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DevOps Meetup Stockholm Building Clouds with Open Source

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Rational Software - IBM software group.

Rational. software

Topics

1. DevOps adoption
2. Cloud operating system: OpenStack
3. The contribution of IBM
4. Developer self-service: Full-Stack provisioning
5. OpenStack ready: UrbanCode Deploy with Patterns

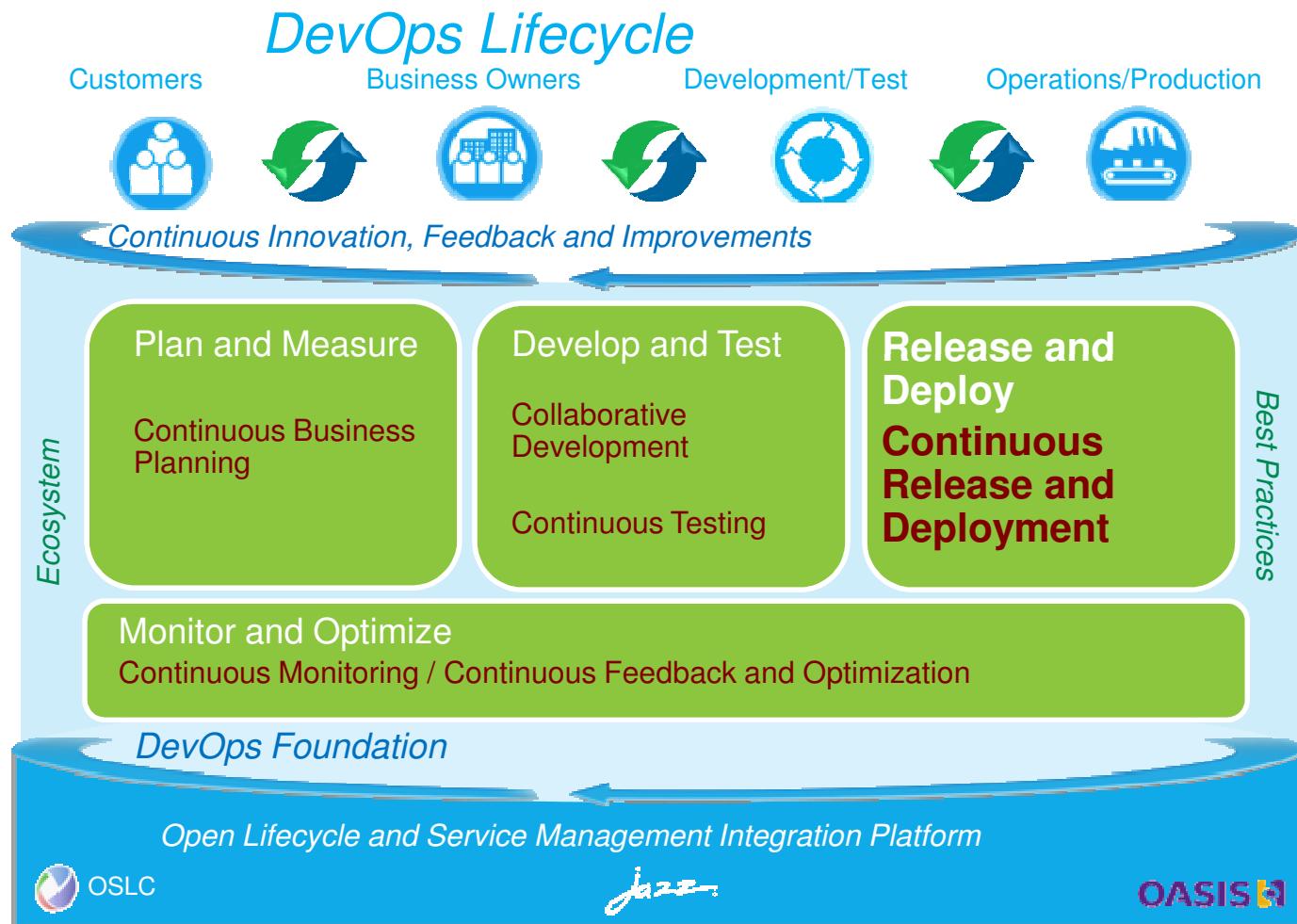
Why DevOps?



- **Time to value**
 - Deploy faster. Deploy Often
 - Reduce cost/time to deliver
- **Developer ‘Self-service’**
 - Allow Developers to Build and Test against ‘Production-like’ systems
- **Increase Quality**
 - Reduce cost/time to test
 - Increase test coverage
- **Increase environment utilization**
 - Virtualize Dev and Test Environments

Capabilities to enable a DevOps approach

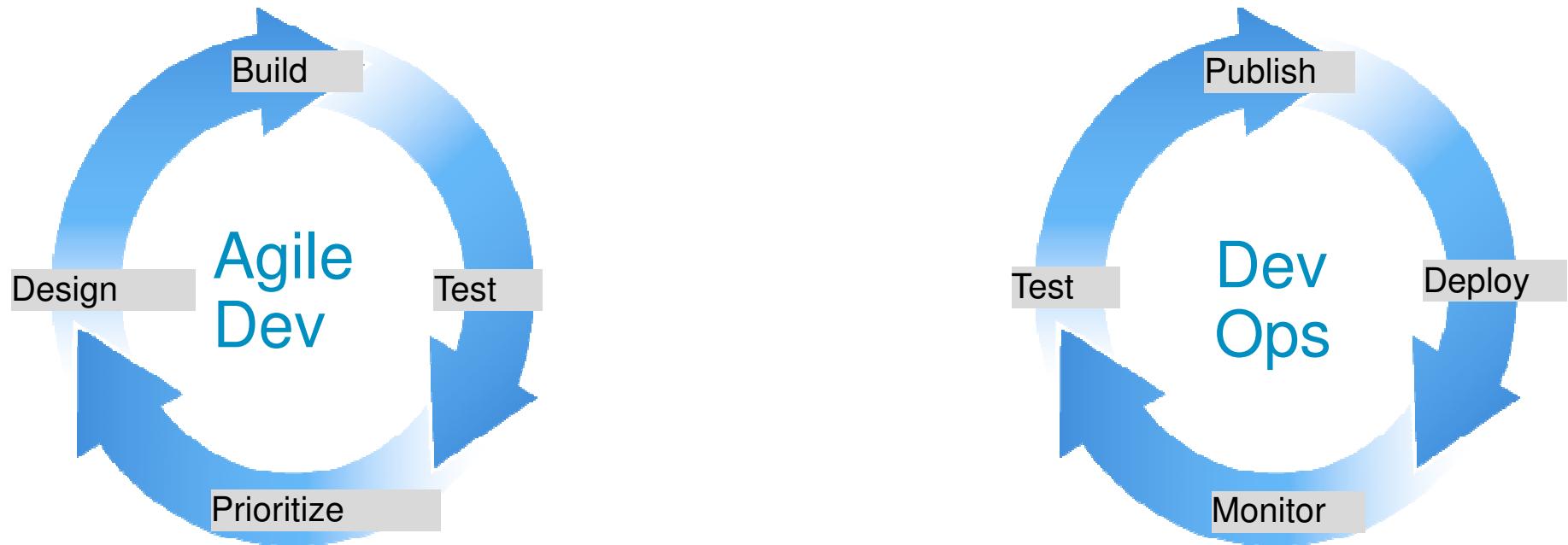
Practices



Agile Development and Delivery



Continuous Integration extends to Continuous Delivery



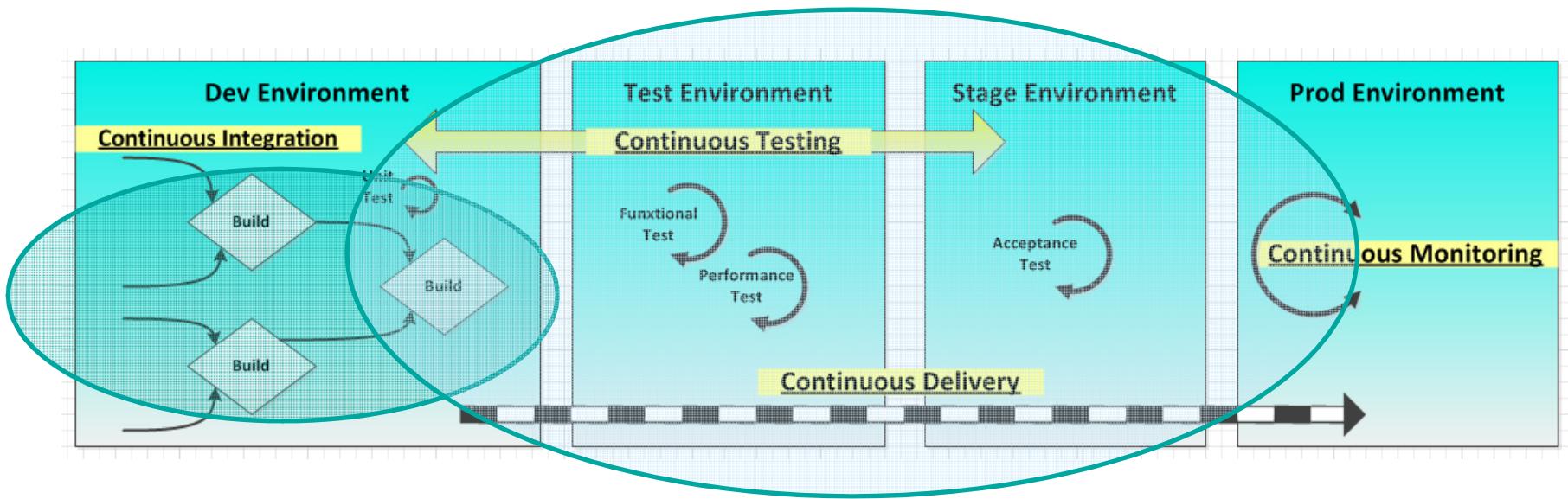
Continuous Feedback

DevOps: Tighter alignment between Development & Operations

The key technical Capabilities of DevOps

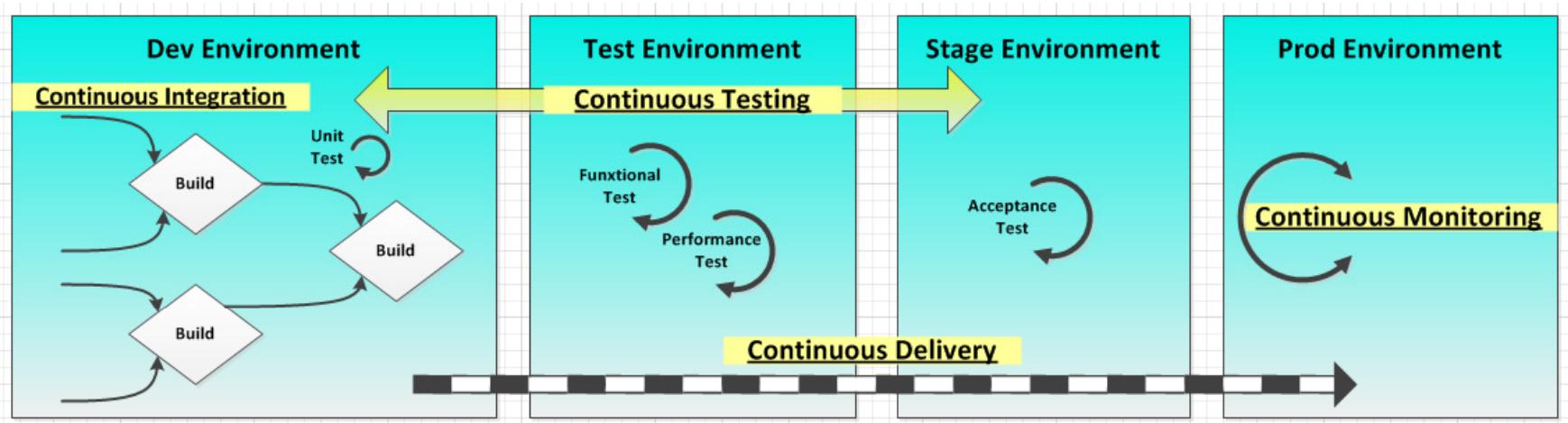
1. Continuous Integration
2. Continuous Delivery
3. Continuous Test
4. Continuous Monitoring
5. Infrastructure/ Middleware as Code
6. Build and Delivery Pipeline
7. Organizational Change

Build & Delivery Pipeline



<http://bit.ly/PRQ9dQ>

Organizational Change



'Shift Left' – Operational Concerns
Build 'Application aware' Environments
Environment Sprints

Put you seatbelts on :

OpenStack has many components & subcomponents (Services)

This helps with decentralized development & physical deployment scalability

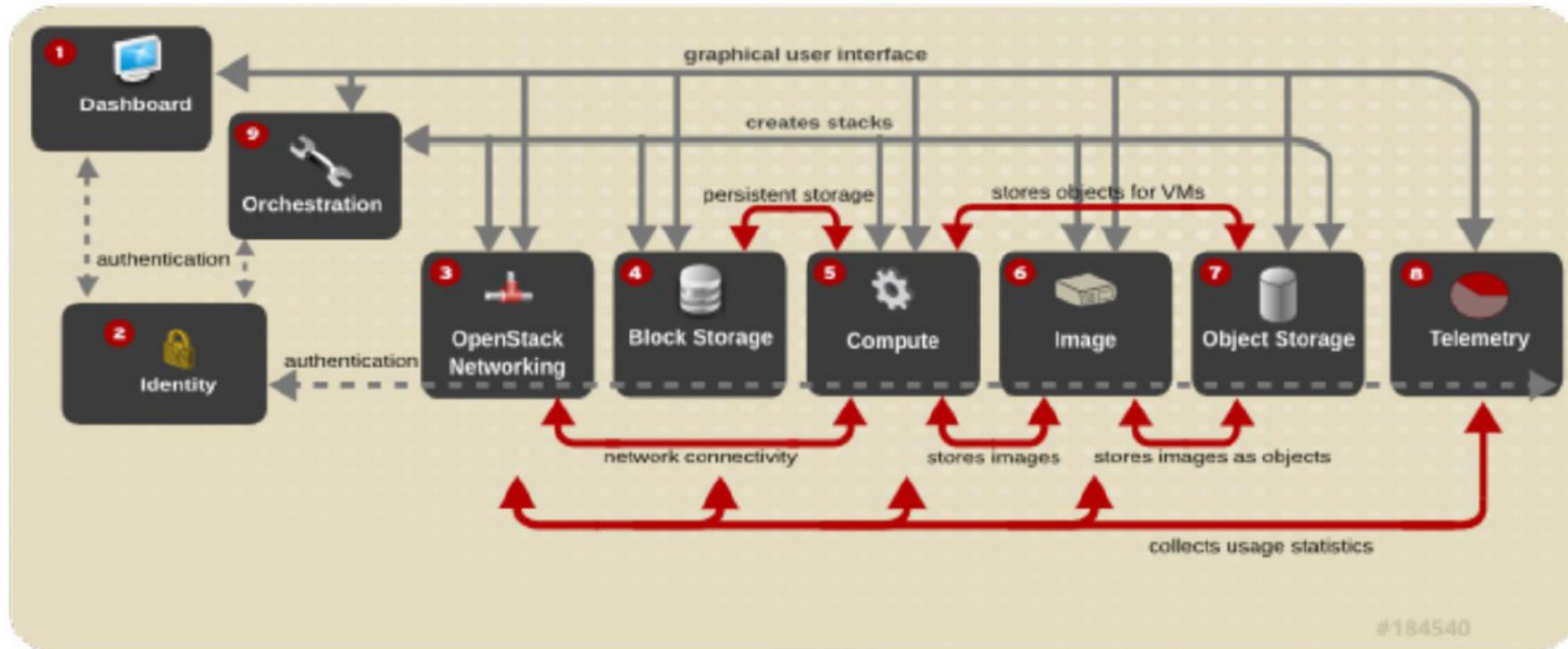
Facilitates extensibility (3Rd party plugins & drivers)

Increases complexity of administration and solution design

Can enable decoupling of Admin activities from end user services

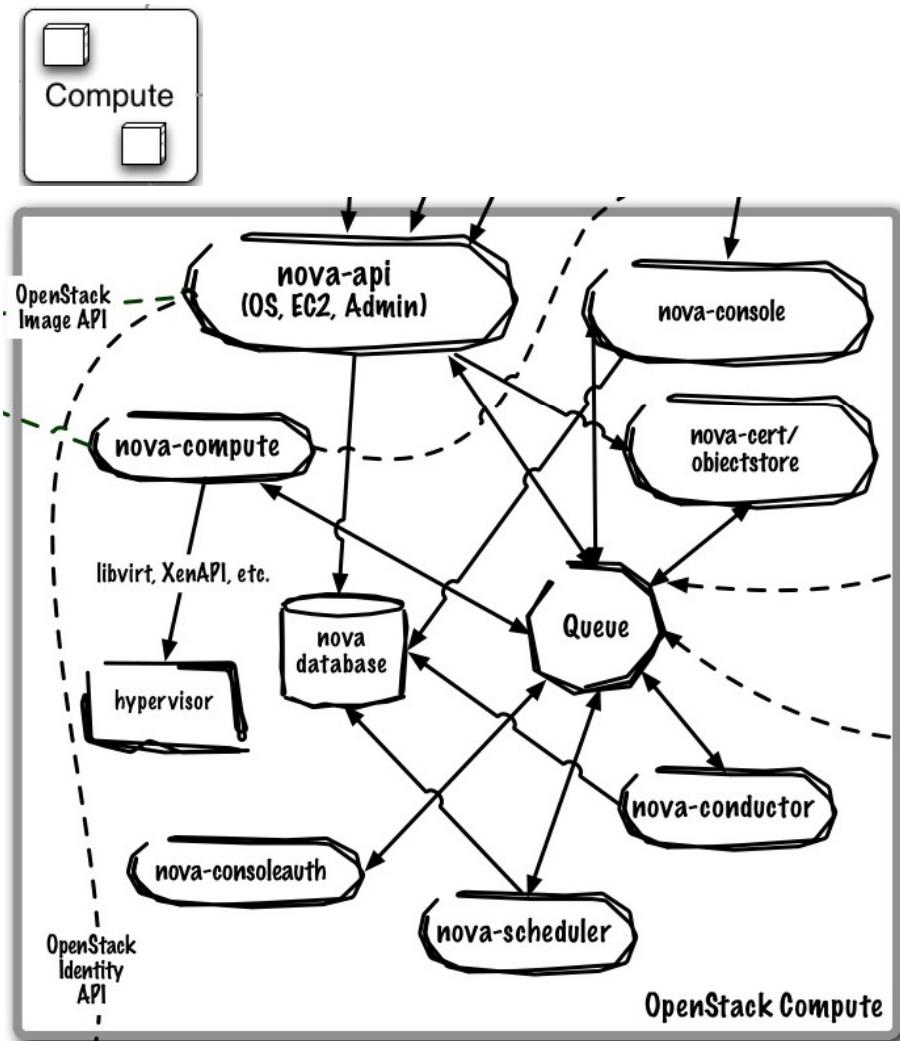
Reliance on an end-to-end component interface through a common messaging bus

Logical Architecture



- 1) Dashboard (Horizon)
- 2) Identity (Keystone)
- 3) Networking (Neutron)
- 4) Block Storage (Cinder)
- 5) Compute (Nova)
- 6) Image Service (Glance)
- 7) Object Storage (Swift)
- 8) Telemetry (Ceilometer)
- 9) Orchestration (Heat)

Compute (Nova) is a horizontally scalable platform offering on-demand compute resources by provisioning and managing VMs



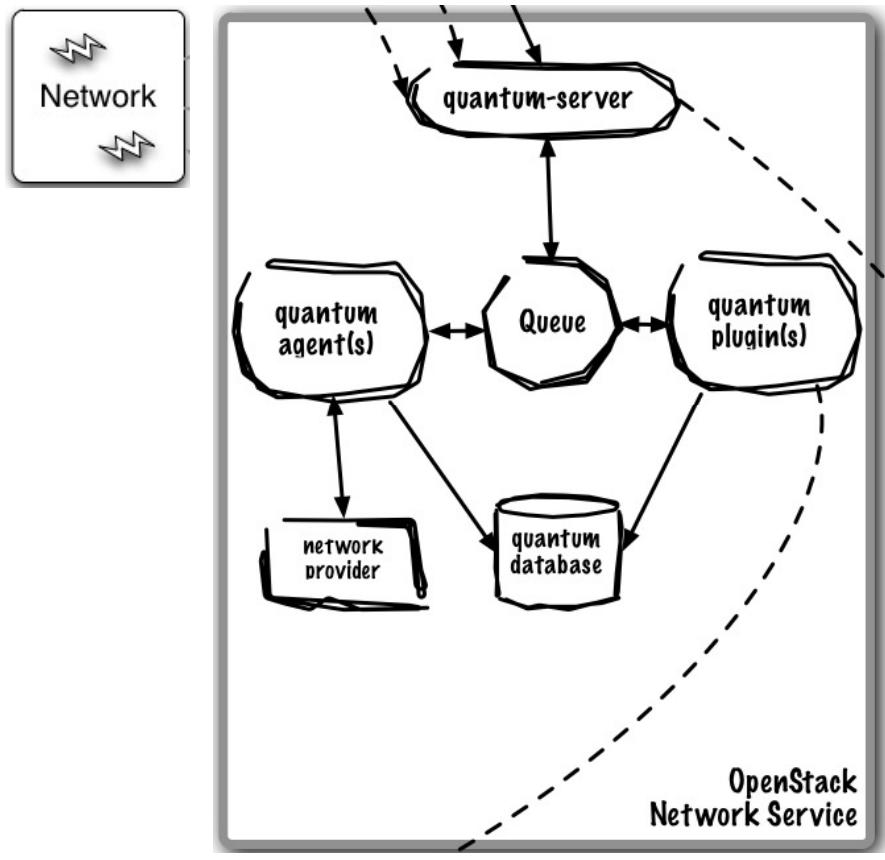
Core Use Case:

- Provision and manage virtualized compute resources (CPU, memory, disk, network)

Key Capabilities:

- REST-based APIs with rate limiting and authentication
- Manage Local Area Networks (LAN)
- Live migration of guests
- VM management (Instance)
 - Run, reboot, suspend, resize, terminate instances
- Floating IP addresses
- Security Groups
- RBAC with Projects & Quotas
- Manage to KVM, Xen (XenServer, Xen Cloud Platform), LXC, VMware vSphere 4.1+, Hyper-V, Bare Metal, PowerVM (limited)

Network (Quantum) is a pluggable, scalable and API-driven system for managing networks and IP addresses



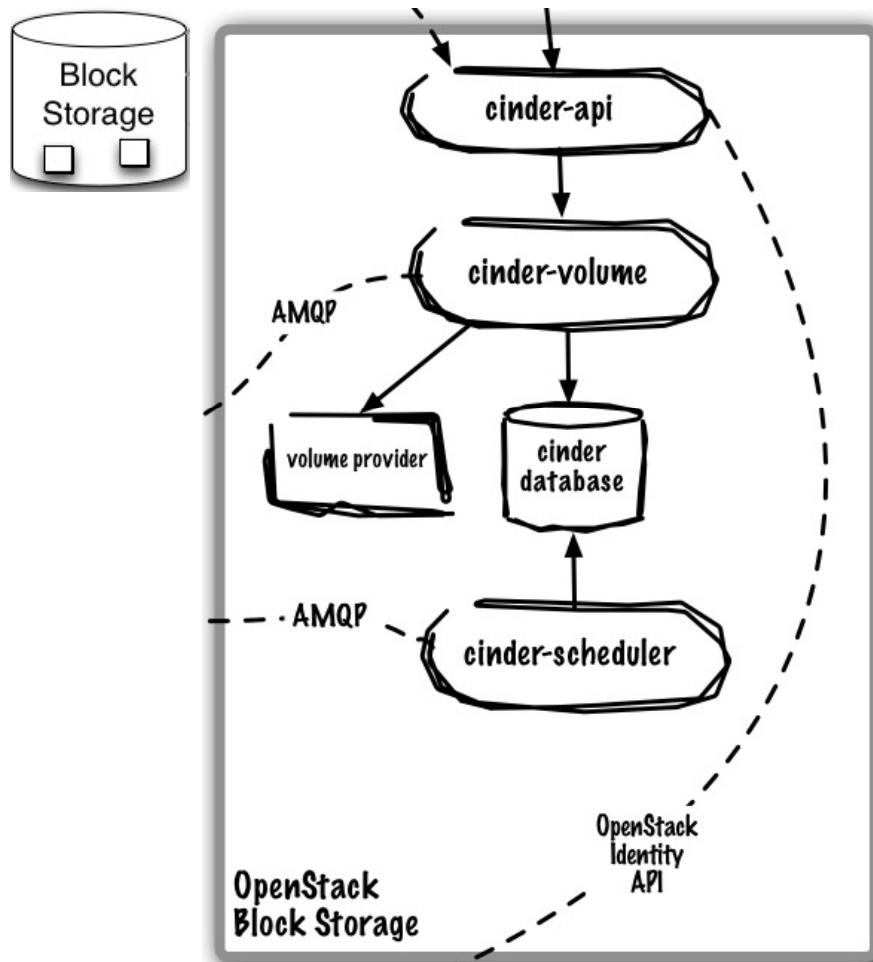
Core Use Cases:

- Provision and manage virtualized network resources (networks, ports, attachments)

Key Capabilities:

- Flexible networking models to suit the needs of different applications or user groups
- Create/delete tenant-specific L2 networks
- Attach / Detach host to network
- L3 support (IPAM – dedicated static and DHCP, Floating IPs, DHCP, Routing)
- L4-7 Support (Load Balancers)
- Extension framework enabling deploy and management of additional network services: intrusion detection systems (IDS), load balancing, firewalls and virtual private networks (VPN)
- Support for
 - Open vSwitch
 - OpenFlow (Big Switch, Floodlight, NEC controllers)
 - Cisco Nexus
 - Numerous SDN and network virtualization providers (e.g Niciria, Midokura, Plum Grid, Brocade, Mellanox)

Storage (Cinder) exposes block devices to be connected to compute instances for expanded storage, better performance and enterprise storage platform integration



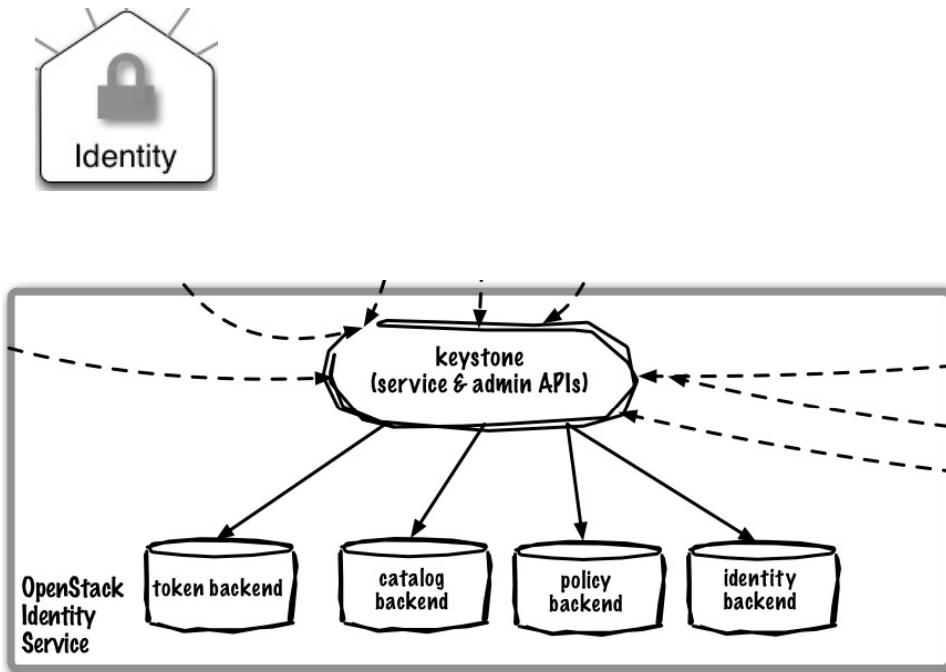
Core Use Cases:

- Provision and manage lifecycle of volumes and their exposure for attachment

Key Capabilities:

- Persistent block level storage devices for use with OpenStack compute instance
 - Manage the creation, attaching and detaching of the block devices to servers
 - Support for booting virtual machines from Cinder-backed storage
 - Snapshot and restore functionality
 - Supports following
 - LVM-backed volumes (iSCSI)
 - XIV (iSCSI)
 - SVC (iSCSI and Fiber Channel)
 - NetApp (iSCSI and NFS)
 - EMC (iSCSI)
 - HP/Lefthand (iSCSI)
 - RADOS block devices (e.g. Ceph distributed file system)
- (full list at [Cinder Support Matrix](#))

Identity Service (Keystone) offers project-wide identity, token, service catalog, and policy services designed for integration with existing systems



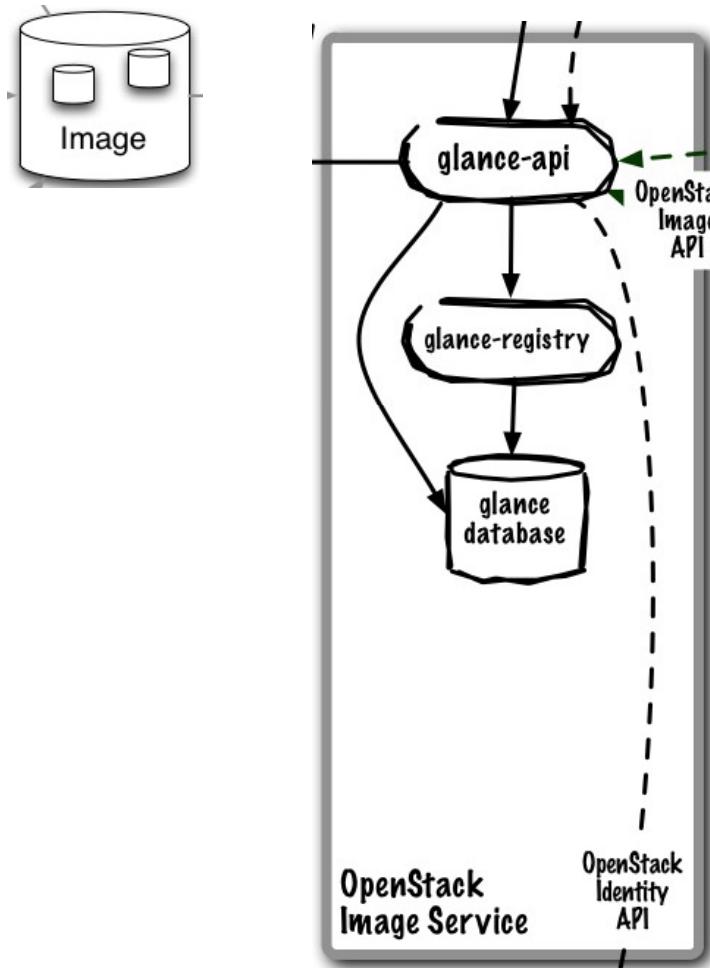
Core Use Cases:

- Installation-wide authentication and authorization to OpenStack services

Key Capabilities:

- Authenticate user / password requests against multiple backends (SQL, LDAP, etc) (Identity Service)
- Validate / manage tokens used after initial username/password verification (Token Service)
- Endpoint registry of available services (Service Catalog)
- Authorize API requests (Policy Service)
- Domain / Project / User model with RBAC for access to compute, storage, networking
- Policy service provides a rule-based authorization engine and the associated rule management interface.

Image Service (Glance) provides registration, discovery, and delivery services for virtual disk and server images



Core Use Cases:

- Administrator registers available guest images
- End-user discovers available guest images
- Deliver image to compute node on provisioning

Key Capabilities:

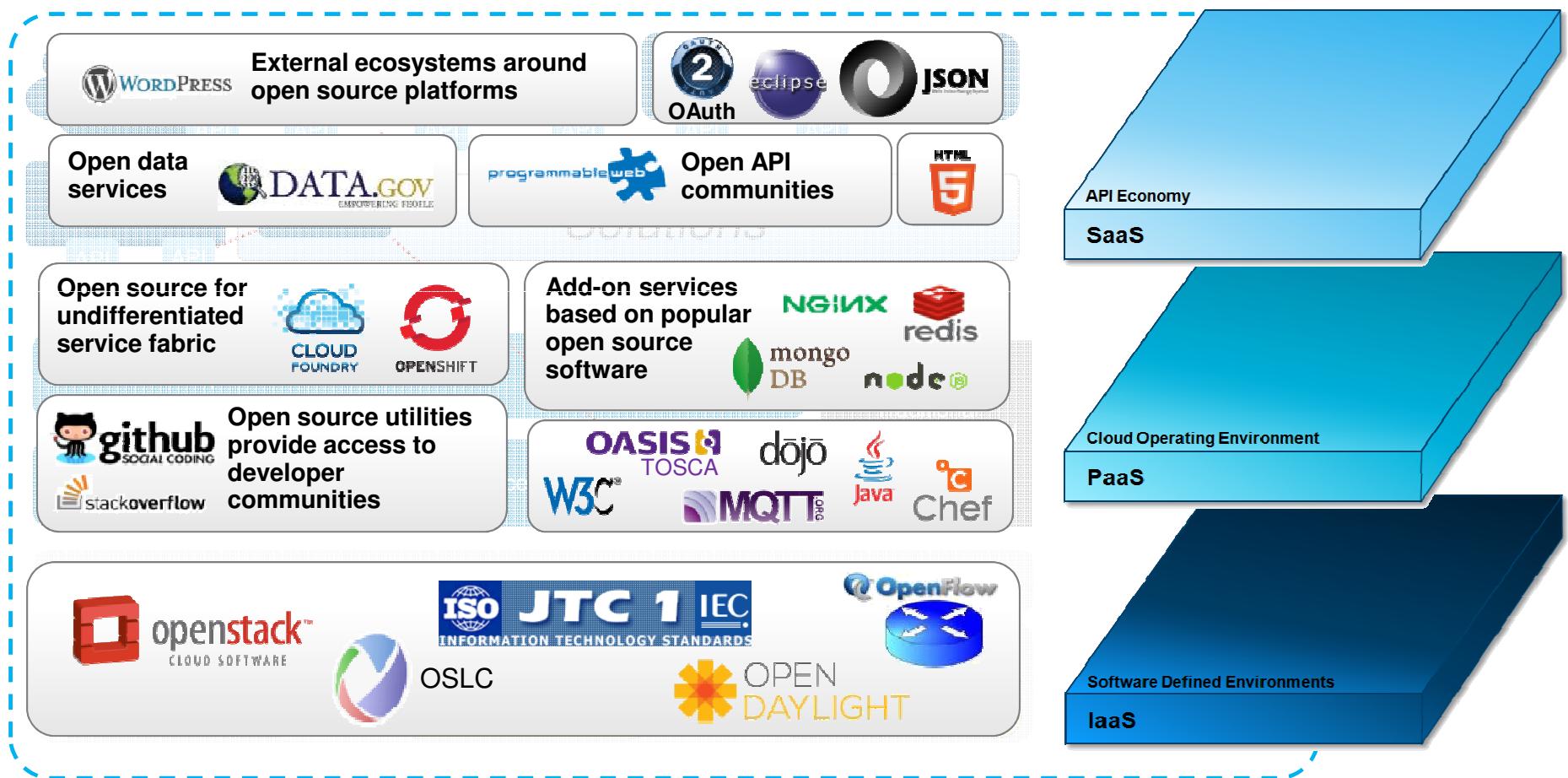
- Image Registry (storage optional and is delegated to a configurable store)
- Administrators can create base templates from which users can start new compute instances
- Users can choose from available images, or create their own from existing servers
- Snapshots can also be stored in the Image Service so that virtual machines can be backed up quickly
- Supported formats: Raw, Machine (a.k.a. Amazon AMI), VHD (Hyper-V), VDI (VirtualBox), qcow2 (Qemu/KVM), VMDK (VMWare), OVF (VMWare, others)

Orchestration (Heat)

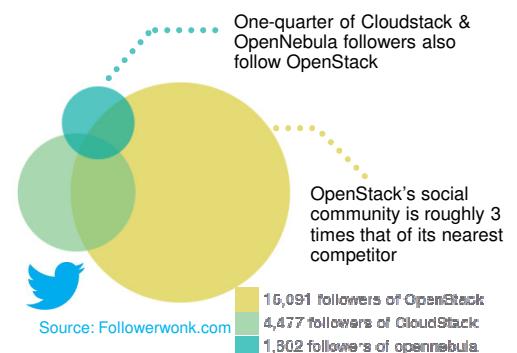
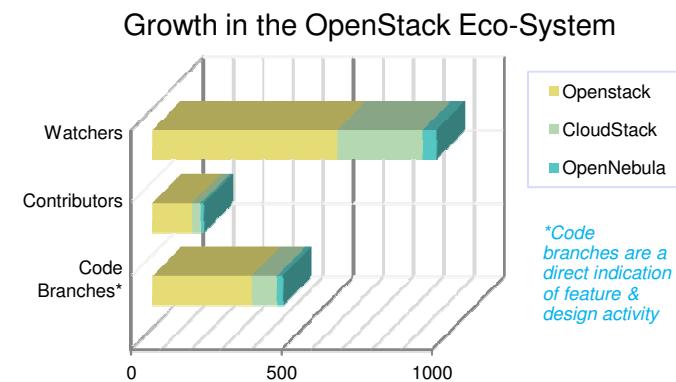


- A service to orchestrate multiple composite cloud applications using templates, through both an OpenStack-native ReST API and a CloudFormation-compatiable Query API
- Templates allow creation of OpenStack resource types (instances, floating IP's, volumes, security groups, users, and etc
 - Currently based on AWS CloudFormation templates
 - cloud-init
- Think of heat like rpm for the cloud

Building the next generation of Cloud architecture on Open technologies



The OpenStack ecosystem has exploded in the 18 months since the proposal, becoming the largest open source cloud community



OpenStack ecosystem growth

- OpenStack has the **largest active open source, cloud project community** (~2,500)
- Individual **membership up 273% since April 2012** (2,300 – 8,600+), with 52 User Groups in 37 countries
- **Social media leader** (3x the followers of nearest cloud project community)
- **Corporate sponsorship grew 22%** (135 - 165) since the OpenStack Foundation announcement
 - Notable additions include VMware & Microsoft
- **Summit attendance grew 3x**, 2011 to 2012
- **2,300 attendees of the Asia Pacific conference** in China, across 2 cities (Beijing & Shanghai), in July 2012

IBM impact on OpenStack

- IBM has **250+ employees working on OpenStack** (internal & external)
- **90 IBMers have signed the contributor agreement** for the community
 - **39 IBMers have had code contributions accepted**
 - **10 core contributors** on 8 projects from across IBM
 - **About One fourth of core contributors are IBMers**
- **IBM 2rd overall in code contributions and reviews** for current Grizzly release behind Red Hat.
 - 21% of the design features for the Nova (Compute) project were led by IBM
 - 11% of the design features for the upcoming Grizzly release were led by IBM

DevOps and Cloud adoption

IBM TRM

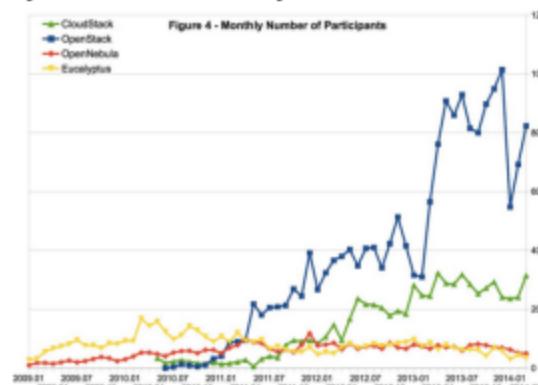
IBM is working to accelerate OpenStack Foundation success

| | | |
|-------------------|---------------------------|-------------------|
| Mar 2013 | Exponential growth | Sep 2014 |
| 859 Contributors | 2556 Contributors | 19088 Individuals |
| 8,500 Individuals | | |

Because an open interoperable Cloud is critical for flexible cloud deployment and customer success...



OpenStack Participant Growth



13

IBM has 13 core contributors

2

IBM is #2 in contributions to last releases

+80

IBMer active in the projects

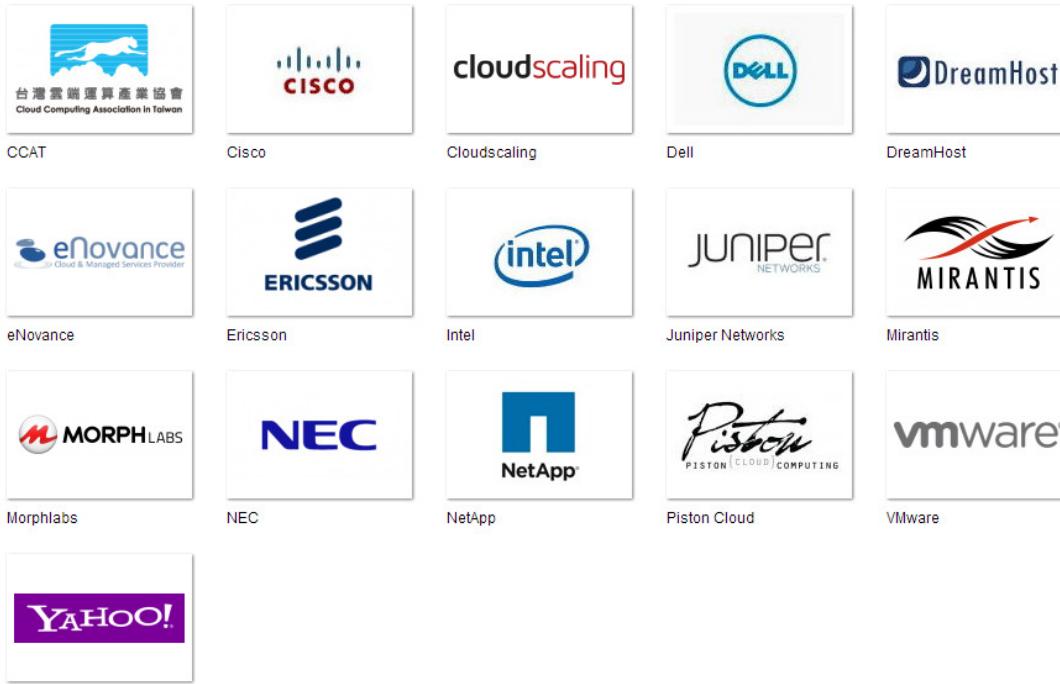
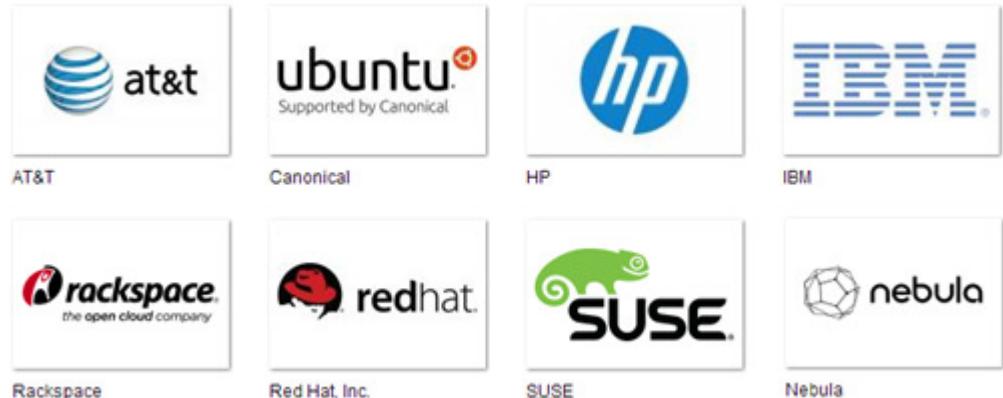
+400

IBMer working on OpenStack – from formation of the Foundation to Code Quality & New Function

IBM is 1 of 8 OpenStack Foundation Platinum Members

Platinum Members

- Maximum of 8
- Guaranteed board seat
- Responsible for committing full-time resources
- Provide significant portion of funding



Gold Members

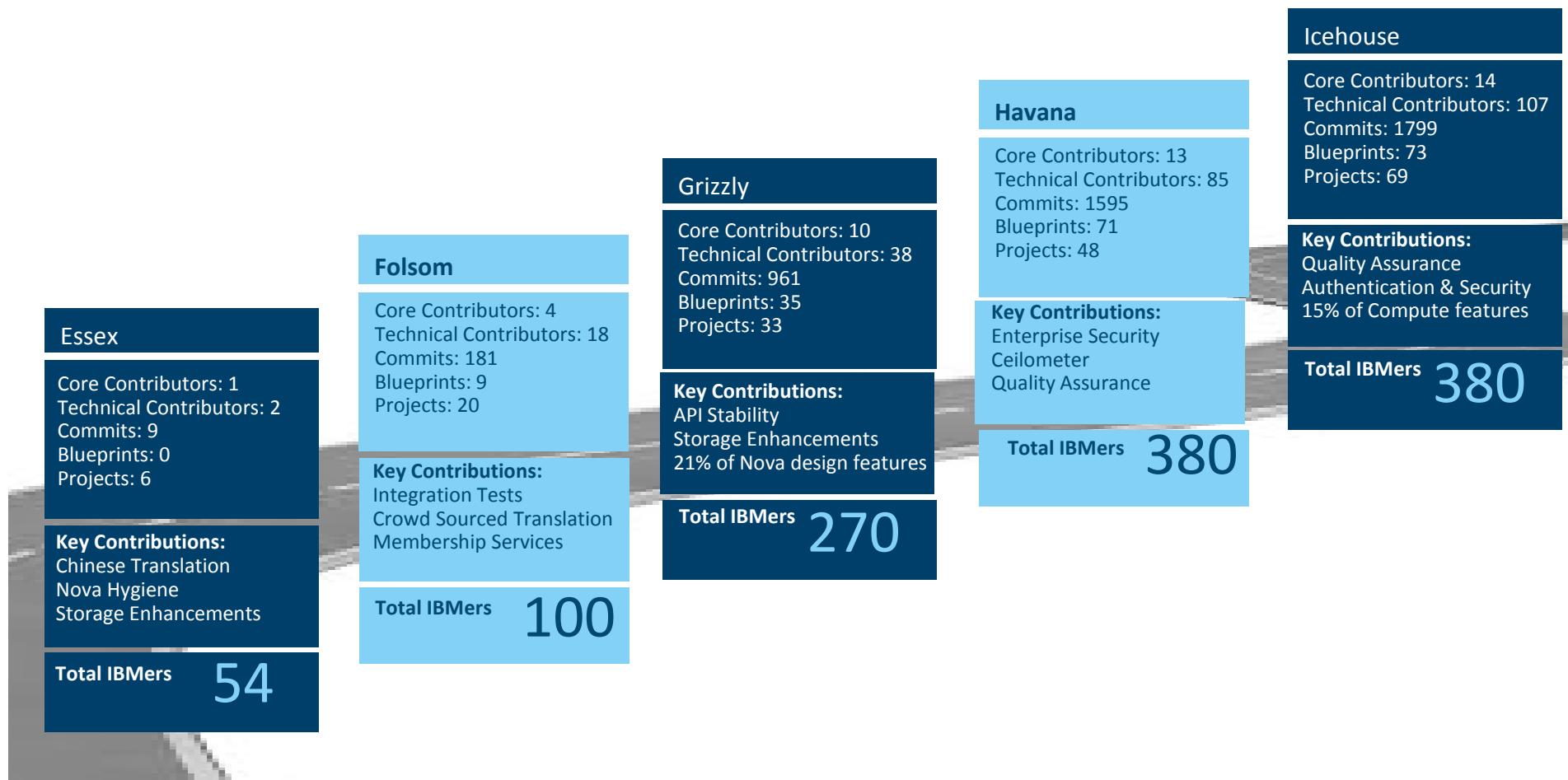
- Maximum of 24
- Gold Members elect 8 to represent on Foundation board
- Provide funding and pledge strategic alignment to the OpenStack mission

180+ companies have pledged support to OpenStack



Full List: <http://www.openstack.org/foundation/companies/>

IBM's Contributions to OpenStack: Road to Icehouse

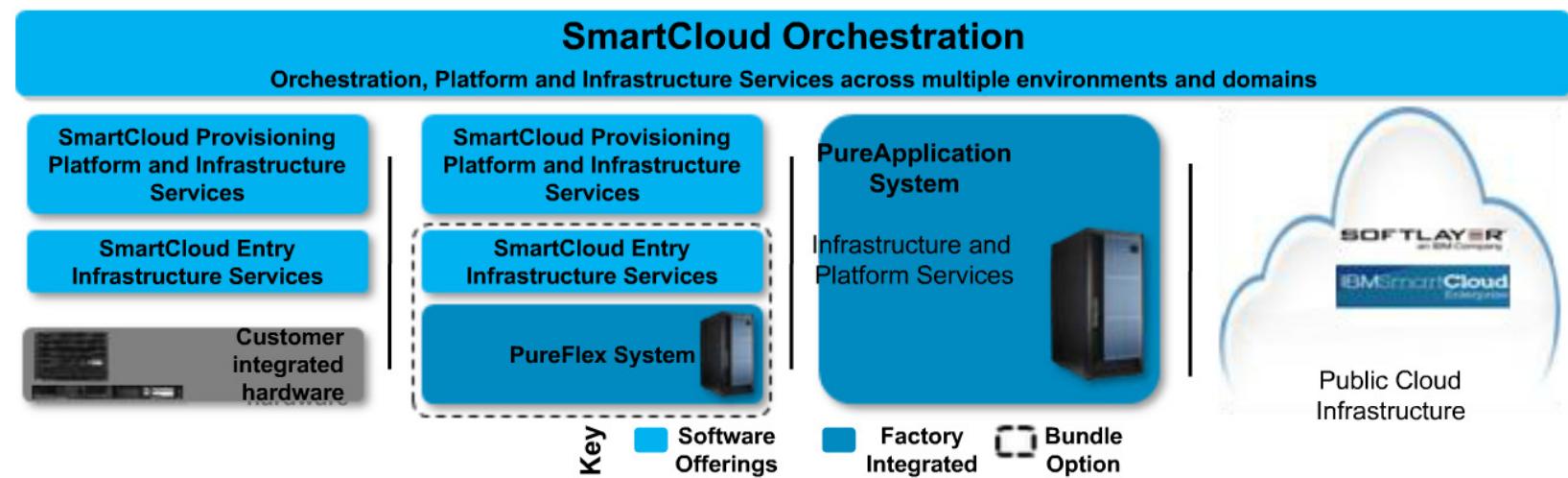


<http://www.stackalytics.com/> as of April 17th

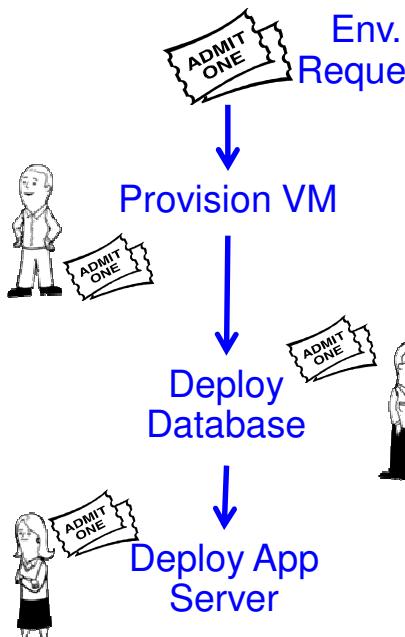
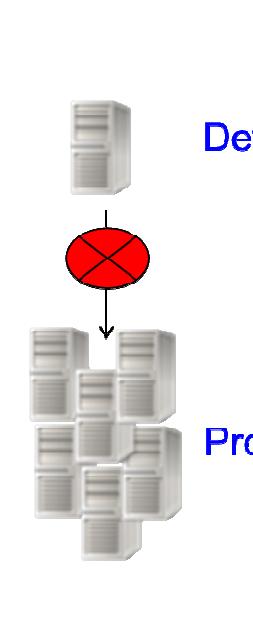
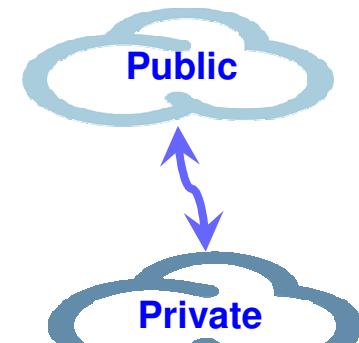
Where is it in IBM products?

IBM SmartCloud Offerings are built on OpenStack

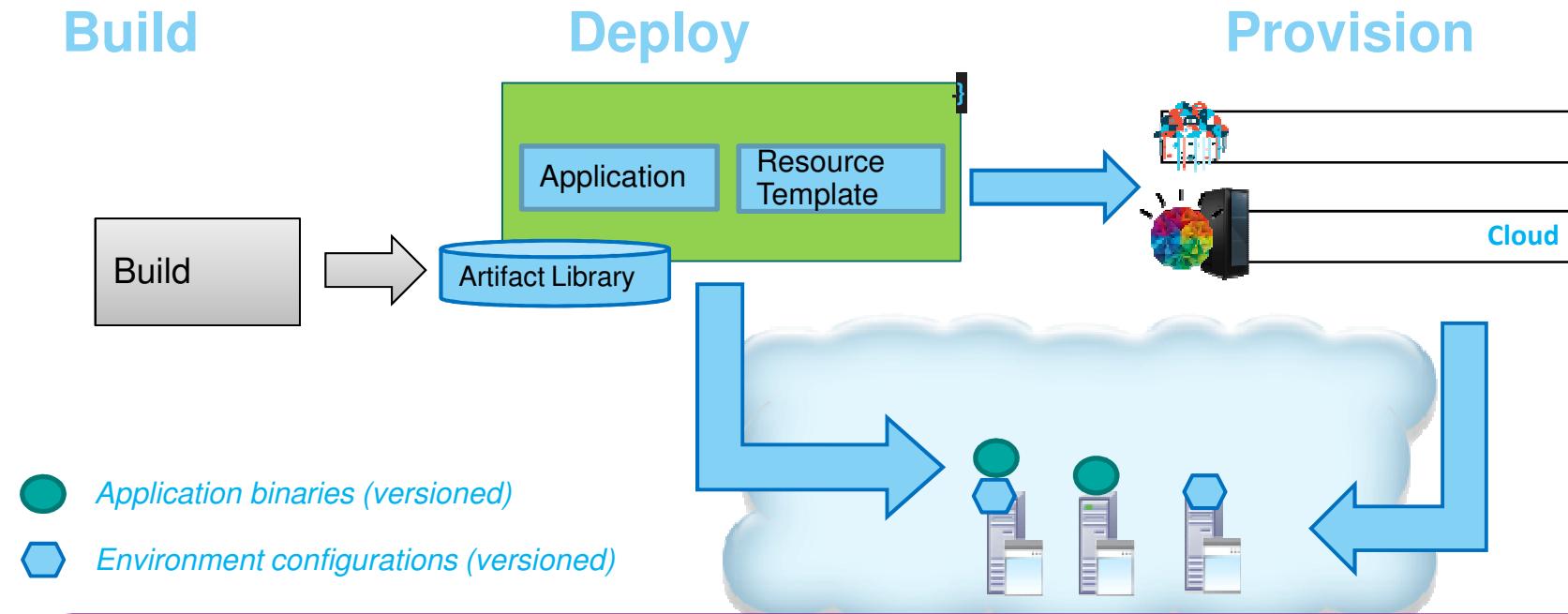
- Simple 3-tier structure, increasing client value at each tier and extending across hybrid cloud environments
- Using open, common, standards-based architecture providing choice, flexibility, interoperability and portability
- Clean upgrade paths with progression to fully integrated and factory optimized PureApplication System
- Significant benefits including ease of installation, enterprise hardening and additional capabilities above base OpenStack



Delivery challenges with infrastructure deployment

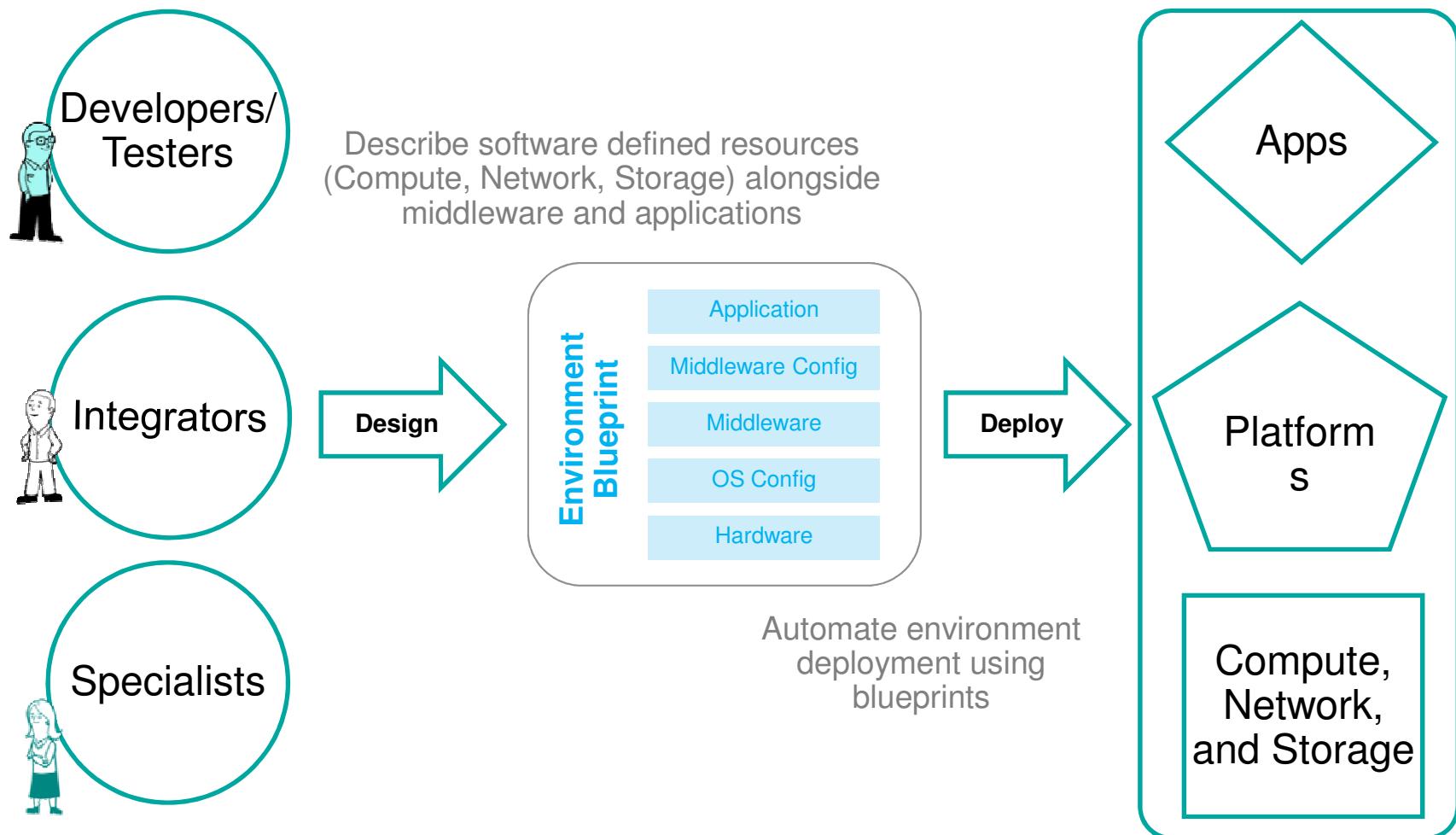
| Complex manual processes for deploying infrastructure lack repeatability and speed | Failures due to inconsistent development and production environments | Slow Infrastructure changes impacting delivery lifecycle | Managing large number of configurations for deploying to Hybrid Cloud |
|---|---|---|---|
|  <p>Env. Request Provision VM Deploy Database Deploy App Server</p> |  <p>Dev Prod</p> | <p>Application Changes</p>  <p>Infrastructure Changes</p>  |  <p>Public Private Develop Public, Deploy Private Market-Test Workloads Cloud Bursting</p> |

**How do we ensure that we deploy
What we want, When we want, Where we want!**

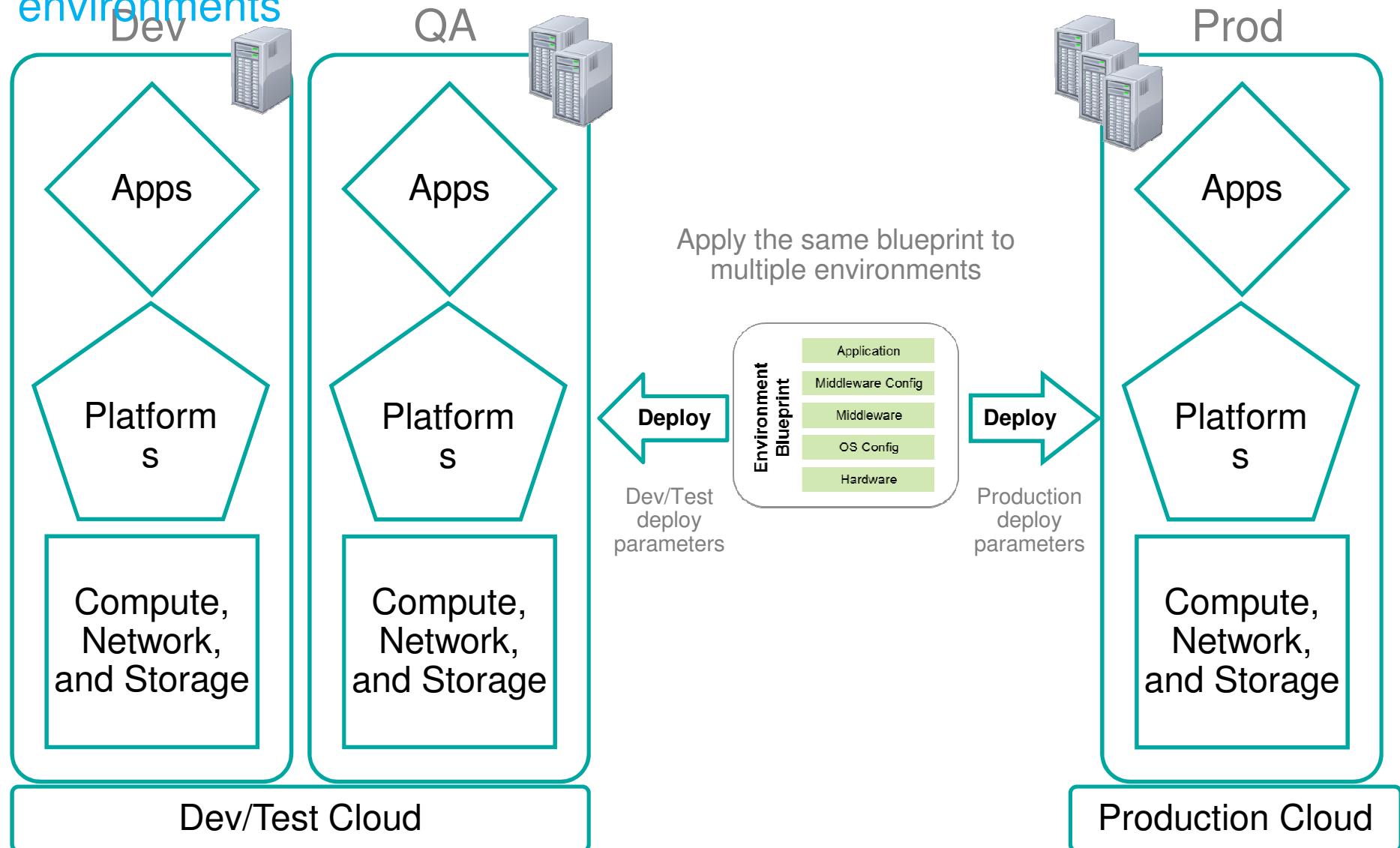


- **Automate provisioning of environments as part of the end-to-end delivery process** – Establish and automate deployment of Application Blueprint with resource templates imported from Cloud patterns.
- **Deploy early and often to ensure high quality and faster releases using repeatable, reliable, and managed automation** - Seamless process flow for incremental, full stack provisioning and application deployment automation

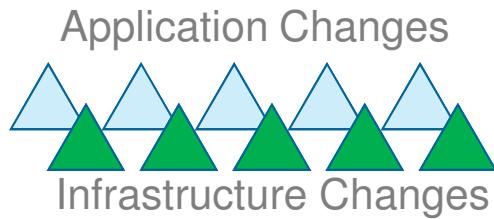
Capture and automate full-stack blueprints for faster and consistent environment deployments



Apply same blueprints across delivery pipeline for consistent environments



Manage infrastructure as code for simplified environment management

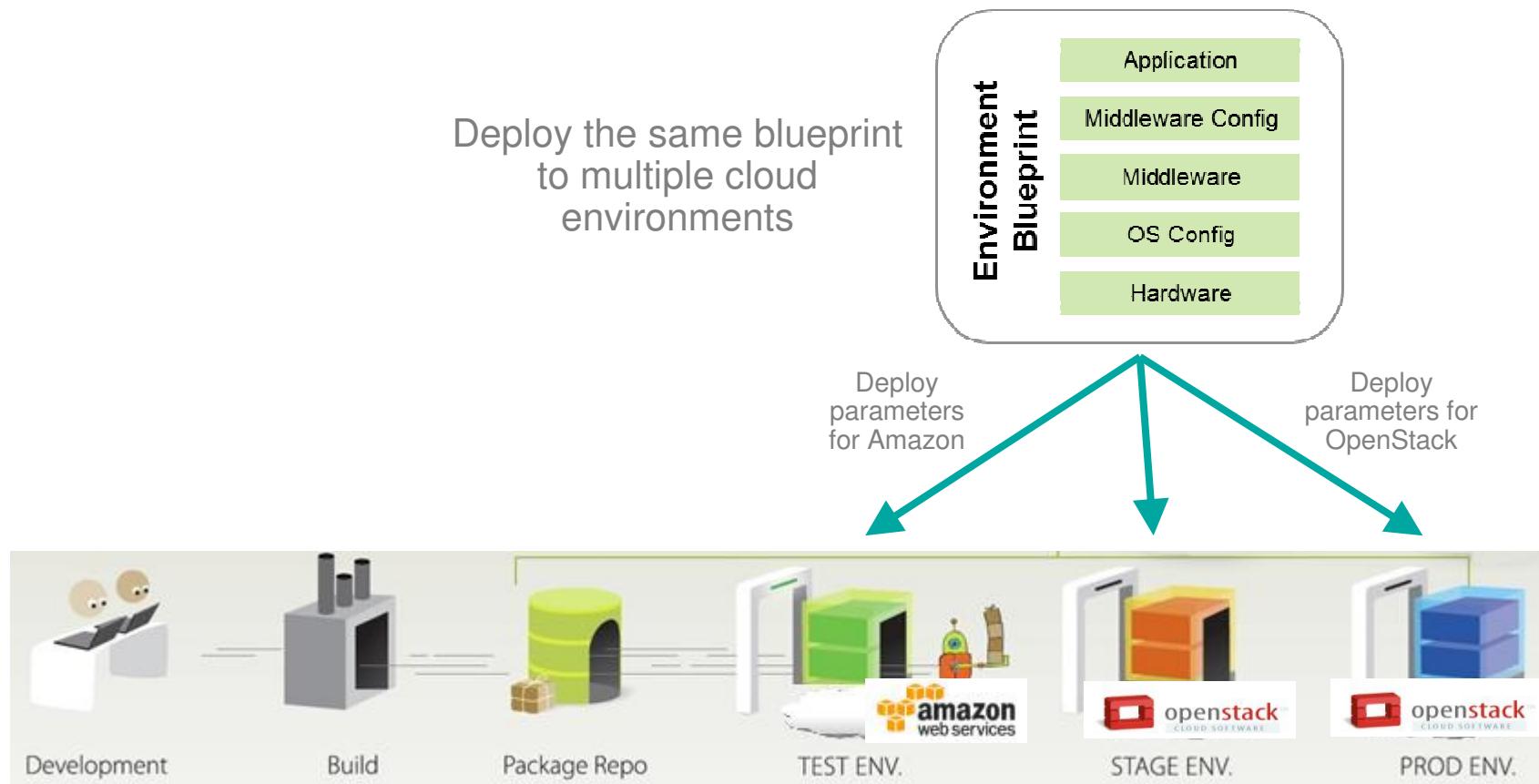


A Change is a Change !



- **Version** the blueprint using your source control repo (native support for git)
- **Apply** the new versions of the template to an existing environment or provision an entire new stack
- **Validate** changes with a "canary" pattern to ensure correctness and detect problems earlier
- **Verify** entire stack before production

Use Cloud portable blueprints to automatically deploy environments to hybrid clouds

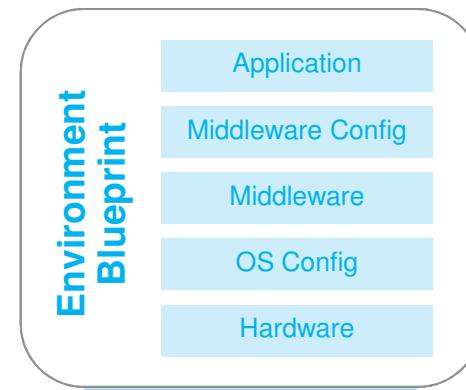


Introducing IBM UrbanCode Deploy with Patterns

Design and deploy full stack application environments for multiple clouds

✓ Pattern designer

Design open, full stack application environments in a diagram or textual editor



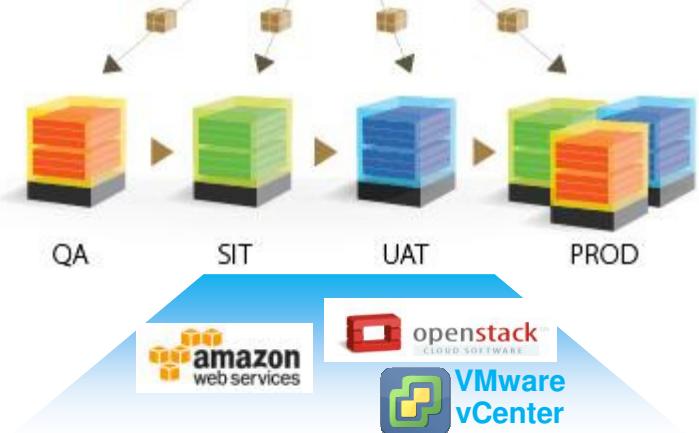
✓ Design once, deploy anywhere

Deploy full stack environments to multiple clouds

✓ Environment lifecycle management

Manage infrastructure change and easily apply changes to existing environments

IBM UrbanCode Deploy with Patterns



✓ Delivery process automation

Automated delivery process with integrated full stack environments

✓ Pattern designer



Diagram Editor

The screenshot illustrates the UrbanCode Deploy with Patterns Diagram Editor interface. The top navigation bar includes the IBM logo, the title "UrbanCode Deploy with Patterns", and user account information. The main workspace displays a network diagram titled "demo-net" with two web server components: "money_that_matters_web" and "money_that_matters_web1". The left sidebar, labeled "Pattern Browser", lists various deployment patterns such as "AllImageExample", "Example1", "GoodExample", and "MoneyThatMatters", with "MoneyThatMatters" currently selected. The right sidebar, labeled "Palette for diagram and text editor", lists components like "Referenced...Image", "CentOS-6.5", "cirros", "fedora-heat", "fedora-pageja-cfn", "heat-fedora-200", "RHEL-6.5", "ubuntu", and "ubuntu 12.04 (precise)". A large blue callout box highlights the "Provision new or update existing environment" button, which is positioned between the "Pattern Browser" and the "Palette for diagram and text editor". Red arrows point from this callout box towards the "Provision..." button in the toolbar and the "MoneyThatMatters" pattern in the browser.

✓ Pattern designer



Switch between Diagram and Text editor

The screenshot shows the UrbanCode Deploy Pattern Designer interface. On the left is a navigation sidebar with sections like Example3, New..., Save, Provision..., Files, Outline, Parameters, Parameter Groups, Resources (with items like resource_tree, ext_net, network_subnet, private_network, network_router, network_router_interface, router_gateway, database_tier1, database_tier2, database_tier3, web_tier1, web_tier2, web_tier3, mtm.db, mtm.db1), Outputs, and a bottom Outputs section. The database_tier1 item is selected and highlighted in blue. At the top, there are tabs for Diagram and Source, with the Source tab being active and highlighted with a red box and arrow. The main area is a code editor displaying a HOT (Human-Optimized Text) file for a database tier1 resource. The code defines properties such as type, properties (router_id, subnet_id), networks (port, flavor, image, key_name, name), and user_data (str_replace template). A large blue callout box states: "Environment Blueprint is a text document (HOT)". To the right is a palette titled "Component" under "Compute", listing various OS components: cirros, fedora-heat, fedora-pageja-cfn, heat-fedora-200, ubuntu, ubuntu 12.04 (precise), and ubuntu saucy. An arrow points from the palette to another blue callout box stating: "Palette works seamlessly on both editors". The bottom right shows sections for Network, Storage, Security, and Blueprint.

```
type: OS::Neutron::RouterInterface
properties:
  router_id: { get_resource: network_router }
  subnet_id: { get_resource: network_subnet }

database_tier1:
type: OS::Nova::Server
properties:
  networks:
    - port: { get_resource: database_tier1_port }
  flavor: { get_param: flavor }
  image: "53f6a6a9-0dd6-47c3-8ac4-cb82e250f75c"
  key_name: { get_param: key_name }
  name: database_tier1
  user_data:
    str_replace:
      template: |
        #!/usr/bin/env bash

        export UCD_AGENT_NAME="%application_name%.%environment_name%.%server_name%"
        echo ""
        echo ****
        echo "Installing UrbanCode Deploy agent for %ucd_hostname%:7918"
        echo "as $UCD_AGENT_NAME"
        echo ****
        echo ""
        echo ****
        echo "Installing dependencies for installation files - unzip command"
        sudo apt-get install unzip
        echo ****
        echo ""

        export UCD_INSTALL_HOME=/tmp/install_ucd_agent
        export UCD_INSTALL_TO=/opt/IBM

        export IBM_JDK_PACKAGE=ibm-java-jre-7.1-0.0-linux-x86_64.tgz
        export IBM_UCD_AGENT_PACKAGE=ibm-ucd-agent-script-package.zip

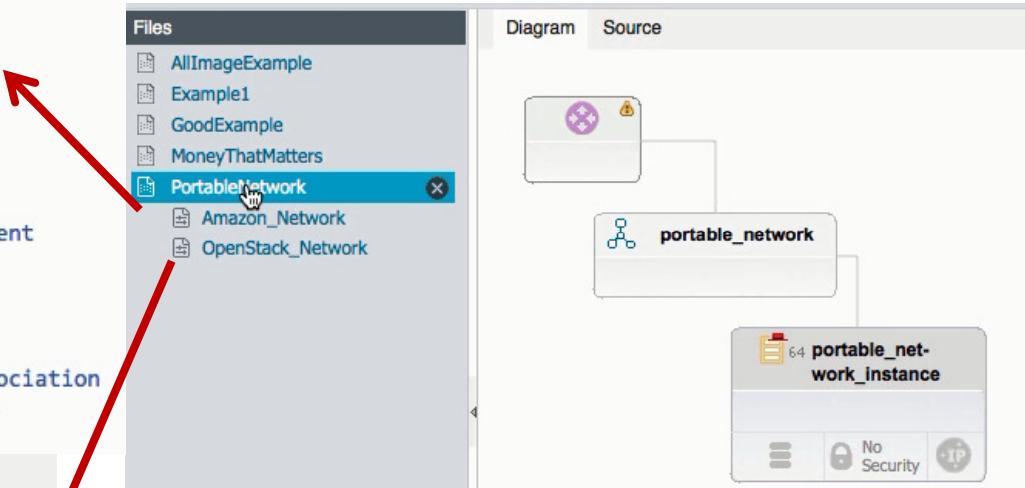
        export IBM_JDK_PACKAGE_URL="%bootstraps..url%/dIBM_JDK_PACKAGE"
```

Design Cloud Portable blueprints, and decorate for multiple clouds

```
Configuration
1 # Configuration file template
2 @ parameters:
3   image_id: ami-a73264ce
4   flavor: t1.micro
5   ssh_key_name: ucdev-aws-nva
6   zone_id: us-east-1d
7   access_id: AKIAJ5KAQU3TOCQWFIEQ
8   secret_key: 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
9   public_network_id: vpc-52bda430
10
11 @ resource_registry:
12   OS::Nova::Server : IBM::EC2::Server
13   OS::Cinder::Volume : IBM::EC2::Volume
14   OS::Cinder::VolumeAttachment : IBM::EC2::VolumeAttachment
15   OS::Neutron::Port : IBM::EC2::Port
16   OS::Neutron::Net : IBM::EC2::VPC
17   OS::Neutron::Subnet : IBM::EC2::Subnet
18   OS::Neutron::Router : IBM::EC2::RouteTable
19   OS::Neutron::RouterInterface : IBM::EC2::RouteTableAssociation
20   OS::Neutron::RouterGateway : IBM::EC2::InternetGateway

Configuration
1 # Configuration file template
2 @ parameters:
3   image_id: 53f6a6a9-0dd6-47c3-8ac4-cb82e250f75c
4   flavor: m1.small
5   ssh_key_name: example_key
6   zone_id: nova
7   access_id: None
8   secret_key: None
```

Decorate
portable
Blueprint for
Amazon



Decorate
Portable
Blueprint for
OpenStack

✓ **Environment lifecycle management**



Manage infrastructure change and easily apply changes to existing environments

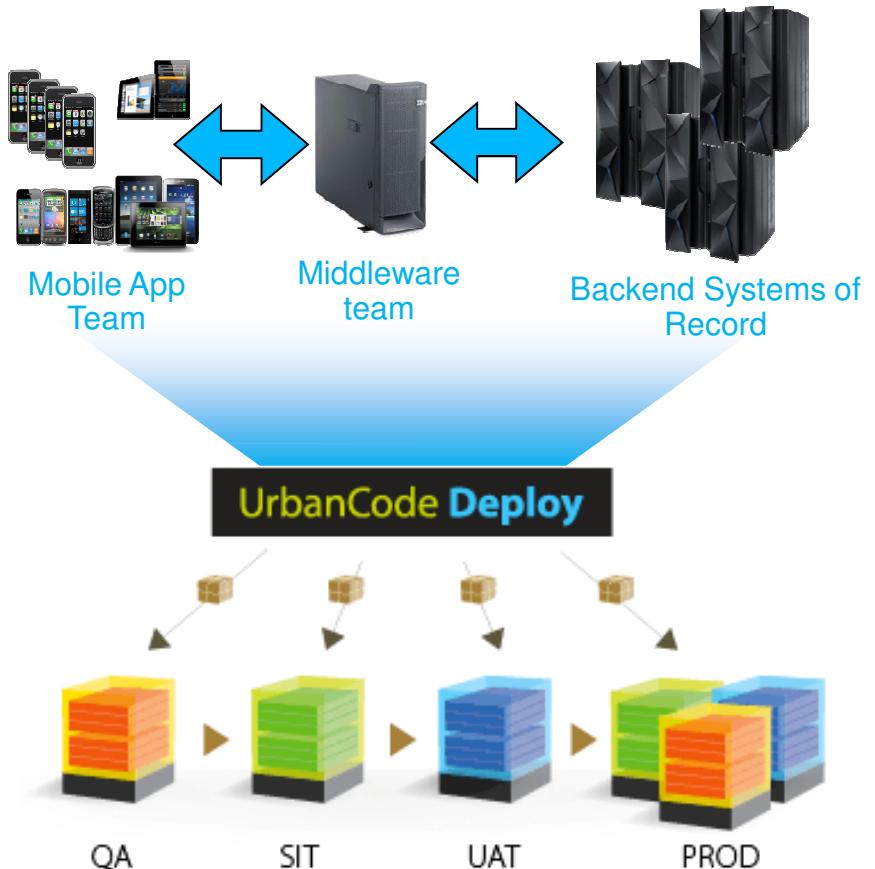
The screenshot shows the UrbanCode Deploy with Patterns application interface. On the left, a sidebar lists various environments: AllImageExample, Example1, GoodExample, MoneyThatMatters (selected), PortableNetwork, Amazon_Network, and OpenStack_Network. A blue callout box with the text "Apply blueprint changes to existing provisioned environments" points to the "Apply..." button in the top navigation bar. The main workspace displays a network diagram with a central "demo-net" node connected to two "money_that_matters_web" instances, labeled "mtm.web" and "mtm.web1". To the right, a sidebar titled "Component" lists Compute, Network, Storage, Security, and Blueprint sections, with Compute expanded to show options like CentOS-6.5, cirros, fedora-heat, fedora-pageja-cfn, heat-fedora-200, RHEL-6.5, ubuntu, ubuntu 12.04 (precise), and ubuntu saucy.

✓ **Delivery process automation**



Extending the power of UC Deploy to deploy application and manage delivery process

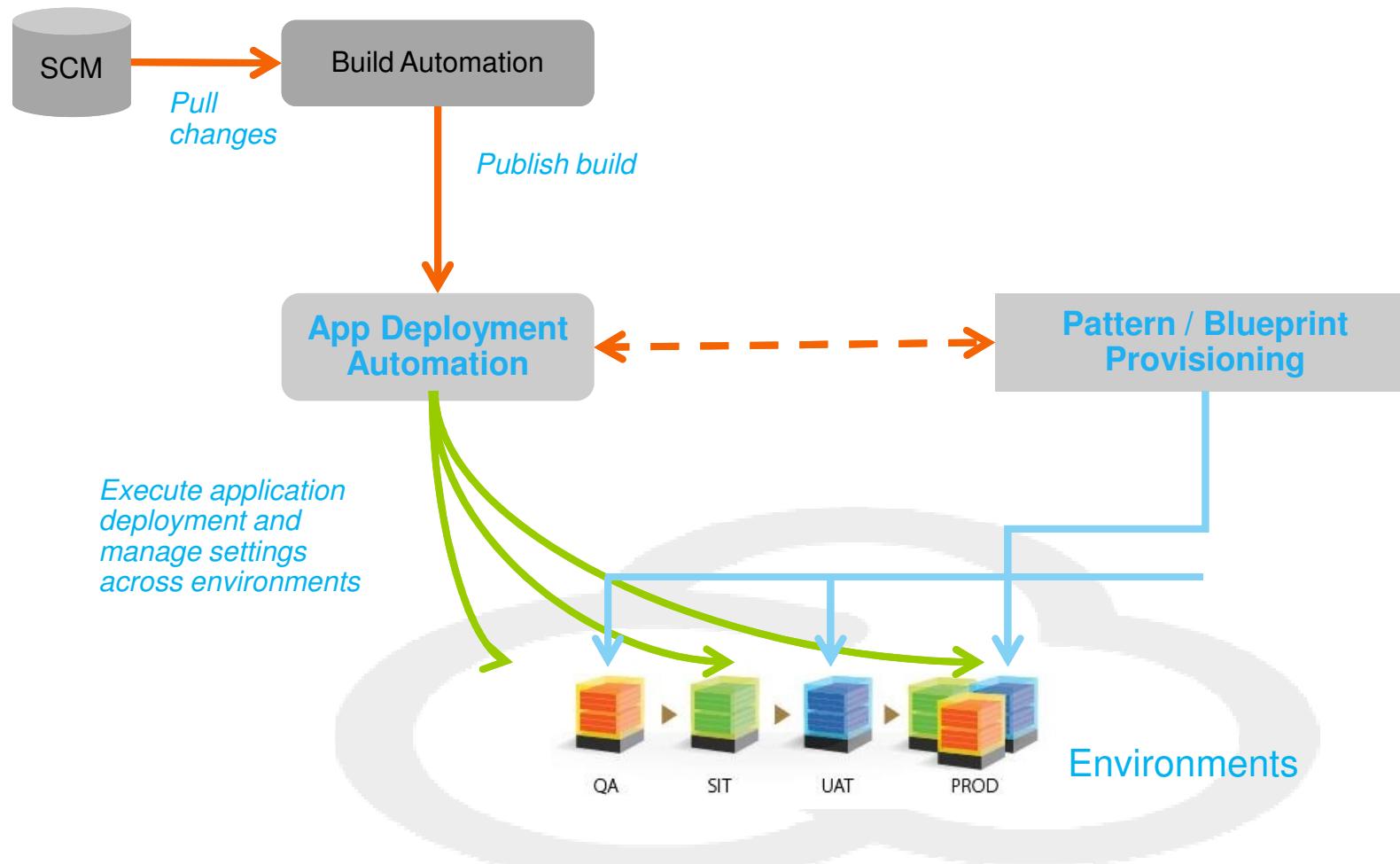
- Manage application components and versions
- Manage configurations across all environments
- Offer secure ‘self-service’ capabilities
- Increase transparency
- Ensure governance and compliance



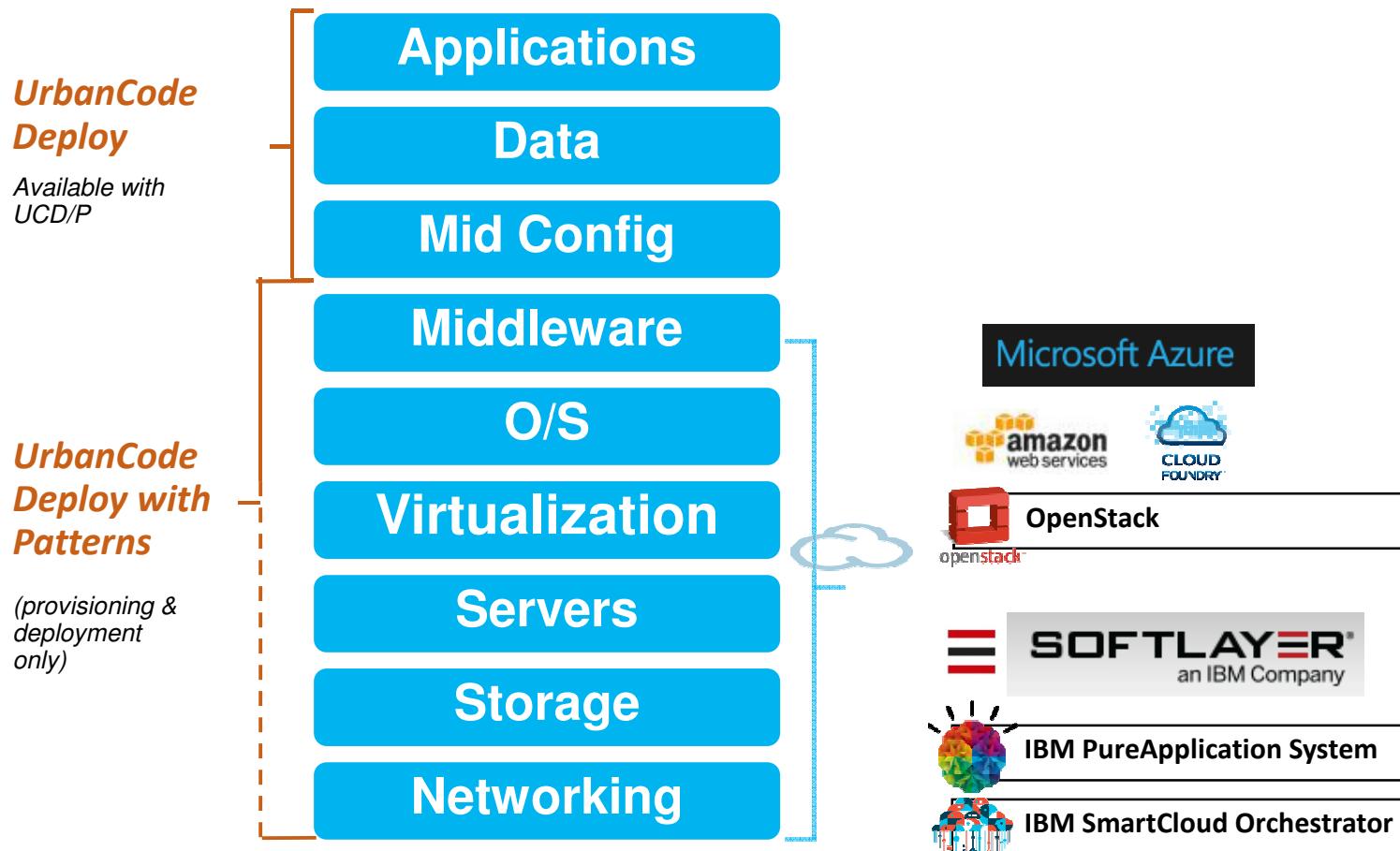
✓ **Delivery process automation**



Faster, repeatable, reliable full-stack deployment processes



DevOps and Cloud adoption



References

- IBM DevOps
 - www.ibm.com/ibm/devops/us/en/solutions
 - www.ibm.com/developerworks/devops/
 - www.ibm.com/software/rational/dummiesbooks/devops
- Jazz and OSLC
 - www.jazz.net
 - www.open-services.net
- Background info on this session:
 - DevOps learning circle community: (on developerworks):
[https://www.ibm.com/developerworks/community/groups/service/html/communityview?communit](https://www.ibm.com/developerworks/community/groups/service/html/communityview?communityUuid=860ff390-6cab-4f95-ab37-66d2ca7521b4)
<http://openstak.org>
 - OpenStack Community Documentation
<http://docs.openstack.org/>