Running Docker applications on Linux on the Mainframe

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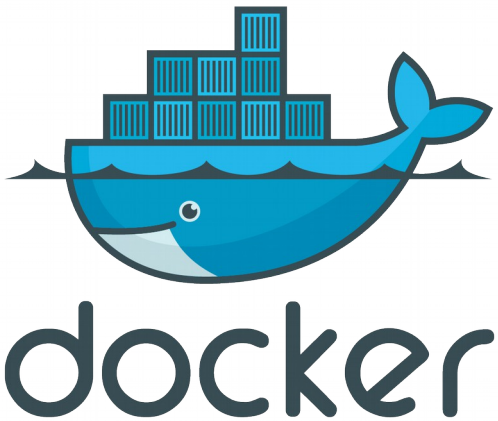
Agenda

What is Docker?

Why are we doing Docker now ?

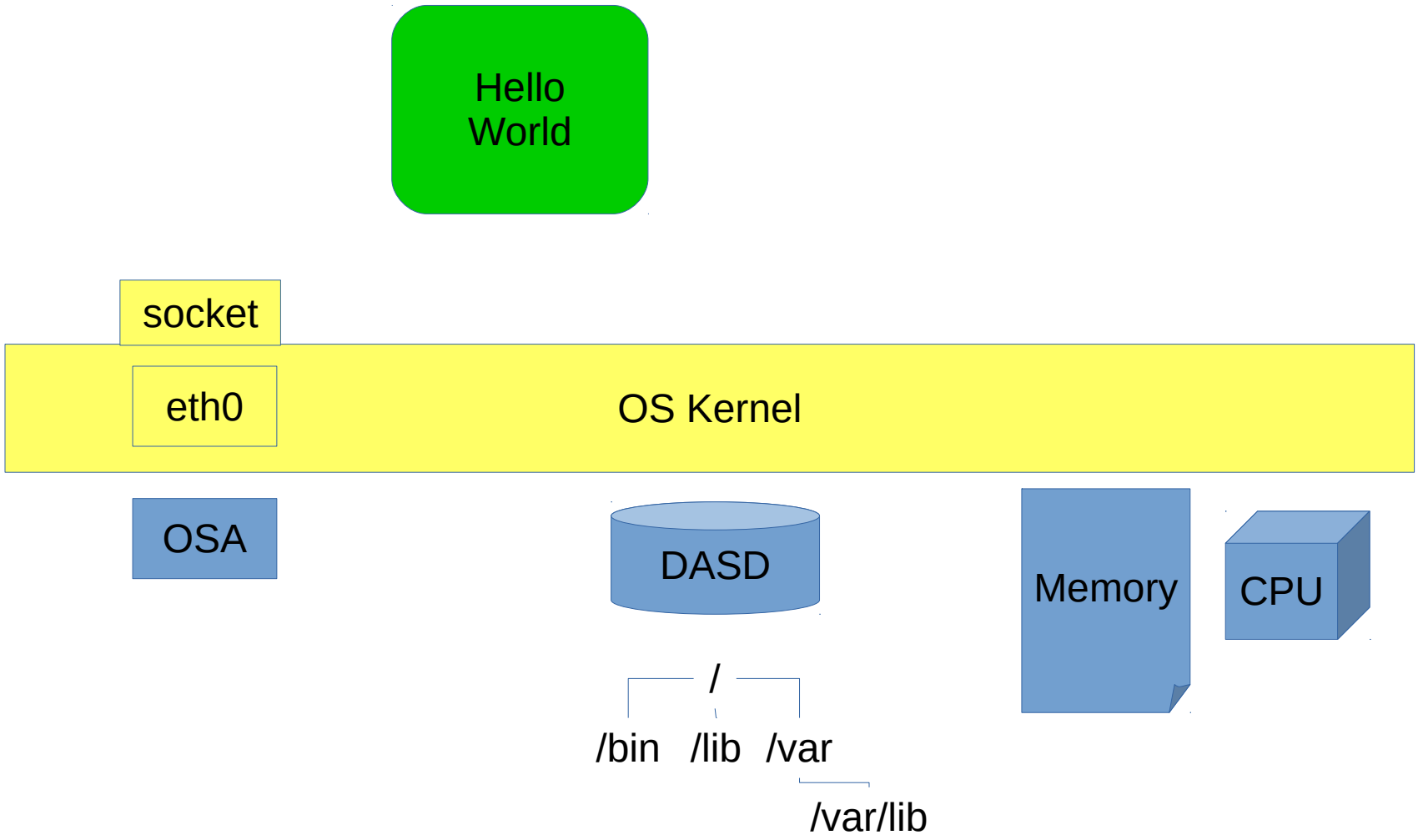
Ok – so how does one run Docker on Linux on Z ?



Docker Overview

- Docker is a management tool that handles the construction of a container which provides for all the runtime requirements of an application
- A container is
  - a file system image that contains all the libraries needed to run an application
  - the application itself, which is included in the file system image
  - a union filesystem layer which contains all the writes made to the file system image
  - the specification of what network connectivity the application requires
  - the specification of processor and memory resources that the application requires
- An Image is
  - just a file system inside a file (sorta like an .iso) which can be loopback mounted

Docker Overview



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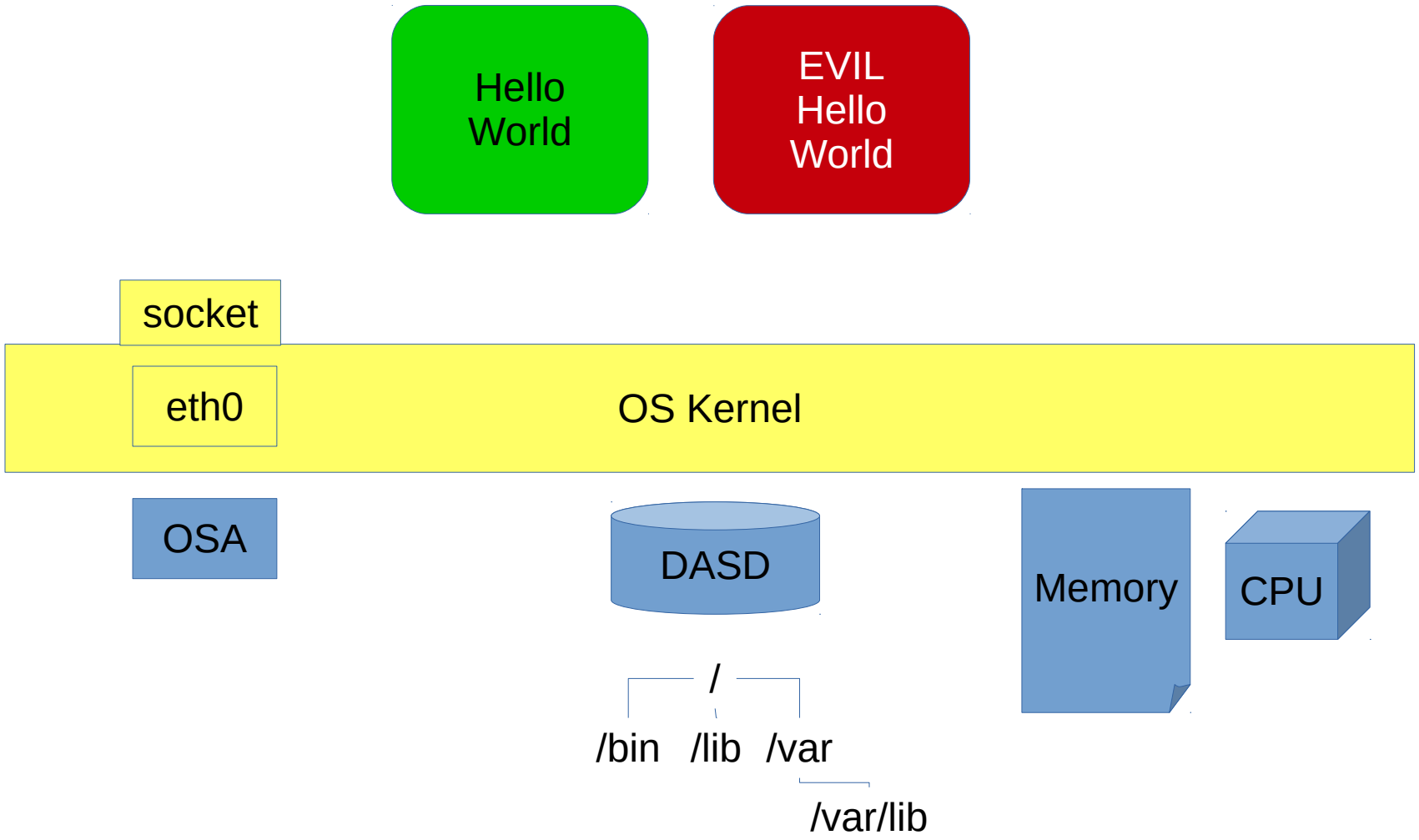

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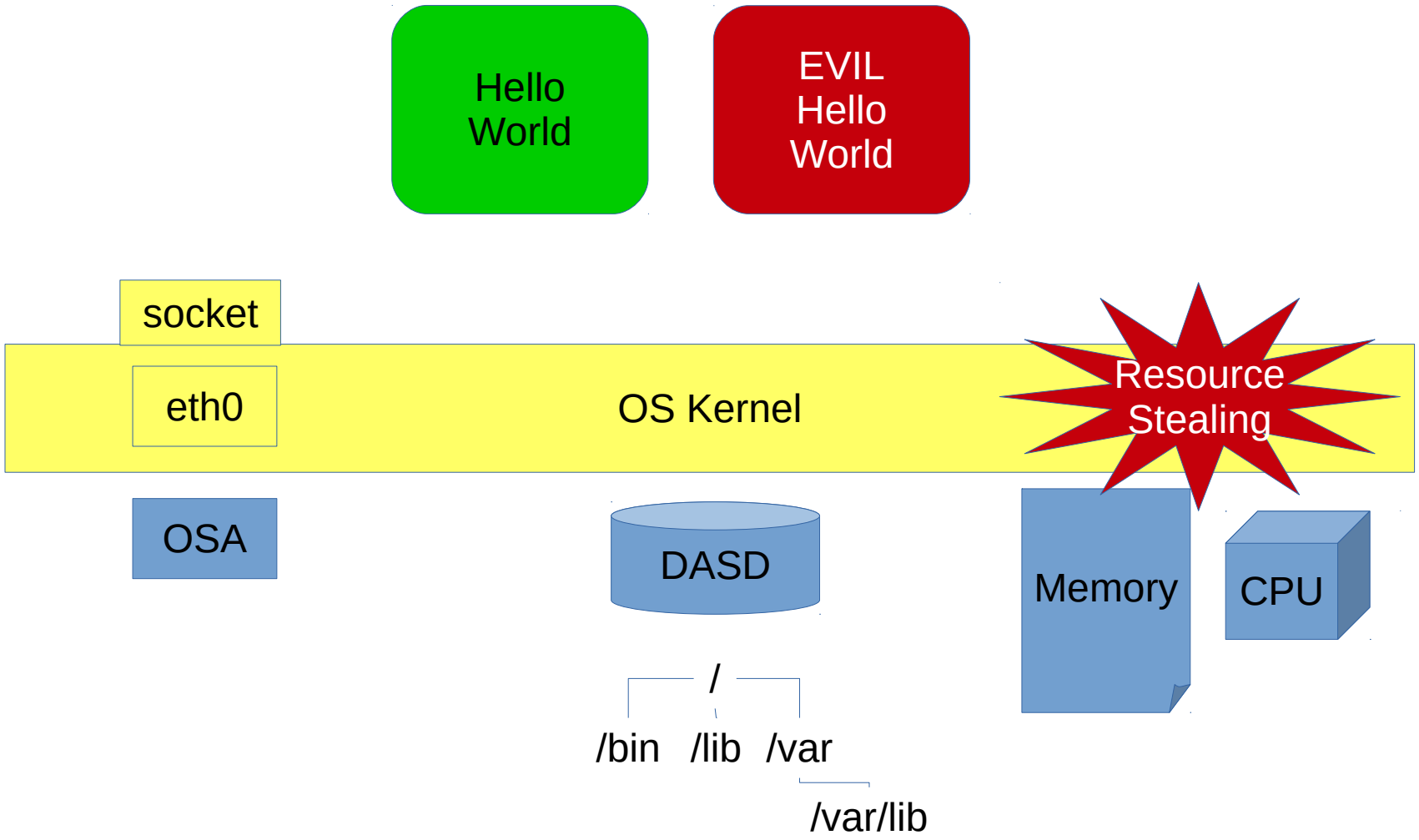

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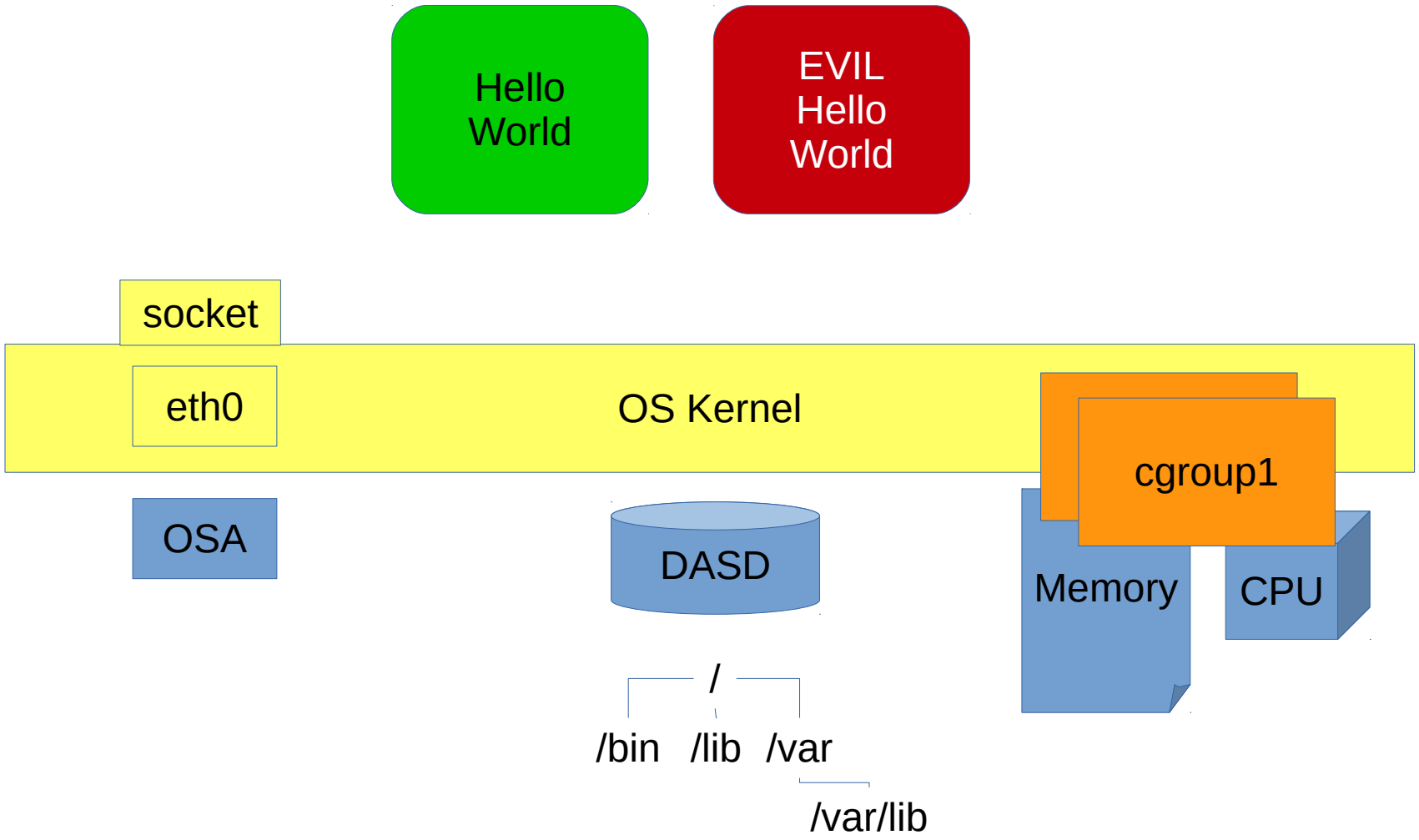

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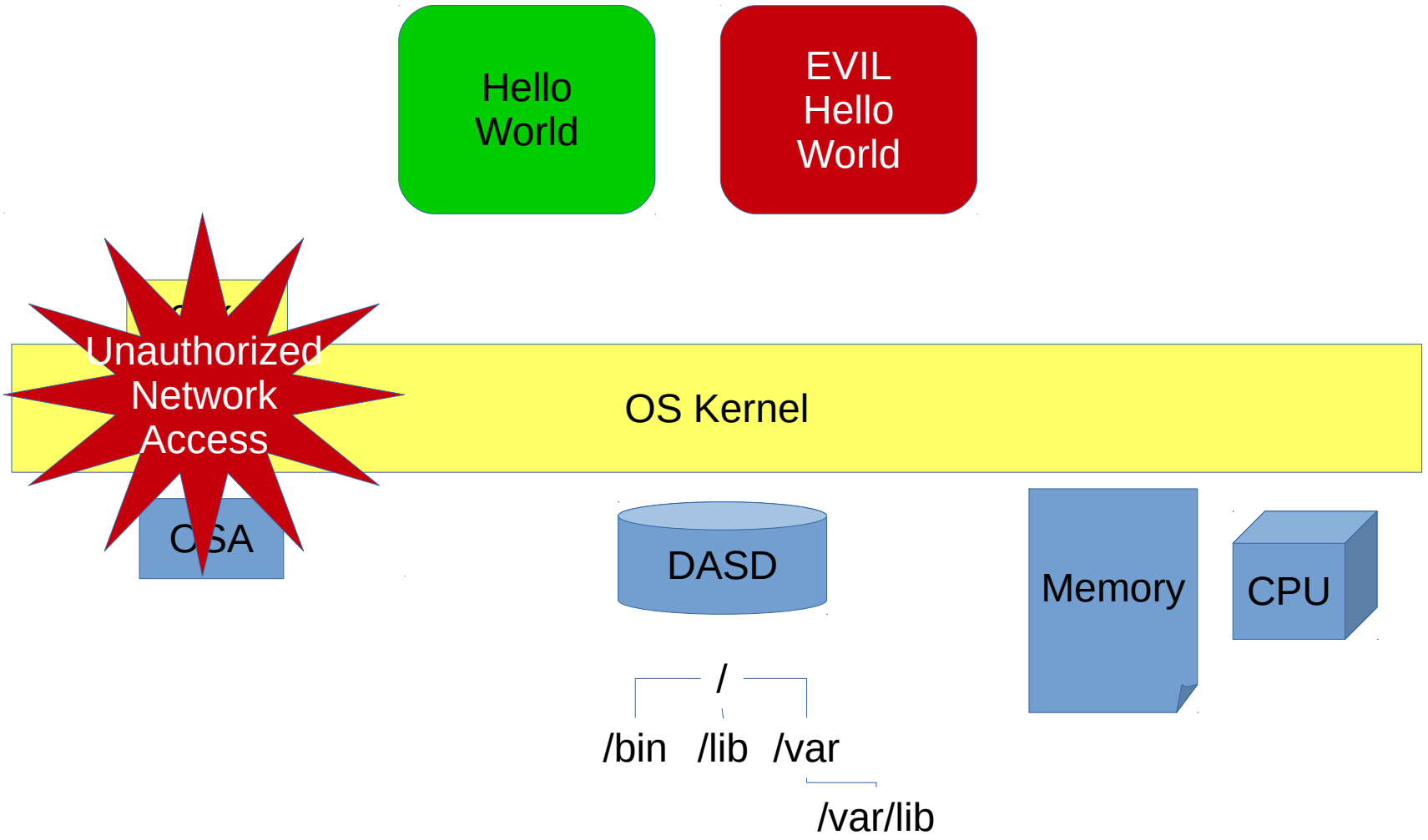

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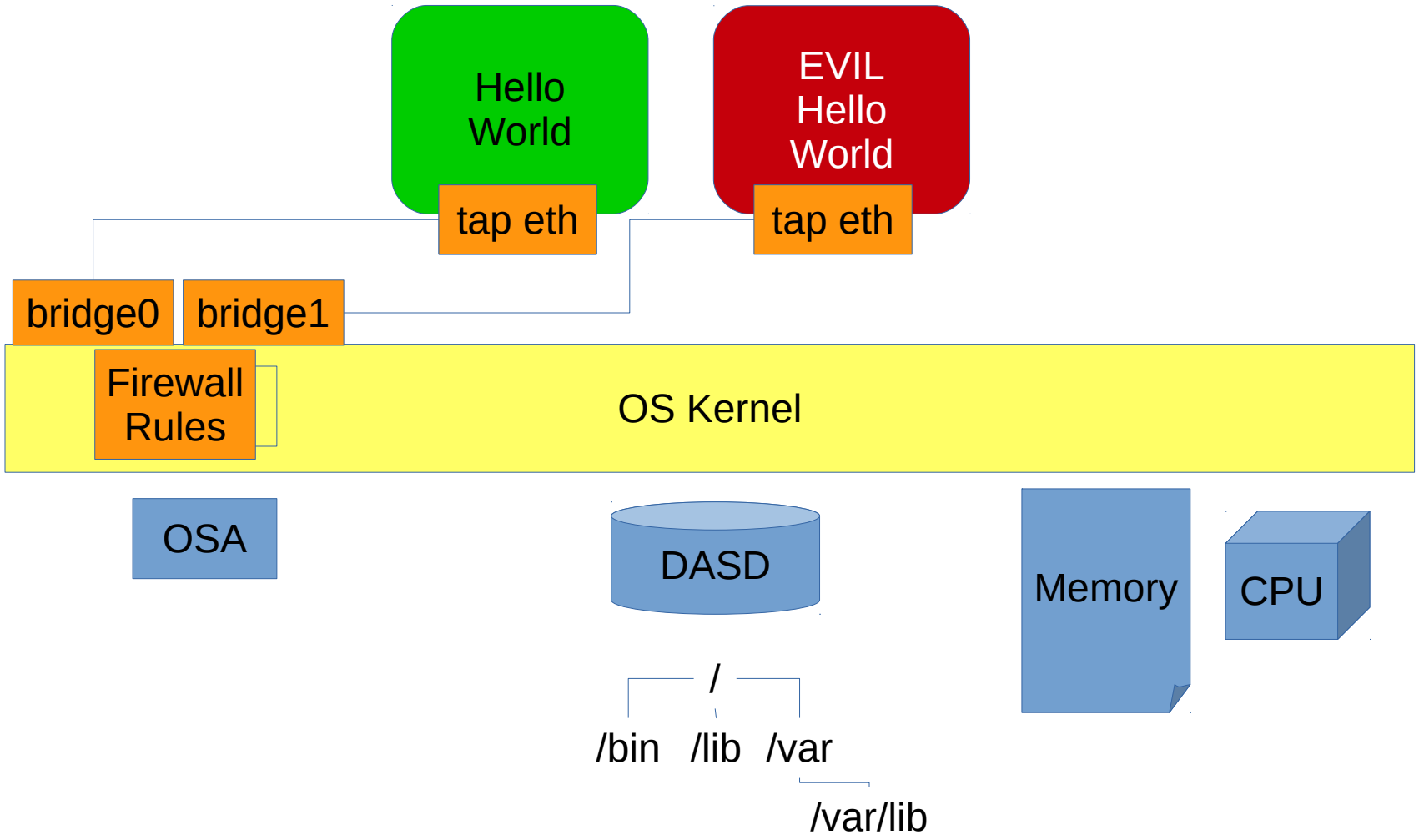

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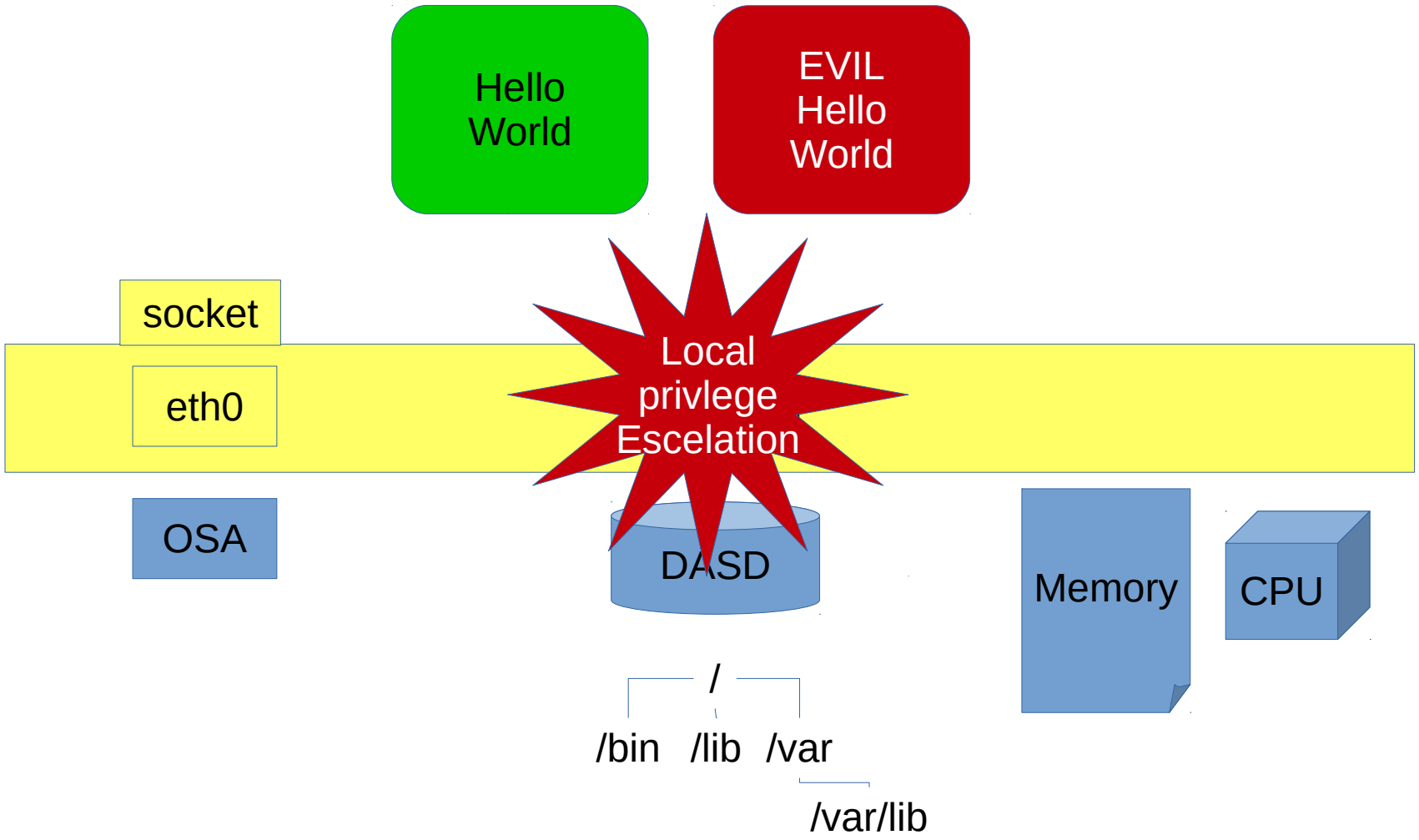

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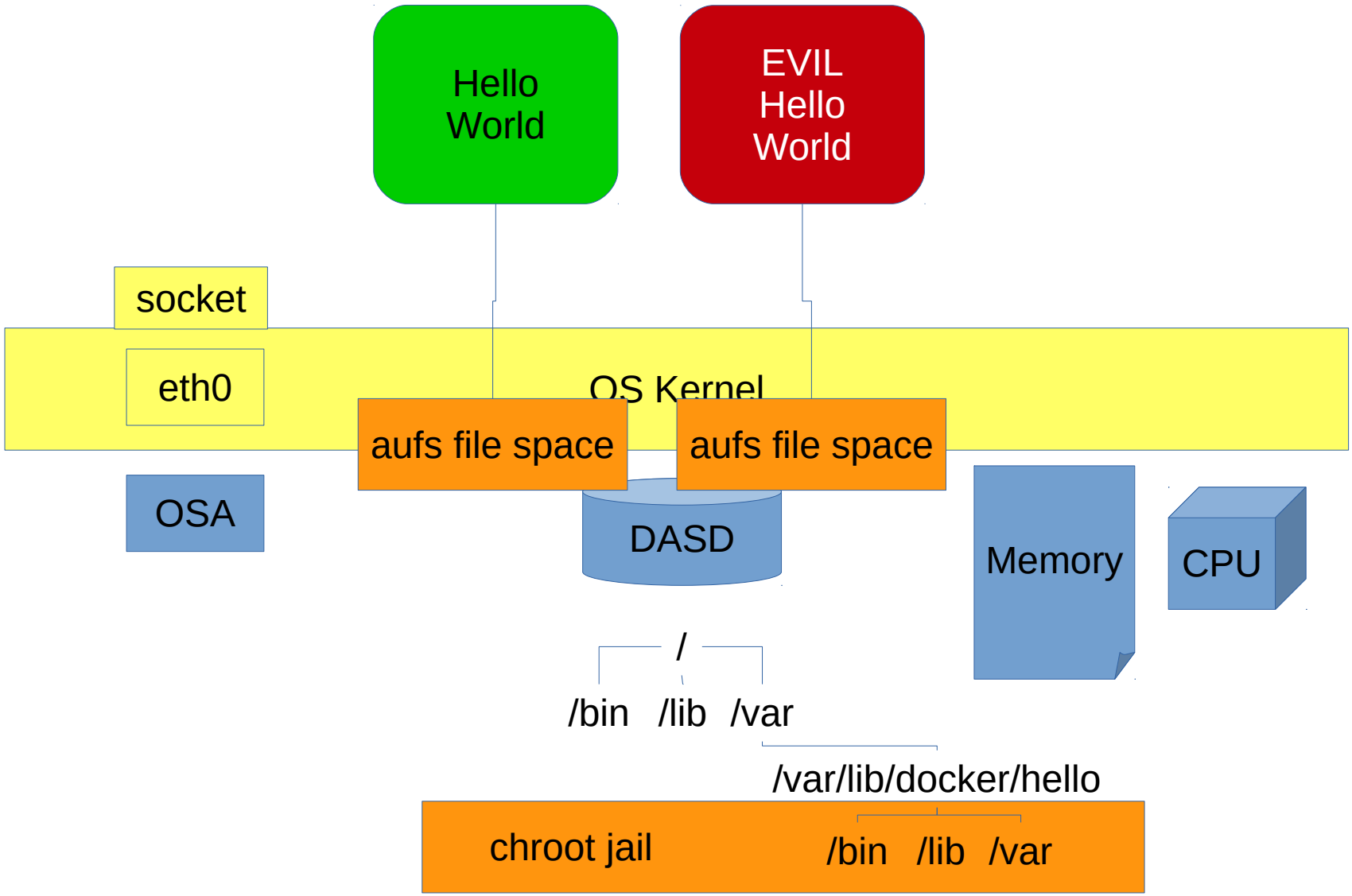
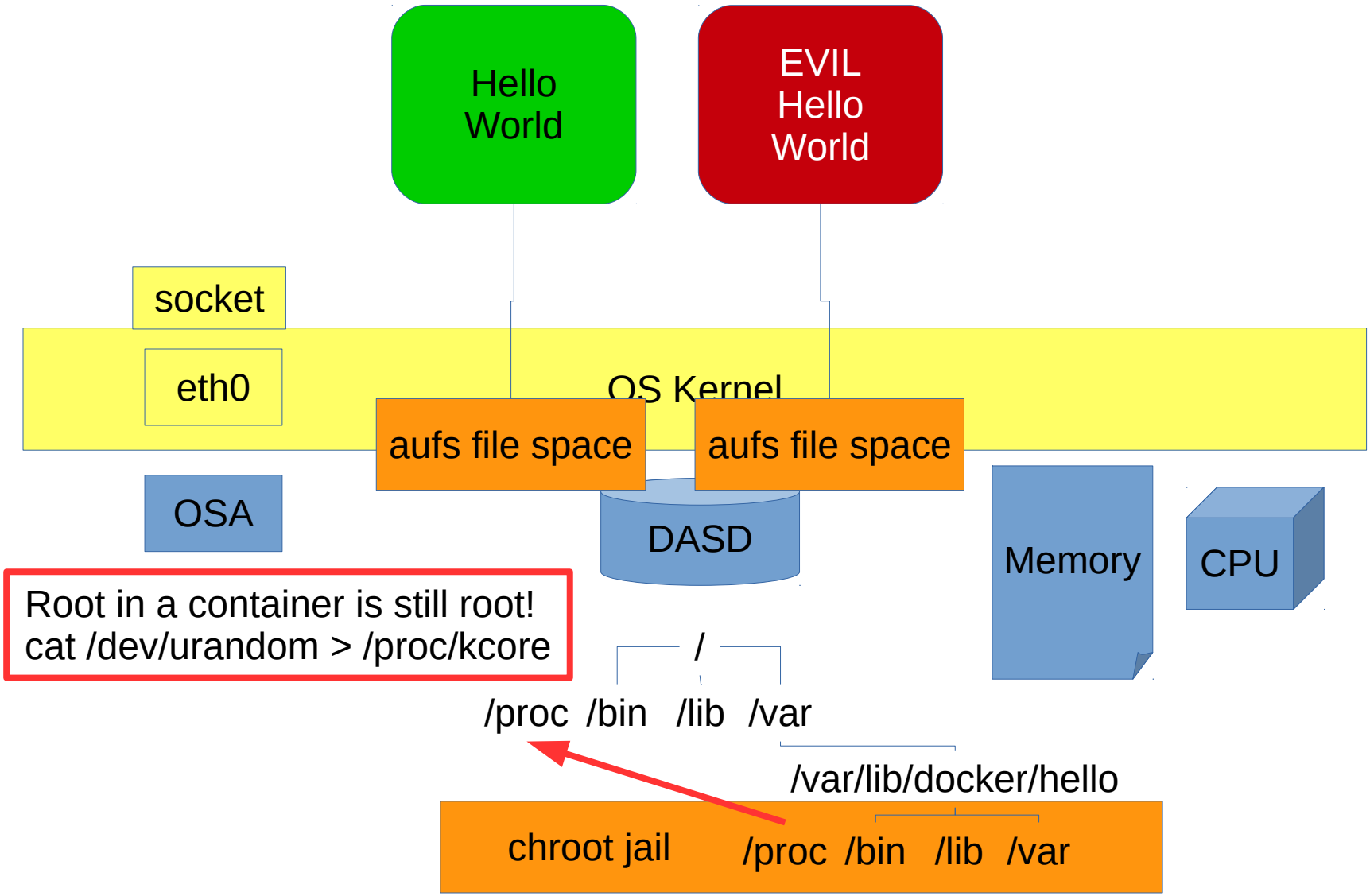


Docker Overview **



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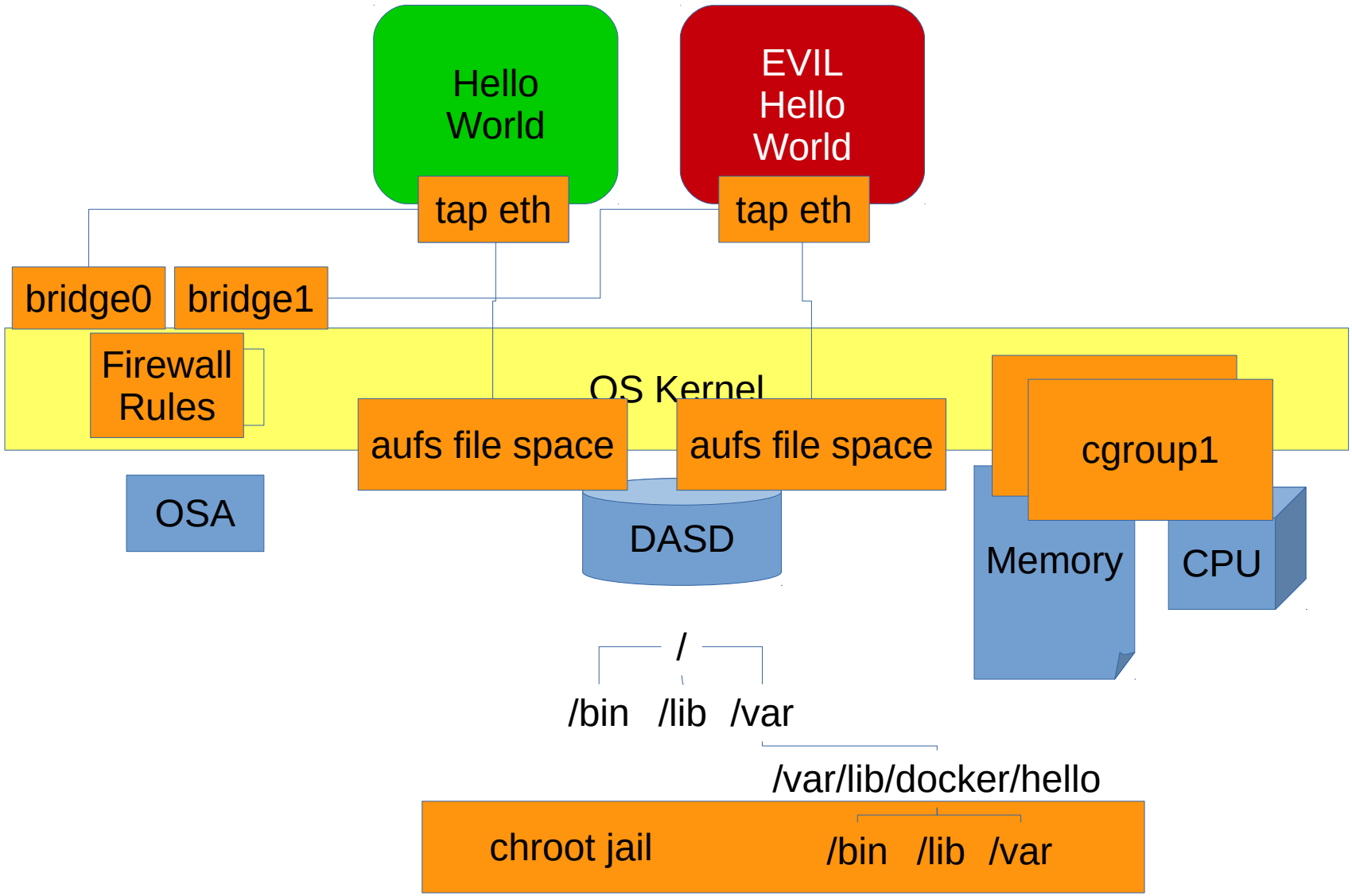

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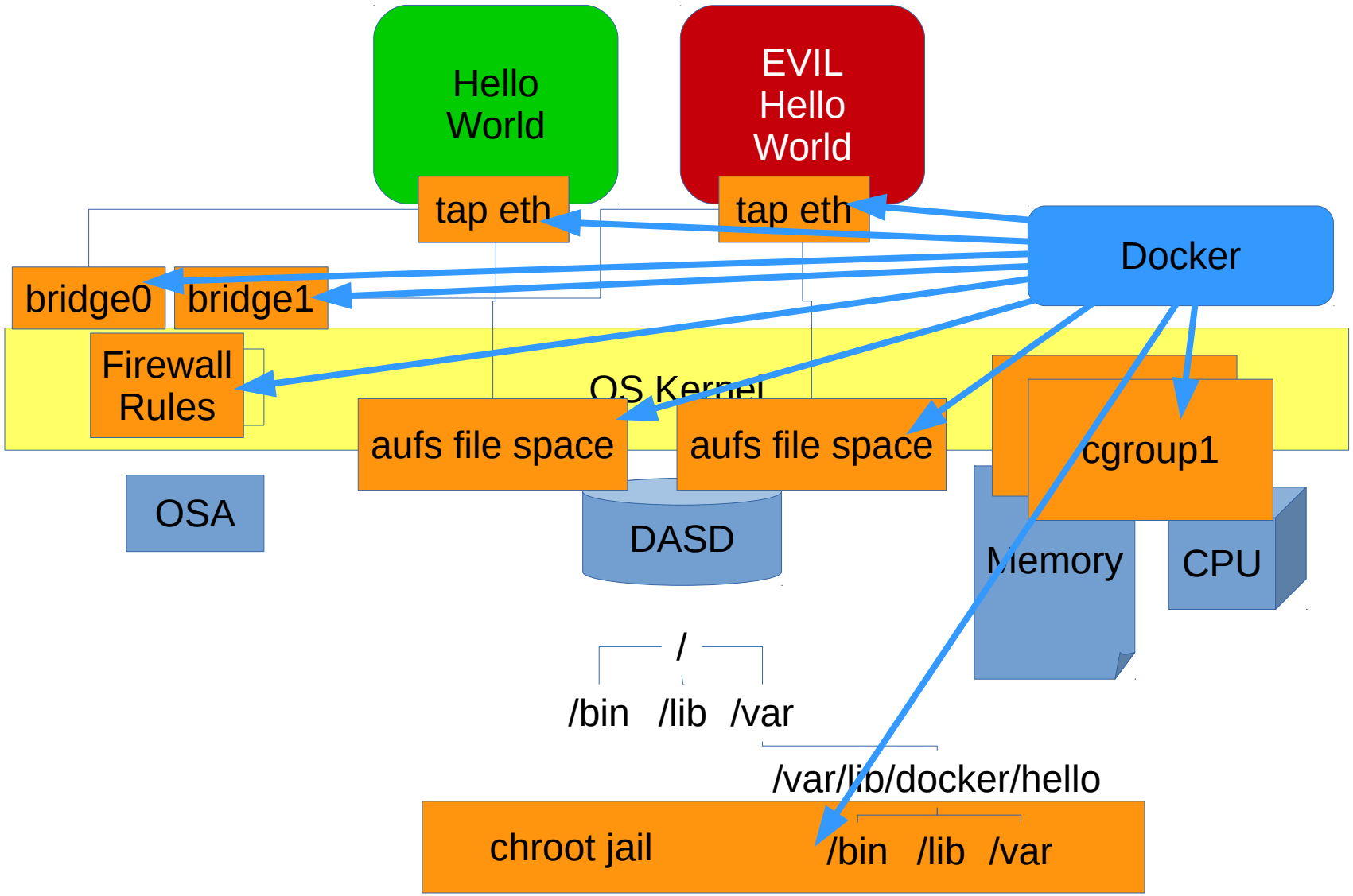
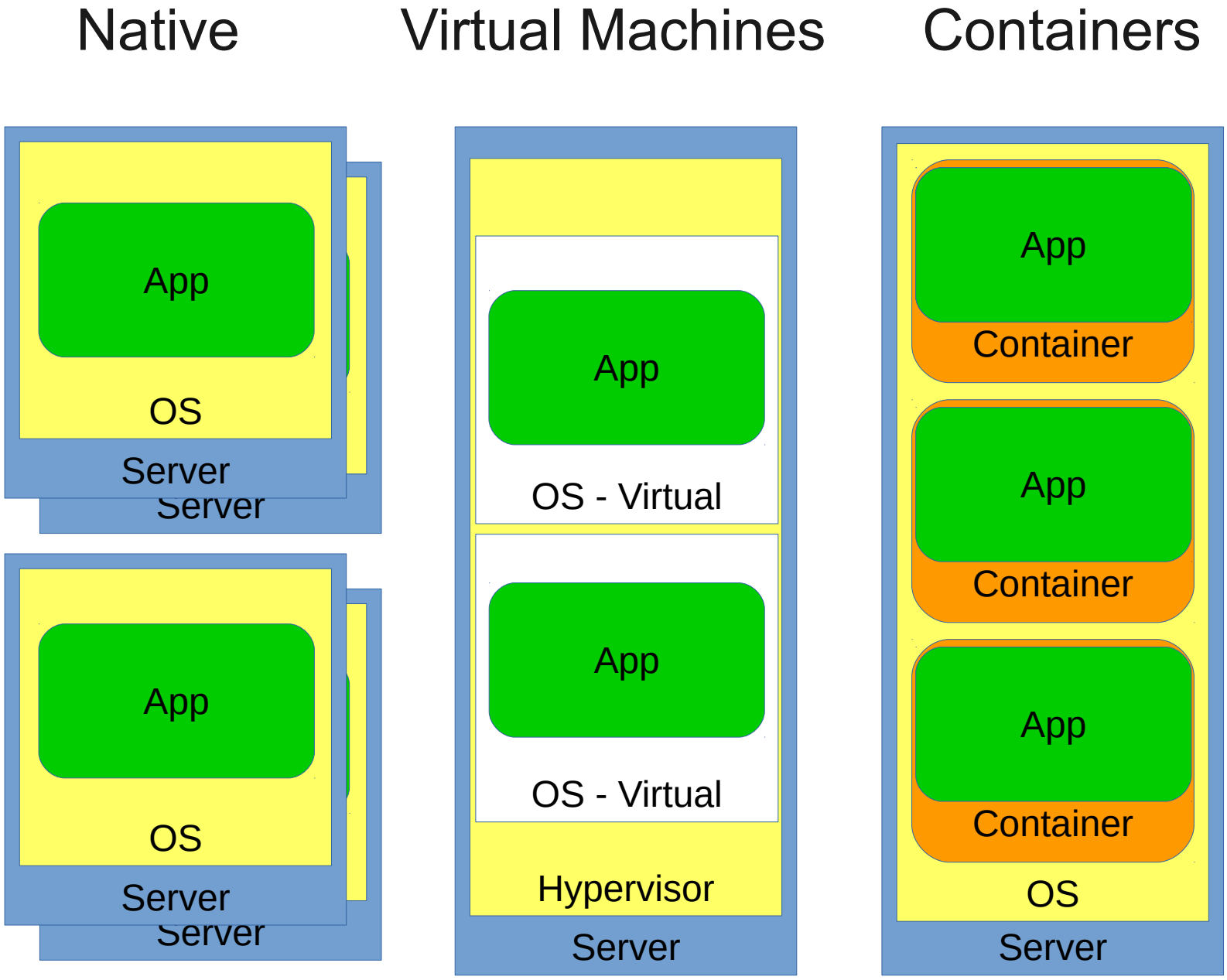


Docker will perform all the required setup for you

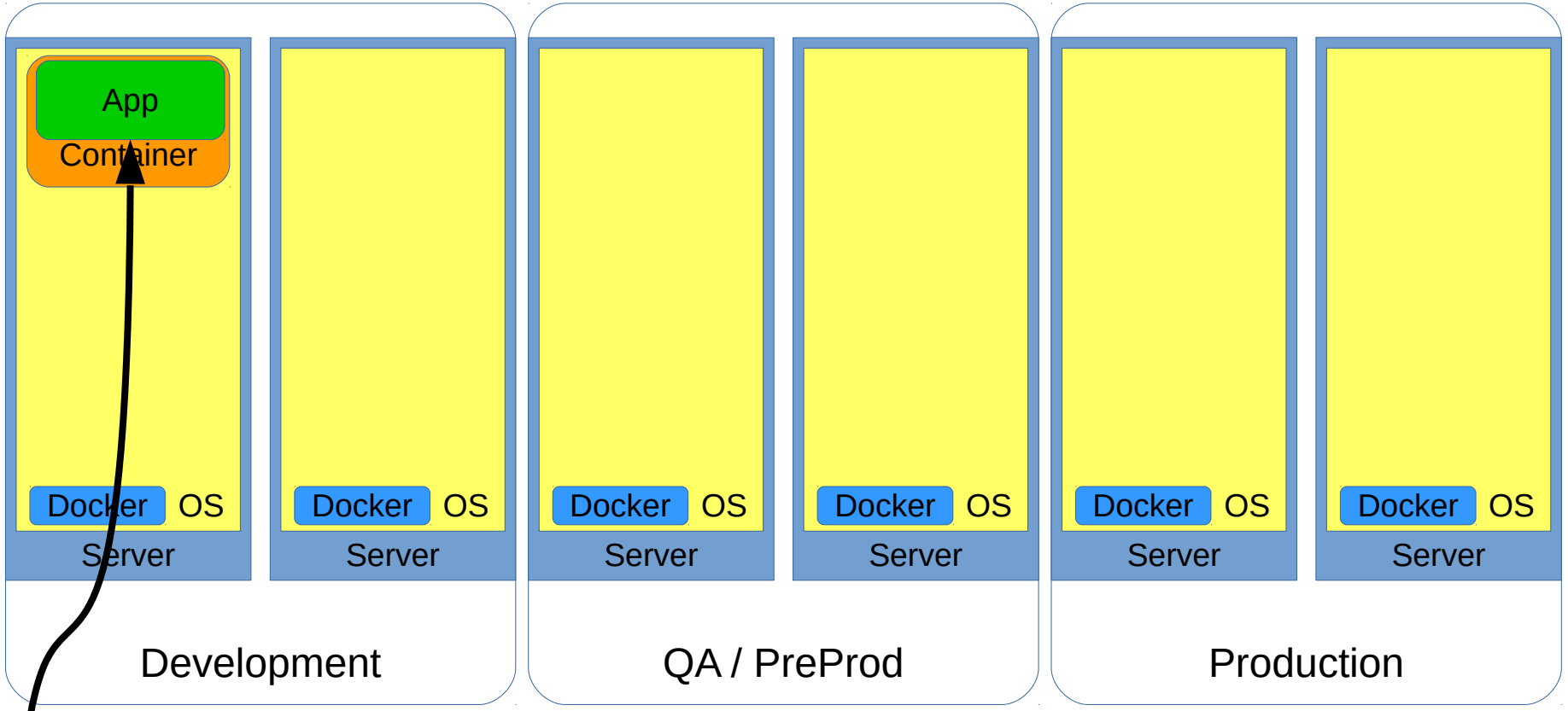
- `> docker pull debian-s390x`
  - Downloads a debian s390x image from docker hub
- `> docker run -it debian-s390x bash`
  - Starts a bash shell within a new container using the debian image
- This new bash shell is contained in a chroot jail
- This new bash shell's writes go to a container specific AUFS layer
- This new bash shell can be limited to a subset of CPU or memory resources using cgroups
- This new bash shell is only permitted outbound NAT access to the network



So what does Docker enable us to do now ?

- Application Development is more automate-able
  - Well suited to a DevOps managed Agile process
- Placing applications is relatively straightforward. There are fewer dependancies between the application and the host that runs it.
  - You can deploy a container to any Docker host of the same processor and operating system family. An application in an image with Debian libraries will run just fine on a Suse host.
  - You still need the right processor architecture though – no deploying x86_64 images on a s390x host.
- Once an image is tested – there is more confidence that the application will work as expected since it brings all its software dependancies along with it.
- Multiple containers can be deployed to a single host, increasing system utilization without the overhead of an additional OS instance to manage.
  - Like Virtualization, but easier
  - Plays to the mainframe's strengths

Docker based development and management



DockerHub
Or
Local Registry

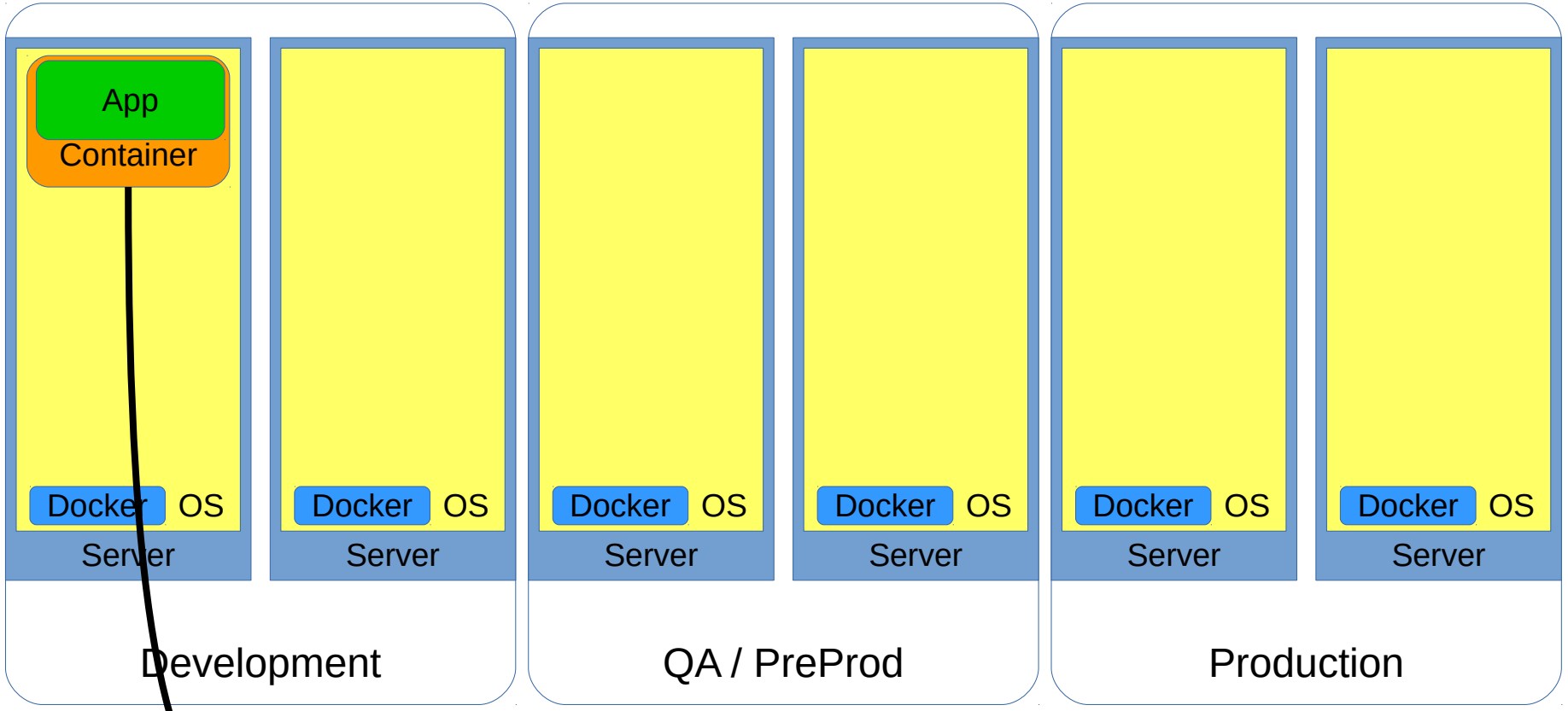
Docker Machine — Install and Manage docker hosts

Docker Swarm — Host clustering and scheduling

Docker Compose — Multi Container orchestration

Developer Develops & Runs Unit Tests

Docker based development and management



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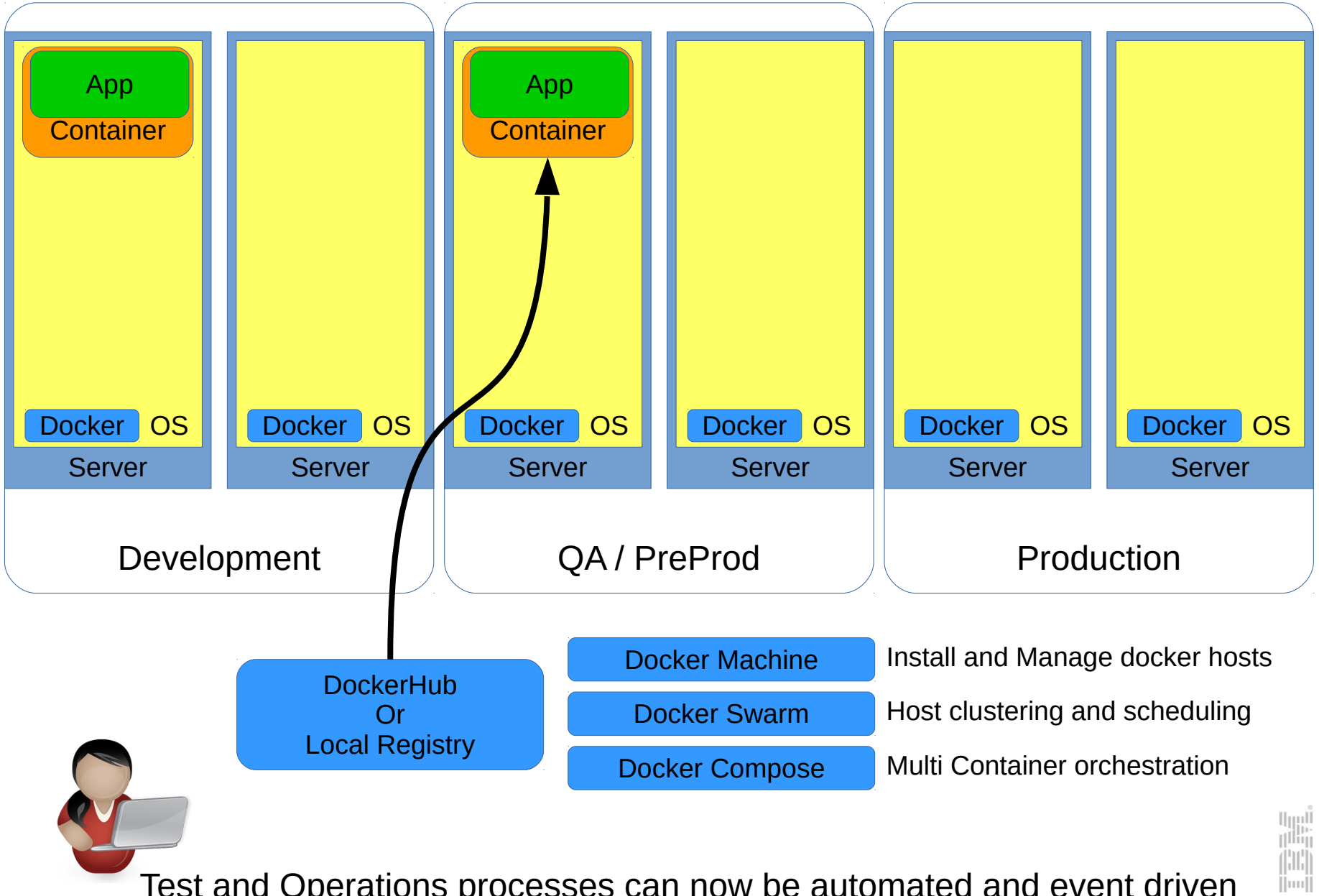
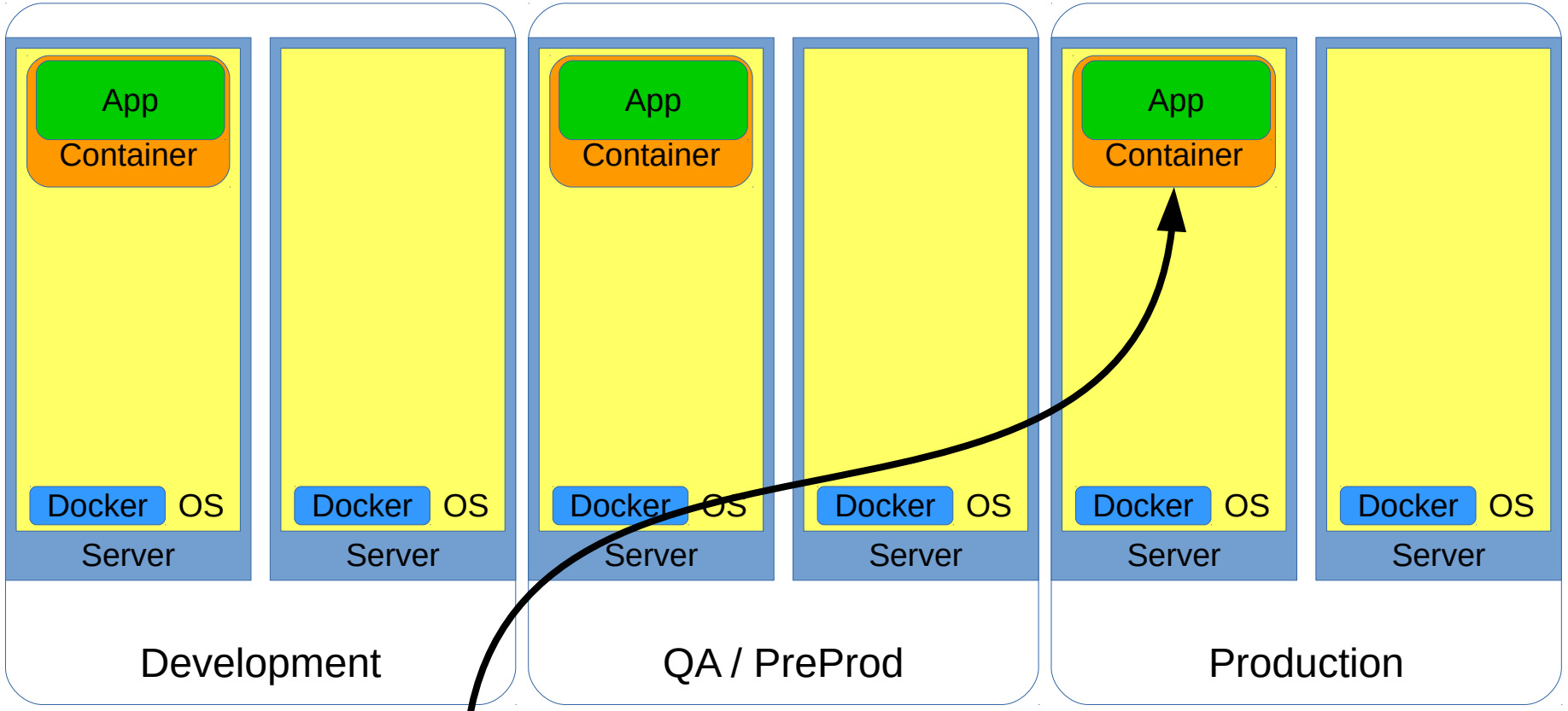
Developer Tags the image & Pushes to Registry

Docker based development and management



Test and Operations processes can now be automated and event driven

Docker based development and management



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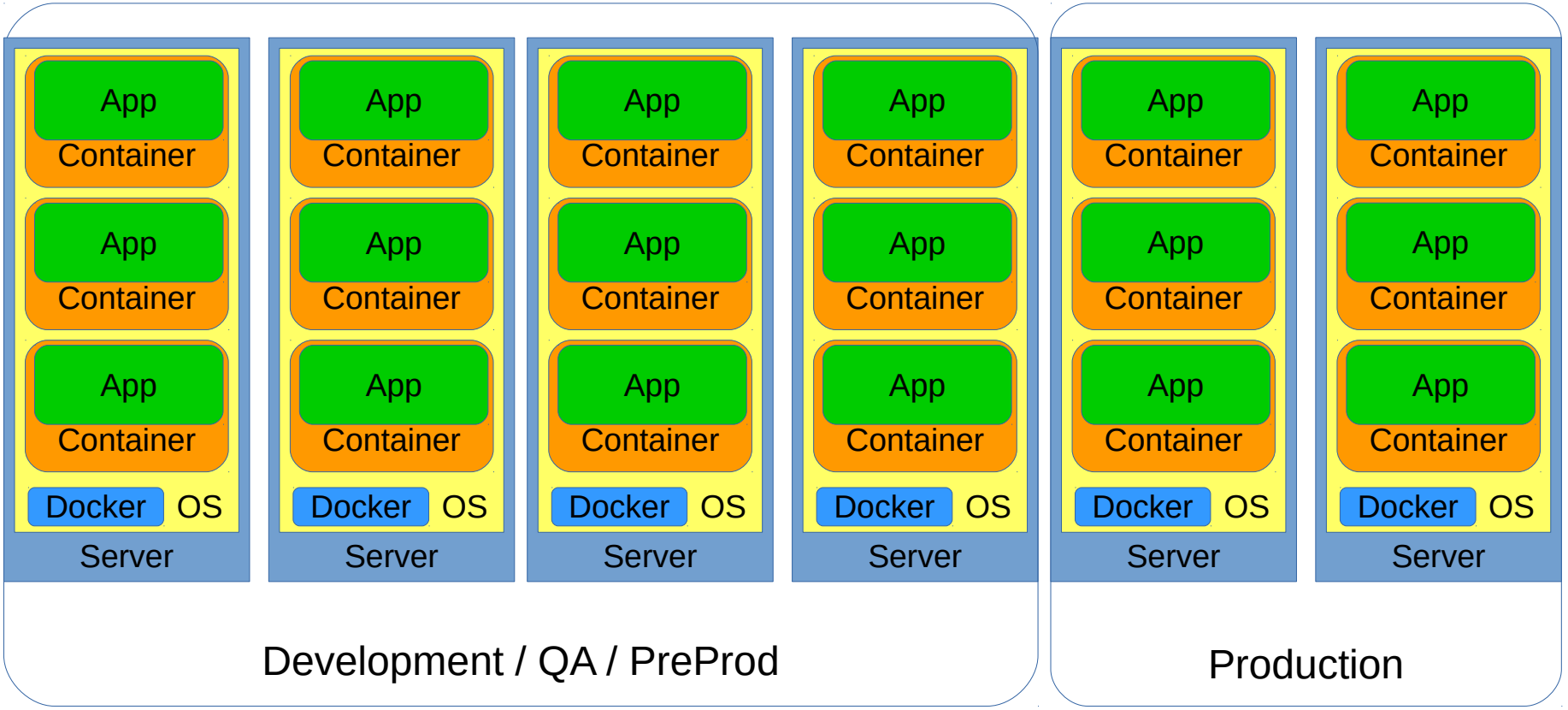
Applications are deployed to production along with their requisite libraries and and config files

Docker based development and management



DockerHub
Or
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Docker Machine — Install and Manage docker hosts

Docker Swarm — Host clustering and scheduling

Docker Compose — Multi Container orchestration

So how do we run Docker on Linux on Z ?

- Download the docker package
  - http://www.ibm.com/developerworks/linux/linux390/docker.html
  - Follow the instructions & make sure you have more than 500MB available in /var
- If you want a local registry, download and install docker on a local x86 system, then start the local registry container
  - `some_x86_machine# docker run -d -p 5000:5000 registry:2`
- Use the mkimage.sh script from a machine with a workable yum / zypper / apt config to create a usable image
  - http://containerz.blogspot.com/2015/03/creating-base-images.html
  - You can add more packages to the image by adding what you're looking for to the yum or zypper install command in the script
  - `imagedir# tar -cf - . | docker import - mynewimage`
- Tag your new image and push it to your local repository for safe keeping
  - `# docker tag mynewimage wherever.the.registry.is.com:5000/mynewimage`
  - `# docker push wherever.the.registry.is.com:5000/mynewimage`
- Start your container adventure!
  - `# docker run -it wherever.the.registry.is.com:5000/mynewimage bash`

Test Lab Notebook

- CPU / Memory performance is more or less native
- Disk Throughput into the image is lower for equivalent CPU consumption
  - ~60% of native speed for Writes: lots of additional codepath, but it is providing value
  - ~85% of native speed for Reads: some additional codepath, but it is providing value
- Disk Throughput into an mapped volume is more or less native
  - Use the -v switch on the docker run command to map a host directory into a container. For example:
    ```
    docker run –it –v /home/bobby:/home ubuntu bash
    ```
- Most Z shops will likely want to use a local image repository so they are not publishing their applications to the public DockerHub portal. Docker also offers private hub cloud services if you want images to be available to multiple orgs or sites.
- You cannot search the local image repository, that support is missing at the moment.
- The Docker daemon will use http_proxy and https_proxy environment variables to get access to the outside world if required, but the squid proxy may not support all the RESTful calls it may make.

Questions?