ONAP & DevOps - integration with CI/CD pipelines

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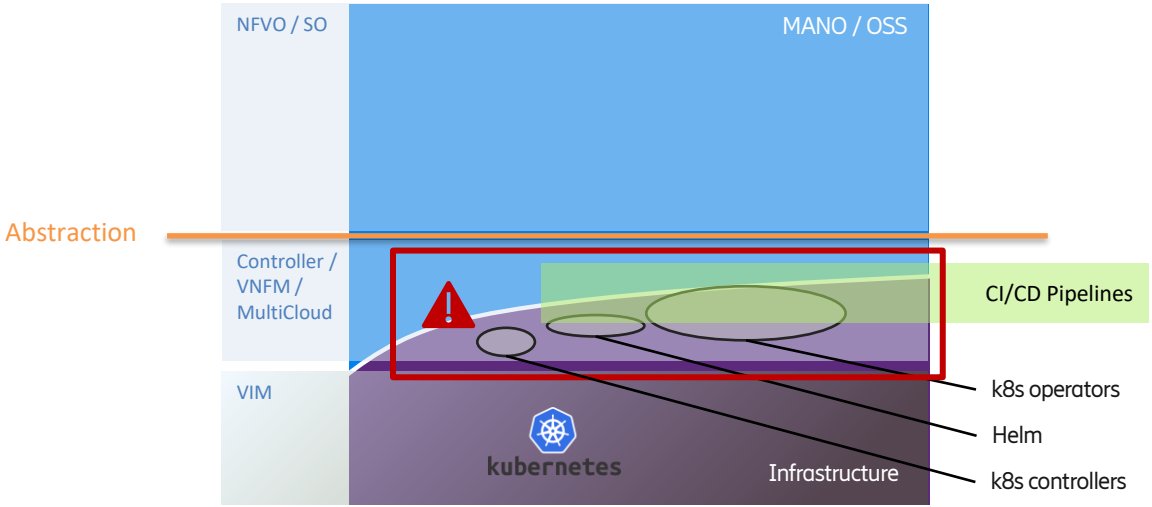
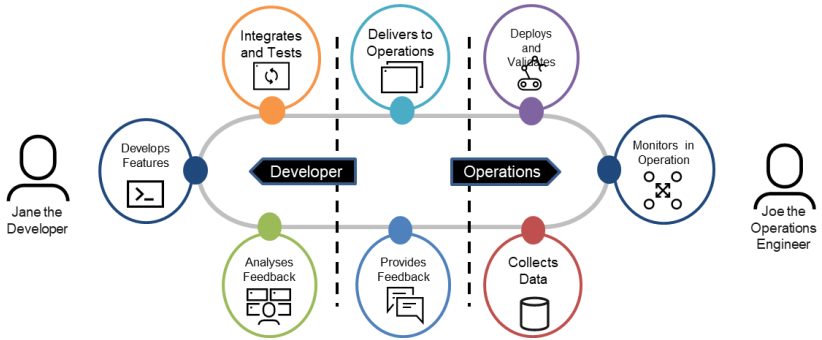
Problem statement



- Growth of automation functionality in infrastructure layer
- API extensions (e.g. with custom resources) for non-infrastructure resources
- CI/CD pipelines further add (autonomous) LCM capabilities used in DevOps
- Overlap with existing management components
- How to leverage CI/CD pipeline capabilities and integration to Kubernetes?

DevOps Concepts



- DevOps brings software development (Dev) and operations (Ops) together. It aims to shorten the systems development life cycle and provide continuous delivery with high software quality.
- **Continuous Integration**: software developers are merging changes back to the main branch as often as possible.
  - This can also apply to integration of new/updated features in the network.
- **Continuous Delivery**: automatic deployment of all code changes to a testing and/or production environment.
- **Continuous Deployment**: every software update, which successfully passes through all stages of the development cycle, is released to customers.
- **Pipelines** are used to automate the processes of software delivery including continuous integration, build, test, continuous delivery and continuous deployment.

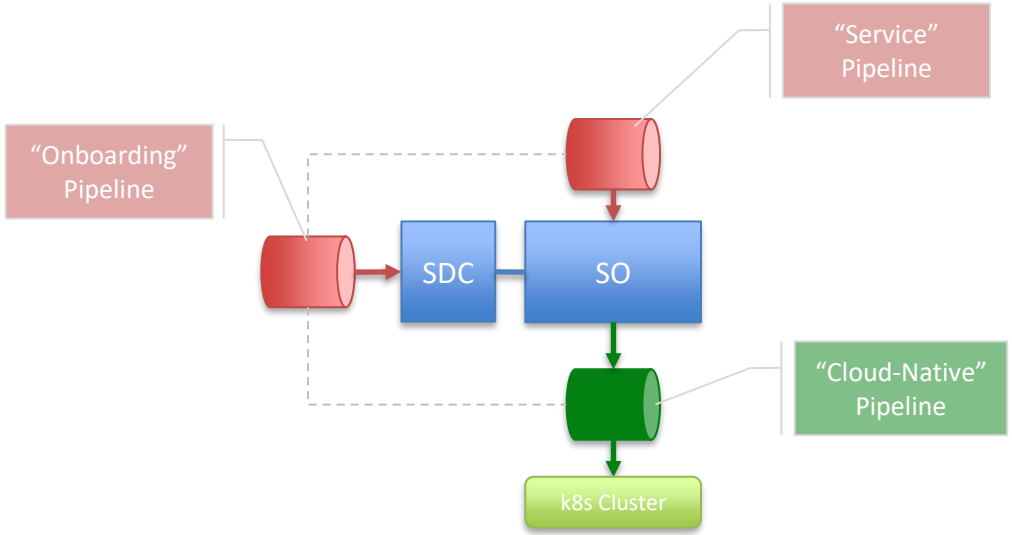
Per Microservice LCM

- Continuous deployment of small, frequent software updates into production systems is widespread in the software industry
- As CSPs transition to a DevOps way of working, they have a growing expectation that this capability should be supported by their suppliers of xNFs, IT applications, and management / orchestration systems
- Performing LCM on the level of VNFs and CNFs has served the industry well, but LCM needs to be performed on a more-fine grained level in the near future to make it feasible to deploy frequent software updates with minimum impact to existing services
- It is thus proposed to introduce a Cloud Native Pipeline at the lowest level of the orchestration system to:
  - Continually onboard new/updated software, on the level of individual microservices or groups of microservices, and other content provided by vendors – for example policies, descriptors, …
  - Automatically perform canary test and upgrade of already deployed microservices, subject to policy control
  - Inform the orchestrator of new/updated content that it cannot handle by itself
  - Execute on software LCM requests from higher layers of the orchestration system

Continuous Delivery Foundation

- "The Continuous Delivery Foundation (CDF) serves as the vendor-neutral home of many of the fastest-growing projects for continuous integration/continuous delivery (CI/CD)"
  - Founded in March 2019 and hosted by Linux Foundation
  - Members include Google, Netflix, IBM, JFrog, Salesforce, CircleCI, CloudBees, …
  - Industries represented include software, CI/CD, cloud, telecoms, …
  - Hosts open-source projects such as Jenkins, Jenkins X, Spinnaker, Tekton, …
  - Hosts working/special interest groups
- Interoperability SIG (Special Interest Group) has been established to:
  - Facilitate collaboration between developers, users + vendors of CI/CD tools
  - Promote native interoperability between tools from different open-source projects and vendors
  - Current topics under discussion include events in CI/CD, standardized metadata, policy driven CI/CD
  - With respect to the proposal in this presentation to include a CI/CD pipeline(s) as part of the ONAP architecture, interoperability between pipelines and tools from different vendors and open-source projects is vital

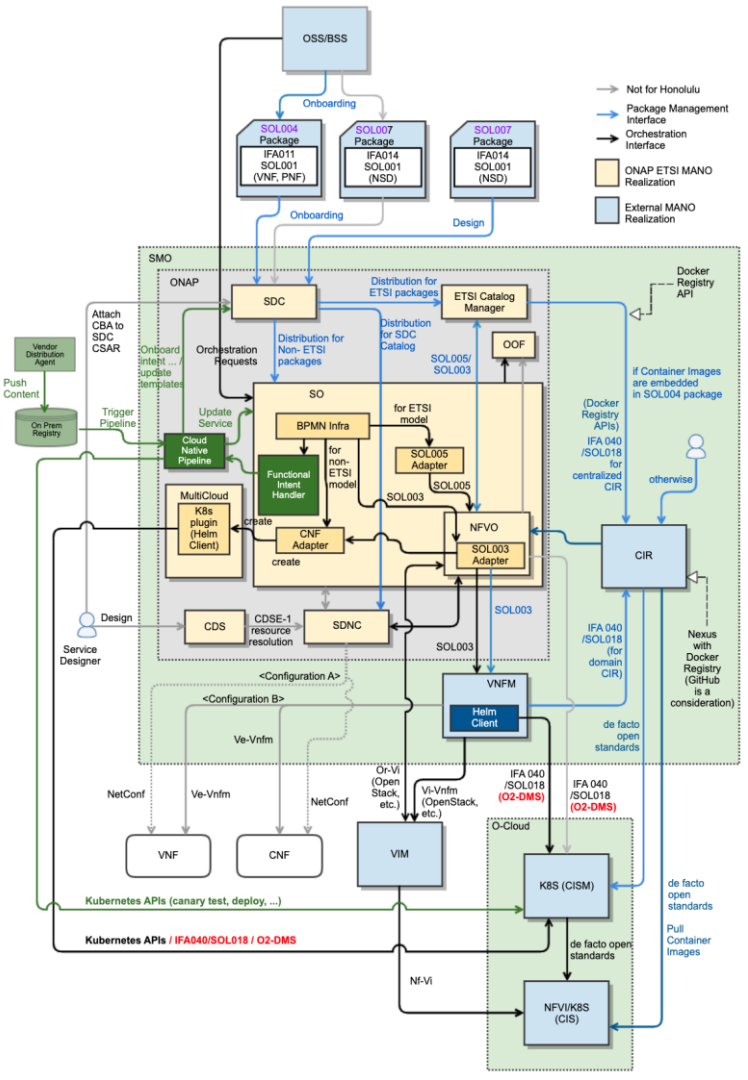
Pipelines in the architecture
(logical view)



- Pipelines can have different roles in operations
  - "Onboarding" Pipeline
    - Link to vendor SW delivery
    - Can include pre-checks before onboarding into SDC
    - Uses ONAP onboarding API
  - "Service" Pipeline
    - Implements flows across several network function
    - Uses ONAP NBI
  - "Cloud-Native" Pipeline
    - Implements LCM procedures for any workload on k8s
    - Uses k8s API
    - Controlled / policed by ONAP
    - Can act autonomous (independent of SO) on "minor" software changes
- Not all roles have to be fulfilled at the same time
- Not all pipelines have to use the same pipeline tools
- Pipelines in different roles may interact

ONAP Architecture Impacts

- External:
  - Vendor distribution agent pushes content to On Prem Registry
  - This triggers the Cloud Native Pipeline to do something
- New: Cloud Native Pipeline
  - For new/updated content Pipeline can query Policy Framework when content is on-boarded
  - If allowed by policy control, Pipeline will:
    - Initiate canary test / microservice upgrade on k8s
    - Query/update A&AI SW inventory
    - Use analytics from DCAE to evaluate canary test results
  - Otherwise, Pipeline will:
    - Onboard content to SDC
    - Request SO to update services with new templates, subject to policy control
  - Pipeline will also respond to SW LCM requests from upper layers
- Update: SO has new FIH (Functional Intent Handler)
  - Supports LCM of intent driven abstraction of functions provided by microservices
  - Requests Pipeline to perform SW LCM actions



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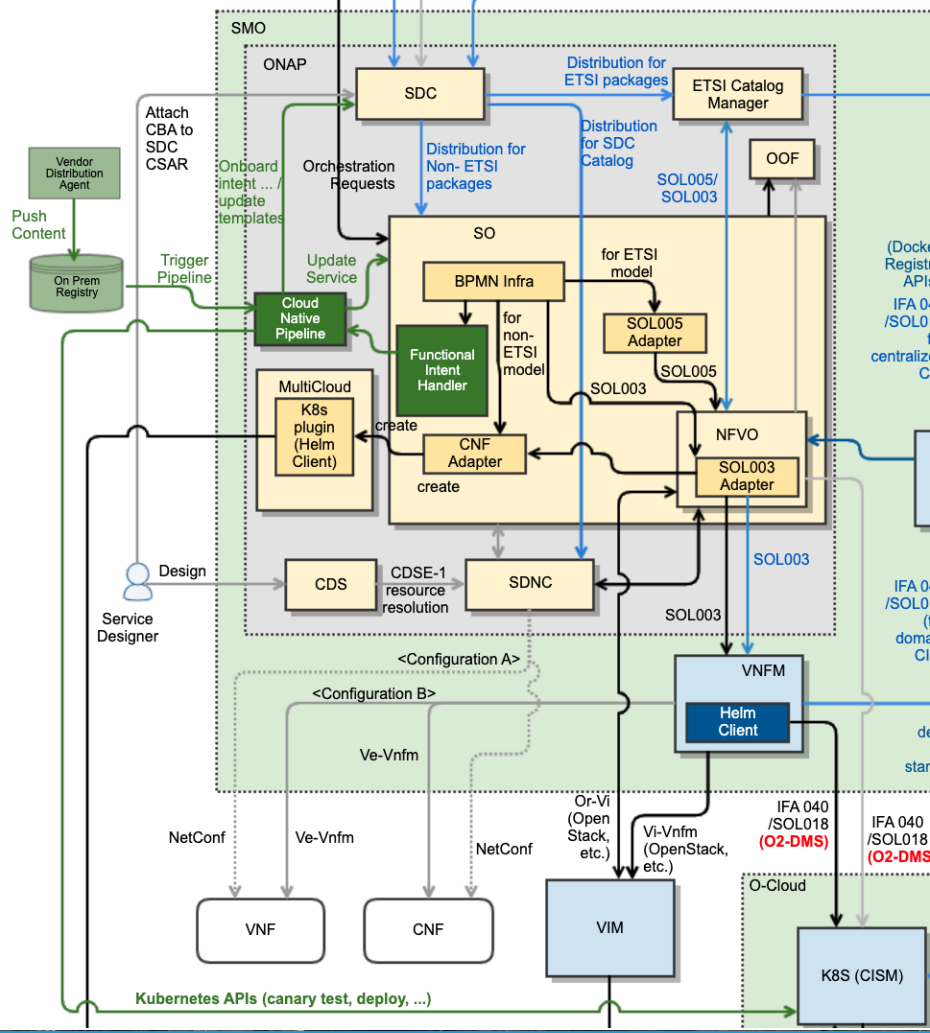

Feedback + Proposed Next Steps

- ONAP + SO architecture discussion
- Align with proposal for pipeline on VNF/CNF level
- Explore options for pipeline technology
  - Pure cloud native – e.g. Argo
  - More generic – e.g. Spinnaker
- PoC of pipeline integration
- Alignment with relevant standards
- Propose to focus on “Helm / K8S” APIs as the integration point


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