



# ONAP Multi-Architecture Support Challenges

## Migrating to Docker Hub

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# Supporting Background Information

# Principle of the ONAP Technical Charter

**"ONAP will include product / service / resource agnostic platform modules for lifecycle management (from definition, deployment, monitor / manage to retirement) of cloud centric, software controlled network functions."**

Section 1b above can be found in both the original and revised LFN series charters.

It is unchanged since originally being adopted and placed into effect on March 9, 2017.

<https://www.onap.org/wp-content/uploads/sites/20/2018/01/ONAP-Project-a-Series-of-LF-Projects-LLC-Technical-Charter-12-22-2017-FINAL.pdf>

# ONAP Architecture Principles

ONAP Architecture Principles include:

## **ONAP Scope**

**Vendor & Service Agnostic:** ONAP Platform must be VNF, Resources, Products, and Service agnostic. Each service provider or integrator that uses ONAP can manage their specific environment (Resources, VNFs, Products, and services) by creating necessary metadata / artifacts using Design Studio to support their needs / environment.

## **ONAP Deployment / resiliency / scalability Support**

**Cloud Environment Support:** All components in ONAP should be virtualized, preferably with support for both virtual machines and containers. All components should be software-based with no requirement on a specific hardware platform.

**Availability & Resiliency:** ONAP must support various deployment and configuration options to meet varying availability and resiliency needs of various service providers.

See <https://wiki.onap.org/display/DW/Architecture+Principles>

# ONAP Platform Maturity Requirements (S3P)

ONAP S3P (Stability, Security, Scalability, Performance) requirements include:

## Manageability

### Level 1:

- All ONAP components will use a single logging system.
- Instantiation of a simple ONAP system should be accomplished in <1 hour with a **minimal footprint**

### Level 2:

- A component can be independently upgraded (for bug fixes only) without impacting the operation of interacting components
- Component configuration to be externalized in a common fashion across ONAP projects
- All application logging to adhere to ONAP Application Logging Specification v1.2
- **Implement guidelines for a minimal container footprint**

### Level 3:

- Transaction tracing across components

Starting with the ONAP Dublin Release, all projects required to meet a **minimum Level 2**.

Footprint minimization considered a Must Have for Dublin

The footprint minimization effort is introducing multi-arch support base images.

Multi-arch support proposal was vetted by ARCH in Casablanca release timeframe

See <https://wiki.onap.org/display/DW/Manageability>

# Container Images - Best Practices & Tools (CIA)

## ONAP Container Optimization (CIA) project goals:

This project will deliver re-usable artifacts & tooling to help ONAP projects simplify the development of vendor-agnostic container images using build templates that implement industry best practices.

- Enable Multi-Architecture support while reducing the container image footprint.
- Recommends using Alpine base images

### **Scalability**

- Resource-constrained images (small & fast) improve horizontal scalability of ONAP deployments

### **Manageability**

- Efficient, small images reduce transport, deployment, upgrade and recovery time

### **Usability**

- Re-usable templates & reusable base images
- Multi-platform images offer operators more deployment options

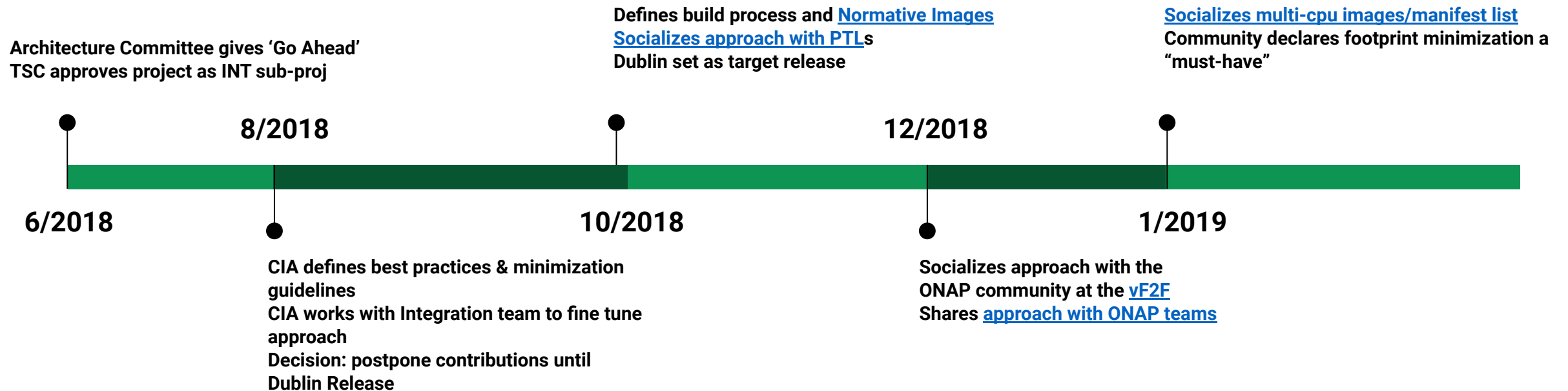
### **Deployability**

- With platform-agnostic images, operators and VNF vendors may choose among a variety of hardware/server providers with different OS and CPU architectures

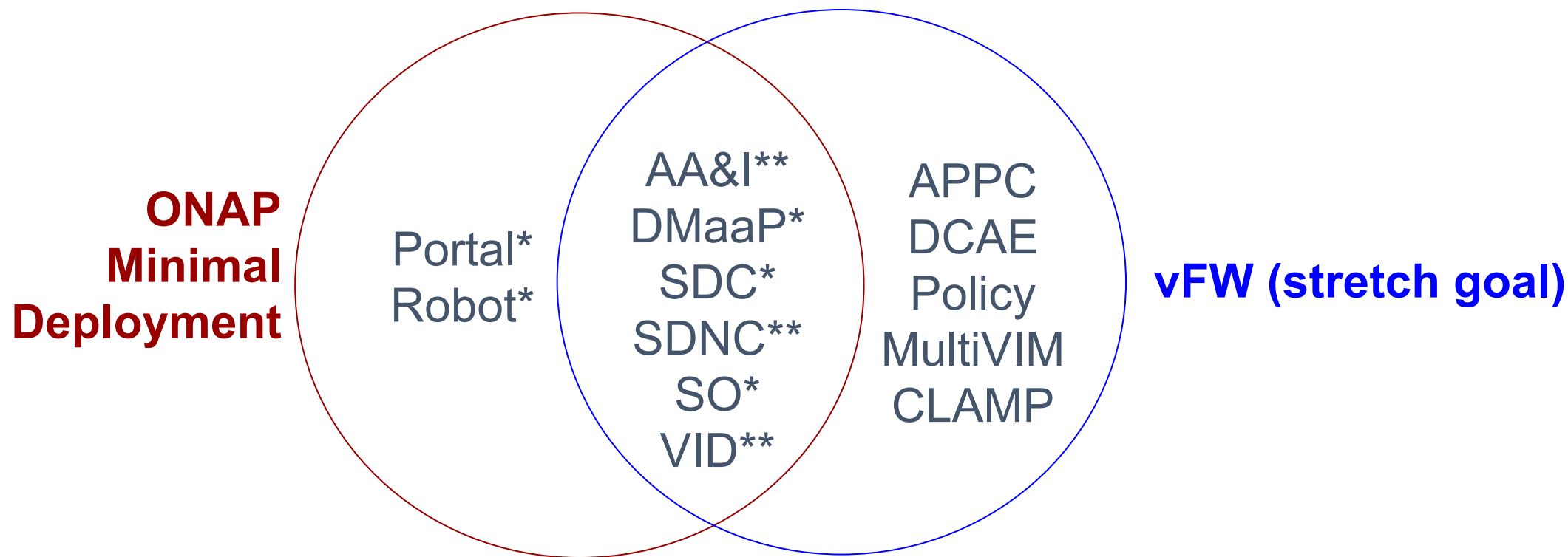
See <https://wiki.onap.org/pages/viewpage.action?pageId=34375682>

Project being led by ARM

# Container Optimization Timeline



# CIA Dublin Scope



vFW Source: <https://wiki.onap.org/pages/viewpage.action?pageId=3246170>



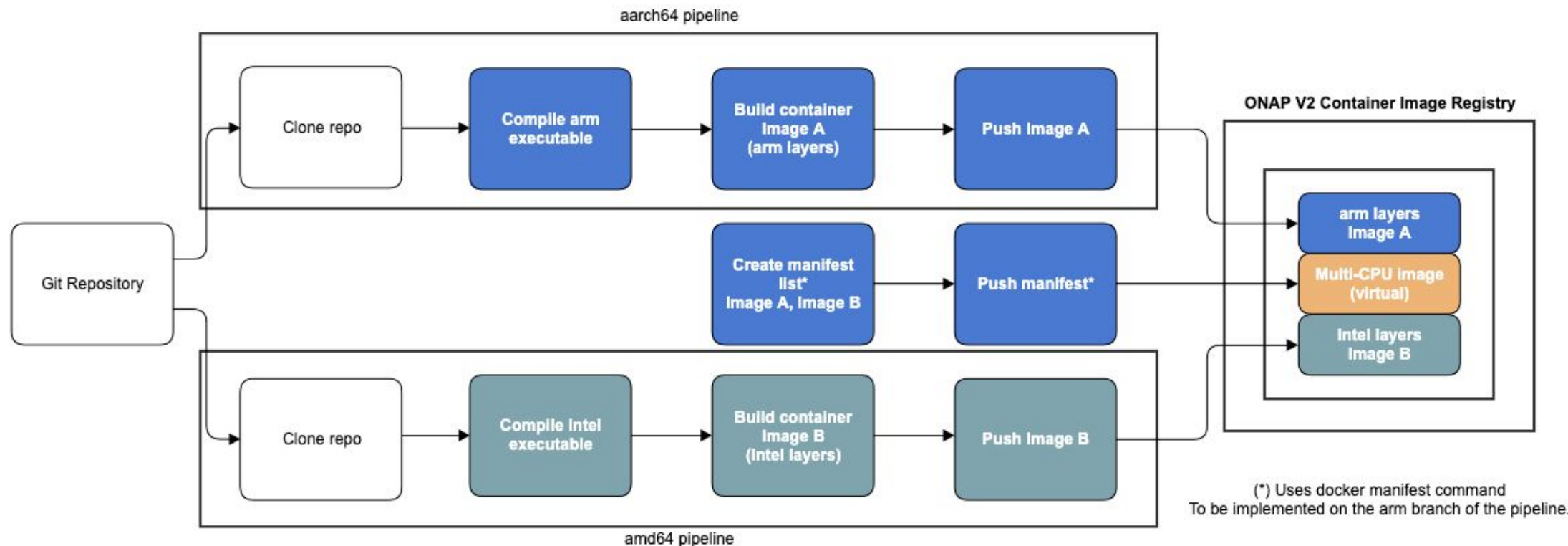


# Problem Statement & Solution Proposal

# Multi-Arch Support: Parallel CI/CD Pipeline

The following blocking issue was raised to LF Help Desk Jan 17:

- ONAP Nexus3 registry doesn't support manifest lists (Image Manifest v2)
- Current ONAP Nexus3 registry does not support manifest lists
- Ticket #67224
- **ARM resources have been working toward a CI/CD pipeline that supports multi-cpu with no resolution**



# LF Infrastructure Upgrade Challenges

## LF Infrastructure Team Priority:

1. [CIMAN-234](#): Nexus2 - Migrate to Global-jjb gerrit-maven-stage job (opened 1/29/19)
2. [CIMAN-229](#): Multi-cpu docker build jobs (opened 1/4/19)
3. [CIMAN-239](#): Nexus3 - Migrate teams to start deploying images in DockerHub (opened 2/13/19)

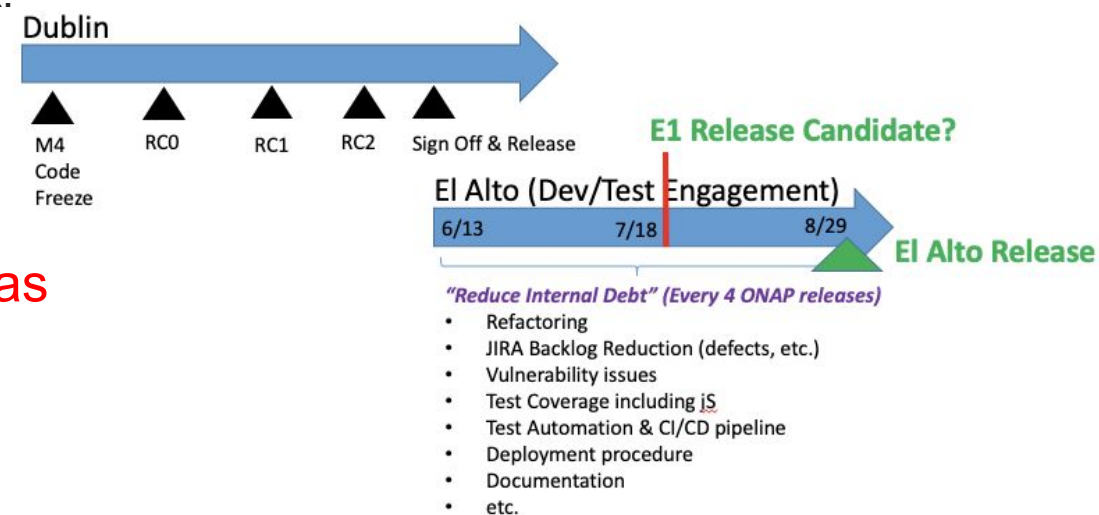
The goal for the Dublin timeframe was to use Nexus 3 with the necessary changes requested by the ARM team. This effort was abandoned as not possible after parallel efforts to make it work.

ONAP El Alto proposed release includes a shorter technical debt release

Request is to include Docker Hub Migration in El Alto as part of the “Test Automation & CI/CD Pipeline and Deployment procedure”

See

[https://wiki.onap.org/display/DW/TSC+2019-04-18?preview=/60889264/63996004/2019-04-18%20ONAP%20Cadence%20Release\\_V5.pptx](https://wiki.onap.org/display/DW/TSC+2019-04-18?preview=/60889264/63996004/2019-04-18%20ONAP%20Cadence%20Release_V5.pptx)



# So what's the problem with Nexus docker registry?

- Nexus3 docker registry implementation does not allow the creation of manifest-list (multiarch images)
  - <https://issues.sonatype.org/browse/NEXUS-18546>
- Nexus3 docker caching registry does not allow to pull and cache a multiarch docker image (caches only the x86\_64 image).

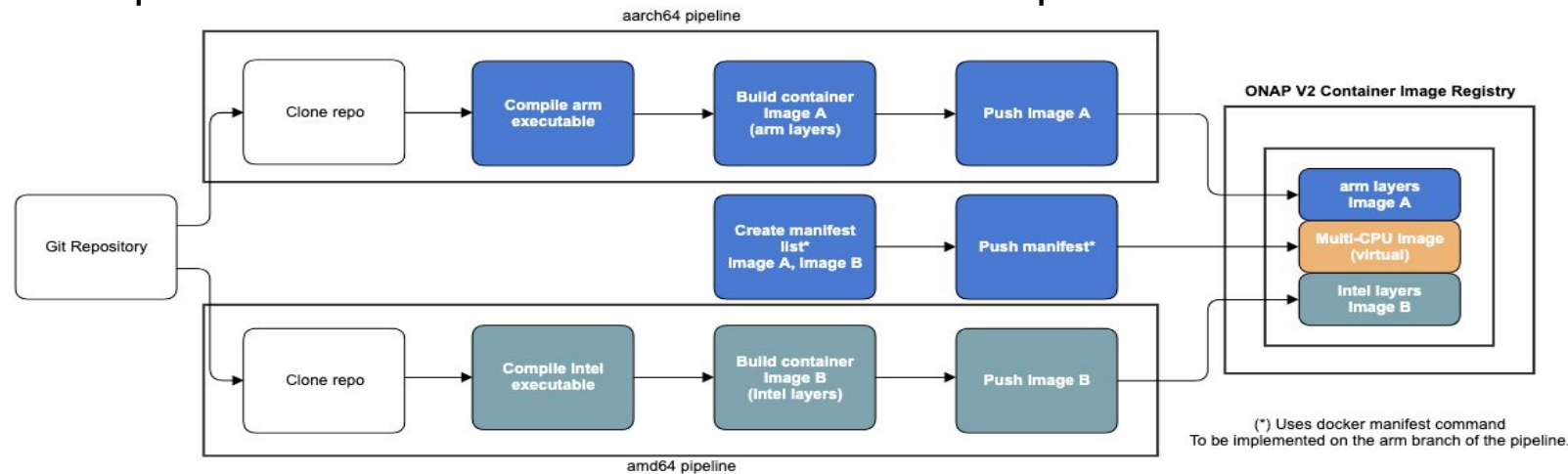
# Docker Trusted Registry

This storage solution is available but currently out of the picture as a possible solution:

- Additional cost for ONAP which hasn't been proposed yet
  - Will need additional planning and analysis to provide the exact numbers
- Extra cost for running operations to support it
- Availability of resources from the Infrastructure team will need to be acquired
- Requires about 6+ weeks for implementation if approved

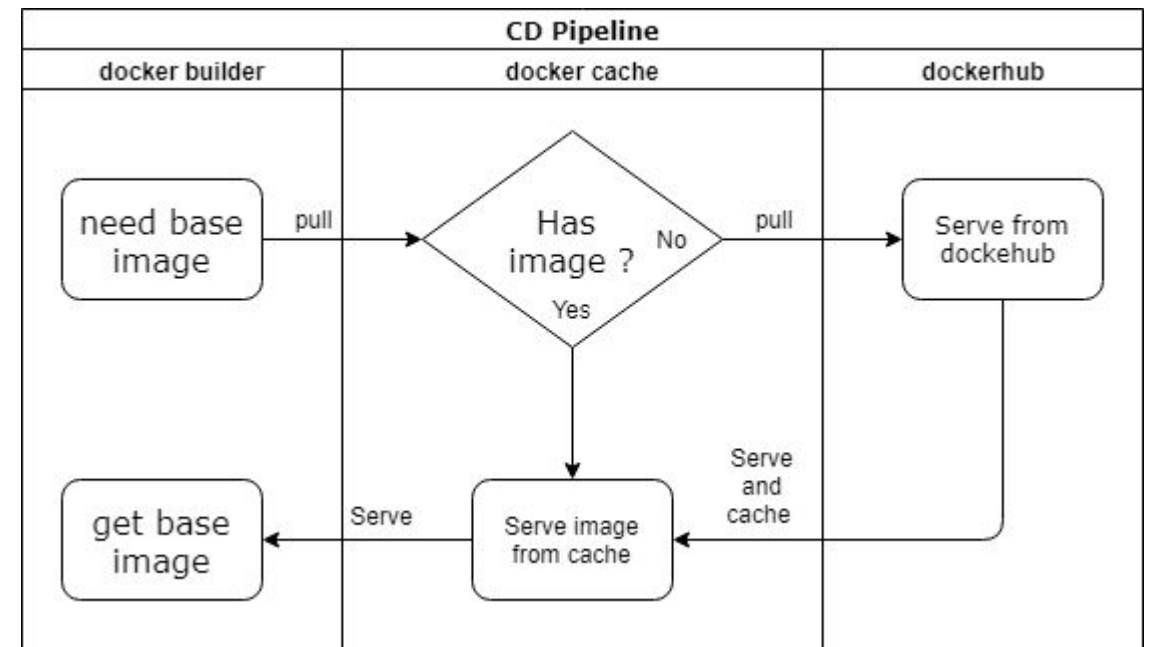
# ONAP Teams Tasks to Multi-arch CI/CD Pipeline

1. ONAP teams to provide a component dependency chart to plan for an effective migration.
2. Tagging convention is still not consistent across components. Requires a fixing by tech teams.
3. Create additional jobs for building each container on new arch e.g. arm64 (under works to support it)
4. Projects to migrate to global-jjb docker jobs.
5. Switching from Nexus3 docker registries to Docker Hub.
6. Rename all docker images to contain a suffix (a reference to arch of the image) to have different names for each architecture.
7. Create an additional job for building the manifest list (multi-arch image) out of the existent arch specific images e.g. aarch64 and amd64.
  - a. This step will require additional research as it is still a concept LF has not worked on before.



# Performance Concerns using Docker Hub

- Since Docker Hub registry is not in the proximity of the build infra, one could have concerns regarding bandwidth and performance for the docker build / push jobs.
- LF has given assurances that if such an issue arises they will provide docker images caching in the proximity of the build infrastructure.



# Security Concerns using Docker Hub

- The recent security breach refers to a database of Docker Hub accounts whose account information have been stolen
  - [https://motherboard.vice.com/en\\_us/article/7xgbzb/docker-hub-breach-hackers-stole-private-keys-tokens](https://motherboard.vice.com/en_us/article/7xgbzb/docker-hub-breach-hackers-stole-private-keys-tokens)
- The impact of this incident is
  - Proprietary code of companies could have been hacked
    - Not applicable to ONAP as all code is open source
  - Images build with Docker autobuild system might contain injected code
    - Not applicable to ONAP as it uses its own build servers
- The conclusion is that this incident does not affect ONAP in any way, nor will possible future similar incidents



# Docker Hub Availability

- The world's leading service for finding and sharing container images with your team and the Docker community.
- Docker Hub is the world's largest repository of container images with an array of content sources including container community developers, open source projects and independent software vendors (ISV) building and distributing their code in containers.\*
- Incidents / downtime reported are related in the vast majority to their automated build system, not the registry itself.\*\*

\*<https://www.docker.com/products/docker-hub>

\*\*<https://cloudstatus.eu/status/docker>

# Nexus3 Availability/Performance Requirements

- There are no High Availability implementations for ONAP Nexus or Nexus3. They are individual services running on virtual machines in a shared cloud environment at Vexxhost.
  - [nexus3.onap.org](https://nexus3.onap.org) is running on a VM with 4x Intel Xeon 2.9GHz CPU, 15G of RAM, and 12G SSD disk.
  - [nexus.onap.org](https://nexus.onap.org) is running on a VM with 4x Intel Xeon 2.5GHz CPU, 16G of RAM, and 10G SSD disk
- LF doesn't have any Application Performance Monitoring (APM) in place for nexus3 at this time, their monitoring is strictly at the system level, system load, number of processes, disk fill, network latency, open ports, total memory usage, etc.

# Summary

ONAP Platform mandates support for any CPU architecture (e.g., Resource agnostic) to allow deployments on any hardware infrastructure

Nexus3 docker registry does not support multi-arch images

**Request is to include Docker Hub Migration in El Alto as a Non-Functional Requirement**