Global Operations with Docker Enterprise

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Who's running Docker Enterprise in production?

Who's running Docker Enterprise in production in multiple datacenters?

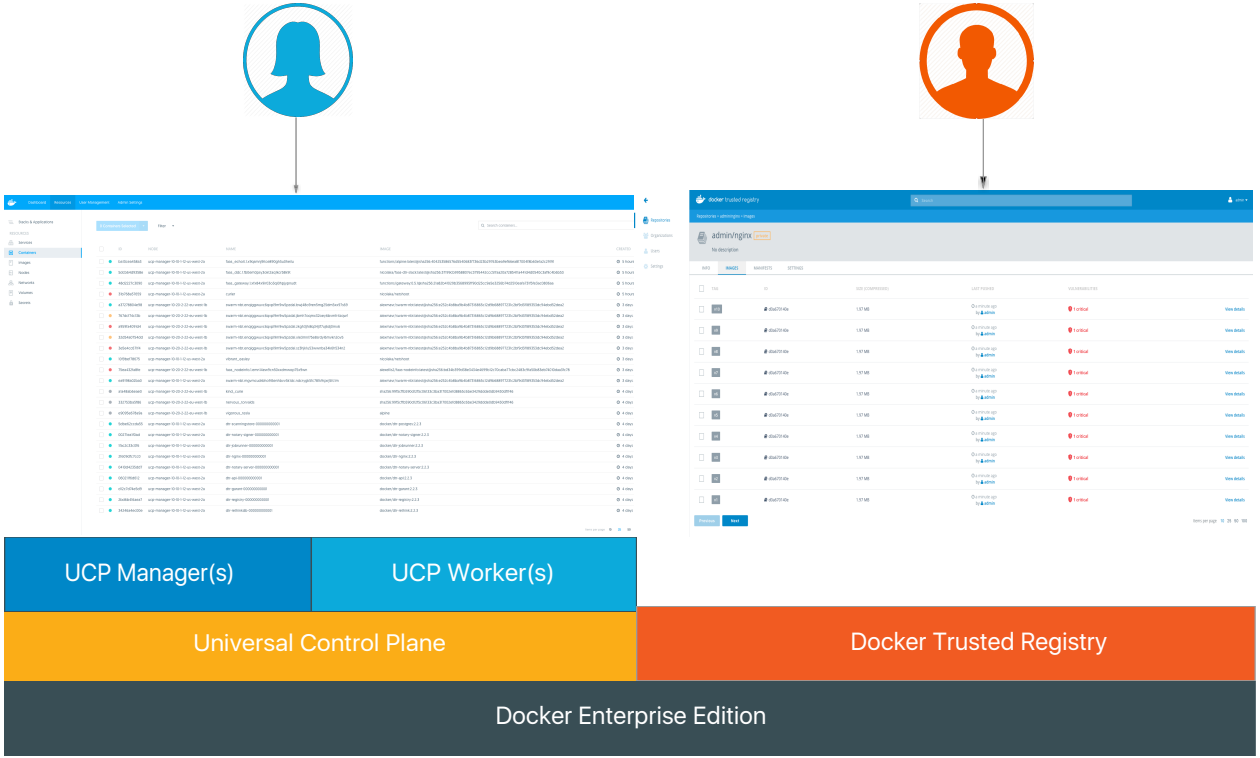
Who's planning on running Docker Enterprise in Production in multiple datacenters?

Agenda

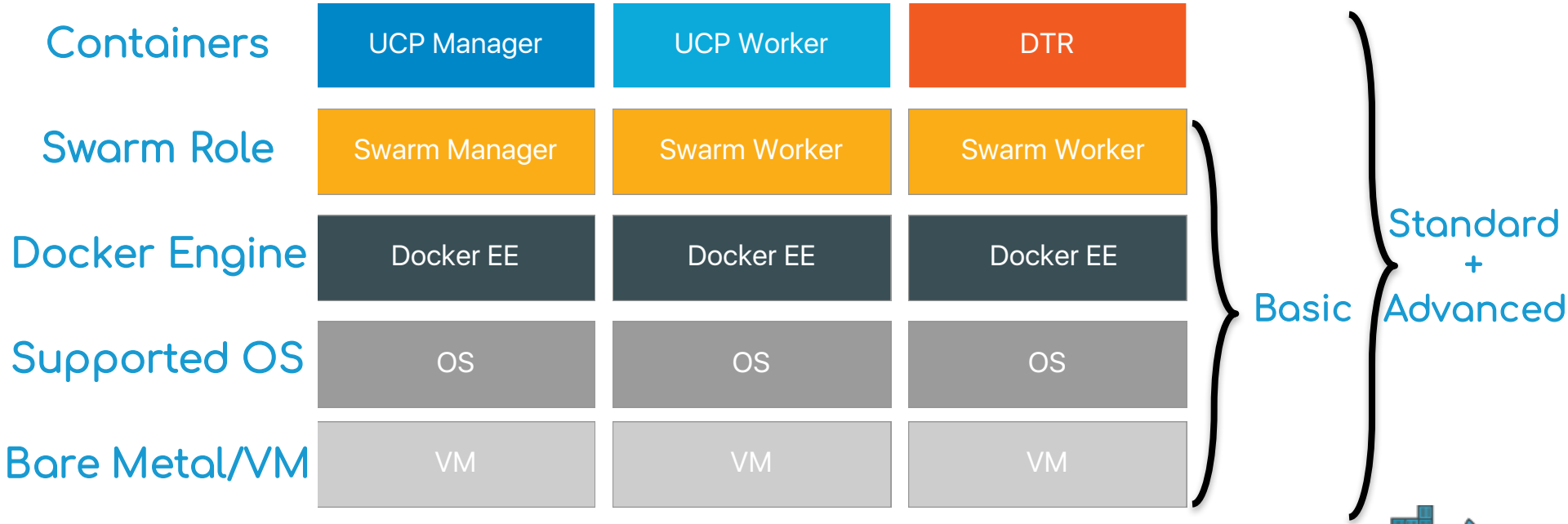
- Docker Enterprise Architecture Overview
- Motivation & Design Consideration
- Building a Global Platform
    1. Robust Infrastructure
    2. Accelerated Image Distribution
    3. Resilient Application Deployment
- Key Takeaways
- Q&A

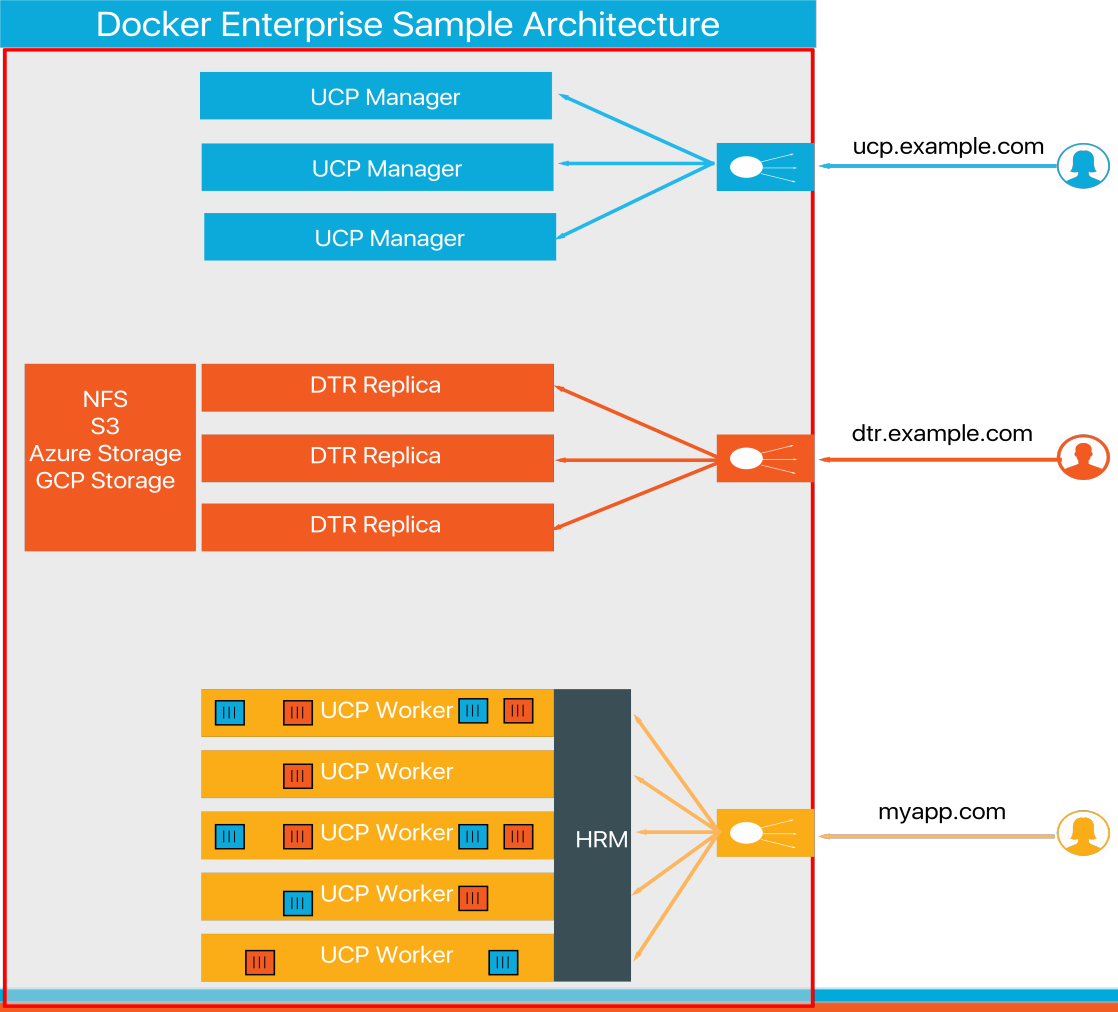
Docker Enterprise Edition Architecture Overview

Docker Enterprise Overview



Docker Enterprise Edition Building Blocks





Docker Enterprise Sample Architecture

Multi-Datacenter Motivation & Key Design Areas

Multi-Datacenter Motivation

- Application Resiliency
- Redundancy
- Disaster Mitigation
- Hybrid Cloud Strategy
- User Experience
- Capacity
- Compliance + Regulations

Let's Build a Global Platform!

Key Design Areas

Robust Infrastructure	Accelerated Image Distribution	Resilient Application Deployments

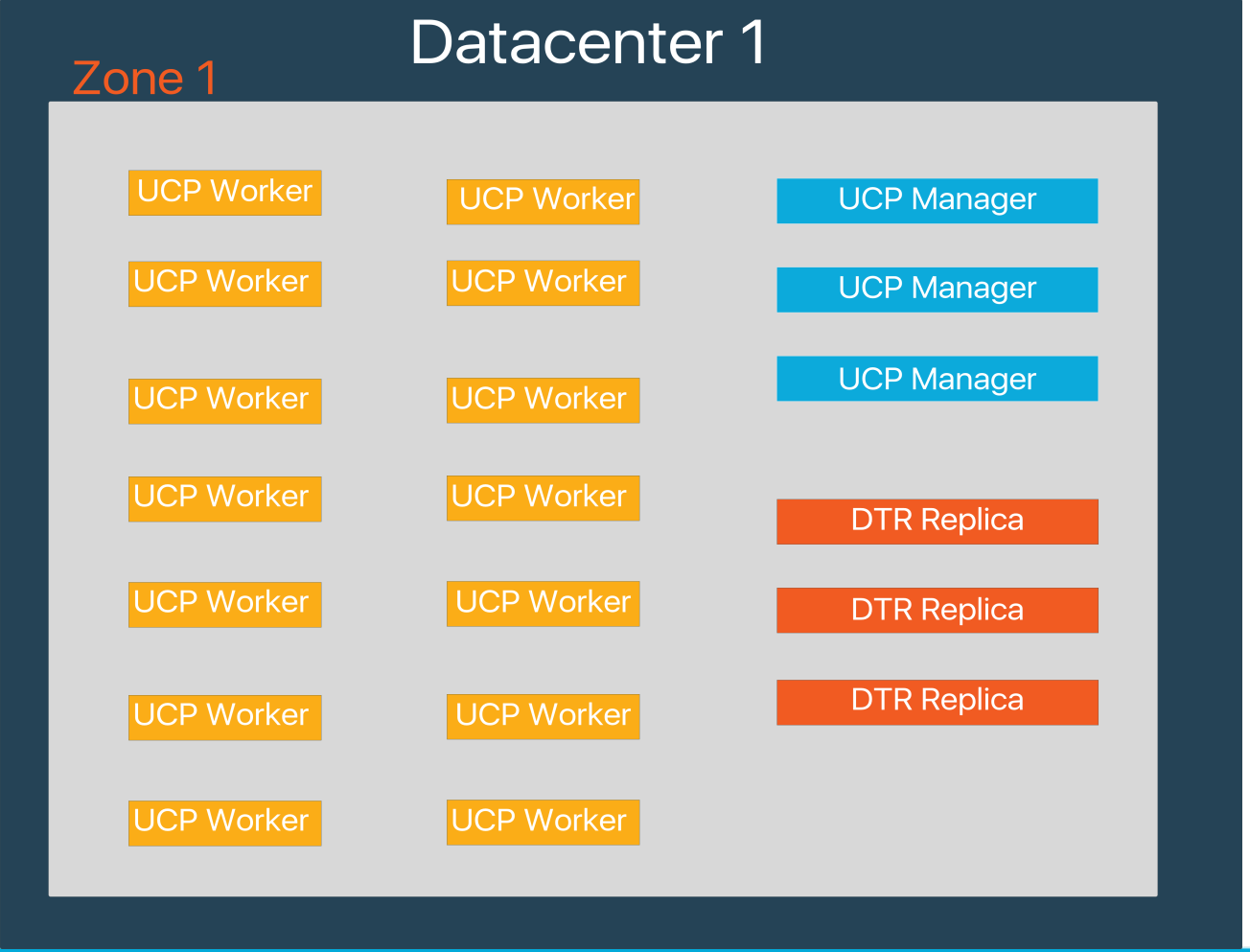
Robust Infrastructure

Number of UCP Managers or DTR Replicas

Number	Majority Requirement	Fault Tolerance
1	1	0
3	2	1
5	3	2
7	4	3

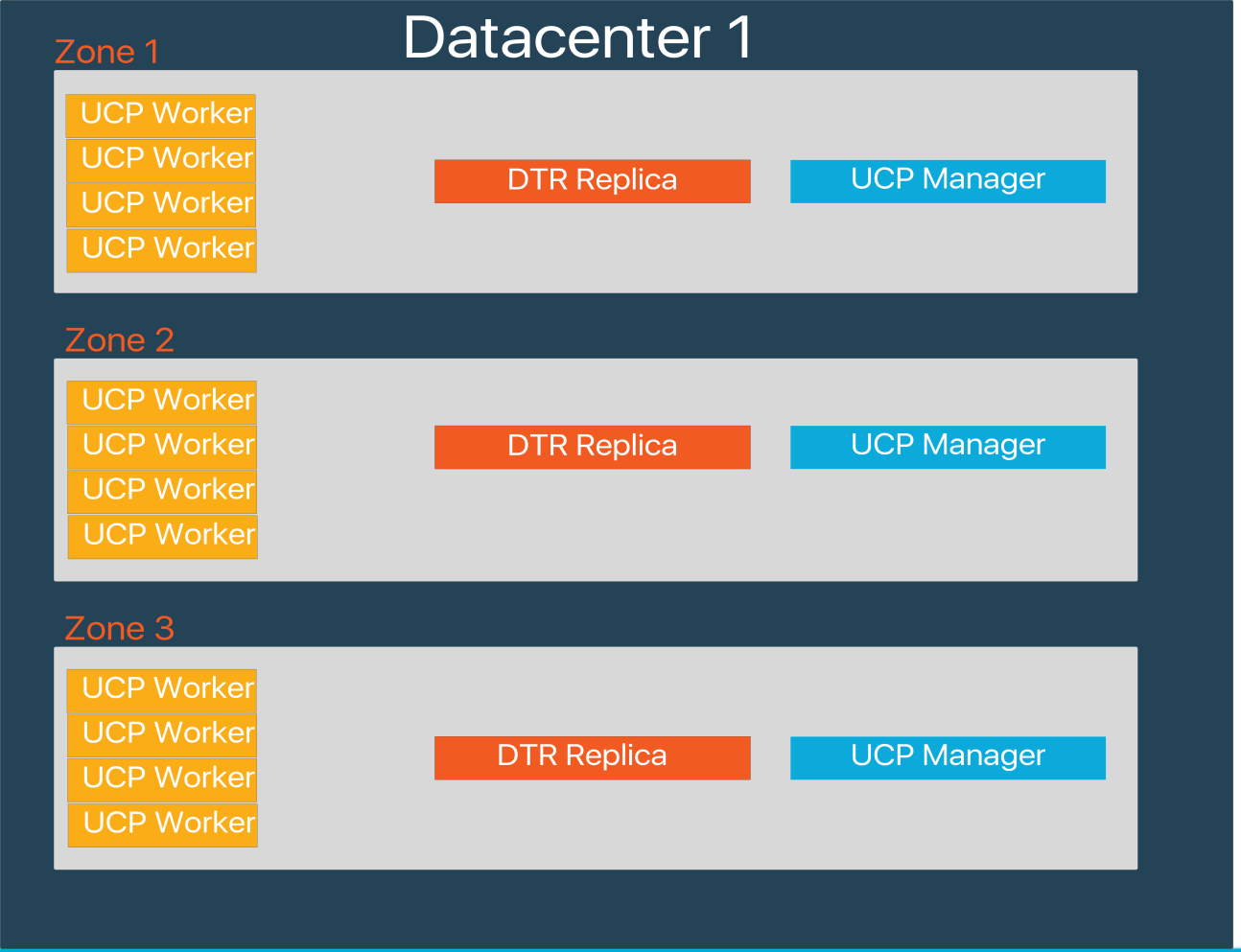
Number of UCP and DTR Clusters

Metric/Cluster Design	Per Stage Only (dev,qa,prod)	Per Datacenter Only (us-west, eu-west)	Per Stage and Datacenter (dev in us-west, dev in eu-west)
Management Complexity	Low	Moderate	High
Resource Utilization	High	High	Moderate
Separation + Isolation	High	Low	High
Network Requirement	Moderate	Low	Low
Infrastructure Requirement	Low	Low	High
Operational Continuity (Docker Content Trust, Image Promotion, RBAC, Application Deployment)	High	Moderate	Low



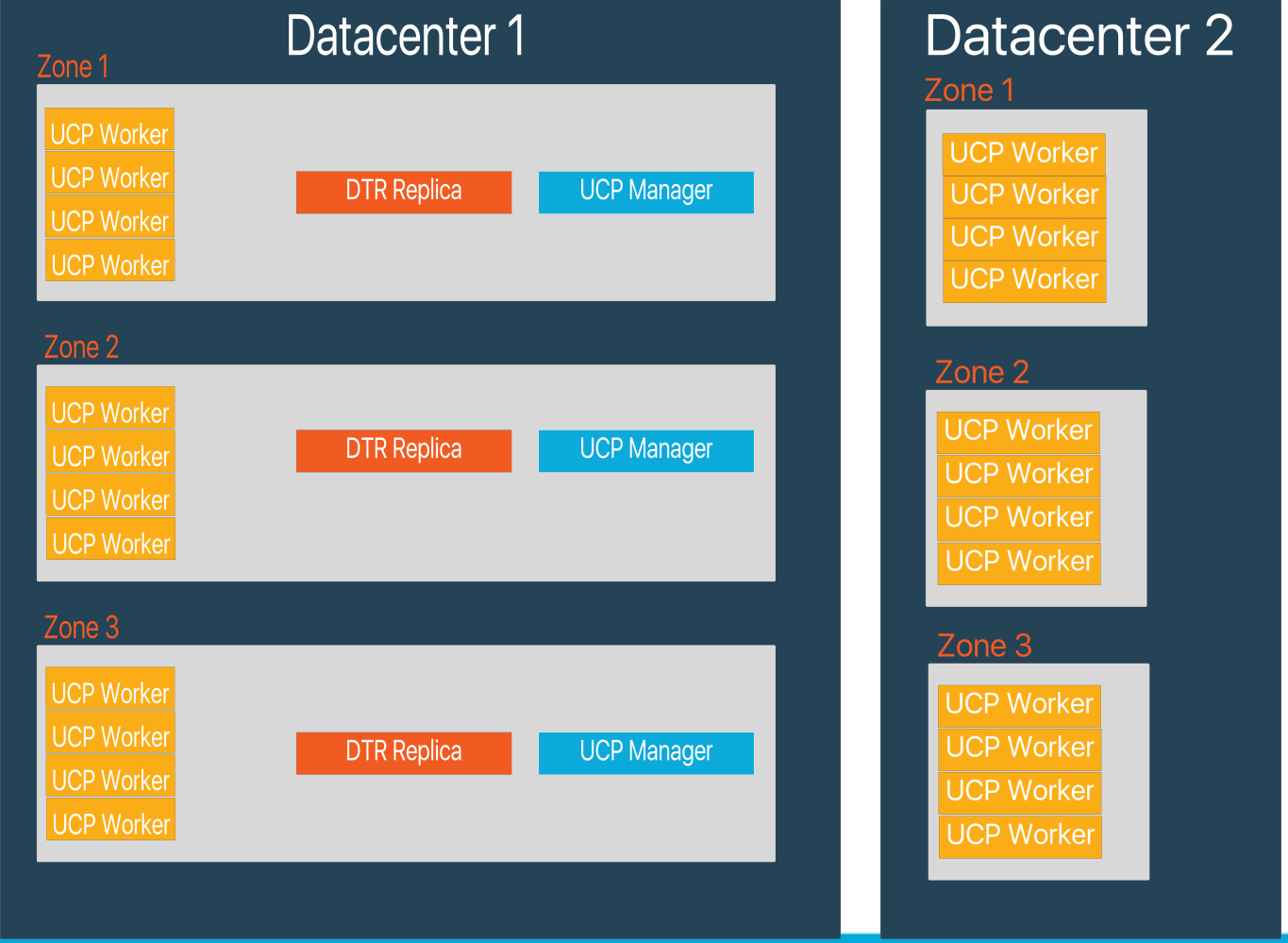
Node Placement

Option 1
Single Zone in a Single Datacenter



Node Placement

Option 2 Multiple Zones in a Single Datacenter



Node Placement

Option 3 Multiple Zones in Multiple-Datacenter

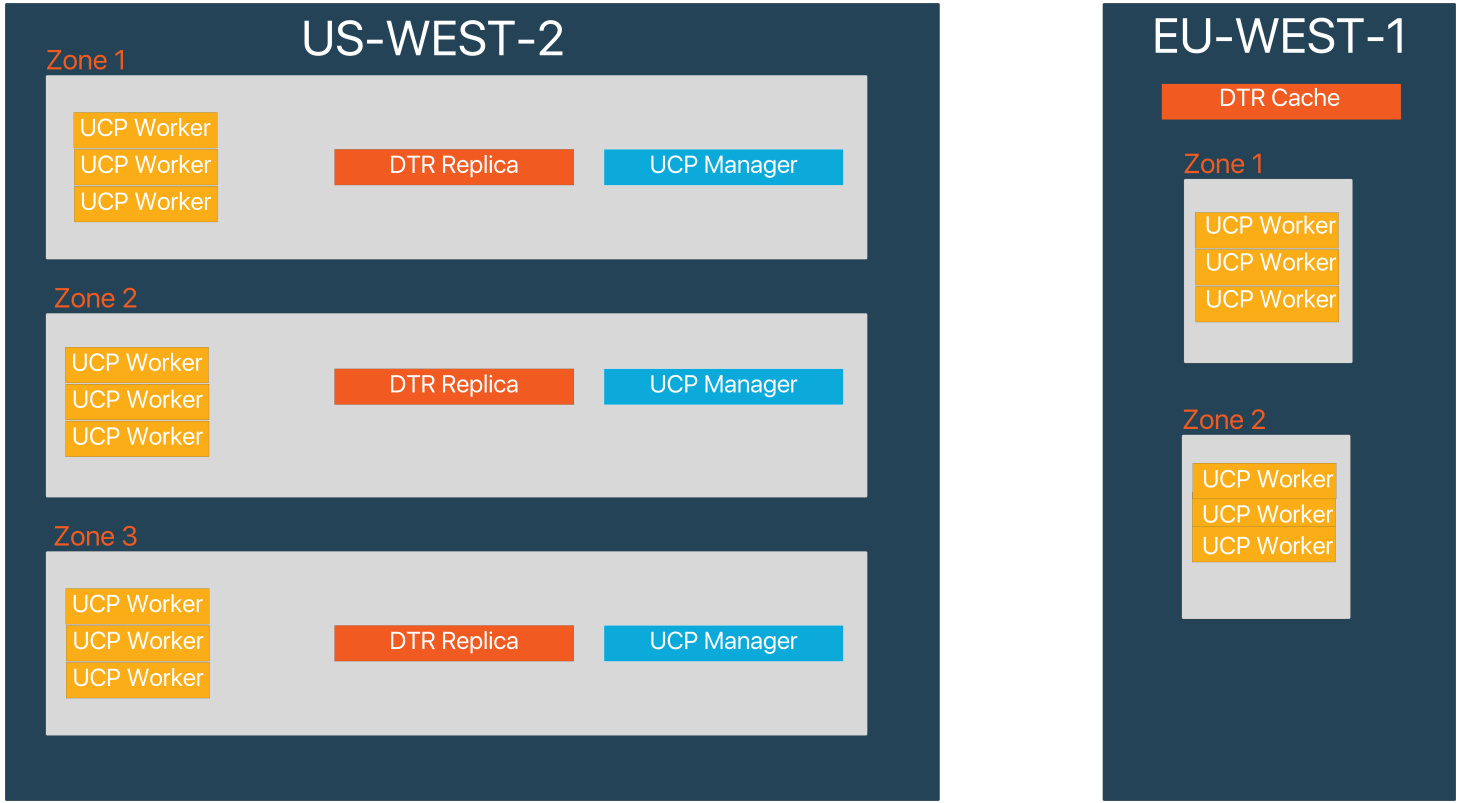
Network Latency Considerations

Role	Component	Heartbeat (ms)	Timeout (ms)	Impact
Swarm Manager	Raft (SwarmKit)*	1000	3000	swarm ops
Swarm Manager, Swarm Worker	Gossip (libnetwork)	1000	5000	overlay, ingress, routing mesh, dns, lb
UCP Manager	Etcd*	500	5000	UCP ops.
UCP Manager, DTR	Rethink*	2000	10000	UCP and DTR Ops.

* Quorum Based

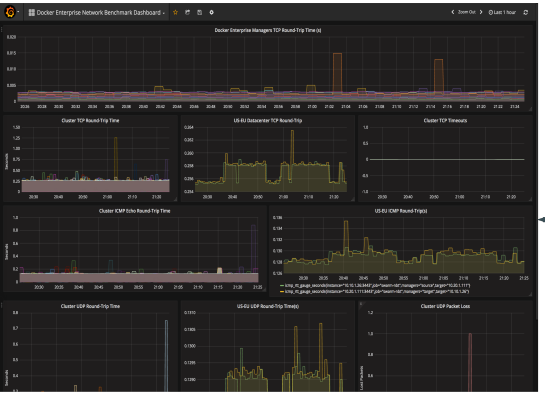
Swarm Network Monitoring

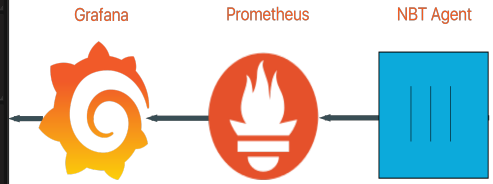
Multi-Datacenter Cluster

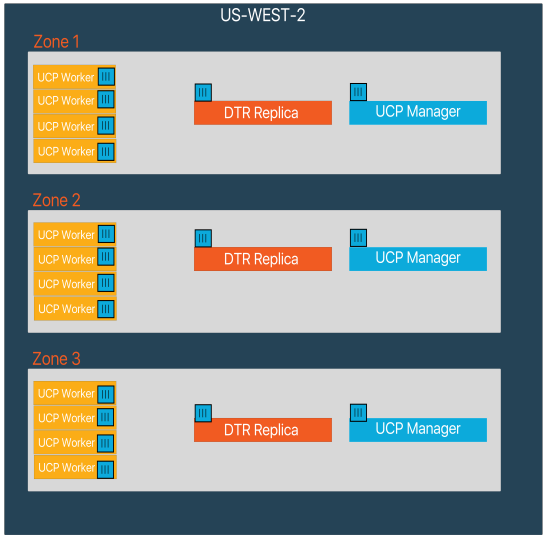


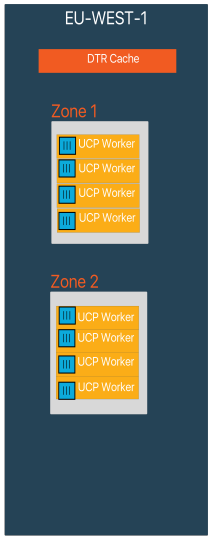
Swarm Network Monitoring

https://github.com/alexmavr/swarm-nbt

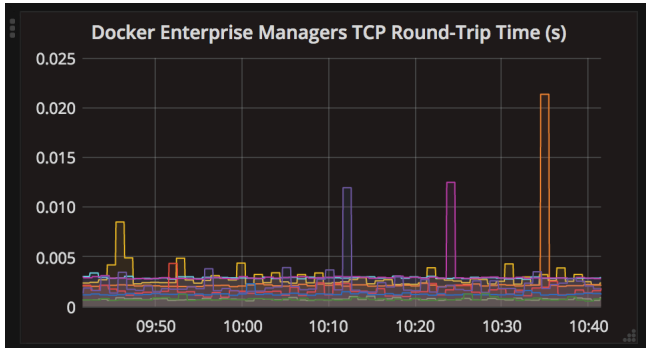


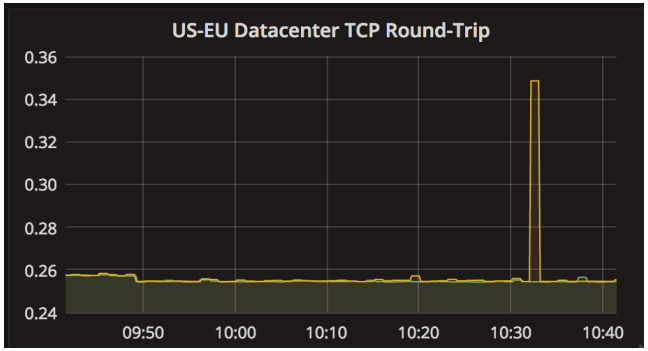


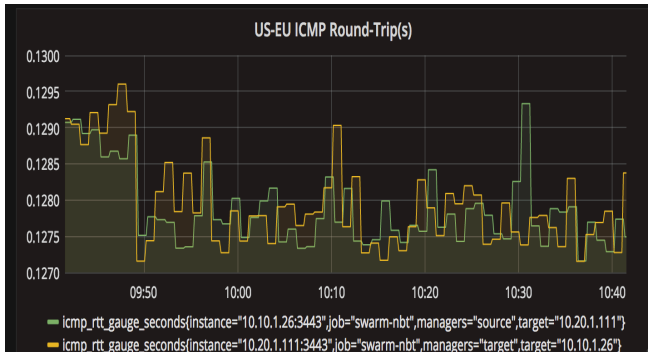


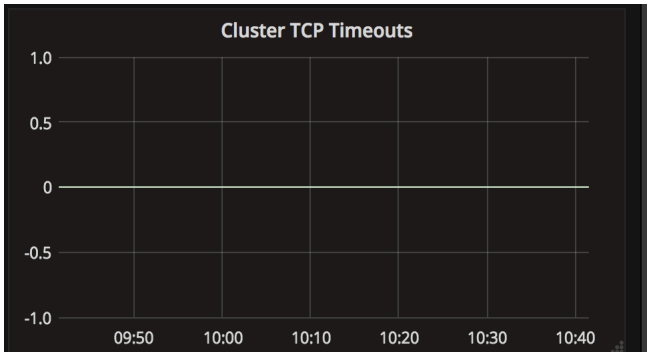


Network Metrics









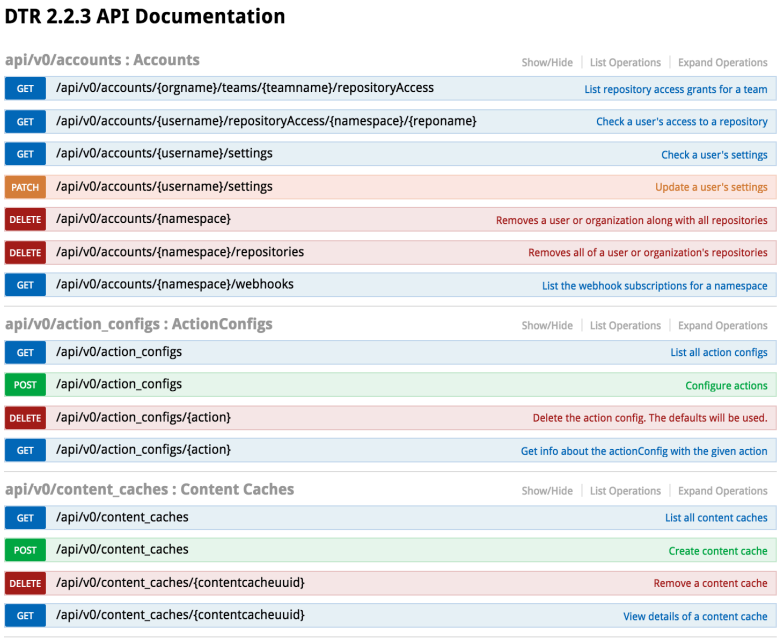
Accelerated Image Distribution

DTR Backend Storage

- Filesystem
  - Local
  - NFS
- Object (Recommended)
  - AWS S3/Compatible
  - Microsoft Azure Blob Storage
  - Google Cloud Storage
  - OpenStack Swift

DTR API

- Configurations(Certs, Storage,Proxies..etc)
- Organization/Account CRUD
- Repository CRUD
- Image Scanning
- Outgoing Webhooks
- Events



DTR 2.2.3 API Documentation

api/v0/accounts : Accounts — Show/Hide | List Operations | Expand Operations

GET	/api/v0/accounts/{orgname}/teams/{teamname}/repositoryAccess	List repository access grants for a team
GET	/api/v0/accounts/{username}/repositoryAccess/{namespace}/{reponame}	Check a user's access to a repository
GET	/api/v0/accounts/{username}/settings	Check a user's settings
PATCH	/api/v0/accounts/{username}/settings	Update a user's settings
DELETE	/api/v0/accounts/{namespace}	Removes a user or organization along with all repositories
DELETE	/api/v0/accounts/{namespace}/repositories	Removes all of a user or organization's repositories
GET	/api/v0/accounts/{namespace}/webhooks	List the webhook subscriptions for a namespace

api/v0/action_configs : ActionConfigs — Show/Hide | List Operations | Expand Operations

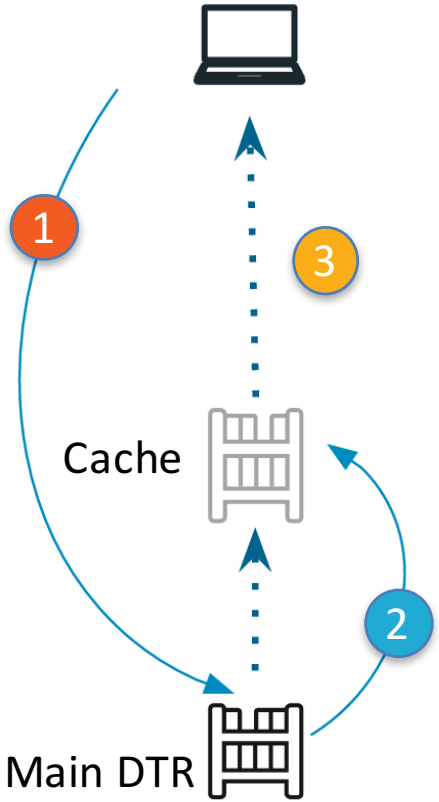
GET	/api/v0/action_configs	List all action configs
POST	/api/v0/action_configs	Configure actions
DELETE	/api/v0/action_configs/{action}	Delete the action config. The defaults will be used.
GET	/api/v0/action_configs/{action}	Get info about the actionConfig with the given action

api/v0/content_caches : Content Caches — Show/Hide | List Operations | Expand Operations

GET	/api/v0/content_caches	List all content caches
POST	/api/v0/content_caches	Create content cache
DELETE	/api/v0/content_caches/{contentcacheuuid}	Remove a content cache
GET	/api/v0/content_caches/{contentcacheuuid}	View details of a content cache

Content Caching

- Faster Pulls
- Reduces WAN Traffic
- Per User Configuration
- Chaining OK
- Configurable TTL
- Supports Same Storage Backbends as DTR
- Advanced Caching (e.g Secure Image Caching)



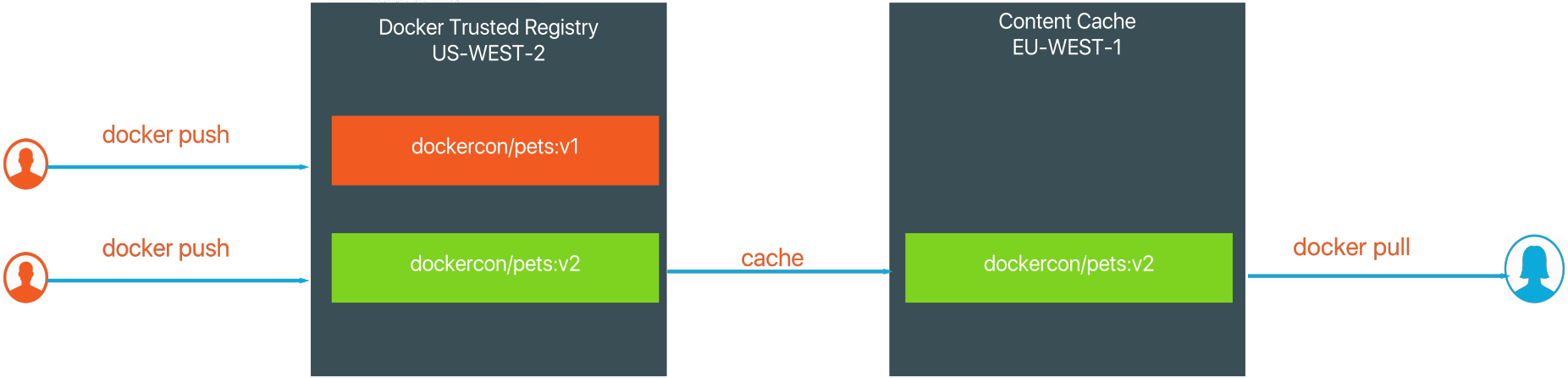
docker17 con

Demo 1
Automating Secure Image Caching

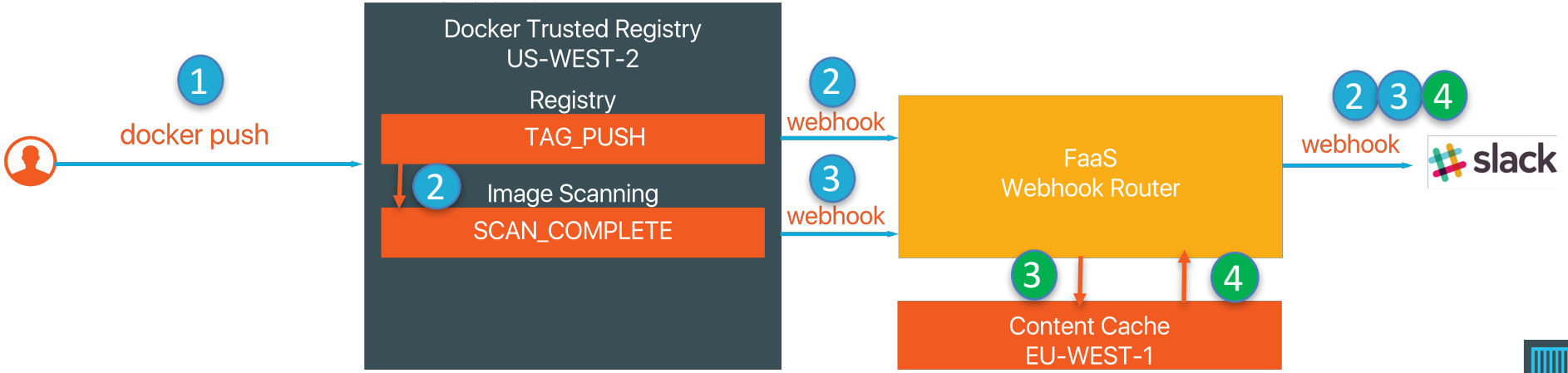
Demo Objectives

1. Integrate DTR Webhooks with Slack
2. Automate DTR Caching based on Security Scanning Results
3. Show Content Caching Results

Demo Details



Demo Details



- Secure Images Only

Resilient Application Deployment

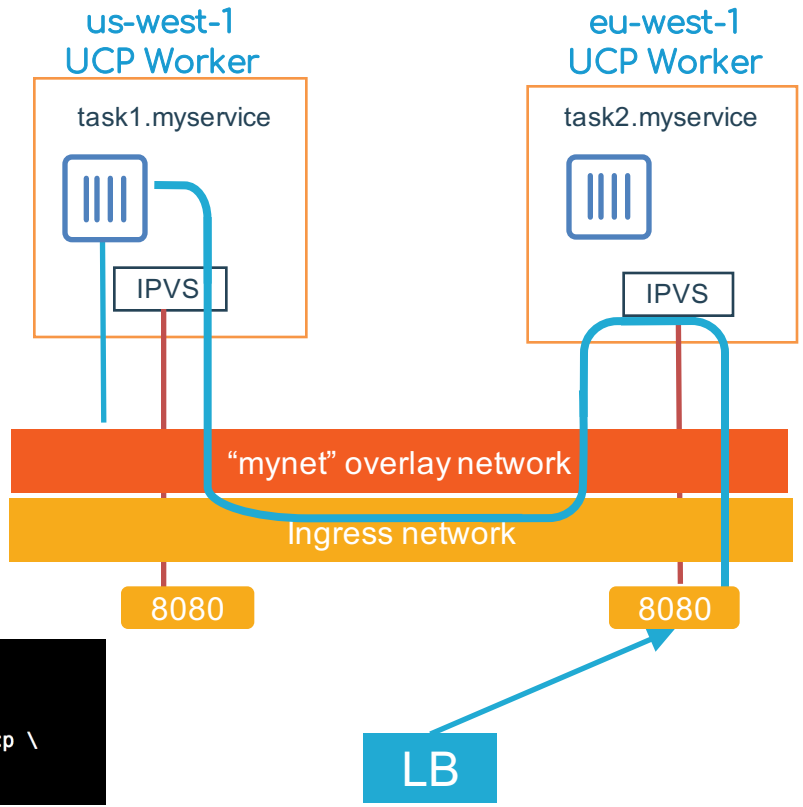
Topology Aware Scheduling

- Placement preference based on node/engine label
- Equal distribution of tasks based on node label
- Hierarchal preference (region > zone > rack)
- Best Effort
- In 17.04-ce & 17.06-ee

```
docker service create \
 --name myapp \
 --replicas 10 \
 --placement-pref 'spread=node.labels.region' \
 --placement-pref 'spread=node.labels.zone' \
 --placement-pref 'spread=node.labels.rack' \
 myapp:v1
```

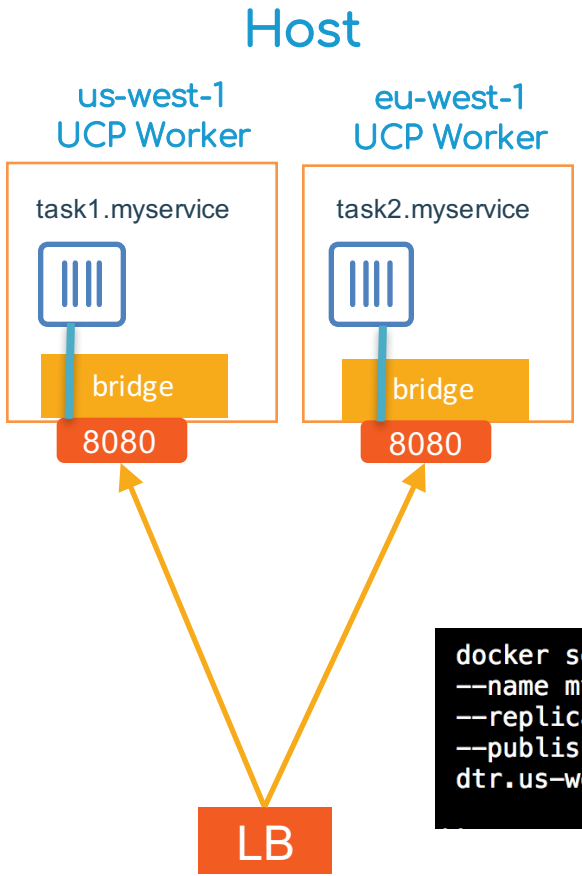
Ingress Networking Mode

- Uses Overlay + IPVS
- Good for East-West traffic
- Potentially bad if you don't control the underlay (public cloud, internet)




```
docker service create \
 --name myapp \
 --replicas 2 \
 --publish mode=ingress,target=5000,published=32000,protocol=tcp \
 dtr.us-west.dcus17.dckr.org/dockercon/myapp:v1
```

Host Networking Mode



- Uses default bridge + NAT to expose service port
- No cross-datacenter networking traffic
- Good for North<>South Traffic

```
docker service create \
--name myapp \
--replicas 2 \
--publish mode=host,target=5000,published=32000,protocol=tcp \
dtr.us-west.dcus17.dckr.org/dockercon/myapp:v1
```

docker17 con

Demo 3

Geo-Aware Application Deployment + Access

Demo Objectives

1. Launch a service in two datacenter
2. Use topology aware scheduling to ensure equal distribution across 2 regions and 5 zones
3. Access the application based geo-DNS

Geo-Aware Service Scheduling

US User EU User

Key Takeaways

- Choose the right architecture that fits your requirements
- Per app-stage clusters recommended
- UCP Managers/DTR Replicas in same region
- UCP Workers can extend across regions
- (Keep) Monitoring Your Platform
- Utilize DTR API and webhooks for automation
- Use Content Cache to minimize pull time
- Use topology aware scheduling for enhanced scheduling
- Use the networking model that best suits your applications

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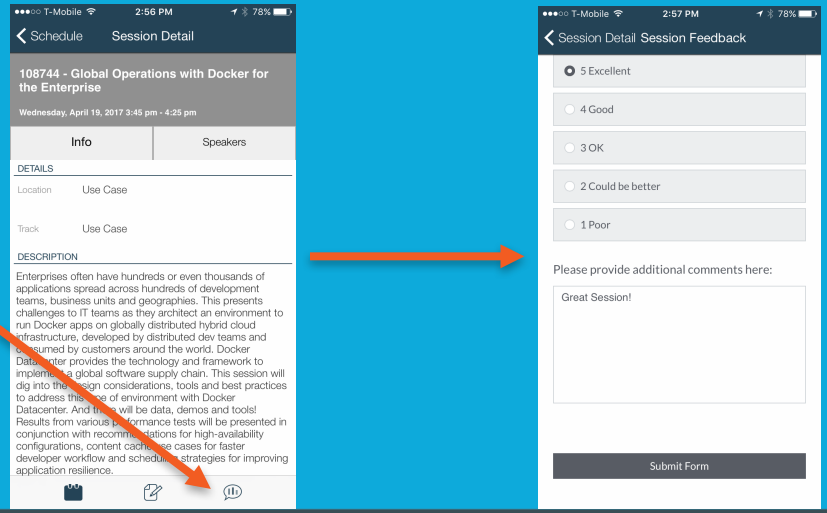
Thanks! Questions?

Feedback Welcome!



@docker #dockercon

docker17 con