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ARM-9 Board Software (II)

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Software for the Geode

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Shopping list

- We need something that loads a system kernel into the RAM memory used by the processor (boot loader, Wrap uses BIOS)
- We need a Linux kernel
- We need a Linux root file system with startup files and a command interpreter

PCEngines information

- Voyage Linux WEB site

- Buy a CF card
- Connect it to your PC (you need a CF card reader)
- Partition the CF card into 2 partitions
- Download voyage Linux to your PC
- Write it to the newly created CF partitions
- Put the CF card into the Wrap
- Boot it

Let's try!

- I do not have a CF card reader on the Laptop but I do have one at home
- System has already been prepared
- How do we see it the system does something?
- Connect the Wrap's console port to a terminal emulator!

minicom

- Type *minicom*
- Answer: *command not found*
- What's wrong?

Install minicom

- Apt-get install minicom installs minicom into the system
- How does minicom work?
- *man minicom*
- As super user: *minicom -s*
- Defined the base configuration
- Define baud rates (Wrap uses 38400 8N1)
- Save it in the defaults file
- Install minicom in the toolbar

Start it!

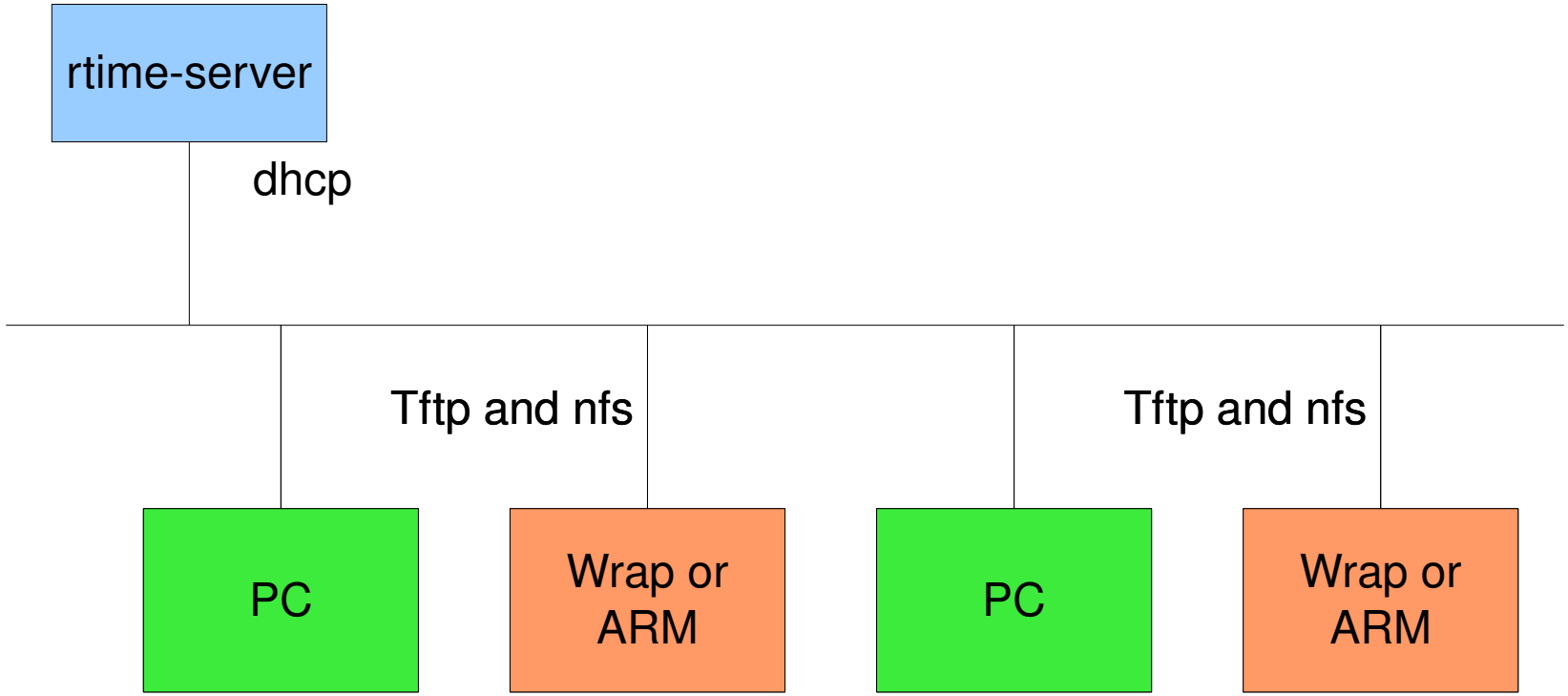
- Connect the RS-232 connection to the Wrap board
- Connect power and watch
- You don’t see anything?
- Check the cable (null modem?), check the power
- You only have strange characters?
- Check the baud rate.
- It works? We are in business!

At ICTP

- We do not have CF card readers!
- We do not have CF cards for each Wrap board!
- How do we boot the kernel?

Let's take out the CF card and see what it does without it.

Network layout



Booting over the network

- Wrap BIOS consists of 2 parts:
  - Settings of system resource parameters
  - Etherboot

    Etherboot Website

Boot sequence

- Get a ethernet connection going between the PC and the Wrap board
- Wrap needs an IP address which it gets via dhcp form the PC
  - -> we must set up a DHCP server on the PC
- The boot loader in downloaded into the Wrap via tftp
  - -> need the boot loader (pxelinux.0) from the syslinux project
  - -> we must setup a tftp server on the PC

Setup DHCP

In the lab a single DHCP server is set up for you serving all embedded systems (Wrap and ARM)

- We must provide the configuration file /etc/dhcp3/dhcpd.conf
  and we must run the dhcp daemon

DCHP config file

```
#
# DHCP Server Configuration file.
#   see /usr/share/doc/dhcp*/dhcpd.conf.sample
#   see 'man 5 dhcpd.conf'
#
subnet 10.41.25.0 netmask 255.255.255.0 {
   range 10.41.25.200 10.41.25.220;
   default-lease-time 86400;
   max-lease-time 86400;
   option domain-name-servers 10.41.25.254;
   authoritative;
   option broadcast-address 10.41.25.255;
   option routers 10.41.25.254;
}
host wrap {
     hardware ethernet 00:0D:B9:04:4B:2C;
     option host-name "wrap";
     option root-path "/opt/ICTP/micros/pcengines/voyage-0.6.2";
     filename "pxelinux.0";
     fixed-address 10.41.25.201;
     next-server 10.41.25.12;
}
```

Setup tftpd

- The tftp daemon in started by xinet
- The xinetd must be running!
- We need to have a look at /etc/xinetd.conf and the startup file for tftp in /etc/xinetd.d

/var/lib/tftpboot

- As seen in the /etc/xinetd.d/tftp the tftp server uses /var/lib/tftpboot as directory for the files it distributes
- Here is /var/lib/tftpboot
- There are 2 files of interest:
  - pxelinux.0, which is the boot loader. This is a binary file
  - pxelinuc.cfg
    which contains configuration files for each Wrap system served

pxeconfig file

- For each Wrap board there is a file with the Wrap's MAC address as file name or a default file for all
- pxe config file
- Let's check again the files in /var/lib/tftpboot where we should find:
  - vmlinuz
  - display.msg

What is still missing?

- We have the boot loader
- We have the kernel
- We do not have...?

The root file system

- The root file system must be mounted through nfs
  - The network driver and nfs must be included into the kernel image (not as a kernel module!)
  - The root file system must be by exportedthe nfs server
    eports are defined in /etc/exports
  - An nfs server must be running on the PC hosting the root file system for the Wrap

Summary

- Wrap gets its IP address through DHCP
- It asks its tftp server for pxelinux.0 (bootloader)
- The bootloader in transfered to the Wrap and started
- The boot loader is started and gets its configuration for pxelinux.cfg
- It loads the kernel and starts it
- It displays the welcome message display.msg
- The kernel mounts its root file system on nfs and starts the initialisation program (init)
- Control is passed to the command interpreter