

2026년 9월 1일 화요일 오전 10:13

Software Image Update 방법

```
$ cd meta-intel-fpga-refdes/recipes-bsp/device-tree/files/
$ vim socfpga_agilex5_ghrd.dtsi
```

TSN용 device tree 위치 device-tree.bbappend파일의 편집해야 함

```
$ cd meta-altera-tsn-sgmii/recipes-bsp/device-tree/
$ vim device-tree.bbappend
```

소스 수정 후 재빌드 할 때 명령어

```
//device tree 업데이트
$ bitbake device-tree -c compile -f
$ bitbake device-tree -c deploy -f
agilex5_mnk_a5e065bb32a51-gsr-rootfs/tmp/deploy/images/agilex5_mnk_a5e065bb32a51/devicetree/
위치에 dtb 파일 timestamp 업데이트 됨을 확인 가능
```

```
//kernel 업데이트
$ bitbake virtual/kernel -c compile -f
$ bitbake virtual/kernel -c deploy -f
agilex5_mk_a5e065b32a2e1-gsr-rootfs/tmp/deploy/images/agilex5_mk_a5e065b32a2e1/
위치에 kernel.itb 파일 timestamp 업데이트 됨을 확인 가능
```

```
//rootfs 업데이트
$ bitbake bitbake gsrds-console-image
```

```
//업데이트된 이미지들로 sd image 재빌드
$ package
```

```
agilex5_mk_a5e065bb32aes1-gsrd-rootfs/conf/ 위치 local.conf 맨 마지막 줄에 내용 추가
IMAGE_INSTALL:append = " i2c-tools phytool devmem2"
```

```
//Reset release logic 추가
```

Modular Kit는 MAX10이 PYH reset을 제어하는데 Premium은 Agilx5에만 연결되어 있어 Reset을 풀어주는 로직을 추가함

```

logic [23:0] phy_rst_cnt = '0;
logic phy_hw_rst_n_reg;

//8002110 phy reset ctrl
assign phy_hw_rst_n = phy_hw_rst_n_reg;

logic rst_sync_0, rst_sync_1;

always_ff @(posedge fpga_clk_100 or posedge ninit_done) begin
    if (ninit_done) begin
        rst_sync_0 <= '0;
        rst_sync_1 <= '1'b1;
    end else begin
        rst_sync_0 <= '1'b0;
        rst_sync_1 <= rst_sync_0;
    end
end

wire sys_rst = rst_sync_1; // 클럭이 동기화되어 안전한지 Low로 떨어지는 리셋

always_ff @(posedge fpga_clk_100 or posedge sys_rst) begin
    if (sys_rst) begin
        phy_rst_cnt <= '0;
        phy_hw_rst_n_reg <= '1'b0;
    end else begin
        if (phy_rst_cnt < 22'd4200_000) begin // 100MHz * 20ms = 2,000,000
            phy_rst_cnt <= phy_rst_cnt + '1'b1;
            phy_hw_rst_n_reg <= '1'b0;
        end else begin
            phy_hw_rst_n_reg <= '1'b1;
        end
    end
end

```

POR -> core.rbf configuration -> 20ms 정도 기다린 후에 reset release 해줌

```
//ptp 관련 핀 처리
output logic [NUM_PHY-1:0] pp_app_tx_serial_data_n,
//hudson output logic [NUM_PHY-1:0] enac_ptp_trig,
//hudson output logic [NUM_PHY-1:0] enac_ptp_pps,
input logic [NUM_PHY-1:0] app_pp_rx_serial_data,

.enac_timestamp_clk clk
('b0),
//hudson enac_nsta mar nsta_tria
('b0), //enac_nsta_tria[0]
```

```
do_configure:append() {
    # TSN CONFIG-3: device-tree MACHINE is ${MACHINE} and IMAGE_TYPE is ${IMAGE_TYPE}

    if [ "${MACHINE}" = "agilex5_mk_a5e065bb32aes1" ]; then
        # GSRD DTB Generation
        cp ${STAGING_KERNEL_DIR}/arch/${ARCH}/boot/dts/intel/socfpga_agilex5_socdk_tsn_cfg3_dr.dts ${WORKDIR}/socfpga_agilex5_socdk_tsn_cfg3_dr.dts
        sed -i 's/\#include "\socfpga_agilex5_socdk.dts"/\#include "\socfpga_agilex5_socdk_modular.dts"/' ${WORKDIR}/socfpga_agilex5_socdk_tsn_cfg3_dr.dts
        echo "" >> ${WORKDIR}/socfpga_agilex5_socdk_tsn_cfg3_dr.dts
        cat << 'EOF' >> ${WORKDIR}/socfpga_agilex5_socdk_tsn_cfg3_dr.dts

&mac0 {
    /delete-property/ altr,mu-speed;
};

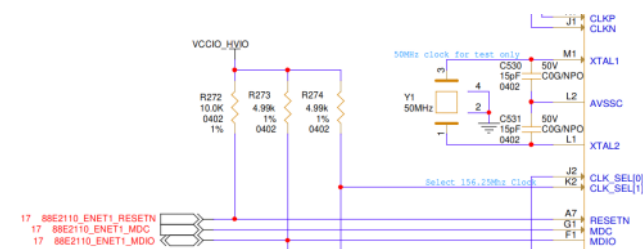
&mac1 {
    status = "disabled";
    /delete-property/ phy-handle;
};

&mac2 {
    status = "disabled";
};

/* 기존 Root(/) 하위의 mdio 노드 삭제 후 재정의 */
/ {
    /delete-node/ mdio@30020500;

    mdio: mdio@30020500 {
        compatible = "altr,altr-mdio";
        reg = <0x0 0x30020500 0x0 0x100>;
        #address-cells = <1>;
        #size-cells = <0>;
        status = "okay";

        phy_0: ethernet-phy@0 {
            reg = <0>;
            compatible = "ethernet-phy-ieee802.3-c45";
            max-speed = <2500>;
            status = "okay";
        };
    };
};
EOF
fi
}
```



Devmem2 내용

```
# gmac0 (ethernet@10810000) min-speed 제거 확인 (출력에 min-speed가 없어야 정상)
```

//ptp 관련 핀 처리

```
output logic [NUM_PHY-1:0] pp_app_tx_serial_data_n,
//hudson input logic [NUM_PHY-1:0] emac_ptp_trig,
//hudson output logic [NUM_PHY-1:0] emac_ptp_pps,
input logic [NUM_PHY-1:0] app_pp_rx_serial_data,
```

```
.emac_timestamp_clk_clk                                     ('b0'),
//hudson .emac0_ptp_mac_ptp_trig                          (emac_ptp_trig[0]),
//hudson .emac0_ptp_mac_ptp_pps                          (emac_ptp_pps[0]),
.emac0_ptp_mac_ptp_trig                                  ('b0'),
.emac0_ptp_mac_ptp_pps                                  (),
//hudson .emac1_ptp_mac_ptp_trig                          (emac_ptp_trig[1]),
//hudson .emac1_ptp_mac_ptp_pps                          (emac_ptp_pps[1]),
.emac1_ptp_mac_ptp_trig                                  ('b0'),
.emac1_ptp_mac_ptp_pps                                  (),
//hudson .emac2_ptp_mac_ptp_trig                          (emac_ptp_trig[2]),
//hudson .emac2_ptp_mac_ptp_pps                          (emac_ptp_pps[2]),
.emac2_ptp_mac_ptp_trig                                  ('b0'),
.emac2_ptp_mac_ptp_pps                                  (),
```

Devmem2 내용

```
# gmac0 (ethernet@10810000) min-speed 재가 확인 (출력에 min-speed가 없어야 정상)
dtc -i dtb -O dts socfpga_agilex5_socdk_tsn_cfg3_dr.dtb | grep -A 30 "ethernet@10810000" | grep "min-speed"
```

```
# gmac2 (ethernet@10830000) disabled 확인
dtc -i dtb -O dts socfpga_agilex5_socdk_tsn_cfg3_dr.dtb | grep -A 30 "ethernet@10830000" | grep "status"
```

```
[ OK ] Finished Virtual Console Setup.
[ 10.467478] socfpga-dwmac 10810000.ethernet eth0: Register MEM_TYPE_PAGE_POOL RxQ-0
[ 10.475893] socfpga-dwmac 10810000.ethernet eth0: Register MEM_TYPE_PAGE_POOL RxQ-1
[ 10.484237] socfpga-dwmac 10810000.ethernet eth0: Register MEM_TYPE_PAGE_POOL RxQ-2
[ 10.492481] socfpga-dwmac 10810000.ethernet eth0: Register MEM_TYPE_PAGE_POOL RxQ-3
[ 10.500830] socfpga-dwmac 10810000.ethernet eth0: Register MEM_TYPE_PAGE_POOL RxQ-4
[ 10.509093] socfpga-dwmac 10810000.ethernet eth0: Register MEM_TYPE_PAGE_POOL RxQ-5
[ 10.517470] socfpga-dwmac 10810000.ethernet eth0: Register MEM_TYPE_PAGE_POOL RxQ-6
[ 10.525731] socfpga-dwmac 10810000.ethernet eth0: Register MEM_TYPE_PAGE_POOL RxQ-7
[ 10.541443] socfpga-dwmac 10810000.ethernet eth0: PHY [mdio-altera-0:00] driver [mv88e2110] (irq=POLL)
[ OK ] Started D-Bus System Message Bus.
[ 10.551089] socfpga-dwmac 10810000.ethernet eth0: No Safety Features support found
[ 10.564938] socfpga-dwmac 10810000.ethernet eth0: IEEE 1588-2008 Advanced Timestamp supported
[ 10.573686] socfpga-dwmac 10810000.ethernet eth0: registered PTP clock
[ 10.580222] socfpga-dwmac 10810000.ethernet eth0: configuring for phy/2500base-x link mode
[ 10.589127] 8021q: adding VLAN 0 to HW filter on device eth0
[ OK ] Started Connection service...
[ OK ] Started Telephony service.
[ OK ] Finished OpenSSH Key Generation.
[ OK ] Listening on Load/Save RF Kill Switch Status /dev/rfkill Watch.
[ 11.018848] Bluetooth: Core ver 2.22
[ 11.022989] NET: Registered PF_BLUETOOTH protocol family
[ 11.027965] Bluetooth: HCI device and connection manager initialized
[ 11.034333] Bluetooth: HCI socket layer initialized
[ 11.039216] Bluetooth: L2CAP socket layer initialized
[ 11.044280] Bluetooth: SCO socket layer initialized
[ OK ] Started Connection service.
[ OK ] Reached target Network.
[ OK ] Starting Avahi mDNS/DNS-SD Stack...
[ OK ] Starting WPA supplicant...
[ OK ] Starting Hostname Service...
[ OK ] Started Avahi mDNS/DNS-SD Stack.
[ OK ] Started Hostname Service.
[ OK ] Started WPA supplicant.
```

EMAC0에 PHY가 제대로 인식되고 eth0로 할당됨

```
root@agilex5mka5e065bb32aes1:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.7.255 netmask 255.255.255.0 broadcast 192.168.7.255
inet6 fe80::1888:92ff:fe05:f06f prefixlen 64 scopeid 0x20<link>
ether 8a:89:92:05:f0:6f txqueuelen 1000 (Ethernet)
RX packets 749 bytes 72216 (70.5 KiB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 46 bytes 8413 (8.2 KiB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
device interrupt 22 base 0x8000

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
inet 127.0.0.1 netmask 255.0.0.0
inet6 ::1 prefixlen 128 scopeid 0x10<host>
loop txqueuelen 1000 (Local Loopback)
RX packets 260 bytes 20024 (19.5 KiB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 260 bytes 20024 (19.5 KiB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@agilex5mka5e065bb32aes1:~#
```

ifconfig 명령을 지면 DHCP로 IP address 자동 할당됨을 확인가능

```
root@eth0code: ~# cat /etc/network/interfaces
root@agilex5mka5e065bb32aes1:~# ethtool eth0
Settings for eth0:
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: 10baseT/Half 10baseT/Full
                                   100baseT/Half 100baseT/Full
                                   1000baseT/Full

Link partner advertised pause frame use: Symmetric
Link partner advertised auto-negotiation: Yes
Link partner advertised FEC modes: Not reported
Speed: 1000Mb/s
Duplex: Full
Auto-negotiation: on
Port: Twisted Pair
PHYAD: 0
Transceiver: external
MDI-X: on (auto)
Supports Wake-on: g
Wake-on: d
Current message level: 0x0000003f (63)
Link detected: yes
drv probe link timer ifdown ifup

root@agilex5mka5e065bb32aes1:~#
```

사후설 test한경이 1G에서 1000Mb/s로 자동교섭됨을 연결됨