5GTANGO

5G DEVELOPMENT AND VALIDATION PLATFORM FOR GLOBAL INDUSTRY-SPECIFIC NETWORK SERVICES AND APPS

Benoit ORIHUELA (EGM)
Eleni Fotopoulou, Anastasios Zafeiropoulos (UBITECH)

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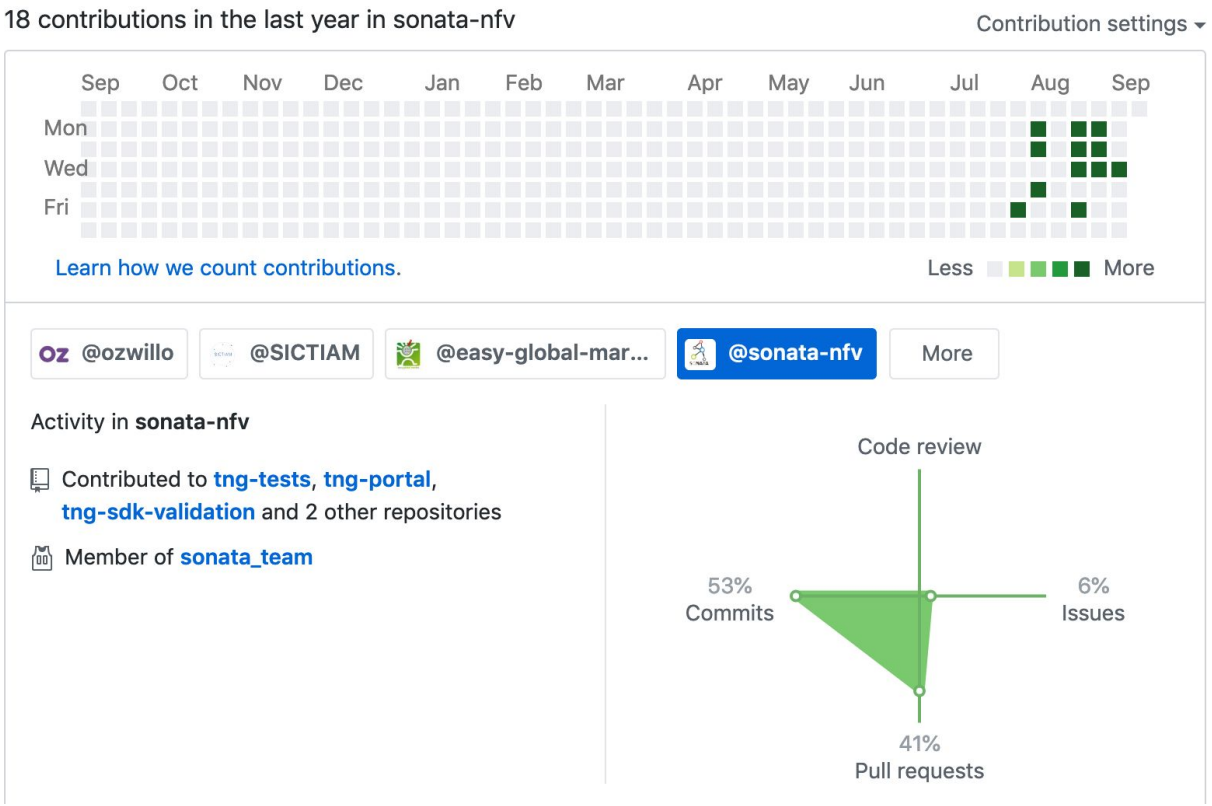
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#1 - The 5Gtango project

5Gtango

Short intro

- Working at Easy Global Market
- Newcomer in the 5G world
- A “service developers” view



About 5Gtango Project

- 5Gtango is an EU-funded project (Horizon 2020) and part of the 5G-PPP initiative
- 30 month work plan, started in June 2017
- 18 partners representing telecom operators, manufacturers, system integrators, service providers, SME developers, research and academic institutes



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5Gtango Objectives

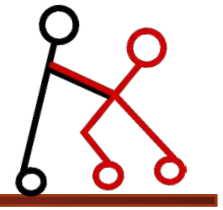
Reduce the time-to-market for networked services by shortening the service development cycle and by qualifying those network services to be adopted.

Reduce the entry barrier to 3rd party developers and support the creation and composition of Virtual Network Functions (VNFs) and application elements as "Network Services".

Enable new business opportunities with the customisation and adaptation of the network to vertical application´s requirements.

Accelerate the NFV uptake in industry via an 'extended' DevOps model and the validation at scale of Network Service capabilities of the 5GTANGO platform in vertical showcases.

5Gtango Key contributions



1

- An NFV-enabled SERVICE DEVELOPMENT KIT (SDK).

2

- A STORE PLATFORM with advanced VALIDATION AND VERIFICATION MECHANISMS for VNFs/Network Services qualification (including 3rd party contributions).

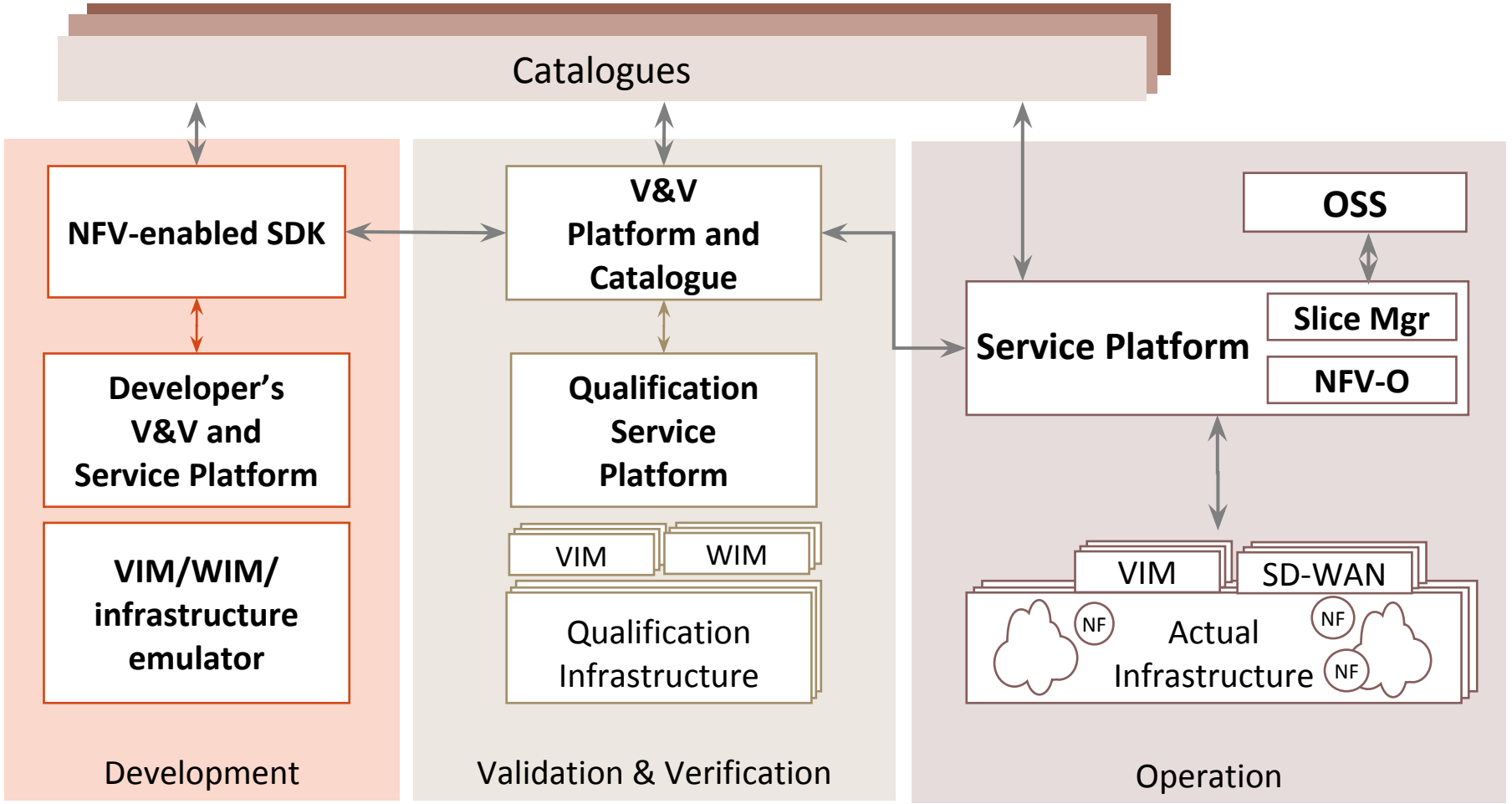
3

- A modular SERVICE PLATFORM with an innovative ORCHESTRATOR in order to bridge the gap between business needs and network operational management systems.

4

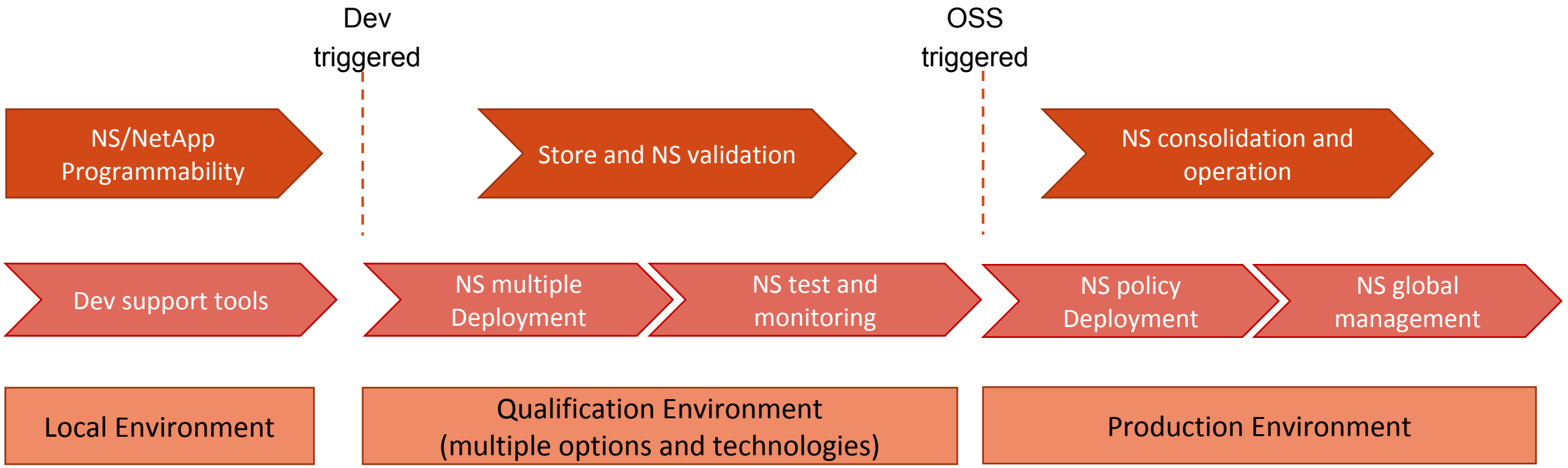
- Methodology and tools to implement a modern DevOps workflow with a multi-organizational design.

5Gtango High Level Architecture



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Three service phases in 5Gtango



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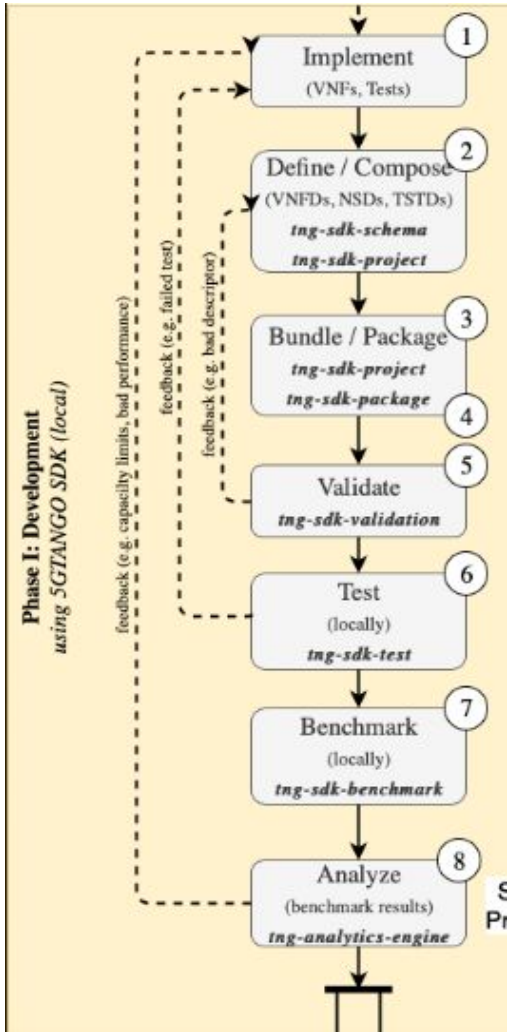
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#2 - The SDK

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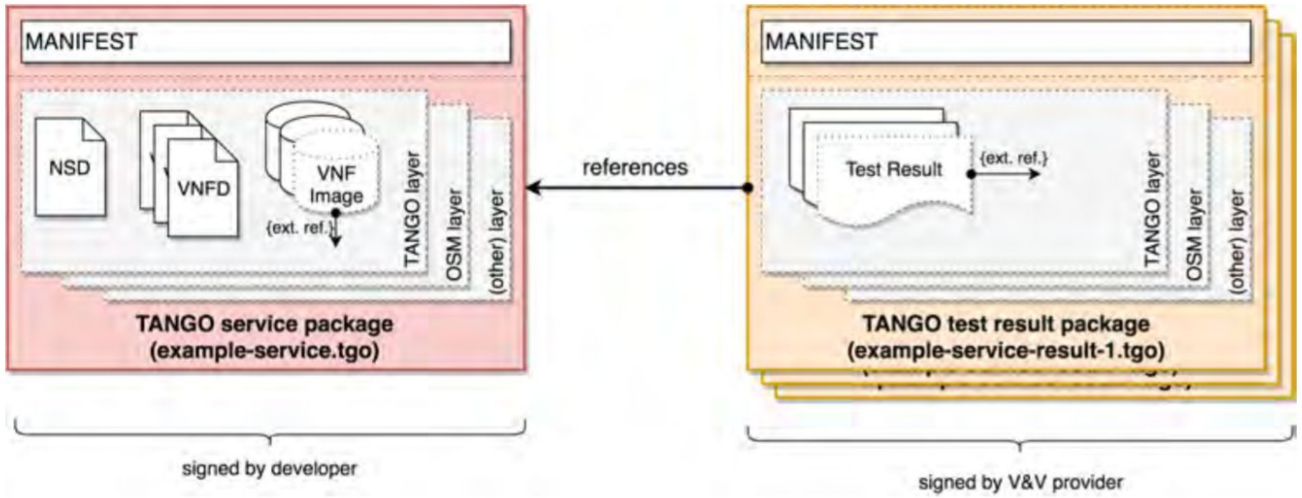
SDK - Tools

- **Schemas:** schemas defining the structure and syntax of all descriptors within the project (VNF, NS, pkgs, SLA, policies, …)
- **Descriptor generation and project management:** generation of VNFD and NSD descriptors based on high-level information and management of created NFV projects
- **Validator:** validation of generated descriptors and projects based on syntax, integrity, topology, or custom rules
- **Packager:** creation and unpacking of 5GTANGO packages
- **Emulator:** emulation platform to support NS developers in locally prototyping and testing complete NS chains in realistic end-to-end multi-PoP scenarios
- **Benchmarker:** tool for fully automated VNF and network service benchmarking and profiling



SDK - a Model-Based Approach

- Descriptors defining functions and services
  - Used in all phases
- Package layering
  - Support integrity checks
  - Consistent updating at the different phases
  - Integrate VnV procedures



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SDK - Project files

File: **packages/NSMQTT_OSM/project.yml**

```yaml
---
version: '0.5'
package:
  name: mqtt-osm-cloud-init
  vendor: eu.5gtango.egm
  version: '0.1'
  maintainer: Benoit Orihuela, Easy Global Market, benoit.orihuela@eglobalmark.com
  description: A VNF running a MQTT-based Mosquitto broker
descriptor_extension: yml
files:
- path: mosquitto_nsd.yaml
  type: application/vnd.etsi.osm.nsd
  tags:
  - etsi.osm
  testing_tags:
  - "osm-mosquitto"
- path: mosquitto_vnfd.yaml
  type: application/vnd.etsi.osm.vnfd
  tags:
  - file-ref:cloud_init/mosquitto_cloud_init.cfg
  - etsi.osm
- path: cloud_init/mosquitto_cloud_init.cfg
  type: text/x-shellscript
  tags:
  - etsi.osm
```

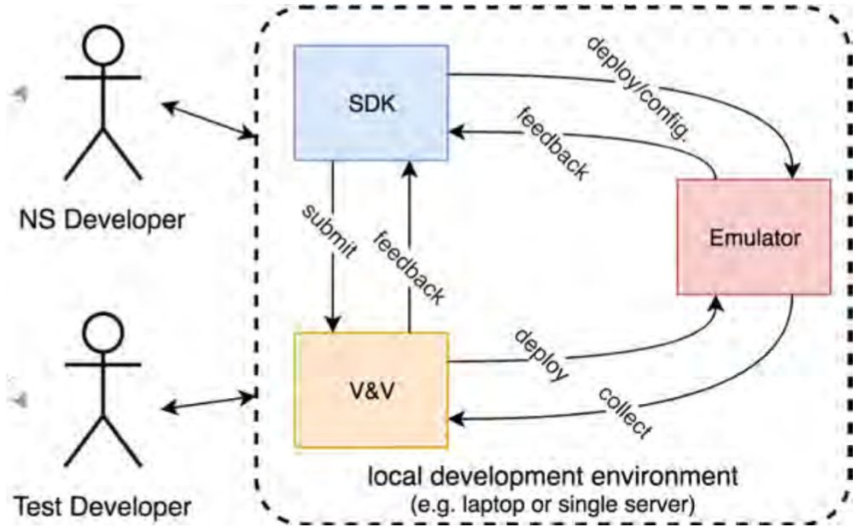
SDK - Validation of a package

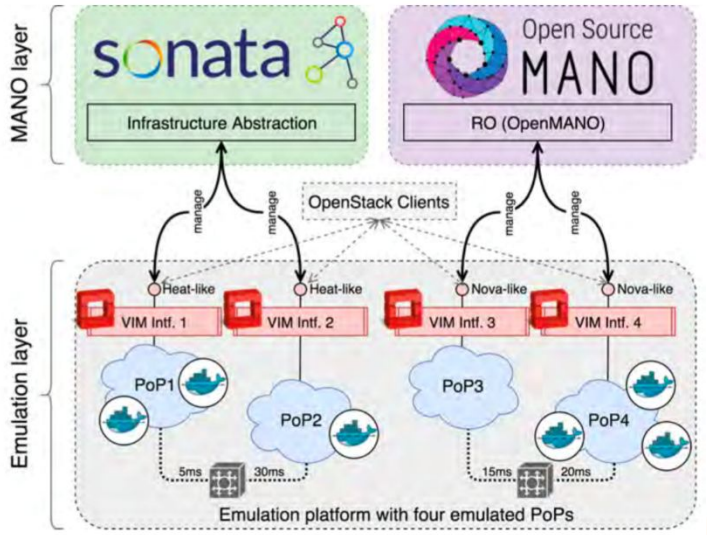
```
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.cli:l123 INFO Syntax, integrity and topology validation
2019-09-08 10:55:32 khatovar tngsdk.project.project[9394] INFO Loading project '/Users/bobeal/egm/dev/5gtango/tng-tests/packages/NSID1V_hybrid/project.yml
'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l301 INFO Validating project descriptors'/Users/bobeal/egm/dev/5gtango/tng-tests/packages/N
SID1V_hybrid'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l303 INFO ... syntax: True, integrity: True, topology: True
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l1121 INFO Validating test descriptor '/Users/bobeal/egm/dev/5gtango/tng-tests/packages/NSI
D1V_hybrid/test-descriptor.yml'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l1123 INFO ... syntax: True, integrity: True
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l1144 INFO Validating syntax of test descriptor 'eu.5gtango.optare.test-ping-sonata.0.1'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l1162 INFO Validating integrity of test descriptor 'eu.5gtango.optare.test-ping-sonata.0.1'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l381 INFO Validating service descriptor '/Users/bobeal/egm/dev/5gtango/tng-tests/packages/N
SID1V_hybrid/nsd.yaml'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l383 INFO ... syntax: True, integrity: True, topology: True
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l694 INFO Validating syntax of service descriptor'eu.5gtango.test-nsid1v-sonata.0.2'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l716 INFO Validating integrity of service descriptor 'eu.5gtango.test-nsid1v-sonata.0.2'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l876 INFO Validating function descriptor '/Users/bobeal/egm/dev/5gtango/tng-tests/packages/
NSID1V_hybrid/vnfd1.yaml'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l880 INFO ... syntax: True, integrity: True, topology: True, custom: False
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l921 INFO Validating syntax of function descriptor 'eu.5gtango.cirros_vnf.0.2'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l941 INFO Validating integrity of function descriptor 'eu.5gtango.cirros_vnf.0.2'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l1049 INFO Validating topology of function descriptor 'eu.5gtango.cirros_vnf.0.2'
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.validator:l1086 INFO Built topology graph of function descriptor'eu.5gtango.cirros_vnf.0.2': [('mgmt'
, 'br-mgmt-2-mgmt'), ('br-mgmt-2-mgmt', 'vdu01')]
2019-09-08 10:55:32 khatovar tango.validator.events:l50 ERROR 1 Undeclared connection point(s)
2019-09-08 10:55:32 khatovar tango.validator.events:l64 ERROR Virtual links section has undeclared connection point: mgmt
2019-09-08 10:55:32 khatovar tango.tngsdk.validation.cli:l135 INFO Cant validate the project descriptors
2019-09-08 10:55:32 khatovar tango.tngsdk.package.packager.packager:l310 ERROR tng-validate error(s): '[{'source_id': 'eu.5gtango.test-nsid1v-sonata.0.2',
 'event_code': 'evt_nsd_itg_undeclared_cpoint', 'level': 'error', 'event_id': 'eu.5gtango.test-nsid1v-sonata.0.2', 'header': '1 Undeclared connection poin
t(s)', 'detail': [{'message': 'Virtual links section has undeclared connection point: mgmt', 'detail_event_id': 'eu.5gtango.test-nsid1v-sonata.0.2'}]}]';
Exception of type: <class 'tngsdk.package.validator.TangoValidationException'>
```


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SDK - The emulator

- Initial validation
  - Through emulation
  - Connected with the VnV process
- Shaping a DevOps loop suitable for critical infrastructures





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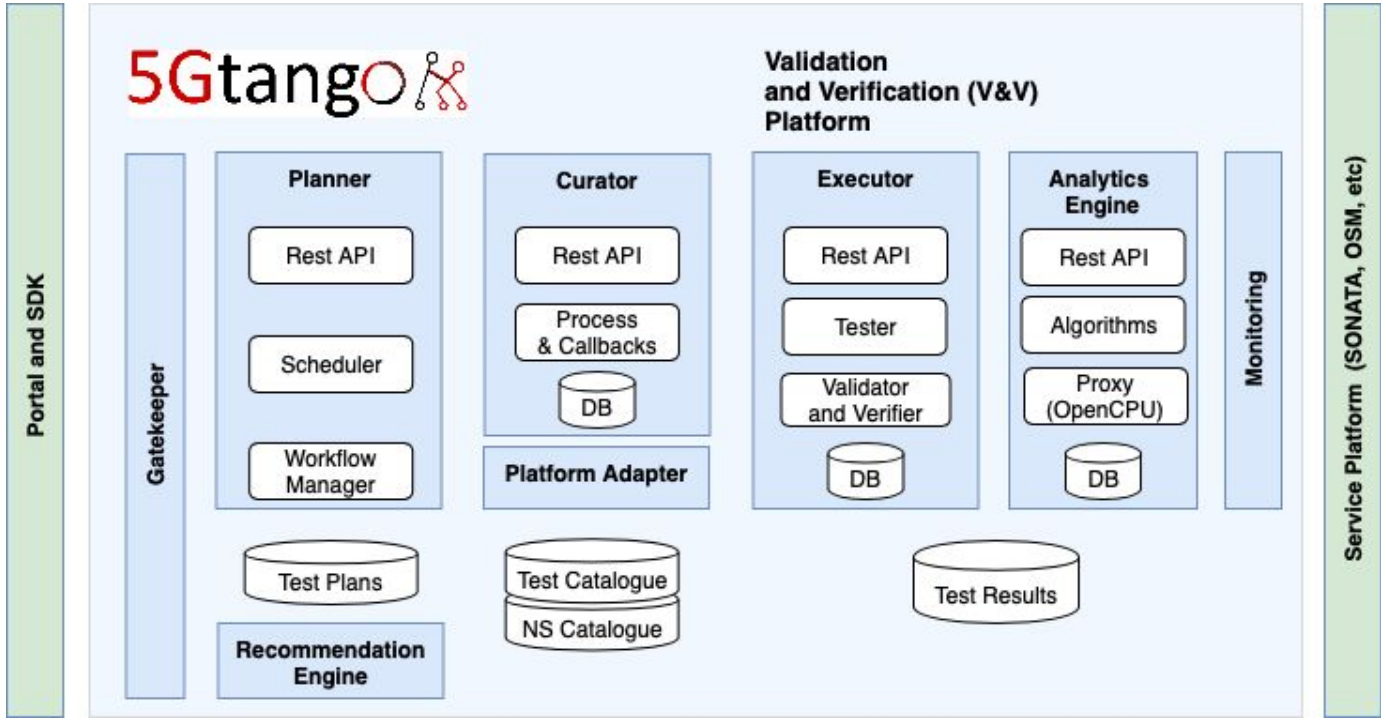
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#3 - The Verification & Validation platform

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VnV - Verifying and Validating

- Support for :
  - Different test specification sources
  - Automated test execution
  - Linked test results
- Enabling Continuous Testing
- Multi-platform support
  - SONATA, **OSM**, ONAP (WIP)



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VnV - Main Features

Easy testing automation

Definition of Test plans, which can be applied to multiple NS

Complete Network Service/VNF Qualification

Reporting of test results on a Qualification SP and environment

Multi-MANO support

Ready to test with SONATA, OSM, ONAP (expected for v5.1)

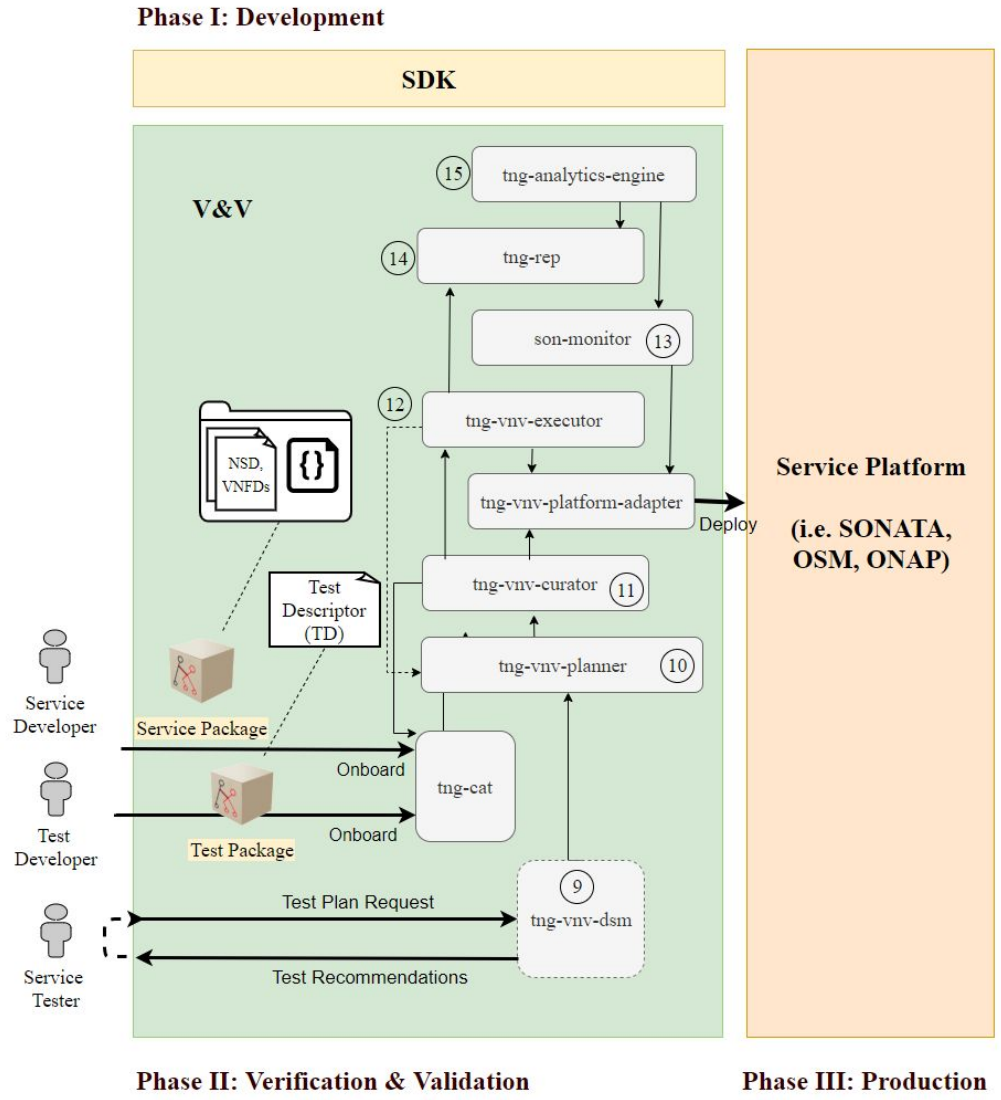
Probes and Metrics

Out-of-the-box probes for your NS

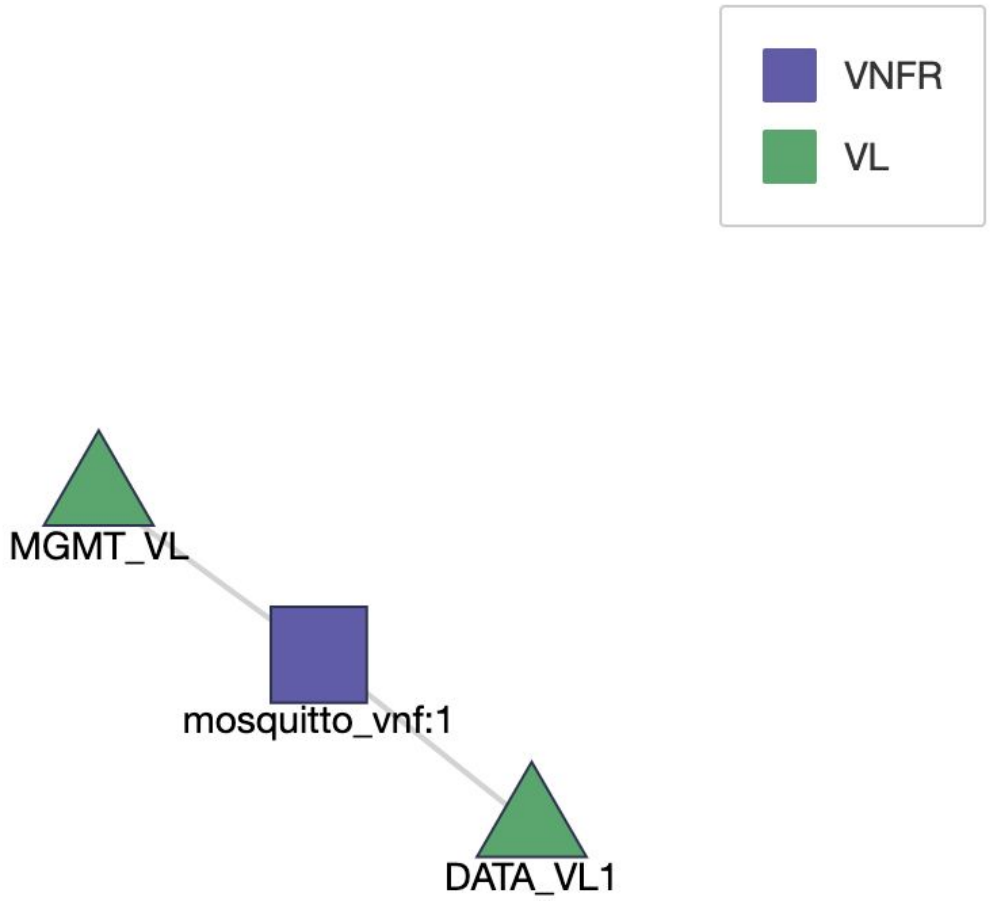
Comprehensive result analysis

Analyser component to support tests results analysis

VnV - Flow and Tools



VnV - A (very) simple use-case



NS View

NS instance id	5af71c13-2ac7-4eb6-816b-c1afc1c79063
NSD name	mqtt-osm-stress-test-Mosquitto_NS-osm
Operational status	running
Config status	configured
Detailed status	done

VnV - Project file for the test

File: **TSTMQTT/project.yml**

```yaml
---
descriptor_extension: yml
version: '0.5'
package:
  vendor: eu.5gtango.egm
  name: mqtt-osm-stress-test
  version: '0.9'
  maintainer: Benoit Orihuela, EGM, benoit.orihuela@eglobalmark.com
  description: This is a 5GTANGO test package for MQTT benchmarking in OSM
files:
- path: Definitions/test-descriptor.yml
  type: application/vnd.5gtango.tstd
  testing_tags:
  - "osm-mosquitto"
- path: Icons/upb_logo.png
  type: image/png
- path: Licenses/LICENSE
  type: text/plain
```

VnV - Test descriptor - Metadata

File: **TSTMQTT/Definitions/test-descriptor.yml**

```yaml
---
author: "Benoit Orihuela (EGM)"
description: "Performance test for mqtt broker"
descriptor_schema: https://raw.githubusercontent.com/sonata-nfv/tng-schema/master/test-descriptor/testdescriptor-schema.yml
name: "mqtt-osm-stress-test"
vendor: "eu.5gtango.egm"
version: '0.8'

service_platforms:
  - "OSM"
test_category:
  - "benchmarking"
testing_tags:
  - "osm-mosquitto"
```

VnV - Test descriptor - Setup

```yaml
phases:
  - id: setup
    steps:
    - action: deploy
      description: "Deploying a NS"
      name: deployment
    - action: configure
      description: "Configuration"
      name: configuration
      probes:
      - id: mqttprobe
        description: "A service initial configuration container"
        image: "easyglobalmarket/mqtt-probe:latest"
        name: mqttprobe
        parameters:
        - key: IP
          value: '$(Mosquitto_VNF/endpoints/name:data_vl1/address)'
        - key: PORT
          value: '1883'
        - key: CLIENTS
          value: '100'
        - key: COUNT
          value: '100'
        - key: SIZE
          value: '100'
        - key: QOS
          value: '0'
        - key: ROUNDS
          value: '50'
```

VnV - Test descriptor - Exercise & Verify

```
- id: exercise
  steps:
  - command: /bin/sh
    dependencies: []
    description: "Starting the MQTT probe"
    entrypoint: /app/entrypoint.sh
    index: 1
    instances: 1
    name: mqttprobe
    output:
    - {results: results.log}
    run: mqttprobe
    start_delay: 60
- id: verification
  steps:
  - step: parser
    description: "Check obtained results"
    name: parser
    conditions:
        - condition: present
          file: results.log
          find: '"failures": 0'
          name: no-error
          verdict: pass
```


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VnV - Test execution

```
${VNV_HOST}     http://int-vnv.5gtango.eu
${SP_HOST}      http://172.31.8.163
${FILE_SOURCE_DIR}  ./packages
${NS_PACKAGE_NAME}  eu.5gtango.egm.mqtt-osm-cloud-init.0.1.tgo
${TST_PACKAGE_NAME}  eu.5gtango.egm.mqtt-osm-stress-test.0.9.tgo
${NS_PACKAGE_SHORT_NAME}  mqtt-osm-cloud-init
${TST_PACKAGE_SHORT_NAME}  mqtt-osm-stress-test
${READY}        READY
${PASSED}       PASSED
${TERMINATED}   terminated
${CREATE_SERVICE}       CREATE_SERVICE

*** Test Cases ***
Setting the VnV Path
    #From date to obtain GrayLogs
    ${from_date} =   Get Current Date
    Set Global Variable  ${from_date}
    Set SP Path     ${VNV_HOST}
    ${result} =     Sp Health Check
    Should Be True  ${result}
Clean the Packages
    @{PACKAGES} =   Get Packages
    FOR     ${PACKAGE}  IN  @{PACKAGES[1]}
        Run Keyword If     '${PACKAGE['name']}'== '${NS_PACKAGE_SHORT_NAME}' or '${PACKAGE['name']}'== '${TST_PACKAGE_SHORT_NAME}'
age_uuid']}
    END
Upload the NS Package
    ${result}=      Upload Package      ${FILE_SOURCE_DIR}/${NS_PACKAGE_NAME}
    Should Be True     ${result[0]}
Upload the TST Package
    ${result}=      Upload Package      ${FILE_SOURCE_DIR}/${TST_PACKAGE_NAME}
    Should Be True     ${result[0]}
Wait For Service Instance Ready
    Set SP Path     ${VNV_HOST}
    ${result} =     Sp Health Check
    Should Be True   ${result}
    Sleep   120
    ${request_list} =   Get Requests
    Set Suite Variable  ${REQUEST}  ${request_list[1][0]['request_uuid']}
    Wait until Keyword Succeeds     5 min   5 sec   Check Request Status
Wait For Test Execution
    Set SP Path     ${VNV_HOST}
    Wait until Keyword Succeeds     20 min   5 sec   Check Test Result Status
Obtain GrayLogs
    ${to_date} =  Get Current Date
    Set Suite Variable  ${param_file}   True
    Get Logs  ${from_date}  ${to_date}  ${VNV_HOST}  ${param_file}
```


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VnV - CI / CD

Project test-osm-onboarding

VnV Industrial pilot stress Test

edit description

Disable Project

ENABLE AUTO REFRESH

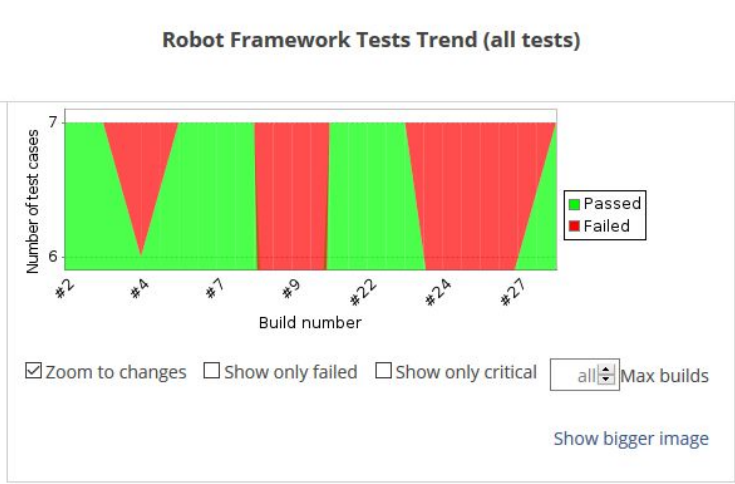
Last Successful Artifacts

graylogs.log	170.97 KB	view
log.html	222.85 KB	view
output.xml	13.75 KB	view
report.html	224.04 KB	view

Recent Changes

Disk Usage

Job	23 MB
All builds	23 MB
Locked builds	-
All workspaces	57 MB
Slave workspaces	57 MB
Non-slave workspaces	-

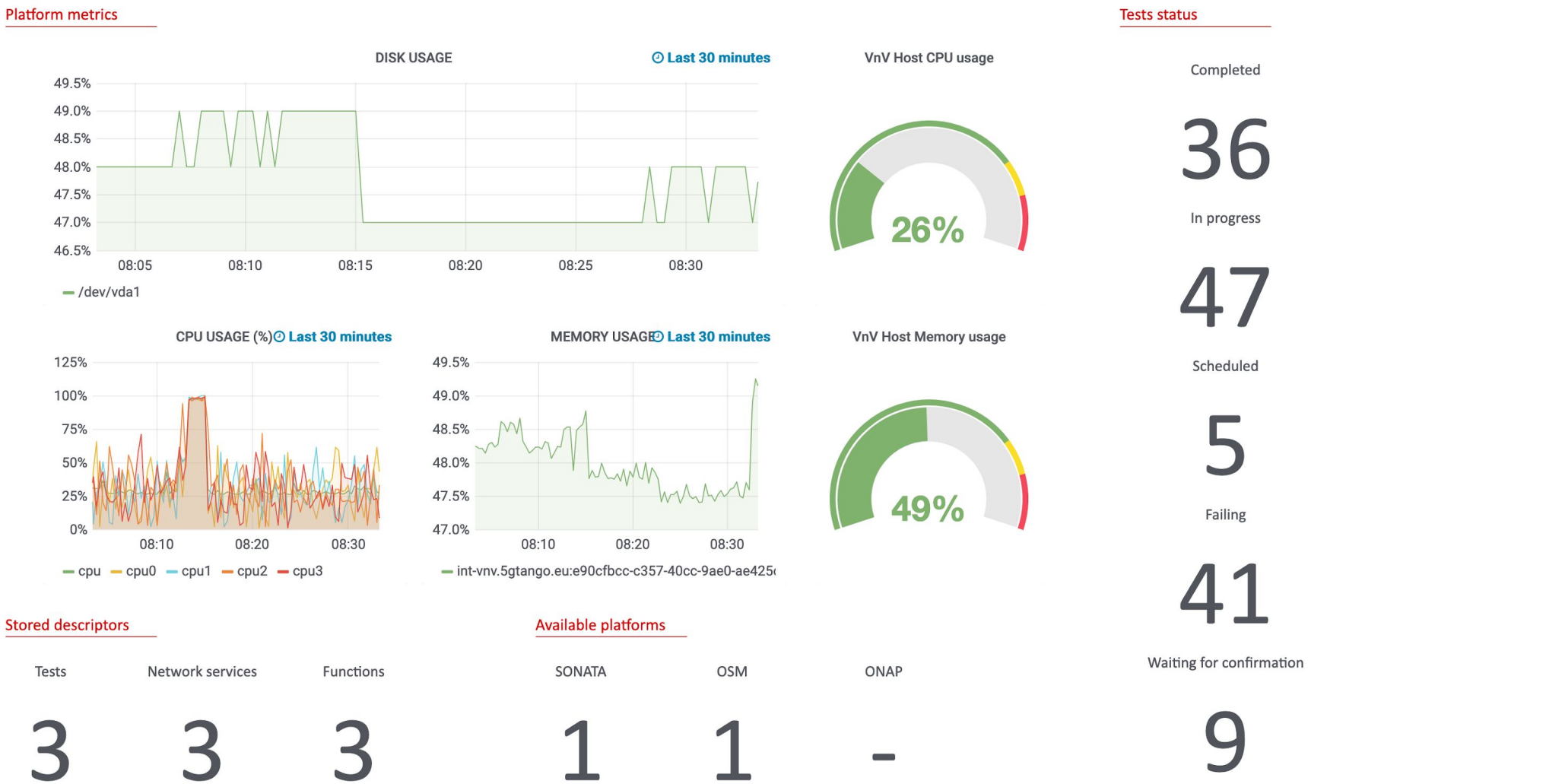


MTTR	Last 7 Days	10 hr
	Last 30 Days	21 hr
	All Time	21 hr
MTTF	Last 7 Days	7 hr 27 min
	Last 30 Days	1 day 18 hr
	All Time	1 day 18 hr
Standard Deviation	Last 7 Days	13 min
	Last 30 Days	12 min
	All Time	12 min

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VnV - The portal



VnV - The portal

VALIDATION AND VERIFICATION

Test plans

Search

Test name	Service name	Updated at ↓	Status
mqtt-osm-stress-test.eu.5gtango.egm.0.8	Mosquitto_NS.Easy Global Market.1.1	Tue, 10 Sep 2019 08:15:13 GMT	Completed
mqtt-osm-stress-test.eu.5gtango.egm.0.8	Mosquitto_NS.Easy Global Market.1.1	Tue, 10 Sep 2019 08:08:02 GMT	Cancelled
mqtt-osm-stress-test.eu.5gtango.egm.0.8	Mosquitto_NS.Easy Global Market.1.1	Tue, 10 Sep 2019 07:17:56 GMT	Cancelled
mqtt-osm-stress-test.eu.5gtango.egm.0.8	Mosquitto_NS.Easy Global Market.1.1	Mon, 09 Sep 2019 14:41:30 GMT	Cancelled
test-generic-probes.eu.5gtango.optare.0.1	test-nsid1v.eu.5gtango.0.1	Thu, 05 Sep 2019 10:57:22 GMT	Starting
test-generic-probes.eu.5gtango.optare.0.1	test-nsid1v.eu.5gtango.0.1	Thu, 05 Sep 2019 10:31:37 GMT	Error
test-generic-probes.eu.5gtango.optare.0.1	test-nsid1v.eu.5gtango.0.1	Thu, 05 Sep 2019 10:11:00 GMT	Error

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#4 - Analytics Engine: A Scientific Toolbox for Introducing Automation in Orchestration Mechanisms

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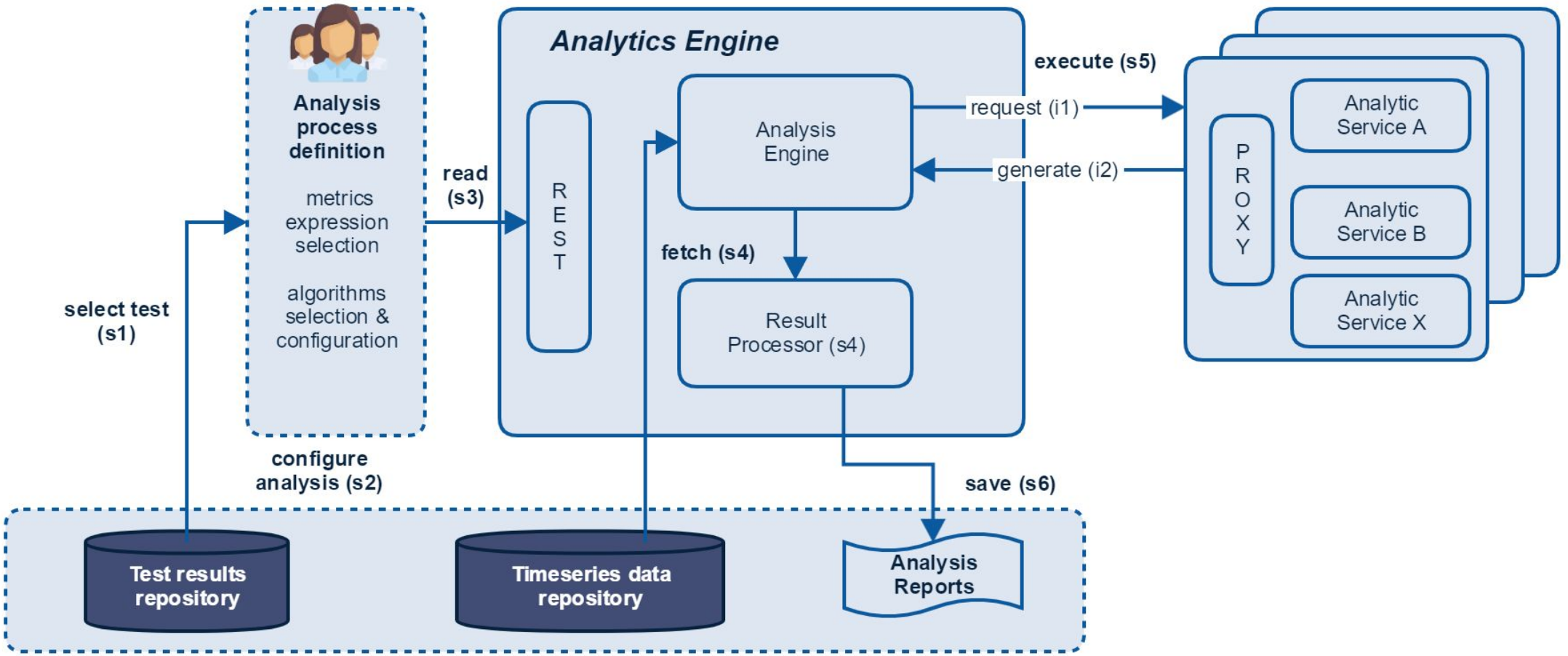
Analytics Engine - Motivation (1)

- **Extract insights building upon the results of VnV tests**
  - Main performance KPIs
  - Stability, self-recovery functionalities
  - Scalability aspects
- **Identify capacity limits and extract resource consumption trends**
  - Proper dimensioning of resources allocation
  - Specification of elasticity policies
- **Identify unknown or not well-examined relationships among monitoring metrics**
  - Identify bottlenecks in performance of VNFs within a NS triggered by malperformance of other VNFs

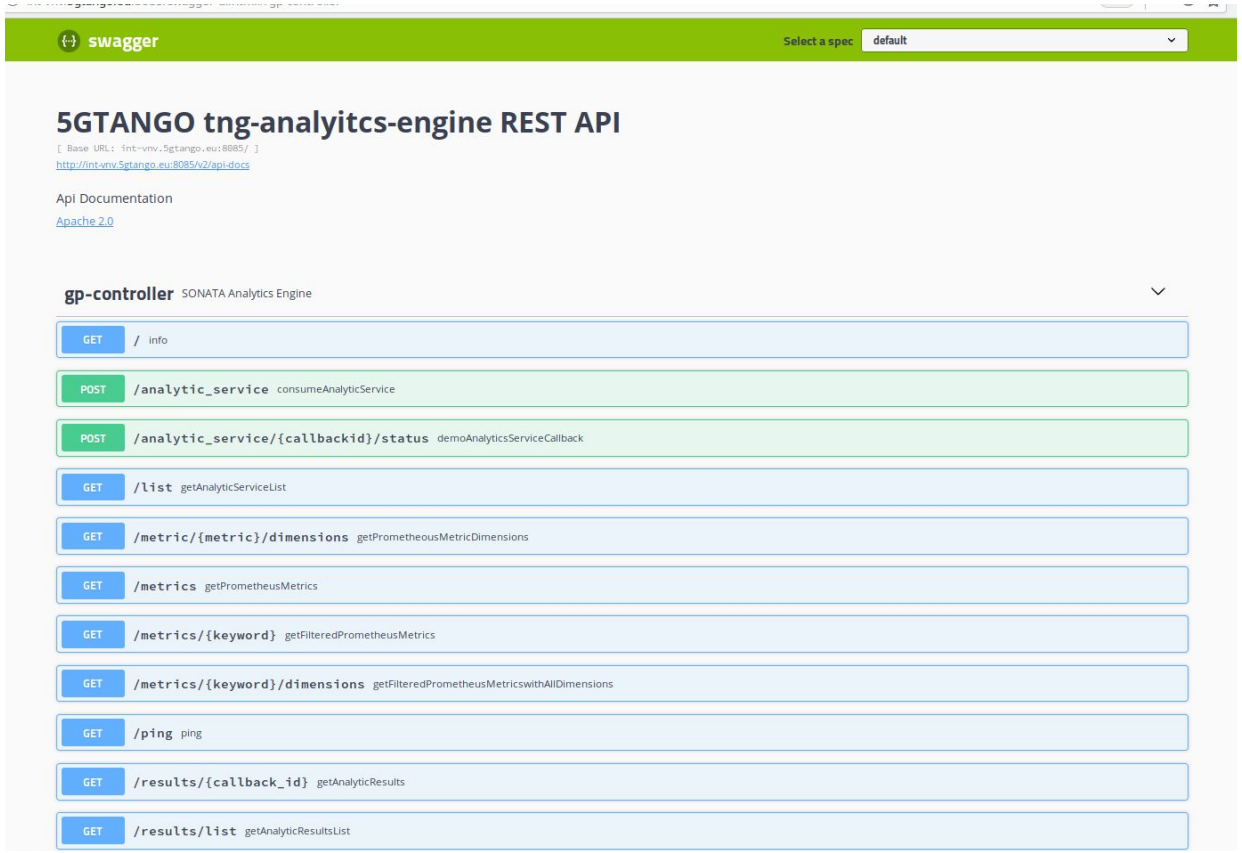
Analytics Engine - Motivation (2)

- **Anomalies detection**
  - Considering performance or security aspects
- **Introduce automation in orchestration mechanisms**
  - Design efficient deployment and runtime policies based on:
  - Resource consumption trends
  - Machine learning mechanisms for guaranteeing desired objectives
  - Design forecasting models for proactive decision making (e.g. scaling, anomaly detection)
- **Compare performance of software providing similar functionality**
  - Resource usage and achieved performance

Analytics Engine Architecture



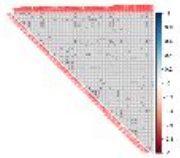
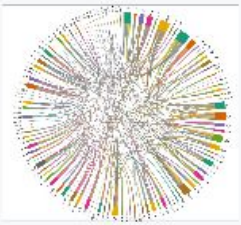
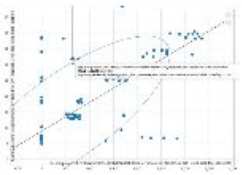
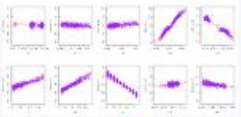
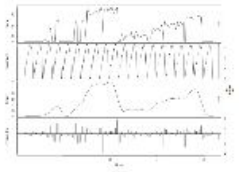
Analytics Engine Rest APIs



http://int-vnv.5gtango.eu:8085/swagger-ui.html#/gp-controller

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Supported Analysis Services

Analysis Service	Description	Result
correlogram	generation of correlogram with all high significant (positive and negative) correlation between the retrieved metrics from prometheus for a spesific application graph	
chord diagram	generation of chord diagram with all high significant (positive and negative) correlation between the retrieved metrics from prometheus for a spesific application graph	
linear regression	calculation and representation of the linear regression model for two aplication graph metrics	
multiple linear regression	calculation and representation of a multilinear regression model for many aplication graph metrics	
times series decomposition	time series decomposition and forecasting for a metric timeseries	
filter healthy metrics	separate monitoring metrics to healthy and unhealthy. Provide basic statistics	

http://int-vnv.5gtango.eu:8085/list


```
[{
        "name": "correlogram",
        "description": "Provide a correlogram with high statistical correlations between metrics",
        "id": "5d778342a927cb000104c8aa",
        "constraints": "Select the set of metrics (more than one) to be used for the calculation of the correlation matrix",
        "results": ["correlogram.html"],
        "url": "/ocpu/library/Physiognomica/R/correlogram"
}, {
        "name": "chord",
        "description": "Provide a correlogram with high statistical correlations between metrics via an interactive chord diagram",
        "id": "5d778342a927cb000104c8ab",
        "constraints": "Select the set of metrics (more than one) to be used for the calculation of the correlation matrix",
        "results": ["correlation_page.html"],
        "url": "/ocpu/library/Physiognomica/R/chord"
}]
```


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V&V - Focus on Analytics Engine

List all V&V executed tests :
http://int-vnv.5gtango.eu:4012/trr/test-suite-results


```
[{
        "created_at": "2019-09-11T06:30:00.829+00:00",
        "ended_at": "2019-09-11T06:30:00.785Z",
        "instance_uuid":
"c65f337c-edf8-4c2b-9124-53928e1da557",
        "package_id":
"2ebfe959-bb47-415f-b874-b9fbe5c599aa",
        "service_uuid":
"99d3a768-a93c-4cce-b40f-8db0ff498901",
        "started_at": "2019-09-11T06:22:01.276Z",
        "status": "PASSED",
        "test_uuid":
"c34cf687-8653-4804-9b06-be7ecd43f91b",
        "updated_at": "2019-09-11T06:30:00.779+00:00",
        "uuid": "2f05c095-0a42-4bbe-96b0-d40327146020"
}
]
```

V&V - Focus on Analytics Engine

Gather monitoring metrics
http://int-vnv.5gtango.eu:8085/tests/vnv/{test_results_uuid}/metrics

Example:
http://int-vnv.5gtango.eu:8085/tests/vnv/2f05c095-0a42-4bbe-96b0-d40327146020/metrics

["libvirt_block_stats_errors_number{resource_id='8d8fcbf4-c1da-4db9-9547-41f5b4cfa090'}",
"libvirt_block_stats_read_bytes{resource_id='8d8fcbf4-c1da-4db9-9547-41f5b4cfa090'}",
"libvirt_block_stats_read_requests_issued{resource_id='8d8fcbf4-c1da-4db9-9547-41f5b4cfa090'}",
"libvirt_block_stats_write_bytes{resource_id='8d8fcbf4-c1da-4db9-9547-41f5b4cfa090'}",
"libvirt_block_stats_write_requests_issued{resource_id='8d8fcbf4-c1da-4db9-9547-41f5b4cfa090'}"]

V&V - Focus on Analytics Engine

Request Analytic Process:
http://int-vnv.5gtango.eu:8085/analytic_service

```
{
"name":"filter_healthy_metrics"
,
"vendor":"5gtango.vnv",
"testr_uuid":
"2f05c095-0a42-4bbe-96b0-d40327
146020",
"step":"1s"
}
```

Fetch Analytic Result
http://int-vnv.5gtango.eu:8085/results/list

prometheus_url: http://int-vnv.5gtango.eu:9090

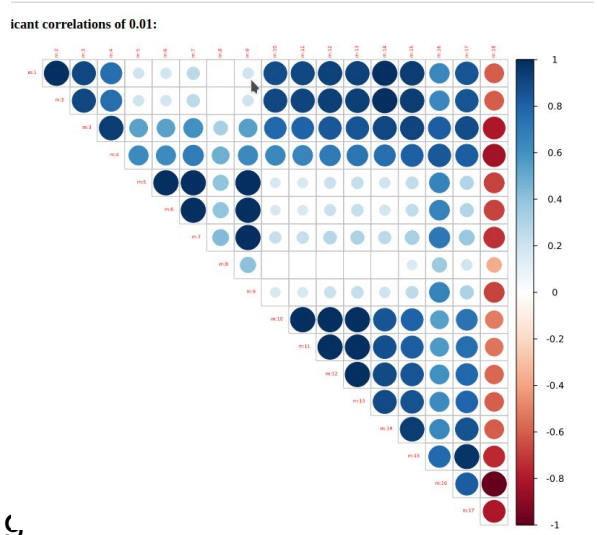

```
{
    "analyticServiceName": "filter_healthy_metrics",
    "executionDate": "Tue Sep 10 09:31:52 UTC 2019",
    "executionMessage": "The analytic service has succesfully completed.",
    "id": "5d776d88a927cb000104c89c",
    "results": [{
"result":
"http://int-vnv.5gtango.eu:8083/ocpu/tmp/x060db1646ea938/files/filter_healthy_metrics.html",
"type": "html"},
{"result":
"http://int-vnv.5gtango.eu:8083/ocpu/tmp/x060db1646ea938/files/healthy_metrics.json",
"type": "json"},
{"result":
"http://int-vnv.5gtango.eu:8083/ocpu/tmp/x060db1646ea938/files/unhealthy_metrics.json",
"type": "json"}],
"status": "SUCCESS"
}
```

V&V - Focus on Analytics Engine

Request Analytic Process:
http://int-vnv.5gtango.eu:8085/analytic_service


```
{
"name":"correlogram",
"vendor":"5gtango.vnv",
"testr_uuid":
"2f05c095-0a42-4bbe-96b0-d40327
146020",
"step":"1s",
"metrics":["libvirt_block_stats
_read_bytes{resource_id='c40e65
f9-c202-408a-bc33-84999d13a237'
}",...,"libvirt_mem_stats_unuse
d{resource_id='c40e65f9-c202-40
8a-bc33-84999d13a237'}"]
}
```


Fetch Analytic Result
http://int-vnv.5gtango.eu:8085/results/list



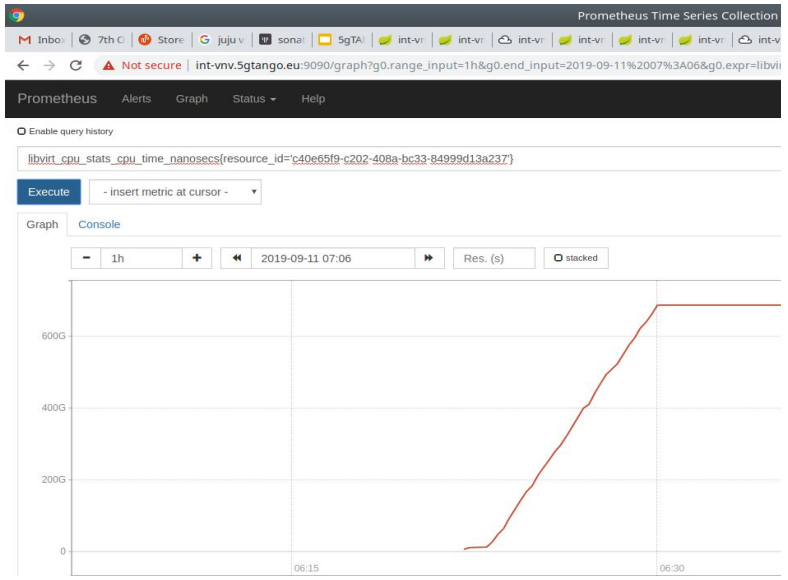

```
{
        "analyticServiceName": "correlogram",
        "executionDate": "Wed Sep 11 07:00:51 UTC 2019",
        "executionMessage": "The analytic service has succesfully
completed.",
        "id": "5d789ba3a927cb000104c8b9",
        "results": [{
                "result":
"http://int-vnv.5gtango.eu:8083/ocpu/tmp/x06dbee443f4e8a/files/correlo
gram.html",
                "type": "html"
        }],
        "status": "SUCCESS"
}
```

V&V - Focus on Analytics Engine

Request Analytic Process:
http://int-vnv.5gtango.eu:8085/analytic_service


```
{
"name":"linear_regression",
"vendor":"5gtango.vnv",
"testr_uuid":
"2f05c095-0a42-4bbe-96b0-d40327
146020",
"step":"1s",
    "metrics":[
"libvirt_cpu_stats_cpu_time_nan
osecs{resource_id='c40e65f9-c20
2-408a-bc33-84999d13a237'}",
"libvirt_mem_stats_mem_util{res
ource_id='c40e65f9-c202-408a-bc
33-84999d13a237'}"]
}
```

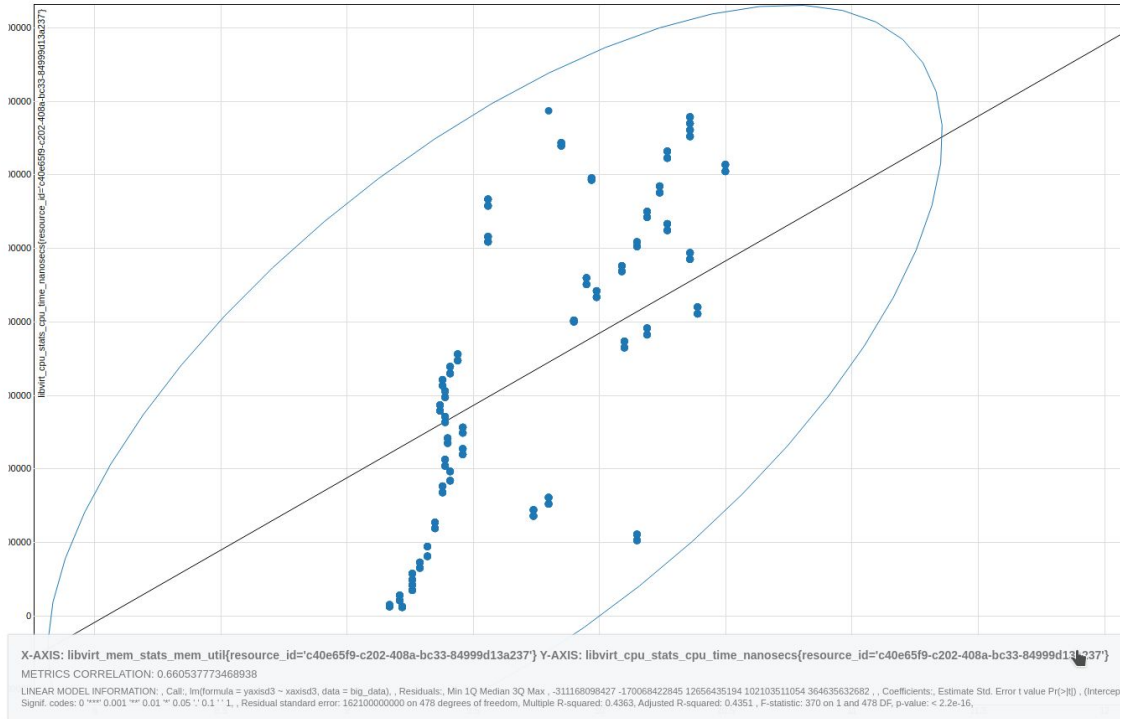


V&V - Focus on Analytics Engine

Fetch Linear Regression Analytic Result
http://int-vnv.5gtango.eu:8085/results/list


```
{
        "analyticServiceName": "linear_regression",
        "executionDate": "Wed Sep 11 07:05:59 UTC 2019",
        "executionMessage": "The analytic service has succesfully
completed.",
        "id": "5d789cd7a927cb000104c8ba",
        "results": [{
                "result":
"http://int-vnv.5gtango.eu:8083/ocpu/tmp/x063142329e5e6e/files/li
near_regression.html",
                "type": "html"
        }],
        "status": "SUCCESS"
}
```

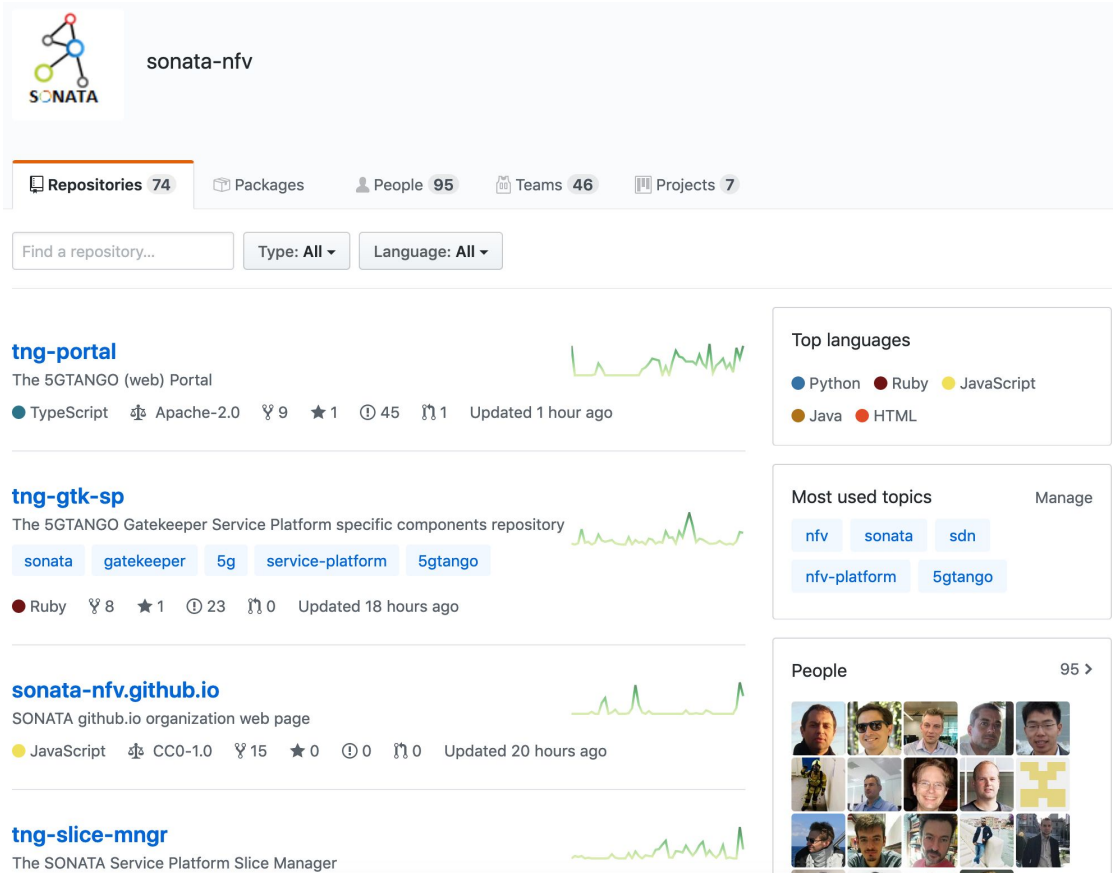
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#5 - The future (and a bit of present)

5GTANGO

SONATA release 5.0

- Release 5 has been published last week 👋
- Quick hands on guide : https://sonata-nfv.github.io/quickguide
- And the code on GH : https://github.com/sonata-nfv/



What’s next ?

- Main features are integrated with OSM
- The V&V Platform and the Analytics Engine support the realisation of tests and the analysis of test results with OSM
- EGM is willing to help and contribute
- Join the community ! 😎

5GTANGO on the web

www.5gtango.eu

@5Gtango