

Getting Telecommunications Workloads Ready for the Edge: CNF WG and Test Suite Introduction

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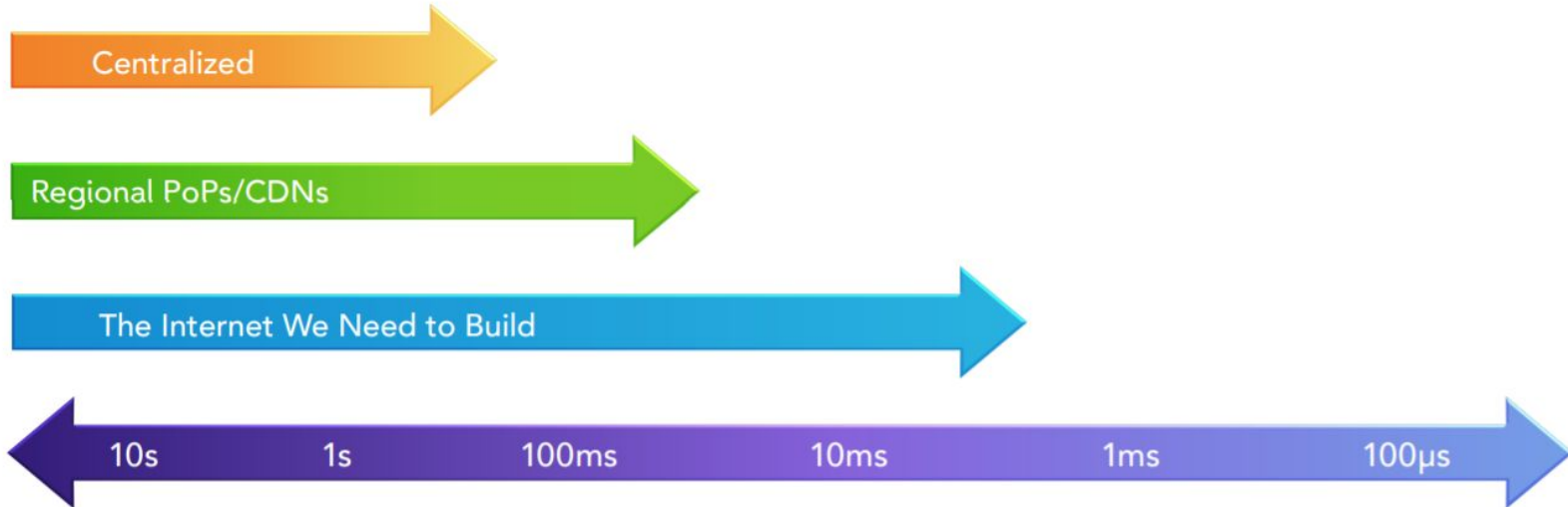
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Edge Computing is Creating a New Internet

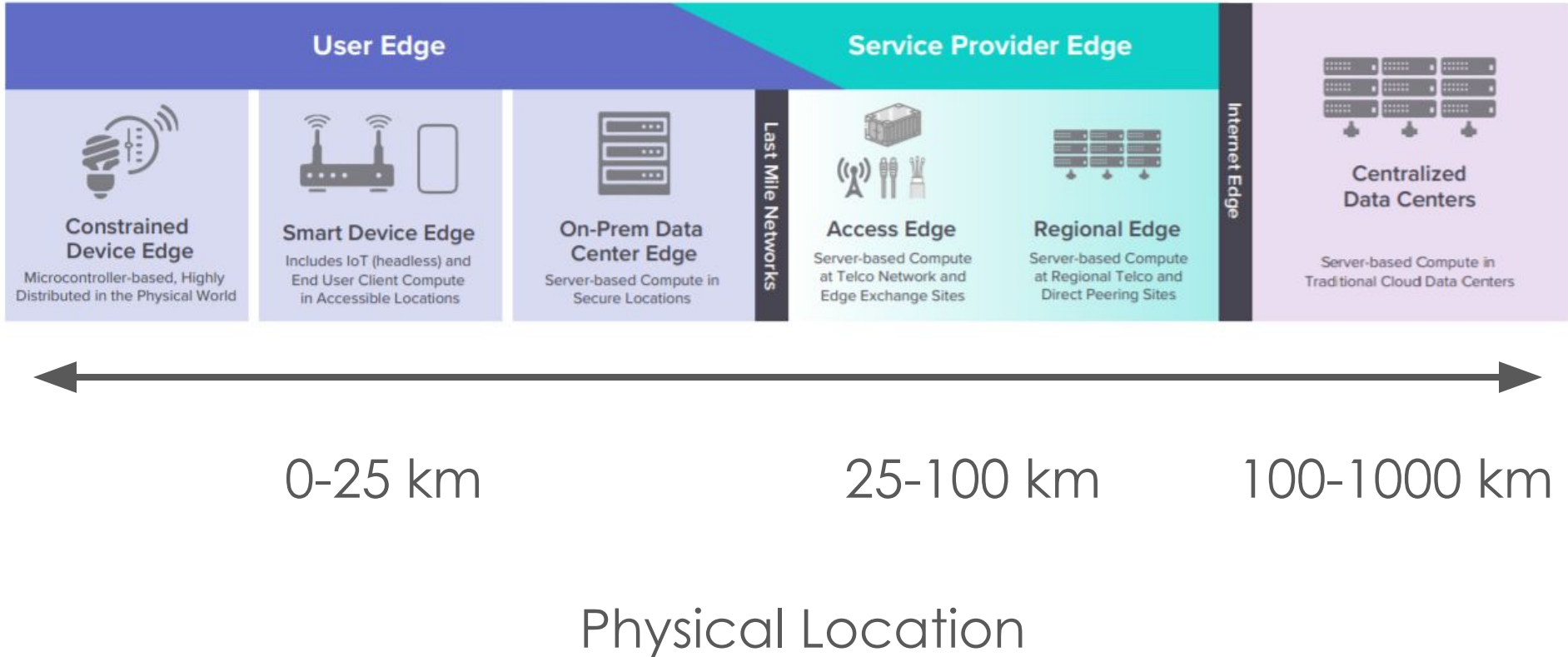
The Three Acts of the Internet



Credit: State of the Edge



Edge Computing is Creating a New Internet



Edge Computing is Creating a New Internet

	Cloud Computing	Edge Computing
Location	Centralized	Distributed
Control	Human	Machine
Capacity	Scalable	Constrained
Number	Hundreds	Billions



What are the challenges on the Edge?

Millions of locations, Billions of devices with small margins for error and profit



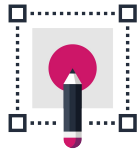
Automation
required



Constrained
Resources



Risky
Devices/
Locations



Limited
Connectivity



Delays/
Disconnections



Edge Computing in Telecommunications Requires Cloud Native Thinking

Cloud Native Definition v1.0

Cloud native technologies empower organizations to build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds. Containers, service meshes, microservices, immutable infrastructure, and declarative APIs exemplify this approach.

These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil.



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Cloud Native Benefits for Edge and Telcos

By adopting cloud native technologies, Telcos are ensuring:

- **Improved resiliency and availability** despite failures of individual CNFs, machines, or even data centers
- **Better resource efficiency** to run the same number of services on fewer servers
- **Higher development velocity** with reduced risk
- **Interoperability improvements** to help with disaggregation and multi-vendor compatibility



Why Cloud Native Best Practices for Telcos

Implementing and running applications in a cloud native manner will enable you to more fully benefit from the advantages of cloud native infrastructure.

- **Shared experience:** build upon the work of the community
- **Interoperability:** Standardization for communication between applications and the cloud platforms
- **Predictability:** Your application acts in a predictable manner when running on cloud native infrastructure like Kubernetes. Unexpected behavior should be rare because application specific issues are weeded out during the best practice testing.



Making CNFs Cloud Native and Edge Ready

CNCF Initiatives for Telecom

Cloud Native Principles and Best Practices



Cloud Native Network Function Definition

A cloud native network function (**CNF**) is an application that implements or facilitates network functionality in a cloud native way.

A cloud native network function consists of one or more microservices, and has been developed using [Cloud Native Principles](https://networking.cloud-native-principles.org/) including **immutable infrastructure**, **declarative APIs**, and a “**repeatable deployment process**.”

<https://networking.cloud-native-principles.org/>



Challenges

- CNFs are hard to develop and operate
 - ***We want to make this easier***
- There are good and bad ways to build CNFs
 - ***We want to help avoid pitfalls***
- There's no consistency in the lifecycle of CNFs
 - ***We want CNFs, and their environment, to follow recognisable patterns***



CNF WG Intro

CNF Working Group Intro

CNF WG kick-off meeting at KubeCon NA in November 2020

- a collaboration of Communication Service Providers, CNF Developers and the Cloud Native community

CNF WG Mission:

- to simplify the creation and consumption of CNFs by publicising best practices for their development and operation

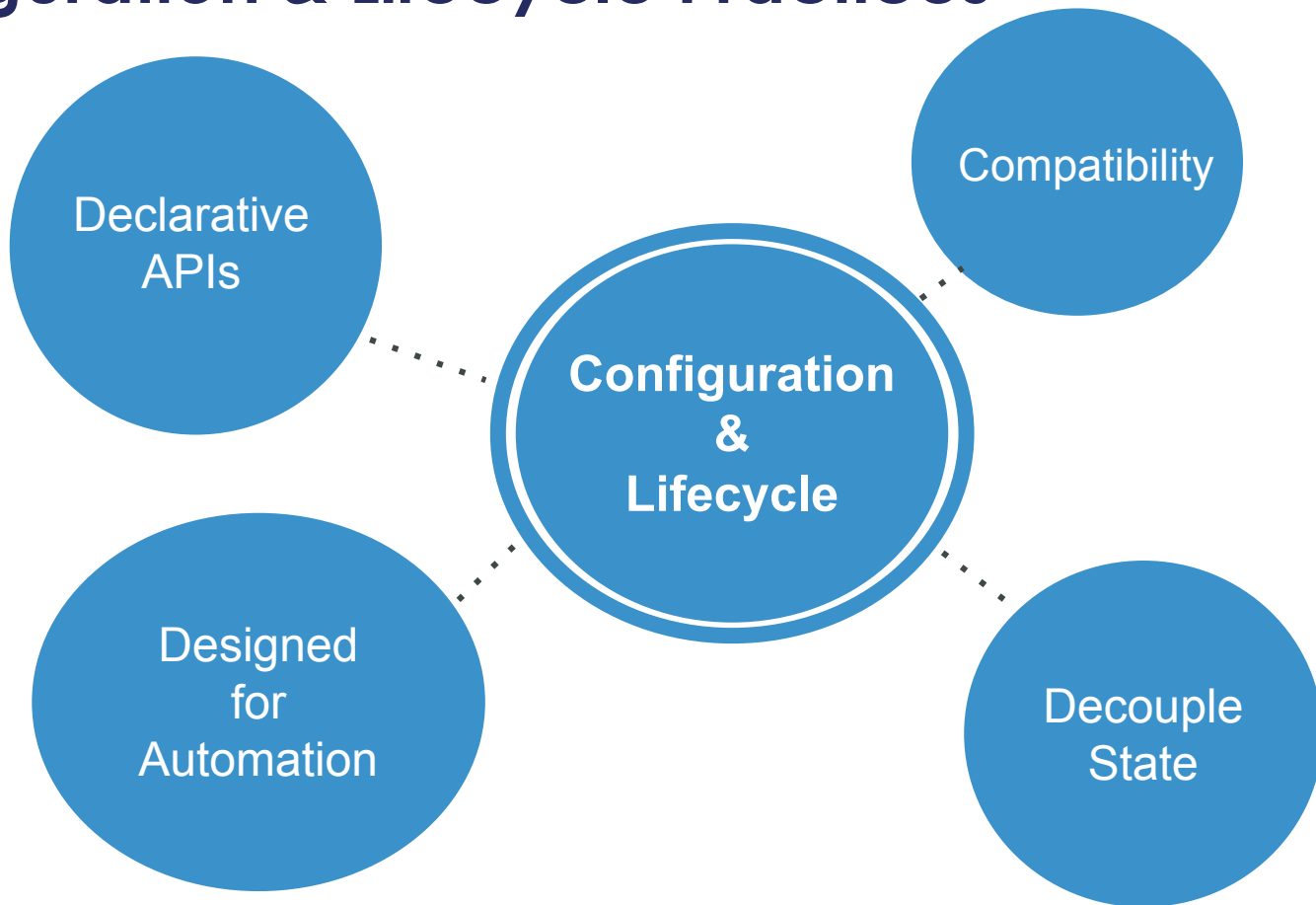


Best Practices

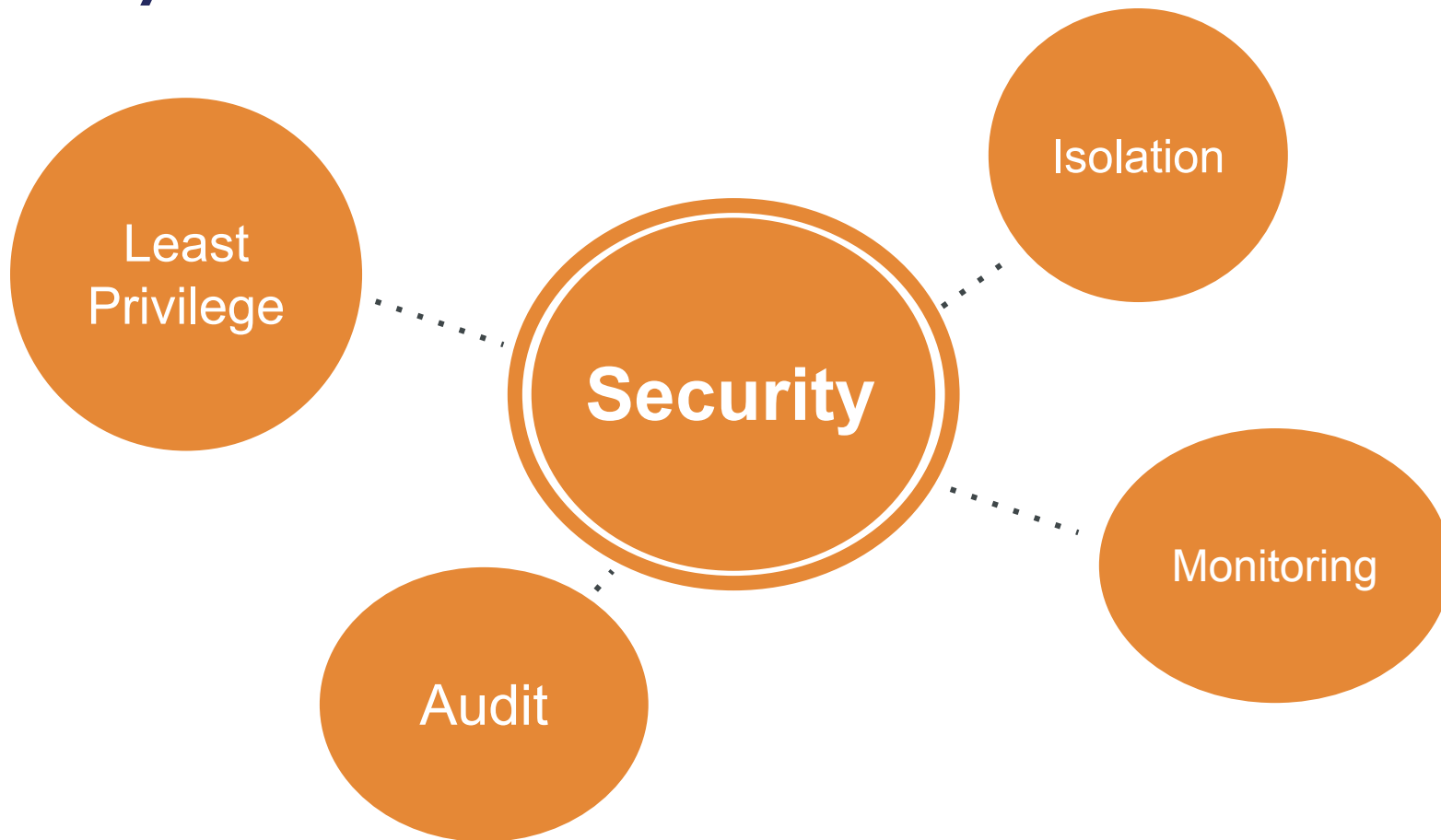
Best Practices



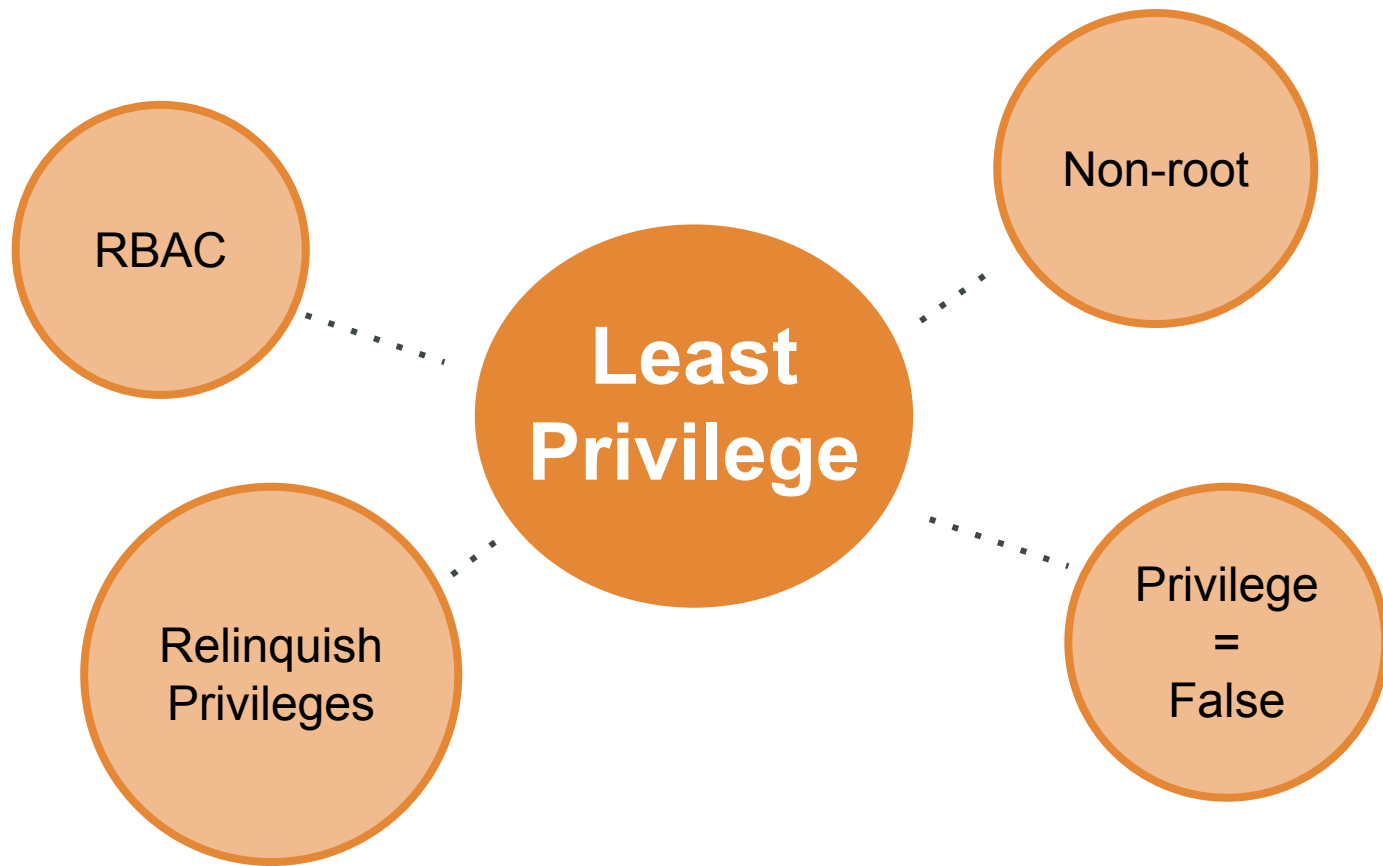
Configuration & Lifecycle Practices



Security Practices



Principle of Least Privilege



Areas to Explore

- Multiple network connections
- Node labels and performant hardware
- Packet performance
- Over optimization and tuning



Collaboration

CNF WG Interested Parties

arm



EQUINIX



Google Cloud



HUAWEI



INFRA CLOUD



NOKIA



PANTHEON
.tech



SAMSUNG



swisscom

vmware®



vodafone



VULK COOP



CNCF and K8s Groups



**CLOUD
NATIVE
SECURITY**



TAG
App Delivery



**Cloud Native
Glossary**



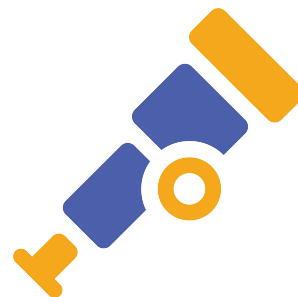
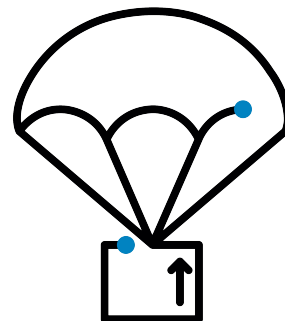
**CNCf TAG
Network**



**CNCf TAG
Observability**



CNCF Projects



Other Orgs and Projects



CNF Test Suite

What is the CNF Test Suite?

An open source **test suite** for CNF developers and network operators to evaluate how well a network application, aka **Cloud Native Network Function (CNF)**, follows [cloud native principles](#) and best practices.

This test suite initiative works closely with the [CNF Working Group](#) which identifies best practices.

<https://github.com/cncf/cnf-testsuite>



Development and Ops Tool

Designed to help developers and operation teams to adopt and improve cloud native practices

- **Faster feedback loop**
- Integrated with your existing **CI/CD pipelines**
- Aligned with upstream **CNCF ecosystem**



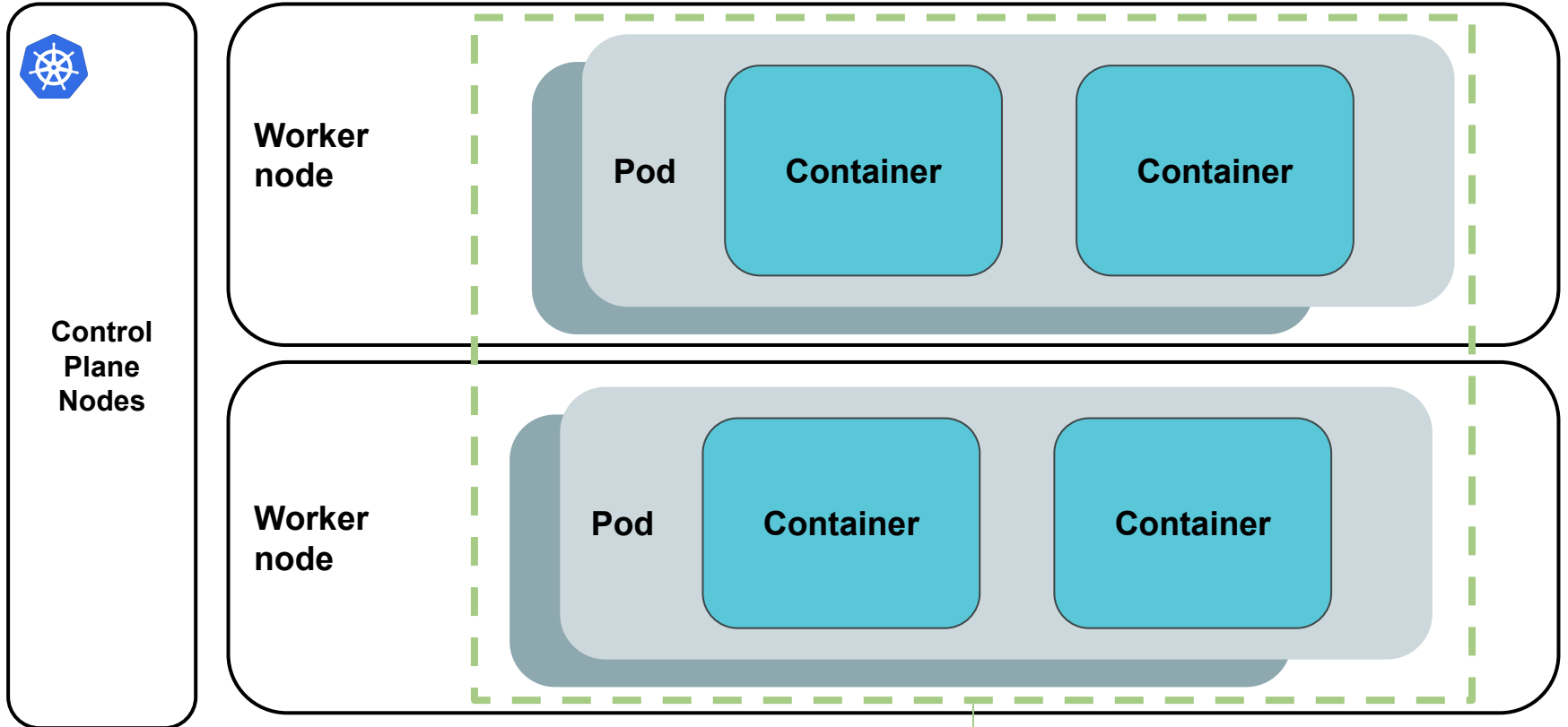
Features

- Is **self-contained** with minimal requirements and necessary configuration
- Runs in any certified Kubernetes environment
 - Supports **air-gapped environments**
 - Supports self-hosted and protected image repositories
- Gives fair assessment with a **flexible scoring system**
 - Remediation steps and suggestions
 - Tests fail gracefully
 - Tests are skipped when prerequisites are not met



CNF Test Suite Workload and Platform Tests

What is a Workload?



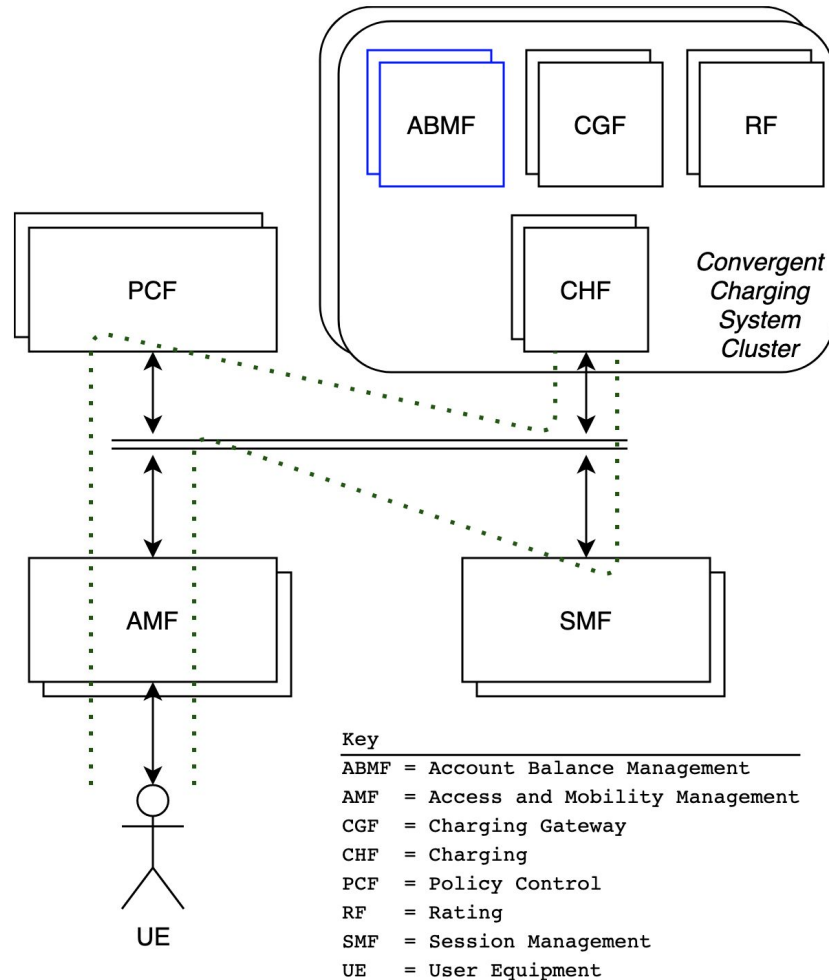
The workload



Simple to...



Complex



Platform Testing

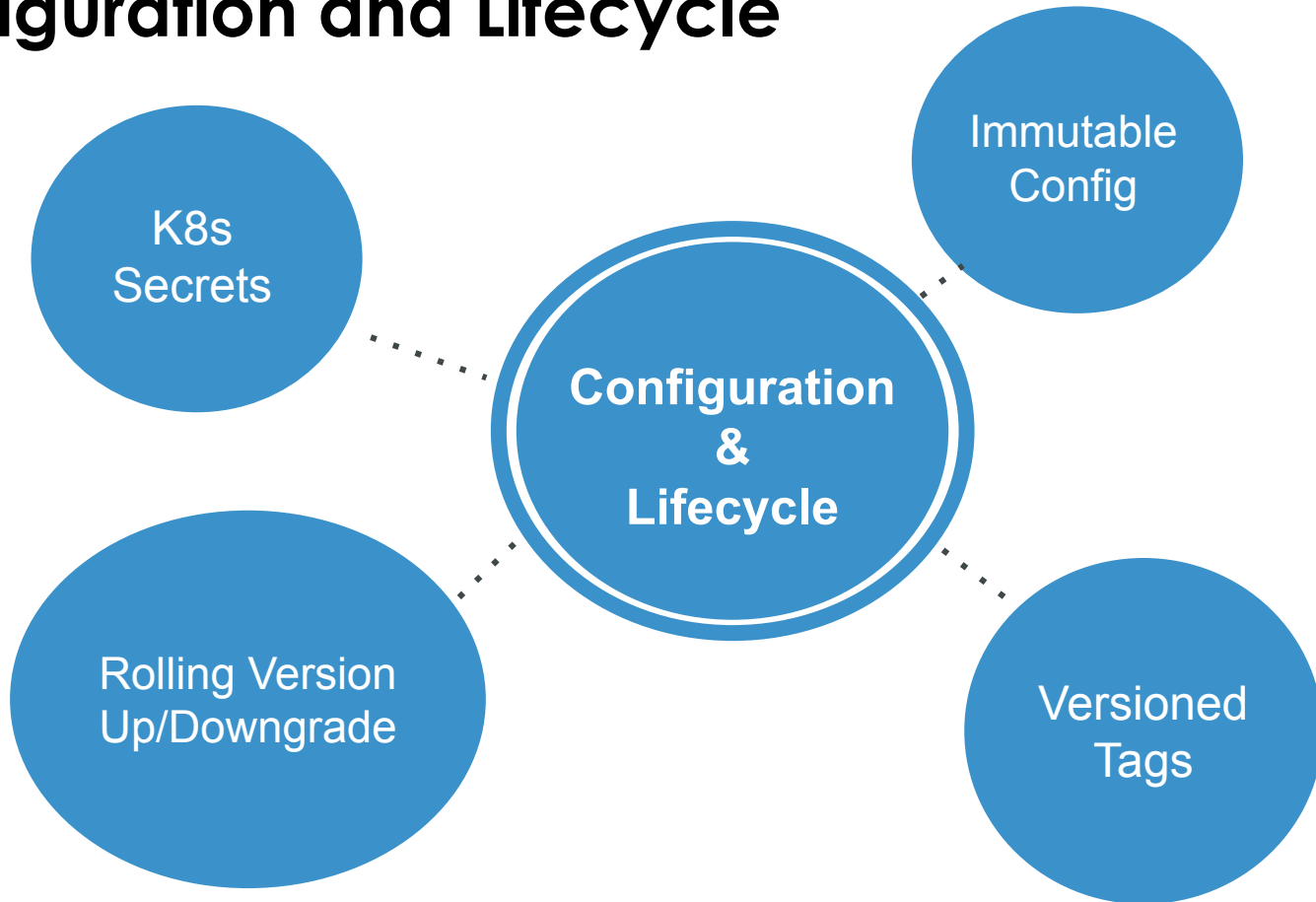
- **Kubernetes-based** platforms
- OCI Compliance
- Worker Node Failure (*destructive*)
- Observability



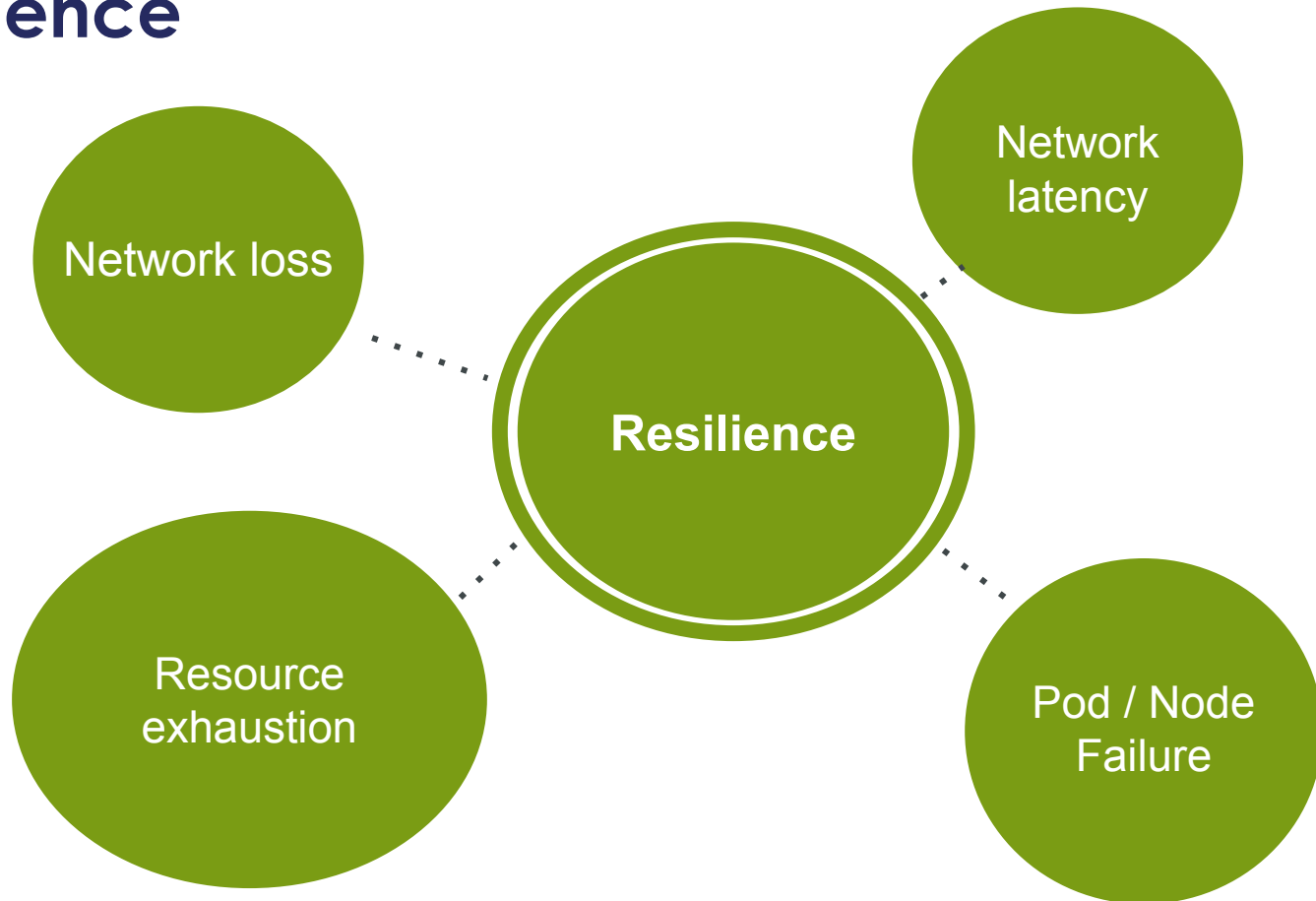
Test Categories



Configuration and Lifecycle



Resilience



Running the Test Suite

Installation, Setup, and Running Workload Tests

To get the CNF Test Suite up and running, see the Installation Guide.

To give it a try immediately, you can use these **quick install steps**

Prereqs: Kubernetes cluster, kubectl, curl, helm 3.1.1 or greater on your system already

1. Install the latest test suite binary: `source <(curl https://raw.githubusercontent.com/cncf/cnf-testsuite/main/curl_install.sh)`
2. Run `setup` to prepare the CNF Test Suite: `cnf-testsuite setup`
3. Download an example CNF configuration to try: `curl -o cnf-testsuite.yml https://raw.githubusercontent.com/cncf/cnf-testsuite/main/example-cnfs/coredns/cnf-testsuite.yml`
4. Initialize the test suite for using the CNF: `cnf-testsuite cnf_setup cnf-config=./cnf-testsuite.yml`
5. Run all of application/workload tests: `cnf-testsuite workload`

<https://github.com/cncf/cnf-testsuite/blob/main/README.md#installation-and-usage>



Testing Feedback

```
✗ FAILED: immutable configmaps are not enabled in this k8s cluster.
✗ FAILED: Found mutable configmap(s) ⚖️
✓ PASSED: CNF for Rolling Update Passed
✓ PASSED: CNF for Rolling Downgrade Passed
✓ PASSED: CNF for Rolling Version Change Passed
Configuration Lifecycle final score: 45 of 51

✓ PASSED (by default): No install script provided
Successfully created directories for cnf-testsuite
✓ PASSED: Helm Chart chart Lint Passed * ✍️ ✓
✗ FAILED: Published Helm Chart Not Found * 📦 🌐
SKIPPED: Helm Deploy
Installability final score: 9 of 20

✓ PASSED: Image size is good 🐜 ⚖️
Pod Ready Status: true
✓ PASSED: CNF had a reasonable startup time 🚀
✓ PASSED: Only one process type used 🐜 ⚖️
Microservice final score: 15 of 15

Final workload score: 98 of 161
CNFManager::Points::Results.have been saved to results/cnf-testsuite-results
```



Test Results

```
76 - name: pod_network_latency
77   status: passed
78   points: 5
79 - name: pod_network_corruption
80   status: passed
81   points: 5
82 - name: pod_network_duplication
83   status: passed
84   points: 5
85 - name: disk_fill
86   status: passed
87   points: 5
88 - name: pod_delete
89   status: passed
90   points: 5
91 - name: pod_memory_hog
92   status: passed
```



Running Platform Tests

Run all of platform tests: `cnf-testsuite platform`



What's Next?

What's Next?

- **Remediation** suggestions to failing tests
- More tests
 - **Security**
 - **Configuration and Lifecycle**
 - **Resilience**
 - **Observability**
 - **State**
- Validate best practices as defined by **CNF WG**



How to Contribute

Join the Conversation

CNF Working Group Meeting (Mondays at 16:00 UTC)

- [Meeting Details](#)
- **GitHub:** <https://github.com/cncf/cnf-wg>
- **Mailing List:** <https://lists.cncf.io/g/cnf-wg>

CNF Test Suite & Testbed Contributor Meeting (Thursdays at 14:15 UTC)

- [Meeting Details](#)
- **GitHub:** <https://github.com/cncf/cnf-testsuite>
- **Mailing List:** <https://lists.cncf.io/g/cnf-test-suite>

CNCF Slack Channels

- slack.cncf.io
 - [#cnf-wg](#)
 - [#cnf-testsuite-dev](#)
 - [#cnf-testbed-dev](#)



Upcoming Events

- **Oct 1-15: ETSI Plugtests (virtual)**
 - CNCF CNF Testing Track
- **Oct 12: Open Networking & Edge Summit + K8s on Edge Day (virtual)**
 - BoF: Cloud Native Best Practices for Networking Applications
- **Oct 15: KubeCon + CloudNative North America 2021 (virtual)**
 - [CNF WG Intro and Deep Dive](#)
- **Nov 16: Layer 123 World Congress 2021 (virtual)**
 - Panel discussion on the role of standards in containerized VNF management



Join Us



Meet users where they are

Learn from each other

Improve over time



Q/A

Feel free to reach us anytime!



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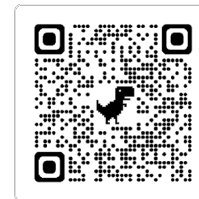
[Meet with Bill](#)



Taylor Carpenter, Vulk Coop

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[Schedule a test suite demo](#)



Thank You!