NemOS
Release Notes

Project: Erlangen
Milestone: NemOS Cycle-2
Release Date: 2023-03-24

Announcement

Purpose of the Release

- Add support for the following networking features in NemOS reference image:
    - VETH
    - VLAN
    - SSH server / client
    - DHCP server / client
    - PTP
    - TFTP
- Implement partitioning layout described in "**nemos-images-reference-lunar/README.md**".
- Add Development image which provides Snapd and apt support.

How to get it

Artifacts

All files pertaining to this release are available for download on the NemOS Launchpad project site's release page: https://launchpad.net/nemos/+milestone/nemos-cycle2

Usage Instructions

Refer to the Test Environment section for an example of how to run the virtual machine image.

Build Instructions

Refer to the README file in the NemOS images repository for instructions on how to build the image from scratch.

Related Tickets

Features delivered

- User Story: Add support for networking features.
- User Story: Add support for storage features and implement reference partitioning layout.
- User Story: Create dev-image containing devtools (snap, apt).

Bugs found during QA validation

None

Validation

Test Environment

Virtual machine image tested using QEMU on Ubuntu 22.10 amd64 using the following version of QEMU:

```
$ qemu-system-x86_64 --version
QEMU emulator version 7.0.0 (Debian 1:7.0+dfsg-7ubuntu2.1)
```

Script used for executing the QEMU virtual machine:

```
#!/bin/bash

if [ -d /var/tmp/my_lunar ];then
    # target-dir used in README.rst
    pushd /var/tmp/my_lunar
fi

NVRAM=$(mktemp)
cp /usr/share/OVMF/OVMF_VARS.fd ${NVRAM}

qemu-system-x86_64 \
    -m 1G \
    --enable-kvm \
    --smp 2 \
    --cpu host \
    -nographic \
    -M q35 \
```

```
    -drive
file=/usr/share/OVMF/OVMF_CODE.fd,readonly=on,if=pflash,format=raw,unit=0 \
    -drive file="${NVRAM}",if=pflash,format=raw,unit=1 \
    -netdev user,id=user0,hostfwd=tcp::10022-:22 \
    -device virtio-net-pci,netdev=user0 \
    -object rng-random,filename=/dev/urandom,id=rng0 \
    -device virtio-rng-pci,rng=rng0 \
    -drive file=nemos-image-reference-lunar.x86_64-1.0.1.qcow2,if=virtio

rm ${NVRAM}
```

Test Matrix

Test Item	Expected Result	Console Output	Passed

DHCP client	System should obtain a DHCP lease from the host's DHCP server on its network interface	`# udhcpc -i lan0`
		`udhcpc: started, v1.35.0`
		`Dropped protocol specifier '.udhcpc' from 'lan0.udhcpc'. Using 'lan0' (ifindex=2).`
		`udhcpc: broadcasting discover`
		`udhcpc: broadcasting select for 10.0.2.15, server 10.0.2.2`
		`udhcpc: lease of 10.0.2.15 obtained from 10.0.2.2, lease time 86400`
		`Dropped protocol specifier '.udhcpc' from 'lan0.udhcpc'. Using 'lan0' (ifindex=2).`
			Y

DHCP server	System should have a DHCP server application	`# udhcpd --help`
		`BusyBox v1.35.0 (Ubuntu 1:1.35.0-4ubuntu1ppa5) multi-call binary.`
		
		`Usage: udhcpd [-fS] [-I ADDR] [-a MSEC] [CONFFILE]`
		
		`DHCP server`
		
		`-f Run in foreground`
		`-S Log to syslog too`
		`-I ADDR Local address`
		`-a MSEC Timeout for ARP ping (default 2000)`
		`Signals:`
		`USR1 Update lease file`
			Y

OpenSSH client	System should have the `ssh` binary to be able to connect to remote systems over SSH	`# ssh 10.0.2.2` `root@10.0.2.2: Permission denied (publickey).`	Y

OpenSSH server	The `sshd` service should be running to allow other remote systems to connect to the system over SSH	`$ sudo systemctl status sshd --no-pager`
		`● ssh.service - OpenBSD Secure Shell server`
		`Loaded: loaded (/lib/systemd/system/ssh.service; enabled; preset: enabled)`
		`Drop-In: /etc/systemd/system/ssh.service.d`
		`└─00-socket.conf`
		`Active: active (running) since Thu 2023-03-23 12:05:24 UTC; 6min ago`
		`TriggeredBy: ● ssh.socket`
			Y

		Docs: man:sshd(8) man:sshd_config(5) Process: 563 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS) Main PID: 575 (sshd) Tasks: 1 (limit: 1066) Memory: 9.0M CPU: 146ms CGroup: /system.slice/ssh.service └─575 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"	
Bridge utilities	System should provide the `brctl` tool for managing network bridge interfaces and be able to create a bridge interface	# brctl BusyBox v1.35.0 (Ubuntu 1:1.35.0-4ubuntu1ppa5) multi-call binary. Usage: brctl COMMAND [BRIDGE [ARGS]] Manage ethernet bridges Commands: addbr BRIDGE Create BRIDGE delbr BRIDGE Delete BRIDGE addif BRIDGE IFACE Add IFACE to BRIDGE delif BRIDGE IFACE Delete IFACE from BRIDGE # brctl addbr br0 # ip addr show br0 3: br0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop qlen 1000 link/ether 62:78:f1:73:fc:39 brd ff:ff:ff:ff:ff:ff # brctl delbr br0 # ip addr show br0 ip: can't find device 'br0'	Y
VLANs	System is able to create and manage VLANs	# ip link add link lan0 name lan0.100 type vlan id 100 # ip link show lan0.100 7: lan0.100@lan0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop qlen 1000 link/ether 52:54:00:12:34:56 brd ff:ff:ff:ff:ff:ff	Y
TUN/TAP	System is able to create and manage TUN/TAP devices	# tunctl -t tun0 tun0 # ip link show tun0 16: tun0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop qlen 1000 link/ether 1e:65:e3:95:f8:12 brd ff:ff:ff:ff:ff:ff	Y
Network QoS	System provides the `tc` tool for	# tc	Y

	managing traffic shaping and QoS	`BusyBox v1.35.0 (Ubuntu 1:1.35.0-4ubuntu1ppa5) multi-call binary.`
		
		`Usage: tc OBJECT CMD [dev STRING]`
		
		`OBJECT: qdisc|class|filter`
		`CMD: add|del|change|replace|show`
		
		`qdisc [handle QHANDLE] [root|ingress|parent CLASSID]`
		`[[QDISC_KIND] [help|OPTIONS]]`
		`QDISC_KIND := [p|b]fifo|tbf|prio|cbq|red|etc.`
		`qdisc show [dev STRING] [ingress]`
		`class [classid CLASSID] [root|parent CLASSID]`
		`[[QDISC_KIND] [help|OPTIONS] ]`
		`class show [ dev STRING ] [root|parent CLASSID]`
		`filter [pref PRIO] [protocol PROTO]`
		`[root|classid CLASSID] [handle FILTERID]`
		`[[FILTER_TYPE] [help|OPTIONS]]`
		`filter show [dev STRING] [root|parent CLASSID]`	

VETH	System is able to create and manage virtual Ethernet (VETH) devices	`# ip link add dev veth1 type veth`
		`# ip link show veth1`
		`22: veth1@veth0: <BROADCAST,MULTICAST,M-DOWN> mtu 1500 qdisc noop qlen 1000`
		`link/ether 82:e5:77:77:72:e2 brd ff:ff:ff:ff:ff:ff`
			Y

OpenSSL	System should provide the `openssl` tool	`# openssl version` `OpenSSL 3.0.8 7 Feb 2023 (Library: OpenSSL 3.0.8 7 Feb 2023)`	Y

`ethtool`	System should provide the `ethtool` tool	`# ethtool lan0`
		`Settings for lan0:`
		`Supported ports: [ ]`
		`Supported link modes: Not reported`
		`Supported pause frame use: No`
		`Supports auto-negotiation: No`
		`Supported FEC modes: Not reported`
		`Advertised link modes: Not reported`
		`Advertised pause frame use: No`
		`Advertised auto-negotiation: No`
		`Advertised FEC modes: Not reported`
		`Speed: Unknown!`
		`Duplex: Unknown! (255)`
		`Auto-negotiation: off`
		`Port: Other`
			Y

		PHYAD: 0 Transceiver: internal Link detected: yes	
iptables	System should provide the iptables tool and be able to manipulate the local firewall	# iptables -V iptables v1.8.7 (nf_tables)	Y
tftp	System should provide tftp client utilities	# tftp BusyBox v1.35.0 (Ubuntu 1:1.35.0-4ubuntu1ppa5) multi-call binary. Usage: tftp [OPTIONS] HOST [PORT] Transfer a file from/to tftp server -l FILE Local FILE -r FILE Remote FILE -g Get file -p Put file -b SIZE Transfer blocks in bytes	Y
PTP	System should provide the ptp4l utility for managing the synchronisation with a PTP time source	# ptp4l -v 3.1.1	Y
Root partition	The base root filesystem should be read-only and use SquashFS	# mount | grep /dev/mapper/verityRoot /dev/mapper/verityRoot on /live/image type squashfs (ro,relatime,errors=continue,threads=single)	Y
dm-verity	The root filesystem should be protected against tampering using dm-verity	# dmsetup ls luks (253:2) luks_dif (253:1) verityRoot (253:0) # dmsetup status verityRoot 0 341264 verity V	Y
Root overlay partition	An XFS filesystem should be used to provide a read/write capable overlay for the root partition using overlayfs	# mount | grep cow overlay on / type overlay (rw,noatime,lowerdir=/live/image,upperdir=/cow/rw,workdir=/cow/work,d efault_permissions,xino=off)	Y

		/dev/mapper/luks on /live/cow type xfs (rw,relatime,attr2,inode64,logbufs=8,logbsize=32k,noquota)	
dm-crypt	The root overlay partition should be encrypted using a known key and automatically decrypted at boot to demonstrate encryption capabilities	# dmsetup ls luks (253:2) luks_dif (253:1) verityRoot (253:0) # dmsetup status luks 0 890344 crypt	Y
dm-integrity	The root overlay partition should be protected by `dm-integrity` as part of the `dm-crypt` device.	# dmsetup status luks_dif 0 890344 integrity 0 890344 - # cryptsetup luksDump /dev/vda8 LUKS header information Version: 2 Epoch: 3 Metadata area: 16384 [bytes] Keyslots area: 16744448 [bytes] UUID: 91cc01dd-345c-4d50-9608-de8414a23e09 Label: (no label) Subsystem: (no subsystem) Flags: (no flags) Data segments: 0: crypt offset: 16777216 [bytes] length: (whole device) cipher: aes-gcm-random sector: 512 [bytes] integrity: aead	Y
EFI	The system should boot in EFI mode	# dmesg | grep -i efi [0.000000] efi: EFI v2.70 by EDK II	Y
Boot partition	The boot partition should be read/write capable and formatted with XFS	# mount | grep /boot /dev/disk/by-uuid/f7c611d0-4d53-4a57-9d60-70346b629aa1 on /boot type ext4 (rw,relatime)	Y
Read-only container storage	The system should provide a read-only OCI container storage partition using SquashFS.	# mount | grep /var/lib/containers/loaded /dev/disk/by-partuuid/05cf2c72-a891-49ea-96e4-7dbc880b4e78 on /var/lib/containers/loaded type squashfs (ro,relatime,errors=continue,threads=single)	Y

	There are no OCI containers currently specified to be included, so this partition does not need to contain anything.		
Read/write container storage	The system should provide a read/write capable OCI container storage partition using XFS. There are no OCI containers currently specified to be included, so this partition does not need to contain anything.	`# mount | grep /var/lib/containers/storage` `/dev/disk/by-uuid/65d398e6-deeb-4fff-ba8b-0ce12f47c675 on /var/lib/containers/storage type xfs (rw,relatime,attr2,inode64,logbufs=8,logbsize=32k,noquota)`	Y

EXT2/3/4 and SquashFS, overlay filesystems are available
cat /proc/filesystems | grep 'squashfs|ext2|ext3|ext4'
	All five filesystems are available	`# cat /proc/filesystems | grep 'squashfs|ext2|ext3|ext4|overlay'`
		`ext3`
		`ext2`
		`ext4`
		`squashfs`
		`nodev overlay`
			Y

Boot the virtual machine image using QEMU	System boots without kernel panics or bootloader errors	N/A	Y

Image shows the correct Ubuntu version in `/etc/os-release`	23.04 (Lunar Lobster)	`# cat /etc/os-release`
		`PRETTY_NAME="Ubuntu Lunar Lobster (development branch)"`
		`NAME="Ubuntu"`
		`VERSION_ID="23.04"`
		`VERSION="23.04 (Lunar Lobster)"`
		`VERSION_CODENAME=lunar`
			Y

System automatically logs in as the root user	User is not prompted for a password, and the command `whoami` returns `root`	`# whoami` `root`	Y

Virtual machine has IPv4 network access	IPv4 ICMP ping to the host machine is successful	`# ping 10.0.2.2 -c 4`
		`PING 10.0.2.2 (10.0.2.2): 56 data bytes`
		`64 bytes from 10.0.2.2: seq=0 ttl=255 time=0.256 ms`
		`64 bytes from 10.0.2.2: seq=1 ttl=255 time=0.304 ms`
		`64 bytes from 10.0.2.2: seq=2 ttl=255 time=0.516 ms`
		`64 bytes from 10.0.2.2: seq=3 ttl=255 time=0.307 ms`
			Y

		--- 10.0.2.2 ping statistics --- 4 packets transmitted, 4 packets received, 0% packet loss round-trip min/avg/max = 0.256/0.345/0.516 ms	
Virtual machine has IPv6 network access	IPv6 ICMP ping to the host machine is successful	# ping6 fe80::2 -c 4 PING fe80::2 (fe80::2): 56 data bytes 64 bytes from fe80::2: seq=0 ttl=255 time=0.273 ms 64 bytes from fe80::2: seq=1 ttl=255 time=0.338 ms 64 bytes from fe80::2: seq=2 ttl=255 time=0.335 ms 64 bytes from fe80::2: seq=3 ttl=255 time=0.368 ms --- fe80::2 ping statistics --- 4 packets transmitted, 4 packets received, 0% packet loss round-trip min/avg/max = 0.273/0.328/0.368 ms	Y
Home filesystem is read-write	Files in the /home directory should be modifiable	# touch /home/test #	Y
The family of apt tools are not installed in the image	The apt, apt-get, and apt-cache commands should be unavailable	# apt -ash: apt: not found # apt-get -ash: apt-get: not found # apt-cache -ash: apt-cache: not found	Y

License and Terms of Use

Please refer to "**/usr/share/doc/*/copyright**" for license information of each package used in this release, where * is the package name.

As this is a demo release there is no guarantee or support associated with this release.

Appendix: (Optional)