Deploying applications to Heterogeneous Hardware using Rancher and Docker
Outline

- Brief introduction to Rancher
- Modifications in rancher-agent to support ARM (aarch64 systems)
- How to schedule applications to specific hosts
  - In Rancher and Swarm
- Multi-arch Docker images with the manifest tool
Rancher 101

- Container management platform focused on delivering containers on any infrastructure
  - Created in 2014
  - Packet, Orange (…) are using it
- Takes care of creating/managing your infrastructure
  - Cloud Providers (AWS, DO, Rackspace, Exoscale…)
  - Custom Hosts
    - Linux machines with Docker engine installed
- Multiple types of environments available
  - Cattle, Swarm, k8s, Mesos
    - Cattle is an orchestrator created by Rancher
Before adding your first service or launching a container, you'll need to add a Linux host with a supported version of Docker. Add a host.
Rancher 101

- Comprises of `rancher-server` and `rancher-agent`
- `rancher-server` runs in a standalone container
  - Manages environments/infrastructure
  - Provides user friendly UI...
- `rancher-agent` runs in a container in each host:
  - Is deployed when docker-engine initialized
    - Or must be run explicitly for addition of custom hosts
  - Runs in privileged mode
  - Controls network configuration, health monitoring and can support deployment of applications
What about ARM?

- ARM processors are present in many devices...
  - smartphones, tablets, chromebooks, embedded devices
- Interesting to consider contexts where components can be deployed to heterogeneous infrastructure
  - x86 in cloud and a Raspberry Pi, but could also be ARM server or larger ARM system at the edge
- Rancher has excellent support for docker-engine running on x86 infrastructure...
  - ...support for other infrastructures is somewhat limited
- Partial support for ARM existed in previous versions of rancher-agent
- We updated ARM (aarch64) support to newer rancher-agent versions
Building rancher-agent for ARM

- We chose to focus on aarch64 environment
  - Used Suse Leap on Raspberry Pi 3
    - Raspbian and other distros use armhf
  - Tooling and applications for aarch64 are not problematic
    - docker-engine version 1.12 available
    - Build tools available - golang, gcc

- Instructions for building containers provided in rancher Dockerfiles
  - Mix of apt-get commands plus building specific binaries
    - Binaries include healthcheck, network-manager, scheduler
Experience building rancher-agent for ARM

- The build process itself was somewhat complex
  - Containers on rancher-agent host are written primarily in golang
- There were some specific tricks
  - Some binaries had to be installed into volumes manually
    - rancher-agent installs x86 binaries obtained from rancher-server; had to circumvent this
  - The network configuration took longer to come up on the Raspberry Pi…
    - ...resulting in issues for the healthcheck and scheduler
  - Docker swarm orchestration exhibited problems with Raspberry Pi joining the swarm
    - This was solved by removing a pruning phase in the rancher agent setup
Application Deployment

- Significant constraint exists relating to application deployment
  - Containers deployed on Raspberry Pi must have been built for this architecture
    - Partial support exists for this in docker registries
- Scheduling is based on labels to differentiate between hosts
  - For both Swarm and Cattle
    - Specific labels required according to the environment used
Examples

Cattle

version: '2'
services:
    wordpress:
        image: aarch64/wordpress
        depends_on:
            - mariadb
        labels:
            io.rancher.scheduler.affinity:host_label: type=raspberry
        ports:
            - 8080:80
        environment:
            WORDPRESS_DB_PASSWORD: ...
    mysql:
        image: mariadb
        labels:
            io.rancher.scheduler.affinity:host_label: type=VM
        environment:
            MYSQL_ROOT_PASSWORD: ...
            MYSQL_DATABASE: wordpress

Swarm

version: '3'
services:
    wordpress:
        image: aarch64/wordpress
        deploy:
            placement:
                constraints:
                    - node.labels.type == raspberry
            depends_on:
                - mysql
        (...)
    mysql:
        image: mariadb
        deploy:
            placement:
                constraints:
                    - node.labels.type == VM
        (...)

Cattle

Swarm
Creating multi-arch images for Docker registry

- Docker registry has support for multi-arch images
  - Currently this is limited to pulling images in the CLI
  - Getting multi-arch images into the registry is a bit more tricky
    - Although there is a third party tool solving this issue

manifests:
- image: ubuntu:16.04
  platform:
    architecture: amd64
    os: linux
- image: aarch64/ubuntu:16.04
  platform:
    architecture: arm64
    os: linux
Questions?