNF implemented by the vendor, and the VNF Operator cannot directly monitor the test result
3. Common test framework	Obtain the test scripts from VNF package then kdeploy the in VNF operator' s common test framework	VNF Operator Instruct the common test framework to start test executing.	Test code(scripts) and standardized test description files are provided by vendor, common test framework can parse the test description file so that it can support execution of different scripts, and parse the output of execution; the common test framework can decrease the complexity of test environment and decrease the cost of knowledge transfer.
4. Vendor-specific test framework	VNF operator needs to install the test framework and obtain the test scripts (according to information in VNFD), and deploy the test scripts in that framework.	Control test framework to start test executing according to vendor-provided instruction.	For different vendors need to install different test execution environments, which increases the complexity of the whole test environment and increases the cost of knowledge transfer.

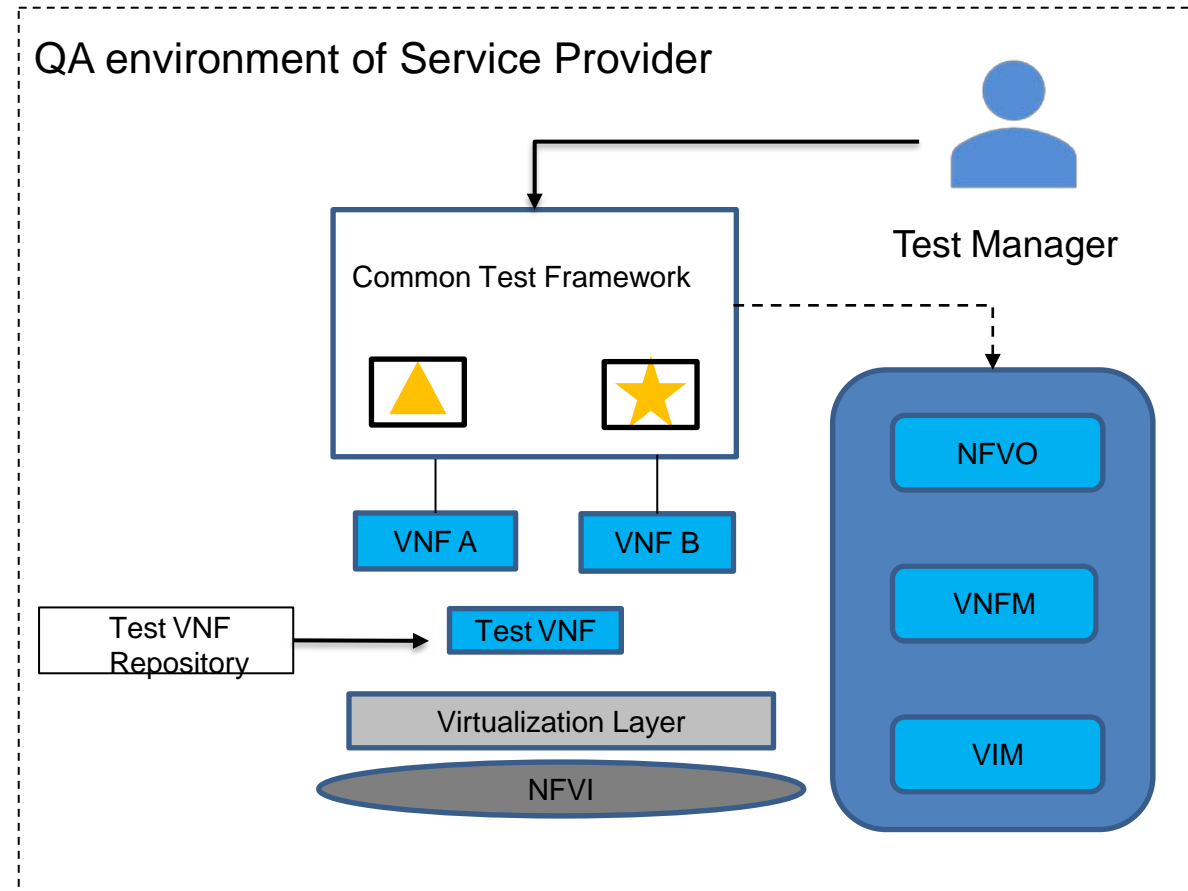
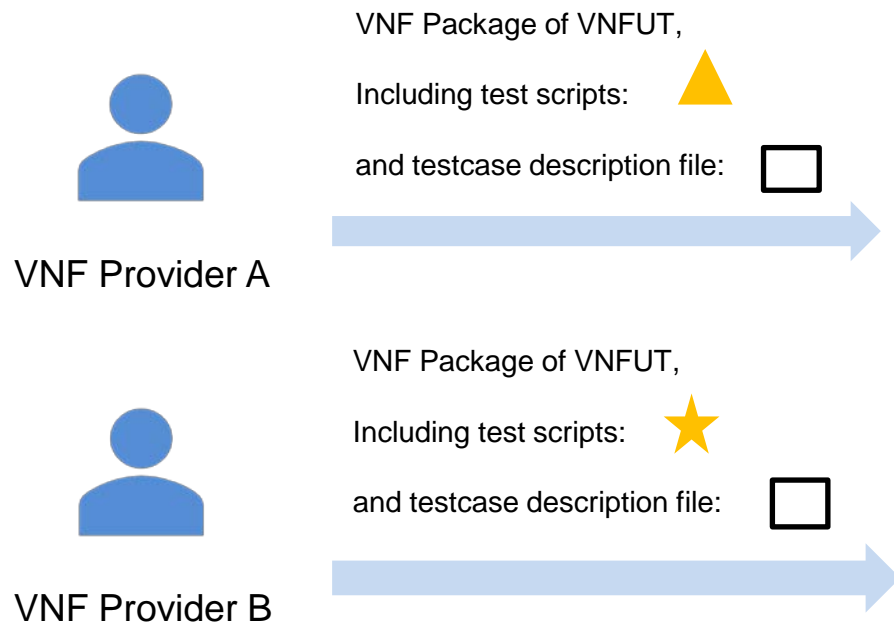


ETSI NFV Release4 Feat-25 (Cross-organizational Continuous VNF Delivery)

Goal: Realize a joint DevOps pipeline to meet the requirements of cross-organizational VNF delivery by extending MANO related components, interfaces, process, etc.

Typical Scenario of Joint DevOps

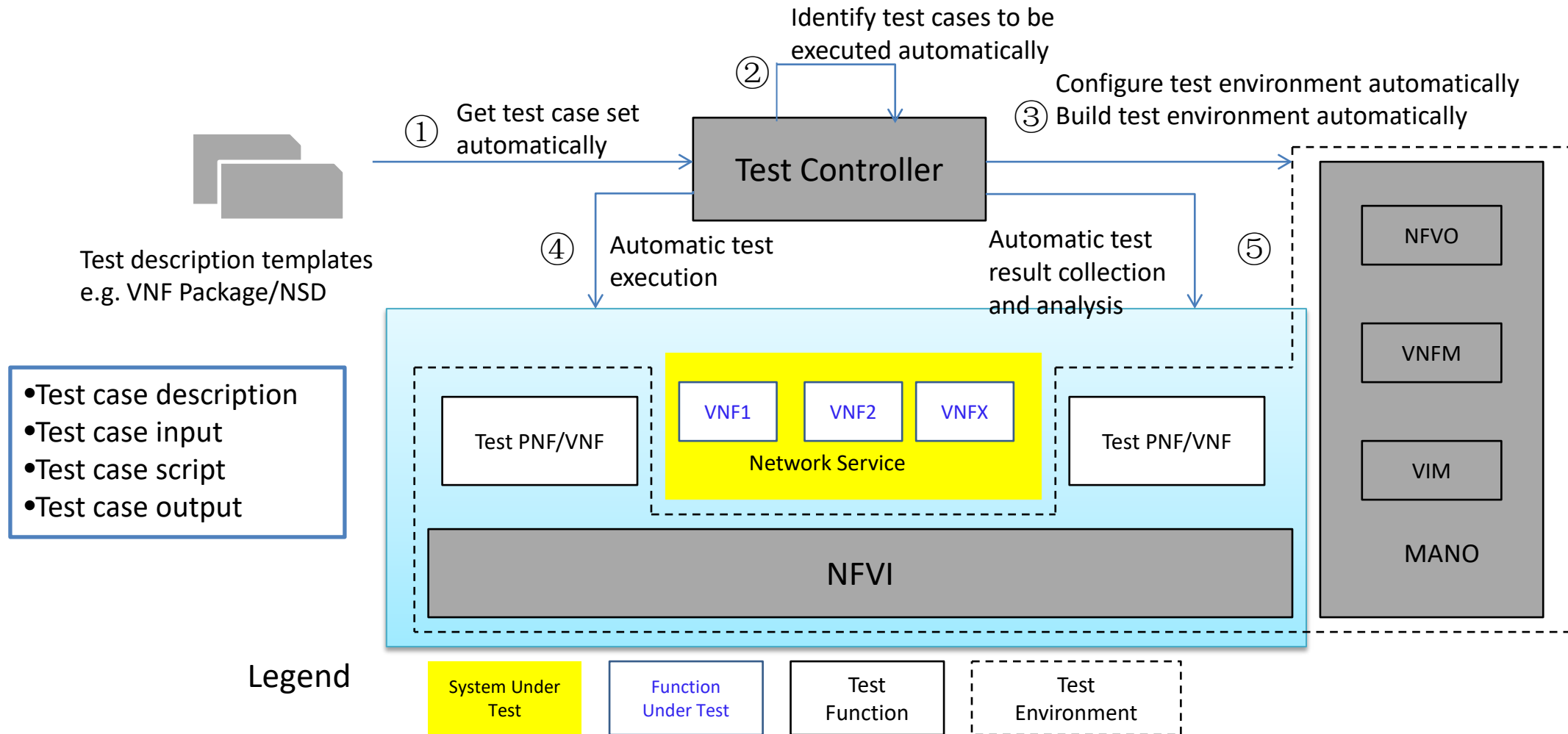
In this scenario, the unified test system needs to be used to perform unified execution and result analysis of test cases from different vendors.



The models, processes, interfaces, components, etc. involved in the process of software delivery, test execution, test data collection, and test data feedback need to be standardized to quickly realize the agile delivery of DevOps across operators and vendors.

ETSI NFV TST013: Standardised Test Case Description Template

- Standardize the input and output information used for automatic test execution and result analysis.
- Ensure test controller performs unified and effective test control of test cases from different providers.



Automatic test execution flow under the control of a unified test controller

Overview of joint DevOps Standard Progress

ETSI NFV-TST013 NfV Testing Test Case Description Template Specification

Standardized test case description form to ensure that the operator-side test controller performs unified and effective test control on test cases from different Vendors

NFV-TST NWI Extension of TST006 (CI/CD and DevOps)

In Progress

Analyze the standard processes, components, feedback mechanisms and possible enhancements to existing MANOs that need to be defined in order to realize the common VNF delivery joint DevOps pipeline.

Feat25 Cross-organizational Continuous VNF Delivery

In Progress



Work Programme					
2020-09-10 Version 2.3.3					
Simple Search Advanced Search Pre-Defined Reports Help					
Details of 'DGS/NFV-TST013' Work Item					
ETSI	Work Item Reference	Type	STF	Technical Body in Charge	Standard Not Ready For Download
	DGS/NFV-TST013	GS		NEV/ISI	
	Current Status (Click to View Full Schedule)	Latest Version	Cover Date	Standstill	Creation Date
	Early draft (2020-09-02)	0.0.1 Draft			2020-06-19
	Rapporteur	Technical Officer		Harmonised Standard	
	Lei Huang	Laurent Vreck		No	
Title	Network Functions Virtualisation (NFV) Testing Test Case Description Template Specification Test Case Description Template Specification				
Scope and Field of Application	Define standardized test case description template to determine the standardized machine-readable format including, but not limited to : 1. Test case description info; 2. Test case input info; 3. Test case script designation info; 4. Test case output info				
Supporting Organizations	Spirent Communications, ZTE Corporation, DOCCOMO Communications Lab., AsialInfo Technologies Inc.				

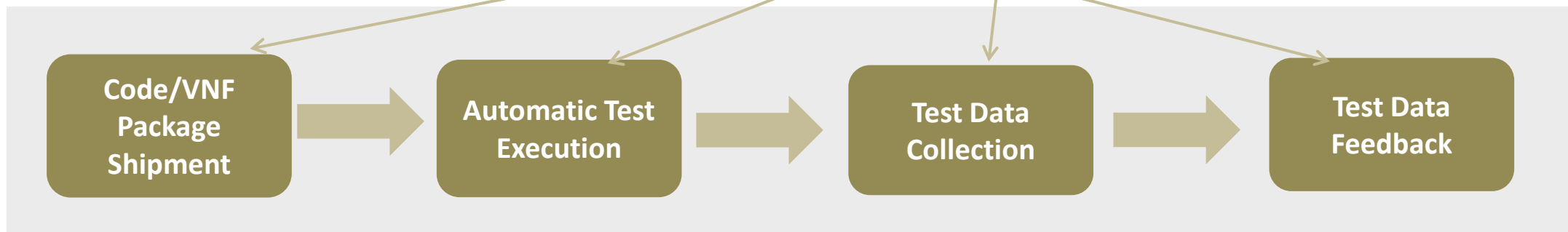
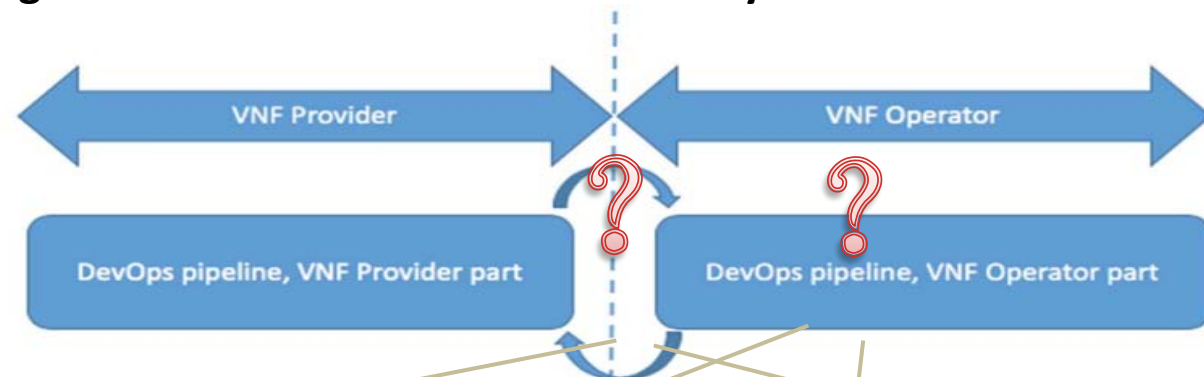


Thank You!

If you have more expertise for automated testing , continuous testing , DevOps & CI/CD, or you are interested in any of the above aspects, welcome to discuss with us.

Contact Information: Yan Yang , email address : yangyanyj@chinamobile.com

Feat25 focuses on Cross-organizational Continuous VNF Delivery



The following content needs to be standardized to realize Joint Pipeline

- Structure of a VNF Package including automated testing functionality
- Interface specification between a VNF provider and an VNF Operator for VNF delivery
- Extensions to the MANO stack for automatic testing and test data collection
- The feedback on test data from the VNF operator to the VNF provider