Rockchip RV1126 GMAC TEST Report

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前言

概述

本文测试报告仅提供内部使用。

产品版本

芯片名称	内核版本
RV1126	Linux 4.19

读者对象

本文档（本指南）主要适用于以下工程师：

技术支持工程师 软件开发工程师

修订记录

版本号	作者	修改日期	修改说明
V1.0.0	吴达超	2020-03-31	初始版本

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1 Clock 配置

1.1 RGMII mode

下面以 m1 为例子

1.1.1 PLL output 25M for PHY, PLL output 125M for TX_CLK

```
    assigned-clocks = <&cru CLK_GMAC_SRC>, <&cru CLK_GMAC_TX_RX>, <&cru CLK_GMAC_ETHERNET_OUT>;
    assigned-clock-parents = <&cru CLK_GMAC_SRC_M1>, <&cru RGMII_MODE_CLK>;
    assigned-clock-rates = <125000000>, <0>, <25000000>;

    pinctrl-names = "default";
    pinctrl-0 = <&rgmiim1_pins &clk_out_ethernetm1_pins>;
```

1.1.2 PLL output 25M for PHY, RGMII_CLK input 125M for TX_CLK

```
diff --git a/arch/arm/boot/dts/rv11xx-evb-v10.dtsi b/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
index 3cfc5aa2d3bc..1f42c9a93349 100644
--- a/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
+++ b/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
@@ -480,12 +480,12 @@
        /* Reset time is 20ms, 100ms for rtl8211f */
        snps,reset-delays-us = <0 20000 100000>;

-       assigned-clocks = <&cru CLK_GMAC_SRC>, <&cru CLK_GMAC_TX_RX>, <&cru CLK_GMAC_ETHERNET_OUT>;
-       assigned-clock-parents = <&cru CLK_GMAC_SRC_M1>, <&cru RGMII_MODE_CLK>;
-       assigned-clock-rates = <125000000>, <0>, <25000000>;
+       assigned-clocks = <&cru CLK_GMAC_RGMII_M1>, <&cru CLK_GMAC_SRC_M1>, <&cru CLK_GMAC_SRC>, <&cru CLK_GMAC_TX_RX>, <&cru CLK_GMAC_ETHERNET_OUT>;
+       assigned-clock-parents = <&gmac_clkini_m1>, <&cru CLK_GMAC_RGMII_M1>, <&cru CLK_GMAC_SRC_M1>, <&cru RGMII_MODE_CLK>;
+       assigned-clock-rates = <0>, <0>, <0>, <0>, <25000000>;

        pinctrl-names = "default";
-       pinctrl-0 = <&rgmiim1_pins &clk_out_ethernetm1_pins>;
+       pinctrl-0 = <&rgmiim1_pins &gmac_clk_m1_pins &clk_out_ethernetm1_pins>;

        tx_delay = <0x2a>;
        rx_delay = <0x1a>;
@@ -494,6 +494,10 @@
        status = "okay";
 };

+&gmac_clkini_m1{
+       clock-frequency = <125000000>;
+};
+
```

1.1.3 Crytal 25M for PHY, PLL output 125M for TX_CLK

```
diff --git a/arch/arm/boot/dts/rv11xx-evb-v10.dtsi b/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
index 3cfc5aa2d3bc..70cf6bcf5b62 100644
--- a/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
+++ b/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
@@ -480,12 +480,12 @@
        /* Reset time is 20ms, 100ms for rtl8211f */
        snps,reset-delays-us = <0 20000 100000>;

-       assigned-clocks = <&cru CLK_GMAC_SRC>, <&cru CLK_GMAC_TX_RX>, <&cru
CLK_GMAC_ETHERNET_OUT>;
+       assigned-clocks = <&cru CLK_GMAC_SRC>, <&cru CLK_GMAC_TX_RX>;
        assigned-clock-parents = <&cru CLK_GMAC_SRC_M1>, <&cru RGMII_MODE_CLK>;
-       assigned-clock-rates = <125000000>, <0>, <25000000>;
+       assigned-clock-rates = <125000000>, <0>;

        pinctrl-names = "default";
-       pinctrl-0 = <&rgmiim1_pins &clk_out_ethernetm1_pins>;
+       pinctrl-0 = <&rgmiim1_pins>;

        tx_delay = <0x2a>;
        rx_delay = <0x1a>;
```

1.1.4 Crytal 25M for PHY, RGMII_CLK input 125M for TX_CLK

```
diff --git a/arch/arm/boot/dts/rv11xx-evb-v10.dtsi b/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
index 3cfc5aa2d3bc..7fb991780746 100644
--- a/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
+++ b/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
@@ -480,12 +480,12 @@
        /* Reset time is 20ms, 100ms for rtl8211f */
        snps,reset-delays-us = <0 20000 100000>;

-       assigned-clocks = <&cru CLK_GMAC_SRC>, <&cru CLK_GMAC_TX_RX>, <&cru CLK_GMAC_ETHERNET_OUT>;
-       assigned-clock-parents = <&cru CLK_GMAC_SRC_M1>, <&cru RGMII_MODE_CLK>;
-       assigned-clock-rates = <125000000>, <0>, <25000000>;
+       assigned-clocks = <&cru CLK_GMAC_RGMII_M1>, <&cru CLK_GMAC_SRC_M1>, <&cru CLK_GMAC_SRC>, <&cru CLK_GMAC_TX_RX>;
+       assigned-clock-parents = <&gmac_clkini_m1>, <&cru CLK_GMAC_RGMII_M1>, <&cru CLK_GMAC_SRC_M1>, <&cru RGMII_MODE_CLK>;
+       assigned-clock-rates = <0>, <0>, <0>, <0>;

        pinctrl-names = "default";
-       pinctrl-0 = <&rgmiim1_pins &clk_out_ethernetm1_pins>;
+       pinctrl-0 = <&rgmiim1_pins &gmac_clk_m1_pins>;

        tx_delay = <0x2a>;
        rx_delay = <0x1a>;
@@ -494,6 +494,10 @@
        status = "okay";
 };

+&gmac_clkini_m1{
+       clock-frequency = <125000000>;
+};
+
 &i2c0 {
        status = "okay";
        clock-frequency = <100000>;
```

1.2 RMII mode

下面以 m0 为例子

1.2.1 RMII output mode

```
diff --git a/arch/arm/boot/dts/rv11xx-evb-v10.dtsi b/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
index 38a054176bf8..4a85e4a4c6f9 100644
--- a/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
+++ b/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
@@ -472,20 +472,20 @@
 };

 &gmac {
-       phy-mode = "rgmii";
-       clock_in_out = "input";
+       phy-mode = "rmii";
+       clock_in_out = "output";

-       snps,reset-gpio = <&gpio2 RK_PB1 GPIO_ACTIVE_LOW>;
+       snps,reset-gpio = <&gpio3 RK_PA6 GPIO_ACTIVE_LOW>;
        snps,reset-active-low;
        /* Reset time is 20ms, 100ms for rtl8211f */
        snps,reset-delays-us = <0 20000 100000>;

-       assigned-clocks = <&cru CLK_GMAC_SRC>, <&cru CLK_GMAC_ETHERNET_OUT>;
-       assigned-clock-parents = <&cru CLK_GMAC_SRC_M1>;
-       assigned-clock-rates = <125000000>, <25000000>;
+       assigned-clocks = <&cru CLK_GMAC_TX_RX>, <&cru CLK_GMAC_SRC>;
+       assigned-clock-rates = <0>, <50000000>;
+       assigned-clock-parents = <&cru RMII_MODE_CLK>;

        pinctrl-names = "default";
-       pinctrl-0 = <&rgmiim1_pins &clk_out_ethernetm1_pins>;
+       pinctrl-0 = <&rmiim0_pins &gmac_clk_m0_drv_level0_pins>;

-       tx_delay = <0x2a>;
-        rx_delay = <0x1a>;
};
```

1.2.2 RMII input mode

```
diff --git a/arch/arm/boot/dts/rv11xx-evb-v10.dtsi b/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
index 38a054176bf8..4a140511aacd 100644
--- a/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
+++ b/arch/arm/boot/dts/rv11xx-evb-v10.dtsi
@@ -471,21 +471,25 @@
        status = "okay";
 };

 &gmac {
-       phy-mode = "rgmii";
-       clock_in_out = "input";
+       phy-mode = "rmii";
+       clock_in_out = "output";

-       snps,reset-gpio = <&gpio2 RK_PB1 GPIO_ACTIVE_LOW>;
+       snps,reset-gpio = <&gpio3 RK_PA6 GPIO_ACTIVE_LOW>;
        snps,reset-active-low;
        /* Reset time is 20ms, 100ms for rtl8211f */
        snps,reset-delays-us = <0 20000 100000>;

-       assigned-clocks = <&cru CLK_GMAC_SRC>, <&cru CLK_GMAC_ETHERNET_OUT>;
-       assigned-clock-parents = <&cru CLK_GMAC_SRC_M1>;
-       assigned-clock-rates = <125000000>, <25000000>;
+       assigned-clocks = <&cru CLK_GMAC_SRC_M0>, <&cru CLK_GMAC_SRC>, <&cru
CLK_GMAC_TX_RX>;
+       assigned-clock-rates = <0>, <50000000>;
+       assigned-clock-parents = <&cru CLK_GMAC_RGMII_M0>, <&cru CLK_GMAC_SRC_M0>, <&cru
RMII_MODE_CLK>;

        pinctrl-names = "default";
-       pinctrl-0 = <&rgmiim1_pins &clk_out_ethernetm1_pins>;
+       pinctrl-0 = <&rmiim0_pins &gmac_clk_m0_pins>;

-       tx_delay = <0x2a>;
-        rx_delay = <0x1a>;
};
```

2 默认代码性能测试

2.1 TCP 测试

2.1.1 iperf2

- CPU 1G, DDR3 1000M, TCP

```
[root@Puma:/]# iperf -c 192.168.1.102 -i 1 -t 10 -w 400K
------------------------------------------------------------
Client connecting to 192.168.1.102, TCP port 5001
TCP window size:  320 KByte (WARNING: requested  400 KByte)
------------------------------------------------------------
[  3] local 192.168.1.100 port 34890 connected with 192.168.1.102 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 1.0 sec   113 MBytes   949 Mbits/sec
[  3]  1.0- 2.0 sec   113 MBytes   949 Mbits/sec
[  3]  2.0- 3.0 sec   113 MBytes   950 Mbits/sec
[  3]  3.0- 4.0 sec   113 MBytes   949 Mbits/sec
[  3]  4.0- 5.0 sec   113 MBytes   949 Mbits/sec
[  3]  5.0- 6.0 sec   113 MBytes   950 Mbits/sec
[  3]  6.0- 7.0 sec   113 MBytes   948 Mbits/sec
[  3]  7.0- 8.0 sec   113 MBytes   950 Mbits/sec
[  3]  8.0- 9.0 sec   113 MBytes   949 Mbits/sec
[  3]  9.0-10.0 sec   113 MBytes   949 Mbits/sec
[  3]  0.0-10.0 sec  1.10 GBytes   949 Mbits/sec
```

- CPU 1.5G, DDR3 1000M, TCP

```
[root@Puma:/]# iperf -c 192.168.1.102 -i 1 -t 100 -w 400K
CPU:   0% usr   4% sys   0% nic  90% idle   0% io   0% irq   4% sirq
Load average: 0.00 0.00 0.00 1/99 647
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  644   582 root     S    22984   2%   2% iperf -c 192.168.1.102 -i 1 -t 100 -w
  588   573 root     S       97m  10%   0% rknn_server
  560     1 root     S    31548   3%   0% /usr/bin/adbd
  502     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  498     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  490     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  509     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  101     1 root     S     2968   0%   0% /sbin/udevd -d
  454     1 dbus     S     2820   0%   0% dbus-daemon --system
  521     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
   91     1 root     S     2372   0%   0% /sbin/syslogd -n
   94     1 root     S     2372   0%   0% /sbin/klogd -n
  582     1 root     S     2372   0%   0% -/bin/sh
  573     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  647   582 root     R     2372   0%   0% top
  517     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  581     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
    9     2 root     SW       0   0%   0% [ksoftirqd/0]
[  3]  2.0- 3.0 sec   113 MBytes   950 Mbits/sec
[  3]  3.0- 4.0 sec   113 MBytes   949 Mbits/sec
[  3]  4.0- 5.0 sec   113 MBytes   949 Mbits/sec
```

2.1.2 iperf3

- CPU 1G, DDR3 1000M, TCP

```
[root@Puma:/]# iperf3 -c 192.168.1.102 -i 1 -t 100 -w 300K &
[root@Puma:/]# Connecting to host 192.168.1.102, port 5201
[  4] local 192.168.1.100 port 56858 connected to 192.168.1.102 port 5201
Mem: 73448K used, 953792K free, 532K shrd, 3120K buff, 37904K cached
CPU:   0% usr   7% sys   0% nic  84% idle   0% io   0% irq   6% sirq
Load average: 0.19 0.05 0.01 1/111 627
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  623   587 root     R     2524   0%   6% iperf3 -c 192.168.1.102 -i 1 -t 100 -w
  591   578 root     S      97m  10%   0% rknn_server
  627   587 root     R     2372   0%   0% top
  565     1 root     S    31548   3%   0% /usr/bin/adbd
  508     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  504     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  496     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  514     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  106     1 root     S     2968   0%   0% /sbin/udevd -d
  460     1 dbus     S     2820   0%   0% dbus-daemon --system
  526     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
   96     1 root     S     2372   0%   0% /sbin/syslogd -n
   99     1 root     S     2372   0%   0% /sbin/klogd -n
  578     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  587     1 root     S     2372   0%   0% -/bin/sh
  522     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  586     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
   53     2 root     IW       0   0%   0% [kworker/2:1-mm_]
[  4]  38.00-39.00  sec   113 MBytes   949 Mbits/sec    0    473 KBytes
[  4]  39.00-40.00  sec   113 MBytes   949 Mbits/sec    0    473 KBytes
[  4]  40.00-41.00  sec   113 MBytes   949 Mbits/sec    0    473 KBytes
[  4]  41.00-42.00  sec   113 MBytes   948 Mbits/sec    0    473 KBytes
```

- CPU 1.5G, DDR3 1000M, TCP

```
[root@Puma:/]# iperf3 -c 192.168.1.102 -i 1 -t 100 -w 300K
[root@Puma:/]# Connecting to host 192.168.1.102, port 5201
[  4] local 192.168.1.100 port 56858 connected to 192.168.1.102 port 5201
Mem: 73956K used, 953288K free, 532K shrd, 3216K buff, 37976K cached
CPU:   0% usr   3% sys   0% nic  89% idle   0% io   0% irq   5% sirq
Load average: 0.02 0.01 0.00 1/103 641
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  640   588 root     S     2524   0%   4% iperf3 -c 192.168.1.102 -i 1 -t 100 -w
  594   579 root     S      97m  10%   0% rknn_server
  641   588 root     R     2372   0%   0% top
  566     1 root     S    31548   3%   0% /usr/bin/adbd
  508     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  504     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  496     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  515     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  106     1 root     S     2944   0%   0% /sbin/udevd -d
  460     1 dbus     S     2820   0%   0% dbus-daemon --system
  527     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
  588     1 root     S     2372   0%   0% -/bin/sh
   96     1 root     S     2372   0%   0% /sbin/syslogd -n
   99     1 root     S     2372   0%   0% /sbin/klogd -n
  579     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  523     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  587     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
   53     2 root     IW       0   0%   0% [kworker/2:1-mm_]
[  4]  16.00-17.00  sec   113 MBytes   949 Mbits/sec    0    318 KBytes
[  4]  17.00-18.00  sec   113 MBytes   949 Mbits/sec    0    318 KBytes
[  4]  18.00-19.00  sec   113 MBytes   948 Mbits/sec    0    318 KBytes
 [  4]  19.00-20.00  sec   113 MBytes   950 Mbits/sec    0    318 KBytes
```

2.2 UDP 测试

2.2.1 iperf2

- CPU 1G, DDR3 1000M, UDP

```
[root@Puma:/]# iperf -c 192.168.1.102 -i 1 -t 10 -w 400K -u -b 1000M
------------------------------------------------------------
Client connecting to 192.168.1.102, UDP port 5001
Sending 1470 byte datagrams, IPG target: 11.22 us (kalman adjust)
UDP buffer size:  320 KByte (WARNING: requested  400 KByte)
------------------------------------------------------------
[  3] local 192.168.1.101 port 37889 connected with 192.168.1.102 port 5001
[   16.017222] random: crng init done
[   16.017548] random: 1 urandom warning(s) missed due to ratelimiting
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 1.0 sec  83.9 MBytes   703 Mbits/sec
[  3]  1.0- 2.0 sec  83.5 MBytes   701 Mbits/sec
[  3]  2.0- 3.0 sec  83.4 MBytes   700 Mbits/sec
[  3]  3.0- 4.0 sec  83.5 MBytes   701 Mbits/sec
[  3]  4.0- 5.0 sec  83.5 MBytes   701 Mbits/sec
[  3]  5.0- 6.0 sec  83.4 MBytes   700 Mbits/sec
[  3]  6.0- 7.0 sec  83.5 MBytes   701 Mbits/sec
[  3]  7.0- 8.0 sec  83.6 MBytes   701 Mbits/sec
[  3]  8.0- 9.0 sec  83.5 MBytes   701 Mbits/sec
[  3]  0.0-10.0 sec   836 MBytes   701 Mbits/sec
[  3] Sent 596294 datagrams
[  3] WARNING: did not receive ack of last datagram after 10 tries.
```

- CPU 1G, DDR3 1000M, UDP, -l 4000

```
[root@Puma:/]# iperf -c 192.168.1.102 -i 1 -t 10 -w 400K -u -b 1000M -l 4000
------------------------------------------------------------
Client connecting to 192.168.1.102, UDP port 5001
Sending 4000 byte datagrams, IPG target: 30.52 us (kalman adjust)
UDP buffer size:  320 KByte (WARNING: requested  400 KByte)
------------------------------------------------------------
[  3] local 192.168.1.101 port 43790 connected with 192.168.1.102 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0- 1.0 sec  96.8 MBytes   812 Mbits/sec
[  3]  1.0- 2.0 sec   114 MBytes   956 Mbits/sec
[  3]  2.0- 3.0 sec   114 MBytes   957 Mbits/sec
[  3]  3.0- 4.0 sec   114 MBytes   956 Mbits/sec
[  3]  4.0- 5.0 sec   114 MBytes   956 Mbits/sec
[  3]  5.0- 6.0 sec   114 MBytes   956 Mbits/sec
[  3]  6.0- 7.0 sec   114 MBytes   957 Mbits/sec
[  3]  7.0- 8.0 sec   114 MBytes   957 Mbits/sec
[  3]  8.0- 9.0 sec   114 MBytes   956 Mbits/sec
[  3]  9.0-10.0 sec   114 MBytes   957 Mbits/sec
[  3]  0.0-10.0 sec  1.10 GBytes   942 Mbits/sec
[  3] Sent 294351 datagrams
```

- CPU 1.5G, DDR3 1000M, UDP

```
[root@Puma:/]# iperf -c 192.168.1.102 -i 1 -t 10 -w 400K -u -b 1000M
CPU:   2% usr  21% sys   0% nic  56% idle   0% io   5% irq  13% sirq
Load average: 0.15 0.03 0.01 1/108 630
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  626   582 root     S    22984   2%  18% iperf -c 192.168.1.102 -i 1 -t 10 -w 4
  629   582 root     R     2372   0%   1% top
  588   573 root     S      97m  10%   0% rknn_server
  560     1 root     S    31548   3%   0% /usr/bin/adbd
  502     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  498     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  490     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  509     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  101     1 root     S     2968   0%   0% /sbin/udevd -d
  454     1 dbus     S     2820   0%   0% dbus-daemon --system
  521     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
   91     1 root     S     2372   0%   0% /sbin/syslogd -n
   94     1 root     S     2372   0%   0% /sbin/klogd -n
  582     1 root     S     2372   0%   0% -/bin/sh
  573     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  517     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  581     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
    9     2 root     SW       0   0%   0% [ksoftirqd/0]
[  3]  8.0- 9.0 sec   114 MBytes   957 Mbits/secer/2:1-mm_]
[  3]  9.0-10.0 sec   114 MBytes   957 Mbits/sec
[  3]  0.0-10.0 sec  1.11 GBytes   954 Mbits/sec
```

2.2.2 iperf3

- CPU 1.5G, DDR3 1000M, UDP

```
[root@Puma:/]# iperf3 -c 192.168.1.102 -i 1 -t 100 -w 300K -u -b 1000M
Connecting to host 192.168.1.102, port 5201
[  4] local 192.168.1.101 port 57686 connected to 192.168.1.102 port 5201
[ ID] Interval           Transfer     Bandwidth       Total Datagrams
[  4]   0.00-1.00   sec  80.4 MBytes   675 Mbits/sec  57752
[  4]   1.00-2.00   sec  80.6 MBytes   676 Mbits/sec  57867
[  4]   2.00-3.00   sec  80.4 MBytes   674 Mbits/sec  57735
[  4]   3.00-4.00   sec  80.2 MBytes   673 Mbits/sec  57616
[  4]   4.00-5.00   sec  80.4 MBytes   675 Mbits/sec  57774
[  4]   5.00-6.00   sec  80.2 MBytes   673 Mbits/sec  57634
[  4]   6.00-7.00   sec  80.2 MBytes   673 Mbits/sec  57624
[  4]   7.00-8.00   sec  80.4 MBytes   675 Mbits/sec  57753
[  4]   8.00-9.00   sec  80.5 MBytes   675 Mbits/sec  57784
[  4]   9.00-10.00  sec  80.3 MBytes   674 Mbits/sec  57675
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bandwidth       Jitter    Lost/Total Datagrams
[  4]   0.00-10.00  sec  1.76 GBytes   687 Mbits/sec  0.000 ms  0/1293819 (0%)

```

- CPU 1.5G, DDR3 1000M, UDP, -l 4000

```
[root@Puma:/]# iperf3 -c 192.168.1.100 -i 1 -t 10  -u -b 1000M -l 4000
Connecting to host 192.168.1.100, port 5201
[  4] local 192.168.1.101 port 39962 connected to 192.168.1.100 port 5201
[ ID] Interval           Transfer     Bandwidth       Total Datagrams
[  4]   0.00-1.00   sec   112 MBytes   937 Mbits/sec  29280
[  4]   1.00-2.00   sec   114 MBytes   956 Mbits/sec  29887
[  4]   2.00-3.00   sec   114 MBytes   956 Mbits/sec  29890
[  4]   3.00-4.00   sec   114 MBytes   956 Mbits/sec  29889
[  4]   4.00-5.00   sec   114 MBytes   957 Mbits/sec  29891
[  4]   5.00-6.00   sec   114 MBytes   956 Mbits/sec  29890
[  4]   6.00-7.00   sec   114 MBytes   956 Mbits/sec  29889
[  4]   7.00-8.00   sec   114 MBytes   956 Mbits/sec  29891
[  4]   8.00-9.00   sec   114 MBytes   956 Mbits/sec  29890
[  4]   9.00-10.00  sec   114 MBytes   956 Mbits/sec  29890
[ ID] Interval           Transfer     Bandwidth       Jitter    Lost/Total Datagrams
[  4]   0.00-10.00  sec  1.11 GBytes   955 Mbits/sec  0.008 ms  2/298287 (0.00067%)
[  4] Sent 298287 datagrams

```

2 TSO 测试

2. 1 关闭 TSO

```
[root@Puma:/]# ethtool -K eth0 tx-tcp-segmentation off
[root@Puma:/]# ethtool -K eth0 tx-tcp6-segmentation off
```

- iperf2 CPU 1.5G, DDR3 1000M, TCP

```
[root@Puma:/]# iperf -c 192.168.1.102 -i 1 -t 100 -w 400K
CPU:   0% usr   3% sys   0% nic  74% idle   0% io   3% irq  18% sirq
Load average: 0.03 0.02 0.00 1/100 658
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  655   582 root     S    22984   2%   4% iperf -c 192.168.1.102 -i 1 -t 100 -w
    9     2 root     SW       0   0%   2% [ksoftirqd/0]
  588   573 root     S      97m  10%   0% rknn_server
  658   582 root     R     2372   0%   0% top
  560     1 root     S    31548   3%   0% /usr/bin/adbd
  502     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  498     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  490     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  509     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  101     1 root     S     2968   0%   0% /sbin/udevd -d
  454     1 dbus     S     2820   0%   0% dbus-daemon --system
  521     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
   91     1 root     S     2372   0%   0% /sbin/syslogd -n
   94     1 root     S     2372   0%   0% /sbin/klogd -n
  582     1 root     S     2372   0%   0% -/bin/sh
  573     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  517     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  581     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
[  3] 13.0-14.0 sec   113 MBytes   948 Mbits/secer/3:0-mm_]
[root@Puma:/]# [  3] 14.0-15.0 sec   113 MBytes   951 Mbits/sec
 [  3] 15.0-16.0 sec   113 MBytes   949 Mbits/sec
 [  3] 16.0-17.0 sec   113 MBytes   949 Mbits/sec
 [  3] 17.0-18.0 sec   113 MBytes   949 Mbits/sec
655[  3] 18.0-19.0 sec   113 MBytes   949 Mbits/sec
```

- iperf3 CPU 1.0G, DDR3 1000M, TCP

```
[root@Puma:/]#  iperf3 -c 192.168.1.102 -i 1 -t 100 -w 300K
Mem: 74452K used, 952788K free, 536K shrd, 3852K buff, 38148K cached
CPU:   0% usr   7% sys   0% nic  72% idle   0% io   2% irq  17% sirq
Load average: 0.14 0.05 0.01 1/103 634
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  632   587 root     S     2524   0%  10% iperf3 -c 192.168.1.102 -i 1 -t 100 -w
    9     2 root     SW       0   0%   8% [ksoftirqd/0]
  634   587 root     R     2372   0%   3% top
  591   578 root     S      97m  10%   0% rknn_server
  565     1 root     S    31548   3%   0% /usr/bin/adbd
  508     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  504     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  496     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  514     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  106     1 root     S     2968   0%   0% /sbin/udevd -d
  460     1 dbus     S     2820   0%   0% dbus-daemon --system
  526     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
   96     1 root     S     2372   0%   0% /sbin/syslogd -n
   99     1 root     S     2372   0%   0% /sbin/klogd -n
  587     1 root     S     2372   0%   0% -/bin/sh
  578     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  522     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  586     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
[  4]  19.00-20.00  sec   113 MBytes   949 Mbits/sec    0    305 KBytes
[  4]  20.00-21.00  sec   113 MBytes   950 Mbits/sec    0    305 KBytes
```

2.2 TSO 开启

```
[root@Puma:/]# ethtool -K eth0 tx-tcp-segmentation on
[root@Puma:/]# ethtool -K eth0 tx-tcp6-segmentation on
```

- iperf2 CPU 1.5G, DDR3 1000M, TCP

```
[root@Puma:/]# iperf -c 192.168.1.102 -i 1 -t 100 -w 400K
CPU:   0% usr   4% sys   0% nic  90% idle   0% io   0% irq   4% sirq
Load average: 0.00 0.00 0.00 1/99 647
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  644   582 root     S    22984   2%   2% iperf -c 192.168.1.102 -i 1 -t 100 -w
  588   573 root     S      97m  10%   0% rknn_server
  560     1 root     S    31548   3%   0% /usr/bin/adbd
  502     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  498     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  490     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  509     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  101     1 root     S     2968   0%   0% /sbin/udevd -d
  454     1 dbus     S     2820   0%   0% dbus-daemon --system
  521     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
   91     1 root     S     2372   0%   0% /sbin/syslogd -n
   94     1 root     S     2372   0%   0% /sbin/klogd -n
  582     1 root     S     2372   0%   0% -/bin/sh
  573     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  647   582 root     R     2372   0%   0% top
  517     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  581     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
    9     2 root     SW       0   0%   0% [ksoftirqd/0]
[  3]  2.0- 3.0 sec   113 MBytes   950 Mbits/sec
[  3]  3.0- 4.0 sec   113 MBytes   949 Mbits/sec
[  3]  4.0- 5.0 sec   113 MBytes   949 Mbits/sec
```

- iperf3 CPU 1.5G, DDR3 1000M, TCP

```
[root@Puma:/]# iperf3 -c 192.168.1.102 -i 1 -t 100 -w 300K
CPU:   0% usr   3% sys   0% nic  90% idle   0% io   0% irq   5% sirq
Load average: 0.01 0.01 0.00 2/97 678
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  677   582 root     S     2524   0%   4% iperf3 -c 192.168.1.102 -i 1 -t 100 -w
  588   573 root     S      97m  10%   0% rknn_server
  678   582 root     R     2372   0%   0% top
  560     1 root     S    31548   3%   0% /usr/bin/adbd
  502     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  498     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  490     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  509     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  101     1 root     S     2968   0%   0% /sbin/udevd -d
  454     1 dbus     S     2820   0%   0% dbus-daemon --system
  521     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
  582     1 root     S     2372   0%   0% -/bin/sh
   91     1 root     S     2372   0%   0% /sbin/syslogd -n
   94     1 root     S     2372   0%   0% /sbin/klogd -n
  573     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  517     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  581     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
    9     2 root     SW       0   0%   0% [ksoftirqd/0]
[  4]   9.00-10.00  sec   113 MBytes   950 Mbits/sec    0    319 KBytes
[  4]  10.00-11.00  sec   113 MBytes   949 Mbits/sec    0    319 KBytes
[  4]  11.00-12.00  sec   113 MBytes   949 Mbits/sec    0    319 KBytes
[  4]  12.00-13.00  sec   113 MBytes   950 Mbits/sec    0    319 KBytes
```

- iperf3 CPU 1.0G, DDR3 1000M, TCP

```
[root@Puma:/]# iperf3 -c 192.168.1.102 -i 1 -t 100 -w 300K &
[root@Puma:/]# Connecting to host 192.168.1.102, port 5201
[  4] local 192.168.1.100 port 56876 connected to 192.168.1.102 port 5201
Mem: 87836K used, 939404K free, 536K shrd, 17568K buff, 38148K cached
CPU:   0% usr   5% sys   0% nic  85% idle   0% io   0% irq   7% sirq
Load average: 0.16 0.06 0.02 1/103 701
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  698   587 root     S     2524   0%   5% iperf3 -c 192.168.1.102 -i 1 -t 100 -w
  591   578 root     S      97m  10%   0% rknn_server
  699   587 root     R     2372   0%   0% top
  565     1 root     S    31548   3%   0% /usr/bin/adbd
  508     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  504     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  496     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  514     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  106     1 root     S     2968   0%   0% /sbin/udevd -d
  460     1 dbus     S     2820   0%   0% dbus-daemon --system
  526     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
  587     1 root     S     2372   0%   0% -/bin/sh
   96     1 root     S     2372   0%   0% /sbin/syslogd -n
   99     1 root     S     2372   0%   0% /sbin/klogd -n
  578     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  522     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  586     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
    9     2 root     SW       0   0%   0% [ksoftirqd/0]
[  4]  48.00-49.00  sec   113 MBytes   949 Mbits/sec    0    304 KBytes
[  4]  49.00-50.00  sec   113 MBytes   949 Mbits/sec    0    304 KBytes
```

从以上对比测试来看，TSO 开启，CPU IDLE 时间增加 15%左右。

3 USO 测试

patch for gso_size 1470

```
diff --git a/drivers/net/ethernet/stmicro/stmmac/stmmac_main.c
b/drivers/net/ethernet/stmicro/stmmac/stmmac_main.c
index 419fb60e9782..5b0469ea2dcd 100644
--- a/drivers/net/ethernet/stmicro/stmmac/stmmac_main.c
+++ b/drivers/net/ethernet/stmicro/stmmac/stmmac_main.c
@@ -4387,6 +4387,11 @@ int stmmac_dvr_probe(struct device *device,
                ndev->hw_features |= NETIF_F_TSO | NETIF_F_TSO6;
                if (priv->plat->has_gmac4)
                        ndev->hw_features |= NETIF_F_GSO_UDP_L4;
+
+               ndev->hw_features |= NETIF_F_GSO_PARTIAL;
+               ndev->gso_partial_features|= NETIF_F_GSO_UDP_L4;
+               ndev->features |= NETIF_F_GSO_UDP_L4;
+
                priv->tso = true;
                dev_info(priv->device, "TSO feature enabled\n");
        }
diff --git a/net/ipv4/udp.c b/net/ipv4/udp.c
index 0ef04cda1b27..4c8469619b16 100644
--- a/net/ipv4/udp.c
+++ b/net/ipv4/udp.c
@@ -993,6 +993,7 @@ int udp_sendmsg(struct sock *sk, struct msghdr *msg, size_t len)
                connected = 1;
        }

+       up->gso_size = 1470;
        ipcm_init_sk(&ipc, inet);
        ipc.gso_size = up->gso_size;
```

3.1 USO 关闭

```
ethtool -K eth0 tx-udp-segmentation off
```

3.1.1 iperf2

3.1.2 iperf3

- iperf3 CPU 1.5G, DDR3 1000M, -l 4000, UDP

```
[root@Puma:/]# iperf3 -c 192.168.1.101 -i 1 -t 100 -w 300K -u -b 1000M -l 4000
Mem: 72360K used, 954880K free, 412K shrd, 3392K buff, 38020K cached
CPU:   0% usr  26% sys   0% nic  56% idle   0% io   4% irq  12% sirq
Load average: 1.00 0.45 0.17 2/104 651
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  650   588 root     R     2400   0%  27% iperf3 -c 192.168.1.101 -i 1 -t 100 -w
  651   588 root     R     2372   0%   2% top
  592   579 root     S      97m  10%   0% rknn_server
  566     1 root     S    31548   3%   0% /usr/bin/adbd
  508     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  504     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  496     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  515     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  107     1 root     S     2952   0%   0% /sbin/udevd -d
  460     1 dbus     S     2820   0%   0% dbus-daemon --system
  527     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
  588     1 root     S     2372   0%   0% -/bin/sh
  100     1 root     S     2372   0%   0% /sbin/klogd -n
   97     1 root     S     2372   0%   0% /sbin/syslogd -n
  579     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  523     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  587     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
    9     2 root     SW       0   0%   0% [ksoftirqd/0]
[  4]   8.00-9.00   sec  77.4 MBytes   650 Mbits/sec  20303
[  4]   9.00-10.00  sec  77.6 MBytes   651 Mbits/sec  20344
[  4]  10.00-11.00  sec  77.6 MBytes   651 Mbits/sec  20333
```

- iperf3 CPU 1.5G, DDR3 1000M, -l 16000, UDP

```
Mem: 72984K used, 954256K free, 424K shrd, 3908K buff, 38040K cached
CPU:   0% usr  10% sys   0% nic  67% idle   0% io   5% irq  17% sirq
Load average: 0.36 0.55 0.35 2/103 663
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  662   588 root     R     2412   0%  10% iperf3 -c 192.168.1.101 -i 1 -t 100 -w
    9     2 root     SW       0   0%   5% [ksoftirqd/0]
  663   588 root     R     2372   0%   3% top
  592   579 root     S      97m  10%   0% rknn_server
  566     1 root     S    31548   3%   0% /usr/bin/adbd
  508     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  504     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  496     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  515     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  107     1 root     S     2952   0%   0% /sbin/udevd -d
  460     1 dbus     S     2820   0%   0% dbus-daemon --system
  527     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
  588     1 root     S     2372   0%   0% -/bin/sh
  100     1 root     S     2372   0%   0% /sbin/klogd -n
   97     1 root     S     2372   0%   0% /sbin/syslogd -n
  579     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  523     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  587     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
[  4]   3.00-4.00   sec   114 MBytes   957 Mbits/sec  7474
[  4]   4.00-5.00   sec   114 MBytes   957 Mbits/sec  7473
[  4]   5.00-6.00   sec   114 MBytes   957 Mbits/sec  7474
```

3.2 USO 开启

```
ethtool -K eth0 tx-udp-segmentation on
```

3.2.1 iperf2

3.2.2 iperf3

- iperf3 CPU 1.5G, DDR3 1000M, -l 4000, UDP

```
[root@Puma:/]# iperf3 -c 192.168.1.101 -i 1 -t 100 -w 300K -u -b 1000M -l 4000
Mem: 72652K used, 954588K free, 412K shrd, 3640K buff, 38024K cached
CPU:   2% usr  23% sys   0% nic  65% idle   0% io   2% irq   6% sirq
Load average: 0.61 0.63 0.29 2/105 656
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  654   588 root     R     2400   0%  25% iperf3 -c 192.168.1.101 -i 1 -t 100 -w
  592   579 root     S      97m  10%   0% rknn_server
  655   588 root     R     2372   0%   0% top
  566     1 root     S    31548   3%   0% /usr/bin/adbd
  508     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  504     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  496     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  515     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  107     1 root     S     2952   0%   0% /sbin/udevd -d
  460     1 dbus     S     2820   0%   0% dbus-daemon --system
  527     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
  588     1 root     S     2372   0%   0% -/bin/sh
  100     1 root     S     2372   0%   0% /sbin/klogd -n
   97     1 root     S     2372   0%   0% /sbin/syslogd -n
  579     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  523     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  587     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
    9     2 root     SW       0   0%   0% [ksoftirqd/0]
[  4]  11.00-12.00  sec  83.6 MBytes   702 Mbits/sec  21922
[  4]  12.00-13.00  sec  83.8 MBytes   703 Mbits/sec  21976
[  4]  13.00-14.00  sec  83.9 MBytes   704 Mbits/sec  21988
```

- iperf3 CPU 1.5G, DDR3 1000M, -l 16000, UDP

```
[root@Puma:/]# iperf3 -c 192.168.1.101 -i 1 -t 100 -w 300K -u -b 1000M -l 16000
Mem: 73168K used, 954072K free, 424K shrd, 3804K buff, 38036K cached
CPU:   0% usr   9% sys   0% nic  82% idle   0% io   0% irq   7% sirq
Load average: 0.43 0.60 0.34 1/103 660
  PID  PPID USER     STAT   VSZ %VSZ %CPU COMMAND
  659   588 root     S     2412   0%  12% iperf3 -c 192.168.1.101 -i 1 -t 100 -w
  592   579 root     S       97m  10%   0% rknn_server
  566     1 root     S    31548   3%   0% /usr/bin/adbd
  508     1 root     S     7660   1%   0% /usr/sbin/ntpd -g
  504     1 root     S     5772   1%   0% /usr/sbin/wpa_supplicant -u
  496     1 root     S     4416   0%   0% /usr/sbin/connmand -n
  515     1 avahi    S     3272   0%   0% avahi-daemon: running [Puma.local]
  107     1 root     S     2952   0%   0% /sbin/udevd -d
  460     1 dbus     S     2820   0%   0% dbus-daemon --system
  527     1 root     S     2496   0%   0% /usr/sbin/fcgiwrap -f -s unix:/run/fcg
    1     0 root     S     2372   0%   0% init
  588     1 root     S     2372   0%   0% -/bin/sh
  100     1 root     S     2372   0%   0% /sbin/klogd -n
   97     1 root     S     2372   0%   0% /sbin/syslogd -n
  660   588 root     R     2372   0%   0% top
  579     1 root     S     2372   0%   0% {start_rknn.sh} /bin/sh /usr/bin/start
  523     1 root     S     2232   0%   0% /usr/sbin/dropbear -R
  587     1 root     S     1736   0%   0% input-event-daemon -v /dev/input/event
    9     2 root     SW       0   0%   0% [ksoftirqd/0]
[  4]   6.00-7.00   sec   114 MBytes   957 Mbits/sec  7473
[  4]   7.00-8.00   sec   114 MBytes   957 Mbits/sec  7474
[  4]   8.00-9.00   sec   114 MBytes   957 Mbits/sec  7473
```

从以上测试看出 USO 开启后，CPU idle 时间增加，packet size 长度越长，idle 百分比增加越多。

4 Jumbro frame 测试

mtu: 9000

```
<pre>[root@Puma:/]# ping -s 9000 192.168.1.100
PING 192.168.1.100 (192.168.1.100) 9000(9028) bytes of data.
9008 bytes from 192.168.1.100: icmp_seq=1 ttl=64 time=0.784 ms
9008 bytes from 192.168.1.100: icmp_seq=2 ttl=64 time=0.675 ms
9008 bytes from 192.168.1.100: icmp_seq=3 ttl=64 time=0.666 ms
9008 bytes from 192.168.1.100: icmp_seq=4 ttl=64 time=0.656 ms
9008 bytes from 192.168.1.100: icmp_seq=5 ttl=64 time=0.677 ms
9008 bytes from 192.168.1.100: icmp_seq=6 ttl=64 time=0.637 ms
9008 bytes from 192.168.1.100: icmp_seq=7 ttl=64 time=0.641 ms
9008 bytes from 192.168.1.100: icmp_seq=8 ttl=64 time=0.692 ms
9008 bytes from 192.168.1.100: icmp_seq=9 ttl=64 time=0.656 ms
```

5 PTP1588 测试

patch for ptp

```
https://10.10.10.29/c/rk/kernel/+/98577
```

5.1 PC master and RV1126 slave

```
david@thinkpad-p51:~/work/develop-4.19/kernel$ sudo ptp4l -i enp0s31f6 -m -H
ptp4l[1790161.443]: selected /dev/ptp0 as PTP clock
ptp4l[1790161.443]: port 1: INITIALIZING to LISTENING on INIT_COMPLETE
ptp4l[1790161.443]: port 0: INITIALIZING to LISTENING on INIT_COMPLETE
ptp4l[1790168.489]: port 1: LISTENING to MASTER on ANNOUNCE_RECEIPT_TIMEOUT_EXPIRES
ptp4l[1790168.489]: selected local clock 54e1ad.fffe.dfa454 as best master
ptp4l[1790168.490]: assuming the grand master role
```

```
[root@Puma:/]# ptp4l -i eth0 -m -H -s
ptp4l[39.868]: selected /dev/ptp0 as PTP clock
[   39.871092] rk_gmac-dwmac ffc40000.ethernet eth0: stmmac_hwtstamp_set config flags:0x0, tx_type:0x1, rx_filter:0xc
[   39.872029] stmmac_hwtstamp_set, value: 0x17e03
ptp4l[39.870]: port 1: INITIALIZING to LISTENING on INIT_COMPLETE
ptp4l[39.871]: port 0: INITIALIZING to LISTENING on INIT_COMPLETE
ptp4l[41.251]: port 1: new foreign master 54e1ad.fffe.dfa454-1
[   43.817340] rk_gmac-dwmac ffc40000.ethernet eth0: stmmac_hwtstamp_set config flags:0x0, tx_type:0x1, rx_filter:0xc
[   43.818262] stmmac_hwtstamp_set, value: 0x17e03
ptp4l[45.251]: selected best master clock 54e1ad.fffe.dfa454
ptp4l[45.251]: port 1: LISTENING to UNCALIBRATED on RS_SLAVE
ptp4l[49.251]: master offset      -1608 s0 freq      +0 path delay      5691
ptp4l[50.251]: master offset      -5579 s0 freq      +0 path delay      9435
ptp4l[51.251]: master offset      -4831 s2 freq    +748 path delay      9435
ptp4l[51.251]: port 1: UNCALIBRATED to SLAVE on MASTER_CLOCK_SELECTED
ptp4l[52.251]: master offset      12189 s2 freq  +12937 path delay      7563
ptp4l[53.251]: master offset      14413 s2 freq  +18818 path delay      8287
ptp4l[54.251]: master offset      10712 s2 freq  +19441 path delay      8861
ptp4l[55.251]: master offset       7185 s2 freq  +19127 path delay      8861
ptp4l[56.251]: master offset       3234 s2 freq  +17332 path delay      9435
ptp4l[57.251]: master offset       1787 s2 freq  +16855 path delay      9454
ptp4l[58.251]: master offset        785 s2 freq  +16389 path delay      9454
ptp4l[59.251]: master offset         89 s2 freq  +15928 path delay      9473
ptp4l[60.251]: master offset         31 s2 freq  +15897 path delay      9454
ptp4l[61.251]: master offset        -71 s2 freq  +15804 path delay      9454
ptp4l[62.251]: master offset       -100 s2 freq  +15754 path delay      9406
ptp4l[63.251]: master offset        -27 s2 freq  +15797 path delay      9406
ptp4l[64.251]: master offset        -69 s2 freq  +15747 path delay      9395
ptp4l[65.251]: master offset         29 s2 freq  +15824 path delay      9395
ptp4l[66.251]: master offset        -73 s2 freq  +15731 path delay      9395
ptp4l[67.251]: master offset         32 s2 freq  +15814 path delay      9388
ptp4l[68.251]: master offset        -20 s2 freq  +15772 path delay      9388
ptp4l[69.251]: master offset       -104 s2 freq  +15682 path delay      9395
ptp4l[70.251]: master offset        -56 s2 freq  +15699 path delay      9395
ptp4l[71.251]: master offset         24 s2 freq  +15762 path delay      9388
ptp4l[72.251]: master offset         11 s2 freq  +15756 path delay      9374
ptp4l[73.251]: master offset        -13 s2 freq  +15735 path delay      9371
ptp4l[74.251]: master offset        -47 s2 freq  +15697 path delay      9378
ptp4l[75.252]: master offset         26 s2 freq  +15756 path delay      9378
ptp4l[76.252]: master offset         21 s2 freq  +15759 path delay      9381
ptp4l[77.252]: master offset        -32 s2 freq  +15712 path delay      9381
ptp4l[78.252]: master offset        -23 s2 freq  +15712 path delay      9370
ptp4l[79.252]: master offset        -25 s2 freq  +15703 path delay      9370
ptp4l[80.252]: master offset         48 s2 freq  +15768 path delay      9370
ptp4l[81.252]: master offset        -79 s2 freq  +15656 path delay      9370
ptp4l[82.252]: master offset        -31 s2 freq  +15680 path delay      9370
ptp4l[83.252]: master offset        -88 s2 freq  +15614 path delay      9375
ptp4l[84.252]: master offset         10 s2 freq  +15685 path delay      9375
ptp4l[85.252]: master offset         62 s2 freq  +15740 path delay      9371
ptp4l[86.252]: master offset        -65 s2 freq  +15632 path delay      9371
ptp4l[87.252]: master offset        -11 s2 freq  +15666 path delay      9365
```

```
ptp4l[88.252]: master offset        -15 s2 freq  +15659 path delay      9366
ptp4l[89.252]: master offset         58 s2 freq  +15728 path delay      9366
ptp4l[90.252]: master offset          1 s2 freq  +15688 path delay      9371
ptp4l[91.252]: master offset        -48 s2 freq  +15639 path delay      9393
ptp4l[92.252]: master offset        -76 s2 freq  +15597 path delay      9394
ptp4l[93.252]: master offset        -23 s2 freq  +15627 path delay      9389
ptp4l[94.252]: master offset          0 s2 freq  +15643 path delay      9389
ptp4l[95.252]: master offset         34 s2 freq  +15677 path delay      9403
ptp4l[96.252]: master offset          7 s2 freq  +15660 path delay      9403
ptp4l[97.252]: master offset        -79 s2 freq  +15577 path delay      9412
ptp4l[98.252]: master offset          2 s2 freq  +15634 path delay      9403
ptp4l[99.252]: master offset         11 s2 freq  +15643 path delay      9392
ptp4l[100.252]: master offset         9 s2 freq  +15645 path delay      9392
ptp4l[101.252]: master offset        13 s2 freq  +15651 path delay      9386
ptp4l[102.252]: master offset       -18 s2 freq  +15624 path delay      9390
ptp4l[103.252]: master offset        30 s2 freq  +15667 path delay      9390
ptp4l[104.252]: master offset        82 s2 freq  +15728 path delay      9386
ptp4l[105.252]: master offset       -45 s2 freq  +15626 path delay      9386
```

5.1 RV1126 master and PC slave

```
[root@Puma:/]# ptp4l -i eth0 -m -H
ptp4l[15.668]: selected /dev/ptp0 as PTP clock
ptp4l[15.670]: port 1: INITIALIZING to LISTENING on INIT_COMPLETE
ptp4l[15.670]: port 0: INITIALIZING to LISTENING on INIT_COMPLETE
ptp4l[22.120]: port 1: LISTENING to MASTER on ANNOUNCE_RECEIPT_TIMEOUT_EXPIRES
ptp4l[22.120]: selected local clock aadc46.fffe.5da6d9 as best master
ptp4l[22.121]: assuming the grand master role
```

```
david@thinkpad-p51:~/work/linuxptp/linuxptp$ sudo ptp4l -i enp0s31f6 -m -H -s
ptp4l[1879661.603]: selected /dev/ptp0 as PTP clock
ptp4l[1879661.603]: port 1: INITIALIZING to LISTENING on INIT_COMPLETE
ptp4l[1879661.603]: port 0: INITIALIZING to LISTENING on INIT_COMPLETE
ptp4l[1879662.249]: port 1: new foreign master aadc46.fffe.5da6d9-1
ptp4l[1879665.849]: selected best master clock aadc46.fffe.5da6d9
ptp4l[1879665.849]: port 1: LISTENING to UNCALIBRATED on RS_SLAVE
ptp4l[1879667.649]: master offset         49 s0 freq   -9515 path delay      9364
ptp4l[1879668.549]: master offset        128 s2 freq   -9436 path delay      9338
ptp4l[1879668.549]: port 1: UNCALIBRATED to SLAVE on MASTER_CLOCK_SELECTED
ptp4l[1879669.449]: master offset        256 s2 freq   -9180 path delay      9338
ptp4l[1879670.349]: master offset       -230 s2 freq   -9589 path delay      9338
ptp4l[1879671.249]: master offset       -399 s2 freq   -9827 path delay      9360
ptp4l[1879672.149]: master offset        142 s2 freq   -9406 path delay      9360
ptp4l[1879673.049]: master offset        232 s2 freq   -9273 path delay      9347
ptp4l[1879673.949]: master offset       -303 s2 freq   -9739 path delay      9347
ptp4l[1879674.849]: master offset       -267 s2 freq   -9794 path delay      9338
ptp4l[1879675.749]: master offset        327 s2 freq   -9280 path delay      9335
ptp4l[1879676.649]: master offset        405 s2 freq   -9104 path delay      9335
ptp4l[1879677.549]: master offset       -156 s2 freq   -9543 path delay      9335
ptp4l[1879678.449]: master offset       -178 s2 freq   -9612 path delay      9335
ptp4l[1879679.349]: master offset       -100 s2 freq   -9587 path delay      9335
ptp4l[1879680.249]: master offset        -73 s2 freq   -9590 path delay      9335
ptp4l[1879681.149]: master offset        -79 s2 freq   -9618 path delay      9344
ptp4l[1879682.049]: master offset        -76 s2 freq   -9639 path delay      9344
ptp4l[1879682.949]: master offset        -59 s2 freq   -9645 path delay      9329
ptp4l[1879683.849]: master offset        -31 s2 freq   -9634 path delay      9329
ptp4l[1879684.750]: master offset         22 s2 freq   -9591 path delay      9329
ptp4l[1879685.650]: master offset         -9 s2 freq   -9615 path delay      9337
ptp4l[1879686.550]: master offset        -31 s2 freq   -9640 path delay      9337
ptp4l[1879687.450]: master offset         -3 s2 freq   -9621 path delay      9337
ptp4l[1879688.350]: master offset        -15 s2 freq   -9634 path delay      9351
ptp4l[1879689.250]: master offset        113 s2 freq   -9511 path delay      9351
ptp4l[1879690.150]: master offset        115 s2 freq   -9475 path delay      9351
ptp4l[1879691.050]: master offset         43 s2 freq   -9512 path delay      9351
ptp4l[1879691.950]: master offset        124 s2 freq   -9418 path delay      9348
ptp4l[1879692.850]: master offset        137 s2 freq   -9368 path delay      9337
ptp4l[1879693.750]: master offset        268 s2 freq   -9196 path delay      9334
ptp4l[1879694.650]: master offset       -342 s2 freq   -9726 path delay      9334
ptp4l[1879695.550]: master offset       -162 s2 freq   -9648 path delay      9331
ptp4l[1879696.450]: master offset       -284 s2 freq   -9819 path delay      9331
ptp4l[1879697.350]: master offset        421 s2 freq   -9199 path delay      9317
ptp4l[1879698.250]: master offset        -92 s2 freq   -9586 path delay      9319
ptp4l[1879699.150]: master offset       -139 s2 freq   -9660 path delay      9319
ptp4l[1879700.050]: master offset        -67 s2 freq   -9630 path delay      9324
ptp4l[1879700.950]: master offset        -59 s2 freq   -9642 path delay      9319
ptp4l[1879701.850]: master offset        -81 s2 freq   -9682 path delay      9319
ptp4l[1879702.750]: master offset         -8 s2 freq   -9633 path delay      9324
ptp4l[1879703.650]: master offset         14 s2 freq   -9613 path delay      9329
ptp4l[1879704.550]: master offset         17 s2 freq   -9606 path delay      9329
ptp4l[1879705.450]: master offset         76 s2 freq   -9542 path delay      9323
ptp4l[1879706.350]: master offset        220 s2 freq   -9375 path delay      9331
ptp4l[1879707.250]: master offset        123 s2 freq   -9406 path delay      9331
```