Secure Boot
with STH Hypervisor
3 Guest to login

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Chapter **1** .

Test log Summary

Test	Level	Prio	Result
SB eMMC Boot Divided port 0	MUST	HIGH	passed
SB eMMC Boot Divided port 2	MUST	HIGH	passed
SB eMMC Boot Divided port 3	MUST	HIGH	passed
Performance	SHOULD	LOW	passed

Chapter   **2**   .

Detailed report

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SB eMMC Boot Divided port 0

Boot Hypervisor and payload as separate objects from eMMC
The HSBF image is first loaded to the internal SD card, then secure boot is
loaded, finally the hardware is configured for internal boot and reset.
The bootlogs are then parsed for tokens representing progress in the boot procedure.

Input

Parameter	Type	Value
flash_image	path	--flash_image $PREFIX/hikey_fip/hsbf_image.bin
flash_boot	path	--flash_boot $PREFIX/fip/bl1.bin
boot	cmd	--boot
logfile	path	--logfile uart0.log

Actual output

Parameter	Value
l_loader	CPU0 executes at 0xf9801000!
suite_id	SUITE_BUILD_ID 761055
pk_hash_retr	ROOT_PK_HASH retreved
pk_hash_inst	ROOT_PK_HASH installed
root_pk_ver	ROOT_PK verified
hsbf_image_id	HSBF Image ID=[Divided objects]
sdram_found	SDRAM found in HSBF (pass1)
sdram_verified	SDRAM Verified image_size = 0/15243296
root_pk_ignored	ROOT_PK Ignored 5
sdram_ignored	SDRAM Ignored 1
atf_runtime_fnd	ATF_RUNTIME found in HSBF
atf_payload_fnd	ATF_PAYLOAD found in HSBF
ramdisk_found	RAMDISK found in HSBF
atf_boot_fnd	ATF_BOOT found in HSBF
bl31_address	BL1: BL3-1 address = 0xf9858000
bl33_address	BL1: BL3-3 address = 0x3800000
bl33_spsr	BL1: BL3-3 spsr = 0x3c9
bl33_x0	BL1: BL3-3 X0 = 0x3820000
login	buildroot login:

Exit code

Expected	0
Actual	0

Addtional info

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Actual error output
No error message
Test info
No test info

Test Criteria
If Expected output match actual output , and
exit code is [0] , then test will be reported [passed]

SB eMMC Boot Divided port 2

Parse output from serialport 2
Collect SMC Monitor call for power on cores
Expect login prompt from guest
Input

Parameter	Type	Value
logfile	path	--logfile uart2.log

Actual output

Parameter	Value
login	buildroot login: INFO: psci_cpu_on called
psci_cpu_on	INFO: psci_cpu_on called [This token occurs 2 time(s)]

Exit code

Expected	0
Actual	0

Addtional info
Actual error output
Error occured , but no info
Test info
No test info

Test Criteria
If Expected output match actual output , and
exit code is [0] , then test will be reported [passed]

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SB eMMC Boot Divided port 3   4

Parse output from serialport 3
    Expect login prompt from guest
    Input

Parameter		Type	Value
logfile		path	--logfile uart3.log

    Actual output

Parameter		Value
login		buildroot login:

    Exit code

Expected	0
Actual	0

    Addtional info
        Actual error output
            Error occured , but no info
        Test info
            No test info

    Test Criteria
        If Expected output match actual output , and
        exit code is [0] , then test will be reported [passed]

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Performance 5

Timestamps in bootlogs beig used to
calculate boot time, performance of verification.
Size of Secure Boot image also measured
Input

Parameter	Type	Value
logfile	path	--logfile uart0.log

Actual output

Parameter	Value
elapsed.bios_low	1920 milliseconds
elapsed.bios_high	3288 milliseconds
hsbf_speed	Retrieve and verify HSBF image speed: 4.636 Mb/s
romsize	Size of Secure boot 57272 bytes
hsbf_image_size	15243296

Exit code

Expected	0
Actual	0

Addtional info
Actual error output
Error occured , but no info
Test info
No test info

Test Criteria
If Expected output match actual output , and
exit code is [0] , then test will be reported [passed]

Chapter **3** .

Tested Software

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libraries

File	Version
https://cm-ext.dev.oniteo.com/svn/nanodev/pack-ages/boot_test/trunk/boot_test/test_dir/boot/tester.py	27179

Tested Software

binaries

File	Version
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_fip/trunk/bios_fip/boot_bl31.S	26031
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_high/branches/haspoc/hikey/bios_high/main.c	27062
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_high/branches/haspoc/hikey/bios_high/bios_high.h	26907
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_high/branches/haspoc/hikey/bios_high/runtime.c	26989
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_low/branches/haspoc/arm64_v8_sb/bios_low/arm64_v8_dev-1.1/bl1/aarch64/bl1_entry-point.S	26799
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_memory/branches/haspoc/hikey/bios_memory/cache/cache_helpers.S	26001
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_memory/branches/haspoc/hikey/bios_memory/mmu/h_mmu.h	26651
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_memory/branches/haspoc/hikey/bios_memory/mmu/xlat_static.h	26902
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_memory/branches/haspoc/hikey/bios_memory/mmu/h_mmu.c	26902
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_memory/branches/haspoc/hikey/bios_memory/config/sdram_setup.c	26632
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_output/branches/haspoc/arm64_v8/bios_output/asm_print.S	25866
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_output/branches/haspoc/arm64_v8/bios_output/performance.S	26649
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_output/branches/haspoc/arm64_v8/bios_output/pl011_console.S	25866
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/bios_output/branches/haspoc/arm64_v8/bios_output/printf.c	25866
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/plf_bios_arm/branches/haspoc/arm64_v8/plf_bios_arm/optimized.S	26497
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/secure_bios/branches/haspoc/hikey/secure_bios/pki/bignum.c	26005
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/secure_bios/branches/haspoc/hikey/secure_bios/pki/bignum.h	17411
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/secure_bios/branches/haspoc/hikey/secure_bios/pki/rsa_math.c	25403
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/secure_bios/branches/haspoc/hikey/secure_bios/pki/rsa_math.h	17411
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/secure_bios/branches/haspoc/hikey/secure_bios/pki/rsa_ver.c	26466
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/secure_bios/branches/haspoc/hikey/secure_bios/pki/rsa_ver.h	24674
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/secure_bios/branches/haspoc/hikey/secure_bios/pki/sha2.c	26394
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/secure_bios/branches/haspoc/hikey/secure_bios/pki/sha2.h	26394
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/spdlib/branches/haspoc/juno/spdlib/spd_install.c	26962
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/spdlib/branches/haspoc/juno/spdlib/spd.h	26876

Tested Software

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https://cm-ext.dev.oniteo.com/svn/nanodev/packages/spdlib/branches/haspoc/juno/spdlib/spd_verify.c	26962
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/plf_bios_arm/branches/haspoc/arm64_v8/plf_bios_arm/misc.h	20589
https://cm-ext.dev.oniteo.com/svn/nanodev/packages/plf_bios_arm/branches/haspoc/arm64_v8/plf_bios_arm/misc.c	20822

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Chapter   **4**   .

Test logs

Serialport 0
Output from UART0

```
SARA: Capturing data from localhost:2001 Connection timeout 2 Session timeout 30
SARA: Rejected Input , nonascii
debug EMMC boot: print init OK
debug EMMC boot: send RST_N .
debug EMMC boot: start eMMC boot......
load fastboot1!
Switch to aarch64 mode. CPU0 executes at 0xf9801000!
mmu/h_mmu.c:bios_memory_mmu_setup:24: SUITE_BUILD_ID 761055
TCR_EL3 = 80803520
Start address of l1_xlation_table=f980f000
Start address of l2_xlation_table=f980d000
Sample values before assignment: l1_xlat[1]: 40000725 l2_xlat[460]: F9800721, l2_xlat[511]:
FFE00725
Sample values  after assignment: l1_xlat[1]: 40000725 l2_xlat[460]: F9800721, l2_xlat[511]:
FFE00725
Enabling MMU & D-Cache with sctlr= c5383d
Secure Boot VMA
SRAM
__SRAM_BASE__             = 0xf9800000
__RO_START__              = 0xf9801000
__RO_END__                = 0xf980efb8
__DATA_RAM_START__        = 0xf980efb8
__DATA_RAM_END__          = 0xf980f120
__BSS_START__             = 0xf9810000
__BSS_END__               = 0xf9810100
__PARAMS_BASE__           = 0xf9811000
_LOW_LEVEL_SRAM_STACK_END = 0xf9812000
_LOW_LEVEL_SRAM_STACK     = 0xf98125e0
__SRAM_TOP__              = 0xf9c00000
Size
SRAM_SIZE                 = 4194304
__RO_SIZE__               = 57272
__BSS_SIZE__              = 256
__DATA_SIZE__             = 360
STACK_SIZE                = 1504
SRAM_HEAP_SIZE            = 262144
Config Elapsed time(ms): 1920
```

```
main.c:_main:51: SUITE_BUILD_ID 761055
ROOT_PK_HASH retreved
ROOT_PK_HASH installed
ROOT_PK found in HSBF (pass1)
main.c:_main:96:
ROOT_PK verified
ROOT_PK installed
HSBF Image ID=[Divided objects]
SDRAM found in HSBF (pass1)
main.c:_main:122: About to assign 50000000 bytes starting at 0x4000 for heap
SDRAM Verified image_size = 0/15243296
main.c:_main:152: 15243296 bytes allocated, about to read from eMMC into 0x4000
main.c:_main:164: HSBF processing node of type 1 len=15243296
main.c:_main:168:
ROOT_PK Ignored 5
main.c:_main:164: HSBF processing node of type 4 len=15242904
main.c:_main:172:
SDRAM Ignored 1
main.c:_main:164: HSBF processing node of type 8 len=15094512
ATF_RUNTIME found in HSBF
main.c:_main:214: verify ok 1
main.c:_main:164: HSBF processing node of type 9 len=15055944
ATF_PAYLOAD found in HSBF
main.c:_main:227: verify ok 1
main.c:_main:164: HSBF processing node of type 5 len=15005792
RAMDISK found in HSBF
main.c:_main:202: verify ok 1
main.c:_main:164: HSBF processing node of type 3 len=1728
ATF_BOOT found in HSBF
main.c:_main:182: verify ok 1
Parameter block written at 0xf9811000
Flushed start 0xf9858000 36880 bytes
bl33_X0 0x3820000
bl33_X1 0x0
Flushed start 0x3800000 48464 bytes
Post Platform config
About to boot
Secure boot
BL1:
BL1: BL3-1 address  = 0xf9858000
BL1: BL3-1 spsr     = 0x3cd
BL1: BL3-1 E-level  = 3
BL1: BL3-1 X0       = 0xf9811000
BL1: BL3-1 X1       = 0x4b5a6978
BL33
BL1: BL3-3 address  = 0x3800000
BL1: BL3-3 spsr     = 0x3c9
BL1: BL3-3 E-level  = 2
BL1: BL3-3 X0       = 0x3820000
BL1: BL3-3 X1       = 0x0
Exit Elapsed time(ms): 5208
Booting Linux on physical CPU 0x0
Initializing cgroup subsys cpu
```

```
Linux version 4.4.0+ (haspoc@Dell) (gcc version 4.9.2 (Ubuntu/Linaro 4.9.2-10ubuntu13) ) #2
SMP PREEMPT Wed Jun 29 22:13:07 2016
Boot CPU: AArch64 Processor [410fd033]
bootconsole [uart0] enabled
efi: Getting EFI parameters from FDT:
efi: UEFI not found.
cma: Reserved 16 MiB at 0x0000000017000000
On node 0 totalpages: 65536
DMA zone: 1024 pages used for memmap
DMA zone: 0 pages reserved
DMA zone: 65536 pages, LIFO batch:15
psci: probing for conduit method from DT.
psci: PSCIv0.2 detected in firmware.
psci: Using standard PSCI v0.2 function IDs
psci: MIGRATE_INFO_TYPE not supported.
PERCPU: Embedded 15 pages/cpu @ffffffc00efc3000 s24576 r8192 d28672 u61440
pcpu-alloc: s24576 r8192 d28672 u61440 alloc=15*4096
pcpu-alloc: [0] 0 [0] 1 [0] 2
Detected VIPT I-cache on CPU0
CPU features: enabling workaround for ARM erratum 845719
Built 1 zonelists in Zone order, mobility grouping on.  Total pages: 64512
Kernel command line: earlycon console=ttyAMA0 earlyprintk debug user_debug=1 loglevel=31
cma=16M
PID hash table entries: 1024 (order: 1, 8192 bytes)
Dentry cache hash table entries: 32768 (order: 6, 262144 bytes)
Inode-cache hash table entries: 16384 (order: 5, 131072 bytes)
software      IO      TLB      [mem      0x11c00000-0x15c00000]      (64MB)      mapped      at
[ffffffc009c00000-ffffffc00dbfffff]
Memory: 147884K/262144K available (7274K kernel code, 549K rwdata, 3124K rodata, 3592K init,
235K bss, 97876K reserved, 16384K cma-reserved)
Virtual kernel memory layout:
vmalloc : 0xffffff8000000000 - 0xffffffbdbfff0000   (   246 GB)
vmemmap : 0xffffffbdc0000000 - 0xffffffbfc0000000   (     8 GB maximum)
0xffffffbdc0200000 - 0xffffffbdc0600000   (     4 MB actual)
fixed   : 0xffffffbffa7fd000 - 0xffffffbffac00000   (  4108 KB)
PCI I/O : 0xffffffbffae00000 - 0xffffffbffbe00000   (    16 MB)
modules : 0xffffffbffc000000 - 0xffffffc000000000   (    64 MB)
memory  : 0xffffffc000000000 - 0xffffffc010000000   (   256 MB)
.init : 0xffffffc000aaa000 - 0xffffffc000e2c000   (  3592 KB)
.text : 0xffffffc000080000 - 0xffffffc000aa9a14   ( 10407 KB)
.data : 0xffffffc000e41000 - 0xffffffc000eca400   (   549 KB)
SLUB: HWalign=64, Order=0-3, MinObjects=0, CPUs=3, Nodes=1
Preemptible hierarchical RCU implementation.
Build-time adjustment of leaf fanout to 64.
RCU restricting CPUs from NR_CPUS=64 to nr_cpu_ids=3.
RCU: Adjusting geometry for rcu_fanout_leaf=64, nr_cpu_ids=3
NR_IRQS:64 nr_irqs:64 0
Architected cp15 timer(s) running at 1.20MHz (virt).
clocksource: arch_sys_counter: mask: 0xffffffffffffff max_cycles: 0x11b661f8e, max_idle_ns:
1763180809113 ns
sched_clock: 56 bits at 1200kHz, resolution 833ns, wraps every 4398046510838ns
Console: colour dummy device 80x25
Calibrating delay loop (skipped), value calculated using timer frequency.. 2.40 BogoMIPS
```

```
(lpj=4800)
 pid_max: default: 32768 minimum: 301
 Security Framework initialized
 Mount-cache hash table entries: 512 (order: 0, 4096 bytes)
 Mountpoint-cache hash table entries: 512 (order: 0, 4096 bytes)
 Initializing cgroup subsys memory
 Initializing cgroup subsys hugetlb
 EFI services will not be available.
 ASID allocator initialised with 65536 entries
 Detected VIPT I-cache on CPU1
 CPU1: Booted secondary processor [410fd033]
 Detected VIPT I-cache on CPU2
 CPU2: Booted secondary processor [410fd033]
 Brought up 3 CPUs
 SMP: Total of 3 processors activated.
 CPU: All CPU(s) started at EL1
 alternatives: patching kernel code
 devtmpfs: initialized
 DMI not present or invalid.
 clocksource: jiffies: mask: 0xffffffff max_cycles: 0xffffffff, max_idle_ns: 7645041785100000
ns
 pinctrl core: initialized pinctrl subsystem
 NET: Registered protocol family 16
 cpuidle: using governor ladder
 cpuidle: using governor menu
 vdso: 2 pages (1 code @ fffffc000e49000, 1 data @ fffffc000e48000)
 hw-breakpoint: found 6 breakpoint and 4 watchpoint registers.
 DMA: preallocated 256 KiB pool for atomic allocations
 Serial: AMBA PL011 UART driver
 c0004000.uart: ttyAMA0 at MMIO 0xc0004000 (irq = 12, base_baud = 0) is a PL011 rev2
 console [ttyAMA0] enabled
 console [ttyAMA0] enabled
 bootconsole [uart0] disabled
 bootconsole [uart0] disabled
 vgaarb: loaded
 SCSI subsystem initialized
 libata version 3.00 loaded.
 usbcore: registered new interface driver usbfs
 usbcore: registered new interface driver hub
 usbcore: registered new device driver usb
 dmi: Firmware registration failed.
 Advanced Linux Sound Architecture Driver Initialized.
 clocksource: Switched to clocksource arch_sys_counter
 NET: Registered protocol family 2
 TCP established hash table entries: 2048 (order: 2, 16384 bytes)
 TCP bind hash table entries: 2048 (order: 3, 32768 bytes)
 TCP: Hash tables configured (established 2048 bind 2048)
 UDP hash table entries: 256 (order: 1, 8192 bytes)
 UDP-Lite hash table entries: 256 (order: 1, 8192 bytes)
 NET: Registered protocol family 1
 RPC: Registered named UNIX socket transport module.
 RPC: Registered udp transport module.
 RPC: Registered tcp transport module.
```

```
RPC: Registered tcp NFSv4.1 backchannel transport module.
PCI: CLS 0 bytes, default 128
hw perfevents: enabled with armv8_pmuv3 PMU driver, 7 counters available
kvm [1]: HYP mode not available
futex hash table entries: 1024 (order: 5, 131072 bytes)
audit: initializing netlink subsys (disabled)
audit: type=2000 audit(0.619:1): initialized
HugeTLB registered 2 MB page size, pre-allocated 0 pages
VFS: Disk quotas dquot_6.6.0
VFS: Dquot-cache hash table entries: 512 (order 0, 4096 bytes)
NFS: Registering the id_resolver key type
Key type id_resolver registered
Key type id_legacy registered
fuse init (API version 7.23)
9p: Installing v9fs 9p2000 file system support
io scheduler noop registered
io scheduler cfq registered (default)
pinctrl-single c0107000.pinmux: 159 pins at pa ffffff8000060000 size 636
pinctrl-single c0107800.pinmux: 163 pins at pa ffffff8000062800 size 652
pl061_gpio c010a000.gpio: PL061 GPIO chip @0x00000000c010a000 registered
pl061_gpio c010b000.gpio: PL061 GPIO chip @0x00000000c010b000 registered
pl061_gpio c010c000.gpio: PL061 GPIO chip @0x00000000c010c000 registered
Serial: 8250/16550 driver, 4 ports, IRQ sharing disabled
msm_serial: driver initialized
[drm] Initialized drm 1.1.0 20060810
Mali<2>: Inserting Mali v800 device driver.
Mali<2>: Compiled: Jun 29 2016, time: 22:11:49.
Mali<2>: Driver revision: -308d78c
Mali<2>: mali_module_init() registering driver
Mali: Mali device driver loaded
Unable to detect cache hierarchy from DT for CPU 0
loop: module loaded
tun: Universal TUN/TAP device driver, 1.6
tun: (C) 1999-2004 Max Krasnyansky <maxk@qualcomm.com>
sky2: driver version 1.30
usbcore: registered new interface driver asix
usbcore: registered new interface driver ax88179_178a
usbcore: registered new interface driver cdc_ether
usbcore: registered new interface driver net1080
usbcore: registered new interface driver cdc_subset
usbcore: registered new interface driver zaurus
usbcore: registered new interface driver cdc_ncm
ehci_hcd: USB 2.0 'Enhanced' Host Controller (EHCI) Driver
ehci-pci: EHCI PCI platform driver
ehci-platform: EHCI generic platform driver
ohci_hcd: USB 1.1 'Open' Host Controller (OHCI) Driver
ohci-pci: OHCI PCI platform driver
ohci-platform: OHCI generic platform driver
usbcore: registered new interface driver usb-storage
mousedev: PS/2 mouse device common for all mice
sdhci: Secure Digital Host Controller Interface driver
sdhci: Copyright(c) Pierre Ossman
Synopsys Designware Multimedia Card Interface Driver
```

```
 dwmmc_k3 c0109000.dwmmc2: fifo-depth property not found, using value of FIFOTH register as
default
 dwmmc_k3 c0109000.dwmmc2: IDMAC supports 32-bit address mode.
 dwmmc_k3 c0109000.dwmmc2: Using internal DMA controller.
 dwmmc_k3 c0109000.dwmmc2: Version ID is 250a
 dwmmc_k3 c0109000.dwmmc2: DW MMC controller at irq 13,32 bit host data width,128 deep fifo
 sdhci-pltfm: SDHCI platform and OF driver helper
 ledtrig-cpu: registered to indicate activity on CPUs
 usbcore: registered new interface driver usbhid
 usbhid: USB HID core driver
 NET: Registered protocol family 17
 9pnet: Installing 9P2000 support
 Key type dns_resolver registered
 registered taskstats version 1
 c0120000.usb supply vusb_d not found, using dummy regulator
 c0120000.usb supply vusb_a not found, using dummy regulator
 dwc2 c0120000.usb: EPs: 16, dedicated fifos, 1920 entries in SPRAM
 dwc2 c0120000.usb: DWC OTG Controller
 dwc2 c0120000.usb: new USB bus registered, assigned bus number 1
 dwc2 c0120000.usb: irq 14, io mem 0x00000000
 hub 1-0:1.0: USB hub found
 hub 1-0:1.0: 1 port detected
 dwmmc_k3 c0109000.dwmmc2: fifo-depth property not found, using value of FIFOTH register as
default
 dwmmc_k3 c0109000.dwmmc2: IDMAC supports 32-bit address mode.
 dwmmc_k3 c0109000.dwmmc2: Using internal DMA controller.
 dwmmc_k3 c0109000.dwmmc2: Version ID is 250a
 dwmmc_k3 c0109000.dwmmc2: DW MMC controller at irq 13,32 bit host data width,64 deep fifo
 dwmmc_k3 c0109000.dwmmc2: No vqmmc regulator found
 mmc_host mmc0: Bus speed (slot 0) = 25000000Hz (slot req 400000Hz, actual 390625HZ div = 32)
 dwmmc_k3 c0109000.dwmmc2: 1 slots initialized
 hctosys: unable to open rtc device (rtc0)
 dwmmc_k3 c0109000.dwmmc2: card claims to support voltages below defined range
 mmc_host mmc0: Bus speed (slot 0) = 25000000Hz (slot req 25000000Hz, actual 25000000HZ div =
0)
 ALSA device list:
 No soundcards found.
 uart-pl011 c0004000.uart: no DMA platform data
 mmc0: queuing unknown CIS tuple 0x91 (3 bytes)
 mmc0: new SDIO card at address 0001
 wl18xx_driver wl18xx.0.auto: Direct firmware load for ti-connectivity/wl1271-nvs.bin failed
with error -2
 wl18xx_driver wl18xx.0.auto: Direct firmware load for ti-connectivity/wl18xx-conf.bin failed
with error -2
 wlcore: ERROR could not get configuration binary ti-connectivity/wl18xx-conf.bin: -2
 wlcore: WARNING falling back to default config
 Freeing unused kernel memory: 3592K (ffffffc000aaa000 - ffffffc000e2c000)
 Freeing alternatives memory: 60K (ffffffc000e2c000 - ffffffc000e3b000)
 Starting logging: OK
 SICS Thin Hypervisor Ethernet driver
 STH IGC network interface eth0 created with 256 producer buffers and 256 consumer buffers
 SICS Thin Hypervisor: driver for making hypercalls
 Initializing random number generator... random: dd urandom read with 4 bits of entropy
```

```
available                                                         15
 done.
 Starting network...
 Guest 1 setting up networking
 wlcore: wl18xx HW: 183x or 180x, PG 2.2 (ROM 0x11)
 wlcore: loaded
 Welcome to Buildroot
 buildroot login:
```

Serialport 2
Output from UART2

```
SARA: Capturing data from localhost:2002 Connection timeout 2 Session timeout 30
SARA: Rejected Input , nonascii
NOTICE:  BL3-1: v1.1(debug):ca9f7ed
NOTICE:  BL3-1: Built : 11:24:57, Sep 19 2016
INFO:    BL3-1: Initializing runtime services
INFO:    BL3-1: Preparing for EL3 exit to normal world
INFO:    BL3-1: Next image address = 0x3800000
INFO:    BL3-1: Next image spsr = 0x3c9
INFO:    Elapsed time at exit(ms): 5199
Booting STH ARMv8
Created Jun 29 2016 22:14:13 (DEBUG=2) #059BC8B8
[C0] Performance monitor; Time at boot(ms): 5203
HYP RAM: 0000000003810000-0000000003820000
HYP ROM: 0000000003800000-0000000003810000
ID_AA64AFR  = (0000000000000000 0000000000000000)
ID_AA64DFR  = (0000000010305106 0000000000000000)
ID_AA64ISAR = (0000000000011120 0000000000000000)
ID_AA64MMFR = (0000000000001122 0000000000000000)
ID_AA64PFR  = (0000000000002222 0000000000000000)
ID_MMFR     = (10101105 40000000 01260000 02102211)
MAIR = 0100000000000000, TCR = 80800000, SCTLR=30CD183C
MIDR_EL1=410FD033 MPIDR_EL1=0000000080000000 VMPIDR_EL2=0000000080000000
CACHES: CLIDR = 0A200023, CTR = 84448004
L1 (type 3)  D/U CCSIDR=700FE01A I CCSIDR=201FE00A
L2 (type 4)  D/U CCSIDR=703FE07A
GICD=F6801000 GICC=F6802000 GICH=F6804000 GICV=F6806000
GICD CTLR=00000000 TYPER=0000FCE4 IIDR=0200143B
GICC CTLR=00000060 PMR=000000F0 IIDR=0202143B
GICH HCR=00000000 VTR=90000003 VMCR=004C0000 MISR=00000000
vGIC configuration: 256 pIRQ -> 172 vIRQ
[C0] PAYLOAD at 0000000003820000
[C0] Bundle S=00E4EB00 F=00000000 T=01752356:
[C0]     0: O=00000140 S=00000B10 F=00000000 T=01752355 config
[C0]     1: O=00000C80 S=00001F67 F=00000000 T=01752355 guest1.dtb
[C0]     2: O=00002C00 S=00E4A400 F=00000000 T=01752355 linux.bin
[C0]     3: O=00E4D000 S=00000DEC F=00000000 T=01752355 guest2.dtb
[C0]     4: O=00E4DE00 S=00000CDC F=00000000 T=01752355 guest3.dtb
[C0] Using configuration '3 x linux' dated 01752356
[C0] Available memory [idx,type  A?  G?  region current  (initial) ]:
[C0] 0,0  N N 0000000003800000-0000000005E00000 (03800000-05E00000)
[C0] 1,2  Y N 0000000006000000-0000000006200000 (06000000-06200000)
[C0] 2,3  Y N 0000000006200000-0000000007400000 (06200000-07400000)
[C0] 3,4  Y Y 0000000008000000-0000000018000000 (08000000-18000000)
[C0] 4,5  Y Y 0000000018000000-0000000040000000 (18000000-40000000)
[C0] allocated type=2 reg=1 size=00010000 align=00002000 PTR=0000000006000000
[C0] allocated 65536 bytes for coredata at 0000000006000000
[C0] CPU map:
[C0]     0 -> PID=00000000 MPIDR=00000000 (0:0) STATE=00000001 STACK=06001FF0
[C0]     1 -> PID=00000001 MPIDR=00000001 (1:0) STATE=00000001 STACK=06003FF0
[C0]     2 -> PID=00000002 MPIDR=00000002 (2:0) STATE=00000001 STACK=06005FF0
```

```
[C0]        3 -> PID=00000003 MPIDR=00000003 (3:0) STATE=00000001 STACK=06007FF0
[C0]        4 -> PID=00000004 MPIDR=00000100 (0:1) STATE=00000001 STACK=06009FF0
[C0]        5 -> PID=00000005 MPIDR=00000101 (1:1) STATE=00000001 STACK=0600BFF0
[C0]        6 -> PID=00000006 MPIDR=00000102 (2:1) STATE=00000001 STACK=0600DFF0
[C0]        7 -> PID=00000007 MPIDR=00000103 (3:1) STATE=00000001 STACK=0600FFF0
[C0] EE driver global init...
[C0] SIZE TO ALLOC: 000000000000A000 for 2
[C0] allocated type=2 reg=1 size=0000A000 align=00002000 PTR=0000000006010000
[C0] GUEST 1 at 06010000 06018000
[C0]      vmid=1 name=linux 1 flags=00000001 at 0000000006018000
[C0]      pcpu mask 00000007 => vcpu 00000007/3, cluster00000001/1
[C0]      RAM type=4 ipadr=0000000008000000 size=0000000010000000
[C0] allocated type=4 reg=3 size=10000000 align=00200000 PTR=0000000008000000
[C0] GUEST linux 1 memory sharing (SH) flags: 0000000000000200
[C0]      mem 08000000 -> 0000000008000000-0000000018000000
[C0]      l0=06010000 l1 ram=06018058 misc=06014000 l2 dev=06012000 igc=06013000
[C0]      device 00000000C0004000 -> 00000000F8015000 (1 pages)
[C0]      device 00000000C0104000 -> 00000000F7030000 (2 pages)
[C0]      device 00000000C0106000 -> 00000000F7032000 (1 pages)
[C0]      device 00000000C0107000 -> 00000000F7010000 (1 pages)
[C0]      device 00000000C0108000 -> 00000000F8000000 (1 pages)
[C0]      device 00000000C0109000 -> 00000000F723F000 (1 pages)
[C0]      device 00000000C0120000 -> 00000000F72C0000 (64 pages)
[C0]      gic ipadr 00000000C0000000
[C0]      device 00000000C0001000 -> 00000000F6806000 (1 pages)
[C0]      irq map: [ 0->0 1->1 2->2 3->3 4->4 27->27 30->30 32->68 33->0 34->0 35->0 40->106
43->109 48->0 ]
[C0]      fw 0000000008010000: ipadr=08010000:+00001F67 guest1.dtb
[C0]      fw 0000000008080000: ipadr=08080000:+00E4A400 linux.bin
[C0] SIZE TO ALLOC: 000000000000A000 for 2
[C0] allocated type=2 reg=1 size=0000A000 align=00002000 PTR=000000000601A000
[C0] GUEST 2 at 0601A000 06022000
[C0]      vmid=2 name=linux 2 flags=00000001 at 0000000006022000
[C0]      pcpu mask 00000038 => vcpu 00000007/3, cluster00000003/2
[C0]      RAM type=5 ipadr=0000000000000000 size=0000000010000000
[C0] allocated type=5 reg=4 size=10000000 align=00200000 PTR=0000000018000000
[C0] GUEST linux 2 memory sharing (SH) flags: 0000000000000200
[C0]      mem 00000000 -> 0000000018000000-0000000028000000
[C0]      l0=0601A000 l1 ram=06022058 misc=0601E000 l2 dev=0601C000 igc=0601D000
[C0]      device 00000000C0004000 -> 00000000F7112000 (1 pages)
[C0]      device 00000000C0100000 -> 00000000F7800000 (2 pages)
[C0]      gic ipadr 00000000C0000000
[C0]      device 00000000C0001000 -> 00000000F6806000 (1 pages)
[C0]      irq map: [ 0->0 1->1 2->2 3->3 4->4 27->27 30->30 32->70 48->0 49->0 ]
[C0]      fw 0000000018010000: ipadr=00010000:+00000DEC guest2.dtb
[C0]      fw 0000000018080000: ipadr=00080000:+00E4A400 linux.bin
[C0] SIZE TO ALLOC: 000000000000A000 for 2
[C0] allocated type=2 reg=1 size=0000A000 align=00002000 PTR=0000000006024000
[C0] GUEST 3 at 06024000 0602C000
[C0]      vmid=3 name=linux 3 flags=00000001 at 000000000602C000
[C0]      pcpu mask 000000C0 => vcpu 00000003/2, cluster00000002/1
[C0]      RAM type=5 ipadr=0000000000000000 size=0000000010000000
[C0] allocated type=5 reg=4 size=10000000 align=00200000 PTR=0000000028000000
```

```
[C0] GUEST linux 3 memory sharing (SH) flags: 0000000000000200
[C0]     mem 00000000 -> 0000000028000000-0000000038000000
[C0]     l0=06024000 l1 ram=0602C058 misc=06028000 l2 dev=06026000 igc=06027000
[C0]     device 00000000C0004000 -> 00000000F7113000 (1 pages)
[C0]     device 00000000C0100000 -> 00000000F7800000 (2 pages)
[C0]     gic ipadr 00000000C0000000
[C0]     device 00000000C0001000 -> 00000000F6806000 (1 pages)
[C0]     irq map: [ 0->0 1->1 2->2 3->3 4->4 27->27 30->30 32->71 49->0 ]
[C0]     fw 0000000028010000: ipadr=00010000:+00000CDC guest3.dtb
[C0]     fw 0000000028080000: ipadr=00080000:+00E4A400 linux.bin
[C0] IGC configuration:
[C0] allocated type=3 reg=2 size=000C0000 align=00001000 PTR=0000000006200000
[C0]   IGC channel test channel 1 @00000000038100B8
[C0]     EP1: ADR=C0200000:C0201000:C0261000 WSIZE=00060000 IRQ=48 linux 1
[C0]     EP2: ADR=C0200000:C0201000:C0261000 WSIZE=00060000 IRQ=48 linux 2
[C0] allocated type=3 reg=2 size=000C0000 align=00001000 PTR=00000000062C0000
[C0]   IGC channel test channel 2 @00000000038101B0
[C0]     EP1: ADR=C02C1000:C02C2000:C0322000 WSIZE=00060000 IRQ=49 linux 2
[C0]     EP2: ADR=C0200000:C0201000:C0261000 WSIZE=00060000 IRQ=49 linux 3
[C0] [HI6220] installing aoctrl driver...
[C0] [HI6220] install gpio driver...
[C0] [HI6220] GPIO driver guest configuration:
[C0]     linux 1   @C010A000, 00000007 ->  000000FF:33 000000FF:34 000000FF:35
[C0] [HI6220] GPIO driver vgic configuration:
[C0]     GPIO_0, pirq 84 pbase=F8011000:
[C0]         linux 1    virq=33 notifier=03806D34
[C0]     GPIO_1, pirq 85 pbase=F8012000:
[C0]         linux 1    virq=34 notifier=03806D34
[C0]     GPIO_2, pirq 86 pbase=F8013000:
[C0]         linux 1    virq=35 notifier=03806D34
[C0] Performance monitor; Time at guest1 launch(ms): 6290
[C0] Awakening sleeping CPU 3
INFO:    psci_cpu_on called
[C0] psci request: 00000003 0000000003807EC8 0000000006006000 -> 00000000
[C3] core boot: PCPU=0000000006006000 STACK=06007FF0
[C0] Awakening sleeping CPU 6
[C3] C re ectry registarle
[C3] X00=0000000006006000 X10=0000000000000000 X20=0000000000000000
[C0] psci request: 00000102 0000000003807EC8 000000000600C000 -> 00000000
[C6] core boot: PCPU=000000000600C000 STACK=0600DFF0
[C0] core boot: PCPU=0000000006000000 STACK=06001FF0
[C3] X01=0000000000000000 X11=0000000000000000 X21=0000000000000000
[C0] Core entry registers:
[C3] X02=0000000000000000 X12=0000000000000000 X22=0000000000000000
[C0] X00=0000000003820000 X10=0000000000000000 X20=0000000000000000
[C3] X03=0000000000000000 X13=0000000000000000 X23=0000000000000000
[C0] X01=0000000000000000 X11=0000000000000000 X21=0000000000000000
[C3] X04=0000000000000000 X14=0000000000000000 X24=0000000000000000
[C0] X02=0000000000000000 X12=0000000000000000 X22=0000000000000000
[C3] X05=0000000000000000 X15=0000000000000000 X25=0000000000000000
[C6] Core entry registers:
[C3] X06=0000000000000000 X16=0000000000000000 X26=0000000000000000
[C6] X00=000000000600C000 X10=0000000000000000 X20=0000000000000000
```

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[C0] X03=0000000000000000 X13=0000000000000000 X23=0000000000000000
[C3] X07=0000000000000000 X17=0000000000000000 X27=0000000000000000
[C0] X04=0000000000000000 X14=0000000000000000 X24=0000000000000000
[C3] X08=0000000000000000 X18=0000000000000000 X28=0000000000000000
[C0] X05=0000000000000000 X15=0000000000000000 X25=0000000000000000
[C3] X09=0000000000000000 X19=0000000000000000 X29=0000000000000000
[C0] X06=0000000000000000 X16=0000000000000000 X26=0000000000000000
[C3] X30=0000000003807F18 PC=104980BF5F7F8AA6 CPSR=00000000
[C0] X07=0000000000000000 X17=0000000000000000 X27=0000000000000000
[C6] X01=0000000000000000 X11=0000000000000000 X21=0000000000000000
[C0] X08=0000000000000000 X18=0000000000000000 X28=0000000000000000
[C6] X02=0000000000000000 X12=0000000000000000 X22=0000000000000000
[C0] X09=0000000000000000 X19=0000000000000000 X29=0000000000000000
[C6] X03=0000000000000000 X13=0000000000000000 X23=0000000000000000
[C0] X30=0000000003807F18 PC=4121A7FF7497CE24 CPSR=08010100
[C6] X04=0000000000000000 X14=0000000000000000 X24=0000000000000000
[C3] EE driver init on cpu 3...
[C0] EE driver init on cpu 0...
[C6] X05=0000000000000000 X15=0000000000000000 X25=0000000000000000
[C3] core boot is starting 'linux 2'....
[C6] X06=0000000000000000 X16=0000000000000000 X26=0000000000000000
[C3]     Guest entry VADR=00080000 PADR=18080000 Memory=91005A4D 140003FF
[C6] X07=0000000000000000 X17=0000000000000000 X27=0000000000000000
[C3] Starting guest linux 2 on CPU 3 at 00080000
[C6] X08=0000000000000000 X18=0000000000000000 X28=0000000000000000
[C3] MIDR_EL1=410FD033 MPIDR_EL1=80000003 HCR_EL2=000000008008601B
[C6] X09=0000000000000000 X19=0000000000000000 X29=0000000000000000
[C0] core boot is starting 'linux 1'....
[C6] X30=0000000003807F18 PC=00194B7F6FFBCE66 CPSR=00001000
[C0]     Guest entry VADR=08080000 PADR=08080000 Memory=91005A4D 140003FF
[C6] EE driver init on cpu 6...
[C0] Starting guest linux 1 on CPU 0 at 08080000
[C6] core boot is starting 'linux 3'....
[C0] MIDR_EL1=410FD033 MPIDR_EL1=80000000 HCR_EL2=000000008008601B
[C6]     Guest entry VADR=00080000 PADR=28080000 Memory=91005A4D 140003FF
[C0] Delaying guest1 boot...
[C6] Starting guest linux 3 on CPU 6 at 00080000
[C6] MIDR_EL1=410FD033 MPIDR_EL1=80000102 HCR_EL2=000000008008601B
Booting Linux on physical CPU 0x0
Initializing cgroup subsys cpu
Linux version 4.4.0+ (haspoc@Dell) (gcc version 4.9.2 (Ubuntu/Linaro 4.9.2-10ubuntu13) ) #2
SMP PREEMPT Wed Jun 29 22:13:07 2016
Boot CPU: AArch64 Processor [410fd033]
bootconsole [uart0] enabled
efi: Getting EFI parameters from FDT:
efi: UEFI not found.
cma: Reserved 16 MiB at 0x000000000f000000
On node 0 totalpages: 65536
DMA zone: 1024 pages used for memmap
DMA zone: 0 pages reserved
DMA zone: 65536 pages, LIFO batch:15
psci: probing for conduit method from DT.
psci: PSCIv0.2 detected in firmware.
```

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psci: Using standard PSCI v0.2 function IDs
psci: MIGRATE_INFO_TYPE not supported.
PERCPU: Embedded 15 pages/cpu @ffffffc00efd8000 s24576 r8192 d28672 u61440
pcpu-alloc: s24576 r8192 d28672 u61440 alloc=15*4096
pcpu-alloc: [0] 0 [0] 1
Detected VIPT I-cache on CPU0
CPU features: enabling workaround for ARM erratum 845719
Built 1 zonelists in Zone order, mobility grouping on.  Total pages: 64512
Kernel  command  line:  earlycon  console=ttyAMA0  earlyprintk  debug  user_debug=1  loglevel=31
cma=16M
PID hash table entries: 1024 (order: 1, 8192 bytes)
Dentry cache hash table entries: 32768 (order: 6, 262144 bytes)
Inode-cache hash table entries: 16384 (order: 5, 131072 bytes)
software     IO     TLB     [mem     0x09c00000-0x0dc00000]     (64MB)     mapped     at
[ffffffc009c00000-ffffffc00dbfffff]
Memory: 147976K/262144K available (7274K kernel code, 549K rwdata, 3124K rodata, 3592K init,
235K bss, 97784K reserved, 16384K cma-reserved)
Virtual kernel memory layout:
vmalloc : 0xffffff8000000000 - 0xffffffbdbfff0000   (   246 GB)
vmemmap : 0xffffffbdc0000000 - 0xffffffbfc0000000   (     8 GB maximum)
0xffffffbdc0000000 - 0xffffffbdc0400000   (     4 MB actual)
fixed   : 0xffffffbffa7fd000 - 0xffffffbffac00000   (  4108 KB)
PCI I/O : 0xffffffbffae00000 - 0xffffffbffbe00000   (    16 MB)
modules : 0xffffffbffc000000 - 0xffffffc000000000   (    64 MB)
memory  : 0xffffffc000000000 - 0xffffffc010000000   (   256 MB)
.init : 0xffffffc000aaa000 - 0xffffffc000e2c000   (  3592 KB)
.text : 0xffffffc000080000 - 0xffffffc000aa9a14   ( 10407 KB)
.data : 0xffffffc000e41000 - 0xffffffc000eca400   (   549 KB)
SLUB: HWalign=64, Order=0-3, MinObjects=0, CPUs=2, Nodes=1
Preemptible hierarchical RCU implementation.
Build-time adjustment of leaf fanout to 64.
RCU restricting CPUs from NR_CPUS=64 to nr_cpu_ids=2.
RCU: Adjusting geometry for rcu_fanout_leaf=64, nr_cpu_ids=2
NR_IRQS:64 nr_irqs:64 0
Architected cp15 timer(s) running at 1.20MHz (virt).
clocksource: arch_sys_counter: mask: 0xffffffffffffff max_cycles: 0x11b661f8e, max_idle_ns:
1763180809113 ns
sched_clock: 56 bits at 1200kHz, resolution 833ns, wraps every 4398046510838ns
Console: colour dummy device 80x25
Calibrating  delay  loop  (skipped),  value  calculated  using  timer  frequency..  2.40  BogoMIPS
(lpj=4800)
pid_max: default: 32768 minimum: 301
Security Framework initialized
Mount-cache hash table entries: 512 (order: 0, INFO:    psci_cpu_on called
[C3] psci request: 00000100 0000000003807EC8 0000000006008000 -> 00000000
[C4] core boot: PCPU=0000000006008000 STACK=06009FF0
[C4] Core entry registers:
[C4] X00=0000000006008000 X10=0000000000000000 X20=0000000000000000
[C4] X01=0000000000000000 X11=0000000000000000 X21=0000000000000000
[C4] X02=0000000000000000 X12=0000000000000000 X22=0000000000000000
[C4] X03=0000000000000000 X13=0000000000000000 X23=0000000000000000
[C4] X04=0000000000000000 X14=0000000000000000 X24=0000000000000000
[C4] X05=0000000000000000 X15=0000000000000000 X25=0000000000000000
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[C4] X06=0000000000000000 X16=0000000000000000 X26=0000000000000000
[C4] X07=0000000000000000 X17=0000000000000000 X27=0000000000000000
[C4] X08=0000000000000000 X18=0000000000000000 X28=0000000000000000
[C4] X09=0000000000000000 X19=0000000000000000 X29=0000000000000000
[C4] X30=0000000003807F18 PC=084941F5FFBF8CE2 CPSR=06000000
[C4] EE driver init on cpu 4...
[C4] core boot is starting 'linux 2'....
[C4]     Guest entry VADR=000827E0 PADR=180827E0 Memory=97FFFFB0 97FFFFE7
[C4] Starting guest linux 2 on CPU 4 at 000827E0
[C4] MIDR_EL1=410FD033 MPIDR_EL1=80000100 HCR_EL2=000000008008601B
4096 bytes)
Mountpoint-cache hash table entries: 512 (order: 0, 4096 bytes)
InitialINFO:    psci_cpu_on called
[C3] psci request: 00000101 0000000003807EC8 000000000600A000 -> 00000000
[C5] core boot: PCPU=000000000600A000 STACK=0600BFF0
[C5] Core entry registers:
[C5] X00=000000000600A000 X10=0000000000000000 X20=0000000000000000
[C5] X01=0000000000000000 X11=0000000000000000 X21=0000000000000000
[C5] X02=0000000000000000 X12=0000000000000000 X22=0000000000000000
[C5] X03=0000000000000000 X13=0000000000000000 X23=0000000000000000
[C5] X04=0000000000000000 X14=0000000000000000 X24=0000000000000000
[C5] X05=0000000000000000 X15=0000000000000000 X25=0000000000000000
[C5] X06=0000000000000000 X16=0000000000000000 X26=0000000000000000
[C5] X07=0000000000000000 X17=0000000000000000 X27=0000000000000000
[C5] X08=0000000000000000 X18=0000000000000000 X28=0000000000000000
[C5] X09=0000000000000000 X19=0000000000000000 X29=0000000000000000
[C5] X30=0000000003807F18 PC=0049421F0F5FC684 CPSR=00000000
[C5] EE driver init on cpu 5...
[C5] core boot is starting 'linux 2'....
[C5]     Guest entry VADR=000827E0 PADR=180827E0 Memory=97FFFFB0 97FFFFE7
[C5] Starting guest linux 2 on CPU 5 at 000827E0
[C5] MIDR_EL1=410FD033 MPIDR_EL1=80000101 HCR_EL2=000000008008601B
izing cgroup subsys memory
Initializing cgroup subsys hugetlb
EFI services will not be available.
ASID allocator initialised with 65536 entries
INFO:    psci_cpu_on called
[C6] psci request: 00000103 0000000003807EC8 000000000600E000 -> 00000000
[C7] core boot: PCPU=000000000600E000 STACK=0600FFF0
[C7] Core entry registers:
[C7] X00=000000000600E000 X10=0000000000000000 X20=0000000000000000
[C7] X01=0000000000000000 X11=0000000000000000 X21=0000000000000000
[C7] X02=0000000000000000 X12=0000000000000000 X22=0000000000000000
[C7] X03=0000000000000000 X13=0000000000000000 X23=0000000000000000
[C7] X04=0000000000000000 X14=0000000000000000 X24=0000000000000000
[C7] X05=0000000000000000 X15=0000000000000000 X25=0000000000000000
[C7] X06=0000000000000000 X16=0000000000000000 X26=0000000000000000
[C7] X07=0000000000000000 X17=0000000000000000 X27=0000000000000000
[C7] X08=0000000000000000 X18=0000000000000000 X28=0000000000000000
[C7] X09=0000000000000000 X19=0000000000000000 X29=0000000000000000
[C7] X30=0000000003807F18 PC=004842373F6DCEE4 CPSR=08024010
[C7] EE driver init on cpu 7...
[C7] core boot is starting 'linux 3'....
```

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[C7]      Guest entry VADR=000827E0 PADR=280827E0 Memory=97FFFFB0 97FFFFE7
[C7] Starting guest linux 3 on CPU 7 at 000827E0
[C7] MIDR_EL1=410FD033 MPIDR_EL1=80000103 HCR_EL2=000000008008601B
Detected VIPT I-cache on CPU1
CPU1: Booted secondary processor [410fd033]
Brought up 2 CPUs
SMP: Total of 2 processors activated.
CPU: All CPU(s) started at EL1
alternatives: patching kernel code
devtmpfs: initialized
DMI not present or invalid.
clocksource: jiffies: mask: 0xffffffff max_cycles: 0xffffffff, max_idle_ns: 7645041785100000
ns
 pinctrl core: initialized pinctrl subsystem
 NET: Registered protocol family 16
 cpuidle: using governor ladder
 cpuidle: using governor menu
 vdso: 2 pages (1 code @ fffffffc000e49000, 1 data @ fffffffc000e48000)
 hw-breakpoint: found 6 breakpoint and 4 watchpoint registers.
 DMA: preallocated 256 KiB pool for atomic allocations
 Serial: AMBA PL011 UART driver
 c0004000.uart: ttyAMA0 at MMIO 0xc0004000 (irq = 12, base_baud = 0) is a PL011 rev2
 console [ttyAMA0] enabled
 console [ttyAMA0] enabled
 bootconsole [uart0] disabled
 bootconsole [uart0] disabled
 vgaarb: loaded
 SCSI subsystem initialized
 libata version 3.00 loaded.
 usbcore: registered new interface driver usbfs
 usbcore: registered new interface driver hub
 usbcore: registered new device driver usb
 dmi: Firmware registration failed.
 Advanced Linux Sound Architecture Driver Initialized.
 clocksource: Switched to clocksource arch_sys_counter
 NET: Registered protocol family 2
 TCP established hash table entries: 2048 (order: 2, 16384 bytes)
 TCP bind hash table entries: 2048 (order: 3, 32768 bytes)
 TCP: Hash tables configured (established 2048 bind 2048)
 UDP hash table entries: 256 (order: 1, 8192 bytes)
 UDP-Lite hash table entries: 256 (order: 1, 8192 bytes)
 NET: Registered protocol family 1
 RPC: Registered named UNIX socket transport module.
 RPC: Registered udp transport module.
 RPC: Registered tcp transport module.
 RPC: Registered tcp NFSv4.1 backchannel transport module.
 PCI: CLS 0 bytes, default 128
 hw perfevents: enabled with armv8_pmuv3 PMU driver, 7 counters available
 kvm [1]: HYP mode not available
 futex hash table entries: 512 (order: 4, 65536 bytes)
 audit: initializing netlink subsys (disabled)
 audit: type=2000 audit(0.515:1): initialized
 HugeTLB registered 2 MB page size, pre-allocated 0 pages
```

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VFS: Disk quotas dquot_6.6.0
VFS: Dquot-cache hash table entries: 512 (order 0, 4096 bytes)
NFS: Registering the id_resolver key type
Key type id_resolver registered
Key type id_legacy registered
fuse init (API version 7.23)
9p: Installing v9fs 9p2000 file system support
io scheduler noop registered
io scheduler cfq registered (default)
Serial: 8250/16550 driver, 4 ports, IRQ sharing disabled
msm_serial: driver initialized
[drm] Initialized drm 1.1.0 20060810
Mali<2>: Inserting Mali v800 device driver.
Mali<2>: Compiled: Jun 29 2016, time: 22:11:49.
Mali<2>: Driver revision: -308d78c
Mali<2>: mali_module_init() registering driver
Mali: Mali device driver loaded
Unable to detect cache hierarchy from DT for CPU 0
loop: module loaded
tun: Universal TUN/TAP device driver, 1.6
tun: (C) 1999-2004 Max Krasnyansky <maxk@qualcomm.com>
sky2: driver version 1.30
usbcore: registered new interface driver asix
usbcore: registered new interface driver ax88179_178a
usbcore: registered new interface driver cdc_ether
usbcore: registered new interface driver net1080
usbcore: registered new interface driver cdc_subset
usbcore: registered new interface driver zaurus
usbcore: registered new interface driver cdc_ncm
ehci_hcd: USB 2.0 'Enhanced' Host Controller (EHCI) Driver
ehci-pci: EHCI PCI platform driver
ehci-platform: EHCI generic platform driver
ohci_hcd: USB 1.1 'Open' Host Controller (OHCI) Driver
ohci-pci: OHCI PCI platform driver
ohci-platform: OHCI generic platform driver
usbcore: registered new interface driver usb-storage
mousedev: PS/2 mouse device common for all mice
sdhci: Secure Digital Host Controller Interface driver
sdhci: Copyright(c) Pierre Ossman
Synopsys Designware Multimedia Card Interface Driver
sdhci-pltfm: SDHCI platform and OF driver helper
ledtrig-cpu: registered to indicate activity on CPUs
usbcore: registered new interface driver usbhid
usbhid: USB HID core driver
NET: Registered protocol family 17
9pnet: Installing 9P2000 support
Key type dns_resolver registered
registered taskstats version 1
hctosys: unable to open rtc device (rtc0)
ALSA device list:
No soundcards found.
uart-pl011 c0004000.uart: no DMA platform data
Freeing unused kernel memory: 3592K (ffffffc000aaa000 - ffffffc000e2c000)
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 Freeing alternatives memory: 60K (ffffffc000e2c000 - ffffffc000e3b000)
 Starting logging: OK
 SICS Thin Hypervisor Ethernet driver
 STH IGC network interface eth0 created with 256 producer buffers and 256 consumer buffers
 SICS Thin Hypervisor: driver for making hypercalls
 Initializing random number generator... random: dd urandom read with 1 bits of entropy avail-
able
 done.
 Starting network...
 Guest 3 setting up networking
 Welcome to Buildroot
 buildroot login: INFO:    psci_cpu_on called
 [C0] psci request: 00000001 0000000003807EC8 0000000006002000 -> 00000000
 [C1] core boot: PCPU=0000000006002000 STACK=06003FF0
 [C1] Core entry registers:
 [C1] X00=0000000006002000 X10=0000000000000000 X20=0000000000000000
 [C1] X01=0000000000000000 X11=0000000000000000 X21=0000000000000000
 [C1] X02=0000000000000000 X12=0000000000000000 X22=0000000000000000
 [C1] X03=0000000000000000 X13=0000000000000000 X23=0000000000000000
 [C1] X04=0000000000000000 X14=0000000000000000 X24=0000000000000000
 [C1] X05=0000000000000000 X15=0000000000000000 X25=0000000000000000
 [C1] X06=0000000000000000 X16=0000000000000000 X26=0000000000000000
 [C1] X07=0000000000000000 X17=0000000000000000 X27=0000000000000000
 [C1] X08=0000000000000000 X18=0000000000000000 X28=0000000000000000
 [C1] X09=0000000000000000 X19=0000000000000000 X29=0000000000000000
 [C1] X30=0000000003807F18 PC=000927FD0B79C2E0 CPSR=00000000
 [C1] EE driver init on cpu 1...
 [C1] core boot is starting 'linux 1'....
 [C1]      Guest entry VADR=080827E0 PADR=080827E0 Memory=97FFFFB0 97FFFFE7
 [C1] Starting guest linux 1 on CPU 1 at 080827E0
 [C1] MIDR_EL1=410FD033 MPIDR_EL1=80000001 HCR_EL2=000000008008601B
 INFO:    psci_cpu_on called
 [C0] psci request: 00000002 0000000003807EC8 0000000006004000 -> 00000000
 [C2] core boot: PCPU=0000000006004000 STACK=06005FF0
 [C2] Core entry registers:
 [C2] X00=0000000006004000 X10=0000000000000000 X20=0000000000000000
 [C2] X01=0000000000000000 X11=0000000000000000 X21=0000000000000000
 [C2] X02=0000000000000000 X12=0000000000000000 X22=0000000000000000
 [C2] X03=0000000000000000 X13=0000000000000000 X23=0000000000000000
 [C2] X04=0000000000000000 X14=0000000000000000 X24=0000000000000000
 [C2] X05=0000000000000000 X15=0000000000000000 X25=0000000000000000
 [C2] X06=0000000000000000 X16=0000000000000000 X26=0000000000000000
 [C2] X07=0000000000000000 X17=0000000000000000 X27=0000000000000000
 [C2] X08=0000000000000000 X18=0000000000000000 X28=0000000000000000
 [C2] X09=0000000000000000 X19=0000000000000000 X29=0000000000000000
 [C2] X30=0000000003807F18 PC=004546BFCFF5CAC0 CPSR=00000000
 [C2] EE driver init on cpu 2...
 [C2] core boot is starting 'linux 1'....
 [C2]      Guest entry VADR=080827E0 PADR=080827E0 Memory=97FFFFB0 97FFFFE7
 [C2] Starting guest linux 1 on CPU 2 at 080827E0
 [C2] MIDR_EL1=410FD033 MPIDR_EL1=80000002 HCR_EL2=000000008008601B
```

Serialport 3
Output from UART3

```
SARA: Capturing data from localhost:2003 Connection timeout 2 Session timeout 30
SARA: Rejected Input , nonascii
Booting Linux on physical CPU 0x0
Initializing cgroup subsys cpu
Linux version 4.4.0+ (haspoc@Dell) (gcc version 4.9.2 (Ubuntu/Linaro 4.9.2-10ubuntu13) ) #2
SMP PREEMPT Wed Jun 29 22:13:07 2016
Boot CPU: AArch64 Processor [410fd033]
bootconsole [uart0] enabled
efi: Getting EFI parameters from FDT:
efi: UEFI not found.
cma: Reserved 16 MiB at 0x000000000f000000
On node 0 totalpages: 65536
DMA zone: 1024 pages used for memmap
DMA zone: 0 pages reserved
DMA zone: 65536 pages, LIFO batch:15
psci: probing for conduit method from DT.
psci: PSCIv0.2 detected in firmware.
psci: Using standard PSCI v0.2 function IDs
psci: MIGRATE_INFO_TYPE not supported.
PERCPU: Embedded 15 pages/cpu @ffffffc00efc8000 s24576 r8192 d28672 u61440
pcpu-alloc: s24576 r8192 d28672 u61440 alloc=15*4096
pcpu-alloc: [0] 0 [0] 1 [0] 2
Detected VIPT I-cache on CPU0
CPU features: enabling workaround for ARM erratum 845719
Built 1 zonelists in Zone order, mobility grouping on.  Total pages: 64512
Kernel command line: earlycon console=ttyAMA0 earlyprintk debug user_debug=1 loglevel=31
cma=16M
PID hash table entries: 1024 (order: 1, 8192 bytes)
Dentry cache hash table entries: 32768 (order: 6, 262144 bytes)
Inode-cache hash table entries: 16384 (order: 5, 131072 bytes)
software      IO      TLB      [mem      0x09c00000-0x0dc00000]      (64MB)      mapped      at
[ffffffc009c00000-ffffffc00dbfffff]
Memory: 147912K/262144K available (7274K kernel code, 549K rwdata, 3124K rodata, 3592K init,
235K bss, 97848K reserved, 16384K cma-reserved)
Virtual kernel memory layout:
vmalloc : 0xffffff8000000000 - 0xffffffbdbfff0000   (   246 GB)
vmemmap : 0xffffffbdc0000000 - 0xffffffbfc0000000   (     8 GB maximum)
0xffffffbdc0000000 - 0xffffffbdc0400000   (     4 MB actual)
fixed   : 0xffffffbffa7fd000 - 0xffffffbffac00000   (  4108 KB)
PCI I/O : 0xffffffbffae00000 - 0xffffffbffbe00000   (    16 MB)
modules : 0xffffffbffc000000 - 0xffffffc000000000   (    64 MB)
memory  : 0xffffffc000000000 - 0xffffffc010000000   (   256 MB)
.init : 0xffffffc000aaa000 - 0xffffffc000e2c000   (  3592 KB)
.text : 0xffffffc000080000 - 0xffffffc000aa9a14   ( 10407 KB)
.data : 0xffffffc000e41000 - 0xffffffc000eca400   (   549 KB)
SLUB: HWalign=64, Order=0-3, MinObjects=0, CPUs=3, Nodes=1
Preemptible hierarchical RCU implementation.
Build-time adjustment of leaf fanout to 64.
RCU restricting CPUs from NR_CPUS=64 to nr_cpu_ids=3.
RCU: Adjusting geometry for rcu_fanout_leaf=64, nr_cpu_ids=3
```

NR_IRQS:64 nr_irqs:64 0
Architected cp15 timer(s) running at 1.20MHz (virt).
clocksource: arch_sys_counter: mask: 0xffffffffffffff max_cycles: 0x11b661f8e, max_idle_ns: 1763180809113 ns
sched_clock: 56 bits at 1200kHz, resolution 833ns, wraps every 4398046510838ns
Console: colour dummy device 80x25
Calibrating delay loop (skipped), value calculated using timer frequency.. 2.40 BogoMIPS (lpj=4800)
pid_max: default: 32768 minimum: 301
Security Framework initialized
Mount-cache hash table entries: 512 (order: 0, 4096 bytes)
Mountpoint-cache hash table entries: 512 (order: 0, 4096 bytes)
Initializing cgroup subsys memory
Initializing cgroup subsys hugetlb
EFI services will not be available.
ASID allocator initialised with 65536 entries
Detected VIPT I-cache on CPU1
CPU1: Booted secondary processor [410fd033]
Detected VIPT I-cache on CPU2
CPU2: Booted secondary processor [410fd033]
Brought up 3 CPUs
SMP: Total of 3 processors activated.
CPU: All CPU(s) started at EL1
alternatives: patching kernel code
devtmpfs: initialized
DMI not present or invalid.
clocksource: jiffies: mask: 0xffffffff max_cycles: 0xffffffff, max_idle_ns: 7645041785100000 ns
pinctrl core: initialized pinctrl subsystem
NET: Registered protocol family 16
cpuidle: using governor ladder
cpuidle: using governor menu
vdso: 2 pages (1 code @ ffffffc000e49000, 1 data @ ffffffc000e48000)
hw-breakpoint: found 6 breakpoint and 4 watchpoint registers.
DMA: preallocated 256 KiB pool for atomic allocations
Serial: AMBA PL011 UART driver
c0004000.uart: ttyAMA0 at MMIO 0xc0004000 (irq = 12, base_baud = 0) is a PL011 rev2
console [ttyAMA0] enabled
console [ttyAMA0] enabled
bootconsole [uart0] disabled
bootconsole [uart0] disabled
vgaarb: loaded
SCSI subsystem initialized
libata version 3.00 loaded.
usbcore: registered new interface driver usbfs
usbcore: registered new interface driver hub
usbcore: registered new device driver usb
dmi: Firmware registration failed.
Advanced Linux Sound Architecture Driver Initialized.
clocksource: Switched to clocksource arch_sys_counter
NET: Registered protocol family 2
TCP established hash table entries: 2048 (order: 2, 16384 bytes)
TCP bind hash table entries: 2048 (order: 3, 32768 bytes)

```
TCP: Hash tables configured (established 2048 bind 2048)
UDP hash table entries: 256 (order: 1, 8192 bytes)
UDP-Lite hash table entries: 256 (order: 1, 8192 bytes)
NET: Registered protocol family 1
RPC: Registered named UNIX socket transport module.
RPC: Registered udp transport module.
RPC: Registered tcp transport module.
RPC: Registered tcp NFSv4.1 backchannel transport module.
PCI: CLS 0 bytes, default 128
hw perfevents: enabled with armv8_pmuv3 PMU driver, 7 counters available
kvm [1]: HYP mode not available
futex hash table entries: 1024 (order: 5, 131072 bytes)
audit: initializing netlink subsys (disabled)
audit: type=2000 audit(0.607:1): initialized
HugeTLB registered 2 MB page size, pre-allocated 0 pages
VFS: Disk quotas dquot_6.6.0
VFS: Dquot-cache hash table entries: 512 (order 0, 4096 bytes)
NFS: Registering the id_resolver key type
Key type id_resolver registered
Key type id_legacy registered
fuse init (API version 7.23)
9p: Installing v9fs 9p2000 file system support
io scheduler noop registered
io scheduler cfq registered (default)
Serial: 8250/16550 driver, 4 ports, IRQ sharing disabled
msm_serial: driver initialized
[drm] Initialized drm 1.1.0 20060810
Mali<2>: Inserting Mali v800 device driver.
Mali<2>: Compiled: Jun 29 2016, time: 22:11:49.
Mali<2>: Driver revision: -308d78c
Mali<2>: mali_module_init() registering driver
Mali: Mali device driver loaded
Unable to detect cache hierarchy from DT for CPU 0
loop: module loaded
tun: Universal TUN/TAP device driver, 1.6
tun: (C) 1999-2004 Max Krasnyansky <maxk@qualcomm.com>
sky2: driver version 1.30
usbcore: registered new interface driver asix
usbcore: registered new interface driver ax88179_178a
usbcore: registered new interface driver cdc_ether
usbcore: registered new interface driver net1080
usbcore: registered new interface driver cdc_subset
usbcore: registered new interface driver zaurus
usbcore: registered new interface driver cdc_ncm
ehci_hcd: USB 2.0 'Enhanced' Host Controller (EHCI) Driver
ehci-pci: EHCI PCI platform driver
ehci-platform: EHCI generic platform driver
ohci_hcd: USB 1.1 'Open' Host Controller (OHCI) Driver
ohci-pci: OHCI PCI platform driver
ohci-platform: OHCI generic platform driver
usbcore: registered new interface driver usb-storage
mousedev: PS/2 mouse device common for all mice
sdhci: Secure Digital Host Controller Interface driver
```

```
sdhci: Copyright(c) Pierre Ossman
Synopsys Designware Multimedia Card Interface Driver
sdhci-pltfm: SDHCI platform and OF driver helper
ledtrig-cpu: registered to indicate activity on CPUs
usbcore: registered new interface driver usbhid
usbhid: USB HID core driver
NET: Registered protocol family 17
9pnet: Installing 9P2000 support
Key type dns_resolver registered
registered taskstats version 1
hctosys: unable to open rtc device (rtc0)
ALSA device list:
No soundcards found.
uart-pl011 c0004000.uart: no DMA platform data
Freeing unused kernel memory: 3592K (ffffffc000aaa000 - ffffffc000e2c000)
Freeing alternatives memory: 60K (ffffffc000e2c000 - ffffffc000e3b000)
Starting logging: OK
SICS Thin Hypervisor Ethernet driver
STH IGC network interface eth0 created with 256 producer buffers and 256 consumer buffers
STH IGC network interface eth1 created with 256 producer buffers and 256 consumer buffers
SICS Thin Hypervisor: driver for making hypercalls
Initializing random number generator... random: dd urandom read with 1 bits of entropy avail-
able
done.
Starting network...
Guest 2 setting up networking
Welcome to Buildroot
buildroot login:
```

Sara command log
Logged commands from Sara load server

```
Timeout 30
Collect output from port  2001
Collect output from port  2002
Collect output from port  2003
boot  thread time_out
Start watch dog thread time_out  33
Power off
```