STM32 Open Development Environment
L’accélérateur de développement de produits IoT
ST a Perfect Play in IoT

ST well positioned for this movement

The right building blocks for IoT devices

Lower barriers for developers getting started

Lower barriers from prototyping to first product

Lower barriers to connect devices to the Cloud

Enable product & service commercialization

Building Blocks
- Processing
- Security
- Sensing & Actuating
- Connectivity
- Motor Control
- Power & Energy Management

Stackable Boards & modular SW

Application specific SW
- Audio Algorithms
- Sensor Fusion

Integration of Cloud Provider SDKs
- Microsoft Azure Certified
- IBM Watson IoT

Pre-integrated Software for vertical Applications
- Smart Home
- Building automation
- Wearable

Partner Program
- Ready to use Smartphone Apps
IoT Product Development
Make it Easy and Make it Fast
IoT Product Development
Make it Easy and Make it Fast

Select your functionality

Function Packs

Advanced Prototypes

Accelerate your product dev.

Time to make it real

Build your prototype & start SW development

STM32 Open Development Environment

Cloud services
STM32 Nucleo Development Boards

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

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

36 expansion boards and growing… covering all the key functions

<table>
<thead>
<tr>
<th>Sense</th>
<th>Connect</th>
<th>Power Drive</th>
<th>Move Actuate</th>
<th>Translate</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>11</td>
<td>3</td>
<td>13</td>
<td>4</td>
</tr>
</tbody>
</table>

- **Motion & environmental sensors**: Proximity sensor, Microphone
- **Connect**: BLE, Wi-Fi, Sub-GHz, NFC
- **Power management**: LED boost
- **Motor drive**: Actuator
- **Audio amplifier**: OpAmp

![Image of expansion boards]
IoT Product Development
Make it Easy and Make it Fast

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All the Software Needed to Start Application Coding from Day One

Expansion SW (X-Cube)
- Prototype with a single expansion board

Function Pack
- Create advanced use cases based on multiple expansion boards

Sample applications

Pre-integrated application example
- Wearables
- IoT
- Smart Things
- Home applications
- Building automation
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STM32 Open Development Environment
Cloud Connectivity out of the Box!

STM32 ODE Function Packs to access to multiple cloud IoT suppliers

<table>
<thead>
<tr>
<th>Network</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge</td>
<td></td>
</tr>
<tr>
<td>Nodes</td>
<td></td>
</tr>
</tbody>
</table>
Single Function Pack Example

ST SensNet

Sensor Function Packs

Cloud Function Packs

via Wi-Fi access point

ST SensNet

Download on the App Store

GET IT ON Google Play

Microsoft Azure

Certified

Watson IoT
Multiple Function Pack Examples
### Required hardware

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motion and environmental sensor expansion board</td>
<td>MEMS 3D accelerometer, gyroscope and magnetometer</td>
</tr>
<tr>
<td></td>
<td>MEMS pressure and humidity sensors</td>
</tr>
<tr>
<td></td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>Wi-Fi expansion board</td>
<td>Wi-Fi network processor</td>
</tr>
<tr>
<td></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>Dynamic NFC tag expansion board</td>
<td>Dynamic NFC/RFID tag IC</td>
</tr>
<tr>
<td></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>STM32 Nucleo-64 development board</td>
<td>STM32L4 or STM32F4 MCU</td>
</tr>
<tr>
<td></td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
</tbody>
</table>

### Software (free of charge)

<table>
<thead>
<tr>
<th>Software Package</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP-CLD-AZURE1 SW package</td>
<td>Azure IoT Client application</td>
</tr>
<tr>
<td></td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td></td>
<td>Wi-Fi, Sensor and NFC expansion software for STM32Cube</td>
</tr>
<tr>
<td></td>
<td>X-CUBE-WIFI1, X-CUBE-MEMS1, X-CUBE-NFC1</td>
</tr>
<tr>
<td></td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td></td>
<td>STM32Cube</td>
</tr>
<tr>
<td></td>
<td><img src="image7.png" alt="Image" /></td>
</tr>
<tr>
<td></td>
<td>“ST25 NFC” mobile application</td>
</tr>
<tr>
<td>Domain</td>
<td>Function Packs</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Local and cloud connectivity</td>
<td>3 Function Packs</td>
</tr>
<tr>
<td></td>
<td>- Wi-Fi connectivity</td>
</tr>
<tr>
<td></td>
<td>- Microsoft, Amazon and IBM (Google to come in 2018)</td>
</tr>
<tr>
<td></td>
<td>- NFC</td>
</tr>
<tr>
<td></td>
<td>- Motion and environmental sensors</td>
</tr>
<tr>
<td>Sensing</td>
<td>3 Function Packs</td>
</tr>
<tr>
<td></td>
<td>- BLE connectivity</td>
</tr>
<tr>
<td></td>
<td>- Motion and environmental sensors</td>
</tr>
<tr>
<td></td>
<td>- ToF</td>
</tr>
<tr>
<td></td>
<td>- Digital microphone</td>
</tr>
<tr>
<td>Safe and security</td>
<td>2 Function Packs</td>
</tr>
<tr>
<td></td>
<td>- Wi-Fi or BLE connectivity</td>
</tr>
<tr>
<td></td>
<td>- NFC</td>
</tr>
<tr>
<td>Network infrastructure</td>
<td>4 Function Packs</td>
</tr>
<tr>
<td></td>
<td>- Wi-Fi and Sub-GHz connectivity</td>
</tr>
<tr>
<td></td>
<td>- Motion and environmental sensors</td>
</tr>
<tr>
<td></td>
<td>- ToF</td>
</tr>
<tr>
<td>Audio</td>
<td>2 Function Packs</td>
</tr>
<tr>
<td></td>
<td>- BLE connectivity</td>
</tr>
<tr>
<td></td>
<td>- Digital microphone</td>
</tr>
<tr>
<td>Industrial</td>
<td>1 Function Pack</td>
</tr>
<tr>
<td></td>
<td>- Wi-Fi connectivity</td>
</tr>
<tr>
<td></td>
<td>- Industrial digital input/output ICs</td>
</tr>
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STM32 Open Development Environment

Internet of Things

Cloud services
STM32 ODE Product Accelerators

A fast track from idea to production

NUCLEO-F401RE + X-NUCLEO-IDW01M1 + X-NUCLEO-IKS01A2 + X-NUCLEO-NFC01A1 =

Idea → Prototype → Engineering sample → Product
STM32 ODE Product Accelerators

Cloud - JAM

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.

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

+ Customization service
STM32 ODE Product Accelerators

SensorTile

By
STMicroelectronics
www.st.com

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

Nucleo boards
- NUCLEO-F476RG
- X-NUCLEO-IDB05A1
- X-NUCLEO-IKS01A2
- X-NUCLEO-CCA02M1

Available Function Packs
- FP-SNS-ALLMEMS1
- FP-SNS-MOTENV1
- FP-AUD-BVLINK1
STM32 ODE Product Accelerators

SensiBLE

By
SensiEDGE
www.sensiedge.com

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

Nucleo boards
NUCLEO-L476RG
X-NUCLEO-IDB05A1
X-NUCLEO-IKS01A1
X-NUCLEO-CCA02M1

Available Function Packs
FP-SNS-ALLMEMS1

+ Customization service
+ Data logger
+ Light color detection
+ Buzzer
ST Solutions for the IoT

**Common SW Platform**

3 Cloud Provider SDKs supported, enabling sensor-to-cloud

131 SW packages from drivers to full application examples and Mobile Applications

**Modular Hardware**

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

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

**ST & 3rd party form-factor boards**

ST & 3rd party form-factor boards

Cloud JAM

SensiBLE

Bluecoin

Sensor Tile

IoT Discovery

Form factor boards
STM32 and ST Peripherals in other Ecosystems
STM32 ODE, mbed and Arduino

**Same HW boards leveraging 3 ecosystems**

**SW & programming tools**

Ease of use / prototyping path

- [Arduino for STM32](http://www.stm32duino.com/)
- [ARM mbed](https://developer.mbed.org/)
- [www.st.com/stm32cube](www.st.com/stm32cube)

Industrialization path

**HW**

- STM32 Nucleo development boards
- STM32 Nucleo expansion boards
- Compatible integrated boards can be supported additionally (STEVAL, Discovery, 3rd party)
• Platforms 38 platforms (biggest offer)
  • 16 STM32Nucleo LQFP64
  • 6 STM32Nucleo LQFP32
  • 7 STM32Nucleo LQFP128
  • 9 Discovery Kits
• Components 24 expansion boards
  • 19 boards got the “MBED Enabled” validation
    • 15 expansion boards’ insert cards
• “SensorTile”
• IoT discovery
  • Sharing all libraries with X-Nucleo, except Wi-Fi
• Promotion
  • Videos published on Youtube
  • 2 demos presented at mbed connect (6LowPan and BLE connectivity)
• ARM mbed ([www.mbed.com](http://www.mbed.com)) is a platform developed by ARM to support easy and quick development of applications on Cortex M-series based microcontrollers

• Two main categories:
  • Platforms → ST Nucleo boards
  • Components → ST Expansion boards

• Online compiler for easy-to-use development and fast prototyping
• Most of STM32 boards are compliant with Arduino Eco-system.
• Many libraries/examples are available.
STM32 on stm32duino

• Nucleo and Discovery boards supported
  • NUCLEO-L476RG, -F401RE, -F411RE, -L053R8, -L152RE, -F030R8, -F091RC, -F103RB, -F207ZG, -F303RE, -F429ZI, -L432KC
  • STM32VLDISCOVERY, STM32F407G-DISC1, STM32F746G-DISCOVERY, B-L072Z-LRWAN1 and B-L475E-IOT01A

• X-Nucleo boards supported
  • X-NUCLEO-IKS01A1 (+ LSM6DS3), X-NUCLEO-IKS01A2
  • X-NUCLEO-NFC01A1, X-NUCLEO-NFC04A1
  • X-NUCLEO-6180XA1, X-NUCLEO-53L0A1
  • X-NUCLEO-IDB05A1 (only Device Mode)
  • X-NUCLEO-LED61A1
  • X-NUCLEO-IKA01A1
  • X-NUCLEO-IHM02A1

Where you can find these libraries
http://stm32duino.com/viewtopic.php?f=60&t=2902
https://github.com/stm32duino/Arduino_Core_STM32
STM32 Boards

Sensor libraries

B-L475E-IOT01AX board ready for IoT

Arduino for STM32
Everything relating to using STM32 boards with the Arduino IDE
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