Ph2_ACF overview

Installation

The installation and setup of the Ph2_ACF software is described in the following steps:

1. Installing RHEL/AlmaLinux 9
2. Installing additionally required software
3. Installing rarpd
4. Setting up the Ph2_ACF software

Contributing

For the C++ code of Ph2_ACF, `clang-format` is used to format the code according to the `.clang-format` configuration file in the repository. Before creating a merge request, please run:

```
formatAll
```

This requires the `setup.sh` to be sourced first.

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Installing RHEL/AlmaLinux 9

Installation Guide

Please follow the AlmaLinux 9 Installation Guide:

- Download the latest AlmaLinux OS 9 DVD ISO from almalinux.org/get-almalinux/ and write the ISO file contents on a USB drive (in March 2024 this is version 9.3).
- ***Attention***: do **not** download/use the ISO from CERN unless the computer will be installed and located at CERN (the pre-configured software repositories are only available within the CERN network).
- Plug in the USB drive with the AlmaLinux OS 9 ISO contents and boot the target computer choosing the option to install AlmaLinux 9 in the boot menu.
- Follow the on-screen instructions to "Install AlmaLinux 9". You can follow the step-by-step instructions.
- If your system is at CERN, follow the instructions by CERN IT instead.
- When asked to select the software to install, select "Workstation".

Post-installation Guide

Once the system has been installed and the PC has rebooted, log in as `root` or user with `sudo` privileges. Follow the AlmaLinux after-installation guide to set up the network (if needed), install updates, and enable the EPEL and PowerTools/CRB repositories:

```
sudo dnf update
sudo dnf config-manager --set-enabled crb
sudo dnf install epel-release
```

Then reboot the system.

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Installing additionally required software

Libraries needed by Ph2_ACF

```
sudo dnf install -y boost-devel pugixml-devel json-devel \
     bzip2-devel xz-devel zlib-devel libzstd-devel
```

Erlang (needed by uHAL)

Create a new file `/etc/yum.repos.d/modern_erlang.repo` with the following content, see github.com/rabbitmq/erlang-rpm/blob/main/README.md for more details:

```
[modern-erlang]
name=modern-erlang-el9
# uses a Cloudsmith mirror @ yum1.novemberain.com.
# Unlike Cloudsmith, it does not have traffic quotas
baseurl=https://yum1.novemberain.com/erlang/el/9/$basearch
repo_gpgcheck=1
enabled=1
gpgkey=https://dl.cloudsmith.io/public/rabbitmq/rabbitmq-
erlang/gpg.E495BB49CC4BBE5B.key
gpgcheck=1
sslverify=1
sslcacert=/etc/pki/tls/certs/ca-bundle.crt
metadata_expire=300
pkg_gpgcheck=1
autorefresh=1
type=rpm-md

[modern-erlang-noarch]
name=modern-erlang-el9-noarch
# uses a Cloudsmith mirror @ yum1.novemberain.com.
# Unlike Cloudsmith, it does not have traffic quotas
baseurl=https://yum1.novemberain.com/erlang/el/9/noarch
repo_gpgcheck=1
enabled=1
gpgkey=https://dl.cloudsmith.io/public/rabbitmq/rabbitmq-
erlang/gpg.E495BB49CC4BBE5B.key
        https://github.com/rabbitmq/signing-keys/releases/download/2.0/rabbitmq-
release-signing-key.asc
gpgcheck=1
sslverify=1
sslcacert=/etc/pki/tls/certs/ca-bundle.crt
```

```
metadata_expire=300
pkg_gpgcheck=1
autorefresh=1
type=rpm-md

[modern-erlang-source]
name=modern-erlang-el9-source
# uses a Cloudsmith mirror @ yum1.novemberain.com.
# Unlike Cloudsmith, it does not have traffic quotas
baseurl=https://yum1.novemberain.com/erlang/el/9/SRPMS
repo_gpgcheck=1
enabled=1
gpgkey=https://dl.cloudsmith.io/public/rabbitmq/rabbitmq-erlang/gpg.E495BB49CC4BBE5B.key
        https://github.com/rabbitmq/signing-keys/releases/download/2.0/rabbitmq-release-signing-key.asc
gpgcheck=1
sslverify=1
sslcacert=/etc/pki/tls/certs/ca-bundle.crt
metadata_expire=300
pkg_gpgcheck=1
autorefresh=1
```

Then run the following commands:

```
sudo dnf update
sudo dnf install erlang
```

uHAL libraries (cactus)

```
sudo curl https://ipbus.web.cern.ch/doc/user/html/_downloads/ipbus-sw.repo -o /etc/yum.repos.d/ipbus-sw.repo
sudo dnf clean all
sudo dnf groupinstall -y uhal controlhub
```

ROOT

```
sudo dnf install -y root root-net-http root-net-httpsniff root-graf3d-gl \
  root-physics root-montecarlo-eg root-graf3d-eve root-geom libusb-devel \
  xorg-x11-xauth.x86_64
```

Build tools and some nice git extras

```
sudo dnf install -y cmake3 clang-tools-extra git-extras
```

gcc-toolset-12

```
sudo dnf makecache --refresh
sudo dnf -y install gcc-toolset-12
```

python3

```
sudo dnf install -y python3 python3-devel
```

protobuf

Follow instructions to install protobuf from gitlab.cern.ch/cms_tk_ph2/MessageUtils/-/blob/master/README.md (only the install part is needed)

pybind11

If installed in parallel to the directory where you plan to install `Ph2_ACF`, the `setup.sh` script will point to the correct location.

```
wget https://github.com/pybind/pybind11/archive/refs/tags/v2.9.2.tar.gz
tar zxvf v2.9.2.tar.gz
```

Git LFS

```
sudo dnf install git-lfs
git lfs install
```

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Installing rarpd

The rarpd (Reverse Address Resolution Protocol daemon) responds to RARP requests. RARP is used by some machines such as the FC7 at boot time to discover their IP address. They provide their Ethernet address (see list of FC7 MAC addresses) and rarpd responds with their IP address if it finds it in the ethers database (here `/etc/ethers`).

Obtaining and installing rarpd package

There is currently no `rarpd` package available specifically for AlmaLinux 9. However, the Fedora version can be used and is available from https://pkgs.org/download/rarpd. Make sure to choose Fedora 39 and `x86_64`. Direct download link: https://dl.fedoraproject.org/pub/fedora/linux/releases/39/Everything/x86_64/os/Packages/r/rarpd-ss981107-63.fc39.x86_64.rpm

Install the downloaded `RPM` file (replace file name if needed):

```
sudo rpm -i rarpd-ss981107-63.fc39.x86_64.rpm
```

Configuring rarpd for FC7

Information on the FC7 needs to be added in two places.

In `/etc/ethers`:

```
00:00:00:00:00:00 fc7-1
```

Replace `00:00:00:00:00:00` by your FC7 MAC address.

In `/etc/hosts`:

```
192.168.1.80 fc7-1
```

When using more than one FC7, call e.g. the second one `fc7-2` and add its MAC and IP addresses in the same way, increasing the IP number by 1, i.e. `192.168.1.81`.

Enabling rarpd

Create the following file: `/etc/systemd/system/rarpd.service` with the following content:

```
[Unit]
Description=Reverse Address Resolution Protocol Requests Server
Documentation=https://linux.die.net/man/8/rarpd
Requires=network.target
After=network.target

[Service]
Type=forking
User=root
#EnvironmentFile=/etc/sysconfig/rarpd
ExecStart=/usr/sbin/rarpd -e -v ethernet_card

[Install]
WantedBy=multi-user.target
```

Make sure to replace `ethernet_card` by the ethernet device connected to the FC7, e.g. `enp1s0`.

Enable and start the `rarpd` service:

```
sudo systemctl enable --now rarpd
```

You can watch the service activity using:

```
journalctl -fu rarpd.service
```

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