IBM Systems
White Paper

IBM UrbanCode Deploy, Docker on IBM LinuxONE and z Systems

Connecting all the dots

Unleashing the full potential of Linux

Using IBM® LinuxONE and IBM z Systems™ gives you the ultimate flexibility, scalability, performance and trust for business critical Linux applications. With a huge capacity range you can grow with virtually limitless scale to handle the most demanding workloads-gaining the benefits of centralization and enabling specialized servers to operate at lower costs, while using less floor space.

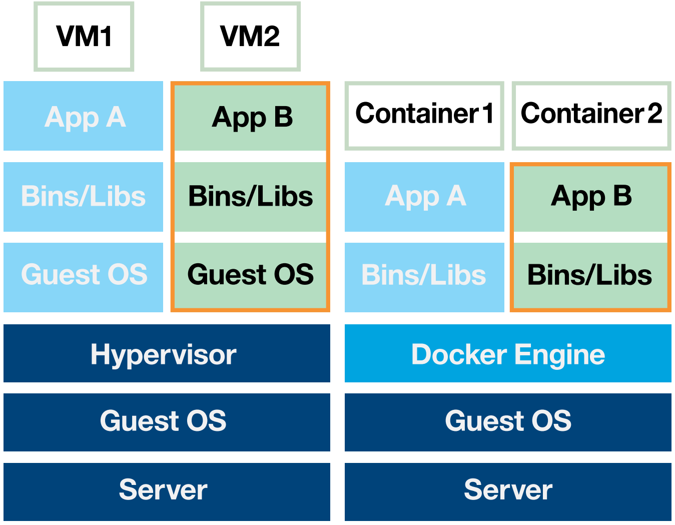
Additionally, LinuxONE and z Systems facilitate transparent use of redundant processor execution steps and integrity checking, which is necessary in financial services industries. The IBM z platform typically enables hot-swapping of hardware, such as processors and memory. This swapping is typically transparent to the operating system, enabling routine repairs to be performed without shutting down the system.

Docker containers and why they are your future

Today's applications are more complex, and yet they must be developed more quickly. These trends increase demands on infrastructure, IT teams and processes. Enterprises are struggling to find ways to lower costs, keep systems and data secure and provision applications with an increasing number of moving parts.

Virtual machines do a great job at abstracting from the underlying hardware. This lowers costs and makes it possible to automate provisioning of a complete software stack, including the operating system, the application and all its dependencies. However, virtual machines aren't ideal for every use case.

One way to increase flexibility is to run even the simplest application on its own virtual machine. However, this approach also makes scalability of virtual machines impractical to use for microservices architectures. When physical servers are replaced by virtual machines, physical resource utilization tends to remain low, but patching and lifecycle management for virtual machines still require a significant effort. Due to the administrative overhead of a complete software stack, including the operating system kernel, an application running on a virtual machine will not perform as fast as it would were it deployed on bare metal.



Docker, on the other hand, is all about making it easier to create, deploy and run applications by using Linux containers. One of the container's strongest benefits is that it enables a developer to simplify packaging an application with all the parts it needs, such as libraries and other dependencies—then ship it all as one package.

At first glance, Docker looks like a virtual machine. But, unlike a virtual machine, rather than create a whole virtual operating system, Docker enables applications to use the same Linux kernel as the system that they're running on, and only requires applications to be shipped with parts not already running on the host computer. This provides a significant performance boost, reduces the size of the application, simplifies security and helps achieve greater application mobility.

One additional benefit is the introduction of some DevOps practices into the development and deployment process. DevOps requires a higher level of cooperation between development and operations teams. By accepting the Docker format, development teams can produce code without worrying much about where it's going to run.

Developers who change code can find their changes automatically tested and added to the correct layer in the Docker workload, thus relieved of the burden of maintenance. Operations teams, on the other hand, can accept code that's already been tested, certified it's been formatted in a standard way and guaranteed to be isolated from other code in a production environment.

However, developers still need to share, distribute and collaborate on applications that use Docker container technology. The solution is to use the Docker Trusted Registry, which enables businesses to take advantage of the power of container technology within their company, behind the firewall, by creating a private repository of Docker images. Docker Trusted Registry also enables developers to access content from the more than 60,000 Docker services available in the Docker Hub public hosted repository.

Docker use cases on IBM LinuxONE and z Systems

Docker complements key capabilities of LinuxONE and z Systems, and enables the transfer of mission-critical platform attributes of the platform to these new Docker-based applications. This is of utmost importance in large enterprise environments, where enterprise-grade qualities of service are paramount. Synonymous with LinuxONE and z Systems are reliability, availability and serviceability (RAS). Using Docker with these systems means the attributes of the platform are inherited by solutions built with Docker. Therefore, enterprises can use the combination of IBM and Docker Trusted Registry solutions to create and manage a new generation of portable distributed applications that are composed of discrete interoperable Docker containers, have a dynamic lifecycle and can scale to run in concert anywhere from the developer's laptop to hundreds of hosts running in a LinuxONE or z System.

Here are some of the ways that Docker and LinuxONE and z Systems are a natural fit:

- **Virtualization:** On LinuxONE and z Systems, there is a very elaborate system of virtualization. There is multilevel virtualization, comprised of logical partitions (LPARs); IBM z/VM®, which is a tried and tested hypervisor technology; and in the future, the open source KVM (Kernel-based Virtual Machine) for IBM z Systems. Docker is an ideal addition to those virtualization approaches because, within the virtual entity, you can set up your application landscape, which is comprised of multiple services. This means you will be able to provision the same kind of applications using the same kind of deployment paradigm on LinuxONE and z Systems that you do on an x86 or other architecture, yet retain the sophisticated virtualization management used by many z Systems clients.

- **Application portability:** Docker will facilitate the use of all the applications that are now on distributed platforms, including LinuxONE and z Systems. The same packaging structure makes it simpler to deploy the z Systems edition of the application in a container and run it on LinuxONE or z Systems. Eventually, it will enable the z Systems architecture to also play a role in environments that are dominated by and only considered for the distributed space today.
- **Consolidation:** It is widely known that IBM z Systems is the platform for consolidation, where multiple services are combined on the platform using its proven virtualization infrastructure. The containers used by Docker can accommodate larger density than virtual machines and enable more applications in one system, which further expands the consolidation capabilities of z Systems by making it possible to introduce new types of applications. On LinuxONE and z Systems you can shape your environment with system virtualization and Docker containers according to your landscape and requirements, without performance constraints.
- **Security:** IBM understands the requirements of enterprise organizations as well as public sector and government entities with mission-critical environments for security and isolation. LPAR technology provides the highest non-military certification of virtualization isolation. In addition, the z/VM hypervisor also provides an extremely high level of isolation, and likewise for KVM on z Systems. Security and isolation of workloads are often critical concerns to large enterprise clients. We are bringing this high level of security into the partnership with Docker. From our many client interactions, we know well that when you get into production in an enterprise environment, virtualization suddenly plays a major role and workload isolation becomes an issue. Docker running in virtualized environments provides workload and tenant isolation with mature and sophisticated management—combining simple deployment with enterprise-grade compute environments.

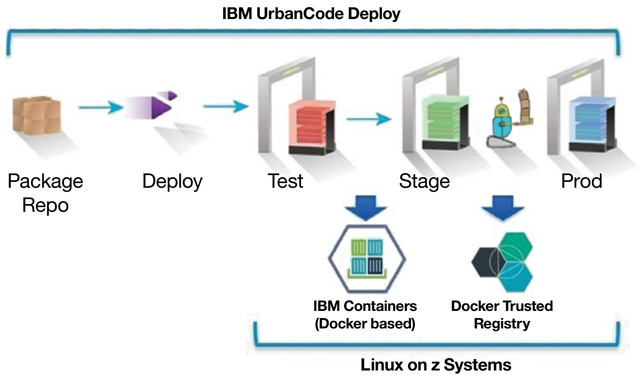
Paving the way for a successful Docker adoption

The current trends of increasing the use of mobile devices for all workloads, the proliferation of sensors and the growth of the Internet of Things (IoT) all point to a future where systems are cross-platform and must handle large volumes of data and high numbers of transactions securely and quickly.

For this reason, applications with many components are challenging on several fronts. First, there is the challenge of figuring out which version of each component should be deployed. Then, there is the challenge of getting the required versions of all the components to their destinations. Next, there is the challenge of managing the risks from deployments to different environments, across different data centers and with different processes. Finally, there is the challenge of keeping up with the growing number of deployment targets in our networks (manual deployments are slow and error-prone).

Within the IBM DevOps portfolio, IBM UrbanCode™ Deploy orchestrates the deployment of applications across environments. IBM UrbanCode Deploy provides an application-centric view of the world, and provides visibility into every step of a reliable and repeatable deployment process, so that it can be exposed as self-service in a controlled manner to those who need it. Everything is traceable, as in who did what and where and when it was done. Everything is secure, controlled by approvals and supported by notifications.

IBM UrbanCode Deploy provides an automation framework for the dockerized application to share the same general deployment process as traditional applications within the deployment lifecycle management setup. It also provides deployment artifact versioning and approvals in production environments. It makes the deployment of application changes fast and convenient, which can support continuous application delivery.



Conclusion

By combining Docker and IBM UrbanCode Deploy with LinuxONE or z Systems, you get enterprise-grade automation, orchestration, management, visibility and control capabilities for the application development and deployment process, in which an application can include software components hosted in bare metal, virtual machines or Docker containers—all fortified by the reliability, security and scalability of IBM z .

Docker is a game changer for clients using IBM z Systems and LinuxONE. Docker paves a new way of creating and moving applications to and from IBM LinuxONE and z Systems, making it possible for developers to reuse a micro service and put it together in a bigger application, using Docker containers and interconnects between them. This enablement of Docker on IBM z Systems means Linux users can further extend and advance their innovation with Docker technology to support enterprise-grade business-critical data and applications.

Docker will provide a consistent and agile approach for packaging and transporting applications, facilitating the transfer between the distributed world, the cloud and z Systems environments.

For more information

To learn more about Linux on z Systems and IBM UrbanCode Deploy, contact your IBM representative or IBM Business Partner, or visit the following websites:

- Linux on IBM z Systems home page (http://www.ibm.com/systems/z/os/linux)
- IBM UrbanCode Deploy home page (http://www.ibm.com/software/products/us/en/ucdep)

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