The Emergence of the Datacenter Developer

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@superguenter

mesosphere

A Brief History of Operating Systems

1950's

Punchcards

No operating systems

Time Sharing

Computing as a utility

1960’s

UNIX

Small, composable programs

Machine-independent language (C)

Multitasking & Multiuser

Everything is a file

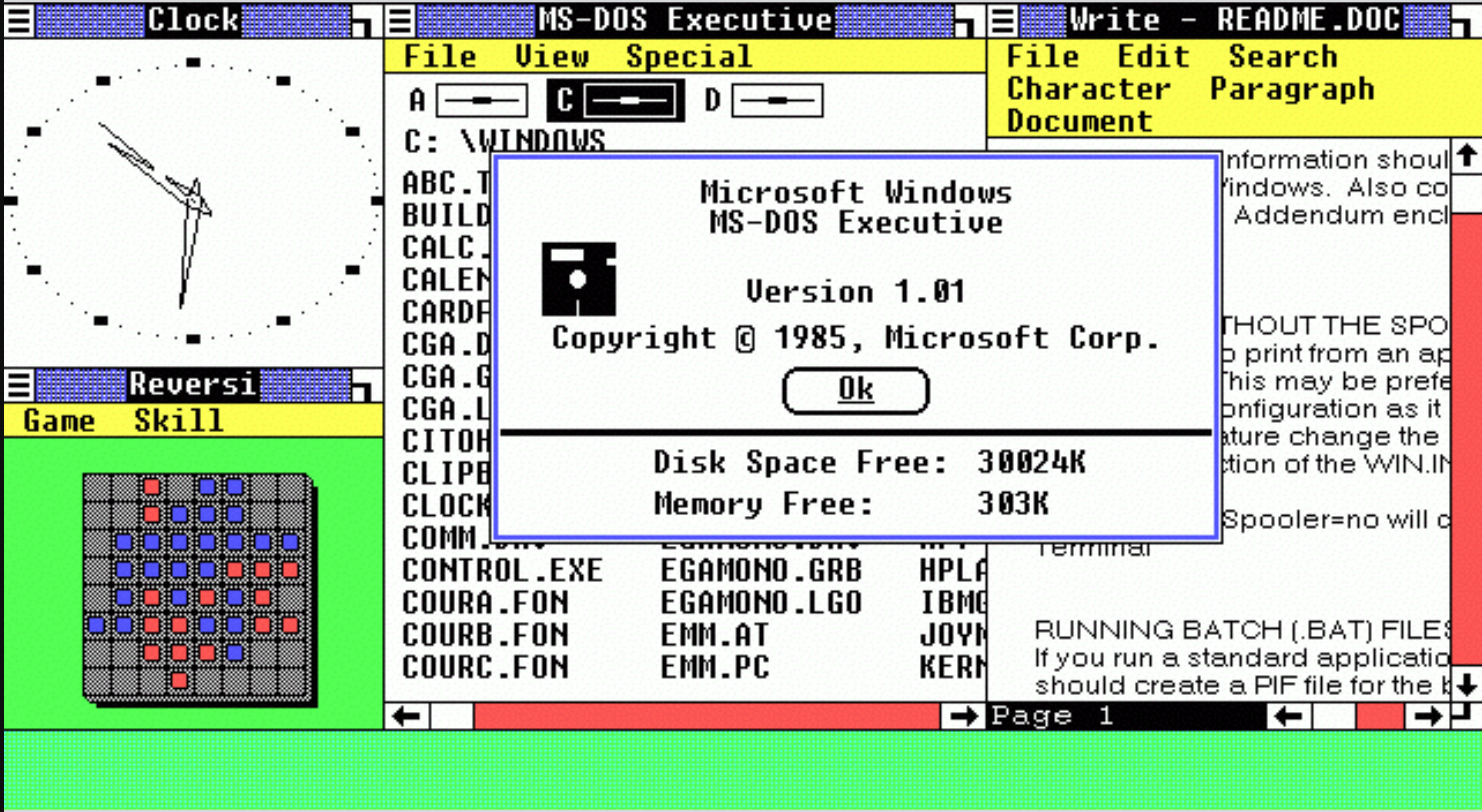
Shell

mesosphere

1980's

PC OS

- Windows, Mac OS, Amiga
- GUI
- Mouse
- Virtual Memory



Microsoft Windows
MS-DOS Executive

Version 1.01

Copyright © 1985, Microsoft Corp.

Disk Space Free: 30024K
Memory Free: 303K

```
C: \WINDOWS
ABC.T
BUILD
CALC.
CALEN
CARDF
CGA.D
CGA.G
CGA.L
CITOH
CLIPB
CLOCK
COMM.
CONTROL.EXE    EGAMONO.GRB    HPLA
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COURB.FON      EMM.AT         JOYN
COURC.FON      EMM.PC         KERN
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Terminal

RUNNING BATCH (.BAT) FILES
If you run a standard applicatio
should create a PIF file for the b

2000's

Mobile OS

iOS, Android

Touchscreen

Camera

GPS, Accelerometer

2010’s

Datacenter OS

Apache Mesos

Linux Containers

Cluster Scheduling

API for the Datacenter

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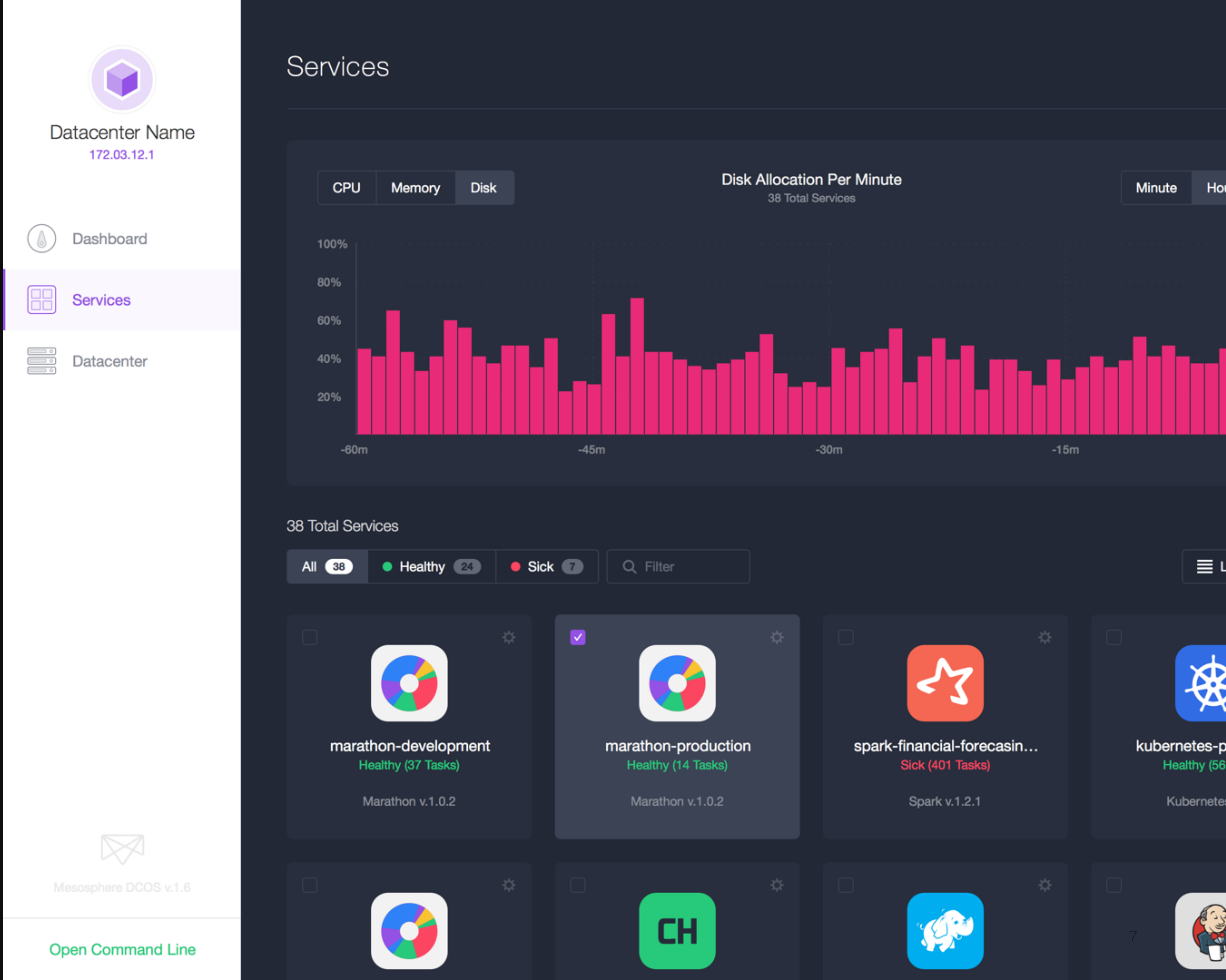


marathon-development
Healthy (37 Tasks)
Marathon v.1.0.2

marathon-production
Healthy (14 Tasks)
Marathon v.1.0.2

spark-financial-forecasin…
Sick (401 Tasks)
Spark v.1.2.1

kubernetes-p
Healthy (56
Kubernete

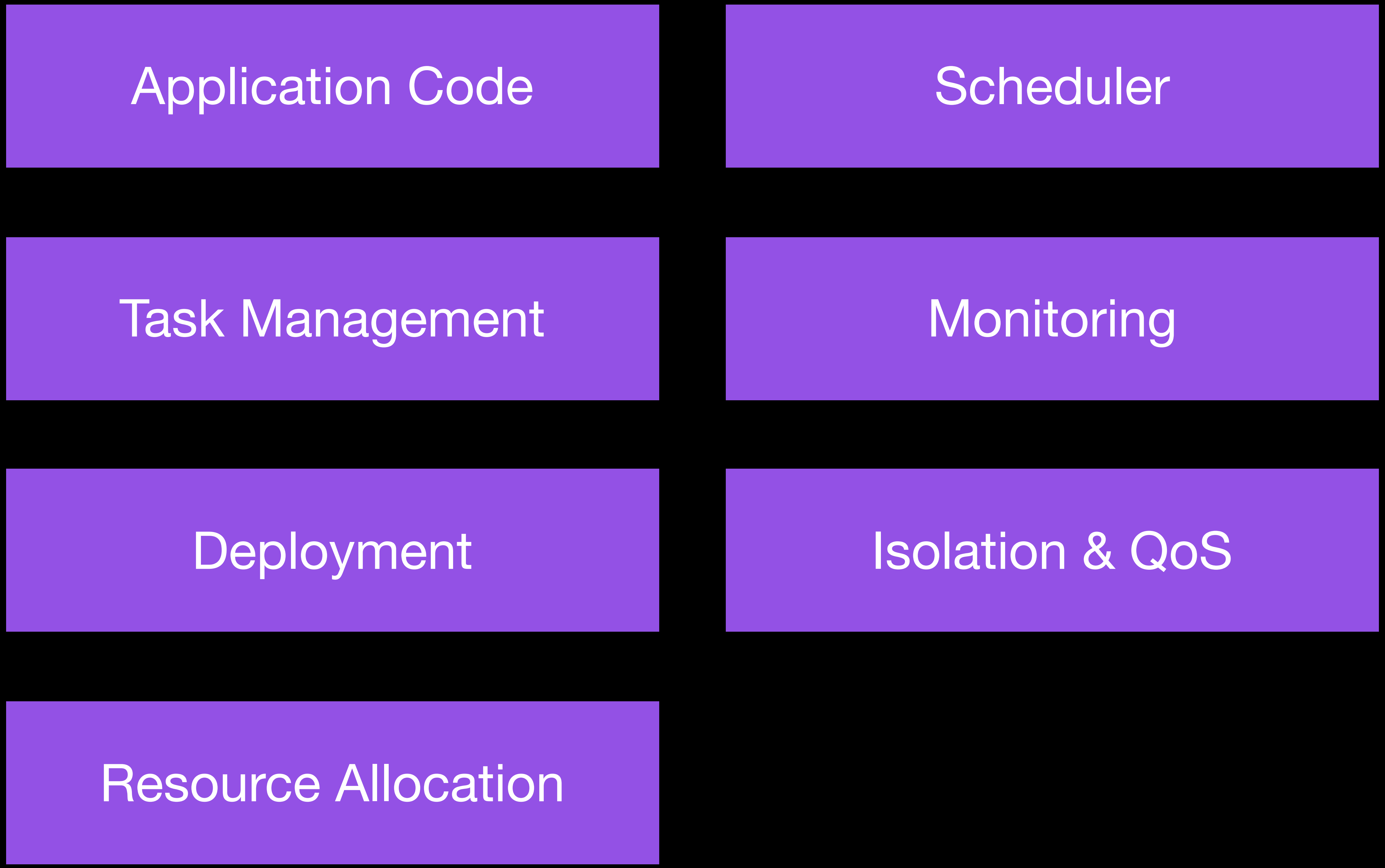
The Datacenter Developer

The Datacenter Developer

A developer who uses an SDK to build distributed systems that can dynamically leverage all the resources available in a datacenter.

Building Distributed Systems

Without Apache Mesos



Application Code

Scheduler

Task Management

Monitoring

Deployment

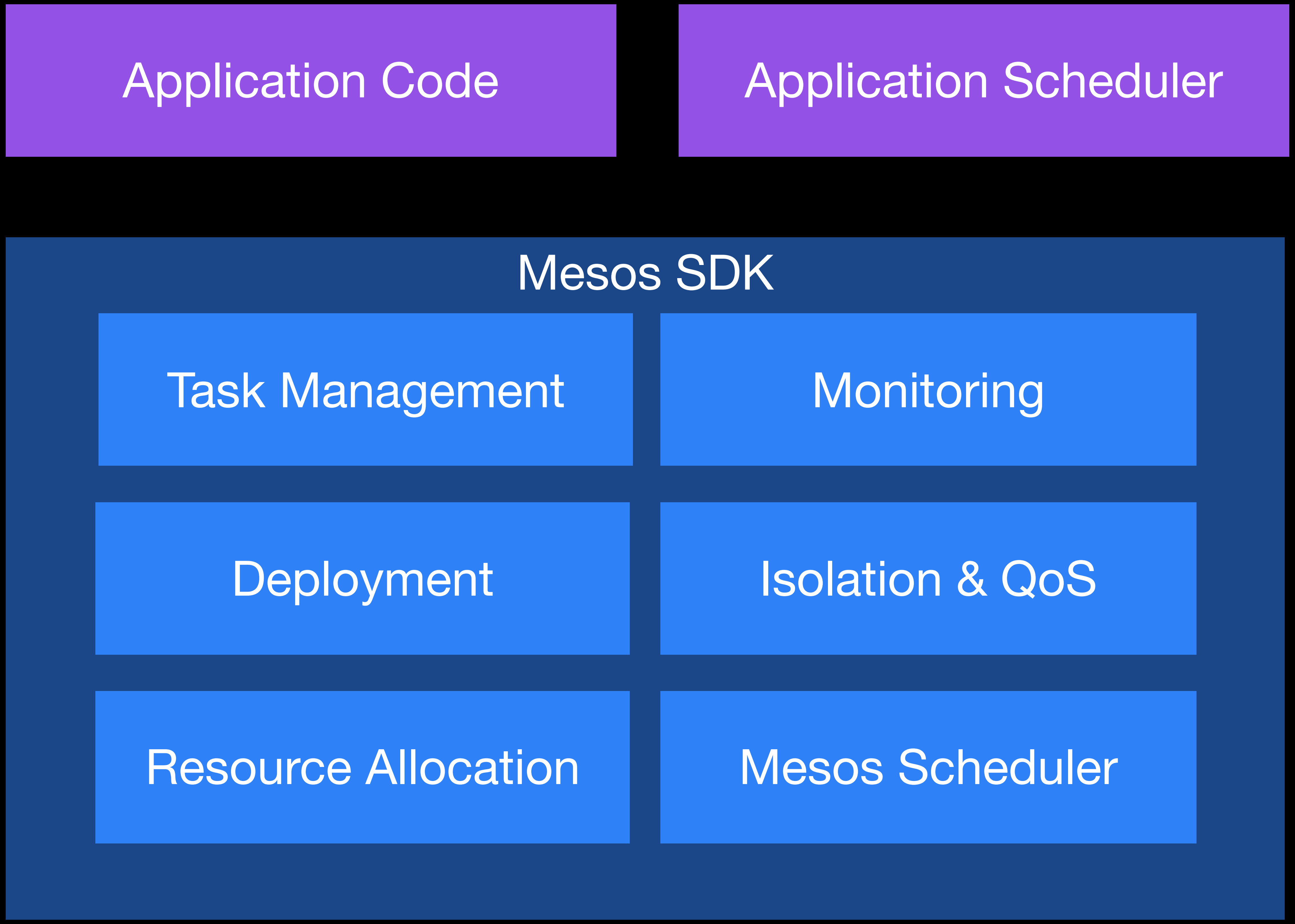
Isolation & QoS

Resource Allocation

mesosphere

Building Distributed Systems

With Apache Mesos


Application Code

Application Scheduler

Mesos SDK

Task Management

Monitoring

Deployment

Isolation & QoS

Resource Allocation

Mesos Scheduler

A Datacenter Developer has …

… more Time to focus on her Application

Hard distributed systems problems are already solved by Mesos

High level APIs allow developers to be more productive

Task and Executor APIs provide a model similar to processes

A Datacenter Developer uses …

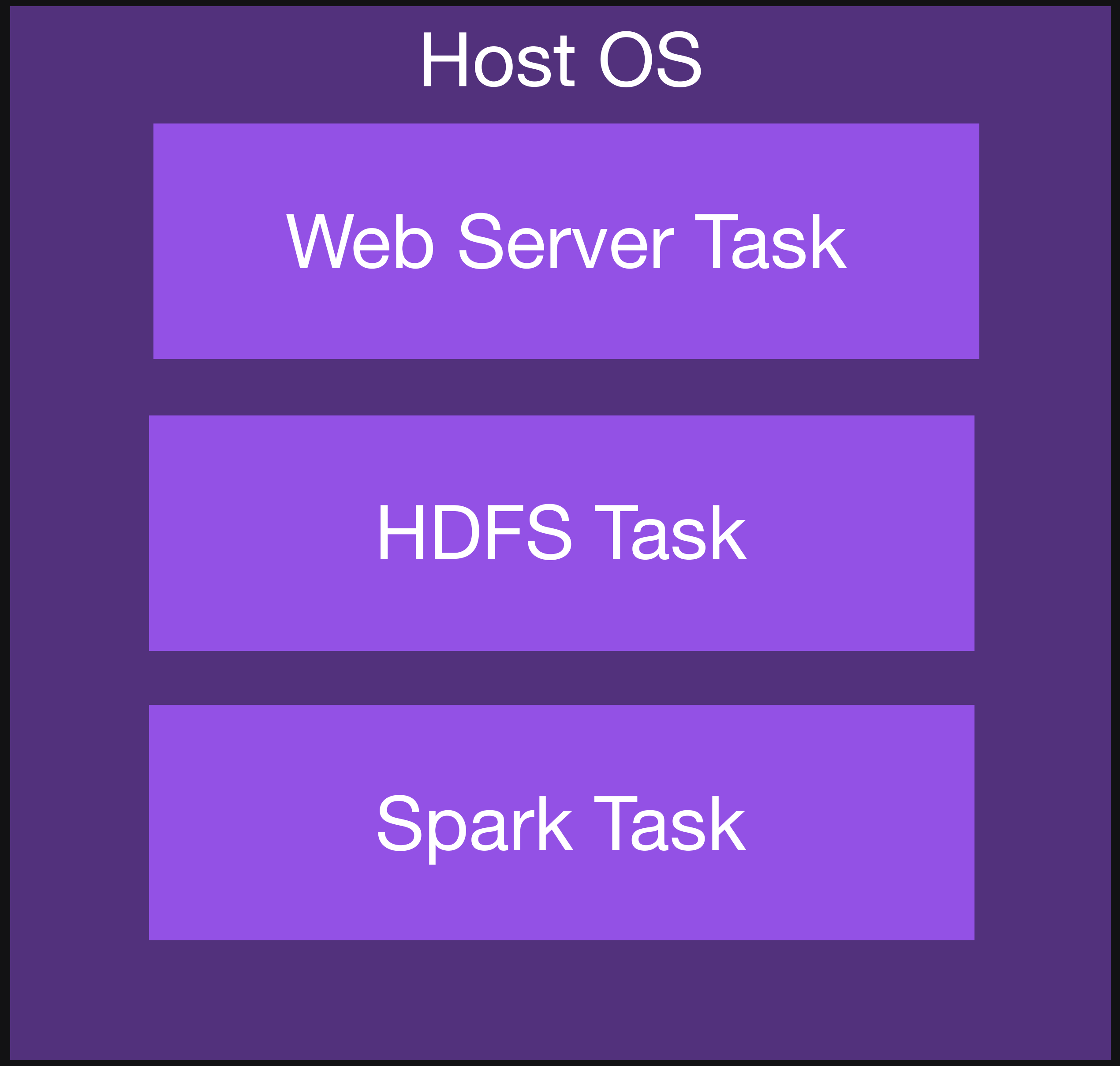
… Containers to isolate Tasks

Time share of CPU

Memory/pid/user namespace

Chroot

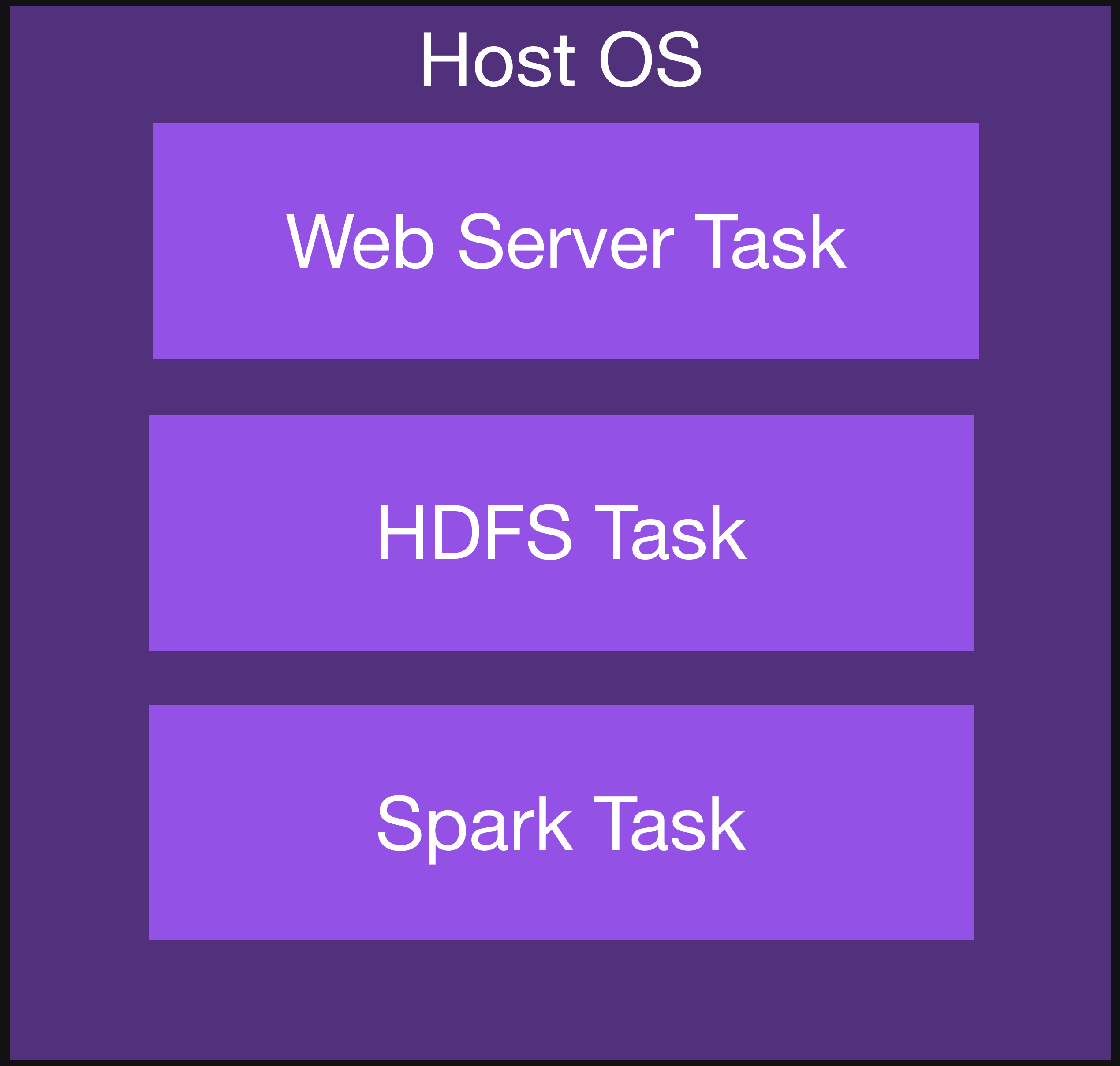
Disk and network QoS



A Datacenter Developer can …

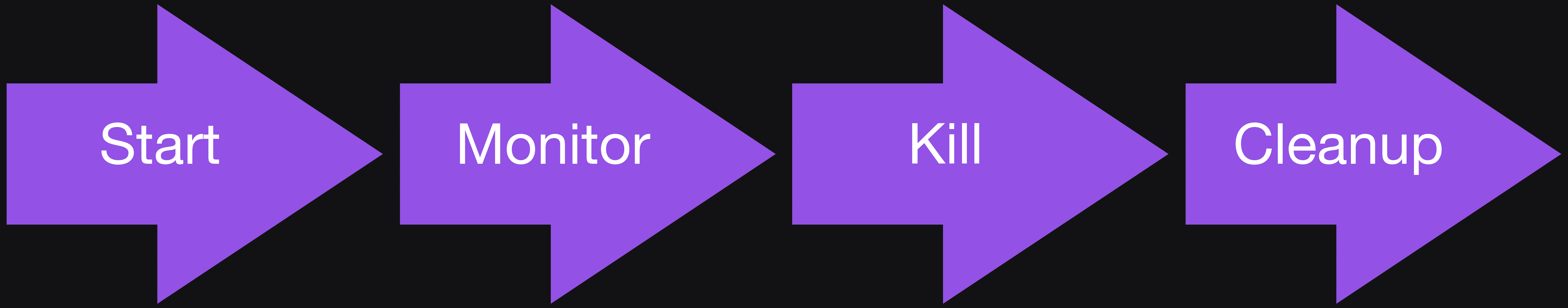
… run her apps next to the data

Data-heavy applications can run where the data is stored.



A Datacenter Developer gets …

… task lifecycle management



A Datacenter Developer gets …

… task metadata

```
TaskInfo {
  task_id: “myapp.45b70272-d88c-11e4-98ef-a689777343be”,
  labels: {
    environment: “production”,
    owner: “tobi@mesosphere.io”
  }
}
```

A Datacenter Developer gets …

… task metadata

```
TaskInfo {
  task_id: “myapp.45b70272-d88c-11e4-98ef-a689777343be”,
  discovery: {
    visibility: EXTERNAL,
    ports: [
      { number: 80, name: “http”, protocol: “TCP” }
    ]
  }
}
```

A Datacenter Developer can …

… easily respond to failures

Machine and task failure detection

Health checks: HTTP, TCP, or custom program

Every part of Mesos is fault tolerant

A Datacenter Developer gets …

… notified of failed tasks

```
TaskStatus {
  task_id: “dispatch.45b70272-d88c-11e4-98ef-a689777343be”,
  state: TASK_FAILED,
  source: SOURCE_SLAVE,
  reason: REASON_COMMAND_EXECUTOR_FAILED,
  message: “Command exited with status 1”
}
```

A Datacenter Developer gets …

… notified when tasks run out of memory

```
TaskStatus {
  task_id: “dispatch.45b70272-d88c-11e4-98ef-a689777343be”,
  state: TASK_FAILED,
  source: SOURCE_SLAVE,
  reason: REASON_MEMORY_LIMIT,
  message: “Task exceeded its memory limit”
}
```

A Datacenter Developer gets …

… notified of failing machines

```
TaskStatus {
  task_id: “dispatch.45b70272-d88c-11e4-98ef-a689777343be”,
  state: TASK_LOST,
  source: SOURCE_MASTER,
  reason: REASON_SLAVE_DISCONNECTED,
  message: “Slave disconnected”
}
```

A Datacenter Developer gets …

… easy access to logs

```
$ mesos tail -f poseidon.*
==>poseidon.4729069a-d87d-11e4-8cee-f20d55470486:stdout<==
[2015-04-07 19:37:23,842] INFO 104.236.41.240 -  -  [07/Apr/2015:19:37:23 +0000] "GET /ping HTTP/1.1"
[2015-04-07 19:37:33,915] INFO 104.236.41.240 -  -  [07/Apr/2015:19:37:33 +0000] "GET /ping HTTP/1.1"
[2015-04-07 19:37:43,877] INFO 104.236.41.240 -  -  [07/Apr/2015:19:37:43 +0000] "GET /ping HTTP/1.1"
[2015-04-07 19:38:44,037] INFO 104.236.41.240 -  -  [07/Apr/2015:19:38:43 +0000] "GET /ping HTTP/1.1"
[2015-04-07 19:38:54,004] INFO 104.236.41.240 -  -  [07/Apr/2015:19:38:53 +0000] "GET /ping HTTP/1.1"
==>poseidon.15bb96b9-d63a-11e4-93c0-f6e64c94ec3c:stdout<==
[2015-04-07 19:37:23,905] INFO 104.236.41.240 -  -  [07/Apr/2015:19:37:23 +0000] "GET /ping HTTP/1.1"
[2015-04-07 19:37:33,891] INFO 104.236.41.240 -  -  [07/Apr/2015:19:37:33 +0000] "GET /ping HTTP/1.1"
[2015-04-07 19:37:43,924] INFO 104.236.41.240 -  -  [07/Apr/2015:19:37:43 +0000] "GET /ping HTTP/1.1"
[2015-04-07 19:38:44,022] INFO 104.236.41.240 -  -  [07/Apr/2015:19:38:43 +0000] "GET /ping HTTP/1.1"
[2015-04-07 19:38:54,042] INFO 104.236.41.240 -  -  [07/Apr/2015:19:38:53 +0000] "GET /ping HTTP/1.1"
```

A Datacenter Developer gets …

… powerful resource monitoring

```
$ curl http://localhost:5051/monitor/statistics.json
{
        "statistics": {
            "cpus_system_time_secs": 154.42,
            "cpus_user_time_secs": 258.74,
            "mem_file_bytes": 30613504,
            "mem_rss_bytes": 140341248,
            "net_rx_bytes": 2402099,
            "net_tx_bytes": 1507798,
            "net_tx_dropped": 0,
            "net_tx_errors": 0,
            . . .
```

A Datacenter Developer…

… programs against a whole datacenter

No longer program against machines, but fungible resources

Developers only need to know WHAT they need, not HOW to get it

Allocate more resources on existing machines or populate new ones via an API

A Datacenter Developer can …

… scale elastically

Populating new cluster nodes is baked in

Mesos fetches the code via HTTP, HDFS, or Docker

Can also be used to deploy config, models, etc.

A Datacenter Developer can …

… build her own cluster scheduler easily

Mesos has a two level scheduler

Dominant Resource Fairness (DRF) provides fair resource allocation

Applications implement their own specialized scheduling logic

Projects built on top of Mesos

Apache Projects ported to Mesos

cassandra

hadoop

Apache YARN (Myriad)

Apache HDFS

Apache Kafka

Apache Storm

Other Projects ported to Mesos

Jenkins

elastic

CRATE

ArangoDB

Projects built directly on Mesos

Apache AURORA™

CHRONOS

rbonut

Spark

MARATHON

An Example

A modern Web App built entirely on Mesos

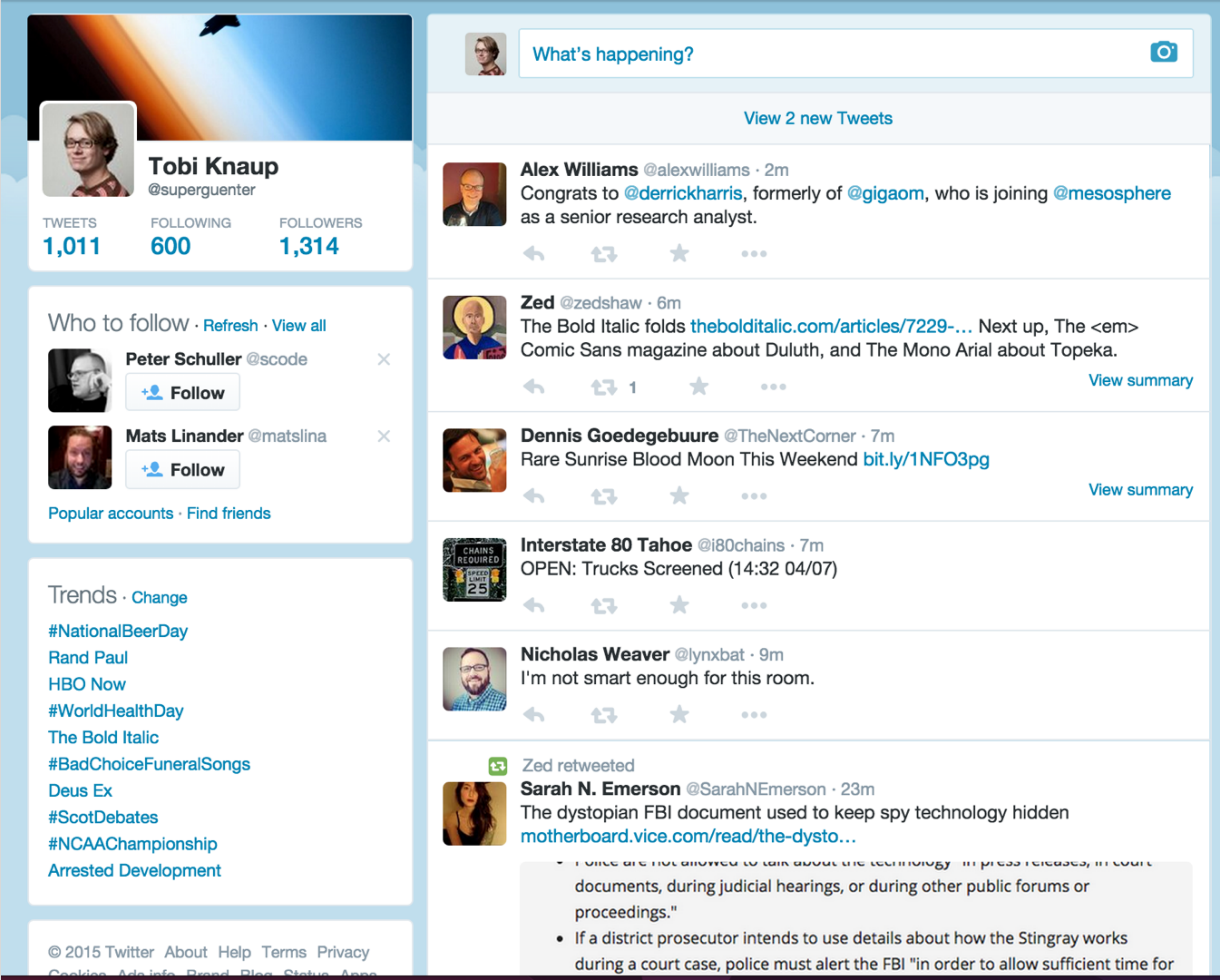
Twitter

Anatomy of a Web App

Millions of users

Lots of data

Data products



Tobi Knaup
@superguenter

TWEETS	FOLLOWING	FOLLOWERS
1,011	600	1,314

Who to follow · Refresh · View all

Peter Schuller @scode ✕
Follow

Mats Linander @matslina ✕
Follow

Popular accounts · Find friends

Trends · Change

#NationalBeerDay
Rand Paul
HBO Now
#WorldHealthDay
The Bold Italic
#BadChoiceFuneralSongs
Deus Ex
#ScotDebates
#NCAAChampionship
Arrested Development

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Cookies Ads info Brand Blog Status Apps

What's happening?

View 2 new Tweets

Alex Williams @alexwilliams · 2m
Congrats to @derrickharris, formerly of @gigaom, who is joining @mesosphere as a senior research analyst.

Zed @zedshaw · 6m
The Bold Italic folds thebolditalic.com/articles/7229-... Next up, The <em> Comic Sans magazine about Duluth, and The Mono Arial about Topeka.
1
View summary

Dennis Goedegebuure @TheNextCorner · 7m
Rare Sunrise Blood Moon This Weekend bit.ly/1NFO3pg
View summary

Interstate 80 Tahoe @i80chains · 7m
OPEN: Trucks Screened (14:32 04/07)

Nicholas Weaver @lynxbat · 9m
I'm not smart enough for this room.

Zed retweeted
Sarah N. Emerson @SarahNEmerson · 23m
The dystopian FBI document used to keep spy technology hidden
motherboard.vice.com/read/the-dysto...

- Police are not allowed to talk about the technology "in press releases, in court documents, during judicial hearings, or during other public forums or proceedings."
- If a district prosecutor intends to use details about how the Stingray works during a court case, police must alert the FBI "in order to allow sufficient time for

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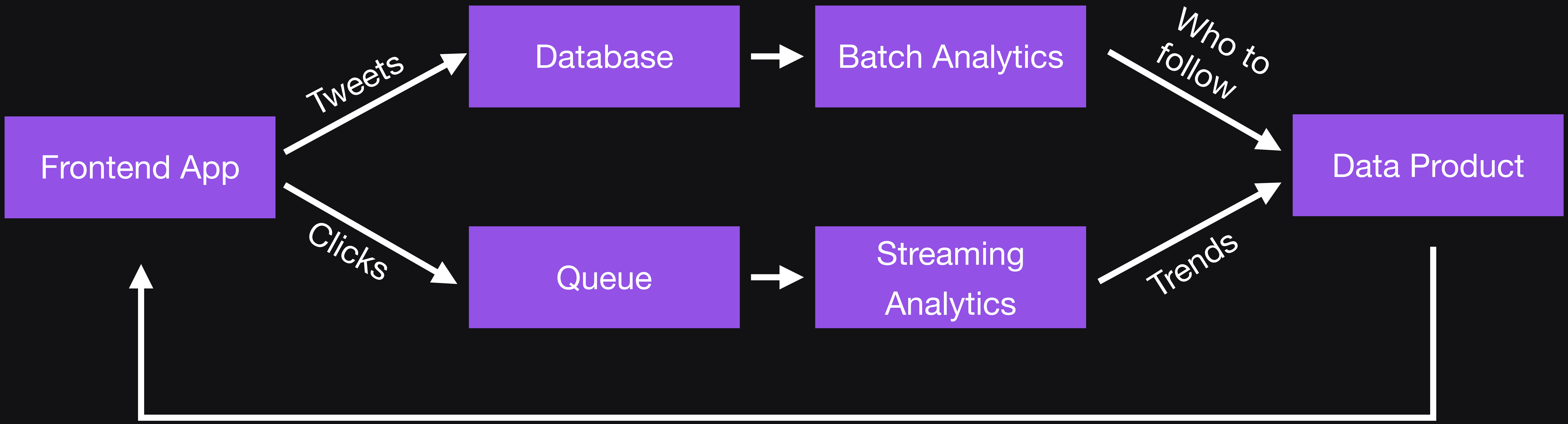
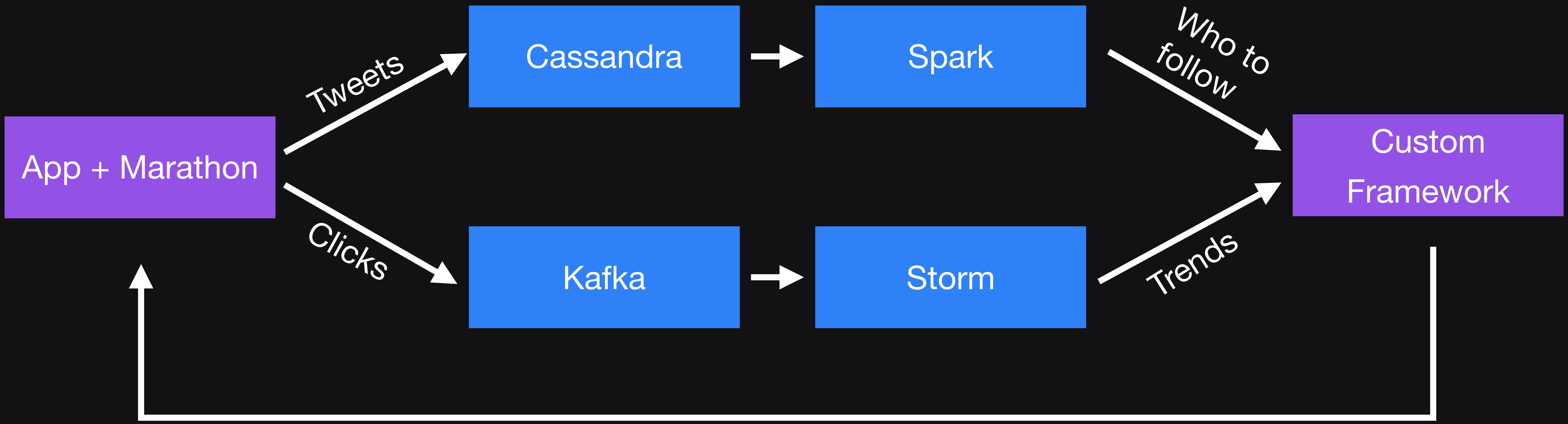
Anatomy of a Web App



Anatomy of a Web App - entirely on Mesos



Links to get you started

Become a Datacenter Developer!

App Development Guide: https://mesos.apache.org/documentation/latest/app-framework-development-guide/

Mesos Protobuf Messages: https://github.com/apache/mesos/blob/master/include/mesos/mesos.proto

Learning Framework (RENDLER): https://github.com/mesosphere/RENDLER

Language Bindings

Become a Datacenter Developer!

Go: https://github.com/mesos/mesos-go

Akka/Scala: https://github.com/drexin/akka-mesos

Erlang: https://github.com/mdevilliers/erlang-mesos

Clojure: https://github.com/dgrnbrg/clj-mesos

Pure Java: https://github.com/groupon/jesos

Pure Python: https://github.com/wickman/pesos

Haskell: https://github.com/iand675/hs-mesos