IBM Z
Introduction
November 2017

# Docker and IBM Z

## Frequently Asked Questions

Worldwide

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## What is Docker and how does it deliver value?

Docker is a company and an open source container project. Docker creates portable lightweight containers for software applications that can be run on any machine with Docker installed, regardless of the underlying OS environment. Docker solves many of the same problems that a VM solves, plus some others that VMs can't solve because they are often too resource-intensive. Consistent with the IBM Hybrid Cloud POV, containers help create application portability. Docker has received a lot of buzz because its processes for creating and using containers are significantly easier than previous methods.

## How are clients using Docker containers?

DevOps is currently the primary use case for Docker containers. Essentially, clients are building and packaging applications using Docker containers so that applications can be easily tested, deployed and run on other systems, either on- or off-premises. Docker allows the application images to be isolated, replicated, scaled and disposed, which simplifies the development and testing iteration process.

## Is Docker open source like OpenStack® and Cloud Foundry?

Yes, Docker is an open technology. However, one of the key differences between Docker and other open organizations like OpenStack and Cloud Foundry is the governance of the open project. Both OpenStack and Cloud Foundry projects are managed by a foundation that helps ensure that the open technology project has a long life and a vibrant community that is represented by members of the community and not just the leading vendors. The Docker project is managed by Docker, Inc., a for-profit company. Docker is working with IBM to establish an open governance system similar to Cloud Foundry and OpenStack, but no timetable has been established for implementation. Note: The open container project is under The Linux® Foundation and ensures investment protection as one of the key goals of the foundation is to maintain independence from any one vendor or platform.

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The Docker project is managed and maintained by Docker, Inc., a for-profit company. However, the growing ecosystem of Docker has triggered creation of the Open Container Project (https://www.opencontainers.org/). This project is hosted by the Linux foundation and ensures openness of specifications. Key goals are independency from particular clients, orchestration tools, vendors, as well as platforms and Cloud infrastructures. Docker has contributed their container format and a runtime to the Open Container Initiative, but is still controlling the Docker project on its own.

## Are there other companies delivering container technologies?

Yes. There several competing technologies to Docker, including CoreOS (Rocket), Ubuntu (LXD), Microsoft (Hyper-V), and others, some of which follow the Open Container specification. Docker is regarded by many in the industry as the leader. That said, IBM is also considering other container technologies for future integration and partnership.

## How are IBM and Docker working together?

IBM is among the companies and open technology foundations partnering with Docker. IBM is the first and only reseller of Docker Trusted Registry, Docker's behind-the-firewall repository for storing and managing Docker containers. This is not an exclusive agreement and it is expected that other companies will become resellers over time, although IBM is the only vendor offering Docker L1 and L2 support. Many of the core Docker maintainers and contributors are also IBM employees.

## What is Docker Trusted Registry and what is the significance of IBM's reseller agreement with Docker?

IBM is Docker's leading partner to bring containers to the enterprise. Docker and IBM bring hybrid cloud portability to enterprise applications in a number of ways:

- Docker Trusted Registry and IBM UrbanCode® enable multiplatform and multi-container deployments to hybrid clouds.
- Docker Trusted Registry and IBM PureApplication™ help speed application deployments by including Docker containers as part of PureApplication patterns.
- Docker Trusted Registry comes with IBM's trusted world class level 1 and level 2 support, which is important to enterprise customers.

## How does IBM add value to Docker over and above what Docker provides natively?

IBM is the first and currently the only partner reselling Docker Trusted Registry (DTR). One of the client benefits is that IBM will service and support DTR giving a higher level of confidence to clients that their offering will continue to work as intended.

## What IBM products and services work with Docker?

Bluemix®, IBM Cloud OpenStack Services, UrbanCode Deploy, PureApplication System, IBM LinuxONE™, POWER Systems™, and IBM Z®.

## How does IBM Cloud OpenStack Services work with Docker?

IBM Cloud OpenStack Services allows you to build applications in IBM Bluemix and then use Docker containers to deploy them as virtual machines on OpenStack on SoftLayer. This simplifies deployment and provides a quick and reliable public cloud service experience.

## How does Docker work with IBM Z? What is the value add?

Docker binaries for both RedHat 7 and SUSE 12 are based on the Open Source version for IBM LinuxONE, IBM Z, and POWER®. SUSE provides a supported Docker environment in their containers module for SLES 12. They are available for technology preview at IBM developerWorks® (http://www.ibm.com/developerworks/linux/linux390/docker.html). Managed images can be uploaded to "ibmcom" in Docker Hub. The uploaded files might be named with "s390x" appended to the filename. IBM Z application performance per Docker container is higher with a high number of containers per virtualized or physical resource. Its low hypervisor overhead allows Docker

containers that are running on second level VM guests to have minimal impact on application performance while providing full security isolation in a multitenant enterprise environment.

## What are some examples of how Docker can be used?

The following use cases illustrate the value of Docker.

Use case 1: You can write an app once, and send to other people; they know how to deploy. Now your organization does not need to know how to install the app and what other packages are required. The containers provide the user with the automation for packaging with automated scripts inside the container. Thus, it provides an easier, more efficient, and faster way to deploy and run apps.

Use case 2 – You have an app that requires lots of parts for a multi-tiered application requiring a workflow component, WebSphere® component, database component and math library component. You can put them in four different containers. If you are not interested in, say, the workflow component, the user would deploy only three of the containers. This allows the user to break down apps into different parts and use only the ones needed. Software products usually ship the entire product where one installs, say, 25 pieces to get possibly only one needed component. If your app required all components, put them in one container. If your app did not, keep them separate as if pieces are optional. It's like choosing Lego® blocks to build what you want.

Use case 3: Docker allows for larger density than VMs and enables more apps in one system. Before containers, a user could run only 10 WebSphere instances on an Intel system, but now with containers and enhanced memory efficiency, the user can run hundreds of the same instance, as you don't have to set up separate VMs with hypervisors. As a platform, IBM Z has some advantages over x86 with memory overcommit, and the overhead on IBM z with CPU virtualization is relatively small. Thus, one will see a bigger advantage in the distrusted environment leveraging containers, but what is interesting is the combination of containers and security isolation advantages of IBM z due to this memory overcommit – lower VM overhead.

- In a Docker environment that leverages density, the user loses the security isolation between these apps because the hypervisor is not present. Thus, if you don't care that much about security, running on bare metal gives good density at faster response time. If security is important, as with a bank, then you will want the isolation, and as stated above, the overhead on IBM Z is minimal.
- For mission-critical enterprises, you can leverage density/bare metal in a development-test environment to rapidly put everything on one LPAR on IBM Z to eliminate the provisioning associated with hypervisors; in production, you can revert back to second level guests to get the isolation, and live with the hypervisor overhead as the production environment is not changing rapidly. Use this VM isolation on a tenant granularity to get the isolation on a tenant base, and on sufficient "mass" of applications to gain from the efficiency opportunities because VMs don't have as big overhead on IBM Z as compared with that on an x86 platform[1].

- For IBM Z, you can shape your environment with system virtualization and container elements according to your landscape and your requirements, with hardly any constraints in performance, and define IT structures according to your needs, not your system constraints.

For more information, see the Docker web site (https://www.docker.com).

For a complete list of Open Source applications and tools available for IBM Z, please visit the IBM developerWorks Open Source Community Forum site.

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Endnotes

[1] Based on results from IBM internal lab measurements.

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