

ICOM5007/CIIC4050 Operating Systems

Professor: Emmanuel Arzuaga

Instructor: Alejandro González Araya, Email: alejandro.gonzalez3@upr.edu

Laboratory: Virtual Memory in Minix (11/22/2019)

Read documentation on:

<http://wiki.minix3.org/doku.php?id=developersguide:vminternals>

Serial Output Debugging

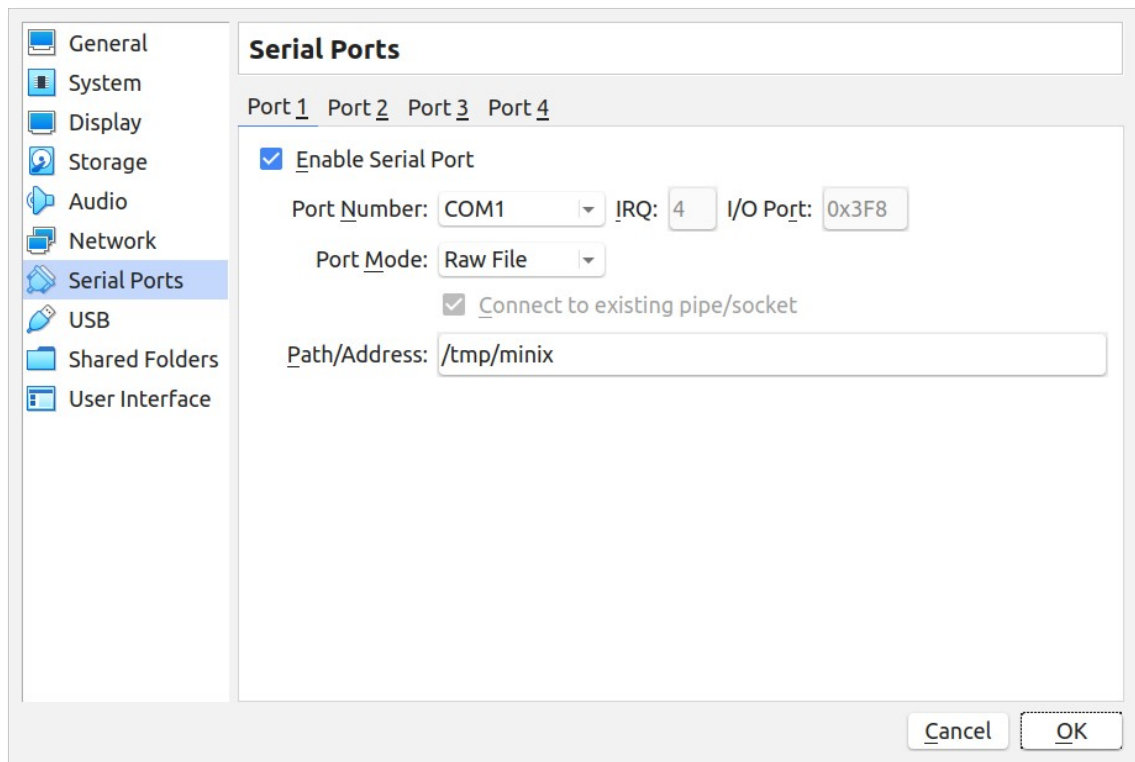
1. Turn off the Minix virtual machine (sync; shutdown).
2. On the virtual machine settings window on VirtualBox add a **Serial Port**:

Port 1> Enable Serial Port

Port Number: COM1

Port Mode: Raw File

Path/Address: /tmp/minix



- ```
File Machine View Input Devices Help
--- Welcome to MINIX 3. This is the boot monitor. ---
Memory: 639/1047552 k

1. Start MINIX 3
2. Start latest MINIX 3
3. Start latest MINIX 3 in single user mode
4. Edit menu option
5. Drop to boot prompt
6. Start MINIX 3 (3.2.1r1)
7. Start MINIX 3 (3.2.1r4)

Choose an option; RETURN for default; SPACE to stop countdown.
Option 2 will be chosen in 0 seconds.

Option (edit): [2]:
> load_mods /boot/minix_latest/mod*;multiboot /boot/minix_latest/kernel rootdevn
ame=c0d0p0s0 ctttyline=0 ctttybaud=115200_
```

- The screenshot displays two windows from a virtual machine. The primary window, titled 'tail -f /tmp/minix 80x36', shows the output of the Minix installation process. It begins with '-----FIRST FIT START-----', followed by 'Startscan: 10869', 'Low: 0', 'Pages: 8', 'freerange\_start: 10861', 'Search restarts: 1', and 'First Fit Bitmap: 111111110'. This is followed by '-----FIRST FIT END-----', '-----BEST FIT START-----', 'Startscan: 10869, Low: 0, Pages: 8', and '-----BEST FIT HOLE FOUND-----'. The output then lists several holes: 'Hole Start: 1', 'Hole End: 143', 'Hole Size: 143', '-----BEST FIT HOLE FOUND-----', 'Hole Start: 256', 'Hole End: 1042', 'Hole Size: 787', '-----BEST FIT HOLE FOUND-----', '-----BEST FIT CANDIDATE-----', 'Hole Start: 1982', 'Hole End: 2002', 'Hole Size: 21', '-----BEST FIT HOLE FOUND-----', 'Hole Start: 2102', 'Hole End: 4094', 'Hole Size: 1993', '-----BEST FIT HOLE FOUND-----', 'Hole Start: 4096', 'Hole End: 10868', 'Hole Size: 6773', '-----BEST FIT-----', 'Hole Start: 1982', 'Hole End: 2002', and 'Hole Size: 21'. The secondary window, titled 'Minix 2019-2 (openssh) [Running] - Oracle VM VirtualBox', shows the system's boot process. It lists the loading of modules: 'Loading /boot/minix\_latest/mod06\_memory.gz', 'Loading /boot/minix\_latest/mod07\_log.gz', 'Loading /boot/minix\_latest/mod08\_tty.gz', 'Loading /boot/minix\_latest/mod09\_mfs.gz', 'Loading /boot/minix\_latest/mod10\_vm.gz', 'Loading /boot/minix\_latest/mod11\_pfs.gz', and 'Loading /boot/minix\_latest/mod12\_init.gz'. This is followed by 'dev/c0d0p0s0: clean', 'dev/c0d0p0s0 is mounted on /', 'none is mounted on /proc', 'dev/c0d0p0s2: clean', 'dev/c0d0p0s1: clean', 'size on /dev/imgrd set to 0kB', 'Multiuser startup in progress ...', 'Starting hotplugging infrastructure... done.', 'Starting services: random lance inet printer ipc vbox.', 'Starting daemons: update cron syslogd.', 'Starting networking: dhcpd nonamed.', 'Local packages (start): sshd Starting sshd.', 'done.', 'Minix Release 3 Version 2.1 (console)', and '10.0.2.15 login:'.

## Troubleshooting

- The serial debugger needs to be setup on every boot for it to work
- If you cannot access the /tmp folder on the host machine use your home folder
- The Minix file defined in VirtualBox is a text file that can be opened by any editor
  - This file is erased every time the virtual machine is started even if the serial debugger is not enabled in Minix
- Do not print on the kernel unless **pages>2**
- Outputting the console to the Serial Port is a **blocking** instruction
  - The Kernel will be blocked until the print is complete, this slows down the VM
- You need to compile the Kernel for the changes on the Virtual Memory Server to be reflected
- Additional information: <http://wiki.minix3.org/doku.php?id=developersguide:serialout>