Common NFVI Telco Taskforce

Technical F2F Work Shop – January 13-16, 2020

RC Workstream: Key Updates

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Content & MVP Targets

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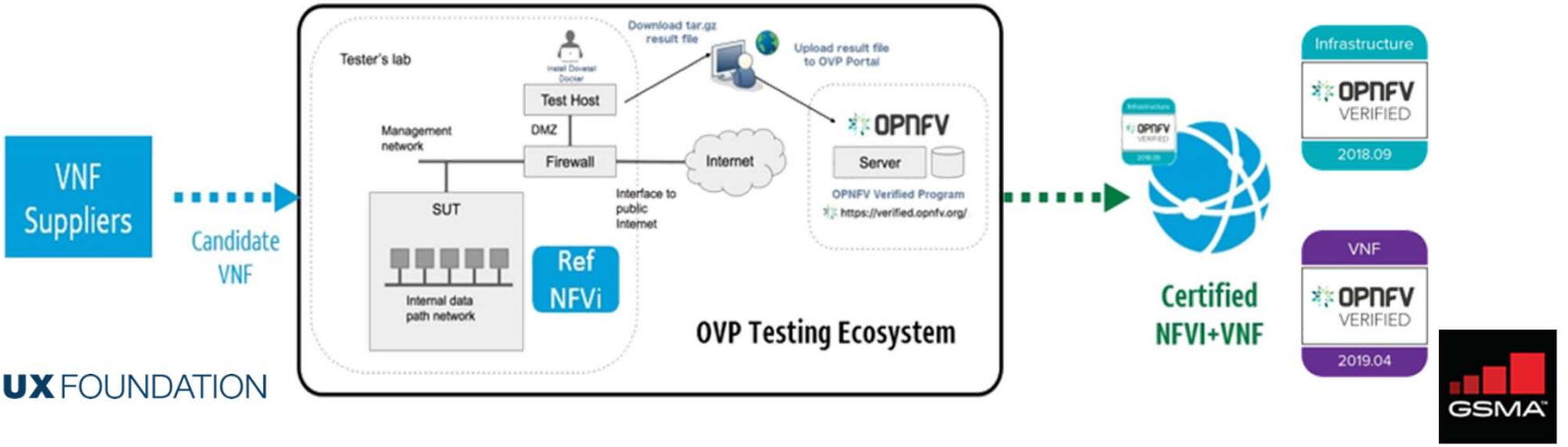
Progress to Date | Key Accomplishments

Objectives

- Re-write(WIP) for Certification Process/Frameworks/Badging
- Onboard Additional Team Support (Frameworks), Methodologies, Badging
- Stage Jenkins Hosts & Prep Health/Smoke Suites
- Perform initial compliance validations
- Identify Gaps in initial Alpha RI Release and expected compliance validations
- **Initial Badging Framework for NFVI | VNFs**
- **Certification Process Drafted**
- **Automation Tool Chain Framework**



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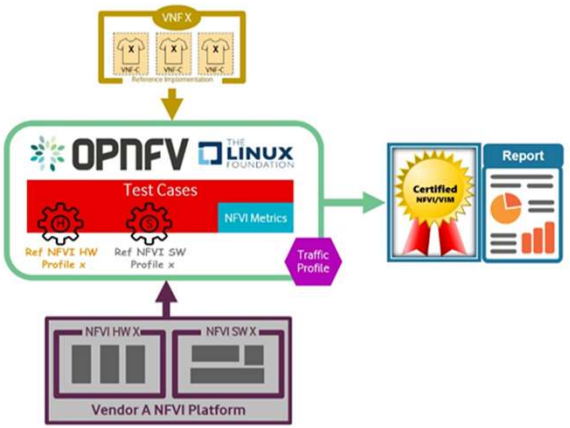
Level Set on MVPs

Initial Badging Framework for NFVI | VNFs

- ✓ **Lab** setup
- ✓ **Compliant** requirements
- ✓ **Execution** empirical, verification & validation
- ✓ **Evidence** meeting qualifications
- ✓ **Governance (Badging) reviews** & badging

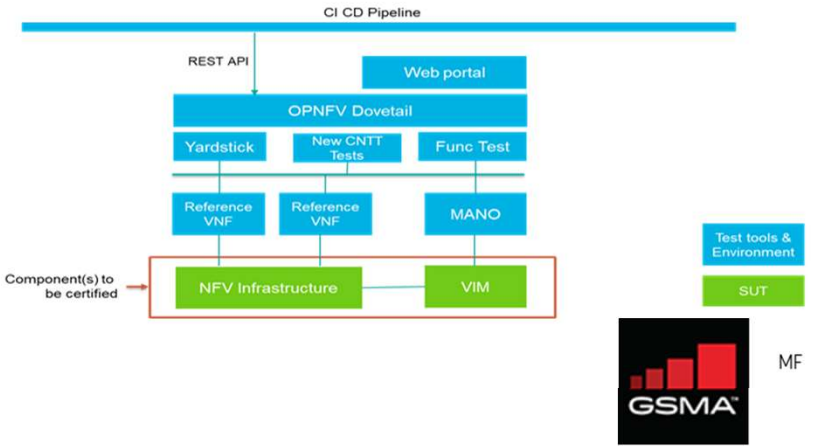
Certification Process Drafted

- ✓ **Certified Lab** utilized
- ✓ **Test Case Traceability** to req's
- ✓ **Execution** complete & passing
- ✓ **Results Collation** normalized & centralized
- ✓ **Evidence** meeting qualifications
- ✓ **Governance** reviews of Entry/Exit criteria and certification



Automation Tool Chain Framework

- ✓ **Refactor** existing OVP toolchain
- ✓ **Versatile** test harnesses using standard interfaces & services
- ✓ **Supplier Integration enabling** VNF testing using Supplier Apparatus
- ✓ **Adaptable** & Portable Tool Chaining across releases



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Progress: Initial Content Creation

Initial Content

NFVI

- Ch01: Introduction
- Ch02: NFVI E2E C&V Framework Requirements
- alpha Ch03: NFVI Test Case Requirements
- alpha Ch04: NFVI TC Traceability to RA Requirements.

VFN

- Ch05: VNF E2E C&V Framework Requirements
- alpha Ch06: VNF Test Case Requirements
- alpha Ch07: VNF TC Traceability to RM Requirements.

DEV

- alpha Ch08: E2E Framework Integration.
- alpha Ch09: NFVI Tests Traceability to TC Requirements.
- alpha Ch10: VNF Tests Traceability to TC Requirements.
- alpha Ch11: Gap analysis & Development

"RI-Alpha & RC-Pre Alpha Phase"

Delivered - Snezka MVP

- Defined Certification
- Provide NFVI and VNF Certification Methodology
- Outline E2E Frameworks for Tools, Badges, and Process
- Included Gaps Identified During Installation

Next Release

- Include Normalized Results Template & Repo
- Finalize TC Requirements and Traceability
- Reach consensus on Entry & Exit Criteria

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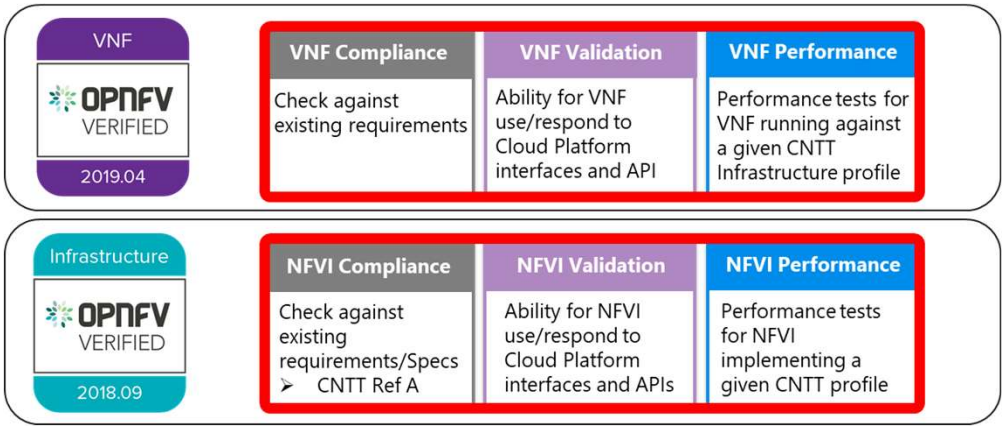
Progress: Badging Requirements

Badging Requirements



Badging Defined

*G*ranting of certification by the OVP to Suppliers of NFVI+VNF upon demonstrating testing confirms:

- NFVI adheres to CNTT RA/RM requirements.
- VNFs pass interoperability tests on target NFVI with acceptable levels of stability and performance.

Suppliers seeking NFVI & VNF certification will furnish the following:

Category	OVP/CVC Expectation	Supporting Artifact(s)
Lab	Delivered test lab conforms to RI-x lab requirements for SUT	Bare-metal H/W Validations
Compliance	Installed software conforms to RM/RA requirements for components & options	Manifest S/W Validations
Validation	FR Validation of Component and API functional behavior meets requirements	API & Platform Test Results
Performance	NFR Validation of Component, Interface, and API, results are within baseline tolerance	Performance Test Results
Results Reporting	Test Results published into centralized and common repository & portal	Normalized Results per Standards
Release Notes	Supplier provides concluding remarks, links to artifacts, having met exit criteria for testing	Release Notes

Progress: Badging Requirements.. Test Results

Categorization

Test suites – Functional/Platform or Performance based

Results

Test results communicated as boolean (pass/fail), or Measurements Only

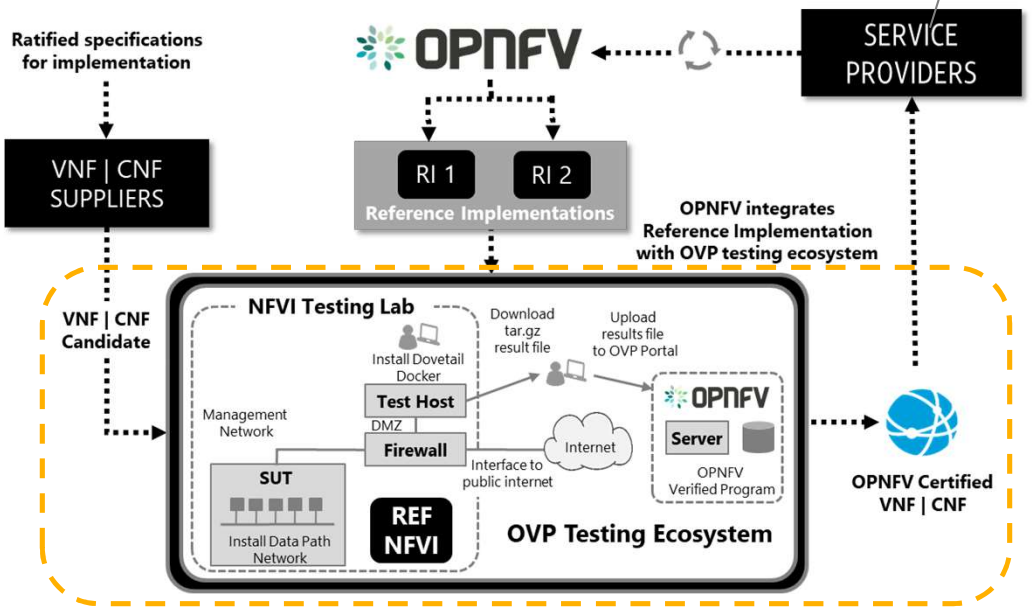
- **Functional Pass/Fail** - assertions in a test script verify the FR met its stated objective delivered by the developer
- **Performance-based Pass/Fail** - compares measured results with NFR KPIs &/or Reference VNF KPIs
- **Measurement Results -** baseline measurements when no benchmarks available to compare

Collation | Portal

Criteria applied to collation and presentation of test-result data:

- RA number and name (e.g. RA-1 OpenStack)
- Version of software tested (e.g. OpenStack Ocata)
- Normalized results will be collated across all test runs (i.e. centralized database)
- Clear time stamps of test runs will be provided.
- Identification of test engineer / executor.
- Traceability to requirements.
- Summarized conclusion if conditions warrant test certification (see Badging Section).
- Portal contains links to certification badge(s) received.

Reference Certification



Objective

Deliver community certified NFVI | VNFs | CNFs to the Service Provider Marketplace

Goals

- Provide uniform approach for NFVI | VNF | CNF certification process, lifecycle, & badging
- Certify NFV | VNF | CNF on infrastructure, instantiation, tear-down, performance, & resiliency
- Provide VNFs | CNFs with effective & efficient intake & onboarding for Lab Management
- Ensure test framework can be reused for Manifest, Empirical, and Interoperability validations for new distributions

Target Delivery

March | April 2020 (v 1.0 - Alpha)
Aligns with Reference Architecture # 1 (OpenStack)

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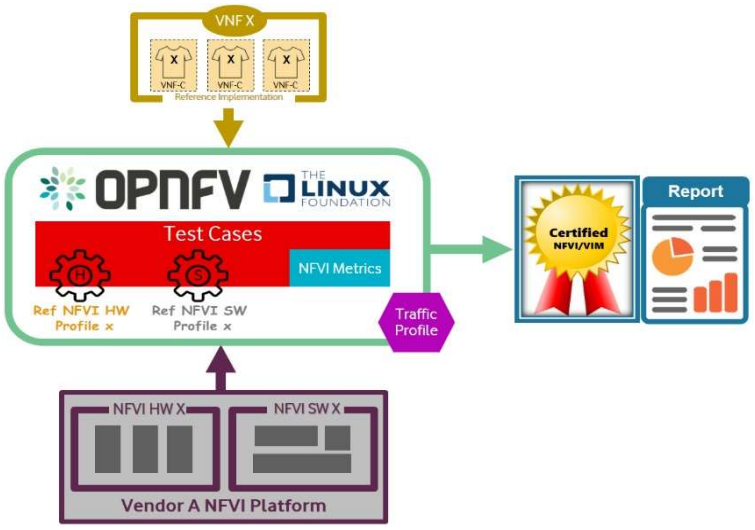
Progress: Certification Process Framework

Certification Process Framework

Core Principles

- **Certification fulfilled** by the OPNFV Verified Program (**OVP**), under the Linux Foundation Networking (LFN) umbrella
- Program **overseen** by the Compliance Verification Committee (**CVC**) providing tracking and governance
- **NFVI and VNFs supplied** by vendors **must adhere** to Reference Model (RM) and Reference Architecture (RA)



By Definition

- **Verification** conformance that NFVI is delivered per implementation specifications
- **Validation** testing performed confirms the actual output of a product meets the expected or desired outcome, or behavior
- **Certification** issuance of NFVI/VNF badges in recognition of the successful completion of verification and validation testing

Certification and Issuance of NFVI+VNF Badges

Infrastructure
OPNFV VERIFIED
2018.09

- ✓ Utilization of target RM/RA-x certified RI lab
- ✓ Traceable test cases to requirements
- ✓ Adoption & Execution of XTesting for RC pre-alpha validations
- ✓ Collation of Normalized Results in Centralized Repository
- ✓ Entry and exit criteria satisfied
- ✓ Required artifacts supplied to the OVP

VNF
OPNFV VERIFIED
2019.04

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Reference Certification Achievements | Targets for Alpha

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NFVI Compliance

Scope & Test Strategy

- **Manifest Verifications** verify NFVI matches hardware and software profile specifications for RM/RA
- **Empirical Validations** baseline NFVI and Ref/Golden VNFs behaviors for future comparison
- **Interoperability Validation** performed leveraging VVP/CVC test suites to ensure VNF can be spun up, modified, or removed, on the target NFVI

Not In Scope

- VNF functional testing
- ONAP as a MANO for VNFs
- Validating VNF's ability to be upgraded
- Georedundant and Load Testing

RI-Alpha & RC-Pre Alpha Release

Xtesting and Xtesting CI meet Requirements for verification, compliance and certification:

- Assembly of multiple heterogeneous test cases
- OPNFV Release Engineering Jenkins jobs to verify RI
- Test case results & logs for third-party certification review
- Deploy local CI/CD toolchains to verify RI compliance

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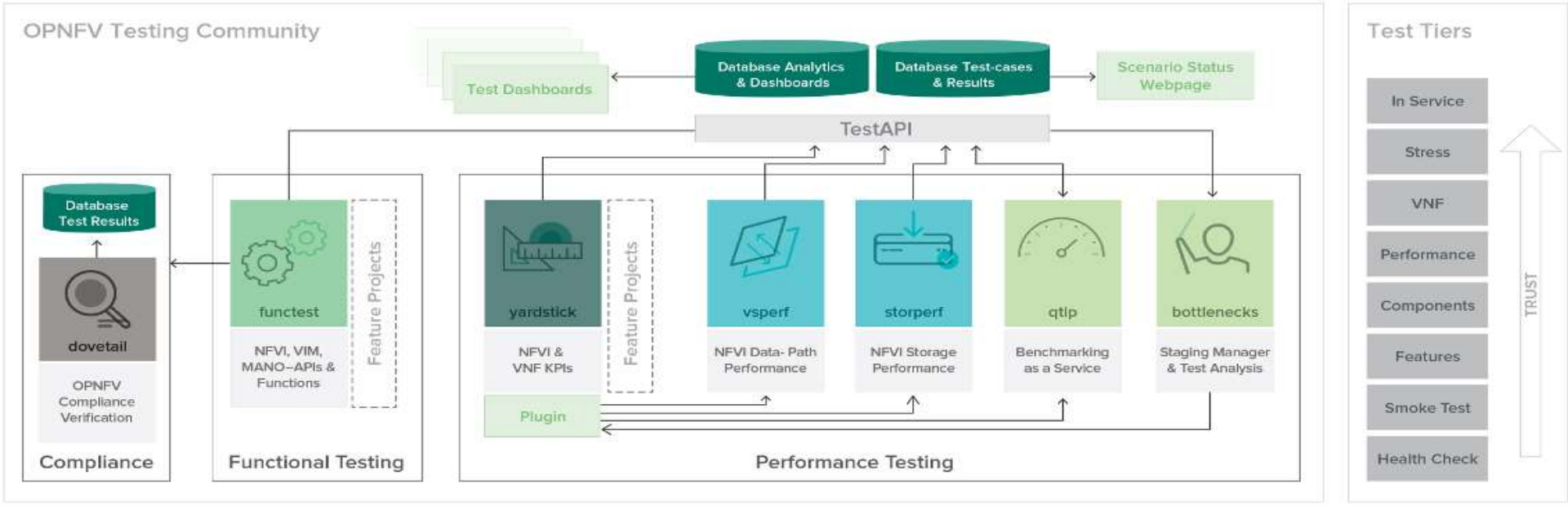
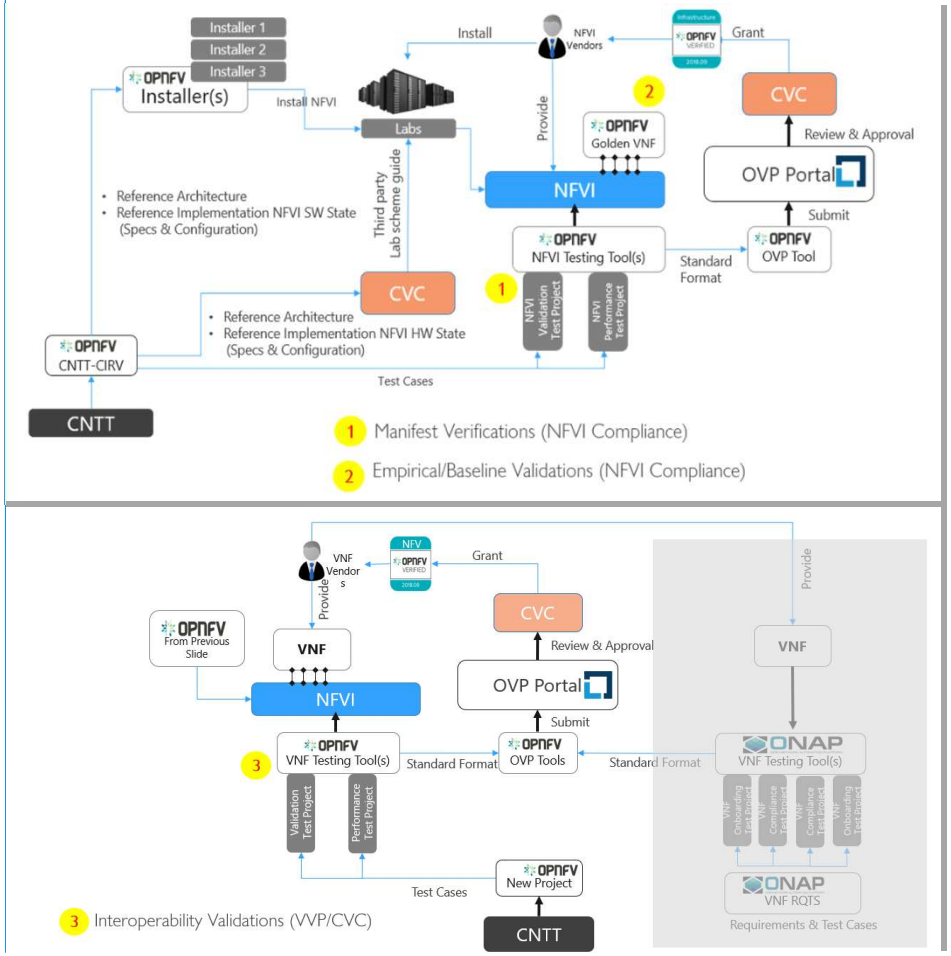
Framework

- ✓ NFVI+VNF verifications performed against well defined profiles
- ✓ Utilizing common CICD frameworks across RI and RC via CIRV project:
  - ✓ RI verification (jjb in releng)
  - ✓ RC compliance and certification (local CI toolchains)
- ✓ Test cases delivered as **Docker containers**
- ✓ Automated CIRV deployments: **PMO**: local component deployment, **FMO**: Jenkins triggered deployments
- ✓ OPNFV test cases launched automatically for NFVI verification
- ✓ Test results stored in a **centralized test database** along with all artifacts (reports, logs, etc.) to **an S3 storage service**



Certification Process | Gap Analysis



Process

➢ **Certification based on successful delivery of:**

1) **Manifest Verifications** – confirming NFVI delivered per RI-x requirements.
2) **Baseline Validations** – measuring FR/NFR behaviors using reference VNFs
3) **Interoperability Validations** – confirming capabilities, stability and perf

➢ **For NFVI Certification:**

- Vendor NFVI/VIM images under Test will be installed and configured
- For Phase 1, OPNFV **FuncTest** tests used for Compliance and Validation

➢ **For VNF Certification.:**

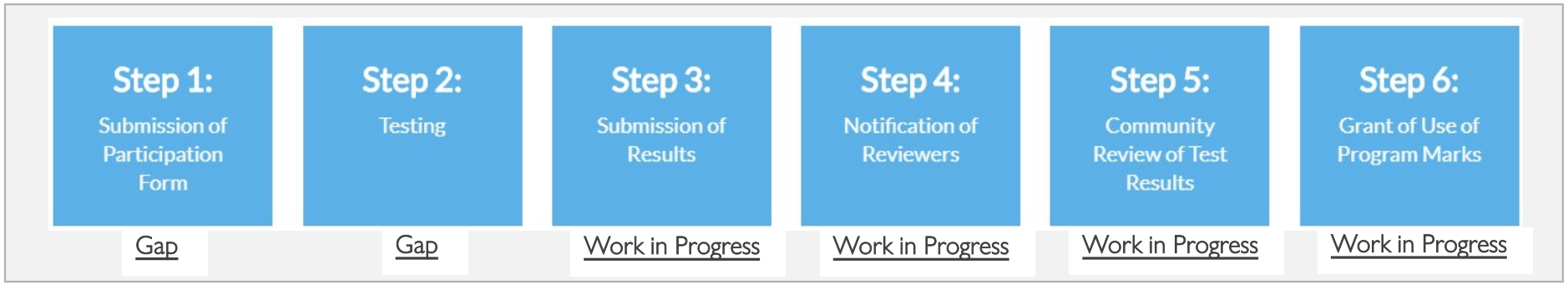
- Vendor VNF images are ingested by the CICD pipeline, implemented in lab
- VNF on-boarding and lifecycle operations validation is performed using upstream projects such as VNFSDK and VPP

➢ Test results submitted to OVP for review by committee. If results are validated, the vendor's application for certification is approved and the badge(s) awarded.

Gaps

➢ No automated means for Manifest (s/w) or Lab (h/w) Validations
➢ Need support vehicle for Installer changes (to meet RI-x specs)
➢ Normalization and Centralization of Results Alignment needed
➢ Storage and Performance scenarios (or tools) missing
➢ Need Installers which are OpenStack release agnostic
➢ Need priority on lab support with proactive monitoring

Exceptions: Certifications From the OVP Process



OPNFV Verification Program (OVP) is a five step process resulting in the issuance of three badges: NFVI, VNF, and Lab

CNTT seeks to align with the OVP process, noting two Gaps above in process:

- **Step 1** for client (NFVI/VNF) participation in badging and certification
- **Step 2** for Test(ing) & tools utilized for testing.

Mitigating Process Gaps:

- **Step 1:** Friendly and Controlled Introductions in 2020, using key learnings to create formal participation mechanism
- **Step 2:** Use results from RI-alpha compliance validations with FuncTest and XTesting/XTestingCI and assess feasibility as a platform to be Dovetail compliant

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Results: Compliance

With RI-Alpha

- Released first CNTT API compliance containers from OPNFV FuncTest
- Compliance containers forbid skipping tests for mandatory services/capabilities
- Commands deploy the full CI/CD toolchain within minutes
- Tests run for Compliance Verification include:
  - Benchmarking
  - Healthcheck
  - VNF (tests mainline API interoperability.

Conclusion: Functest confirmed the RI System Under Tests (SUT) is compliant (aka Pass) per RA1 Chapter 5 (API) feature capability and exposure, with the caveat using Ocata vs. Pike.

Observations

- OpenStack Helm (OSH) doesn't support live migration and resize server for Ocata
- Compliance checks for Live Migration and Resize Servers blacklisted
- Metrics needed for API / data-plane benchmarking

Recommendations (for RC-Alpha)

- Implement Stein, OSH supported
- Update RM/RA-1 OpenStack documentation for Stein
- Leverage XTesting to wrap the RI deployment calls, simplifying the RI “cookbook”

Next Steps

Current Status

Completed:

- RM | RA | RI Requirements
- Lab Requirements
- Initial Lab Secured
- S/W Deployed | Config
- Smoke Test | Sanity
- Continuous Deployment (with errors)

In-Progress

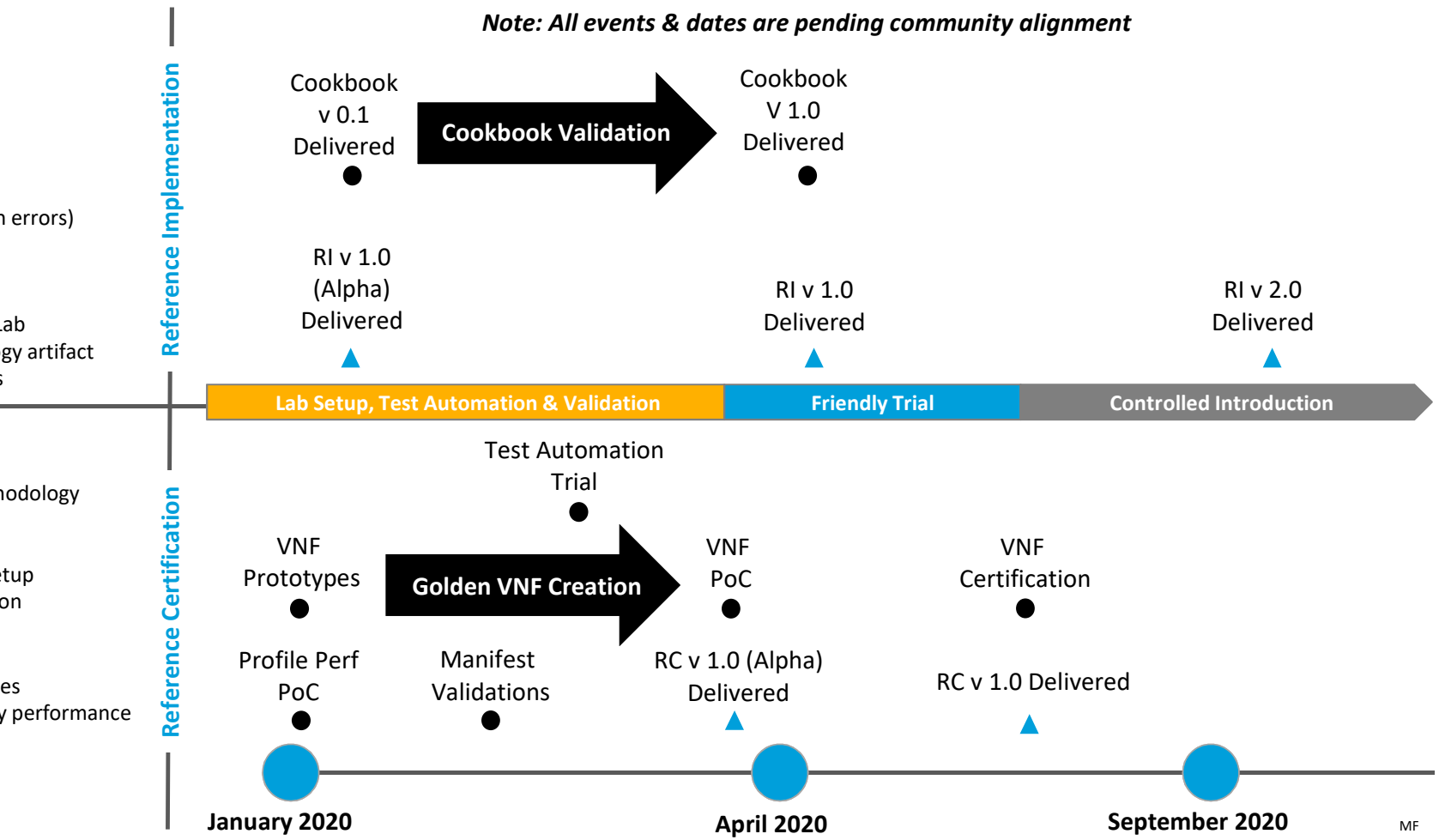
- Manifest > PDF & IDF
- Complete Lab PoC & Deliver Lab
- Create Cookbook & RI Topology artifact
- Implement PoC Key Learnings

Completed:

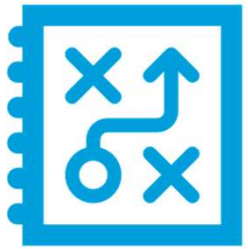
- Define & Vet Verification Methodology
- Stage Jenkins Hosts
- Prep Health/Smoke Suites
- Completed API test harness setup
- Initial API Compliance Validation

In-Progress

- Design & deliver VNF Prototypes
- Integrate upstream community performance & storage test cases



Reference Certification Challenges



- Availability of OVP | CNTT resources & active engagement
- **OVP's ability to scale to demand, & alignment with CNTT objectives, including:**
  - Fully automated ecosystem & badging process
  - Intuitive and efficient VNF on-boarding processes
  - Lab optimization & rationalization
  - Lab-use management & control strategy
    - Augmentation of OVP processes to include third party certification platforms & process
    - Clear and efficient third party certification requirements
  - Audits of lab certifications confirming availability, state (current), & accessibility
- Normalized test results with a centralized repository
- Manifest validations require an automated check of requirements

CNTT will maintain ownership of the Reference Certification until a satisfactory level of support, stability, & maturity is attained

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Reference Certification Approach | Outcomes

Actions Underway	Outcomes
Define requirements & criteria for profile based implementations & certifications	Clearly defined requirements to assess vendor software, hardware, and VNF solutions
Define badging requirements to achieve certification	Deliver compliant & stable VNFs | CNFs to CSPs
Define, align, and select NFVI | VNF | CNF test case requirements, covering: • Infrastructure • Tear-Down • Resiliency • Instantiation • Performance • Security	Ensure certification criteria and badging requirements are met through an robust & optimized test suite
Establish guidelines and/or processes for: • Entry | Exit Criteria • Quality Assurance • Test Categories • Test Case In-Take	Ensure proper level of structure & discipline exists within test ecosystem to effectively manage & scale to demand
Define & align across communities on the test framework & tooling	Optimized test ecosystem, designed to scale, manage, & perform VNF | CNF certifications

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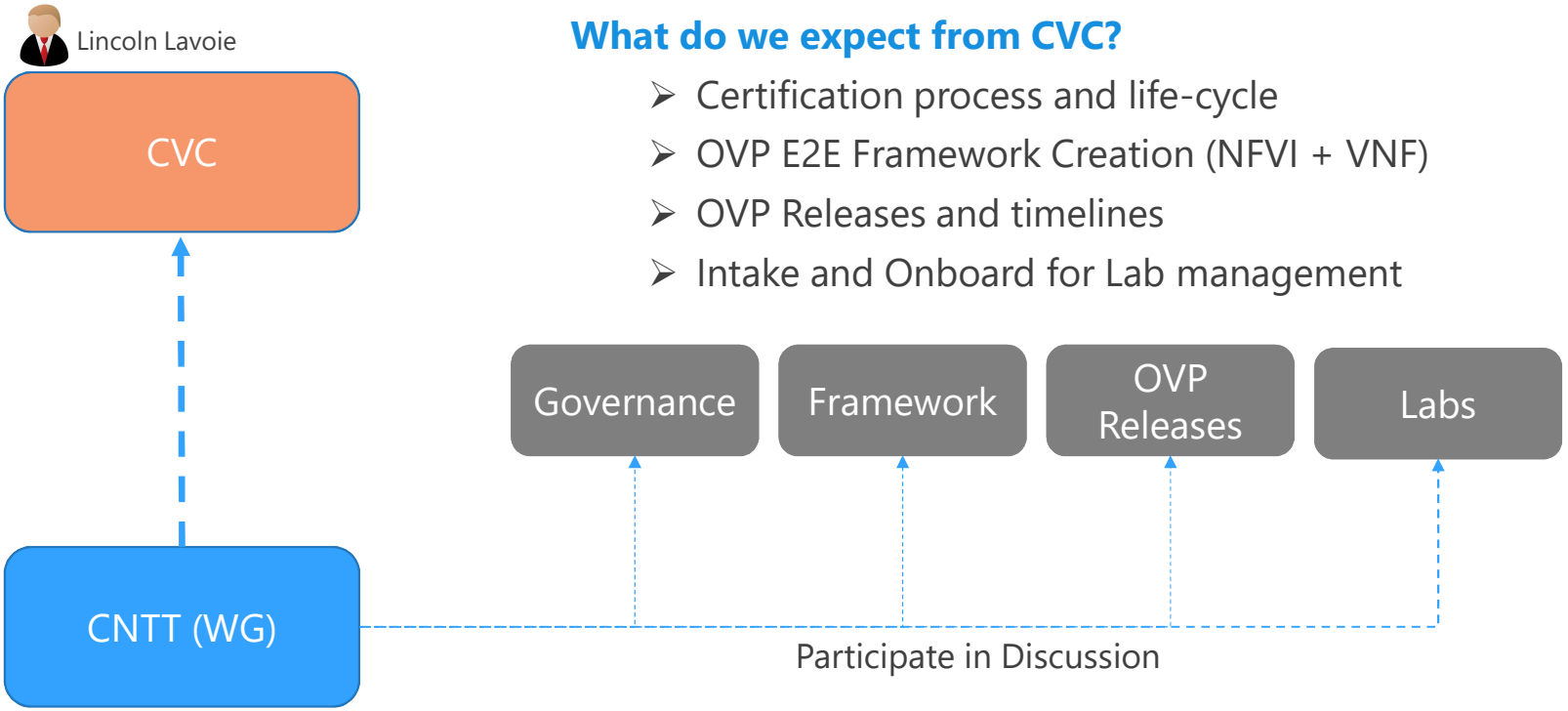
Relationship with CVC



What do we expect from CVC?

- Certification process and life-cycle
- OVP E2E Framework Creation (NFVI + VNF)
- OVP Releases and timelines
- Intake and Onboard for Lab management

- CNTT will work directly with CVC to align with governance
- Output of CNTT will be input to release scope, labs needs, and augment governance where needed

Relationship with OPNFV and OVP

Bin Hu

OPNFV

CNTT (WG)

OPNFV CNTT-RI

What do we expect from OPNFV?

- Installers to install NFVI with a state aligned with CNTT RM, RA.
- Test tools to test NFVI (against a given state) and VNFs.
- Provide test scripts to cover tests cases of CNTT interest.
- Leverage OVP Ecosystem for labs and certification.

Installer(s) | Tool(s) | Tests | OVP Ecosystem

Engineering Resources to accelerate development

- CNTT will work directly with OPNFV via the RI Project
- Output of CNTT-RI will be RI requirements and test cases

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Chapter 8 Team: North Star

Mission

Ensure Implementation of CNTT Reference Model and Reference Architecture meets industry driven quality assurance standards for compliance, verification and validation.

Objectives

- **Data Driven** RA Verification and Validations
- **OPNFV, CVC, and OVP Processes used** to onboard and check for NFVI compliance
- **Entry** and **Exit** Quality **Standards** are satisfied
- Ensure **test harnesses** can be **ported** and utilized **across multiple distributions**

Guiding Tenets

- **Verification** and **Validations** determine NFVI+VNF compliance
- **Verification** signals conformance to design requirement specifications
- **Validations** signals compliance that output of a product meets the expected, or desired outcome
- **Certifications**, are out of scope as this measures adherence to development, however, no code is being delivered by testing
- OVP and CVC track and govern RM/RA verification

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Test Category / Case Gap Summary

Projects Identified

* Airship Installer
Barometer
Bottlenecks
Doctor
* Dovetail
* Fuel
FuncTest
* High Availability
NFVBench
* Pharos
SampleVNF
VSPerf
Yardstick

- **# Total OPNFV Projects = 31**
- # CNTT-NFVI = 13 (potential value)
- # 5/13 NA for Review – *Already Covered by Yardstick and Functest

Results

- # 6 Projects can be adopted (as is)
- # 4 We can add/augment TCs for gaps
- # 3 Create projects for new testing

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Assessment Strategy

- Select Project by activity, use, and maturity state
- Compare Against Test Categories
- Identify Gaps
- Form Professional Opinion – e.g. augment, adopt
- Solicit Strategic Partner Contributions

Test Categories

- **(Hardware Validations)** BareMetal – HW & O/S validations
- **(Component Validation and VNF Validation Config Only)** VNF Interoperability – validations
- **(Platform Stability)** Compute Component – validations
- **(Platform Resiliency)** Control Plane Component – validations

Next Steps

- **Review Projects** Identified during Antwerp not considered
- **Integrate TCs** from these projects into the delivery stream
- **Discuss augmenting existing test project**s, or create new
- **Onboard Spirent Test Case contributions** – **Where?**
- **Finalize** Test-/Use- Case Needs

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Test Category / Case Gap Summary.. Continued

Project	Purpose	Recommendation
FuncTest	▪ Functional interoperability validations	✓ **ADOPT,** as an RI suite. Covers 2k+ Openstack Interoperability Validations ✓ **Augment** to include Baremetal testing for Manifest Validations
Yardstick	▪ VNF/Payload performance validations	✓ **ADOPT,** 62 TCs, leverages Shaker and YAML for test-case development ✓ **Augment** to perform POD restarts and HA for Maria/Ceph restarts
VSPerf	▪ vSwitch perf testing	✓ **ADOPT,** for OVS-DPDK validations with 32 perf and functional TCs ✓ **Setup** external packet generator to avoid latency caused by the tool.
DoveTail	▪ Automation framework	✓ **ADOPT,** with large number of test cases for conformance evaluation
Barometer	▪ Platform availability and NW usage validations	✓ **ADOPT,** for use of NFVI+VNF validations capturing Telemetry data ✓ **Augment** to include device specific resiliency testing and monitoring.
"**NEW**"	▪ **Baremetal Validations**	✓ **CREATE New** Baremetal Validations to verify engineering packages
"**Augment**"	▪ **Spirent Validations**	✓ **Augment** projects with 240 TC adds for load, scaling, cloud migration.
"**NEW**"	▪ **Chaos Toolkit**	✓ **CREATE New**, project to test POD resiliency by injecting chaos (failover)
Bottlenecks	• Stress Testing	✗ **Not recommended** with limited test sets and results categorization
Doctor	• Computer NFVI Fault Mgmt validations	✗ **Not recommended** with limited/no coverage for SDN, KVM, or containers
XTesting	• CICD tool chaining in CNTT validations.	? **REQUIRES POC** if CNTT NFVI requires ADOPTION and USE of tool chaining. ? **There are no specific TCs**, as XTesting is for chaining together CICD test projects, and not for NFVI validation.
NFVBench	• NFVI Perf Measurements (at physical hardware/host level)	✓ **ADOPT,** as a complement to vsperf and yardstick ✓ **Augment** to expand SRIOV and/or OVS-DPDK test cases.

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