NTAG SmartSensor

NHS31xx SW overview

SECURE CONNECTIONS
FOR A SMARTER WORLD

PUBLIC

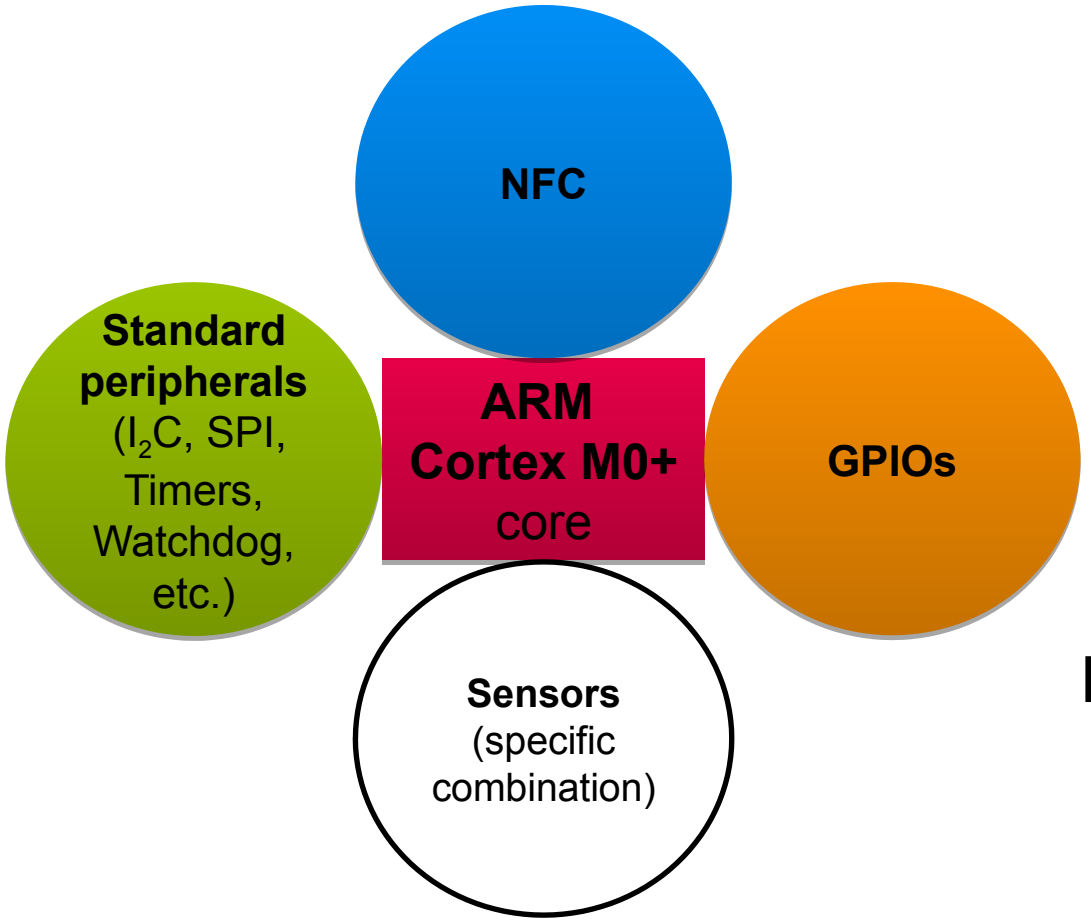
Contents

- IC family
- Demo/Evaluation HW
- Development environment
- Architecture
- Documentation
- Release
- Quality

IC family

Smart Sensor
- Low cost
- Ultra-low power
- Programmable
- NFC enabled

Compute core
- 62.5kHz – 8 MHz
- 32k Flash
- 8k Ram
- 4k EEPROM



NHS31xx

Built-in sensors
- Voltage – ADC/DAC
- Current – I2D
- Temperature

Demo/Evaluation HW

Typical setup

NHS31xx board

SWD

USB Debugger (LPC-Link2)

USB

Development workstation

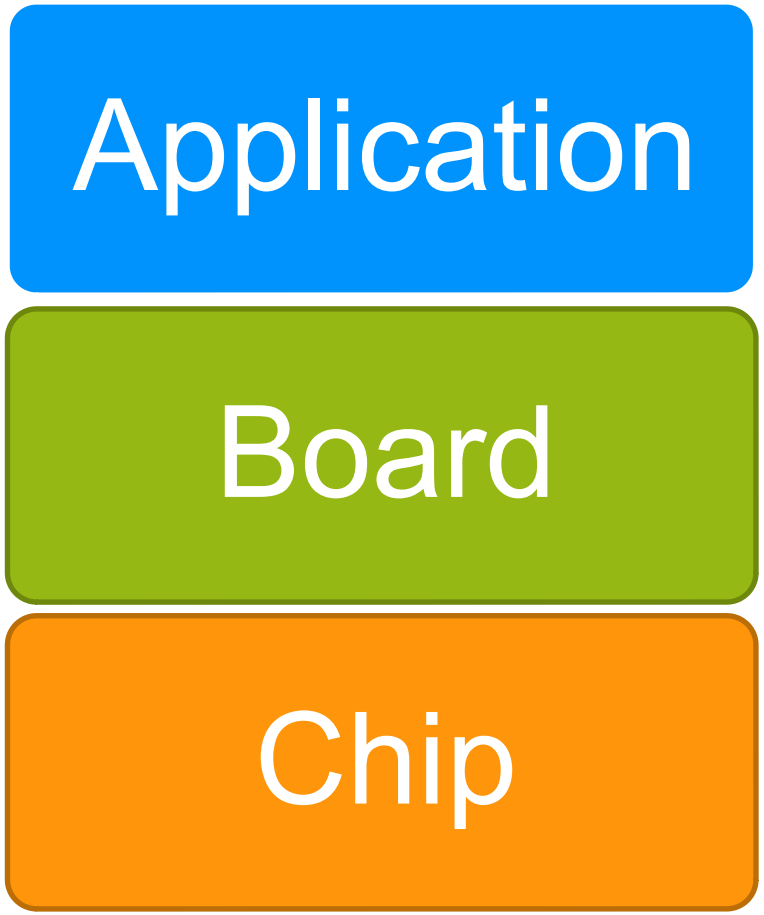
NFC host device

Development environment

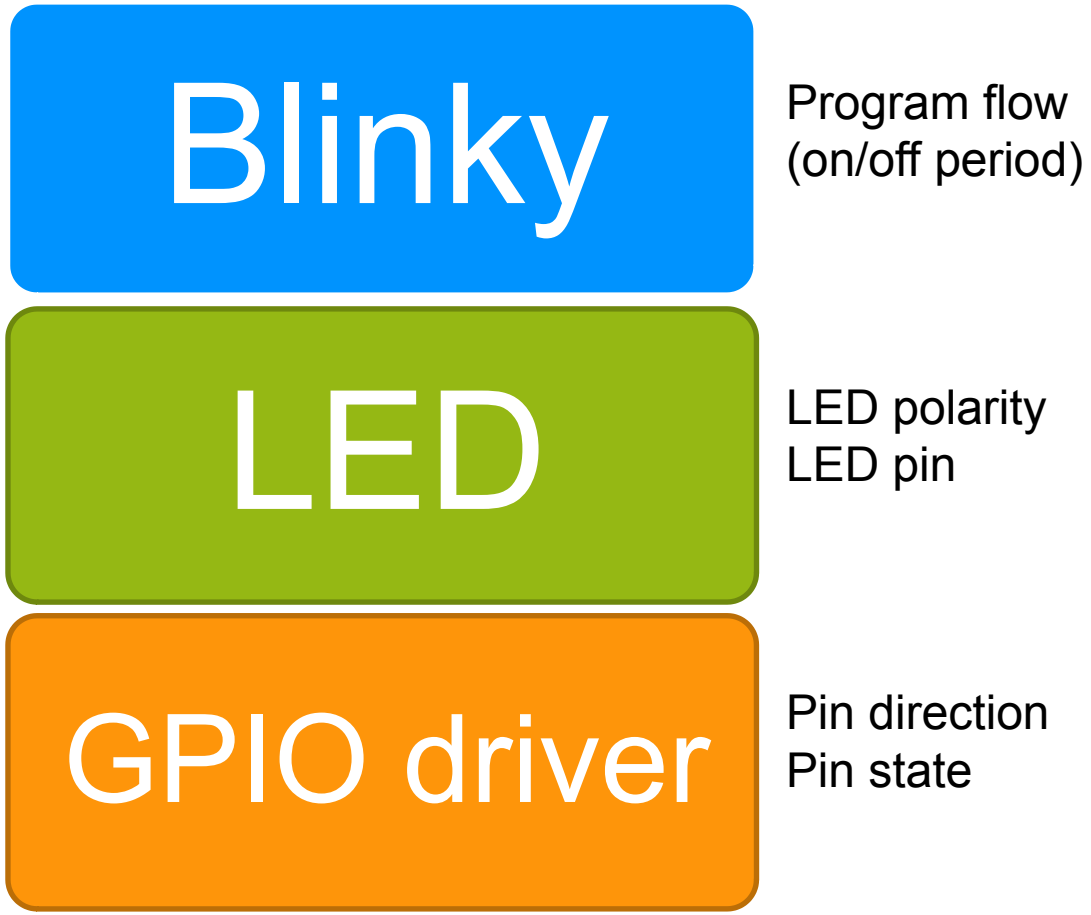
- Adapted for NHS31xx (plugin)
- Eclipse based
- GNU C compiler, linker, libraries
- GDB debugger
- Integration with LPC-Link2
- Freely available

SDK is not compatible with
the MCUXpresso IDE v10.3.0 and later

Architecture



An example

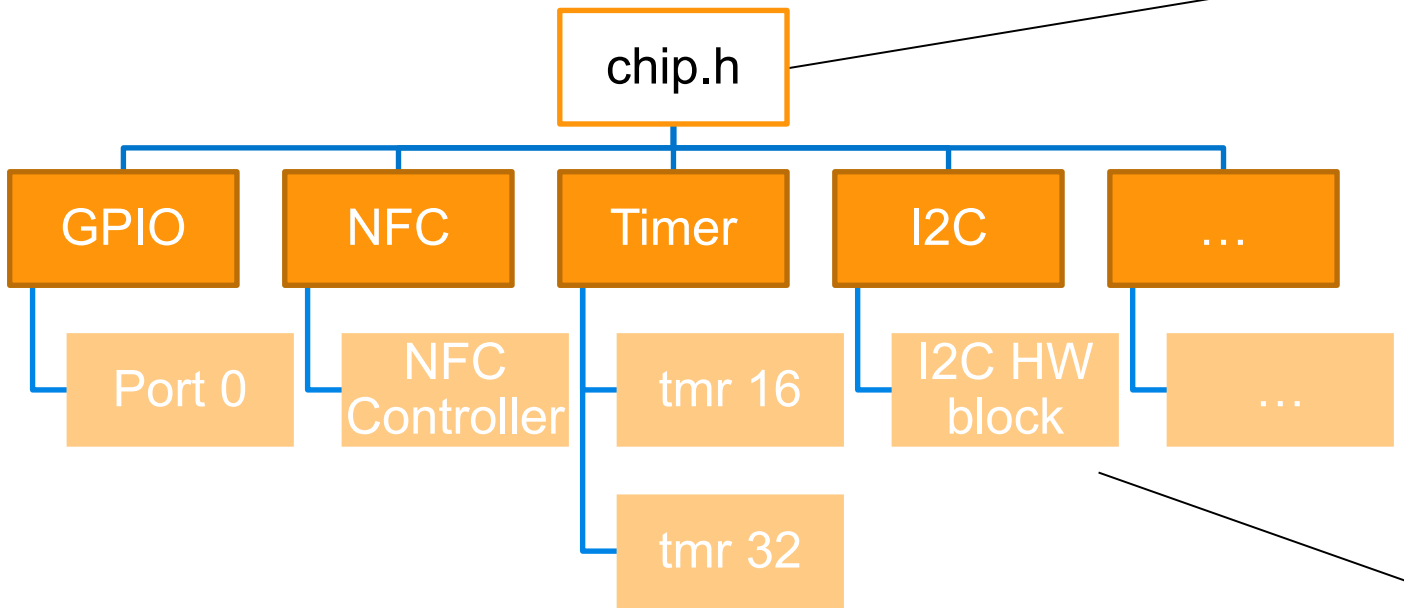


Program flow
(on/off period)

LED polarity
LED pin

Pin direction
Pin state

Architecture – Chip layer



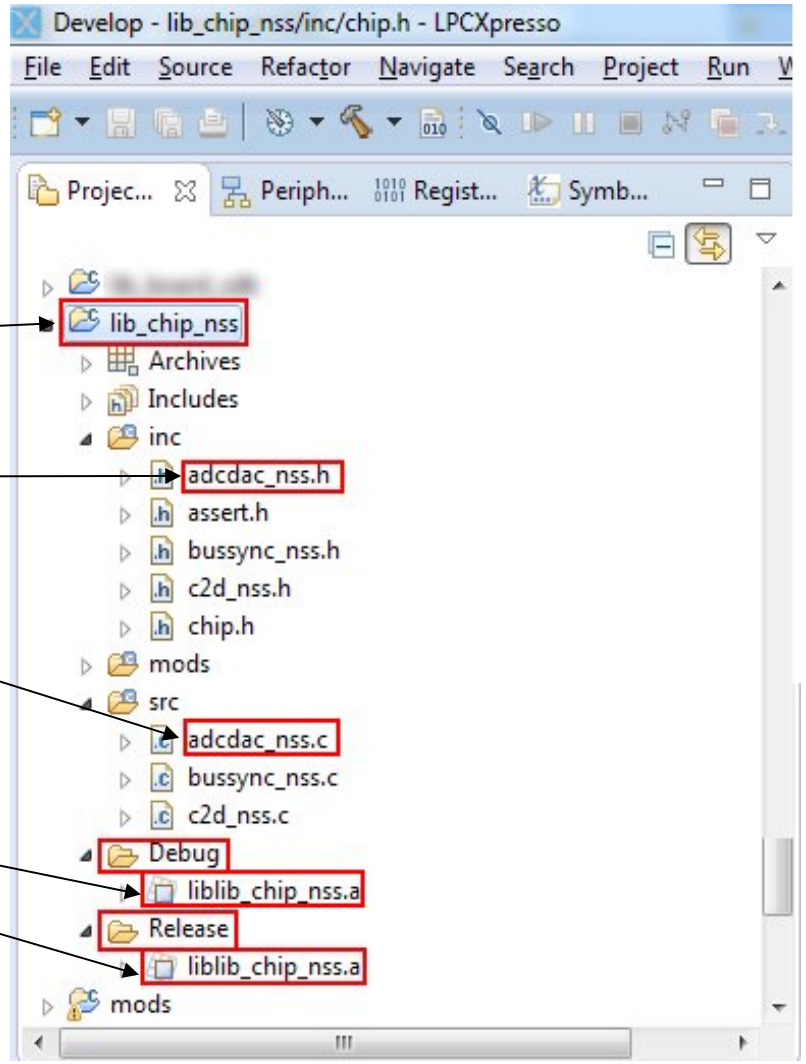
- Single entry point to the drivers
- Describes the specific IC model
- Publishes chip level info
  - PUBLIC oscillators
  - PUBLIC memories
  - Factory data addresses

1 driver per HW block:
direct mapping with HW

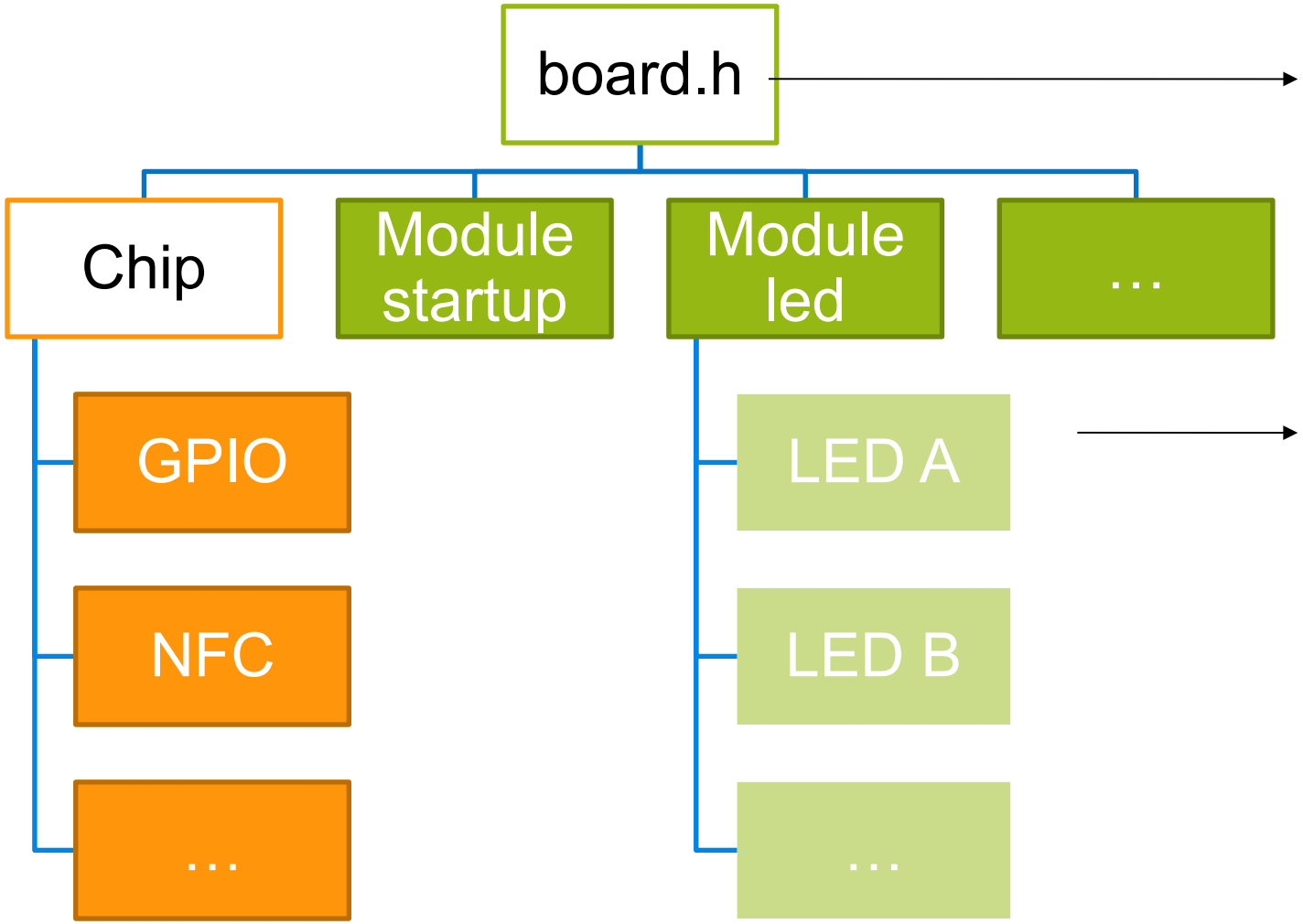
Architecture – Chip layer in LPCXpresso

- 1 LPCXpresso project
- 1 .c and 1 .h file per driver
- 2 flavors: Debug and Release

  build into .a libraries



Architecture – Board layer



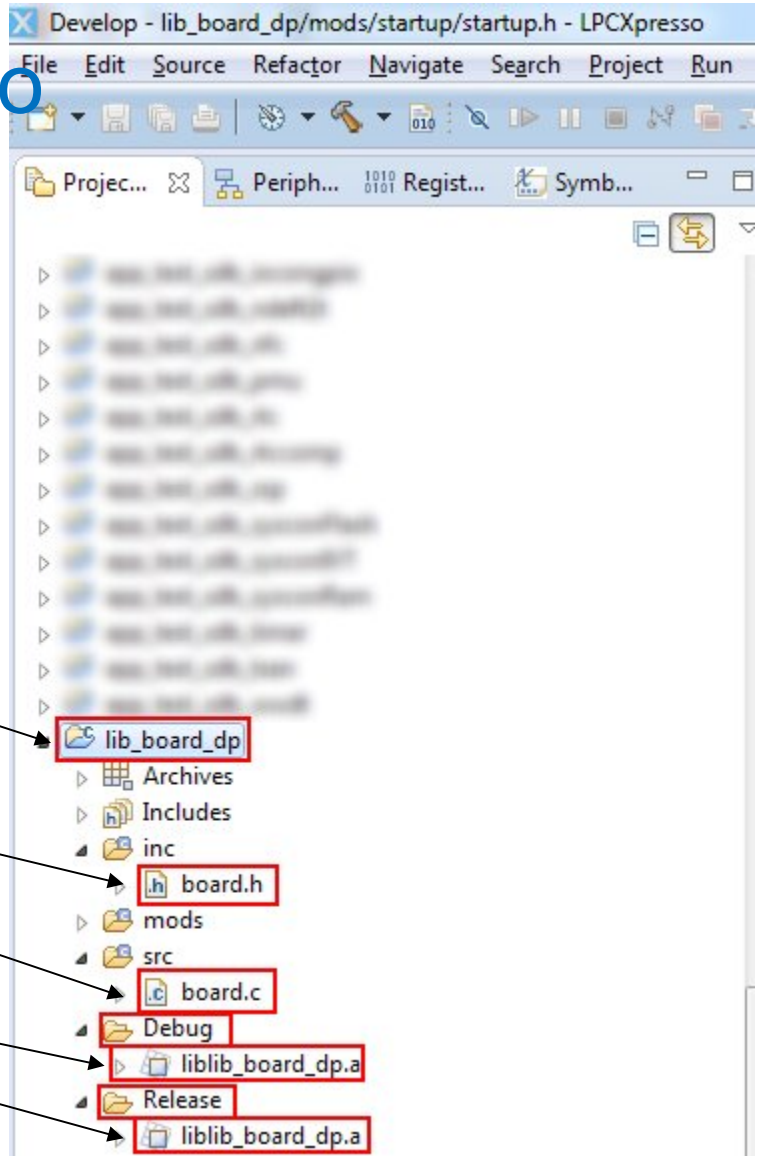
- Single entry point to the HW
- Describes the specific board
- Abstracts application from HW

- A board always contains a chip and the startup SW module
- A board provides an API per HW feature (e.g. LED)

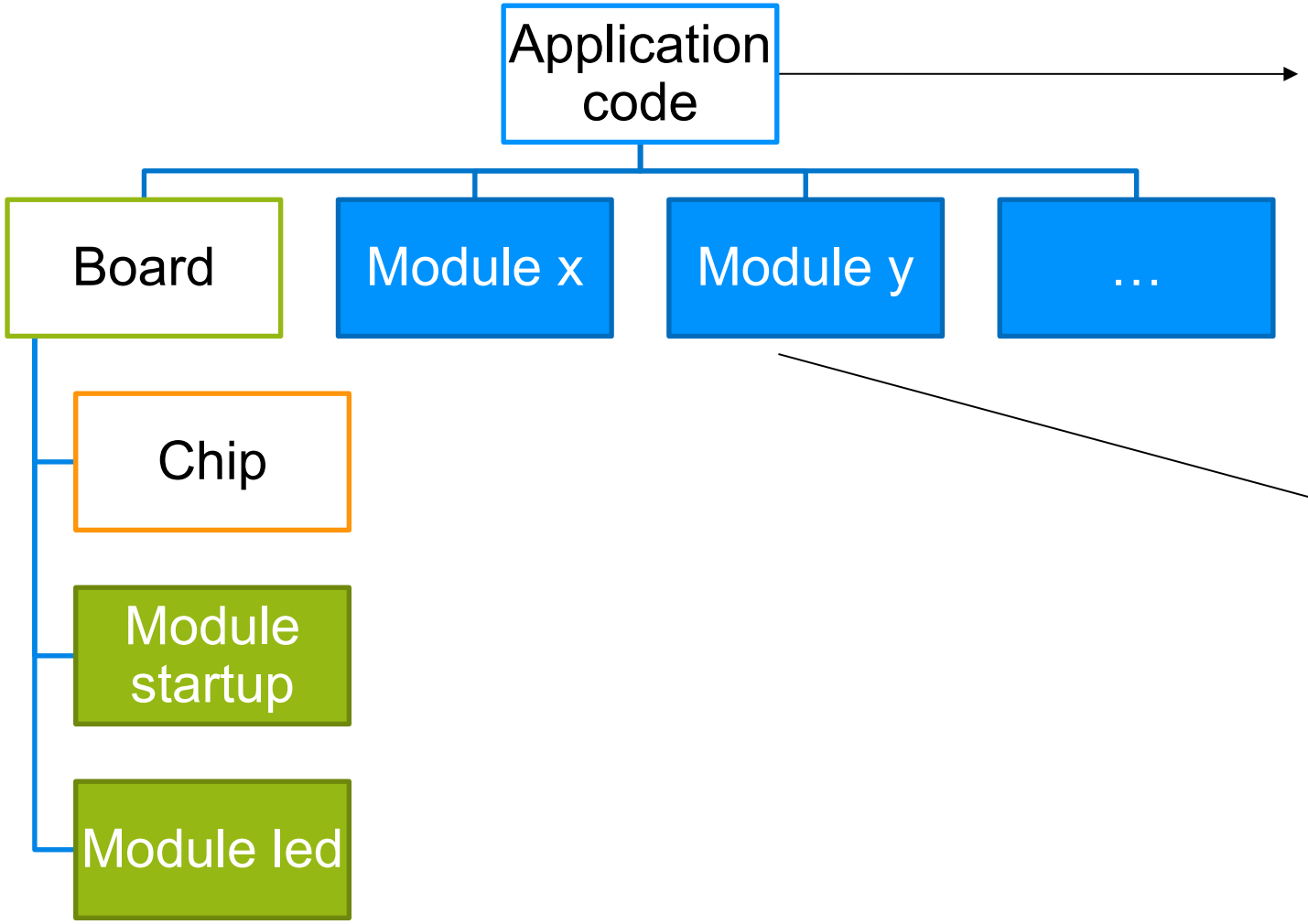
Architecture – Board layer in LPCXPresso

- 1 LPCXpresso project per board
- 1 .c and 1 .h file
- 2 flavors: Debug and Release

  build into .a libraries



Architecture – Application layer

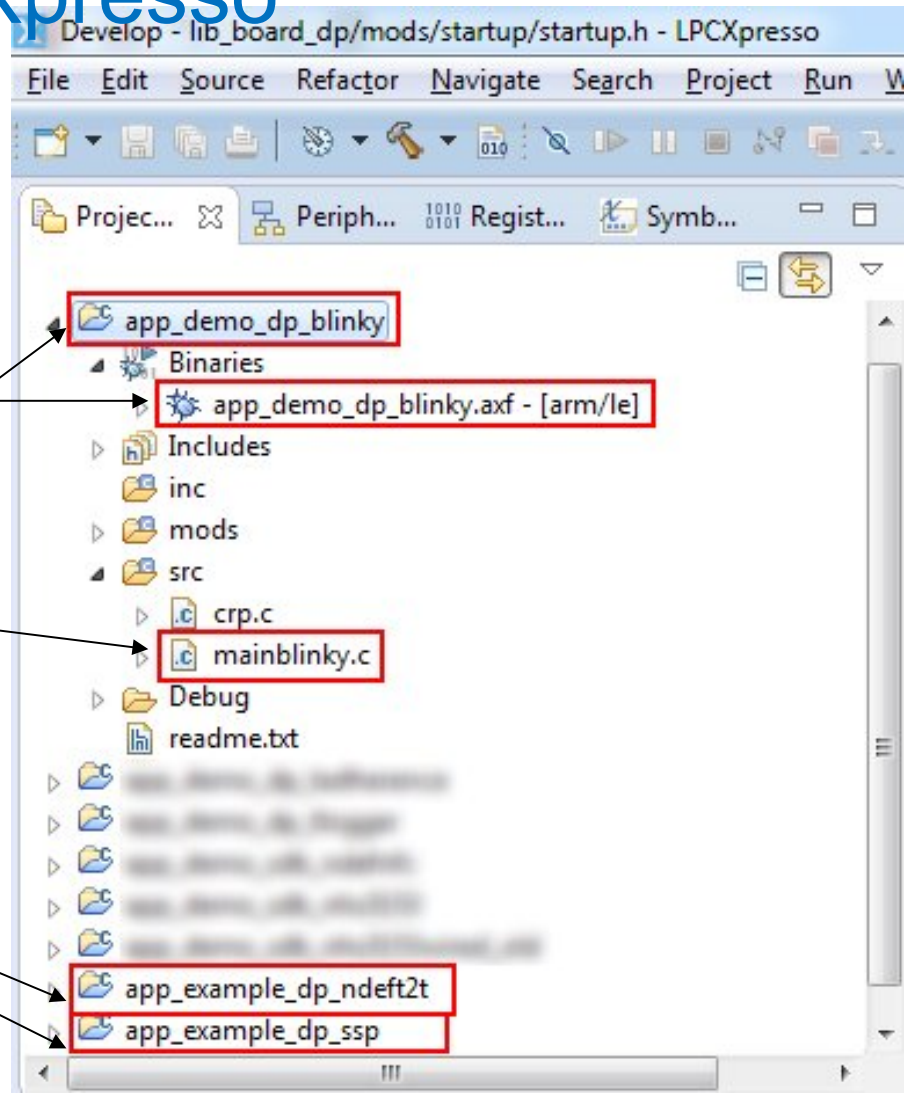


- Implements the application flow
- Accesses HW in an abstracted way

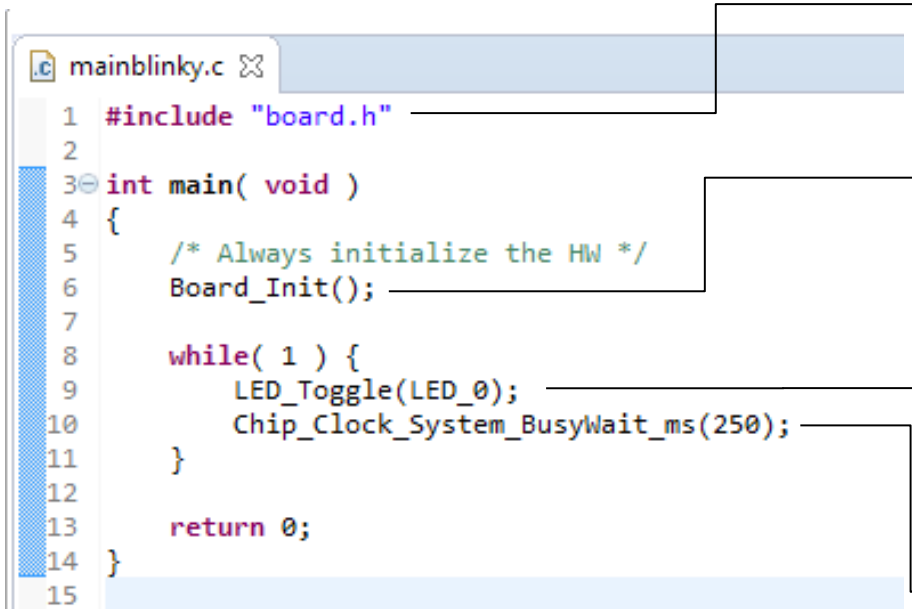
- An application runs on a board
- Modules can be re-used across applications (“mods” folder)

Architecture – Application layer in LPCXpresso

- Builds into an executable (.axf)
- At least 1 file (main.c)
- Links with chip and board libraries
- 1 LPCXpresso project per application



Architecture – Code example



Includes both the **board** and the **chip** APIs

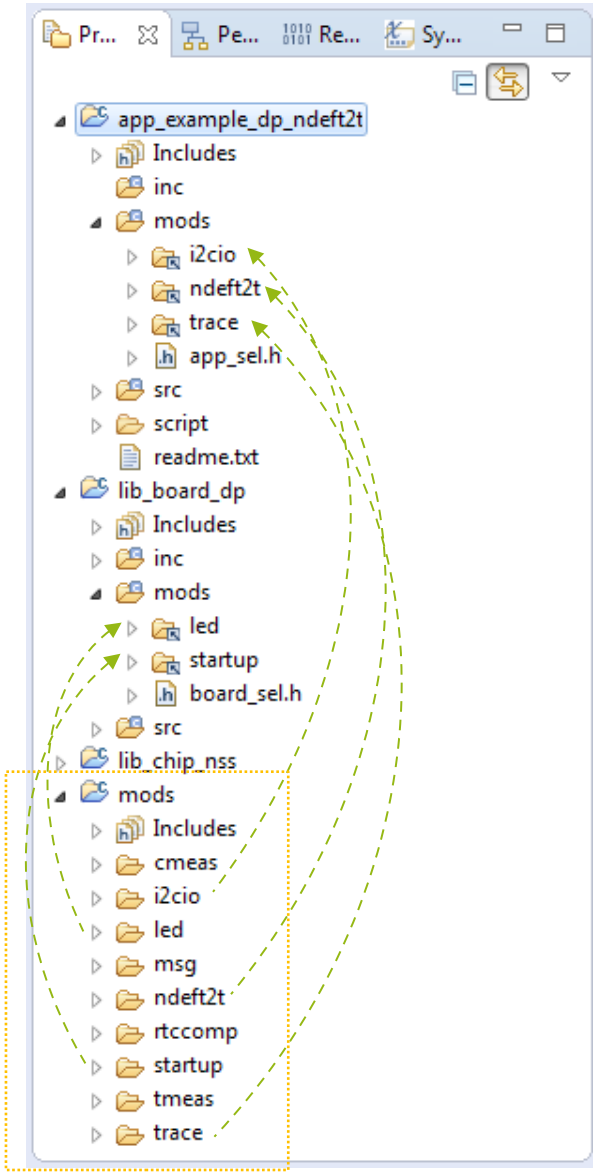
The **board** library knows how to initialize our board

The **board** has LEDs, so it will link in its library, the LED **mod**

The **chip** knows how long an instruction takes

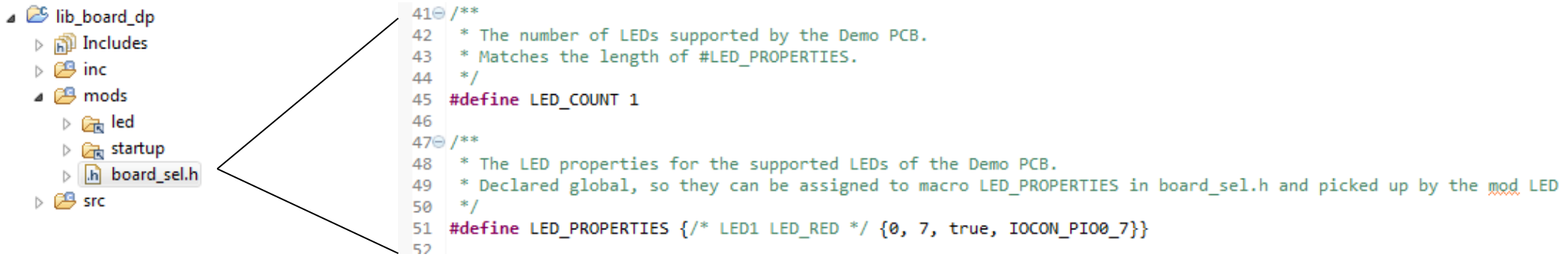
Architecture – Code reusability

- The “mods” project is just a container of reusable modules (does not build)
- One folder in the “**mods**” project contains one module
- Modules can be reused in every **chip**, **board** or **application** project (a reference to the module is created in the “mods” folder of the respective project)
- The code of the module is compiled by the project they are referenced in



Architecture – Diversity

- Reusable modules support diversity
- Diversity settings for module “xxx” are described in “xxx_dft.h”
- The project that reuses the module is responsible for defining the required settings (in [chip|board|app]_sel.h)
- E.g.: for module ‘led’, the number of LEDs, the physical pins and the polarity differ per board



Documentation of NHS31xx firmware

- Every API is documented
- Embedded in source code
- Doxygen style
- Output in HTML

```
146
147 /**
148  * @brief    Sets the System Clock frequency in Hz
149  * @param    frequency        : The System Clock frequency in Hz to set
150  * @note     This setting affects the core execution speed.
151  *           Only a set of frequencies is supported. If not valid,
152  *           the 'frequency' will be clipped to the closest supported value
153  *           higher than or equal to it.
154  *           The System Clock frequency range is (62.5 kHz - 8MHz).
155  *           Frequencies of 0 and higher than 8MHz are NOT allowed.
156  *           Use the #Chip_Clock_System_GetClockFreq to read to exact
157  *           frequency that was set.
158  */
159 void Chip_Clock_System_SetClockFreq(int frequency);
160
```

void Chip_Clock_System_SetClockFreq (int frequency)

Sets the System Clock frequency in Hz.

Parameters

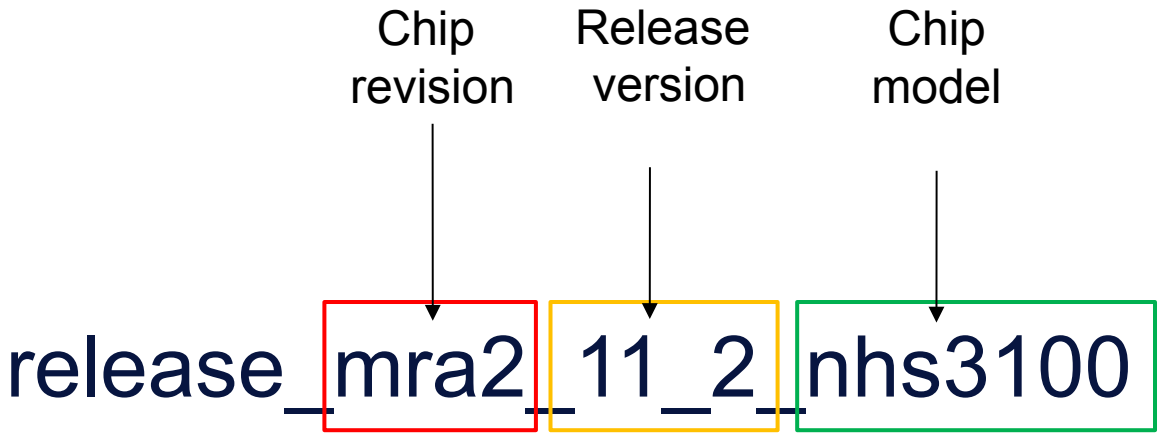
frequency : The System Clock frequency in Hz to set

Note

This setting affects the core execution speed. Only a set of frequencies is supported. If not valid, the 'frequency' will be clipped to the closest supported value higher than or equal to it. The System Clock frequency range is (62.5 kHz - 8MHz). Frequencies of 0 and higher than 8MHz are NOT allowed. Use the **Chip_Clock_System_GetClockFreq** to read to exact frequency that was set.

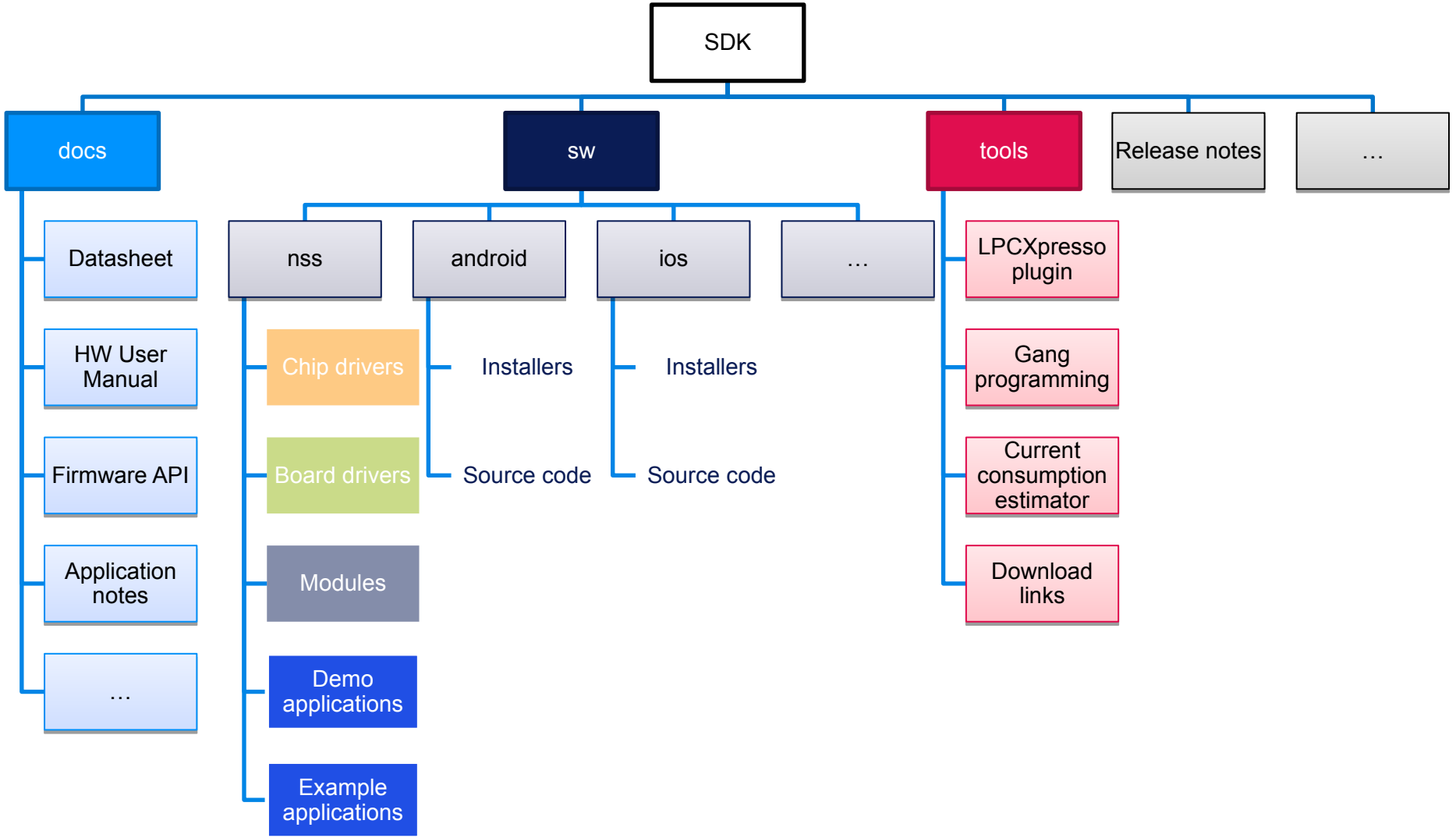
Definition at line **91** of file **clock_nss.c**.

Release – Naming



- A dedicated release per chip model (NHS3100, NHS3152)
- Valid only for a single revision of the chip
- File tree structure is kept between versions to allow easy upgrade

SDK contents



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