

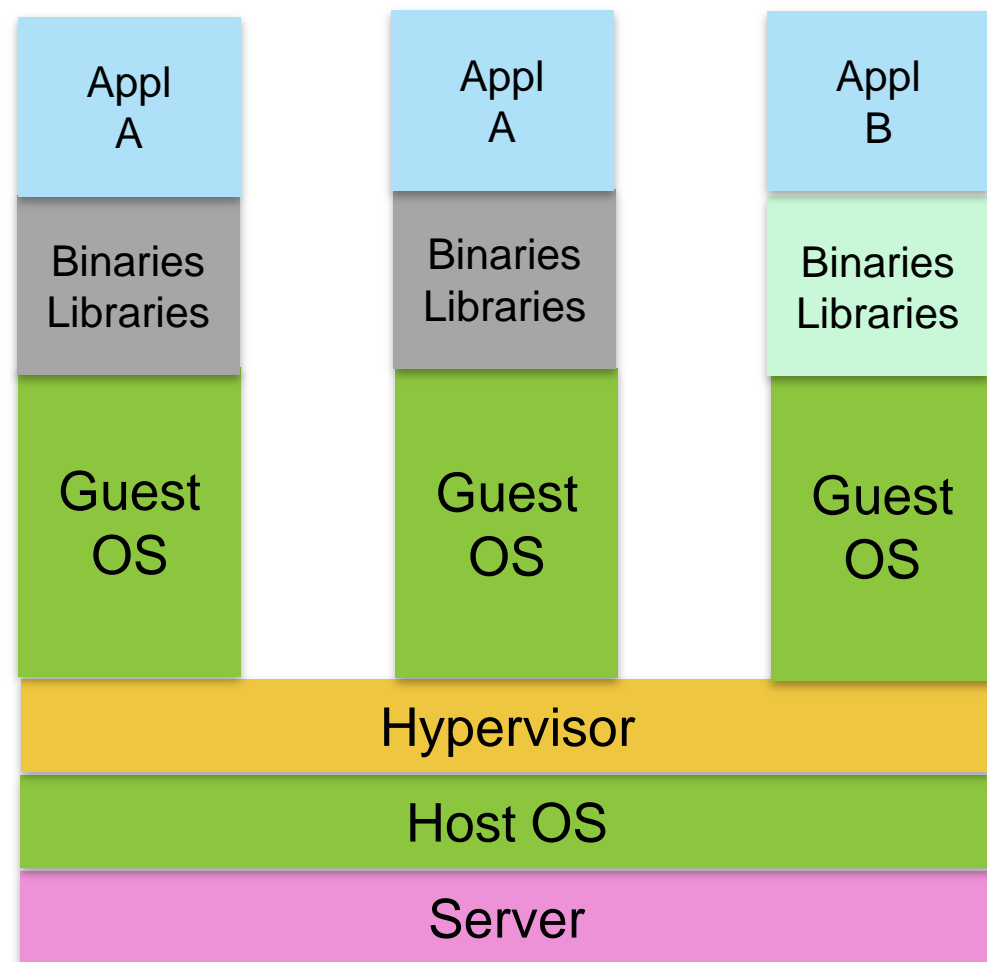


Module 8: Containers

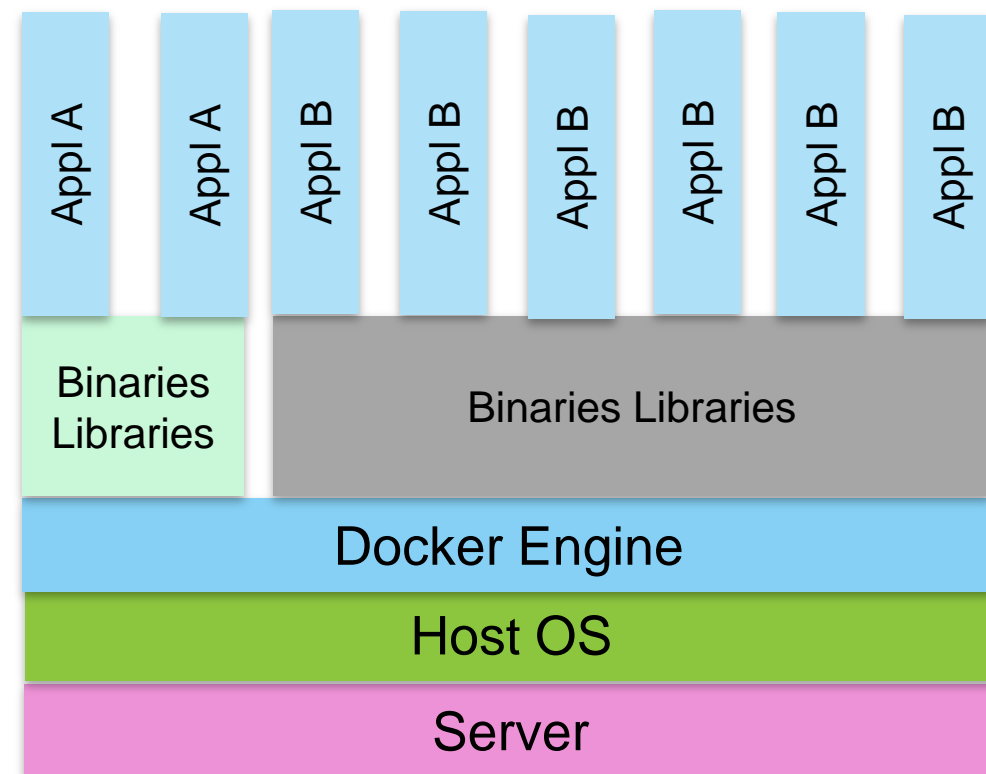
Docker, virtual machines, and Dockerfiles

Docker containers and virtual machines (VMs)

VM



Docker



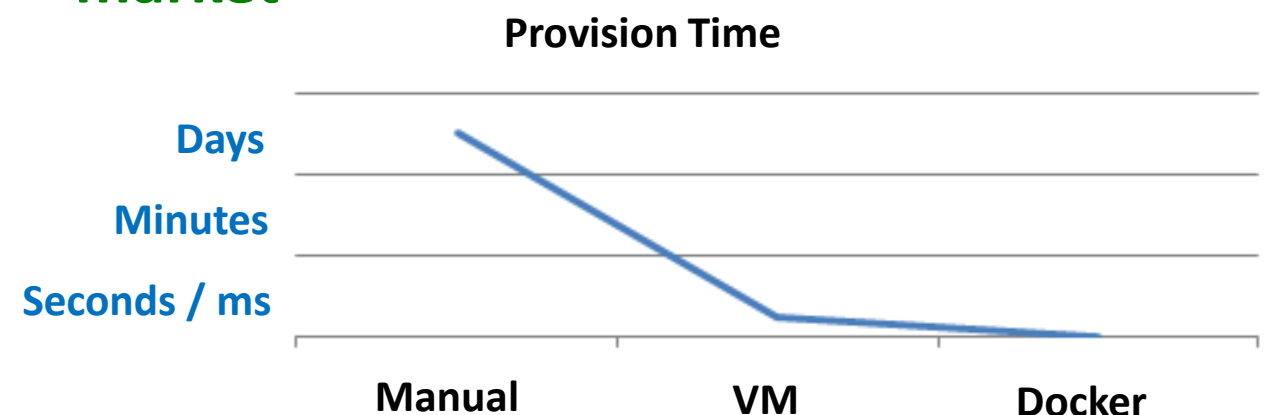
Docker = Linux namespaces + cgroups + overlay file system + image format

Advantages to using containers

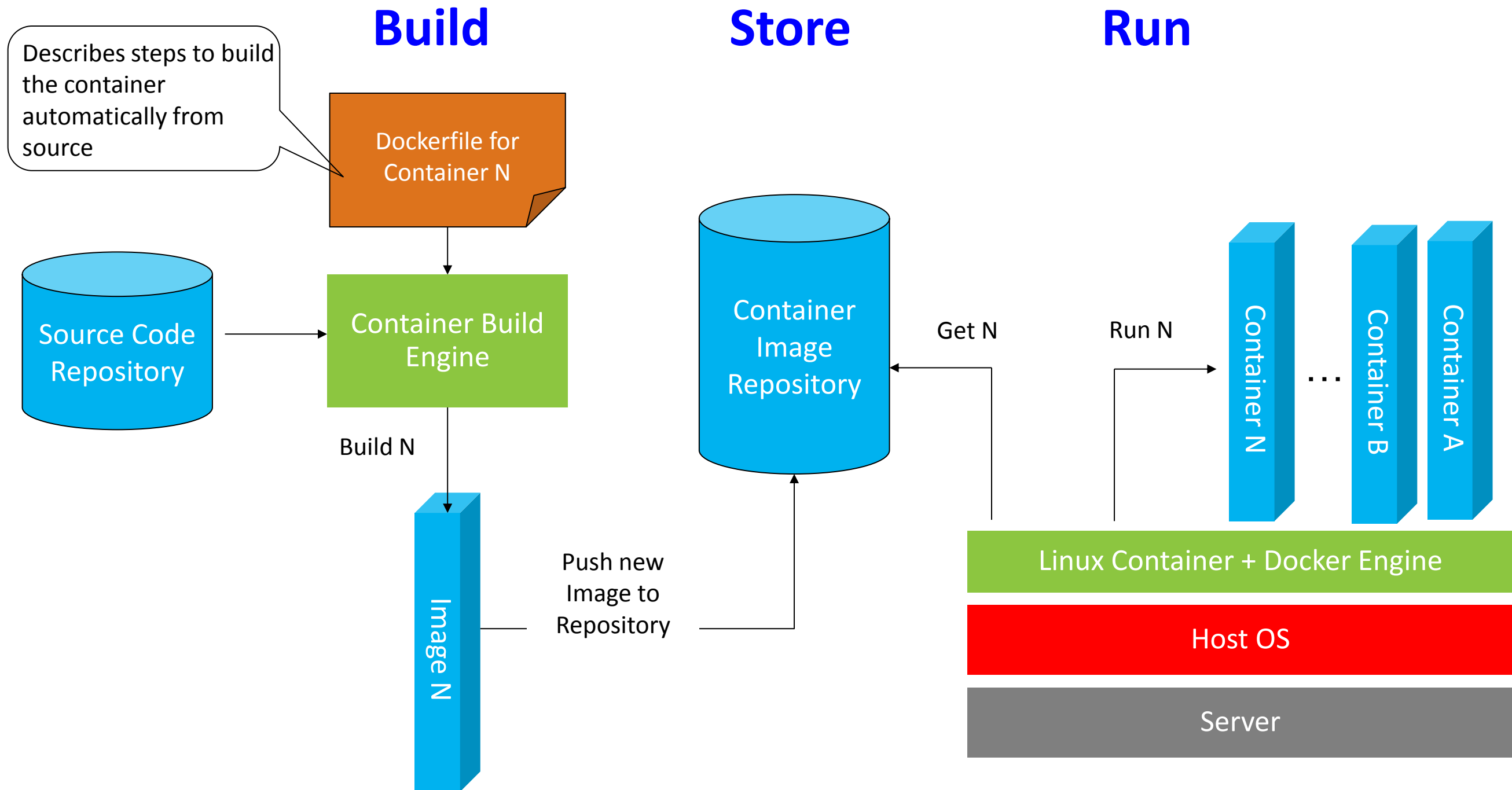
- **High density:** Because containers share the same operating system (OS) image and middleware (when applicable), you can run more applications on a server.
 - For example, if the full stack image required to run an application requires 1 GB, if you wanted to use a full VM, you'd 1 GB times the number of VMs. With LXC containers and AuFS, you can share the bulk of the 1 GB, and you can have hundreds of containers and still use a little over 1 GB (assuming they are all running the same OS image).
- **Fast start-up:** Because containers might have several layers in common, only the new layers need to be copied, dramatically reducing build/transfer/boot/load times.
 - A full virtualized system usually takes about 10 minutes to start; LXC containers take seconds, and sometimes even less than a second.
- **Portability across environments:** Deploying a consistent production environment is hard. Even if you use tools like Chef and Puppet, there are always OS and library updates that change between hosts and environments.
 - Docker gives you the ability to snapshot the OS into a common image, and when combined with IBM's patterns technology, Docker makes it easy to deploy a collection of images comprising a given workload in another collection of Docker hosts.

- Cloudy operations with Docker LXC outperform VM
 - 48x server reboot, 1.5x server boot, 1.62x server snapshot, etc.
- Docker LXC density potential compared to VMs
 - 3x memory savings
 - 26x CPU savings
 - 3.22x smaller images in this test (note – image sizes can vary based on required packages)

Significant threat to virtualization market



Docker's components and functions



Sample Dockerfile

- Dockerfile for WebSphere Liberty Profile:

```
FROM ubuntu:12.04
# add the files we require, jar + WLP files
ADD wlp-developers-extended-8.5.5.2.jar /root/
ADD wlp-developers-runtime-8.5.5.2.jar /root/
ADD JAXWSEJBSample.jar /root/
# install WLP
RUN apt-get update
RUN apt-get install -y default-jre
RUN java -jar /root/wlp-developers-runtime-8.5.5.2.jar --acceptLicense /root/
RUN java -jar /root/wlp-developers-extended-8.5.5.2.jar --acceptLicense /root/
RUN cd /root/wlp && java -jar ../JAXWSEJBSample.jar /root/wlp
EXPOSE 9080
CMD /root/wlp/bin/server run JAXWSEJBSample
```

Summary

- The advantages of containers:
 - Containers and VMs allow you to easily bring applications to Bluemix.
 - They provide a way to virtualize and partition physical infrastructure.
 - They allow IaaS and PaaS to converge and be co-located.
 - They support a large scale deployment with low latency.
 - Containers provide portability across environments.