embotics
the cloud automation company

Next Generation Cloud Management Platforms

Transforming Digital Business with CMP 2.0

Executive Overview

Business today is increasingly digital; core capabilities and services provided to customers are software-based. To effectively compete, today's businesses need to be able to deliver these software features, services and solutions far more rapidly than ever before while maintaining high quality and preserving a rich user experience. Businesses are strategically investing in next generation cloud-native applications built and delivered using DevOps methodology and also modernizing complex existing enterprise applications and moving them to the cloud.

With digital businesses, bringing software based functionality to market in a timely manner with high performance is a competitive necessity. Software-based services are no longer back-office functions, they are a core element that businesses are directly providing to customers. Microservices, containers, serverless computing and PaaS are the building block technologies used to deliver these cloud-based services along with DevOps methodologies, however applications based on these technologies are comprised of many more moving parts and have more components to manage; hence easy-to-consume automation and orchestration are a necessity.

Traditional cloud management platforms (CMPs) were focused on virtual infrastructure/Infrastructure as a Service (IaaS), and with delivering IT efficiency and control, but were not as well-aligned with DevOps methodology and the associated faster delivery of functionality and services.

The first generation of CMP software solutions were designed for managing legacy applications and focused on a subset of virtual machine (VM) and infrastructure-centric capabilities including provisioning automation, self-service, and cost reporting. The next generation of CMPs must also manage cloud-native, and microservice-based application architectures while providing an expanded portfolio of functionality that also facilitates DevOps methodologies.

Enterprises today want the benefits promised by true multi-cloud technology, including the ability to manage their applications and infrastructure, spanning public, private and hybrid clouds, as well as help with selecting the right platform for any given application. This includes provisioning, automation, orchestration, governance, resource optimization and cost control.

What is CMP 2.0?

CMPs arose to fill gaps in transformational virtualization technology so that customers could achieve the benefits/value/justification with fewer resources and fewer labor-intensive manual tasks. CMP 2.0 considers the changing world of next generation applications where containers are first class citizens and the platform is built with Microservices and DevOps in mind. As with CMP 1.0 systems, CMP 2.0 also fills a gap in sea change technologies, that of cloud-native applications so that customers can achieve the benefits/value/justification more easily.

With the explosive growth of the cloud, big data analytics and SaaS-based business applications and services, we've seen a transformation of the underlying application architecture. Modern applications are being constructed out of a collection of autonomous, independent building blocks, each dedicated to a single function.

To be successful, however, a CMP 2.0 must manage both IaaS and the next generation of cloud applications.

Microservices, Containers and Cloud-Native Applications

With the explosive growth of the cloud, big data analytics and SaaS-based business applications and services, we've seen a transformation of the underlying application architecture. Modern applications are being constructed out of a collection of autonomous, independent building blocks, each dedicated to a single function. These microservices (cloud-native applications) represent a new application architecture and methodology that decomposes the large monolithic applications of the past into a set of small, discrete processes that facilitates independent development, deployment and release schedules for each independent function.

At a basic level, the use of microservices is a more evolved successor to principles first espoused as service-oriented architectures (SOA) used to build flexible, independently deployable software systems. Services in a microservice architecture are processes that can scale out independently. They communicate with other microservices over a network message bus, and each microservice fulfills one and only one specific function for the overall application. Each microservice has a carefully constructed API that other microservices use to make requests of it. Microservices typically have their own dedicated persistent state that is not exposed to other microservices, enabling each microservice to provide its function without any information about the internal implementation visible to any other services — all that is required is that they have well-defined APIs that they support respectively.

Containers are a key building block for developing cloud-native applications or microservices, as they serve as a convenient envelope for frictionless application portability and rapid provisioning. Containers are frequently used to run each individual microservice and the rapid, automated creation of containers is what enables the scale-out and high availability properties for the service.

While microservices can make it easier to efficiently build, deploy and scale today's large-scale applications, their complexity when viewed as a whole system can be daunting for application lifecycle management and resource efficiency if not properly managed. Automation is the key to reducing this complexity and enabling the seamless delivery of complex, global scale services delivered with less and less custom code. Microservices design methodology makes it easier to develop systems with reusable component parts that can be maintained and distributed independently by separate teams and utilized by multiple applications and services throughout an organization.

The more component parts that exist in an application, the greater the need for abstraction and automation. When CMPs fully embrace microservices and containers, they can ease the manual workload and allow development teams to innovate and deliver functionality faster, as separate development teams can build and deploy each microservice independently of others, as well as ease friction with operations teams.

DevOps Methodology

DevOps is a game-changing development and deployment methodology that can enable businesses to deliver services faster and with higher quality than with traditional methods. DevOps embraces a close collaboration between contributing software developers, quality assurance (QA) and IT operations staff, and encourages a continuous technological flow. This can lead to shorter release cycles, faster time-to-market for valuable new capabilities, less intrusive upgrades, higher software quality and better user experiences. Increasingly, companies of all sizes are looking to embrace this style of development because:

1) they recognize that the software services they deliver have become strategic to the business, not just a back-office function, and,

2) their competitors are using these techniques and they have to keep up.

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Why does DevOps give quicker, more predictable and higher quality results? DevOps encourages rapid/frequent integrations and frequent communication between team members. Waterfall development meant a lot of upfront design work, building large components independently and then integrating them. This usually resulted in many missed deadlines as team members made different incompatible assumptions. Also, upfront design didn't allow for adjusting the design along the way as more was learned about the details of the project. DevOps arose as a reaction to the problems with waterfall development and avoids these problems through continuous integration, with each integration being much smaller in scope.

Well-designed CMPs can facilitate and help traverse the technical and cultural impediments to DevOps deployments in areas such as QA or performance evaluations before impacting end-users. CMPs can also assist with automating staging to production roll-outs.

Differences Between CMP 1.0 and 2.0 Systems

CMP 1.0 solutions provide provisioning automation, workflow orchestration, self-service, cloud governance, single pane of glass visibility, capacity rightsizing, and cost management across public, private and hybrid clouds. They allow IT organizations to deliver IaaS and enable value through business agility, operational consistency, and efficiency savings.

CMP 2.0 solutions bring the same values as a CMP 1.0, while also reducing the friction and complexity associated with microservices, containers, serverless applications, and the adoption of agile DevOps methodologies and seamlessly providing corporate governance and compliance to these environments without impeding agility.

HOW CMP 2.0 DELIVERS VALUE

SPEED

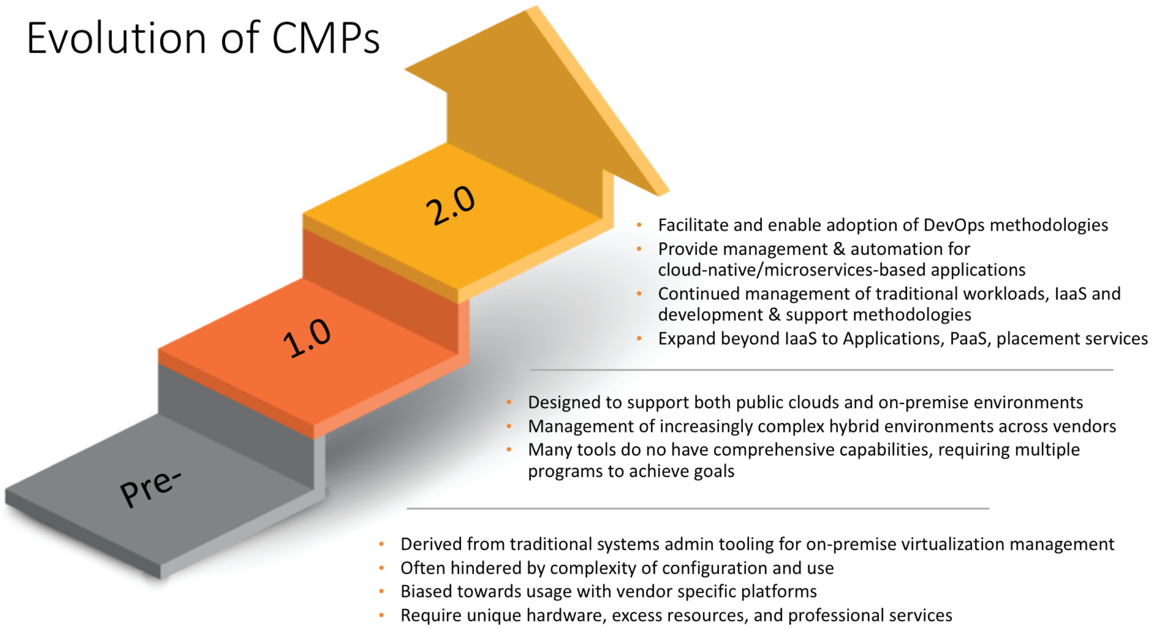
- Get your digital business moving faster than ever with provisioning automation and DevOps orchestration, designed for frictionless operations of microservice based applications running in hybrid cloud environments.

AUTOMATION AND ORCHESTRATION

- Eliminate error-prone manual tasks while improving the performance of applications through process orchestration and cloud-native API consumption. Enable automation of unit/ system/production testing, and intelligent workload and application placement.

GOVERNANCE

- Maintain the integrity and optimize cost of building, testing, running and decommissioning applications without slowing down the speed of business with governance and cloud cost optimization. In addition, provide system administrators the flexibility to offer and/ or enforce cloud governance policies at provisioning time through workflows.


Evolution of CMPs

- Facilitate and enable adoption of DevOps methodologies
- Provide management & automation for cloud-native/microservices-based applications
- Continued management of traditional workloads, IaaS and development & support methodologies
- Expand beyond IaaS to Applications, PaaS, placement services

- Designed to support both public clouds and on-premise environments
- Management of increasingly complex hybrid environments across vendors
- Many tools do no have comprehensive capabilities, requiring multiple programs to achieve goals

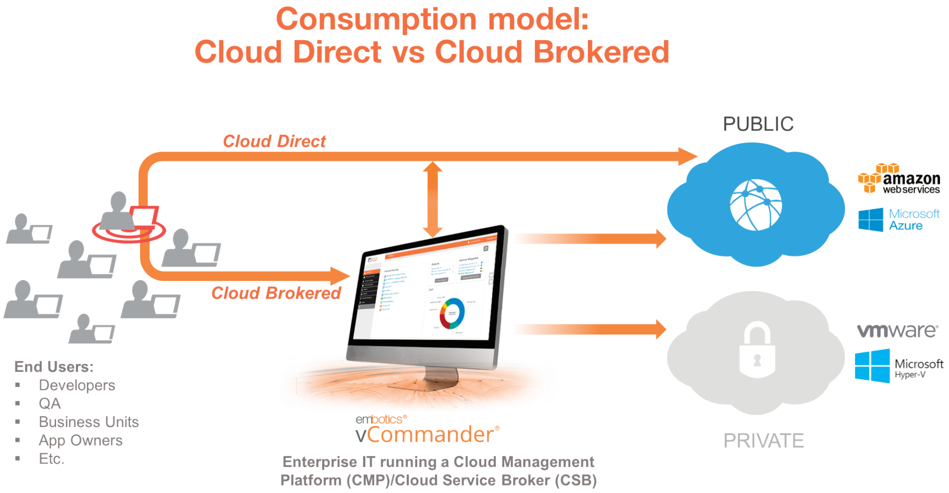
- Derived from traditional systems admin tooling for on-premise virtualization management
- Often hindered by complexity of configuration and use
- Biased towards usage with vendor specific platforms
- Require unique hardware, excess resources, and professional services

How CMP 2.0 Will Advance Digital Businesses

First generation CMPs deliver self-service provisioning, automation and orchestration, right-sizing, cost insights, governance & compliance, and single-pane-of-glass management for public, private & hybrid cloud. They have an IaaS/VM focus. But the world is changing and cloud-native applications are being built with microservices & DevOps methodology. Infrastructure is provisioned by applications using APIs (referred to as infrastructure as code). CMP 2.0 considers this changing world of next generation applications. CMP 2.0 must also consider the two main cloud consumptions models, as illustrated in the following section.

Cloud Consumption Model: Direct vs Brokered

In many enterprises today, cloud consumption is happening in an ad-hoc or varied fashion in various pockets of a large organization. There are two basic consumption models for public resources: With “Cloud Direct”, the end users are communicating directly through cloud-native APIs. With “Cloud Brokered”, a CMP is acting as an intermediary between the end users and the public clouds. There are also cases within a single enterprise where both cloud consumption models are used. These various options are illustrated as follows:



In a CMP 2.0 world, value must be added, regardless of the cloud consumption model. As an example, in the Cloud Direct case, the CMP can provide a single pane-of-glass across the entire hybrid cloud environment and can perform showback/chargeback as well as some reactive cost optimizations. This provides engineering teams with the freedom to consume public cloud resources as needed, thus preserving overall corporate agility. In the Cloud Brokered case, additional, more proactive CMP values can be achieved, such as cost/quota enforcement and optimized workload placement. Over time, cloud consumption can move from direct to brokered, to fully realize the value of a CMP.

CMP 2.0 Business Benefits

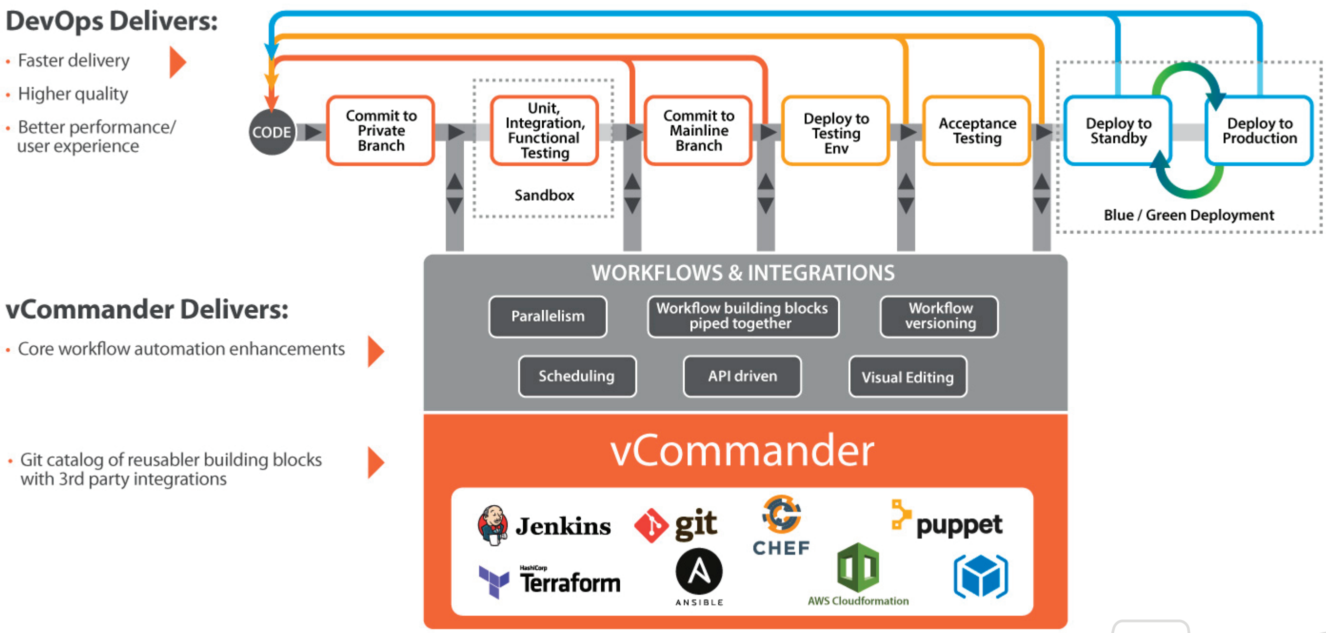
As previously discussed, with CMP 2.0, containers are first class citizens and the platform is built with microservices and DevOps in mind. Below are some key use cases in which businesses stand to realize significant benefits after implementing next-generation CMP software solutions:

DevOps Methodology

Embotics recognizes the need to both augment and integrate the leading DevOps products in the marketplace. It offers a multi-pronged approach:

a **Embotics vCommander embedded into DevOps pipeline**. For enterprises that have standardized on an enterprise DevOps pipeline based on products and technologies such as Jenkins, Altassian Bamboo or Electric Cloud, Embotics offers plug-ins that seamlessly integrate and add capabilities to the environment such as sandbox provisioning, automation workflows, and automated IT policy compliance and enforcement.

b **Embotics vCommander orchestrating the DevOps pipeline.** For enterprises seeking cohesiveness across a multiplicity of DevOps products, Embotics offers a high capability pipeline with “on the glass” integration (seamless uniform one point integration) of leading DevOps products.



Continuous QA

DevOps staging requires developers to perform unit testing on their modifications before committing the updates for more comprehensive system level testing. When performing unit tests on complex applications comprised of multiple tiers or even microservices, it is often necessary to create private instances of all the related components and wall them off together behind an isolated virtual network. vCommander's automation workflows and self-service provisioning via the service catalog can be a powerful tool for improving developer efficiency in creating and managing such developer sandboxes.

Shipping software updates more frequently means more and almost continuous testing and doing so much earlier in the development cycle. It means thorough unit testing of any change, then sandbox testing of the system with the new change. Both are critical. Test early and often, when errors are more easily diagnosed and repaired. Automation is also critical to avoid manual error creep and discourage developers from skipping steps.

DevOps methodology increases the velocity of software development and improves quality. DevOps toolchains and Continuous Integration/Continuous Deployment (CI/CD) pipelines require automation assistance to facilitate continuous system testing and during unit testing. Changes are made and unit-tested in a sandbox and successful products are scheduled and staged for production deployment.

CMP 2.0 eases the integration of DevOps methodology by enabling continuous testing through sandboxing and automated provisioning and workflows for test environments. It can also automate production deployments from staging, including managing Blue/Green update scenarios.

vCommander, with its automated workflow engine and comprehensive third-party integration capabilities, can be a strong asset to DevOps oriented shops. Several of our large customers use vCommander to facilitate test lab automation for iterative software development.

For this use case, the vCommander catalog is most frequently populated with operating system master images coupled with Chef, Puppet or post-provisioning scripted workflows that install the latest version of application code for automated testing. These workflows can be initially triggered automatically via CI events such as a Git commit. One of our larger customers uses vCommander in a variant of this approach for weekend test runs. They provision numerous VMs populated with their latest build for weekend long automated testing. With successful tests, the completed VMs are deleted while VMs for failed tests are preserved for Monday morning analysis.

Continuous, Shift-Left Performance

Performance means user experience. In today's world, customers care about user experience first and foremost. If a change makes the system slower or less responsive, that needs to be detected as early as possible before it's deeply embedded in the architecture or even worse in live deployment and causing customer dissatisfaction. Fully embracing DevOps means evaluating performance of the system earlier during the testing phases and address issues early.

Errors that are found and fixed earlier in the release cycle cost less to fix when they have less user impact. The goal is to reduce human errors and deliver a better user experience.

Automated Staging to Production

Another error-prone link in the chain is during the transition from production to live deployment. Many organizations still perform this manually and this step is where human errors tend to creep in. Fully embracing DevOps means automating the move from staging to production and the various flavors of blue/green roll forward and back.

vCommander offers several automation capabilities to convert time-consuming manual process to end-user driven fulfillment. By automating repetitive provisioning and lifecycle tasks, the IT team can be refocused to deliver on high value consultative services that add value to your organization.

Single Pane of Glass Management for Containers

Embotics CMP 2.0 adds containers and microservices application blueprints as first-class objects in its service catalog. It can provision container-based applications to both new and existing Kubernetes clusters, making the solution suitable for both brownfield and greenfield deployments. It provides discovery, cloning and single pane of glass management and is Kubernetes distro-independent.

Kubernetes Version Management with Integrated Application Validation

Many dedicated container systems offer Kuernetes version management; the automated update of a Kubernetes cluster to a new version of the middleware. What they do not do is ensure that the new version of Kubernetes is compatible with existing microservices-based applications running on it. With its automation workflows, vCommander offers the ability to create and clone an application sandbox comprising a Kubernetes cluster running the new version, and a copy of the microservices-based application and its regression test suite. Automated workflows can then validate that the application is compatible with the new version of Kubernetes and notify the system administrator of the result. The administrator can then complete the upgrade or refer any issues detected to the support team.

Integrated Cloud Governance

With most businesses operating several public cloud solutions at any given time and increasingly using developer-driven DevOps methodology, IT governance has never been more critical. CMPs are designed to help with security and compliance by automatically orchestrating change processes, enforcing standardized configurations, and applying policy-based governance to workloads.

IT process and procedures provide corporate governance and safeguards. Unfortunately, they slow down and create roadblocks for developers who have circumvented IT controls that track costs by directly engaging with public clouds. Security risks have escalated to have a significant negative impact on the business. Organizations must find a way to reign in rogue processes without slowing down the pace of innovation. CMPs solve this by providing provisioning automation, as well as by orchestrating overall

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approval, deployment, and stage management processes. This provides frictionless consumption for DevOps engineers, while at the same time ensuring adherence to corporate IT governance policies.

Cloud management platforms can also help enterprises manage risk by enforcing standardized configurations and templates. Organizations must typically create security requirements around component levels and images that they deploy. By updating them in a common service catalog and deploying them through a portal or via API automation, the deployments will automatically have the IT-mandated components configured in a way that IT has dictated and validated. This removes the manual risk of ad-hoc provisioning and facilitates consistent corporate risk-management coverage.

Additionally, policies around security settings such as workload placement and networking, as well as configuration/tagging parameters, can be enforced in the orchestration engine. Customers are provided with easy-to-use provisioning to the public cloud, while the automation transparently ensures the relevant policy-based compliance. This allows vCommander to ensure that cloud governance guidelines are followed without impeding the agility of development teams and that cloud costs and resources are fully optimized, as illustrated in the following section.

All of these cloud governance values are achieved when consuming in a “Cloud Brokered” model. However even when consuming “Cloud Direct” a CMP adds significantly business value in cloud governance as well as cloud expense management.

Cloud Expense Management

In a CMP 1.0 world, it is important to achieve proper cost governance across your private, public, and hybrid cloud environments. This includes making application placement decisions, so that initial deployment choice considers the cost to the business. This also includes follow-on optimizations such as workload rightsizing in both private and public clouds, as well as power scheduling and reserved instance purchases in public cloud.

With the advent of CMP 2.0, the need for cloud expense management is that much greater. As illustrated throughout this paper, everything is increased: Speed of deployment, frequency of deployment, and application architecture complexity. Without proper cost governance in such an environment, the inherent values of DevOps and micro-services can be consumed by out-of-control spend. Fully integrated cost management is therefore the only way to thoroughly realize the business benefits in these next generation environments.

Easier Adoption of Both DevOps & Microservices

CMP 1.0 arose to fill gaps in a then sea-change technology (virtualization) so that customers could achieve the benefits/value/justification with less heavy lifting. Similarly, CMP 2.0s will fill gaps in the next sea-change technologies used in cloud-native applications so that customers can achieve the benefits/value/justification more easily. A successful CMP 2.0 must manage both IaaS as well as the next generation of cloud applications.

Embotics CMP 2.0 dramatically enhances its automation and workflow capabilities. It provides a Git catalog of reusable, versioned workflow building blocks that can be stitched together both serially and in parallel to create more complex workflows including notifications and approval steps. A visual editor allows much greater workflow visibility and management. Third party integration workflows provide bidirectional coordination with common tools such as Jenkins, Terraform, Ansible, Chef, Puppet and AWS Cloud Formation templates.

Embotics CMP 2.0 fully embraces containers and microservices, making Containers first class objects in the vCommander service catalog along with microservice application blueprints. Discovery and provisioning to existing Kubernetes clusters along with the ability to provision new Kubernetes clusters makes the Embotics CMP 2.0 ideal for both brownfield and greenfield deployments. Kubernetes support is distribution independent and provides reusable workflow building blocks for Auto-scaling, auto-HA, rolling upgrades and integrated Kubernetes management with continuous application QA.

Summary

Automation, orchestration and **governance** are fundamentally required to manage the increasing complexity of hybrid cloud environments and are critical to the success of **Digital Business**. The first generation of Cloud Management Platform (CMP) software solutions were designed for managing traditional applications and focused on a subset of virtual machine (VM) and infrastructure-centric capabilities including provisioning automation, self-service, and cost reporting. The next generation of CMPs must also manage cloud-native, and microservice-based application architectures while providing an expanded portfolio of functionality that also facilitates DevOps.

Enterprise IT must adapt to the new realities of modern application architectures. Leveraging CMP 2.0 technology, these enterprises will successfully be able to support both their existing application infrastructures, and the changing needs of their next generation applications.

Embotics CMP 2.0 enables high-speed digital business transformation, and provides hybrid cloud orchestration andgovernance software for IT organizations, DevOps teams and service providers that need to improve provisioning, control usage, and accelerate the delivery of both legacy and next-generation microservice applications.

Delivering a premier user experience, Embotics' enterprise-grade software is the fastest and easiest way to unify IT and development while reducing costs and maintaining proper governance.

Glossary

- **Application** – A computer program designed to perform a group of coordinated functions, tasks, or activities for the benefit of a user.
- **Cloud Brokered** – The end consumers of public cloud resoures are communicating through a CMP that is acting as an intermediary between the end users and the public clouds.
- **Cloud Direct** - The end consumers of public cloud resources are communicating directly through cloud-native APIs.
- **Container** - A container consists of an entire runtime environment: an application, plus all its dependencies, libraries and other binaries, and configuration files needed to run it, bundled into one package. By containerizing the application platform and its dependencies, differences in OS distributions and underlying infrastructure are abstracted away.
- **DevOps** – A software development methodology (process, organization, culture) emphasizing collaboration between developers and IT operations teams, automating the delivery of software and infrastructure changes, with the goal of creating software more rapidly and reliably
- **Hybrid Cloud** – A cloud computing environment with a mix of on-premise, private cloud, and public cloud services with orchestration between the platforms.
- **Infrastructure as a Service (IaaS)** – The most basic cloud-service model, providing self-service access to compute, storage and networking resources. IaaS users do not have to purchase the physical resources/hardware but are responsible for managing their applications.
- **Microservices** – An application architecture that is a "loosely-coupled service oriented architecture (SOA) with bounded contexts". Microservices relate application components as a graph of independent service-evoked functions, rather than a series of persistent and dependent tiers.
- **Multi Cloud** – Use of multiple cloud computing services in a single heterogeneous architecture to reduce reliance on single vendors, increase flexibility through choice and mitigate against disasters.
- **Platform as a Service (PaaS)** – A set of cloud based services that enable business users and developers to build modern cloud-scale applications much more rapidly through a modular building block approach coupled with infrastructure abstraction and automation. PaaS also typically delivers a set of building block services and APIs that enable more modular and rapid creation of complex cloud scale applications.
- **Private Cloud** – A type of cloud computing delivering similar advantages to public cloud, such as scalability and self-service, but through proprietary infrastructure, and dedicated to a single organization.
- **Public Cloud** – A multi-tenant cloud environment, where you buy a "server slice" in a cloud computing environment shared with other clients. A service provider such as Microsoft Azure or AWS makes resources available to the public over the internet. Benefits include scalability, reduced costs (pay as you go) and reduced overhead.
- **Self-service** – Processes that allow end-users to provision computing capabilities, such as server time and storage, automatically without approval or support.
- **Serverless Computing** – A cloud computing execution model in which the cloud provider dynamically manages the allocation of machine resources. Pricing is based on the actual amount of resources consumed by an application, rather than on pre-purchased units of capacity.
- **Software as a Service (SaaS)** – Users gain access to application software and databases. Cloud providers manage the infrastructure and platforms that run the applications. SaaS is sometimes referred to as "on-demand software" and is usually priced on a pay-per-use basis or using a subscription fee.
- **Workload** – When leveraging virtualization or containerization, a workload is a fundamental unit of work that can be provisioned and/or moved across hosts.

embotics

about embotics. Embotics is the cloud automation company for IT organizations and service providers that need to improve provisioning or enable self-service capabilities. With a relentless focus on delivering a premier user experience and unmatched customer support, Embotics is the fastest and easiest way to automate provisioning across private/public/hybrid cloud infrastructures. Its flagship product, Embotics vCommander, is used by organizations such as Nordstrom, NASA, Fanatics, and Informatica.

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