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INSIGHTS



## DevOps Overview and Market Trends

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# What is DevOps?

**DevOps:** The blending of tasks performed by a company's application development and systems operations teams. In its broadest meaning, DevOps is an operational philosophy that promotes better communication between development and operations team as more elements of IT operations become programmable.

- DevOps integrates **Developers** and **Operations** teams in order to improve collaboration and productivity by automating infrastructure, automating workflows, and continuously measuring application performance.
- Seeks to meld application development and deployment into a more streamlined process, shifting some of the operation team's responsibilities back to the development team in order to facilitate continuous development, continuous integration, continuous delivery, and continuous monitoring processes.



## Prior to DevOps

- ✓ Traditionally in the enterprise, the development team tested new code in an isolated environment for quality assurance and if requirements were met, released the code to operations for use. The operations team would then deploy and maintain the program from that point on.
- ✓ One of the problems with this approach, which is called **Waterfall Development**, is that there was a long time between software releases and since the two teams worked separately, the development team was not always aware of operational roadblocks that might prevent the program from working smoothly.

# DevOps Segment Overview

## aPaaS

A PaaS designed to enable low-code development, runtime deployment, management, and maintenance of cloud application services.

## Automated Deployment

Allows applications to be deployed across the various environments used in the development process, as efficiently delivered into real-time production environments.

## DevOps Testing

The process of executing automated tests as part of the software delivery pipeline to obtain immediate feedback on potential bugs or defects.

## Continuous Integration

A practice that allows developers to integrate code into a repository throughout the process. Each check-in to the shared code is verified in an automated fashion, allowing teams to detect integration issues early.

## PaaS

A computing platform that allows the creation of web applications quickly and easily and without the complexity of buying and maintaining the software and underlying infrastructure.

## Containers

Offer developers a simple, lightweight, and portable way to package and deploy applications across various hosts or cloud environments in a self-contained format.

## Infrastructure Automation

The process of scripting environments from installing an operating system, to configuring instances on servers, to automating how the instances and software components communicate with one another.

# DevOps Landscape

## aPaaS



## Automated Deployment



## DevOps Testing



## Continuous Integration



## PaaS



## Containers



## Infrastructure Automation



DISCLAIMER: This is a representative list only and may not include all relevant companies. If your company is not on the list and would like to be added for future publications, kindly shoot us a note at [scard@agcpartners.com](mailto:scard@agcpartners.com) and we would be happy to consider for inclusion.

# DevOps Principles

## Iterative

DevOps embodies agile principles; iterating toward a goal is a primary aspect of its design. Iterative sets the context, in that it is less important where you start, and more important to begin the journey.

## Continuous

DevOps strives to enable continuous delivery of every source code repository change. This supports the rapid change needed by the business. "Continuous" also implies that organizations are continuously optimizing and experimenting with new processes, tools, and organizational structures.

## Collaborative

DevOps doesn't succeed unless all stakeholders have a set of common objectives and trust that their colleagues "have their backs." Some organizations even choose to realign their structures to achieve. This is facilitated through transparent communication among relevant team members.

## Systemic

Agile approaches have significantly improved the development process within many enterprises. However, without applying similar concepts to the operations, the bottleneck has merely been shifted. DevOps analyzes the impact of changes in organization to remove as many constraints as possible.

## Automated

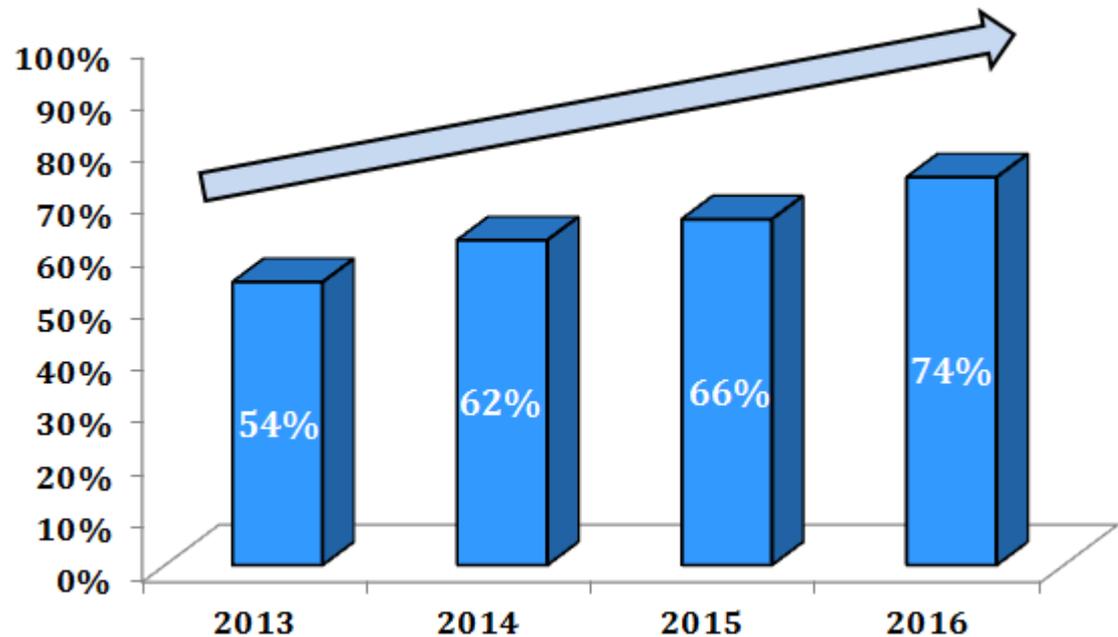
Automation links development, test, operations, and security systems to deliver fast, continuous, safe and cost-effective services. The technology framework must be designed where as much work as possible is performed through programmatic means.

# DevOps Trends

## Takeaway:

In the past 3 years, we have seen very strong growth in DevOps adoption. The adoption percentage increased **20%** from 54% to 74%.

## DevOps Adoption Over Time



# PaaS

**PaaS:** A computing platform that allows the creation of web applications quickly and easily and without the complexity of buying and maintaining the software and underlying infrastructure.

- PaaS users are organizations that create applications for both internal and customer-facing use cases. PaaS provides services for the development, deployment, and management of these applications. The applications are built using various platform services such as application (aPaaS), database (dbPaaS), and integration (iPaaS) platform services.
- Gartner refers to PaaS more precisely as “Cloud Application Infrastructure Services”. These IT services extend application development, integration, and deployment of software services into the Cloud. PaaS is application infrastructure functionality that is enriched with cloud characteristics and offered as a service.
- Although the “**Service**” in “PaaS” implies the availability online through shared or dedicated resources, some users prefer in-house PaaS running under the control of their own IT departments, either in their own or hosted data centers

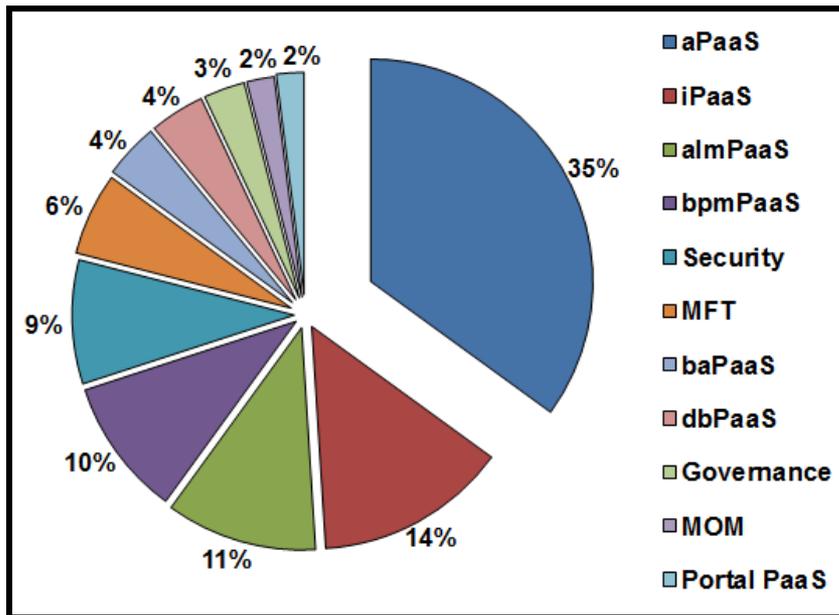


**Cloud Foundry:** An open-source PaaS framework, meaning that an enterprise or cloud service provider can deploy it atop virtualized infrastructure, such as that provided by an IaaS provider or through a cloud management platform, and create its own PaaS environment.

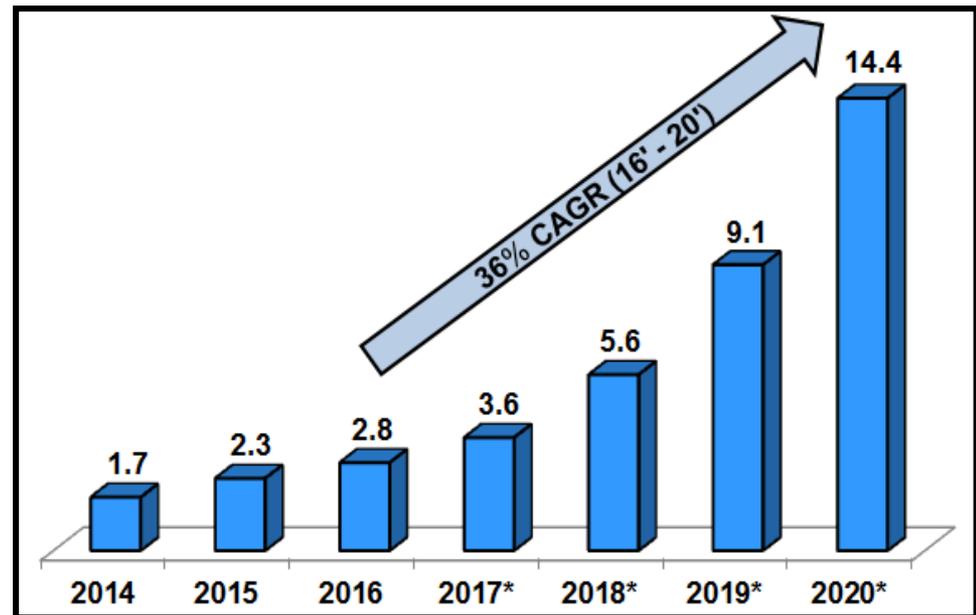
# PaaS Market

- PaaS market is **fragmented**, with offerings employing a broad set of capabilities, technologies and architectures. These differences impact the way each market participant delivers its solution offering.
- IT leaders must understand the trade-offs inherent in these products when selecting PaaS technologies to match their Cloud application requirements.
- aPaaS holds the largest portion of the PaaS market share (**35%**), followed by iPaaS (11%) and almPaaS (11%)
- PaaS market is currently **\$2.8 B**, with an impressive CAGR of **36%** in the future; expected to reach **\$14.4 B** by 2020
- Although the "service" in "PaaS" implies the availability online through shared or dedicated resources, some users prefer in-house PaaS running under the control of their own IT departments, either in their own or hosted data centers.

## Market Segmentation



## Market Size (\$B)



# PaaS Trends

## What are the General Trends?

- ✓ PaaS pure plays, especially **Pivotal**, have shown impressive growth in the last few years. However, most PaaS pure play implementations are operated as a group or subsidiary within a larger company (Ex: Pivotal is a subsidiary of Dell/EMC).
- ✓ Most companies choose to invest in PaaS to solve a specific problem, or to address a group of applications before rolling it out company wide.
- ✓ In the next few years, we will see more wide-scale implementations across organizations.

## What is Driving Demand?

- ✓ When enterprises first enter the cloud, they usually approach it from an infrastructure mindset.
- ✓ Putting SaaS aside, most enterprises pick an IaaS provider, and then spend 2-3 years learning and maturing. Eventually, after becoming cloud competent, they get proficient at IaaS and look for ways to improve efficiency. That's when they pursue PaaS.
- ✓ These cloud competent enterprises that understand the value of PaaS are becoming more interested in it than previous years, as they seek to increase innovation and **reduce time-to-market**.

### Takeaway:

PaaS adoption is on the rise in 2016. Expect to see more consolidation and PaaS vendors pivoting into adjacent areas. It could be hard for the smaller players to compete with the resources of Pivotal and other large PaaS providers.

# PaaS: Company Comparison

**Pivotal**

**Founded:** 2012  
**HQ:** Palo Alto, CA  
**Employees:** 1,617  
**Invested Capital:** \$1.3 B  
**Description:** Pivotal provides solutions that enable the creation of software applications on a Cloud-independent platform. The Company offers Pivotal CF, a PaaS solution for agile development teams to update applications on a private cloud; and Pivotal One, a multi-cloud enterprise PaaS.

**apprenda**

**Founded:** 2007  
**HQ:** Troy, NY  
**Employees:** 122  
**Invested Capital:** \$56 M  
**Description:** Apprenda provides a PaaS solution for building and delivering enterprise applications. It offers a PaaS software layer that transforms infrastructure into a hybrid cloud application platform.

**Engine Yard**

**Founded:** 2006  
**HQ:** San Francisco, CA  
**Employees:** 87  
**Invested Capital:** \$38 M  
**Description:** Engine Yard develops a cloud orchestration platform to deploy, manage, monitor, scale, and control applications in the public and private cloud. The Company's platform provides stack management, automation & orchestration, monitoring & alerting, and add-ons solutions.

# aPaaS

**aPaaS:** A PaaS designed to enable low-code development, runtime deployment, management, and maintenance of Cloud application services.

- An aPaaS supports business logic and data handling for both the back-end services and web & mobile user experience.
- Some Cloud platform service offerings are “**Headless**” — they only support the back-end business logic, delegating user experience to other platforms, while others focus mainly on the user interface and rapid time to value
- 2 forms of aPaaS: **High-Control** and **High-Productivity**.

## High-Control

Provides traditional programming environments and requires some advanced IT skills to be used well. Typically, they target the central IT department (Ex: Microsoft Azure).

## High-Productivity

Encodes the business logic in metadata, offers graphical design tools, and requires less advanced IT skills for successful use. Typically, they target the LOB customers (Ex: TrackVia).

# aPaaS Trends

## An Evolving Market

The market remains dynamic — for example, new versions of **Cloud Foundry** have continued to be released after various design changes. This trend is likely to continue as new entrants come into the market and established vendors reinvent their products, architectures, and strategic roadmaps.

## Adoption of Docker

Ecosystems and libraries of crowdsourced and vendor-provided accelerators are evolving around aPaaS offerings. The greatest impact of the formation of a components ecosystem will come from the adoption of Docker containers by most of the leading aPaaS providers, including Microsoft, IBM, and Red Hat.

## Open-Source

Open-source has become more common in cloud computing than it is on-premises. While the aPaaS market lacks official de jure (legal) standards, many open-source technologies act as de facto (actual) standards.

## Bimodal IT

Bimodal IT creates new demands for high-productivity aPaaS offerings targeting LOB & citizen developers. Some aPaaS products already offer high productivity alongside high control (Ex: Salesforce), with others expanding either capability in their roadmaps.

## Enterprise Adoption

Public aPaaS offerings challenge traditional platforms for mainstream enterprise projects and not only for experimental, cloud-centric initiatives. The advantages of higher productivity and efficiency and new capabilities make aPaaS a **mainstream technology** option.

# aPaaS: Company Comparison



**Founded:** 2005  
**HQ:** Boston, MA  
**Employees:** 222  
**Invested Capital:** \$38 M  
**Description:** Mendix provides an aPaaS solution for building smart applications to business and IT users. The Company's open-platform ecosystem enables users to build business applications using IoT, big data, and machine learning platforms.



**Founded:** 2006  
**HQ:** Denver, CO  
**Employees:** 55  
**Invested Capital:** \$22 M  
**Description:** TrackVia provides a cloud-based low-code application development platform for business users in process-intensive verticals. The Company's platform allows users to deploy configurable workflows and applications, simplify data collection, and visualize data with real-time reports.



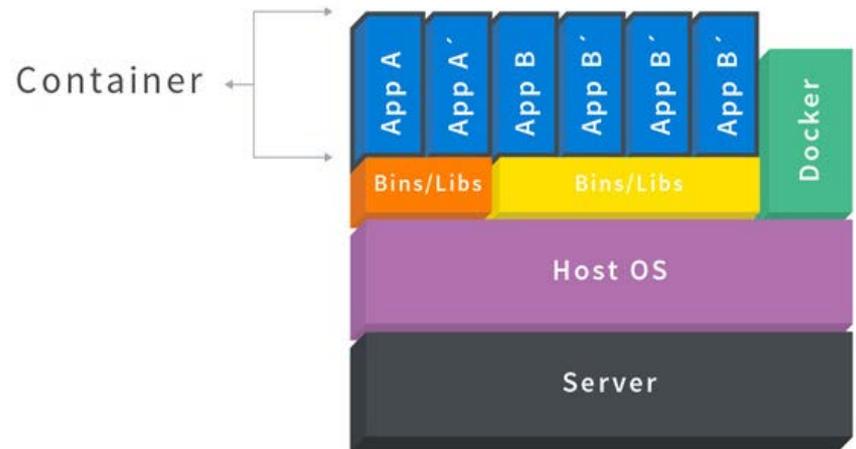
**Founded:** 2001  
**HQ:** Atlanta, GA  
**Employees:** 494  
**Invested Capital:** \$55 M  
**Description:** OutSystems develops and operates an aPaaS platform for clients to create, deploy, and manage enterprise mobile and web applications. The Company offers applications in the areas of Omni-channel and in-branch banking, customer acquisition, loans & credit, and risk management.

# Containers

**Containers:** Offer developers a simple, lightweight, and portable way to package and deploy applications across various hosts or cloud environments in a self-contained format.

- ✓ Despite the fact that containers were created primarily to host stateless application services, they are currently being evaluated for a broad set of stateful enterprise applications.
- ✓ The primary appeal of containers is to enable a decomposed, microservices-based architecture for **complex web applications**. By enabling microservices, organizations can achieve better scalability, more efficient resource utilization, and more rapid application development and deployment.
- ✓ The adoption of containers in software testing and application development is rapidly growing due to the collaboration and portability benefits that can significantly enhance developer productivity.

Containers are isolated, but share OS and, where appropriate, bins/libraries



# Container Uses

## Micro-Services

Containers are ideal for very small applications or components of applications that scale out by replicating instances (“Microservices”). Containers are useful for short-lived workloads, such as event handlers, and short-lived periodic jobs. Broadly, Containers allow greater utilization of resources by allowing the OS to more precisely manage resource allocation to different types of processes.

## Developer Workflow

Developers need tools that help ameliorate the differences in environments between their workstations, development servers, quality assurance servers, and production servers. Tools such as Vagrant (by HashiCorp) have been popular for this type of use, and developers increasingly are using containers (mainly Docker) to facilitate this. Containers may also be used in conjunction with continuous integration and continuous deployment systems.

## Batch Computing

High-Performance Computing (HPC), data analytics, and other highly parallel, short-lived workloads can often benefit from bare-metal performance combined with the ability to use containers for fast provisioning. In this context, software such as Apache Mesos is typically used to orchestrate the deployment, although grid computing and other HPC scheduling tools may be used as well.

## PaaS Frameworks

Containers are used by PaaS frameworks such as Cloud Foundry and OpenShift. However, many organizations are increasingly eschewing a traditional PaaS framework and instead utilize a container approach, allowing developers to easily deploy workloads through containers. This approach often replaces more complicated private cloud IaaS efforts, such as an OpenStack deployment. Some organizations offer container services on tVMs, while others do so on bare metal.

# Containers: Market Segments

MARKET SEGMENT	KEY CHALLENGES	INNOVATIONS
MANAGEMENT/ ORCHESTRATION	Lack of standards and best practices, mixed use, software immaturity.	High level of competition, specialization on scheduling, management or orchestration.
MONITORING/LOGGING	Lack of parity to monitoring of VMs and physical servers, visualization, scale.	Container monitoring integrated with existing tools and processes.
DATA MANAGEMENT/ SERVICES	Sometimes overlooked with container deployments, lack of standards and best practices.	Container-specific data monitoring and management, integrations with existing systems and process, persistent databases.
SECURITY	Lack of parity to VM security, hurdle to production use.	Unified container and VM security, isolation, hardware-based container security.
NETWORKING	Similar to cloud computing, among the more complex and difficult issues of containers.	Plug-ins and integrations joining container and traditional networking.
STORAGE	Uncertainty on how large container images should be, backup support, performance issues.	Scale-out storage for containers, diversion of spare capacity.
CI/CD	Containers add to an already large and often disparate set of tools and approaches.	Containers are being used by large organizations for speed, developer productivity and efficient infrastructure management.

## Takeaway:

Given the high level of overlap between the various container segments, there could be overlap and consolidation between management/orchestration, monitoring/logging, data management/services, etc. As new vendors enter the market, many will offer point solutions that address only 1 or 2 segments, but ultimately these segments should consolidate, consistent with other emerging infrastructure management segments

# Docker Overview



- ✓ **Founded:** 2008
- ✓ **HQ:** San Francisco, CA
- ✓ **Employees:** 350
- ✓ **Invested Capital:** \$184 M
- ✓ **Description:** Docker develops an open platform for building, shipping, and running distributed applications. The Company's platform allows developers and system administrators to create and run applications as a collection of containers that work across laptops, data center virtual machines, and public clouds.
- ✓ Perhaps the biggest emerging trend in the DevOps segment over the past couple of years has been the explosion of containers, with Docker driving the path toward developer and enterprise adoption since its launch in early 2013.
- ✓ With Docker, there has been significant uptake from developers for **2 reasons:**

## Lower Barrier to Entry

Docker lowered the barrier to entry by creating a simplified command-line user interface (UI) to a previously complex combination of Linux kernel features and file systems.

## Market Timing

Docker hit the market at the right time, with DevOps rising in popularity as the Company filled a niche that coincides with DevOps trends such as artifact versioning, immutable infrastructure, and collaboration among dev and operations teams.

# Docker: Key Ecosystem Partners



**IBM** has been among PaaS providers that have rapidly integrated and supported Docker and application containers in its Bluemix PaaS. IBM also partners with Docker to provide integrated, enterprise container offerings that support development and deployment of multi-Cloud applications.



**Microsoft** has partnered with Docker to support Docker containers on Windows Server and to make Docker containers and services available on its Azure marketplace. Components on Azure – Microsoft has also contributed Docker orchestration tools and Docker Client on Windows to the open source community.

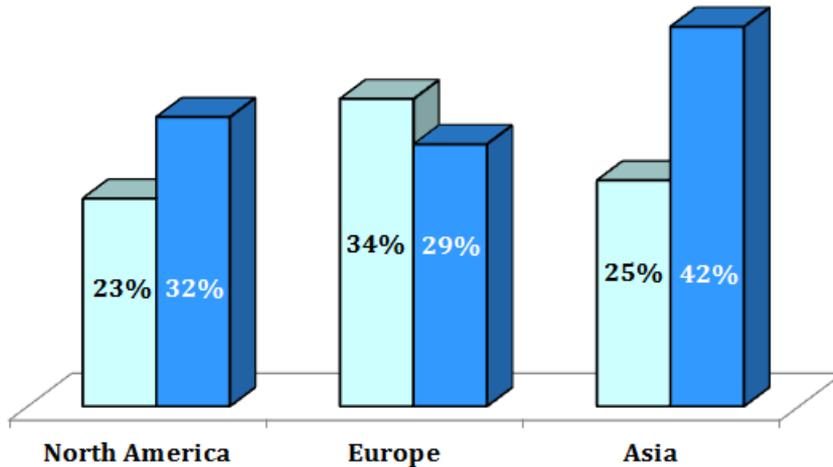


**Red Hat** has been among the most aggressive established vendors to support application containers. The Company was early to introduce support for Docker in its flagship Red Hat Enterprise Linux OS in 2014. Red Hat has also deepened its support for Docker and containers in its OpenShift PaaS.

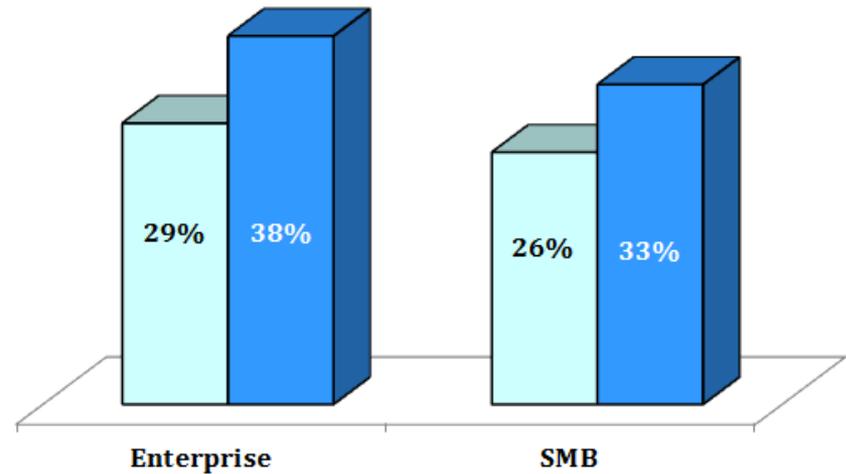
# Respondents Adopting Docker

- Use
- Plan to Use

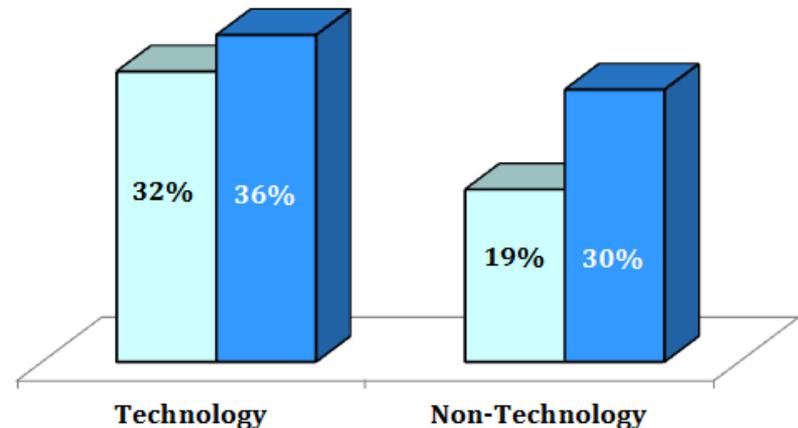
## Business Location



## Business Size



## Business Type



### Takeaway:

Interest in DevOps is increasing, and the adoption of Docker containers is accelerating quickly. Unlike many previous technology shifts where enterprises adopt more slowly, enterprises are arguably adopting Docker more quickly than smaller organizations.

# Containers: Company Comparison



**Founded:** 2013  
**HQ:** San Francisco, CA  
**Employees:** 167  
**Invested Capital:** \$135 M  
**Description:** Mesosphere develops a datacenter operating system that spans various machines in a cloud. This product, called Mesosphere DCOS, provides a single platform for running containers, big data, and distributed apps in production. The Company also organizes the infrastructure and provides a scalable way of deploying applications and services.



**Founded:** 2014  
**HQ:** Cupertino, CA  
**Employees:** 29  
**Invested Capital:** \$30 M  
**Description:** Rancher provides a container management platform that provides container networking, load balancing, service discovery, monitoring, and recovery paired with Docker. The Company's platform also provides infrastructure services, including host management, load balancing, storage management, and service discovery.



**Founded:** 2013  
**HQ:** San Francisco, CA  
**Employees:** 63  
**Invested Capital:** \$51 M  
**Description:** CoreOS develops open source projects for Linux Containers and provides container security solutions. The Company's main products are Quay Enterprise and Tectonic Enterprise. Quay Enterprise hosts an on-premises software to build, store, and distribute containers. Tectonic Enterprise deploys, manages, and secures containers.

# Infrastructure Automation

**Infrastructure Automation:** The process of scripting environments—from installing an operating system, to installing and configuring instances on servers, to automating how the instances and software components communicate with one another.

- Infrastructure Automation also includes the updating of information that describes an enterprise's hardware and software. This information typically includes the versions and updates that have been applied to installed software packages and the locations and network addresses of hardware devices.
- When a system needs a hardware or software upgrade, a computer technician can access the Infrastructure Automation program and database to see what is currently installed. The technician can then make a more informed decision about the upgrade needed.
- An advantage of Infrastructure Automation is that the entire collection of systems can be reviewed to ensure any changes made to one system do not adversely affect any other systems.

# Infrastructure Automation Uses

## Cloud Computing

Cloud Computing & Infrastructure Automation are a natural match. The cloud makes it easy to spin up servers on demand, but it would be a prohibitively expensive and likely error-prone process to configure each one manually, especially when operating at scale. Infrastructure Automation provides solutions to automate the creation of cloud servers and manage their configuration details, saving organizations time when launching new and managing existing clouds, time savings which translate directly into cost savings.

## Ease of Use

An advantage of a Infrastructure Automation application is that the entire collection of systems can be reviewed to make sure any changes made to one system don't adversely affect any of the other systems.

## Efficiency

Infrastructure Automation reduces the time required to make network changes and to resolve problems. For example, one organization that has gone from manually making 20 changes per hour to individual network elements to implementing 10,000 changes per hour using an automated configuration management tool. In another case, the average time to discover a security vulnerability has been reduced from two weeks to less than two minutes.

# Infrastructure Automation: Company Comparison



**Founded:** 2008  
**HQ:** Seattle, WA  
**Employees:** 271  
**Invested Capital:** \$105 M  
**Description:** Chef offers a cloud management solution that enables users to manage and scale cloud infrastructure as well as build, destroy, and rebuild servers on public or private cloud. The Company also provides Enterprise Chef, which automates user infrastructure to accelerate time-to-market and safeguards their systems.



**Founded:** 2005  
**HQ:** Portland, OR  
**Employees:** 452  
**Invested Capital:** \$85 M  
**Description:** Puppet offers Open Source Puppet, an open source IT management system that automates repetitive and error-prone system administration tasks. The Company also offers Puppet Enterprise, which automates the provisioning, configuration, and management of machines and the software running on them.



**Founded:** 2011  
**HQ:** Lehi, UT  
**Employees:** 58  
**Invested Capital:** ND  
**Description:** SaltStack develops systems management software used by businesses for infrastructure automation, hybrid cloud building, server provisioning, and data center automation. The Company helps organizations automate the most complex cloud management tasks with the flexibility required by the most-advanced computing environments.

# Automated Deployment

**Automated Deployment:** Allows applications to be deployed across the various environments used in the development process, as well as large-scale enterprise production environments.

## Main Benefits of Automated Deployment

- ✓ **Repeatability:** Every deployment operates through the same framework.
- ✓ **Fewer Errors:** Removing manual steps reduces human error.
- ✓ **Anyone Can Deploy:** Eliminate bottlenecks by removing the need for experts to do the work.
- ✓ **Work On What Matters:** Developers can spend time working on new features and ideas, instead of manual deployments.
- ✓ **Customer Satisfaction:** Frequent updates with new features addresses customer needs sooner and keeps organizations competitive.
- ✓ **Lower Costs:** Fewer errors, fewer human hours needed for deployments drives lower costs.

# Automated Deployment Approaches

## Scripting

Deployments can be automated by writing scripts which perform actions automatically on specific environments in a specific context. The scripting approach is simple but limited, because as soon as environments change, scripts can “break” and deployments can fail.

## Basic Deployment Tools

These tools are typically suitable only for basic applications that do not have multi-step installations, because they do not have "orchestration" capabilities. Therefore, they cannot support deployments that have a sequence of steps with dependencies between different components. Also, the basic tools typically cannot model the underlying environment on which the application is installed.

## Model-Driven Deployment

The most advanced tools are able to package even the most complex software systems, model the environments on which these systems run, and orchestrate the deployment process across numerous software components/servers. They also provide visibility, tracking, and auditing of existing deployments.

## Continuous Deployment

An extreme form of deployment automation where applications in development undergo automated testing and are immediately deployed to production. This approach should arguably be the goal of most companies that aren't constrained by regulatory or other requirements.

# Automated Deployment: Company Comparison



**Founded** 2002  
**HQ:** San Jose, CA  
**Employees:** 125  
**Invested Capital:** \$39 M  
**Description:** Electric Cloud develops enterprise continuous delivery solutions to deliver software faster. The Company offers ElectricFlow, which orchestrates DevOps tools in the delivery process from code check-in to release.



**Founded** 2000  
**HQ:** New York, NY  
**Employees:** 118  
**Invested Capital:** \$31 M  
**Description:** GigaSpaces provides software middleware for deployment of applications on cloud environments. The Company's products include XAP, a computing platform that processes data in real time; and Cloudify, an open-source platform that automates and manages applications.



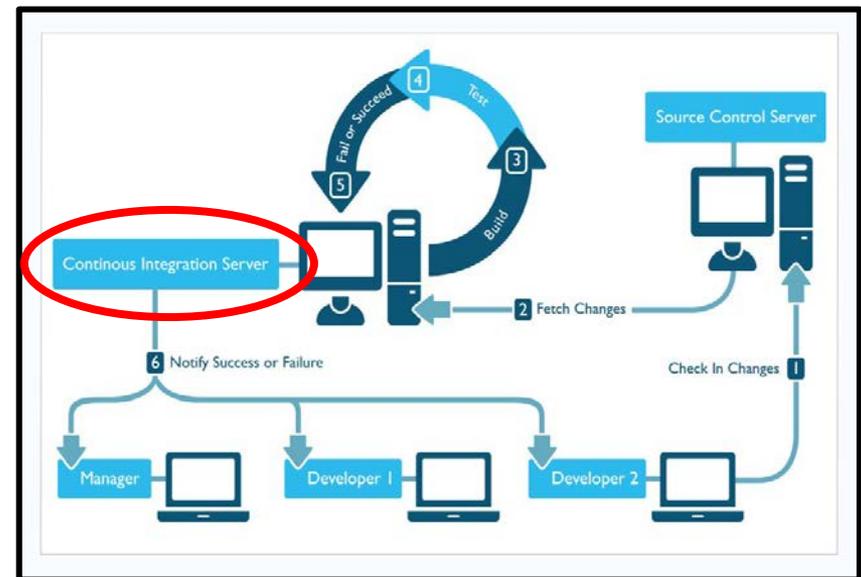
**Founded** 2008  
**HQ:** Boston, MA  
**Employees:** 89  
**Invested Capital:** \$12 M  
**Description:** Xebia Labs develops and supplies delivery automation software for enterprises. The Company offers an XL Platform (XL Release, XL Deploy, XL TestView), which includes release management solutions, automation products for deployment, and a test management tool.

# Continuous Integration (CI)

**Continuous Integration:** A practice that allows developers to integrate code into a repository throughout the application development process. Each check-in to the shared code is verified in automated fashion, allowing teams to detect integration issues early.

## Benefits:

- ✓ Increased visibility which enables greater communication
- ✓ Mitigate integration problems to enhance software delivery efficiency
- ✓ Significantly less back-tracking to discover mistakes and more time building features
- ✓ “Continuous Integration is cheap. Not continuously integrating is costly. If you don’t follow a continuous approach, you’ll have longer periods between integrations. This makes it exponentially more difficult to find/fix problems. Such integration problems can easily knock a project off-schedule, or cause it to fail altogether.”



# Continuous Integration: Best Practices

## Rethink your team structure to maximize collaboration and agility.

- For applications requiring frequent releases, think in terms of cross-functional product teams instead of project teams.
- Bring teams together from their organizational units to allow for collaboration on technology and process improvements

## Automate your pipeline to reduce inefficiencies, reduce errors, and compress release cycles.

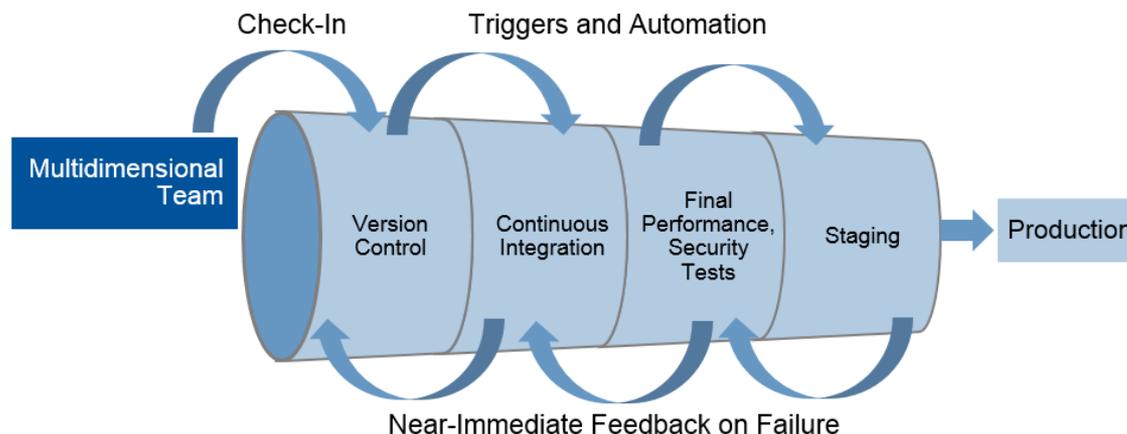
- Let your customers' needs determine the maximum rate of change to the software.
- Start small and grow with CI. Learn from one initiative, tweak based on feedback, gain small successes, and build momentum.

## Use private/public cloud computing as the foundation for CI implementation.

- Before designing your cloud architecture, make sure you understand your product architecture and how you want to automate the deployment pipeline, as well as what types of skills will be needed.
- Provision identical environments as production all the way through the CI pipeline to achieve high-quality code.

## Assess whether your organization should use a PaaS platform to enable greater repeatability and agility for developers.

- Enforce consistency and standards through the PaaS platform.
- Use the same tools (security, availability, performance) in the entire pipeline, from development through production.



## Software Delivery Pipeline:

This image shows a sample pipeline with triggers. A form of pass/fail exists between each section of the pipeline, called a **Gate**. If the tests fail, instant feedback is provided to the owner of that part. However, if the tests pass, the code releases on to the next phase of the pipeline.

# Continuous Integration: Company Comparison



**Founded:** 2004  
**HQ:** San Jose, CA  
**Employees:** 421  
**Invested Capital:** \$156 M  
**Description:** Apigee develops a software platform that enables application programmable interface (API) based digital strategies and insights. The Company's platform allows businesses to design, deploy, and scale API's as a connection between IT systems & applications.



**Founded:** 2002  
**HQ:** Sydney, Australia  
**Employees:** 1,832  
**Invested Capital:** \$66 M  
**Description:** Atlassian designs, develops, licenses, and maintains software. The Company offers JIRA, a planning and project management platform; Confluence, a content creation solution; HipChat, a messaging and communications tool; and Bitbucket, a code sharing and management software.



**Founded:** 2010  
**HQ:** San Jose, CA  
**Employees:** 186  
**Invested Capital:** \$51 M  
**Description:** CloudBees provides solutions that enable IT organizations to respond rapidly to the software delivery needs of the business. The Company offers CloudBees Jenkins, a technology platform for implementing continuous integration and continuous delivery.

# DevOps Testing

**DevOps Testing:** The process of executing automated tests as part of the software delivery pipeline to obtain immediate feedback on potential bugs or defects.

## Why do we need DevOps Testing?

“Continuous Integration is meaningless without DevOps Testing. If the application isn’t monitored and tracked during production, the DevOps process is compromised. What is the purpose of having a streamlined Continuous Integration process if the only way to find out about application functionality issues is through the complaints of a disgruntled user?”

## Benefits

- ✓ **Drive Down Costs.** Cost of software development is driven by the effort, hardware, and software required to configure and deploy complex test environments.
- ✓ **Reduce Risk.** If testing does not depend on “big bang” integration, project risks can be curtailed. Testing that begins earlier in the cycle can help development teams identify and resolve defects sooner.
- ✓ **Improve Cycle Time.** Decreasing the use of complex test environments can speed up testing velocity as can eliminating slow manual testing processes. DevOps testing helps development teams balance quality and speed. It uses automation, the cloud and service virtualization to eliminate testing bottlenecks and allows the creation of test environments that can be more easily deployed, shared and updated as systems change. These capabilities reduce the cost of provisioning and maintaining test environments, and they shorten test cycle times by enabling integration testing earlier in the lifecycle.

# DevOps Testing: Key Elements

## Risk Assessment

Covers risk mitigation tasks, technical debt, quality assessment and test coverage optimization to ensure the build is ready to progress toward next SDLC stage.

## Policy Analysis

Ensure all processes align with the business and compliance demands. Primary objectives include identifying trends associated with injection of dangerous patterns within the code and isolating risk in target areas.

## Traceability

Ensure true requirements are met and re-work is not required. An object assessment to identify which requirements are at risk, working as expected or require further validation.

## Advanced Analysis

Using automation in areas such as static code analysis, change impact analysis and scope assessment & prioritization to prevent defects in the first place and accomplishing more within each iteration.

## Test Optimization

Ensure tests yield accurate outcomes and provide actionable findings. Aspects include Test Data Management, Test Optimization Management and Test Maintenance.

## Service Virtualization

Testing requires access to real-world testing environments. Service virtualization enables access to the virtual form of the required testing stages, cutting the time required for test environment setup.

# DevOps Testing: Company Comparison



**Founded:** 2011  
**HQ:** Mountain View, CA  
**Employees:** 59  
**Invested Capital:** ND  
**Description:** BlazeMeter provides cloud-based application performance testing and monitoring solutions. The Company offers a self-service testing platform that enables its users to run massive load tests for mobile apps, web apps, websites, API's, and web services.



**Founded:** 2006  
**HQ:** Mountain View, CA  
**Employees:** 209  
**Invested Capital:** \$132 M  
**Description:** SOASTA provides cloud testing, web & mobile application testing, performance testing, and real user monitoring for digital businesses. The Company offers a view of the relationship between end-to-end performance, user behavior, and business goals, as well as provides intelligence to maximize performance.



**Founded:** 2005  
**HQ:** Gémenos, France  
**Employees:** 74  
**Invested Capital:** \$5 M  
**Description:** Neotys develops load testing tools for Web applications. The Company offers NeoLoad, a software to test Web applications under increasing loads.

# About AGC

AGC is a leading investment bank with a focus on providing strategic advisory services to technology companies, helping them achieve their vision. With more than 50 investment banking professionals across the Americas and in Europe, we provide global coverage across all products and sectors, from software and digital media to tech-enabled services and mobile communications. Since our inception in 2003, AGC Partners has completed more than 270 investment banking transactions for emerging growth companies.



**Scott Card**  
*Partner*

- Scott is a Partner in the Investment Banking Group and founding team member at AGC Partners, focused on Enterprise Infrastructure sectors including Cloud Infrastructure, Data Analytics, Storage & Security
- In his 20 plus years as an investment banker, Scott has completed more than 50 M&A and debt / equity financing transactions
- Prior to joining AGC Partners, Scott was part of Deutsche Bank Alex Brown's Technology Investment Banking Group in Boston
- Previously, Scott was an Associate in Global Mergers & Acquisitions at SBC Warburg and an Analyst in the Financial Institutions Group at Merrill Lynch & Co. in New York
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# M&A Transactions

# M&A Transactions

Date	Target Name	Acquirer Name	Target Description	EV (\$M)	LTM Rev. (\$M)	EV / LTM Rev.
Jun-16	ElasticBox	CenturyLink	Provides enterprise cloud deployment and management SaaS, enabling users to access workspaces, which are hosted on multiple cloud environments	ND	ND	ND
Mar-16	StackStorm	Brocade	Provides productivity improvements of highly automated DevOps environments to the broader market	ND	ND	ND
Mar-16	Virtual Instruments	Load DynamiX	Provides and develops infrastructure performance management solutions for physical, virtual, and cloud computing environments	ND	ND	ND
Mar-16	Xendo	AppDirect	Offers a service to help business users to find and act upon their content in cloud-based services	ND	ND	ND
Mar-16	Verilume	Intralinks	Allows companies to deploy OpenStack-powered clouds and Hadoop data analytics environments to provide end-user access	ND	ND	ND
Mar-16	Sense.io	Cloudera	Provides a modern platform for data science and big data analytics that accelerates data science from exploration to production	ND	ND	ND
Mar-16	Serena Software	Micro Focus International	Provides enterprise application lifecycle management, business process management, automation, and Web content management software	\$540	162	3.3x
Mar-16	AppSense	LANDESK	Specializes in Windows migration, desktop virtualization (VDI), hardware refresh, desktop security, and break/fix and recovery solutions	ND	100	ND
Mar-16	HyPer	Tableau Software	Provides a main-memory-based relational DBMS for mixed online transaction processing and online analytical processing workloads	ND	ND	ND
Mar-16	Synata	Cisco	Provides and develops enterprise cloud search services	ND	ND	ND
Mar-16	Intuit (QuickBase)	Welsh, Carson, Anderson & Stowe	Provides business and financial management solutions for small businesses, consumers, and accounting professionals	ND	76	ND
Mar-16	Conductant	Docker	Designs and develops open source software for cluster management	ND	ND	ND
Mar-16	CliQr	Cisco	Provides hybrid cloud application management software to enable migration, governance, and management of applications from on-premises	260	6	43.3x
Feb-16	Ravello	Oracle	Provides cloud-based virtualization software solutions	500	ND	ND
Feb-16	InterCloud Systems (VaultLogix)	KepttSafe	Provides end-to-end IT and network solutions to the telecommunications service provider through cloud platforms and professional services	24	ND	ND
Feb-16	GroundWork	Fox Technologies (Parallax)	Provides unified monitoring solution for IT operations management and cloud monitoring	ND	ND	ND
Feb-16	Diligent	Insight Venture Partners	Provides subscription-based access to its software; and associated services, including hosting the clients' data	624	94	6.6x
Feb-16	Mineset	ESI Group	Designs and develops a visual analytics platform that integrates advanced visualization with machine-learning technology	ND	ND	ND
Feb-16	Trilead	HP	Provides a backup and disaster recovery software solution for virtualized IT environments	ND	ND	ND

# M&A Transactions (Cont'd)

Date	Target Name	Acquirer Name	Target Description	LTM Rev. EV / LTM		
				EV (\$M)	(\$M)	Rev.
Feb-16	Xamarin	Microsoft	Provides Visual Studio enterprise mobile application development SaaS, add-on tools and extensions for software developers and businesses	\$400	\$38	10.5x
Feb-16	Ravello	Oracle	Provides nested application virtualization SaaS for use in cloud computing environments such as ASW or Google Cloud for businesses globally	500	10	50.0x
Jan-16	NexGen Storage	Pivot3	Offers PCIe flash arrays that allow customers to prioritize performance based on the business value of data	ND	ND	ND
Jan-16	Unikernel Systems	Docker	Focuses on open source unikernel movement and exploration of commercial avenues for their application	ND	ND	ND
Jan-16	Cosentry	TierPoint	Services include cloud services, virtual data center, private cloud, hybrid cloud, compliant cloud, cloud migration, managed services, etc	ND	50	ND
Jan-16	Citrix	Accelerite	Develops and sells products and services that enable the delivery of applications and data over public, private, or hybrid clouds	ND	ND	ND
Jan-16	Comtrade	Citrix	Engages in trading and leasing information technology, integrated global solutions, and general technology to third parties	ND	ND	ND
Jan-16	Datahero	Cloudability	Offers DataHero, a self-service cloud BI that allows users to connect to cloud services without the help of an IT team	ND	ND	ND
Jan-16	Appcelerator	Axway Software	Provides native and cross-platform mobile application development and testing SaaS, as well as mobile-optimized APIs	ND	20	ND
Jan-16	Gravitant	IBM	Provides enterprise cloud brokerage PaaS for businesses. Software enables the design, provisioning and management of public, private, and hybrid cloud	95	2	47.5x
Oct-15	Ansible	Red Hat	Offers an enterprise-ready orchestration platform to information technology organizations	125	10	12.5x
Aug-15	Xceedium	CA	Provides privileged identity management solutions for hybrid cloud enterprises	100	15	6.7x
Jul-15	Stackato	HP	Provides an open source cloud application deployment PaaS for enterprises	27	4	6.8x
Jun-15	Blue Box	IBM	Provides OpenStack-based managed private-cloud hosting services for enterprises	ND	ND	ND
Jun-15	BlueStripe	Microsoft	Provides application staging and performance management software for enterprises and datacenters	ND	7	ND
May-15	Rally Development	CA	Provides agile software development and project management SaaS	480	88	5.5x
Feb-15	Immidio	VMware	Provides user environment management (UEM) desktop virtualization SaaS	ND	ND	ND
Jan-15	Latisys	Zayo Group	Provides IaaS solutions and offers hybrid cloud hosting services and enterprise cloud services	675	ND	ND
Jan-15	GoGrid	Datapipe	Provides cloud computing and Infrastructure-as-a-Service for businesses around the world	ND	40	ND
Jan-15	Librato	SolarWinds	Develops solutions to visualize, analyze, alert, and store metrics that impact businesses	40	3	13.3x

# M&A Transactions (Cont'd)

Date	Target Name	Acquirer Name	Target Description	LTM Rev. EV / LTM		
				EV (\$M)	(\$M)	Rev.
Dec-14	Cognilytics	CenturyLink	Provides decision sciences and advanced analytics consulting solutions and software	ND	ND	ND
Oct-14	Cloudscaling	EMC	Provides OpenStack IaaS to enable private and hybrid cloud for businesses	ND	ND	ND
Oct-14	Sentilla	Ericsson	Operates as an IT infrastructure intelligence company	ND	ND	ND
Oct-14	Telerik	Progress Software	Provides .NET, JavaScript, user interface mobile application development SaaS, Web content management, application management, etc	\$263	\$60	4.4x
Sep-14	Metacloud	Cisco	Designs and deploys private clouds software solutions	149	8	18.6x
Sep-14	FeedHenry	Red Hat	Provides mobile application PaaS to enable the development, integration, deployment, and management of mobile applications via HTML5/JavaScript	82	6	13.7x
Sep-14	Apcera	Ericsson	Provides enterprises with more visibility and control over their on-premise and public cloud-based resources and the deployment of applications	250	ND	ND
Jul-14	InMage Systems	Microsoft	Provides continuous data protection hardware-based software and SaaS to enable cloud backup, disaster recovery, etc	ND	15	ND
Jul-14	Tower3	Chef	Provides backend IT systems workflow, change management and analytics tracking SaaS for enterprise network systems administrators	ND	ND	ND
Jun-14	eNovance	Red Hat	Provides open source cloud hosting and virtualization build and deployment IaaS and managed hosting for businesses	95	13	7.3x
May-14	ScaleXtreme	Citrix	Provides cloud-based monitoring and server management solutions for enterprise and public cloud servers	ND	ND	ND
May-14	Stackdriver	Google	Provides computing software to help companies run and manage their applications on and across public cloud infrastructure	ND	ND	ND
Mar-14	Systar	Axway Software	Provides BPM, corporate performance management, and business activity monitoring software	78	28	2.8x
Feb-14	ViewTrust Technology	Virtuestream	Provides IT and security compliance monitoring and management software	ND	ND	ND
Feb-14	Cloudant	IBM	Provides DBaaS software that enables application developers to create access to enterprise data from mobile devices	150	7	21.4x
Jan-14	AirWatch	VMware	Provides mobile device management (MDM) software and mobile application, content and security management software for mobile operating systems	1,540	ND	ND
			<b>25th Percentile</b>	<b>\$95</b>	<b>\$7</b>	<b>6.6x</b>
			<b>MEDIAN</b>	<b>\$200</b>	<b>\$15</b>	<b>10.5x</b>
			<b>75th Percentile</b>	<b>\$495</b>	<b>\$53</b>	<b>18.6x</b>

# Private Placement Transactions

# Private Placement Transactions

Date	Target Name	Buyer/Investor	Size (\$M)
Jul-16	Twistlock	YL Ventures; Rally Ventures; Ten Eleven Ventures	\$10
Jun-16	Resin	Draper Fisher Jurvetson; Ericsson AB; GE Ventures; Aspect Ventures	9
Jun-16	LogicMonitor	Providence Equity Partners	130
Apr-16	Cloud Technology Partners	Rackspace Hosting	25
Mar-16	CloudOne	Hercules Capital; Chatham Ventures; Plymouth Venture Partners; Elevate Ventures; Bootstrap Incubation	9
Feb-16	Moogsoft	Redpoint Ventures; HCL Technologies; Singapore Technologies Telemedia; Northgate Capital Group; Cisco Investments; Singtel Innov8	32
Jan-16	Sendachi Us	Columbia Capital	30
Dec-15	Datavail Corporation	Boulder Ventures; Meritage Funds; Catalyst Investors; Montis Capital; Tahosa Capital; Lumerity Capital	47
Oct-15	AppDynamics	General Atlantic; Goldman Sachs Group; Institutional Venture Partners; Industry Ventures; Lightspeed Venture Partners; Adage Capital Management	158
Sep-15	Chef	Battery Ventures; Draper Fisher Jurvetson; Ignition Partners; Scale Venture Partners; Millennium Technology Value Partners; Hewlett Packard Ventures	40
Jul-15	WSO2	Pacific Control Systems; Toba Capital	61
Jul-15	LeanKit	Insight Venture Partners	18
Jul-15	Delphi	Lightspeed Venture Partners; Credit Suisse Asset Management; Fidelity Management & Research Company; Icon Ventures; Kraft Group; Greylock Partners	75
Jun-15	Tesora	Rho Capital Partners; General Catalyst Partners; Converge Venture Partners; PJC	6
Apr-15	CliQr Technologies	Foundation Capital; Polaris Partners; TransLink Capital; GV	20
Feb-15	TrackVia	ND	3
Feb-15	CloudVelox	Cisco Investments ; Mayfield Fund ; Pelion Venture Partners ; Third Point	15
Jan-15	Ravello Systems	Bessemer Venture Partners ; Norwest Venture Partners ; QUALCOMM Ventures ; SanDisk Ventures ; Sequoia Capital Israel ; Vintage Investment Partners	28
Jan-15	VMTurbo	Bain Capital Ventures ; Globespan Capital Partners ; Highland Capital Partners ; ICONIQ Capital	50
Jan-15	Datadog	Amplify Partners ; Contour Venture Partners ; Index Ventures ; OpenView Venture Partners ; RTP Ventures	31

# Private Placement Transactions (Cont'd)

Date	Target Name	Buyer/Investor	Size (\$M)
Jan-15	Talan	Tikehau Investment Management SAS	\$18
Dec-14	CloudBees	Matrix Partners; Lightspeed Venture Partners; Verizon Ventures; Blue Cloud Ventures	24
Dec-14	Pluribus Networks	Menlo Ventures; Mohr Davidow Ventures; New Enterprise Associates; Temasek Holdings; AME Cloud Ventures	52
Dec-14	Cloud Technology Partners	Oak Investment Partners; Pritzker Group Venture Capital	9
Dec-14	Skytap	Ignition Partners ; Insight Venture Partners ; Madrona Venture Group ; OpenView Venture Partners ; WRF Capital	35
Nov-14	VersionOne	LLR Partners	20
Nov-14	Stratoscale	Battery Ventures ; Bessemer Venture Partners ; Cisco Investments ; Intel Capital ; SanDisk Ventures	32
Oct-14	Mirantis	August Capital; Insight Venture Partners; Sapphire Ventures; Ericsson; Intel Capital; WestSummit Capital	101
Oct-14	MokaFive	Highland Capital Partners; NGEN Partners; Khosla Ventures	23
Oct-14	Joyent	El Dorado Ventures; EPIC Ventures; Intel Capital; LGI Ventures; Orascom TMT Investments	15
Sep-14	Netuitive	Columbia Capital; Rembrandt Venture Partners; MK Capital; Cross Creek Advisors	11
Sep-14	TrackVia	ND	3
Sep-14	Cloudyn	RDSeed; Titanium Investments	4
Sep-14	Docker	Benchmark Capital; Insight Venture Partners; Sequoia Capital; Trinity Ventures; Greylock Partners	40
Sep-14	Violin Memory	ND	105
Jul-14	AppDynamics	Battery Ventures; Institutional Venture Partners; Kleiner Perkins Caufield & Byers; Lightspeed Venture Partners; Sands Capital Management; ClearBridge Investments	70
Jul-14	Hypori	Green Visor Capital Management Company	14
Jul-14	Moogsoft	Redpoint Ventures; Cisco Investments; Wing Venture Partners	14
Jun-14	Puppet Labs	Cisco Systems; Kleiner Perkins Caufield & Byers; VMware; True Ventures; Triangle Peak Partners; GV	40
Jun-14	Egenera	Comvest Partners	16

# Private Placement Transactions (Cont'd)

Date	Target Name	Buyer/Investor	Size (\$M)
Jun-14	Kony	Insight Venture Partners; Hamilton Lane Advisors; SoftBank Capital; Georgian Partners; Delta-v Capital ; Telstra Applications ; Ventures Group	\$50
Jun-14	PLUMgrid	Swisscom Ventures; Qualcomm Ventures; Hummer Winblad Venture Partners; U.S. Venture Partners; Longworth Venture Partners	16
Apr-14	ElasticBox	Sierra Ventures; Intel Capital; Nexus Venture Partners; Andreessen Horowitz	9
Apr-14	Boundary	Adams Street Partners; Scale Venture Partners; Lightspeed Venture Partners; Triangle Peak Partners	22
Apr-14	Apigee	Bay Partners; Focus Ventures; Norwest Venture Partners; SAP Ventures; BlackRock; Wellington Management ; Accenture; Third Point ; Pine River Capital Management	60
Apr-14	Parallels	Maxfield Capital Management Fund	5
Mar-14	Talan	Bpifrance Investissement	8
Mar-14	Mulesoft	Bay Partners; Cisco; Hummer Winblad Venture Partners; MeriTech Capital; Morgenthaler; New Enterprise Associates; Sapphire Ventures; salesforce.com; Lightspeed Venture Partners	51
Mar-14	AppZero	Covington Capital Corporation	3
Mar-14	Cloudera	Google Ventures ; Intel Capital ; MSD Capital ; T. Rowe Price Group	900
Mar-14	Platfora	Battery Ventures; Cisco System; Allegis Capital; Sutter Hill Ventures; In-Q-Tel.; Tenaya Capital; Andreessen Horowitz; Citi Ventures	38
Mar-14	Racemi	Milestone Venture Partners; Paladin Capital Group; Harbert Venture Partners	10
Mar-14	Embrane	Cisco; New Enterprise Associates; North Bridge Venture Partners; Presidio STX; Lightspeed Venture Partners	14
Feb-14	AppDynamics	SVB Silicon Valley Bank	20
Feb-14	Spiceworks	Austin Ventures; Institutional Venture Partners; Shasta Ventures	57
Feb-14	Unidesk	Tresoro Ventures	10
Jan-14	Docker	Benchmark Capital; Insight Venture Partners; Trinity Ventures; Greylock Partners	15
Jan-14	Datadog	RRE Ventures; Index Ventures; OpenView Venture Partners; Contour Venture Partners; NYC Seed; IA Ventures; RTP Ventures; Amplify Partners	15
Jan-14	Cloudlock	Bessemer Venture Partners; Ascent Venture Partners; Cedar Fund	18
		<b>MEDIAN:</b>	<b>\$20</b>