Introduction to Cloud Foundry

WEB AGE SOLUTIONS INC
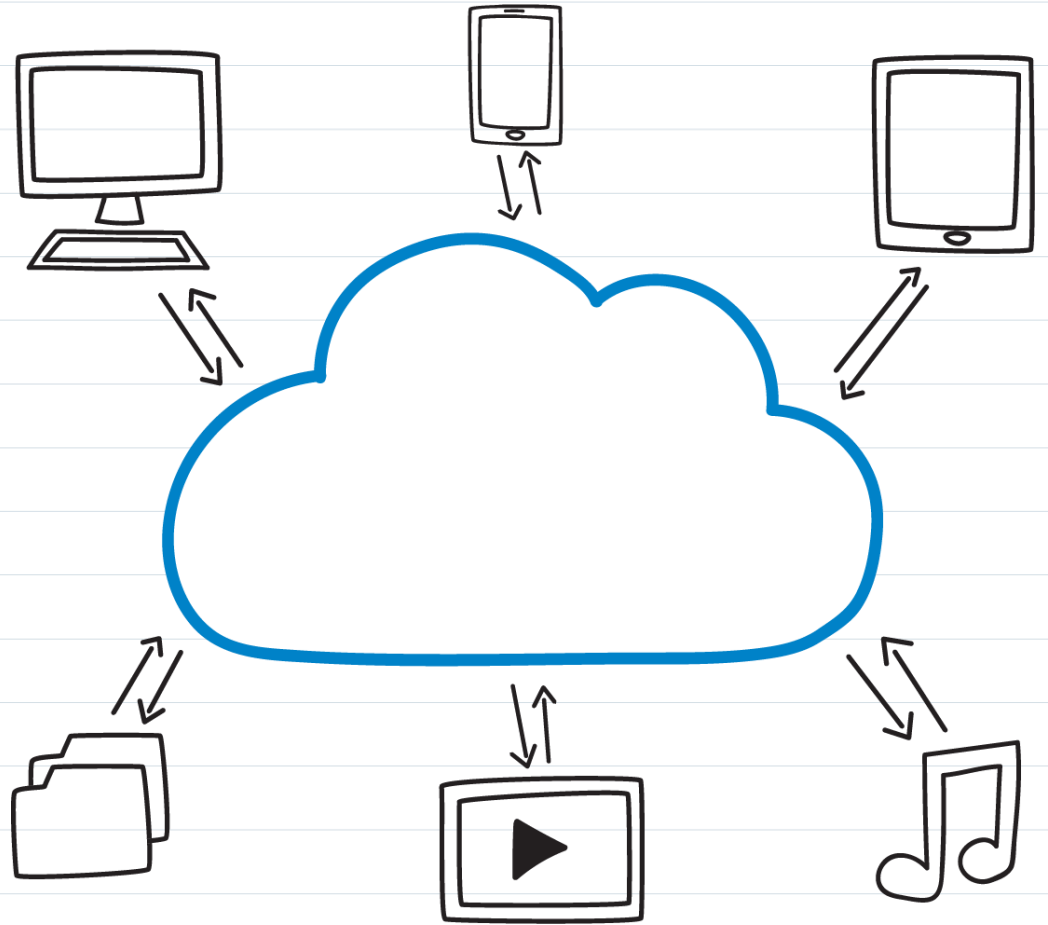
Lesson Objectives
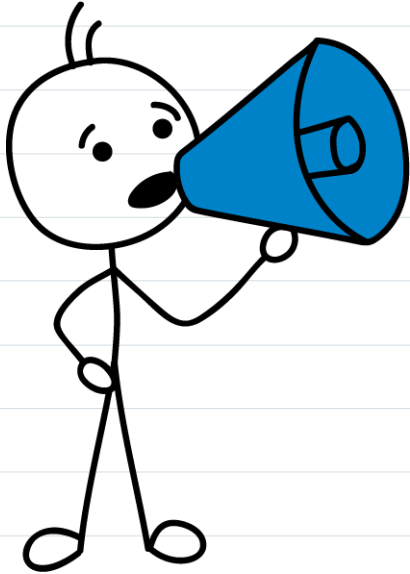
⚙ What is Cloud Foundry?

⚙ Cloud Foundry Usages

⚙ Explain service models in Cloud
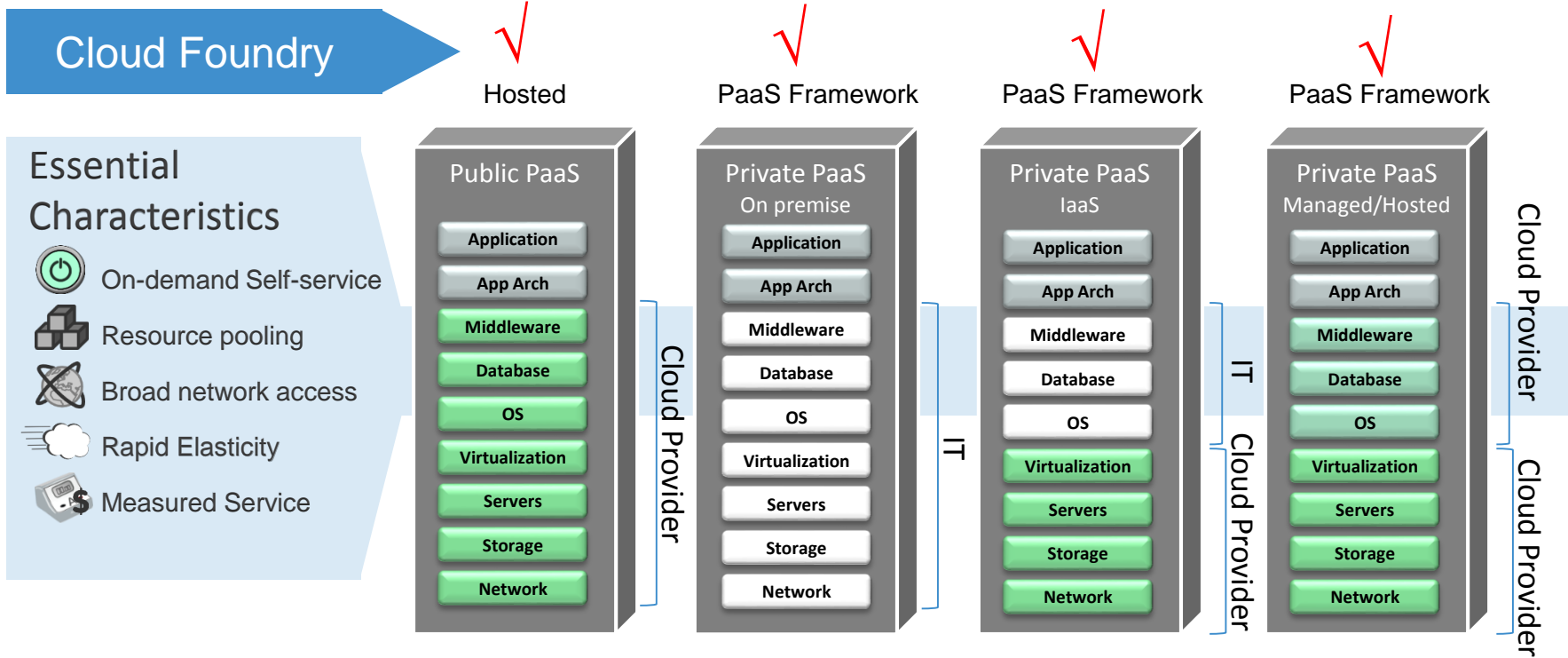
⚙ Describe Cloud deployment models

What exactly is Cloud Foundry?

- An infrastructure independent open Platform-as-a-Service initiated by VMware and now owned by Pivotal Software - a joint venture by EMC, VMware and General Electric.

- Designed to be polyglot in nature, providing a diverse choice of clouds, developer frameworks and application services.

- Enables easy integration with middleware services and APIs.

- Is at the core of many public and private PaaS services and solutions, including Pivotal CF, Pivotal Web Services, and Stackato.

Some History…

- First launched in May 2011 as one of the first PaaS offerings developed based on open standards with full JEE support.

- Has evolved continuously from being offered initially just as a public PaaS to now being offered both as a public (OpenShift Online & Dedicated) and private (OpenShift Enterprise) PaaS.

- The core cloud framework that both OpenShift Online and Enterprise build on is also available as an upstream and open-sourced community project (OpenShift Origin).

- Core platform and architecture were fully revamped recently to build around **Docker** and **Kubernetes**.
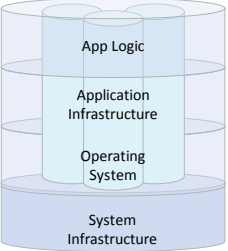
So where does Cloud Foundry fit in?

Cloud Foundry

√ Hosted

√ PaaS Framework

√ PaaS Framework

√ PaaS Framework

Essential Characteristics

- On-demand Self-service
- Resource pooling
- Broad network access
- Rapid Elasticity
- Measured Service

Public PaaS

| Application |
| App Arch |
| Middleware |
| Database |
| OS |
| Virtualization |
| Servers |
| Storage |
| Network |

Cloud Provider

Private PaaS
On premise

| Application |
| App Arch |
| Middleware |
| Database |
| OS |
| Virtualization |
| Servers |
| Storage |
| Network |

IT

Private PaaS
IaaS

| Application |
| App Arch |
| Middleware |
| Database |
| OS |
| Virtualization |
| Servers |
| Storage |
| Network |

IT

Cloud Provider

Private PaaS
Managed/Hosted

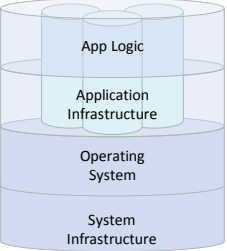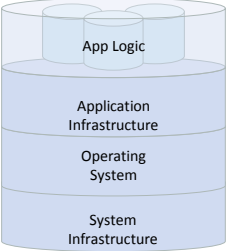| Application |
| App Arch |
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| Virtualization |
| Servers |
| Storage |
| Network |

Cloud Provider

Cloud Provider

So where does Cloud Foundry fit in?

PaaS Architecture Styles:

Cloud Foundry

INSTANCE-BASED PAAS	FRAMEWORK-BASED PAAS	METADATA-BASED PAAS
UNIT OF PROVISIONING	UNIT OF PROVISIONING	UNIT OF PROVISIONING
VM Virtual Machine	OS Process	**App Metadata** Application Metadata
MULTITENANCY APPROACH	MULTITENANCY APPROACH	MULTITENANCY APPROACH
Shared Hardware	Shared Operating System	Shared Everything

App Logic
Application Infrastructure
Operating System
System Infrastructure

App Logic
Application Infrastructure
Operating System
System Infrastructure

App Logic
Application Infrastructure
Operating System
System Infrastructure

Cloud Foundry Solutions from Pivotal

Pivotal offers the following cloud platforms and solutions based on Cloud Foundry:

Public PaaS

- Pivotal Web Services is a publicly available instance of Cloud Foundry operated on Amazon Web Services by Pivotal's Cloud Operations team and used as the production environment for continuous delivery by Pivotal's Cloud Foundry engineering teams.

Enterprise PaaS

- Pivotal CF is a comprehensive multi-cloud enterprise PaaS, powered by Cloud Foundry.
- Offers multiple administration tools and dashboards such as Ops Manager, Services Dashboard, Apps Manager etc. that are not available with the open source version.
- Generally available since Nov 2013.

Cloud Foundry

- an infrastructure independent Open PaaS solution maintained by the Cloud Foundry Foundation
- Cloud Foundry is at the core of many public and private PaaS services/solutions, including Pivotal CF, Pivotal Web Services, and Stackato.
- Designed to be polyglot in nature, providing a diverse choice of clouds, developer frameworks and application services.
- Enables easy integration with middleware services and APIs.

Cloud Foundry Solutions from Other Providers

Public PaaS

- **IBM BlueMix** is a public platform-as-a-service (PaaS) based on Cloud Foundry and hosted by IBM.
- Generally available since June 2014.

- **Appfog** is a public platform-as-a-service (PaaS) based on Cloud Foundry and hosted by CenturyLink.
- Generally available since July 2012.

Enterprise PaaS

- **Stackato** is a secure, stable, and commercially supported Platform-as-a-Service (PaaS) originally from ActiveState and recently acquired by HP.
- Built with and on top of various open source components such as Cloud Foundry and Docker.
- Generally available since Feb 2012.

Managed/ Hosted PaaS

- **HP's Helion Development Platform** is based on Cloud Foundry and integrated with OpenStack.
- The OpenStack community edition of HP Helion has been in GA since June 2014.

Accenture Cloud Platform

- **Accenture's** PaaS provisioning and management services, available for a host of cloud providers such as AWS, Azure, NTT etc.
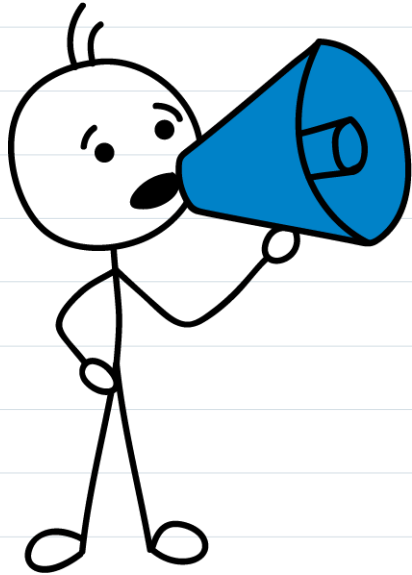
Additional
Knowledge Areas to
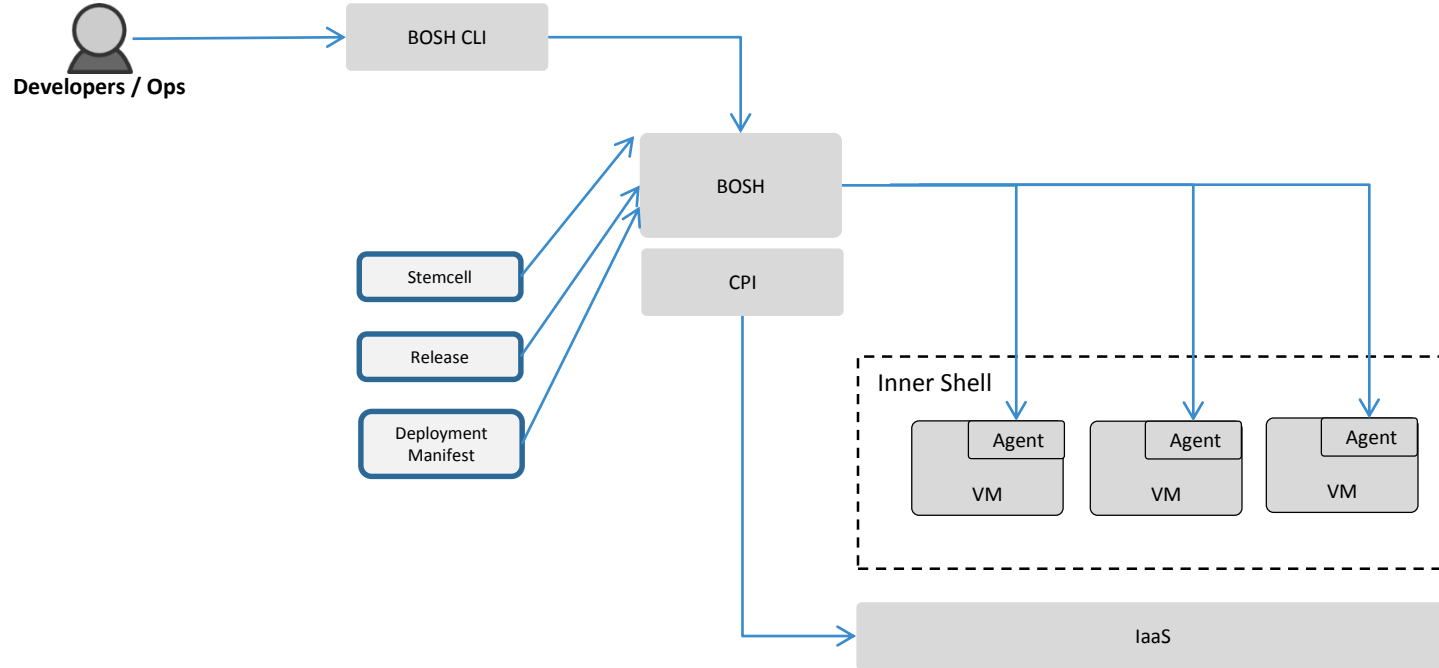Improve Utilizing
Cloud Foundry

BOSH

- BOSH is an open source tool that allows creating, deploying and managing the lifecycle of large-scale distributed services.

- Was originally created by Pivotal Software to manage Cloud Foundry releases.

- Has evolved significantly since its inception and has swiftly gained popularity in being used as a release management tool for use cases beyond Cloud Foundry.

- BOSH can now be used to deploy any distributed system of release components to the cloud (or virtual machines).

- BOSH supports multiple IaaS Platforms such as AWS, vSphere, vCloud Director, vSphere, OpenStack etc and provides a CPI (Cloud Provider Interface) that allows extending it to other providers such as Google Compute Engine (GCE), Apache CloudStack etc.
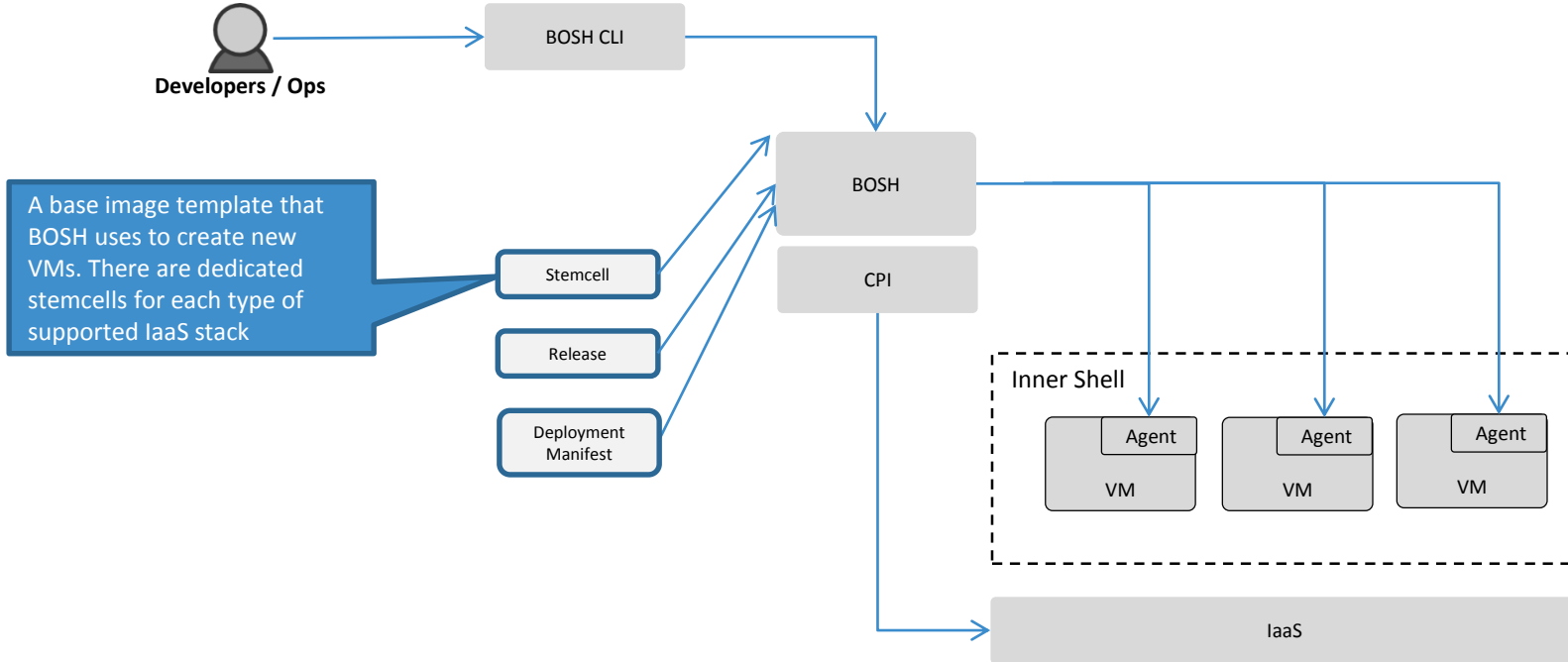
BOSH (cont.)

- BOSH is a recursive acronym for Bosh Outer SHell. The service or component being deployed and managed by BOSH is called the "Inner Shell".
- There are three main constituents to a BOSH Deployment:
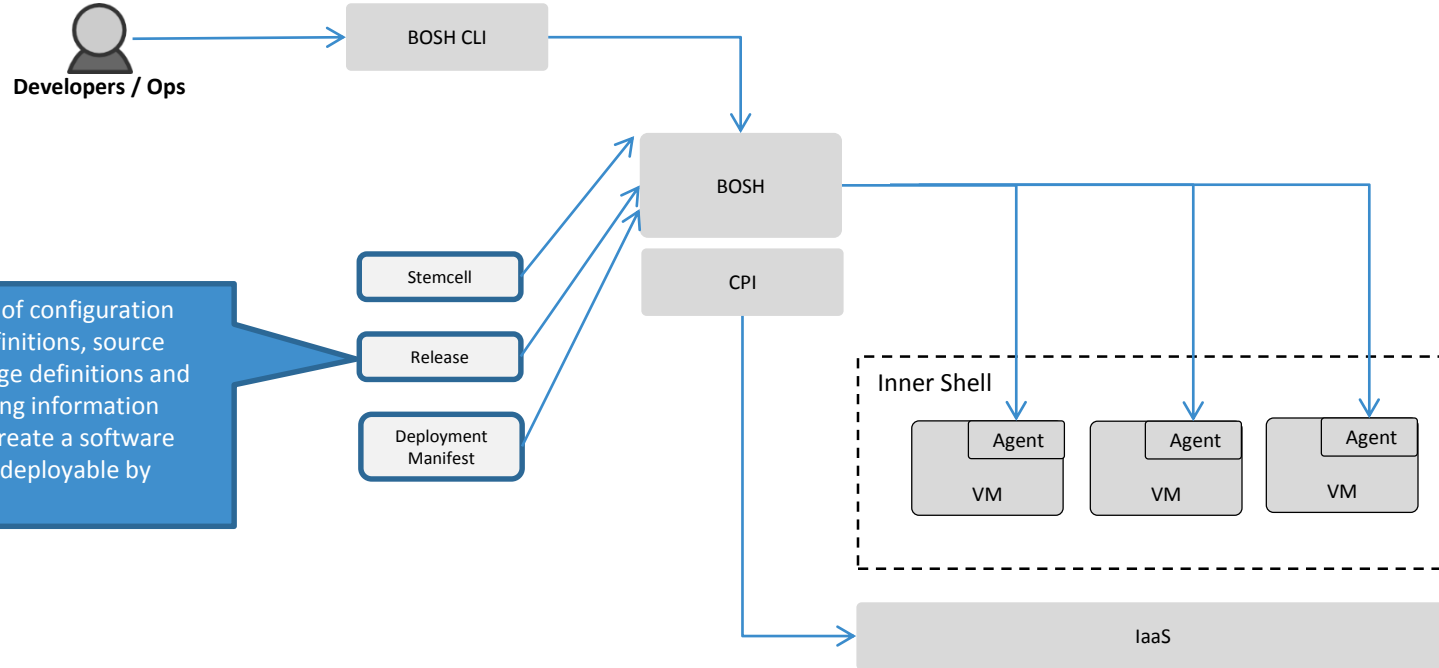 - Stemcell
  - Release
  - Deployment Manifest

BOSH (cont.)

BOSH (cont.)

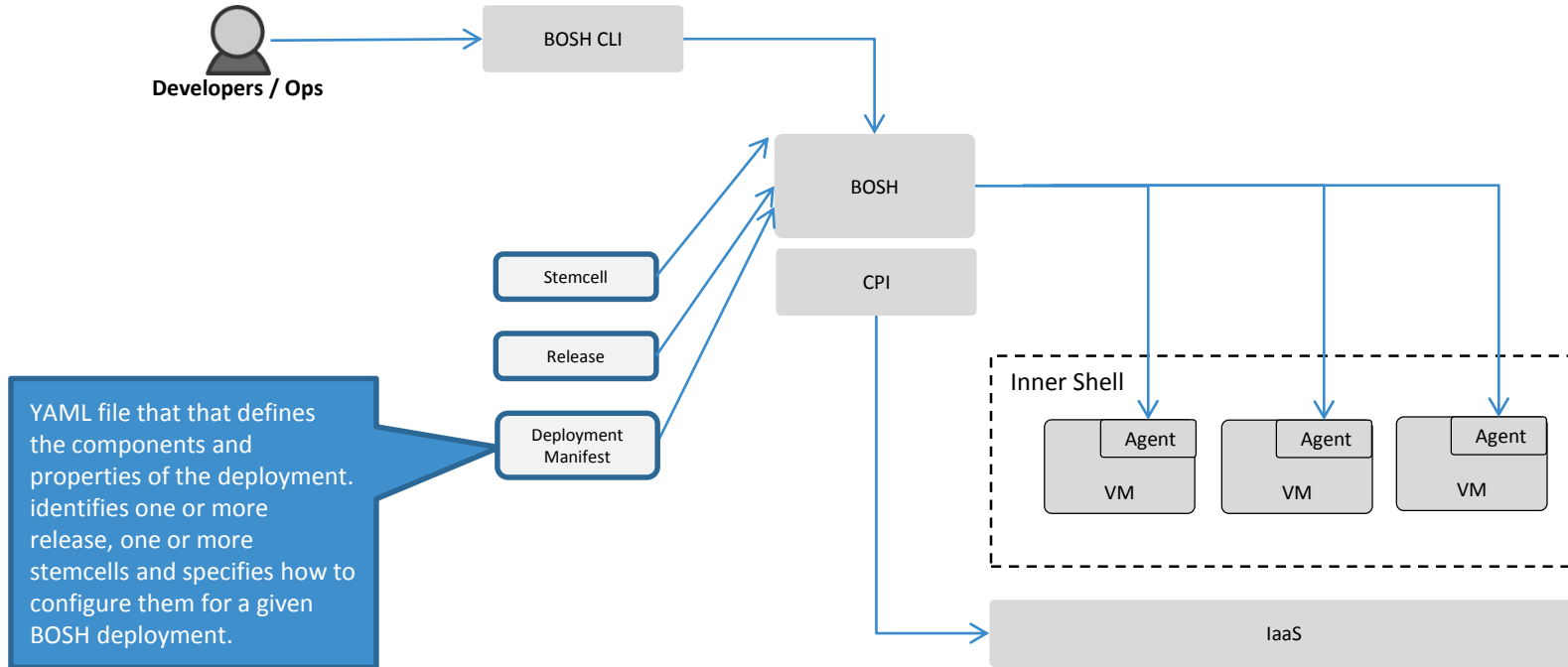A base image template that BOSH uses to create new VMs. There are dedicated stemcells for each type of supported IaaS stack

Developers / Ops

BOSH CLI

BOSH

CPI

Stemcell

Release

Deployment Manifest

Inner Shell

Agent

VM

Agent

VM

Agent

VM

IaaS

BOSH (cont.)

Developers / Ops

BOSH CLI

BOSH

CPI

Stemcell

Release

A collection of configuration files, job definitions, source code, package definitions and accompanying information needed to create a software component deployable by BOSH

Deployment Manifest

Inner Shell

Agent
VM

Agent
VM

Agent
VM

IaaS

BOSH (cont.)

Developers / Ops

BOSH CLI

BOSH

Stemcell

Release

CPI

Deployment Manifest

YAML file that that defines the components and properties of the deployment. identifies one or more release, one or more stemcells and specifies how to configure them for a given BOSH deployment.

Inner Shell

Agent

Agent

Agent

VM

VM

VM

IaaS

Spring Cloud Connectors

- Spring Cloud Connectors is an open source project that provides an abstraction for JVM-based applications to discover bound services and deployment information at runtime.

- Eliminates the need for configuring service connectivity details with the application context/ configuration.

- Provides support for a set of services for Cloud Foundry and Heroku out of the box. Fully and easily extensible to support:

  – Additional Cloud Platforms

  – Additional Services
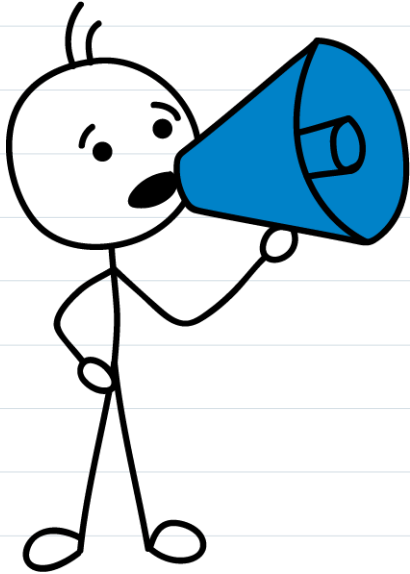
Understanding Config Formats

Understanding Config Formats

- Before using Cloud Foundry, it is essential to understand the different config formats it leverages:

  – JSON (JavaScript Object Notation)

  – YAML (Recursive acronym for YAML Ain't Markup Language)

Understanding Config Formats (cont.)

- JSON allows language independent representation of data as:
    - Collection of name/ value pairs, and/or
    - An ordered list of values
- Cloud Foundry leverages JSON format for requests and responses of its REST API (covered later).

- YAML is a data-serialization language that supports indented representation of values to enhance readability.
- YAML is the format used by BOSH Deployment Manifests.

Understanding Config Formats (cont.)

So let us pick up a sample XML and see how this is represented in JSON and YAML:

XML

```
<student id="S001" name="Joe Customer">
  <course name="Cloud Foundry Academy">
        <session id="1"
subject="Introduction" />
        <session id="2" subject="Platform
Architecture" />
        <session id="3" subject="Services"
/>
  </course>
</student>
```

JSON

```
{ "student": {
"id": "S001",
"name": "Joe Customer",
"course": {
"name": "Cloud Foundry Academy",
"session": [
{ "id": "1",
"subject": "Introduction" },
{ "id": "2",
"subject": "Platform Architecture" },
{ "id": "3",
"subject": "Services" } ]
}}}
```
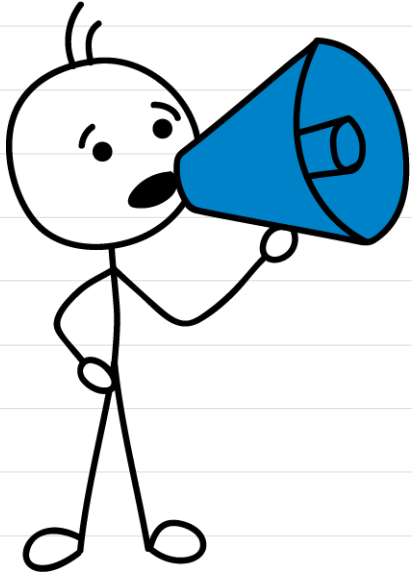
Understanding Config Formats (cont.)

XML

```
<student id="S001" name="Joe Customer">

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        <session id="1"
subject="Introduction" />

        <session id="2" subject="Platform
Architecture" />

        <session id="3" subject="Services"
/>

  </course>

</student>
```

YAML

```
---
student:

  id: S001

  name: Joe Bloke

  course:

    name: Cloud Foundry Academy

    session:

    - id: '1'

      subject: Introduction

    - id: '2'

      subject: Platform Architecture

    - id: '3'

      subject: Services
```

Session Quiz

Quiz 1

What PaaS architecture style is Cloud Foundry?

- ❑ Framework PaaS
- ❑ Instance PaaS
- ❑ Metadata PaaS
- ❑ 1 & 2
- ❑ 2 & 3
- ❑ All of above
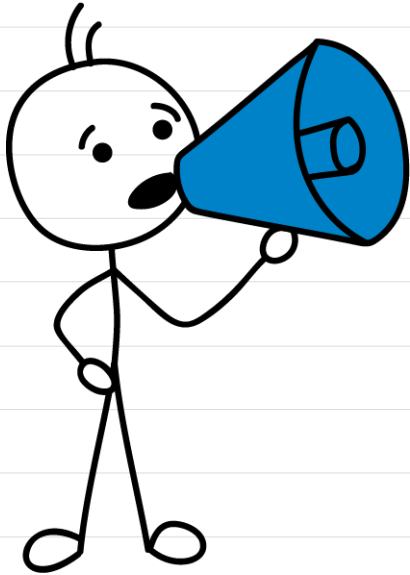- ❑ None of above

Quiz 2

True or False: Pivotal offers Cloud Foundry both as an open source cloud framework and as a commercial offering:
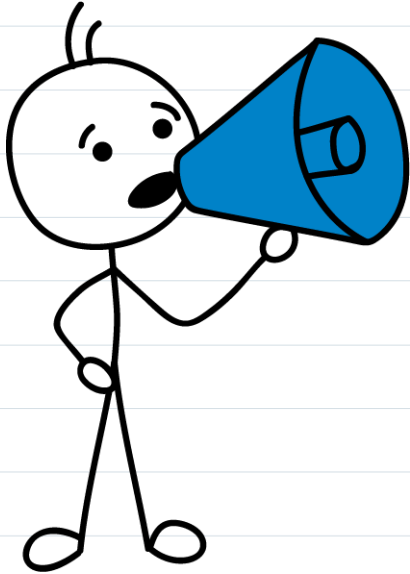
- ❑ True
- ❑ False

Quiz 3

What is the release engineering tool used by Cloud Foundry:

- ❏ Pivotal Web Services

- ❏ YAML

- ❏ Stackato

- ❏ None

Discussion: What are current knowledge sources for cloud-native application modernization with Cloud Foundry?

What did we learn?

⚙ What is Cloud Foundry?

⚙ Cloud Foundry Usages

⚙ Cloud Foundry Components

⚙ Config Formats