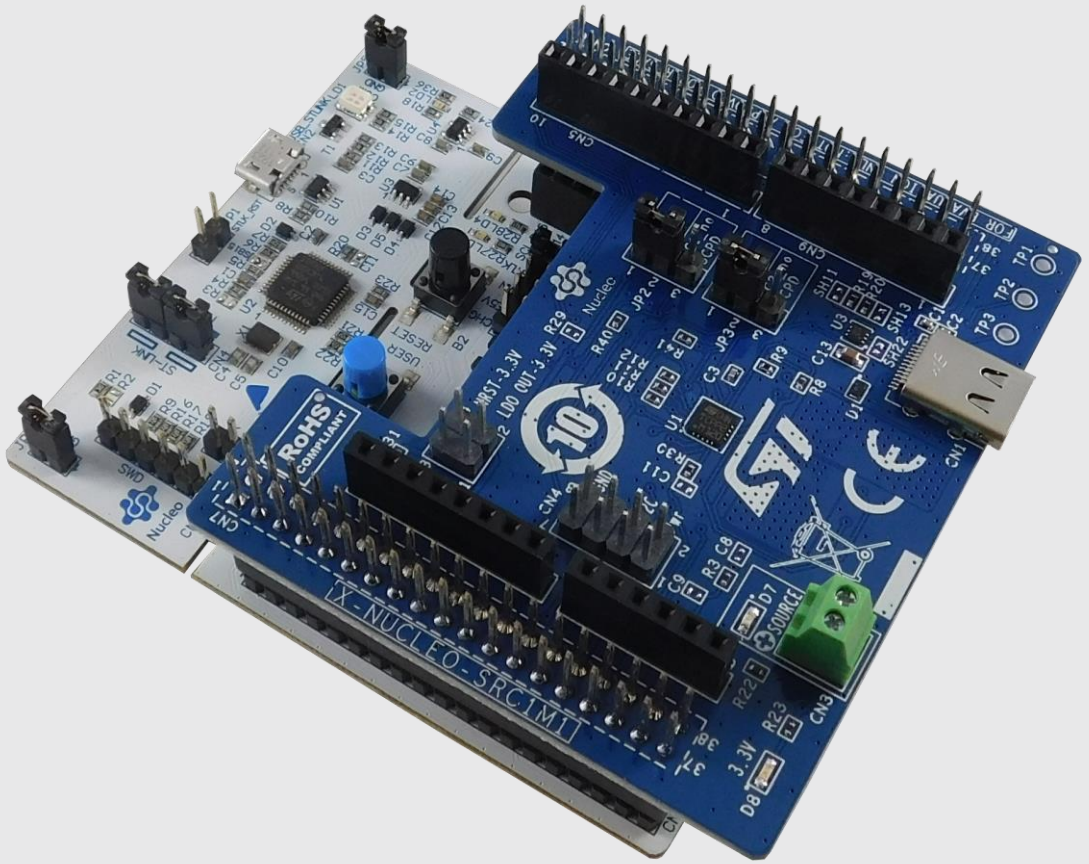

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Quick Start Guide X-NUCLEO-SRC1M1

USB Type-C Power Delivery SOURCE expansion board based on TCPP02-M18 for STM32 Nucleo

STM32 Open Development Environment

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X-NUCLEO-SRC1M1 expansion board

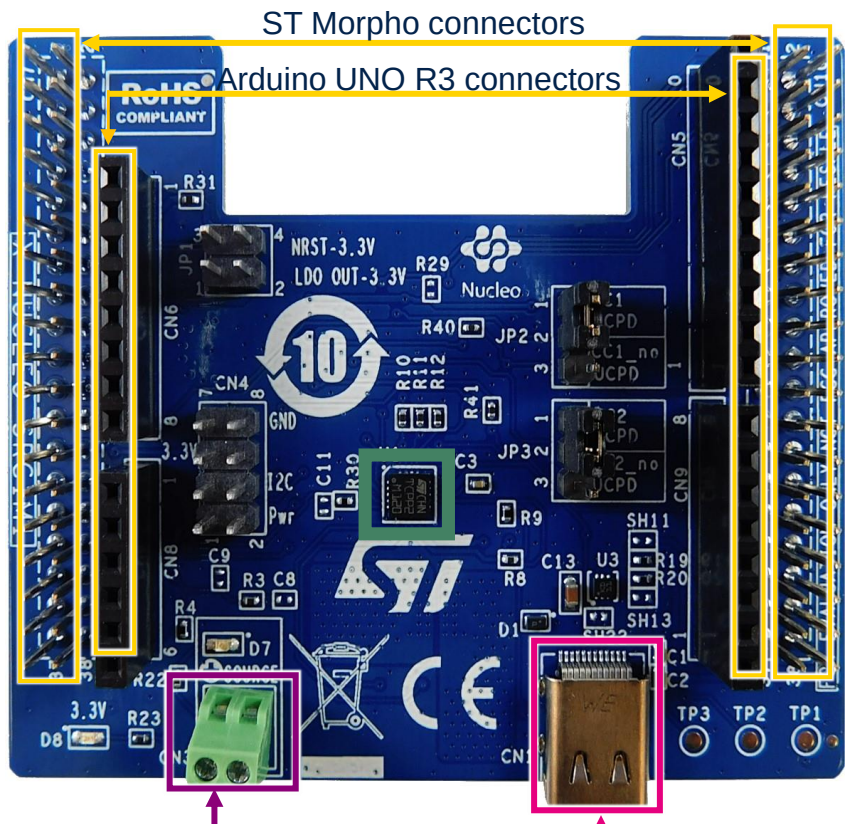
Hardware overview 1/2

Hardware Description

The X-NUCLEO-SRC1M1 is an STM32 Nucleo expansion board to develop USB Type-C & Power Delivery SOURCE applications with STM32 MCUs and companion Type-C Port Protection TCPP02-M18. This expansion board works both with NUCLEO-64 that embeds the UCPD peripheral on STM32, and also with all other NUCLEO-64 for legacy 5V power.

Main Features:

- USB Type-C reversible connector
- Adjustable overcurrent protection (OCP) on V_{BUS}
- Surge protection and system-level ESD protection on V_{BUS}
- Overvoltage protection (OVP) on CC lines against short-to-V_{BUS}
- System-level ESD protection on CC lines
- Discharge on V_{BUS}, current sense on V_{BUS}
- Several power modes for battery-operated, allowing 3µA consumption when no cable attached
- Over temperature protection (OTP)
- Compliant with the latest USB Type-C and USB power delivery standards
- Compliant with Programmable Power Supply (PPS)



Latest info available at www.st.com
X-NUCLEO-SRC1M1

Key Products on the Nucleo expansion board:

TCPP02-M18:
Protection for USB-C or Power Delivery

ESDA25P35-1U1M:
High-power transient voltage suppressor (TVS)

ECMF02-2AMX6:
Common-mode filter and ESD protection for USB 2.0

STL40DN3LLH5:
Dual N-channel MOSFET 30 V, 0.016 Ω typ., 40 A

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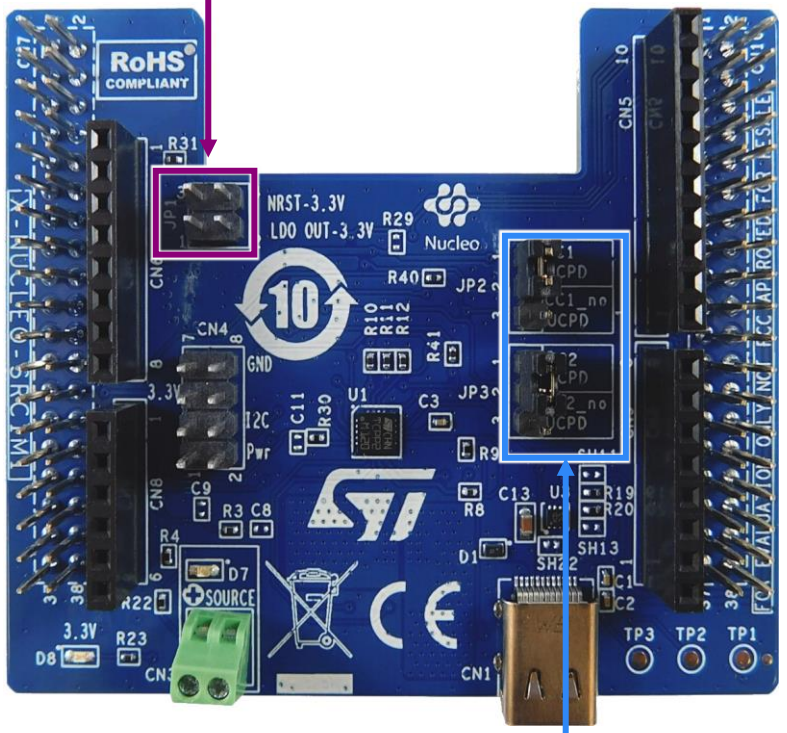
X-NUCLEO-SRC1M1 expansion board
Hardware overview 2/2

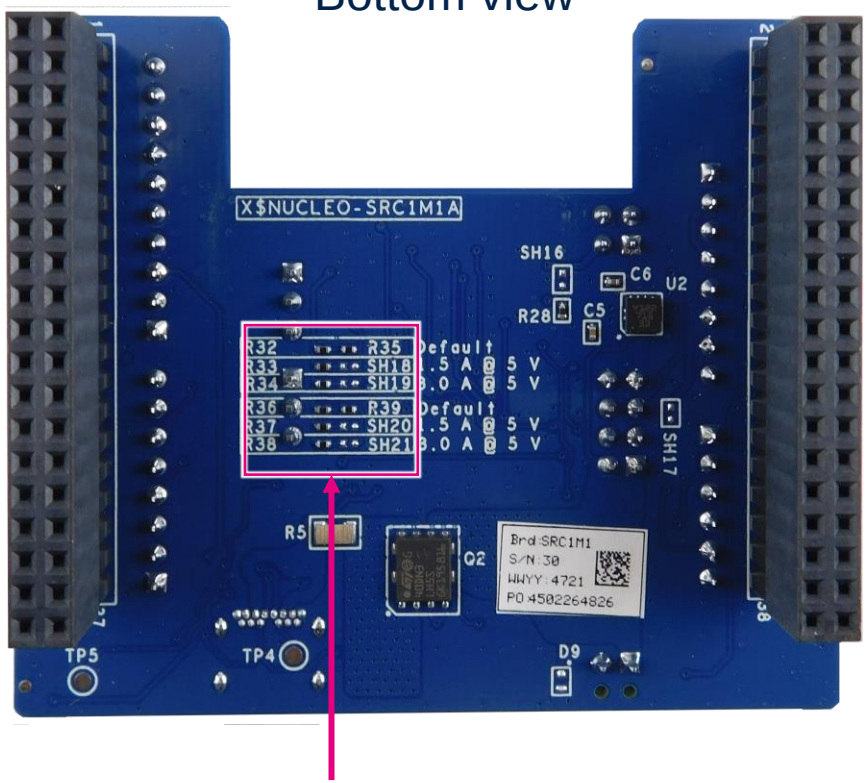
Interface configuration
(JP1)

Top view



CC selection
(JP1/JP2)

Bottom view



5V only SOURCE
max current

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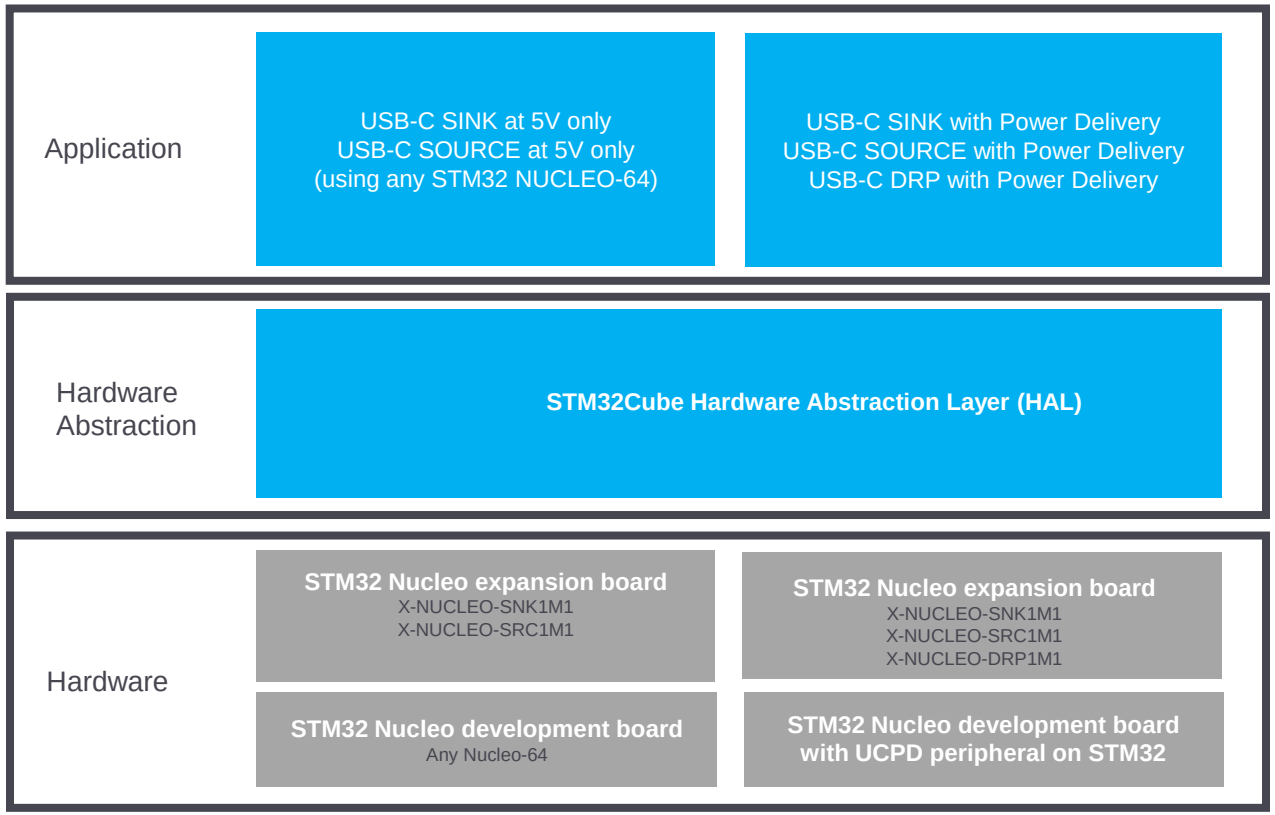
X-CUBE-TCPP software package
SW architecture overview

Software Description:

- The X-CUBE-TCPP software package contains the demo application examples for the USB Type-C SOURCE expansion boards for STM32 Nucleo (X-NUCLEO-SRC11M1) featuring the TCPP02-M18 USB Type-C port protection device.
- The expansion board is plugged onto an STM32 Nucleo development board (any STM32 development board, NUCLEO-G071RB or NUCLEO-G474RE) with an STM32 Nucleo-64 with UCPD peripheral microcontroller that executes the code.
- X-NUCLEO-SRC1M1 or X-NUCLEO-DRP1M1 USB Type-C receptacle can be connected to any Type-C sink. The X-CUBE-TCPP selects only 5V-3A power profile. Higher power profile can be added according to the power source connected to X-NUCLEO.
- Product summary The X-CUBE-TCPP can be downloaded from www.st.com or GitHub.

Key Features:

- Binary and source code application example files for the X-NUCLEO-SRC1M1 USB Type-C Power Delivery SOURCE expansion board
- USB-C&PD capabilities and USB2.0 data operation with NUCLEO-G474RE development board
- Package compatible with STM32CubeMX
- Free user-friendly license terms



Latest info available at www.st.com
X-CUBE-TCPP

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Demo Example: 5V SOURCE application with STM32G474RE with UCPD

HW pre-requisites

- 1x USB-C Power Delivery DRP expansion board
  X-NUCLEO-SRC1M1
- 1x STM32 Nucleo development board
  NUCLEO-G474RE (or NUCLEO-G071RB)
- 1x USB type A to micro-B cable
- 1x Laptop/PC with Windows 7, 8 or above
- 1x USB Type-C cable
- 1x any USB Type-C load

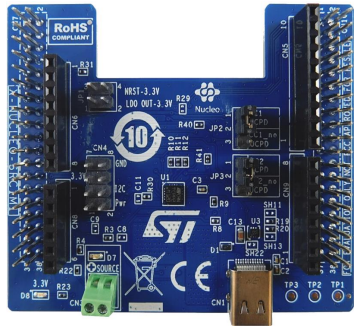
  Smartphone or STM32G071B-DISCO on lock mode
- 1x any 5V – 1.5A (or higher current) voltage power supply

USB type A to micro-B cable

USB type-C cable

USB type-C load

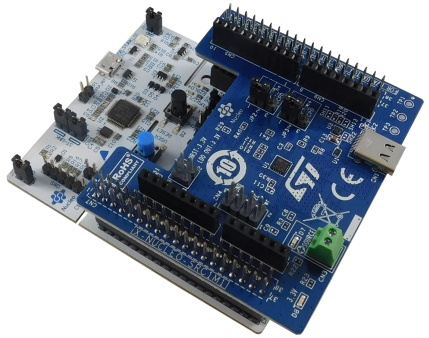
Any 5V source



X-NUCLEO-SRC1M1

+

NUCLEO-G071RB or
NUCLEO-G474RE



NUCLEO
stacked solution

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Demo Example: 5V SOURCE application with STM32G474RE with UCPD

SW pre-requisites

- STM32CubeIDE: All-in-one multi-OS software tool for programming STM32 products or
  STSW-LINK009: ST-LINK/V2-1 USB driver
- STM32CubeMonUCPD: Monitoring and configuration software tool for STM32 USB-C and Power Delivery 3.0 applications
- X-CUBE-TCPP: software package including the application examples for NUCLEO-G071RB, NUCLEO-G474RE to be associated to X-NUCLEO-SRC1M1

Demo Example: 5V SOURCE application with STM32G474RE with UCPD

Introduction

- Programming mode:
  - STM32G474RE is powered by ST-LINK
  - STM32G474RE power supply is always present because ST-LINK power is connected
- System validation (realistic case):
  - STM32G474RE is powered by system:
    - Power SOURCE with LDO or
    - Dedicated 3.3V source
  - STM32G474RE cannot be programmed because ST-LINK does not supply the system (STM32CubeMonUCPD still functional)

- UCPD peripheral will inform the SINK about the SOURCE capabilities (5V – 1.5A)

Demo Example: 5V SOURCE application with STM32G474RE with UCPD

STM32G474RE programming / debugging

HW configuration:

1. X-NUCLEO-SRC1M1:
   - JP2 and JP3 with jumper on CC1_UCPD and CC2_UCPD
2. NUCLEO-G474RE :
   - JP5: 5V_STLINK jumper to select 5V from ST-LINK USB as power source for STM32G747RE
   - JP8: 1-2 jumper to select 5V as reference voltage initiator
3. Connect USB type A to micro-USB cable to NUCLEO-G474RE board

SW programming / monitoring:

1. Drag and drop: G4_SRC1M1_SCR5V.bin to NUCLEO-G474RE NODE (or use IDE for programming)
   - Monitor with STM32CubeMonUCPD

Demo Example: 5V SOURCE application with STM32G474RE with UCPD

STM32G474RE system validation

HW configuration:

1. X-NUCLEO-SRC1M1
   - JP1: 2x jumpers LDO OUT - 3.3V and NRS - 3.3V to power STM32G474RE with 3.3V LDO output
   - JP2 and JP3 with jumper on CC1_UCPD and CC2_UCPD
2. NUCLEO-G474RE :
   - JP5: no jumper
   - JP8: 2-3 jumper to select 3.3V as reference voltage initiator
3. Connect USB type A to micro-USB cable to NUCLEO-G474RE board

SW monitoring:

- Monitor with STM32CubeMonUCPD

Demo Example: 5V SOURCE application with STM32F446RE without UCPD

HW pre-requisites

- 1x USB-C Power Delivery DRP expansion board
  X-NUCLEO-SRC1M1
- 1x STM32 Nucleo development board
  NUCLEO-F446RE
- 1x USB type A to mini-B cable
- 1x Laptop/PC with Windows 7, 8 or above
- 1x USB Type-C cable
- 1x any USB Type-C load

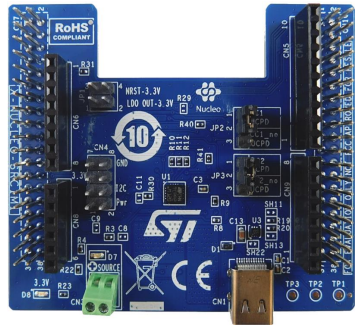
  Smartphone or STM32G071B-DISCO on lock mode
- 1x any 5V – 0.5A (or higher current) voltage power supply

USB type A to mini-B cable

USB type-C cable

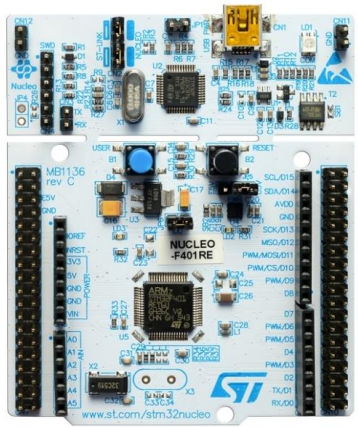
USB type-C load

Any 5V source



X-NUCLEO-SRC1M1

+



NUCLEO-F446RE

NUCLEO
stacked solution

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Demo Example: 5V SOURCE application with STM32F446RE without UCPD

SW pre-requisites

- STM32CubeIDE: All-in-one multi-OS software tool for programming STM32 products or
  STSW-LINK009: ST-LINK/V2-1 USB driver

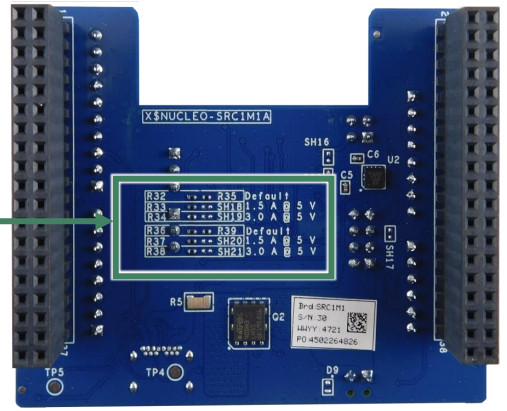
- X-CUBE-TCPP: software package including the application examples for NUCLEO-F446RE to be associated to X-NUCLEO-SRC1M1

Demo Example: 5V SOURCE application with STM32F446RE without UCPD

Introduction

- Programming mode:
  - STM32F446RE is powered by ST-LINK
  - STM32F446RE power supply is always present because ST-LINK power is connected
- System validation (realistic case):
  - STM32F446RE is powered by system:
    - Power SOURCE with LDO or
    - Dedicated 3.3V source
  - STM32F446RE cannot be programmed because ST-LINK does not supply the system
- 5V current capability table on back of X-NUCLEO-SRC1M1 informs the SINK about the 5V SOURCE current capabilities (0.5A by default)

5V current capability table



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Demo Example: 5V SOURCE application with STM32F446RE without UCPD

STM32F446RE programming / debugging

HW configuration:

1. X-NUCLEO-SRC1M1:
   - JP2 and JP3 with jumper on CC1_no_UCPD and CC2_no_UCPD
2. Connect USB type A to mini-USB cable to NUCLEO-F446RE board

SW programming:

1. Drag and drop: SRC1M1_Source_TypeC_Only.bin to NUCLEO-F446RE (or use IDE for programming)

Demo Example: 5V SOURCE application with STM32F446RE without UCPD

STM32F446RE system validation

HW configuration:

1. X-NUCLEO-SRC1M1
   - JP1: 2x jumpers LDO OUT - 3.3V and NRS - 3.3V to power STM32F446RE with 3.3V LDO output
   - JP2 and JP3 with jumper on CC1_no_UCPD and CC2_no_UCPD
2. NUCLEO-F446RE :
   - Place a link between PA3 (CN10-37) and PC4 (CN10-34)

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Documents & related resources

All documents are available in the DOCUMENTATION tab of the related products webpage

X-NUCLEO-SRC1M1:

- Databrief: **DB4628,** USB Type-C™ Power Delivery source expansion board based on TCPP02-M18 for STM32 Nucleo
- User manual: **UM2973,** Getting started with the X-NUCLEO-SRC1M1 USB Type-C™ Power Delivery source expansion board based on TCPP02-M18 for STM32 Nucleo

X-CUBE-TCPP:

- Databrief: **DB4442,** USB Type-C™ software expansion for STM32Cube

TCPP02-M18 Related Resources

- Databrief: **DB4534,** USB type-C protection for source application
- Datasheet: **DS13787,** USB type-C protection for source application

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STM32 ODE Ecosystem

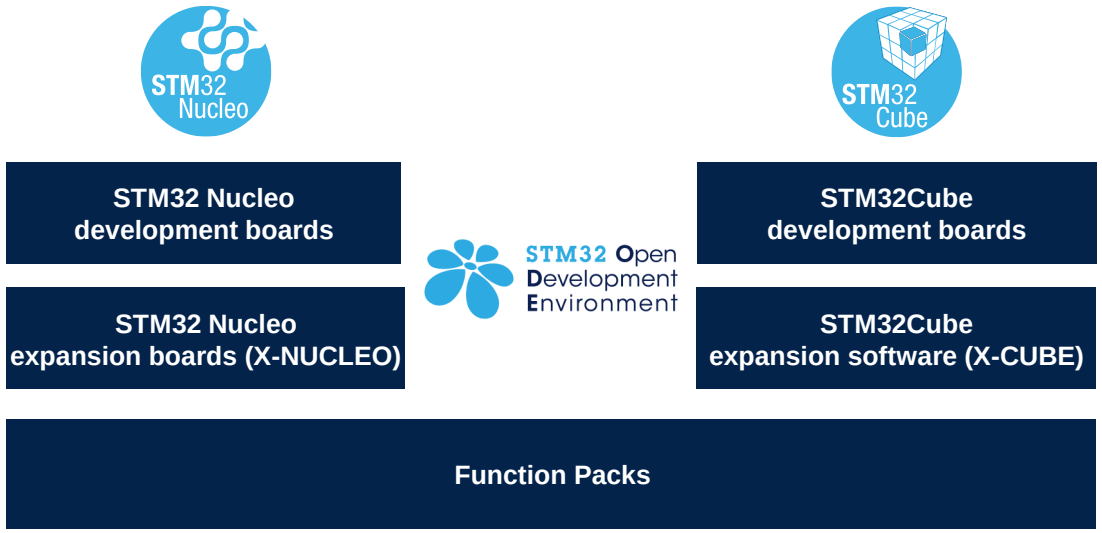
FAST, AFFORDABLE PROTOTYPING AND DEVELOPMENT

The STM32 Open Development Environment (ODE) is an **open**, **flexible**, **easy** and **affordable** way to develop innovative devices and applications based on the STM32 32-bit microcontroller family combined with other state-of-the-art ST components connected via expansion boards. It enables fast prototyping with leading-edge components that can quickly be transformed into final designs.

The STM32 ODE includes the following five elements:

- STM32 Nucleo development boards. A comprehensive range of affordable development boards for all STM32 microcontroller series, with unlimited unified expansion capability, and with integrated debugger/programmer
- STM32 Nucleo expansion boards. Boards with additional functionality to add sensing, control, connectivity, power, audio or other functions as needed. The expansion boards are plugged on top of the STM32 Nucleo development boards. More complex functionalities can be achieved by stacking additional expansion boards
- STM32Cube software. A set of free-of-charge tools and embedded software bricks to enable fast and easy development on the STM32, including a Hardware Abstraction Layer, middleware and the STM32CubeMX PC-based configurator and code generator
- STM32Cube expansion software. Expansion software provided free of charge for use with STM32 Nucleo expansion boards, and compatible with the STM32Cube software framework
- STM32Cube Function Packs. Set of function examples for some of the most common application cases built by leveraging the modularity and interoperability of STM32 Nucleo development boards and expansions, with STM32Cube software and expansions.

The STM32 Open Development Environment is compatible with a wide range of development environments including STM32CubeIDE, IAR EWARM, Keil MDK-ARM, and GCC/LLVM-based IDEs, with the possibility to integrate the various components such as STM32CubeMX, STM32CubeProgrammer or STM32CubeMonitor.



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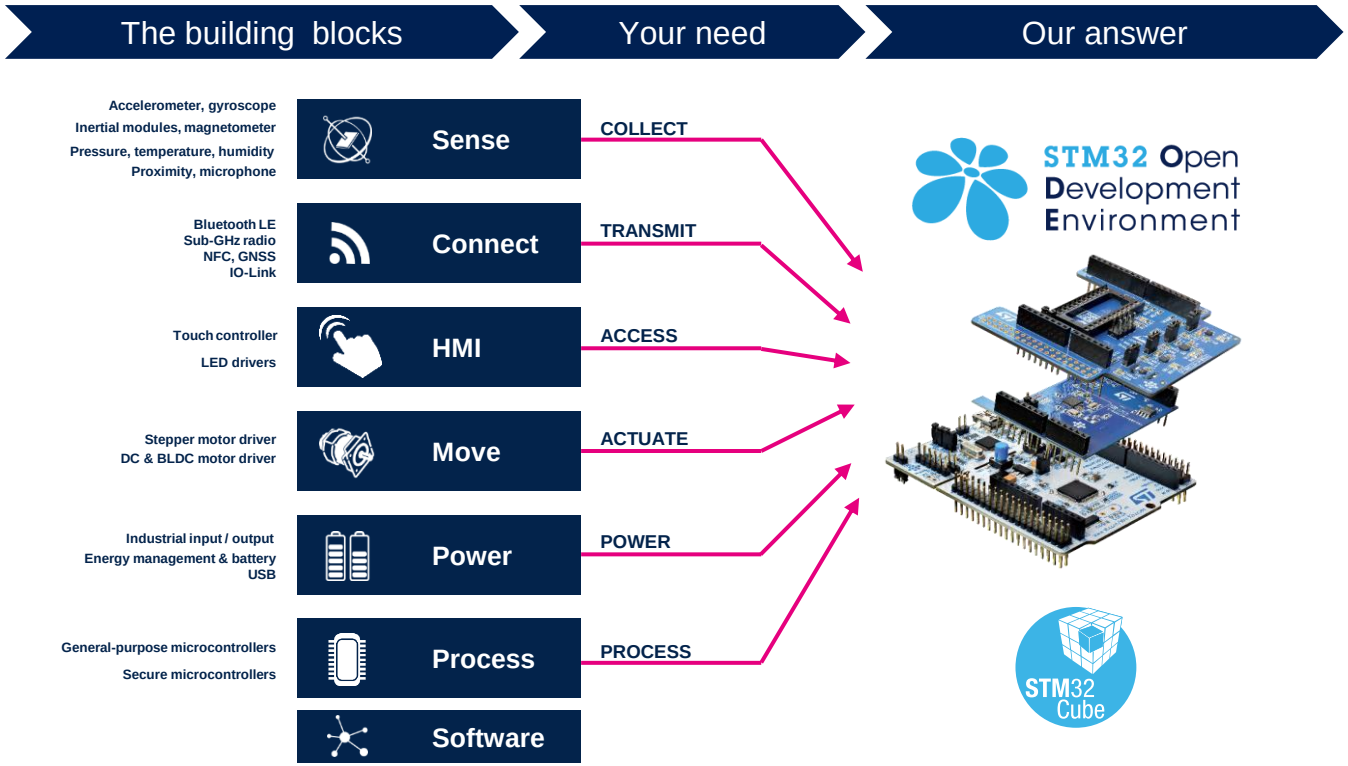
STM32 Open Development Environment: all that you need

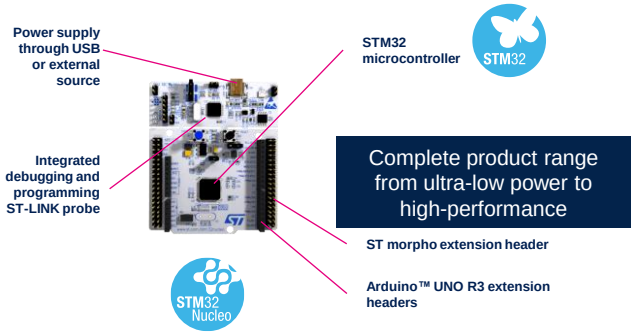
The combination of a broad range of expandable boards based on leading-edge commercial products and modular software, from driver to application level, enables fast prototyping of ideas that can be smoothly transformed into final designs.

To start your design:

- Choose the appropriate STM32 Nucleo development board (NUCLEO) and expansion (X-NUCLEO) boards (sensors, connectivity, audio, motor control etc.) for the functionality you need.
- Select your development environment (IAR EWARM, Keil MDK and GCC/LLVM-based IDEs) and use the free STM32Cube tools and software such as STM32CubeMX, STM32CubeProgrammer, STM32CubeMonitor or STM32CubeIDE.
- Download all the necessary software to run the functionality on the selected STM32 Nucleo expansion boards.
- Compile your design and upload it to the STM32 Nucleo development board.
- Then start developing and testing your application.

Software developed on the STM32 Open Development Environment prototyping hardware can be directly used in an advanced prototyping board or in an end product design using the same commercial ST components, or components from the same family as those found on the STM32 Nucleo boards.





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