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информатики» (СибГУТИ)

Отчёт
Лабораторная работа №1
«Запуск OpenBMC с
использованием QEMU»

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Проверил:

Цель работы

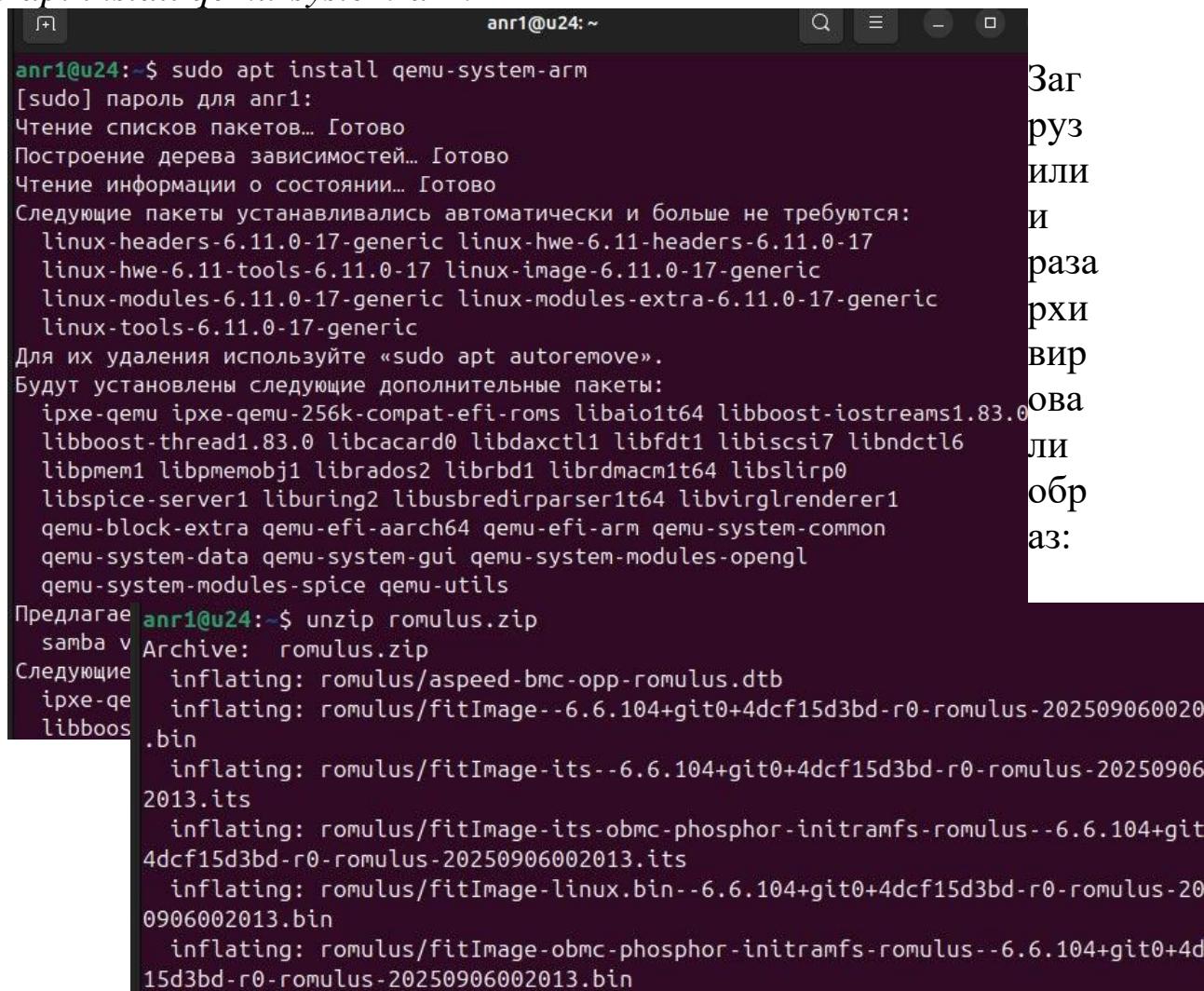
Освоить базовые принципы работы с OpenBMC, развернуть его в эмуляторе QEMU,
изучить процесс загрузки и основные функции системы.

Ход выполнения:

1. Установили Ubuntu

2. Установите QEMU, с помощью команды:

sudo apt install qemu-system-arm



The screenshot shows a terminal window titled "anr1@u24: ~". The command "sudo apt install qemu-system-arm" is run, followed by a password entry prompt "[sudo] пароль для anr1:". The terminal then displays the progress of the package installation, including the reading of package lists, building of dependency trees, and the listing of packages to be installed. It also shows the removal of unnecessary packages like "linux-headers-6.11.0-17-generic" and lists the newly installed packages such as "qemu-system-arm" and "qemu-system-common". Finally, it provides instructions for unzipping a file named "romulus.zip" and extracting its contents.

```
anr1@u24:~$ sudo apt install qemu-system-arm
[sudo] пароль для anr1:
Чтение списков пакетов... Готово
Построение дерева зависимостей... Готово
Чтение информации о состоянии... Готово
Следующие пакеты устанавливались автоматически и больше не требуются:
  linux-headers-6.11.0-17-generic linux-hwe-6.11-headers-6.11.0-17
  linux-hwe-6.11-tools-6.11.0-17 linux-image-6.11.0-17-generic
  linux-modules-6.11.0-17-generic linux-modules-extra-6.11.0-17-generic
  linux-tools-6.11.0-17-generic
Для их удаления используйте «sudo apt autoremove».
Будут установлены следующие дополнительные пакеты:
  ipxe-qemu ipxe-qemu-256k-compat-efi-roms libaio1t64 libboost-iostreams1.83.0
  libboost-thread1.83.0 libcaca0 libdaxctl1 libfdt1 libiscsi7 libndctl6
  libpmem1 libpmemobj1 librados2 librbd1 librdmacm1t64 libslirp0
  libspice-server1 liburing2 libusbredirparser1t64 libvirglrenderer1
  qemu-block-extra qemu-efi-aarch64 qemu-efi-arm qemu-system-common
  qemu-system-data qemu-system-gui qemu-system-modules-opengl
  qemu-system-modules-spice qemu-utils
Предлагаете anr1@u24:~$ unzip romulus.zip
  samba v Archive: romulus.zip
Следующие ipxe-де libboos .bin
  inflating: romulus/aspeed-bmc-opp-romulus.dtb
  inflating: romulus/fitImage--6.6.104+git0+4dcf15d3bd-r0-romulus-2025090600202013.its
  inflating: romulus/fitImage-its--6.6.104+git0+4dcf15d3bd-r0-romulus-2025090600202013.its
  inflating: romulus/fitImage-its-obmc-phosphor-initramfs-romulus--6.6.104+git0+4dcf15d3bd-r0-romulus-2025090600202013.its
  inflating: romulus/fitImage-linux.bin--6.6.104+git0+4dcf15d3bd-r0-romulus-2025090600202013.bin
  inflating: romulus/fitImage-obmc-phosphor-initramfs-romulus--6.6.104+git0+4dcf15d3bd-r0-romulus-2025090600202013.bin
```

3. Запустили QEMU

```
anr1@u24:~$ sudo qemu-system-arm -m 256 -M romulus-bmc -nographic -drive file=romulus/obmc-phosphor-image-romulus-20250906002013.static.mtd,format=raw,if=mtd -net nic -net user,hostfwd=:0.0.0.0:2222-:22,hostfwd=:0.0.0.0:2443-:443,hostfwd=udp:0.0.0.0:2623-:623,hostname=qemu

qemu-system-arm: warning: nic ftgmac100.1 has no peer

U-Boot 2019.04 (May 23 2025 - 06:46:26 +0000)

SOC : AST2500-A1
RST : Power On
2nd Boot : Enable
LPC Mode : SIO:Enable : SuperIO-2e
Eth : MAC0: RMII/NCSI, , MAC1: RMII/NCSI,
Model: Romulus BMC
DRAM: 192 MiB (capacity:256 MiB, VGA:64 MiB, ECC:off)
MMC:
Loading Environment from SPI Flash... SF: Detected n25q256a with page size 256
Bytes, erase size 4 KiB, total 32 MiB
*** Warning - bad CRC, using default environment

In:    serial@1e784000
Out:   serial@1e784000
Err:   serial@1e784000
Net:   ftgmac100_probe - NCSI detected

Warning: ethernet@1e660000 (eth0) using random MAC address - 12:18:cf:56:7c:54
eth0: ethernet@1e660000
```

4. Работа в OpenBMC

- Проверили наличие командной оболочки и утилит

```
[ OK ] Finished Wait for /xyz/openbmc_project/control/host0/restriction_mode.
[ OK ] Finished Wait for /xyz/openbmc_project/time/sync_method.
[ OK ] Finished Phosphor Sysfs - Add LED.
[ OK ] Finished Phosphor Sysfs - Add LED.
[ OK ] Finished Phosphor Sysfs - Add LED.

romulus login: root
Password:
root@romulus:~# 
```

```
root@romulus:~# ps
  PID USER      VSZ STAT COMMAND
    1 root      11088 S  [systemd] /sbin/init
    2 root          0 SW  [kthreadd]
    3 root          0 SW  [pool_workqueue_]
    4 root          0 IW< [kworker/R-slub_]
    5 root          0 IW< [kworker/R-netns]
    7 root          0 IW< [kworker/0:0H-ev]
    8 root          0 IW  [kworker/u2:0-ev]
    9 root          0 IW< [kworker/R-mm_pe]
   10 root          0 IW  [rcu_tasks_trace]
   11 root          0 SW  [ksoftirqd/0]
   12 root          0 SW  [kdevtmpfs]
   13 root          0 IW< [kworker/R-inet_]
   14 root          0 SU  [open_bmc]
```

- Для проверки состояния системы использовали следующую команду:

obmcutil state

```
Password:
root@romulus:~# obmcutil state
CurrentBMCState      : xyz.openbmc_project.State.BMC.BMCState.Ready
CurrentPowerState     : xyz.openbmc_project.State.Chassis.PowerState.Off
CurrentHostState      : xyz.openbmc_project.State.Host.HostState.Off
BootProgress          : xyz.openbmc_project.State.Boot.Progress.ProgressStages.Unspecified
OperatingSystemState: xyz.openbmc_project.State.OperatingSystem.Status.OSStatus.Inactive
root@romulus:~# 
```

- Включили/выключили виртуальный сервер OpenBMC:

-obmcutil poweron

-obmcutil poweroff

```
.Inactive
root@romulus:~# obmcutil poweron
root@romulus:~# obmcutil poweroff
root@romulus:~# 
```

5. Получили доступ к ВМС через IPMI с другого хоста

сначала установили IPMItool

```
anr1@u24: $ sudo apt install ipmitool
[sudo] пароль для anr1:
Чтение списков пакетов... Готово
Построение дерева зависимостей... Готово
Чтение информации о состояниях... Готово
Следующие пакеты устанавливались автоматически и больше не требуются:
 linux-headers-6.11.0-17-generic linux-hwe-6.11-headers-6.11.0-17
 linux-hwe-6.11-tools-6.11.0-17 linux-image-6.11.0-17-generic
 linux-modules-6.11.0-17-generic linux-modules-extra-6.11.0-17-generic
 linux-tools-6.11.0-17-generic
Для их удаления используйте «sudo apt autoremove».
Будут установлены следующие дополнительные пакеты:
 freeipmi-common libfreeipmi17 libopenipmi0t64 openipmi
Предлагаемые пакеты:
   freeipmi-tools
```

доступ через другой хост

```
anr1@u24: ~$ ipmitool -I lanplus -H localhost -p 2623 -U root -P OpenBmc fru pri
nt
FRU Device Description : Builtin FRU Device (ID 0)
Device not present (Requested sensor, data, or record not found)

FRU Device Description : cpu0 (ID 1)
Device not present (Requested sensor, data, or record not found)

FRU Device Description : cpu1 (ID 2)
Device not present (Requested sensor, data, or record not found)

FRU Device Description : system (ID 3)
Device not present (Requested sensor, data, or record not found)

FRU Device Description : dimm0 (ID 4)
Device not present (Requested sensor, data, or record not found)
```

6. Получили доступ к ВМС через Redfish

```
anr1@u24:~$ curl -k https://localhost:2443/redfish/v1/Systems/ -u root:OpenBmc
{
  "@odata.id": "/redfish/v1/Systems",
  "@odata.type": "#ComputerSystemCollection.ComputerSystemCollection",
  "Members": [
    {
      "@odata.id": "/redfish/v1/Systems/system"
    }
  ],
  "Members@odata.count": 1,
  "Name": "Computer System Collection"
}anr1@u24:~$
```

7. Проанализировали логи, документацию:

```
root@romulus:~# journalctl -u xyz.openbmc_project.State.BMC.service
Sep 06 04:00:06 romulus systemd[1]: Starting Phosphor BMC State Manager...
Sep 06 04:00:07 romulus phosphor-bmc-state-manager[355]: Unit obmc-bmc-service-
quiesce@0.target not found: sd_bus_call: org.freedesktop.systemd1.NoSuchUnit: U
nit obmc-bmc-service-quiesce@0.target not loaded.
Sep 06 04:00:07 romulus phosphor-bmc-state-manager[355]: Setting the BMCState f
ield to BMC_NOTREADY
Sep 06 04:00:07 romulus phosphor-bmc-state-manager[355]: Setting the BMCState f
ield to xyz.openbmc_project.State.BMC.BMCState.NotReady
Sep 06 04:00:07 romulus phosphor-bmc-state-manager[355]: Setting the RebootCaus
e field to xyz.openbmc_project.State.BMC.RebootCause.POR
Sep 06 04:00:07 romulus systemd[1]: Started Phosphor BMC State Manager.
Sep 06 04:00:10 romulus phosphor-bmc-state-manager[355]: BMC_READY
Sep 06 04:00:10 romulus phosphor-bmc-state-manager[355]: Setting the BMCState f
ield to xyz.openbmc_project.State.BMC.BMCState.Ready
root@romulus:~#
```

8. Анализ потребляемых ресурсов QEMU:

Во время работы виртуализированного OpenBMC с помощью стандартных системных инструментов зафиксировали использование CPU и RAM процессом QEMU.

С помощью htop, -obmcutil poweron включал деми, но он автоматически выключается.

Main	100%									
PID	USER	PRI	NI	VIRT	RES	SHR	S	CPU% ^{MEM%}	TIME+	Command
6361	root	20	0	2425M	1626M	69928	S	17.4	10.7	5:34.74 qemu-system-arm -m 256 -M romulus-bmc -nographic -drive file=romulus/obmc-phosphor-image-romulus-20250906002013.static.m
6359	root	20	0	2425M	1626M	69928	S	6.9	18.7	1:33.67 qemu-system-arm -m 256 -M romulus-bmc -nographic -drive file=romulus/obmc-phosphor-image-romulus-20250906002013.static.m
7864	anr1	20	0	21420	6464	3648	R	4.7	0.0	0:05.12 htop
3269	anr1	20	0	25.26	231M	157M	S	1.1	1.5	0:54.03 /usr/lib/xorg/Xorg vt2 -displayfd 3 -auth /run/user/1000/gdm/Xauthority -nolisten tcp -background none -noreset -keeptty
1	root	20	0	23736	14996	9184	S	0.0	0.1	0:02.29 /sbin/init splash
508	root	19	-1	67288	18996	17208	S	0.0	0.1	0:01.04 /usr/lib/systemd/systemd-journald
544	root	20	0	38888	8486	4696	S	0.0	0.1	0:00.20 /usr/lib/systemd/systemd-udevd
1083	systemd-oo	20	0	17556	7496	6728	S	0.0	0.0	0:00.88 /usr/lib/systemd/systemd-oomd
1086	systemd-re	20	0	21712	12508	10588	S	0.0	0.1	0:00.18 /usr/lib/systemd/systemd-resolved
1087	systemd-tl	20	0	91644	7752	6856	S	0.0	0.0	0:00.85 /usr/lib/systemd/systemd-timesyncd
1099	systemd-tl	20	0	91644	7752	6856	S	0.0	0.0	0:00.00 /usr/lib/systemd/systemd-timesyncd
1198	avahi	20	0	8752	3948	3820	S	0.0	0.0	0:00.03 avahi-daemon: running [u24.local]
1199	root	20	0	33548	6520	6088	S	0.0	0.0	0:00.85 /usr/libexec/bluetooth/bluetoothd
1206	messagebus	20	0	12384	6824	4392	S	0.0	0.0	0:00.78 @dbus-daemon -system --address=/systemd: --nofork --nopidfile --systemd-activation --syslog-only
1203	gnome-remo	20	0	428M	15944	13896	S	0.0	0.1	0:00.03 /usr/libexec/gnome-remote-desktop-daemon --system
1206	polkitd	20	0	3908	12228	8756	S	0.0	0.1	0:00.29 /usr/lib/polkit-1/polkitd --no-debug
1211	root	20	0	315M	7620	6852	S	0.0	0.0	0:00.85 /usr/libexec/power-profiles-daemon
1228	root	20	0	2455M	39344	24356	S	0.0	0.3	0:00.91 /usr/lib/snapd/snapd
1223	root	20	0	314M	7712	7672	S	0.0	0.0	0:00.07 /usr/libexec/accounts-daemon
1226	root	20	0	16092	2672	2544	S	0.0	0.0	0:00.00 /usr/sbin/cron -f -P
1227	root	20	0	311M	6564	6052	S	0.0	0.0	0:00.21 /usr/libexec/swtcheroo-control
1229	root	20	0	18252	8144	7868	S	0.0	0.1	0:00.29 /usr/lib/systemd/systemd-logind

```
t@romulus:~# obmcutil journal -f
OR: Invalid command 'journal'
ge: obmcutil [-h] [--wait] [-v|verbose] [--id=<INSTANCE_ID>]
cstate,bootprogress,chassiskill,chassisoff,chassison,chassisstate,hoststate,osstate,power,p
roff,poweron,state,status,hostrebootoff,hostrebooton,recoveryoff,recoveryon,bmcrebootoff,b
ebooton,listbootblock,listlogs showlog deletelogs, stopofftargets)
t@romulus:~# obmcutil journal -f
OR: Invalid command 'journal'
ge: obmcutil [-h] [--wait] [-v|verbose] [--id=<INSTANCE_ID>]
cstate,bootprogress,chassiskill,chassisoff,chassison,chassisstate,hoststate,osstate,power,p
roff,poweron,state,status,hostrebootoff,hostrebooton,recoveryoff,recoveryon,bmcrebootoff,b
ebooton,listbootblock,listlogs showlog deletelogs, stopofftargets)
t@romulus:~# obmcutil journal -f
OR: Invalid command 'journal'
ge: obmcutil [-h] [--wait] [-v|verbose] [--id=<INSTANCE_ID>]
cstate,bootprogress,chassiskill,chassisoff,chassison,chassisstate,hoststate,osstate,power,p
roff,poweron,state,status,hostrebootoff,hostrebooton,recoveryoff,recoveryon,bmcrebootoff,b
ebooton,listbootblock,listlogs showlog deletelogs, stopofftargets)
```

Main	100%									
PID	USER	PRI	NI	VIRT	RES	SHR	S	CPU% ^{MEM%}	TIME+	Command
6361	root	20	0	2859M	1630M	69928	R	98.7	10.7	7:55.69 qemu-system-arm -m 256 -M romulus-bmc -nographic -drive file=romulus/obmc-phosphor-image-romulus-20250906002013.static.m
6359	root	20	0	2859M	1630M	69928	S	5.1	18.7	1:56.23 qemu-system-arm -m 256 -M romulus-bmc -nographic -drive file=romulus/obmc-phosphor-image-romulus-20250906002013.static.m
7944	anr1	20	0	21244	6068	1636	R	4.5	0.0	0:12.75 htop
3269	anr1	20	0	25.26	232M	157M	S	1.3	1.5	1:02.53 /usr/lib/xorg/Xorg vt2 -displayfd 3 -auth /run/user/1000/gdm/Xauthority -nolisten tcp -background none -noreset -keeptty
3487	anr1	20	0	4846M	381M	155M	S	1.3	2.5	1:15.6 /usr/bin/gnome-shell
3669	anr1	20	0	388M	12456	7312	S	0.6	0.1	0:02.6 /usr/bin/ibus-daemon --pa
6139	anr1	20	0	849M	67928	45700	S	0.6	0.4	0:17.72 /usr/libexec/gnome-terminal
7927	anr1	20	0	14090	128M	95100	S	0.6	0.8	0:00.22 /snap/chromium/3235/usr/bin/chromium
1	root	20	0	23736	14996	13894	S	0.0	0.1	0:02.38 /sbin/init splash
508	root	19	-1	67288	18996	17208	S	0.0	0.1	0:01.15 /usr/lib/systemd/systemd-journald
544	root	20	0	38888	8488	4696	S	0.0	0.1	0:00.20 /usr/lib/systemd/systemd-oomd
1083	systemd-oo	20	0	17556	7496	6728	S	0.0	0.0	0:00.93 /usr/lib/systemd/systemd-oomd
1086	systemd-re	20	0	21712	12508	10588	S	0.0	0.1	0:00.20 /usr/lib/systemd/systemd-resolved
1087	systemd-tl	20	0	91644	7752	6856	S	0.0	0.0	0:00.85 /usr/lib/systemd/systemd-timesyncd
1099	systemd-tl	20	0	91644	7752	6856	S	0.0	0.0	0:00.85 /usr/lib/systemd/systemd-timesyncd
1198	avahi	20	0	8752	3948	3820	S	0.0	0.0	0:00.03 avahi-daemon: running [u24.local]
1199	root	20	0	33548	6520	6088	S	0.0	0.0	0:00.85 /usr/libexec/bluetooth/bluetoothd
1200	messagebus	20	0	12384	6824	4392	S	0.0	0.0	0:00.82 @dbus-daemon -system --address=/systemd: --nofork --nopidfile --systemd-activation --syslog-only
1203	gnome-remo	20	0	428M	15944	13896	S	0.0	0.1	0:00.03 /usr/libexec/gnome-remote-desktop-daemon --system
1206	polkitd	20	0	3908	12228	8756	S	0.0	0.1	0:00.29 /usr/lib/polkit-1/polkitd --no-debug
1211	root	20	0	315M	7620	6852	S	0.0	0.0	0:00.85 /usr/libexec/power-profiles-daemon
1228	root	20	0	2455M	39344	24356	S	0.0	0.3	0:00.91 /usr/lib/snapd/snapd

