

# Building a Secure Swarm



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# Operating at Scale

**Kubernetes**

**Does Everything**

**Hard**

**Swarm**

**Doesn't Do Everything**

**Simple**



# Overview/ Summary



**Swarm Theory of Operations**

**Build a Secure Swarm**

**Orchestration Primer**

**Recap**



**Up Next:**

# **Swarm Theory of Operations**

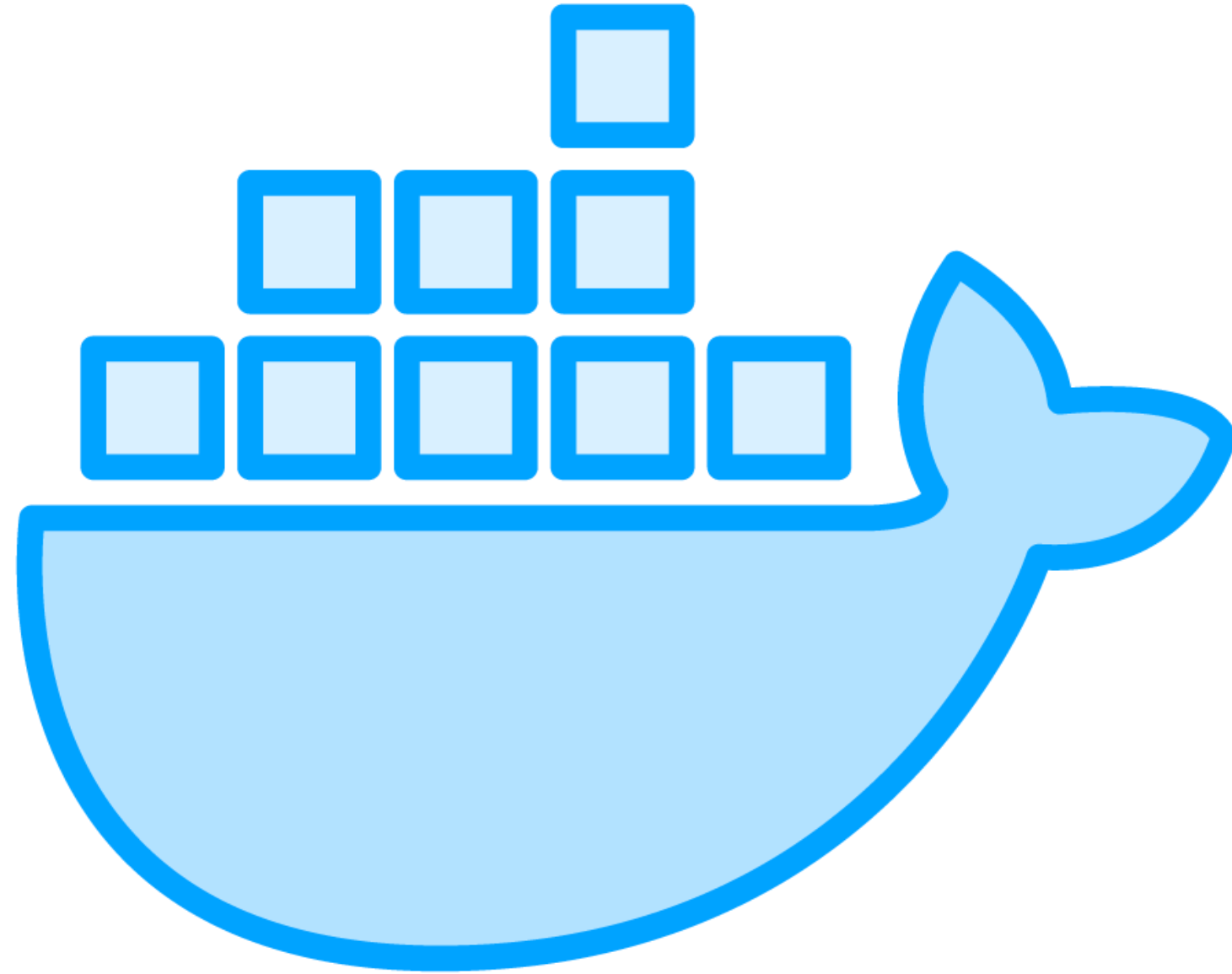
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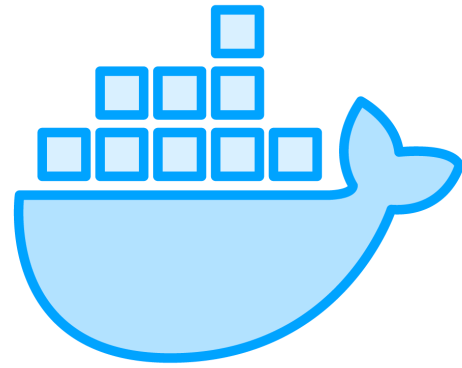




# Swarm Theory of Operations







containerd

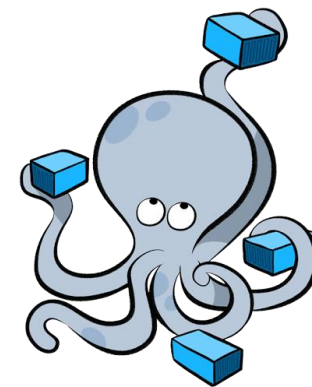
SWARMKIT

CRUNCRUNC

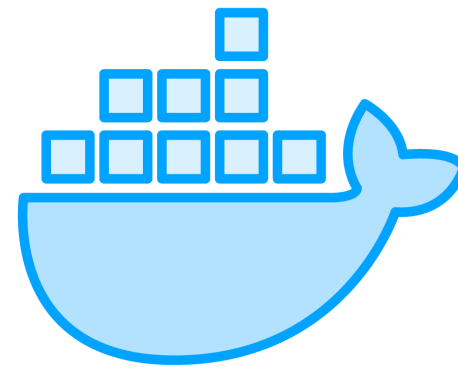
LibNetwork

Notary

Compose







containerd

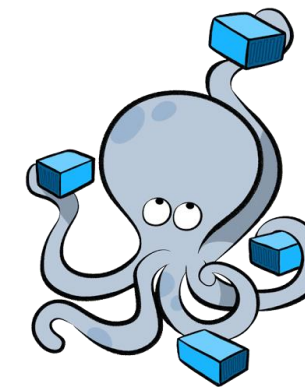
CRUNCRUNC

Notary

SWARMKIT

LibNetwork

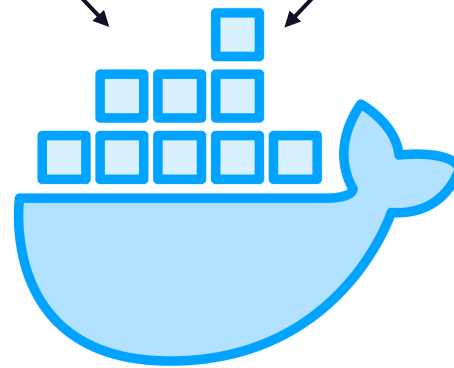
Compose





{API}

> CLI



containerd

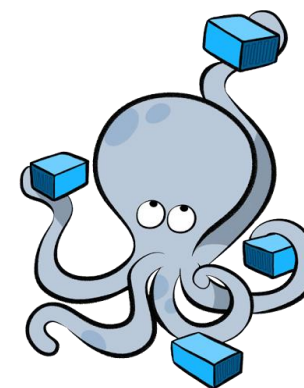
SWARMKIT

RC RUNC

LibNetwork

Notary

Compose



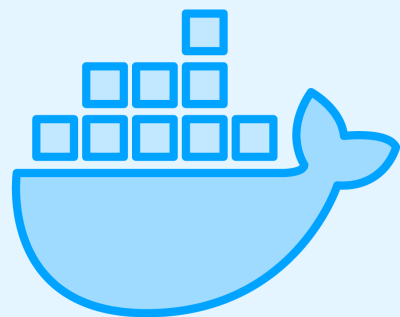


**SWARMKIT**

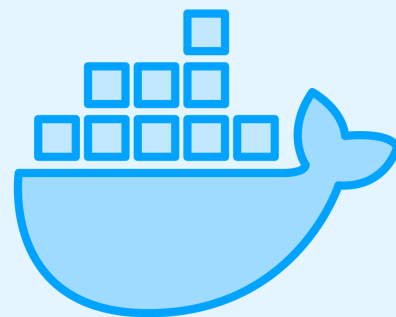
Clustering

Orchestration

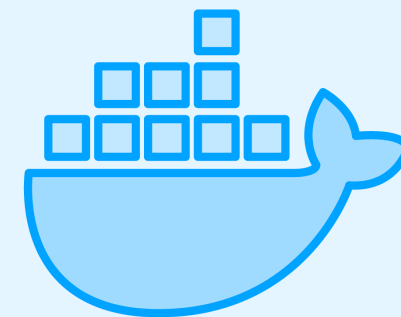




Node1



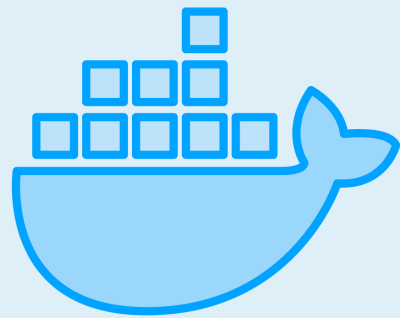
Node2



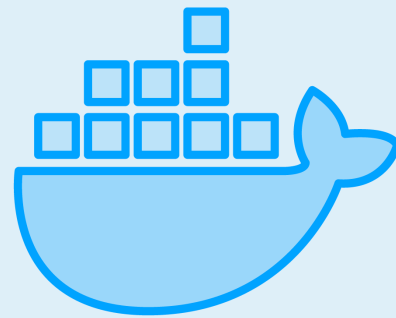
Node3



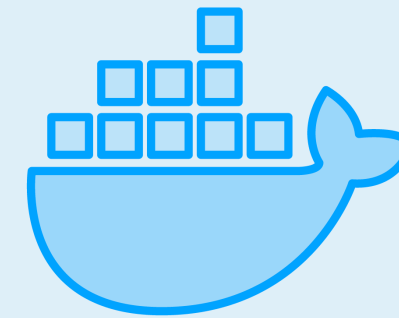
## Swarm



Node1

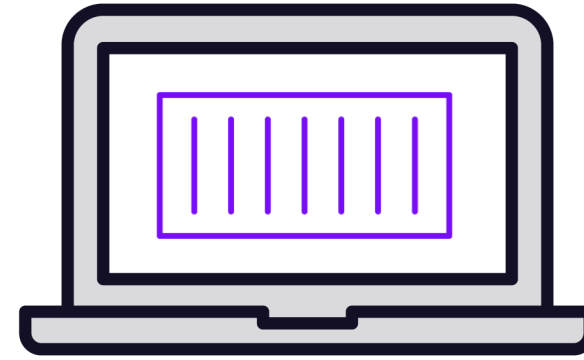


Node2

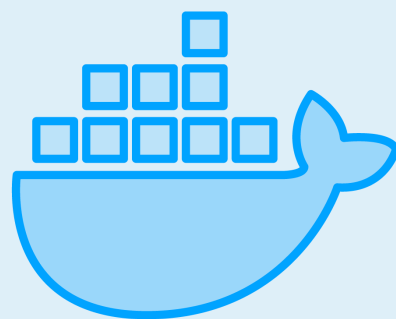


Node3

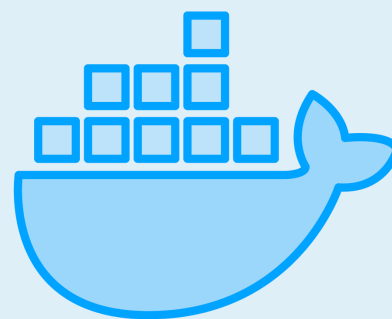




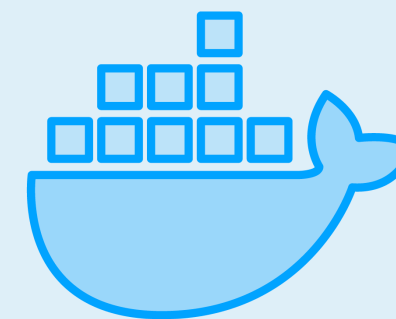
Swarm



Node1

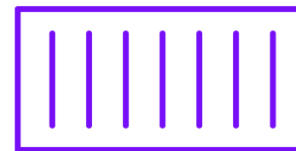


Node2

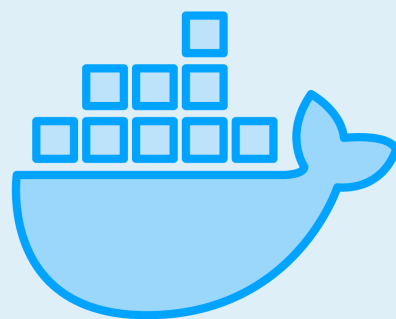


Node3

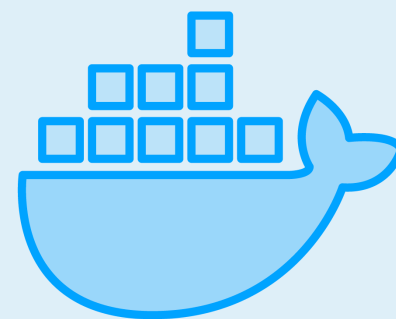




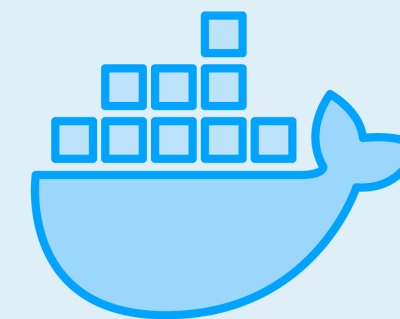
Swarm



Node1



Node2

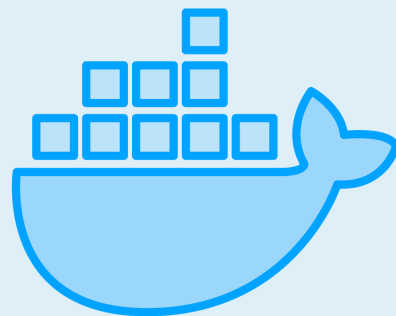


Node3

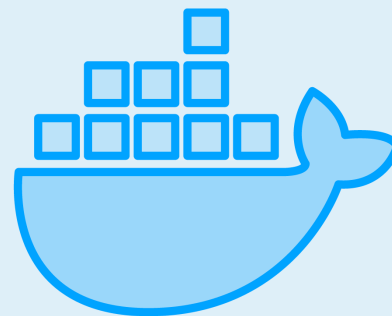




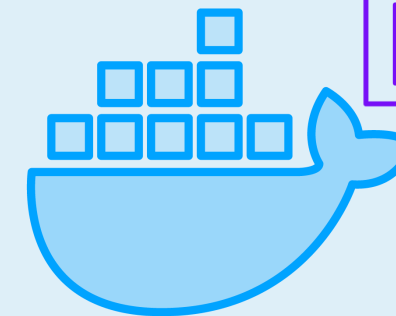
Swarm



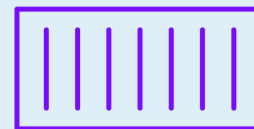
Node1



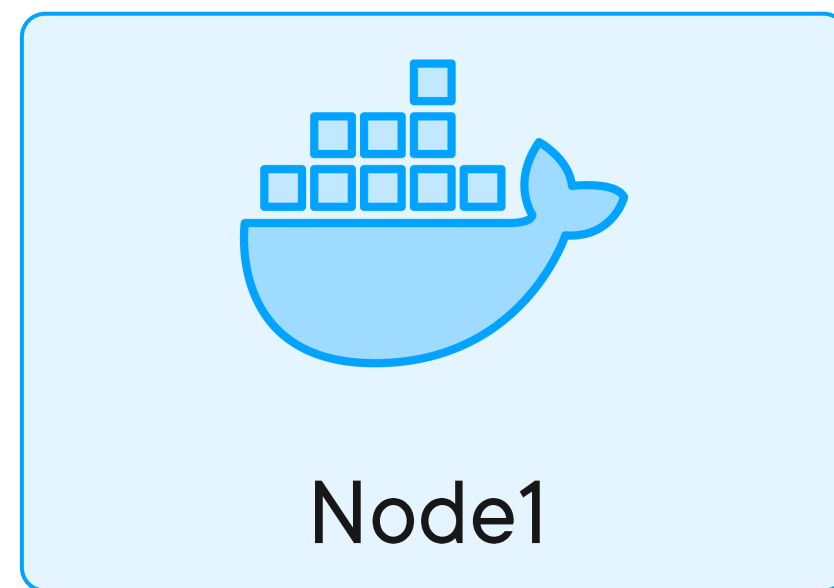
Node2



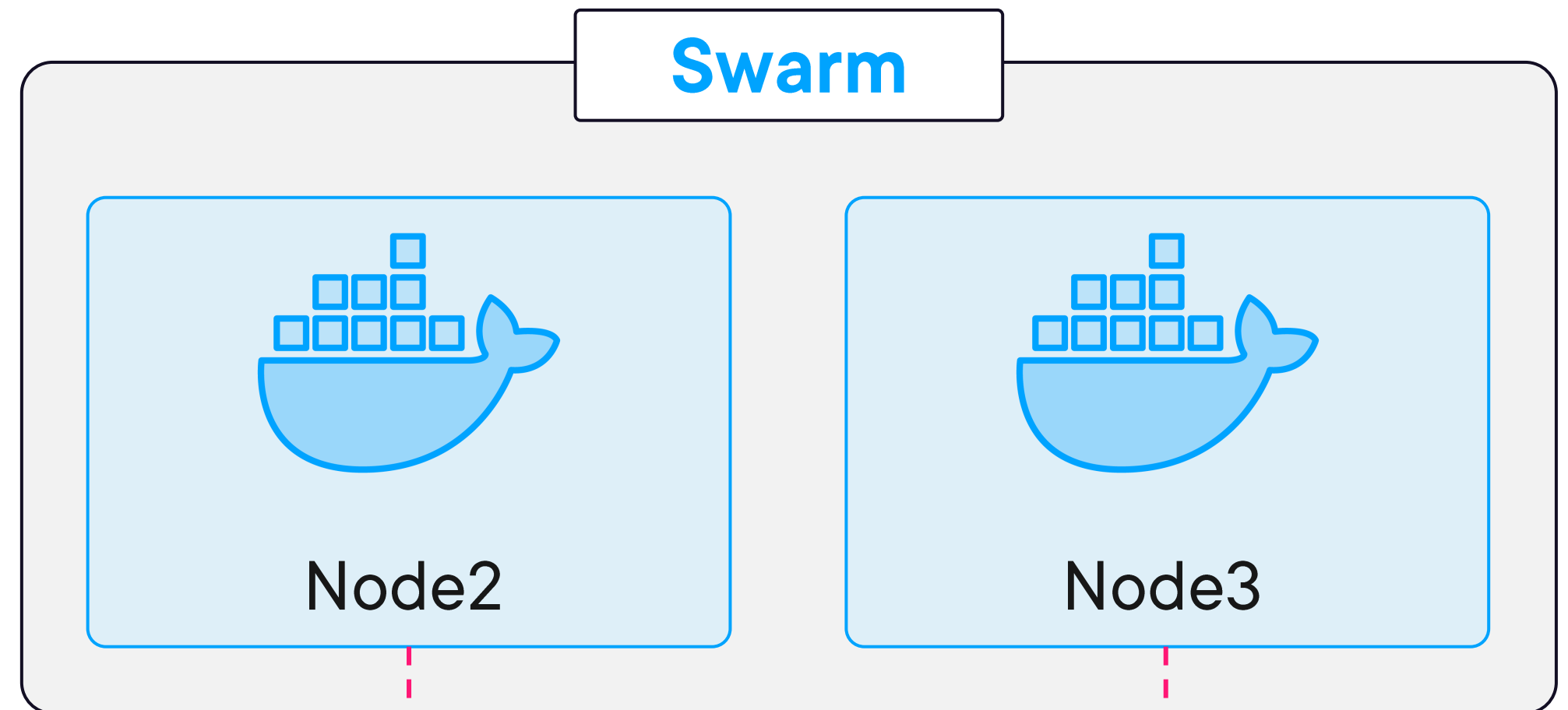
Node3







Single-engine  
mode

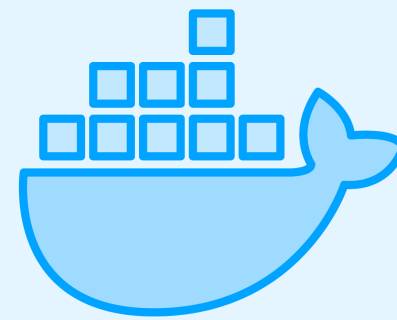


Swarm mode

Swarm mode



```
$ docker swarm init...
```

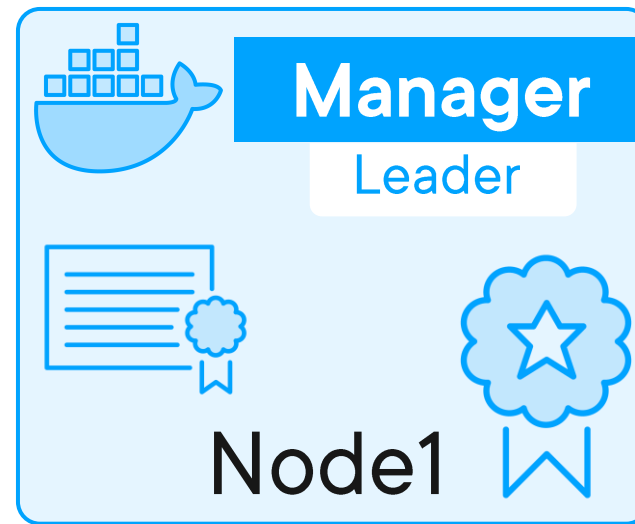
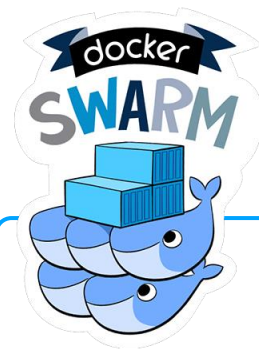


Node1



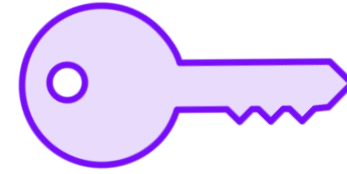
**Single-engine  
mode**



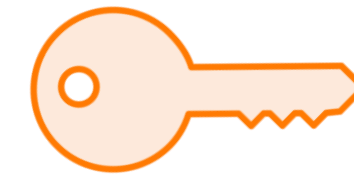




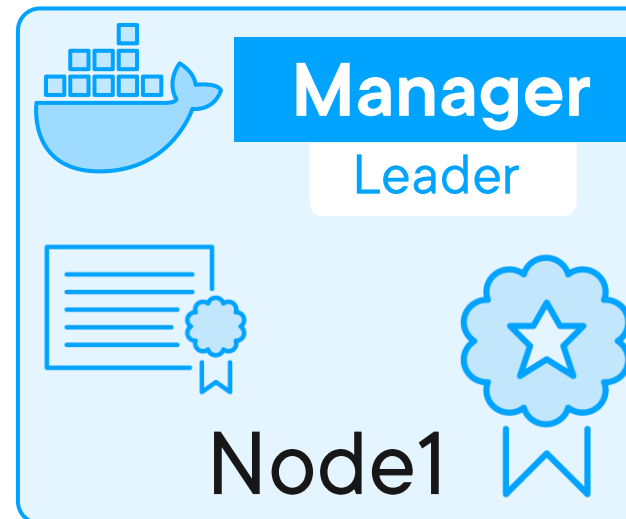
Cluster Store



Manager  
Join Token

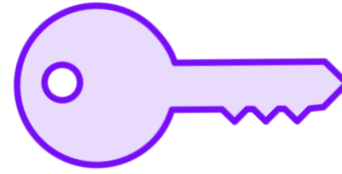


Worker  
Join Token

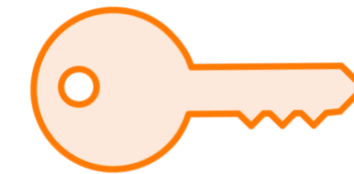




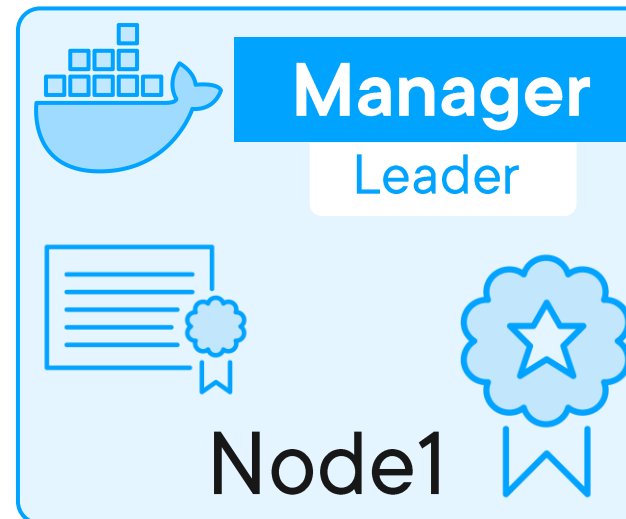
Cluster Store



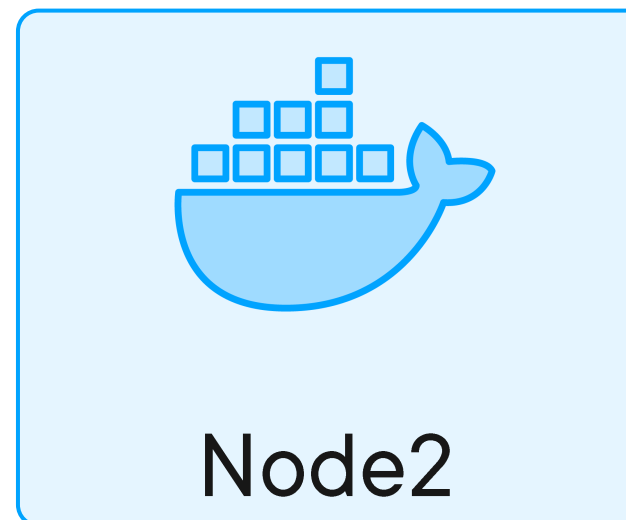
Manager  
Join Token



Worker  
Join Token

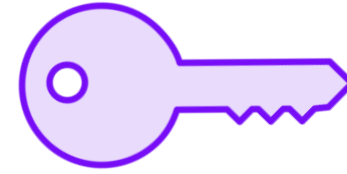


\$ docker swarm init...

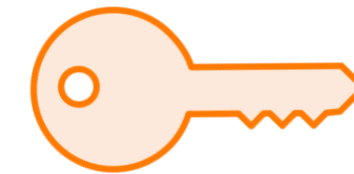





Cluster Store





Manager  
Join Token



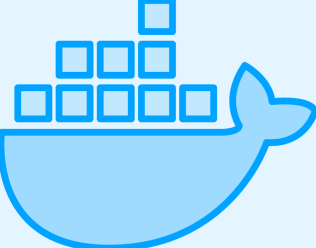
Worker  
Join Token



**Manager**  
Leader



Node1

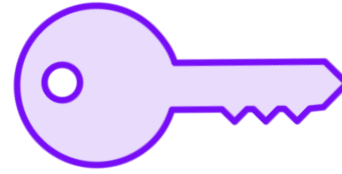


Node2

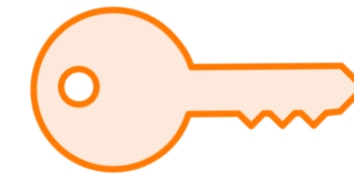




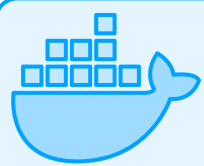
Cluster Store



Manager  
Join Token



Worker  
Join Token



**Manager**

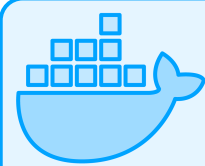
Leader



Node1



Node2



**Manager**



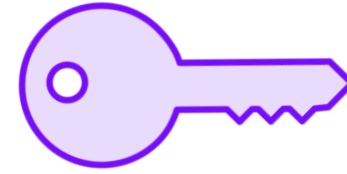
Node2



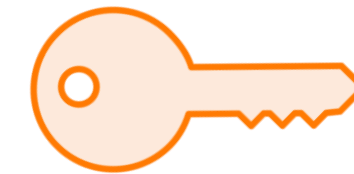




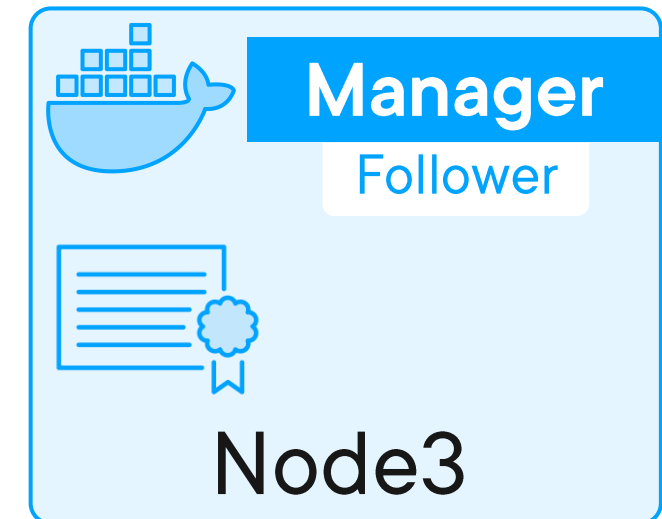
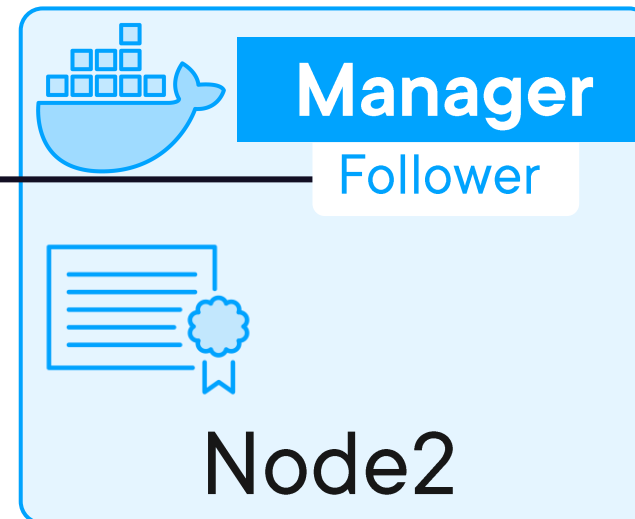
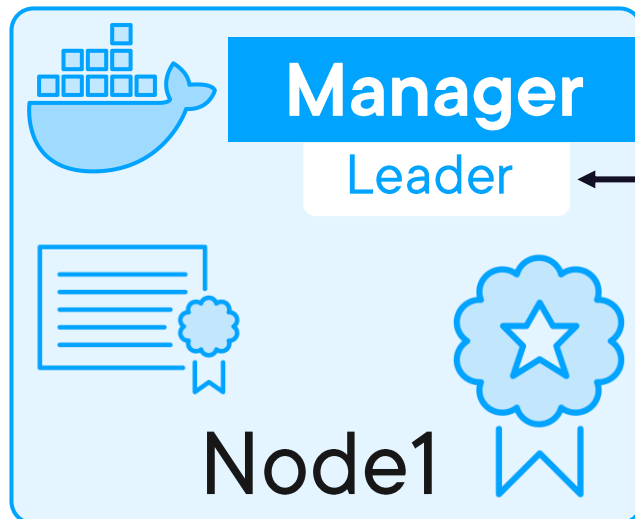
Cluster Store



Manager  
Join Token



Worker  
Join Token

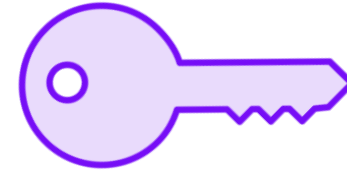


Command

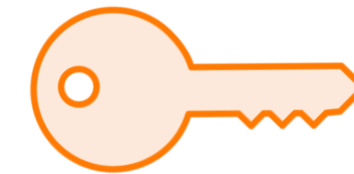




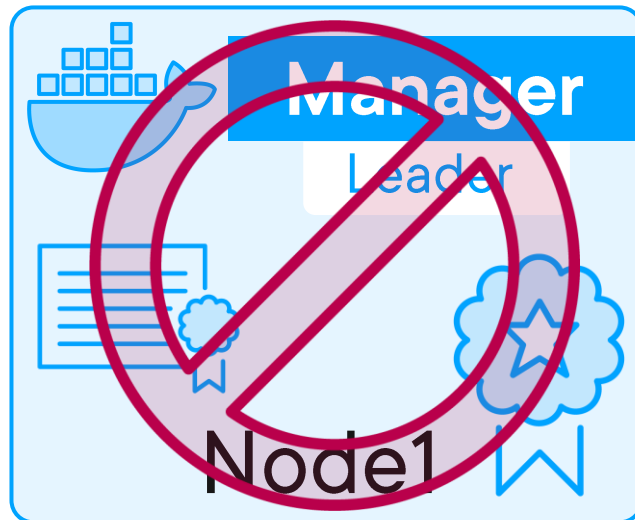
Cluster Store



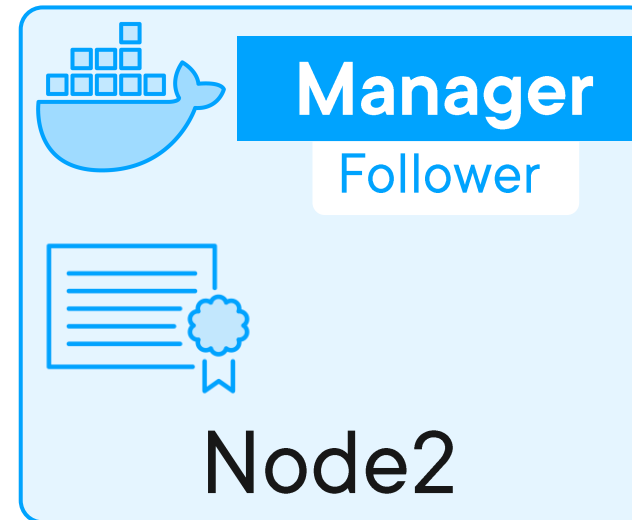
Manager  
Join Token



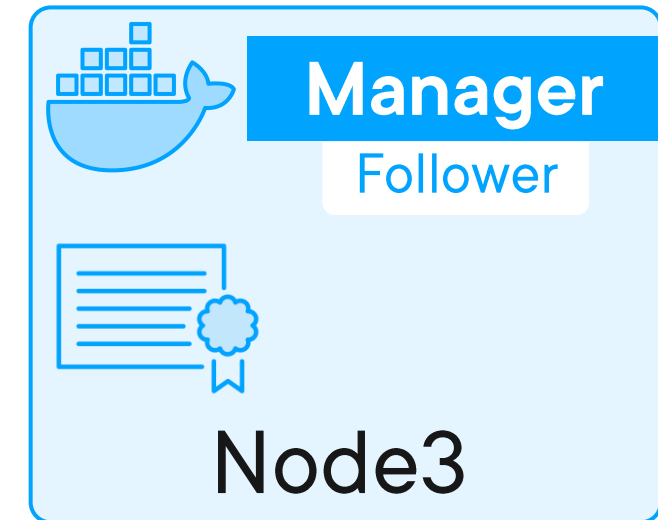
Worker  
Join Token



Node1



Node2

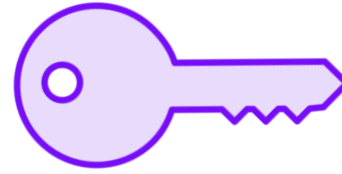


Node3

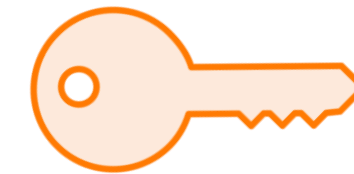




Cluster Store



Manager  
Join Token



Worker  
Join Token

A blue whale icon with a red 'X' over it, indicating a failed state.

**Manager**  
Failed

Node1

A blue whale icon with a star on its back, indicating a leader state.

**Manager**  
Leader

Node2

A blue whale icon with a star on its back, indicating a follower state.

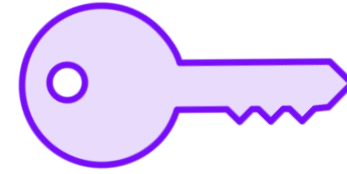
**Manager**  
Follower

Node3

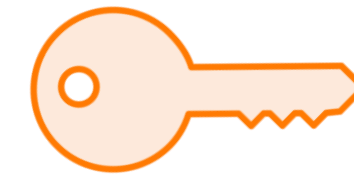




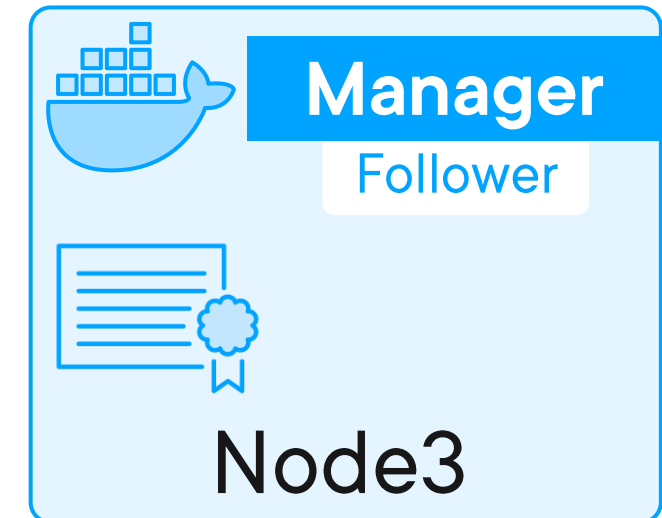
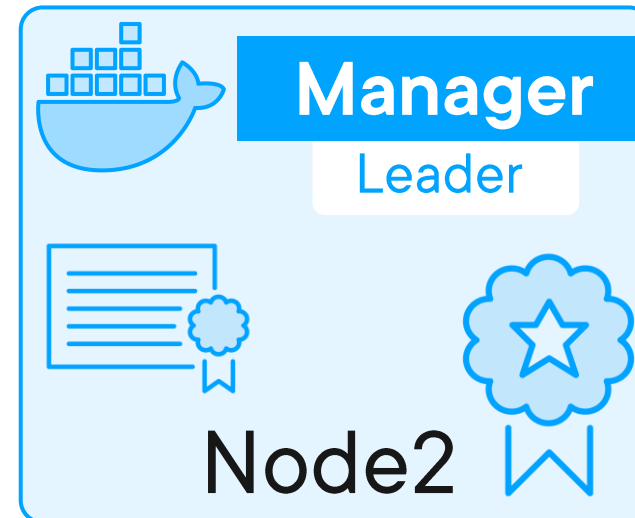
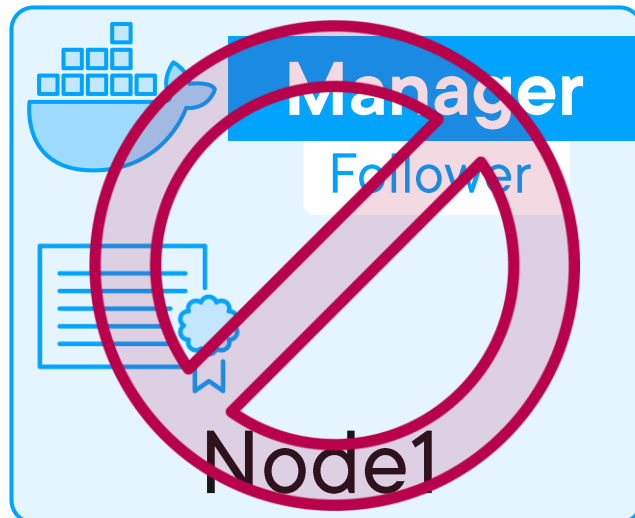
Cluster Store



Manager  
Join Token



Worker  
Join Token

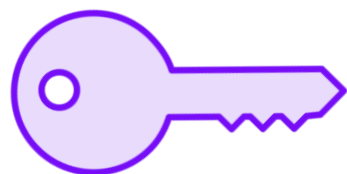




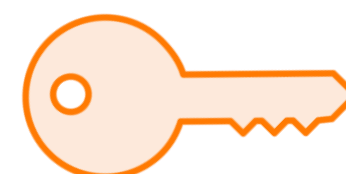
# Raft Consensus Group



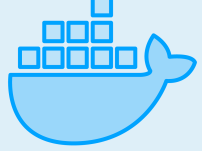
Cluster Store




Manager Join Token

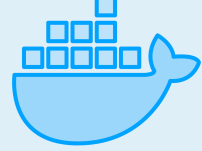




Worker Join Token

**Manager**  
Follower





Node1

**Manager**  
Leader



Node2

**Manager**  
Follower



Node3

Fast & reliable

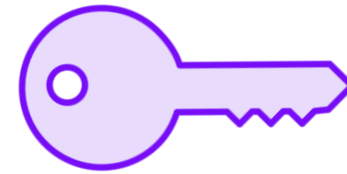




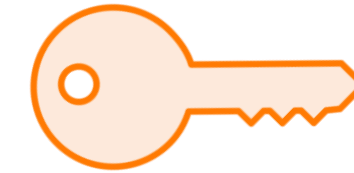
## Raft Consensus Group



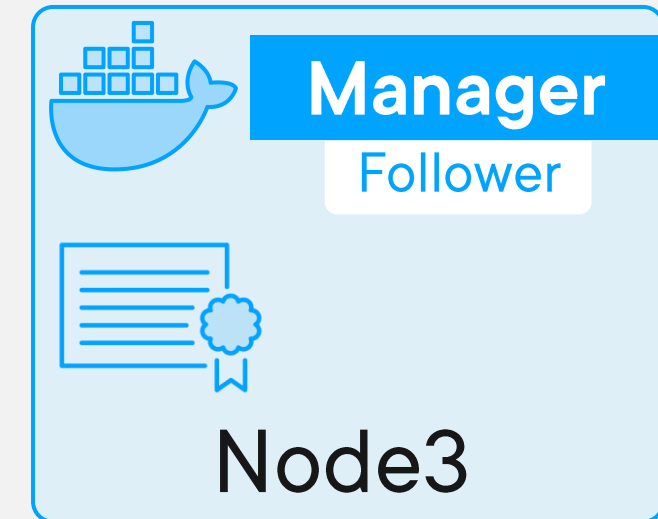
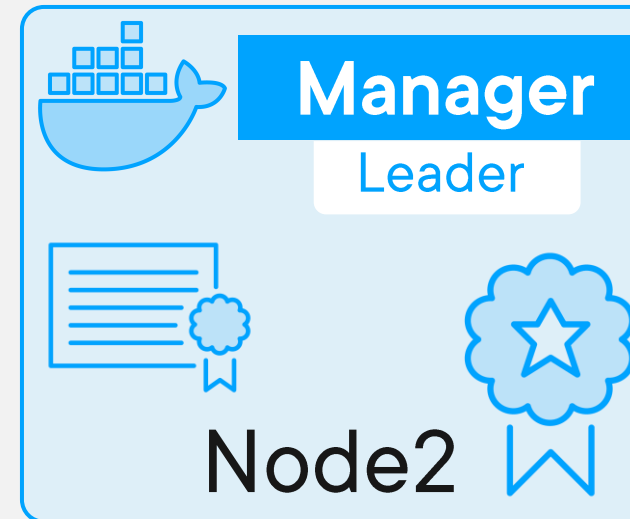
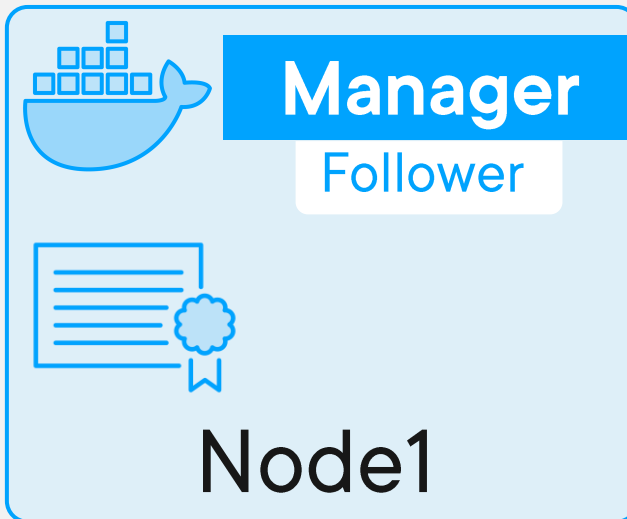
Cluster Store



Manager  
Join Token



Worker  
Join Token

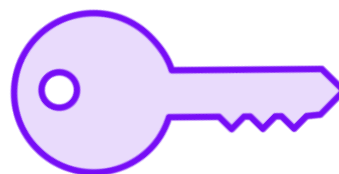




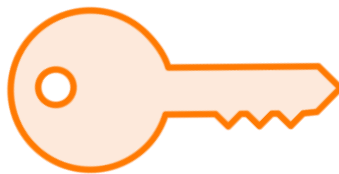
# Raft Consensus Group




Cluster Store





Manager  
Join Token






Worker  
Join Token


**Manager**  
Follower

  
Node1


**Manager**  
Leader


  
Node2

**Manager**  
Follower

  
Node3

**Worker**

**Worker**

**Worker**



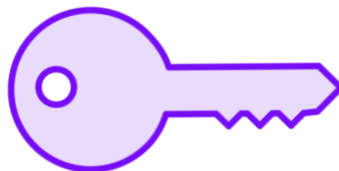




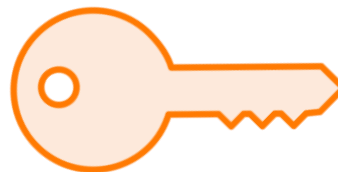
# Raft Consensus Group




Cluster Store




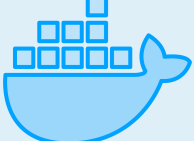
Manager  
Join Token






Worker  
Join Token


**Manager**  
Follower


  
Node1


**Manager**  
Leader


  
Node2


**Manager**  
Follower


  
Node3


**Worker**

  
Node1  
Node2  
Node3

**Worker**

  
Node1  
Node2  
Node3

**Worker**

  
Node1  
Node2  
Node3



**Up Next:**

# **Build a Secure Swarm**

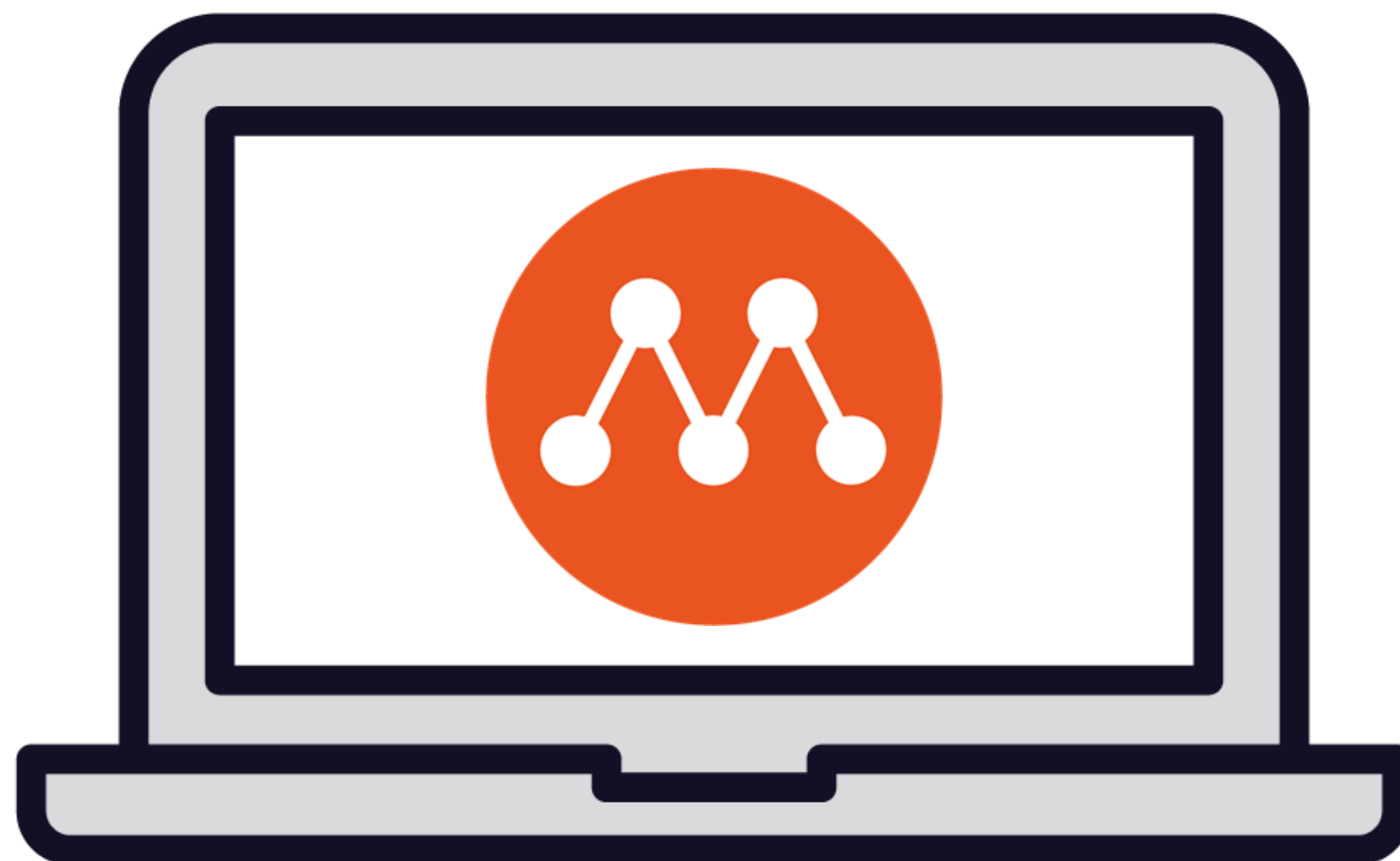
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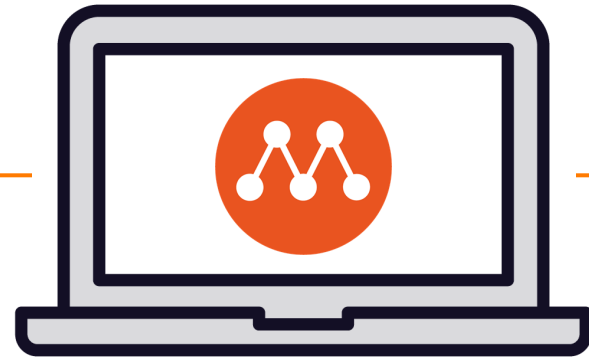




# **Build a Secure Swarm**







**Multipass VM**



mgr1

**Multipass VM**



mgr2

**Multipass VM**



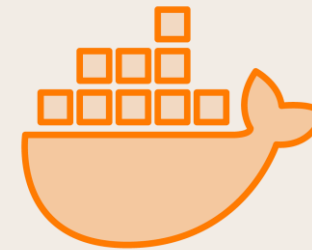
mgr2

**Multipass VM**



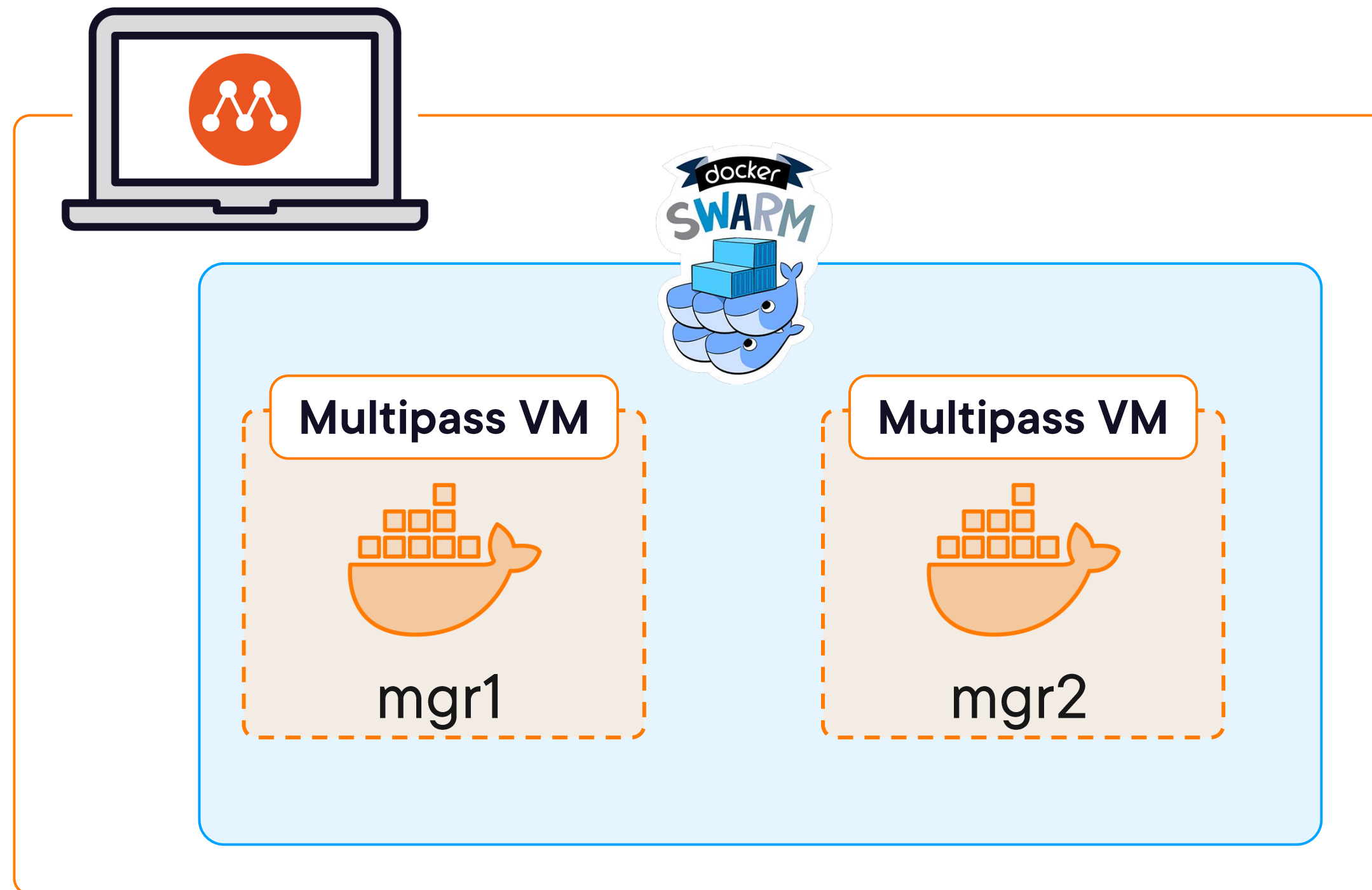
wrk1

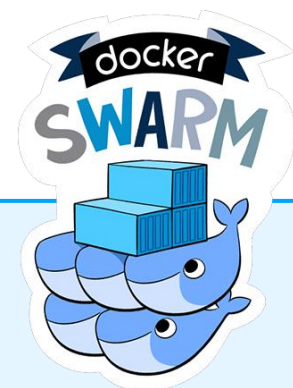
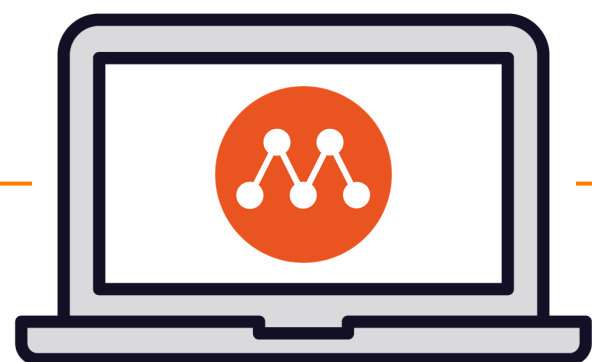
**Multipass VM**



wrk2







**Multipass VM**



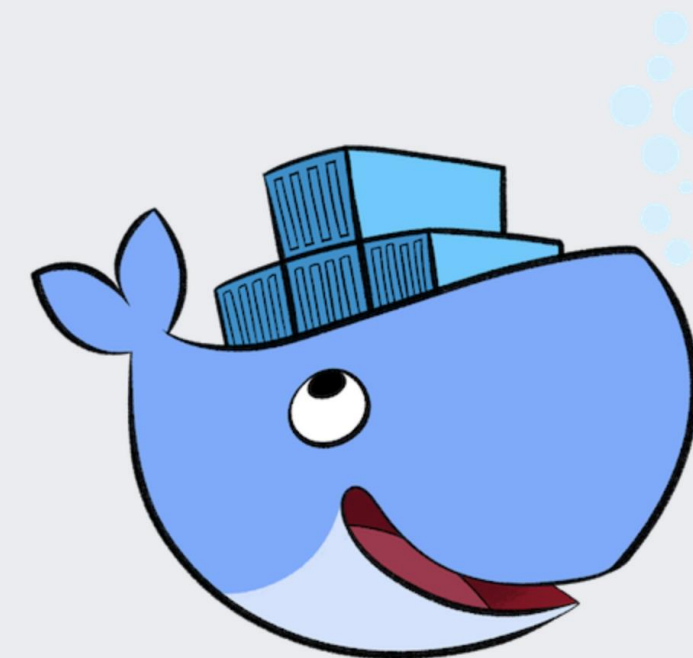
mgr1

**Multipass VM**



mgr2

OR



# Play with Docker

A simple, interactive and fun playground to learn Docker

Login ▾





**Up Next:**

# **Orchestration Primer**

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# Orchestration Primer



**Doing stuff at scale is hard!**

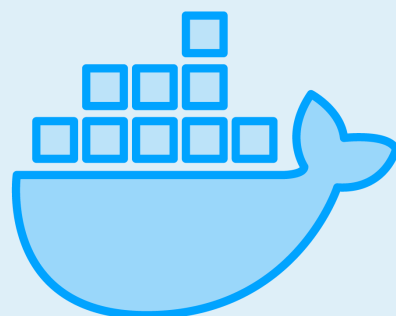




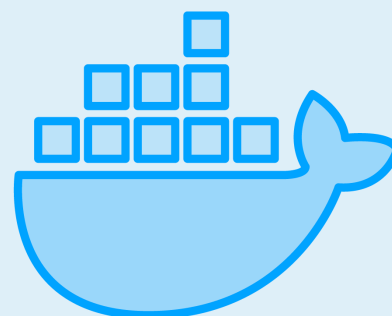
Run my app...

4 x  
web

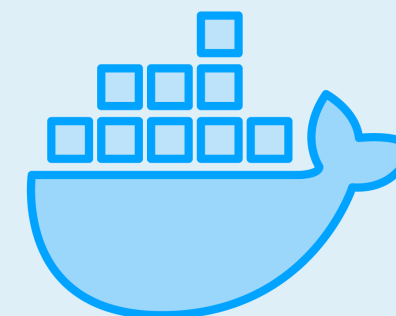
Swarm



Node1



Node2



Node3



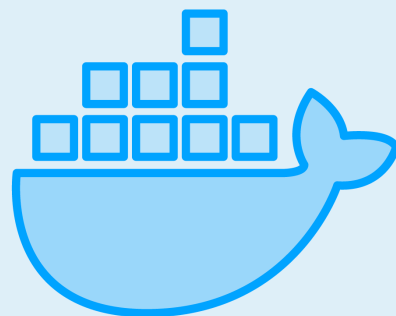


Run my app...

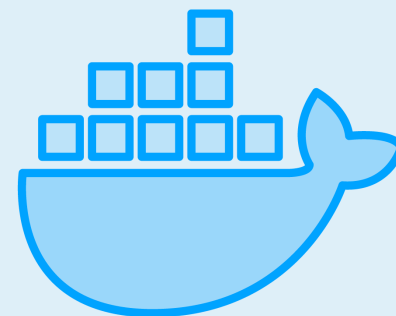
4 x  
web



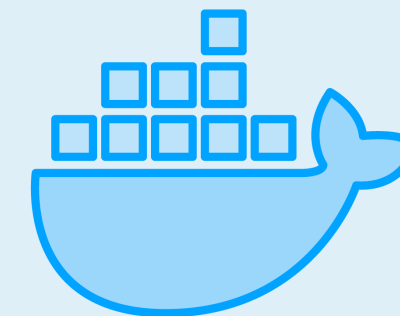
Swarm



Node1



Node2



Node3

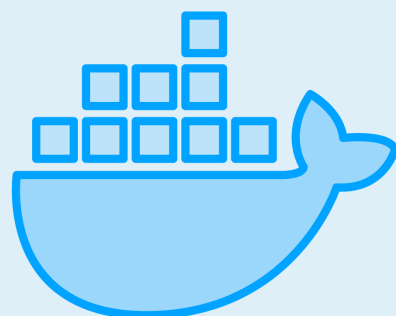




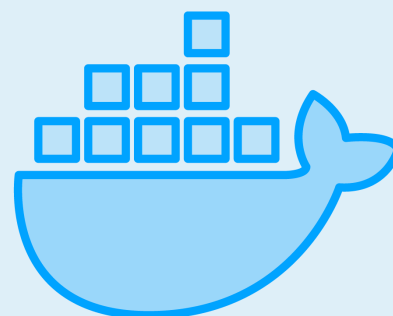
Run my app...

4 x  
web

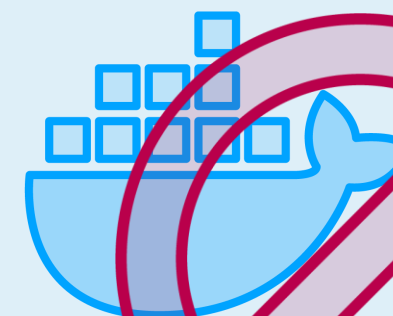
Swarm



Node1



Node2



Node3

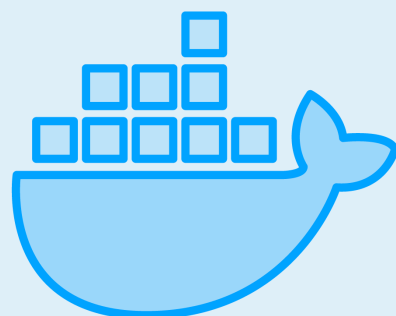




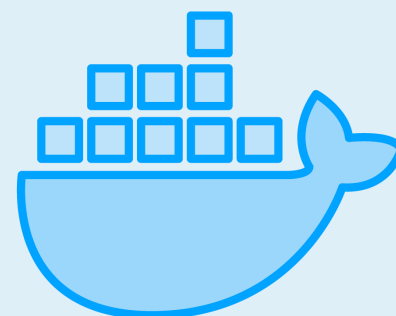
Run my app...

4 x  
web

Swarm



Node1



Node2





**Up Next:**

**Recap**

---







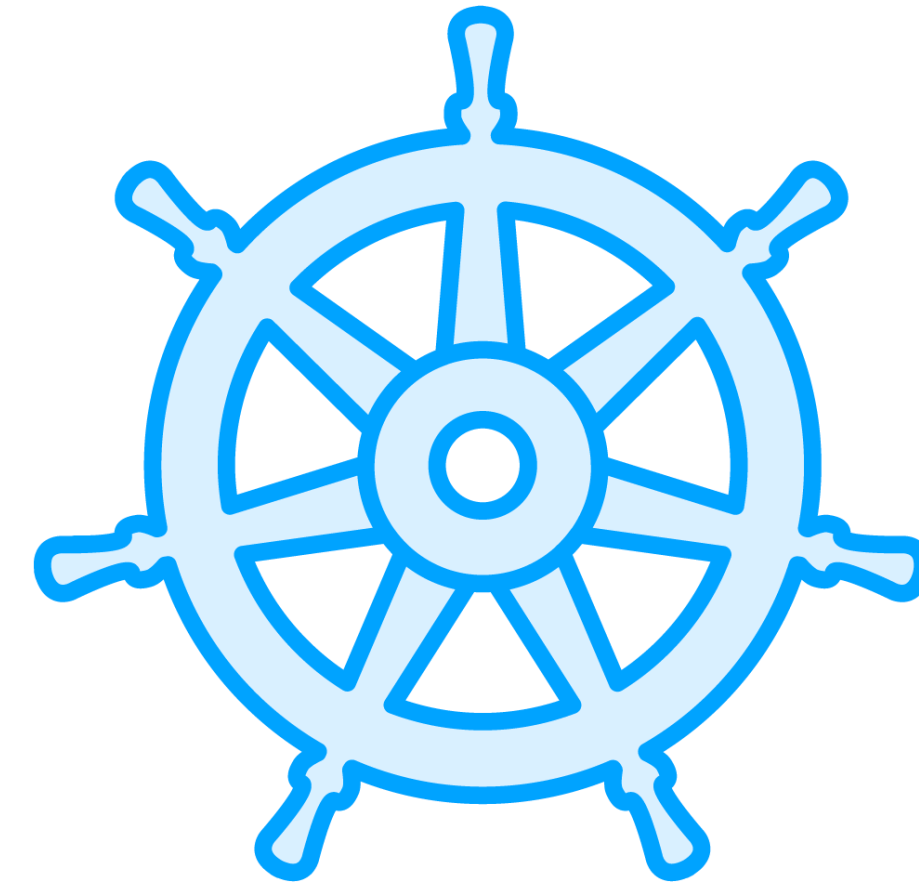
# Recap





**Simple**

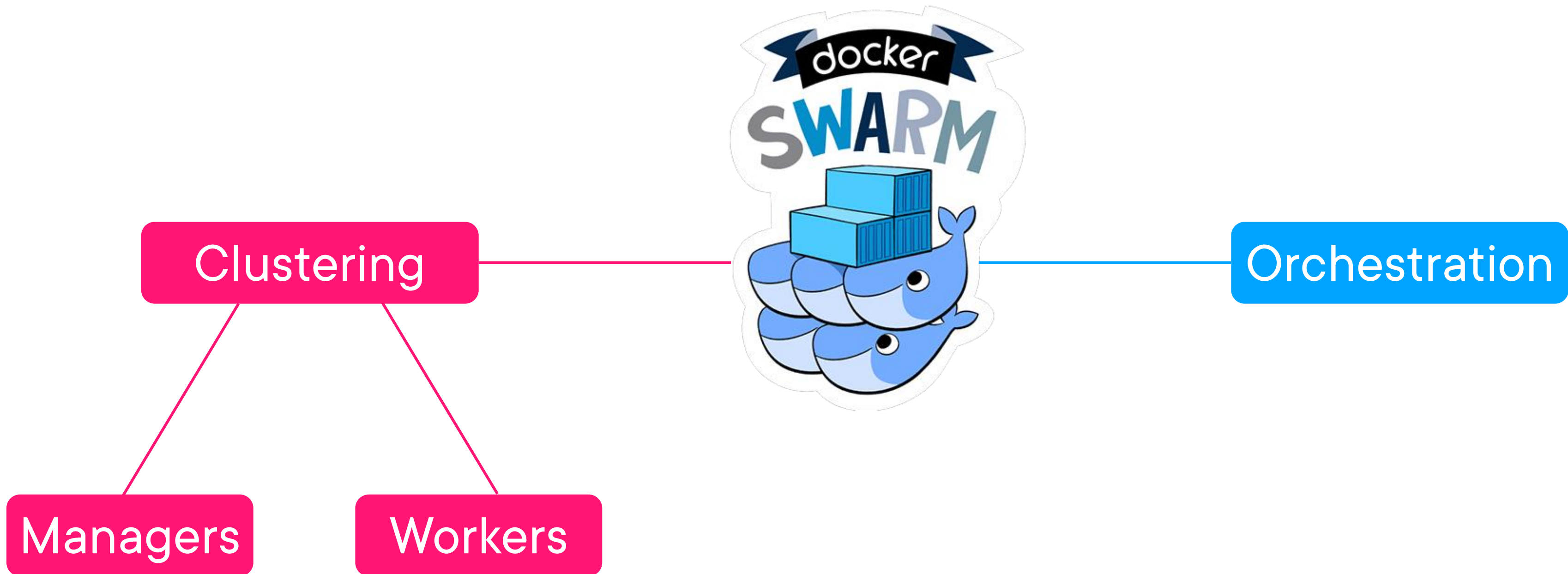
**Does Less**



**Hard**

**Does More**







Clustering

Orchestration

Managers

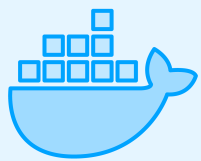
Workers

Cluster  
control

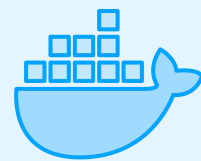
Run apps



```
$ docker swarm init...
```



Node1



Node2



Node3

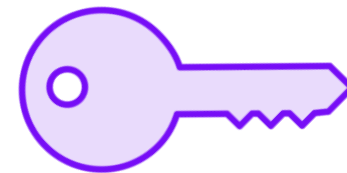




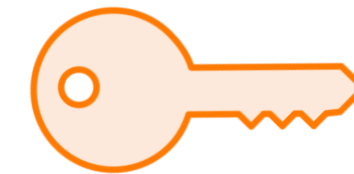
## Raft Consensus Group



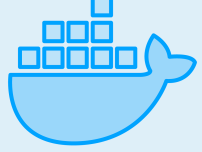
Cluster Store




Manager  
Join Token






Worker  
Join Token

**Manager**  
Follower

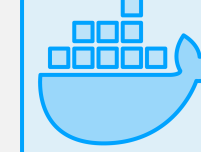



Node1

**Manager**  
Leader



Node2

**Manager**  
Follower



Node3



**Up Next:**

# **Container Networking**

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