采用Harbor开源企业级Registry实现高效安全的镜像运维

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自我介绍

- VMware中国研发先进技术中心首席架构师、技术总监
- Harbor开源企业级容器Registry项目创始人
- Cloud Foundry中国社区最早技术布道师之一
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亨利笔记

《区块链技术指南》

《软件定义存储》

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Agenda

1. Container Image Basics
2. Project Harbor Introduction
3. Consistency of Images
4. Security
5. Image Distribution
6. High Availability of Registry

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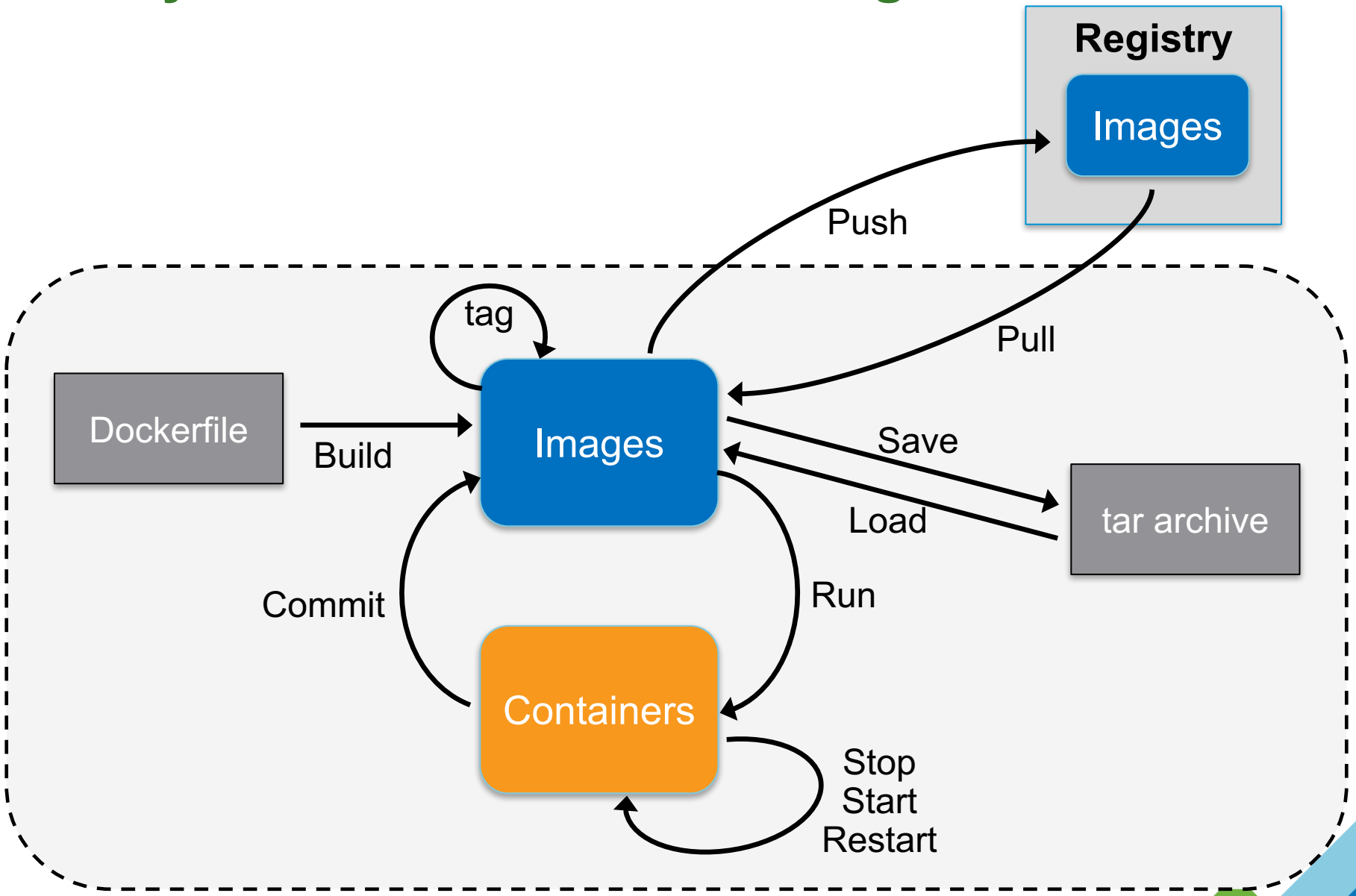
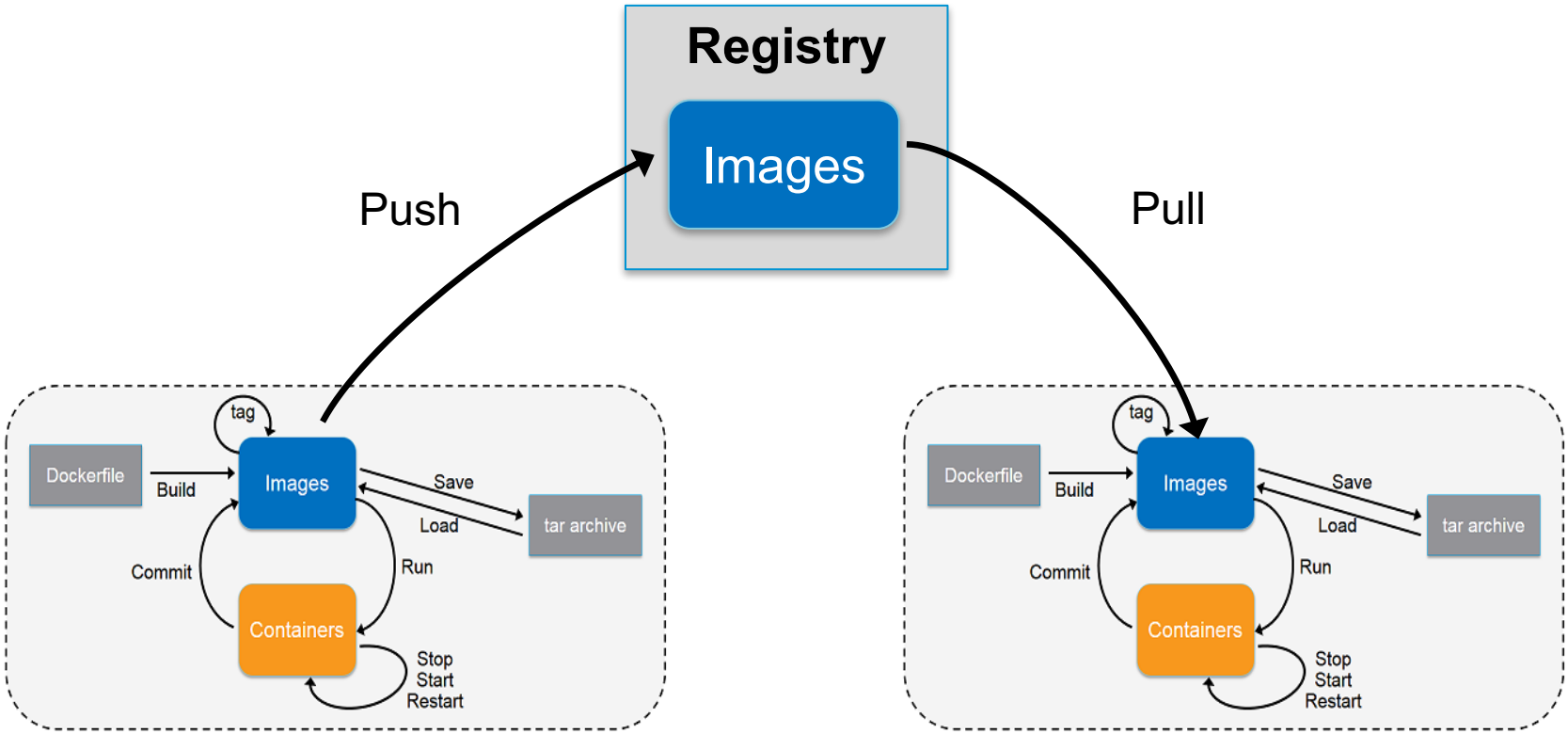
Lifecycle of Containers and Images



Registry - Key Component to Manage Images

- Repository for storing images
- Intermediary for shipping and distributing images
- Ideal for access control and other image management



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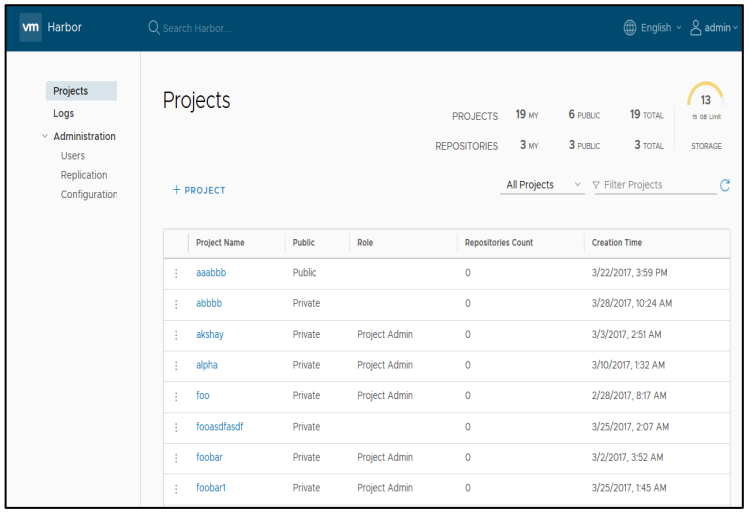
Project Harbor

- An open source enterprise-class registry server.
- Initiated by VMware China, adopted by users worldwide.
- Integrated into vSphere Integrated Containers.
- Apache 2 license.
- https://github.com/vmware/harbor/

Key Features

HARBOR™

- User management & access control
  - RBAC: admin, developer, guest
  - AD/LDAP integration
- Policy based image replication
- Vulnerability Scanning
- Notary
- Web UI
- Audit and logs
- Restful API for integration
- Lightweight and easy deployment



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Users and Developers

HARBOR™

- Users

Downloads

Stars

Users

- Developers

Forks

Contributors

Partners

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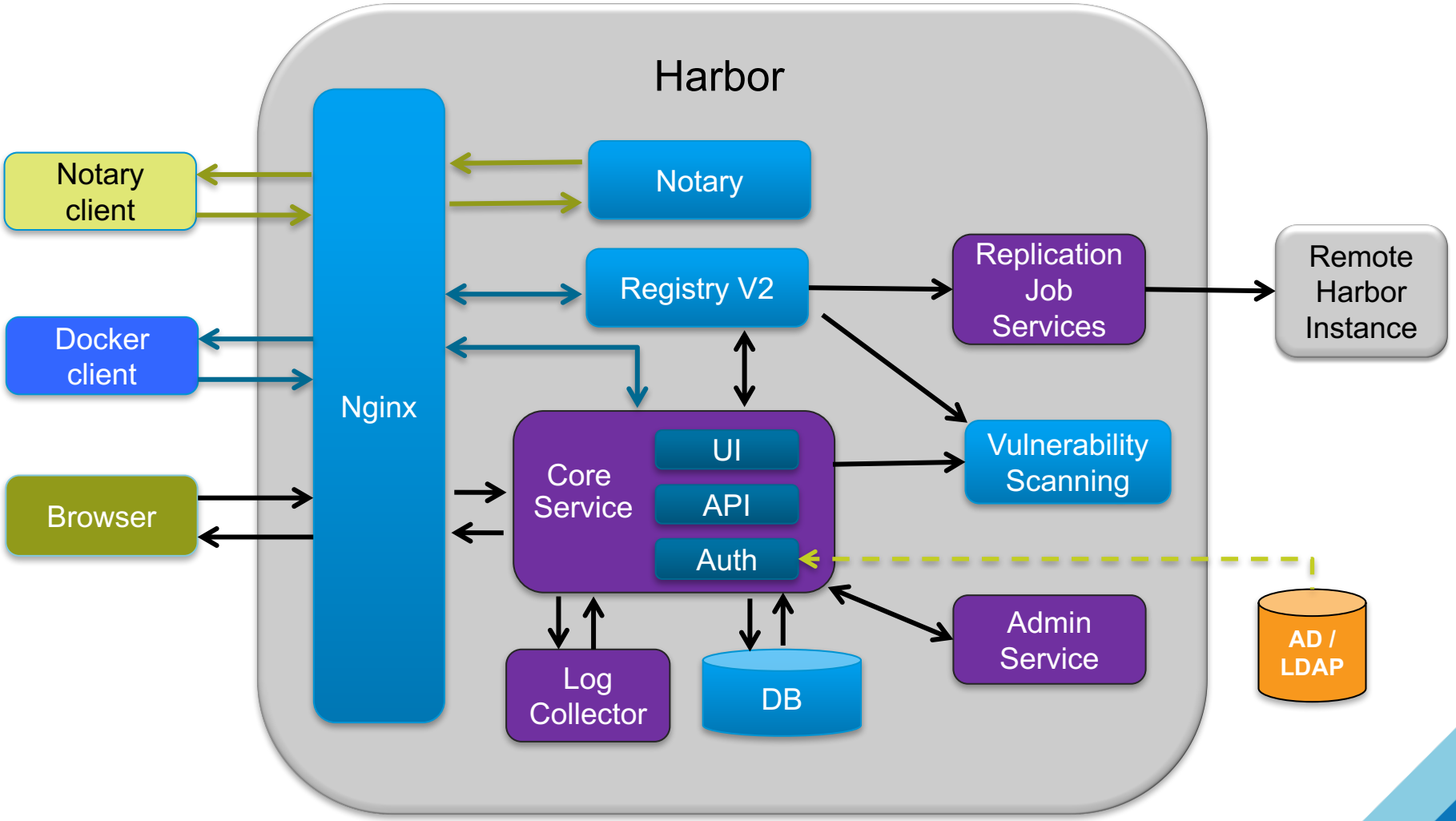
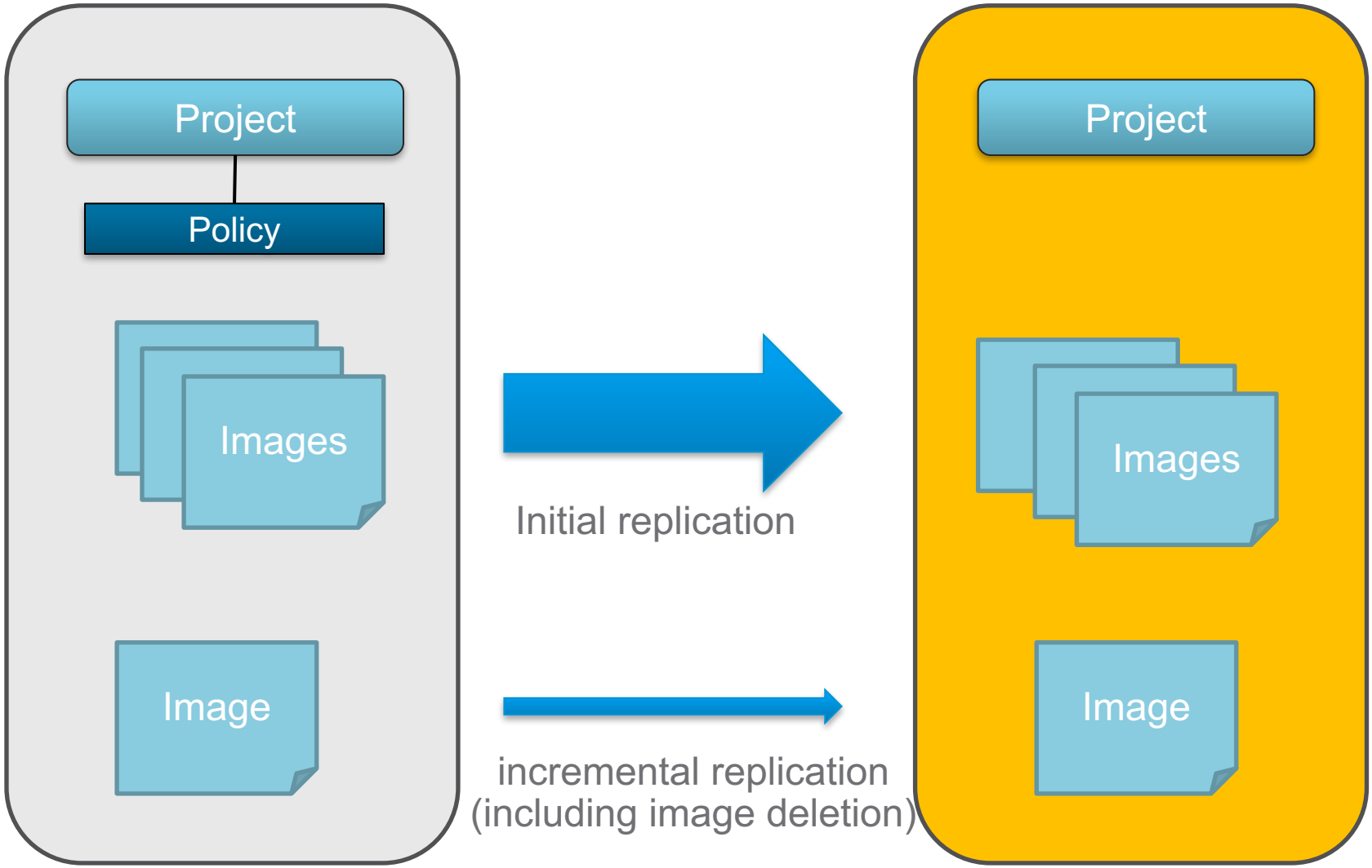
Harbor Architecture



Harbor users and partners (selected)

Image replication (synchronization)



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Consistency of Container Images

- Container images are used throughout the life cycle of software development
  - Dev
  - Test
  - Staging
  - Production
- Consistency must be maintained
  - Version control
  - Issue tracking
  - Troubleshooting
  - Auditing

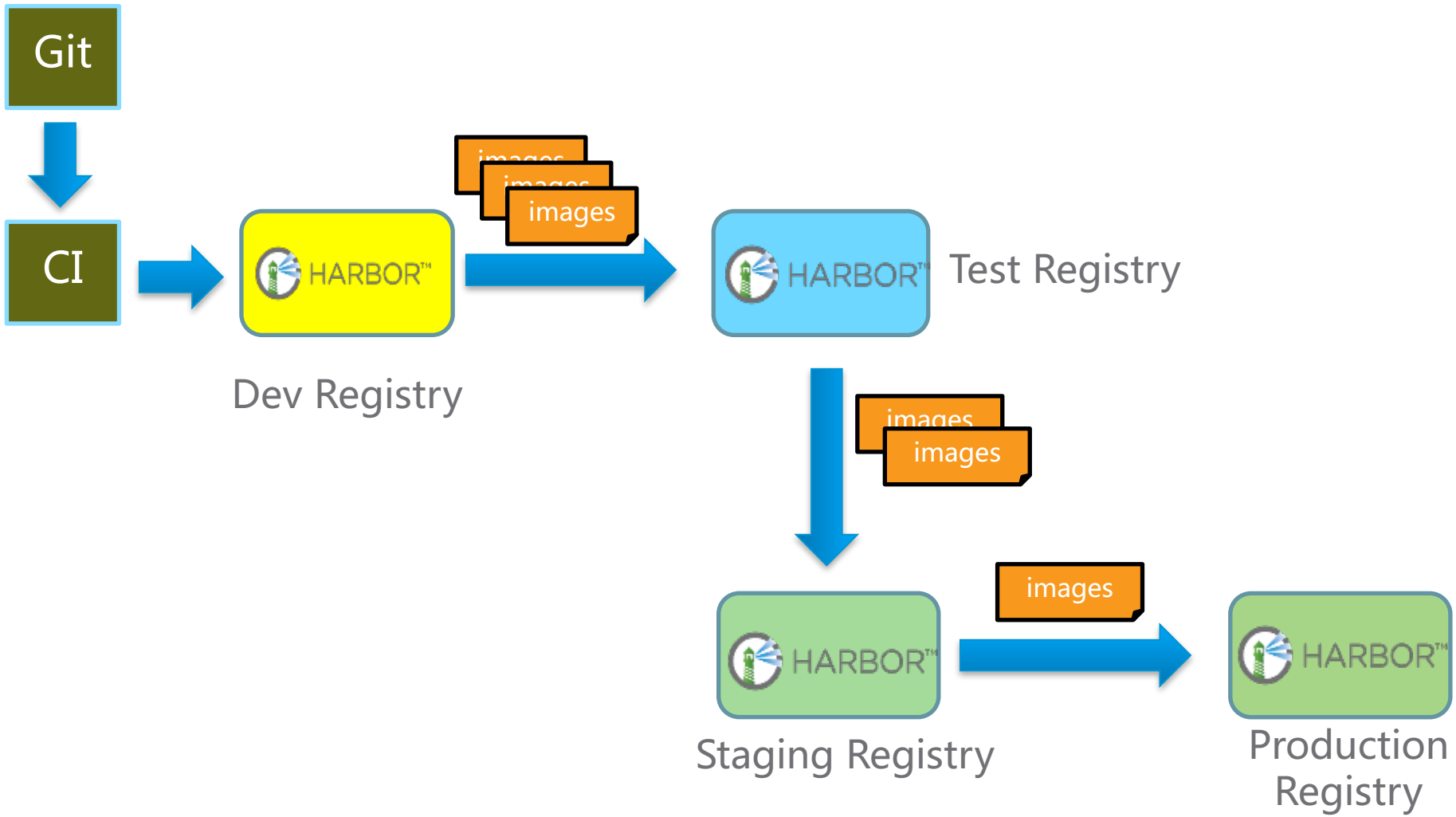
Same Dockerfile Always Builds Same Image?

Example:

```
FROM ubuntu
RUN apt-get install -y python
ADD app.jar /myapp/app.jar
```

- Base image `ubuntu:latest` could be changed between builds
- `ubuntu:14.04` could also be changed due to patching
- `apt-get` (`curl`, `wget`..) cannot guarantee always to install the same packages
- ADD depends on the build time environment to add files

Shipping Images in Binary Format for Consistency



Images are synchronized between environments by using Harbor registry.

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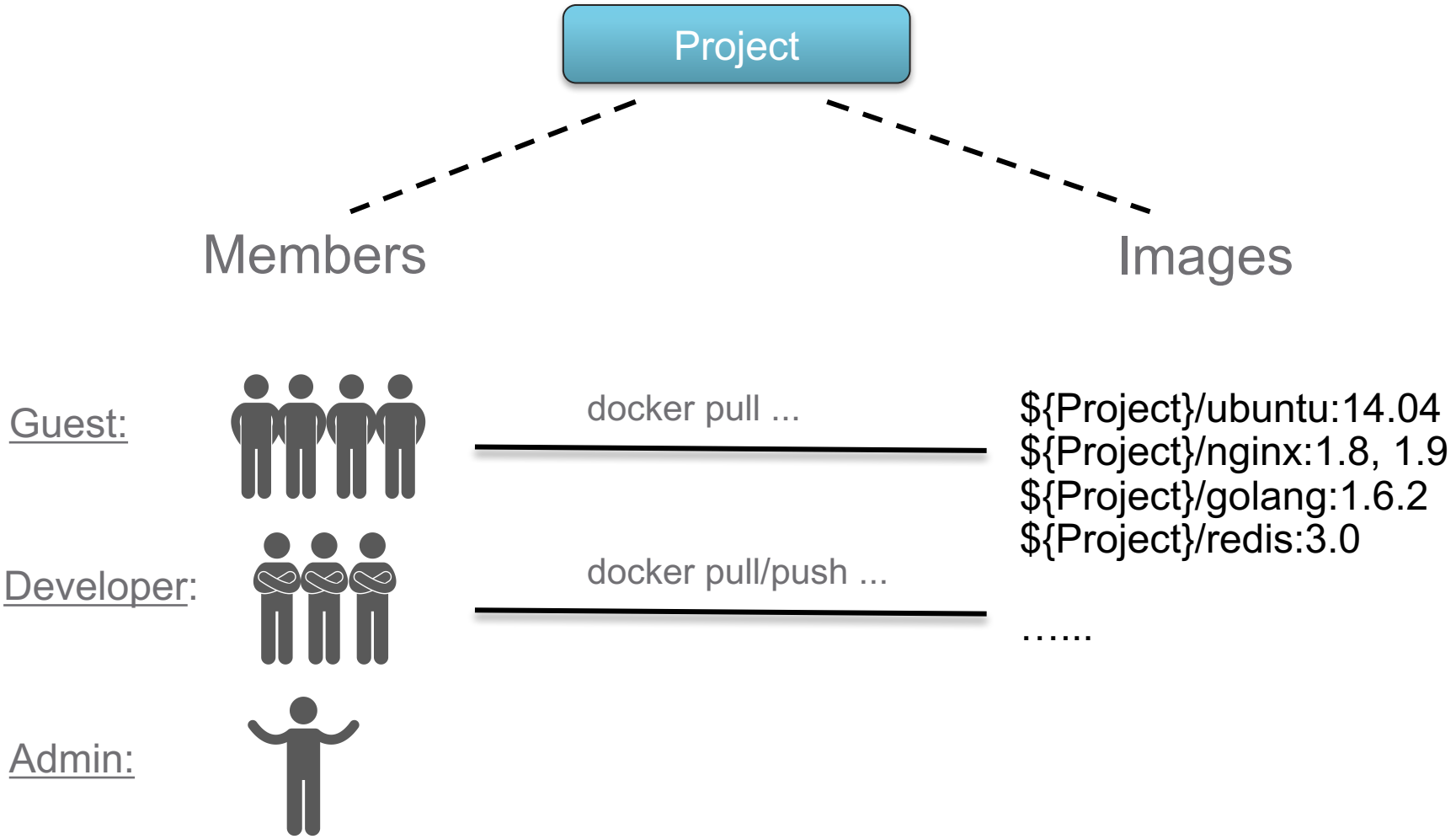
Access Control to Images

- Organizations often keep images within their own organizations
  - Intellectual property stays in organization
  - Efficiency: LAN vs WAN
- People with different roles should have different access
  - Developer – Read/Write
  - Tester – Read Only
- Different rules should be enforced in different environments
  - Dev/test env – many people can access
  - Production – a limited number of people can access
- Can be integrated with internal user management system
  - LDAP/Active Directory

Example: Role Based Access Control in Harbor

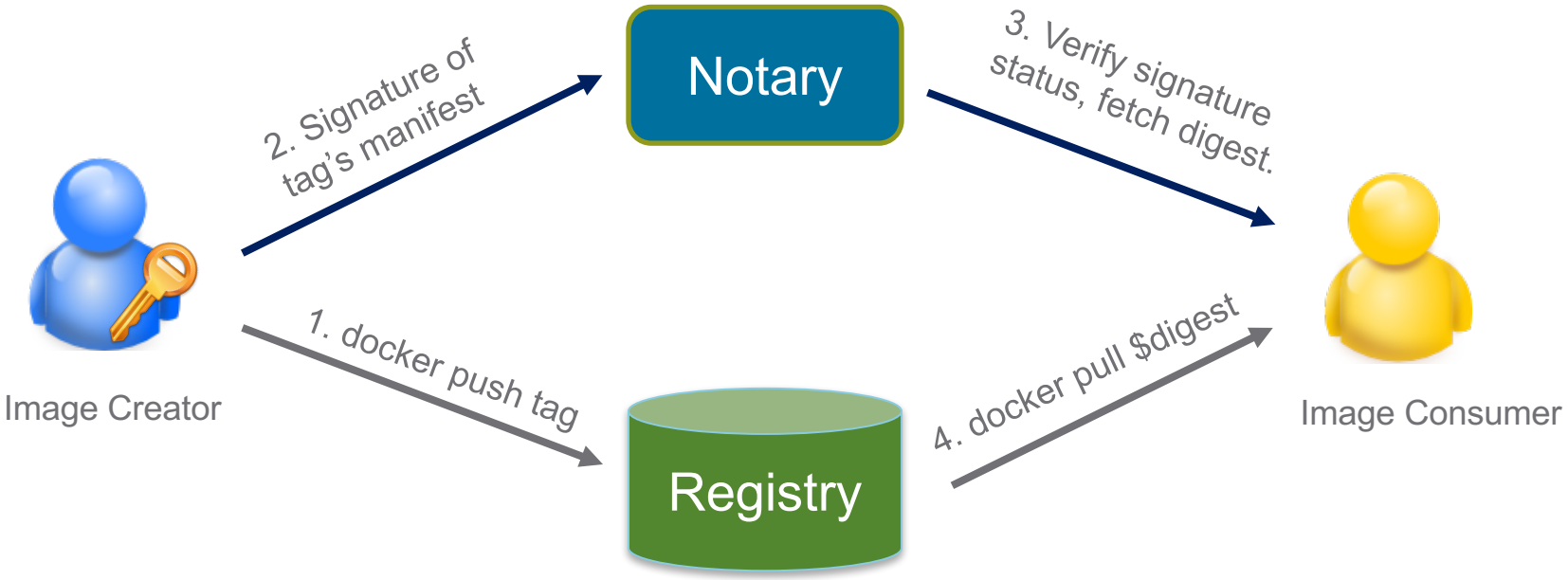


Other security considerations

- Enable content trust by installing Notary service
  - Image is signed by publisher's private key during pushing
  - Image is pulled using digest

- Perform vulnerability scanning
  - Prevent images with vulnerabilities from being pulled
  - Regular scanning based on updated vulnerability database

Content trust for image provenance



Vulnerability Scanning

- **Static analysis** of vulnerability by inspecting filesystem of container image and indexing features in database.
- **Rescanning** is needed only and only if new detectors are added.
- Update vulnerability data regularly
  - Debian Security Bug Tracker
  - Ubuntu CVE Tracker
  - Red Hat Security Data
  - Oracle Linux Security Data
  - Alpine SecDB

Registry – Image Vulnerability Scanning

Vulnerability scanning

- **Set vulnerability threshold**
- **Prevent images from being pulled** if they exceed threshold
- **Periodic scanning** based on updated vulnerability database

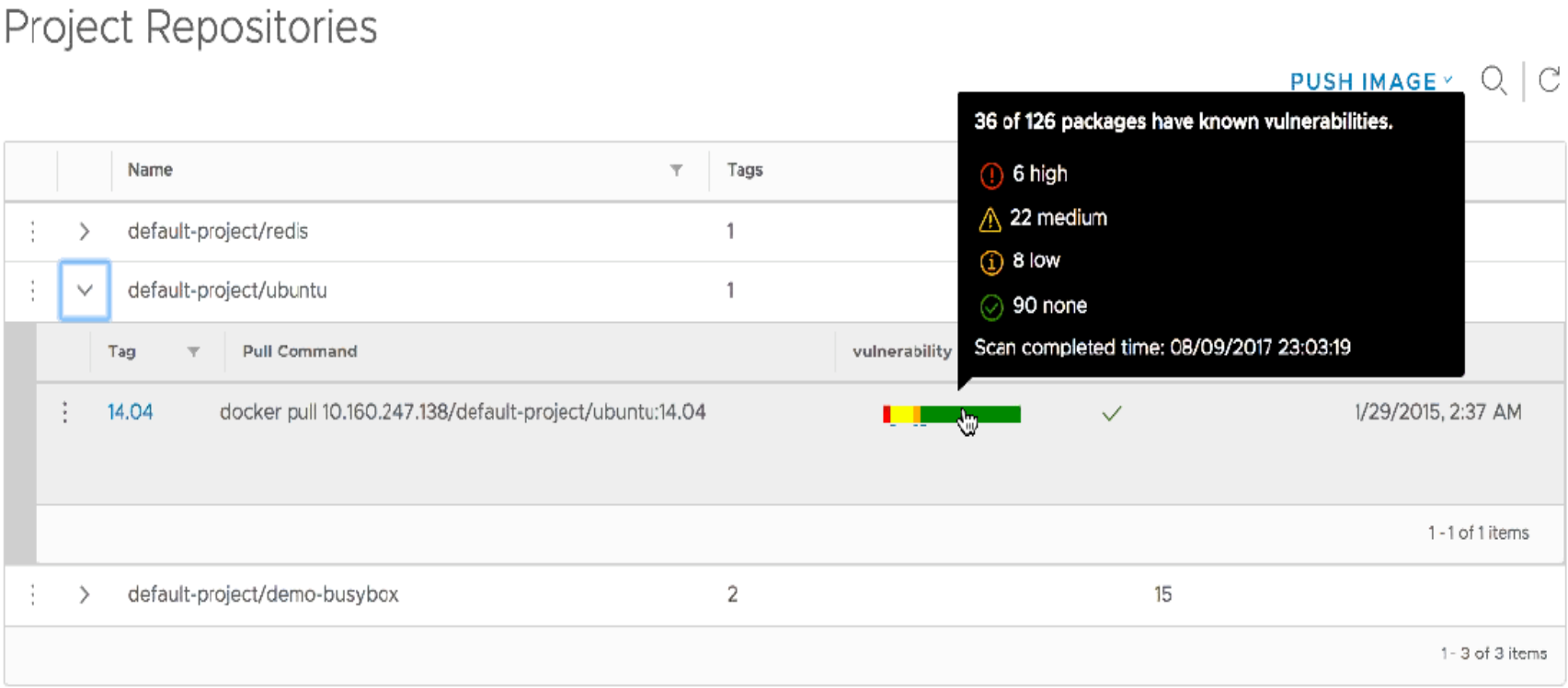


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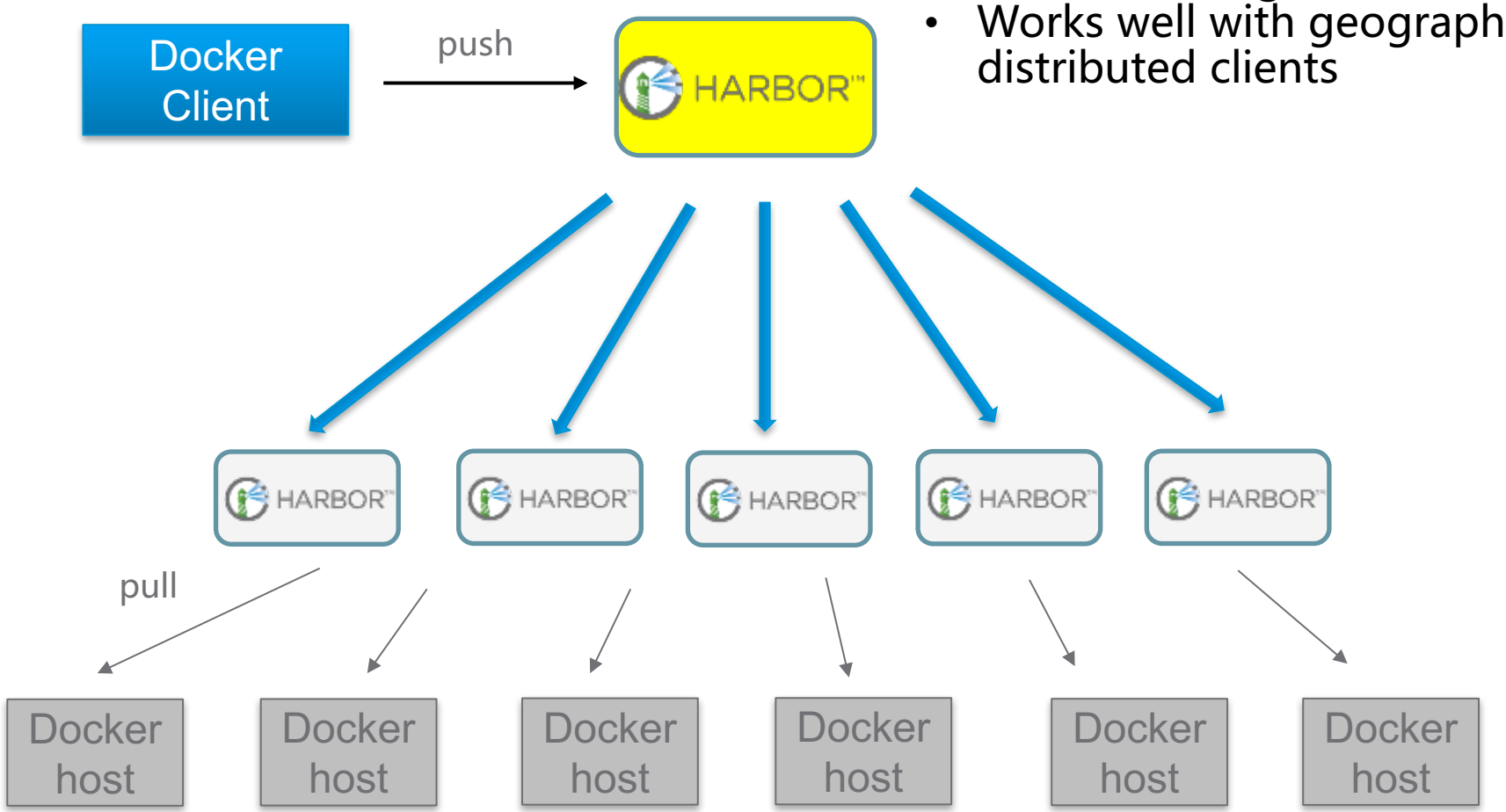
Image Distribution

- Container images are usually distributed from a registry.
- Registry becomes the bottleneck for a large cluster of nodes
  - I/O
  - Network
- Scaling out an registry server
  - Multiple instances of registry sharing same storage
  - Multiple instances of independent registry sharing no storage

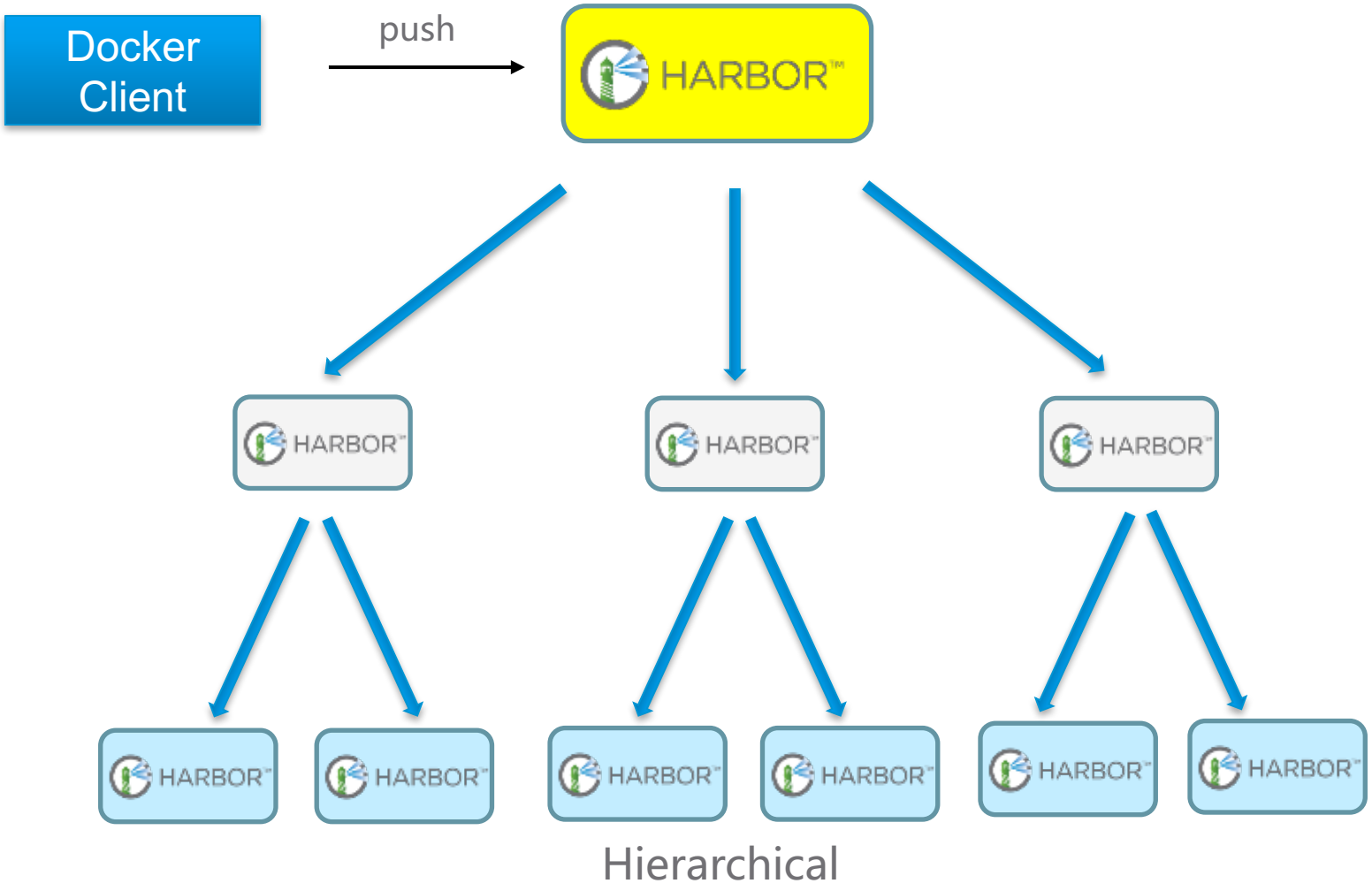
Image Distribution via Master-Slave Replication

- Load balancing
- Works well with geographically distributed clients



Master – Slave model

Hierarchical Image Distribution



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High Availability of Registry

- To remove single point of failure on registry
- Three models to achieve HA
  - Shared storage
  - Replication (no shared storage)
  - Using other HA platform

Registries using Shared Storage

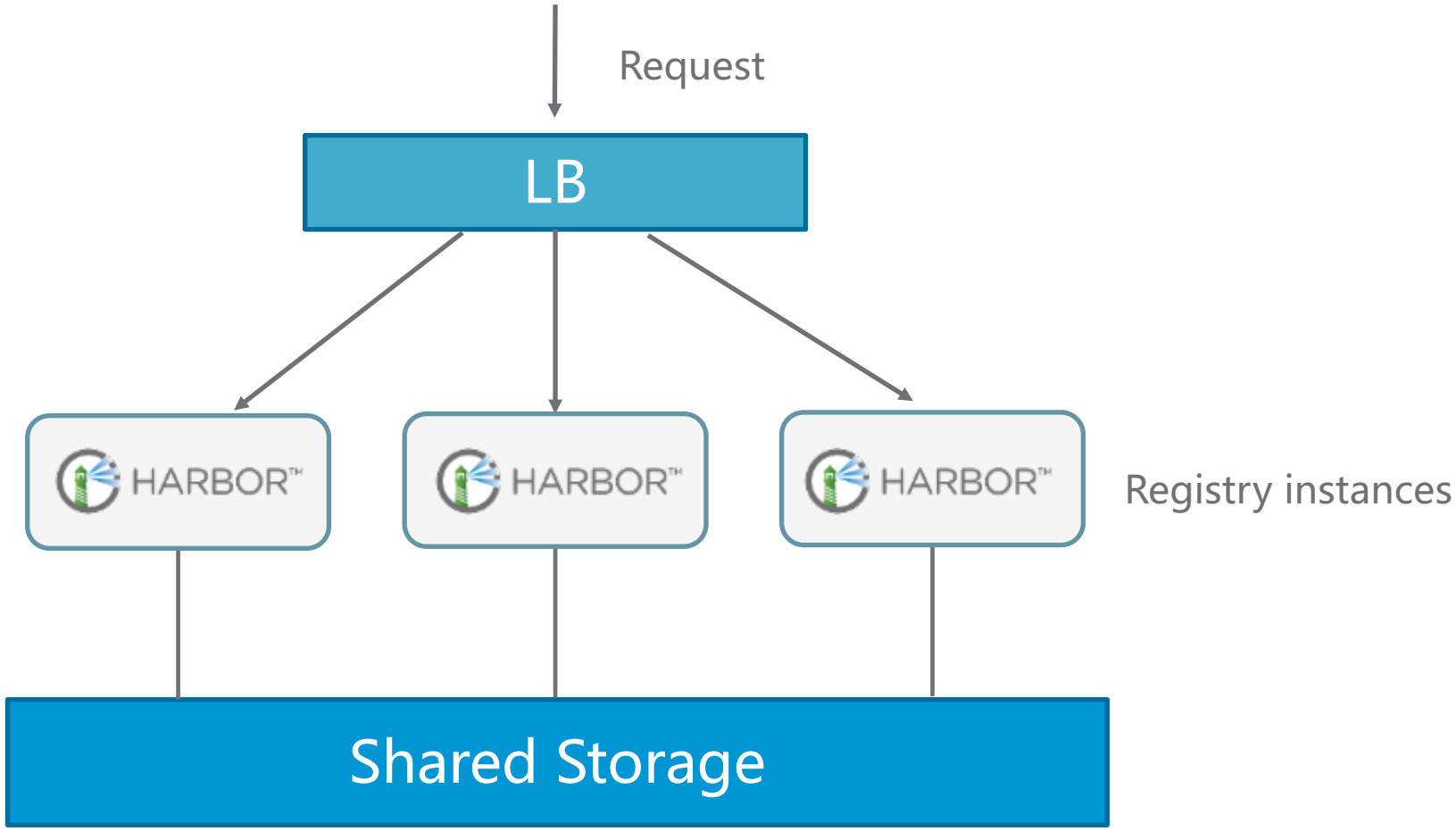

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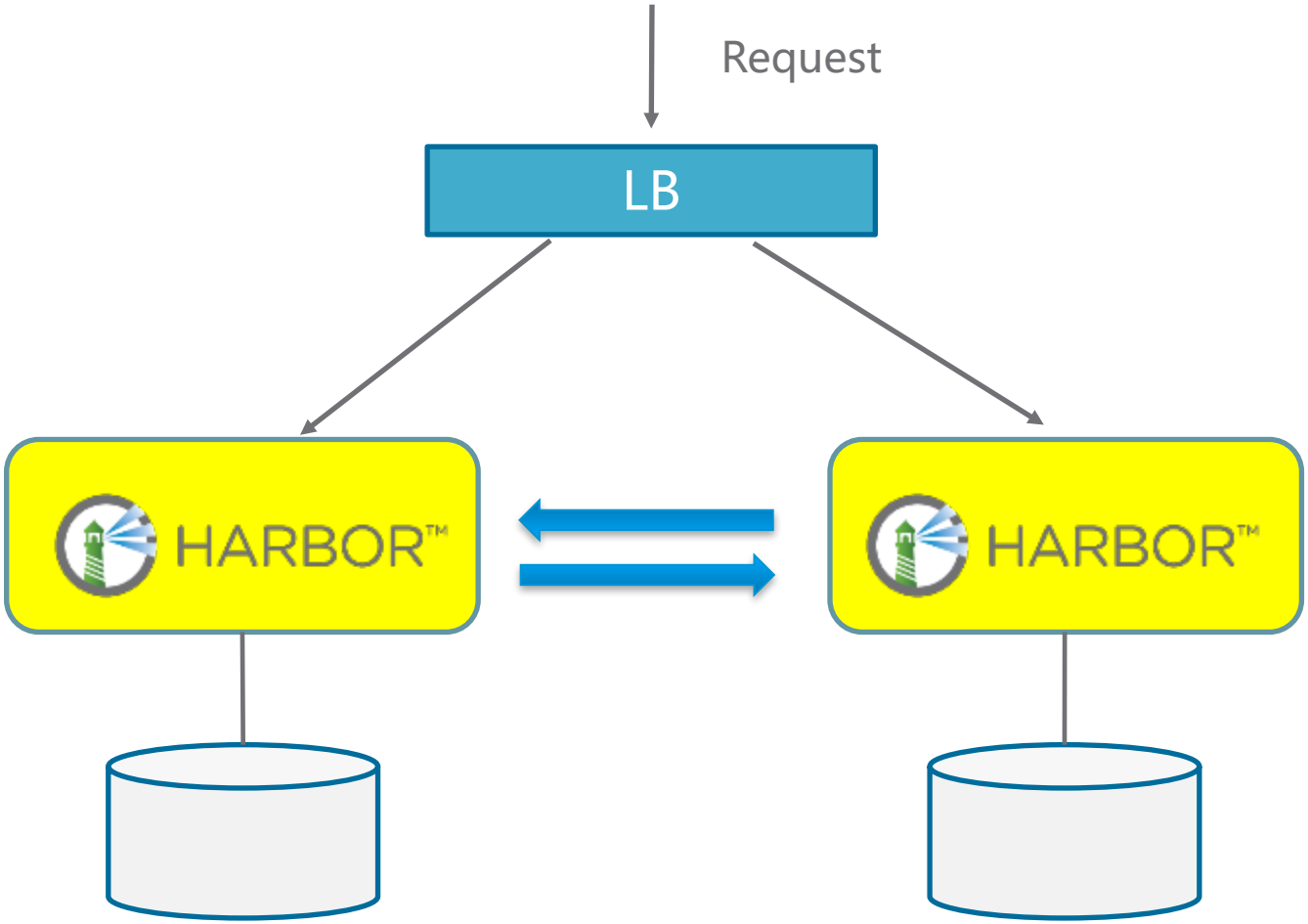
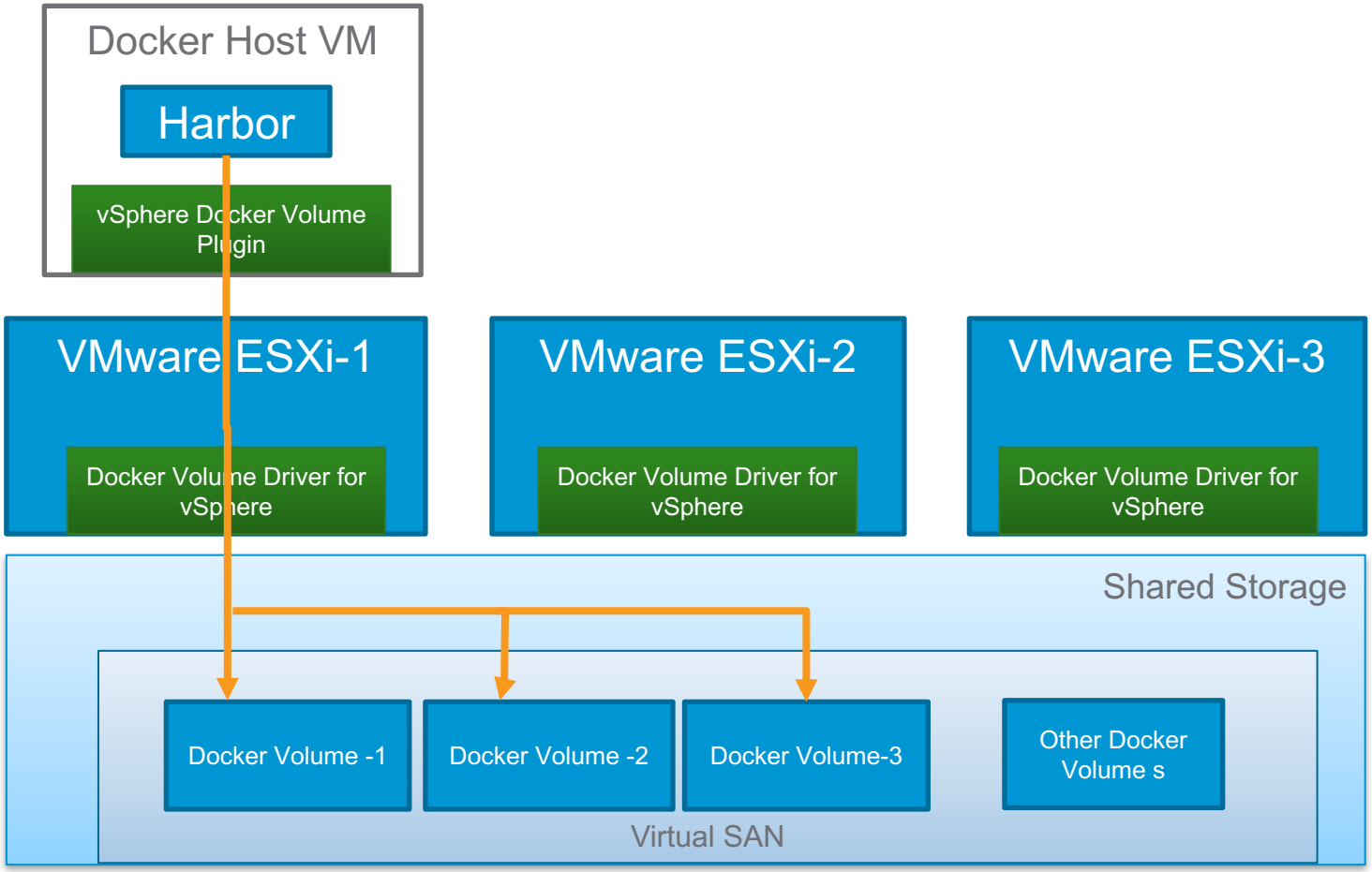
Image replication between registries



Registry HA on vSphere

- Registry in a VM protected by vSphere
- Image storage by VSAN Docker Volume



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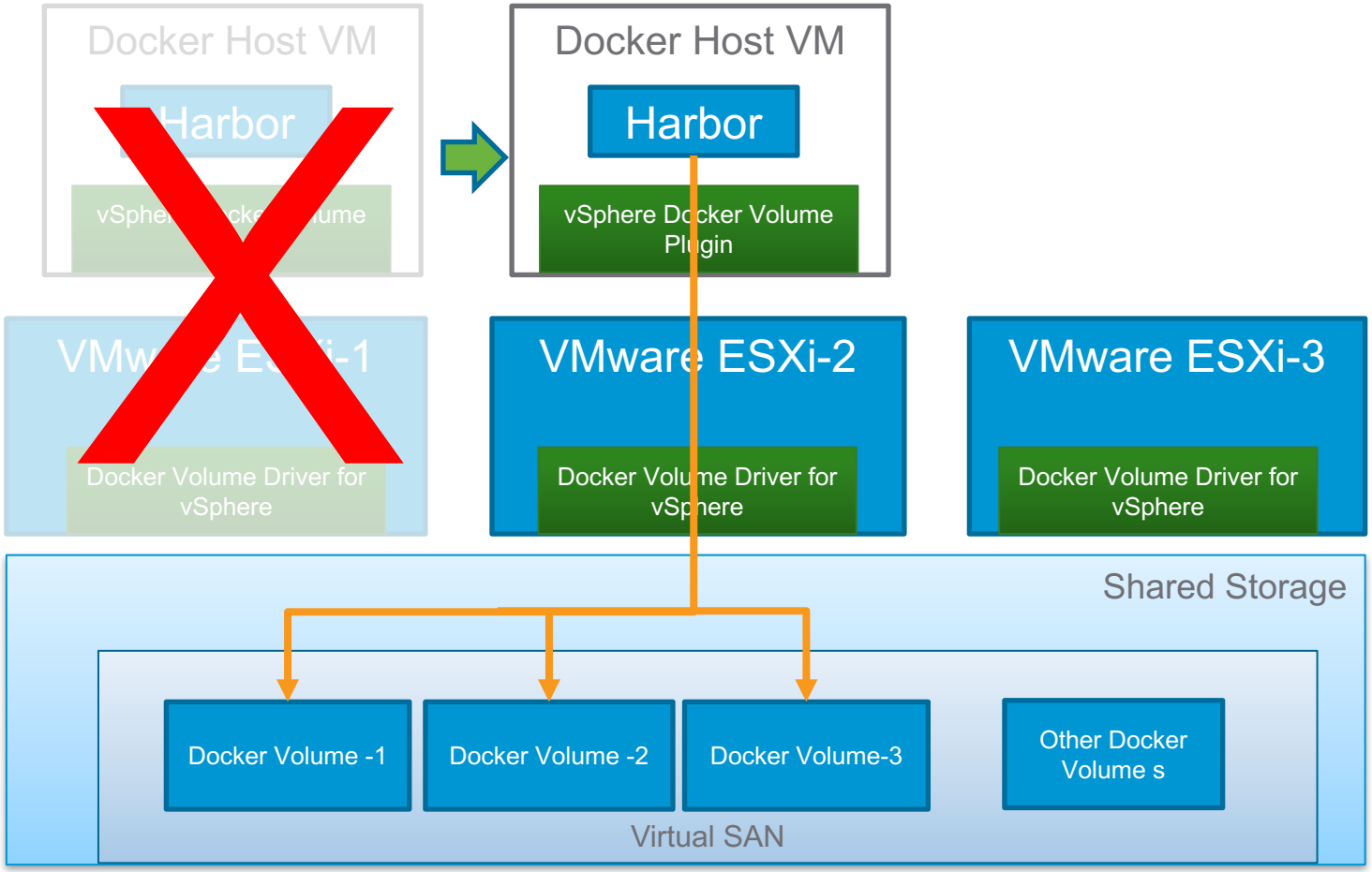
Registry HA on vSphere

- VM failed over to a healthy host
- Image storage still connected by VSAN



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Summary

- Container image is the static part of container lifecycle
- Registry is the key component to manage images
- Organizations usually need a private registry
  - Security
  - Efficiency

Harbor开源项目有奖征文活动

- 您的公司或单位必须是Harbor开源项目v1.1+的真实用户
- 文章应为Harbor镜像仓库的使用案例、经验分享、 功能介绍等方面的中文文章，1000字以上。
- • 文章需要在2017年3月1日之后在网上公开发表，例如技术论坛、个人博客、微信公众号等平台。
- 文章必须内容真实，且是参与者原创，严禁抄袭。
- 立刻扫码参与

提问

Harbor开源项目群

Thank you!

https://github.com/vmware/harbor

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