

432/832

# Advanced Database Systems





# CLOUDS, SERVICES AND BLUEMIX

# Readings

1. R. Buyyaa, C. S. Yeo, S. Venugopala, J. Broberga and I. Brandicc. Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility, *Future Generation Computer Systems, Volume 25, Issue 6, June 2009, Pages 599–616.*
2. E. Griffith. What is Cloud Computing? *Pcmag.com*, April 15, 2015.
3. *Bluemix Overview.*



# ***WHAT IS CLOUD COMPUTING?***



*Google Drive  
Apple iCloud  
MS OneDrive  
Amazon Cloud Drive  
??*

***Cloud computing*** is the delivery of shared computing resources, software or data — as a service and on-demand through the Internet.

# 5 Essential Characteristics of Cloud Computing

Ref: The NIST Definition of Cloud Computing

<http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf>



On-demand  
self-service



Ubiquitous  
network  
access



Location  
transparent  
resource  
pooling



Rapid  
elasticity



Measured  
service with  
pay per use

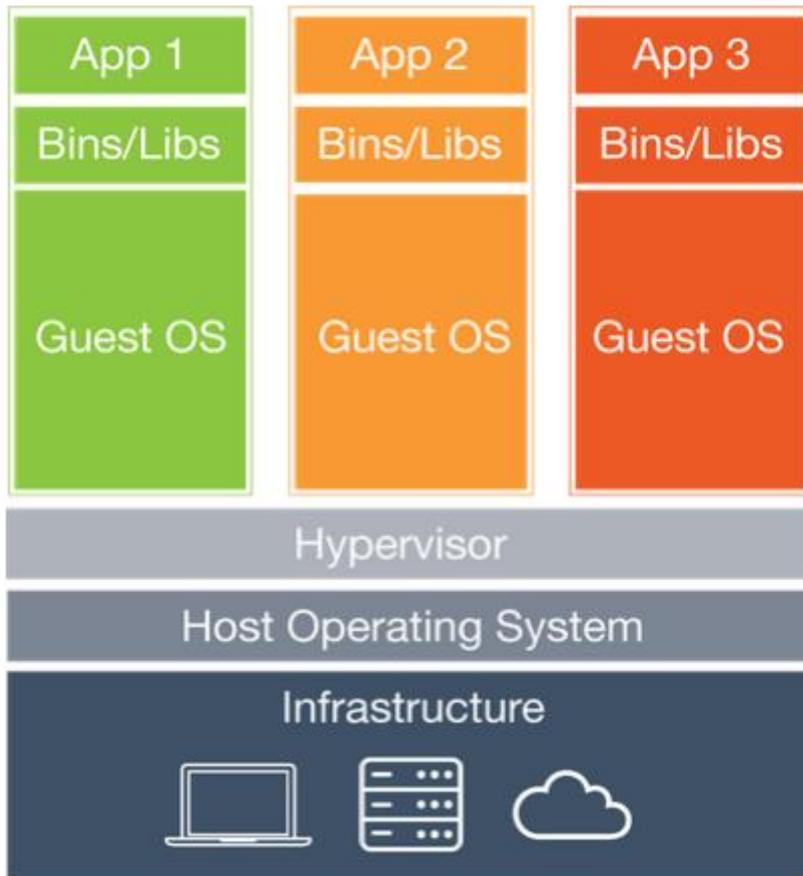
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# Virtualization

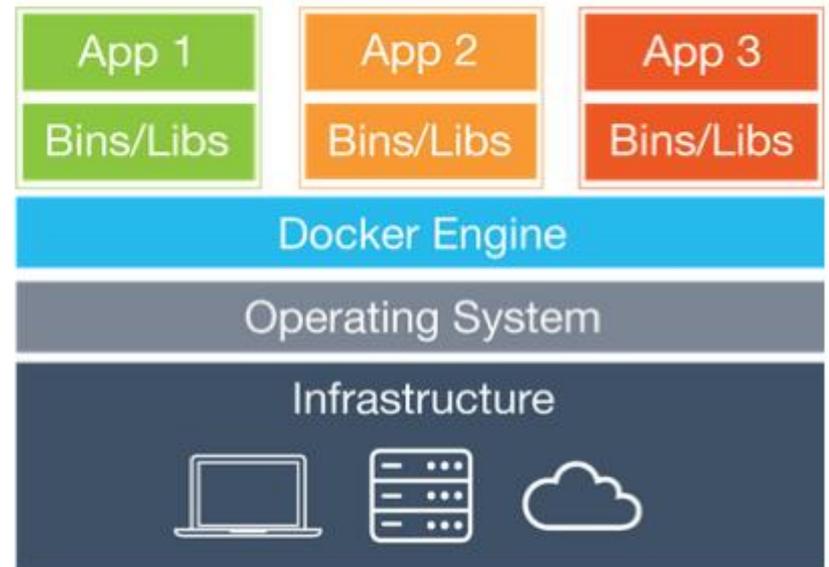
- **Virtualization** is the creation of a virtual (rather than actual) version of something, such as an operating system, a server, a storage device or network resources.
- Virtualization software (eg VMWare, Zen) is a key enabler of cloud computing

# Flavours of Virtualization

## Virtual Machines



## Containers



# Business Models for Cloud Computing

SaaS

• Software



**Consume It!**

PaaS

• Platform



**Build On It!**

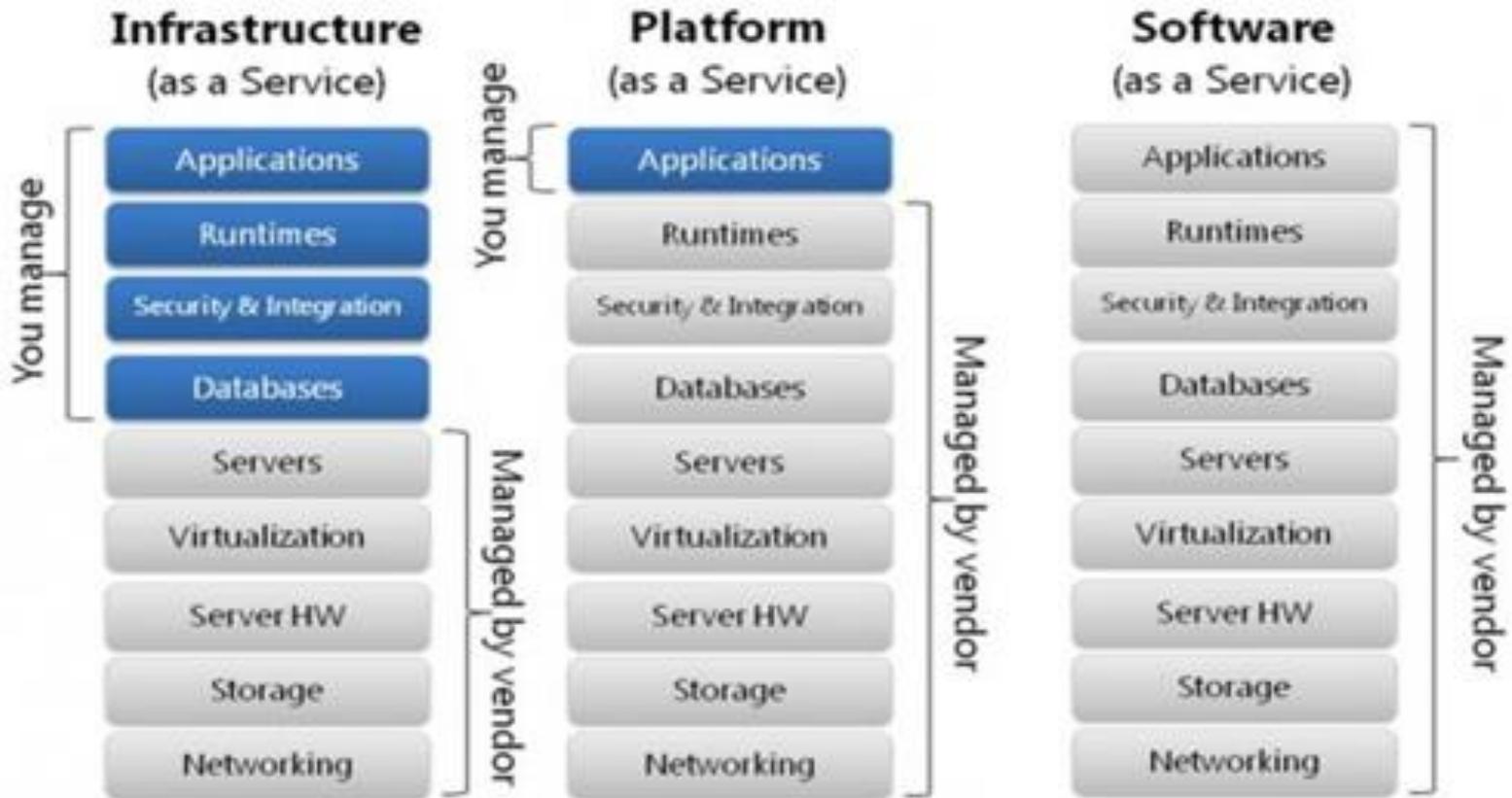
IaaS

• Infrastructure



**Migrate To It!**

# SaaS vs PaaS vs IaaS



# Cloud Landscape



Created by:

CloudTimes



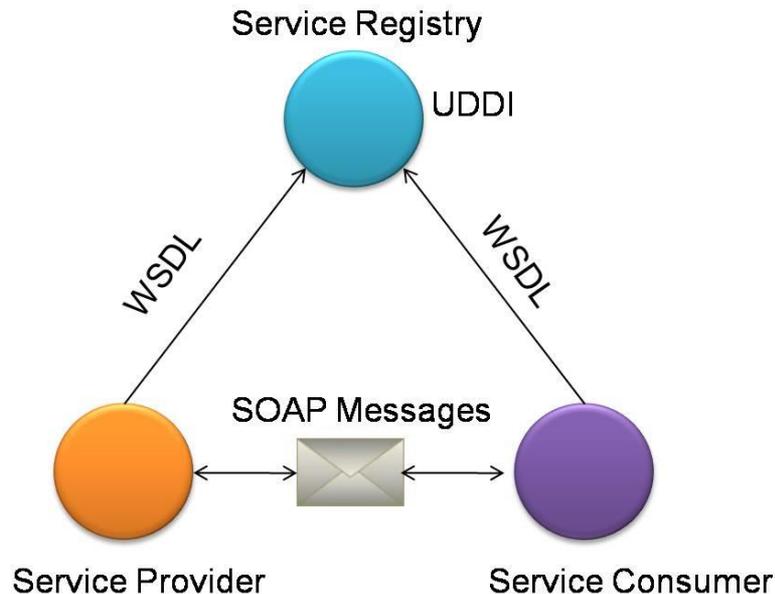
# Services Computing

- Computing architecture that packages functionality as a suite of interoperable routines.
- Requires loose coupling of services with operating systems and other underlying technologies.
- Functions are separated into distinct self-describing and autonomous units, or services.
- Services are accessible via pre-defined interfaces over a network
- Services communicate by passing data in a well-defined, shared format.

# Web Services

- The dominant implementation of services computing.
- Two flavours:
  - SOAP Based (WS-\*) Web Services
  - REST style Web services

# WS-\* Web Services



- **SOAP** – Simple Object Access Protocol
- **WSDL** – Web Service Description Language
- **UDDI** - Universal Description, Discovery and Integration

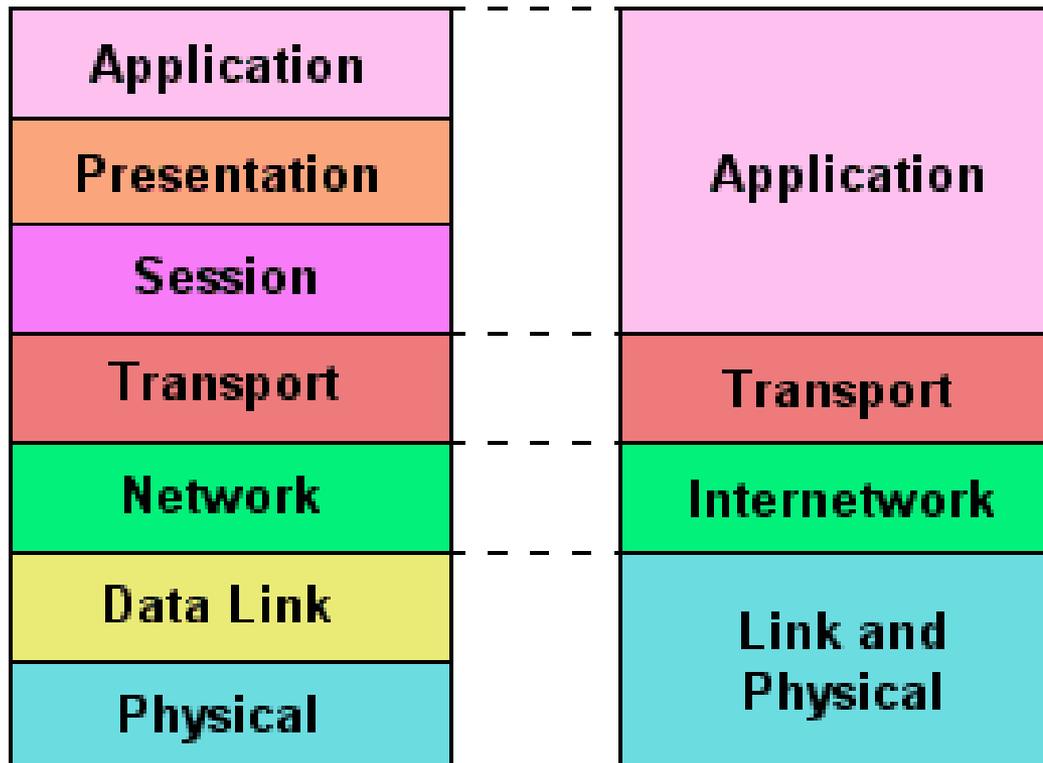
# RESTful Web Services

- **REpresentational State Transfer**
- The web has *addressable resources*.
  - Each resource has a Uniform Resource Identifier (URI).
  - REST is *resource-based* as opposed to action-based (like SOAP)
- The web has a *uniform and constrained interface*.
  - Eg. HTTP, has a small number of methods. Use these to manipulate resources.
- The web is *representation oriented*
  - Can interact with a resource using different representations
- The web may be used to *communicate statelessly* – providing scalability
- *Hypermedia* is used as the engine of application state change.

# Protocol Stack

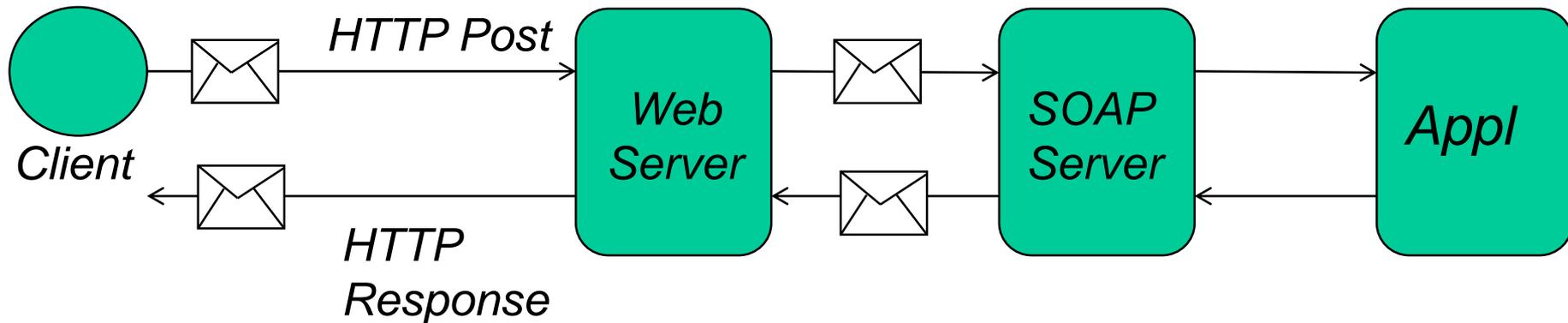
## OSI Model

## TCP / IP



# Uniform Constrained Interface

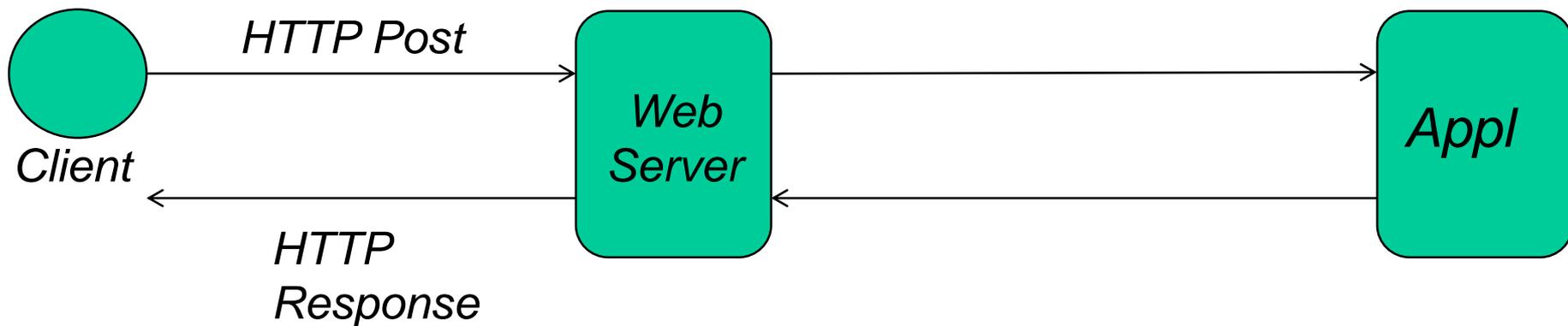
- Most commonly uses HTTP operations
  - GET - read from the resource
  - PUT – modify (insert or update) the state of the resource
  - POST – may modify the state of the resource; request and response may contain additional information
  - DELETE – modify (delete) the state of the resource.



*SOAP*

*VS*

*REST Interactions*





Overview of IBM Cloud Offering

# **BLUEMIX**

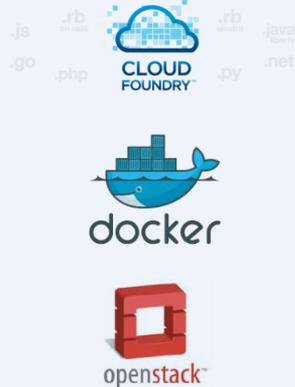
# What is Bluemix?

- **Bluemix** is an *open-standards, cloud-based PaaS* for building, running, and managing applications

# What is Bluemix? (cont)

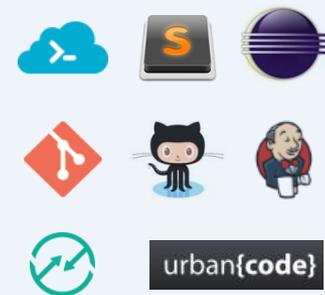
## Compute

Choose the level of **infrastructure abstraction** based on your app's architectural needs.



## Dev Tooling

From editors to source code management to continuous delivery, you can **use Bluemix' powerful tooling** or easily **bring your own**.



## Location

Deploy apps to Bluemix **Public** (in a growing number of geos), your own **dedicated cloud Bluemix**, or one that runs **within your data center (Local\*)**.



## Services

Pick from a catalog of **IBM, third party, open source, or your own** services to extend your apps.



# How does Bluemix work?

Bluemix is underlined by three key open compute technologies: **Cloud Foundry**, **Docker**, and **OpenStack**. It extends each of these with a of **services**, robust **DevOps tooling**, and **integration capabilities**.

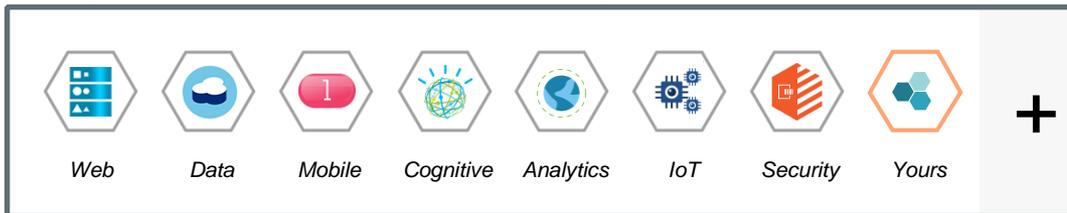
## DevOps Tooling



## Your Own Hosted Apps / Services



## Catalog of Services that Extend Apps' Functionality



## Flexible Compute Options to Run Apps / Services



## Platform Deployment Options that Meet Your Workload Requirements



Powered by IBM SoftLayer

In Your Data Center

## Integration and API Mgmt



# Key Technologies

- *Cloud Foundry*

- Cloud Foundry is an open-source PaaS for developers to run their applications in the cloud
- Developers only push their (web) applications and everything else - from the hardware up to the application servers - is provided by the platform.

# Key Technologies

- *Docker*

- Docker is an open-source container technology to package full application stacks so that these containers can easily be run in different environments.
- Portability is achieved by packaging the core applications along with the complete underlying stack you need to run applications including application servers, Java runtimes, configuration and other dependencies.

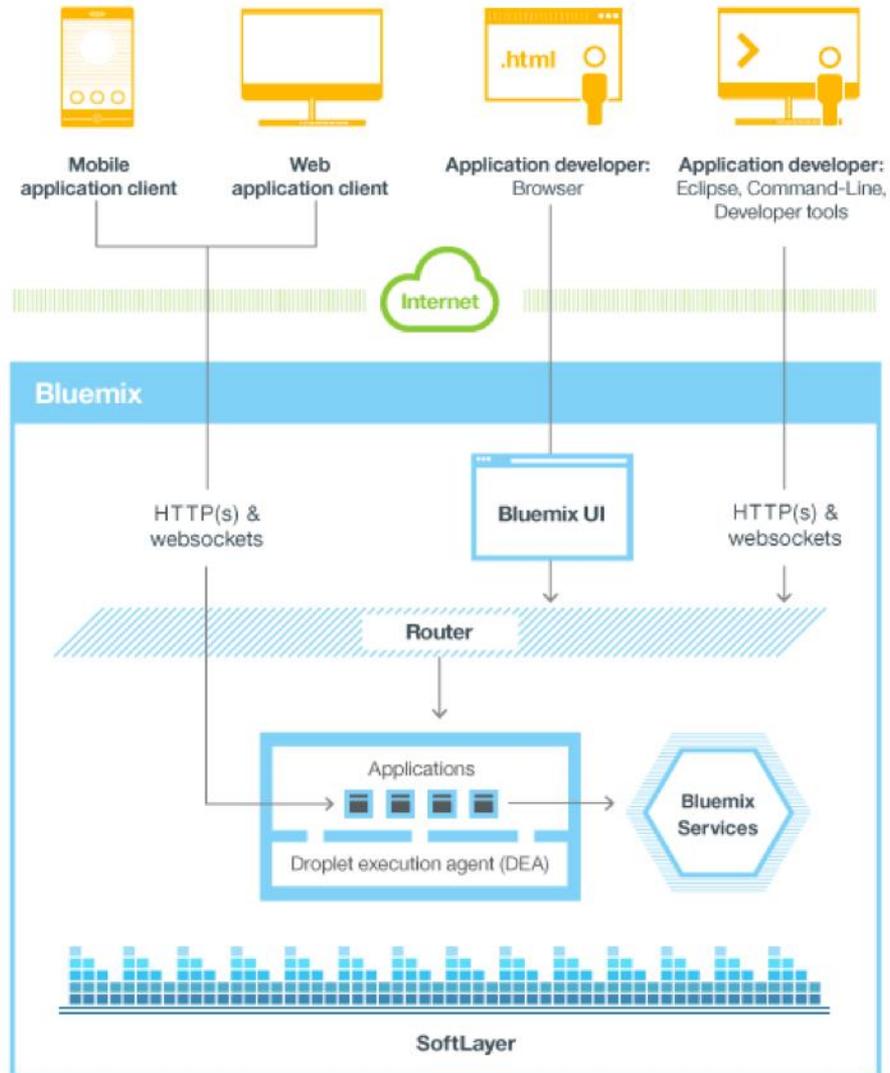
# Key Technologies

- *Openstack*
  - OpenStack is a set of open-source IaaS software tools for building and managing cloud computing platforms for public and private clouds.
  - Allows users to deploy VMs and instances on the fly and to dynamically scale running applications

# Key Technologies

- *SoftLayer*
  - SoftLayer is an IBM-owned company
  - IaaS provider that has data centers around the world

# Bluemix Architecture



# Bluemix Services

The screenshot displays the IBM Bluemix Services Catalog interface. At the top, the navigation bar includes the IBM Bluemix logo, a search bar with the placeholder text "Type to search", and menu items for SOLUTIONS, CATALOG, PRICING, DOCS, and COMMUNITY. The main content area is titled "Watson" and features a sub-header: "Build cognitive apps that help enhance, scale, and accelerate human expertise". Below this, a grid of 18 service icons is presented, each with a name and a status label (IBM, IBM BETA, or Third Party).

Service Name	Status
AlchemyAPI	IBM
Concept Expansion	IBM BETA
Concept Insights	IBM
Dialog	IBM
Document Conversion	IBM
Language Translation	IBM
Natural Language Classifier	IBM
Personality Insights	IBM
Relationship Extraction	IBM BETA
Retrieve and Rank	IBM
Speech To Text	IBM
Text to Speech	IBM
Tone Analyzer	IBM BETA
Tradeoff Analytics	IBM
Visual Recognition	IBM BETA
Cognitive Commerce™	Third Party
Cognitive Graph	Third Party
Cognitive Insights™	Third Party



# WHAT'S COMING UP IN THE COURSE

- **Week 2 – Sept 19 - 23**
  - Lectures – RDBMS implementation issues
- **Week 3 – Sept 26 - 30**
  - Lectures – RDBMS implementation issues, RDBMS architectures
- **Week 4 – Oct 3 – 7**
  - Assignment 1 due Oct 4
  - Bluemix tutorial Oct 4
  - Lectures – RDBMS architectures