



STM32 Open
Development
Environment

STM32 Open Development Environment

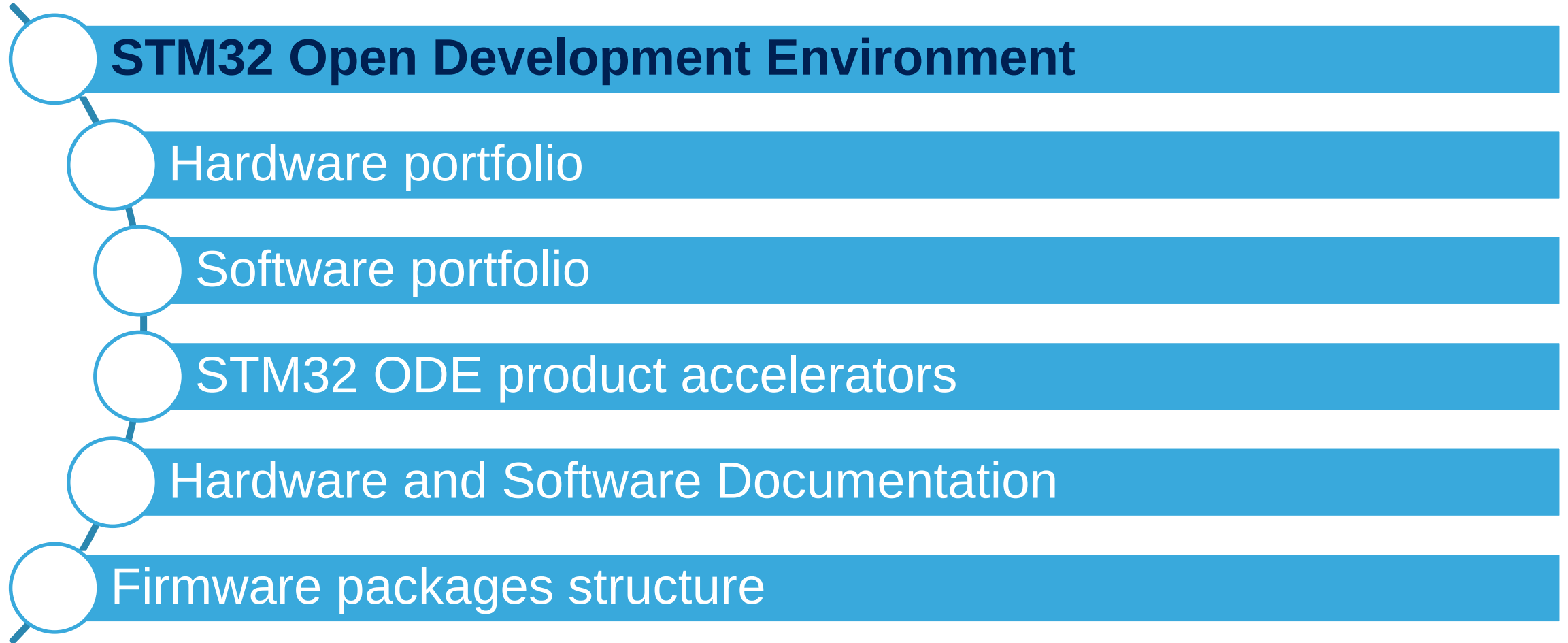
Fast, affordable development and prototyping

Ing. Salvatore Curti



life.augmented





ST's Solutions for IoT

3

INTEGRATION

Common SW platform

3 Cloud provider SDKs supported, enabling sensor-to-cloud platforms



135 SW packages from drivers to full application examples and mobile applications



STM32 Open
Development
Environment



Wearable



IoT
Smart Things



Smart
Home



Building
automation



27 STM32 Nucleo development boards
Covering the broad portfolio of STM32 MCU families

40 STM32 Nucleo expansion boards (X-NUCLEO)
Offering peripheral functions



Modular hardware

ST & 3rd-party form-factor boards

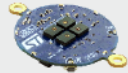
NFC Sensor TAG



SensiBLE



Bluecoin



Sensor Tile



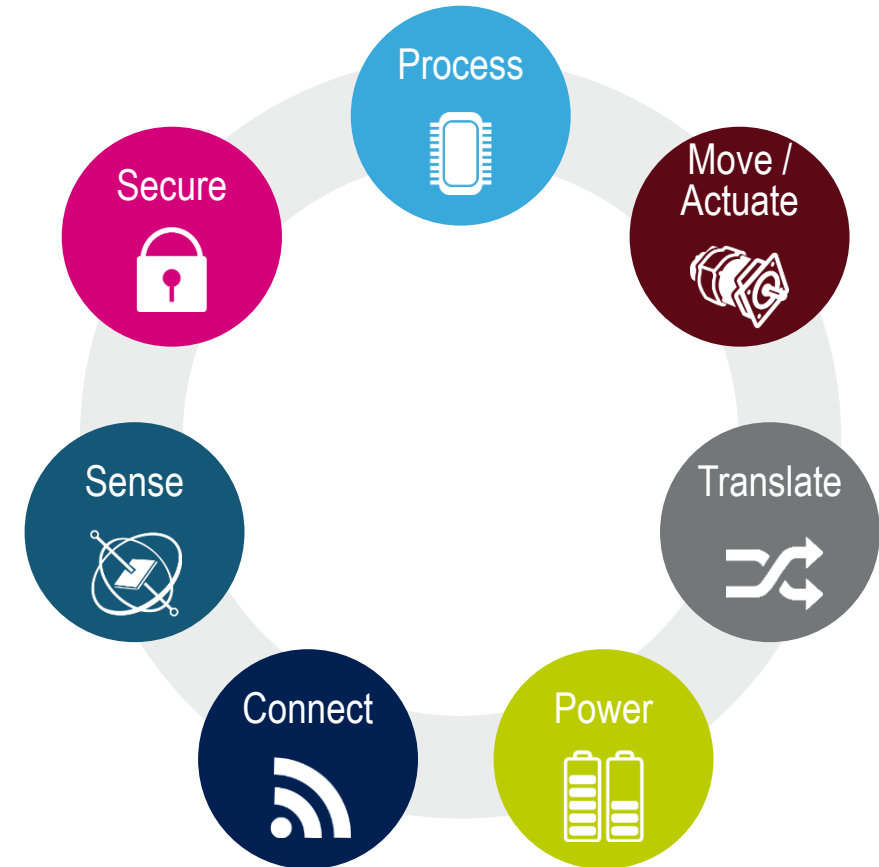
IoT Discovery

Form factor boards

How to Address Developers' Needs

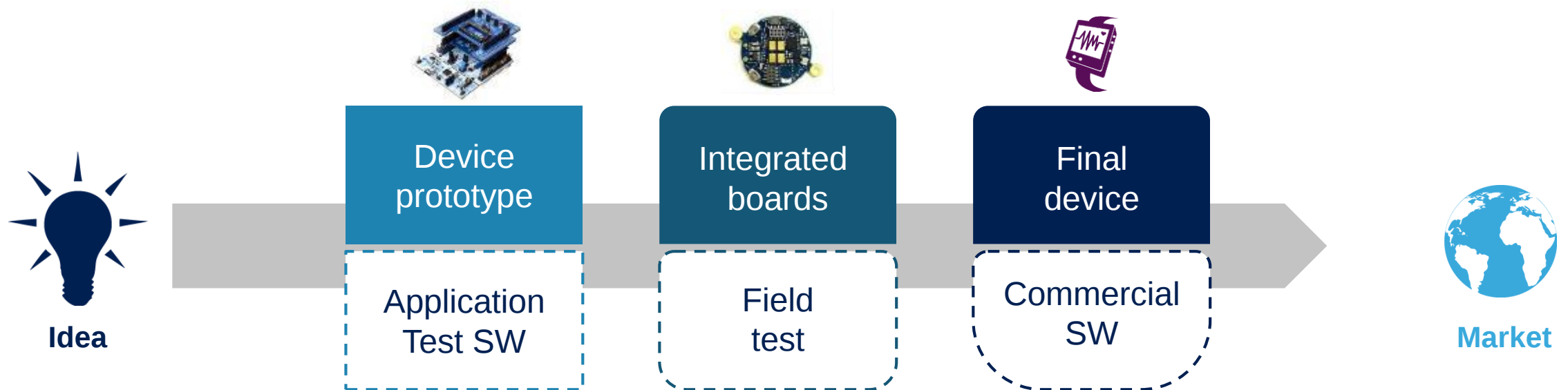
4

- Offer a large range of microcontrollers from low power to high performance to meet application needs
- Ensure that extra functions are covered in the main domains
 - Sensing, connectivity, power management, motor control and audio
- Ease the Development Environment to allow fast development and production
 - Support of multiple IDEs
 - Free-of-charge tools and embedded software to enable fast and easy development



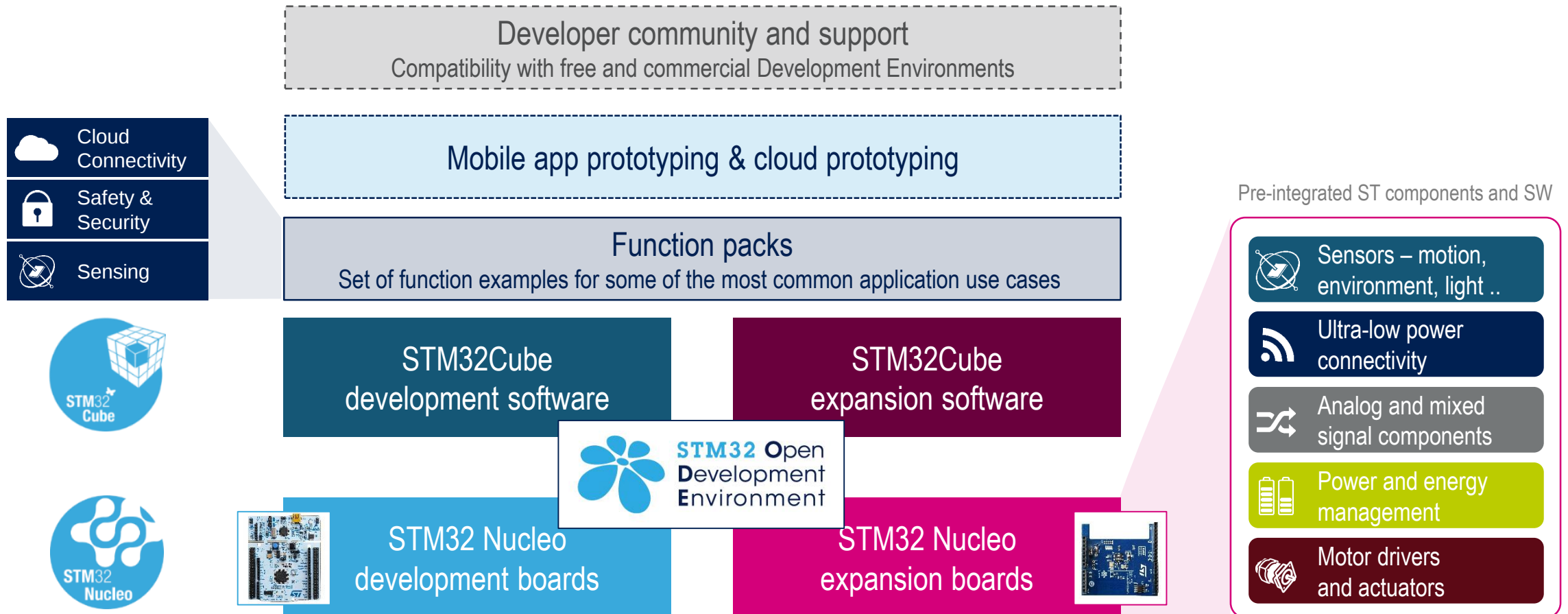
The Real IoT Lifecycle

5



Fast, Affordable Prototyping & Development

6



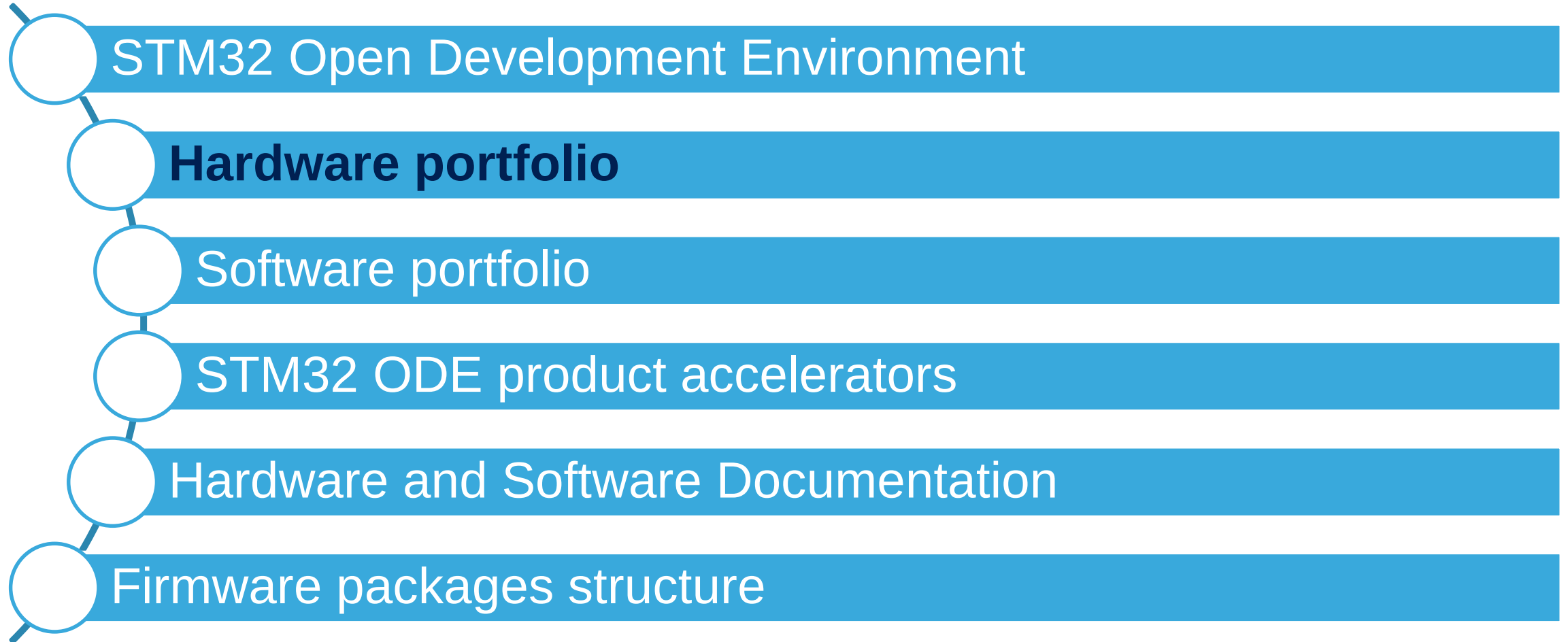
ST University Community

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Vantaggi:

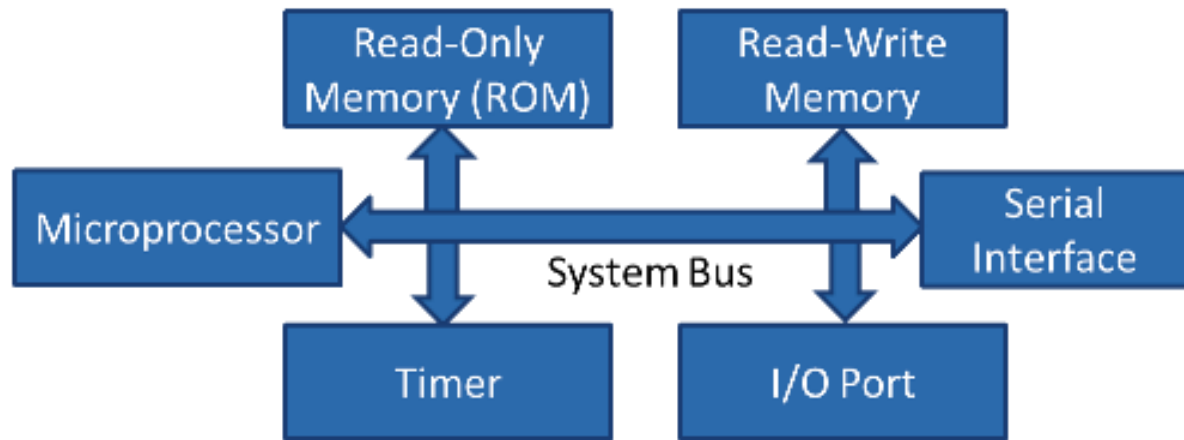
- Creazione di una Community Italiana
- Condivisione di materiale didattico
- Creazione/condivisione di Eventi
- ...





Microcontroller Architecture

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Serial Interface:

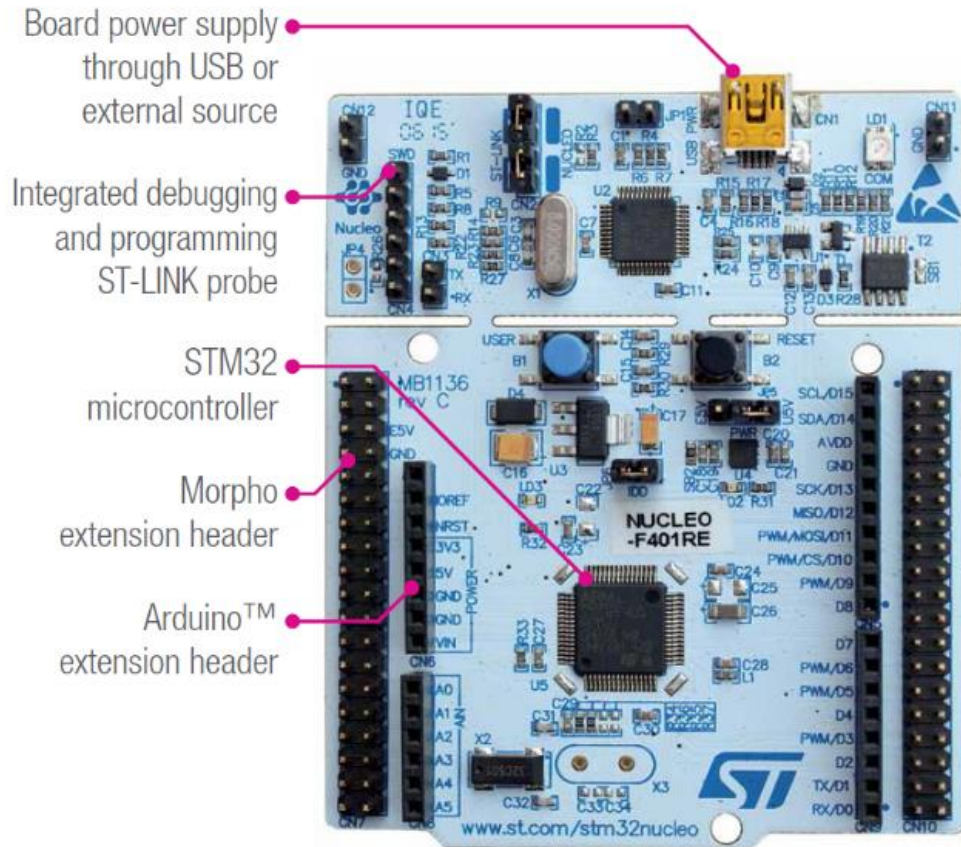
- Inter Integrated Circuit (I2C)
- Serial Peripheral Interface (SPI)
- Universal Asynchronous Receiver-Transmitter (UART)

STM32 is a family of 32-bit microcontroller integrated circuits by STMicroelectronics. The STM32 chips are grouped into related series that are based around the same 32-bit ARM processor core, such as the Cortex-M7F, Cortex-M4F, Cortex-M3, Cortex-M0+, or Cortex-M0. Internally, each microcontroller consists of the processor core, static RAM, flash memory, debugging interface, and various peripherals

STM32 Nucleo Development Boards (1/2)

10

27 development boards and growing... in two flavors (Processing & Security)



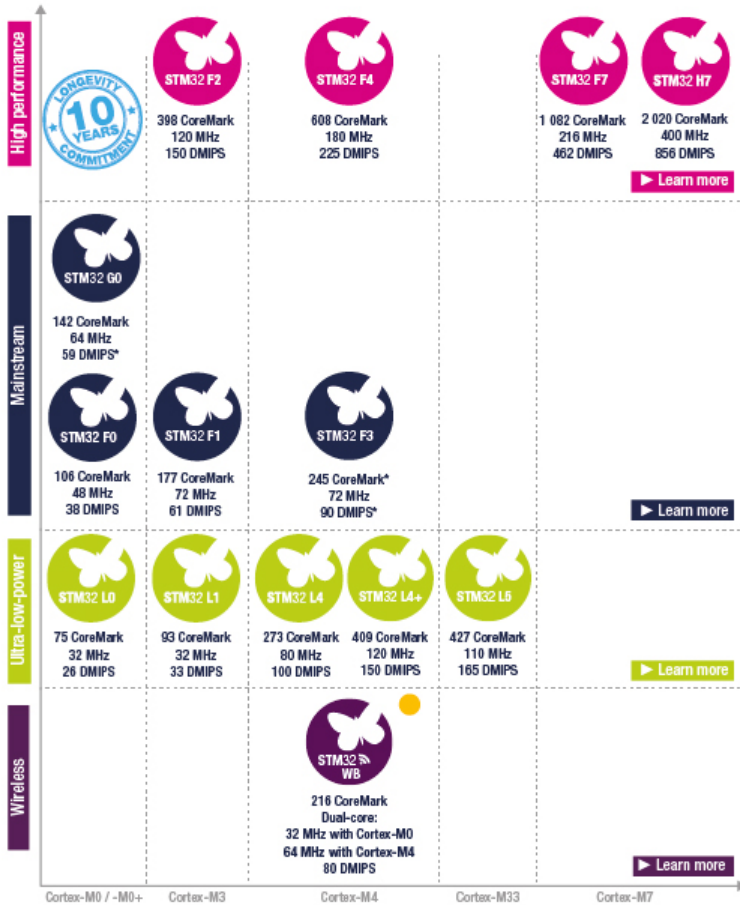
STM32 complete product range from ultra-low power to high performance



STM32 Nucleo Development Boards (2/2)

11

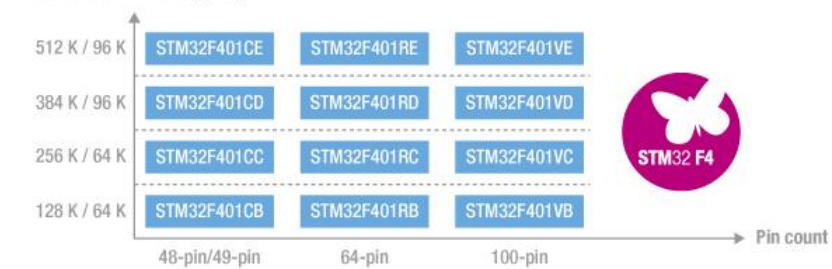
STM32 32-bit ARM Cortex MCUs



Flash memory size / RAM size (bytes)



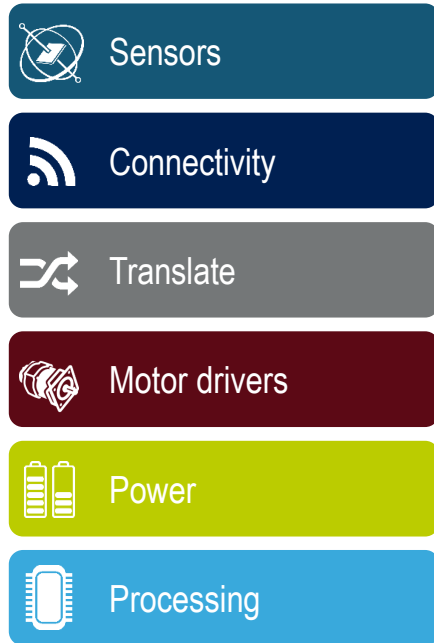
Flash size / RAM size (bytes)



An Application-oriented Approach

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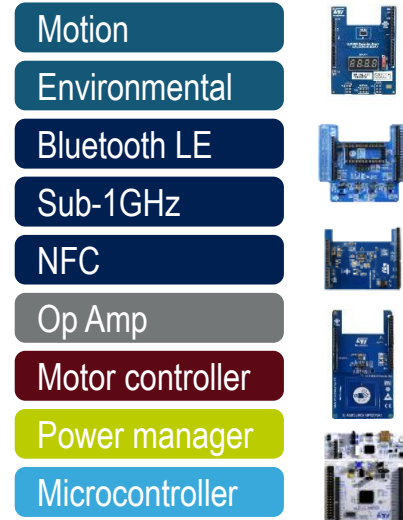
Your need



Application software
and development tools

The building blocks

Processor boards (Nucleo 64)
Expansion boards (X-NUCLEO)



Integrated Development Environment
and middleware

Our answer

Function Packs (FP)

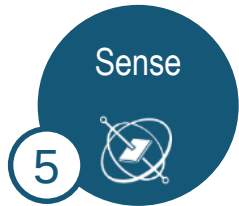


Ready-to-use
application-oriented package

STM32 Nucleo Expansion Boards

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40 expansion boards and growing... covering all the key functions



Motion & environmental
sensors

Proximity sensor

Microphone

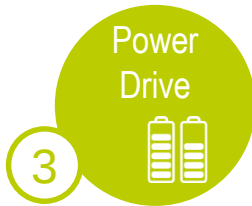


BLE

Sub-GHz

NFC

GNSS



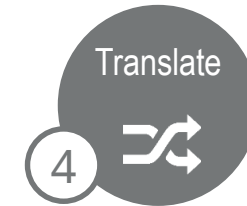
Power management

LED boost



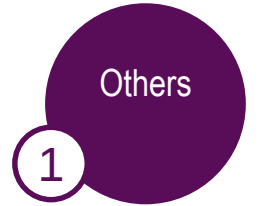
Motor drive

Actuator



Audio amplifier

OpAmp



EEPROM



STM32 Nucleo Expansion Boards

Portfolio (1/3)

14

		Order Code	Description	Key products
Sense 	Motion and environment sensors	X-NUCLEO-IKS01A2	Motion MEMS & environmental sensors	LSM303AGR, LSM6DSL, HTS221, LPS22HB
	Proximity sensors	X-NUCLEO-6180XA1	Proximity, gesture and ambient light sensor expansion board	VL6180X
		X-NUCLEO-53L0A1	Ranging and gesture sensor expansion board	VL53L0X
		X-NUCLEO-53L1A1		VL53L1X
	Microphone	X-NUCLEO-CCA02M1	Digital MEMS microphone expansion board	MP34DT01-M, STPS160A, ESDA7P60-1U1M, USBLC6-2SC6
Connect 	Bluetooth Low Energy 4.1	X-NUCLEO-IDB05A1	Bluetooth Low Energy module expansion board	SPBTLE-RF, M95640-R
	Sub-GHz radio	X-NUCLEO-IDS01A4	SPIRIT1 RF SPSGRF-868 module	SPSGRF-868, M95640-R
		X-NUCLEO-IDS01A5	SPIRIT1 RF SPSGRF-915 module	SPSGRF-915, M95640-R
		X-NUCLEO-S2868A1	SPIRIT2 RF Sub-1 GHz 868	S2-LP
	NFC	X-NUCLEO-NFC01A1	Dynamic NFC Tag expansion board	M24SR
		X-NUCLEO-NFC02A1		M24LR
		X-NUCLEO-NFC03A1	NFC card reader expansion board	CR95HF
		X-NUCLEO-NFC04A1	Dynamic NFC/RFID tag IC expansion board	ST25DV
		X-NUCLEO-NFC05A1	NFC card reader expansion board	ST25R3911B
	Modem	X-NUCLEO-PLM01A1	Power line communication expansion board	ST7580
	GNSS	X-NUCLEO-GNSS1A1	GNSS expansion board based on Teseo-LIV3F module	Teseo-LIV3F

STM32 Nucleo Expansion Boards

Portfolio (2/3)

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		Order Code	Description	Key products
Move/ Actuate 	Motor driver	X-NUCLEO-IHM01A1	Stepper motor driver expansion board	L6474
		X-NUCLEO-IHM02A1	Two-axis stepper motor driver expansion board	L6470, STPS1L60A, SMAJ48A-TR, ST1S14
		X-NUCLEO-IHM03A1	High-power stepper motor expansion board	PowerSTEP01
		X-NUCLEO-IHM04A1	Dual-brush DC motor driver expansion board	L6206
		X-NUCLEO-IHM05A1	Bipolar stepper motor expansion board	L6208
		X-NUCLEO-IHM06A1	Low-power stepper motor driver expansion board	STSPIN220
		X-NUCLEO-IHM07M1	3-phase brushless DC motor drivers expansion board	L6230, TSV994IPT, SMBJ48A-T
		X-NUCLEO-IHM08M1	Low-voltage BLDC motor driver expansion board	L6398D, ST1S14PHR, LD1117S50TR, LMV331ILT, TSV994IPT, STL220N6F7, SMBJ48A-TR, STPS0560Z
		X-NUCLEO-IHM09M1	Motor control connector	-
		X-NUCLEO-IHM11M1	3-phase BLDC motor driver	STSPIN230, TSV991ILT, BAT30KFILM
		X-NUCLEO-IHM12A1	Low-voltage dual-brush DC motor driver	STSPIN240
		X-NUCLEO-IHM13A1	Low-voltage DC motor driver	STSPIN250
		X-NUCLEO-IHM14A1	Stepper motor driver expansion board	STSPIN820
		X-NUCLEO-IHM15A1	Dual-brush DC motor driver	STSPIN840
		X-NUCLEO-IHM16M1	Three-phase brushless DC motor driver	STSPIN830
		X-NUCLEO-IHM17M1	Low-voltage 3-phase brushless DC motor driver	STSPIN233
Translate 	Audio processing	X-NUCLEO-CCA01M1	Sound terminal expansion board	STA350BW, SMA6J26A, ESDA25W
	Op amp	X-NUCLEO-IKA01A1	Multifunctional expansion board (operational amplifiers)	TSZ124 ,TSV734IPT TSU104IPT, ESDALC6V1-1M2, ESDALCL6-2SC6, ESDA7P60-1U1
	Industrial Input/output	X-NUCLEO-PLC01A1	Industrial input/output expansion board	VNI8200XP, CLT01-38SQ7, SM15T33CA, STPS1H100A
		X-NUCLEO-OUT01A1	Industrial Digital output expansion board	ISO8200BQ

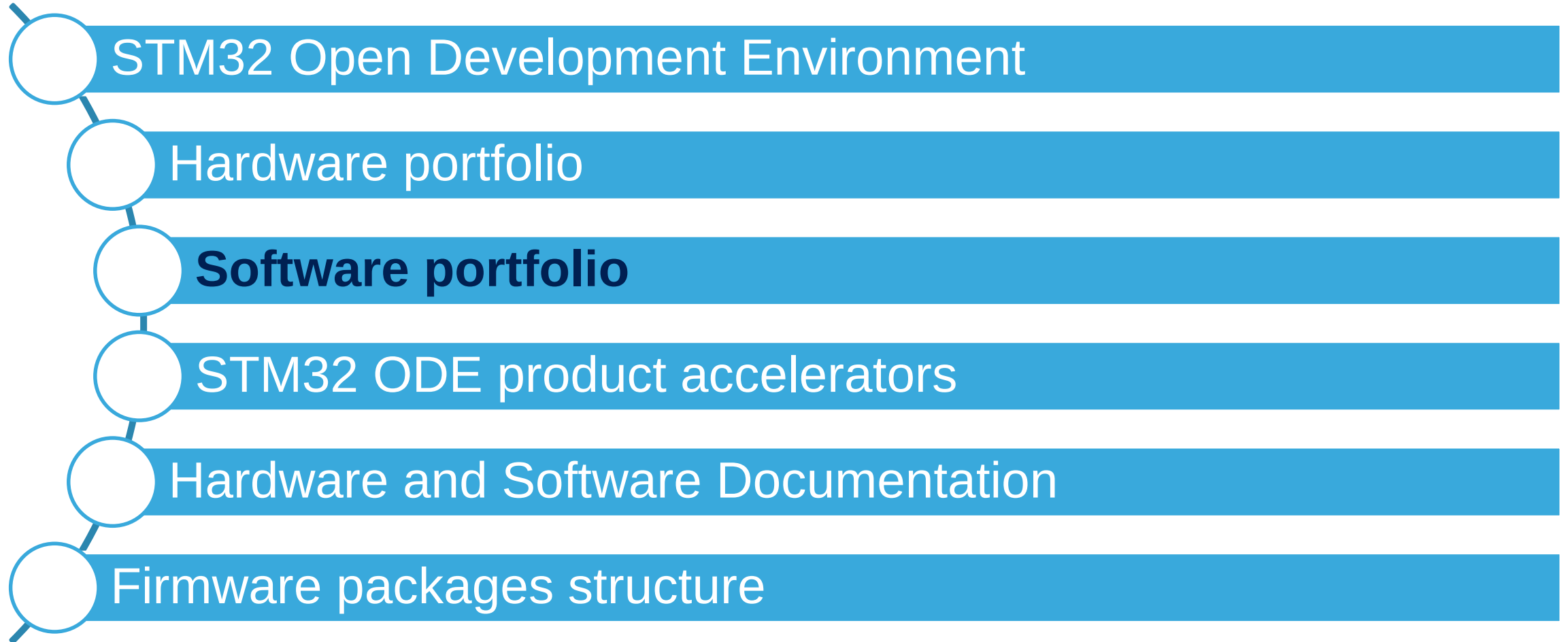
STM32 Nucleo Expansion Boards

Portfolio (3/3)

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		Order Code	Description	Key products
Power / drive 	Battery and energy management	X-NUCLEO-IPS02A1	24 V Intelligent power switch expansion board	VPS2535H
	LED lighting	X-NUCLEO-LED61A1	DC-DC LED driver expansion board	LED6001, STL3N10F7, STL8N10LF3, STPS2L60A, BAS70KFILM, ESDAULC5-1BF4, SMM4F33A-TR
		X-NUCLEO-LED16A1	16-channel LED driver board	LED1642GW
Others	EEPROM	X-NUCLEO-EEPRMA1	Standard I ² C and SPI EEPROM memory expansion board	M24xx and M95xx series

For more information on STM32 Nucleo expansion boards:
<http://www.st.com/en/ecosystems/stm32-nucleo-expansion-boards.html>



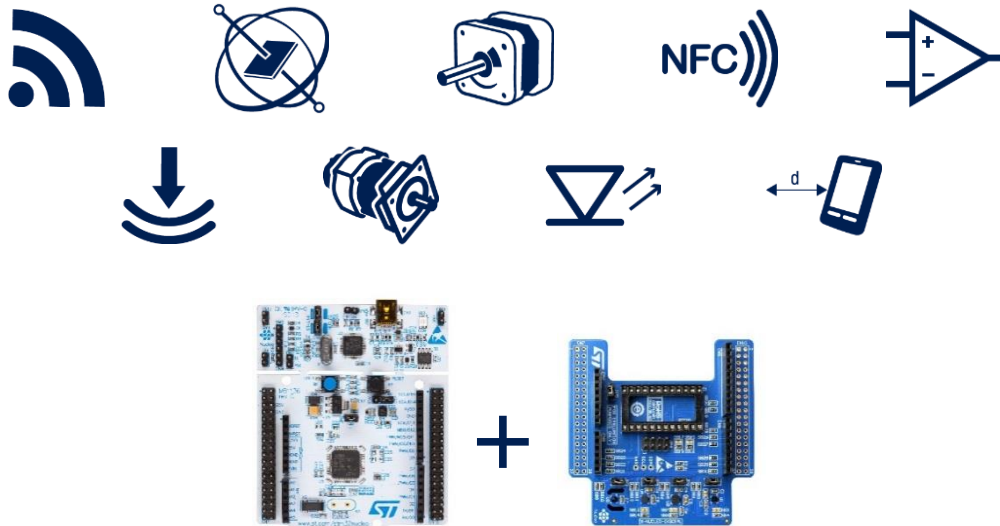
All the Software Needed to Start Application Coding from Day One

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STM32Cube Expansion SW

- Prototype with a single expansion board

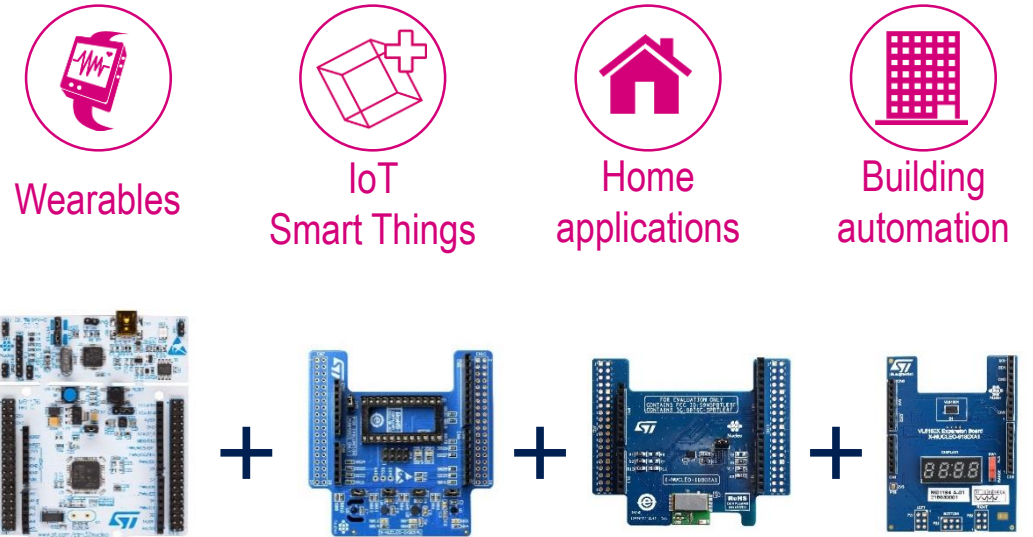
Sample applications



STM32 ODE Function Pack

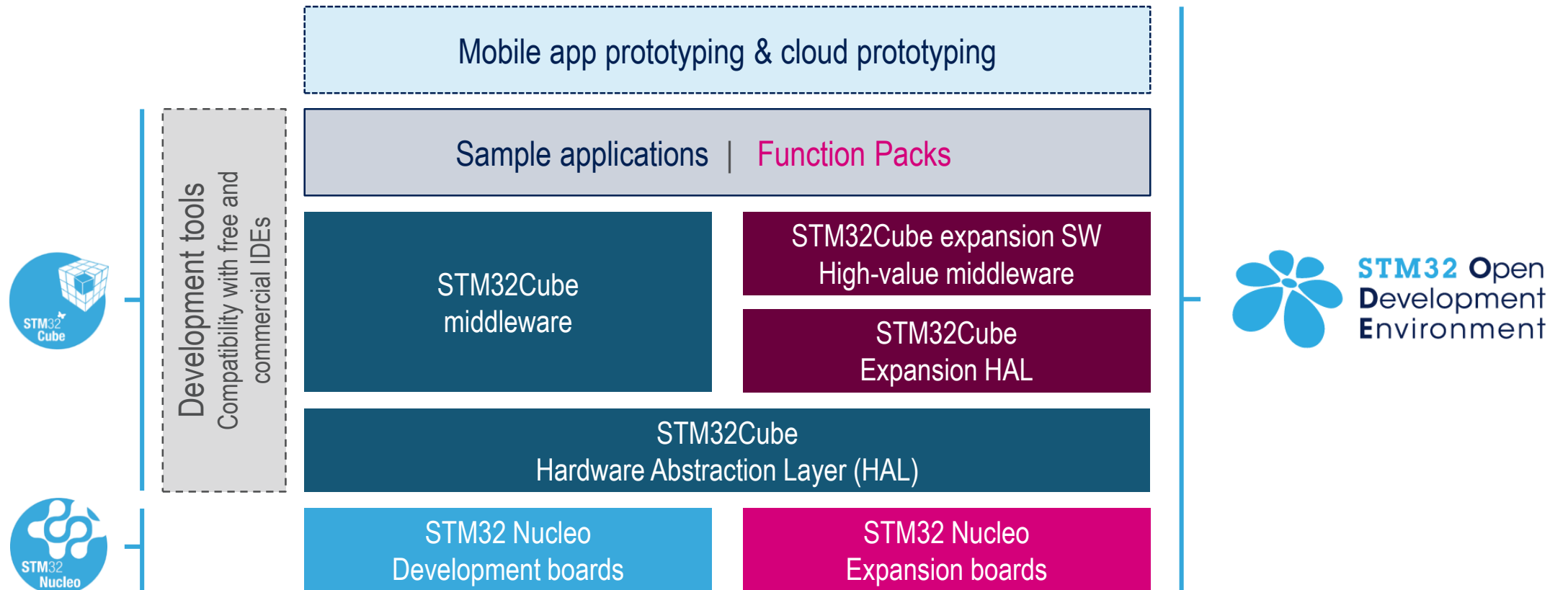
- Create advanced use cases based on multiple expansion boards

Pre-integrated application example



Development Software Architecture

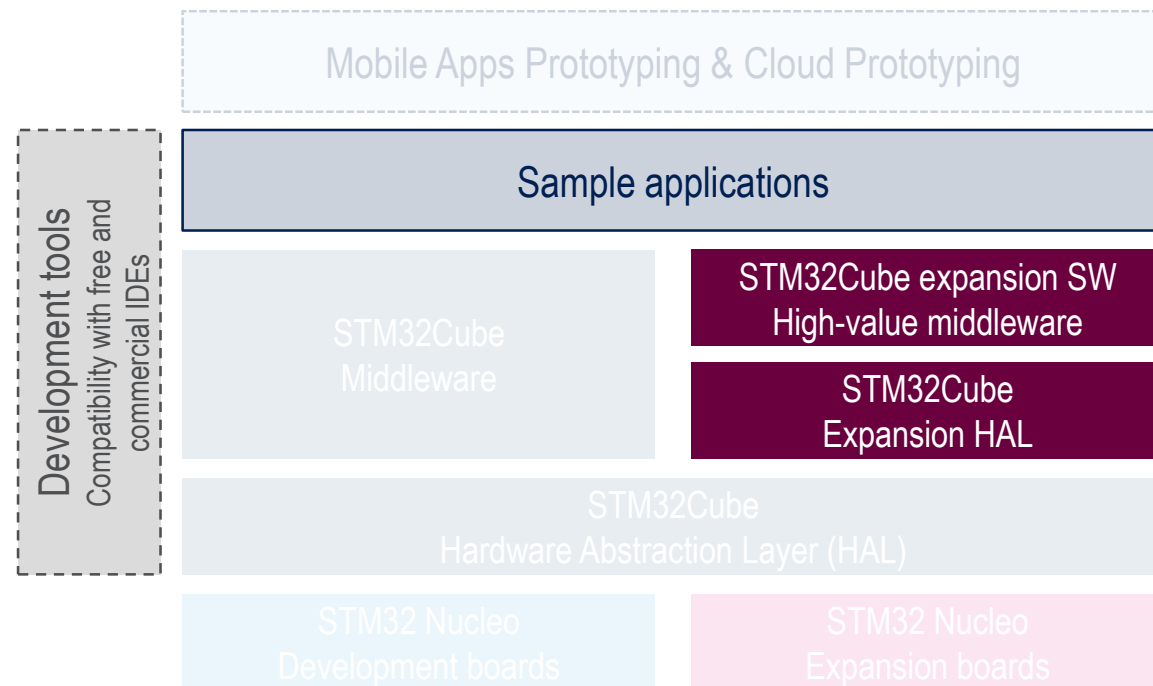
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STM32Cube Expansion SW Packages

20

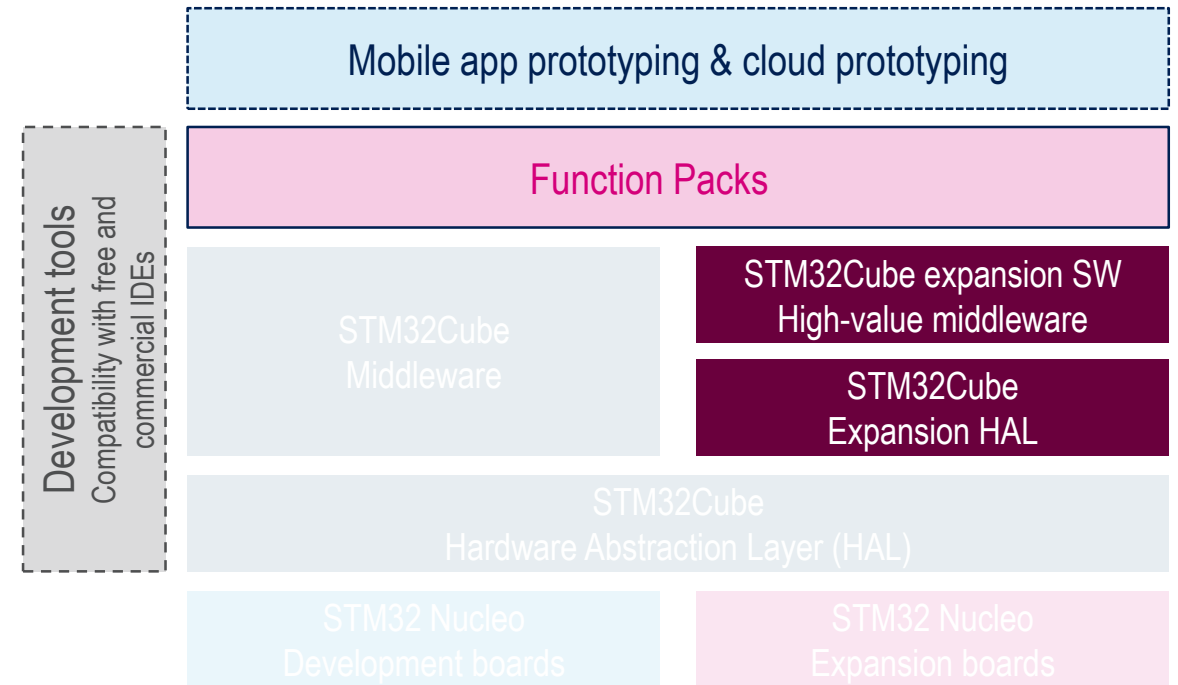
- For each single X-Nucleo board, a STM32Cube Expansion SW package is associated. This SW is validated on several Nucleo boards
 - Example: X-CUBE-BLE1 runs on the X-NUCLEO-IDB05A1
- Sample implementations are included in the package as well as a full documentation set (data brief, user manual, quick start guide and videos)
- These SW extensions are homogeneous in terms of SW structure and API abstraction level to easily combine multiple functions
- All STM32Cube expansion SW packages come with pre-built projects with IAR, Keil and SW4STM32 IDEs, and binaries that can be run out of the box



STM32 ODE Function Packs

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- A Function Pack is a pre-integrated application SW package including a set of key building blocks used in most popular application domains such as Cloud, Wearables, IoT, Home and Building Automation
- Each Function Pack package is associated to two or more X-NUCLEO boards
 - Example: FP-NET-6LPBLE1 runs on the X-NUCLEO-IDB05A1 and X-NUCLEO-IDS01A4
- When relevant for the application demonstrated by the Function Pack, mobile applications (Android™ and iOS™) are included
- All Function Pack come with pre-built projects with IAR, Keil and SW4STM32 IDEs, and binaries that can be run out of the box

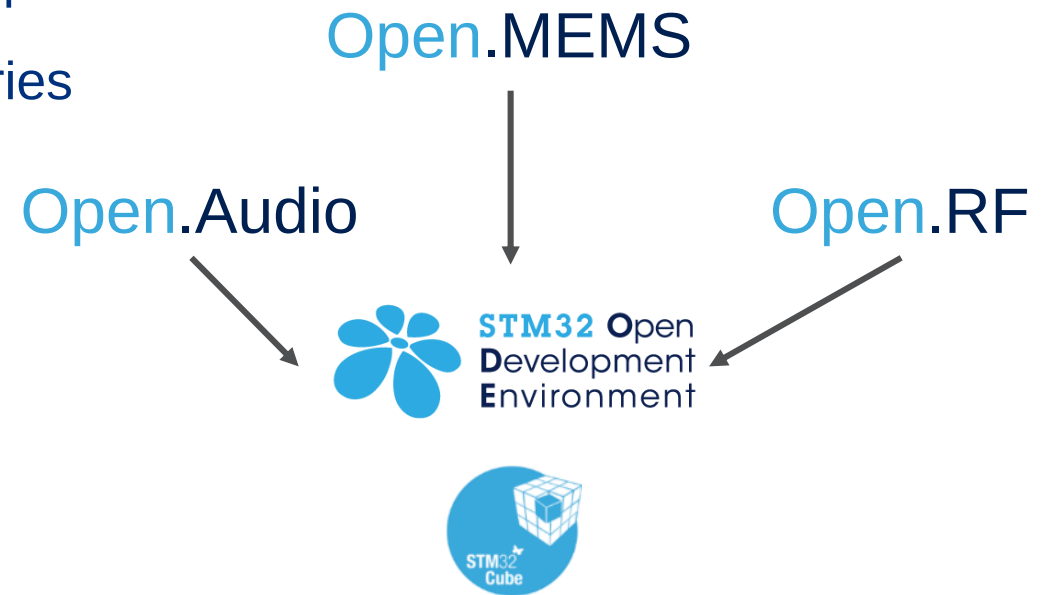


STM32Cube Expansion SW

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Integration of Advanced Audio, MEMS or RF Libraries

- Former **Open.Audio**, **Open.MEMS** and **Open.RF** libraries are now **part of our STM32Cube expansion SW offer**
 - Available without the 'node locking' mechanism
 - Integrated in STM32Cube expansion SW libraries (either in Source Code or Binary)
 - The code will work on every STM32 MCU without the need of any license key



STM32Cube Expansion SW

Detailed Advanced Libraries

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X-CUBE-MEMS1

Compatible with :
LSM6DSL, LSM303AGR, LPS22HB and HTS221

Library	Description
MotionGR	Real-time gesture recognition
MotionFX	Real-time motion-sensor data fusion
MotionCP	Real-time carrying position
MotionPM	Real-time pedometer
MotionAR	Real-time activity recognition
MotionAW	Activity recognition for wrists
MotionPE	Pose estimation
MotionID	Intensity detection
MotionAC	Accelerometer dynamic calibration
MotionMC	Magnetometer dynamic calibration
MotionGC	Gyroscope dynamic calibration
MotionFA	Fitness activity
MotionAT	Active Time

X-CUBE-MEMS1 (continued)

Compatible with :
LSM6DSL, LSM303AGR, LPS22HB and HTS221

Library	Description
MotionFD	Real-time fall detection
MotionPW	Real-time pedometer for wrist
MotionSD	Standing vs sitting desk detection
MotionTL	Tilt measurement
MotionEC	eCompass

X-CUBE-SUBG1

Compatible with : SPSGRF-868, SPSGRF-915 and S2-LP

Library	Description
Contiki6LP	Contiki OS/6LoWPAN middleware

X-CUBE-BLE1

Compatible with : SPBTLE-RF

Library	Description
SmartConnPS	Bluetooth Low Energy profiles

X-CUBE-MEMSMIC1

Compatible with : MP34DT01-M

Library	Description
AcousticSL	Real-time sound source localization
AcousticBF	Real-time beam forming

X-CUBE-MEMS-XT1

Compatible with :
LSM6DSL, LSM303AGR, HTS221, LPS22HB, H3LIS331DL,
LIS2MDL, LIS2DH12, LIS2DW12, A3G4250D, AIS328DQ,
AIS3624DQ, IIS2MDC, ISM303DAC and ISM330DLC

Library	Description
FFT	Fast Fourier Transform
MotionSP	Middleware for vibration analysis in time and frequency domain

Function Pack Example

FP-SNS-MOTENV1

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Required hardware



Motion and environmental sensor expansion board

MEMS 3D accelerometer, gyroscope and magnetometer
MEMS pressure and humidity sensors



X-Nucleo-IKS01A2



Bluetooth Low Energy expansion board

BlueNRG Bluetooth Low Energy network processor



X-NUCLEO-IDB05A1



STM32 Nucleo-64 development board

STM32F4 MCU



NUCLEO-F476RG

Software (free of charge)

FP-SNS-MOTENV1 SW package

Sample applications (streaming sensor data to smartphone app)



Bluetooth Low Energy and Sensor expansion software for STM32Cube
X-CUBE-BLE1
X-CUBE-MEMS1

STM32Cube

“ST Blue Sensor” mobile application

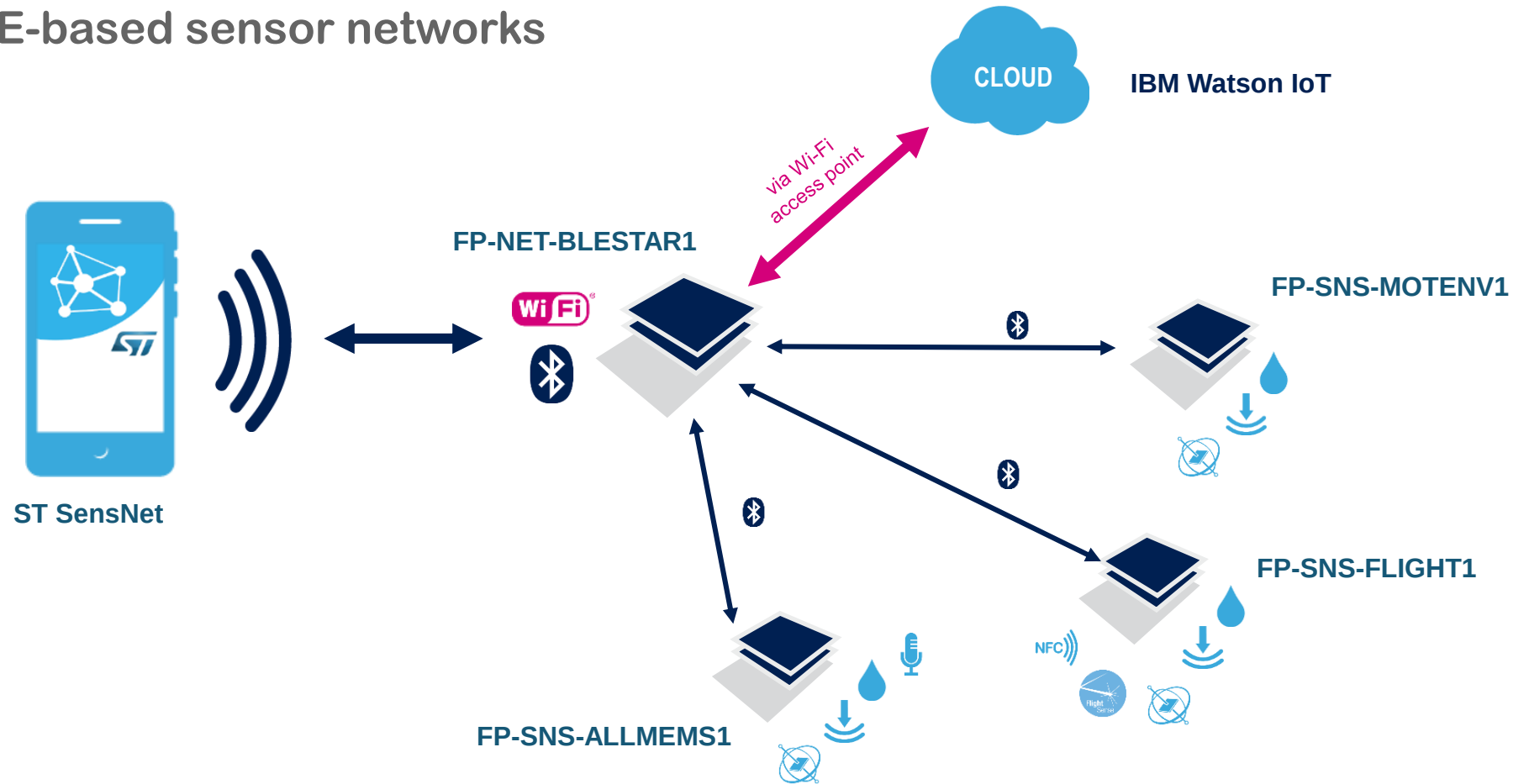


SDK available on Github (BlueSTSDK)

Multiple Function Pack Examples

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Gateway for BLE-based sensor networks



Available Function Packs (1/4)

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Function	Application case	STM32 Nucleo and X-Nucleo boards Discovery and Form Factor boards		STM32 ODE Function Pack	
				Software	Apps iOS / Android
Local and cloud connectivity 	An IoT node with Wi-Fi and sensors, securely connected to Microsoft Azure cloud	B-L475E-IOT01A		<u>FP-CLD-AZURE1</u>	-
	An IoT node with Wi-Fi, NFC and sensors, securely connected to Amazon AWS cloud	B-L475E-IOT01A		<u>FP-CLD-AWS1</u>	-
	An IoT node with Wi-Fi, NFC and sensors for vibration analysis, connected to IBM Watson IoT Cloud	B-L475E-IOT01A		<u>FP-CLD-WATSON1</u>	-
Asset tracking 	An IoT node with GNSS and cellular connectivity for Asset Tracking applications based on TomTom online services	NUCLEO-F401RE 32L496GDISCOVERY	+ X-NUCLEO-GNSS1A1 X-NUCLEO-STMODA1 P-L496G-CELL01	<u>FP-ATR-TOMTOM1</u>	-
	An IoT tracker node with LoRa connectivity, GNSS and sensors	B-L072Z-LRWAN1	+ X-NUCLEO-GNSS1A1 X-NUCLEO-IKS01A2	<u>FP-ATR-LORA1</u>	

Available Function Packs (2/4)

27

Function	Application case	STM32 Nucleo and X-Nucleo boards Discovery and Form Factor boards		STM32 ODE Function Pack	
				Software	Apps iOS / Android
Sensing 	An IoT node with BLE connectivity, sensors and NFC for simple and secure Bluetooth BLE pairing Updated with BLUEMICROSYSTEM3 former Open.Framework package	NUCLEO-F401RE NUCLEO-L476RG	+ X-NUCLEO-IDB05A1 X-NUCLEO-IKS01A2 X-NUCLEO-NFC04A1 X-NUCLEO-53L0A1	<u>FP-SNS-FLIGHT1</u>	<u>ST BLE sensor</u>
		STEVAL-BCNKT01V1 (BlueCoin)			
	An IoT node with BLE connectivity and with sensors for temperature, humidity, pressure, motion, and digital microphone Updated with BLUEMICROSYSTEM2 former Open.Framework package	NUCLEO-F401RE NUCLEO-F446RE NUCLEO-L476RG	+ X-NUCLEO-IDB05A1 X-NUCLEO-IKS01A2 X-NUCLEO-CCA02M1	<u>FP-SNS-ALLMEMS1</u>	<u>ST BLE sensor</u>
		STEVAL-STLKT01V1 (SensorTile) STEVAL-BCNKT01V1 (BlueCoin)			
	An ultra low power IoT node with BLE connectivity and with sensors for temperature, humidity, pressure, motion, and digital microphone	NUCLEO-F446RE NUCLEO-L476RG	+ X-NUCLEO-IDB05A1 X-NUCLEO-IKS01A2 X-NUCLEO-CCA02M1	<u>FP-SNS-ALLMEMS2</u>	<u>ST BLE sensor</u>
		STEVAL-STLKT01V1 (SensorTile) STEVAL-BCNKT01V1 (BlueCoin)			
	An IoT node with BLE connectivity and with 4 sensors for temperature, humidity, pressure and motion Updated with BLUEMICROSYSTEM1 former Open.Framework package	NUCLEO-F401RE NUCLEO-L476RG NUCLEO-L053R8	+ X-NUCLEO-IDB05A1 X-NUCLEO-IKS01A2	<u>FP-SNS-MOTENV1</u>	<u>ST BLE sensor</u>
		STEVAL-STLKT01V1 (SensorTile)			
	An IoT node with NFC connectivity to read the motion and environmental sensor data via an NFC enabled reader such as a mobile phone or a tablet	NUCLEO-L053R8	+ X-NUCLEO-IKS01A2 X-NUCLEO-NFC04A1	<u>FP-SNS-SMARTAG1</u>	ST NFC Sensor
		STEVAL-SMARTAG1 (NFC Sensor TAG)			

Available Function Packs (3/4)

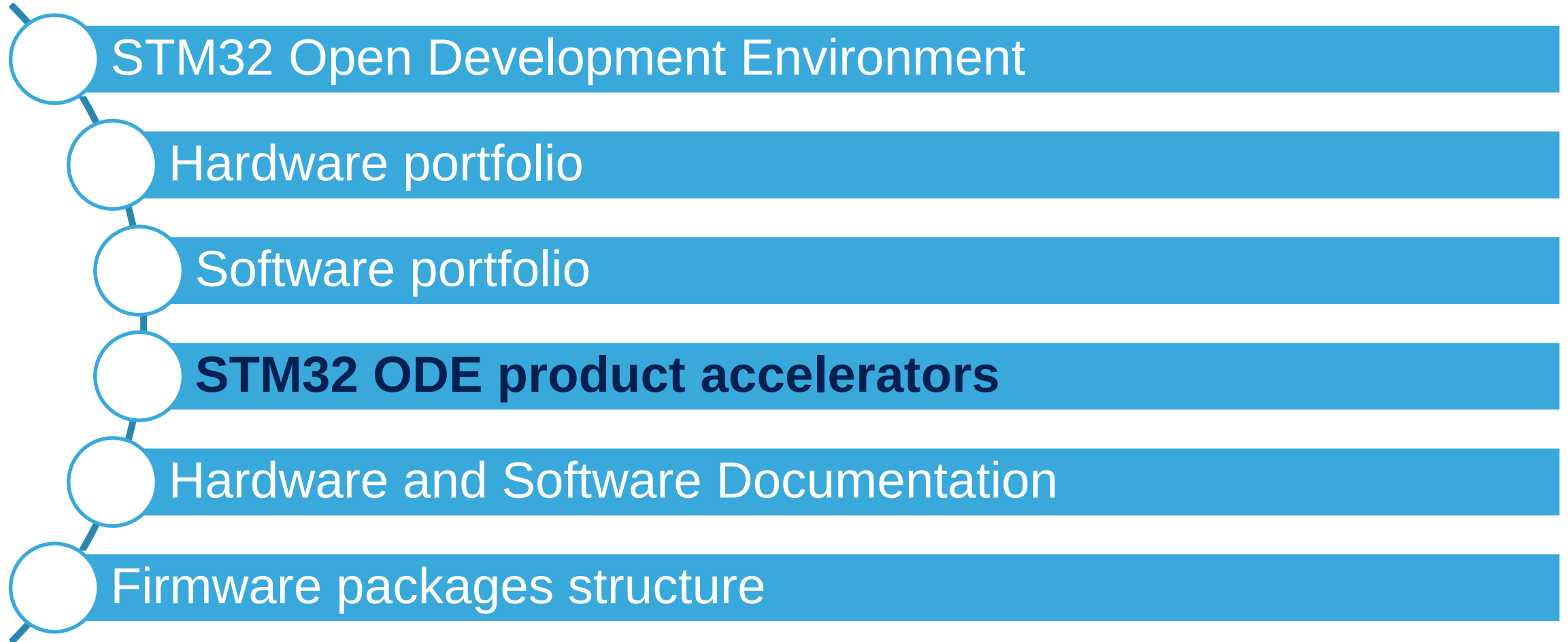
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Function	Application case	STM32 Nucleo and X-Nucleo boards Discovery and Form Factor boards		STM32 ODE Function Pack	
				Software	Apps iOS / Android
Safe and security 	An IoT node with secure BLE network pairing through NFC	NUCLEO-F401RE NUCLEO-L053R8	+ X-NUCLEO-IDB05A1 X-NUCLEO-NFC01A1	<u>FP-SEC-BLENFC1</u>	<u>ST BLE sensor</u>
	A BLE star network connected via Wi-Fi bridge to IBM Bluemix cloud	NUCLEO-F401RE B-L475E-IOT01A	+ X-NUCLEO-IDB05A1 X-NUCLEO-IDW01M1 + X-NUCLEO-IDB05A1	<u>FP-NET-BLESTAR1</u>	<u>ST BLE StarNet</u>
Network infrastructure 	A bridge to connect 6LoWPAN IoT nodes connected to smartphones via BLE interface	NUCLEO-F401RE	+ X-NUCLEO-IDS01A4 X-NUCLEO-IDS01A5 X-NUCLEO-IDB05A1	<u>FP-NET-6LPBLE1</u>	<u>ST BLE StarNet</u>
	6LoWPAN SPIRIT connectivity and bridge to Wi-Fi connectivity	NUCLEO-F401RE B-L475E-IOT01A	+ X-NUCLEO-IDS01A4 X-NUCLEO-IDS01A5 X-NUCLEO-IDW01M1 + X-NUCLEO-S2868A1	<u>FP-NET-6LPWIFI1</u>	-
	6LoWPAN SPIRIT nodes based on the IPSO standard	NUCLEO-F401RE NUCLEO-L152RE	+ X-NUCLEO-IDS01A4 X-NUCLEO-IDS01A5 X-NUCLEO-S2868A1 (X-NUCLEO-6180XA1) (X-NUCLEO-IKS01A2)	<u>FP-SNS-6LPNODE1</u>	-
	A bridge to connect 6LoWPAN IoT nodes connected to the Internet through an Ethernet network	NUCLEO-F429ZI	+ X-NUCLEO-IDS01A4 X-NUCLEO-IDS01A5	<u>FP-NET-6LPETH1</u>	-

Available Function Packs (4/4)

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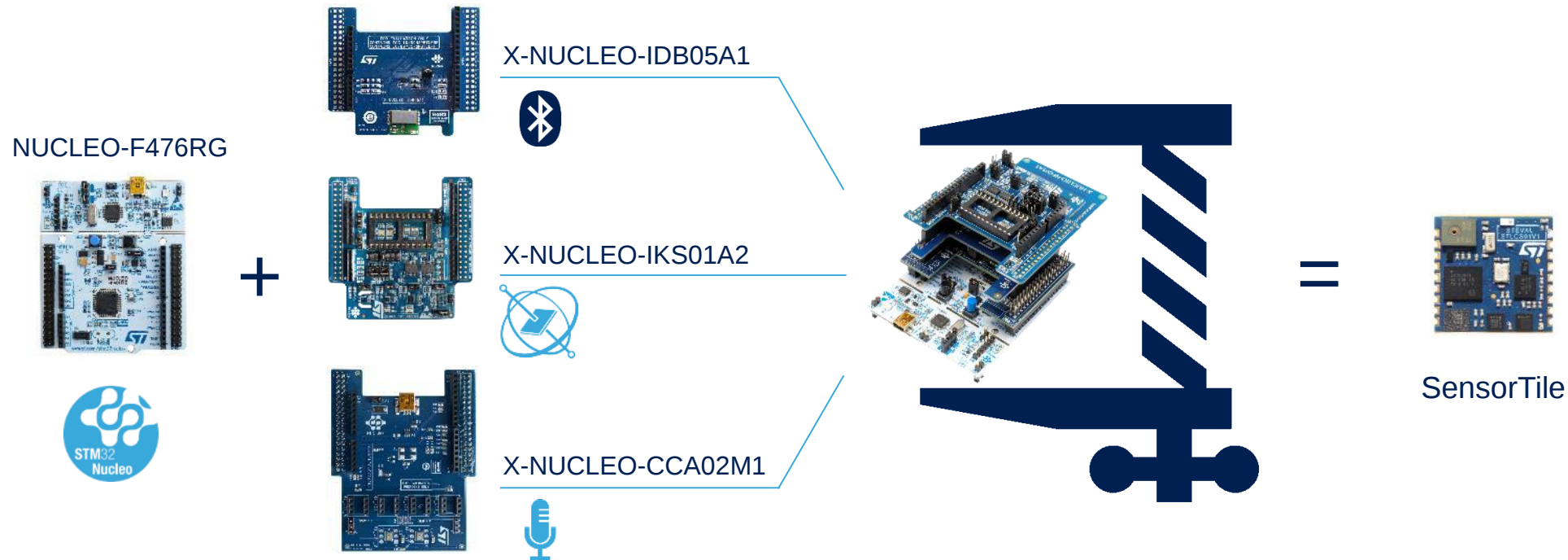
Function	Application case	STM32 Nucleo and X-Nucleo boards Discovery and Form Factor boards		STM32 ODE Function Pack	
				Software	Apps iOS / Android
Audio 	Voice streaming over Bluetooth Low Energy in a half-duplex configuration	NUCLEO-F401RE	+ X-NUCLEO-IDB05A1 X-NUCLEO-CCA02M1	FP-AUD-BVLINK1	ST BLE sensor
	Based on BlueVoice advanced library	STEVAL-STLKT01V1 (SensorTile) STEVAL-BCNKT01V1 (BlueCoin)			
	Full-duplex voice streaming over Bluetooth low energy using Opus compression	NUCLEO-F446RE NUCLEO-L476RG	+ X-NUCLEO-IDB05A1 X-NUCLEO-CCA02M1	FP-AUD-BVLINK2	
		STEVAL-STLKT01V1 (SensorTile) STEVAL-BCNKT01V1 (BlueCoin)			
	Advanced processing for MEMS microphone arrays, including digital MEMS microphone acquisition, beamforming, source localization and acoustic echo cancellation.	NUCLEO-F446RE	+ X-NUCLEO-CCA01M1 X-NUCLEO-CCA02M1	FP-AUD-SMARTMIC1	
	Includes AcousticEC advanced library	STEVAL-BCNKT01V1 (BlueCoin)			
Industrial 	An industrial PLC with Wi-Fi connectivity based on industrial digital input/output ICs.	NUCLEO-F401RE	+ X-NUCLEO-OUT01A1 X-NUCLEO-PLC01A1 X-NUCLEO-IDW01M1	FP-IND-PLCWIFI1	ST PLC
		B-L475E-IOT01A (planned) X-NUCLEO-OUT01A1 X-NUCLEO-PLC01A1			



STM32 ODE Product Accelerators

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A fast track from idea to production



Idea

Prototype



Engineering sample

Product

STM32 ODE Product Accelerators

SensorTile

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By

STMicroelectronics

www.st.com/sensortile

What it is

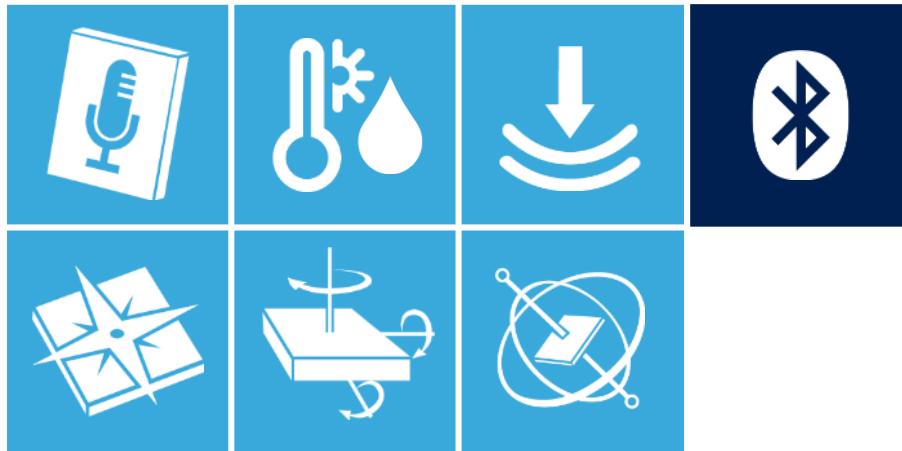
Bluetooth Smart sensorized development kit for IoT design (motion, environmental, microphone).

Equivalent
Nucleo boards

NUCLEO-L476RG
X-NUCLEO-IDB05A1
X-NUCLEO-IKS01A2
X-NUCLEO-CCA02M1

Available Function Packs

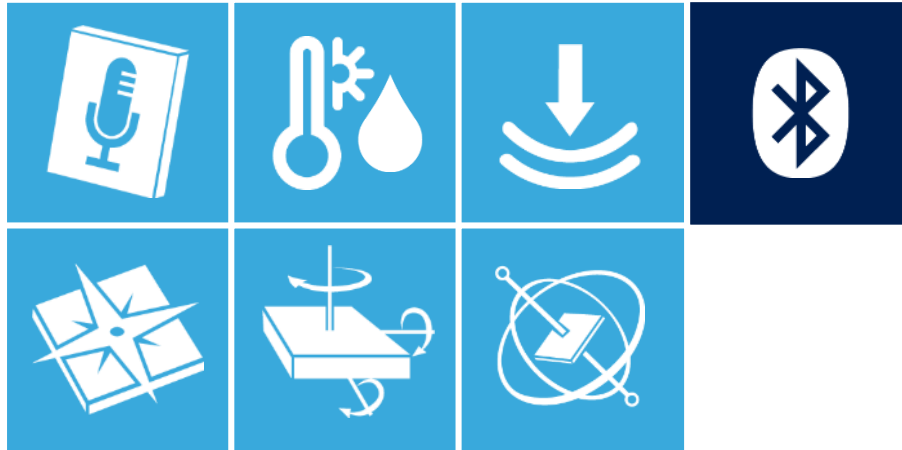
FP-SNS-ALLMEMS1
FP-SNS-ALLMEMS2
FP-SNS-MOTENV1
FP-AUD-BVLINK1
FP-AUD-BVLINK2



STM32 ODE Product Accelerators

BlueCoin

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By

STMicroelectronics

www.st.com/bluecoin

What it is

Bluetooth Smart augmented acoustic and motion sensing development kit for IoT design (motion, environmental, microphone).

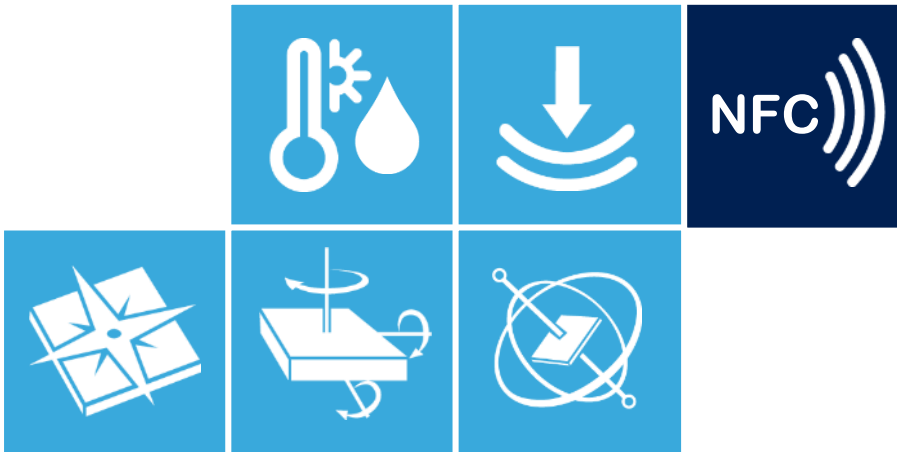
Equivalent
Nucleo boards

NUCLEO-F446RE
X-NUCLEO-IDB05A1
X-NUCLEO-IKS01A2
X-NUCLEO-CCA02M1

Available Function Packs

FP-SNS-ALLMEMS1
FP-SNS-ALLMEMS2
FP-AUD-SMARTMIC1
FP-AUD-BVLINK1
FP-AUD-BVLINK2

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FP-SNS-SMARTAG1

STM32 ODE Product Accelerators

Cloud - JAM

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RUSHUP

JAM



+ Customization service

By

RushUp

www.rushup.tech/jam

What it is

Motion & environmental sensors board connected to the cloud through Wi-Fi network using SSID, password and web authentication stored in the dynamic NFC.

Equivalent
Nucleo boards

NUCLEO-F401RE or
NUCLEO-L476RG
X-NUCLEO-IDW01M1
X-NUCLEO-IKS01A2
X-NUCLEO-NFC01A1

Available Function Packs

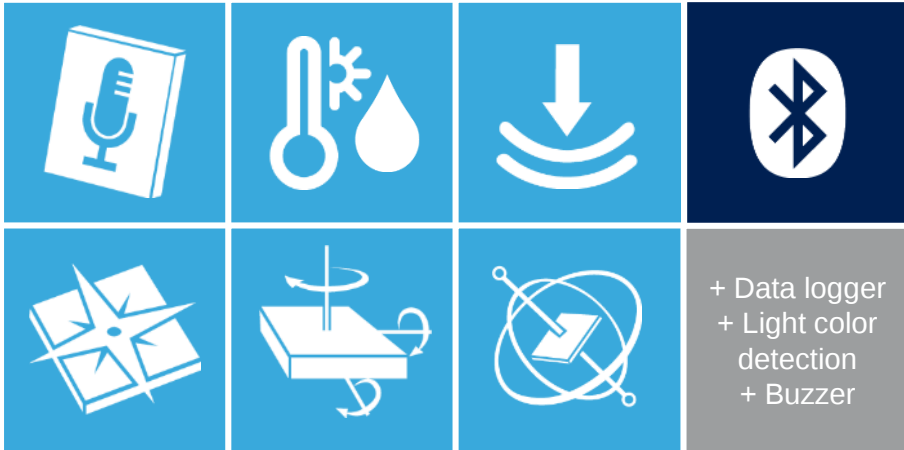
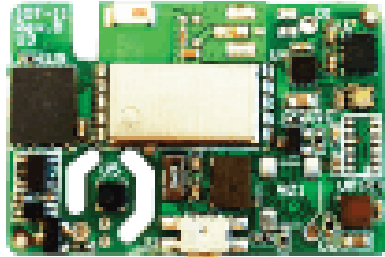
FP-CLD-AZURE1
FP-CLD-AWS1
FP-CLD-WATSON1

STM32 ODE Product Accelerators

SensiBLE

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SensiEDGE



+ Customization service

By

SensiEDGE

www.sensiedge.com

What it is

Complete platform delivering Sensor reading over Bluetooth Low Energy to smartphone and to the cloud.

Equivalent
Nucleo boards

NUCLEO-L476RG
X-NUCLEO-IDB05A1
X-NUCLEO-IKS01A1
X-NUCLEO-CCA02M1

Available Function Packs

FP-SNS-ALLMEMS1



STM32 Open Development Environment

Hardware portfolio

Software portfolio

STM32 ODE product accelerators

Hardware and Software Documentation

Firmware packages structure

Hardware and Software Documentation (1/6)

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Available Hardware and Software Documentation at
www.st.com/sensortile

Data Brief

User Manual

**Design Tips and
Application Notes**

**Presentations
(Quick start guide!)**

Technical Documentation

Product Specifications

Description	Version	Size
 DB2956: SensorTile development kit	6.0	566 KB

User Manuals

Description	Version	Size
 UM2101: Getting started with the STEVAL-STLKT01V1 SensorTile integrated development platform	3.0	2 MB

Errata Sheets

Description	Version	Size
 ES0380: Board limitations	2.0	2 MB

Design Notes & Tips

Description	Version	Size
 DT0063: Bluetooth Low-Energy network: time-stamping and sample-rate-conversion	1.0	206 KB
 DT0095: Datalogging the SensorTile through a PC	1.0	577 KB
 DT0064: Noise analysis and identification in MEMS sensors, Allan, Time, Hadamard, Overlapping, Modified, Total variance	1.0	616 KB

Presentations & Training Material

Presentations

Description	Version	Size
 STEVAL-STLKT01V1 Quick start guide	2.2	1 MB

Hardware and Software Documentation (2/6)

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Hardware Resources

Board Manufacturing Specifications

Description	Version	Size
 STEVAL-STLKT01V1 3D cad files	1.0	8 MB
 STEVAL-STLKT01V1 gerber files	1.0	1 MB

3D CAD and Gerbers



Bill of Materials

Description	Version	Size
 STEVAL-STLKT01V1 BOM	1.0	72 KB

BOM



Schematic Pack

Description	Version	Size
 STEVAL-STLKT01V1 schematic	1.2	256 KB

Publications and Collaterals

Flyers

Description	Version	Size
 SensorTile an IoT design lab		1 MB

Flyers



Available Hardware and Software Documentation at
www.st.com/sensortile

Hardware and Software Documentation (3/6)

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Available Hardware and Software Documentation at
www.st.com/sensortile

License agreements and
certifications



Quality & Reliability

Product Certifications

Description	Version	Size
 Battery 501225 Air Transportation_30-12-2018	1.0	1 MB
 Battery 501225 CE Certification_08-12-2015	1.0	48 KB
 Test Report 501225_19-01-2018	1.0	743 KB

Legal

License Agreement

Description	Version	Size
 Evaluation products license agreement	1.4	128 KB

Hardware and Software Documentation (4/6)

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Available Hardware and Software Documentation at
www.st.com/sensortile

Firmware
packages

App and
corresponding SDK

TOOLS AND SOFTWARE

Embedded Software

EVALUATION TOOL SOFTWARE

Part Number	Manufacturer	Description
STSW-STLKT01	ST	Embedded software samples for SensorTile, including sensor data streaming via USB and BLE, data logging on SD card, audio acquisition and playback

MCUS EMBEDDED SOFTWARE

Part Number	Manufacturer	Description
FP-SNS-ALLMEMS1	ST	STM32 ODE function pack for IoT node with BLE connectivity, digital microphone, environmental and motion sensors
FP-SNS-ALLMEMS2	ST	STM32Cube function pack for ultra-low power IoT node with BLE connectivity, digital microphone, environmental and motion sensors

WIRELESS CONNECTIVITY SOFTWARE

Part Number	Manufacturer	Description
BlueMS	ST	BlueMS Application for Android and iOS
BlueST-SDK	ST	Bluetooth Low Energy and Sensors Technology Software Development Kit (SDK)

Hardware and Software Documentation (5/6)

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Embedded Software		
EVALUATION TOOL SOFTWARE		
Part Number	Manufacturer	Description
STSW-STLKT01	ST	Embedded software samples for SensorTile, including sensor data streaming via USB and BLE, data logging on SD card, audio acquisition and playback

MCUS EMBEDDED SOFTWARE		
Part Number	Manufacturer	Description
FP-SNS-ALLMEMS1	ST	STM32 ODE function pack for IoT node with BLE connectivity, digital microphone, environmental and motion sensors
FP-SNS-ALLMEMS2	ST	STM32Cube function pack for ultra-low power IoT node with BLE connectivity, digital microphone, environmental and motion sensors

GET SOFTWARE

ALLMEMS2 FW (bin + src code)

Part Number	Software Version	Marketing Status	Supplier	Order from ST
FP-SNS-ALLMEMS2	1.0.0	Active	ST	Get Software

- It provides features similar to the FP-SNS-ALLMEMS1 function pack, but with a different implementation for ultra-low power consumption.

FW for beginners (bin + src code)

GET SOFTWARE

Part Number	Software Version	Marketing Status	Supplier	Order from ST
STSW-STLKT01	1.3.1	Active	ST	Get Software

- STSW-STLKT01 runs on SensorTile. It includes 3 samples applications (AudioLoop, BLE_SampleApp, DataLog).

ALLMEMS1 FW (bin + src code)

GET SOFTWARE

Part Number	Software Version	Marketing Status	Supplier	Order from ST
FP-SNS-ALLMEMS1	3.4.0	Active	ST	Get Software

- FP-SNS-ALLMEMS1 runs on SensorTile, as well as on the system made of Nucleo + Nucleo expansions for BLE, MEMS inertial and environmental sensors and MEMS microphones. It includes 1 sample application.

Hardware and Software Documentation (6/6)

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QUICK VIEW	RESOURCES	TOOLS AND SOFTWARE	GET SOFTWARE
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The ST BlueMS is the application available for Android and iOS that shows the data exported by a BLE device using the BlueST protocol (e.g. FP-SNS-ALLMEMS1 STM32CODE function pack).

The app shows different panels based on the data types exported by the firmware, including: environmental data, MEMS sensor fusion, plot, activity recognition, carry position, acceleration event, BlueVoice, pedometer, switch, motion intensity, compass, cloud logging, node status.

All the data received by the app can be logged in CVS files and exported by e-mail.

If the firmware supports the functionality, the application can also show a serial console to exchange string messages with the board. This functionality is also used to upgrade the board firmware.

Both Android and iOS applications support the Bluetooth secure pairing with pin.

For Android it is also possible to use an NFC tag to read the pin and trigger the connection with the node.

Key Features

- Sensor data reception and command transmission over Bluetooth Low Energy (BLE).
- Support for multiple STM32CODE function packs and boards.
- Available on Android and iOS app stores.
- Cross-platform user interface and functionality.
- Based on BlueST-SDK library.
- Data logging support.
- Data plotting support.
- Included serial console (stdout/stdin/stderr) over Bluetooth.
- Secure pairing (with pin) support.
- Data publishing on the cloud support.

IMAGE



24.20 °C



149.00 Lux



1003.64 mBar



59.40 %

Technical Documentation

Product Specifications		
Description	Version	Size
 DB2761: BlueMS application for Android and iOS	3.0	495 KB

User Manuals		
Description	Version	Size
 UM1997: Getting started with the ST BlueMS 3.x application	3.0	3 MB

Presentations & Training Material

Presentations		
Description	Version	Size
 How to use BlueCoin with STBlueMS mobile app hand-on and LABs	1.0	5 MB

GET SOFTWARE

Part Number	Software Version	Marketing Status	Supplier	Third Party Link
BlueMS-Android		Active	ST	GO TO SITE
BlueMS-AndrSrc		Active	ST	GO TO SITE
BlueMS-iOS		Active	ST	GO TO SITE
BlueMS-iOSSrc		Active	ST	GO TO SITE



STM32 Open Development Environment

Hardware portfolio

Software portfolio

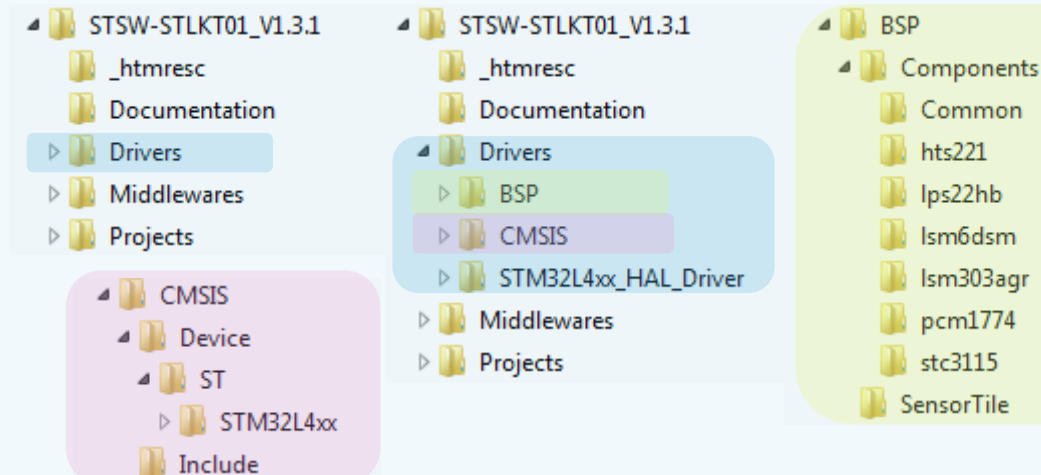
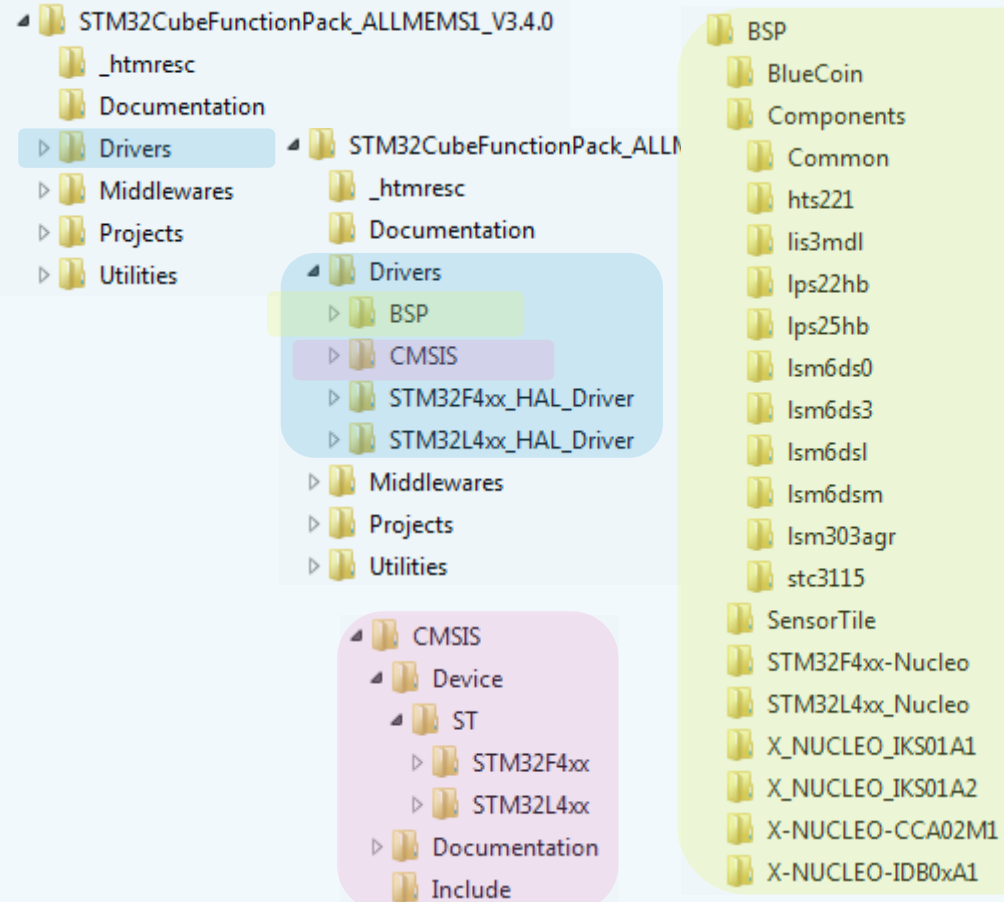
STM32 ODE product accelerators

Hardware and Software Documentation

Firmware packages structure

Firmware Packages Structure (1/3)

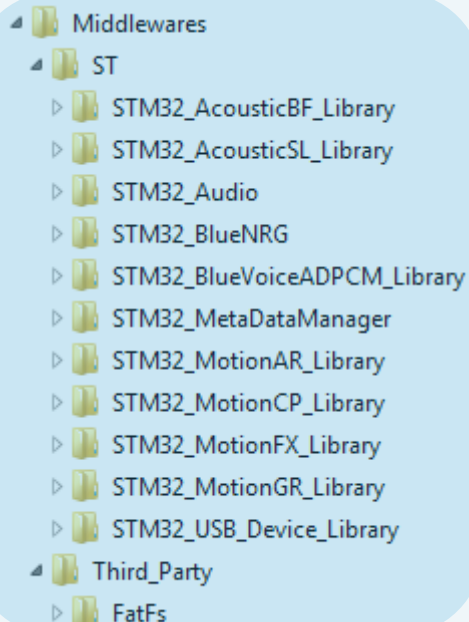
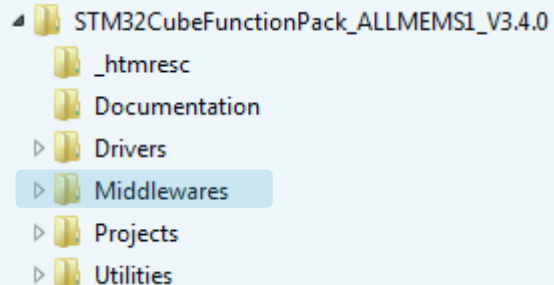
45



- Board Support Package (BSP)
 - Components (typ. MEMS Sensor)
 - Boards (SensorTile, Nucleo, Nucleo-expansion)
- Cortex Microcontroller Software Interface Standard (CMSIS)
 - DSP library collection (fixed / float)
- Hardware Abstraction Layer (HAL)
 - STM32 specific hardware drivers

Firmware Packages Structure (2/3)

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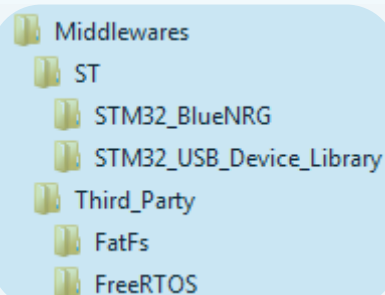
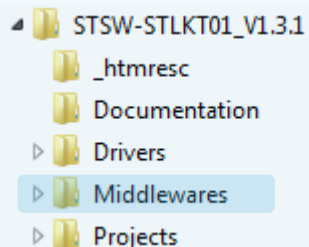


STM32 ODE software libraries

- The STM32 ODE software libraries are distributed as binaries, with example source code on how to use them:
 - X-CUBE-MEMS1 for MEMS Motion Libraries
 - X-CUBE-MEMSMIC1 for AUDIO Libraries
 - FP-AUD-BVLINK1 for Blue Voice Library
- A free license agreement is granted
- The Libraries can run on any STM32 microcontroller, with a generic STM32 MCU locking.

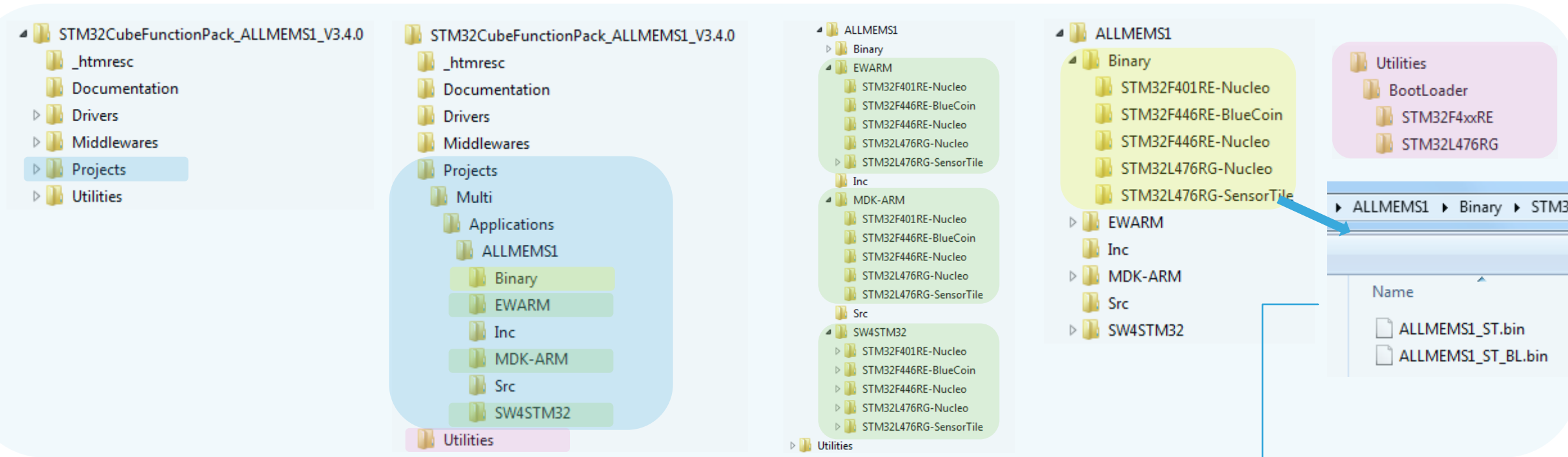
Third Party software libraries

- FatFs is a generic FAT filesystem module for small embedded systems independent of platform and storage device. It is completely separated from the physical devices, such as memory card, hard disk and any type of storage device. A free license agreement is granted
- FreeRTOS is a real time operating system.

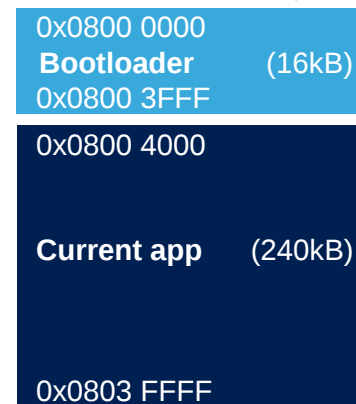


Firmware Packages Structure (3/3)

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- Dedicated folders with project files for popular professional IDEs:
 - IAR Embedded Workbench (EWARM)
 - Keil Microcontroller Development Kit for ARM (MDK-ARM)
 - System Workbench for STM32 (SW4STM32)
- The starting point is obviously the main.c in the src folder
- Dedicated folders for each platform supported
- Dedicated binary folders for each platform supported





Thank You