# 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

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亨利笔记

《区块链技术指南》

《软件定义存储》

# 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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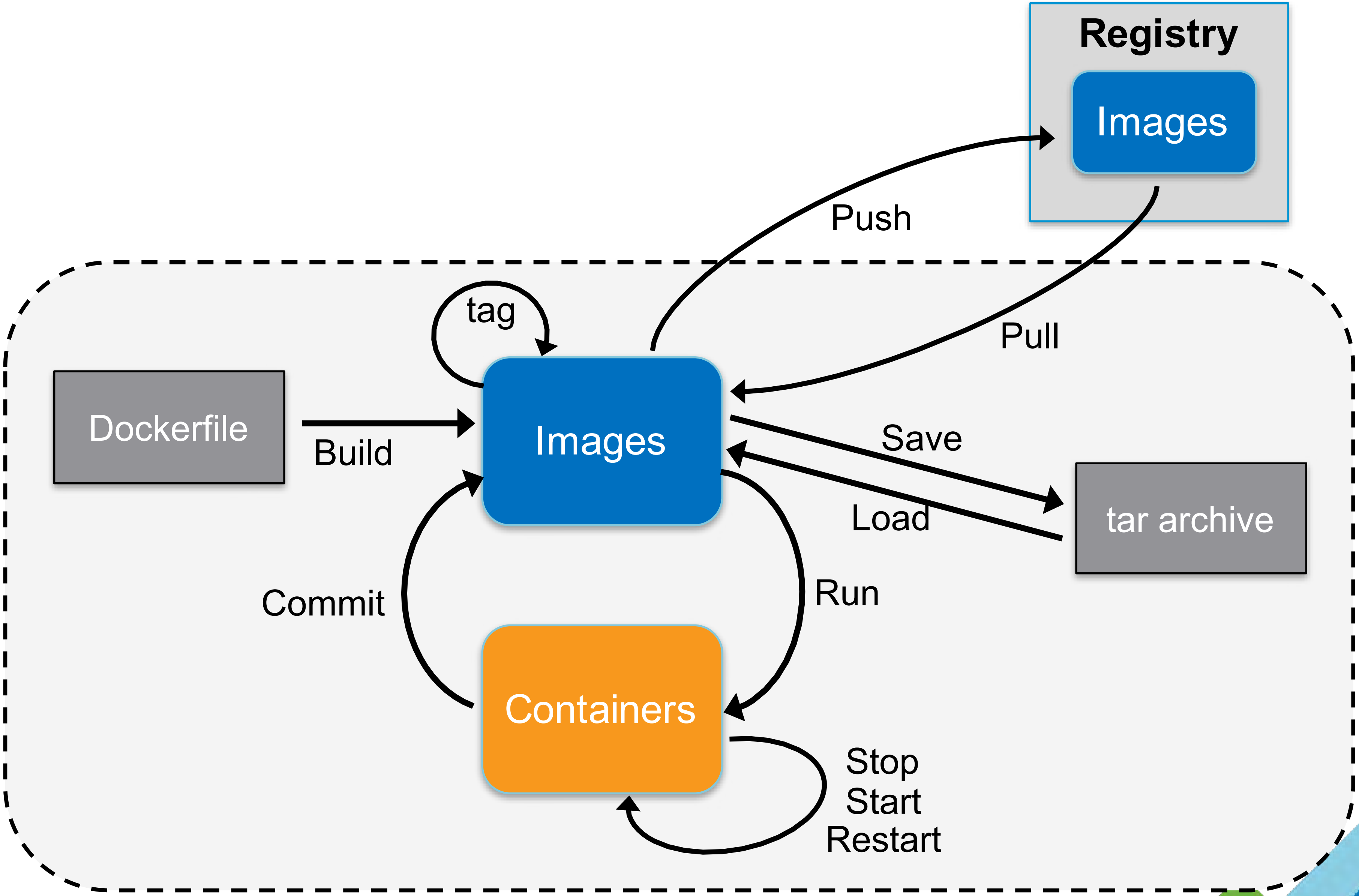
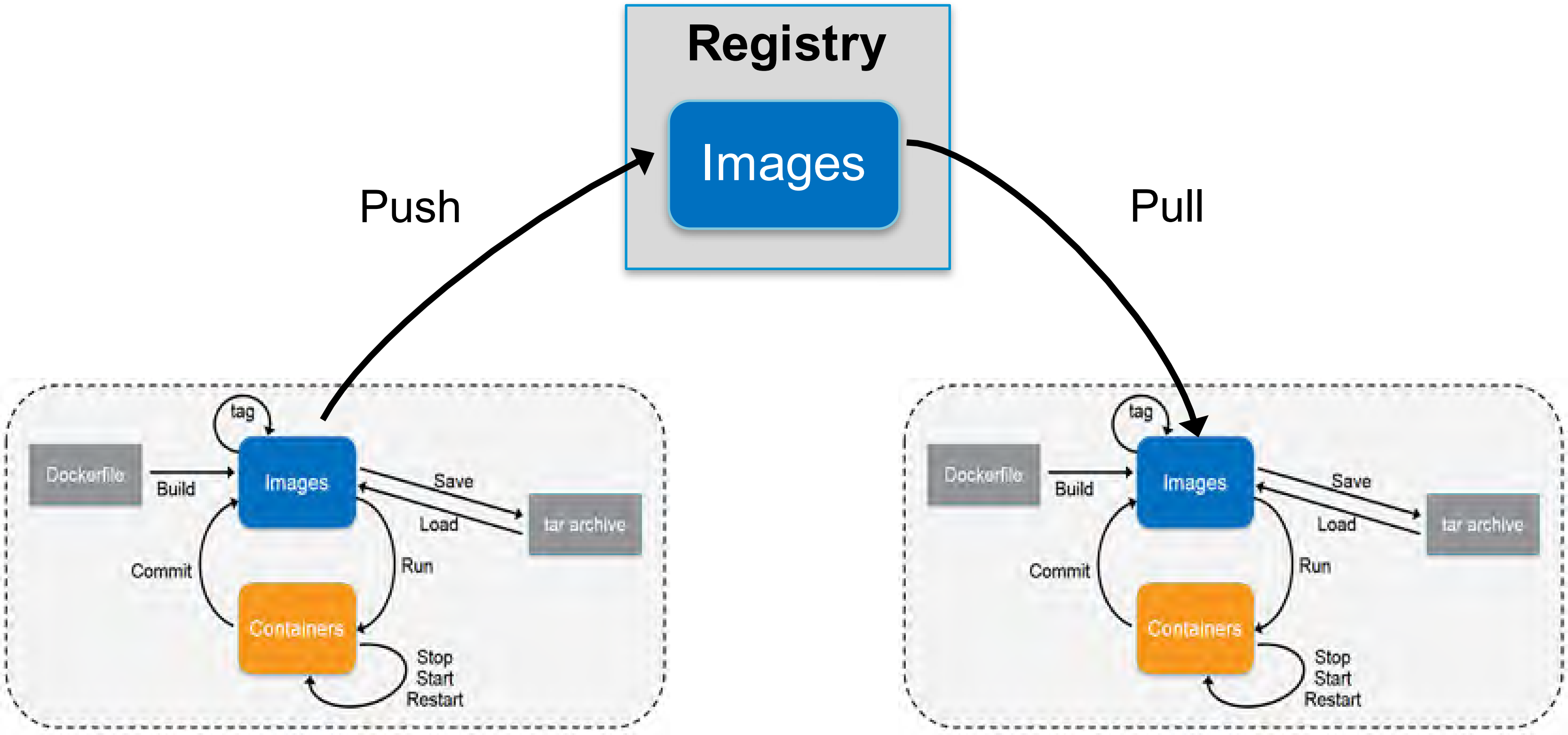
# Lifecycle of Containers and Images



# 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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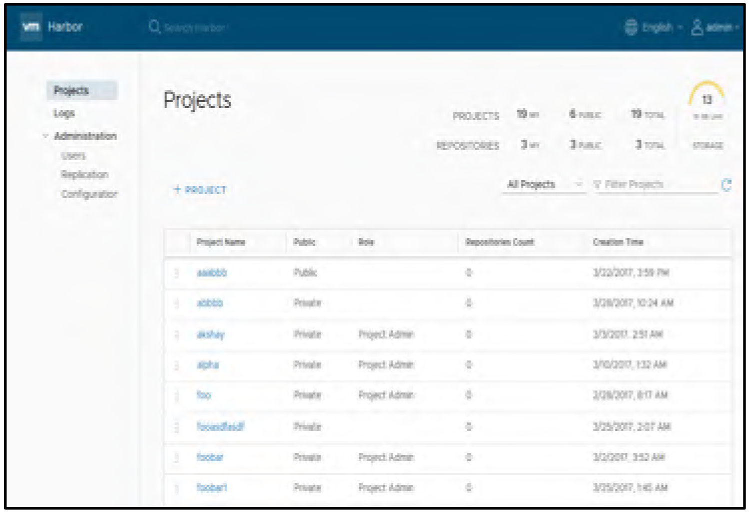
# Project Harbor

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

- 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



Projects

| | | | |
|---|---|---|---|
| PROJECTS | 19 MY | 6 PUBLIC | 19 TOTAL |
| REPOSITORIES | 3 MY | 3 PUBLIC | 3 TOTAL |

| Project Name | Public | Role | Repositories Count | Creation Time |
|---|---|---|---|---|
| aaabbb | Public | | 0 | 3/22/2017, 3:59 PM |
| abbbb | Private | | 0 | 3/28/2017, 10:24 AM |
| akshay | Private | Project Admin | 0 | 3/3/2017, 2:51 AM |
| alpha | Private | Project Admin | 0 | 3/10/2017, 1:32 AM |
| foo | Private | Project Admin | 0 | 2/28/2017, 8:17 AM |
| fooasdfasdf | Private | | 0 | 3/25/2017, 2:07 AM |
| foobar | Private | Project Admin | 0 | 3/2/2017, 3:52 AM |
| foobar1 | Private | Project Admin | 0 | 3/25/2017, 1:45 AM |

# Users and Developers

- Users

20K+

Downloads

2600+

Stars

200+

Users

- Developers

700+

Forks

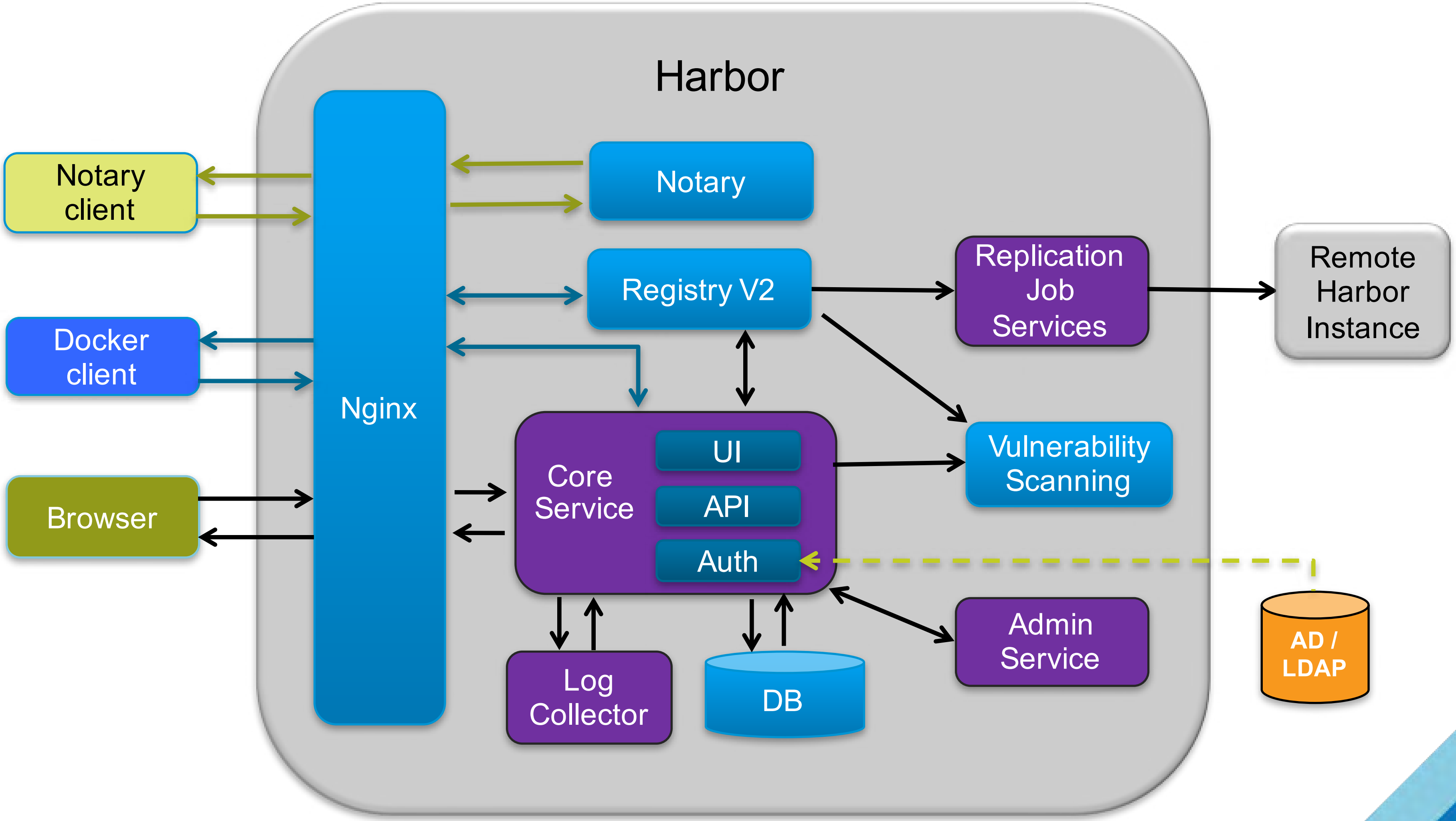
55

Contributors

6

Partners

# Harbor Architecture



# Harbor users and partners (selected)

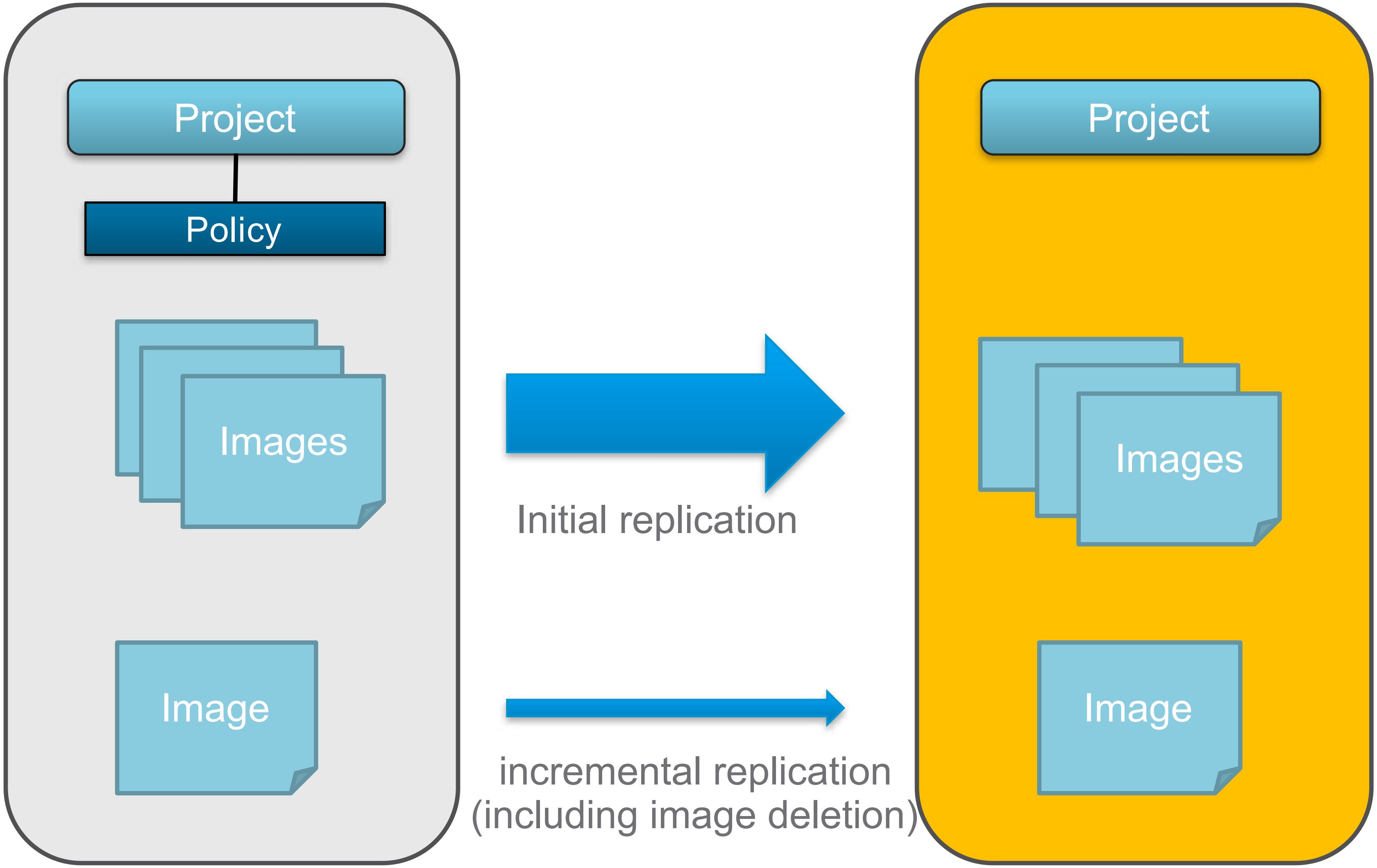
caicloud 才云 RANCHER 数人云 shurenyun.com 品高云 BingoCloud 时速云 tenxcloud.com

OnStar 安吉星 TREND MICRO AXA 安盛天平 TalkingData

通联数据 DATAYES iFRE 亿阳信通 BOCO Inter-Telecom Wise2c TECHNOLOGY 慧博云通 HYDSOFT

SLAMTEC Open 奥鹏教育 BOER 博耳智能 BOER SMART 云星数据 BEYONDSOFT beyond your expectations

# 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

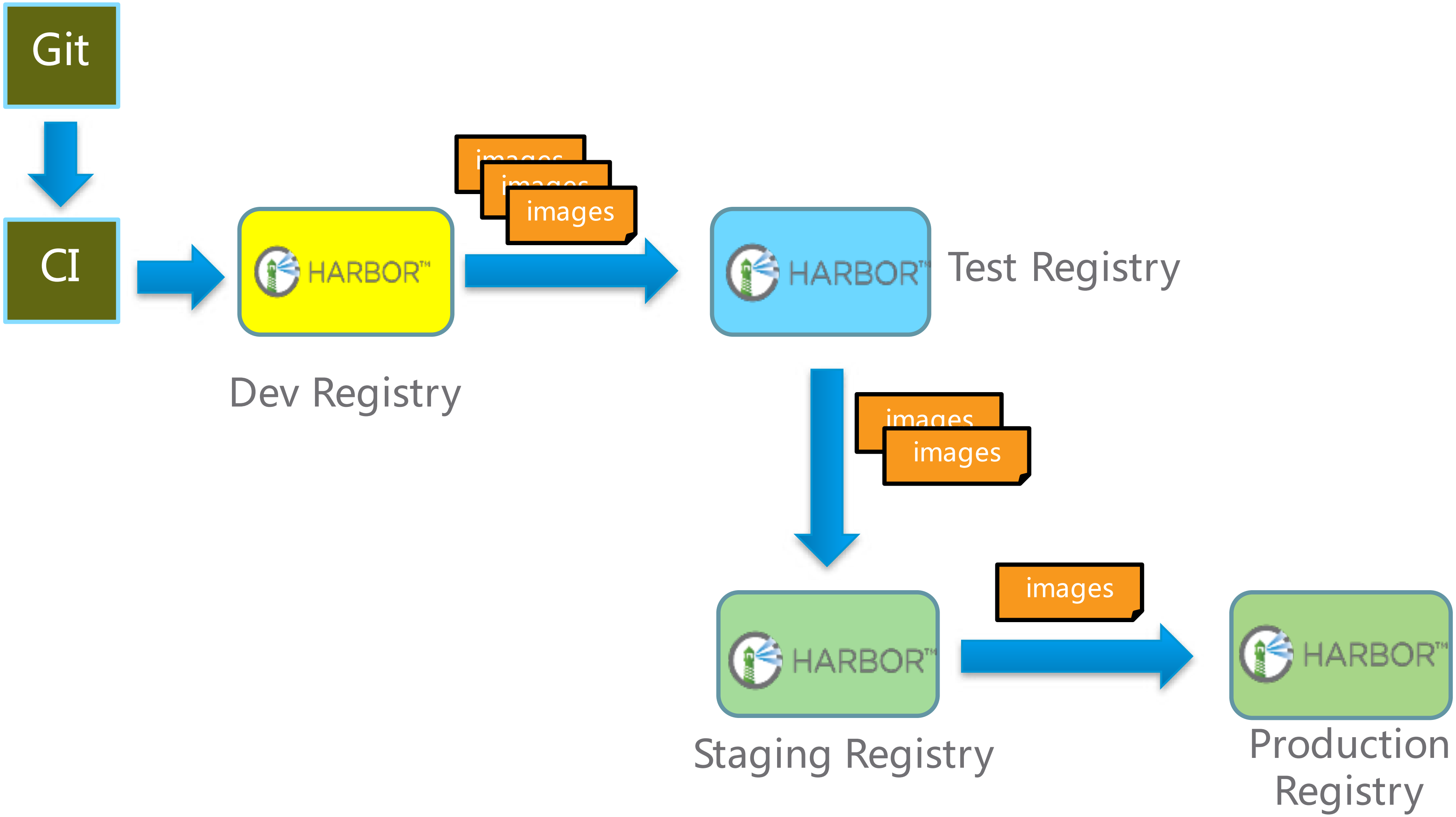
# Same Dockerfile Always Builds Same Image?

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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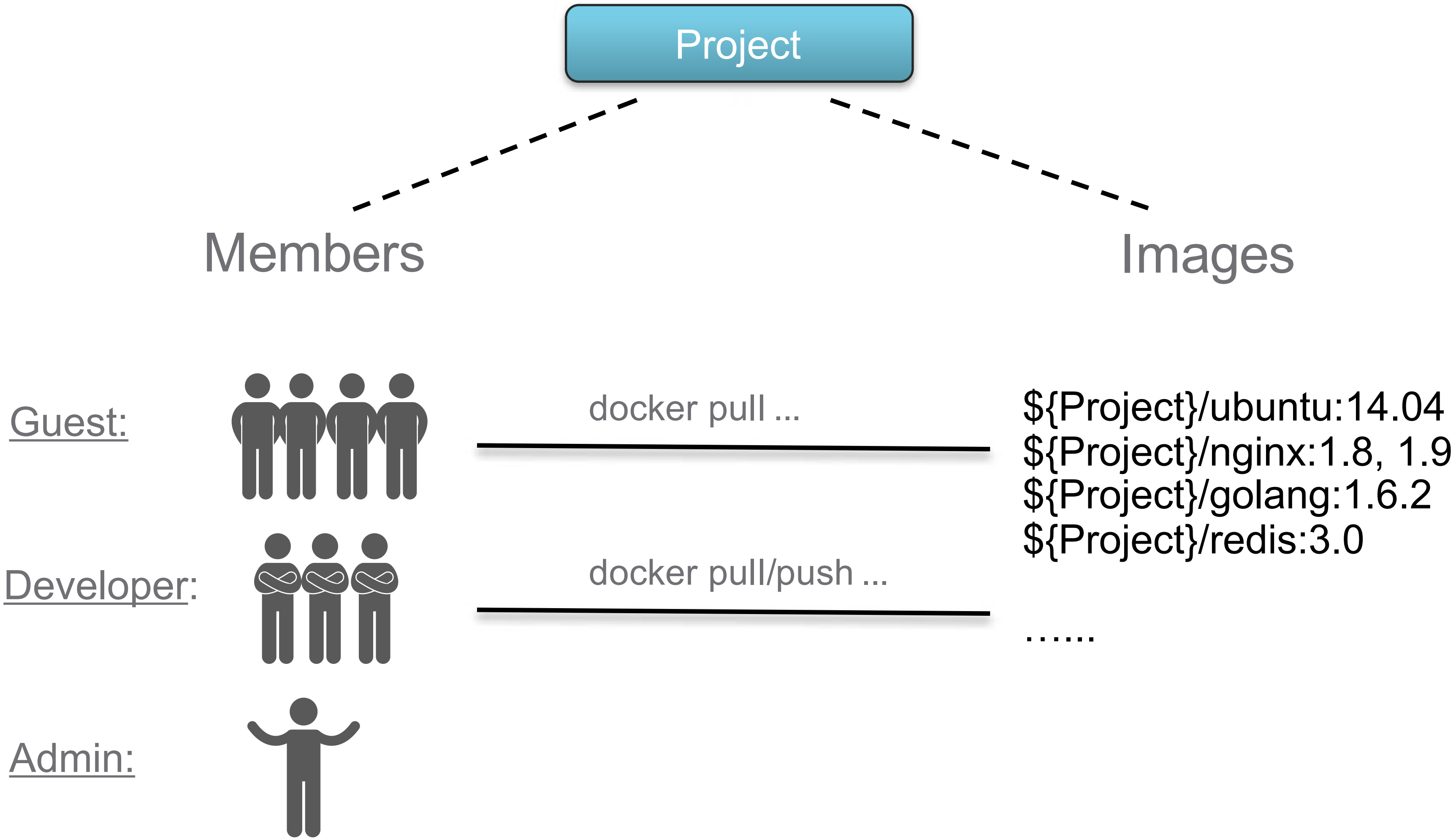
# Access Control to Images

- 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



Project

Members

Images

Guest:

docker pull …

Developer:

docker pull/push …

Admin:

${Project}/ubuntu:14.04
${Project}/nginx:1.8, 1.9
${Project}/golang:1.6.2
${Project}/redis:3.0

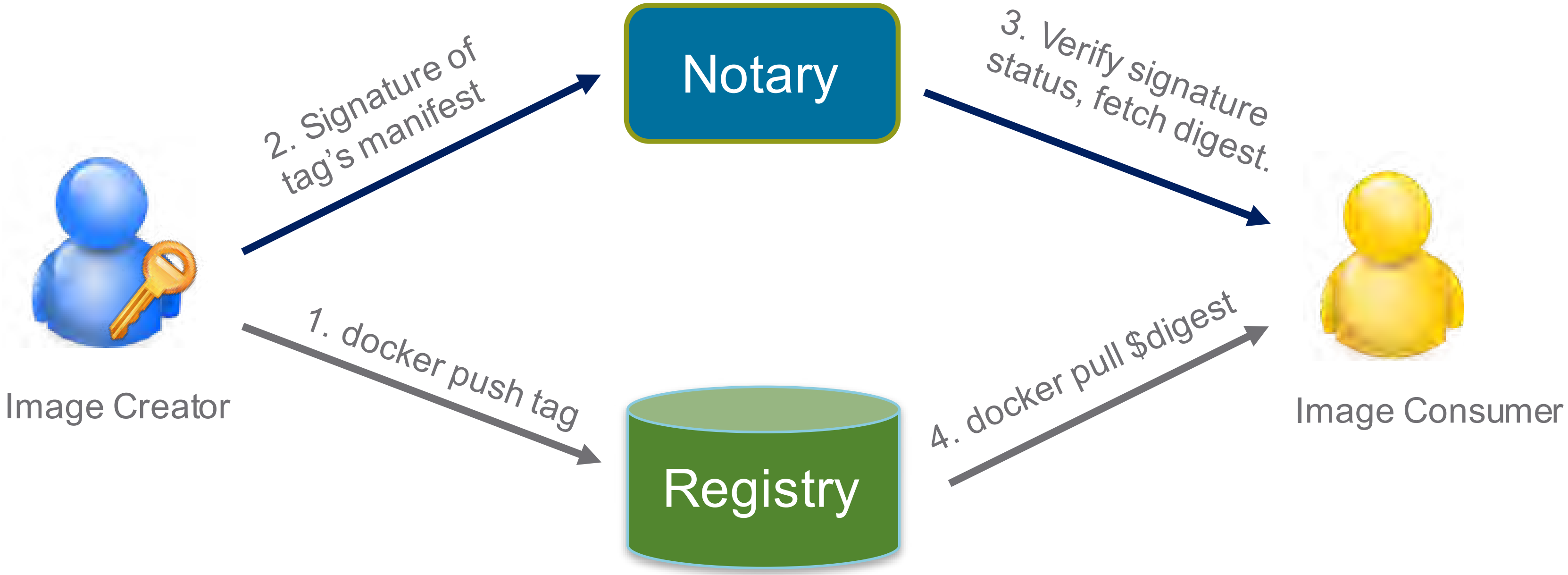
……

# 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



Notary

Registry

Image Creator

Image Consumer

1. docker push tag

2. Signature of tag's manifest

3. Verify signature status, fetch digest.

4. docker pull $digest

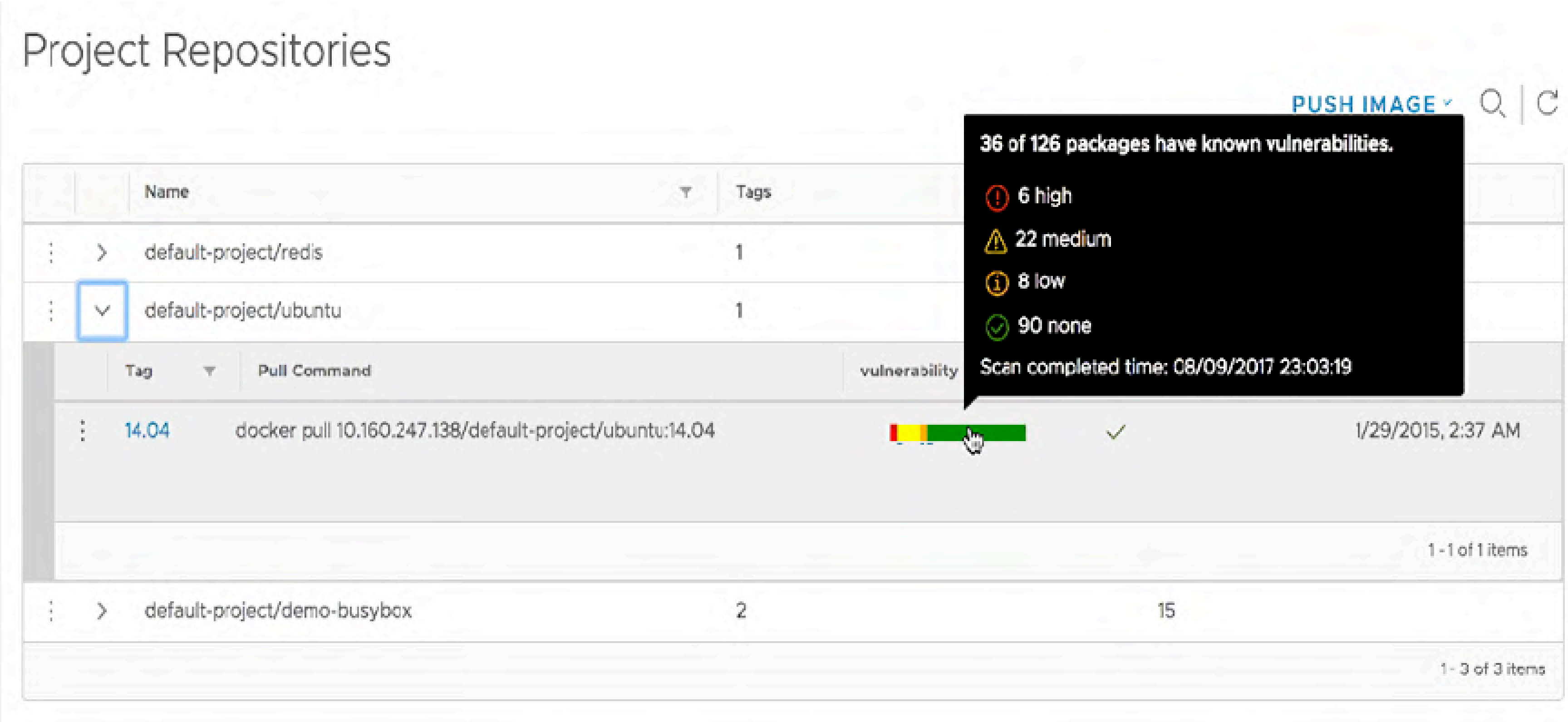
# Vulnerability Scanning

- **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



Project Repositories

| Name | Tags |
|---|---|
| default-project/redis | 1 |
| default-project/ubuntu | 1 |

| Tag | Pull Command | vulnerability | | |
|---|---|---|---|---|
| 14.04 | docker pull 10.160.247.138/default-project/ubuntu:14.04 | 🟥🟨🟩 | ✓ | 1/29/2015, 2:37 AM |

1 - 1 of 1 items

| Name | Tags | |
|---|---|---|
| default-project/demo-busybox | 2 | 15 |

1 - 3 of 3 items

36 of 126 packages have known vulnerabilities.

- 6 high
- 22 medium
- 8 low
- 90 none

Scan completed time: 08/09/2017 23:03:19

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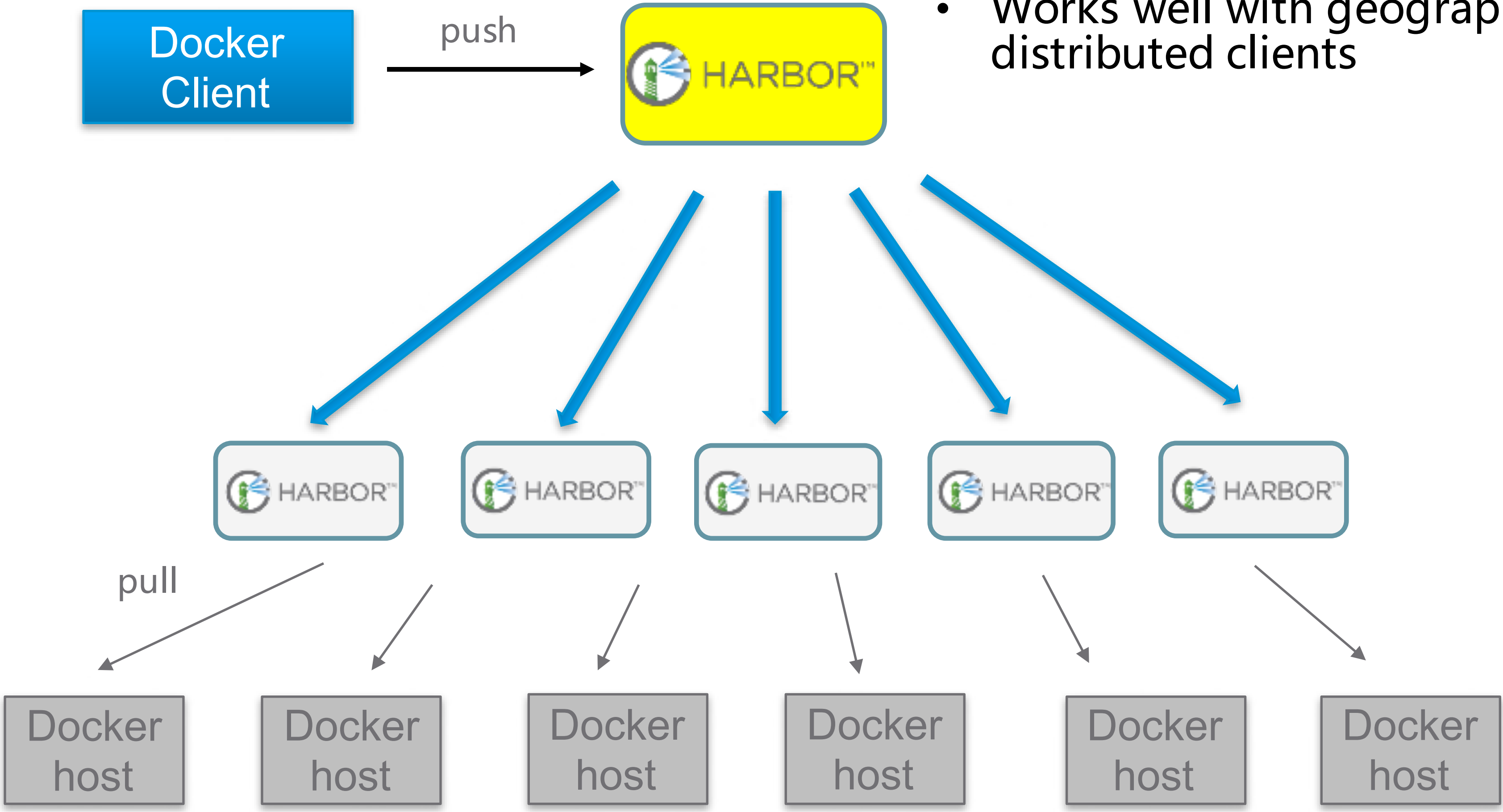
# Image Distribution

- 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

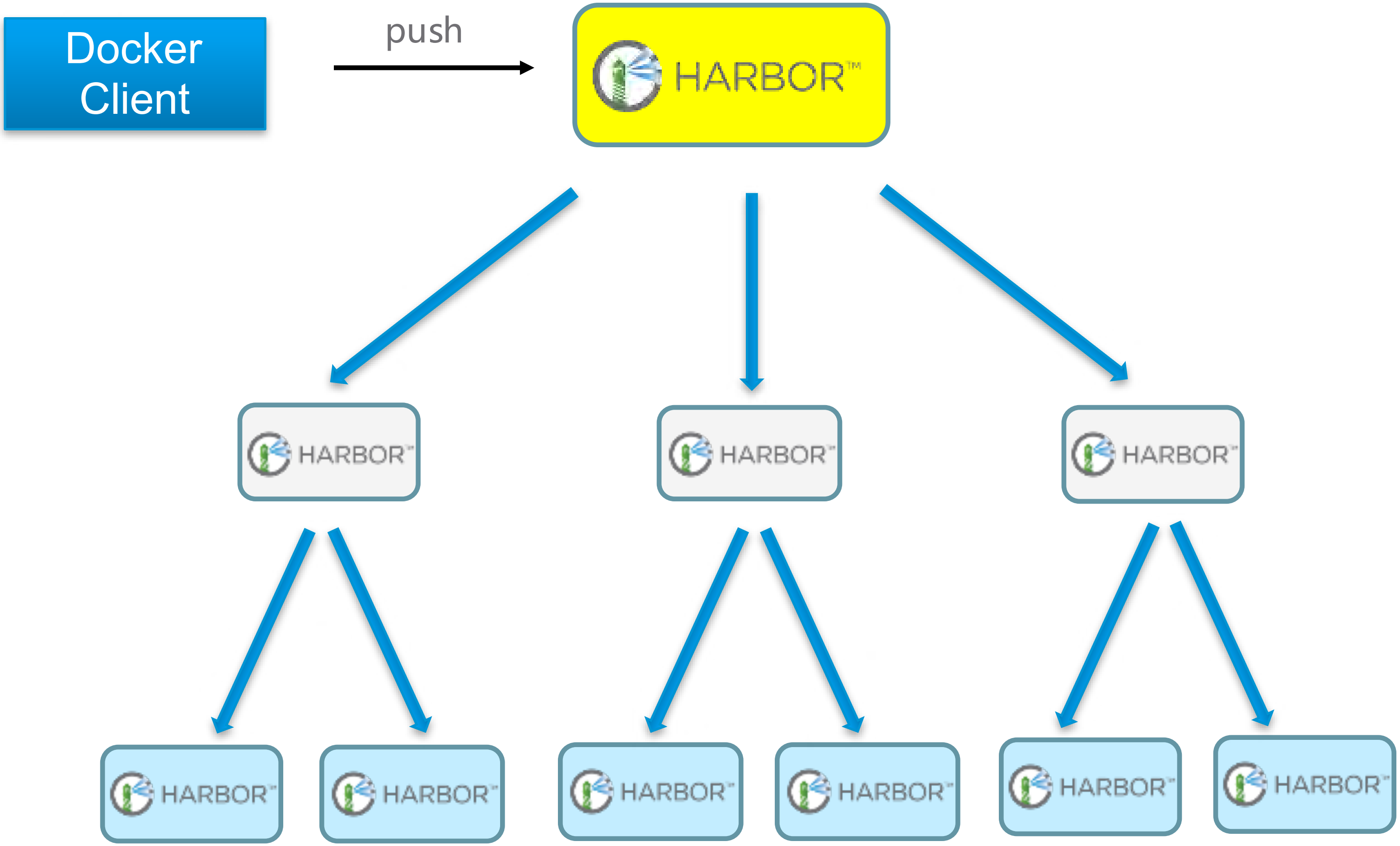
# Image Distribution via Master-Slave Replication



- Load balancing
- Works well with geographically distributed clients

Master – Slave model

# Hierarchical Image Distribution



Hierarchical

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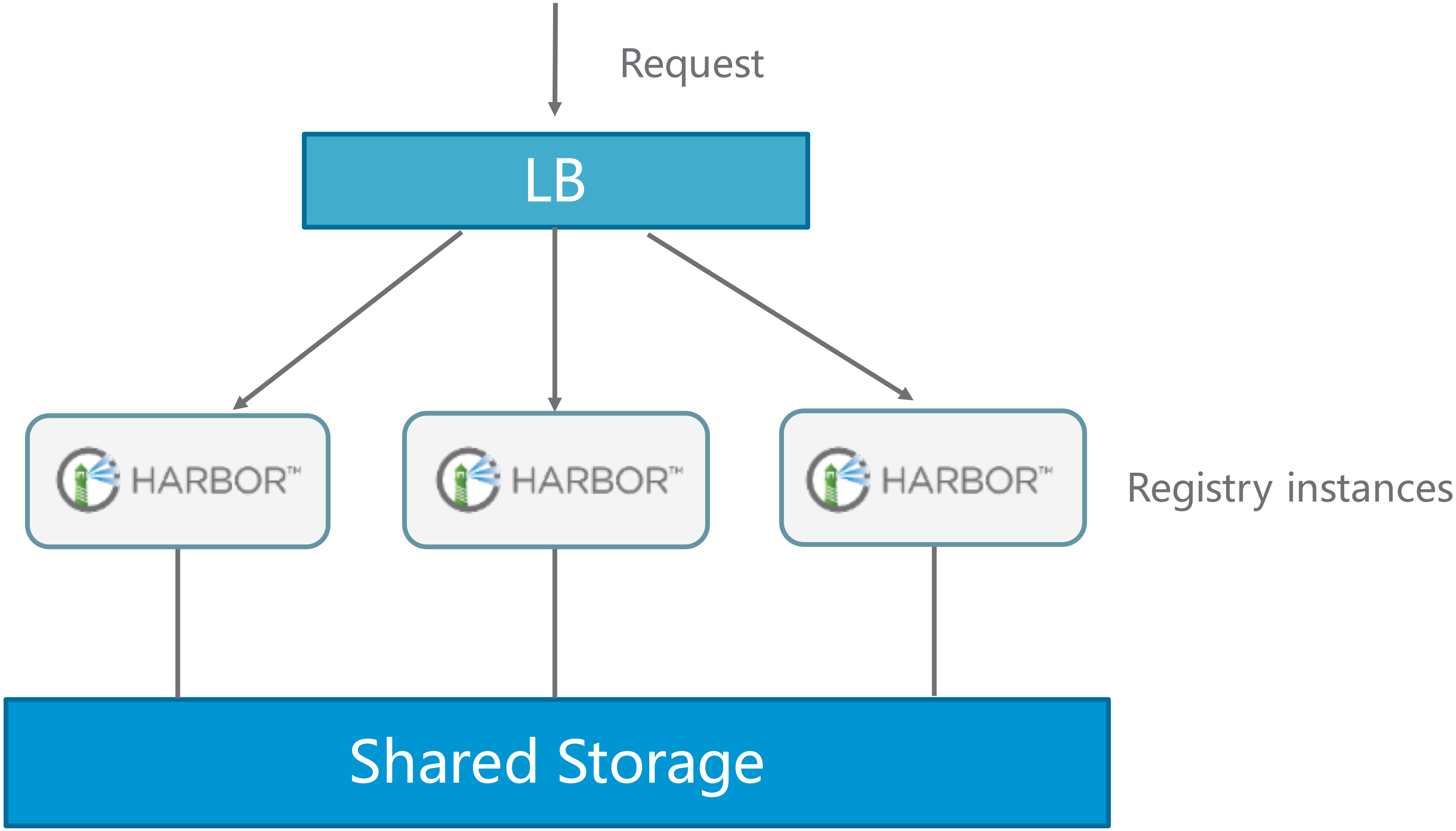
# High Availability of Registry

- 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



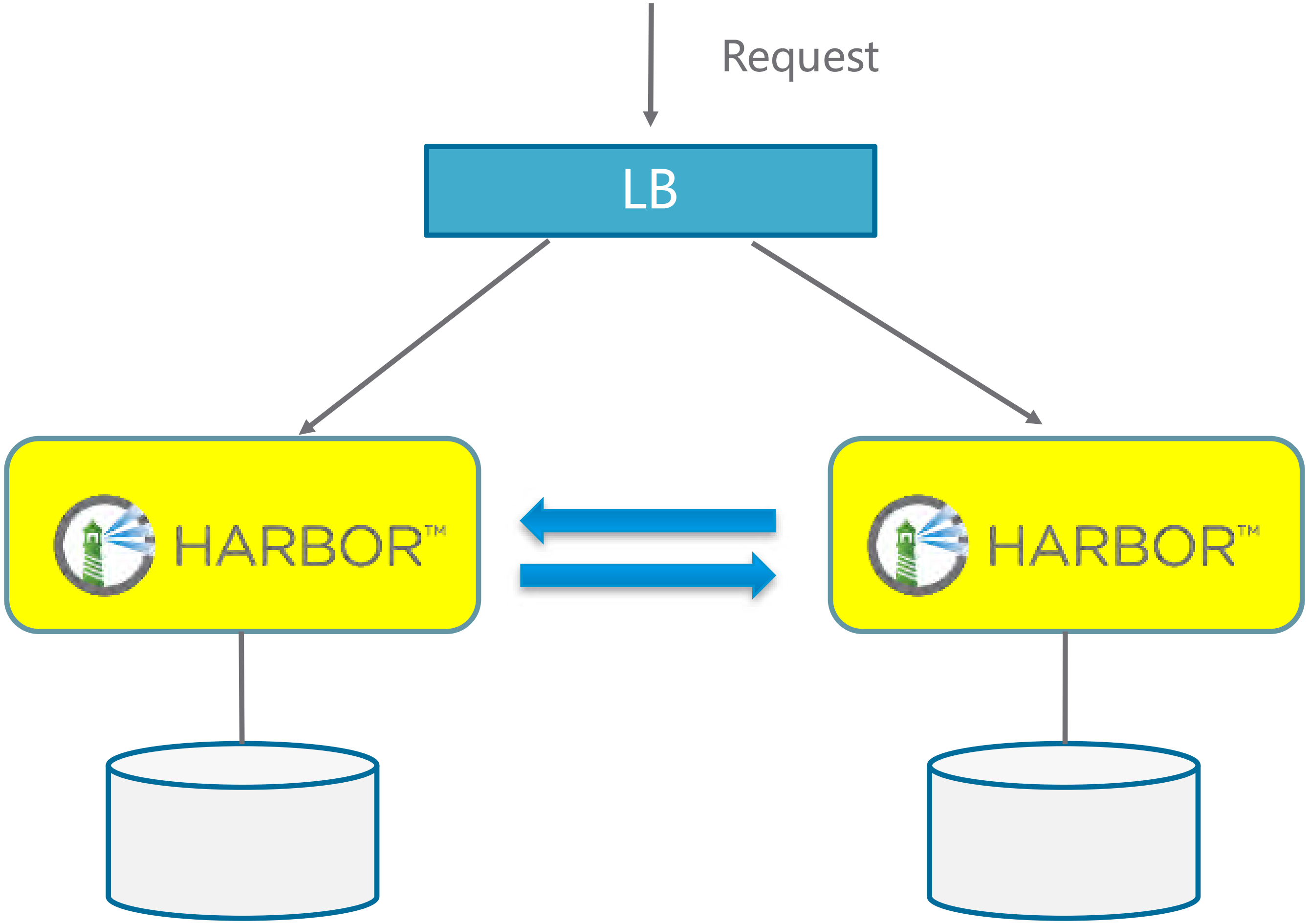
Request

LB

Registry instances

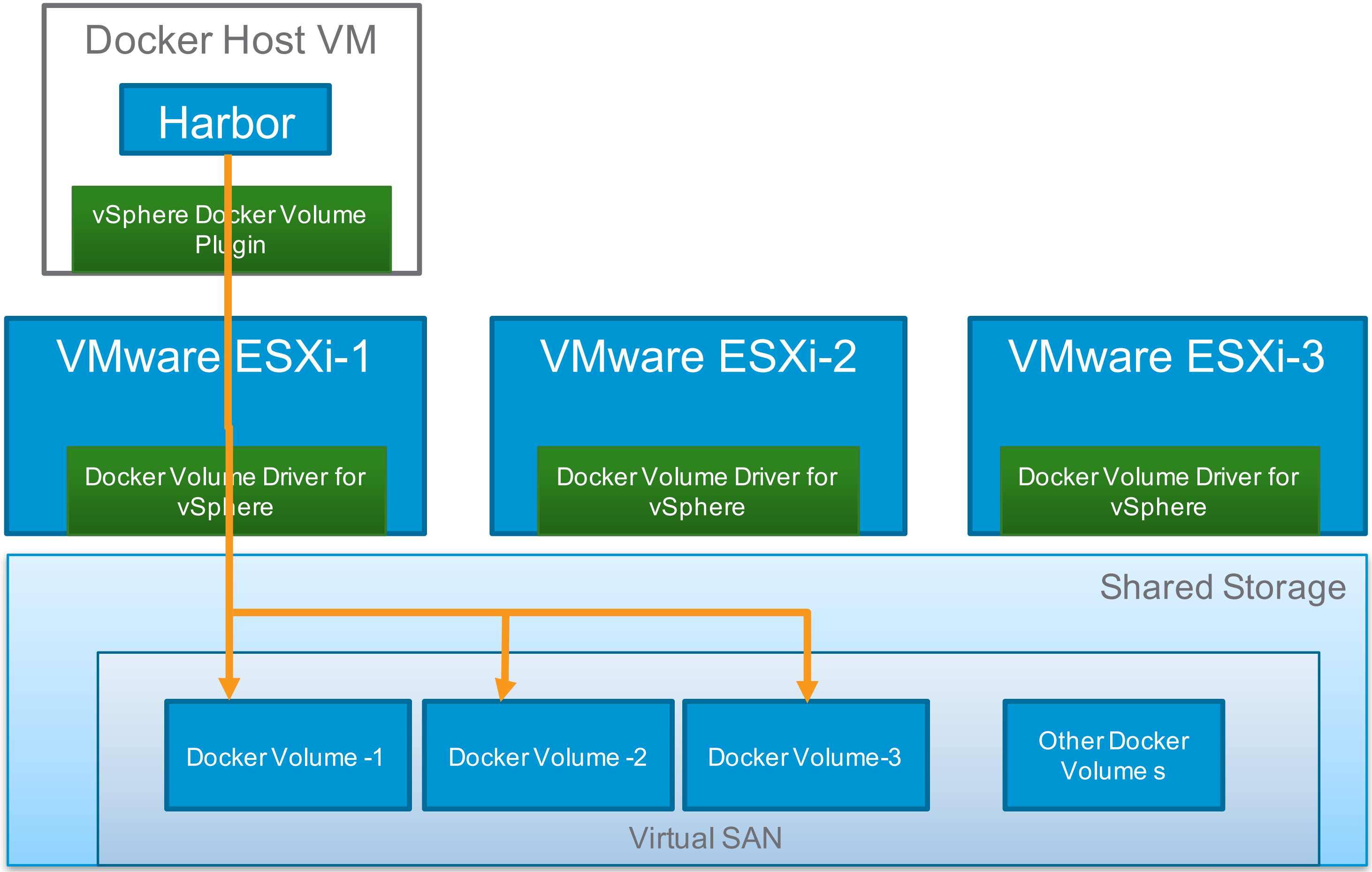
Shared Storage

# Image replication between registries



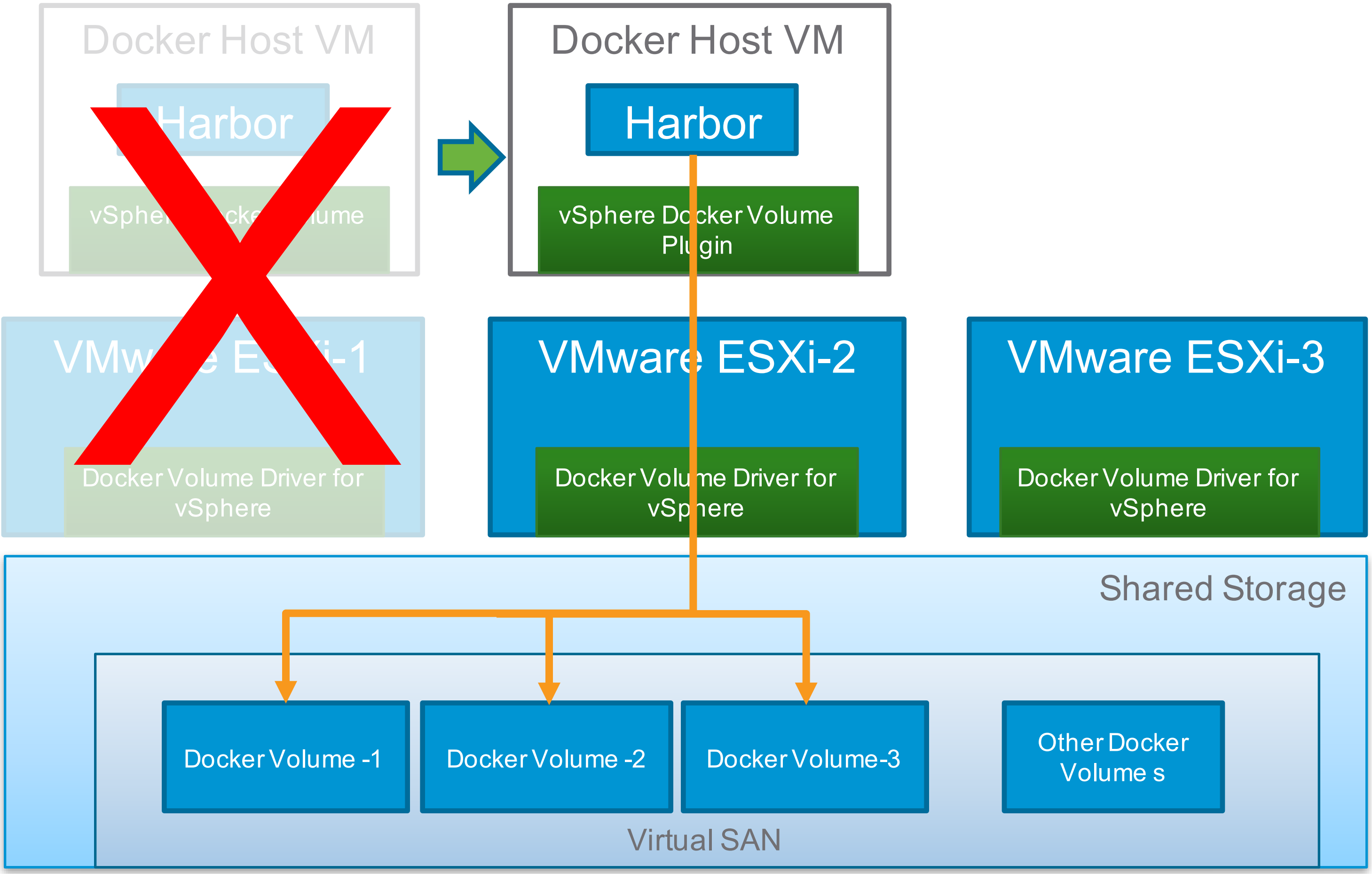
# Registry HA on vSphere

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



# Registry HA on vSphere

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



# 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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