

Cracking the container scale problem with the Datacenter Operating System

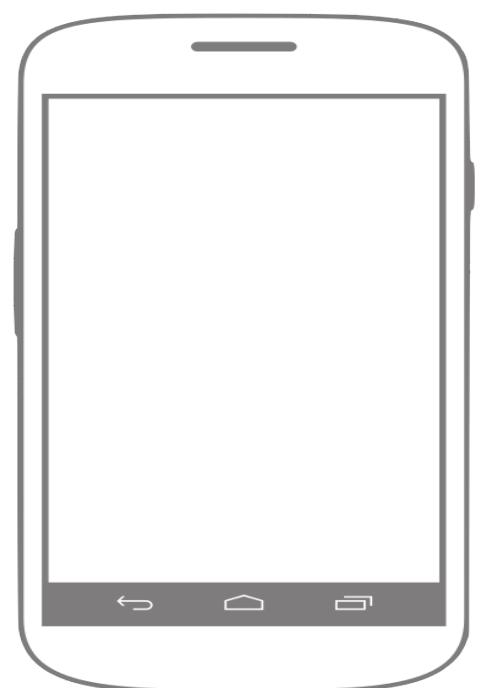
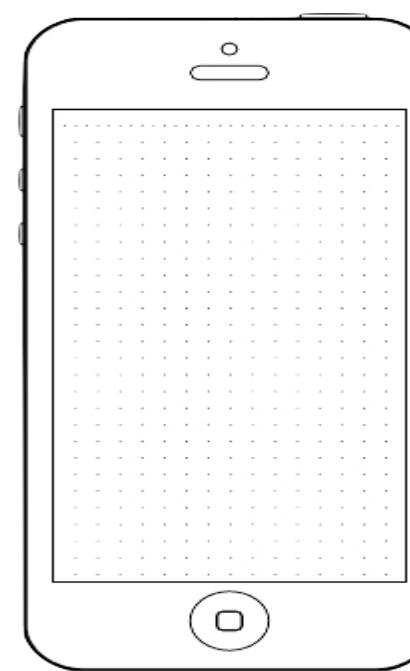
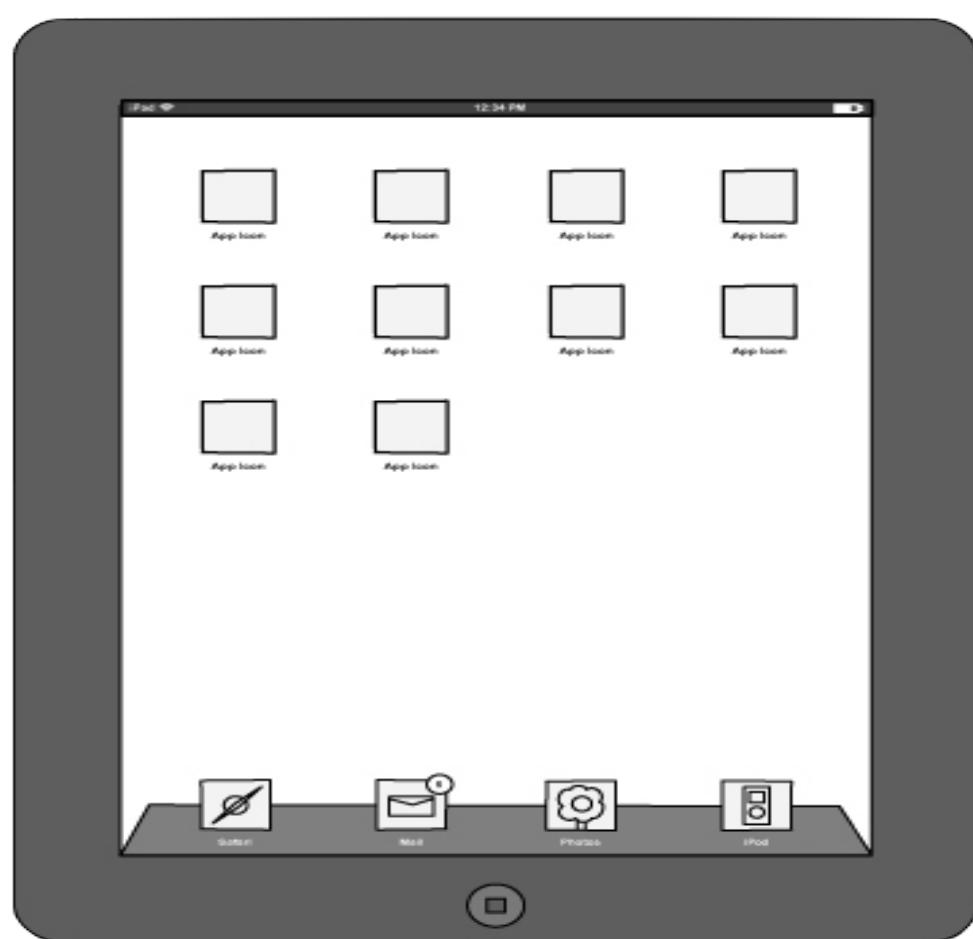
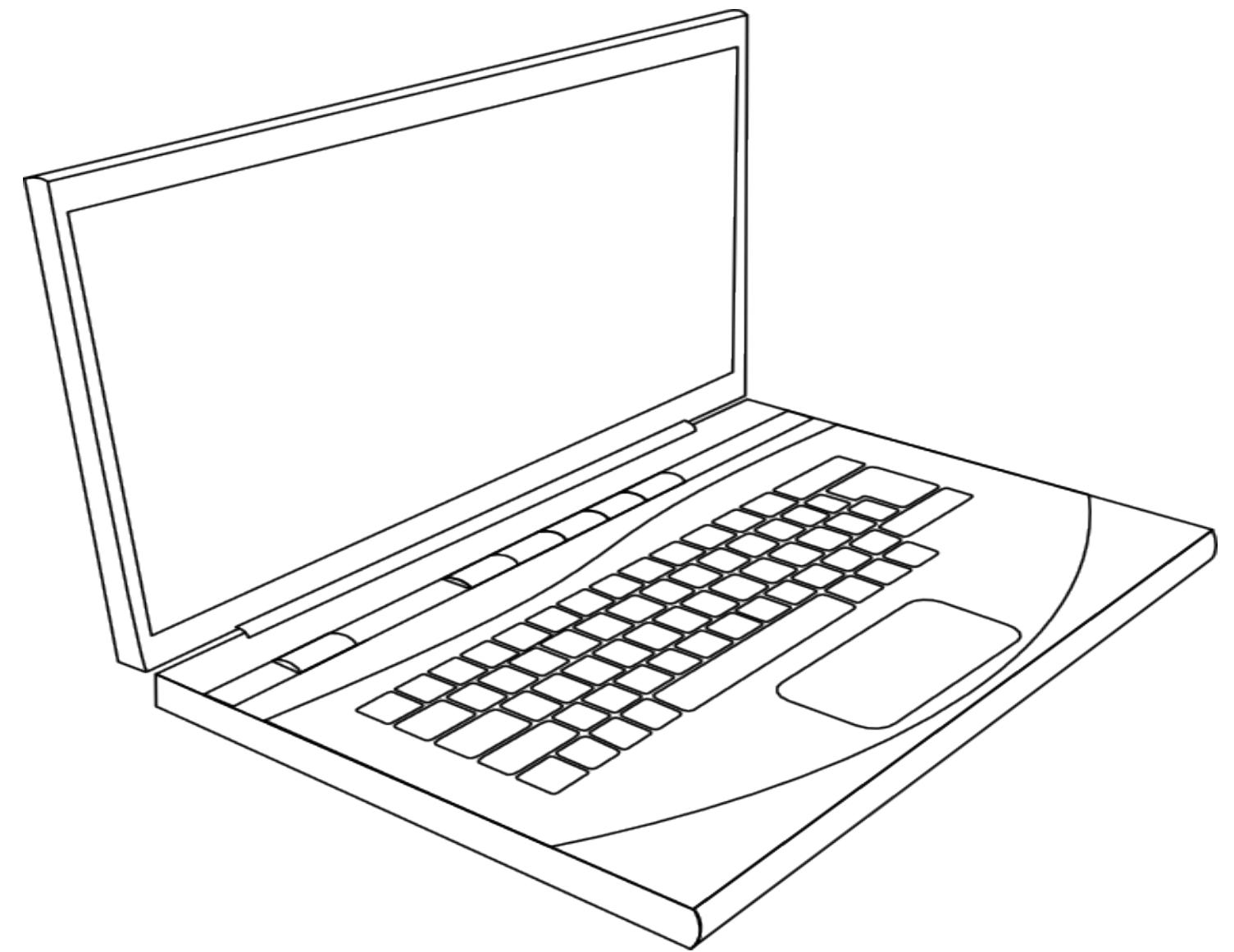
jose@mesosphere.io
sunil@mesosphere.io



What is the container scale problem?



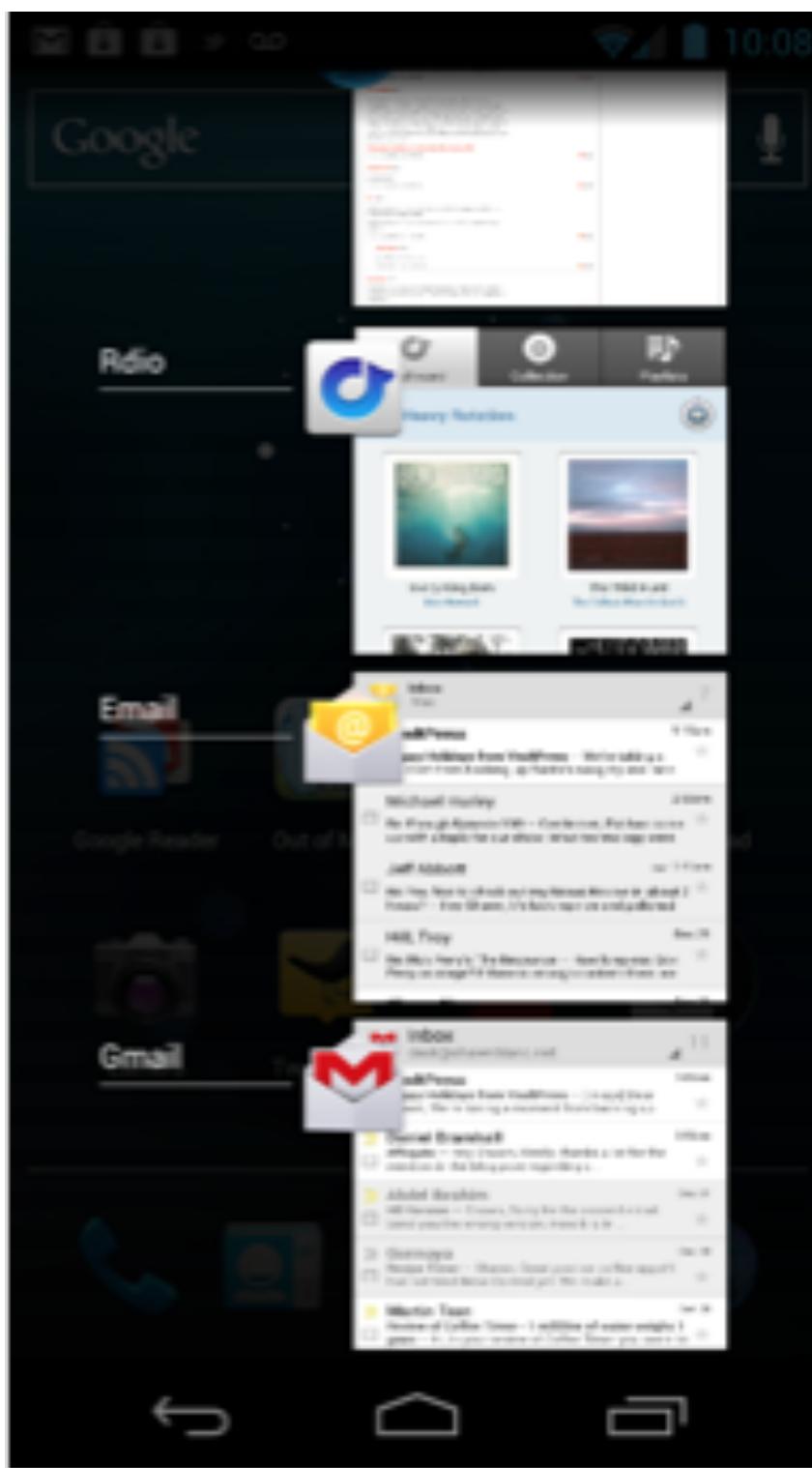
The datacenter as a form factor



The datacenter is just another form factor



Why can't we run applications on our
datacenters just like we run applications on
our mobile phones?



Applications don't fit on a single machine anymore

Applications don't fit on a single machine anymore

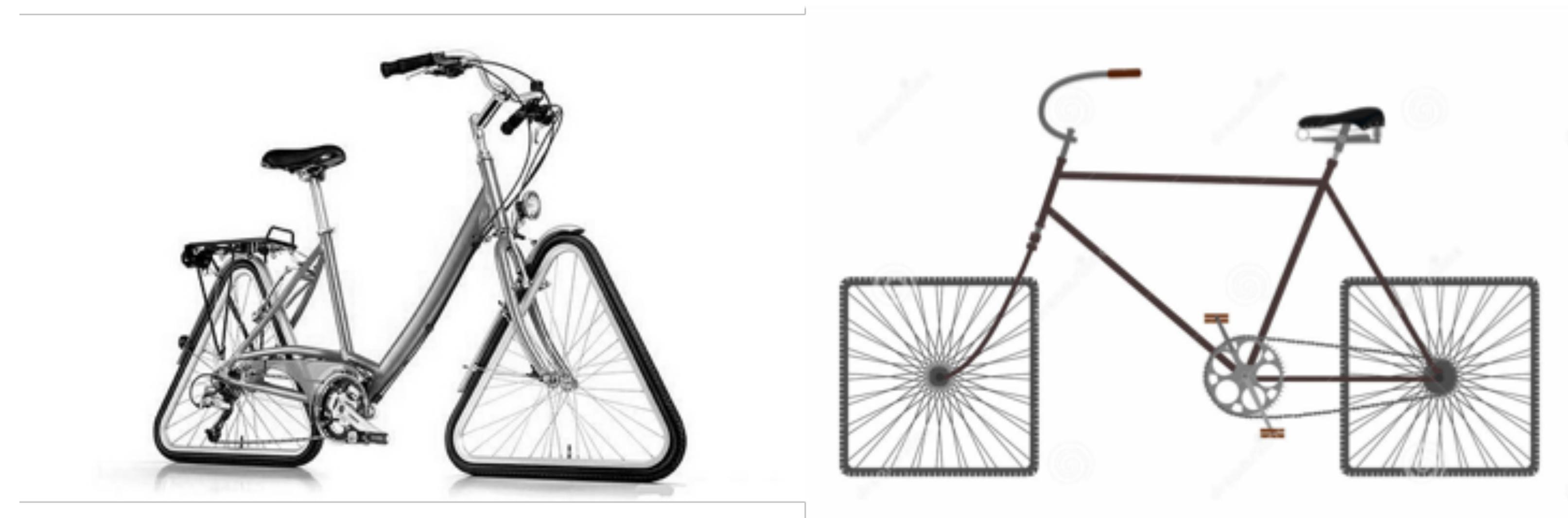
1. Lots of data
2. Lots of users

Applications don't fit on a single machine anymore

1. Lots of data
2. Lots of users

Today's applications need lots of resources (CPU, memory, disk)

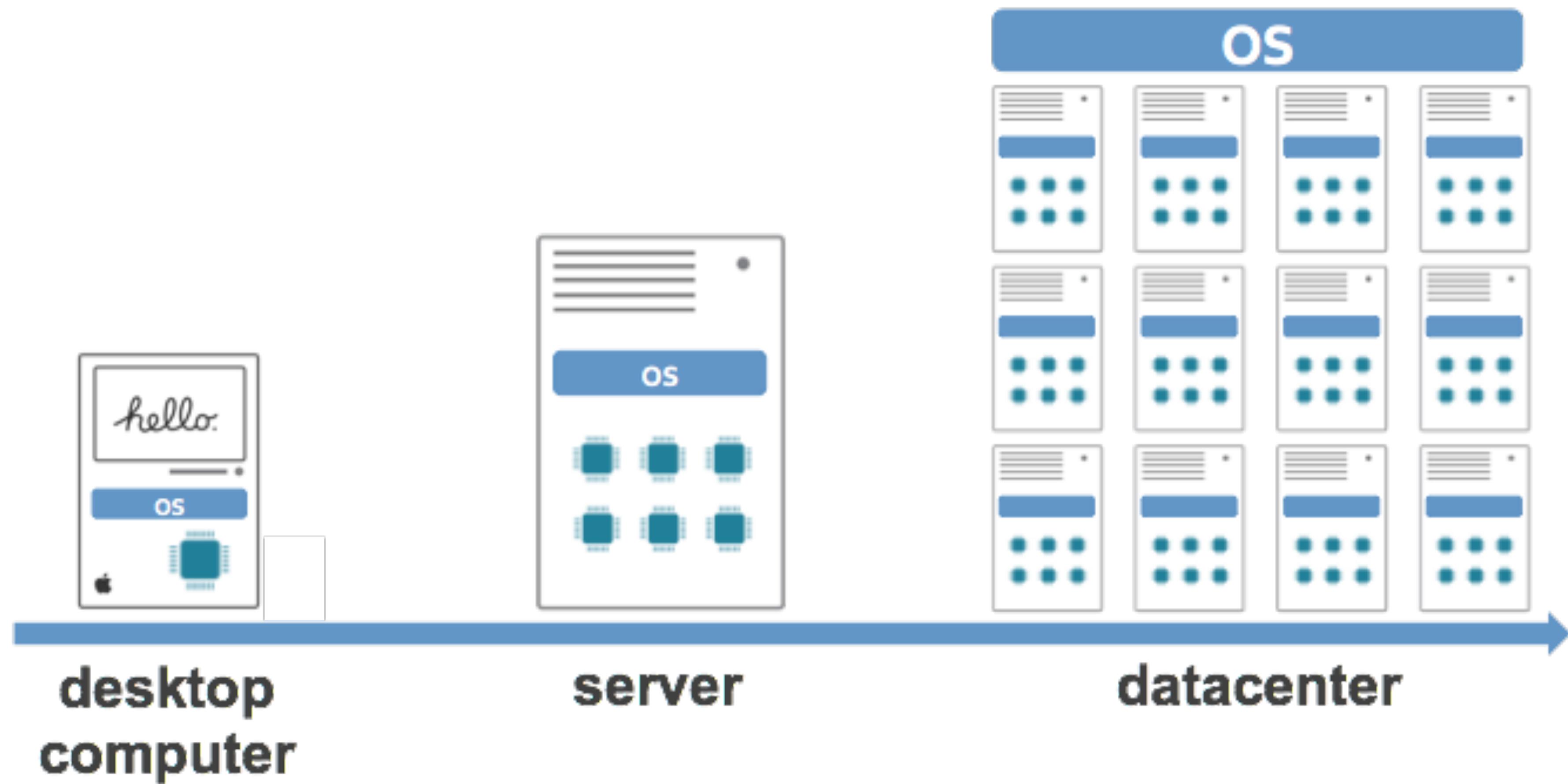
We're all building distributed systems!



operating system (as per Wikipedia)

“a collection of software that manages the computer hardware resources and provides common services for computer programs”

The datacenter needs an operating system



Introducing the datacenter operating system

Mesosphere

DCOS

Frameworks

Marathon

Chronos

...

DCOS CLI

DCOS GUI

Repository

Kernel
Mesos

Modules
mesos-dns



```
c:\dcos>dcos marathon app add marathon.json
c:\dcos>dcos marathon app add spark.json
c:\dcos>dcos marathon app update marathon instances=1000
Created deployment 71c88122-83ae-41dd-bfc0-8eeacd53dc08
c:\dcos>dcos marathon app update spark instances=1000
```

44

Total

24

marathon-tasks

20

spark-tasks

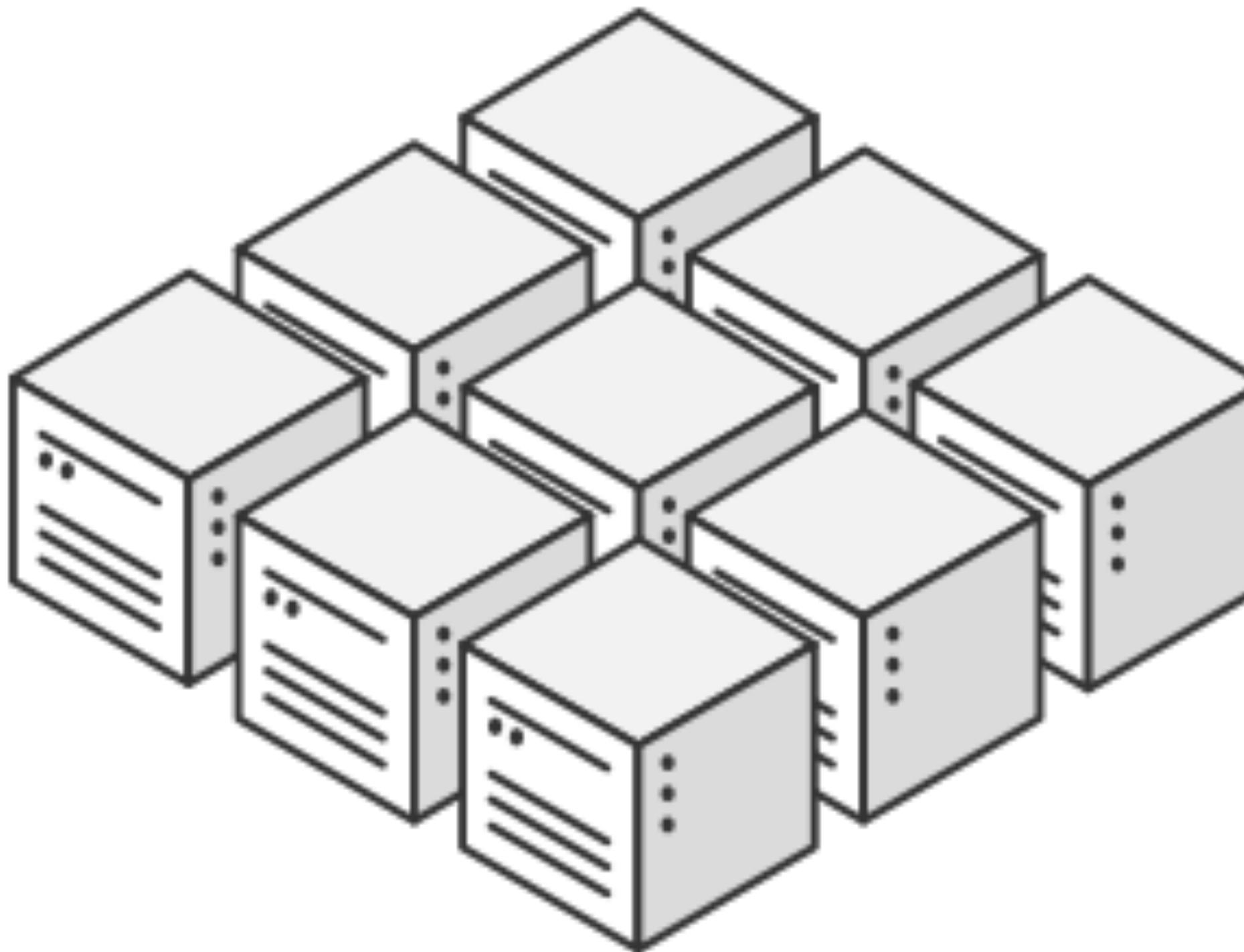


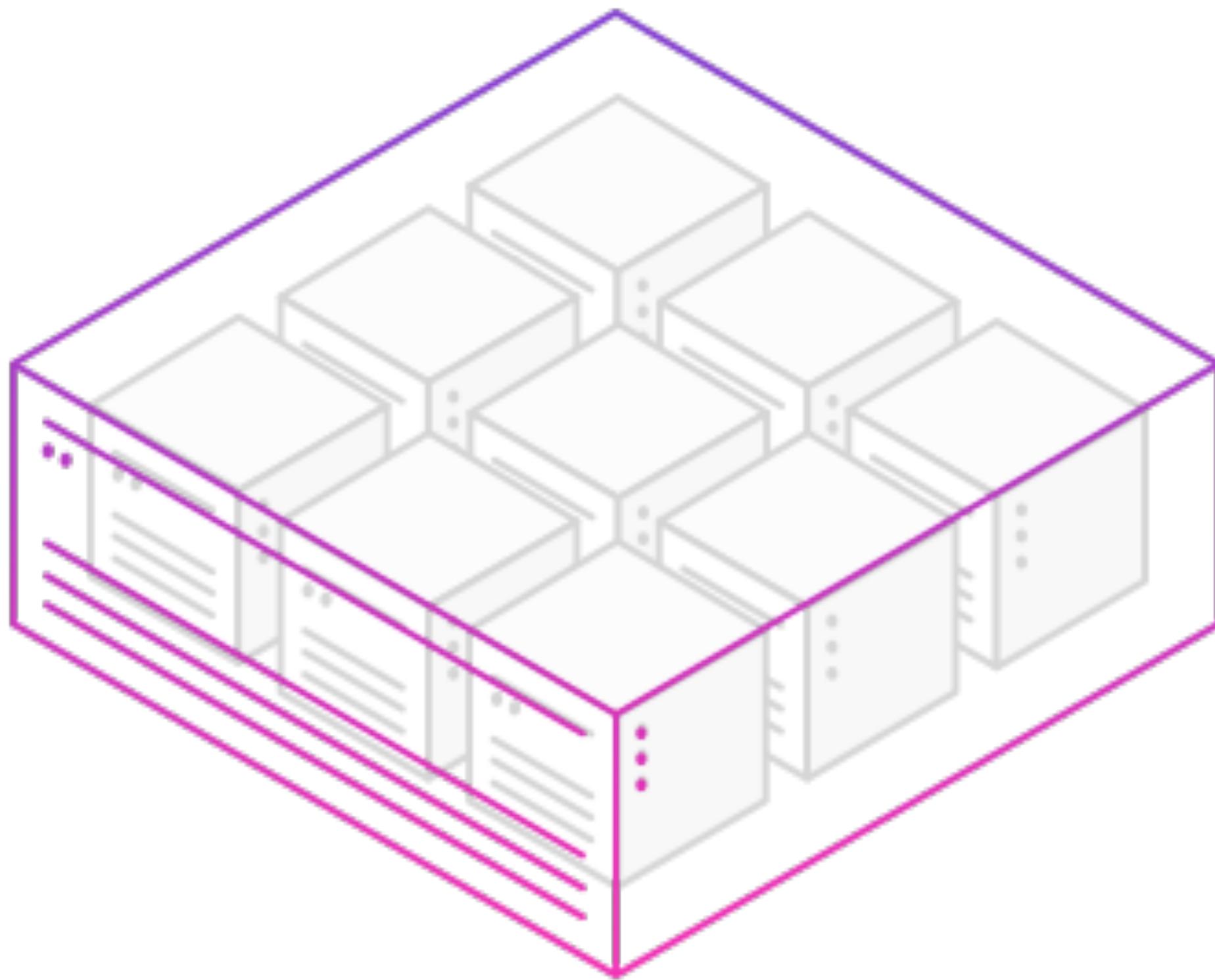
The CLI for the datacenter: dcos

- open source, Apache licensed
- tight integration with the Mesosphere universe, a package repository
- easy, Unix-consistent commands to manage running applications, services and the underlying Mesos
- extensible (e.g. dcos spark, dcos cassandra, etc.)

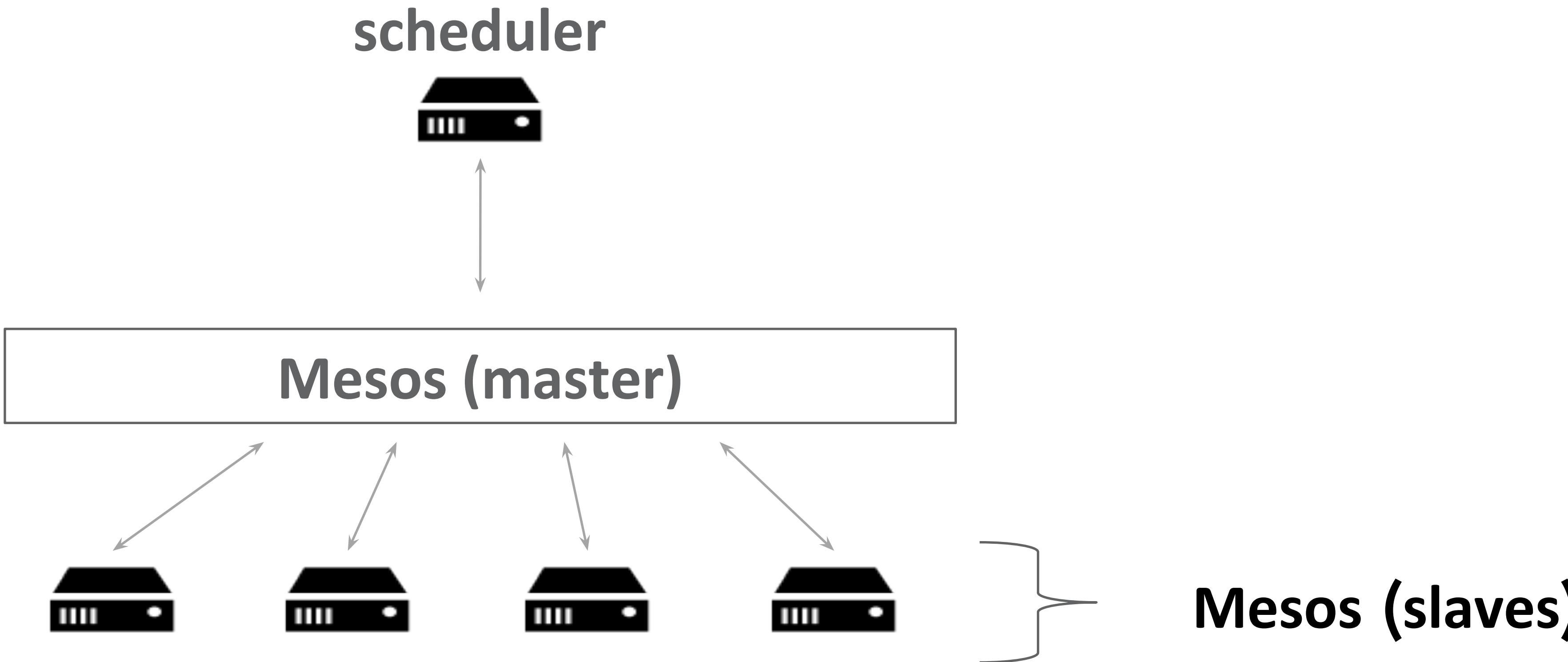
Apache Mesos



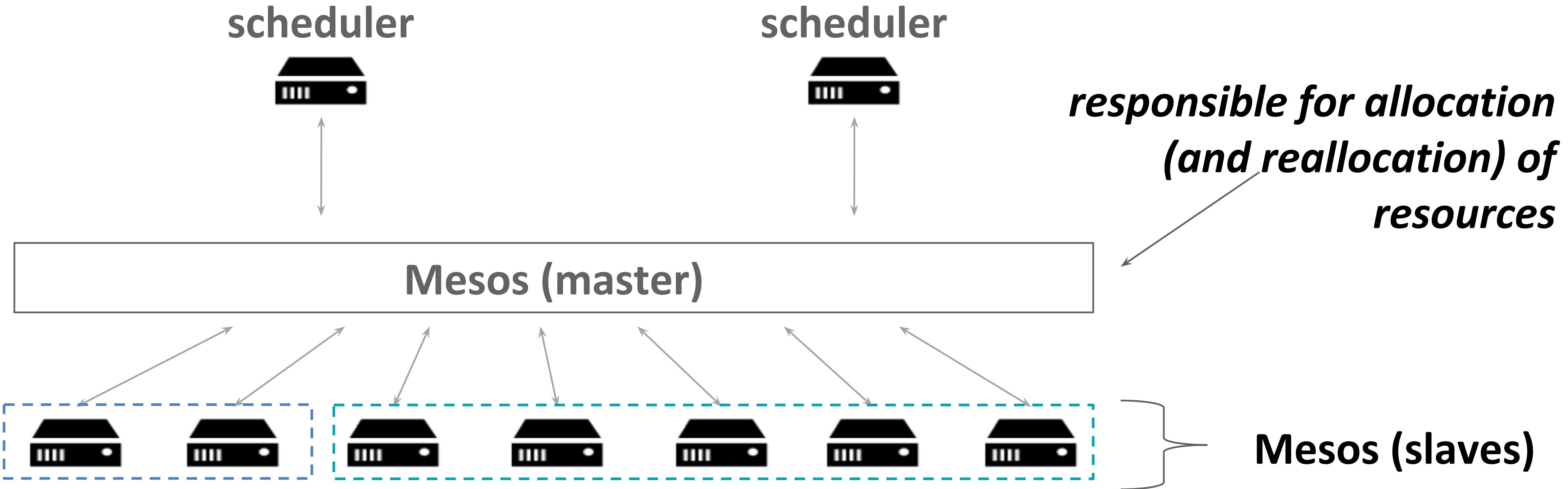




Mesos: level of indirection

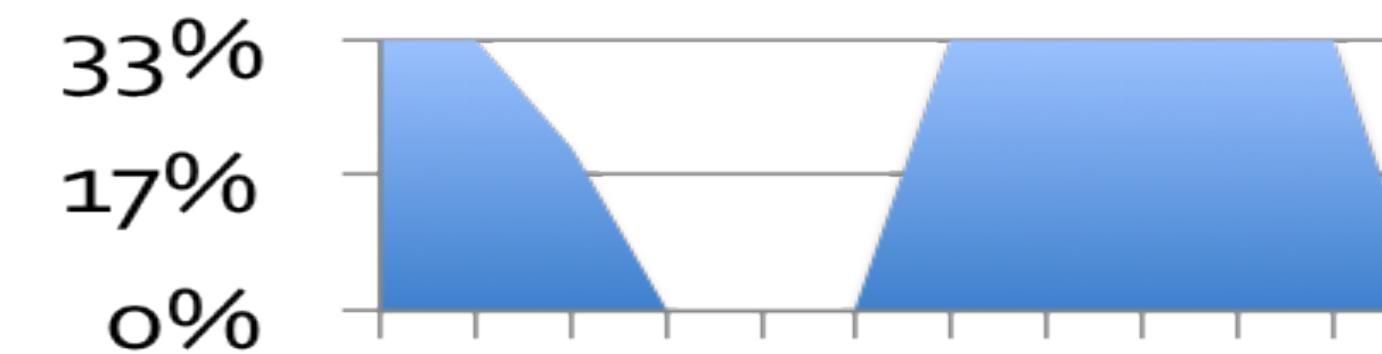


Mesos: level of indirection

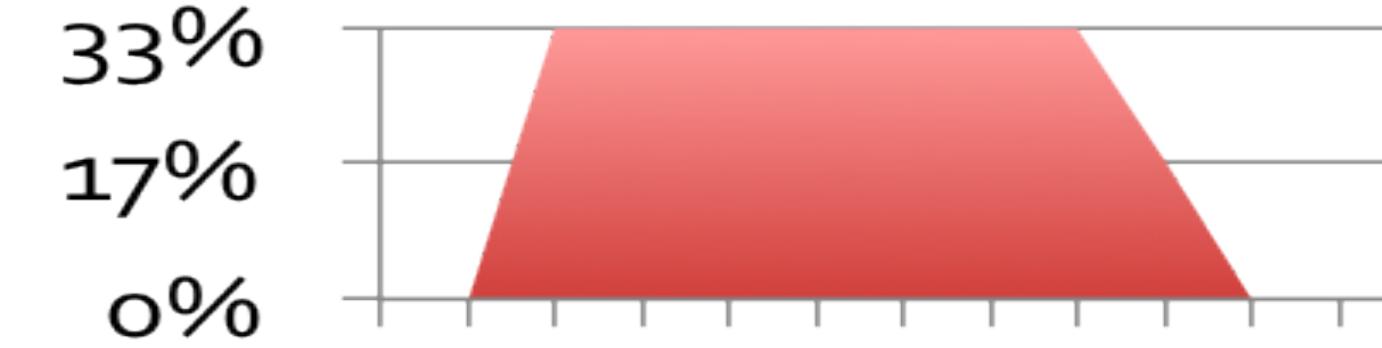


Mesos helps utilization

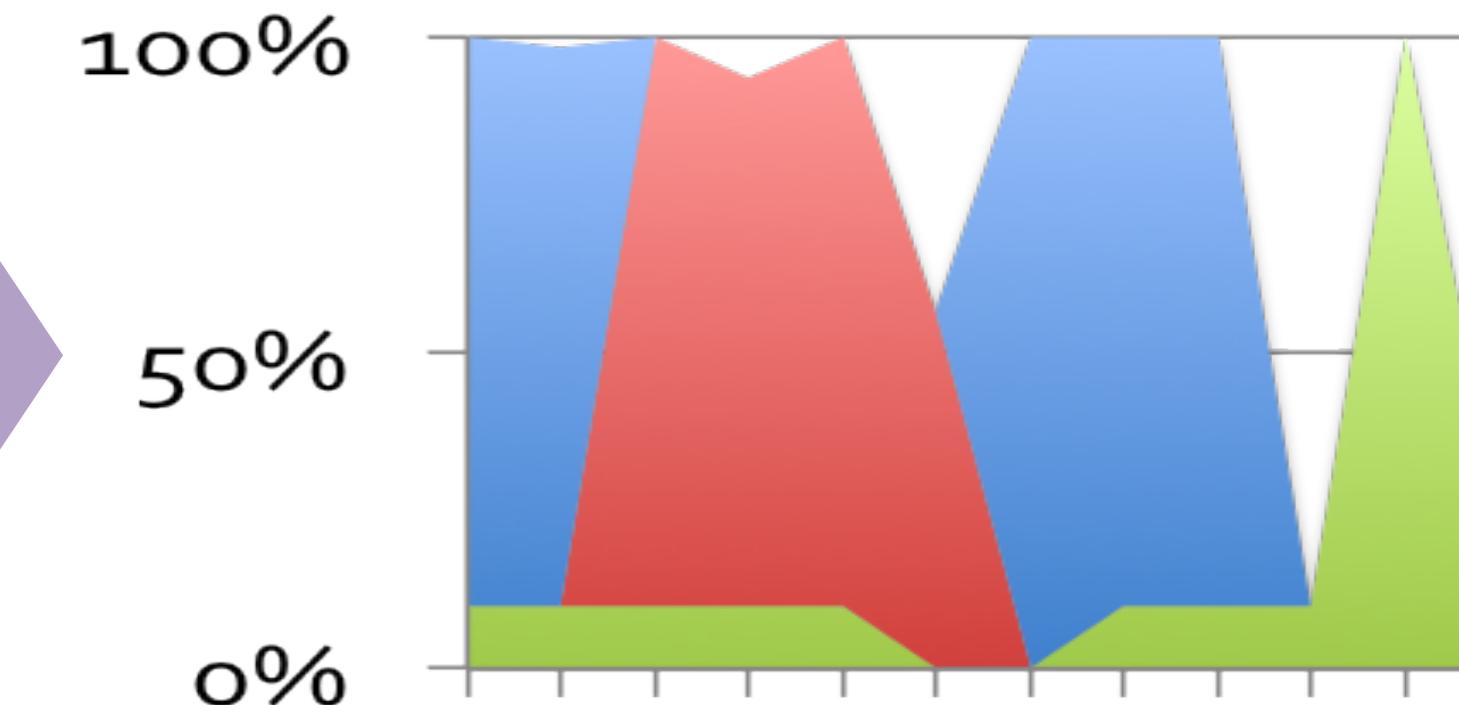
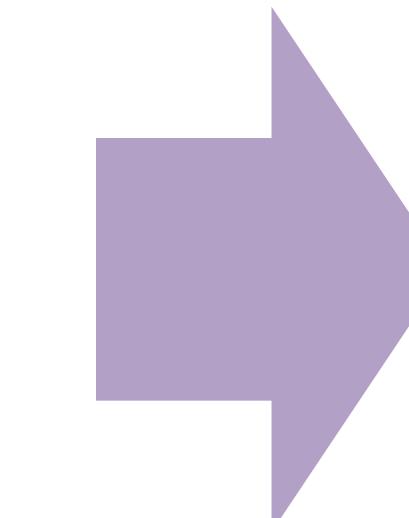
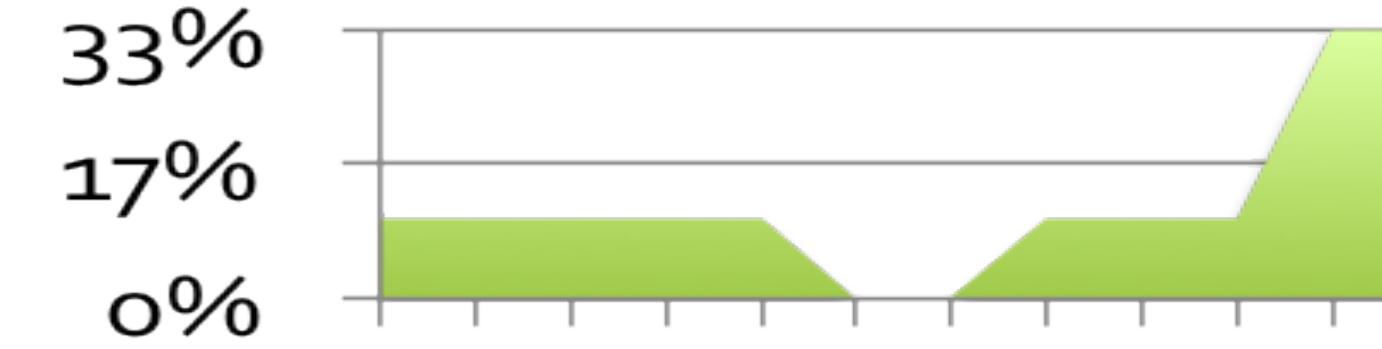
Rails



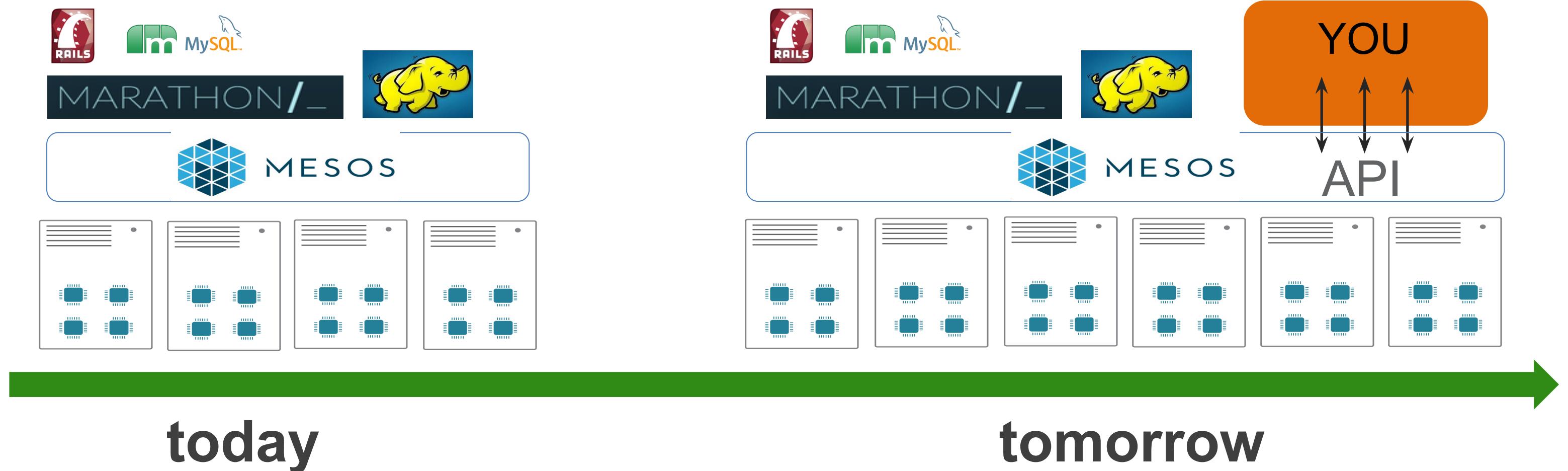
Hadoop



memcached

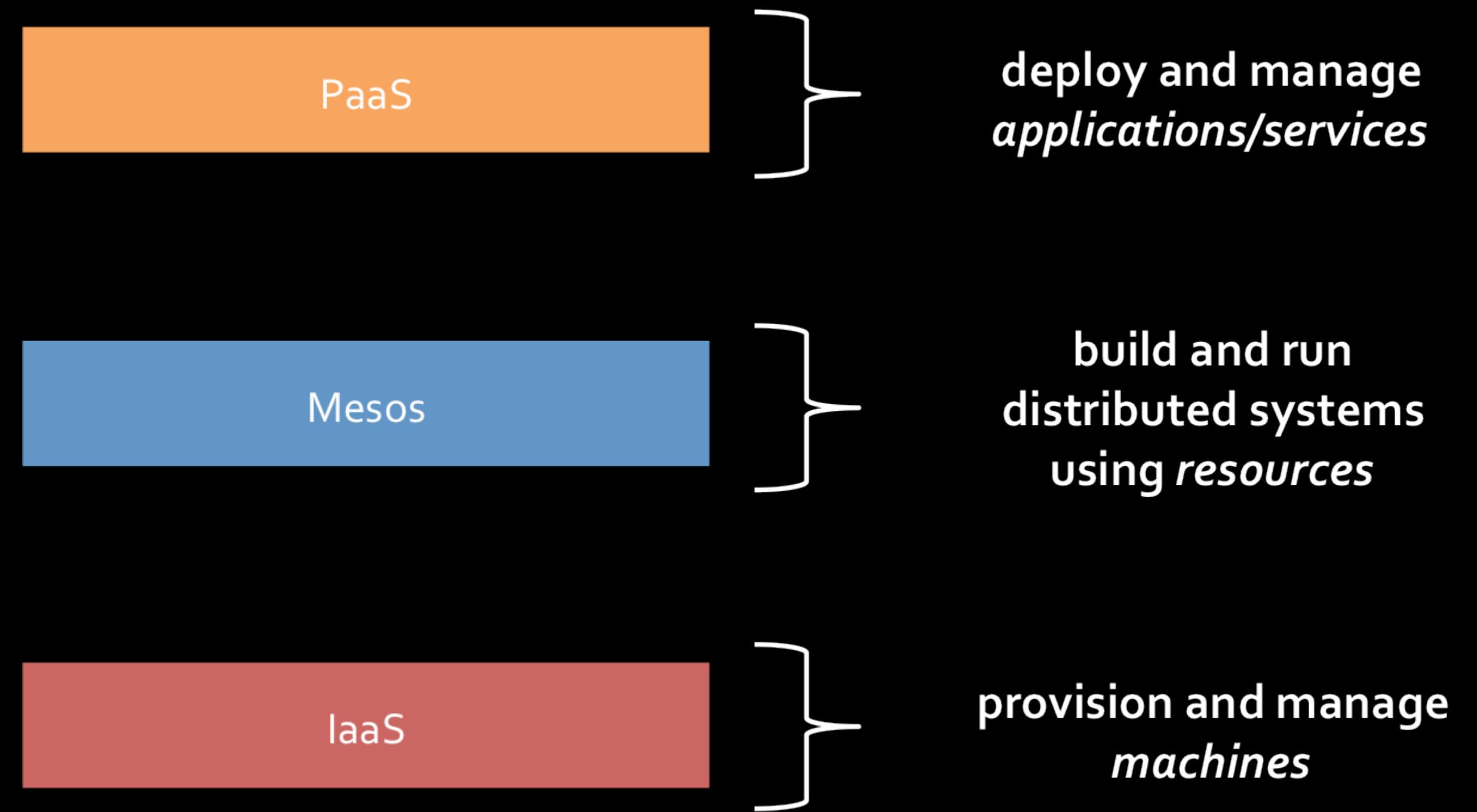


Mesos: datacenter kernel



provides common
functionality every new
distributed system *re-*
implements:

- failure detection
- package distribution
- task starting
- resource isolation
- resource monitoring
- task killing, cleanup
- ...

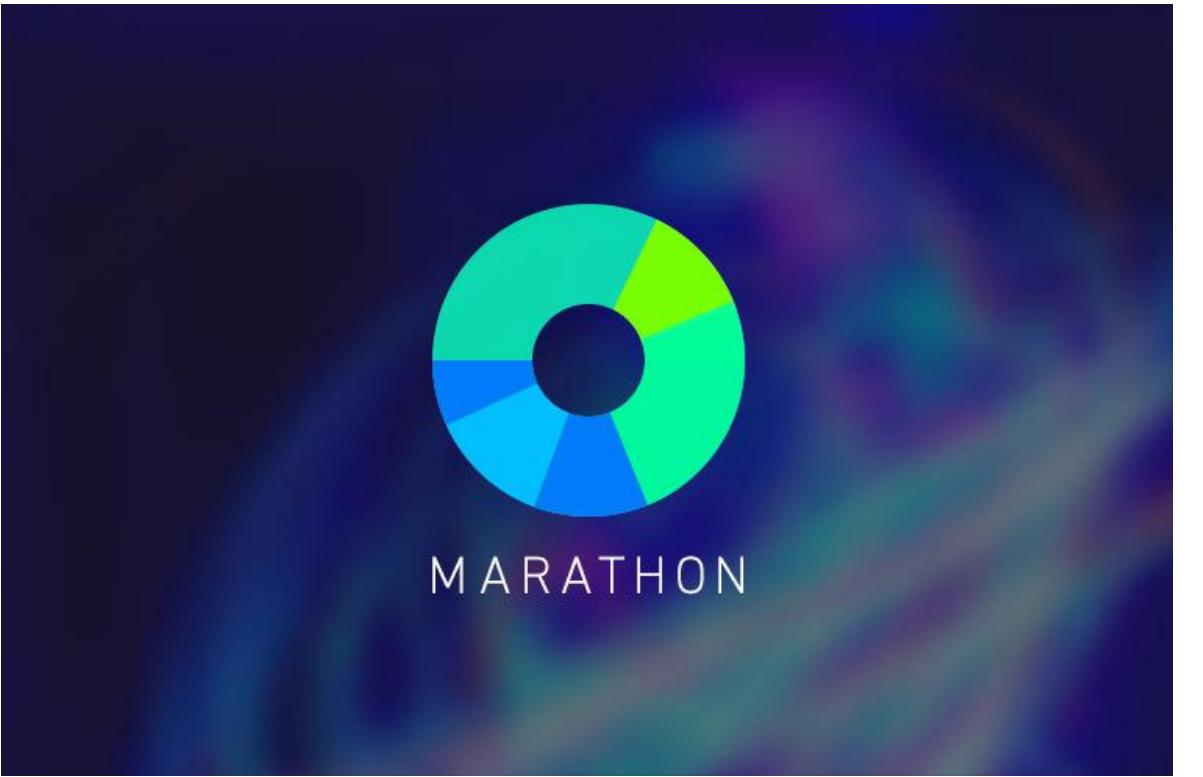


- A top-level Apache project
- A cluster resource negotiator
- Scalable to 10,000s of nodes
- Fault-tolerant, battle-tested
- An SDK for distributed apps





Marathon



Mesosphere Marathon

https://marathon.mesosphere.com

MARATHON

Apps Deployments

+ New App

ID	Memory (MB)	CPUs	Tasks / Instances	Health	Status
/chronos	512	0.5	1 / 1	<div style="width: 100%; background-color: green;"></div>	Running
/cpu-waster	16	0.5	0 / 0	<div style="width: 0%; background-color: gray;"></div>	Suspended
/dcos/service/history	512	0.5	0 / 0	<div style="width: 0%; background-color: gray;"></div>	Suspended
/dispatch	128	0.5	1 / 1	<div style="width: 100%; background-color: gray;"></div>	Running
/em/apollo	1024	1	0 / 0	<div style="width: 0%; background-color: gray;"></div>	Suspended
/em/artemis	1024	1	0 / 0	<div style="width: 0%; background-color: gray;"></div>	Suspended
/em/isemdown	16	0.1	1 / 1	<div style="width: 100%; background-color: gray;"></div>	Running
/gollumwiki	256	0.01	0 / 0	<div style="width: 0%; background-color: gray;"></div>	Suspended
/hdfs	512	1	1 / 1	<div style="width: 100%; background-color: gray;"></div>	Running
/history	256	0.1	1 / 1	<div style="width: 100%; background-color: green;"></div>	Running
/jenkins	1024	1	1 / 1	<div style="width: 100%; background-color: gray;"></div>	Running

MARATHON Apps Deployments About Docs

Apps > /mom-alex-state-explosion-01/d2bce8ce-7edc-48a1-7157-83420e87fb48/slave

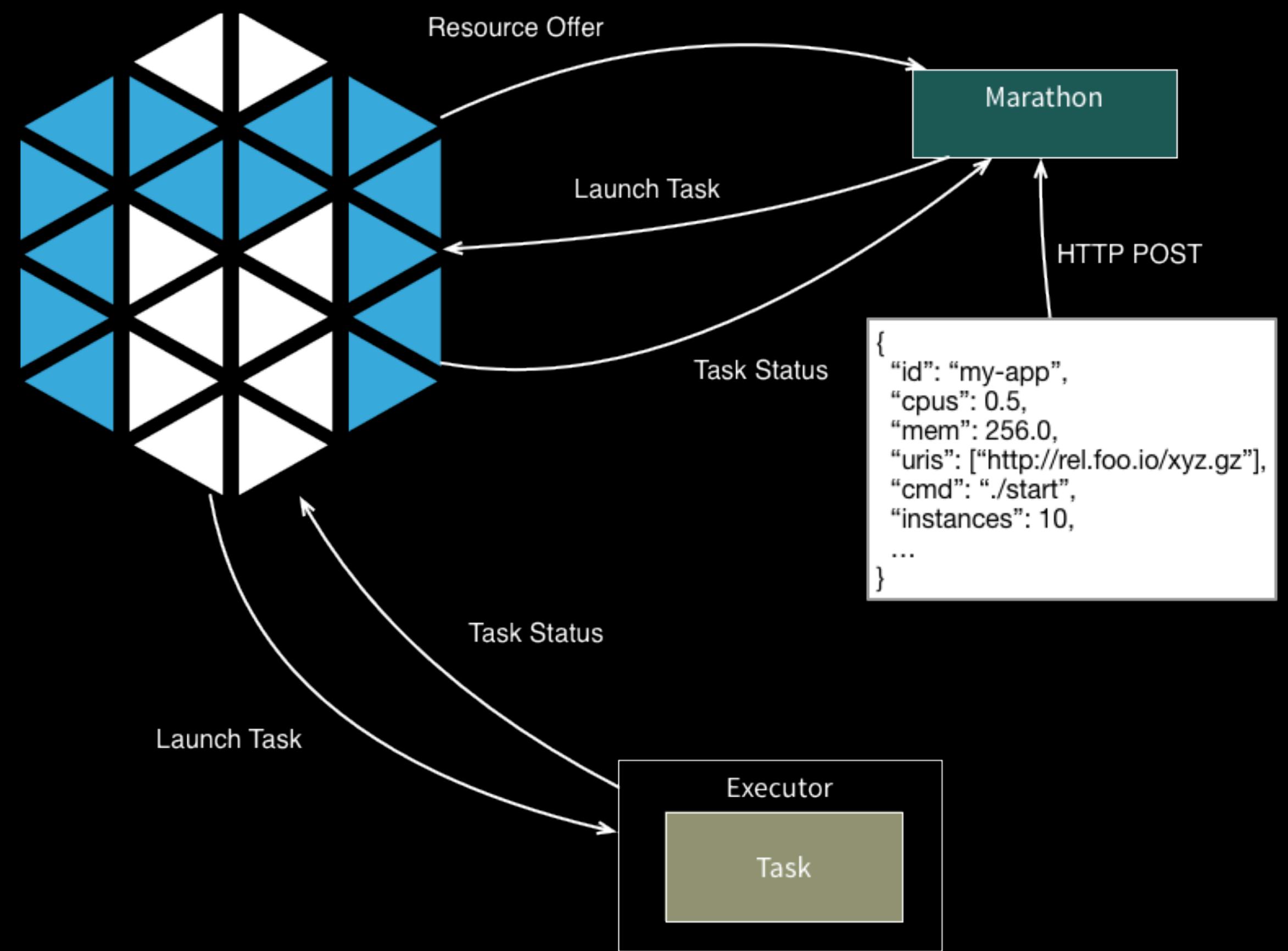
/mom-alex-state-explosion-01/d2bce8ce-7edc-48a1-7157-83420e87fb48/slave Running

Suspend Scale Restart App Destroy App

Tasks Configuration

Refresh 1-8 of 10

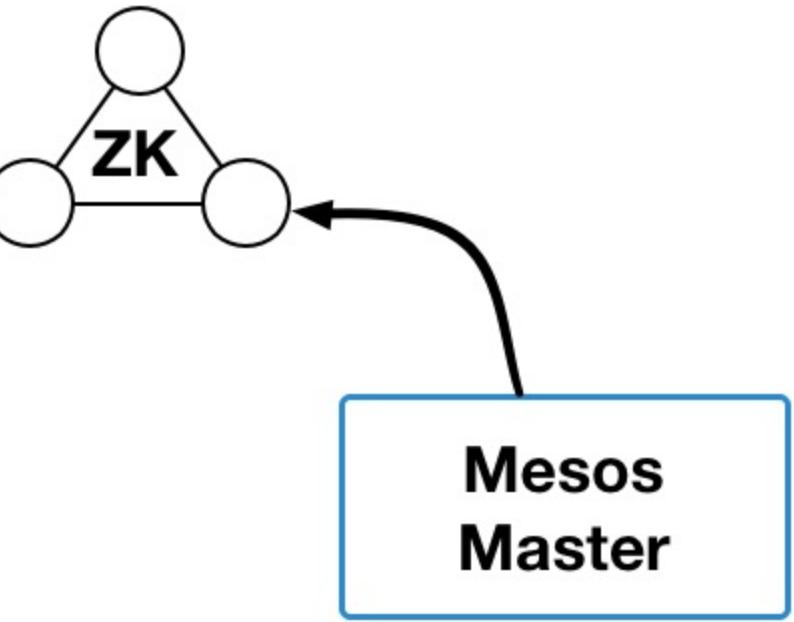
ID	Status	Version	Updated
mom-alex-state-explosion-01_d2bce8ce-7edc-48a1-7157-83420e87fb48_slave.f4638b76-e074-11e4-91df-fe54009f9367 srv5.hw.ca1.mesosphere.com:31887	Started	4 days ago	4/11/2015, 11:02:45 AM
mom-alex-state-explosion-01_d2bce8ce-7edc-48a1-7157-83420e87fb48_slave.ca6ebfd0-df0a-11e4-9bec-da578fc6adbb srv6.hw.ca1.mesosphere.com:31199	Started	4 days ago	4/9/2015, 3:50:17 PM
mom-alex-state-explosion-01_d2bce8ce-7edc-48a1-7157-83420e87fb48_slave.c9d69e7f-df0a-11e4-9bec-da578fc6adbb srv4.hw.ca1.mesosphere.com:31135	Started	4 days ago	4/9/2015, 3:50:17 PM
mom-alex-state-explosion-01_d2bce8ce-7edc-48a1-7157-83420e87fb48_slave.c70f411b-df0a-11e4-9bec-da578fc6adbb srv2.hw.ca1.mesosphere.com:31084	Started	4 days ago	4/9/2015, 3:50:12 PM
mom-alex-state-explosion-01_d2bce8ce-7edc-48a1-7157-83420e87fb48_slave.c773330d-df0a-11e4-9bec-da578fc6adbb srv5.hw.ca1.mesosphere.com:31365	Started	4 days ago	4/9/2015, 3:50:12 PM
mom-alex-state-explosion-01_d2bce8ce-7edc-48a1-7157-83420e87fb48_slave.c7102b7c-df0a-11e4-9bec-da578fc6adbb srv6.hw.ca1.mesosphere.com:31118	Started	4 days ago	4/9/2015, 3:50:12 PM
mom-alex-state-explosion-01_d2bce8ce-7edc-48a1-7157-83420e87fb48_slave.08efafed-df0a-11e4-9bec-da578fc6adbb srv2.hw.ca1.mesosphere.com:31085	Started	4 days ago	4/9/2015, 3:44:53 PM
mom-alex-state-explosion-01_d2bce8ce-7edc-48a1-7157-83420e87fb48_slave.4c3b6cb1-df09-11e4-9bec-da578fc6adbb srv4.hw.ca1.mesosphere.com:31140	Started	4 days ago	4/9/2015, 3:39:36 PM

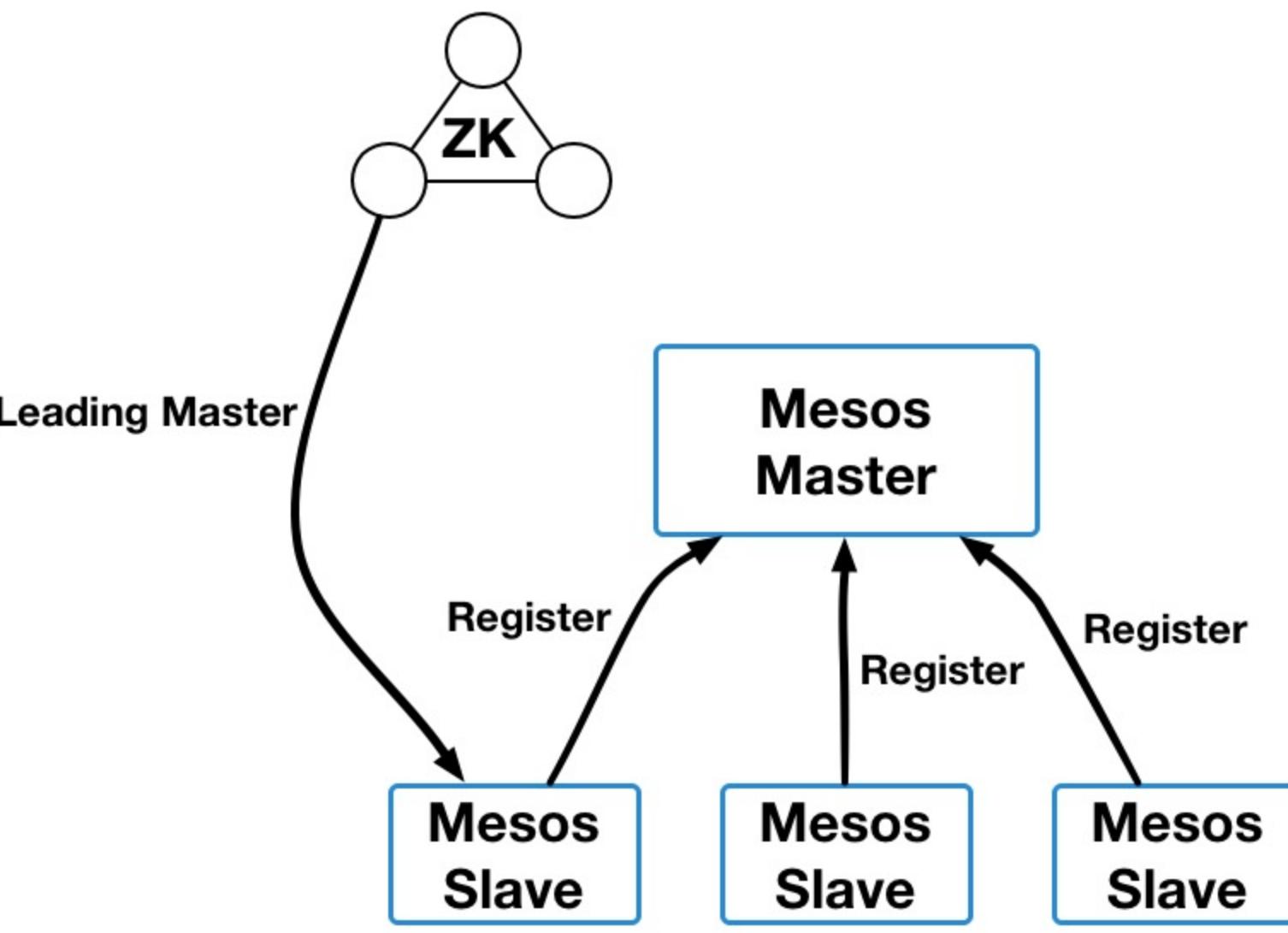


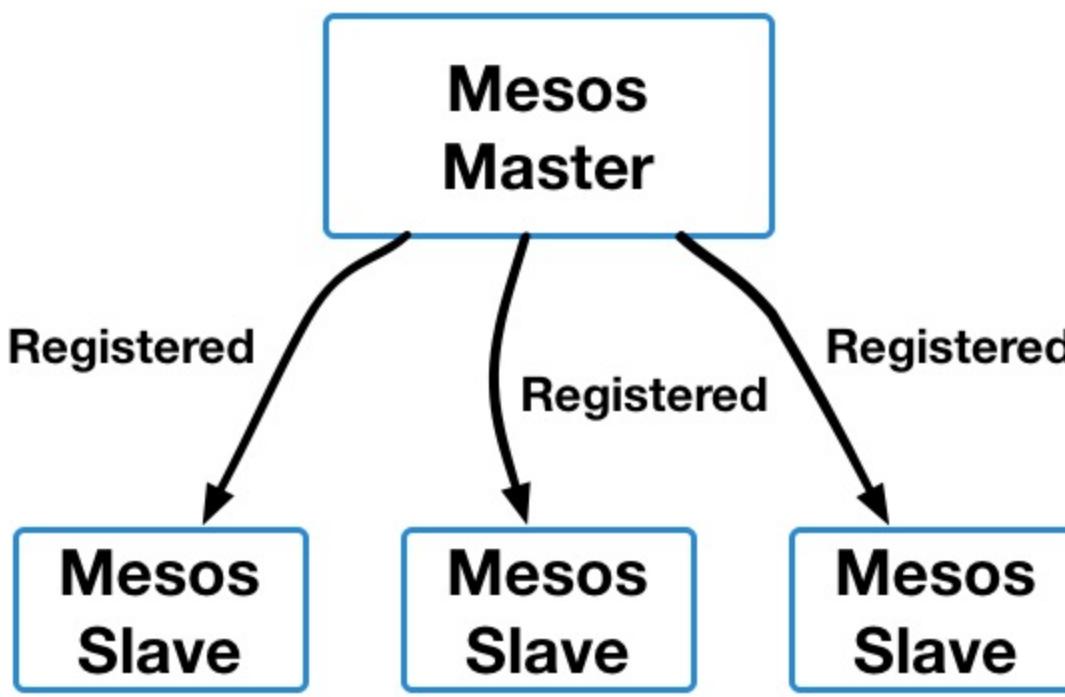
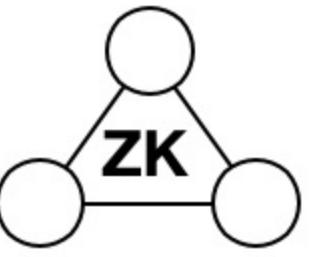
- Start, stop, scale, update apps
- Nice web interface, API
- Highly available, no SPoF
- Native Docker support
- Fully featured REST API
- Pluggable event bus

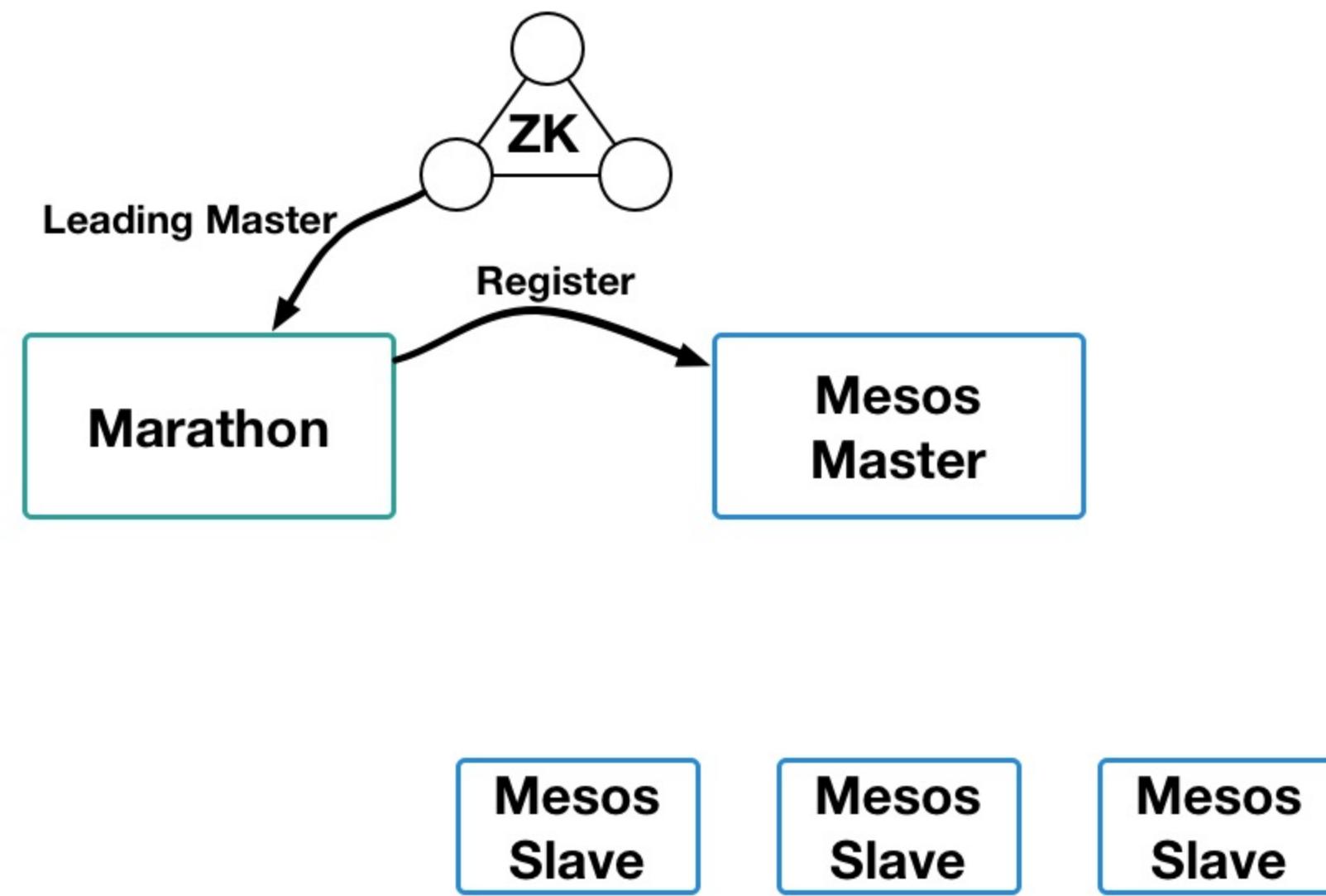
- Rolling deploy / restart
- Application health checks
- Artifact staging

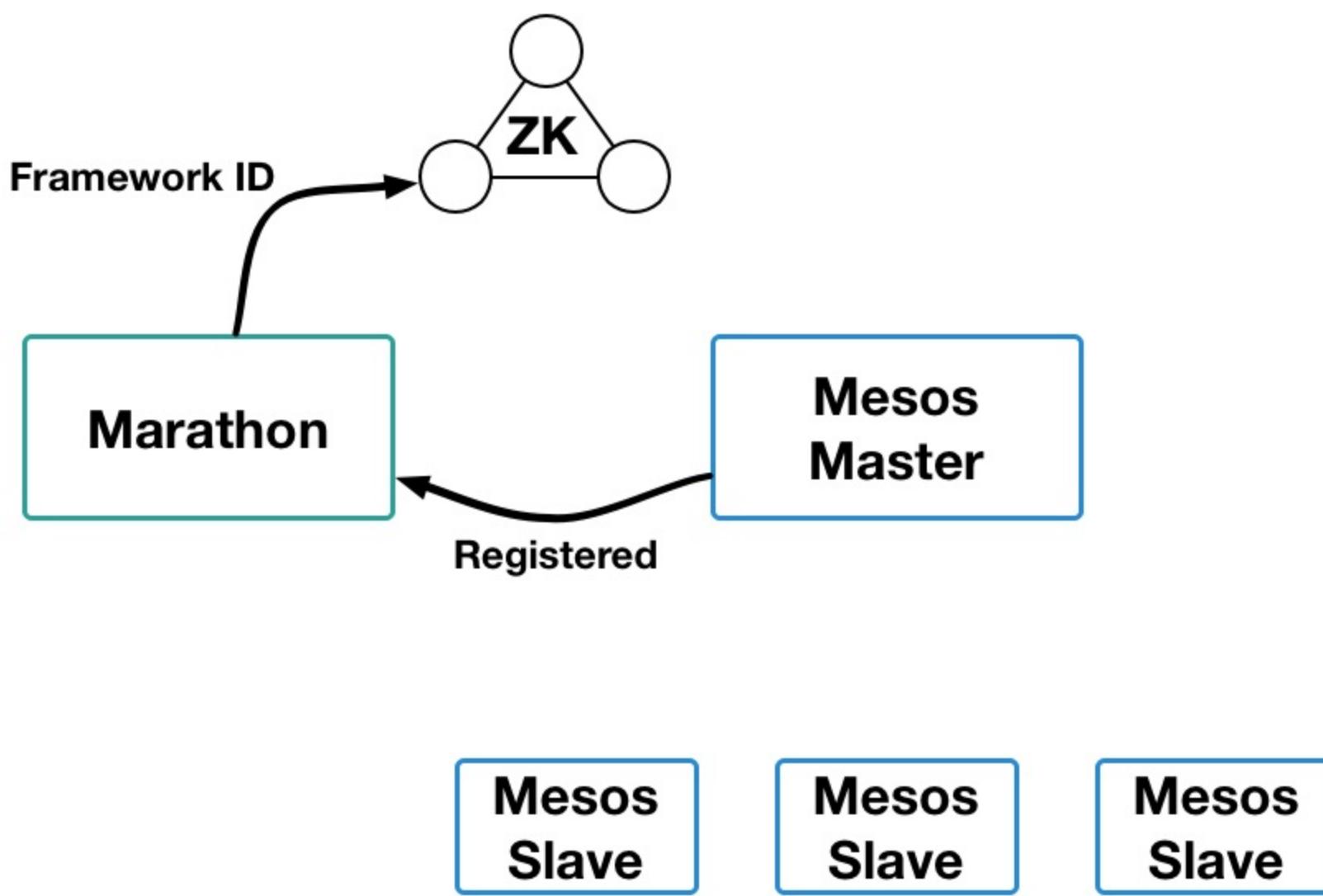
Mesos & Marathon in action

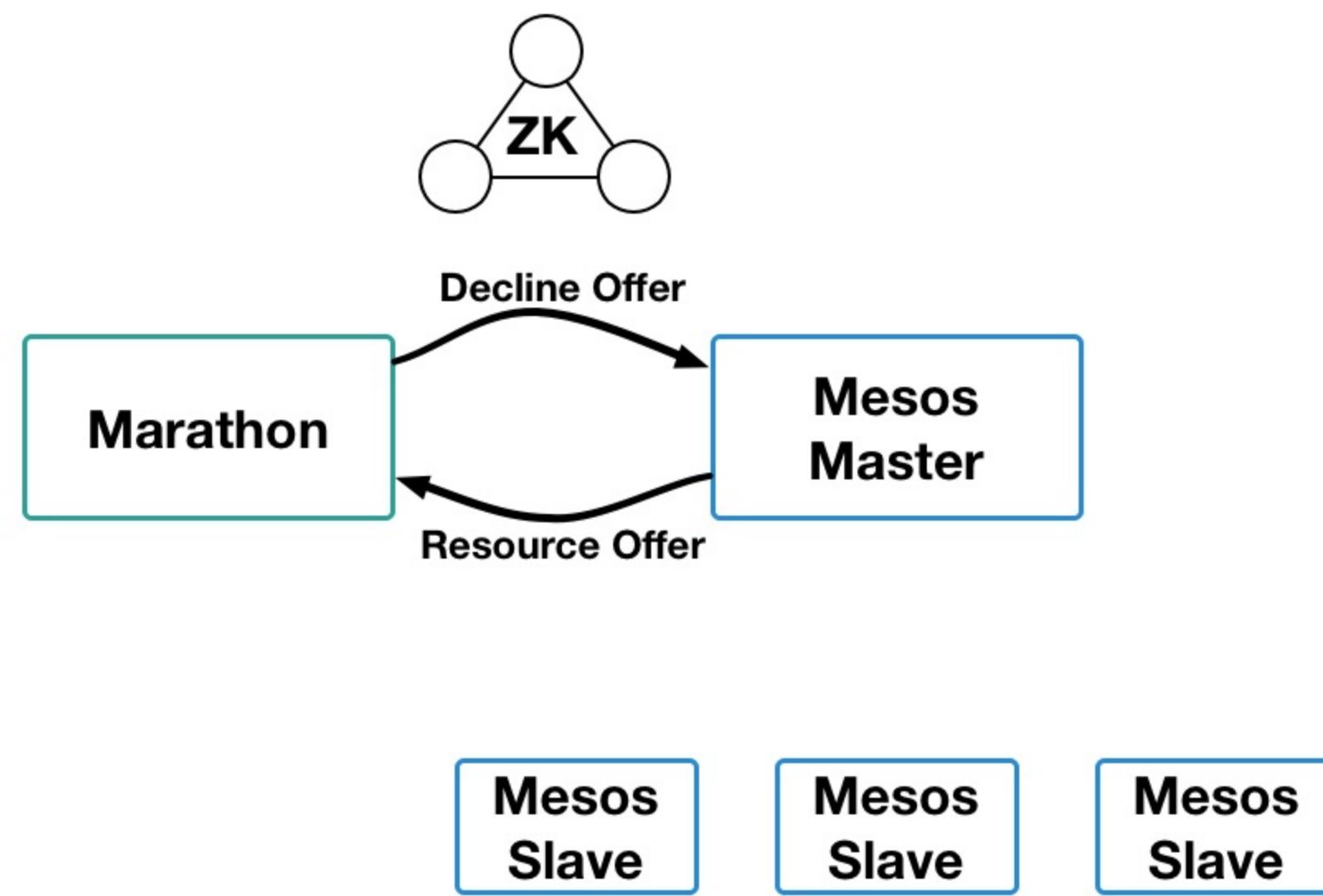


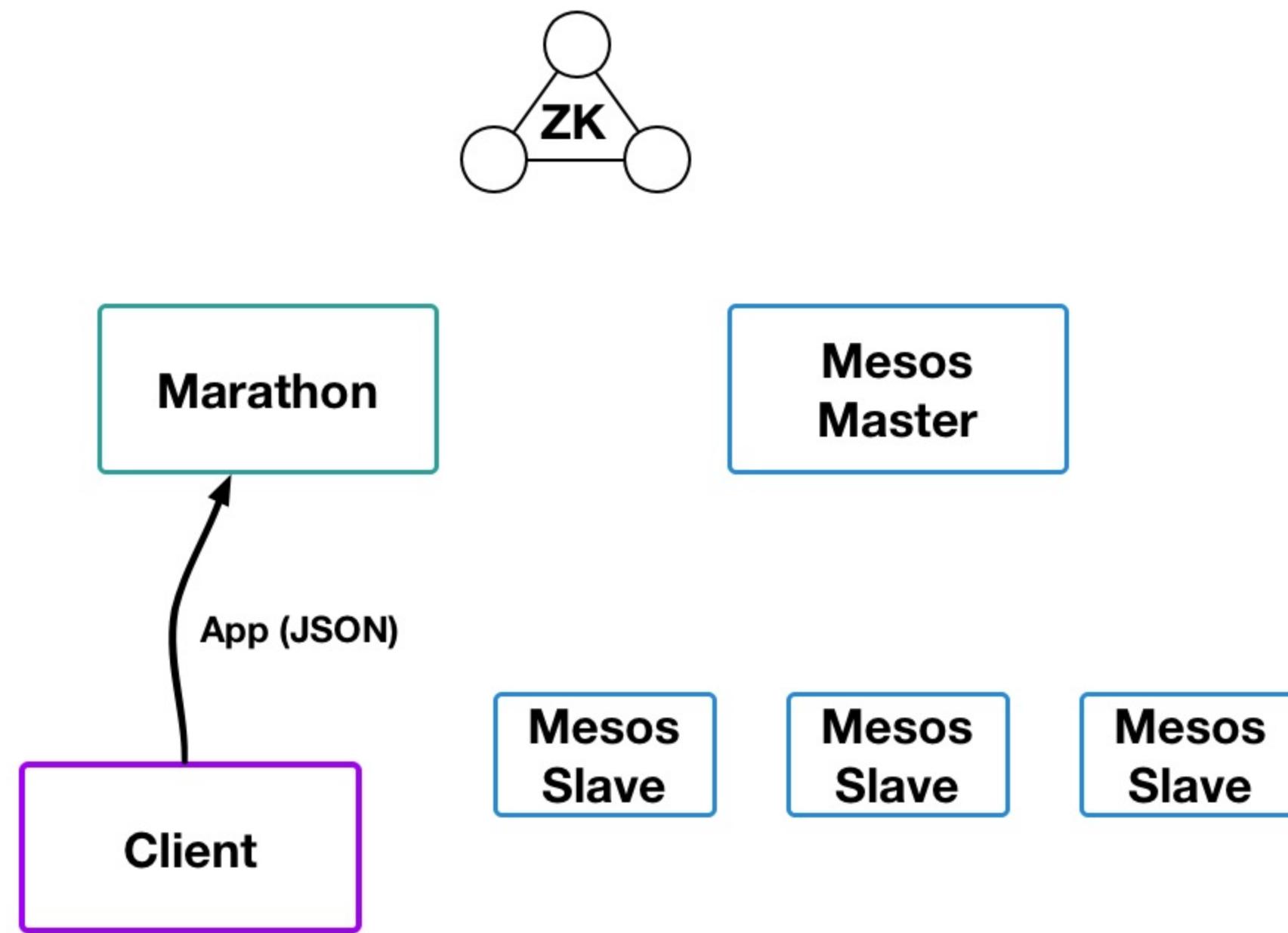


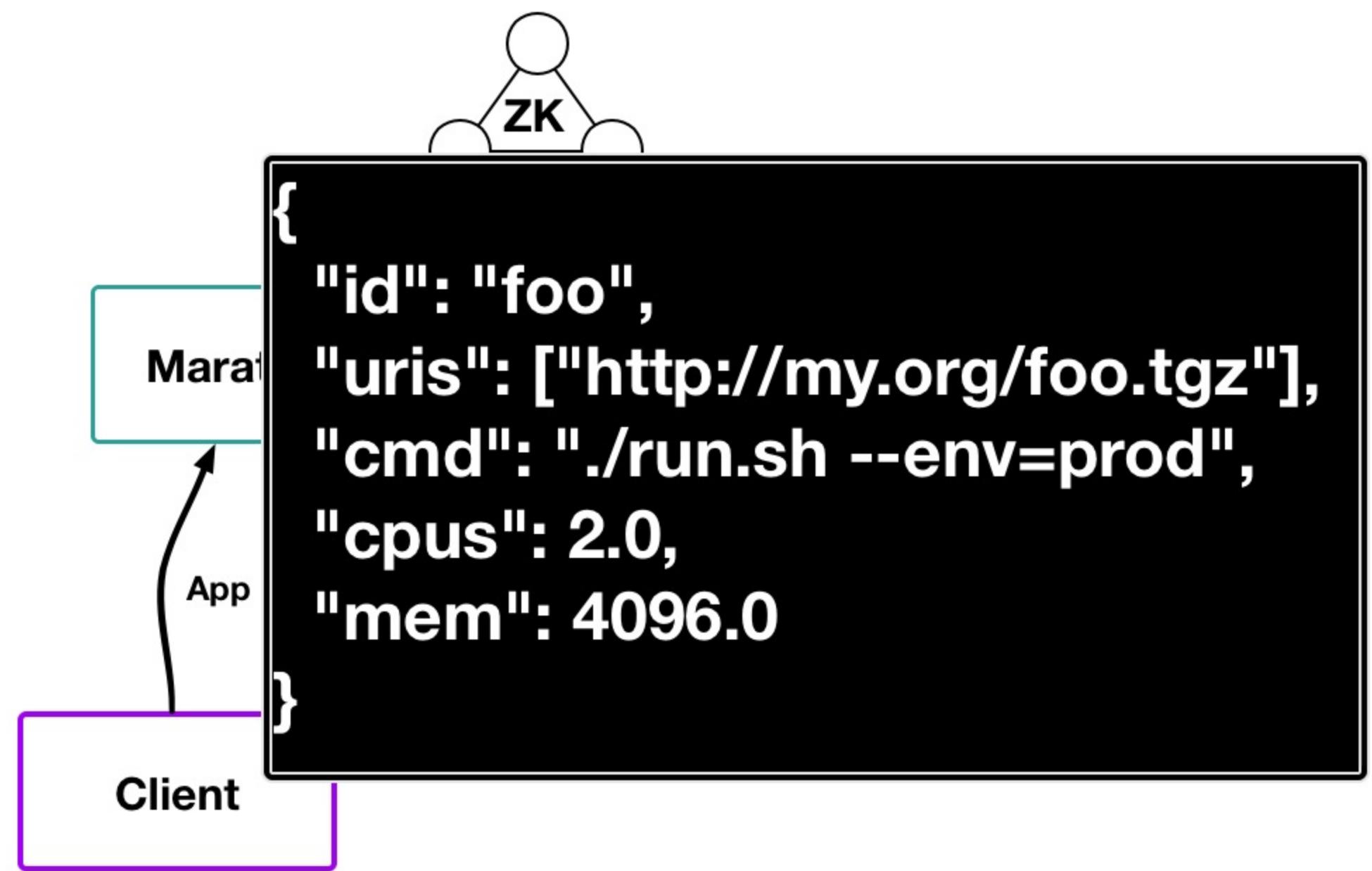


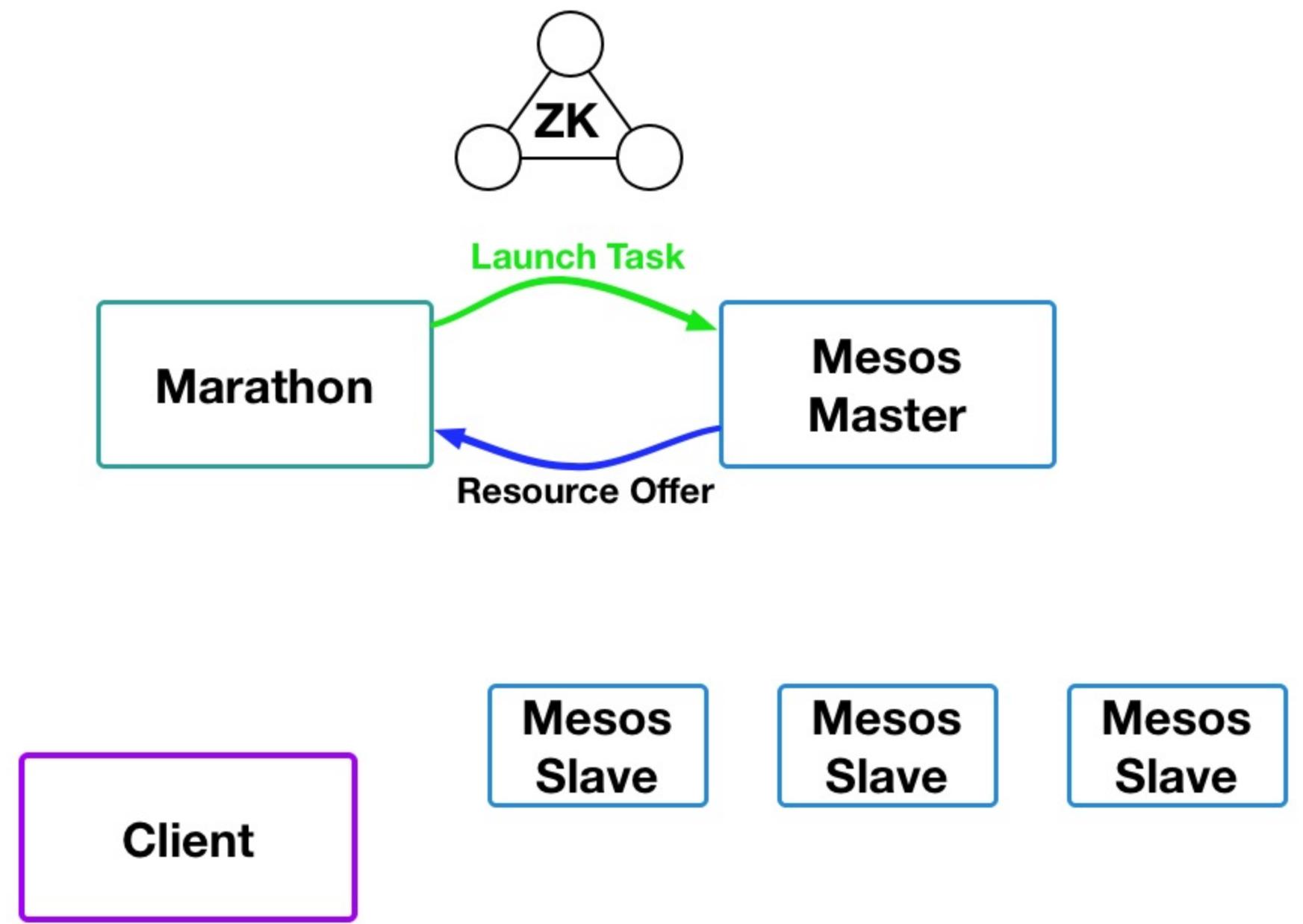


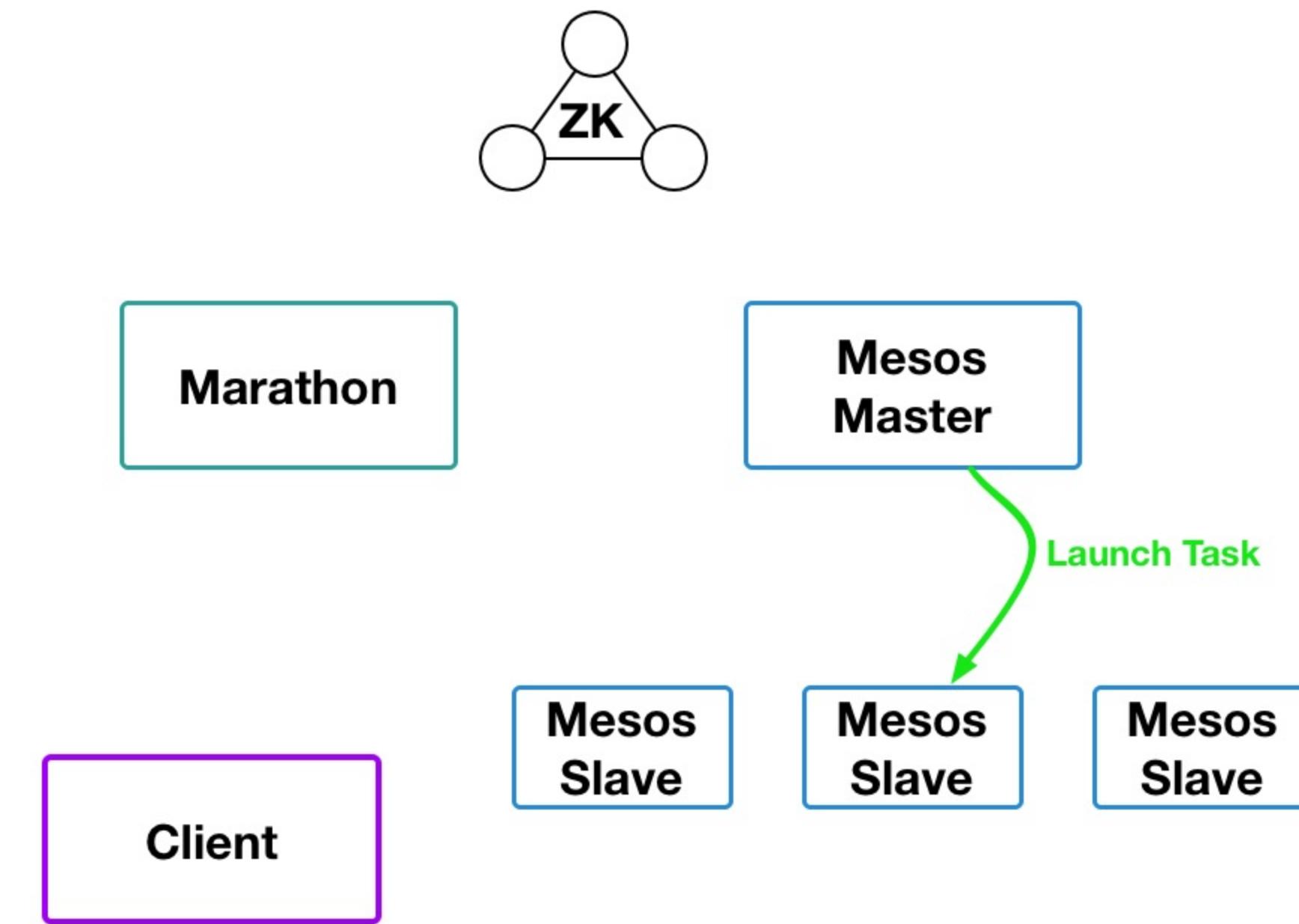


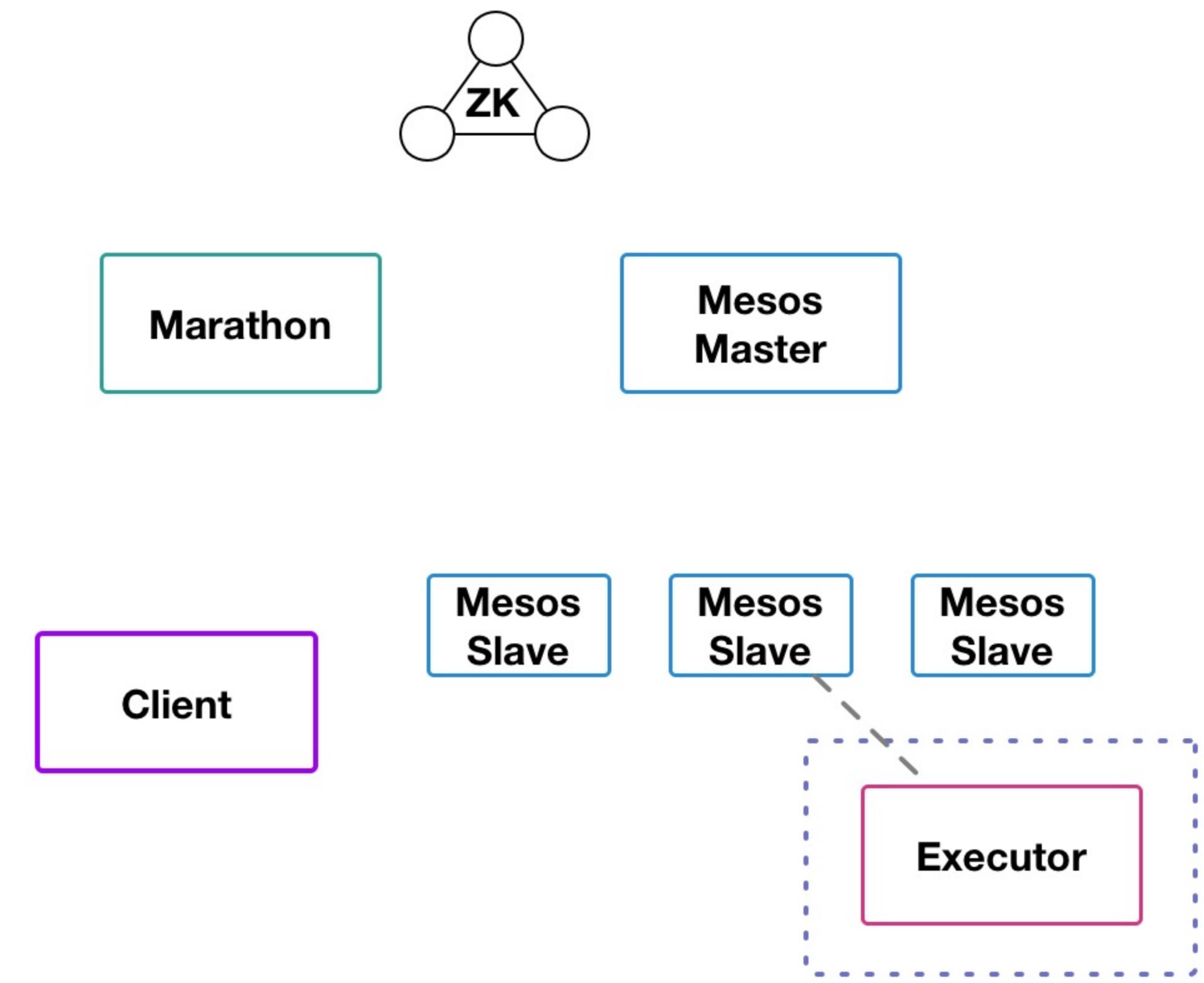


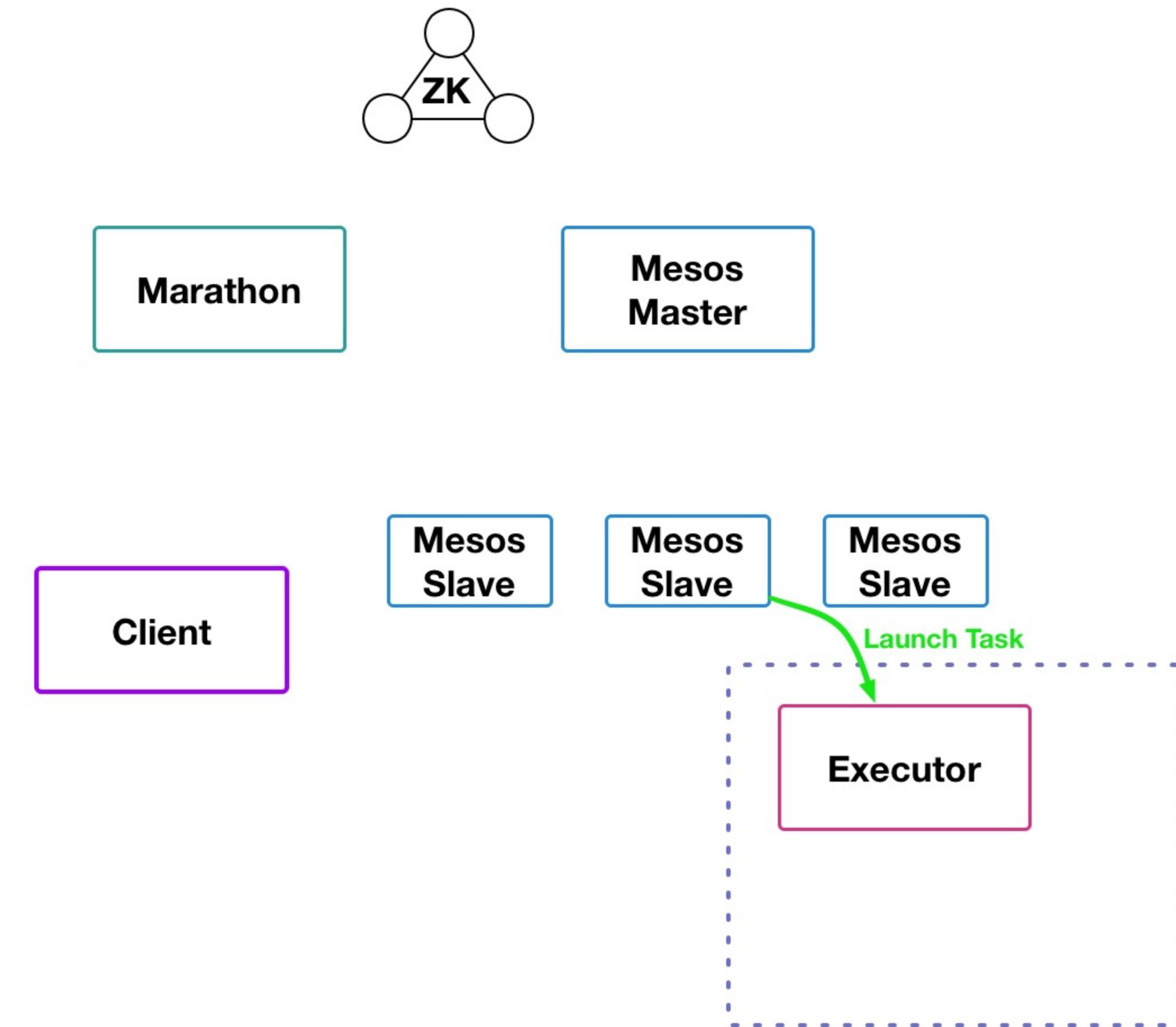


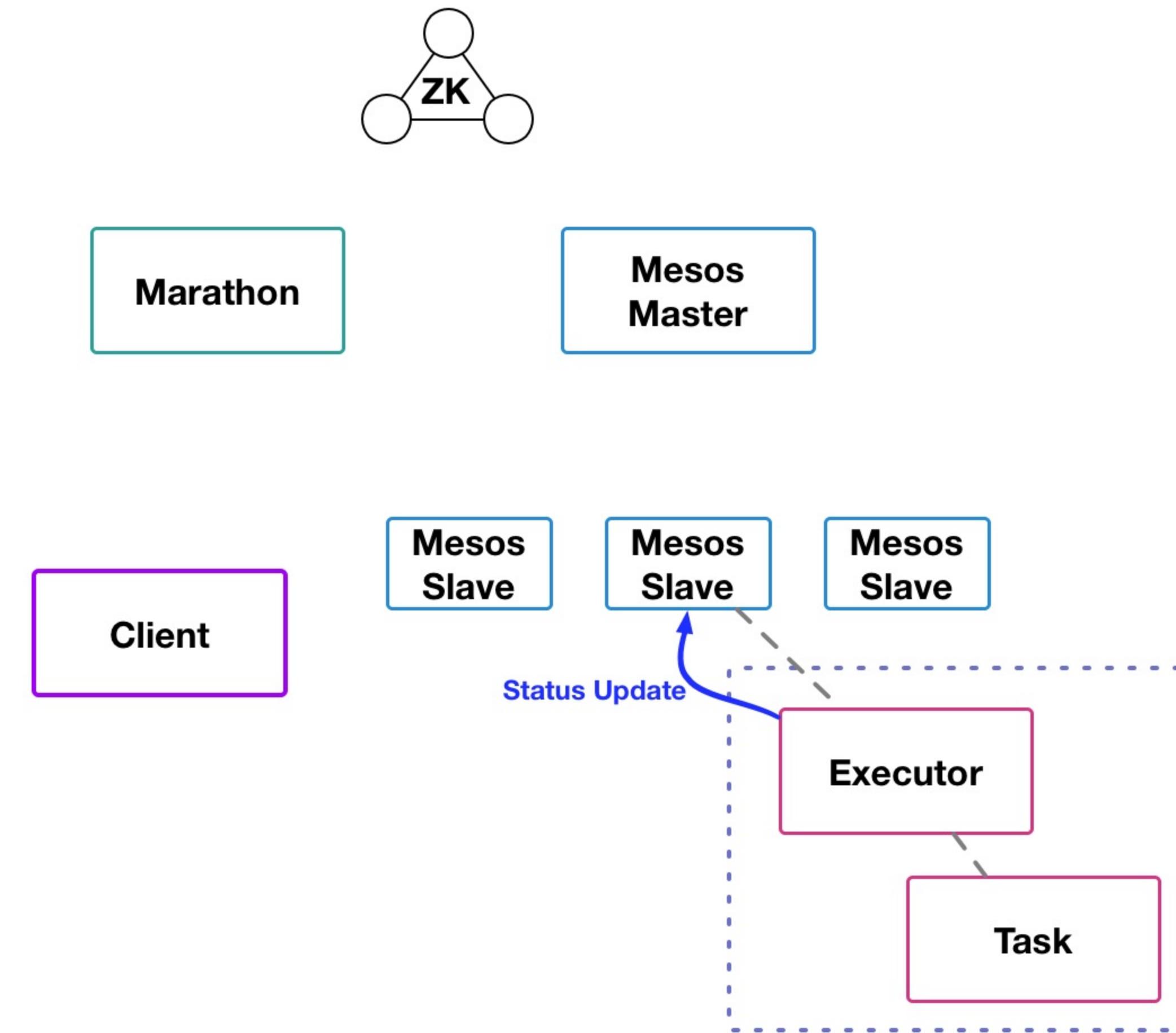


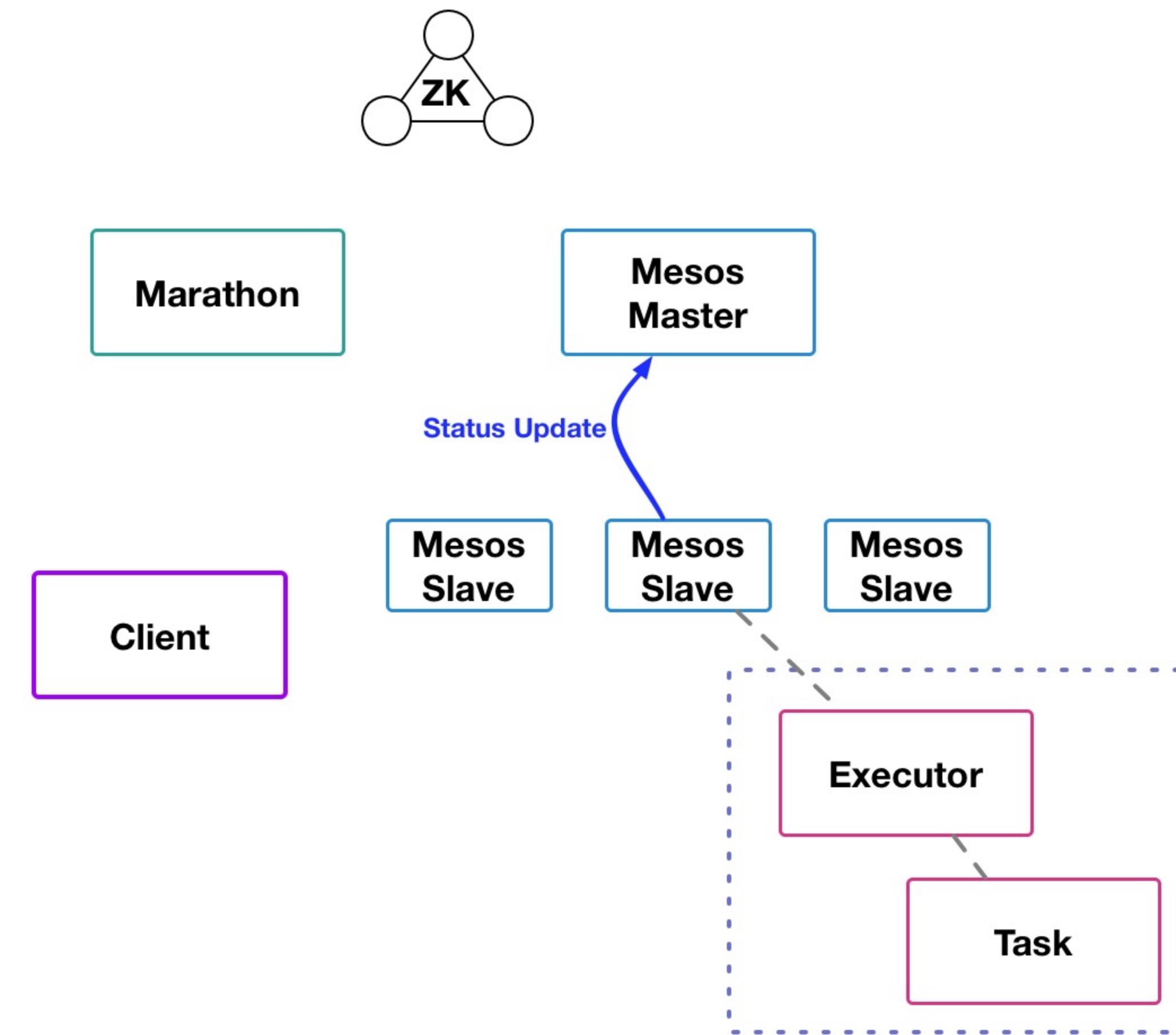


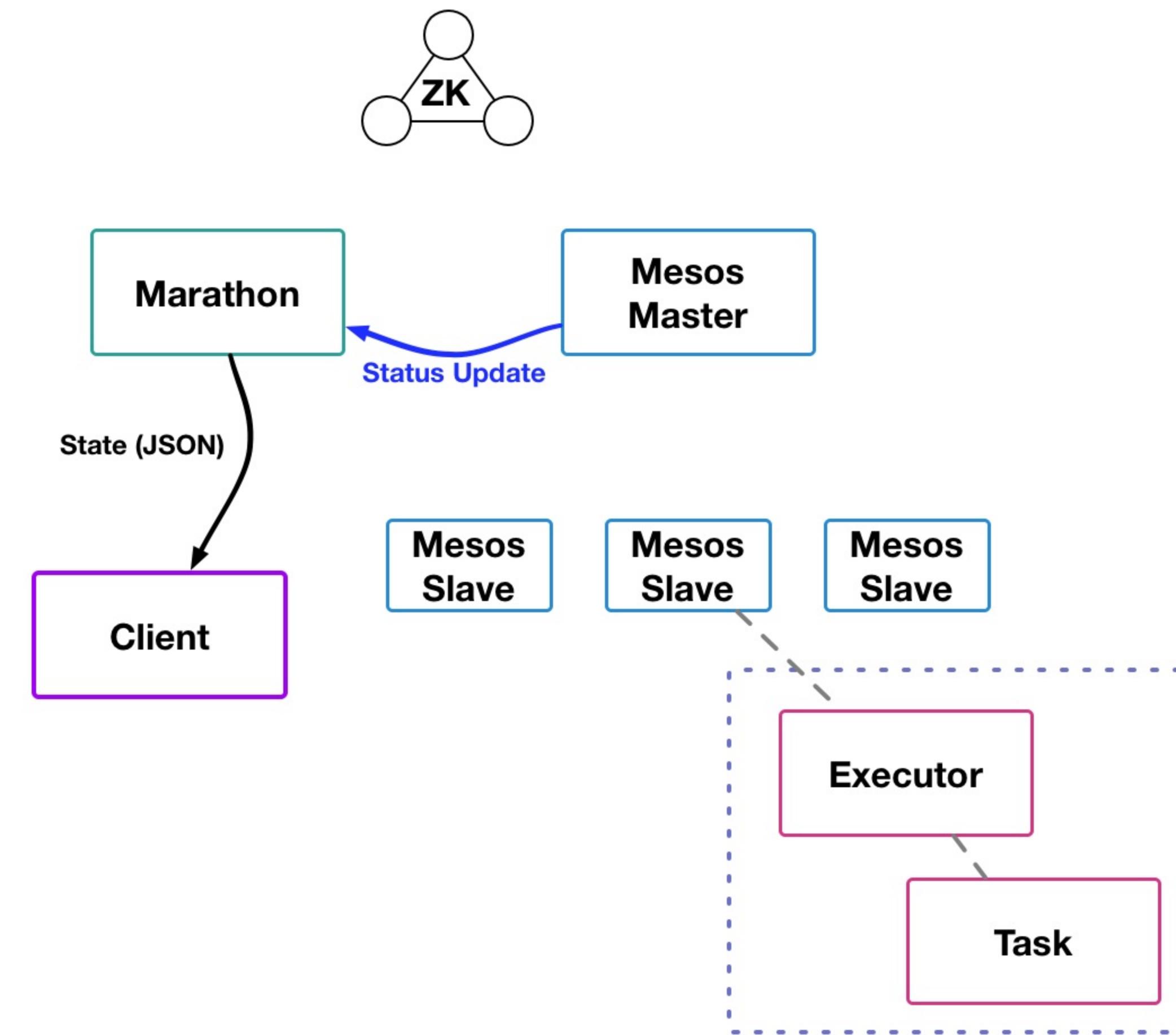


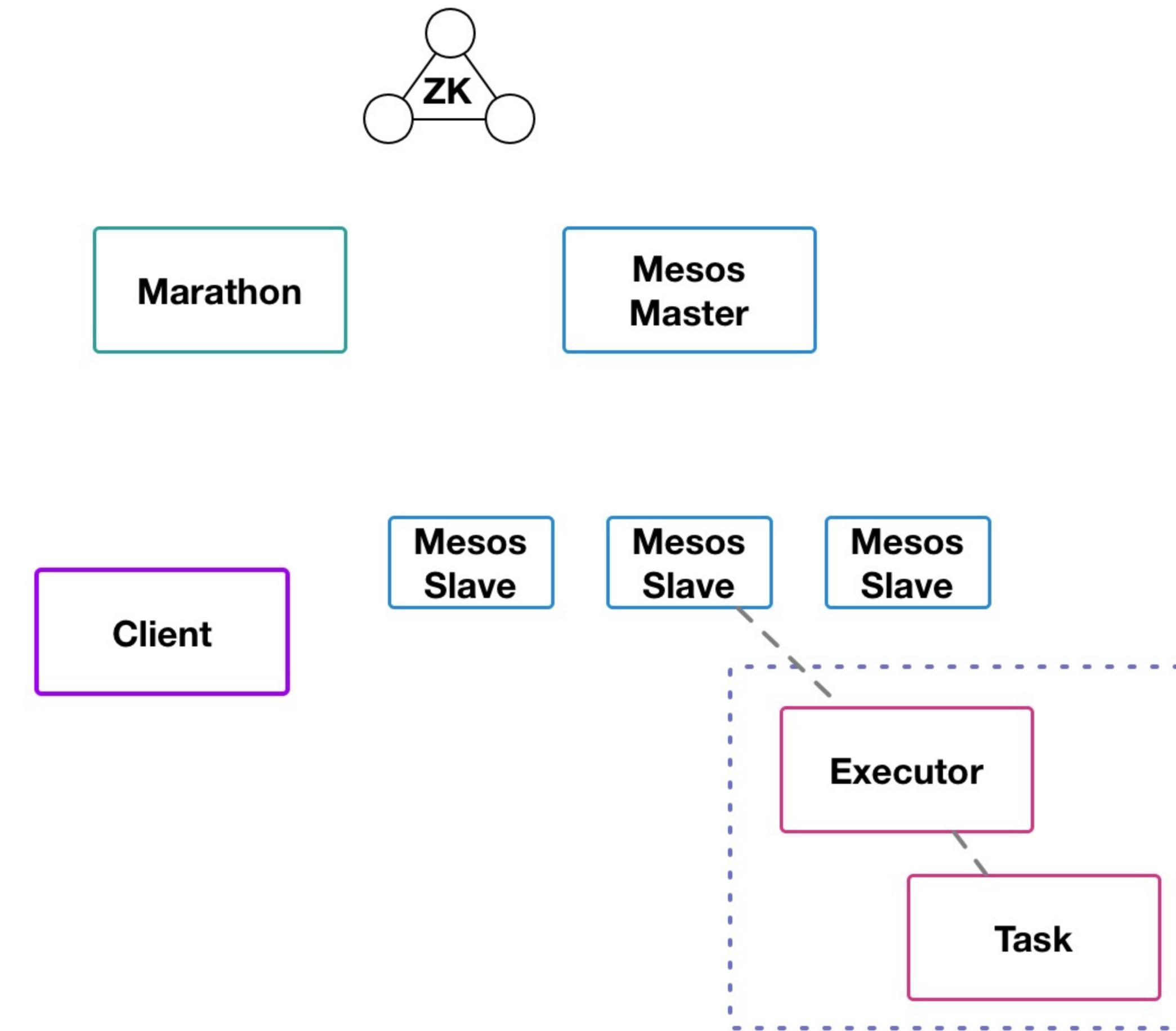




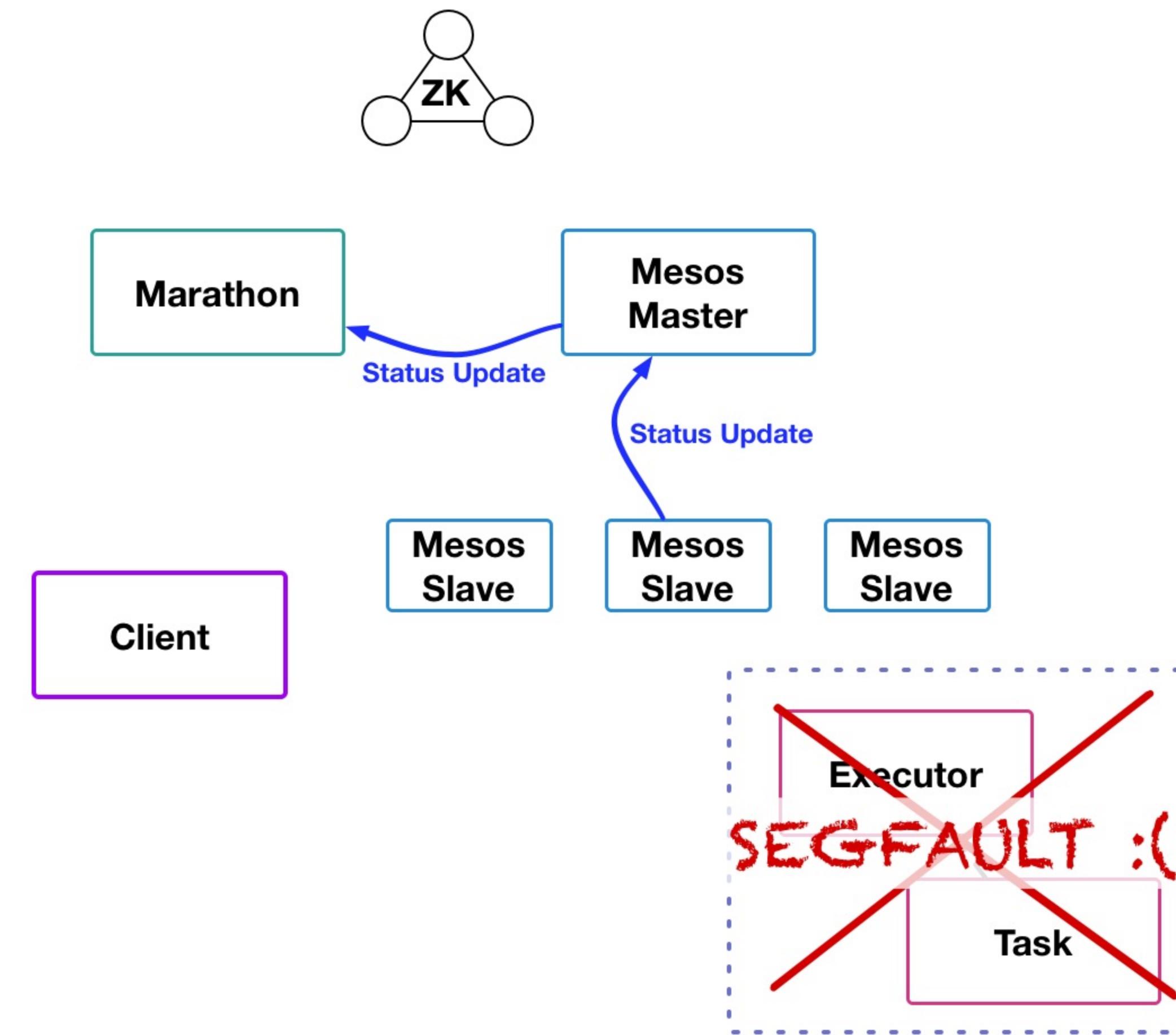


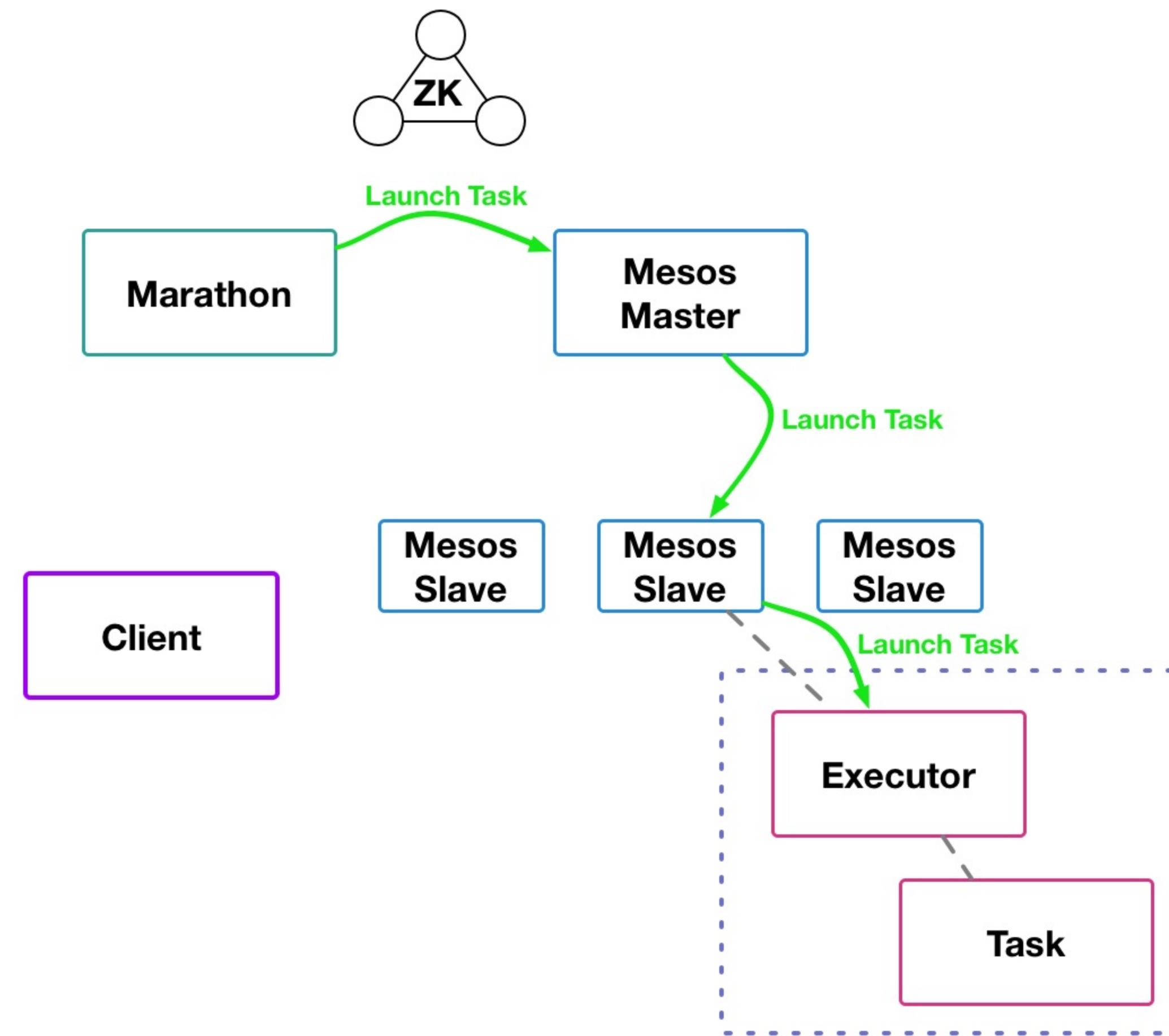


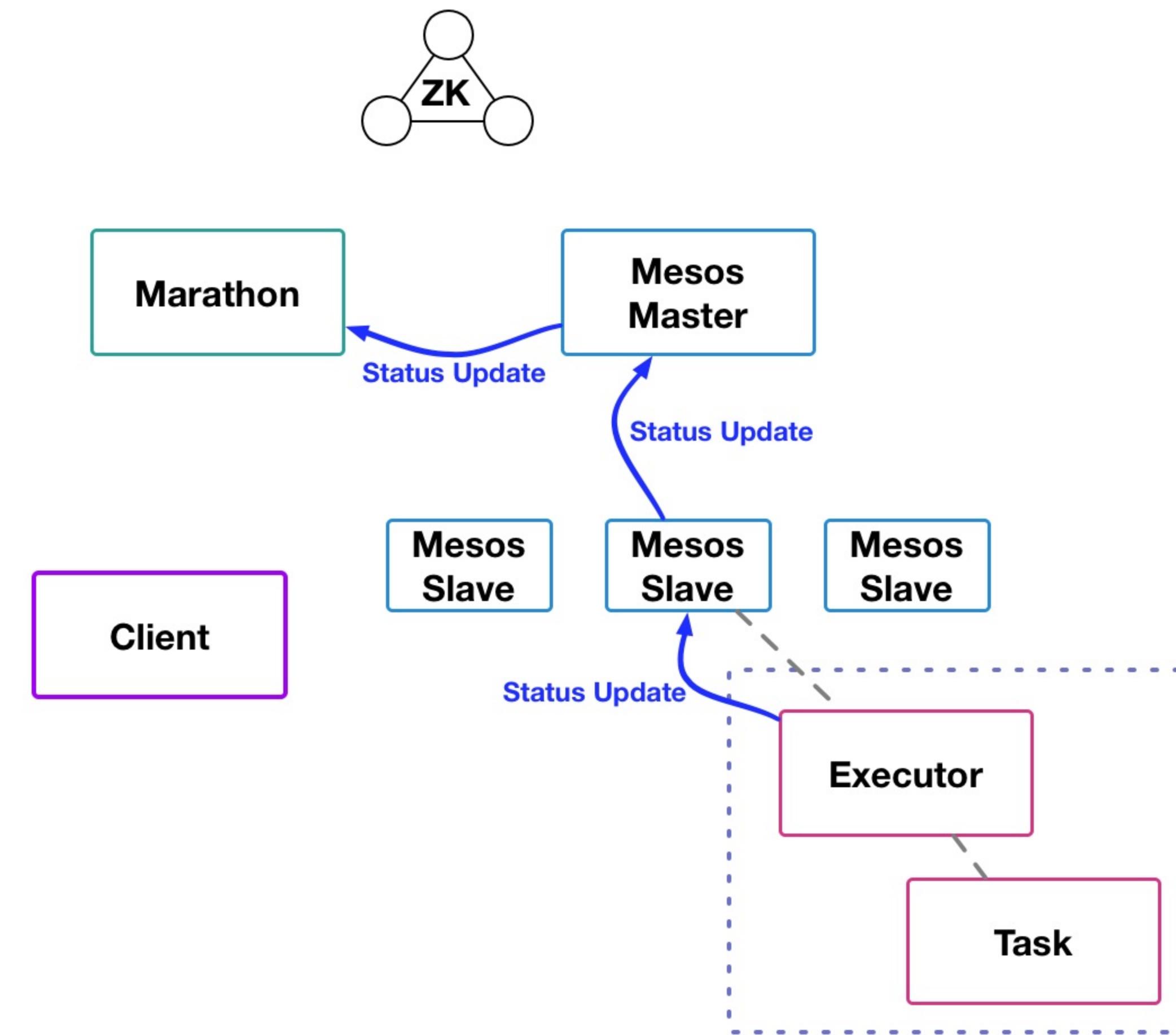


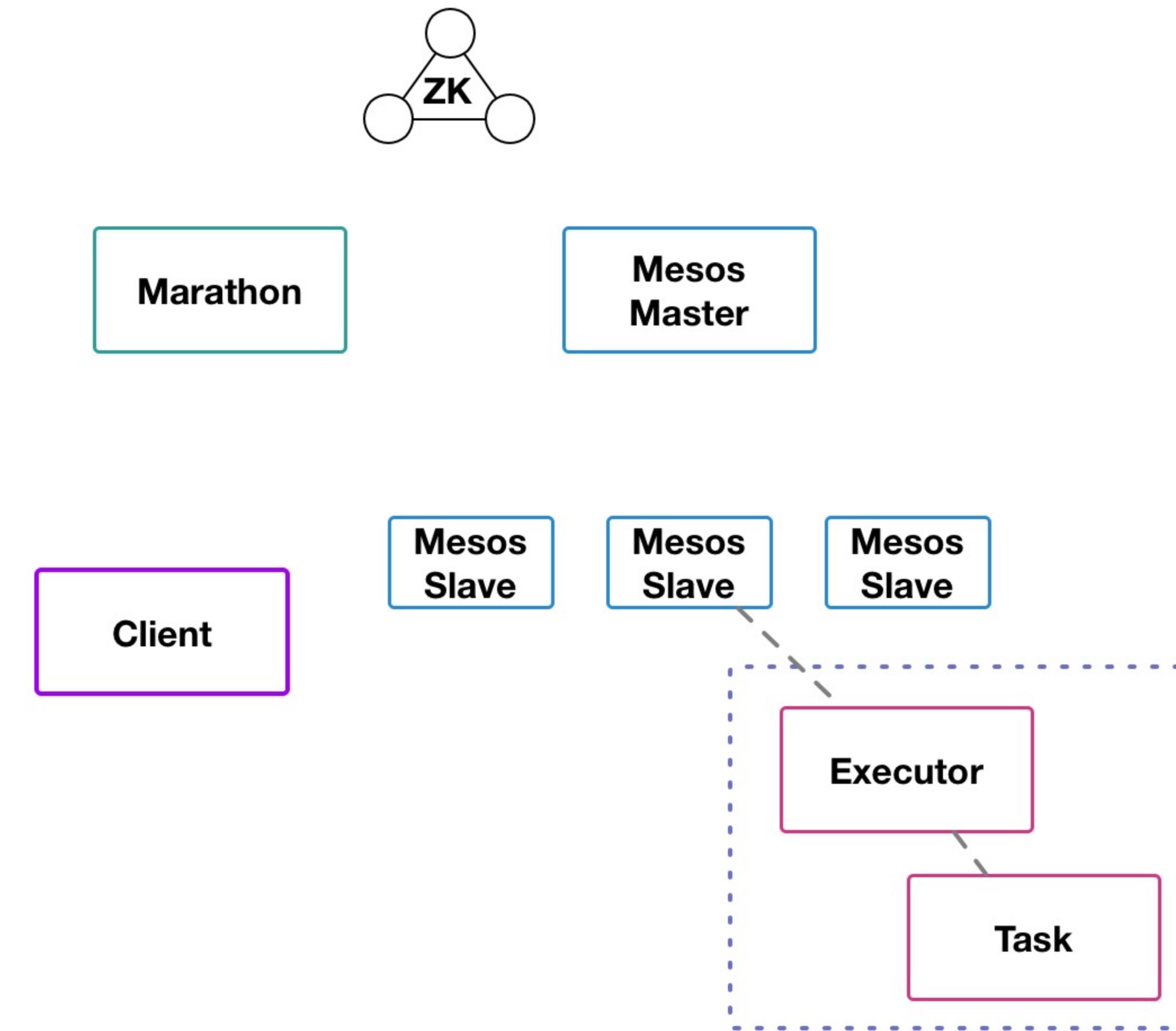


Task failure

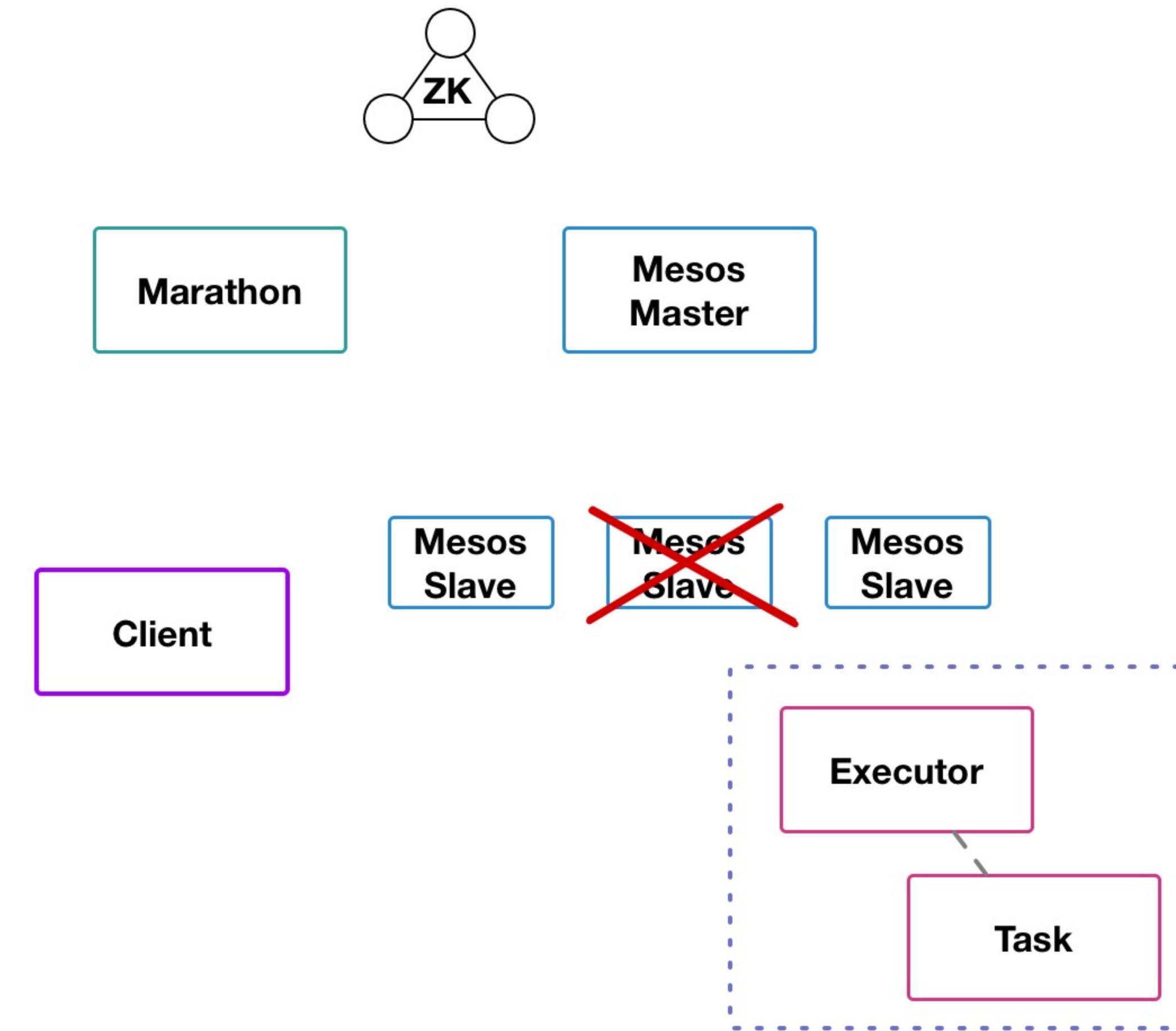


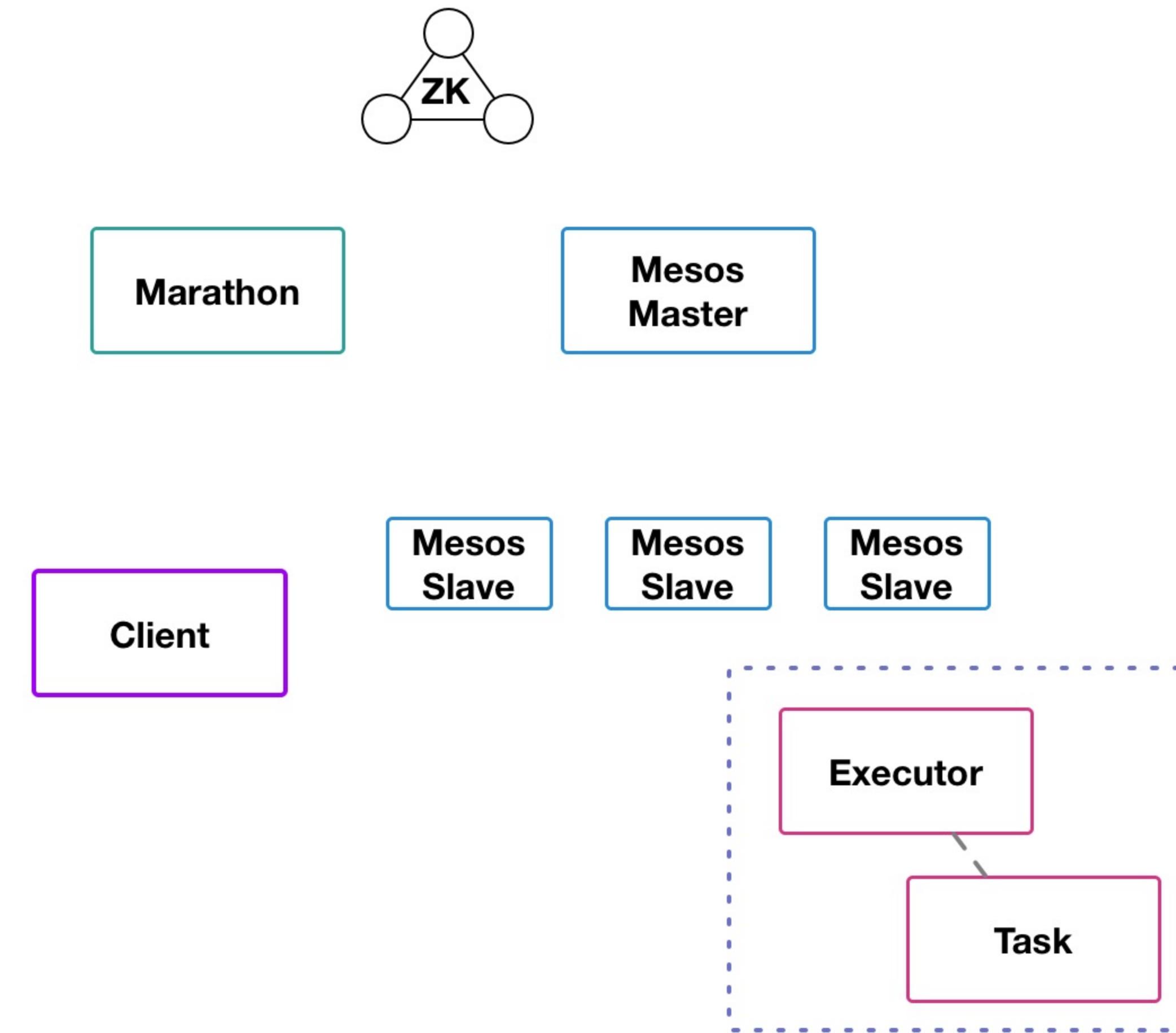


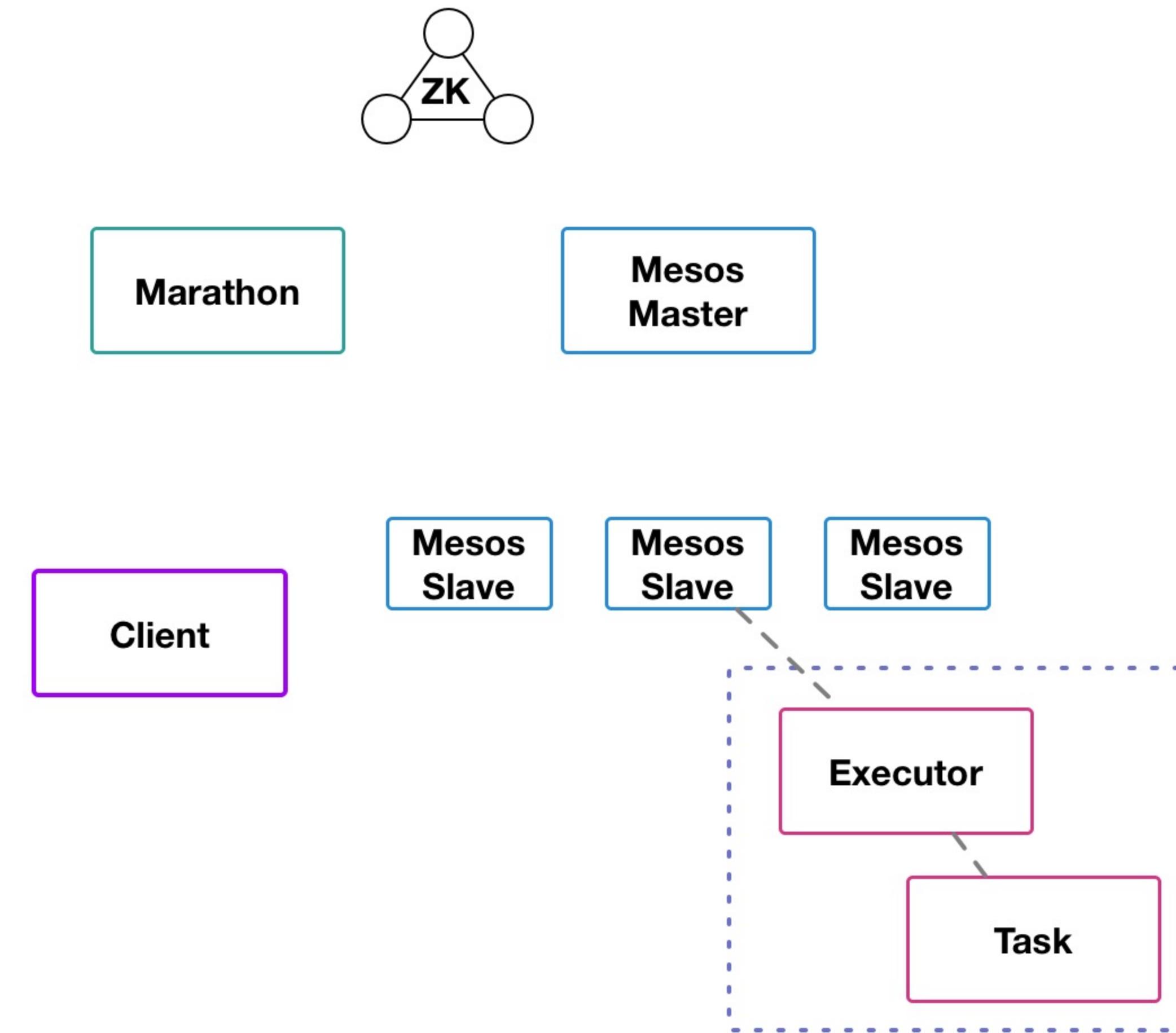


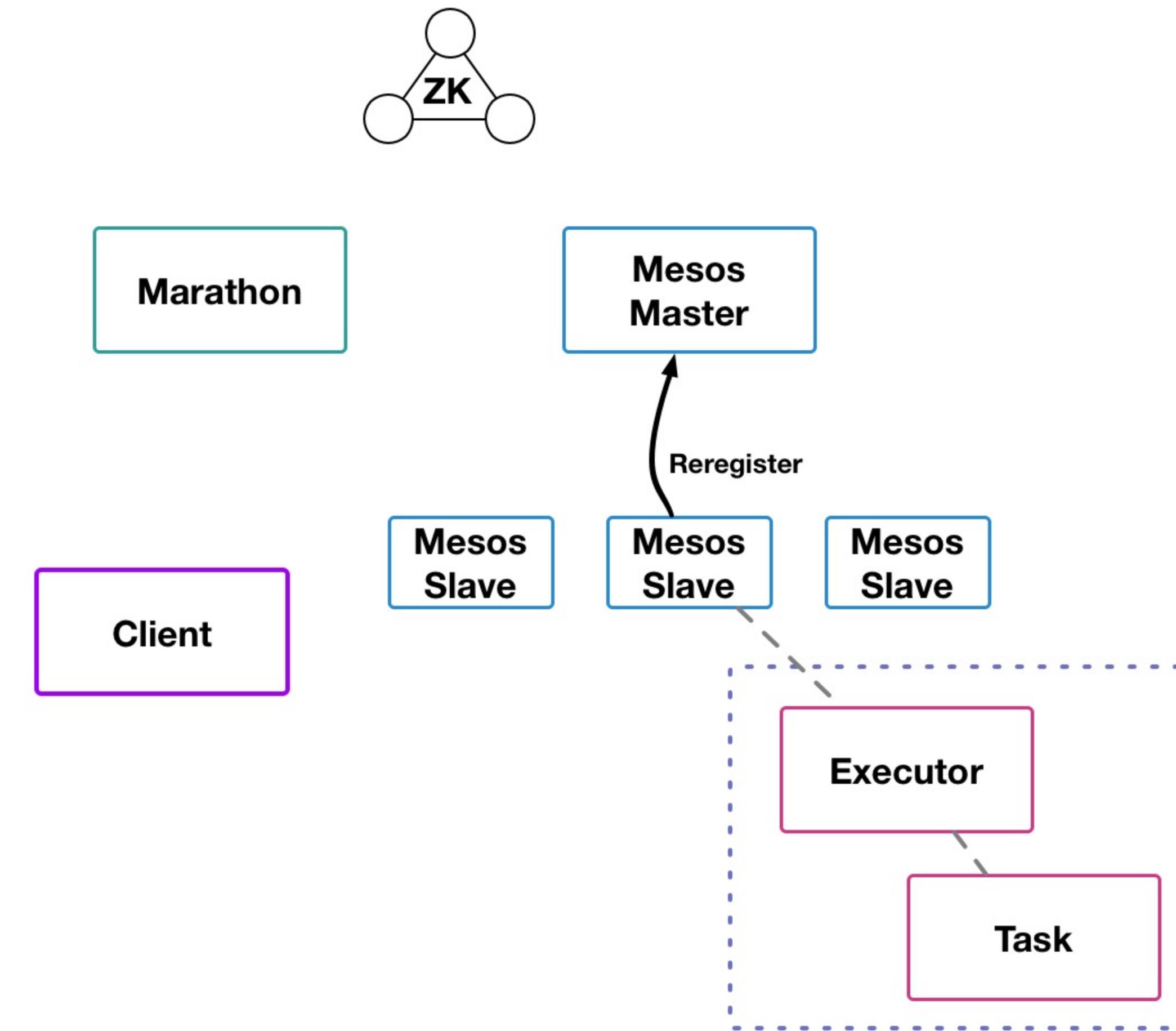


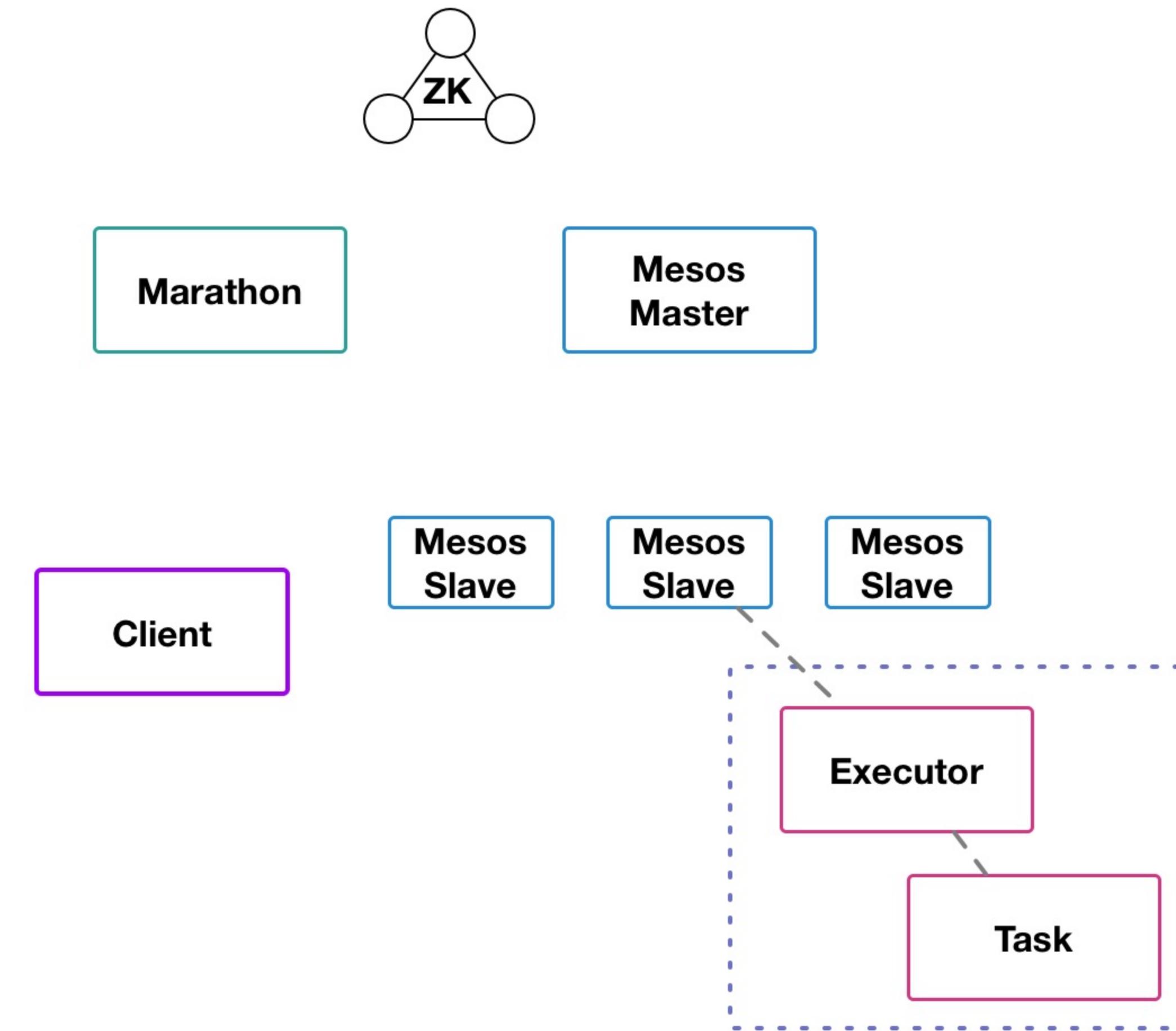
Agent process failure



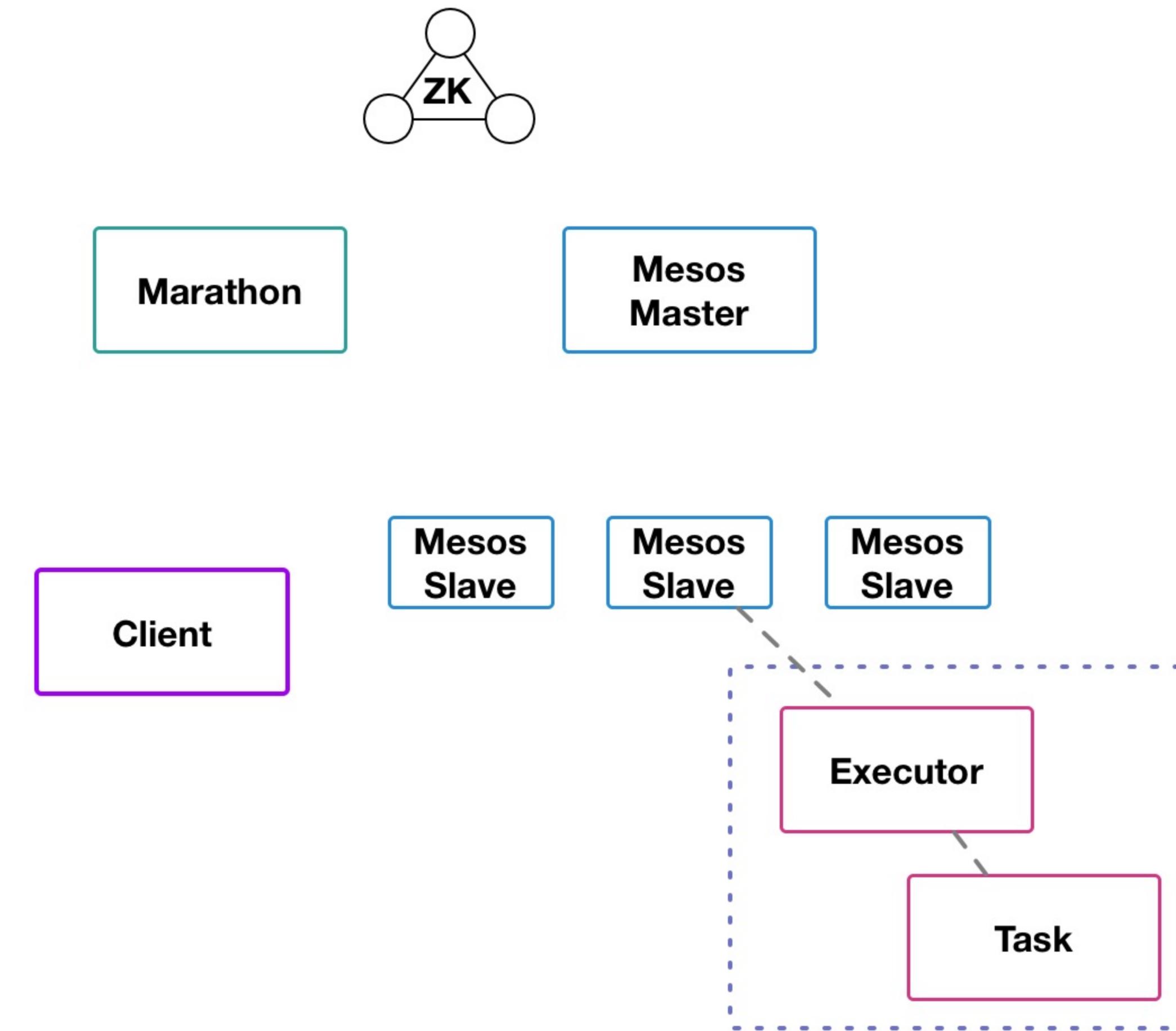


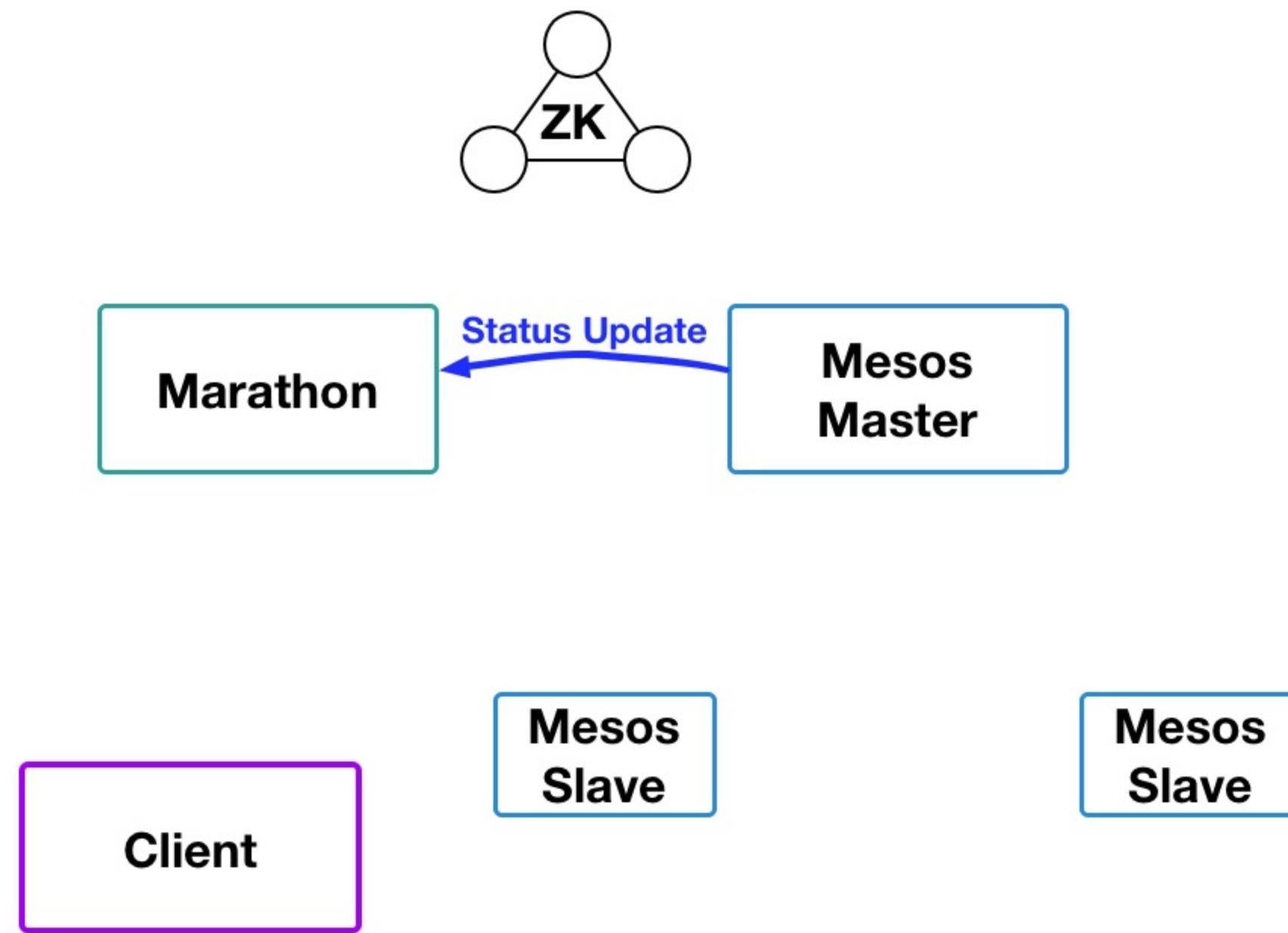


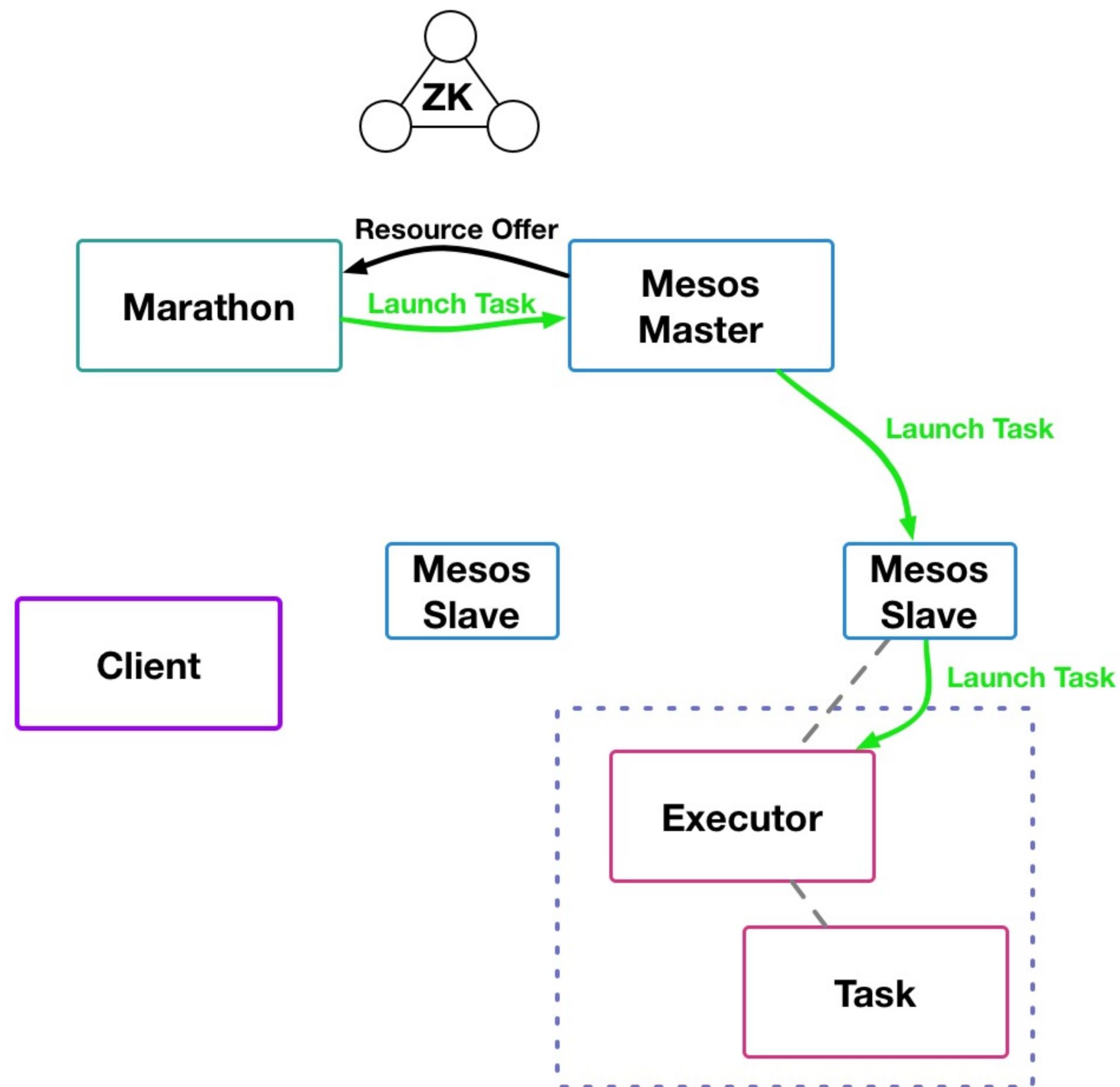


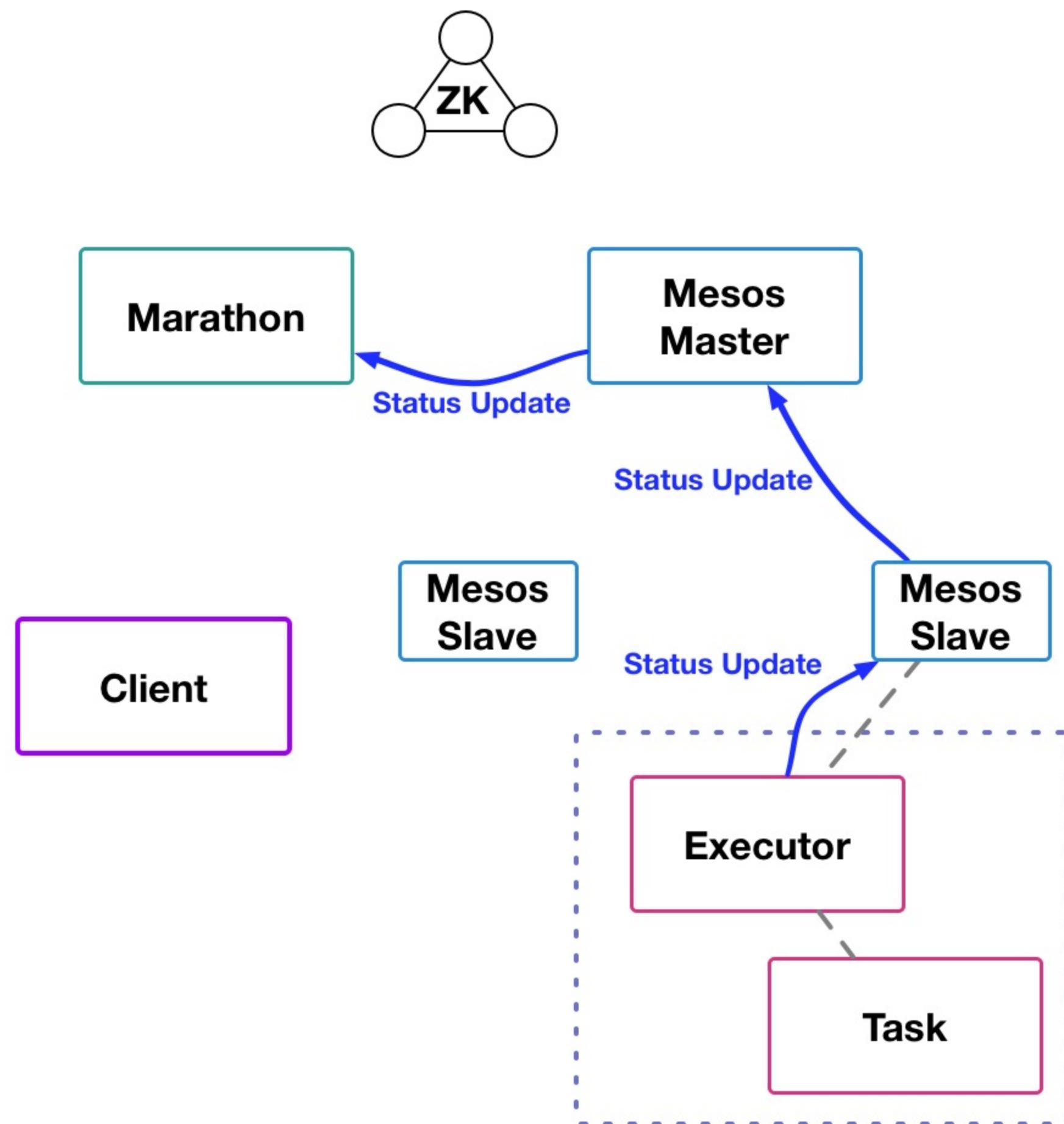


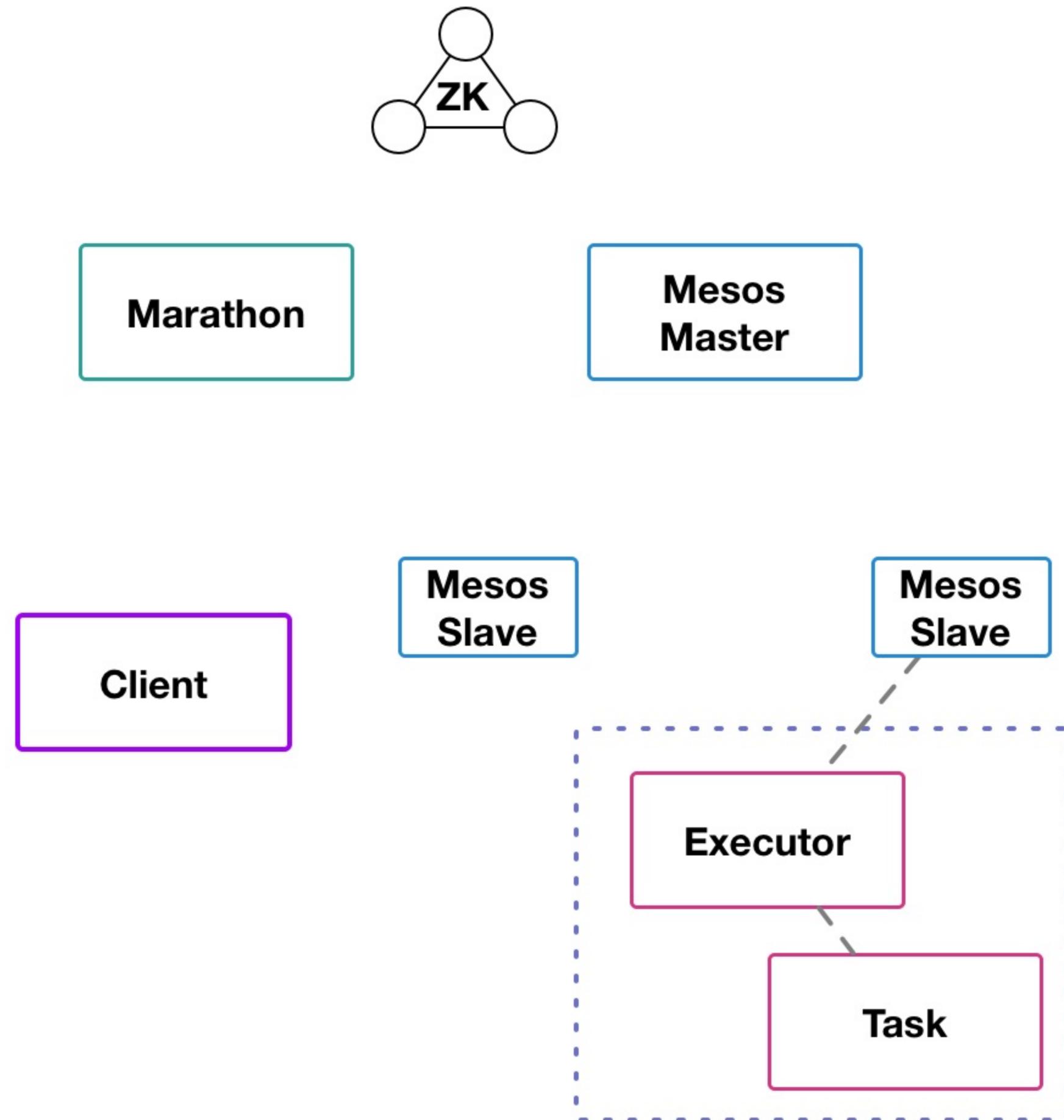
Worker node failure



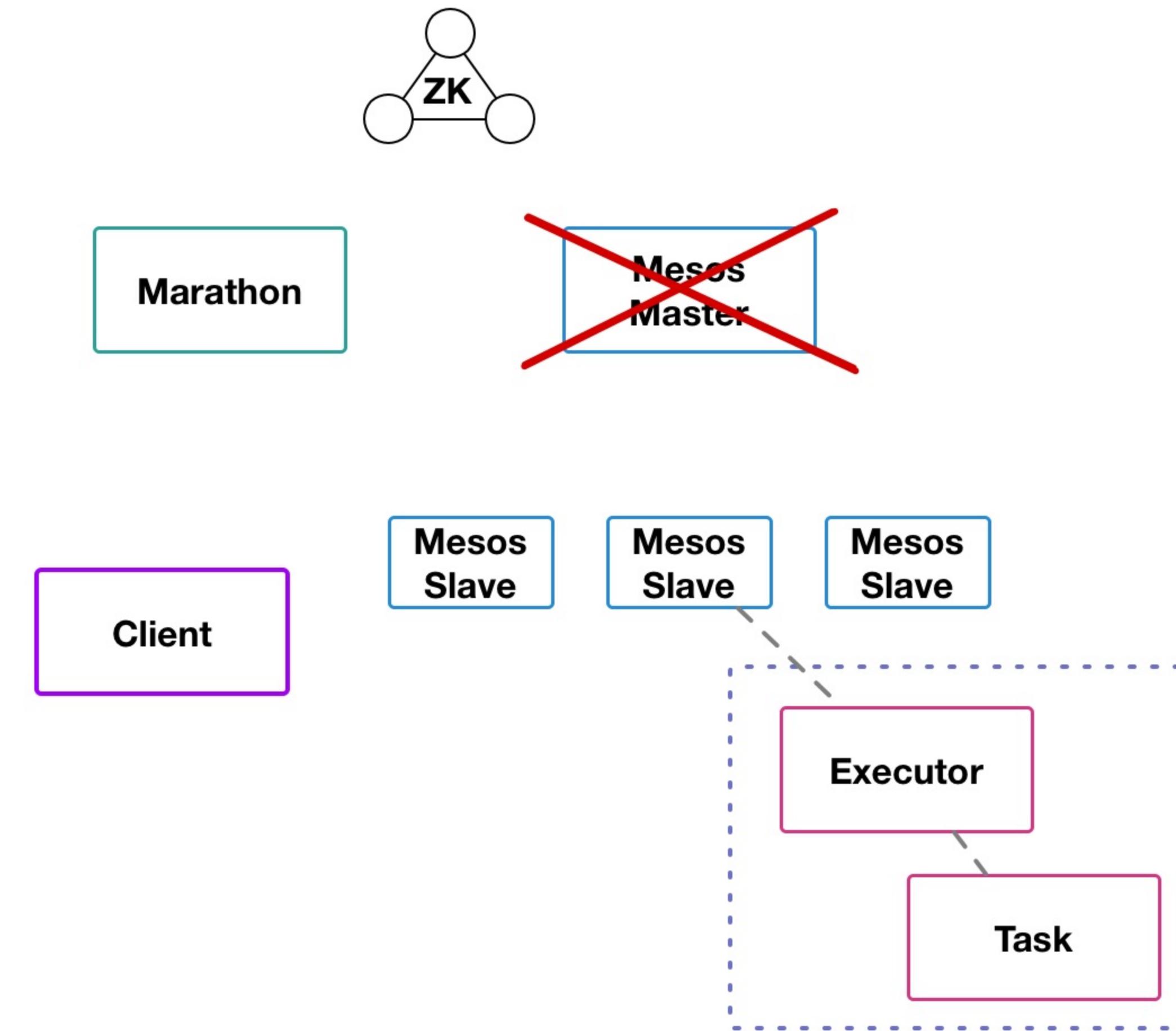


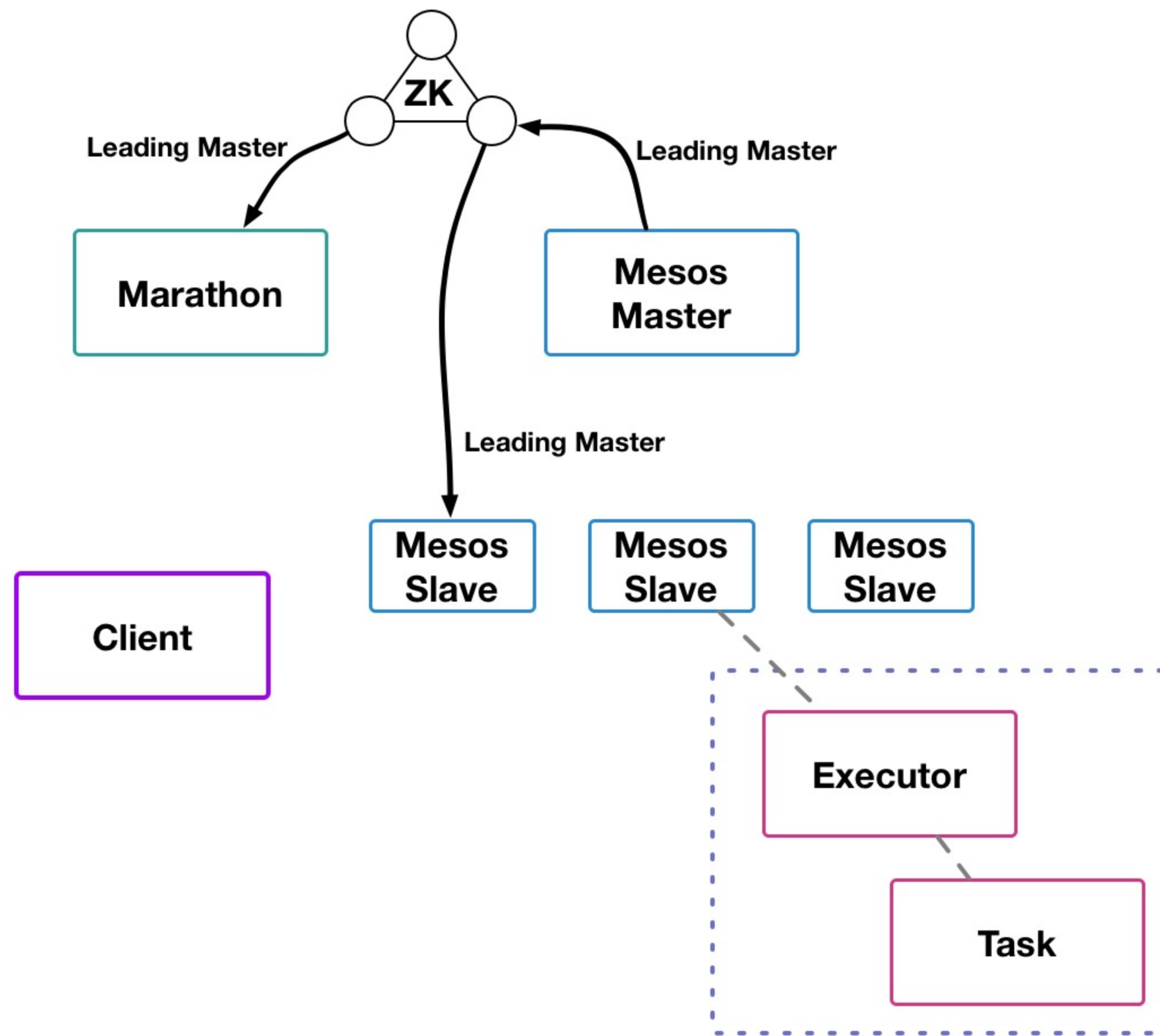


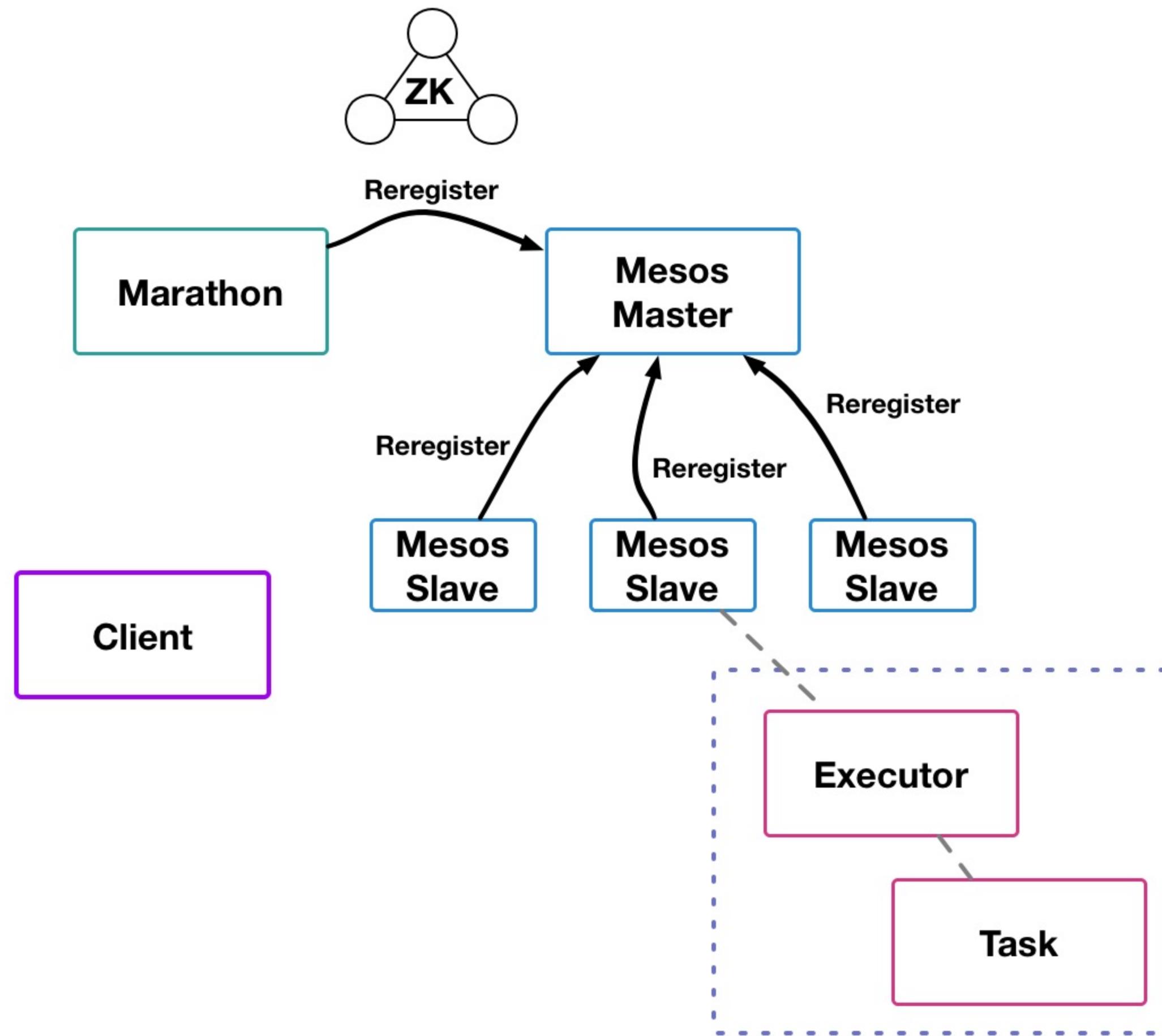


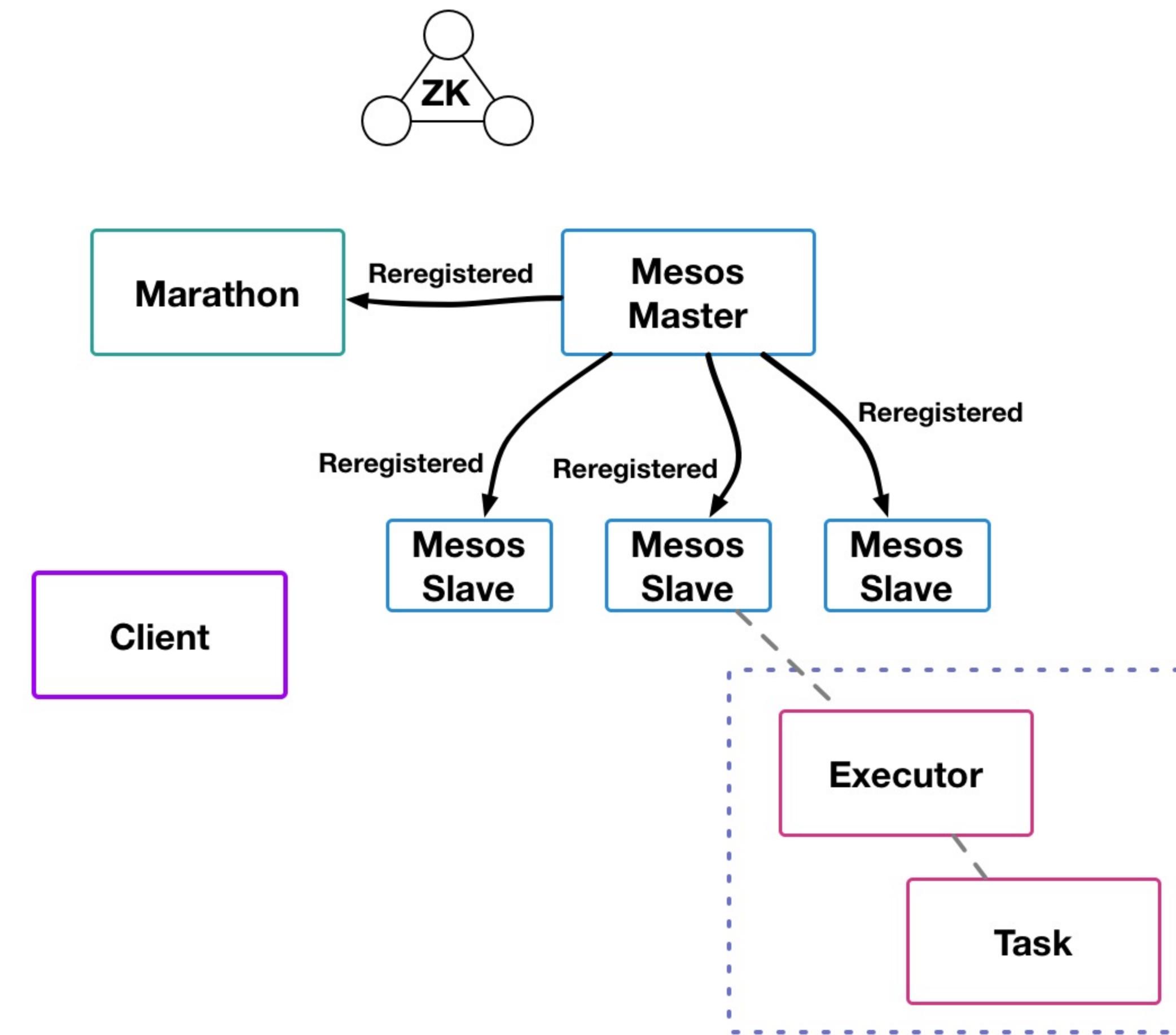


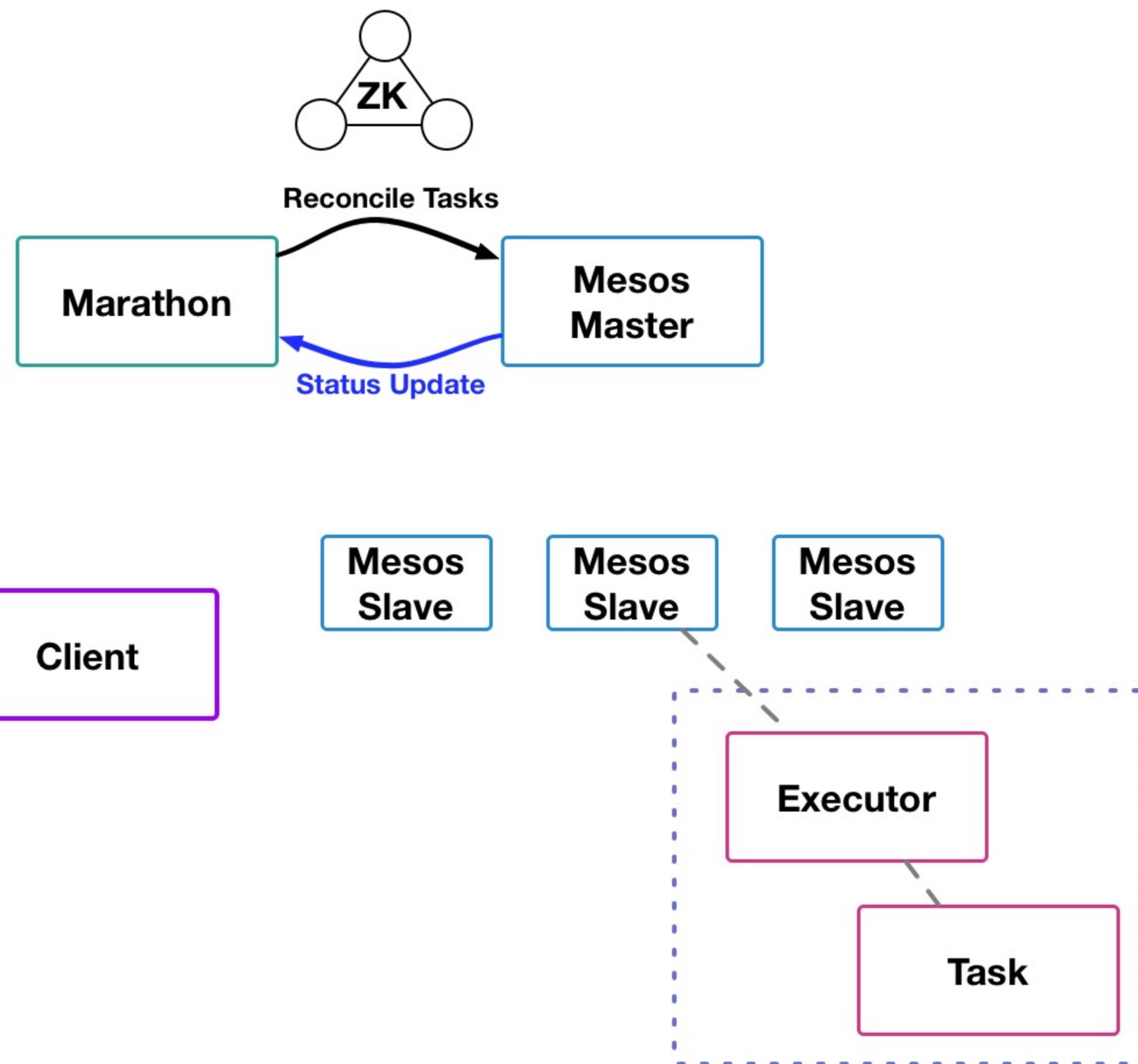
Master failure

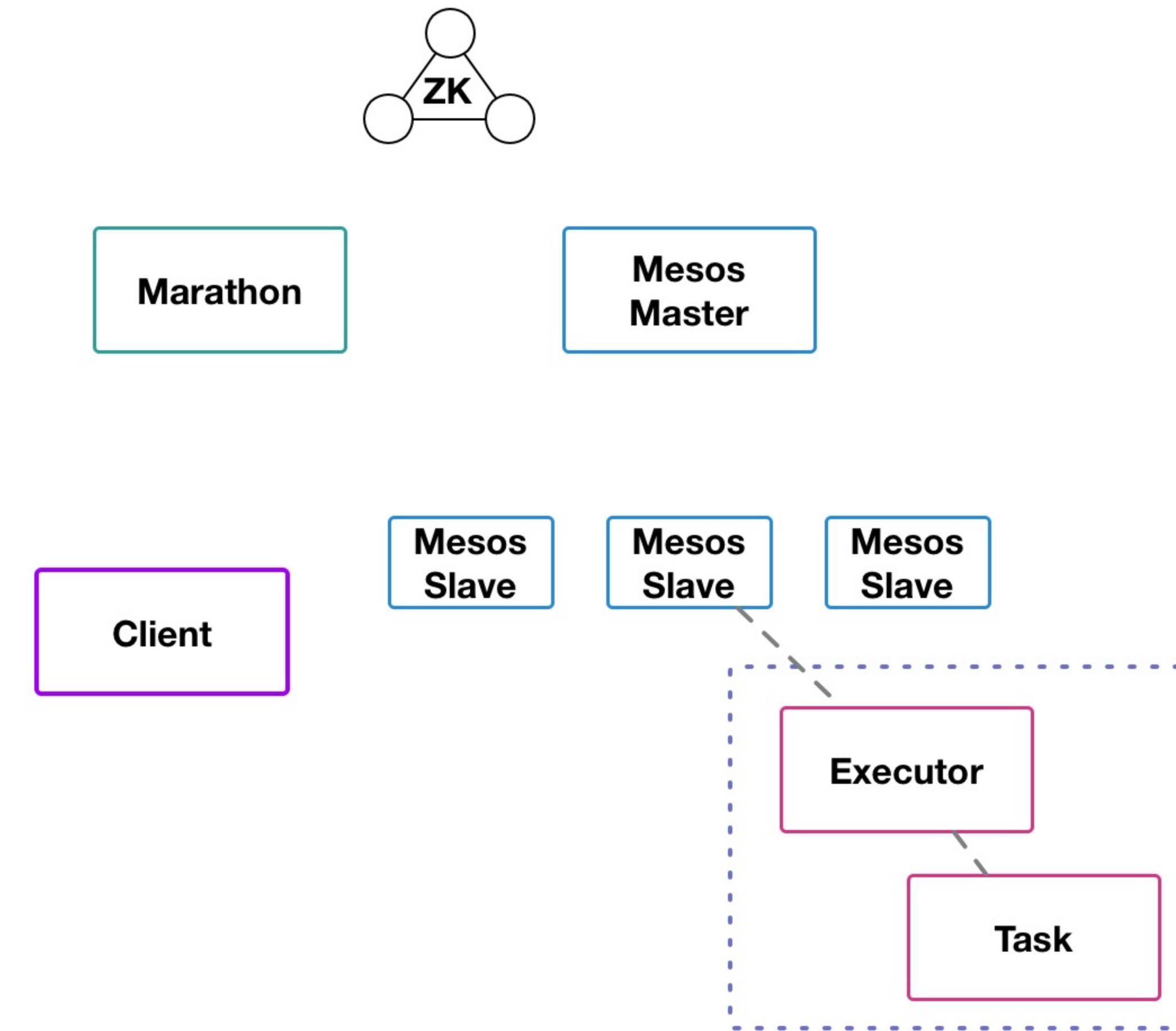




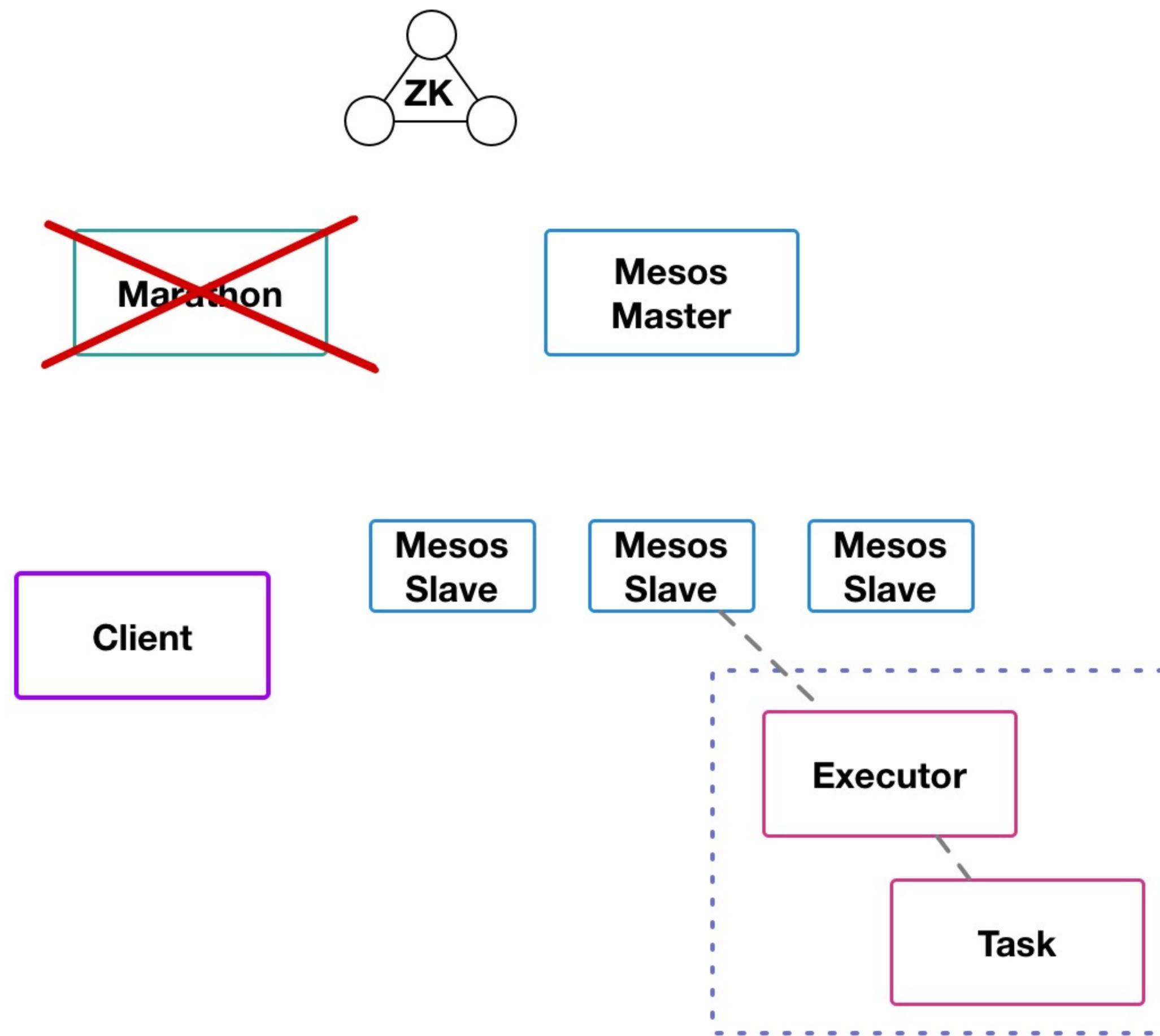


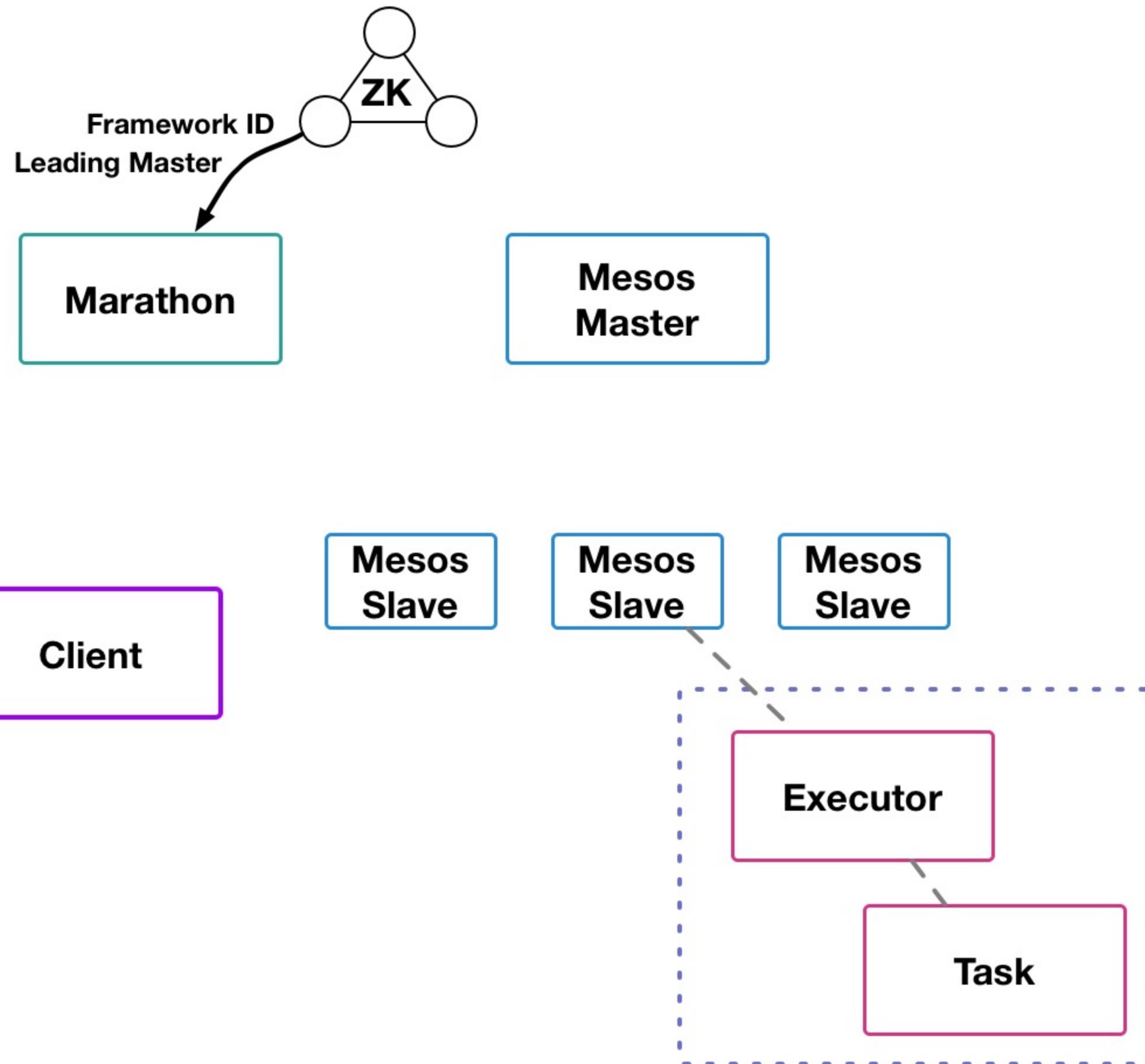


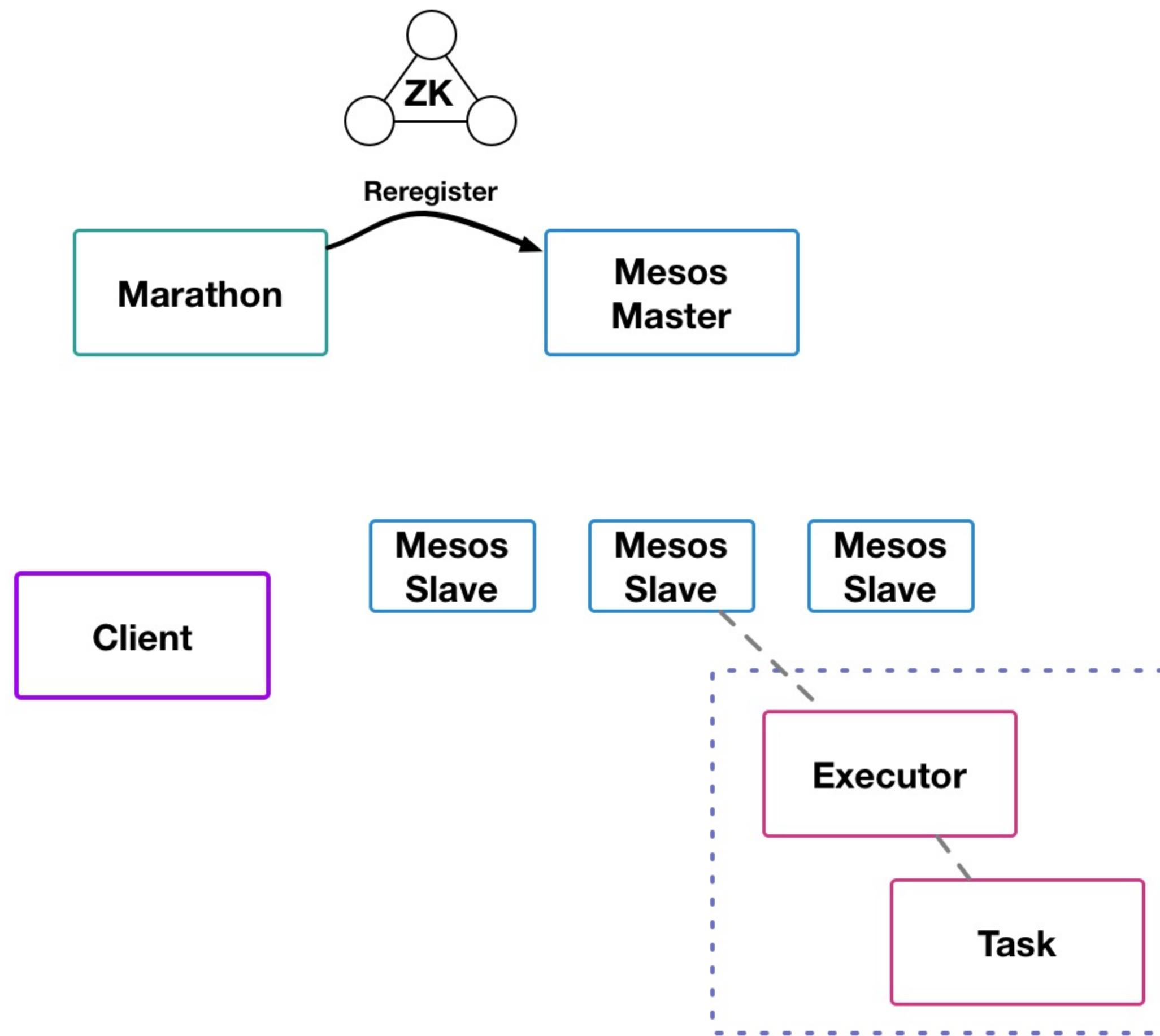


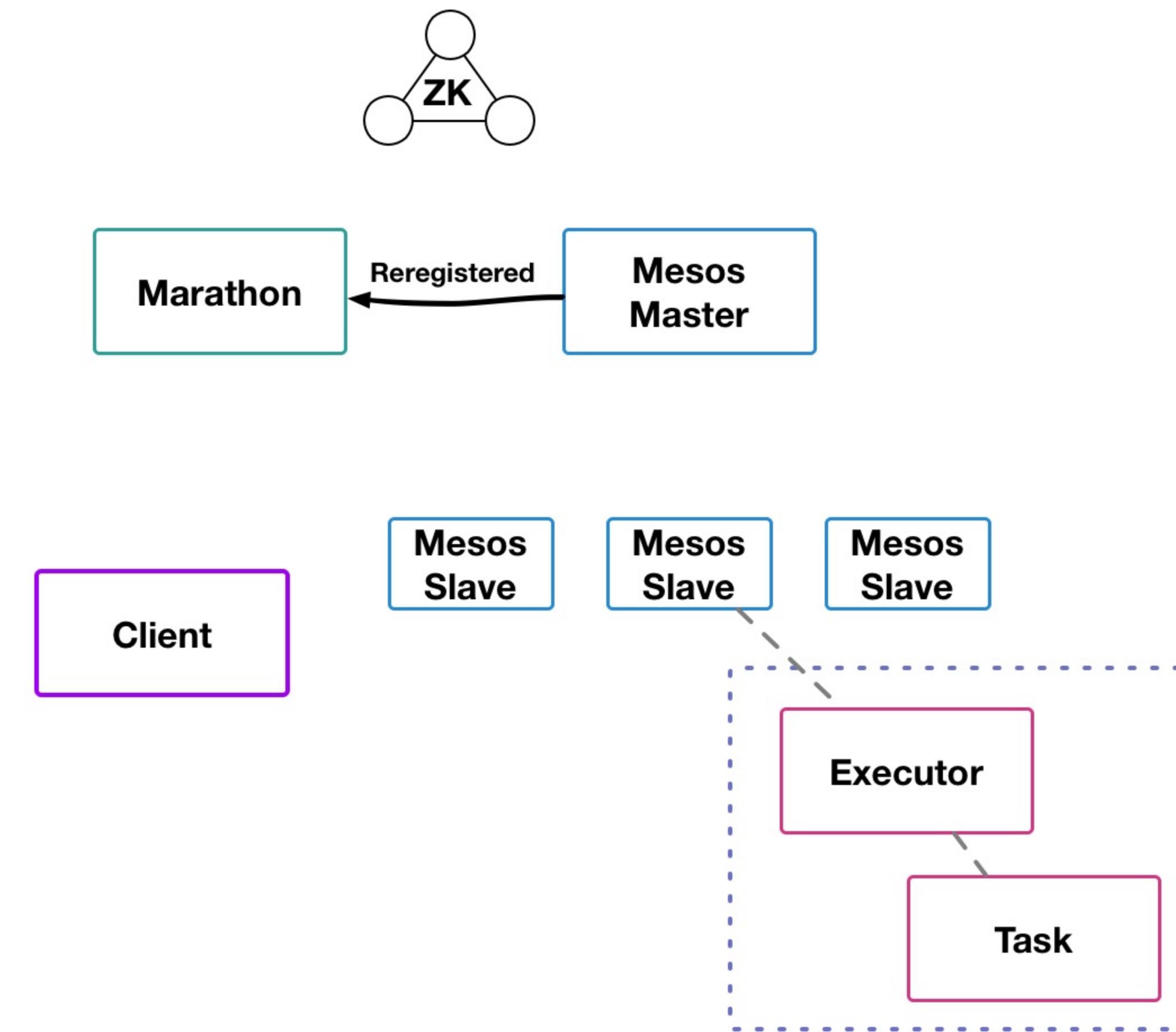


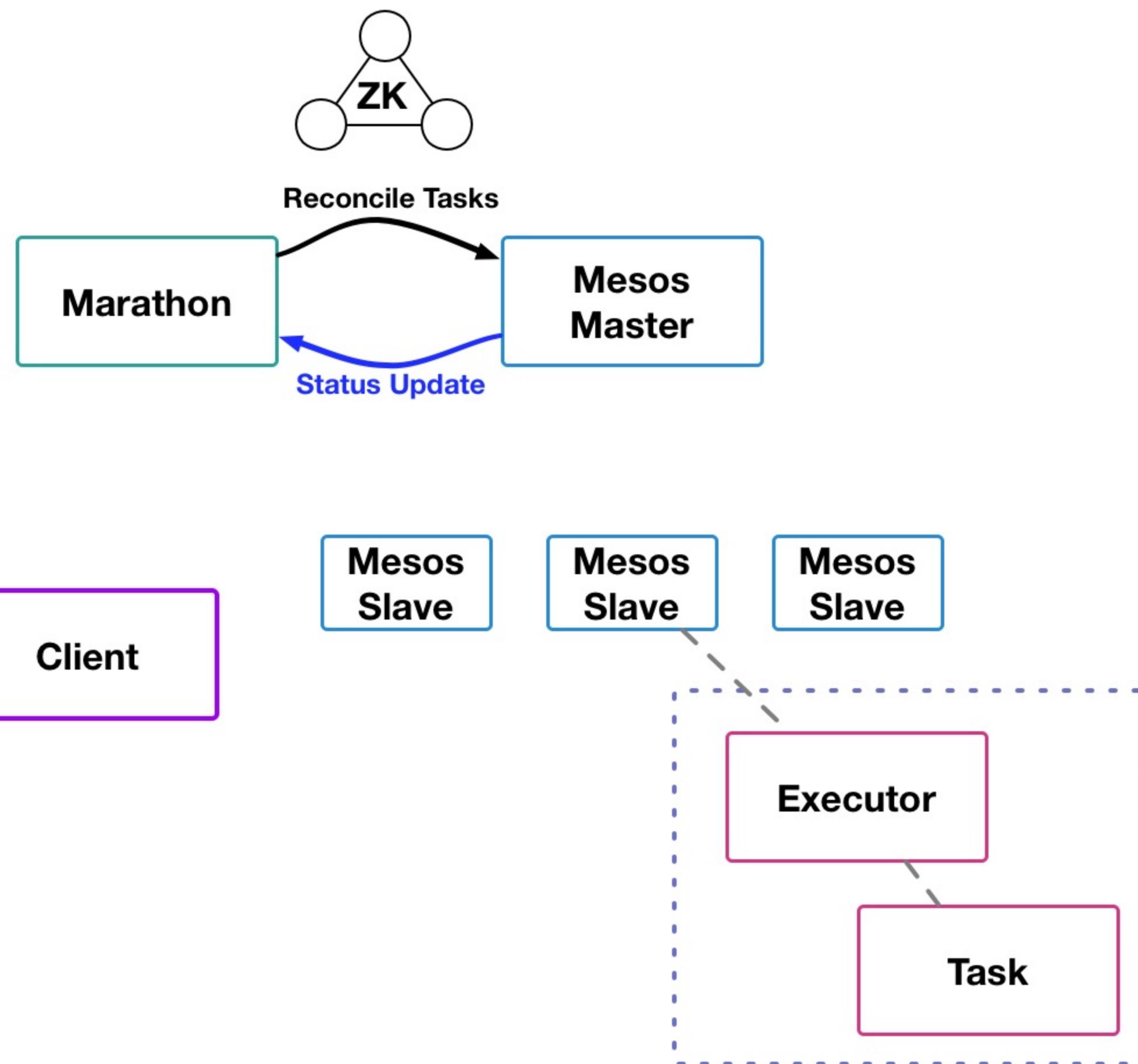
Framework failure

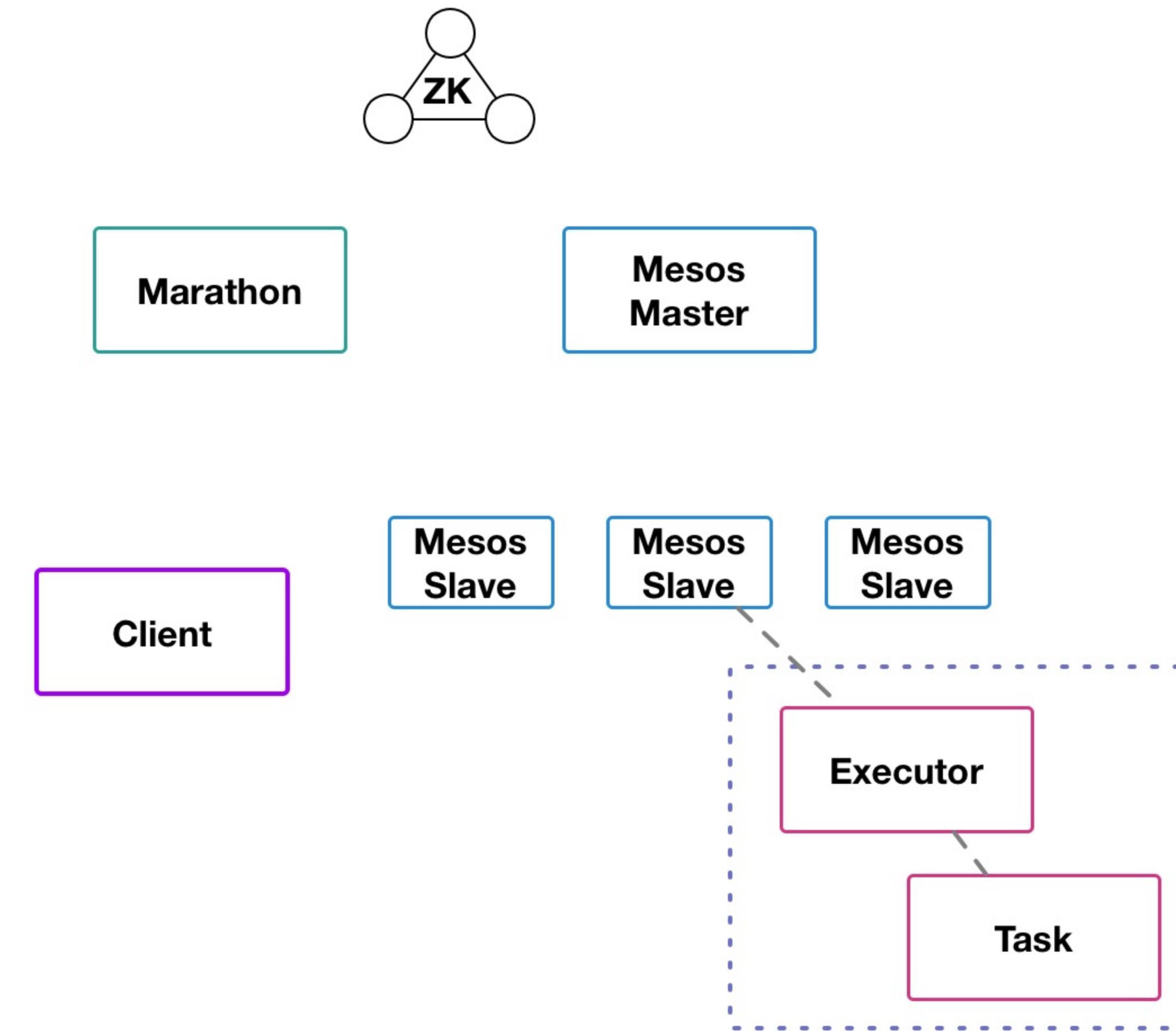












Demo'ing the DCOS

Get early access to the Mesosphere DCOS
Sign up at <http://mesosphere.com/product> and Mesosphere will
send you an email with instructions

DCOS UI

The screenshot shows the DCOS UI Dashboard page. At the top left is a user icon labeled "jose-velocity" with the URL "ip-10-0-5-66.us-west-1.compute.inte...". The left sidebar has a purple header bar with the "Dashboard" icon and the word "Dashboard". Below it are "Services" and "Nodes" icons. At the bottom of the sidebar are icons for "Logs", "Events", and "Help". The main content area is titled "Dashboard". It features three cards: "CPU Allocation" (0% of 14 Shares), "Memory Allocation" (0 B of 98 GiB), and "Task Failure Rate" (0% Current Failure Rate). Below these are two more cards: "Services Health" (marathon, Idle) and "Tasks" (0 Total Tasks). A tooltip box is overlaid on the "Tasks" card, containing the text "Mesosphere DCOS: Your Datacenter OS. Explore the DCOS web interface. The web interface provides a rich graphical view of your datacenter with Dashboard, Services, and Nodes pages." with a "Continue" button.

Install and Configure the DCOS CLI

```
mkdir -p dcos && \  
cd dcos && \  
curl -O https://downloads.mesosphere.io/dcos-cli/install.sh && \  
bash ./install.sh . http://<dcos-hostname> && \  
source ./bin/env-setup
```

Install the Cassandra DCOS Service

dcos package install cassandra

Install Spark and extend the CLI

```
dcos package install spark
```

```
dcos spark --help
```

List all install package and running tasks

```
dcos package list-installed | jq '.[].name'
```

```
dcos tasks
```

Increase the number of instances

```
dcos package install helloworld
```

```
dcos marathon app update helloworld instances=5
```

Hands on with Mesos & Marathon

- + Access the [local Mesos console](#)
- + Access the [local Marathon console](#)

Copy USB data to local hard drive

```
cp -R mesos-usb ~/workspace/mesos-usb
```

Start VM

```
cd ~/workspace/mesos-usb  
vagrant box add mesos mesos.box  
vagrant up
```

Download the install script:

```
wget https://downloads.mesosphere.io/dcos-cli/install.sh
```

Create an empty directory and install into it:

```
mkdir dcos-cli
```

```
bash install.sh dcos-cli http://10.141.141.10:8080
```

Set OSS Mesos & Marathon configuration:

```
dcos config set core.mesos_master_url http://10.141.141.10:  
5050  
dcos config set marathon.url http://10.141.141.10:8080
```

Thanks!

Come and talk to us!
P.S., we're hiring!

