



LF NETWORKING
Developer & Testing Forum

Nephio Configuration Management

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- Introduction
- What is Configuration in Nephio?
- Nephio Controllers - Actuating the Configuration
- Example Use-Case - Multi Domain NF Topology Intent
 - CNF Deployment Intent - Applicable to both Core and RAN CNFs
 - Configuration in RAN domain
 - Configuration in Transport Domain
 - Combining it all - Multi-Domain NS topology Intent

In this topic, we will explore configuration management in Nephio, followed by some high level Ideas on how NFs can be deployed and configured using Nephio across RAN, Core and Transport.

Note: Other than the 5GC controller, none of the other mentioned controllers exist today. They are more of Ideas at this point.

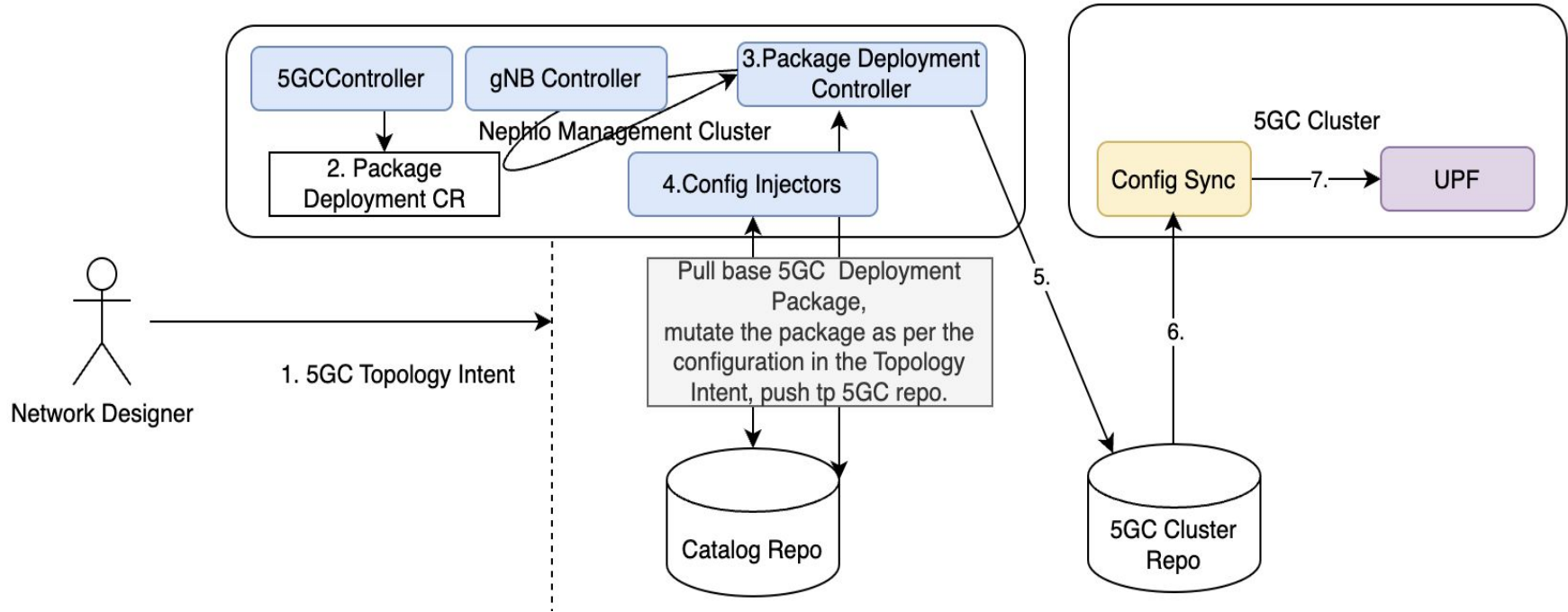
Configuration in Nephio

- Kubernetes is the basis of all of Nephio, which makes it 'declarative'. The intents specified to Nephio are actively reconciled.
- Configuration in Nephio refers to Kubernetes resources specified as KRM objects.
- These Kubernetes resources are used to provision and manage the networks functions, infrastructure and their day N configuration.
- The configurations are packaged as kpt bundles.
 - Configuration as data, separates code that transforms the configurations
- Kpt packages are stored and managed in version control systems like git.
- Examples of Nephio configuration,
 - Kpt package comprising of KCC or ACK KRM objects which have all the configuration to create a kubernetes cluster in GCP or AWS.
 - Kpt package comprising of KRM objects which have all the configuration to create a Networks function.
 - Kpt package containing KRM based Day 0/Day N configurations CNFs and PNFs
 - Kpt package containing KRM objects which define the topology of Network.
 - Kpt package defining multi domain NS - RAN, Transport, Core

Nephio Controllers

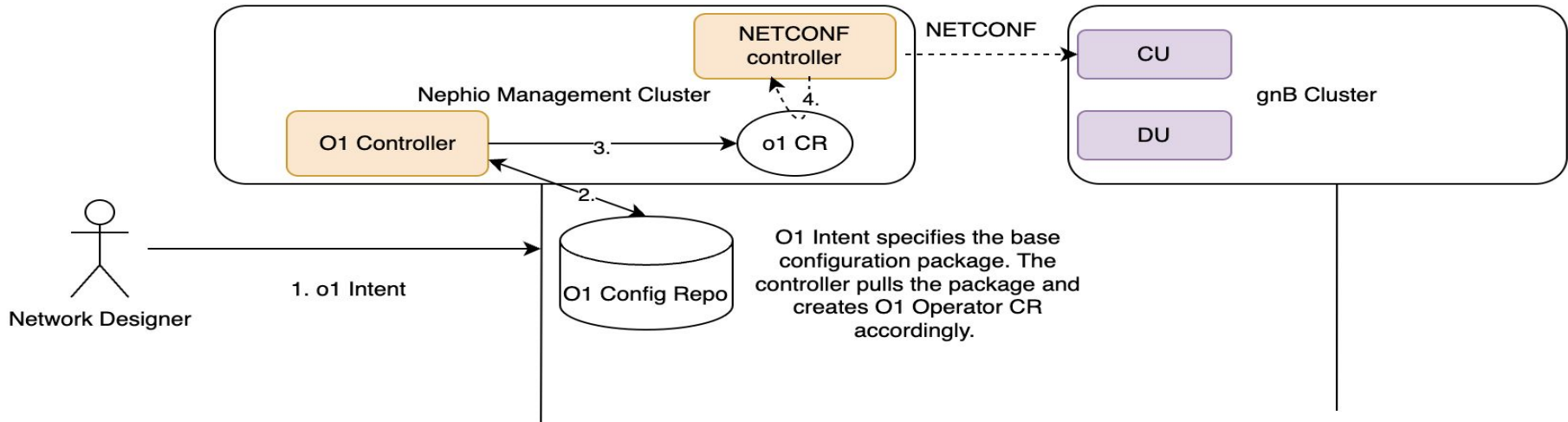
- Nephio controllers extend Kubernetes API - CRDs
- Controllers
 - Control loops actively reconciling the configurations in the kubernetes objects.
 - Injectors: These are type of controllers in Nephio which specifically watch the configuration objects in draft state in the Git repositories. The injectors then mutate the configuration packages by modifying or adding new resources to the configuration package.
 - Porch is used for hydrating/mutating the packages. Porch enables programmatic manipulation of configuration packages and contents.
- Examples of Nephio Controllers
 - A controllers which reconciles the high level Infrastructure intent. In the southbound it creates the cloud provider CRs for creating a kubernetes clusters.
 - Controller which reconciles the workload intent by mutating the workload configuration based on the target environment where it is going to be deployed and pushing the mutated package to the target cluster's repository.
 - Controller which injects PNF configuration in a package which defines the network service Intent.

CNF Deployment Flow



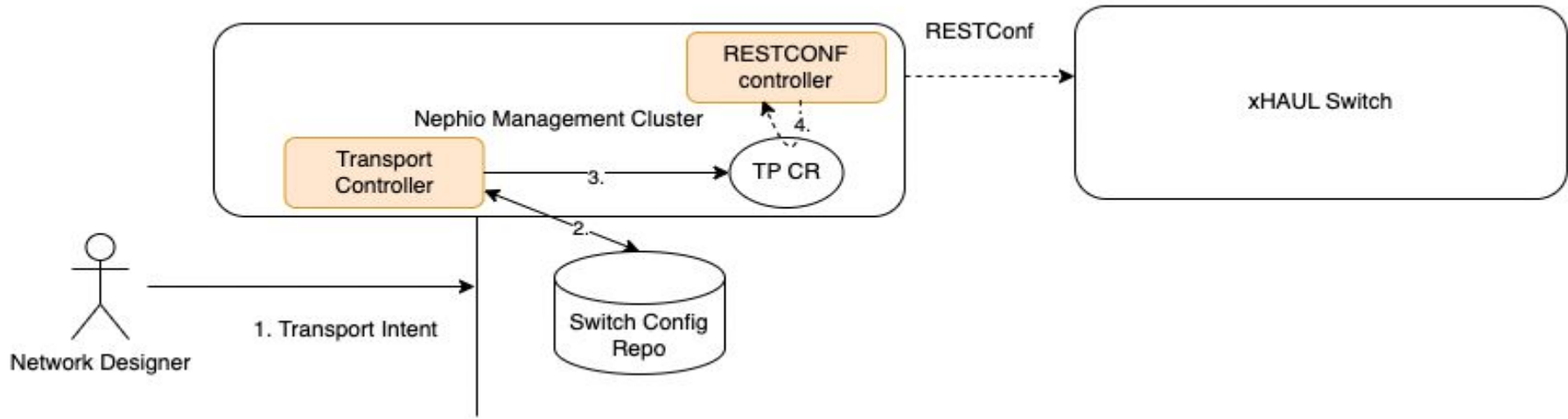
This slide shows how Nephio can reconcile to 5GC configuration, and provisions a UPF in the edge cluster based on the 5GC topology Intent specified by the Network designer. Similar flow can be imagined for gNB (CU/DU) CNF Deployment.

O1 Controller



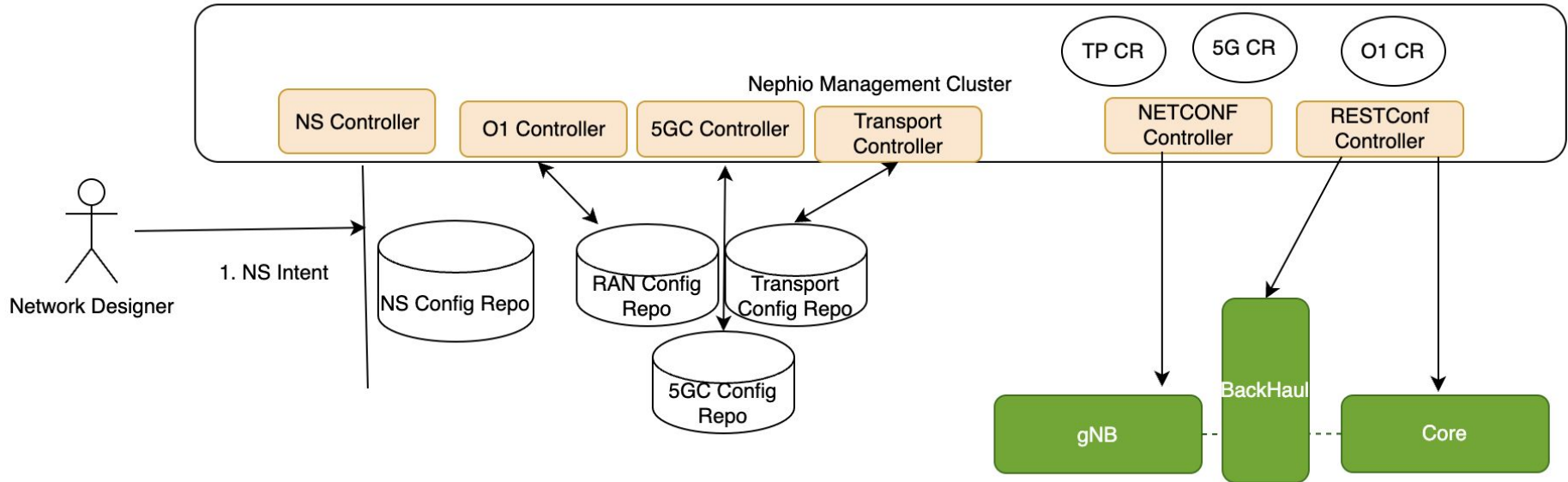
- O1 controller reconciles the RAN configuration intents. It creates NETCONF controller CRs.
- Proposing a NETCONF controller, which configures the RAN components over NETCONF.
- The O1 controller reconciles to RAN configuration in the O1 Config Repo.
- Configurations once applied can be changed via the service assurance (closed loop) path or manually.

Transport Network Controller



- Idea is similar to the O1 Controller.
- This example assumes that the switch exposes configuration over REST, it could be NETCONF as well and in that case we can use the NETCONF operator.

Network Service Intent



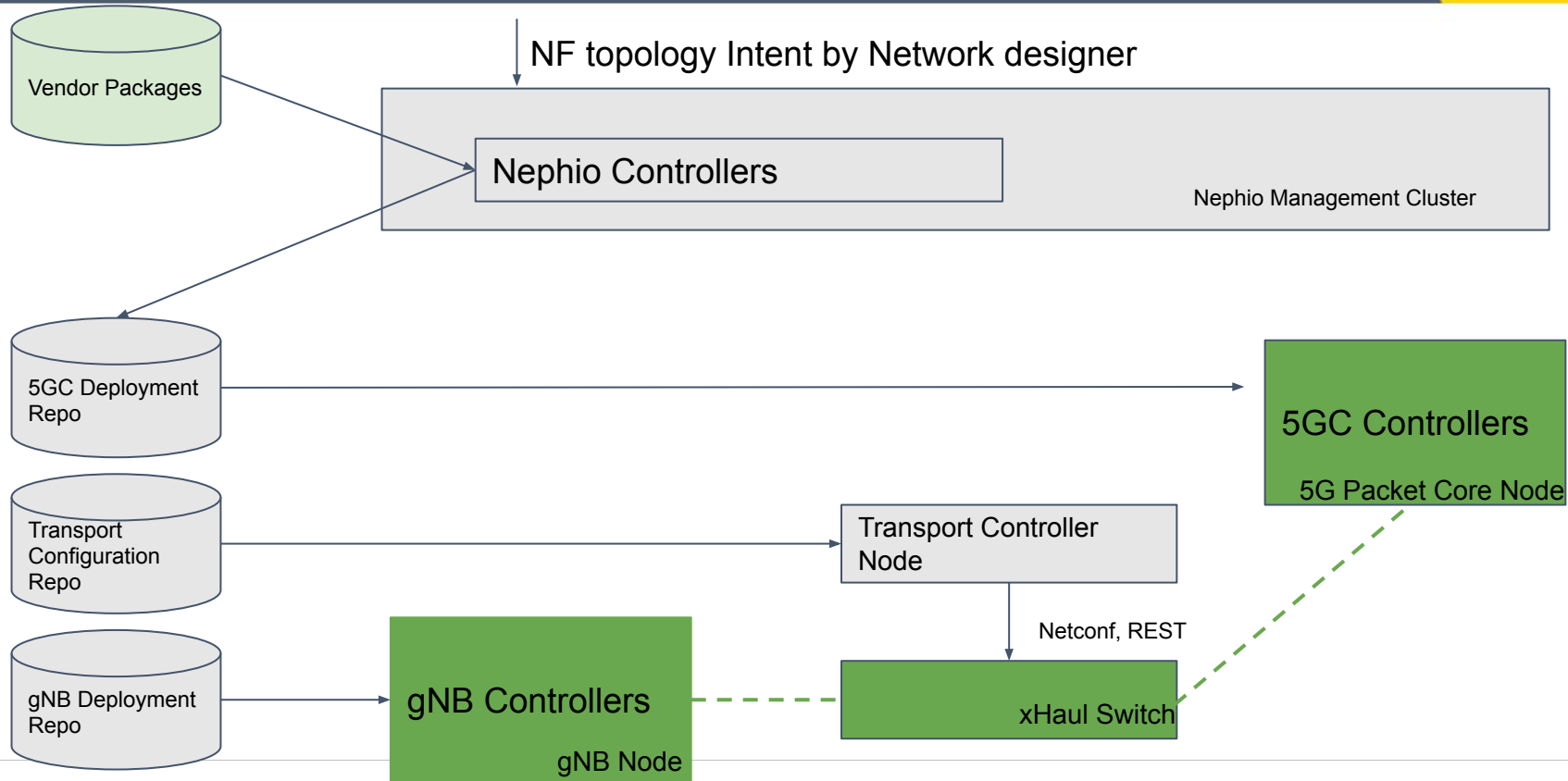
Combining it all!



Thank You

Questions?

Multi Domain NF Topology Intent



CDS as Southbound Controller

