



PNF and Mixed Infrastructure Support for EtE Network Slicing --Cloud Infrastructure Controller

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Agenda

- Why the need for a Cloud Infrastructure Controller
- Cloud Infrastructure Controller
- 5G E2E Network Slicing Implementation with Infrastructure Controller



Why the need for a Cloud Infrastructure Controller

Why Need a Cloud Infrastructure Controller

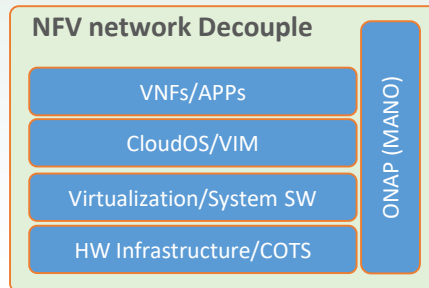
Moving to the Edge Mixed Infra.

- Comms' Edge has variety PNFs and HW accelerators beyond VMs
- 5G requires support:
 - Physical peripherals
 - Bare metal server
 - Hardware (FPGA) acceleration card



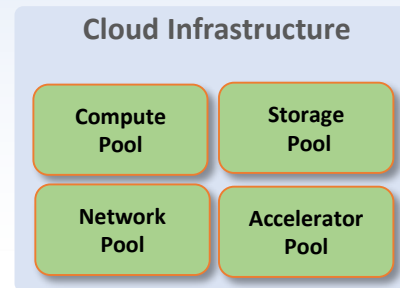
NFV Multi-Layer Decoupling

- An independent cloud infrastructure controller is equally important to VIM:
 - Cloud scheduling
 - Run-time infra. monitor/Update.
 - Pooled resource manage.



Hardware infra. Modeling

- Modelling
 - Service model temp.
 - VNF/PNF model temp.
 - Infra. model temp.
- Infra. model need to be extensible to support legacy and future platform.



Run-Time Network Optimization

- Awareness of Location; Awareness of the topology of cloud
- Support SON
 - Fast Auto-scale within 1S.
 - Efficient auto selection of infra resource.



HA, SA and Beyond

- OOB manage channels for RAS and Five 9's support
- Policy driven infra. Control
- Telemetry for SA.
- ...

Infrastructure Attributes



NFV Automation need better awareness of cloud infrastructure and run-time control capability

Infra Controller to support ONAP 5G use case and requirements:

Functional Platform Requirements	SDC	AAI	SO	SDN-C	APP-C	Portal	DCAE	Policy	OOF
Support for PNF - Onboarding	✓	✓							
Support for PNF - Configuration & Control	✓	✓	✓	✓	✓	✓			
Support for PNF - Data Collection & Monitoring	✓					✓	✓		
Slice Management - Definition	✓								
Slice Management - Composition	✓	✓				✓			
Slice Management - Orchestration & Control	✓		✓	✓	✓	✓			
Slice Management - Data Collection & Monitoring	✓					✓	✓		
Optimization - Onboarding	✓								
Optimization - Configuration & Control	✓		✓	✓	✓	✓		✓	
Optimization - Data Collection & Monitoring	✓					✓	✓	✓	
OOF - Multi-cloud	✓								✓
OOF - Optimization									✓

 Applicable with Cloud infrastructure controller Enhancement



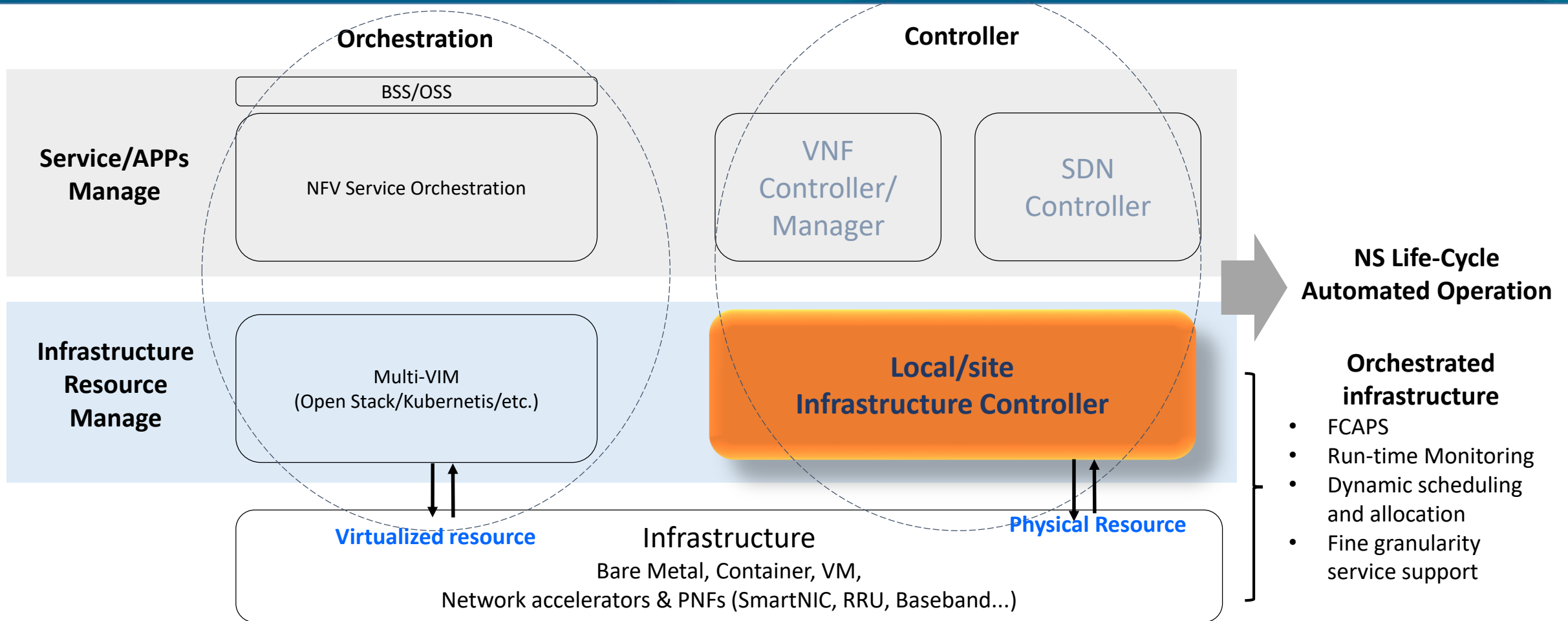
Limited PNFs/DC hardware provisioning capability supported by Open stack and K8S etc.

- **Network Slicing requires Run-Time monitor, modify, control of the services and resources.**



Cloud Infrastructure Controller

Enhancement of current NFV MANO Resource Management



Currently VIM can only manage virtualized infrastructure with limited control of the non-virtualized resources

Cloud Infrastructure Controller Functionality

PNF onboarding and Infrastructure run-time manage/control

- Physical infra on-boarding:
 - Bare metal servers
 - SmartNIC /PCIE acceleration cards
 - Proprietary PNFs
- Support Model-driven infra.
- Dynamic patching of new hardware Json data template

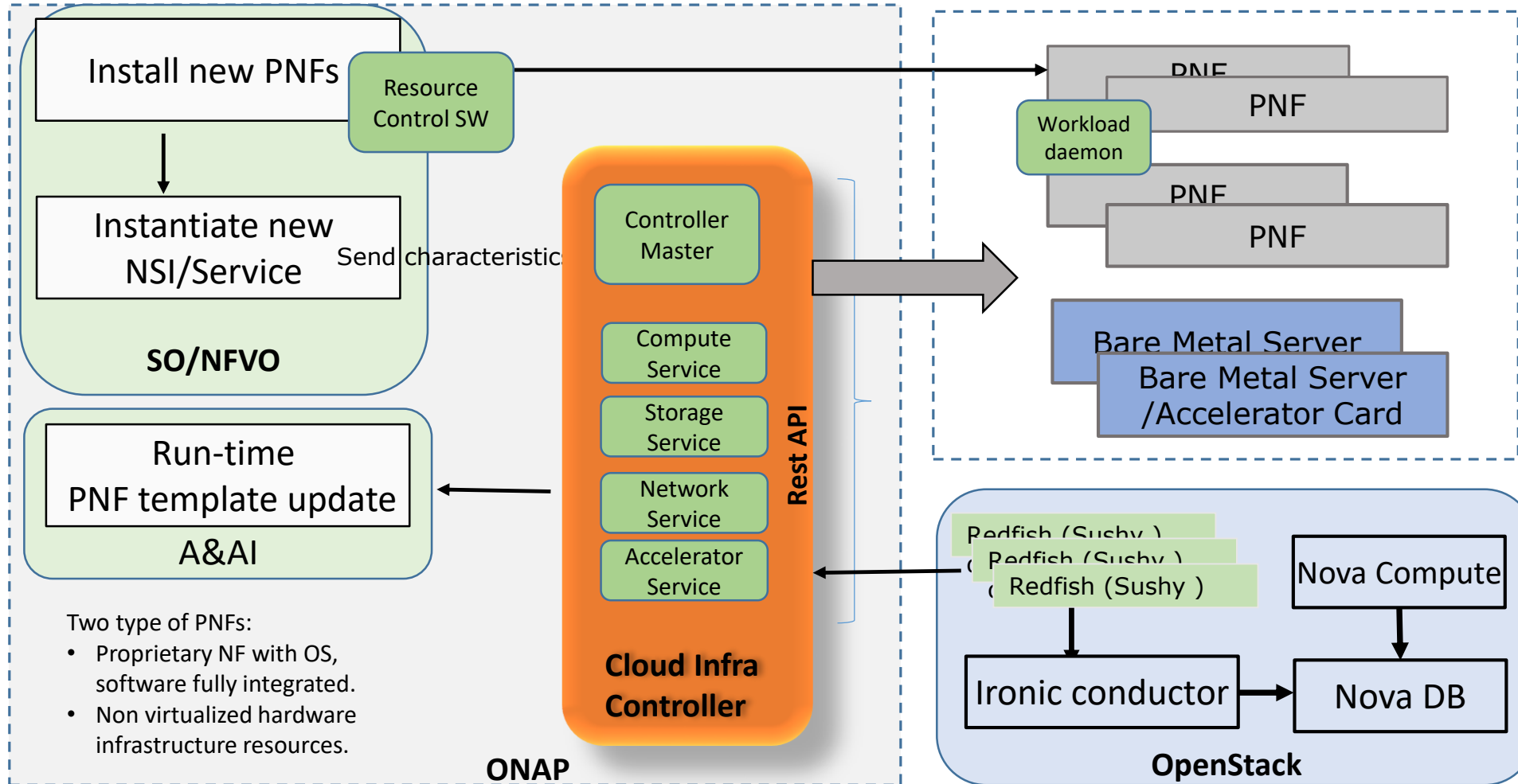
Support Optimization Framework and SON

- Report location and hardware features to SO and OOF (SON).
- Grouping management of infra. resources with specific feature set, to support SLA/SLO of NSI.
- Policy based fast auto-scale, auto-healing within local cloud.
- Run-time update infra. change

Support Telco S3P through OOB channel

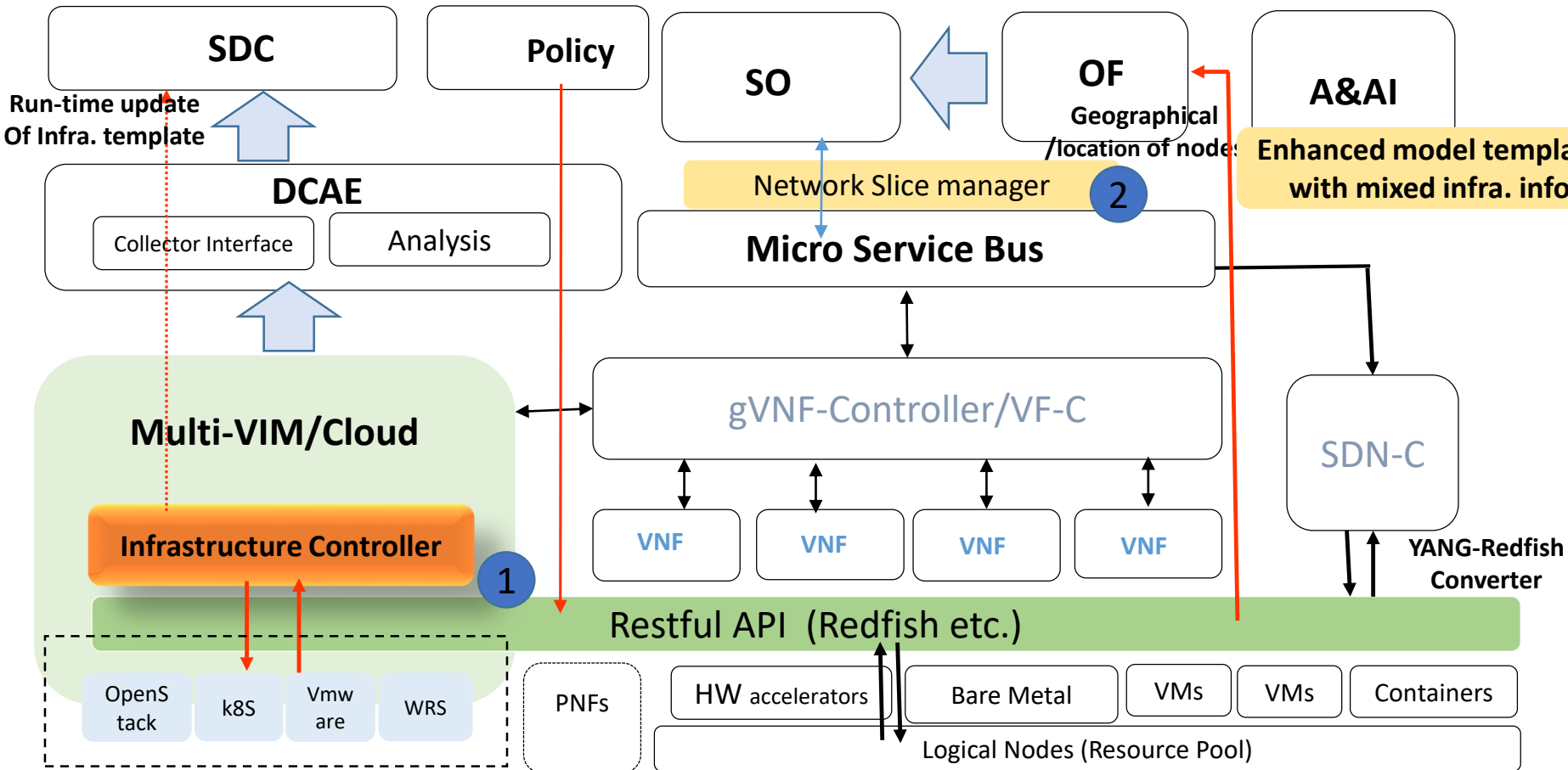
- Support both In-band and Out-of-band (OOB) management.
- With all the platform awareness and run-time monitoring, a hardware level data analytic and policy-based action (execution) can be achieved in longer term

Support PNF/Bare Metal On-boarding & Manage



- PNF on-boarding can be implemented in multiple ways through generic Rest API (e.g. Redfish) .
- Can be directly scheduled and activated from SO/NFVO through API calling.
- Can be run-time scheduled and provisioned through Cloud Infra Controller
- Can be instantiated through Open stack with various enhancements.

How To Support 5G Use Case?



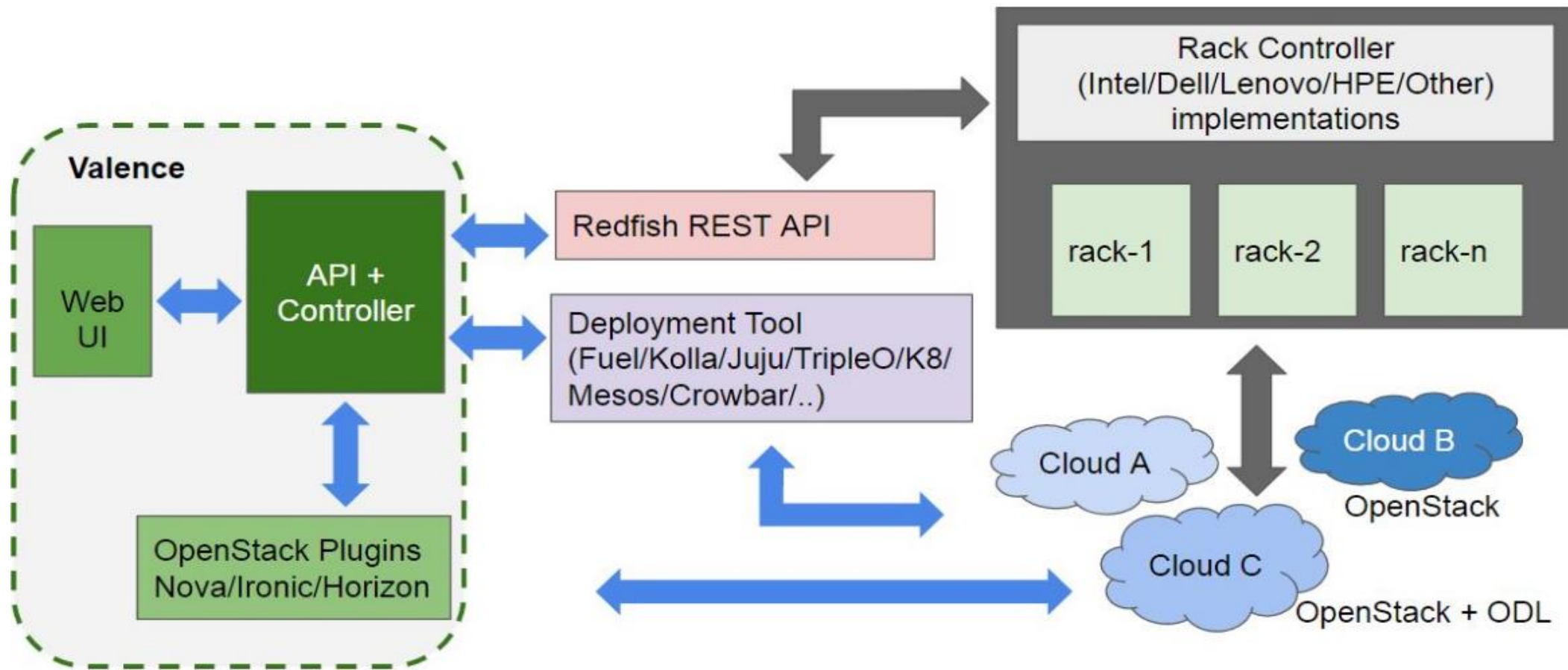
1. Add Infrastructure controller to Multi-Cloud module and further integrated with OpenStack, K8S etc. Support run-time resource provisioning and status monitor.
2. Add Network Slice manager to SO to handle groupings, connections, security, sharing etc. for NSI/NSSI service instantiation.

Run-time Monitor and Control of Infrastructure Attributes

Support Network controller with Yang-Redfish converter

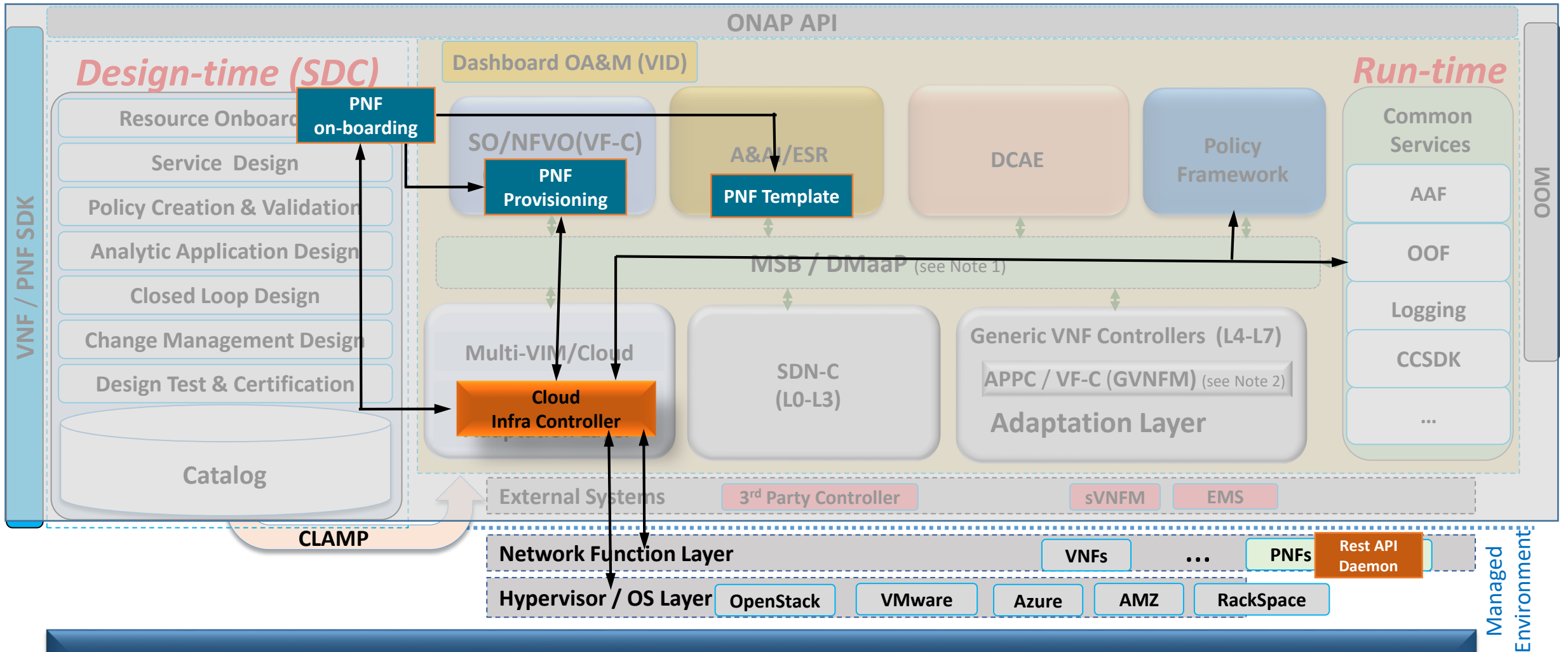
Redfish is a modern interface for DC management which provides common resource models that extensible to other management domains. It is matured and many on-going efforts in open source.

Current Solution of Valence Open Source Project



- Valence can be used today to do PNF on-boarding and Run-time monitoring, configuration and management
- Based on Valence, will build a generic Cloud Infrastructure Controller with Rest API communicate with different type of DC/Comms hardware platform.

Mapping to ONAP R2+ Architecture –Long Term

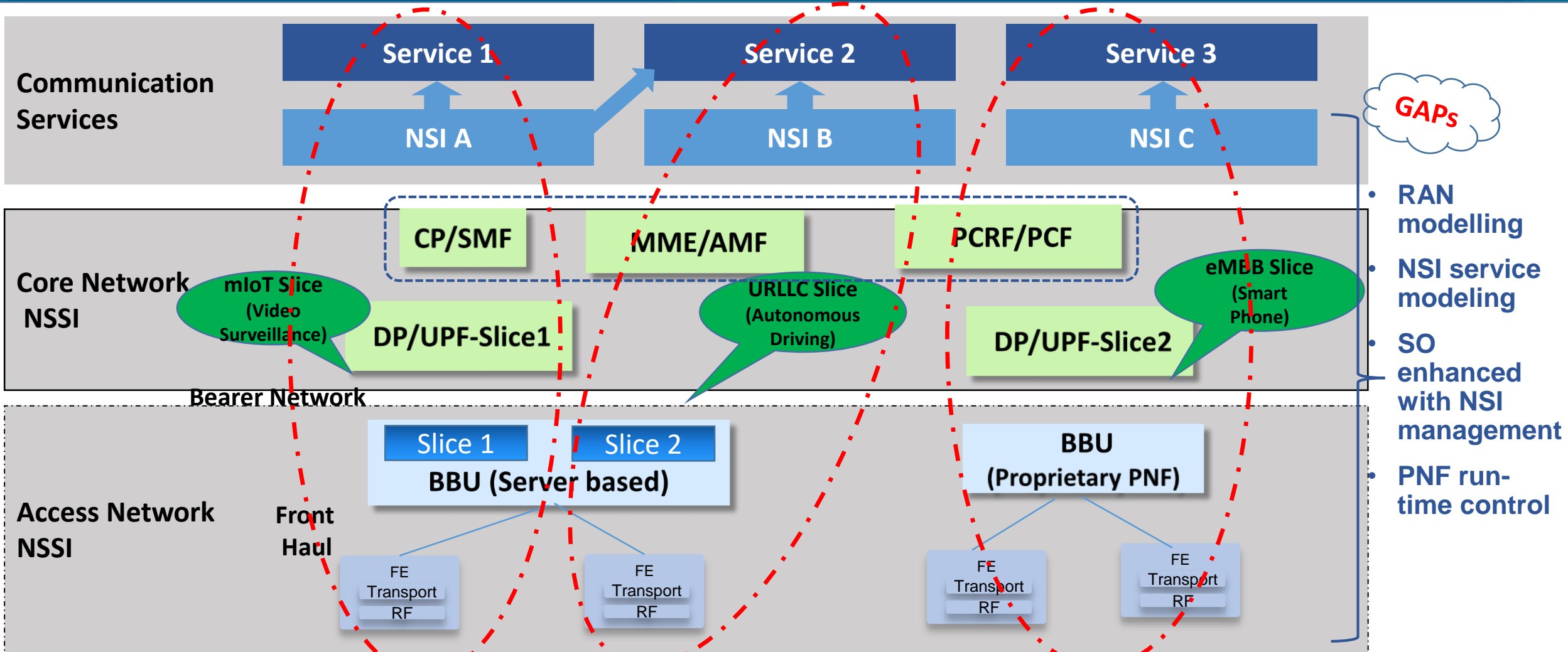


Cloud Infrastructure Controller target to integrate to Multi-Cloud module as a independent engine



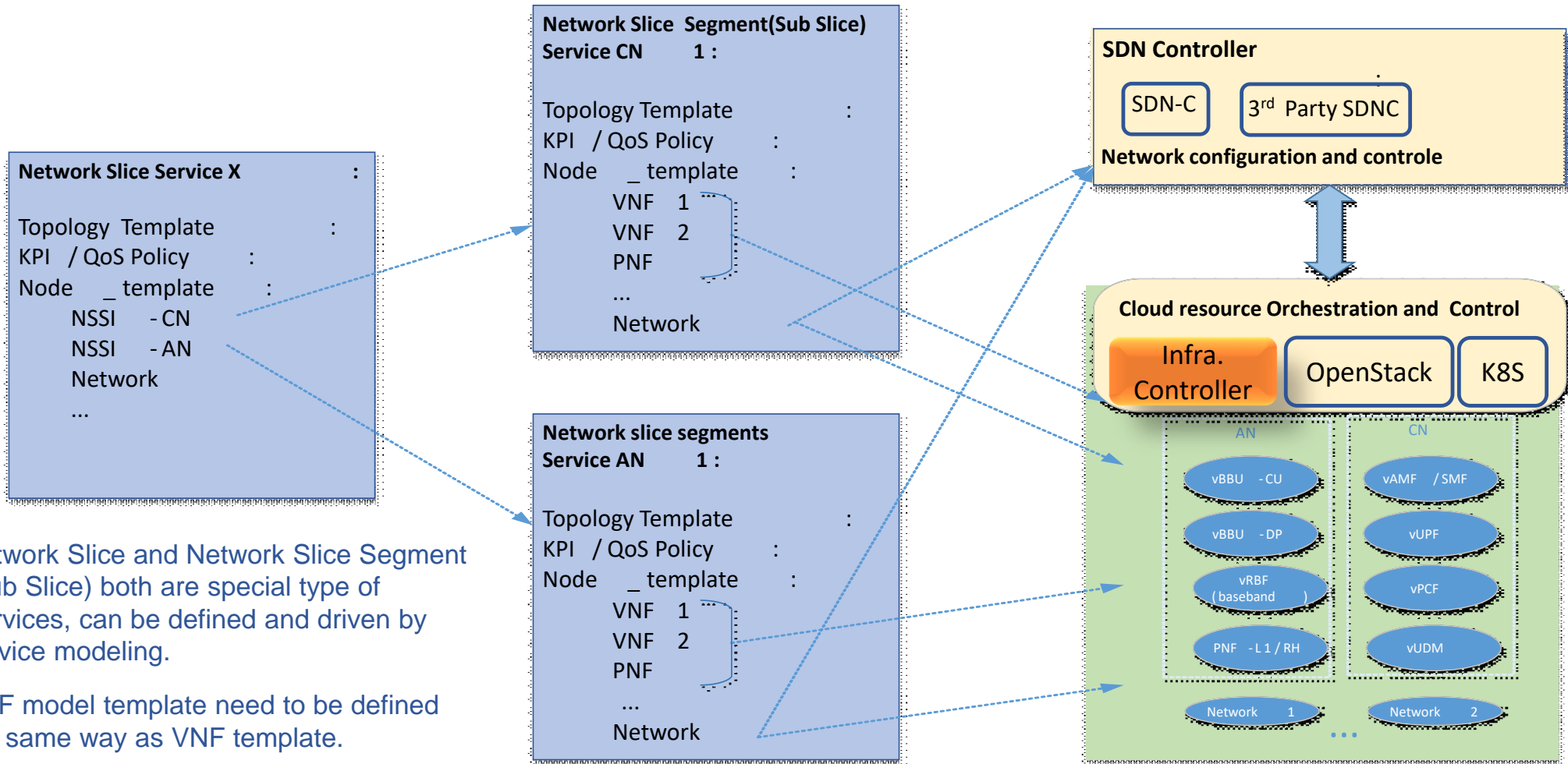
5G E2E Network Slicing Use Case Demo

5G Network Slicing Demo System –Phase1



- Support CUPS; 4G/5G VNF/PNF are both fine as demo
- VNF/PNF co-exist; VM/Container/bare metal co-exist
- RRH, Front-haul, Bearer slicing will be consider later

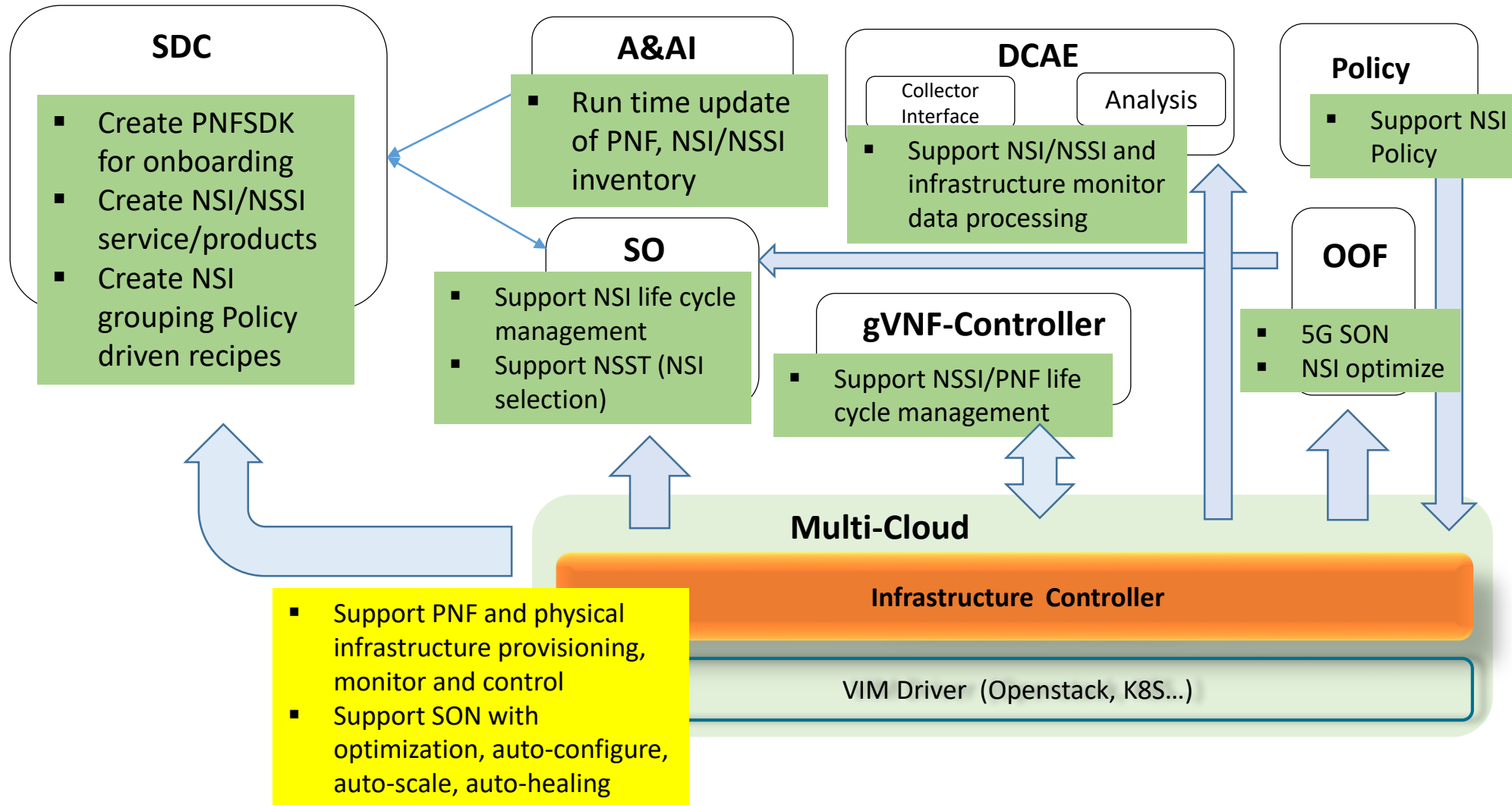
Nested Service Modelling design for Network Slice



- Network Slice and Network Slice Segment (Sub Slice) both are special type of Services, can be defined and driven by service modeling.
- PNF model template need to be defined the same way as VNF template.

Nested service orchestration and Infrastructure controller is required to implement model-driven EtE slicing

5G E2E network slicing demo functional break-down



Summary

- Cloud Infrastructure Controller is a generic function module that can support PNF and physical infrastructure run-to-completion management, as well as support different VIM: OpenStack, K8S etc.
- It can solve the ONAP functional gaps to support 5G RAN, network slicing, MEC etc. enabling the automation of Carrier's operation all the way to the infrastructure (NFVi, Cloud, Edge)
- Plan and Target:
 - R2 5G network slicing use case demo with minor enhancement to several existing modules
 - Integration to Mutli-Cloud in ONAP R2 beyond release in longer term.

Call to Action

- Collect feedback from the community, align with other related proposals to support PNF life cycle management.
- Discuss and work with Multi-Cloud team to define and solve the current gaps.
- Collaborate with parties in ONAP community that interested in 5G use case to build the demo together.

Thanks!

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