Qualcomm Technologies, Inc.

Qualcomm Linux Ethernet Guide

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Contents

1 Ethernet overview

Ethernet technology is designed to transmit data over a channel using wired technology at different link speeds. It uses cables to transmit data in network models, such as local area network (LAN) and wide area network (WAN) for a reliable, secure, and better network connectivity.

Ethernet connectivity is integrated into IoT devices and sensors, allowing them to transmit data to the network. It's defined under IEEE 802.3 standards and provides a standardized interface for these devices to communicate with gateways.

Qualcomm® Linux® provides Ethernet features, architecture, and tools that can help you develop Ethernet applications on Qualcomm® RB3 Gen 2 Development Kit, Qualcomm Dragonwing™ IQ-9075 Evaluation Kit (EVK), and Qualcomm® IQ-8 Beta EVK. Additionally, Qualcomm Linux offers capabilities to bring up the Ethernet functionality, configure its features, and enable logging to debug issues.

Note: See Hardware SoCs that are supported on Qualcomm Linux.

The following table lists the Ethernet interfaces supported on these reference kits.

SOC	Reference kit	Ethernet interfaces
QCS6490	RB3 Gen 2 Development Kit	• 1 x RJ45 connector • 1 x IX connector • 1 x IX connector (optional)
QCS9075	IQ-9075 EVK	1 x RJ45 connector
QCS8275	IQ-8 Beta EVK	1 x RJ45 connector

1.1 Next steps

- Get started with Ethernet
- Bring up Ethernet

- Configure Ethernet features
- Debug Ethernet issues

2 Get started with Ethernet

Before you begin:

- See *Qualcomm Linux Build Guide* for common infrastructure setup and build workflows.
- Flash the corresponding configuration data table (CDT) on the device to ensure that the correct configuration is used for Ethernet bring up.

The following figure shows the workflow to get started with Ethernet functionality on your device.

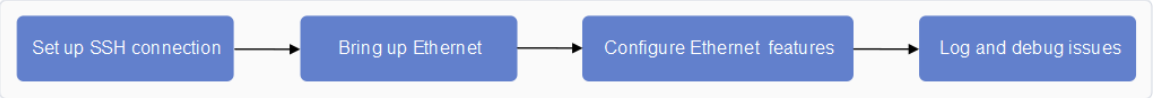

Figure1 Qualcomm Linux Ethernet workflow

2.1 Set up SSH connection

To enable SSH and connect to the device, do the following:

1. Perform the steps mentioned in Sign in using SSH to enable SSH.
2. Connect to the device.

   ```
   ssh root@<device_IP_address>
   ```

   For example:

   ```
   ssh root@10.92.160.222
   ```

3. Enter the following password to connect to the SSH shell.

   ```
   oelinux123
   ```

2.2 Next steps

- Bring up Ethernet
- Configure Ethernet features
- Debug Ethernet issues

3 Ethernet features

QCS6490

3.1 Energy efficient Ethernet

EEE is an optional operational mode that helps in reducing the consumption of power while transmitting and receiving data. When there is no data to transmit or receive, this feature allows the MAC sublayer and a family of physical layers (PHY) to operate in the low-power idle (LPI) mode. During link negotiation, the link partners learn about the capabilities and features, such as EEE, supported by the remote entity. Based on the supported capabilities, features, and data transfer state, the MAC determines whether the system should enter or exit the LPI mode and communicates this information to the PHY. The EEE feature specifies the capabilities and negotiation methods that the link partners can use to:

Determine whether EEE is supported.

- Select the set of parameters that are common to both the devices.

Note: EEE feature is supported only on QEP8121 PHY.

3.2 Next steps

- Bring up Ethernet
- Configure energy efficient Ethernet

QCS9075

Basic Ethernet features such as interface enumeration and data path are supported on QCS9075.

QCS8275

Basic Ethernet features such as interface enumeration and data path are supported on QCS8275.

4 Ethernet architecture

The following figure shows the architecture and its components involved in communicating data over Ethernet on the reference kits.

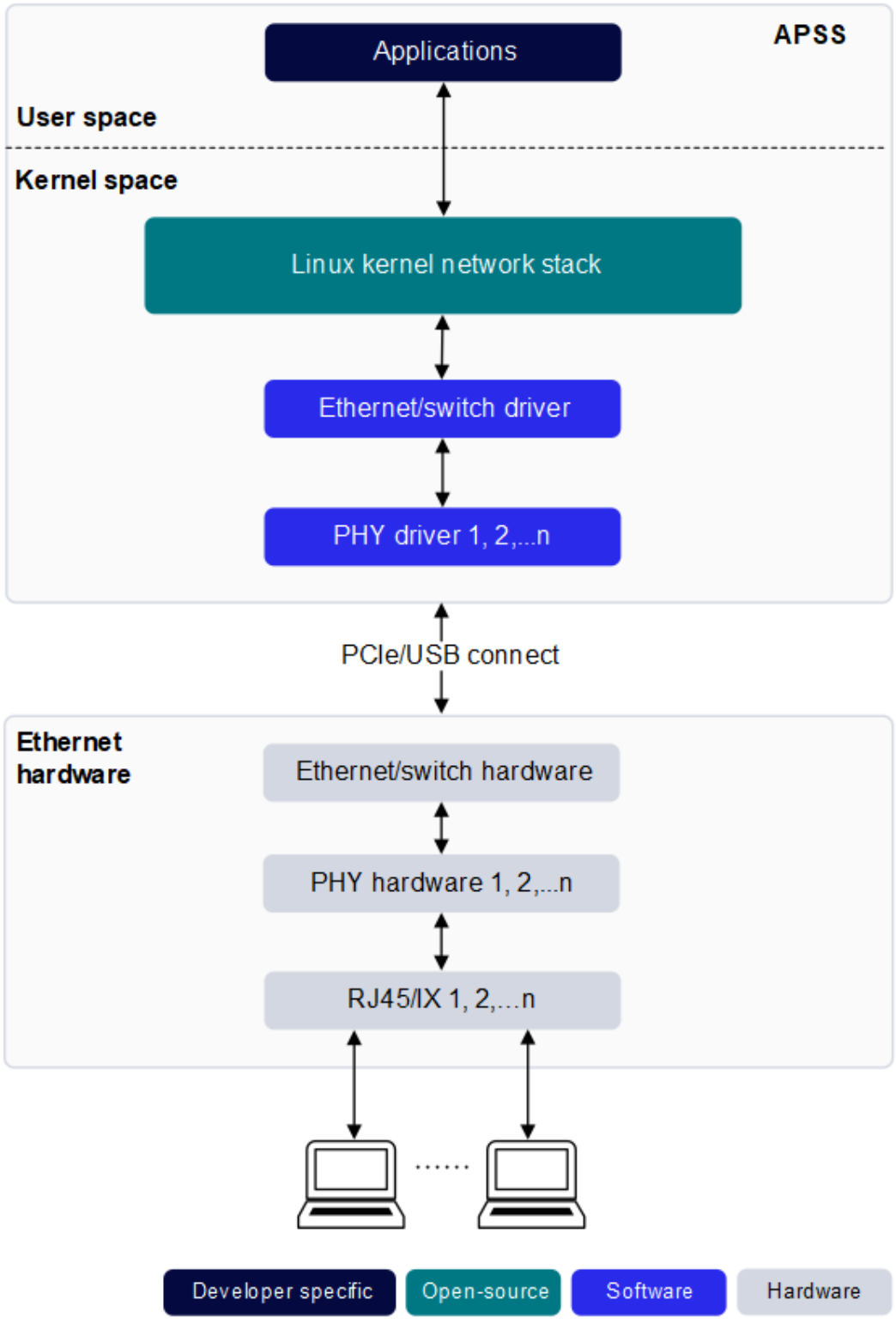

Figure1 Ethernet architecture on reference kits

QCS6490

The following table describes the components of Ethernet architecture.

Component	Description
Application processor subsystem (APSS)	Runs on a Linux-based operating system.
Ethernet driver	• A software driver in the Linux kernel. • Provides data connectivity over a wired Ethernet interface.
PHY driver	• A low-level driver dedicated to manage the Ethernet physical layer. • Implements a software statemachine required to handle the lifecycle of PHY, from initialization to link establishment. • Interacts with an underlying management data input/output (MDIO) to access the PHY register and perform operations such as detecting alive and/or linked PHYs.

Component	Description
Ethernet hardware (RB3 Gen 2 Development Kit)	• Both QEP and AQR PHYs are validated on RB3 Gen 2 Development Kit. • QEP PHY for 2.5 GbE is available by default on SGMII interface. It is enabled and verified on a 1 x QEP8121 IX connector. • USB2ETH interface with 1 GbE is available by default and verified on RJ45 connector. • AQR PHY for 10 GbE is optional and may not be available on the development kit. If available, it is verified on a 1 x AQR113C IX connector. **Note:** The sample outputs shown in Tools for Ethernet operations are based on the verification of QEP8121 PHY, USB2ETH, and AQR113C PHY. • To bring up hardware configurations other than the configuration provided by Qualcomm, see Bring up alternate hardware enablement. • For information on how to configure RJ45 based USB2ETH, see Configure Ethernet with RJ45

QCS9075

The following table describes the components of Ethernet architecture.

Component	Description
Application processor subsystem (APSS)	Runs on a Linux-based operating system.
Ethernet driver	• A software driver in the Linux kernel. • Provides data connectivity over a wired Ethernet interface.

Component	Description
PHY driver	• A low-level driver dedicated to manage the Ethernet physical layer. • Implements a software statemachine required to handle the lifecycle of PHY, from initialization to link establishment. • Interacts with an underlying management data input/output (MDIO) to access the PHY register and perform operations such as detecting alive and/or linked PHYs.
Ethernet hardware (IQ-9075 EVK)	1 x QEP8121 PHY for 10/100/1000 Mbps is validated on IQ-9075 EVK and enabled by RJ45 connector. **Note:** 2.5 GbE is not enabled on IQ-9075 EVK.

Component	Description

QCS8275

The following table describes the components of Ethernet architecture.

Component	Description
Application processor subsystem (APSS)	Runs on a Linux-based operating system.
Ethernet driver	• A software driver in the Linux kernel. • Provides data connectivity over a wired Ethernet interface.
PHY driver	• A low-level driver dedicated to manage the Ethernet physical layer. • Implements a software statemachine required to handle the lifecycle of PHY, from initialization to link establishment. • Interacts with an underlying management data input/output (MDIO) to access the PHY register and perform operations such as detecting alive and/or linked PHYs.
Ethernet hardware (IQ-8 Beta EVK)	1 x AQR115 PHY for 10/100/1000 Mbps and 2.5 GbE is validated on IQ-8 Beta EVK and enabled by RJ45 connector.

5 Tools for Ethernet operations

You can use the following tools to perform basic operations such as configuring addresses, viewing the status of links, monitoring connections, and debugging connection failures.

Tools for Ethernet operations

Tool	Description
`ping` command	Checks the data connectivity between the device interface and the interface connected remotely.
`ethtool` command	• Displays the network interface controller (NIC) parameters. • Configures the NIC settings such as speed, port, auto-negotiation, and so on.
`ifconfig` command	• Assigns an address to a network interface. • Configures the network interface with additional parameters like Maximum Transmission Unit (MTU) and displays its information.
`netstat` command	• Serves as a networking tool to troubleshoot and configure. • Serves as a monitoring tool for connections over the network. • Use this command to monitor both incoming and outgoing connections, routing tables, port listening and usage statistics.

Tool	Description
`tcpdump` command	Analyzes the network traffic by intercepting and displaying packets that are created or received by a network interface.
Routing table	• Contains the parameters necessary to identify and read the network route. • Use the `ip` command or `netstat` command to retrieve information of a routing table.

QCS6490

5.1 ping command

Note:

The client IP address must be in the same subnet as that of the device IP address.

Sample output of the `ping` command to check the network connectivity from the RB3 Gen 2 Development Kit to the host PC.

```
ping 169.254.227.240
PING 169.254.227.240 (169.254.227.240) 56(84) bytes of data.
64 bytes from 169.254.227.240: icmp_seq=1 ttl=64 time=1.45 ms
64 bytes from 169.254.227.240: icmp_seq=2 ttl=64 time=0.689 ms
64 bytes from 169.254.227.240: icmp_seq=3 ttl=64 time=0.611 ms
64 bytes from 169.254.227.240: icmp_seq=4 ttl=64 time=0.711 ms
^C
--- 169.254.227.240 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3027ms
rtt min/avg/max/mdev = 0.611/0.865/1.449/0.339 ms
```

5.2 ethtool command

Sample output of the `ethtool` command to check the status of a link.

```
ethtool enP1p5s0f0
Settings for enP1p5s0f0:
    Supported ports: [  ]
    Supported link modes:   100baseT/Half 100baseT/Full
```

```
                            1000baseT/Full
                            10000baseT/Full
                            1000baseKX/Full
                            10000baseKX4/Full
                            10000baseKR/Full
                            2500baseT/Full
                            5000baseT/Full
    Supported pause frame use: Symmetric Receive-only
    Supports auto-negotiation: Yes
    Supported FEC modes: Not reported
    Advertised link modes:  100baseT/Half 100baseT/Full
                            1000baseT/Full
                            10000baseT/Full
                            1000baseKX/Full
                            10000baseKX4/Full
                            10000baseKR/Full
                            2500baseT/Full
                            5000baseT/Full
    Advertised pause frame use: Symmetric Receive-only
    Advertised auto-negotiation: Yes
    Advertised FEC modes: Not reported
    Link partner advertised link modes:  10baseT/Half 10baseT/
Full
                                         100baseT/Half
100baseT/Full
                                         1000baseT/Full
                                         2500baseT/Full
    Link partner advertised pause frame use: Symmetric Receive-
only
    Link partner advertised auto-negotiation: Yes
    Link partner advertised FEC modes: Not reported
    Speed: 2500Mb/s
    Duplex: Full
    Auto-negotiation: on
    Port: Twisted Pair
    PHYAD: 0
    Transceiver: external
    MDI-X: Unknown
    Supports Wake-on: d
    Wake-on: d
    Current message level: 0x0000003f (63)
                            drv probe link timer ifdown ifup
    Link detected: yes
```

```
ethtool enP1p5s0f1
Settings for enP1p5s0f1:
    Supported ports: [  ]
    Supported link modes:   10baseT/Half 10baseT/Full
                            100baseT/Half 100baseT/Full
                            1000baseT/Full
                            2500baseT/Full
    Supported pause frame use: Symmetric Receive-only
    Supports auto-negotiation: Yes
    Supported FEC modes: Not reported
    Advertised link modes:  10baseT/Half 10baseT/Full
                            100baseT/Half 100baseT/Full
                            1000baseT/Full
                            2500baseT/Full
    Advertised pause frame use: Symmetric Receive-only
    Advertised auto-negotiation: Yes
    Advertised FEC modes: Not reported
    Link partner advertised link modes:  100baseT/Half 100baseT/
Full
                                         1000baseT/Full
                                         2500baseT/Full
    Link partner advertised pause frame use: Symmetric Receive-
only
    Link partner advertised auto-negotiation: Yes
    Link partner advertised FEC modes: Not reported
    Speed: 2500Mb/s
    Duplex: Full
    Auto-negotiation: on
    master-slave cfg: preferred slave
    master-slave status: slave
    Port: Twisted Pair
    PHYAD: 28
    Transceiver: external
    MDI-X: off (auto)
    Supports Wake-on: g
    Wake-on: d
    Current message level: 0x0000003f (63)
                           drv probe link timer ifdown ifup
    Link detected: yes

ethtool enP1p4s0u1u1
Settings for enP1p4s0u1u1:
    Supported ports: [ TP    MII ]
    Supported link modes:   10baseT/Half 10baseT/Full
```

```
                            100baseT/Half 100baseT/Full
                            1000baseT/Half 1000baseT/Full
    Supported pause frame use: No
    Supports auto-negotiation: Yes
    Supported FEC modes: Not reported
    Advertised link modes:  10baseT/Half 10baseT/Full
                            100baseT/Half 100baseT/Full
                            1000baseT/Full
    Advertised pause frame use: No
    Advertised auto-negotiation: Yes
    Advertised FEC modes: Not reported
    Link partner advertised link modes:  1000baseT/Full
    Link partner advertised pause frame use: Symmetric Receive-
only
    Link partner advertised auto-negotiation: Yes
    Link partner advertised FEC modes: Not reported
    Speed: 1000Mb/s
    Duplex: Full
    Auto-negotiation: on
    Port: MII
    PHYAD: 3
    Transceiver: internal
    Supports Wake-on: pg
    Wake-on: d
    Current message level: 0x00000007 (7)
                drv probe link
    Link detected: yes
```

Sample output of the `ethtool` command to check the statistics of NIC packet.

```
ethtool -S enP1p5s0f0
NIC statistics:
    mmc_tx_octetcount_gb: 10234
    mmc_tx_framecount_gb: 84
    mmc_tx_broadcastframe_g: 52
    mmc_tx_multicastframe_g: 32
    mmc_tx_64_octets_gb: 41
    mmc_tx_65_to_127_octets_gb: 23
    mmc_tx_128_to_255_octets_gb: 6
    mmc_tx_256_to_511_octets_gb: 14
```

```
    mmc_tx_512_to_1023_octets_gb: 0
    mmc_tx_1024_to_max_octets_gb: 0
    mmc_tx_unicast_gb: 0
    mmc_tx_multicast_gb: 32
    mmc_tx_broadcast_gb: 52
    mmc_tx_underflow_error: 0
    mmc_tx_singlecol_g: 0
    mmc_tx_multicol_g: 0
    mmc_tx_deferred: 0
    mmc_tx_latecol: 0
    mmc_tx_exesscol: 0
    mmc_tx_carrier_error: 0
    mmc_tx_octetcount_g: 10234
    mmc_tx_framecount_g: 84
    mmc_tx_excessdef: 0
    mmc_tx_pause_frame: 0
    mmc_tx_vlan_frame_g: 0
    mmc_tx_lpi_tran_cntr: 0
    mmc_rx_lpi_tran_cntr: 0
    mmc_rx_framecount_gb: 25
    mmc_rx_octetcount_gb: 5394
    mmc_rx_octetcount_g: 5394
    mmc_rx_broadcastframe_g: 15
    mmc_rx_multicastframe_g: 10
    mmc_rx_crc_error: 0
    mmc_rx_align_error: 0
    mmc_rx_run_error: 0
    mmc_rx_jabber_error: 0
    mmc_rx_undersize_g: 0
    mmc_rx_oversize_g: 0
    mmc_rx_64_octets_gb: 5
    mmc_rx_65_to_127_octets_gb: 4
    mmc_rx_128_to_255_octets_gb: 5
    mmc_rx_256_to_511_octets_gb: 11
    mmc_rx_512_to_1023_octets_gb: 0
    mmc_rx_1024_to_max_octets_gb: 0
    mmc_rx_unicast_g: 0
    mmc_rx_length_error: 0
    mmc_rx_autofrangetype: 0
    mmc_rx_pause_frames: 0
    mmc_rx_fifo_overflow: 0
    mmc_rx_vlan_frames_gb: 0
    mmc_rx_watchdog_error: 0
    mmc_rx_ipc_intr_mask: 0
```

```
    mmc_rx_ipc_intr: 0
    mmc_rx_ipv4_gd: 0
    mmc_rx_ipv4_hderr: 0
    mmc_rx_ipv4_nopay: 0
    mmc_rx_ipv4_frag: 0
    mmc_rx_ipv4_udsbl: 0
    mmc_rx_ipv4_gd_octets: 0
    mmc_rx_ipv4_hderr_octets: 0
    mmc_rx_ipv4_nopay_octets: 0
    mmc_rx_ipv4_frag_octets: 0
    mmc_rx_ipv4_udsbl_octets: 0
    mmc_rx_ipv6_gd_octets: 0
    mmc_rx_ipv6_hderr_octets: 0
    mmc_rx_ipv6_nopay_octets: 0
    mmc_rx_ipv6_gd: 0
    mmc_rx_ipv6_hderr: 0
    mmc_rx_ipv6_nopay: 0
    mmc_rx_udp_gd: 0
    mmc_rx_udp_err: 0
    mmc_rx_tcp_gd: 0
    mmc_rx_tcp_err: 0
    mmc_rx_icmp_gd: 0
    mmc_rx_icmp_err: 0
    mmc_rx_udp_gd_octets: 0
    mmc_rx_udp_err_octets: 0
    mmc_rx_tcp_gd_octets: 0
    mmc_rx_tcp_err_octets: 0
    mmc_rx_icmp_gd_octets: 0
    mmc_rx_icmp_err_octets: 0
    mmc_tx_fpe_fragment_cntr: 0
    mmc_tx_hold_req_cntr: 0
    mmc_rx_packet_assembly_err_cntr: 0
    mmc_rx_packet_smd_err_cntr: 0
    mmc_rx_packet_assembly_ok_cntr: 0
    mmc_rx_fpe_fragment_cntr: 0
    tx_underflow: 0
    tx_carrier: 0
    tx_losscarrier: 0
    vlan_tag: 0
    tx_deferred: 0
    tx_vlan: 0
    tx_jabber: 0
    tx_frame_flushed: 0
    tx_payload_error: 0
```

```
    tx_ip_header_error: 0
    rx_desc: 0
    sa_filter_fail: 0
    overflow_error: 0
    ipc_csum_error: 0
    rx_collision: 0
    rx_crc_errors: 0
    dribbling_bit: 0
    rx_length: 0
    rx_mii: 0
    rx_multicast: 0
    rx_gmac_overflow: 0
    rx_watchdog: 0
    da_rx_filter_fail: 0
    sa_rx_filter_fail: 0
    rx_missed_cntr: 0
    rx_overflow_cntr: 0
    rx_vlan: 0
    rx_split_hdr_pkt_n: 0
    tx_undeflow_irq: 0
    tx_process_stopped_irq[0]: 0
    tx_process_stopped_irq[1]: 0
    tx_process_stopped_irq[2]: 0
    tx_process_stopped_irq[3]: 0
    tx_process_stopped_irq[4]: 0
    tx_process_stopped_irq[5]: 0
    tx_process_stopped_irq[6]: 0
    tx_process_stopped_irq[7]: 0
    tx_jabber_irq: 0
    rx_overflow_irq: 0
    rx_buf_unav_irq[0]: 0
    rx_buf_unav_irq[1]: 0
    rx_buf_unav_irq[2]: 0
    rx_buf_unav_irq[3]: 0
    rx_buf_unav_irq[4]: 0
    rx_buf_unav_irq[5]: 0
    rx_buf_unav_irq[6]: 0
    rx_buf_unav_irq[7]: 0
    rx_process_stopped_irq: 0
    rx_watchdog_irq: 0
    tx_early_irq: 0
    fatal_bus_error_irq[0]: 0
    fatal_bus_error_irq[1]: 0
    fatal_bus_error_irq[2]: 0
```

```
    fatal_bus_error_irq[3]: 0
    fatal_bus_error_irq[4]: 0
    fatal_bus_error_irq[5]: 0
    fatal_bus_error_irq[6]: 0
    fatal_bus_error_irq[7]: 0
    rx_early_irq: 0
    threshold: 1
    tx_pkt_n[0]: 84
    tx_pkt_n[1]: 0
    tx_pkt_n[2]: 0
    tx_pkt_n[3]: 0
    tx_pkt_n[4]: 0
    tx_pkt_n[5]: 0
    tx_pkt_n[6]: 0
    tx_pkt_n[7]: 0
    tx_pkt_errors_n[0]: 0
    tx_pkt_errors_n[1]: 0
    tx_pkt_errors_n[2]: 0
    tx_pkt_errors_n[3]: 0
    tx_pkt_errors_n[4]: 0
    tx_pkt_errors_n[5]: 0
    tx_pkt_errors_n[6]: 0
    tx_pkt_errors_n[7]: 0
    rx_pkt_n[0]: 25
    rx_pkt_n[1]: 0
    rx_pkt_n[2]: 0
    rx_pkt_n[3]: 0
    rx_pkt_n[4]: 0
    rx_pkt_n[5]: 0
    rx_pkt_n[6]: 0
    rx_pkt_n[7]: 0
    normal_irq_n[0]: 19
    normal_irq_n[1]: 0
    normal_irq_n[2]: 0
    normal_irq_n[3]: 19
    normal_irq_n[4]: 19
    normal_irq_n[5]: 19
    normal_irq_n[6]: 19
    normal_irq_n[7]: 19
    rx_normal_irq_n[0]: 17
    rx_normal_irq_n[1]: 0
    rx_normal_irq_n[2]: 0
    rx_normal_irq_n[3]: 0
    rx_normal_irq_n[4]: 0
```

```
    rx_normal_irq_n[5]: 0
    rx_normal_irq_n[6]: 0
    rx_normal_irq_n[7]: 0
    napi_poll_tx[0]: 21
    napi_poll_tx[1]: 0
    napi_poll_tx[2]: 0
    napi_poll_tx[3]: 0
    napi_poll_tx[4]: 0
    napi_poll_tx[5]: 0
    napi_poll_tx[6]: 0
    napi_poll_tx[7]: 0
    napi_poll_rx[0]: 17
    napi_poll_rx[1]: 0
    napi_poll_rx[2]: 0
    napi_poll_rx[3]: 0
    napi_poll_rx[4]: 0
    napi_poll_rx[5]: 0
    napi_poll_rx[6]: 0
    napi_poll_rx[7]: 0
    tx_normal_irq_n[0]: 18
    tx_normal_irq_n[1]: 0
    tx_normal_irq_n[2]: 0
    tx_normal_irq_n[3]: 0
    tx_normal_irq_n[4]: 0
    tx_normal_irq_n[5]: 0
    tx_normal_irq_n[6]: 0
    tx_normal_irq_n[7]: 0
    tx_clean[0]: 21
    tx_clean[1]: 0
    tx_clean[2]: 0
    tx_clean[3]: 0
    tx_clean[4]: 0
    tx_clean[5]: 0
    tx_clean[6]: 0
    tx_clean[7]: 0
    tx_set_ic_bit: 1
    irq_receive_pmt_irq_n: 0
    mmc_tx_irq_n: 0
    mmc_rx_irq_n: 0
    mmc_rx_csum_offload_irq_n: 0
    irq_tx_path_in_lpi_mode_n: 0
    irq_tx_path_exit_lpi_mode_n: 0
    irq_rx_path_in_lpi_mode_n: 0
    irq_rx_path_exit_lpi_mode_n: 0
```

```
    phy_eee_wakeup_error_n: 0
    ip_hdr_err: 0
    ip_payload_err: 0
    ip_csum_bypassed: 0
    ipv4_pkt_rcvd: 0
    ipv6_pkt_rcvd: 0
    no_ptp_rx_msg_type_ext: 0
    ptp_rx_msg_type_sync: 0
    ptp_rx_msg_type_follow_up: 0
    ptp_rx_msg_type_delay_req: 0
    ptp_rx_msg_type_delay_resp: 0
    ptp_rx_msg_type_pdelay_req: 0
    ptp_rx_msg_type_pdelay_resp: 0
    ptp_rx_msg_type_pdelay_follow_up: 0
    ptp_rx_msg_type_announce: 0
    ptp_rx_msg_type_management: 0
    ptp_rx_msg_pkt_reserved_type: 0
    ptp_frame_type: 0
    ptp_ver: 0
    timestamp_dropped: 0
    av_pkt_rcvd: 0
    av_tagged_pkt_rcvd: 0
    vlan_tag_priority_val: 0
    l3_filter_match: 0
    l4_filter_match: 0
    l3_l4_filter_no_match: 0
    irq_pcs_ane_n: 0
    irq_pcs_link_n: 0
    irq_rgmii_n: 0
    mtl_tx_status_fifo_full: 0
    mtl_tx_fifo_not_empty[0]: 0
    mtl_tx_fifo_not_empty[1]: 0
    mtl_tx_fifo_not_empty[2]: 0
    mtl_tx_fifo_not_empty[3]: 0
    mtl_tx_fifo_not_empty[4]: 0
    mtl_tx_fifo_not_empty[5]: 0
    mtl_tx_fifo_not_empty[6]: 0
    mtl_tx_fifo_not_empty[7]: 0
    mmtl_fifo_ctrl[0]: 0
    mmtl_fifo_ctrl[1]: 0
    mmtl_fifo_ctrl[3]: 0
    mmtl_fifo_ctrl[4]: 0
    mmtl_fifo_ctrl[5]: 0
    mmtl_fifo_ctrl[6]: 0
```

```
    mmtl_fifo_ctrl[7]: 0
    mtl_tx_fifo_read_ctrl_write[0]: 0
    mtl_tx_fifo_read_ctrl_write[1]: 0
    mtl_tx_fifo_read_ctrl_write[2]: 0
    mtl_tx_fifo_read_ctrl_write[3]: 0
    mtl_tx_fifo_read_ctrl_write[4]: 0
    mtl_tx_fifo_read_ctrl_write[5]: 0
    mtl_tx_fifo_read_ctrl_write[6]: 0
    mtl_tx_fifo_read_ctrl_write[7]: 0
    mtl_tx_fifo_read_ctrl_wait[0]: 0
    mtl_tx_fifo_read_ctrl_wait[1]: 0
    mtl_tx_fifo_read_ctrl_wait[2]: 0
    mtl_tx_fifo_read_ctrl_wait[3]: 0
    mtl_tx_fifo_read_ctrl_wait[4]: 0
    mtl_tx_fifo_read_ctrl_wait[5]: 0
    mtl_tx_fifo_read_ctrl_wait[6]: 0
    mtl_tx_fifo_read_ctrl_wait[7]: 0
    mtl_tx_fifo_read_ctrl_read[0]: 0
    mtl_tx_fifo_read_ctrl_read[1]: 0
    mtl_tx_fifo_read_ctrl_read[2]: 0
    mtl_tx_fifo_read_ctrl_read[3]: 0
    mtl_tx_fifo_read_ctrl_read[4]: 0
    mtl_tx_fifo_read_ctrl_read[5]: 0
    mtl_tx_fifo_read_ctrl_read[6]: 0
    mtl_tx_fifo_read_ctrl_read[7]: 0
    mtl_tx_fifo_read_ctrl_idle[0]: 0
    mtl_tx_fifo_read_ctrl_idle[1]: 0
    mtl_tx_fifo_read_ctrl_idle[2]: 0
    mtl_tx_fifo_read_ctrl_idle[3]: 0
    mtl_tx_fifo_read_ctrl_idle[4]: 0
    mtl_tx_fifo_read_ctrl_idle[5]: 0
    mtl_tx_fifo_read_ctrl_idle[6]: 0
    mtl_tx_fifo_read_ctrl_idle[7]: 0
    mac_tx_in_pause[0]: 0
    mac_tx_in_pause[1]: 0
    mac_tx_in_pause[2]: 0
    mac_tx_in_pause[3]: 0
    mac_tx_in_pause[4]: 0
    mac_tx_in_pause[5]: 0
    mac_tx_in_pause[6]: 0
    mac_tx_in_pause[7]: 0
    mac_tx_frame_ctrl_xfer: 0
    mac_tx_frame_ctrl_idle: 0
    mac_tx_frame_ctrl_wait: 0
```

```
    mac_tx_frame_ctrl_pause: 0
    mac_gmii_tx_proto_engine: 0
    mtl_rx_fifo_fill_level_full[0]: 0
    mtl_rx_fifo_fill_level_full[1]: 0
    mtl_rx_fifo_fill_level_full[2]: 0
    mtl_rx_fifo_fill_level_full[3]: 0
    mtl_rx_fifo_fill_level_full[4]: 0
    mtl_rx_fifo_fill_level_full[5]: 0
    mtl_rx_fifo_fill_level_full[6]: 0
    mtl_rx_fifo_fill_level_full[7]: 0
    mtl_rx_fifo_fill_above_thresh[0]: 0
    mtl_rx_fifo_fill_above_thresh[1]: 0
    mtl_rx_fifo_fill_above_thresh[2]: 0
    mtl_rx_fifo_fill_above_thresh[3]: 0
    mtl_rx_fifo_fill_above_thresh[4]: 0
    mtl_rx_fifo_fill_above_thresh[5]: 0
    mtl_rx_fifo_fill_above_thresh[6]: 0
    mtl_rx_fifo_fill_above_thresh[7]: 0
    mtl_rx_fifo_fill_below_thresh[0]: 0
    mtl_rx_fifo_fill_below_thresh[1]: 0
    mtl_rx_fifo_fill_below_thresh[2]: 0
    mtl_rx_fifo_fill_below_thresh[3]: 0
    mtl_rx_fifo_fill_below_thresh[4]: 0
    mtl_rx_fifo_fill_below_thresh[5]: 0
    mtl_rx_fifo_fill_below_thresh[6]: 0
    mtl_rx_fifo_fill_below_thresh[7]: 0
    mtl_rx_fifo_fill_level_empty[0]: 0
    mtl_rx_fifo_fill_level_empty[1]: 0
    mtl_rx_fifo_fill_level_empty[2]: 0
    mtl_rx_fifo_fill_level_empty[3]: 0
    mtl_rx_fifo_fill_level_empty[4]: 0
    mtl_rx_fifo_fill_level_empty[5]: 0
    mtl_rx_fifo_fill_level_empty[6]: 0
    mtl_rx_fifo_fill_level_empty[7]: 0
    mtl_rx_fifo_read_ctrl_flush[0]: 0
    mtl_rx_fifo_read_ctrl_flush[1]: 0
    mtl_rx_fifo_read_ctrl_flush[2]: 0
    mtl_rx_fifo_read_ctrl_flush[3]: 0
    mtl_rx_fifo_read_ctrl_flush[4]: 0
    mtl_rx_fifo_read_ctrl_flush[5]: 0
    mtl_rx_fifo_read_ctrl_flush[6]: 0
    mtl_rx_fifo_read_ctrl_flush[7]: 0
    mtl_rx_fifo_read_ctrl_read[0]: 0
    mtl_rx_fifo_read_ctrl_read[1]: 0
```

```
    mtl_rx_fifo_read_ctrl_read[2]: 0
    mtl_rx_fifo_read_ctrl_read[3]: 0
    mtl_rx_fifo_read_ctrl_read[4]: 0
    mtl_rx_fifo_read_ctrl_read[5]: 0
    mtl_rx_fifo_read_ctrl_read[6]: 0
    mtl_rx_fifo_read_ctrl_read[7]: 0
    mtl_rx_fifo_read_ctrl_status[0]: 0
    mtl_rx_fifo_read_ctrl_status[1]: 0
    mtl_rx_fifo_read_ctrl_status[2]: 0
    mtl_rx_fifo_read_ctrl_status[3]: 0
    mtl_rx_fifo_read_ctrl_status[4]: 0
    mtl_rx_fifo_read_ctrl_status[5]: 0
    mtl_rx_fifo_read_ctrl_status[6]: 0
    mtl_rx_fifo_read_ctrl_status[7]: 0
    mtl_rx_fifo_read_ctrl_idle[0]: 0
    mtl_rx_fifo_read_ctrl_idle[1]: 0
    mtl_rx_fifo_read_ctrl_idle[2]: 0
    mtl_rx_fifo_read_ctrl_idle[3]: 0
    mtl_rx_fifo_read_ctrl_idle[4]: 0
    mtl_rx_fifo_read_ctrl_idle[5]: 0
    mtl_rx_fifo_read_ctrl_idle[6]: 0
    mtl_rx_fifo_read_ctrl_idle[7]: 0
    mtl_rx_fifo_ctrl_active[0]: 0
    mtl_rx_fifo_ctrl_active[1]: 0
    mtl_rx_fifo_ctrl_active[2]: 0
    mtl_rx_fifo_ctrl_active[3]: 0
    mtl_rx_fifo_ctrl_active[4]: 0
    mtl_rx_fifo_ctrl_active[5]: 0
    mtl_rx_fifo_ctrl_active[6]: 0
    mtl_rx_fifo_ctrl_active[7]: 0
    mac_rx_frame_ctrl_fifo: 0
    mac_gmii_rx_proto_engine: 0
    tx_tso_frames[0]: 0
    tx_tso_frames[1]: 0
    tx_tso_frames[2]: 0
    tx_tso_frames[3]: 0
    tx_tso_frames[4]: 0
    tx_tso_frames[5]: 0
    tx_tso_frames[6]: 0
    tx_tso_frames[7]: 0
    tx_tso_nfrags[0]: 0
    tx_tso_nfrags[1]: 0
    tx_tso_nfrags[2]: 0
    tx_tso_nfrags[3]: 0
```

```
tx_tso_nfrags[4]: 0
tx_tso_nfrags[5]: 0
tx_tso_nfrags[6]: 0
tx_tso_nfrags[7]: 0
txch_status[0]: 4
txch_status[1]: 0
txch_status[2]: 0
txch_status[3]: 0
txch_status[4]: 0
txch_status[5]: 0
txch_status[6]: 0
txch_status[7]: 0
txch_control[0]: 1052673
txch_control[1]: 4096
txch_control[2]: 0
txch_control[3]: 0
txch_control[4]: 1048577
txch_control[5]: 269484033
txch_control[6]: 269484033
txch_control[7]: 269484033
txch_desc_list_haddr[0]: 16
txch_desc_list_haddr[1]: 0
txch_desc_list_haddr[2]: 0
txch_desc_list_haddr[3]: 0
txch_desc_list_haddr[4]: 16
txch_desc_list_haddr[5]: 16
txch_desc_list_haddr[6]: 16
txch_desc_list_haddr[7]: 16
txch_desc_list_laddr[0]: 4282212352
txch_desc_list_laddr[1]: 0
txch_desc_list_laddr[2]: 0
txch_desc_list_laddr[3]: 0
txch_desc_list_laddr[4]: 4282204160
txch_desc_list_laddr[5]: 4282187776
txch_desc_list_laddr[6]: 4282171392
txch_desc_list_laddr[7]: 4282155008
txch_desc_ring_len[0]: 511
txch_desc_ring_len[1]: 0
txch_desc_ring_len[2]: 0
txch_desc_ring_len[3]: 0
txch_desc_ring_len[4]: 511
txch_desc_ring_len[5]: 511
txch_desc_ring_len[6]: 511
txch_desc_ring_len[7]: 511
```

```
    txch_desc_curr_haddr[0]: 0
    txch_desc_curr_haddr[1]: 0
    txch_desc_curr_haddr[2]: 0
    txch_desc_curr_haddr[3]: 0
    txch_desc_curr_haddr[4]: 0
    txch_desc_curr_haddr[5]: 0
    txch_desc_curr_haddr[6]: 0
    txch_desc_curr_haddr[7]: 0
    txch_desc_curr_laddr[0]: 4282213696
    txch_desc_curr_laddr[1]: 0
    txch_desc_curr_laddr[2]: 0
    txch_desc_curr_laddr[3]: 0
    txch_desc_curr_laddr[4]: 4282204160
    txch_desc_curr_laddr[5]: 4282187776
    txch_desc_curr_laddr[6]: 4282171392
    txch_desc_curr_laddr[7]: 4282155008
    txch_desc_tail[0]: 4282213696
    txch_desc_tail[1]: 0
    txch_desc_tail[2]: 0
    txch_desc_tail[3]: 0
    txch_desc_tail[4]: 4282204160
    txch_desc_tail[5]: 4282187776
    txch_desc_tail[6]: 4282171392
    txch_desc_tail[7]: 4282155008
    txch_desc_buf_haddr[0]: 16
    txch_desc_buf_haddr[1]: 0
    txch_desc_buf_haddr[2]: 0
    txch_desc_buf_haddr[3]: 0
    txch_desc_buf_haddr[4]: 0
    txch_desc_buf_haddr[5]: 0
    txch_desc_buf_haddr[6]: 0
    txch_desc_buf_haddr[7]: 0
    txch_desc_buf_laddr[0]: 4269187074
    txch_desc_buf_laddr[1]: 0
    txch_desc_buf_laddr[2]: 0
    txch_desc_buf_laddr[3]: 0
    txch_desc_buf_laddr[4]: 0
    txch_desc_buf_laddr[5]: 0
    txch_desc_buf_laddr[6]: 0
    txch_desc_buf_laddr[7]: 0
    txch_sw_cur_tx[0]: 84
    txch_sw_cur_tx[1]: 0
    txch_sw_cur_tx[2]: 0
    txch_sw_cur_tx[3]: 0
```

```
    txch_sw_cur_tx[4]: 0
    txch_sw_cur_tx[5]: 0
    txch_sw_cur_tx[6]: 0
    txch_sw_cur_tx[7]: 0
    txch_sw_dirty_tx[0]: 84
    txch_sw_dirty_tx[1]: 0
    txch_sw_dirty_tx[2]: 0
    txch_sw_dirty_tx[3]: 0
    txch_sw_dirty_tx[4]: 0
    txch_sw_dirty_tx[5]: 0
    txch_sw_dirty_tx[6]: 0
    txch_sw_dirty_tx[7]: 0
    rxch_status[0]: 4
    rxch_status[1]: 0
    rxch_status[2]: 0
    rxch_status[3]: 0
    rxch_status[4]: 0
    rxch_status[5]: 0
    rxch_status[6]: 0
    rxch_status[7]: 0
    rxch_control[0]: 1051649
    rxch_control[1]: 0
    rxch_control[2]: 0
    rxch_control[3]: 1051649
    rxch_control[4]: 1051649
    rxch_control[5]: 1051649
    rxch_control[6]: 1051649
    rxch_control[7]: 1051649
    rxch_desc_list_haddr[0]: 16
    rxch_desc_list_haddr[1]: 0
    rxch_desc_list_haddr[2]: 0
    rxch_desc_list_haddr[3]: 16
    rxch_desc_list_haddr[4]: 16
    rxch_desc_list_haddr[5]: 16
    rxch_desc_list_haddr[6]: 16
    rxch_desc_list_haddr[7]: 16
    rxch_desc_list_laddr[0]: 4282261504
    rxch_desc_list_laddr[1]: 0
    rxch_desc_list_laddr[2]: 0
    rxch_desc_list_laddr[3]: 4282253312
    rxch_desc_list_laddr[4]: 4282245120
    rxch_desc_list_laddr[5]: 4282236928
    rxch_desc_list_laddr[6]: 4282228736
    rxch_desc_list_laddr[7]: 4282220544
```

```
    rxch_desc_ring_len[0]: 511
    rxch_desc_ring_len[1]: 0
    rxch_desc_ring_len[2]: 0
    rxch_desc_ring_len[3]: 511
    rxch_desc_ring_len[4]: 511
    rxch_desc_ring_len[5]: 511
    rxch_desc_ring_len[6]: 511
    rxch_desc_ring_len[7]: 511
    rxch_desc_curr_haddr[0]: 0
    rxch_desc_curr_haddr[1]: 0
    rxch_desc_curr_haddr[2]: 0
    rxch_desc_curr_haddr[3]: 0
    rxch_desc_curr_haddr[4]: 0
    rxch_desc_curr_haddr[5]: 0
    rxch_desc_curr_haddr[6]: 0
    rxch_desc_curr_haddr[7]: 0
    rxch_desc_curr_laddr[0]: 4282262560
    rxch_desc_curr_laddr[1]: 0
    rxch_desc_curr_laddr[2]: 0
    rxch_desc_curr_laddr[3]: 4282253568
    rxch_desc_curr_laddr[4]: 4282245376
    rxch_desc_curr_laddr[5]: 4282237184
    rxch_desc_curr_laddr[6]: 4282228992
    rxch_desc_curr_laddr[7]: 4282220800
    rxch_desc_tail[0]: 4282262304
    rxch_desc_tail[1]: 0
    rxch_desc_tail[2]: 0
    rxch_desc_tail[3]: 4282261504
    rxch_desc_tail[4]: 4282253312
    rxch_desc_tail[5]: 4282245120
    rxch_desc_tail[6]: 4282236928
    rxch_desc_tail[7]: 4282228736
    rxch_desc_buf_haddr[0]: 16
    rxch_desc_buf_haddr[1]: 0
    rxch_desc_buf_haddr[2]: 0
    rxch_desc_buf_haddr[3]: 16
    rxch_desc_buf_haddr[4]: 16
    rxch_desc_buf_haddr[5]: 16
    rxch_desc_buf_haddr[6]: 16
    rxch_desc_buf_haddr[7]: 16
    rxch_desc_buf_laddr[0]: 4282097664
    rxch_desc_buf_laddr[1]: 0
    rxch_desc_buf_laddr[2]: 0
    rxch_desc_buf_laddr[3]: 4279795712
```

```
    rxch_desc_buf_laddr[4]: 4277698560
    rxch_desc_buf_laddr[5]: 4275601408
    rxch_desc_buf_laddr[6]: 4273504256
    rxch_desc_buf_laddr[7]: 4271407104
    rxch_sw_cur_rx[0]: 50
    rxch_sw_cur_rx[1]: 0
    rxch_sw_cur_rx[2]: 0
    rxch_sw_cur_rx[3]: 0
    rxch_sw_cur_rx[4]: 0
    rxch_sw_cur_rx[5]: 0
    rxch_sw_cur_rx[6]: 0
    rxch_sw_cur_rx[7]: 0
    rxch_sw_dirty_rx[0]: 50
    rxch_sw_dirty_rx[1]: 0
    rxch_sw_dirty_rx[2]: 0
    rxch_sw_dirty_rx[3]: 0
    rxch_sw_dirty_rx[4]: 0
    rxch_sw_dirty_rx[5]: 0
    rxch_sw_dirty_rx[6]: 0
    rxch_sw_dirty_rx[7]: 0
    total_interrupts: 19
    lpi_intr_n: 0
    pmt_intr_n: 0
    event_intr_n: 0
    tx_intr_n: 1
    rx_intr_n: 17
    xpcs_intr_n: 0
    phy_intr_n: 1
    sw_msi_n: 0
    mtl_tx_underflow[0]: 0
    mtl_tx_underflow[1]: 0
    mtl_tx_underflow[3]: 0
    mtl_tx_underflow[4]: 0
    mtl_tx_underflow[5]: 0
    mtl_tx_underflow[6]: 0
    mtl_tx_underflow[7]: 0
    mtl_rx_miss_pkt_cnt[0]: 0
    mtl_rx_miss_pkt_cnt[1]: 0
    mtl_rx_miss_pkt_cnt[3]: 0
    mtl_rx_miss_pkt_cnt[4]: 0
    mtl_rx_miss_pkt_cnt[5]: 0
    mtl_rx_miss_pkt_cnt[6]: 0
    mtl_rx_miss_pkt_cnt[7]: 0
    mtl_rx_overflow_pkt_cnt[0]: 0
```

```
    mtl_rx_overflow_pkt_cnt[1]: 0
    mtl_rx_overflow_pkt_cnt[3]: 0
    mtl_rx_overflow_pkt_cnt[4]: 0
    mtl_rx_overflow_pkt_cnt[5]: 0
    mtl_rx_overflow_pkt_cnt[6]: 0
    mtl_rx_overflow_pkt_cnt[7]: 0
    rxch_watchdog_timer[0]: 160
    rxch_watchdog_timer[1]: 0
    rxch_watchdog_timer[2]: 0
    rxch_watchdog_timer[3]: 160
    rxch_watchdog_timer[4]: 160
    rxch_watchdog_timer[5]: 160
    rxch_watchdog_timer[6]: 160
    rxch_watchdog_timer[7]: 160
    link_partner_pause_frame_cnt: 0
    m3_debug_cnt0: 0
    m3_debug_cnt1: 0
    m3_debug_cnt2: 0
    m3_debug_cnt3: 0
    m3_debug_cnt4: 0
    m3_debug_cnt5: 0
    m3_debug_cnt6: 0
    m3_debug_cnt7: 0
    m3_debug_cnt8: 0
    m3_debug_cnt9: 0
    m3_debug_cnt10: 0
    m3_watchdog_exp_cnt: 40
    m3_watchdog_monitor_cnt: 16
    m3_debug_cnt13: 0
    m3_debug_cnt14: 0
    m3_systick_cnt_upper_value: 0
    m3_systick_cnt_lower_value: 87630
    m3_tx_timeout_port0: 0
    m3_tx_timeout_port1: 0
    m3_debug_cnt19: 0
    m3_tx_pcie_addr_loc_port0[0]: 0
    m3_tx_pcie_addr_loc_port0[1]: 0
    m3_tx_pcie_addr_loc_port0[2]: 0
    m3_tx_pcie_addr_loc_port0[3]: 0
    m3_tx_pcie_addr_loc_port0[4]: 0
    m3_tx_pcie_addr_loc_port0[5]: 0
    m3_tx_pcie_addr_loc_port0[6]: 0
    m3_tx_pcie_addr_loc_port0[7]: 0
    m3_tx_pcie_addr_loc_port1[0]: 0
```

```
    m3_tx_pcie_addr_loc_port1[1]: 0
    m3_tx_pcie_addr_loc_port1[2]: 0
    m3_tx_pcie_addr_loc_port1[3]: 0
    m3_tx_pcie_addr_loc_port1[4]: 0
    m3_tx_pcie_addr_loc_port1[5]: 0
    m3_tx_pcie_addr_loc_port1[6]: 0
    m3_tx_pcie_addr_loc_port1[7]: 0
    m3_rx_pcie_addr_loc_port0[0]: 0
    m3_rx_pcie_addr_loc_port0[1]: 0
    m3_rx_pcie_addr_loc_port0[2]: 0
    m3_rx_pcie_addr_loc_port0[3]: 0
    m3_rx_pcie_addr_loc_port0[4]: 0
    m3_rx_pcie_addr_loc_port0[5]: 0
    m3_rx_pcie_addr_loc_port0[6]: 0
    m3_rx_pcie_addr_loc_port0[7]: 0
    m3_rx_pcie_addr_loc_port1[0]: 0
    m3_rx_pcie_addr_loc_port1[1]: 0
    m3_rx_pcie_addr_loc_port1[2]: 0
    m3_rx_pcie_addr_loc_port1[3]: 0
    m3_rx_pcie_addr_loc_port1[4]: 0
    m3_rx_pcie_addr_loc_port1[5]: 0
    m3_rx_pcie_addr_loc_port1[6]: 0
    m3_rx_pcie_addr_loc_port1[7]: 0
    mbx_pf_sent_vf[0]: 0
    mbx_pf_sent_vf[1]: 0
    mbx_pf_sent_vf[2]: 0
    mbx_pf_rcvd_vf[0]: 0
    mbx_pf_rcvd_vf[1]: 0
    mbx_pf_rcvd_vf[2]: 0

ethtool -S enP1p5s0f1
NIC statistics:
    mmc_tx_octetcount_gb: 7924
    mmc_tx_framecount_gb: 48
    mmc_tx_broadcastframe_g: 16
    mmc_tx_multicastframe_g: 32
    mmc_tx_64_octets_gb: 5
    mmc_tx_65_to_127_octets_gb: 23
    mmc_tx_128_to_255_octets_gb: 6
    mmc_tx_256_to_511_octets_gb: 14
    mmc_tx_512_to_1023_octets_gb: 0
    mmc_tx_1024_to_max_octets_gb: 0
    mmc_tx_unicast_gb: 0
    mmc_tx_multicast_gb: 32
```

```
    mmc_tx_broadcast_gb: 16
    mmc_tx_underflow_error: 0
    mmc_tx_singlecol_g: 0
    mmc_tx_multicol_g: 0
    mmc_tx_deferred: 0
    mmc_tx_latecol: 0
    mmc_tx_exesscol: 0
    mmc_tx_carrier_error: 0
    mmc_tx_octetcount_g: 7924
    mmc_tx_framecount_g: 48
    mmc_tx_excessdef: 0
    mmc_tx_pause_frame: 0
    mmc_tx_vlan_frame_g: 0
    mmc_tx_lpi_tran_cntr: 0
    mmc_rx_lpi_tran_cntr: 0
    mmc_rx_framecount_gb: 65
    mmc_rx_octetcount_gb: 8358
    mmc_rx_octetcount_g: 8358
    mmc_rx_broadcastframe_g: 51
    mmc_rx_multicastframe_g: 14
    mmc_rx_crc_error: 0
    mmc_rx_align_error: 0
    mmc_rx_run_error: 0
    mmc_rx_jabber_error: 0
    mmc_rx_undersize_g: 0
    mmc_rx_oversize_g: 0
    mmc_rx_64_octets_gb: 41
    mmc_rx_65_to_127_octets_gb: 6
    mmc_rx_128_to_255_octets_gb: 5
    mmc_rx_256_to_511_octets_gb: 13
    mmc_rx_512_to_1023_octets_gb: 0
    mmc_rx_1024_to_max_octets_gb: 0
    mmc_rx_unicast_g: 0
    mmc_rx_length_error: 0
    mmc_rx_autofrangetype: 0
    mmc_rx_pause_frames: 0
    mmc_rx_fifo_overflow: 0
    mmc_rx_vlan_frames_gb: 0
    mmc_rx_watchdog_error: 0
    mmc_rx_ipc_intr_mask: 0
    mmc_rx_ipc_intr: 0
    mmc_rx_ipv4_gd: 0
    mmc_rx_ipv4_hderr: 0
    mmc_rx_ipv4_nopay: 0
```

```
mmc_rx_ipv4_frag: 0
mmc_rx_ipv4_udsbl: 0
mmc_rx_ipv4_gd_octets: 0
mmc_rx_ipv4_hderr_octets: 0
mmc_rx_ipv4_nopay_octets: 0
mmc_rx_ipv4_frag_octets: 0
mmc_rx_ipv4_udsbl_octets: 0
mmc_rx_ipv6_gd_octets: 0
mmc_rx_ipv6_hderr_octets: 0
mmc_rx_ipv6_nopay_octets: 0
mmc_rx_ipv6_gd: 0
mmc_rx_ipv6_hderr: 0
mmc_rx_ipv6_nopay: 0
mmc_rx_udp_gd: 0
mmc_rx_udp_err: 0
mmc_rx_tcp_gd: 0
mmc_rx_tcp_err: 0
mmc_rx_icmp_gd: 0
mmc_rx_icmp_err: 0
mmc_rx_udp_gd_octets: 0
mmc_rx_udp_err_octets: 0
mmc_rx_tcp_gd_octets: 0
mmc_rx_tcp_err_octets: 0
mmc_rx_icmp_gd_octets: 0
mmc_rx_icmp_err_octets: 0
mmc_tx_fpe_fragment_cntr: 0
mmc_tx_hold_req_cntr: 0
mmc_rx_packet_assembly_err_cntr: 0
mmc_rx_packet_smd_err_cntr: 0
mmc_rx_packet_assembly_ok_cntr: 0
mmc_rx_fpe_fragment_cntr: 0
tx_underflow: 0
tx_carrier: 0
tx_losscarrier: 0
vlan_tag: 0
tx_deferred: 0
tx_vlan: 0
tx_jabber: 0
tx_frame_flushed: 0
tx_payload_error: 0
tx_ip_header_error: 0
rx_desc: 0
sa_filter_fail: 0
overflow_error: 0
```

```
    ipc_csum_error: 0
    rx_collision: 0
    rx_crc_errors: 0
    dribbling_bit: 0
    rx_length: 0
    rx_mii: 0
    rx_multicast: 0
    rx_gmac_overflow: 0
    rx_watchdog: 0
    da_rx_filter_fail: 0
    sa_rx_filter_fail: 0
    rx_missed_cntr: 0
    rx_overflow_cntr: 0
    rx_vlan: 0
    rx_split_hdr_pkt_n: 0
    tx_undeflow_irq: 0
    tx_process_stopped_irq[0]: 0
    tx_process_stopped_irq[1]: 0
    tx_process_stopped_irq[2]: 0
    tx_process_stopped_irq[3]: 0
    tx_process_stopped_irq[4]: 0
    tx_process_stopped_irq[5]: 0
    tx_process_stopped_irq[6]: 0
    tx_process_stopped_irq[7]: 0
    tx_jabber_irq: 0
    rx_overflow_irq: 0
    rx_buf_unav_irq[0]: 0
    rx_buf_unav_irq[1]: 0
    rx_buf_unav_irq[2]: 0
    rx_buf_unav_irq[3]: 0
    rx_buf_unav_irq[4]: 0
    rx_buf_unav_irq[5]: 0
    rx_buf_unav_irq[6]: 0
    rx_buf_unav_irq[7]: 0
    rx_process_stopped_irq: 0
    rx_watchdog_irq: 0
    tx_early_irq: 0
    fatal_bus_error_irq[0]: 0
    fatal_bus_error_irq[1]: 0
    fatal_bus_error_irq[2]: 0
    fatal_bus_error_irq[3]: 0
    fatal_bus_error_irq[4]: 0
    fatal_bus_error_irq[5]: 0
    fatal_bus_error_irq[6]: 0
```

```
    fatal_bus_error_irq[7]: 0
    rx_early_irq: 0
    threshold: 1
    tx_pkt_n[0]: 48
    tx_pkt_n[1]: 0
    tx_pkt_n[2]: 0
    tx_pkt_n[3]: 0
    tx_pkt_n[4]: 0
    tx_pkt_n[5]: 0
    tx_pkt_n[6]: 0
    tx_pkt_n[7]: 0
    tx_pkt_errors_n[0]: 0
    tx_pkt_errors_n[1]: 0
    tx_pkt_errors_n[2]: 0
    tx_pkt_errors_n[3]: 0
    tx_pkt_errors_n[4]: 0
    tx_pkt_errors_n[5]: 0
    tx_pkt_errors_n[6]: 0
    tx_pkt_errors_n[7]: 0
    rx_pkt_n[0]: 65
    rx_pkt_n[1]: 0
    rx_pkt_n[2]: 0
    rx_pkt_n[3]: 0
    rx_pkt_n[4]: 0
    rx_pkt_n[5]: 0
    rx_pkt_n[6]: 0
    rx_pkt_n[7]: 0
    normal_irq_n[0]: 62
    normal_irq_n[1]: 0
    normal_irq_n[2]: 0
    normal_irq_n[3]: 62
    normal_irq_n[4]: 62
    normal_irq_n[5]: 62
    normal_irq_n[6]: 62
    normal_irq_n[7]: 62
    rx_normal_irq_n[0]: 58
    rx_normal_irq_n[1]: 0
    rx_normal_irq_n[2]: 0
    rx_normal_irq_n[3]: 0
    rx_normal_irq_n[4]: 0
    rx_normal_irq_n[5]: 0
    rx_normal_irq_n[6]: 0
    rx_normal_irq_n[7]: 0
    napi_poll_tx[0]: 63
```

```
    napi_poll_tx[1]: 0
    napi_poll_tx[2]: 0
    napi_poll_tx[3]: 0
    napi_poll_tx[4]: 0
    napi_poll_tx[5]: 0
    napi_poll_tx[6]: 0
    napi_poll_tx[7]: 0
    napi_poll_rx[0]: 58
    napi_poll_rx[1]: 0
    napi_poll_rx[2]: 0
    napi_poll_rx[3]: 0
    napi_poll_rx[4]: 0
    napi_poll_rx[5]: 0
    napi_poll_rx[6]: 0
    napi_poll_rx[7]: 0
    tx_normal_irq_n[0]: 58
    tx_normal_irq_n[1]: 0
    tx_normal_irq_n[2]: 0
    tx_normal_irq_n[3]: 0
    tx_normal_irq_n[4]: 0
    tx_normal_irq_n[5]: 0
    tx_normal_irq_n[6]: 0
    tx_normal_irq_n[7]: 0
    tx_clean[0]: 63
    tx_clean[1]: 0
    tx_clean[2]: 0
    tx_clean[3]: 0
    tx_clean[4]: 0
    tx_clean[5]: 0
    tx_clean[6]: 0
    tx_clean[7]: 0
    tx_set_ic_bit: 0
    irq_receive_pmt_irq_n: 0
    mmc_tx_irq_n: 0
    mmc_rx_irq_n: 0
    mmc_rx_csum_offload_irq_n: 0
    irq_tx_path_in_lpi_mode_n: 0
    irq_tx_path_exit_lpi_mode_n: 0
    irq_rx_path_in_lpi_mode_n: 0
    irq_rx_path_exit_lpi_mode_n: 0
    phy_eee_wakeup_error_n: 0
    ip_hdr_err: 0
    ip_payload_err: 0
    ip_csum_bypassed: 0
```

```
    ipv4_pkt_rcvd: 0
    ipv6_pkt_rcvd: 0
    no_ptp_rx_msg_type_ext: 0
    ptp_rx_msg_type_sync: 0
    ptp_rx_msg_type_follow_up: 0
    ptp_rx_msg_type_delay_req: 0
    ptp_rx_msg_type_delay_resp: 0
    ptp_rx_msg_type_pdelay_req: 0
    ptp_rx_msg_type_pdelay_resp: 0
    ptp_rx_msg_type_pdelay_follow_up: 0
    ptp_rx_msg_type_announce: 0
    ptp_rx_msg_type_management: 0
    ptp_rx_msg_pkt_reserved_type: 0
    ptp_frame_type: 0
    ptp_ver: 0
    timestamp_dropped: 0
    av_pkt_rcvd: 0
    av_tagged_pkt_rcvd: 0
    vlan_tag_priority_val: 0
    l3_filter_match: 0
    l4_filter_match: 0
    l3_l4_filter_no_match: 0
    irq_pcs_ane_n: 0
    irq_pcs_link_n: 0
    irq_rgmii_n: 0
    mtl_tx_status_fifo_full: 0
    mtl_tx_fifo_not_empty[0]: 0
    mtl_tx_fifo_not_empty[1]: 0
    mtl_tx_fifo_not_empty[2]: 0
    mtl_tx_fifo_not_empty[3]: 0
    mtl_tx_fifo_not_empty[4]: 0
    mtl_tx_fifo_not_empty[5]: 0
    mtl_tx_fifo_not_empty[6]: 0
    mtl_tx_fifo_not_empty[7]: 0
    mmtl_fifo_ctrl[0]: 0
    mmtl_fifo_ctrl[1]: 0
    mmtl_fifo_ctrl[3]: 0
    mmtl_fifo_ctrl[4]: 0
    mmtl_fifo_ctrl[5]: 0
    mmtl_fifo_ctrl[6]: 0
    mmtl_fifo_ctrl[7]: 0
    mtl_tx_fifo_read_ctrl_write[0]: 0
    mtl_tx_fifo_read_ctrl_write[1]: 0
    mtl_tx_fifo_read_ctrl_write[2]: 0
```

```
    mtl_tx_fifo_read_ctrl_write[3]: 0
    mtl_tx_fifo_read_ctrl_write[4]: 0
    mtl_tx_fifo_read_ctrl_write[5]: 0
    mtl_tx_fifo_read_ctrl_write[6]: 0
    mtl_tx_fifo_read_ctrl_write[7]: 0
    mtl_tx_fifo_read_ctrl_wait[0]: 0
    mtl_tx_fifo_read_ctrl_wait[1]: 0
    mtl_tx_fifo_read_ctrl_wait[2]: 0
    mtl_tx_fifo_read_ctrl_wait[3]: 0
    mtl_tx_fifo_read_ctrl_wait[4]: 0
    mtl_tx_fifo_read_ctrl_wait[5]: 0
    mtl_tx_fifo_read_ctrl_wait[6]: 0
    mtl_tx_fifo_read_ctrl_wait[7]: 0
    mtl_tx_fifo_read_ctrl_read[0]: 0
    mtl_tx_fifo_read_ctrl_read[1]: 0
    mtl_tx_fifo_read_ctrl_read[2]: 0
    mtl_tx_fifo_read_ctrl_read[3]: 0
    mtl_tx_fifo_read_ctrl_read[4]: 0
    mtl_tx_fifo_read_ctrl_read[5]: 0
    mtl_tx_fifo_read_ctrl_read[6]: 0
    mtl_tx_fifo_read_ctrl_read[7]: 0
    mtl_tx_fifo_read_ctrl_idle[0]: 0
    mtl_tx_fifo_read_ctrl_idle[1]: 0
    mtl_tx_fifo_read_ctrl_idle[2]: 0
    mtl_tx_fifo_read_ctrl_idle[3]: 0
    mtl_tx_fifo_read_ctrl_idle[4]: 0
    mtl_tx_fifo_read_ctrl_idle[5]: 0
    mtl_tx_fifo_read_ctrl_idle[6]: 0
    mtl_tx_fifo_read_ctrl_idle[7]: 0
    mac_tx_in_pause[0]: 0
    mac_tx_in_pause[1]: 0
    mac_tx_in_pause[2]: 0
    mac_tx_in_pause[3]: 0
    mac_tx_in_pause[4]: 0
    mac_tx_in_pause[5]: 0
    mac_tx_in_pause[6]: 0
    mac_tx_in_pause[7]: 0
    mac_tx_frame_ctrl_xfer: 0
    mac_tx_frame_ctrl_idle: 0
    mac_tx_frame_ctrl_wait: 0
    mac_tx_frame_ctrl_pause: 0
    mac_gmii_tx_proto_engine: 0
    mtl_rx_fifo_fill_level_full[0]: 0
    mtl_rx_fifo_fill_level_full[1]: 0
```

```
    mtl_rx_fifo_fill_level_full[2]: 0
    mtl_rx_fifo_fill_level_full[3]: 0
    mtl_rx_fifo_fill_level_full[4]: 0
    mtl_rx_fifo_fill_level_full[5]: 0
    mtl_rx_fifo_fill_level_full[6]: 0
    mtl_rx_fifo_fill_level_full[7]: 0
    mtl_rx_fifo_fill_above_thresh[0]: 0
    mtl_rx_fifo_fill_above_thresh[1]: 0
    mtl_rx_fifo_fill_above_thresh[2]: 0
    mtl_rx_fifo_fill_above_thresh[3]: 0
    mtl_rx_fifo_fill_above_thresh[4]: 0
    mtl_rx_fifo_fill_above_thresh[5]: 0
    mtl_rx_fifo_fill_above_thresh[6]: 0
    mtl_rx_fifo_fill_above_thresh[7]: 0
    mtl_rx_fifo_fill_below_thresh[0]: 0
    mtl_rx_fifo_fill_below_thresh[1]: 0
    mtl_rx_fifo_fill_below_thresh[2]: 0
    mtl_rx_fifo_fill_below_thresh[3]: 0
    mtl_rx_fifo_fill_below_thresh[4]: 0
    mtl_rx_fifo_fill_below_thresh[5]: 0
    mtl_rx_fifo_fill_below_thresh[6]: 0
    mtl_rx_fifo_fill_below_thresh[7]: 0
    mtl_rx_fifo_fill_level_empty[0]: 0
    mtl_rx_fifo_fill_level_empty[1]: 0
    mtl_rx_fifo_fill_level_empty[2]: 0
    mtl_rx_fifo_fill_level_empty[3]: 0
    mtl_rx_fifo_fill_level_empty[4]: 0
    mtl_rx_fifo_fill_level_empty[5]: 0
    mtl_rx_fifo_fill_level_empty[6]: 0
    mtl_rx_fifo_fill_level_empty[7]: 0
    mtl_rx_fifo_read_ctrl_flush[0]: 0
    mtl_rx_fifo_read_ctrl_flush[1]: 0
    mtl_rx_fifo_read_ctrl_flush[2]: 0
    mtl_rx_fifo_read_ctrl_flush[3]: 0
    mtl_rx_fifo_read_ctrl_flush[4]: 0
    mtl_rx_fifo_read_ctrl_flush[5]: 0
    mtl_rx_fifo_read_ctrl_flush[6]: 0
    mtl_rx_fifo_read_ctrl_flush[7]: 0
    mtl_rx_fifo_read_ctrl_read[0]: 0
    mtl_rx_fifo_read_ctrl_read[1]: 0
    mtl_rx_fifo_read_ctrl_read[2]: 0
    mtl_rx_fifo_read_ctrl_read[3]: 0
    mtl_rx_fifo_read_ctrl_read[4]: 0
    mtl_rx_fifo_read_ctrl_read[5]: 0
```

```
    mtl_rx_fifo_read_ctrl_read[6]: 0
    mtl_rx_fifo_read_ctrl_read[7]: 0
    mtl_rx_fifo_read_ctrl_status[0]: 0
    mtl_rx_fifo_read_ctrl_status[1]: 0
    mtl_rx_fifo_read_ctrl_status[2]: 0
    mtl_rx_fifo_read_ctrl_status[3]: 0
    mtl_rx_fifo_read_ctrl_status[4]: 0
    mtl_rx_fifo_read_ctrl_status[5]: 0
    mtl_rx_fifo_read_ctrl_status[6]: 0
    mtl_rx_fifo_read_ctrl_status[7]: 0
    mtl_rx_fifo_read_ctrl_idle[0]: 0
    mtl_rx_fifo_read_ctrl_idle[1]: 0
    mtl_rx_fifo_read_ctrl_idle[2]: 0
    mtl_rx_fifo_read_ctrl_idle[3]: 0
    mtl_rx_fifo_read_ctrl_idle[4]: 0
    mtl_rx_fifo_read_ctrl_idle[5]: 0
    mtl_rx_fifo_read_ctrl_idle[6]: 0
    mtl_rx_fifo_read_ctrl_idle[7]: 0
    mtl_rx_fifo_ctrl_active[0]: 0
    mtl_rx_fifo_ctrl_active[1]: 0
    mtl_rx_fifo_ctrl_active[2]: 0
    mtl_rx_fifo_ctrl_active[3]: 0
    mtl_rx_fifo_ctrl_active[4]: 0
    mtl_rx_fifo_ctrl_active[5]: 0
    mtl_rx_fifo_ctrl_active[6]: 0
    mtl_rx_fifo_ctrl_active[7]: 0
    mac_rx_frame_ctrl_fifo: 0
    mac_gmii_rx_proto_engine: 0
    tx_tso_frames[0]: 0
    tx_tso_frames[1]: 0
    tx_tso_frames[2]: 0
    tx_tso_frames[3]: 0
    tx_tso_frames[4]: 0
    tx_tso_frames[5]: 0
    tx_tso_frames[6]: 0
    tx_tso_frames[7]: 0
    tx_tso_nfrags[0]: 0
    tx_tso_nfrags[1]: 0
    tx_tso_nfrags[2]: 0
    tx_tso_nfrags[3]: 0
    tx_tso_nfrags[4]: 0
    tx_tso_nfrags[5]: 0
    tx_tso_nfrags[6]: 0
    tx_tso_nfrags[7]: 0
```

```
txch_status[0]: 4
txch_status[1]: 0
txch_status[2]: 0
txch_status[3]: 0
txch_status[4]: 0
txch_status[5]: 0
txch_status[6]: 0
txch_status[7]: 0
txch_control[0]: 1052673
txch_control[1]: 4096
txch_control[2]: 0
txch_control[3]: 0
txch_control[4]: 1048577
txch_control[5]: 269484033
txch_control[6]: 269484033
txch_control[7]: 269484033
txch_desc_list_haddr[0]: 16
txch_desc_list_haddr[1]: 0
txch_desc_list_haddr[2]: 0
txch_desc_list_haddr[3]: 0
txch_desc_list_haddr[4]: 16
txch_desc_list_haddr[5]: 16
txch_desc_list_haddr[6]: 16
txch_desc_list_haddr[7]: 16
txch_desc_list_laddr[0]: 4294909952
txch_desc_list_laddr[1]: 0
txch_desc_list_laddr[2]: 0
txch_desc_list_laddr[3]: 0
txch_desc_list_laddr[4]: 4294901760
txch_desc_list_laddr[5]: 4294885376
txch_desc_list_laddr[6]: 4294868992
txch_desc_list_laddr[7]: 4294852608
txch_desc_ring_len[0]: 511
txch_desc_ring_len[1]: 0
txch_desc_ring_len[2]: 0
txch_desc_ring_len[3]: 0
txch_desc_ring_len[4]: 511
txch_desc_ring_len[5]: 511
txch_desc_ring_len[6]: 511
txch_desc_ring_len[7]: 511
txch_desc_curr_haddr[0]: 0
txch_desc_curr_haddr[1]: 0
txch_desc_curr_haddr[2]: 0
txch_desc_curr_haddr[3]: 0
```

```
    txch_desc_curr_haddr[4]: 0
    txch_desc_curr_haddr[5]: 0
    txch_desc_curr_haddr[6]: 0
    txch_desc_curr_haddr[7]: 0
    txch_desc_curr_laddr[0]: 4294910720
    txch_desc_curr_laddr[1]: 0
    txch_desc_curr_laddr[2]: 0
    txch_desc_curr_laddr[3]: 0
    txch_desc_curr_laddr[4]: 4294901760
    txch_desc_curr_laddr[5]: 4294885376
    txch_desc_curr_laddr[6]: 4294868992
    txch_desc_curr_laddr[7]: 4294852608
    txch_desc_tail[0]: 4294910720
    txch_desc_tail[1]: 0
    txch_desc_tail[2]: 0
    txch_desc_tail[3]: 0
    txch_desc_tail[4]: 4294901760
    txch_desc_tail[5]: 4294885376
    txch_desc_tail[6]: 4294868992
    txch_desc_tail[7]: 4294852608
    txch_desc_buf_haddr[0]: 16
    txch_desc_buf_haddr[1]: 0
    txch_desc_buf_haddr[2]: 0
    txch_desc_buf_haddr[3]: 0
    txch_desc_buf_haddr[4]: 0
    txch_desc_buf_haddr[5]: 0
    txch_desc_buf_haddr[6]: 0
    txch_desc_buf_haddr[7]: 0
    txch_desc_buf_laddr[0]: 4269193218
    txch_desc_buf_laddr[1]: 0
    txch_desc_buf_laddr[2]: 0
    txch_desc_buf_laddr[3]: 0
    txch_desc_buf_laddr[4]: 0
    txch_desc_buf_laddr[5]: 0
    txch_desc_buf_laddr[6]: 0
    txch_desc_buf_laddr[7]: 0
    txch_sw_cur_tx[0]: 48
    txch_sw_cur_tx[1]: 0
    txch_sw_cur_tx[2]: 0
    txch_sw_cur_tx[3]: 0
    txch_sw_cur_tx[4]: 0
    txch_sw_cur_tx[5]: 0
    txch_sw_cur_tx[6]: 0
    txch_sw_cur_tx[7]: 0
```

```
    txch_sw_dirty_tx[0]: 48
    txch_sw_dirty_tx[1]: 0
    txch_sw_dirty_tx[2]: 0
    txch_sw_dirty_tx[3]: 0
    txch_sw_dirty_tx[4]: 0
    txch_sw_dirty_tx[5]: 0
    txch_sw_dirty_tx[6]: 0
    txch_sw_dirty_tx[7]: 0
    rxch_status[0]: 4
    rxch_status[1]: 0
    rxch_status[2]: 0
    rxch_status[3]: 0
    rxch_status[4]: 0
    rxch_status[5]: 0
    rxch_status[6]: 0
    rxch_status[7]: 0
    rxch_control[0]: 1051649
    rxch_control[1]: 0
    rxch_control[2]: 0
    rxch_control[3]: 1051649
    rxch_control[4]: 1051649
    rxch_control[5]: 1051649
    rxch_control[6]: 1051649
    rxch_control[7]: 1051649
    rxch_desc_list_haddr[0]: 16
    rxch_desc_list_haddr[1]: 0
    rxch_desc_list_haddr[2]: 0
    rxch_desc_list_haddr[3]: 16
    rxch_desc_list_haddr[4]: 16
    rxch_desc_list_haddr[5]: 16
    rxch_desc_list_haddr[6]: 16
    rxch_desc_list_haddr[7]: 16
    rxch_desc_list_laddr[0]: 4294959104
    rxch_desc_list_laddr[1]: 0
    rxch_desc_list_laddr[2]: 0
    rxch_desc_list_laddr[3]: 4294950912
    rxch_desc_list_laddr[4]: 4294942720
    rxch_desc_list_laddr[5]: 4294934528
    rxch_desc_list_laddr[6]: 4294926336
    rxch_desc_list_laddr[7]: 4294918144
    rxch_desc_ring_len[0]: 511
    rxch_desc_ring_len[1]: 0
    rxch_desc_ring_len[2]: 0
    rxch_desc_ring_len[3]: 511
```

```
    rxch_desc_ring_len[4]: 511
    rxch_desc_ring_len[5]: 511
    rxch_desc_ring_len[6]: 511
    rxch_desc_ring_len[7]: 511
    rxch_desc_curr_haddr[0]: 0
    rxch_desc_curr_haddr[1]: 0
    rxch_desc_curr_haddr[2]: 0
    rxch_desc_curr_haddr[3]: 0
    rxch_desc_curr_haddr[4]: 0
    rxch_desc_curr_haddr[5]: 0
    rxch_desc_curr_haddr[6]: 0
    rxch_desc_curr_haddr[7]: 0
    rxch_desc_curr_laddr[0]: 4294961440
    rxch_desc_curr_laddr[1]: 0
    rxch_desc_curr_laddr[2]: 0
    rxch_desc_curr_laddr[3]: 4294951168
    rxch_desc_curr_laddr[4]: 4294942976
    rxch_desc_curr_laddr[5]: 4294934784
    rxch_desc_curr_laddr[6]: 4294926592
    rxch_desc_curr_laddr[7]: 4294918400
    rxch_desc_tail[0]: 4294961184
    rxch_desc_tail[1]: 0
    rxch_desc_tail[2]: 0
    rxch_desc_tail[3]: 4294959104
    rxch_desc_tail[4]: 4294950912
    rxch_desc_tail[5]: 4294942720
    rxch_desc_tail[6]: 4294934528
    rxch_desc_tail[7]: 4294926336
    rxch_desc_buf_haddr[0]: 16
    rxch_desc_buf_haddr[1]: 0
    rxch_desc_buf_haddr[2]: 0
    rxch_desc_buf_haddr[3]: 16
    rxch_desc_buf_haddr[4]: 16
    rxch_desc_buf_haddr[5]: 16
    rxch_desc_buf_haddr[6]: 16
    rxch_desc_buf_haddr[7]: 16
    rxch_desc_buf_laddr[0]: 4294074368
    rxch_desc_buf_laddr[1]: 0
    rxch_desc_buf_laddr[2]: 0
    rxch_desc_buf_laddr[3]: 4292493312
    rxch_desc_buf_laddr[4]: 4290396160
    rxch_desc_buf_laddr[5]: 4288299008
    rxch_desc_buf_laddr[6]: 4286201856
    rxch_desc_buf_laddr[7]: 4284104704
```

```
    rxch_sw_cur_rx[0]: 130
    rxch_sw_cur_rx[1]: 0
    rxch_sw_cur_rx[2]: 0
    rxch_sw_cur_rx[3]: 0
    rxch_sw_cur_rx[4]: 0
    rxch_sw_cur_rx[5]: 0
    rxch_sw_cur_rx[6]: 0
    rxch_sw_cur_rx[7]: 0
    rxch_sw_dirty_rx[0]: 130
    rxch_sw_dirty_rx[1]: 0
    rxch_sw_dirty_rx[2]: 0
    rxch_sw_dirty_rx[3]: 0
    rxch_sw_dirty_rx[4]: 0
    rxch_sw_dirty_rx[5]: 0
    rxch_sw_dirty_rx[6]: 0
    rxch_sw_dirty_rx[7]: 0
    total_interrupts: 62
    lpi_intr_n: 0
    pmt_intr_n: 0
    event_intr_n: 0
    tx_intr_n: 0
    rx_intr_n: 58
    xpcs_intr_n: 0
    phy_intr_n: 4
    sw_msi_n: 0
    mtl_tx_underflow[0]: 0
    mtl_tx_underflow[1]: 0
    mtl_tx_underflow[3]: 0
    mtl_tx_underflow[4]: 0
    mtl_tx_underflow[5]: 0
    mtl_tx_underflow[6]: 0
    mtl_tx_underflow[7]: 0
    mtl_rx_miss_pkt_cnt[0]: 0
    mtl_rx_miss_pkt_cnt[1]: 0
    mtl_rx_miss_pkt_cnt[3]: 0
    mtl_rx_miss_pkt_cnt[4]: 0
    mtl_rx_miss_pkt_cnt[5]: 0
    mtl_rx_miss_pkt_cnt[6]: 0
    mtl_rx_miss_pkt_cnt[7]: 0
    mtl_rx_overflow_pkt_cnt[0]: 0
    mtl_rx_overflow_pkt_cnt[1]: 0
    mtl_rx_overflow_pkt_cnt[3]: 0
    mtl_rx_overflow_pkt_cnt[4]: 0
    mtl_rx_overflow_pkt_cnt[5]: 0
```

```
    mtl_rx_overflow_pkt_cnt[6]: 0
    mtl_rx_overflow_pkt_cnt[7]: 0
    rxch_watchdog_timer[0]: 160
    rxch_watchdog_timer[1]: 0
    rxch_watchdog_timer[2]: 0
    rxch_watchdog_timer[3]: 160
    rxch_watchdog_timer[4]: 160
    rxch_watchdog_timer[5]: 160
    rxch_watchdog_timer[6]: 160
    rxch_watchdog_timer[7]: 160
    link_partner_pause_frame_cnt: 0
    m3_debug_cnt0: 0
    m3_debug_cnt1: 0
    m3_debug_cnt2: 0
    m3_debug_cnt3: 0
    m3_debug_cnt4: 0
    m3_debug_cnt5: 0
    m3_debug_cnt6: 0
    m3_debug_cnt7: 0
    m3_debug_cnt8: 0
    m3_debug_cnt9: 0
    m3_debug_cnt10: 0
    m3_watchdog_exp_cnt: 42
    m3_watchdog_monitor_cnt: 16
    m3_debug_cnt13: 0
    m3_debug_cnt14: 0
    m3_systick_cnt_upper_value: 0
    m3_systick_cnt_lower_value: 92087
    m3_tx_timeout_port0: 0
    m3_tx_timeout_port1: 0
    m3_debug_cnt19: 0
    m3_tx_pcie_addr_loc_port0[0]: 0
    m3_tx_pcie_addr_loc_port0[1]: 0
    m3_tx_pcie_addr_loc_port0[2]: 0
    m3_tx_pcie_addr_loc_port0[3]: 0
    m3_tx_pcie_addr_loc_port0[4]: 0
    m3_tx_pcie_addr_loc_port0[5]: 0
    m3_tx_pcie_addr_loc_port0[6]: 0
    m3_tx_pcie_addr_loc_port0[7]: 0
    m3_tx_pcie_addr_loc_port1[0]: 0
    m3_tx_pcie_addr_loc_port1[1]: 0
    m3_tx_pcie_addr_loc_port1[2]: 0
    m3_tx_pcie_addr_loc_port1[3]: 0
    m3_tx_pcie_addr_loc_port1[4]: 0
```

```
    m3_tx_pcie_addr_loc_port1[5]: 0
    m3_tx_pcie_addr_loc_port1[6]: 0
    m3_tx_pcie_addr_loc_port1[7]: 0
    m3_rx_pcie_addr_loc_port0[0]: 0
    m3_rx_pcie_addr_loc_port0[1]: 0
    m3_rx_pcie_addr_loc_port0[2]: 0
    m3_rx_pcie_addr_loc_port0[3]: 0
    m3_rx_pcie_addr_loc_port0[4]: 0
    m3_rx_pcie_addr_loc_port0[5]: 0
    m3_rx_pcie_addr_loc_port0[6]: 0
    m3_rx_pcie_addr_loc_port0[7]: 0
    m3_rx_pcie_addr_loc_port1[0]: 0
    m3_rx_pcie_addr_loc_port1[1]: 0
    m3_rx_pcie_addr_loc_port1[2]: 0
    m3_rx_pcie_addr_loc_port1[3]: 0
    m3_rx_pcie_addr_loc_port1[4]: 0
    m3_rx_pcie_addr_loc_port1[5]: 0
    m3_rx_pcie_addr_loc_port1[6]: 0
    m3_rx_pcie_addr_loc_port1[7]: 0
    mbx_pf_sent_vf[0]: 0
    mbx_pf_sent_vf[1]: 0
    mbx_pf_sent_vf[2]: 0
    mbx_pf_rcvd_vf[0]: 0
    mbx_pf_rcvd_vf[1]: 0
    mbx_pf_rcvd_vf[2]: 0
```

5.3 ifconfig command

Sample output of the `ifconfig` command to display the network interface information.

```
ifconfig
enP1p5s0f0  Link encap:Ethernet  HWaddr XX:XX:XX:YY:YY:YY
            inet addr:169.254.227.235  Bcast:169.254.255.255
Mask:255.255.0.0
            inet6 addr: fe80::533c:8ed6:557:3860/64 Scope:Link
            UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
            RX packets:19 errors:0 dropped:0 overruns:0 frame:0
            TX packets:36 errors:0 dropped:0 overruns:0 carrier:
0
            collisions:0 txqueuelen:1000
            RX bytes:3416 (3.3 KiB)  TX bytes:5559 (5.4 KiB)
            Interrupt:249
```

```
enP1p5s0f1  Link encap:Ethernet  HWaddr XX:XX:XX:YY:YY:YY
            inet addr:169.254.57.126  Bcast:169.254.255.255
Mask:255.255.0.0
            inet6 addr: fe80::77b:2036:be65:dd29/64 Scope:Link
            UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
            RX packets:23 errors:0 dropped:0 overruns:0 frame:0
            TX packets:39 errors:0 dropped:0 overruns:0 carrier:
0
            collisions:0 txqueuelen:1000
            RX bytes:4059 (3.9 KiB)  TX bytes:5624 (5.4 KiB)
            Interrupt:253
```

5.4 netstat command

Sample output of the `netstat` command to retrieve a network interface table.

```
netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address
   State
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type       State         I-Node Path
unix  3      [ ]         STREAM     CONNECTED      21526
unix  3      [ ]         STREAM     CONNECTED       4813
unix  3      [ ]         STREAM     CONNECTED      12072
unix  2      [ ]         DGRAM      CONNECTED      12903
unix  3      [ ]         STREAM     CONNECTED      16907 /run/
systemd/journal/stdout
unix  3      [ ]         STREAM     CONNECTED       4877
unix  2      [ ]         DGRAM      CONNECTED      14242
unix  3      [ ]         STREAM     CONNECTED      17522 /run/
systemd/journal/stdout
```

5.5 tcpdump command

Sample `tcpdump` command to analyze the network traffic.

```
tcpdump -i any -s 0 -w /data/tcpdump.pcap
```

5.6 Route tables

Sample output of the `ip` command to retrieve the IP routing table.

```
ip r s
default dev enP1p5s0f0 scope link  src 169.254.22.123  metric
1001002
169.254.0.0/16 dev enP1p5s0f0 scope link  src 169.254.22.123
metric 1002
```

Sample output of the `netstat` command to retrieve the IP routing table.

```
netstat -r
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS
Window  irtt Iface
default         *               0.0.0.0         U         0 0
      0 enP1p5s0f0
169.254.0.0     *               255.255.0.0     U         0 0
      0 enP1p5s0f0
```

QCS9075

5.7 ping command

Note:

The client IP address must be in the same subnet as that of the device IP address.

Sample output of the `ping` command to check the network connectivity from the IQ-9075 EVK to the host PC.

```
ping 192.168.1.10
PING 192.168.1.10 (192.168.1.10) 56(84) bytes of data.
64 bytes from 192.168.1.10: icmp_seq=1 ttl=64 time=1.67 ms
64 bytes from 192.168.1.10: icmp_seq=2 ttl=64 time=0.739 ms
64 bytes from 192.168.1.10: icmp_seq=3 ttl=64 time=0.996 ms
```

5.8 ethtool command

Sample output of the `ethtool` command to check the status of a link.

```
ethtool eth0
Settings for eth0:
    Supported ports: [  ]
    Supported link modes:   10baseT/Full
                            100baseT/Full
                            1000baseT/Full
    Supported pause frame use: Symmetric Receive-only
    Supports auto-negotiation: Yes
    Supported FEC modes: Not reported
    Advertised link modes:  1000baseT/Full
    Advertised pause frame use: Symmetric Receive-only
    Advertised auto-negotiation: Yes
    Advertised FEC modes: Not reported
    Link partner advertised link modes: 100baseT/Full
                                        1000baseT/Full
                                        2500baseT/Full
    Link partner advertised pause frame use: Symmetric Receive-
only
    Link partner advertised auto-negotiation: Yes
    Link partner advertised FEC modes: Not reported
    Speed: 1000Mb/s
    Duplex: Full
    Auto-negotiation: on
```

```
    master-slave cfg: preferred slave
    master-slave status: slave
    Port: Twisted Pair
    PHYAD: 28
    Transceiver: external
    MDI-X: off (auto)
    Supports Wake-on: g
    Wake-on: d
    Current message level: 0x0000003f (63)
                drv probe link timer ifdown ifup
    Link detected: yes
```

Sample output of the `ethtool` command to check the statistics of NIC packet.

```
ethtool -S eth0
NIC statistics:
    ATPES: 0
    TPES: 0
    RDPES: 0
    MPES: 0
    MTSPES: 0
    ARPES: 0
    CWPES: 0
    ASRPES: 0
    TTES: 0
    RTES: 0
    CTES: 0
    ATES: 0
    PTES: 0
    T125ES: 0
    R125ES: 0
    RVCTES: 0
    MSTTES: 0
    SLVTES: 0
    ATITES: 0
    ARITES: 0
    FSMPES: 0
    TXCES: 0
    TXAMS: 0
    TXUES: 0
```

```
    RXCES: 0
    RXAMS: 0
    RXUES: 0
    ECES: 0
    EAMS: 0
    EUES: 0
    RPCES: 0
    RPAMS: 0
    RPUES: 0
    TCES: 0
    TAMS: 0
    TUES: 0
    mmc_tx_octetcount_gb: 86000
    mmc_tx_framecount_gb: 491
    mmc_tx_broadcastframe_g: 239
    mmc_tx_multicastframe_g: 249
    mmc_tx_64_octets_gb: 114
    mmc_tx_65_to_127_octets_gb: 146
    mmc_tx_128_to_255_octets_gb: 78
    mmc_tx_256_to_511_octets_gb: 153
    mmc_tx_512_to_1023_octets_gb: 0
    mmc_tx_1024_to_max_octets_gb: 0
    mmc_tx_unicast_gb: 3
    mmc_tx_multicast_gb: 249
    mmc_tx_broadcast_gb: 239
    mmc_tx_underflow_error: 0
    mmc_tx_singlecol_g: 0
    mmc_tx_multicol_g: 0
    mmc_tx_deferred: 0
    mmc_tx_latecol: 0
    mmc_tx_exesscol: 0
    mmc_tx_carrier_error: 0
    mmc_tx_octetcount_g: 86000
    mmc_tx_framecount_g: 491
    mmc_tx_excessdef: 0
    mmc_tx_pause_frame: 0
    mmc_tx_vlan_frame_g: 0
    mmc_rx_framecount_gb: 98
    mmc_rx_octetcount_gb: 32384
    mmc_rx_octetcount_g: 32384
    mmc_rx_broadcastframe_g: 93
    mmc_rx_multicastframe_g: 1
    mmc_rx_crc_error: 0
    mmc_rx_align_error: 0
```

```
    mmc_rx_run_error: 0
    mmc_rx_jabber_error: 0
    mmc_rx_undersize_g: 0
    mmc_rx_oversize_g: 0
    mmc_rx_64_octets_gb: 2
    mmc_rx_65_to_127_octets_gb: 3
    mmc_rx_128_to_255_octets_gb: 0
    mmc_rx_256_to_511_octets_gb: 93
    mmc_rx_512_to_1023_octets_gb: 0
    mmc_rx_1024_to_max_octets_gb: 0
    mmc_rx_unicast_g: 4
    mmc_rx_length_error: 0
    mmc_rx_autofrangetype: 0
    mmc_rx_pause_frames: 0
    mmc_rx_fifo_overflow: 0
    mmc_rx_vlan_frames_gb: 62
    mmc_rx_watchdog_error: 0
    mmc_rx_ipc_intr_mask: 1073692671
    mmc_rx_ipc_intr: 0
    mmc_rx_ipv4_gd: 96
    mmc_rx_ipv4_hderr: 0
    mmc_rx_ipv4_nopay: 0
    mmc_rx_ipv4_frag: 0
    mmc_rx_ipv4_udsbl: 0
    mmc_rx_ipv4_gd_octets: 30280
    mmc_rx_ipv4_hderr_octets: 0
    mmc_rx_ipv4_nopay_octets: 0
    mmc_rx_ipv4_frag_octets: 0
    mmc_rx_ipv4_udsbl_octets: 0
    mmc_rx_ipv6_gd_octets: 0
    mmc_rx_ipv6_hderr_octets: 0
    mmc_rx_ipv6_nopay_octets: 0
    mmc_rx_ipv6_gd: 0
    mmc_rx_ipv6_hderr: 0
    mmc_rx_ipv6_nopay: 0
    mmc_rx_udp_gd: 94
    mmc_rx_udp_err: 0
    mmc_rx_tcp_gd: 0
    mmc_rx_tcp_err: 0
    mmc_rx_icmp_gd: 2
    mmc_rx_icmp_err: 0
    mmc_rx_udp_gd_octets: 28232
    mmc_rx_udp_err_octets: 0
    mmc_rx_tcp_gd_octets: 0
```

```
    mmc_rx_tcp_err_octets: 0
    mmc_rx_icmp_gd_octets: 128
    mmc_rx_icmp_err_octets: 0
    mmc_tx_fpe_fragment_cntr: 0
    mmc_tx_hold_req_cntr: 0
    mmc_rx_packet_assembly_err_cntr: 0
    mmc_rx_packet_smd_err_cntr: 0
    mmc_rx_packet_assembly_ok_cntr: 0
    mmc_rx_fpe_fragment_cntr: 0
    tx_underflow: 0
    tx_carrier: 0
    tx_losscarrier: 0
    vlan_tag: 0
    tx_deferred: 0
    tx_vlan: 0
    tx_jabber: 0
    tx_frame_flushed: 0
    tx_payload_error: 0
    tx_ip_header_error: 0
    rx_desc: 0
    sa_filter_fail: 0
    overflow_error: 0
    ipc_csum_error: 0
    rx_collision: 0
    rx_crc_errors: 0
    dribbling_bit: 0
    rx_length: 0
    rx_mii: 0
    rx_multicast: 0
    rx_gmac_overflow: 0
    rx_watchdog: 0
    da_rx_filter_fail: 0
    sa_rx_filter_fail: 0
    rx_missed_cntr: 0
    rx_overflow_cntr: 0
    rx_vlan: 0
    rx_split_hdr_pkt_n: 36
    tx_undeflow_irq: 0
    tx_process_stopped_irq: 0
    tx_jabber_irq: 0
    rx_overflow_irq: 0
    rx_buf_unav_irq: 0
    rx_process_stopped_irq: 0
    rx_watchdog_irq: 0
```

```
    tx_early_irq: 0
    fatal_bus_error_irq: 0
    rx_early_irq: 0
    threshold: 1
    irq_receive_pmt_irq_n: 0
    mmc_tx_irq_n: 0
    mmc_rx_irq_n: 0
    mmc_rx_csum_offload_irq_n: 0
    irq_tx_path_in_lpi_mode_n: 0
    irq_tx_path_exit_lpi_mode_n: 0
    irq_rx_path_in_lpi_mode_n: 0
    irq_rx_path_exit_lpi_mode_n: 0
    phy_eee_wakeup_error_n: 0
    ip_hdr_err: 0
    ip_payload_err: 0
    ip_csum_bypassed: 2
    ipv4_pkt_rcvd: 34
    ipv6_pkt_rcvd: 0
    no_ptp_rx_msg_type_ext: 36
    ptp_rx_msg_type_sync: 0
    ptp_rx_msg_type_follow_up: 0
    ptp_rx_msg_type_delay_req: 0
    ptp_rx_msg_type_delay_resp: 0
    ptp_rx_msg_type_pdelay_req: 0
    ptp_rx_msg_type_pdelay_resp: 0
    ptp_rx_msg_type_pdelay_follow_up: 0
    ptp_rx_msg_type_announce: 0
    ptp_rx_msg_type_management: 0
    ptp_rx_msg_pkt_reserved_type: 0
    ptp_frame_type: 0
    ptp_ver: 0
    timestamp_dropped: 0
    av_pkt_rcvd: 0
    av_tagged_pkt_rcvd: 0
    vlan_tag_priority_val: 0
    l3_filter_match: 0
    l4_filter_match: 0
    l3_l4_filter_no_match: 0
    irq_pcs_ane_n: 0
    irq_pcs_link_n: 0
    irq_rgmii_n: 0
    mtl_tx_status_fifo_full: 0
    mtl_tx_fifo_not_empty: 0
    mmtl_fifo_ctrl: 0
```

```
    mtl_tx_fifo_read_ctrl_write: 0
    mtl_tx_fifo_read_ctrl_wait: 0
    mtl_tx_fifo_read_ctrl_read: 0
    mtl_tx_fifo_read_ctrl_idle: 0
    mac_tx_in_pause: 0
    mac_tx_frame_ctrl_xfer: 0
    mac_tx_frame_ctrl_idle: 0
    mac_tx_frame_ctrl_wait: 0
    mac_tx_frame_ctrl_pause: 0
    mac_gmii_tx_proto_engine: 0
    mtl_rx_fifo_fill_level_full: 0
    mtl_rx_fifo_fill_above_thresh: 0
    mtl_rx_fifo_fill_below_thresh: 0
    mtl_rx_fifo_fill_level_empty: 0
    mtl_rx_fifo_read_ctrl_flush: 0
    mtl_rx_fifo_read_ctrl_read_data: 0
    mtl_rx_fifo_read_ctrl_status: 0
    mtl_rx_fifo_read_ctrl_idle: 0
    mtl_rx_fifo_ctrl_active: 0
    mac_rx_frame_ctrl_fifo: 0
    mac_gmii_rx_proto_engine: 0
    mtl_est_cgce: 0
    mtl_est_hlbs: 0
    mtl_est_hlbf: 0
    mtl_est_btre: 0
    mtl_est_btrlm: 0
    rx_pkt_n: 36
    rx_normal_irq_n: 36
    tx_pkt_n: 491
    tx_normal_irq_n: 18
    tx_clean: 702
    tx_set_ic_bit: 18
    tx_tso_frames: 0
    tx_tso_nfrags: 0
    normal_irq_n: 54
    napi_poll: 738
    q0_tx_pkt_n: 33
    q0_tx_irq_n: 1
    q1_tx_pkt_n: 171
    q1_tx_irq_n: 6
    q2_tx_pkt_n: 37
    q2_tx_irq_n: 1
    q3_tx_pkt_n: 250
    q3_tx_irq_n: 10
```

```
    q0_rx_pkt_n: 36
    q0_rx_irq_n: 36
    q1_rx_pkt_n: 0
    q1_rx_irq_n: 0
    q2_rx_pkt_n: 0
    q2_rx_irq_n: 0
    q3_rx_pkt_n: 0
    q3_rx_irq_n: 0
```

5.9 ifconfig command

Sample output of the `ifconfig` command to display the network interface information.

```
ifconfig eth0
eth0    Link encap:Ethernet  HWaddr XX:XX:XX:YY:YY:YY
        inet6 addr: fe80::34c9:27f8:b0b0:b036/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:34 errors:0 dropped:0 overruns:0 frame:0
        TX packets:453 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:10176 (9.9 KiB)  TX bytes:74668 (72.9 KiB)
        Interrupt:36
```

5.10 netstat command

Sample output of the `netstat` command to retrieve the network interface table.

```
netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address
   State
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type       State         I-Node Path
unix  2      [ ]         DGRAM      CONNECTED      24027
unix  3      [ ]         STREAM     CONNECTED      17210
unix  2      [ ]         DGRAM      CONNECTED      71260
unix  3      [ ]         DGRAM      CONNECTED      19572
unix  3      [ ]         STREAM     CONNECTED       3728 /run/
systemd/journal/stdout
unix  3      [ ]         SEQPACKET  CONNECTED      31807
unix  3      [ ]         STREAM     CONNECTED      17023
```

```
unix  3      [ ]         SEQPACKET  CONNECTED      21568
unix  3      [ ]         STREAM     CONNECTED      21552 /run/
systemd/journal/stdout
unix  2      [ ]         DGRAM      CONNECTED      12991
unix  2      [ ]         DGRAM      CONNECTED      23997
unix  3      [ ]         STREAM     CONNECTED      13455
unix  3      [ ]         STREAM     CONNECTED      18174 /run/
dbus/system_bus_socket
```

5.11 tcpdump command

Sample `tcpdump` command to analyze the network traffic.

```
tcpdump -i any -s 0 -w /data/tcpdump.pcap
```

5.12 Route tables

Sample output of the `ip` command to retrieve the IP routing table.

```
ip r s
192.168.1.0/24 dev eth0 proto kernel scope link src 192.168.1.1
```

Sample output of the `netstat` command to retrieve the IP routing table.

```
netstat -r
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS
Window  irtt Iface
192.168.1.0     *               255.255.255.0   U         0 0
      0 eth0
```

QCS8275

5.13 ping command

Note:

The client IP address must be in the same subnet as that of the device IP address.

Sample output of the `ping` command to check the network connectivity from the IQ-8 Beta EVK to the host PC.

```
ping 192.168.1.10
PING 192.168.1.10 (192.168.1.10) 56(84) bytes of data.
64 bytes from 192.168.1.10: icmp_seq=1 ttl=64 time=0.726 ms
64 bytes from 192.168.1.10: icmp_seq=2 ttl=64 time=0.717 ms
64 bytes from 192.168.1.10: icmp_seq=3 ttl=64 time=0.711 ms
^C
--- 192.168.1.10 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2010ms
rtt min/avg/max/mdev = 0.711/0.718/0.726/0.006 ms
```

5.14 ethtool command

Sample output of the `ethtool` command to check the status of a link.

```
ethtool eth0
Settings for eth0:
    Supported ports: [ TP    MII ]
    Supported link modes:   10baseT/Full
                            100baseT/Full
                            1000baseT/Full
                            2500baseT/Full
    Supported pause frame use: Symmetric Receive-only
    Supports auto-negotiation: Yes
    Supported FEC modes: Not reported
    Advertised link modes:  10baseT/Full
                            100baseT/Full
                            1000baseT/Full
                            2500baseT/Full
    Advertised pause frame use: Symmetric Receive-only
    Advertised auto-negotiation: Yes
    Advertised FEC modes: Not reported
    Link partner advertised link modes:  100baseT/Full
                                         1000baseT/Full
```

```
                                          10000baseT/Full
                                          2500baseT/Full
                                          5000baseT/Full
    Link partner advertised pause frame use: Symmetric Receive-
only
    Link partner advertised auto-negotiation: Yes
    Link partner advertised FEC modes: Not reported
    Speed: 2500Mb/s
    Duplex: Full
    Auto-negotiation: on
    Port: Twisted Pair
    PHYAD: 8
    Transceiver: external
    MDI-X: Unknown
    Supports Wake-on: d
    Wake-on: d
    Current message level: 0x0000003f (63)
                           drv probe link timer ifdown ifup
    Link detected: yes
```

Sample output of the `ethtool` command to check the statistics of NIC packet.

```
ethtool -S eth0
NIC statistics:
    ATPES: 0
    TPES: 0
    RDPES: 0
    MPES: 0
    MTSPES: 0
    ARPES: 0
    CWPES: 0
    ASRPES: 0
    TTES: 0
    RTES: 0
    CTES: 0
    ATES: 0
    PTES: 0
    T125ES: 0
    R125ES: 0
    RVCTES: 0
```

```
    MSTTES: 0
    SLVTES: 0
    ATITES: 0
    ARITES: 0
    FSMPES: 0
    TXCES: 0
    TXAMS: 0
    TXUES: 0
    RXCES: 0
    RXAMS: 0
    RXUES: 0
    ECES: 0
    EAMS: 0
    EUES: 0
    RPCES: 0
    RPAMS: 0
    RPUES: 0
    TCES: 0
    TAMS: 0
    TUES: 0
    mmc_tx_octetcount_gb: 33843
    mmc_tx_framecount_gb: 194
    mmc_tx_broadcastframe_g: 96
    mmc_tx_multicastframe_g: 80
    mmc_tx_64_octets_gb: 47
    mmc_tx_65_to_127_octets_gb: 60
    mmc_tx_128_to_255_octets_gb: 23
    mmc_tx_256_to_511_octets_gb: 64
    mmc_tx_512_to_1023_octets_gb: 0
    mmc_tx_1024_to_max_octets_gb: 0
    mmc_tx_unicast_gb: 18
    mmc_tx_multicast_gb: 80
    mmc_tx_broadcast_gb: 96
    mmc_tx_underflow_error: 0
    mmc_tx_singlecol_g: 0
    mmc_tx_multicol_g: 0
    mmc_tx_deferred: 0
    mmc_tx_latecol: 0
    mmc_tx_exesscol: 0
    mmc_tx_carrier_error: 0
    mmc_tx_octetcount_g: 33843
    mmc_tx_framecount_g: 194
    mmc_tx_excessdef: 0
    mmc_tx_pause_frame: 0
```

```
    mmc_tx_vlan_frame_g: 0
    mmc_rx_framecount_gb: 100
    mmc_rx_octetcount_gb: 26002
    mmc_rx_octetcount_g: 26002
    mmc_rx_broadcastframe_g: 61
    mmc_rx_multicastframe_g: 22
    mmc_rx_crc_error: 0
    mmc_rx_align_error: 0
    mmc_rx_run_error: 0
    mmc_rx_jabber_error: 0
    mmc_rx_undersize_g: 0
    mmc_rx_oversize_g: 0
    mmc_rx_64_octets_gb: 2
    mmc_rx_65_to_127_octets_gb: 29
    mmc_rx_128_to_255_octets_gb: 3
    mmc_rx_256_to_511_octets_gb: 66
    mmc_rx_512_to_1023_octets_gb: 0
    mmc_rx_1024_to_max_octets_gb: 0
    mmc_rx_unicast_g: 17
    mmc_rx_length_error: 0
    mmc_rx_autofrangetype: 0
    mmc_rx_pause_frames: 0
    mmc_rx_fifo_overflow: 0
    mmc_rx_vlan_frames_gb: 42
    mmc_rx_watchdog_error: 0
    mmc_rx_ipc_intr_mask: 1073692671
    mmc_rx_ipc_intr: 0
    mmc_rx_ipv4_gd: 95
    mmc_rx_ipv4_hderr: 0
    mmc_rx_ipv4_nopay: 0
    mmc_rx_ipv4_frag: 0
    mmc_rx_ipv4_udsbl: 0
    mmc_rx_ipv4_gd_octets: 23663
    mmc_rx_ipv4_hderr_octets: 0
    mmc_rx_ipv4_nopay_octets: 0
    mmc_rx_ipv4_frag_octets: 0
    mmc_rx_ipv4_udsbl_octets: 0
    mmc_rx_ipv6_gd_octets: 279
    mmc_rx_ipv6_hderr_octets: 0
    mmc_rx_ipv6_nopay_octets: 0
    mmc_rx_ipv6_gd: 3
    mmc_rx_ipv6_hderr: 0
    mmc_rx_ipv6_nopay: 0
    mmc_rx_udp_gd: 82
```

```
    mmc_rx_udp_err: 0
    mmc_rx_tcp_gd: 0
    mmc_rx_tcp_err: 0
    mmc_rx_icmp_gd: 16
    mmc_rx_icmp_err: 0
    mmc_rx_udp_gd_octets: 20898
    mmc_rx_udp_err_octets: 0
    mmc_rx_tcp_gd_octets: 0
    mmc_rx_tcp_err_octets: 0
    mmc_rx_icmp_gd_octets: 1024
    mmc_rx_icmp_err_octets: 0
    mmc_tx_fpe_fragment_cntr: 0
    mmc_tx_hold_req_cntr: 0
    mmc_rx_packet_assembly_err_cntr: 0
    mmc_rx_packet_smd_err_cntr: 0
    mmc_rx_packet_assembly_ok_cntr: 0
    mmc_rx_fpe_fragment_cntr: 0
    tx_underflow: 0
    tx_carrier: 0
    tx_losscarrier: 0
    vlan_tag: 0
    tx_deferred: 0
    tx_vlan: 0
    tx_jabber: 0
    tx_frame_flushed: 0
    tx_payload_error: 0
    tx_ip_header_error: 0
    rx_desc: 0
    sa_filter_fail: 0
    overflow_error: 0
    ipc_csum_error: 0
    rx_collision: 0
    rx_crc_errors: 0
    dribbling_bit: 0
    rx_length: 0
    rx_mii: 0
    rx_multicast: 0
    rx_gmac_overflow: 0
    rx_watchdog: 0
    da_rx_filter_fail: 0
    sa_rx_filter_fail: 0
    rx_missed_cntr: 0
    rx_overflow_cntr: 0
    rx_vlan: 0
```

```
    rx_split_hdr_pkt_n: 58
    tx_undeflow_irq: 0
    tx_process_stopped_irq: 0
    tx_jabber_irq: 0
    rx_overflow_irq: 0
    rx_buf_unav_irq: 0
    rx_process_stopped_irq: 0
    rx_watchdog_irq: 0
    tx_early_irq: 0
    fatal_bus_error_irq: 0
    rx_early_irq: 0
    threshold: 1
    irq_receive_pmt_irq_n: 0
    mmc_tx_irq_n: 0
    mmc_rx_irq_n: 0
    mmc_rx_csum_offload_irq_n: 0
    irq_tx_path_in_lpi_mode_n: 0
    irq_tx_path_exit_lpi_mode_n: 0
    irq_rx_path_in_lpi_mode_n: 0
    irq_rx_path_exit_lpi_mode_n: 0
    phy_eee_wakeup_error_n: 0
    ip_hdr_err: 0
    ip_payload_err: 0
    ip_csum_bypassed: 2
    ipv4_pkt_rcvd: 55
    ipv6_pkt_rcvd: 1
    no_ptp_rx_msg_type_ext: 58
    ptp_rx_msg_type_sync: 0
    ptp_rx_msg_type_follow_up: 0
    ptp_rx_msg_type_delay_req: 0
    ptp_rx_msg_type_delay_resp: 0
    ptp_rx_msg_type_pdelay_req: 0
    ptp_rx_msg_type_pdelay_resp: 0
    ptp_rx_msg_type_pdelay_follow_up: 0
    ptp_rx_msg_type_announce: 0
    ptp_rx_msg_type_management: 0
    ptp_rx_msg_pkt_reserved_type: 0
    ptp_frame_type: 0
    ptp_ver: 0
    timestamp_dropped: 0
    av_pkt_rcvd: 0
    av_tagged_pkt_rcvd: 0
    vlan_tag_priority_val: 0
    l3_filter_match: 0
```

```
    l4_filter_match: 0
    l3_l4_filter_no_match: 0
    irq_pcs_ane_n: 0
    irq_pcs_link_n: 0
    irq_rgmii_n: 0
    mtl_tx_status_fifo_full: 0
    mtl_tx_fifo_not_empty: 0
    mmtl_fifo_ctrl: 0
    mtl_tx_fifo_read_ctrl_write: 0
    mtl_tx_fifo_read_ctrl_wait: 0
    mtl_tx_fifo_read_ctrl_read: 0
    mtl_tx_fifo_read_ctrl_idle: 0
    mac_tx_in_pause: 0
    mac_tx_frame_ctrl_xfer: 0
    mac_tx_frame_ctrl_idle: 0
    mac_tx_frame_ctrl_wait: 0
    mac_tx_frame_ctrl_pause: 0
    mac_gmii_tx_proto_engine: 0
    mtl_rx_fifo_fill_level_full: 0
    mtl_rx_fifo_fill_above_thresh: 0
    mtl_rx_fifo_fill_below_thresh: 0
    mtl_rx_fifo_fill_level_empty: 0
    mtl_rx_fifo_read_ctrl_flush: 0
    mtl_rx_fifo_read_ctrl_read_data: 0
    mtl_rx_fifo_read_ctrl_status: 0
    mtl_rx_fifo_read_ctrl_idle: 0
    mtl_rx_fifo_ctrl_active: 0
    mac_rx_frame_ctrl_fifo: 0
    mac_gmii_rx_proto_engine: 0
    mtl_est_cgce: 0
    mtl_est_hlbs: 0
    mtl_est_hlbf: 0
    mtl_est_btre: 0
    mtl_est_btrlm: 0
    rx_pkt_n: 58
    rx_normal_irq_n: 58
    tx_pkt_n: 194
    tx_normal_irq_n: 6
    tx_clean: 447
    tx_set_ic_bit: 6
    tx_tso_frames: 0
    tx_tso_nfrags: 0
    normal_irq_n: 64
    napi_poll: 505
```

```
    q0_tx_pkt_n: 58
    q0_tx_irq_n: 2
    q1_tx_pkt_n: 63
    q1_tx_irq_n: 2
    q2_tx_pkt_n: 4
    q2_tx_irq_n: 0
    q3_tx_pkt_n: 69
    q3_tx_irq_n: 2
    q0_rx_pkt_n: 58
    q0_rx_irq_n: 58
    q1_rx_pkt_n: 0
    q1_rx_irq_n: 0
    q2_rx_pkt_n: 0
    q2_rx_irq_n: 0
    q3_rx_pkt_n: 0
    q3_rx_irq_n: 0
```

5.15 ifconfig command

Sample output of the `ifconfig` command to display the network interface information.

```
ifconfig
eth0    Link encap:Ethernet  HWaddr XX:XX:XX:YY:YY:YY
        inet addr:192.168.1.1  Bcast:192.168.1.255  Mask:255.
255.255.0
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:57 errors:0 dropped:0 overruns:0 frame:0
        TX packets:192 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:11403 (11.1 KiB)  TX bytes:31620 (30.8 KiB)
        Interrupt:61
```

5.16 netstat command

Sample output of the `netstat` command to retrieve the network interface table.

```
netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address
   State
Active UNIX domain sockets (w/o servers)
```

```
Proto RefCnt Flags       Type       State         I-Node Path
unix  2      [ ]         DGRAM      CONNECTED      21594
unix  3      [ ]         STREAM     CONNECTED      23935
unix  3      [ ]         STREAM     CONNECTED      13743
unix  3      [ ]         STREAM     CONNECTED      13776 /run/
systemd/journal/stdout
unix  2      [ ]         DGRAM      CONNECTED      24271
unix  2      [ ]         DGRAM      CONNECTED      13745
unix  2      [ ]         DGRAM      CONNECTED      11769
unix  2      [ ]         DGRAM      CONNECTED      21595
unix  3      [ ]         STREAM     CONNECTED      24015
unix  3      [ ]         STREAM     CONNECTED      21620
unix  2      [ ]         DGRAM      CONNECTED      23894
unix  3      [ ]         STREAM     CONNECTED      21929
unix  3      [ ]         STREAM     CONNECTED      19736
unix  3      [ ]         SEQPACKET  CONNECTED      13847
unix  2      [ ]         DGRAM      CONNECTED      23933
unix  4      [ ]         DGRAM      CONNECTED       4042 /run/
systemd/notify
```

5.17 tcpdump command

Sample `tcpdump` command to analyze the network traffic.

```
tcpdump -i any -s 0 -w /data/tcpdump.pcap
```

5.18 Route tables

Sample output of the `ip` command to retrieve the IP routing table.

```
ip r s
192.168.1.0/24 dev eth0 proto kernel scope link src 192.168.1.1
```

Sample output of the `netstat` command to retrieve the IP routing table.

```
netstat -r
Kernel IP routing table
```

```
Destination     Gateway         Genmask         Flags   MSS
Window  irtt Iface
192.168.1.0     *               255.255.255.0   U         0 0
      0 eth0
```

6 Bring up Ethernet

The following figure shows the workflow to bring up Ethernet on the reference kits.

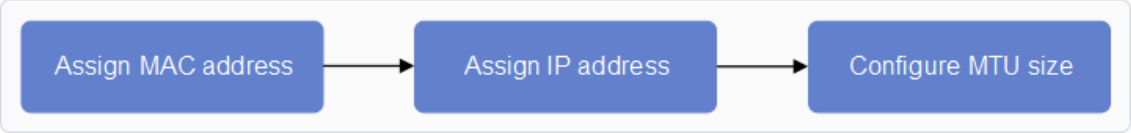

Figure1 Ethernet bringup workflow

QCS6490

Note:

- Flash the corresponding CDT on the device to ensure that the correct configuration is used for Ethernet bringup.
- The QPS615 MAC driver and kernel configuration are enabled by default in the source code.
- To bring up hardware configurations other than the configuration provided by Qualcomm, see Bring up alternate hardware enablement.

To bring up Ethernet functionality on RB3 Gen 2 Development Kit, do the following:

1. The RB3 Gen 2 Development Kit comes with a preconfigured MAC address. Skip this step if you choose to use the same MAC address.

   Alternatively, to modify the preconfigured MAC address on the device, perform the following steps:

   a. Bring down the interface.

   ```
   ifconfig <Interface_name> down
   ```

For example:

```
ifconfig enP1p5s0f0 down
```

b. Assign the MAC address.

```
ifconfig <Interface_name> hw ether <MAC Address>
```

For example:

```
ifconfig enP15s0f0 hw ether XX:XX:XX:YY:YY:YY
```

c. Bring up the interface.

```
ifconfig <Interface_name> <ip address> up
```

For example:

```
ifconfig enP1p5s0f0 169.254.227.235 up
```

Sample output:

```
ifconfig
enP1p5s0f0 Link encap:Ethernet  **HWaddr XX:XX:XX:YY:
YY:YY**
    inet addr:169.254.227.235  Bcast:169.254.255.255
Mask:255.255.0.0
    inet6 addr: fe80::533c:8ed6:557:3860/64 Scope:Link
    UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
    RX packets:19 errors:0 dropped:0 overruns:0 frame:0
    TX packets:36 errors:0 dropped:0 overruns:0
carrier:0
    collisions:0 txqueuelen:1000
    RX bytes:3416 (3.3 KiB)  TX bytes:5559 (5.4 KiB)
    Interrupt:249
```

Note: This MAC address is valid only for the current boot cycle. On rebooting the device, the MAC address is updated with the address from persistent storage as described in Verify preconfigured MAC address.

2. When the device is connected to a public network, the DHCP server connected to the network assigns the IP address automatically. No specific configuration is required.

   Alternatively, you can assign a static IP address.

   ```
   ifconfig <Interface_name> <ip address>
   ```

   For example:

   ```
   ifconfig enP1p5s0f0 169.254.227.235
   ```

   Sample output:

   ```
   ifconfig
   enP1p5s0f0 Link encap:Ethernet  HWaddr XX:XX:XX:YY:YY:
   YY
           **inet addr:169.254.227.235**  Bcast:169.254.
   255.255  Mask:255.255.0.0
           inet6 addr: fe80::533c:8ed6:557:3860/64 Scope:
   Link
           UP BROADCAST RUNNING MULTICAST  MTU:1500
   Metric:1
           RX packets:19 errors:0 dropped:0 overruns:0
   frame:0
           TX packets:36 errors:0 dropped:0 overruns:0
   carrier:0
           collisions:0 txqueuelen:1000
           RX bytes:3416 (3.3 KiB)  TX bytes:5559 (5.4
   KiB)
           Interrupt:249
   ```

   Note: This IP address is valid only for the current boot cycle. On rebooting the device, the IP address isn't retained.

3. Configure the MTU size for the data packets over the Ethernet interface.

   ```
   ifconfig <Interface_name> down

   ifconfig <Interface_name> mtu <mtu_size>
   ```

```
ifconfig <Interface_name> up
```

For example:

```
ifconfig enP1p5s0f0 down

ifconfig enP1p5s0f0 mtu 1500

ifconfig enP1p5s0f0 up
```

Sample output:

```
ifconfig
enP1p5s0f0 Link encap:Ethernet  HWaddr XX:XX:XX:YY:YY:
YY
        inet addr:169.254.227.235  Bcast:169.254.255.
255  Mask:255.255.0.0
        inet6 addr: fe80::533c:8ed6:557:3860/64 Scope:
Link
        UP BROADCAST RUNNING MULTICAST  **MTU:1500**
Metric:1
        RX packets:19 errors:0 dropped:0 overruns:0
frame:0
        TX packets:36 errors:0 dropped:0 overruns:0
carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:3416 (3.3 KiB)  TX bytes:5559 (5.4
KiB)
        Interrupt:249
```

6.1 Bring up alternate hardware enablement

You can attach MAC/PHY components other than the hardware configuration provided by Qualcomm and bring them up. To replace QPS615 with other PCIe based MAC/PHY, see PCIe software support for QPS615 switch.

Note: You must obtain the MAC/PHY driver and firmware from the respective vendor. Qualcomm isn't responsible for these configuration changes.

Retain QPS615 PCIe and replace QEP8121/AQR113C

To retain QPS615 PCIe and replace QEP8121/AQR113C with other PHY components, do the following:

1. Based on the attached PHY recommendations, update all the parameters in the `arch/arm64/boot/dts/qcom/qcs6490-addons-rb3gen2.dtsi` file.
2. Compile the software.

   Sample code for QEP PHY:

```
qep_vreg: qep_vreg {
      compatible = "regulator-fixed";
      regulator-name = "qep_vreg";
      gpio = <&pm7325_gpios 8 0>;
      regulator-min-microvolt = <1800000>;
      regulator-max-microvolt = <1800000>;
      enable-active-high;
      };


qps615_eth1,qps615_eth1@pcie1_rp {
         reg = <0x100 0x0 0x0 0x0 0x0>;
         pinctrl-names = "default";
         pinctrl-0 = <&napa_intn_wol_sig>;
         qcom,phy-rst-gpio = <1>;
         interrupts-extended = <&tlmm 101 IRQ_TYPE_EDGE_
FALLING>;
         interrupt-names = "wol_irq";
         phy-supply = <&qep_vreg>;
         qcom,phy-rst-delay-us = <20000>;
         #address-cells = <1>;
         #size-cells = <1>;
      };
```

   After flashing the modified software, the QPS615 driver scans the physical devices connected to it and matches the device tree information in the `qcs6490-addons-rb3gen2.dtsi` file.

Note: A PHY may fail to load due to mismatch between the configuration in the `.dtsi` file and actual recommendations for the PHY. In such cases, you must update the configuration in the `.dtsi` file accordingly.

6.2 AQR PHY enablement

Though AQR PHY for 10 GbE is optional, it's validated on reference RB3 Gen 2 Development Kit. You must flash the PHY firmware to the hardware only once. However, when the AQR PHY is detected, the PHY driver is enabled by default.

Qualcomm verified the following AQR PHY firmware on RB3 Gen 2 Development Kit:

- Marvell firmware: `AQR-G4_v5.6.1-QR_Marvell_NoSwap_XFI_ID44874_VER1836.cld`
- Marvell proprietary flashburn tool is recommended for flashing Marvell AQR113 PHY.
- Contact Marvell Technology, Inc. to obtain the AQR PHY firmware.

Detect the PHY

To detect the PHY, do the following:

1. Update the AQR PHY parameters in the `arch/arm64/boot/dts/qcom/qcs6490-addons-rb3gen2.dtsi` file.
2. Compile the software.

   Sample code for AQR PHY:

```
aqr_vreg: aqr_vreg {
          compatible = "regulator-fixed";
          regulator-name = "aqr_vreg";
          gpio = <&pm7250b_gpios 4 0>;
          regulator-min-microvolt = <1800000>;
          regulator-max-microvolt = <1800000>;
          enable-active-high;
      };

qps615_eth0,qps615_eth0@pcie1_rp {
          reg = <0x0 0x0 0x0 0x0 0x0>;
          pinctrl-names = "default";
          pinctrl-0 = <&aqr_intn_wol_sig>;
          qcom,phy-rst-gpio = <0>;
          interrupts-extended = <&tlmm 141 IRQ_TYPE_EDGE_
FALLING>;
          interrupt-names = "wol_irq";
          phy-supply = <&aqr_vreg>;
          qcom,phy-rst-delay-us = <221000>;
          #address-cells = <1>;
          #size-cells = <1>;
      };
```

QCS9075

Note:

Flash the corresponding CDT on the device to ensure that the correct configuration is used for Ethernet bringup.

To bring up Ethernet functionality on IQ-9075 EVK, do the following:

1. The IQ-9075 EVK comes with a MAC address. Skip this step if you choose to use the same MAC address.

   Alternatively, you can change the MAC address on the device.

   ```
   ifconfig <Interface_name> hw ether <MAC Address>
   ```

   For example:

   ```
   ifconfig eth0 hw ether XX:XX:XX:YY:YY:YY
   ```

   Sample output:

   ```
   eth0    Link encap:Ethernet  **HWaddr XX:XX:XX:
   YY:YY:YY**
           inet6 addr: fe80::34c9:27f8:b0b0:b036/64
   Scope:Link
           UP BROADCAST RUNNING MULTICAST  MTU:1500
    Metric:1
           RX packets:34 errors:0 dropped:0
   overruns:0 frame:0
           TX packets:453 errors:0 dropped:0
   overruns:0 carrier:0
           collisions:0 txqueuelen:1000
           RX bytes:10176 (9.9 KiB)  TX bytes:74668
   (72.9 KiB)
           Interrupt:36
   ```

2. When the device is connected to a public network, the DHCP server connected to the network assigns the IP address automatically. Skip this step if you choose to use the IP address assigned by the network.

Alternatively, you can assign a static IP address.

```
ifconfig <Interface_name> <ip address>
```

For example:

```
ifconfig eth0 192.168.1.1
```

Sample output:

```
eth0    Link encap:Ethernet  HWaddr XX:XX:XX:YY:
YY:YY
        inet6 addr: fe80::34c9:27f8:b0b0:b036/64
Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500
 Metric:1
        RX packets:34 errors:0 dropped:0
overruns:0 frame:0
        TX packets:453 errors:0 dropped:0
overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:10176 (9.9 KiB)  TX bytes:74668
(72.9 KiB)
        Interrupt:36
```

3. Configure the MTU size for the data packets over the Ethernet interface.

```
ifconfig <Interface_name> down

ifconfig <Interface_name> mtu <mtu_size>

ifconfig <Interface_name> up
```

For example:

```
ifconfig eth0 down

ifconfig eth0 mtu 1500

ifconfig eth0 up
```

Sample output:

```
eth0    Link encap:Ethernet  HWaddr XX:XX:XX:YY:
YY:YY
        inet6 addr: fe80::34c9:27f8:b0b0:b036/64
Scope:Link
        UP BROADCAST RUNNING MULTICAST  **MTU:
1500**  Metric:1
        RX packets:34 errors:0 dropped:0
overruns:0 frame:0
        TX packets:453 errors:0 dropped:0
overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:10176 (9.9 KiB)  TX bytes:74668
(72.9 KiB)
        Interrupt:36
```

QCS8275

Note:

Flash the corresponding CDT on the device to ensure that the correct configuration is used for Ethernet bringup.

To bring up Ethernet functionality on IQ-8 Beta EVK, do the following:

1. The IQ-8 Beta EVK comes with a MAC address. Skip this step if you choose to use the same MAC address.

   Alternatively, you can modify the MAC address on the device.

   ```
   ifconfig <Interface_name> hw ether <MAC Address>
   ```

   For example:

   ```
   ifconfig eth0 hw ether XX:XX:XX:YY:YY:YY
   ```

   Sample output:

   ```
   eth0    Link encap:Ethernet  **HWaddr XX:XX:XX:
   YY:YY:YY**
           inet addr:192.168.1.1  Bcast:192.168.1.
   255  Mask:255.255.255.0
           UP BROADCAST RUNNING MULTICAST  MTU:1500
   ```

```
 Metric:1
        RX packets:57 errors:0 dropped:0
overruns:0 frame:0
        TX packets:192 errors:0 dropped:0
overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:11403 (11.1 KiB)  TX bytes:
31620 (30.8 KiB)
        Interrupt:61
```

2. When the device is connected to a public network, the DHCP server connected to the network assigns the IP address automatically. Skip this step if you choose to use the IP address assigned by the network.

   Alternatively, you can assign a static IP address.

   ```
   ifconfig <Interface_name> <ip address>
   ```

   For example:

   ```
   ifconfig eth0 192.168.1.1
   ```

   Sample output:

   ```
   eth0    Link encap:Ethernet  HWaddr XX:XX:XX:YY:
   YY:YY
           **inet addr:192.168.1.1**  Bcast:192.
   168.1.255  Mask:255.255.255.0
           UP BROADCAST RUNNING MULTICAST  MTU:1500
    Metric:1
           RX packets:57 errors:0 dropped:0
   overruns:0 frame:0
           TX packets:192 errors:0 dropped:0
   overruns:0 carrier:0
           collisions:0 txqueuelen:1000
           RX bytes:11403 (11.1 KiB)  TX bytes:
   31620 (30.8 KiB)
           Interrupt:61
   ```

3. Configure the MTU size for the data packets over the Ethernet interface.

```
ifconfig <Interface_name> down

ifconfig <Interface_name> mtu <mtu_size>

ifconfig <Interface_name> up
```

For example:

```
ifconfig eth0 down

ifconfig eth0 mtu 1500

ifconfig eth0 up
```

Sample output:

```
eth0    Link encap:Ethernet  HWaddr XX:XX:XX:YY:
YY:YY
        inet addr:192.168.1.1  Bcast:192.168.1.
255  Mask:255.255.255.0
        UP BROADCAST RUNNING MULTICAST  **MTU:
1500**  Metric:1
        RX packets:57 errors:0 dropped:0
overruns:0 frame:0
        TX packets:192 errors:0 dropped:0
overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:11403 (11.1 KiB)  TX bytes:
31620 (30.8 KiB)
        Interrupt:61
```

7 Configure Ethernet features

QCS6490

7.1 Configure link speed

You can configure link speed from the supported link modes in the `ethtool` command output.

```
ethtool -s [device_name] autoneg [on/off] speed [10/100/1000/
2500] duplex [full]
```

For example:

```
ethtool -s enP1p5s0f0 autoneg on speed 2500 duplex full
```

7.2 Configure energy efficient Ethernet

Note: EEE feature is supported only on QEP8121 PHY.

You can control EEE by performing certain functions such as verify the status of EEE and enabling or disabling EEE.

To configure EEE, do the following:

1. Verify the status of EEE.

   ```
   ethtool --show-eee [interface]
   ```

   For example:

   ```
   ethtool --show-eee enP1p5s0f1
   ```

   Sample output:

```
EEE settings for enP1p5s0f1:
EEE status: disabled
Tx LPI: disabled
Supported EEE link modes:  1000baseT/Full
                           10000baseT/Full
                           1000baseKX/Full
                           10000baseKX4/Full
                           10000baseKR/Full
Advertised EEE link modes:  Not reported
Link partner advertised EEE link modes:  Not reported
```

2. Enable EEE.

```
ethtool --set-eee [interface] eee on
```

For example:

```
ethtool --set-eee enP1p5s0f1 eee on
```

Sample output:

```
EEE settings for enP1p5s0f1:
EEE status: enabled - inactive
Tx LPI: 17 (us)
Supported EEE link modes:  100baseT/Full
                           1000baseT/Full
Advertised EEE link modes: 100baseT/Full
                           1000baseT/Full
Link partner advertised EEE link modes: Not reported
```

3. Disable EEE.

```
ethtool --set-eee [interface] eee off
```

For example:

```
ethtool --set-eee enP1p5s0f1 eee off
```

Sample output:

```
EEE settings for enP1p5s0f1:
EEE status: disabled
Tx LPI: 17 (us)
Supported EEE link modes:  100baseT/Full
                           1000baseT/Full
Advertised EEE link modes: 100baseT/Full
                           1000baseT/Full
Link partner advertised EEE link modes: Not reported
```

7.3 Verify preconfigured MAC address

QPS615 is a PCIe switch on RB3 Gen 2 Development Kit. It doesn't have an electrically erasable programmable read only memory (EEPROM) to store the MAC address permanently. However, the MAC address is programmed and stored at a persistent path on the device.

To verify the preconfigured MAC address, do the following:

1. Verify the configuration of the interface.

```
ifconfig
```

Sample output:

```
enP1p5s0f0 Link encap:Ethernet  HWaddr XX:XX:XX:YY:YY:YY
          inet addr:169.254.227.235  Bcast:169.254.255.255
Mask:255.255.0.0
          inet6 addr: fe80::533c:8ed6:557:3860/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:19 errors:0 dropped:0 overruns:0 frame:0
          TX packets:36 errors:0 dropped:0 overruns:0 carrier:
0
          collisions:0 txqueuelen:1000
          RX bytes:3416 (3.3 KiB)  TX bytes:5559 (5.4 KiB)
          Interrupt:249
```

The MAC address is stored in the `config.ini` file and is available at `/var/persist` of the device.

2. Verify whether the `config.ini` file is available on the device.

```
ls /var/persist/
```

3. Verify the content of the `config.ini` file.

```
cat /var/persist/config.ini
```

Sample output:

```
#MAC ID configuration, For Test purpose only
MDIOBUSID1: 1: MAC_ID01: XX:XX:XX:YY:YY:YY
```

7.4 Retain and store MAC address

Whenever the device reboots, the MAC address configuration `config.ini` file in the persistent path `/var/persist` is retained. However, while upgrading the software build, if the **Erase all before download** option is selected, then the configuration file is removed from the device. In such cases, the software assigns a random MAC address.

To retain the `config.ini` file and store the MAC address in a location other than `/var/persist`, do the following:

1. Back up the file to a local path.

```
scp  root@<device_ip_address>:/var/persist/config.ini .
```

2. Restore the backed-up file after upgrading the software build.

```
scp config.ini root@<device_ip_address>:/var/persit/
```

Note: When prompted for a password, enter `oelinux123` to authenticate the file transfer via the secure copy protocol (SCP).

---

3. To store the MAC address in a location other than `/var/persist`, update the EMAC driver software with the new path in the following source code.

```
sources/data-eth/drivers/qps615/src/tc956xmac_main.c
ret = kernel_read_file_from_path("/var/persist/config.ini", &
data, &size, 1000, READING_POLICY);
```

QCS9075

7.5 Configure link speed

You can configure link speed from the supported link modes in the `ethtool` command output.

```
ethtool -s [device_name] autoneg [on/off] speed [10/100/1000]
duplex [full]
```

For example:

```
ethtool -s eth0 autoneg on speed 1000 duplex full
```

QCS8275

7.6 Configure link speed

You can configure link speed from the supported link modes in the `ethtool` command output.

```
ethtool -s [device_name] autoneg [on/off] speed [10/100/1000/
2500] duplex [full]
```

For example:

```
ethtool -s eth0 autoneg on speed 2500 duplex full
```

8 Debug Ethernet issues

You can use the following log types to log and debug issues related to Ethernet.

Log type	Purpose
`dmesg`	Debug issues related to the kernel driver
`tcpdump`	Verify the packet transfer

To debug the issues that may occur during Ethernet bringup, do the following:

1. Collect the `dmesg` logs to debug the issues related to kernel driver.

   ```
   dmesg > /var/log/dmesg_logs.txt
   ```

2. Collect the `tcpdump` logs to verify the packet transfer.

   ```
   tcpdump -i any -s 0 -w /data/tcpdump.pcap
   ```

3. Pull the file after the test.

   ```
   scp  root@<device_ip_address>:/data/tcpdump.pcap .
   ```

   ```
   scp  root@<device_ip_address>:/var/log/dmesg_logs.txt .
   ```

   Note: When prompted for a password, enter `oelinux123` to authenticate the file transfer via SCP.

4. Collect the output from ethtool, ifconfig, netstat, and IP route tables for debugging.

   For more information on these tools, see Tools for Ethernet operations.

9 References

9.1 Related documents

Title	Number
Qualcomm Technologies, Inc.	
Qualcomm RB3 Gen 2 Development Kit User Guide	80-70018-251
Qualcomm Dragonwing IQ-9075 Evaluation Kit User Guide	80-73418-123
Qualcomm Linux Build Guide	80-70018-254
Qualcomm Linux Kernel Guide	80-70018-3
Qualcomm Linux Interfaces Guide	80-70018-8

9.2 Acronyms and terms

Acronym or term	Definition
APSS	Application processor subsytem
DHCP	Dynamic host configuration protocol
EEE	Energy Efficient Ethernet
EEPROM	Electrically erasable programmable read only memory
EMAC	Ethernet media access control
EVK	Evaluation kit
GbE	Gigabit Ethernet
IP	Internet protocol
Kconfig	Kernel configuration
LAN	Local area network
LPI	Low-power idle
MAC	Media access control
MDIO	Management data input/output
MTU	Maximum transmission unit
netstat	Network statistics
NIC	Network interface controller
PCIe	Peripheral component interconnect express
PHY	Physical layer
PMD	Poll mode driver
SRIOV	Single root I/O virtualization
VF	Virtual function
WAN	Wide area network

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