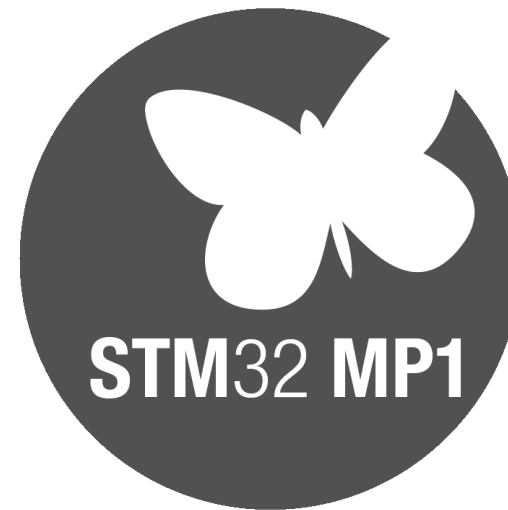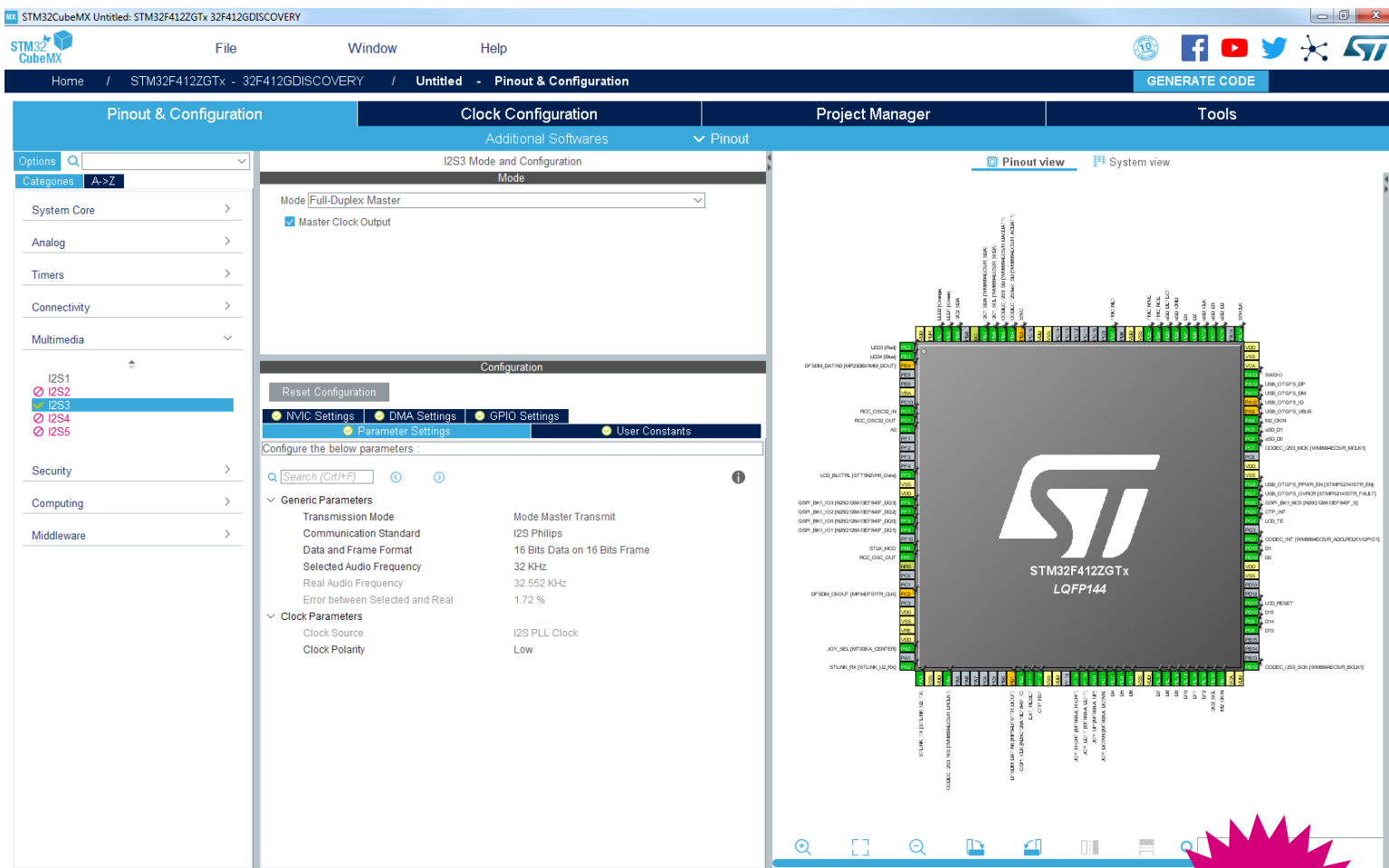# *OpenSTLinux BSP* device tree files

with STM32CubeMX
for an easier HW configuration

Time 10 min

Very powerful configuration and code generation

Support all STM32 MCU and MPU, with integrated powerful Finder

New fresh and modern UI

FREE

Device tree for Linux, U-Boot & TF-A

- STM32 peripheral drivers configuration by device tree

- Linux developers manually edit device tree source files,
  STM32CubeMX enables this **generation from** to ease new comers hands-on!
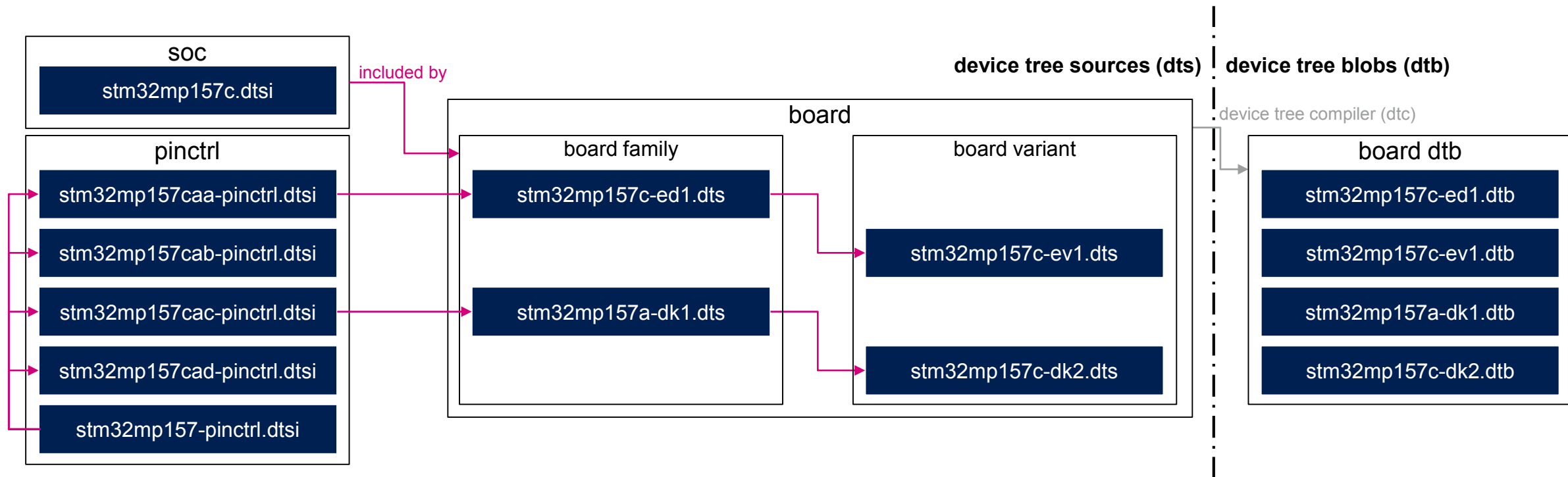
Generated Device Tree

- 3 device tree files (DT) :
  - TF-A (first stage boot loarder) : DDR configuration, RCC clock tree, Peripheral assignment
  - U-Boot (second stage boot loader) : specifics peripherals (Ethernet, USB boot devices)
  - Linux DT : peripheral used by applications at run time

life.augmented

Upstreamed device tree

Linux

Legend
- **ed: evaluation daughter board** (embedding the STM32MP1)
- **ev: evaluation board** (ed plugged on the mother board)
- **dk: discovery kit**

SOC
stm32mp157c.dtsi

included by

pinctrl
- stm32mp157caa-pinctrl.dtsi
- stm32mp157cab-pinctrl.dtsi
- stm32mp157cac-pinctrl.dtsi
- stm32mp157cad-pinctrl.dtsi
- stm32mp157-pinctrl.dtsi

device tree sources (dts)

board

board family
- stm32mp157c-ed1.dts
- stm32mp157a-dk1.dts

board variant
- stm32mp157c-ev1.dts
- stm32mp157c-dk2.dts

device tree compiler (dtc)

device tree blobs (dtb)

board dtb
- stm32mp157c-ed1.dtb
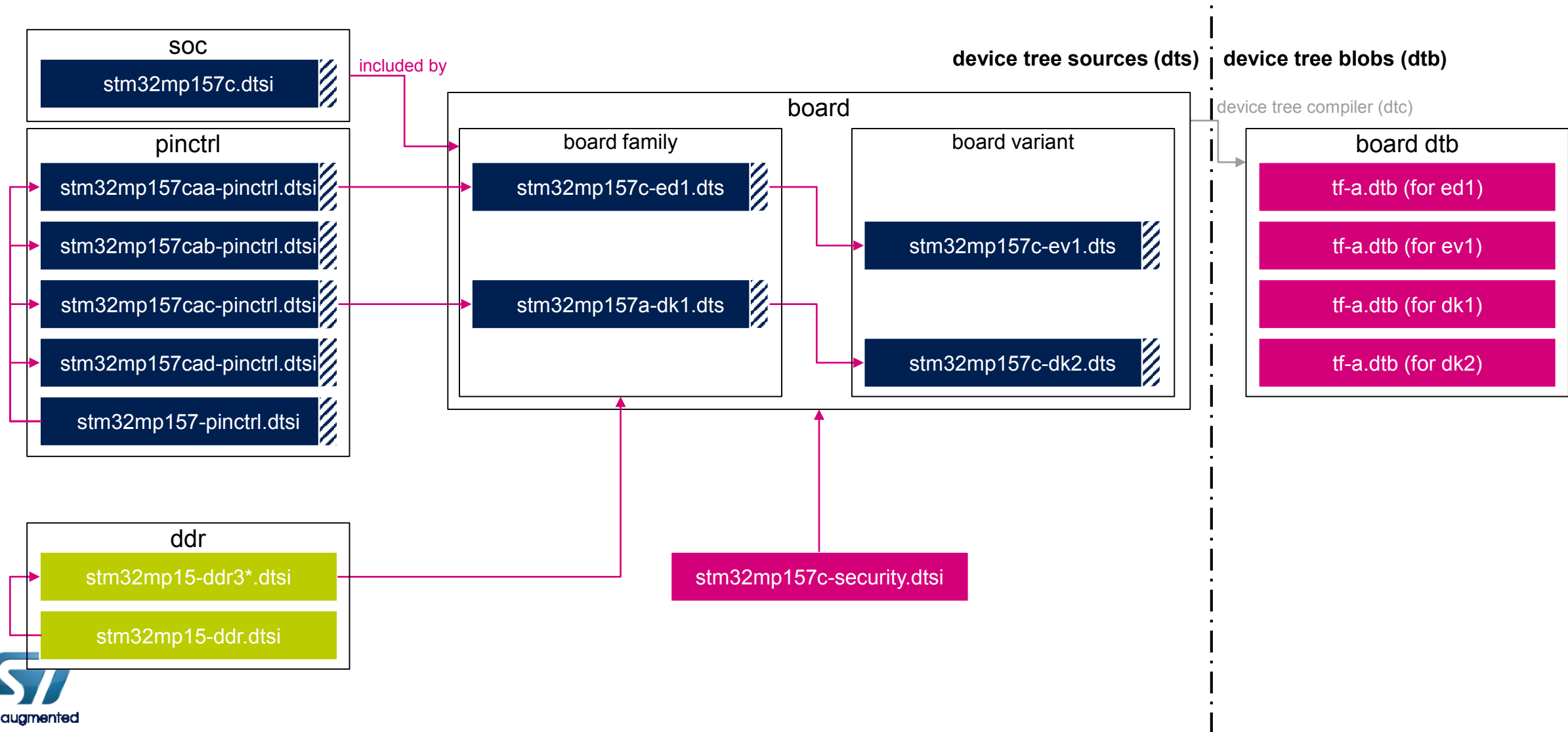- stm32mp157c-ev1.dtb
- stm32mp157a-dk1.dtb
- stm32mp157c-dk2.dtb

Upstreamed device tree

TF-A, overloading subsets of Linux files copies and using DDR config from U-Boot

Legend
- **ed: evaluation daughter board** (embedding the STM32MP1)
- **ev: evaluation board** (ed plugged on the mother board)
- **dk: discovery kit**

device tree sources (dts) | **device tree blobs (dtb)**

soc
stm32mp157c.dtsi

included by

pinctrl
- stm32mp157caa-pinctrl.dtsi
- stm32mp157cab-pinctrl.dtsi
- stm32mp157cac-pinctrl.dtsi
- stm32mp157cad-pinctrl.dtsi
- stm32mp157-pinctrl.dtsi

board

device tree compiler (dtc)

board family
- stm32mp157c-ed1.dts
- stm32mp157a-dk1.dts

board variant
- stm32mp157c-ev1.dts
- stm32mp157c-dk2.dts

board dtb
- tf-a.dtb (for ed1)
- tf-a.dtb (for ev1)
- tf-a.dtb (for dk1)
- tf-a.dtb (for dk2)

ddr
- stm32mp15-ddr3*.dtsi
- stm32mp15-ddr.dtsi

stm32mp157c-security.dtsi

life.augmented

Upstreamed device tree

U-Boot, overloading copies of Linux files

device tree sources (dts) | **device tree blobs (dtb)**

device tree compiler (dtc)

SOC
- stm32mp157c.dtsi

included by

pinctrl
- stm32mp157caa-pinctrl.dtsi
- stm32mp157cab-pinctrl.dtsi
- stm32mp157cac-pinctrl.dtsi
- stm32mp157cad-pinctrl.dtsi
- stm32mp157-pinctrl.dtsi
- stm32mp157ca*-u-boot.dtsi

ddr
- stm32mp15-ddr3*.dtsi
- stm32mp15-ddr.dtsi

board

board family
- stm32mp157c-ed1.dts
- stm32mp157a-dk1.dts

board variant
- stm32mp157c-ev1.dts
- stm32mp157c-dk2.dts

stm32mp157c-*-u-boot.dtsi

board dtb
- u-boot.dtb (for ed1)
- u-boot.dtb (for ev1)
- u-boot.dtb (for dk1)
- u-boot.dtb (for dk2)

fdtgrep

spl board dtb
- u-boot-spl.dtb (for ed1)
- u-boot-spl.dtb (for ev1)
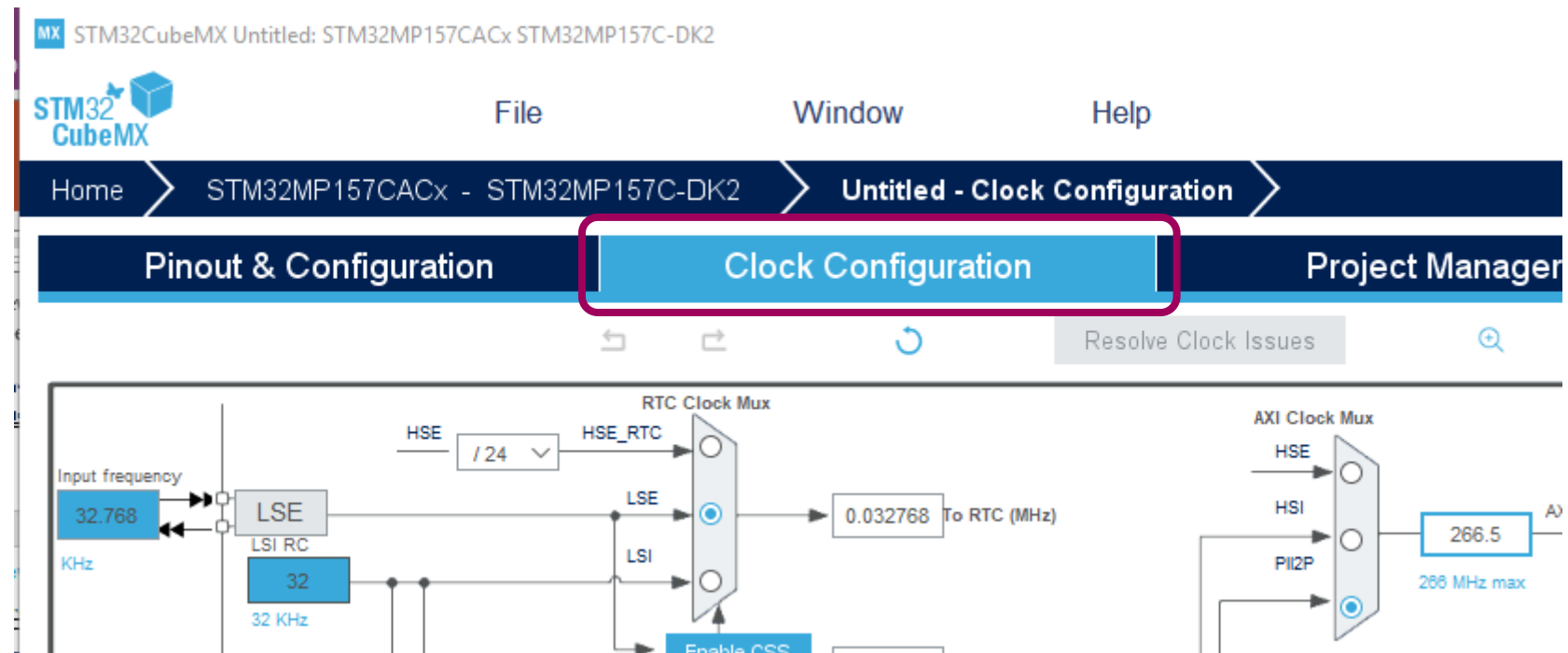- u-boot-spl.dtb (for dk1)
- u-boot-spl.dtb (for dk2)

life.augmented
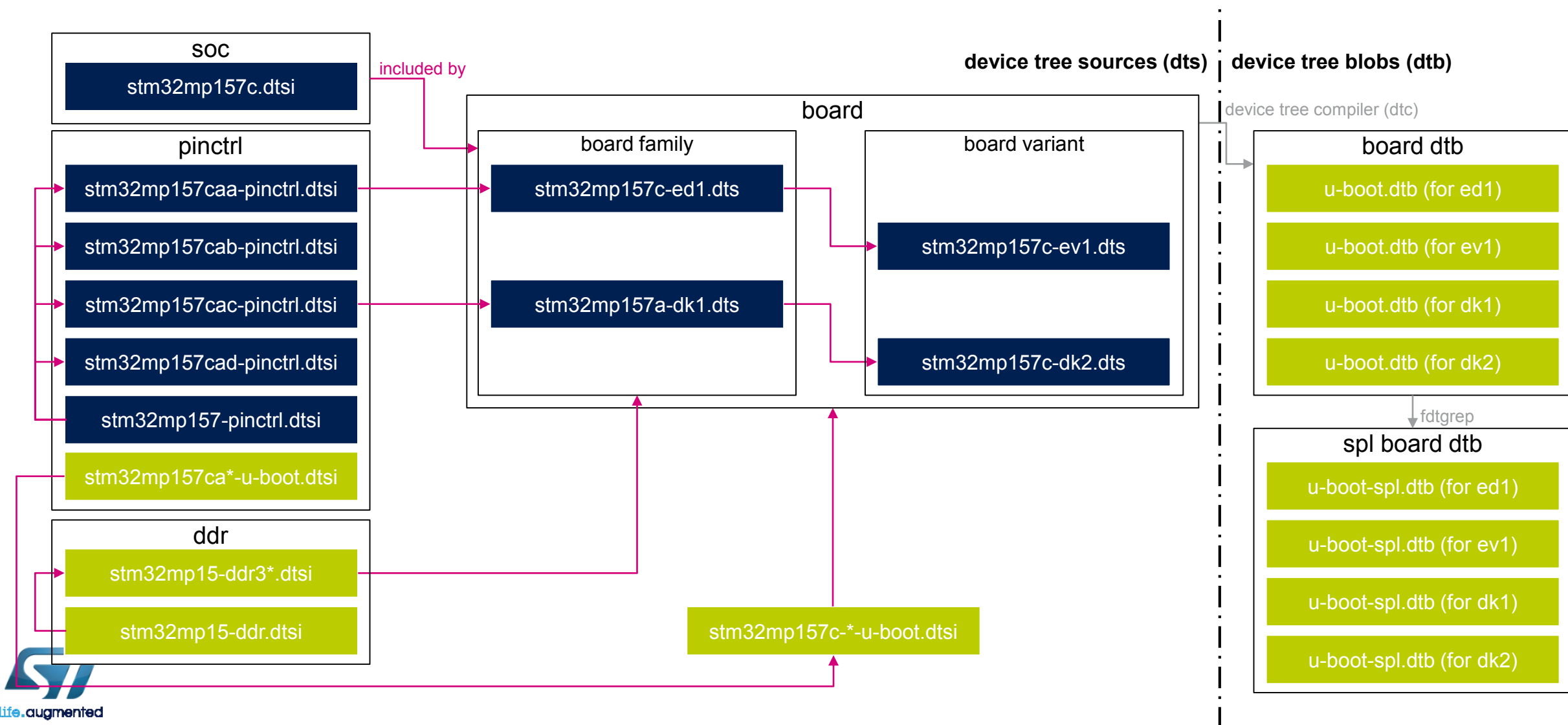
Clock Tree Setup

STM32CubeMX automatic generation

- *Clock tree initialization is done at boot time by TF-A fw*

- *The Clock configuration is contained in the <u>TF-A device tree file</u>*

- *STM32CubeMX tab allow graphical clock tree configuration*

Timer1 clock ex

- *Device tree node*

```
&rcc {
    st,clksrc = <
        CLK_MPU_PLL1P
        CLK_AXI_PLL2P
        CLK_PLL12_HSE
        CLK_PLL3_HSE
    }
```

```
/* VCO = 417.8 MHz => P = 209, Q = 24, R = 11 */
pll3: st,pll@2 {
        cfg = < 1 33 1 16 36 PQR(1,1,1) >;
        frac = < 0x1a04 >;
};
```

```
st,clkdiv = <
    1 /*MPU*/
    0 /*AXI*/
    1 /*APB1*/
    1 /*APB2*/
    1 /*APB3*/
    1 /*APB4*/
    2 /*APB5*/
    23 /*RTC*/
    0 /*MCO1*/
    0 /*MCO2*/
```

- *STM32CubeMX project clock tree generated file*

Peripheral Security Setup

MCU Peripheral hw isolation & A7 trusted context

- *Peripheral assignment to hw context is done at boot time by TF-A fw*

- *Located in the <u>TF-A device tree file</u>*

- *STM32CubeMX Peripheral*
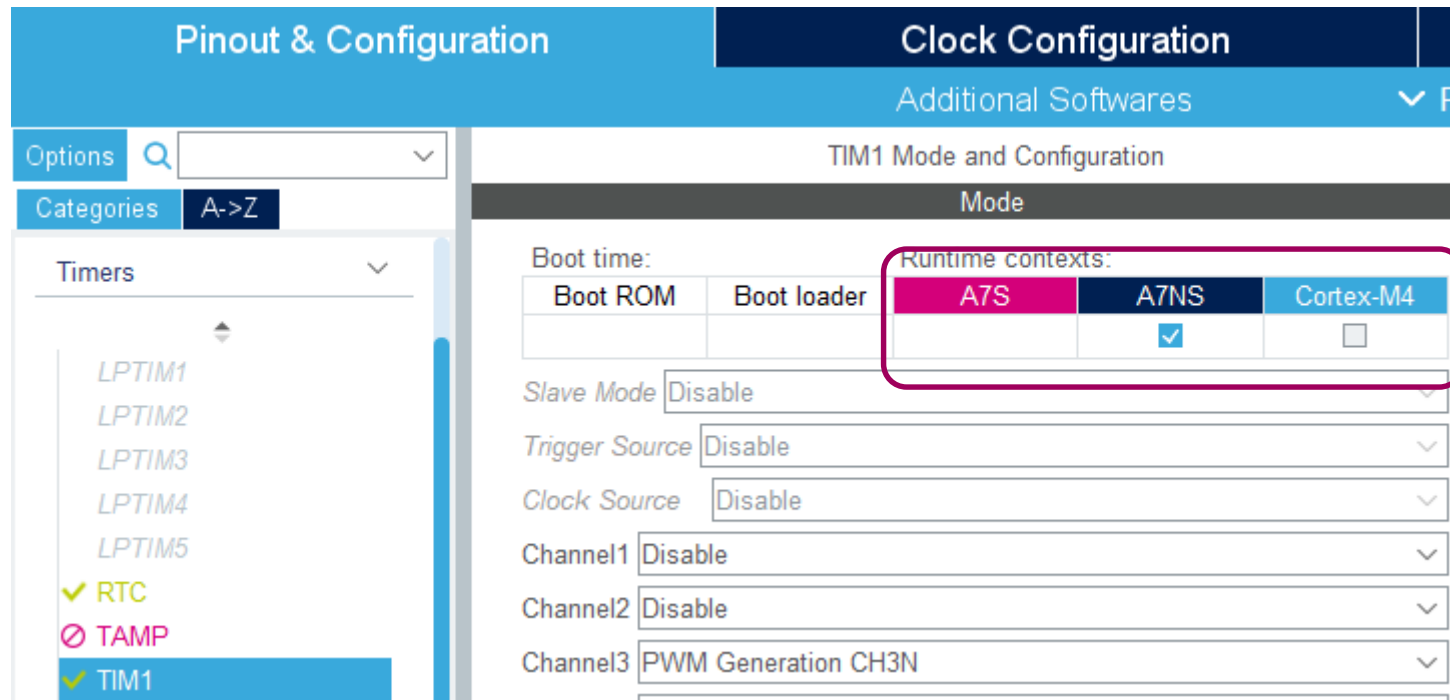
STM32cubeMx project with device tree generated file