Experience with Docker and ICAT

Rolf Krahl

ICAT Meeting @ 11th NOBUGS, Copenhagen, October 2016
Docker is a virtualization environment. Applications are capsuled in *containers*.

Container are similar to virtual machines, but much less overhead in terms of resources.

Basic principle: each service in its own container (e.g. Glassfish/ICAT, Database, Apache frontend).

Container are instances of *images*. An image is a portable file system containing operation system, libraries, and applications.

Docker maintains a private network for all container at the current host. Forwarding public ports of the host to container is possible.
Docker Images

- Creation of docker images is controlled by a Dockerfile, often using another image as starting point.
- Use file system layers and copy-on-write.
- Directories or individual files from the host can be made accessible to containers by a bind mount (volume).

**Example: Dockerfile for MariaDB**

```bash
FROM rkhrahl/opensuse

RUN zypper --non-interactive install mariadb
RUN mkdir -p /etc/mysql /etc/mysql.d
COPY start-mysql.sh /etc/mysql
RUN chmod 0755 /etc/mysql/start-mysql.sh

CMD ["/etc/mysql/start-mysql.sh"]
VOLUME ["/var/lib/mysql"]
EXPOSE 3306
```
Cgroups and namespaces are used to isolate containers from the host system.

Example: Show Processes

```bash
# docker run -d --name test opensuse sleep 120
d147fca80c23ca4cee227a2af2d89205e8b11440cf02df590edfd212d07f6
# docker exec -ti test ps -eH -o pid,ppid,stime,cmd
  PID   PPID  STIME  CMD
   5     0   14:29  ps -eH -o pid,ppid,stime,cmd
   1     0   14:29  sleep 120
# ps -eH -o pid,ppid,stime,cmd
  PID   PPID  STIME  CMD
  [ . . . ]
  1278   1 Oct06   /usr/sbin/containerd --listen fd://
  14197  1278  16:29  containerd-shim d147fca80c23ca4cee227a2
  14209  14197  16:29  sleep 120
```
Problem: generic docker images versus local configuration. In particular: how to share secrets (e.g. database passwords) between containers?

One option: keep configuration files in the host system, outside the images. Use bind mounts to make them accessible to the container.

Consequence: initialization at startup time of the container. Use shell scripts to set the container up.
Hands on MariaDB & ICAT …

Dockerfile for MariaDB

```bash
FROM r k r a h l / o p e n s u s e

RUN zypper --non-interactive install mariadb
RUN mkdir -p /etc/mysql /etc/mysql.d
COPY start-mysql.sh /etc/mysql
RUN chmod 0755 /etc/mysql/start-mysql.sh

CMD ["/etc/mysql/start-mysql.sh"]
VOLUME ["/var/lib/mysql"]
EXPOSE 3306
```
ICAT can be installed and run dockerized.

- Generic Docker images that contain the software as distributed.
- Configuration is added to the container instance as a volume.
- Setup software and apply configuration at startup time of the container.