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Pivotal Cloud Foundry

Objectives of PCF

- Purpose:
  - To learn pivotal cloud foundry and deploy some application into PCF with some services.
- Product:
  - Infrastructure as a Service(Iaas)
  - Platform as a Service (PaaS)
  - Software as a Service (SaaS)
- Process:

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- Pivotal Cloud Foundry Basic
  - Using Services
  - Using BuildPacks
  - Managing Applications in Cloud Foundry
  - Cloud Foundry Architecture and Concepts

Introduction to Cloud Technologies

What is Cloud Foundry?

"The Cloud"

- Means many things to many people.
  - Distributed applications accessible over a network
    - Typically but not necessarily, The internet
  - An application and/or its platform.
  - Resources on demand.
  - Inherently Virtualized
  - Can run in-house(private cloud) as well.
  - Hardware and Software sold as a commodity.

Types of cloud computing

- IaaS → Infrastructure as a Service
- Paas → Platform as a Service
- SaaS → Software as a Service

Infrastructure as a Service (Iaas)

- Replacement for physical hardware
- Provides virtual hardware
- Amazon Web Services (AWS) , RackSpace, Microsoft Azure, Vmware vCloud Air

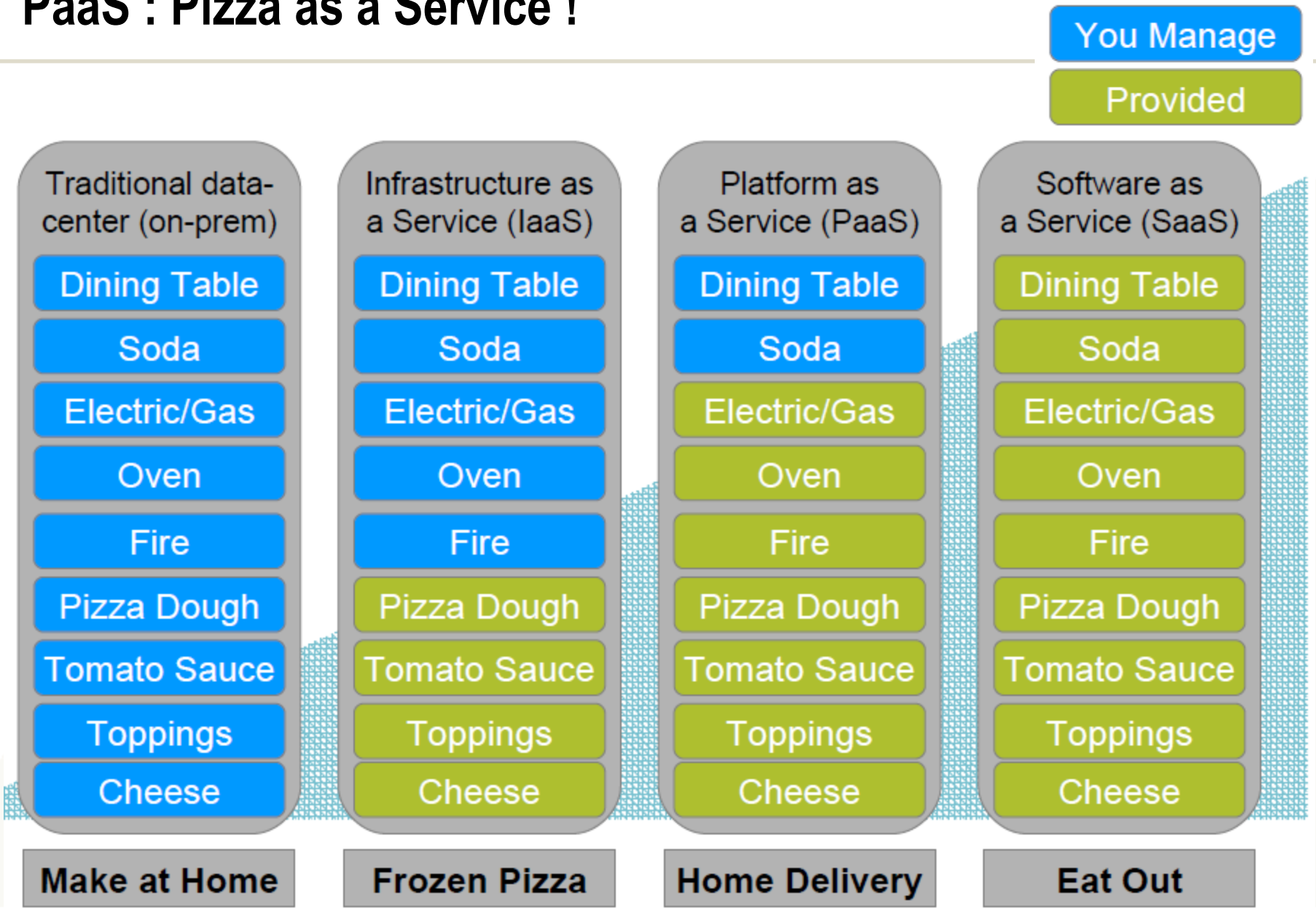
Platform as a Service (Paas)

- More than raw machine with OS.
- Provides ready-made platform for running apps.
- CloudFoundry, Heroku, Google App Engine, Amazon Elastic Beantalk.

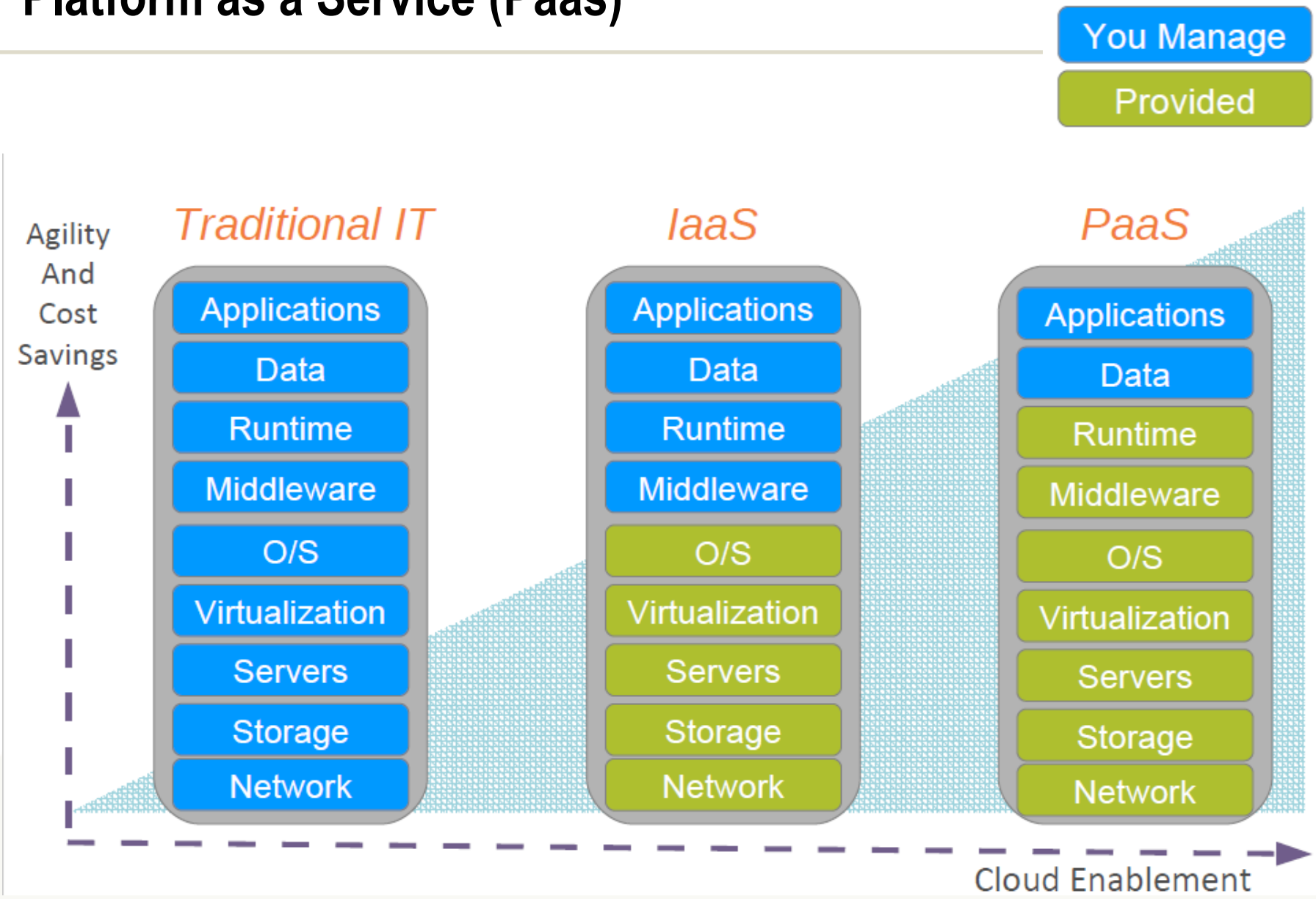
Software as a Service (SaaS)

- Complete Software Application
- SalesForce.com, Google Apps, hundreds of examples.

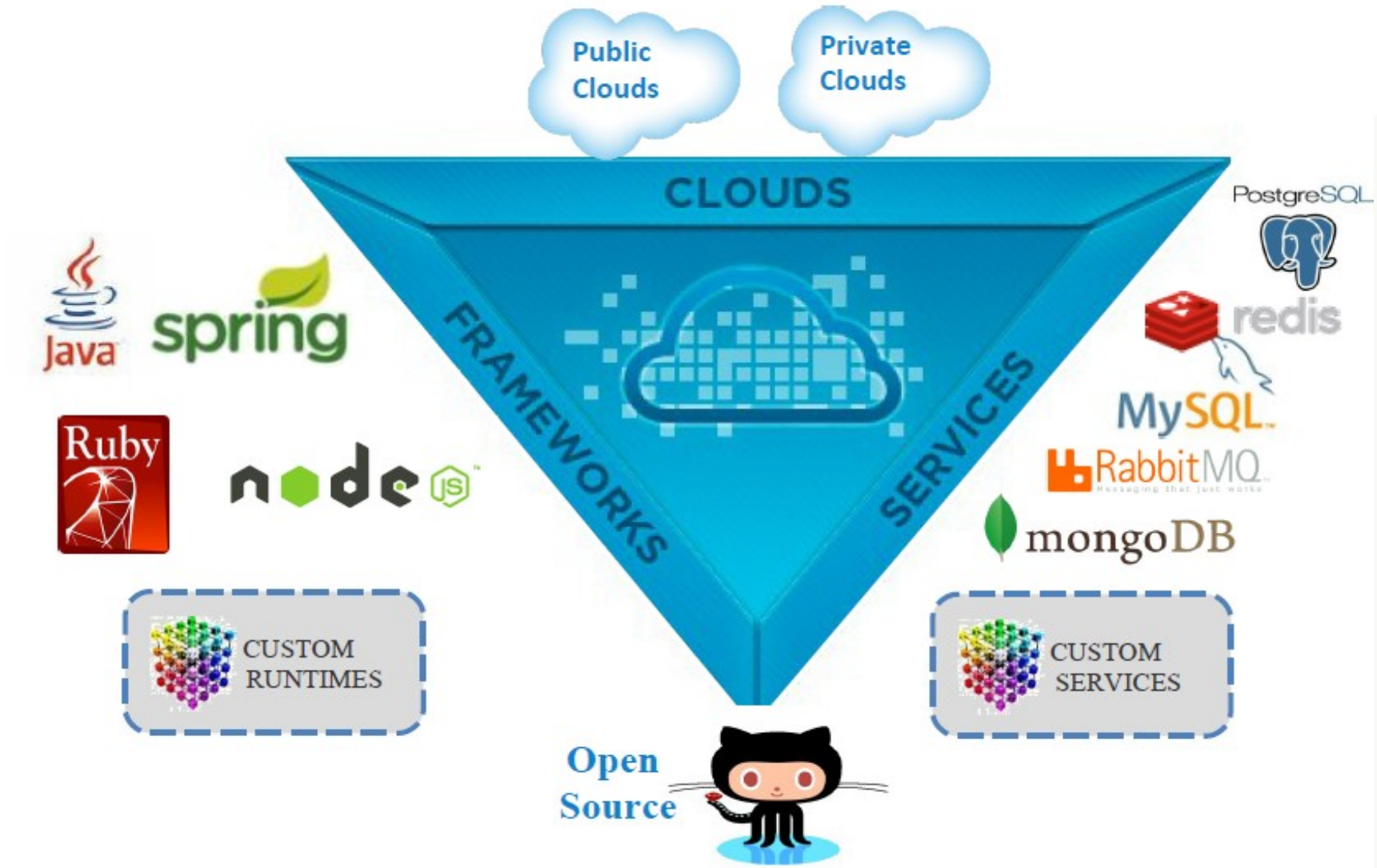
PaaS : Pizza as a Service !



Platform as a Service (Paas)



CloudFoundry – The Open PaaS



Why Cloud Foundry

- Open Source
  - Reduce vendor – lock
- Public or private
- Language Independence
  - Via Buildpacks
- Wide growing range of service

Cloud Foundry : Foundation

Open Governance

An Explanation of the Various Web Sites

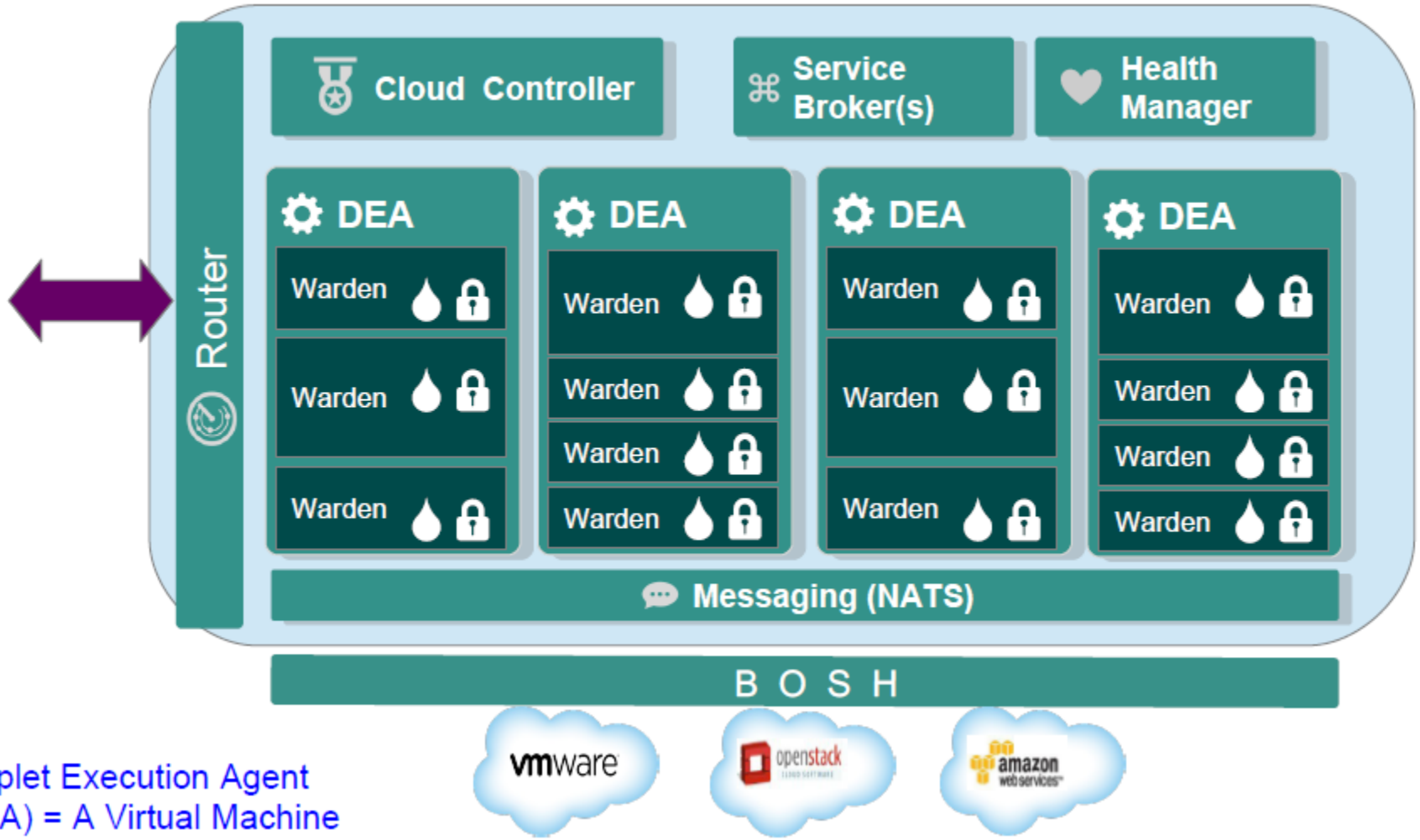
- A web-search for “Cloud Foundry” can be confusing!

URL	Details
cloudfoundry.org	• The open source project’s home page • No hosting of any kind here. •Documentation.
github.com/couldfoundry	• The location of the source. •Download, build and run it you like!
cloudfoundry.com	• Old commercial web-site. • superseded by *run.pivotal.io*
blog.cloudfoundry.org	• Technical blog
run.pivotal.io	• Pivotal Web Services (PWS) • Pivotal’s hosted environment, runs Pivotal CF

A Major Cloud Foundry Site

- Largest Chinese Internet Search Site
  - One billion page views per day
  - Ad-words facility powered by Cloud Foundry

Cloud Foundry Architecture

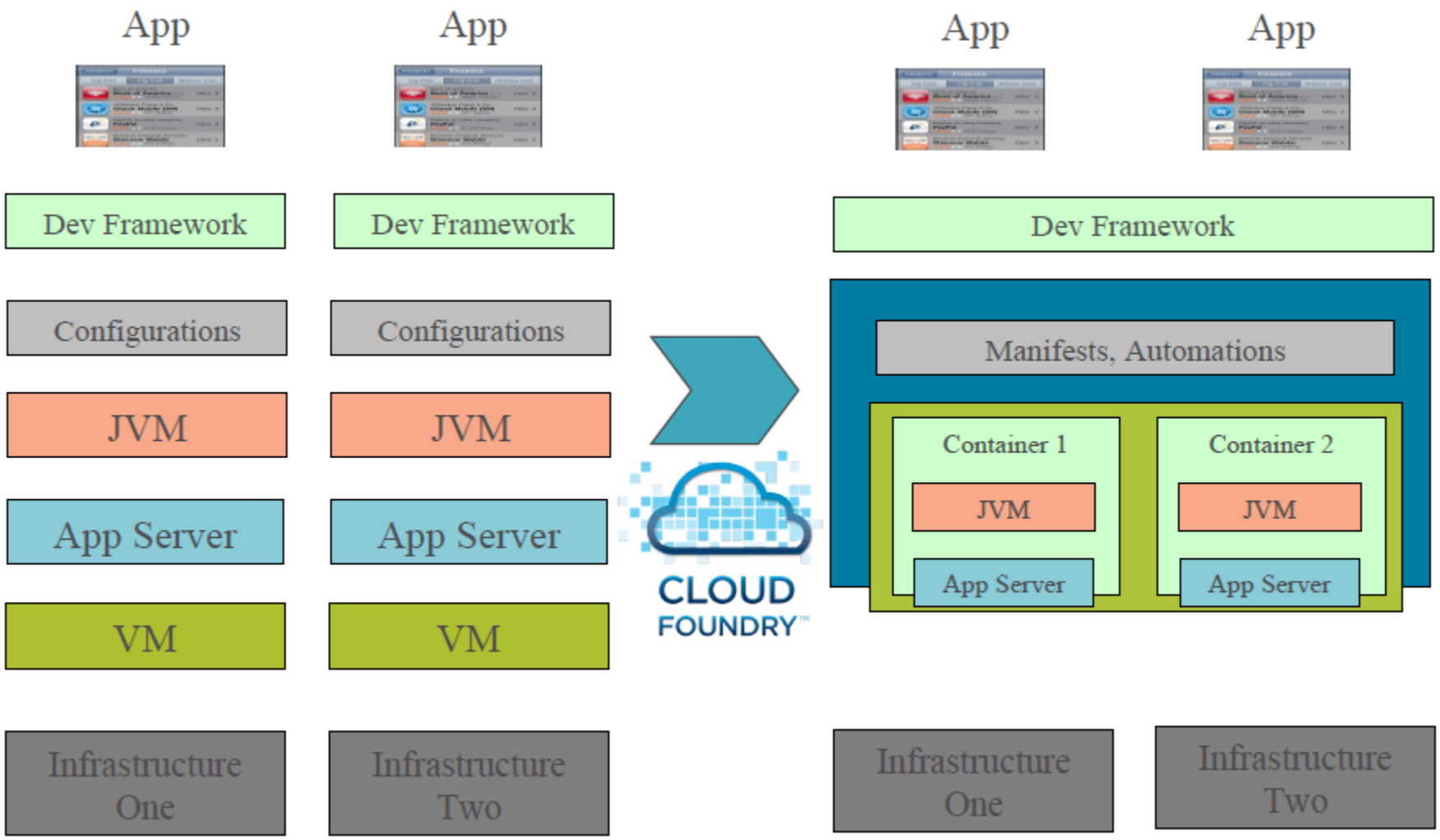


Droplet Execution Agent
(DEA) = A Virtual Machine

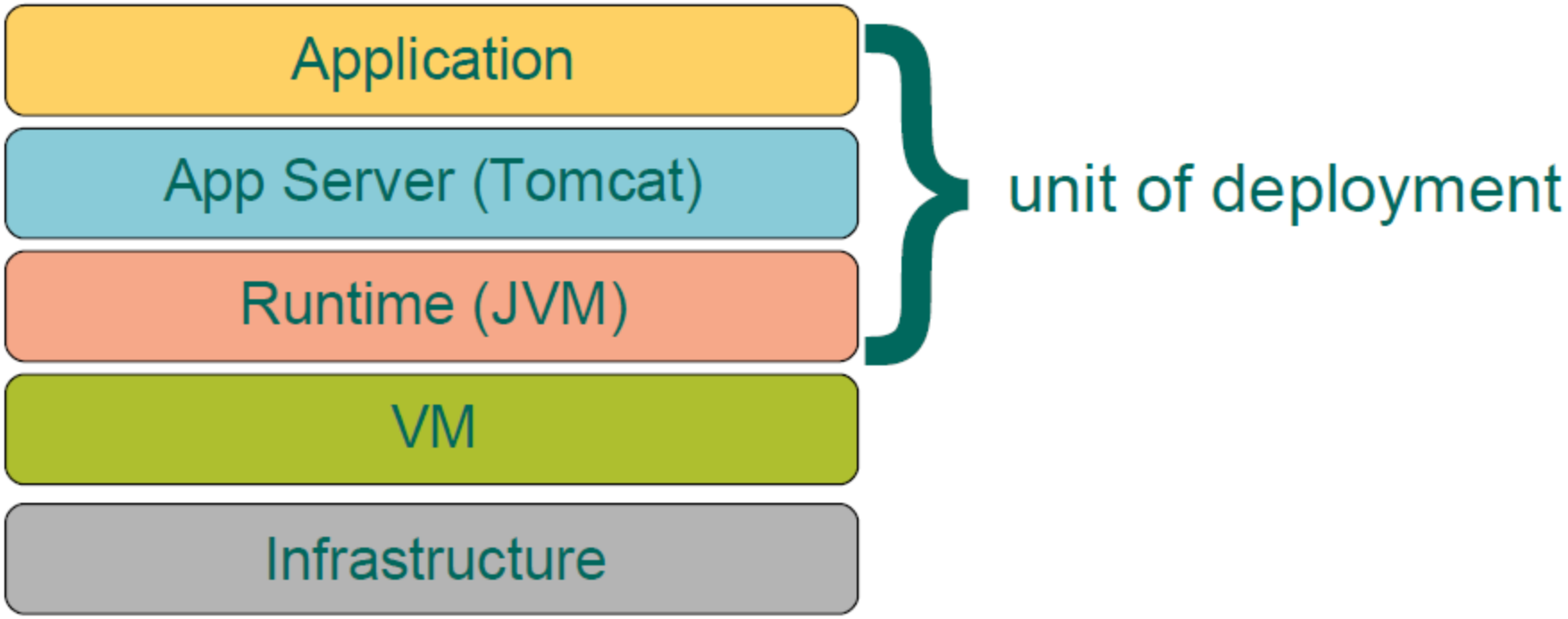
Cloud Foundry Platform as a Service

- Application is the new unit of deployment and control
  - Abstracting VMs and Middleware.
  - Abstracting container and processes.
  - Data as a service.
  - Eliminate bottleneck of provisioning & deployment.

From VM Centric to Application Centric

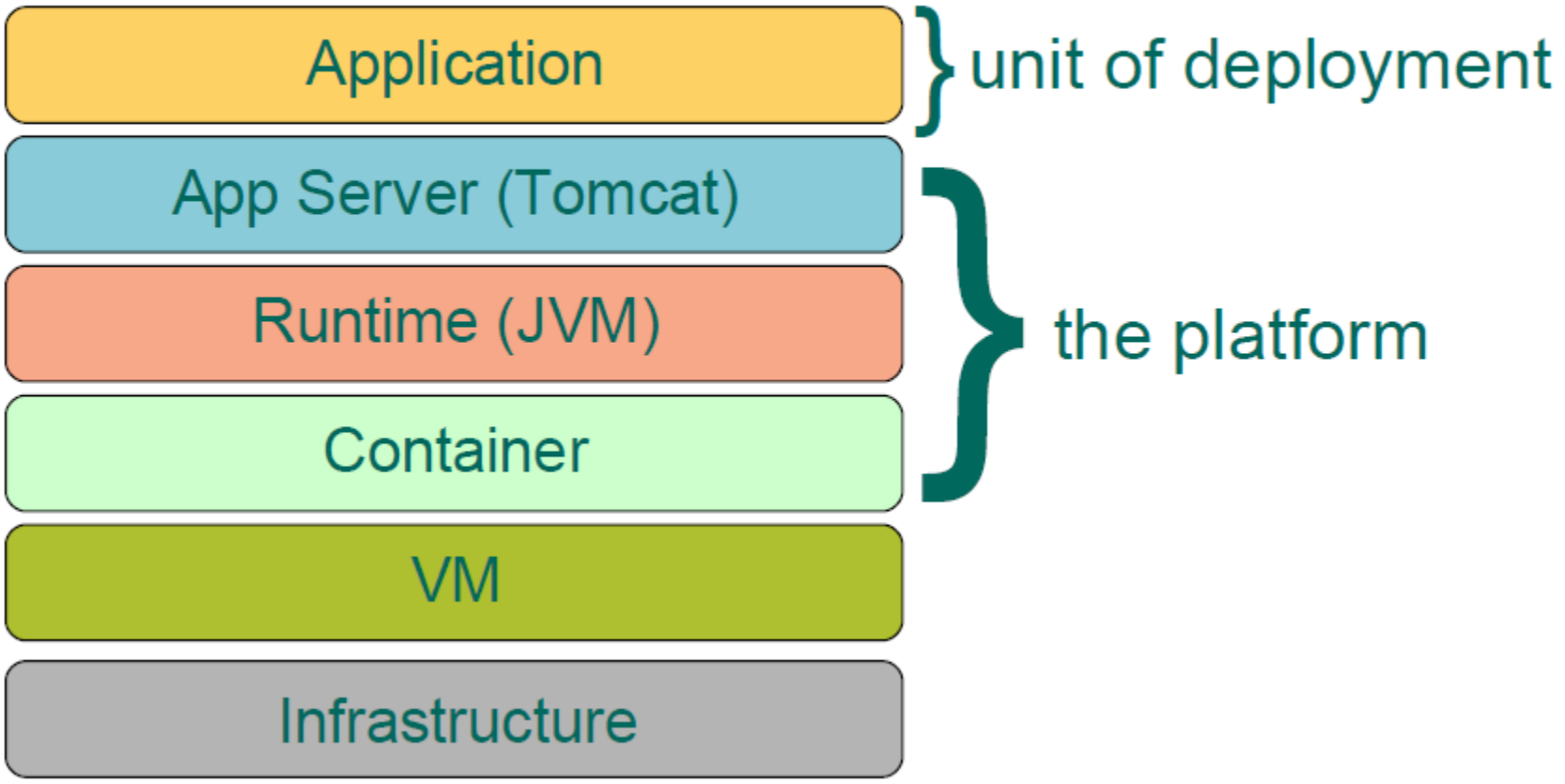


Iaas : VM – centric Deployment



Scaling = creating VM from blueprints/templates

PaaS – App centric Deployment



Scaling = creating container in a VM pool

Core Tenets of Pivotal CF

Radically Simple, Developer Friendly

- Push an app – "it just works"
- Supporting wide ranging use cases
- Support new application patterns – microservices
- Easy to add/customize

Broad Ecosystem of Services

- Data Services
- App Services
- Mobile Services

Operational Benefits for every Application

- Highly scalable
- Self healing
- Logging & audit trail
- Existing enterprise policies – user access & authorization
- Application monitoring
- Operational metrics
- App uptime SLAs

Deploy, Operate Update, Scale Platform on Any IaaS

Which Cloud Foundry Product

- Open source
- Setup and run a PaaS for yourself
- No paid support
- No tools

PWS

- Pivotal Web Services
- Public CF PaaS run/ managed by Pivotal
- Hosted on AWS
- No guaranteed SLAs, not for production
- Support offered

PWS-E

- PWS Enterprise
- Same as PWS with guranteed SLAs.

- Commercial Product
- Run private PaaS in-house, or
- Create public PaaS (ISP managed)
- Sophisticated Web Console (App Mgr)
- Additional Tools(Ops Mgr)
- Less hassle
- Support offered

Getting started with Pivotal CF

What is Pivotal Cloud Foundry?

- An Enterprise PaaS powered by Cloud Foundry

TURN KEY

- **Delivers a turnkey PaaS experience on the private cloud, complete with application and data services.**

GAME CHANGING

- **Enable enterprises to speed up application and data services delivery from months to days and innovate with disruptive speed**

MOMENTUM

- **Entered GA in Nov 2013**
- **www.pivotal.io/pivotal-products/pivotal-cf**

Pivotal CF : Enterprise PaaS Commercially supported

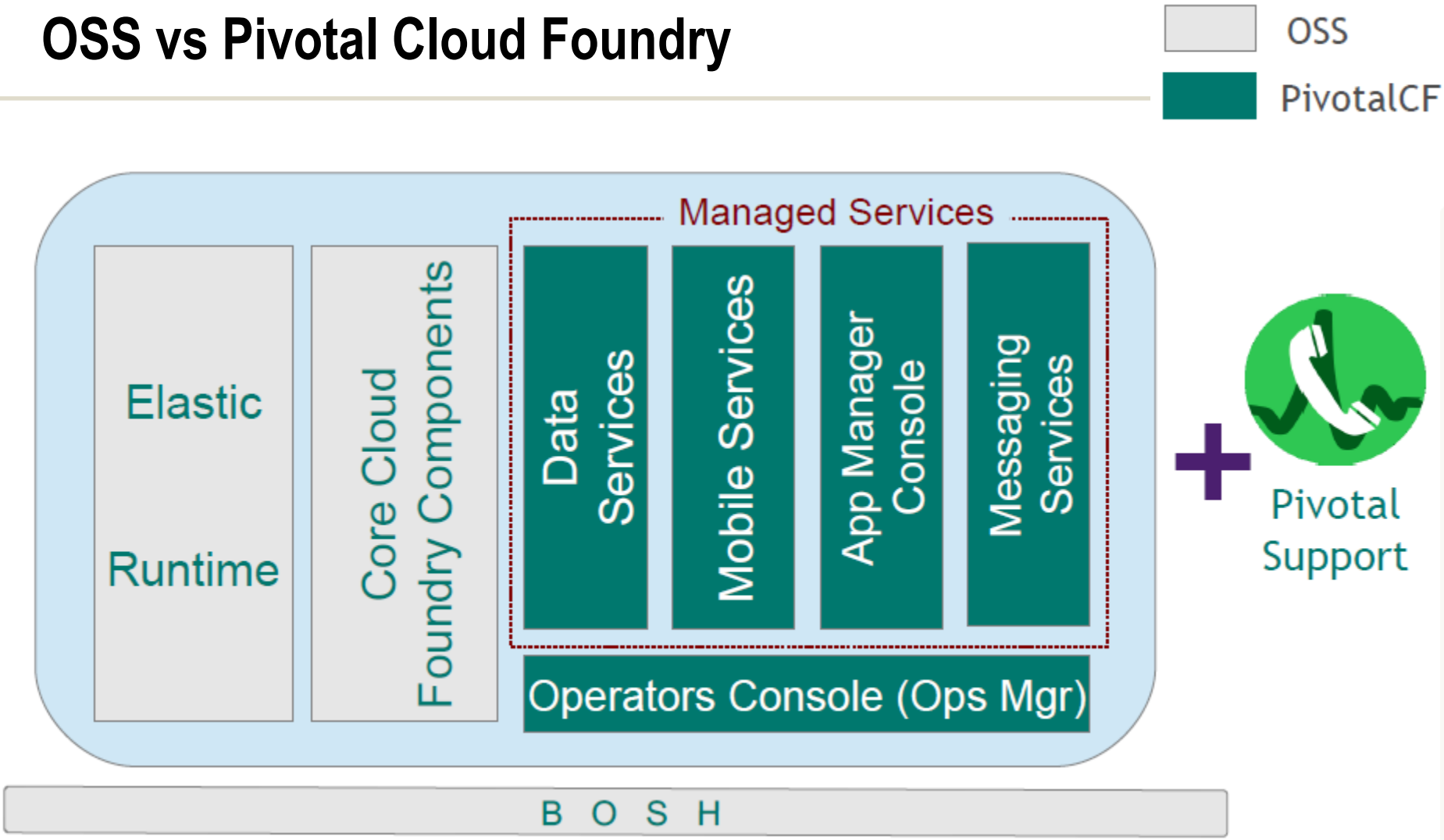
Pivotal CF

- **Certified** upgrades, **curated** & **tested** quarterly releases.
- **Operations Manager** Cloud Administrative Console
- Elastic Runtime **Application manager ***
- Built-in **Application Performance Monitoring (APM**)
- **Operational Metrics** service
- **Auto-Scaling** service

- Easy **LDAP/ Active Directory** Integration
- **Historical Usage** Data per Application Instance
- Declarative **Availability Zones**
- **Behind the firewall** download packages (do not require internet access)
- **Enterprise documentation** (PDF format)

** Formerly Developer Console*

OSS vs Pivotal Cloud Foundry



Data Services: RDB and NOSQL **Messaging services** : Rabbit/MQ

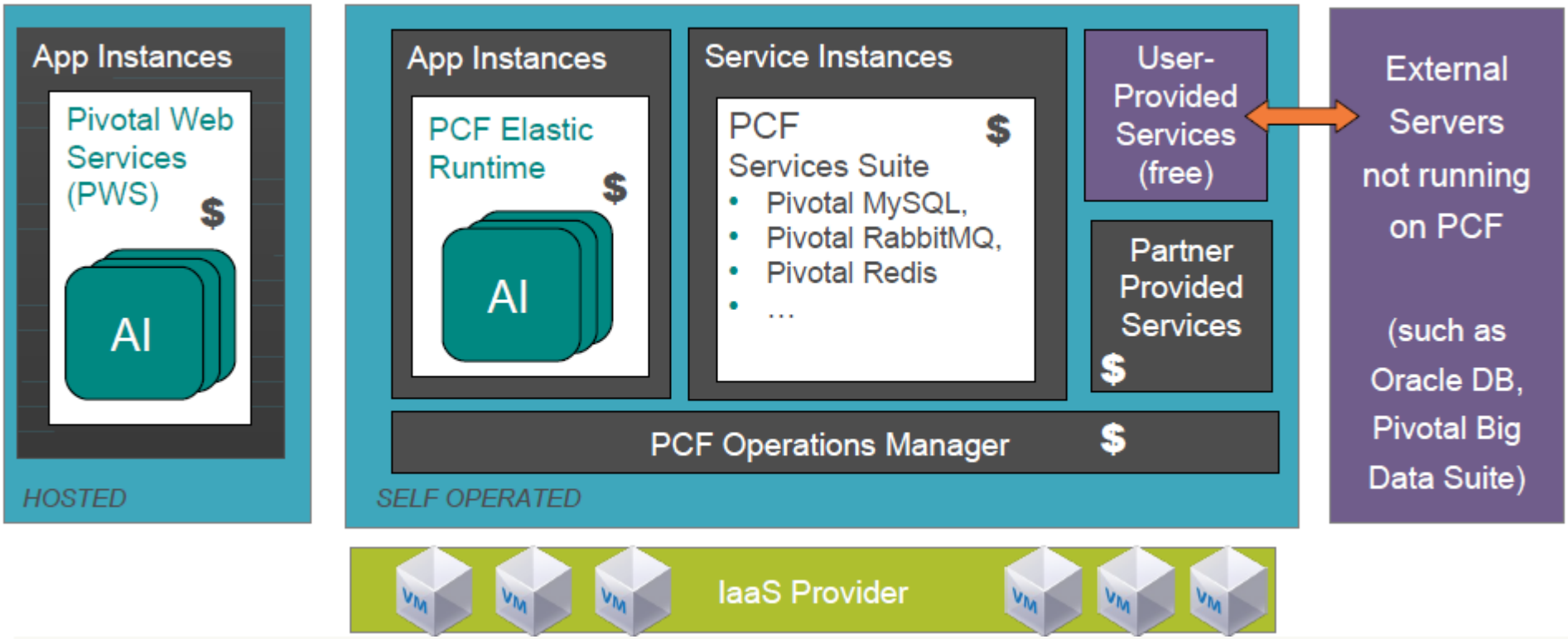
Mobile Services: Push Notifications, API Gateway , Data Sync, ….

Pivotal CF – Commercial Components

PCF Ops Manager	• One Pivotal CF Operation Manager instance hosted across a cluster of VMs. • Typical enterprise deployment contains 2-3 Pivotal CF Ops Manager Instances (dev/test + production x2 for HA)
PCF Elastic Runtime Application Instances (AI)	• Individual instance of deployed applications on PCF Elastic Runtime or on Pivotal Web Services (PWS) • An application may scale up to multiple instances • For a Java app : each AI is a Java Virtual Machine (JVM)
Service Instances (SI)	• A single, unique configuration of a service (such as a database or other software or middleware) within a PCF Foundation (installation) • utilizes resources (such as CPU, cores, virtual machines, messaging, development and/or data storage) within the same (or another) licensed Foundation.

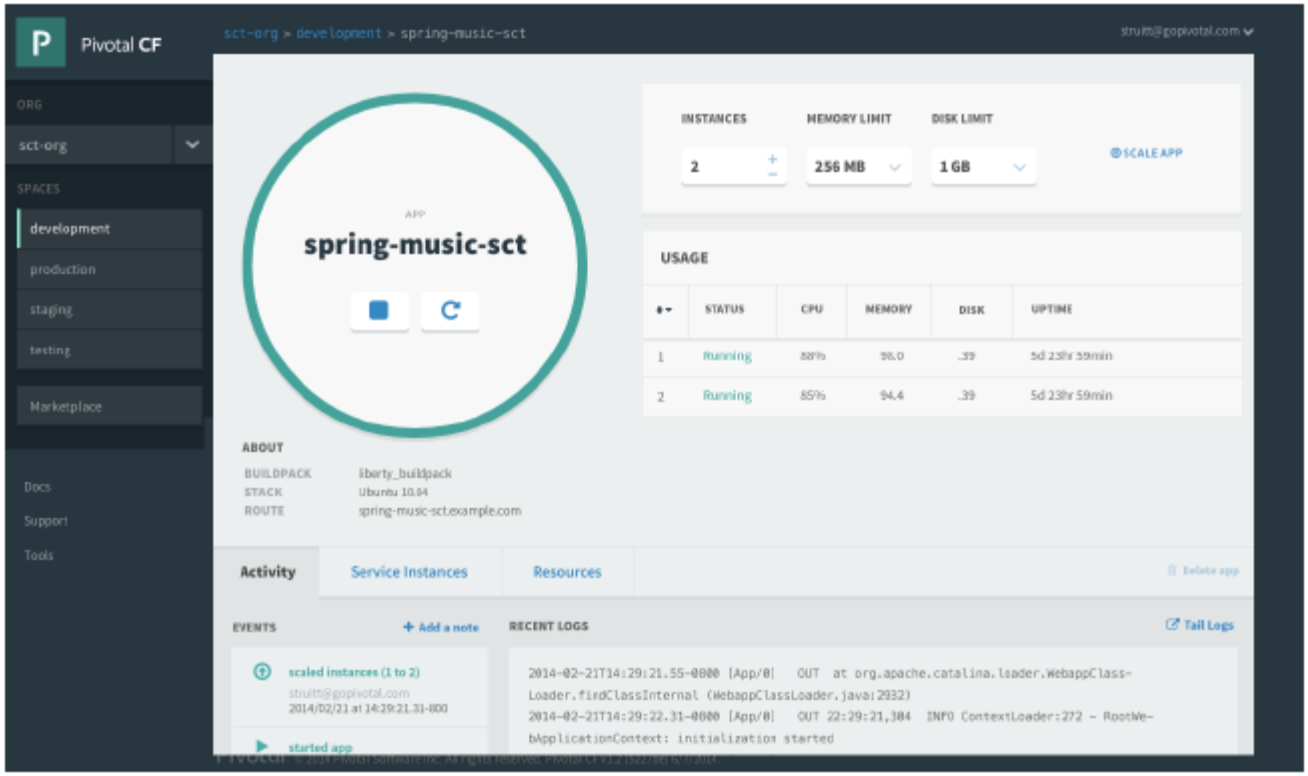
What Pivotal Charge For

- Each App Instance, each Op manager, each managed Service



Pivotal CF : Developer Benefits

- Application Manager
  - Start / Stop
  - Scale
  - Services
  - Logs
  - ect.



Pivotal CF : Operator Benefits

- Click to Install
- No downtime updates
- Explore install logs
- Click to scale platform
- Built – in high availability
- Built – in platform monitoring
- Integrated Services

Pivotal CF : Operators View

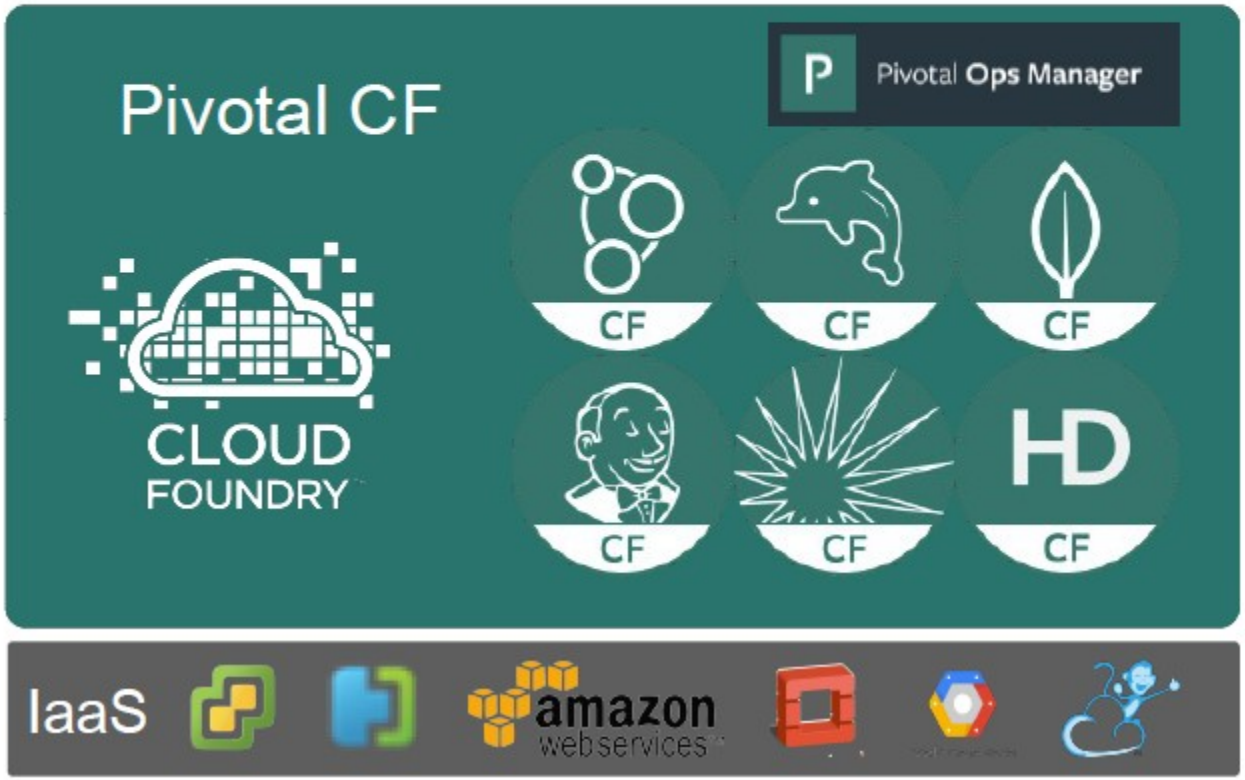
Install platform

Scale and plan capacity

Install and manage services

Target multiple clouds

Handle live upgrades/updates



How can I use Pivotal CF?

- Pivotal CF is the commercial PaaS based on CF
- Many options:
  - Public – Pivotal Web Services : run.pivotal.io
  - Basis of other public PaaS offerings
  - Run it in-house as the basis of your private cloud
  - Run it yourself in third-party cloud provider
    - Open Stack, AWS , …

Documentation

- CF docs can be found on three different sites, depending on the context:
  - http://docs.cloudfoundry.org
    - Open-source CF project docs
  - http://docs.pivotal.io/pivotalcf
    - Setting up and running Pivotal CF
  - http://docs.run.pivotal.io
    - Information about running on Pivotal Web Services
- Generic information about Cloud Foundry can be found on all three sites
  - In general pick one and stay with it.

Pivotal Support

- Support is available for Pivotal Cloud Foundry
  - Options : http://pivotal.io/support/offertings
  - Register : http://tinyurl.com/piv-support
  - Support Portal : https://support.pivotal.io
    - Community forums, knowledge Base, Product documents
  - PWS Support:
    - https://support.run.pivotal.io or support@run.pivotal.io
- Community forums
  - https://groups.google.com/a/cloudfoundry.org/forum/#!forumsearch/

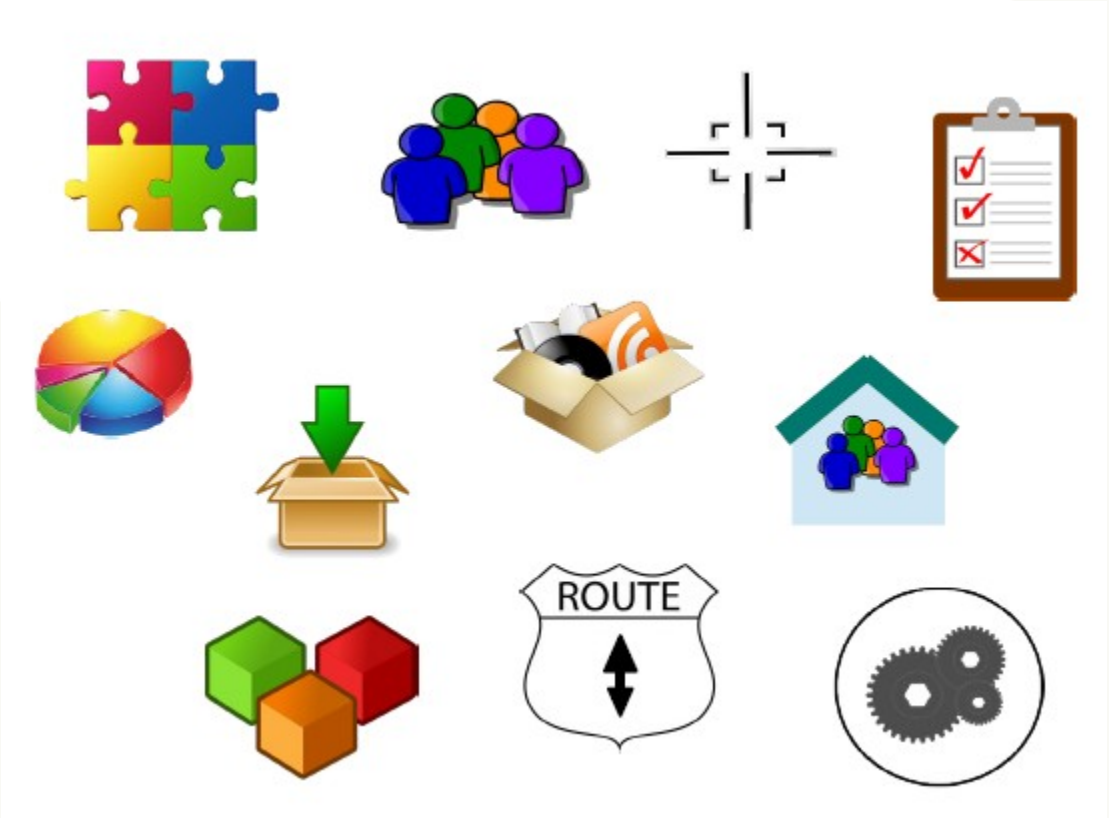
Summary

- Cloud Foundry is “the Open PaaS”
- Key Concepts : Organizations, Spaces, Services
  - The Application is the unit of deployment.
  - Simpler for Developers
- Pivotal CF is Pivotal Cloud Foundry Distribution
  - Supported easier to install /manage
- Various documentation resources available

Cloud Foundry Concepts

Overview

- After completing this lesson, we should understand:
  - Applications
  - Buildpacks
  - Manifests
  - Organizations
  - Spaces
  - Users and Roles
  - Quotas
  - Domains
  - Routes
  - Services



Applications

- PaaS exits to deploy applications
  - In Cloud Foundry, the application is the unit of deployment
  - Developers focus on apps, not runtimes or services

- Cloud Foundry is development agnostic
  - Not limited to specific language
  - Doesn't mandate the runtime environment you get
  - Some are "out-of-the-box"
  - you can add more

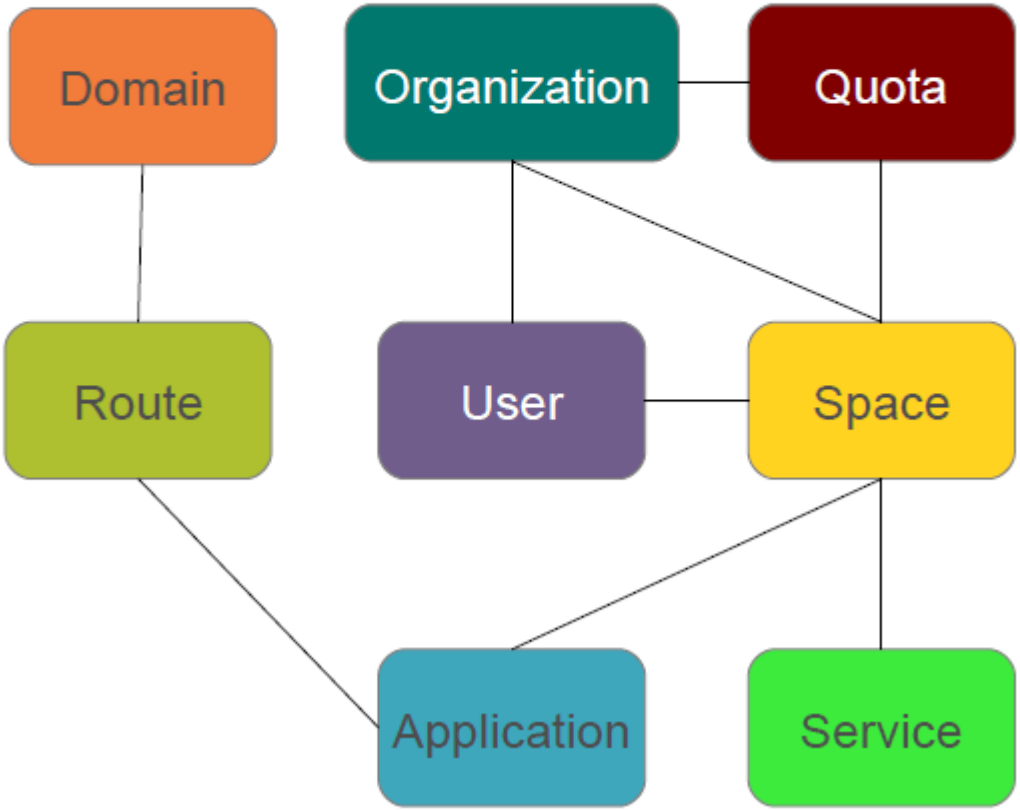
Buildpacks and Manifests

- Buildpacks
  - Allow CF to support multiple languages and deployment environments
    - Buildpacks for Java, Ruby, JavaScript, …
    - Buildpacks for Tomcat, Rails, Node.JS ….
- Manifests
  - A deployment “blueprint” for an application
  - Repeatable : redeploy using same manifest

```
---
applications:
- name: nodetestdh01
  memory: 64M
  instances: 2
  host: crn    # unique
  domain: cfapps.io
  path: .
```

Organizations

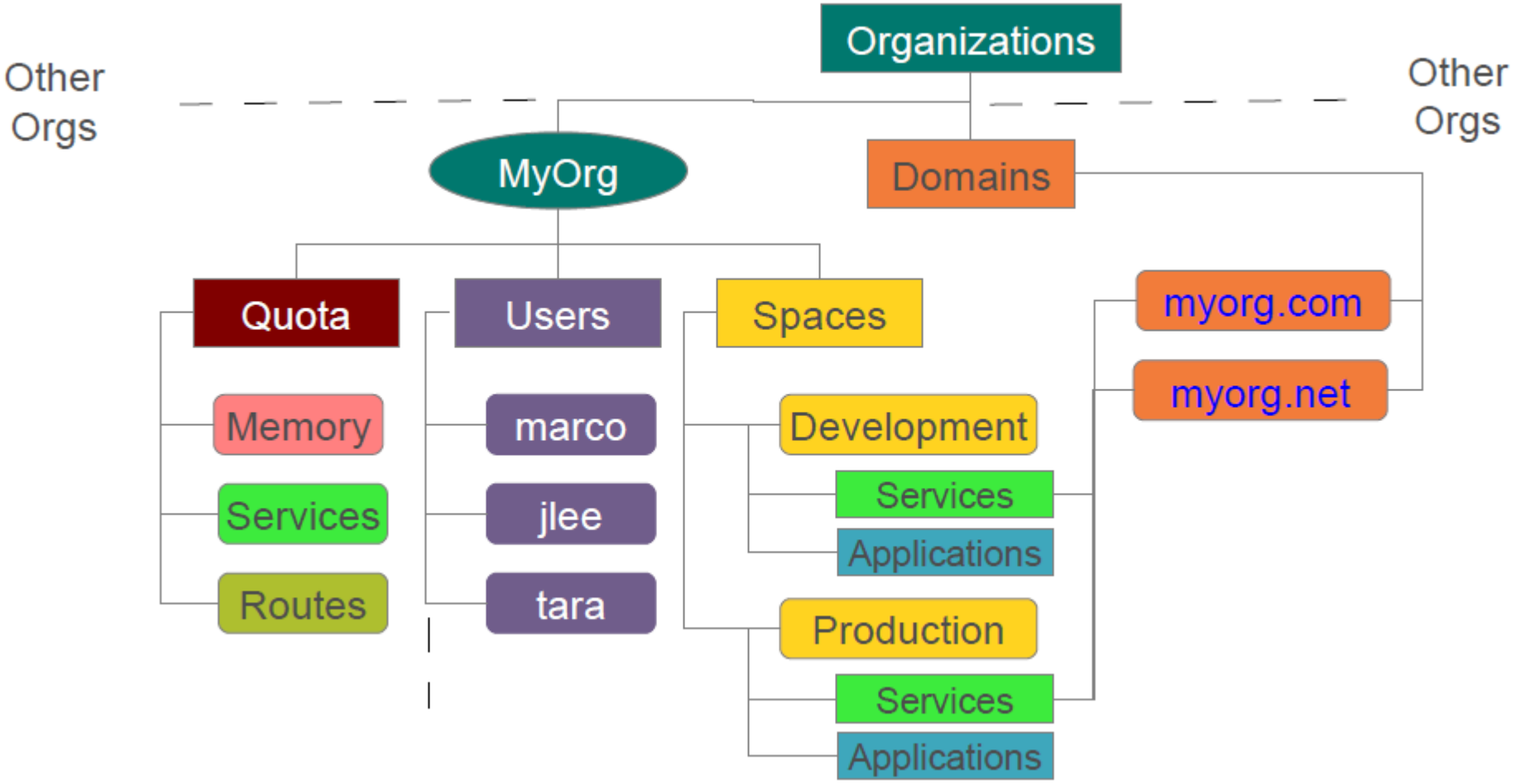
- Top-most administrative unit
- Contains Spaces and users
  - Which own routes, applications and services
- Quotas restrict resources
  - For orgs and spaces
- Domain(s)
  - Define routes to apps



Organizations

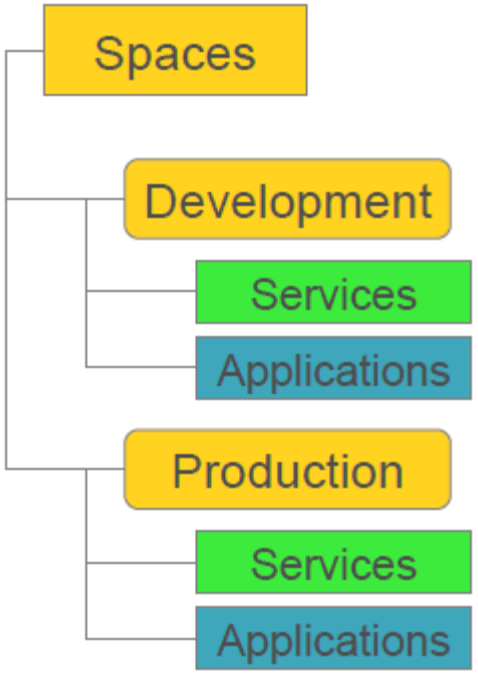
- CF is designed for use by Organizations
  - Typically a company, department, application suite or large project
- Designed to support collaboration
  - Potentially many users
- Defines one or more domains
  - Cloud Foundry instance defines default domain for all organizations
    - For PWS: cfapps.io
  - You may add additional domains
- Defines Security, Quotas

Example Organization



Spaces

- Organization contains multiple spaces
  - Default PWS space: development
  - Users can create additional spaces
- Application and services scoped to a space
  - Many applications can run/scale within space
- Provides set of users access to a shared location
    - Application development
    - Functionality and/or performance testing
    - Quality Assurance
    - Deployment to production
    - Maintenance



Users and Roles

- Members of the organization
  - You can invite users to share your cloud
- Have specific roles
  - Roles control access to domains and spaces
  - Roles therefore control who has permission
    - To manage routes (see later slides)
    - To deploy applications
    - To add/bind/remove services
- Don’t need to be CF User to access deployed apps
  - Each application does its own user-management

Organization Roles

- Organization manager
  - Can invite/manage users, select/change the plan, establish spending limits
- Organization Auditor
  - View only access to all org and space info, settings, reports

Application Space Roles

- Space Manager
  - Can invite/mange users, enable features for a given space
- Space Developer
  - Can create, delete, manage applications and services, full access to all usage reports and logs
- Space Auditor
  - View only access to all space information, settings, reports, logs

Administrator User / Roles

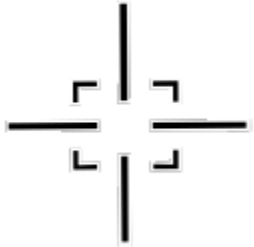
- Special Administrator user / role defined
  - Defined for the Cloud Foundry installation
  - Separate from users defined at Organization / Space
- Several CF commands restricted to Administrator only
  - Setting organization and space qutoas
  - Defining security groups
  - Administering services
  - Adding, modifying and removing user accounts
- Use without right role, CLI return:

```
Server error, status code: 403, error code: 10003, message: You are not
authorized to perform the requested action
```

Quotas

- Restrictions on available resources
  - Total memory available to all applications
  - Total number of routes
  - Max application instance size
  - Total number of services
- Can view
  - Using the CLI
  - Using App Manager (on org homepage)

Domains

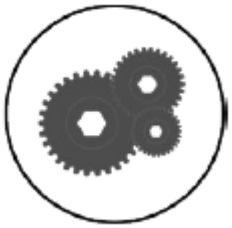


- Deployed applications are associated with a URL
  - All requests to that URL redirect to the application
- Each Cloud Foundry instance has a default app domain
  - PWS has cfapps.io
- Custom Domains
  - Register your own domain
  - Give it to Cloud Foundry to use and manage
- Subdomains
  - Each application has a unique sub-domain
    - Its' URL is therefore sub-domain.domain
    - Example: deploy an app to http://myapp.cfapps.io

Routes

- Define how to get to an application
  - A unique route exits to each application in every space
  - Behind the scenes CF uses a router
    - Maps incoming request to the right application
- Domain can be mapped to multiple spaces
  - Route can only be mapped to one spaces
  - Same application can be deployed in multiple spaces
    - Each mush have a different, unique URL
    - Development space route: http://myapp-test.cfapps.io
    - Production space route : http://myapp.cfapps.io

Services



- Any type of add-on that can be provisioned along side your apps
  - Database, messaging, mail, third-party SaaS provider
- Services are usually “bound” to 1 or more applications
  - Connection info and credentials are put in an environment variable: **VCAP_SERVICES**
  - Note:
    - All configuration data to CF applications should be passed via environment variables
    - Can’t use configuration files: *no file system*

Recap

SaaS

IaaS

PaaS

Pivotal

Cloud

Cloud Foundry

PCF

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