Augmented Things:
A Playground for all
with the STM32 Nucleo platform!

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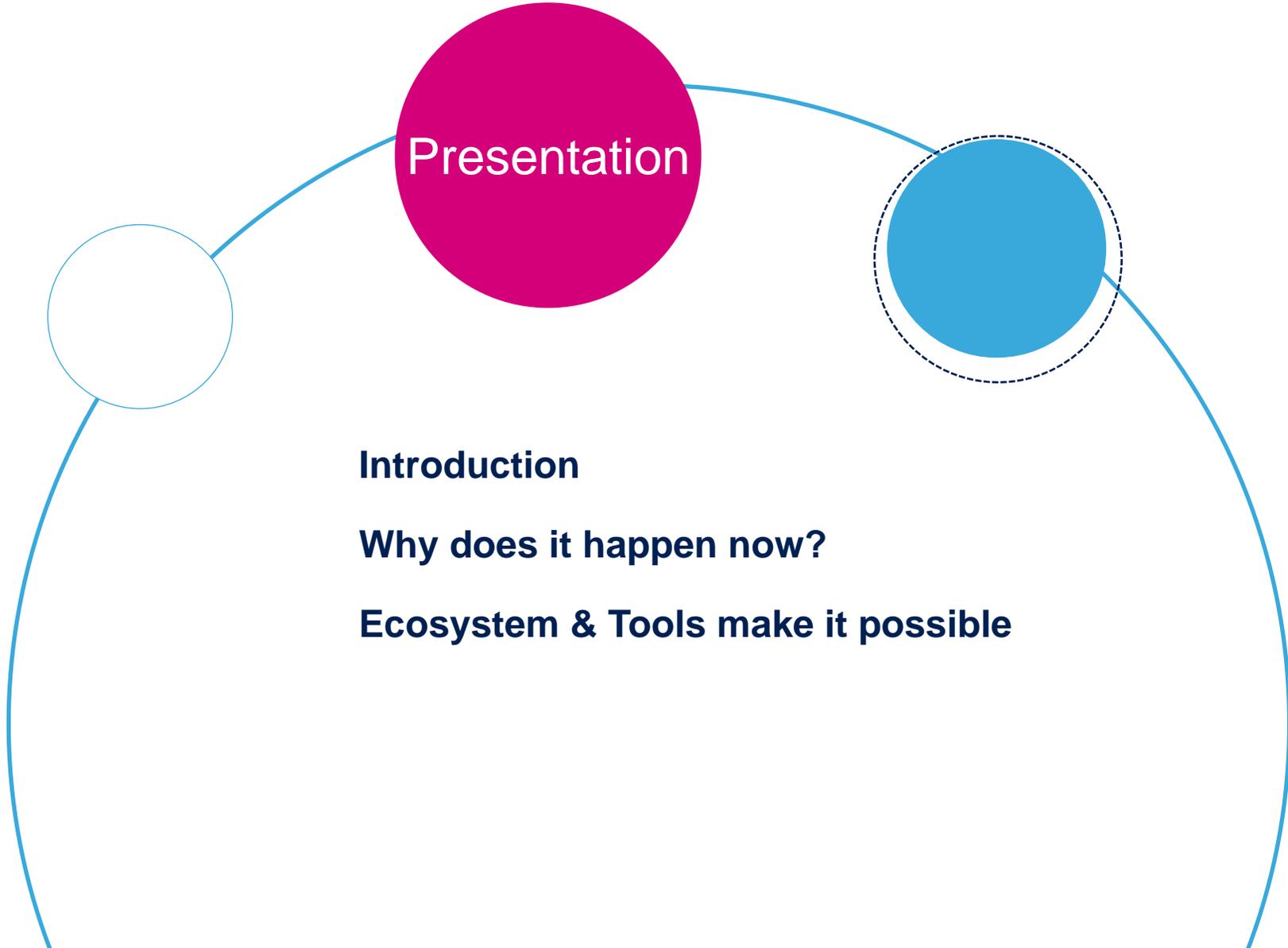
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Presentation

Introduction

Why does it happen now?

Ecosystem & Tools make it possible

How much water do you think you used during your last shower?
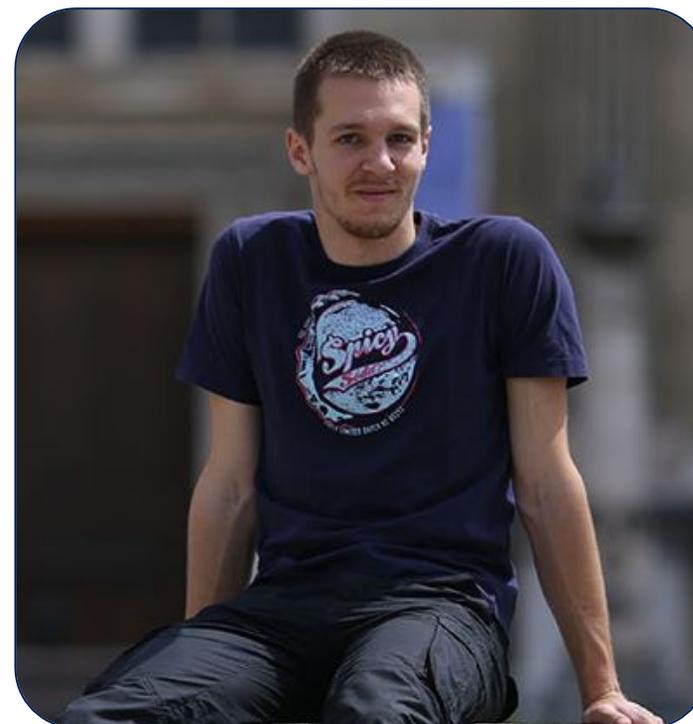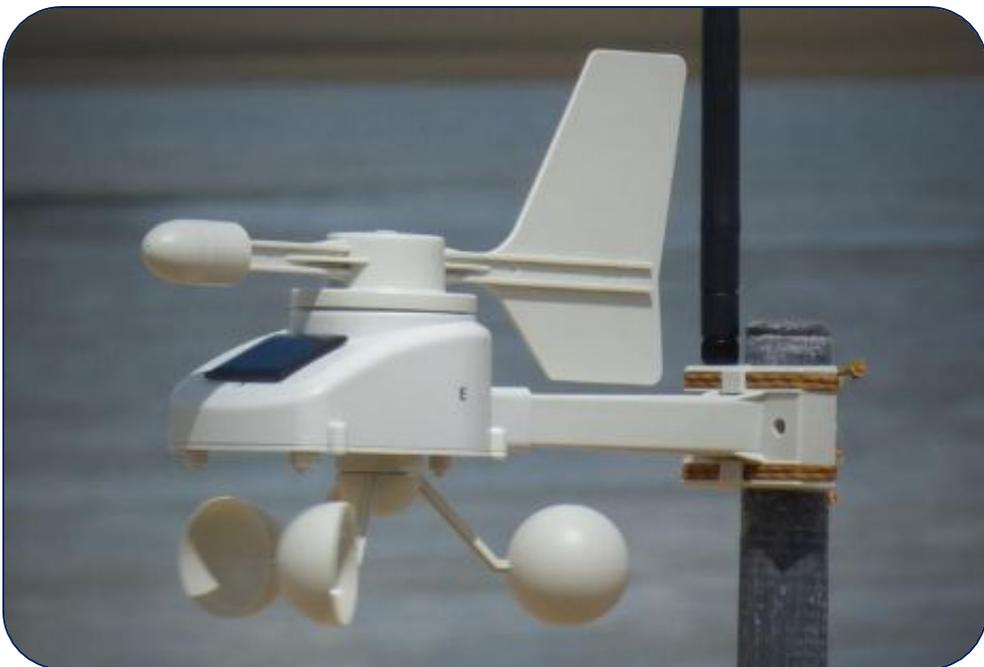
Smart Things for Augmented Life

Smart City

Reduce traffic congestion

Better use of resources

Improve security

Smart Car

Reduce emissions

Increase safety

Save fuel

Smart Home

Make entertainment more interactive and immersive

Increase comfort & Save energy

Smart Me – Healthcare

Empower patients

Help physicians monitor and diagnose remotely

Smart Me – Fitness & Wellness

Help to lead healthier lives

Optimize sports performance

Early warning of illness

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Augmented Life Architecture

Opportunities across the value chain

Things

Gateway

Cloud

User / Utility

Why does it happen now?

2020

>35 Zettabytes

50 Billion

x10

x5

2013

<4 Zettabytes

10 Billion

Yearly Data creation

"Devices"

A Zettabyte = 10^{12} Gigabytes

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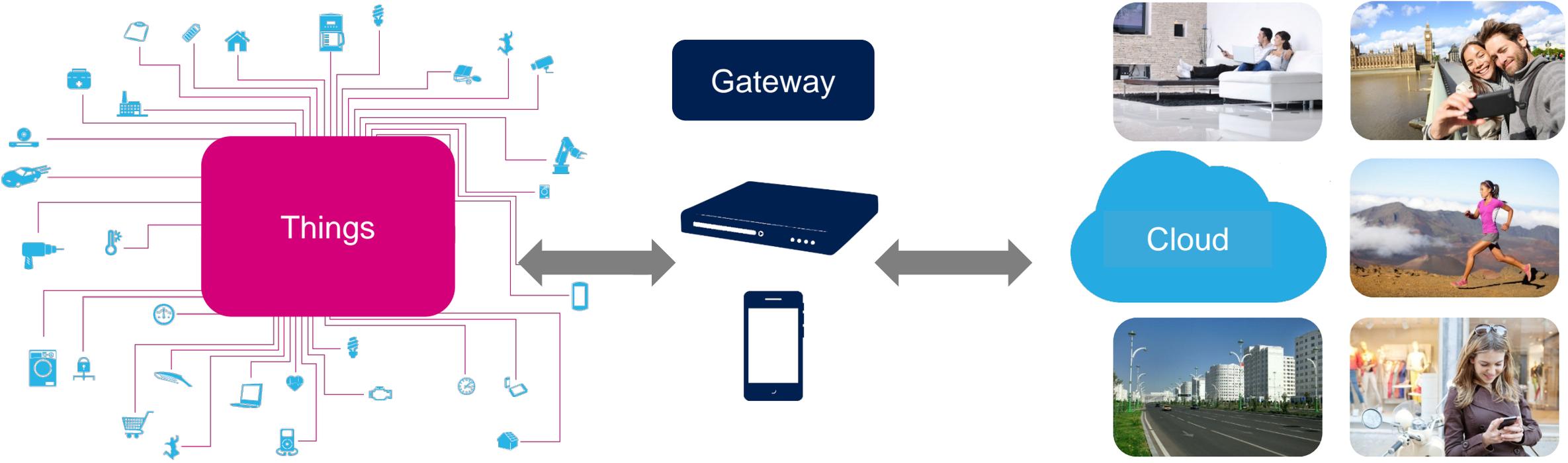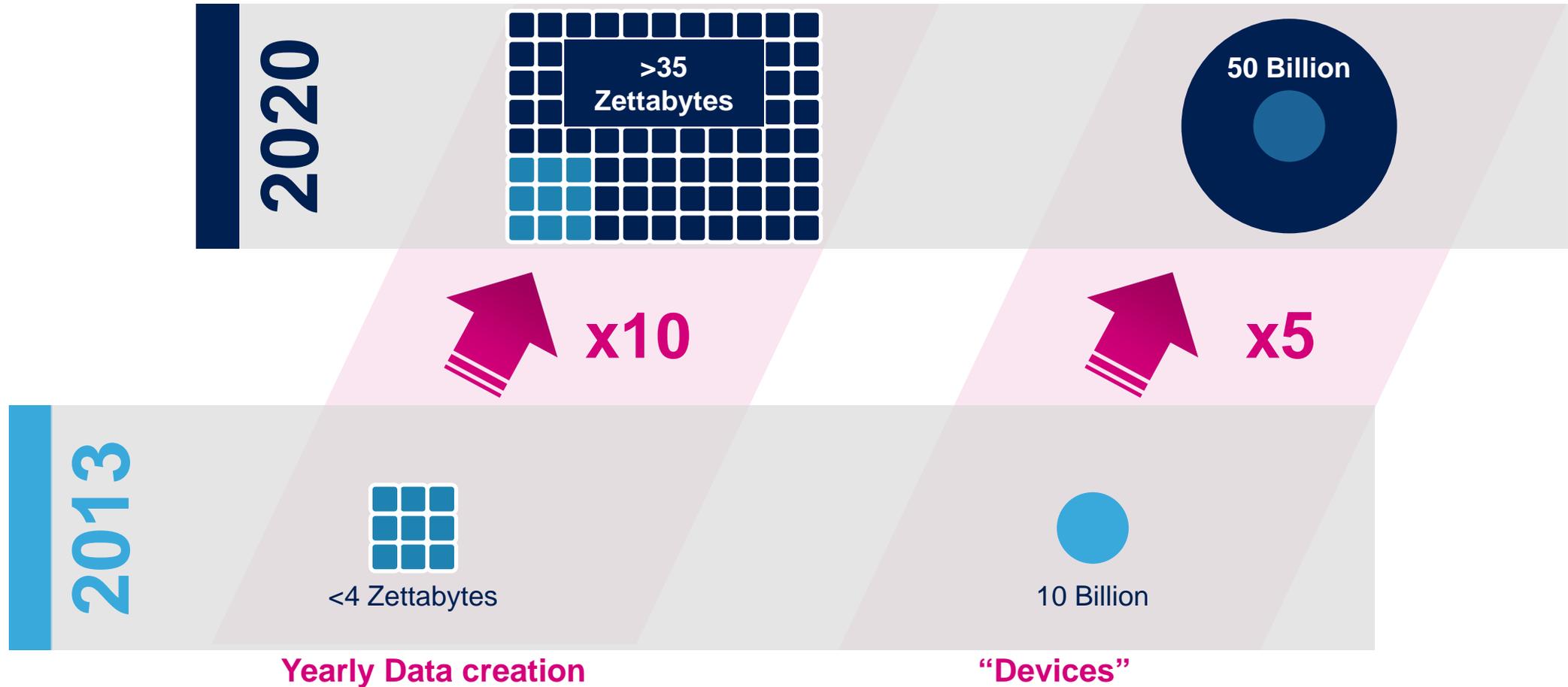
Drastic Improvement of key HW Factors
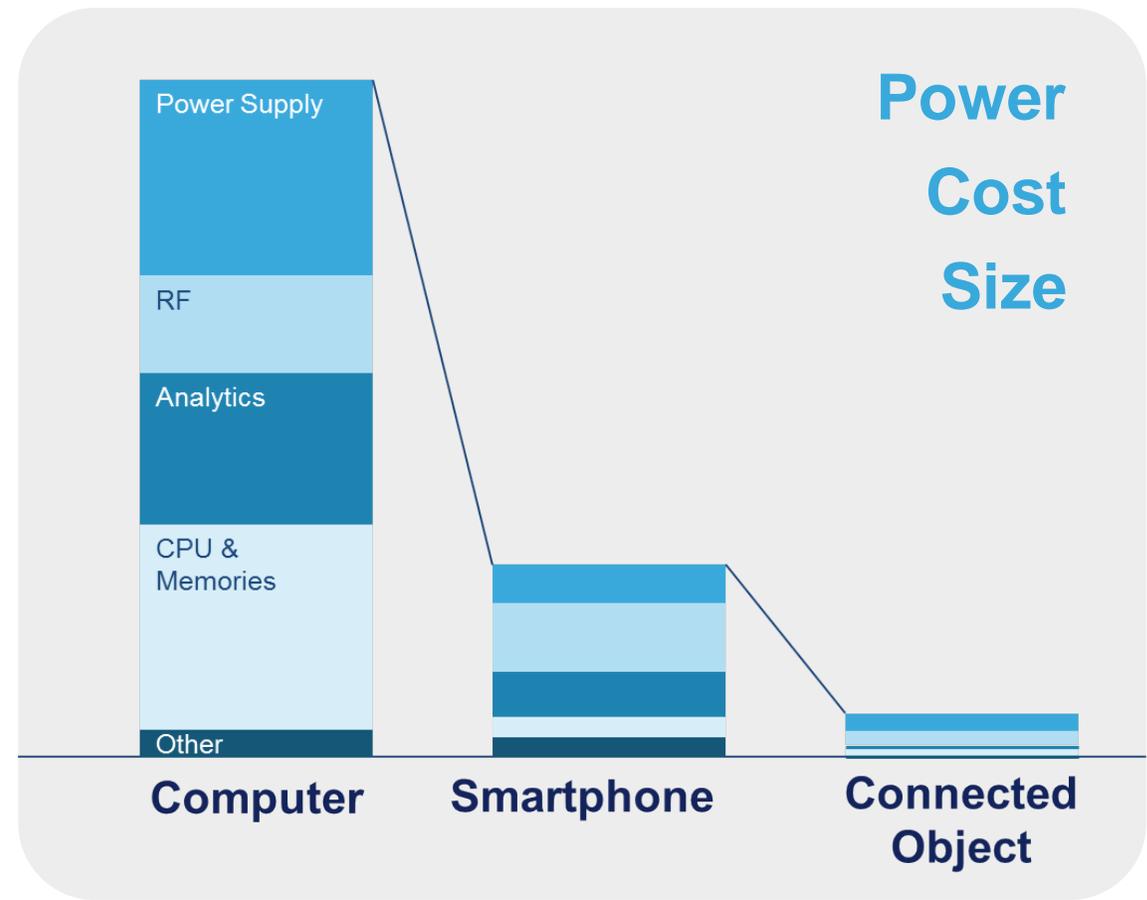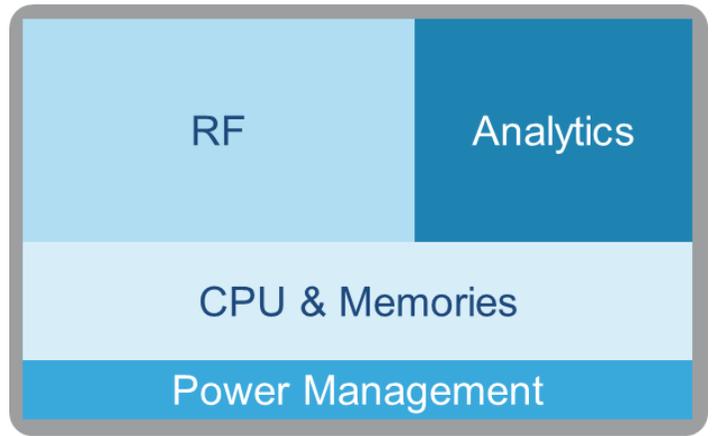
What does a Developer need?

1. A developer usually chooses a **microcontroller** first when designing a new application
   - Need to pick from low power to high performance microcontroller based on application needs

2. Next comes selection of the **other key functions** to implement the system
   - Sensing, data conversion, connectivity, power management, actuators …

3. Then the developer needs an **easy to use** Integrated Development Environment to allow fast prototyping, development and production
   - Support of multiple IDE
   - Pre-integrated drivers & sample applications
   - Free of charge tools and embedded software to enable fast and easy development

RF link

Motor Control

Motion Sensors

Security

Environmental Sensors

Dual Interface

Audio

9 product series / 32 product lines available today

High-performance

398 CoreMark
120 MHz
150 DMIPS

608 CoreMark
180 MHz
225 DMIPS

1 000 CoreMark
200 MHz
428 DMIPS

Mainstream

106 CoreMark
48 MHz
38 DMIPS

177 CoreMark
72 MHz
61 DMIPS

245 CoreMark*
72 MHz
90 DMIPS
(*) from CCM-SRAM

Ultra-low-power

75 CoreMark
32 MHz
26 DMIPS

93 CoreMark
32 MHz
33 DMIPS

273 CoreMark
80 MHz
100 DMIPS

LONGEVITY
10 YEARS
COMMITMENT

Cortex-M0
Cortex-M0+

Cortex-M3

Cortex-M4

Cortex-M7

number of lines

New

The Building Blocks are already here

Sense

Sensors & Actuators
- Motion MEMS
- Environmental Sensors
- MEMS microphones
- Touch Sensor
- Micro-actuators
- Proximity and ranging sensors
- Image sensors

Processing
- Low-power microcontrollers
- Sensor fusion

Communication
- Ultra-low power connectivity

Interfaces
- Analog

Power
- Power & energy management

Process

Connect

Translate

Power

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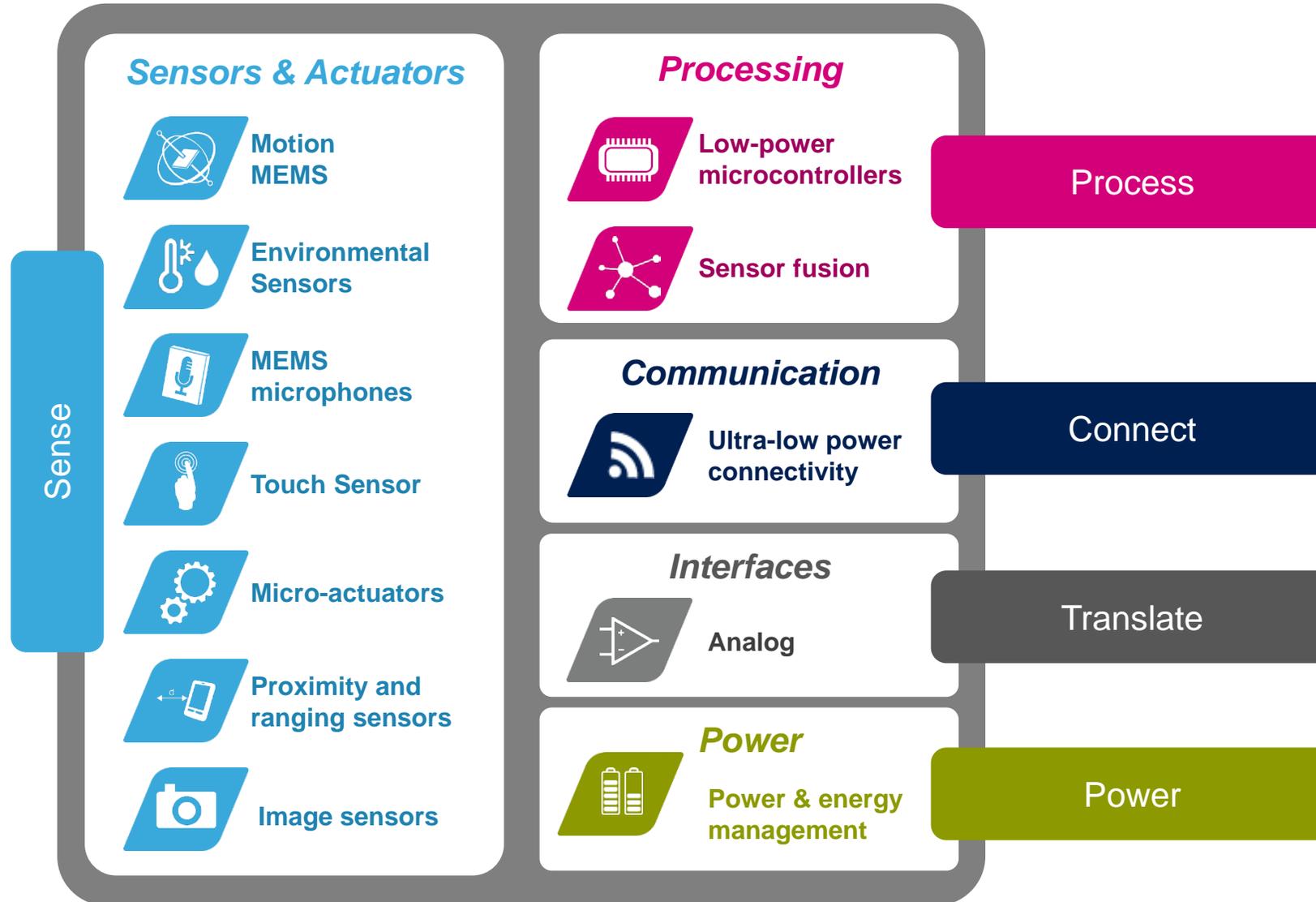
Lowering the Barriers for Developers

Easy Access to technology

Idea

Rapid
Device & SW
Development

Open Development
Environment

Closer to final
Form factor
Device

Field Test

Final
Device
Form factor

Production SW

Market
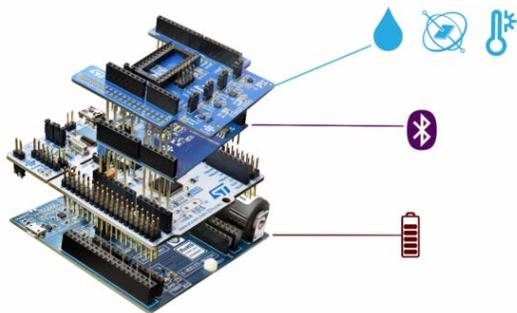
Fast, flexible, affordable and based on commercial components

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New technologies enables Connected Objects

Existing Infrastructure

Global **smartphone** network

Residential broadband penetration

IPv6

Cloud computing

Available Technologies

Low Power

Small

Affordable

Easy to use

Tools & Environment make it possible

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What is an Ecosystem ?

Hardware Development Tools

Evaluation and Promotion boards
Debug Probes
Communication Bridges
Mass Programming tools

Software Development Tools

Configuration Tools
Development & Debugging Tools
Monitoring Tools

Ecosystem

Embedded Software

HAL / Drivers
RTOS
Firmware Stacks
Application Bricks

Information and sharing

Web site
Product selectors
Communities & Social Media

Open source

Partners

ST-designed

STM32 Open Development Environment

STM32 Nucleo
development boards

STM32 Nucleo
expansion boards

STM32Cube
software

STM32Cube
expansion software

Developer community and support

Compatibility with multiple Development Environments

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# STM32 Open Development Environment

Rapid Prototyping

- Modular hardware enables broad deployment through a standardized development framework

- Stack multiple expansion boards to add power management, sensors, connectivity and more to the STM32 Nucleo development boards

- Intuitive software tools offer: code examples and documentation to get up and running quickly

- Price competitive boards

Expansion boards

STM32 Nucleo

STM32 Cube

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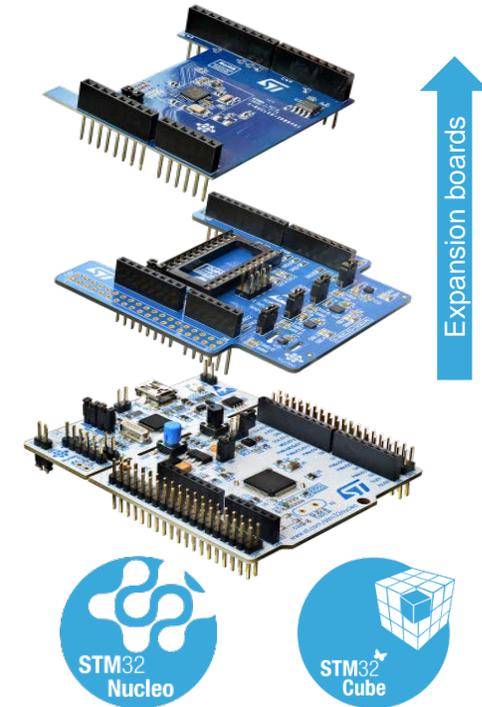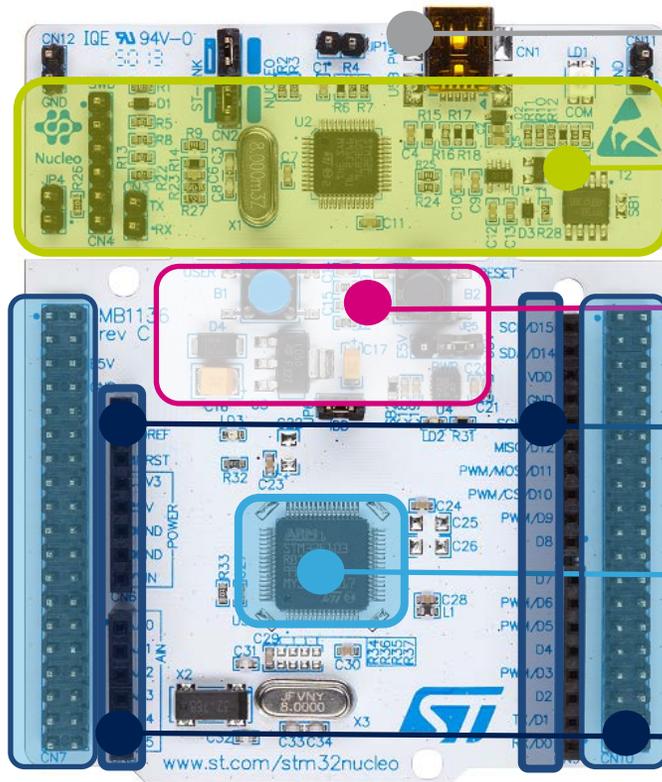
Flexible board power supply :
through USB or external source

Integrated ST-Link/V2-1:
mass storage device flash programming

2 push buttons, 2 color Leds

Arduino extension connectors :
easy access to add-ons

One STM32 MCU flavor with 64 pins

Morpho extension headers :
direct access to all MCU I/Os

ST Nucleo Expansion Board Offer

The building blocks ➤ **Your need** ➤ **Our answer**

Sensor — DATA COLLECT

Connectivity — DATA TRANSMIT

Audio — DATA ACCESS

Actuator — DATA CREATE

Power — DATA POWER

Process — DATA PROCESS

Software
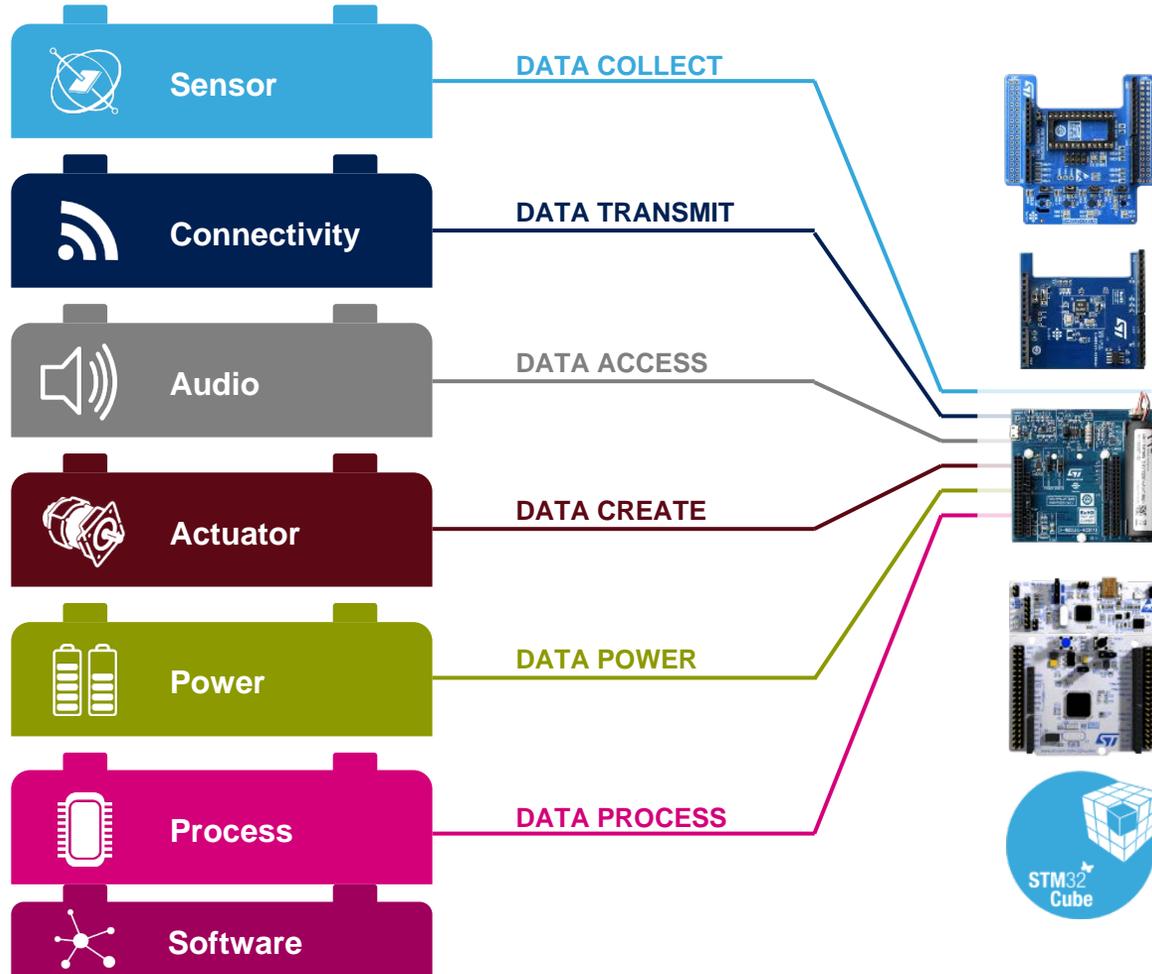
STM32 Cube

STM32 Open
Development Environment
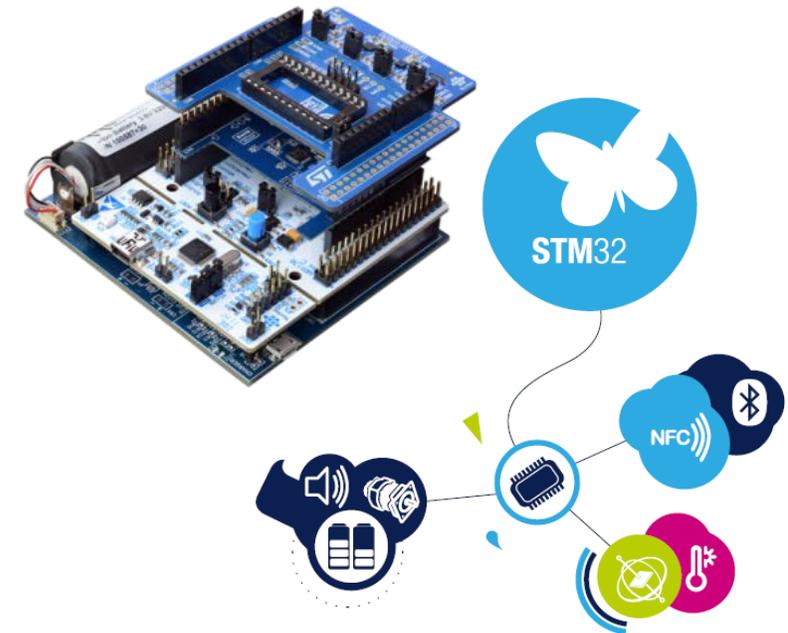
STM32

www.st.com/stm32ode

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STM32CubeMX

Partners IDEs

STMStudio

Generate Code   Compile and Debug   Monitor
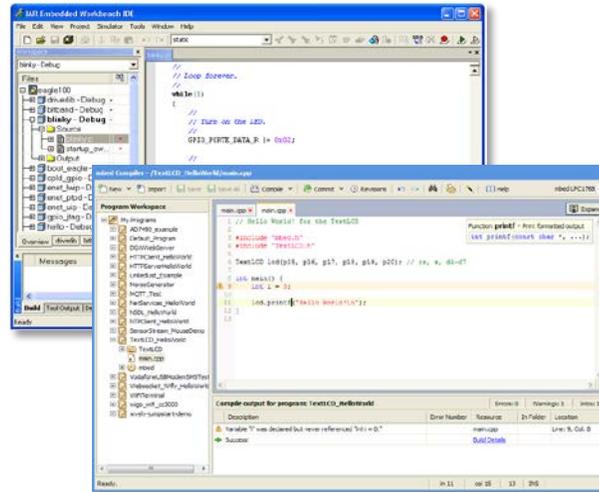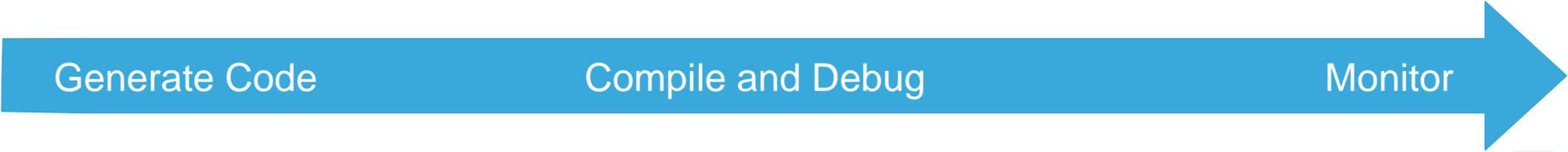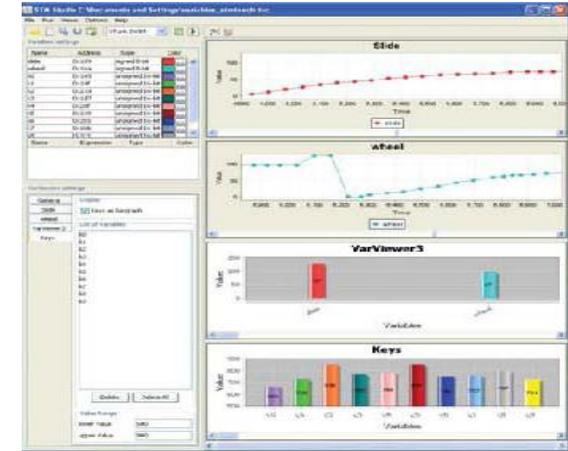
Loops

Embedded Software ST offer – Positioning
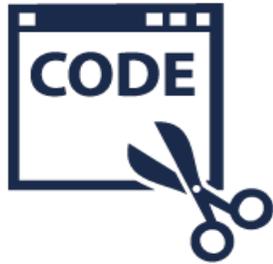
STM32Snippets	STM32Cube and Std Libraries	CMSIS and Mbed SDK	Virtual Machines And models

STM32Java

High optimization Low portability	Average optimization STM32 Portability	Low optimization ARM Portability	Low optimization Large Portability

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ST.COM

ST MCU Finder

Various social media

ST Forums on microcontrollers
Facebook.com/stm32
YouTube.com/STonlineMedia
Twitter.com/@ST_World
Mbed.org

Information | MCU Selection | Communities and Social Media

+ Local trainings / Technical Support
+ Local Sales forces / Distributors

STM32Cube and Mbed

STM32**Cube**MX
Configuration tool on PC

C code generation[1]
for initialization,
depending on user
choices

User Application

CMSIS
COMPLIANT
ARM® Cortex™ Microcontroller
Software Interface Standard

mbed
Enabled

CMSIS-DRIVER

Mbed core

STM32Cube Embedded Software deliverables

Application level Demonstrations

Demonstrations on ST boards

Middleware level

| TCP/IP | USB Host / Device | Gfx | FAT File Sys. | RTOS |

CMSIS

Utilities

Utilities

Hardware Abstraction Layer API

| STM32F0 | STM32F1 | STM32F2 | STM32F3 | STM32F4 | STM32L0 | STM32L1 |

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# STM32CubeMX, microcontroller configuration, step-by-step

- Step 1: Select the microcontroller
  - Through easy filtering capabilities

- Step 2: Configure the microcontroller
  - Pinout wizard
  - Clock tree wizard
  - Peripherals and middleware wizards
  - Power consumption wizard1

- Step 3: Initialization code generation
  - Generates code for your favorite IDE
  - Works with STM32Cube Embedded software offer !
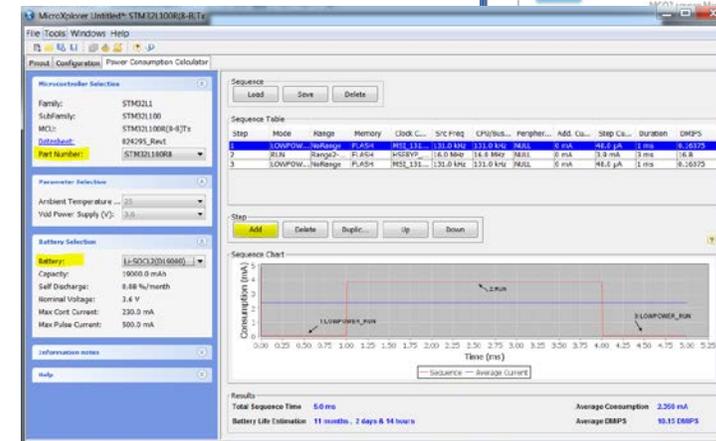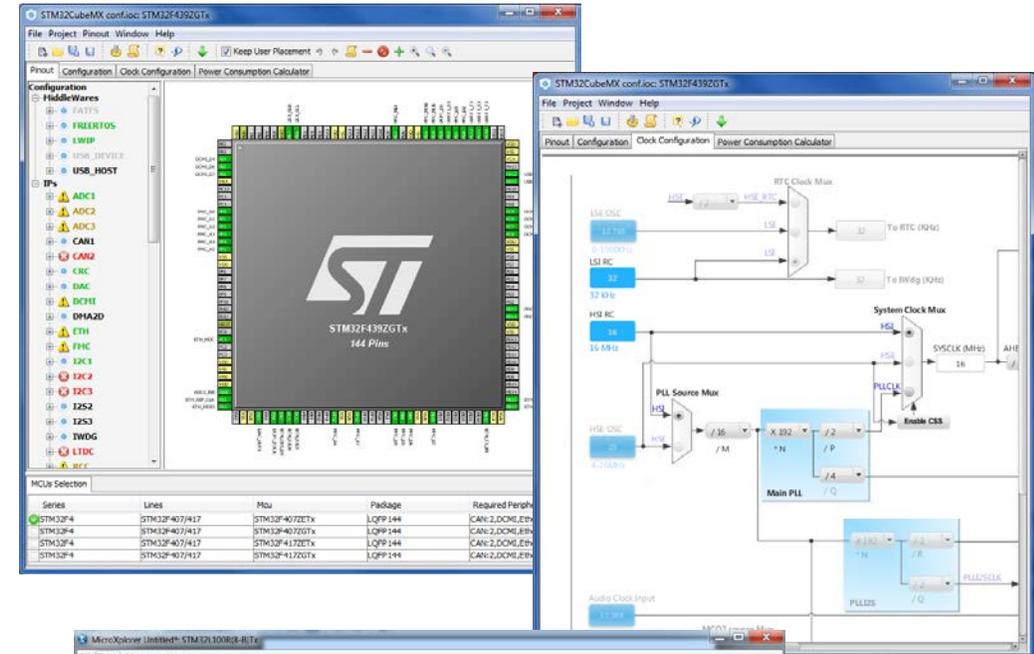
Software offer
STM32Java

- Partnership ST/IS2T

- PC Tools + Dedicated STM32xxx**J**

- **Ubiquity** with same binary code running on different Platforms (PC, MCU/MPU/iOS&Android, …)
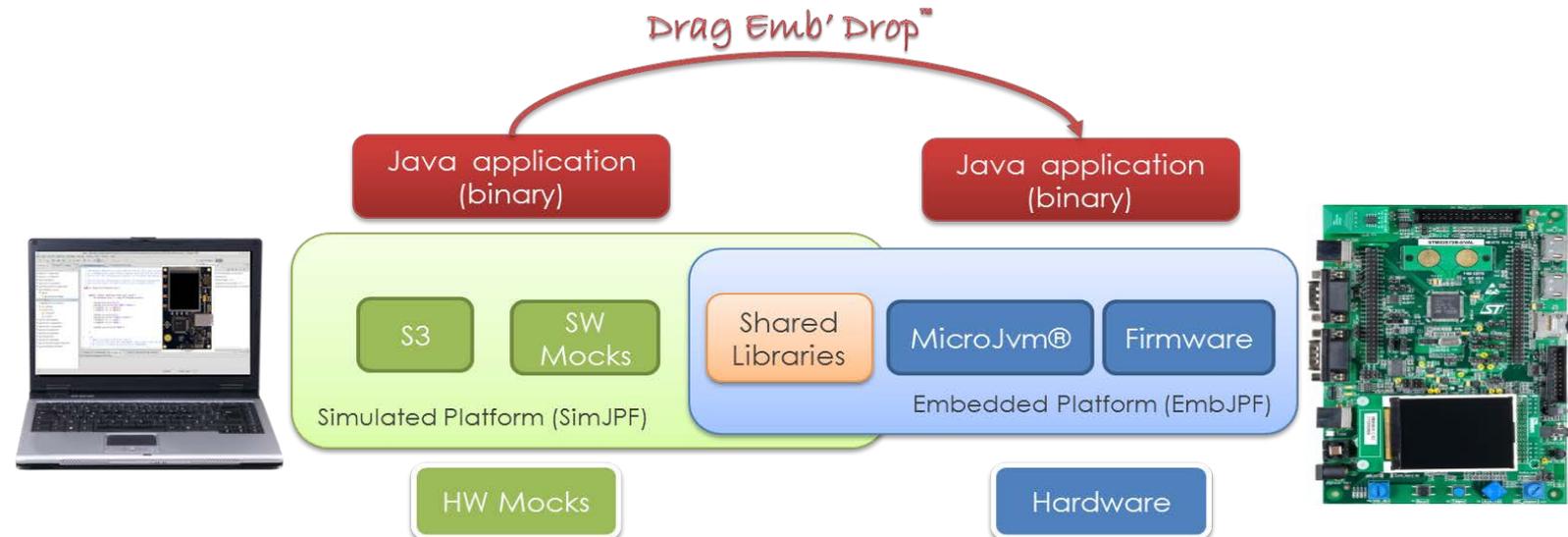
STMStudio
Free ST Monitoring tool

- Takes benefit from low cost STLink-V2 debugging probe

- Ability to select any global variable of your program to be monitored, just providing the compiled file (elf)

- Several acquisition methods:
  - 100% non-intrusive one !
  - Application-synchronized one

- Ability to monitor the behavior of chosen variables, through a collection of graphical widgets
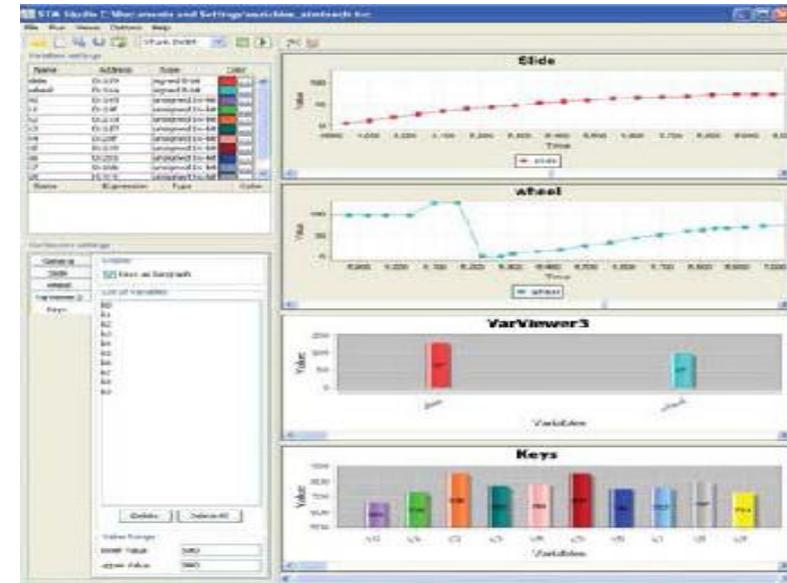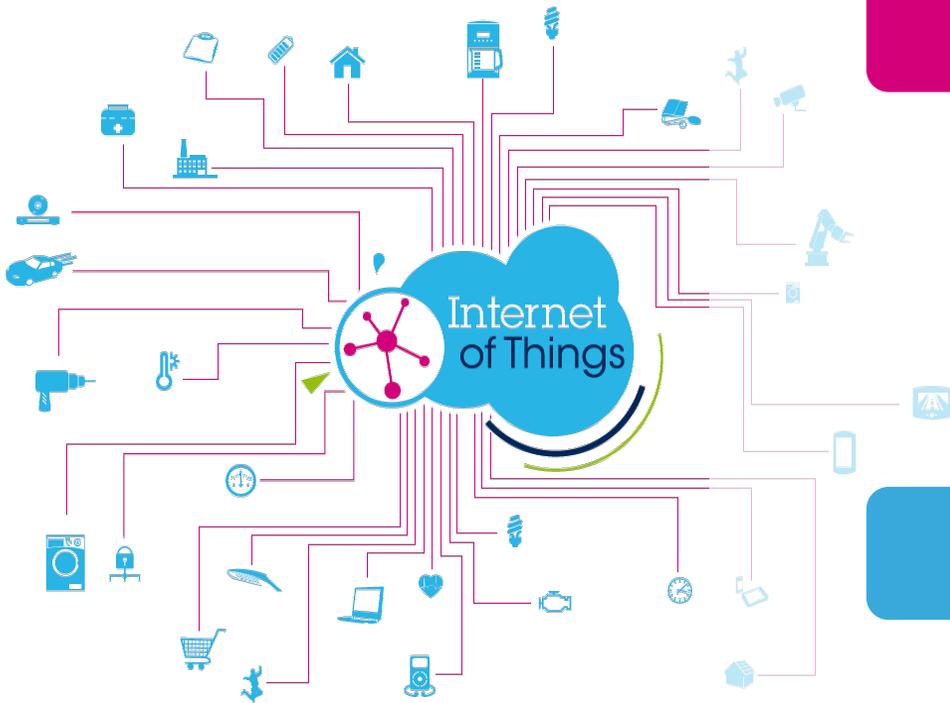
Big opportunity as electronics penetrate
new sectors with the IoT

Need easy access

All the key components are already here

ST has a solution to make access
to electronics easy

Fast

Easy

Open licenses

STM32 Open
Development
Environment

Affordable

Commercial
grade
components

Internet
of Things

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Thank You!