



SAMSUNG

Introducing Containers Platform

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4G to 5G: System Evolution and Deployment Options

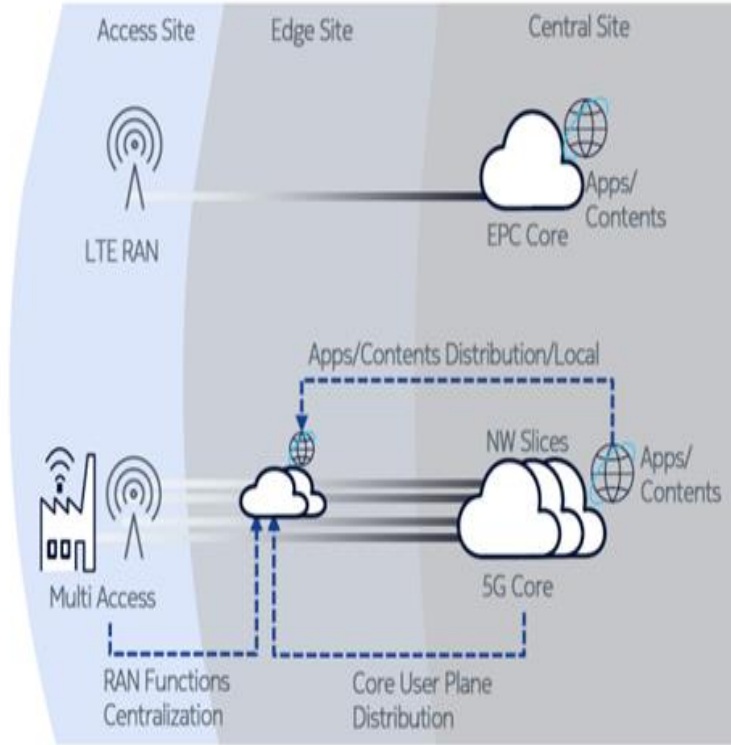
4G

- Centralized Architectures
- VNF orchestration w. SDN/MANO

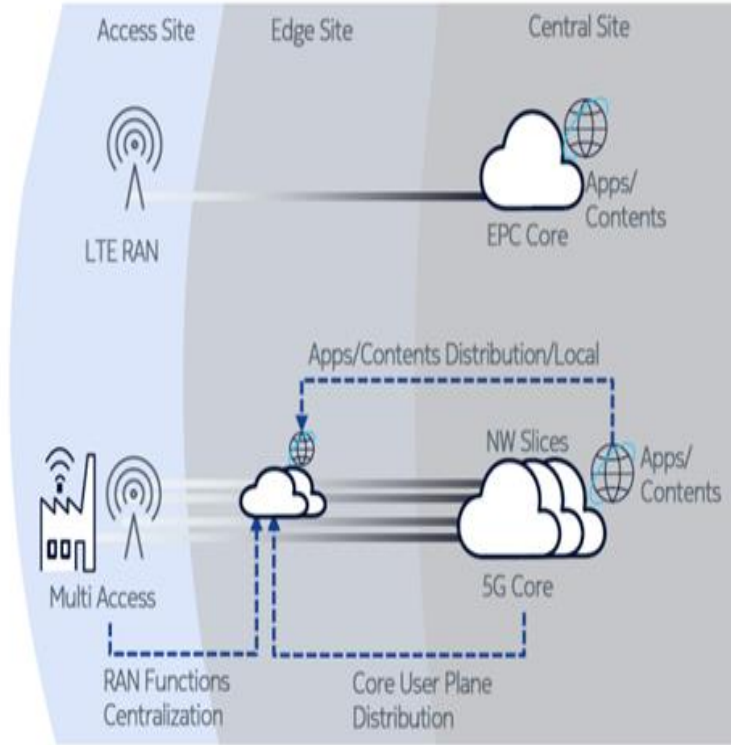
5G

- RAN/Core/Apps move to Edge
- Microservices foundation
- CNF E2E orchestration
- Multi Access

4G Networks

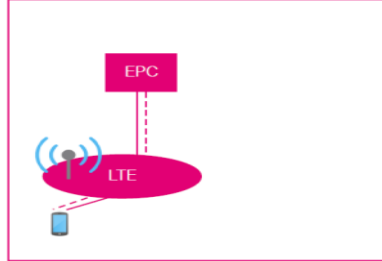


5G Networks

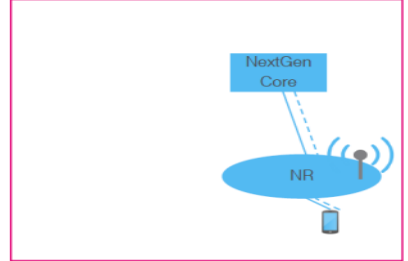


Deployment Options: SA & NSA

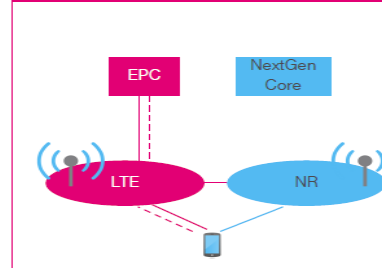
1) Standalone LTE, EPC connected - legacy



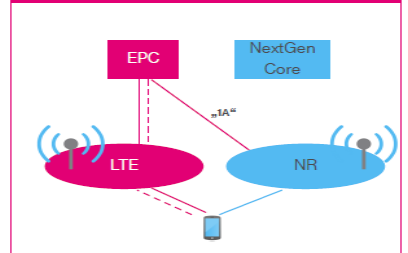
2) Standalone NR, NGCN connected



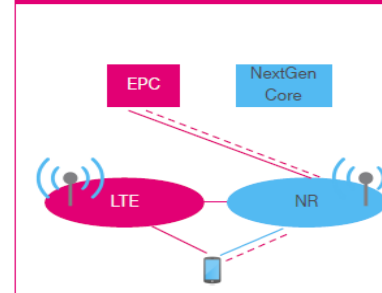
3) Non-Standalone/"LTE assisted", EPC connected



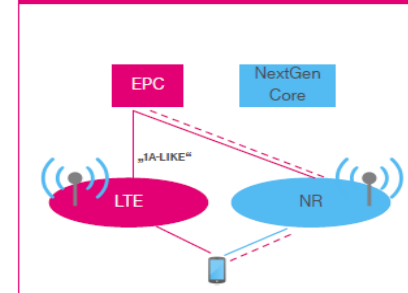
3a) Non-Standalone/"LTE assisted", EPC connected



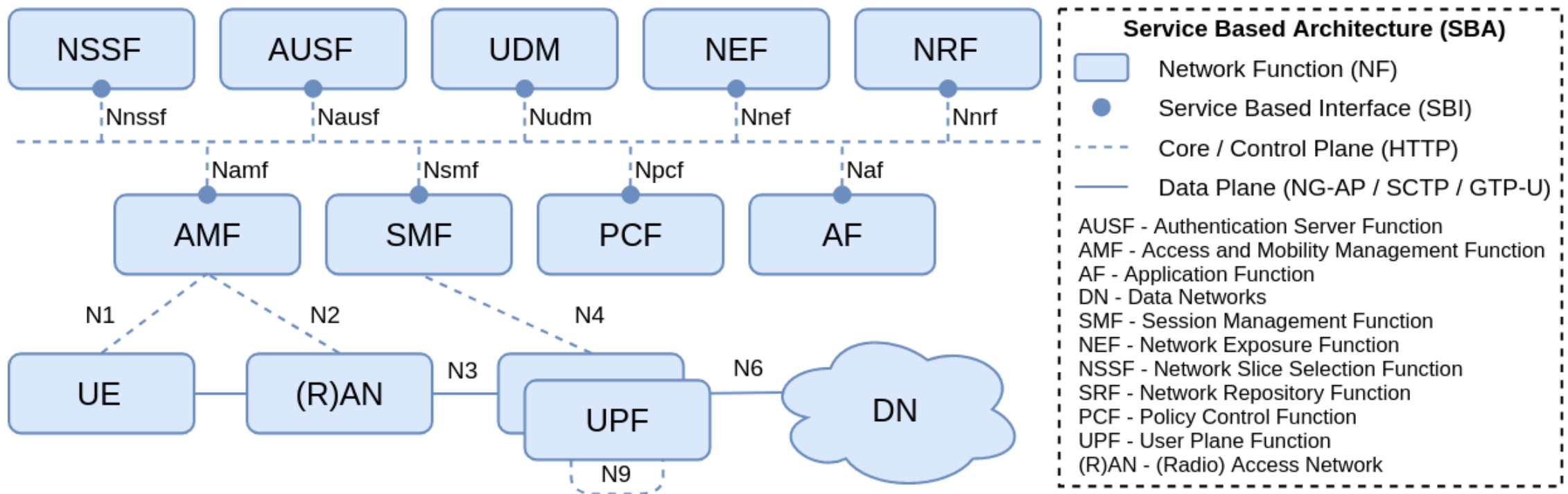
8) Non-Standalone/"NR assisted", EPC connected



8a) Non-Standalone/"NR assisted", EPC connected



5G Service-Based Architecture (SBA)

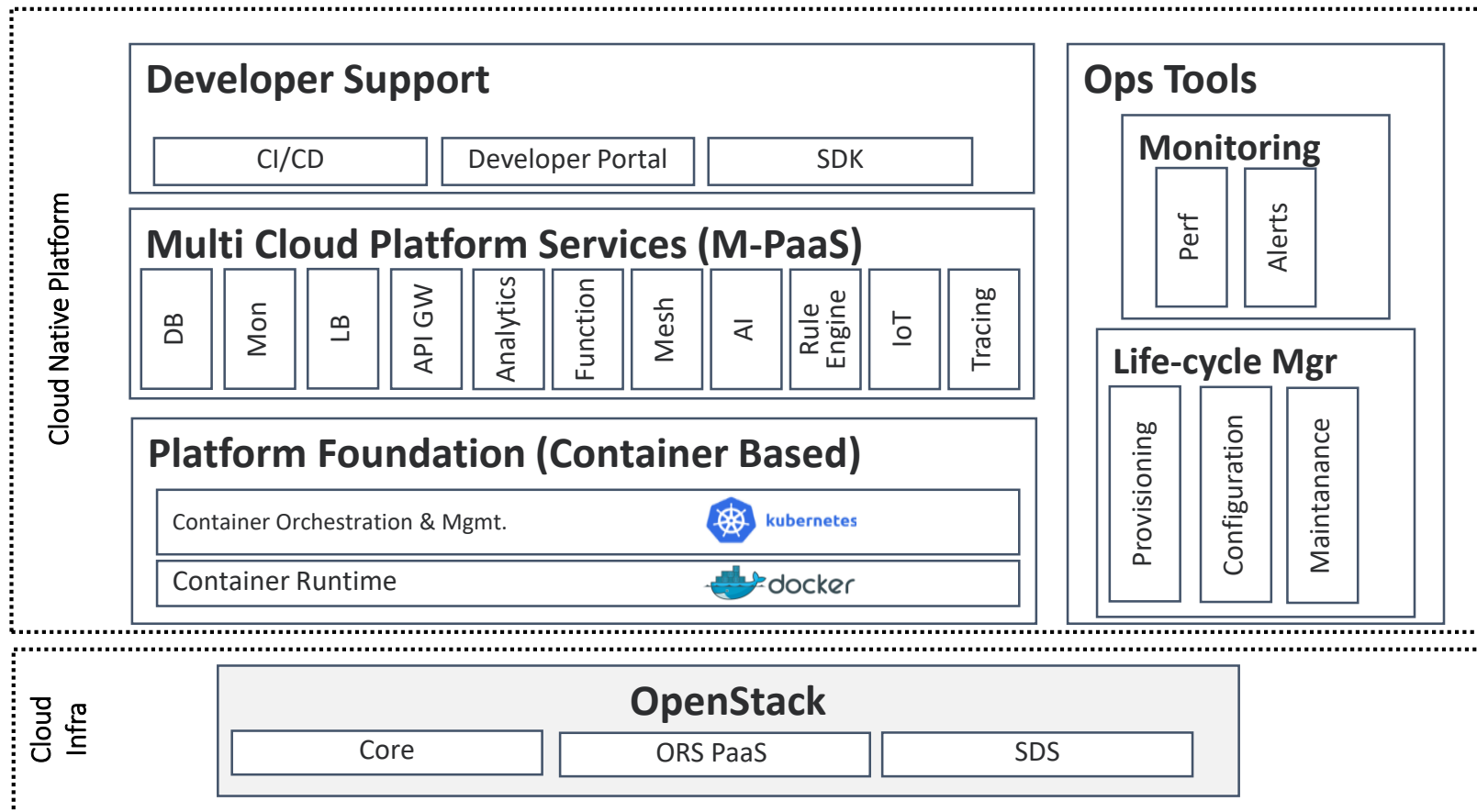


- Required Cloud Native based platform
- Micro service principles: Stateless services, Canary Releases/Blue-Green, Self-Discovery
- Control plane functions communicate via NFR using HTTP (but SCTP is possible)
- PaaS services: DB, LB, API GW, Service Mesh, Mon, Application CI/CD

PaaS and Infra Solutions for 5G SBA

| Service Name | Required | SBA Component |
|--|---|--|
| Container as a Service / Cluster Manager | Yes | ALL |
| DBaaS | Yes | ALL |
| LBaaS (HTTP) | Yes | Control Plane / Service Based Interface |
| API Gateway | Yes | NEF |
| Service Discovery / Registry | Yes | ALL |
| Authentication Service | Yes | ALL |
| Monitoring | Yes | ALL |
| Application CI/CD & DevOps | Yes | ALL |
| Openstack | Yes, but will be replaced by K8S in the future (kubevirt, virtlet). | Those which require support for stable features not provided by K8S. |
| K8S | Yes | NUMA/SR-IOV Evolving towards production grade |
| CEPH Cloud Storage (Cloud Infra) | Optional | ALL |

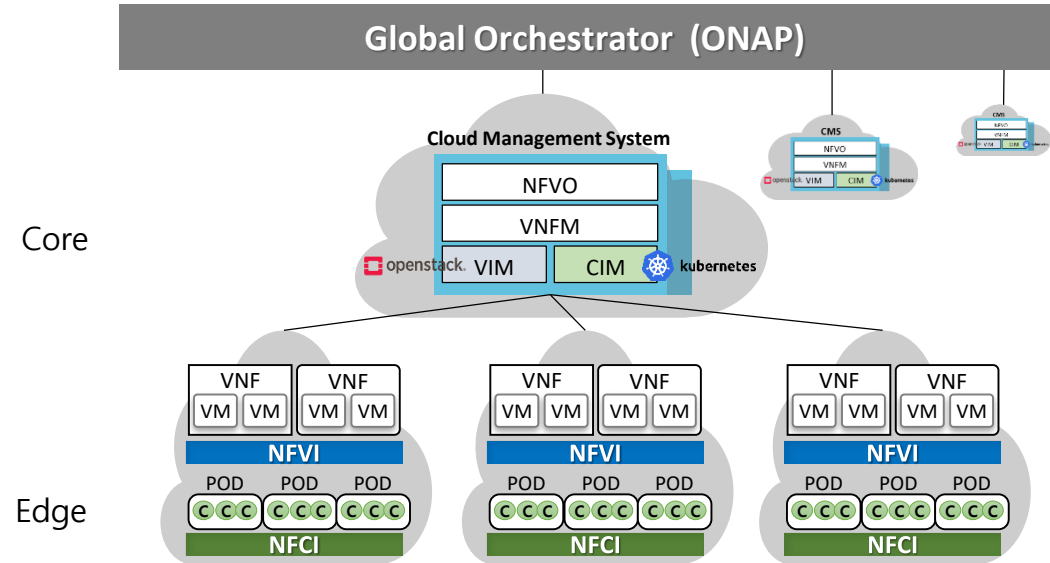
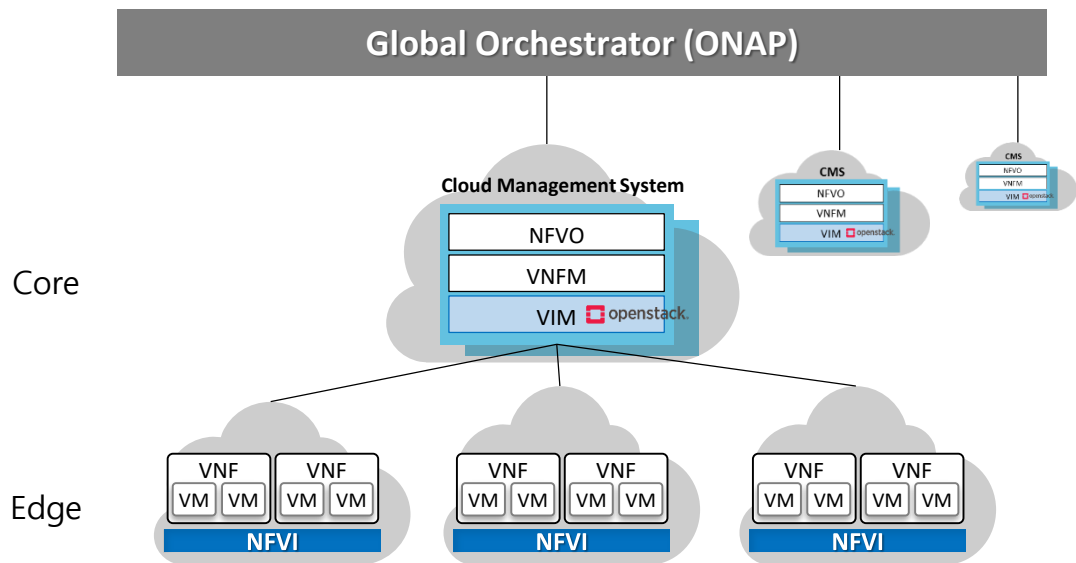
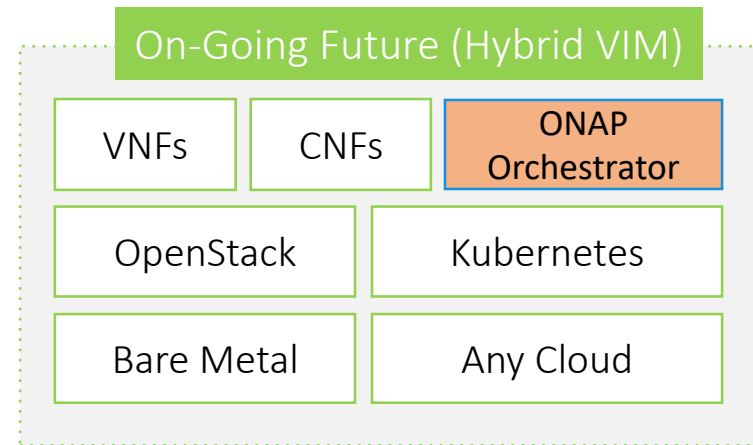
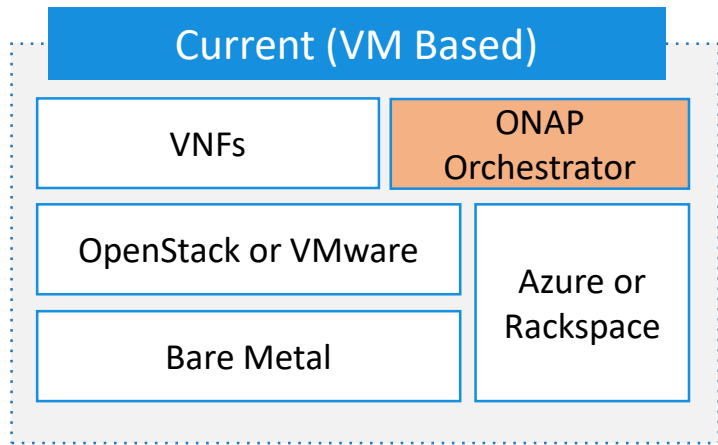
Cloud Native Platform for NFV Solutions



Cloud Native Interoperability

- OpenStack – Kubernetes Interoperability
- Ready for various service operation models
- Based on open source frameworks and standards

Hybrid VIM – NFVI and NFCI





NFVI: Network Function Virtualized Infra.
 NFCI : Network Function Containerized Infra.

Hybrid VIM

- Supporting 3 type of clusters (VM, Container in VM, Container on BM)
- Unified management of Container clusters – Container in VM and Container on BM
- SDN based connectivity between VM cluster and Container cluster
- Openstack integrated networking (Neutron – Kuryr)

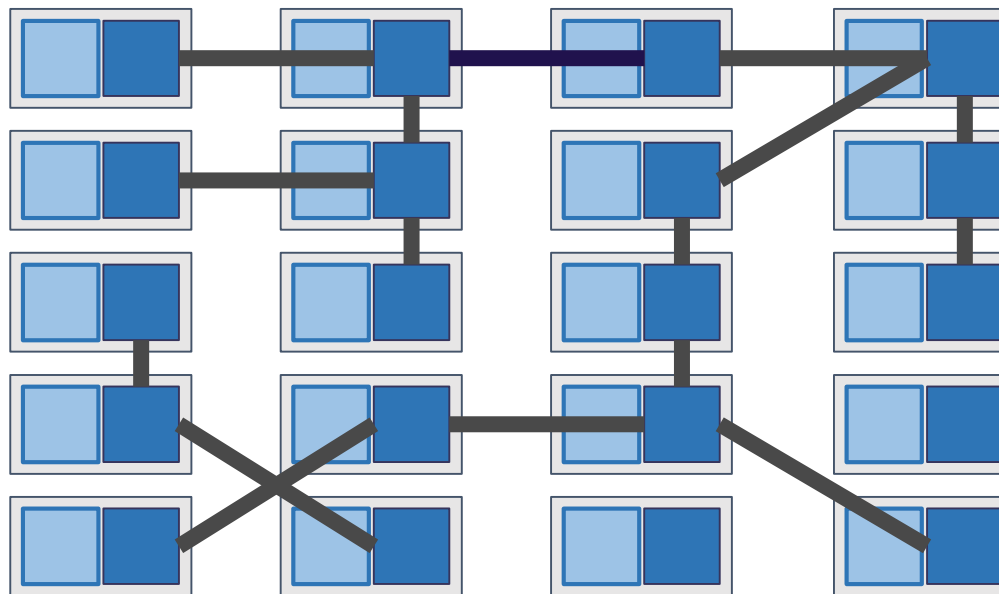
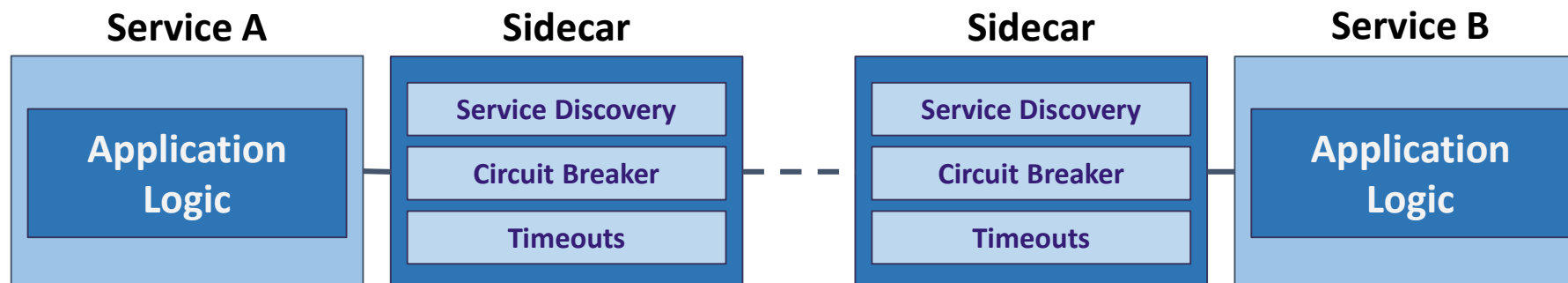
Diversity



| |  |  |  |  |  |
|-------------------|--|---|---|---|---|
| Service Discovery | ✓ | ✓ | ✓ | ✓ | ✓ |
| Load Balancing | ✓ | ✓ | ✓ | ✓ | ✓ |
| Traffic Shifting | ✓ | ✓ | ✓ | ✓ | ✓ |
| Rate Limiting | ✓ | ✓ | ✓ | ✓ | ✓ |
| Circuit Breaking | ✓ | ✓ | ✓ | ✓ | ✓ |
| Timeouts, Retries | ✓ | ✓ | ✓ | ✓ | ✓ |

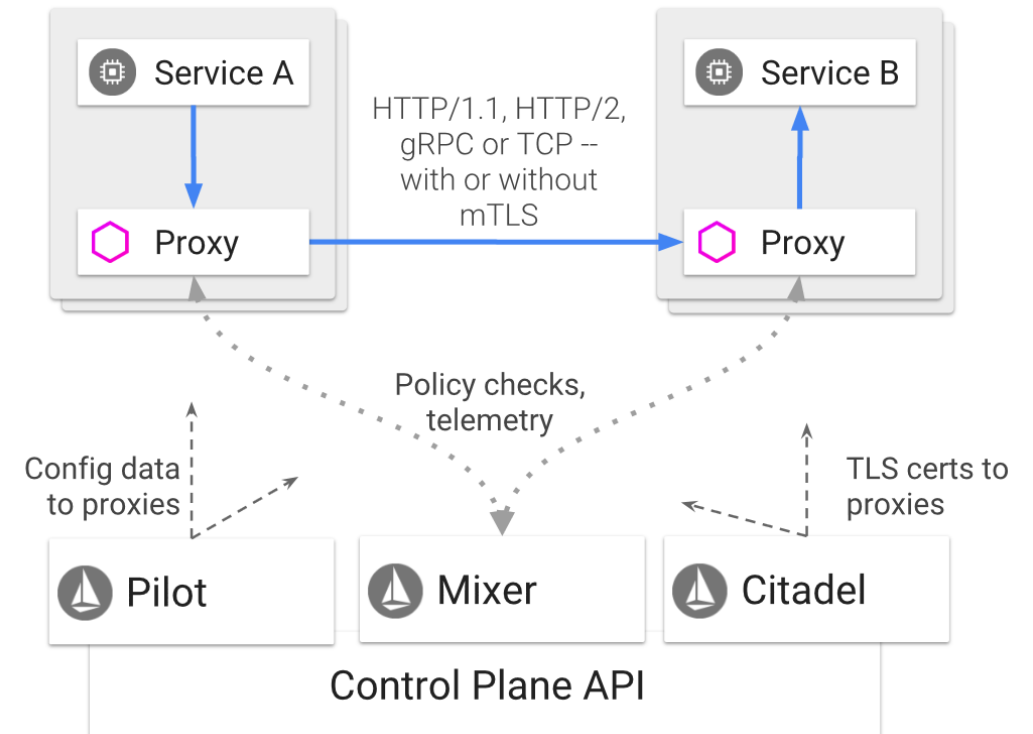


Service Mesh

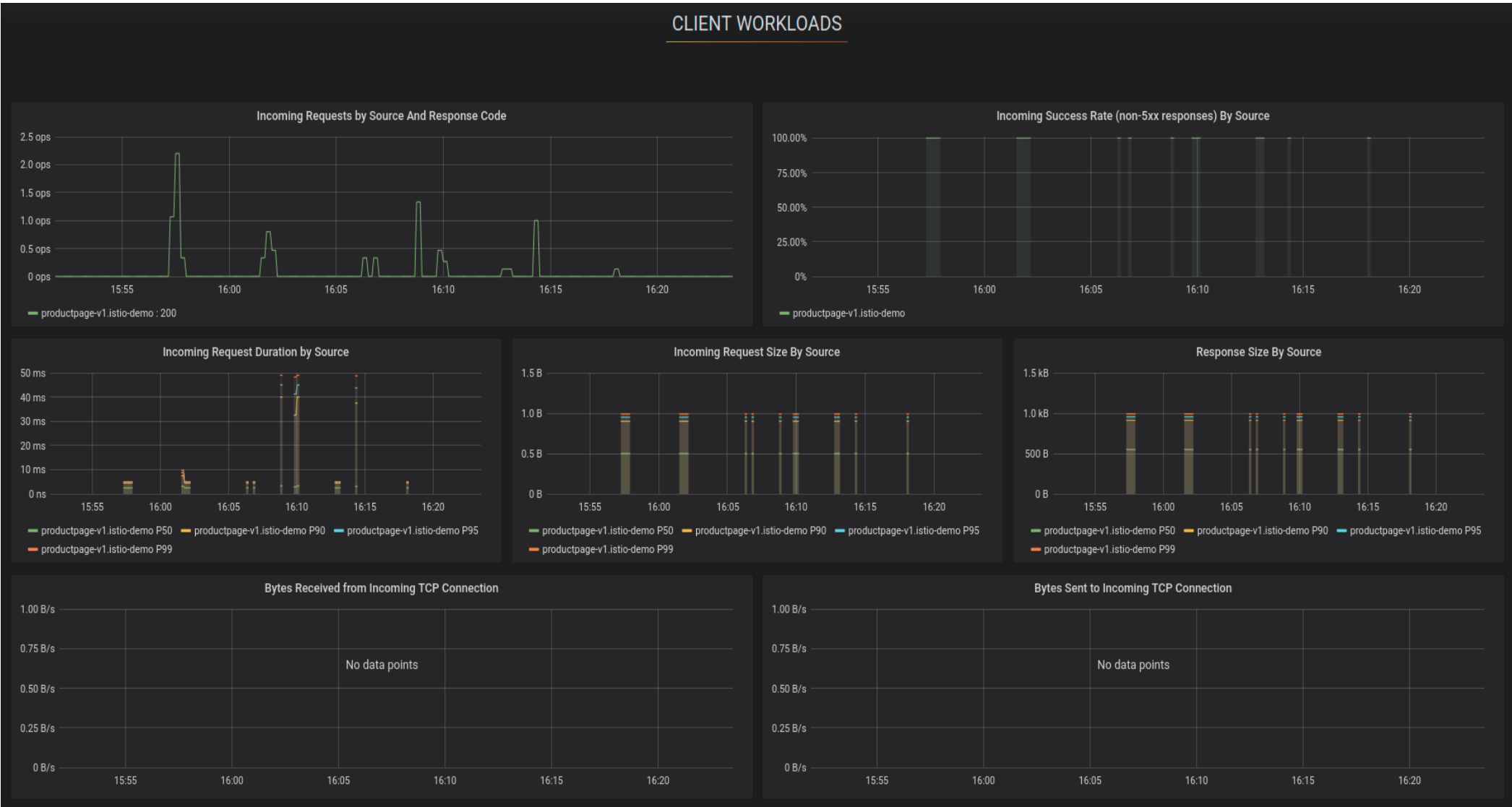


Service Mesh - Istio

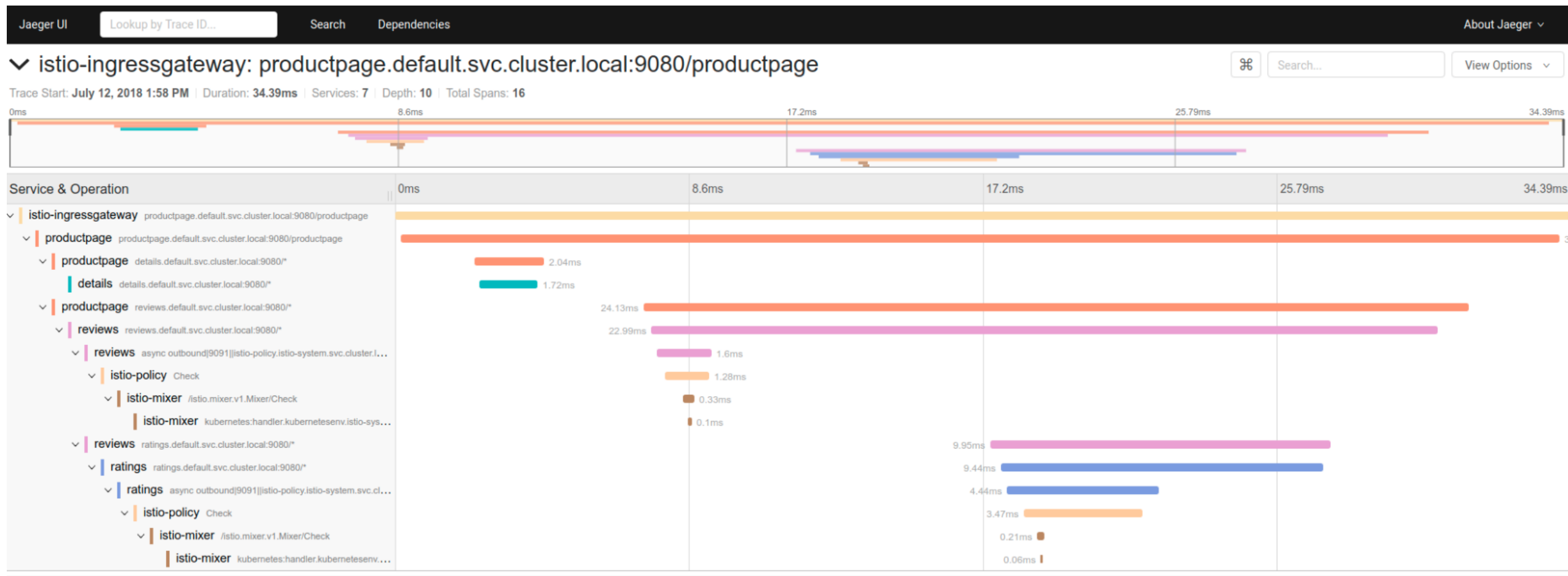
- Open source service mesh control framework
- Provides:
 - Connectivity
 - Control
 - Monitoring
 - Security
 - Discovery
- Uses Envoy as proxy server (sidecar)
- Integration with:
 - Prometheus – metrics
 - Jaeger – distributed tracing



Istio monitoring – Grafana dashboard



Istio tracing – Jaeger dashboard



Istio – Kiali dashboard

Namespace: clearwater-istio

Graph

Display Edge Labels Graph Type App Find... Hide...

Apr 10, 16:15:43 ... Apr 10, 16:16:43

Fetching Last min Every 5 sec

Namespace: clearwater-istio
applications, services, workloads

Current Graph:
10 apps
10 services
1 workload
22 edges

HTTP Traffic (requests per second):

| Total | %Success | %Error |
|-------|----------|--------|
| 3.00 | 100.00 | 0.00 |

HTTP - Total Request Traffic min / max:
RPS: 0.33 / 2.67 , %Error 0.00 / 0.00

TCP - Total Traffic - min / max:
Sent: 19.08 / 56.93 K/s
Received: 17.88 / 57.50 K/s

live-test ellis ellis homer homer cassandra cassandra
homestead-prov homestead-prov
homestead homestead
sprout sprout chronos chronos
bono bono ralf ralf astaire astaire

+ - Legend

Canary Releases – CNF CI/CD

- Spinnaker Platform
- 5G Core CNF's
 - HTTP based protocol
 - Samsung Cloud Native Platform integration

The screenshot shows the Spinnaker UI for configuring a pipeline. The main view is titled 'Automated Canary' and displays a flow diagram with stages: Configuration, Find Baseline Version, Deploy Canary Config, Deploy Baseline, Deploy Canary, Canary Analysis, Deploy to Production, Delete Canary, and Delete Baseline. Below the diagram, there is a configuration form for the 'Canary Analysis' stage. The form includes fields for 'Stage Name' (Canary Analysis), 'Depends On' (Deploy Canary, Deploy Baseline), and 'Canary Analysis Configuration'. The configuration section has 'Analysis Type' set to 'Real Time (Manual)', 'Config Name' set to 'requests', and 'Lifetime' set to 0 hours and 5 minutes.

The screenshot shows the Spinnaker UI displaying pipeline execution results. The main view is titled 'Automated Canary' and shows a list of pipeline executions. The first execution is 'MY-K8S-V2-ACCOUNT Deploy to PROD' with a status of 'SUCCEEDED' and a duration of 01:36. The second execution is 'MY-K8S-V2-ACCOUNT Automated Canary' with a status of 'SUCCEEDED' and a duration of 14:07. Below the list, there is a 'STAGE DETAILS: CANARY ANALYSIS' section showing a table of steps and a 'CANARY ANALYSIS' summary. The summary shows a 'Canary Summary' of 100, indicating a successful canary release.

| Step | Started | Duration | Status |
|-----------------|-------------------------|----------|-----------|
| Canary Analysis | 2019-05-17 04:32:54 PDT | 11:04 | SUCCEEDED |

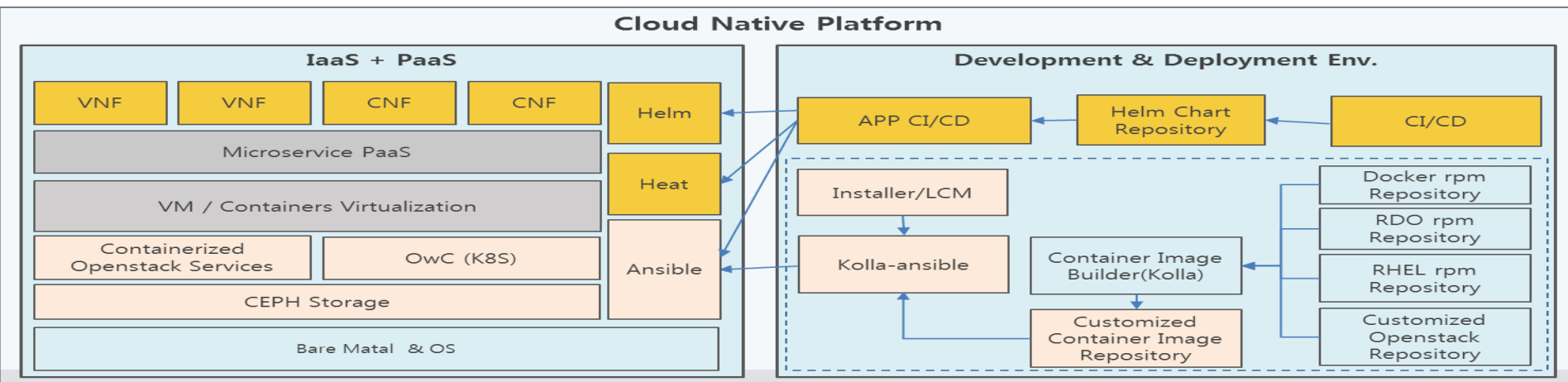
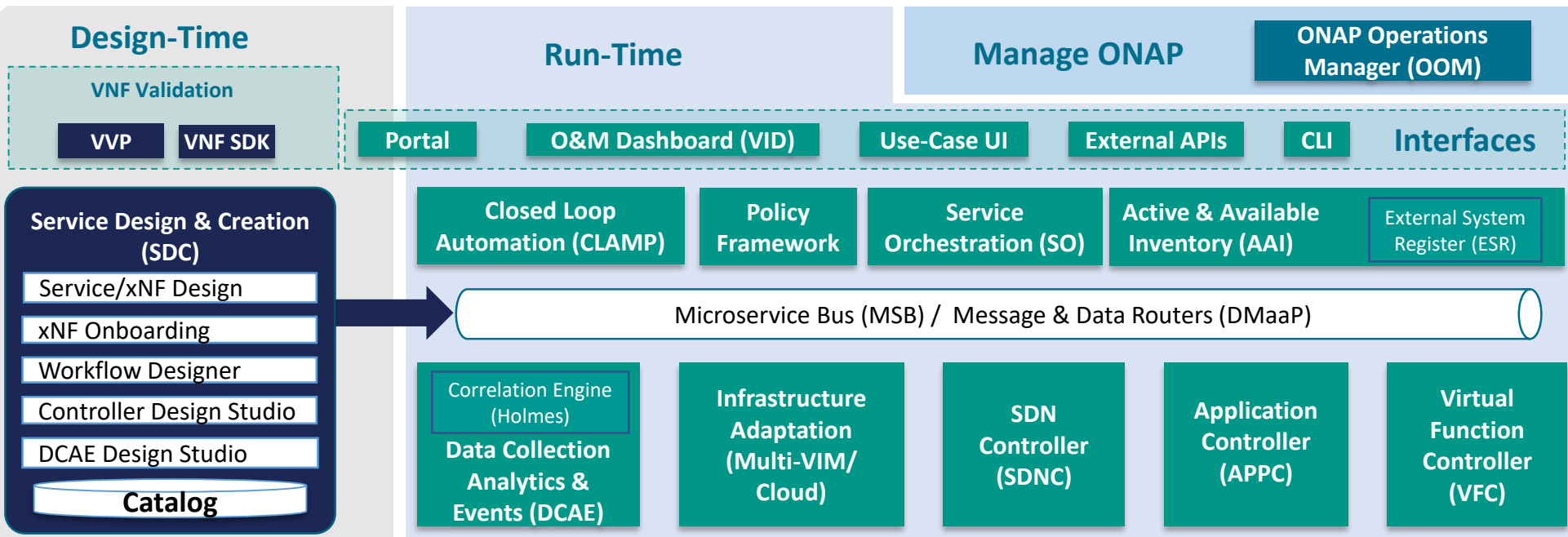
| Canary Result | Duration | Last Updated |
|---------------|----------|-------------------------|
| 100 | PT5M | 2019-05-17 04:37:54 PDT |
| 100 | PT10M | 2019-05-17 04:43:58 PDT |

Clearwater - Sample CNF



- Clearwater sample vIMS application deployed on Samsung Cloud Native Platform
- Sensing ISTIO Service Mesh
- Gained much lessons learnt
 - Istio is not fully transparent for applications
 - Limited set of supported protocols
 - Introduces latency overhead
 - Bigger resource consumption

Cloud Native Solutions and ONAP Integration





ONAP

OPEN NETWORK AUTOMATION PLATFORM