ST MCU Trainings Catalogue 2018
The right information on the right products

T.O.M.A.S.
Technically Oriented Microcontroller Application Services

Version: 1.8
Released: 9th November 2018
Dear Customers,

We are pleased to present you our actual offer of ST microcontroller trainings. The complete ST trainer’s team is looking forward to share with you our expertise and enthusiasm on the ST Microcontroller products and application development techniques. To those of you, who prefer on-line learning courses we have prepared a series of sessions within YouTube platform. Basic information and complete list of available sessions with link to details about each session you will find on next slides and on our dedicated web pages: STM32Education and ST25Education.

In addition, it is our great pleasure to extend the offer of ST MCU trainings thanks to our Training Partners. For more details about our Training Partners please see this page.

**All sessions are thorough technical trainings made for:**
- SW and HW Engineers of embedded systems
- Distributor Field Application Engineers (ST sessions only)

Additional trainings on customer locations or other STMicroelectronics sites are possible upon request (list of possible sessions you can find in this section of the catalogue). Please contact us or our Training Partners to learn the availability and conditions. Please specify the session you are interested in and what are you time constrains.

**A few tips to make your journey and ST organized training a success:**
- Any ST training may be canceled if there is less than a minimum of 8 attendees. Therefore, please, do not book your tickets or rooms unless you have received an official confirmation e-mail from us, which is sent about 4 weeks before the start of the training.
- Confirmation e-mail contains information about tools to be installed and exact location of the session.
- For the residents outside of Europe who need entry visa, please contact us at least 6 weeks before the training.
- ST Trainings are free of charge and include free lunch and collations at ST premises. Accommodation and other expenses are at your charge. For Partners Training, the conditions have to be negotiated with them directly.

**Logistics for ST sessions:**
To reserve the hotel rooms for the training, please provide us the check-in and check-out dates, or make the reservation yourself. For more information about the logistics and ST office locations please see the dedicated page of this catalogue.

Artur IWANICKI
Microcontroller Training Center Manager
microsupport.europe@st.com
The T.O.M.A.S. team consists of fully skilled and professional facilitators. Our everyday working activity is answering microcontroller technical questions (hotline) and designing and validating microcontroller-based applications. This ensures high level of our technical expertise and allows us to understand your application requirements, providing you with optimized solutions and added value.
# H2/2018 ST MCU Trainings Calendar Overview

scheduled face to face sessions

<table>
<thead>
<tr>
<th>Course Description</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST open MCU tools on STM32F4 and STM32F7 High-performance MCUs Arm® Cortex®-M4 and Arm® Cortex®-M7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Prague</td>
<td>(6-8.11)</td>
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<tr>
<td>ST open MCU tools on STM32L0 and STM32L4 Ultra-low-power MCUs Arm® Cortex®-M0+ and Arm® Cortex®-M4</td>
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<td></td>
<td>Munich</td>
<td>(23-25.10)</td>
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<tr>
<td>USB in STM32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Munich</td>
<td>(20-21.11)</td>
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<tr>
<td>Motor Control with ST hardware and software solutions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Prague</td>
<td>(2-4.10)</td>
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<tr>
<td>1 day technical seminars</td>
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Actual offer of day-long technical seminars organized by ST is available [here](#).

Up to date training catalogue is available on our web page [here](#).

**Note:** For more details about the ST trainings please click on the chosen session.
Dear Customers,

We are pleased to announce that we have launched the series of online seminars and trainings. All of the sessions are accessible on our dedicated web pages: STM32Education and ST25Education

**The MOOC platform enables you to**
- study from any place, even from your bed,
- at any time, midnight owls welcome!
- enjoy the lessons and hands-on at your own pace, minute by minute
- on any Internet-enabled device

The benefits the MOOC platform brings to you include saved time and cost.
ST courses are free of charge, your only investment is the STM32 Discovery kit from your local distributor and some USB cable.
Complete list of available sessions is available on the next slides.

In case of any troubles concerning video access, missing materials, please send us an email at mooc.registration@st.com
We have divided our on-line training offer into five steps with growing expertize level. It could help you with selection of the session which is matching your expertize level and your expectations.

**Note:** For more details about the ST trainings please click on the chosen session.
# ST MCU on-line trainings overview (1/2)

<table>
<thead>
<tr>
<th>Session name</th>
<th>duration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM32CubeMX &amp; CubeHAL basics</td>
<td>8h</td>
<td>Complete overview of STM32CubeMX and STM32F4 Cube HAL library</td>
</tr>
<tr>
<td>STM32L4 hands-on workshop</td>
<td>5h 30min</td>
<td>Introduction to STM32L4 MCU family line with low power modes analysis and creation of fancy Audio Player application step by step</td>
</tr>
<tr>
<td>STM32L4 hands-on training</td>
<td>9h 30min</td>
<td>Peripheral by peripheral guide across STM32L4 MCU with series of hands on exercises using STM32L4 HAL library and Eclipse based toolchain</td>
</tr>
<tr>
<td>Ultra Low Power STM32 extras</td>
<td>1h</td>
<td>An additional information about STM32L4 MCU family line with an usage of external SMPS to further lower power consumption</td>
</tr>
<tr>
<td>Basic of security in STM32</td>
<td>1h</td>
<td>Introduction to STM32 safety features and security with hands on sessions</td>
</tr>
<tr>
<td>STM32F7 hands-on workshop</td>
<td>3h 20min</td>
<td>Introduction to STM32F7 family with various hands on sessions including DSP exercise and step by step oscilloscope implementation</td>
</tr>
</tbody>
</table>

**Note:** For more details about the ST trainings please click on the chosen session.

**All sessions are FREE**
### ST MCU on-line trainings overview (2/2)

<table>
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<tr>
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<th>duration</th>
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</tr>
</thead>
<tbody>
<tr>
<td>LoRa workshop</td>
<td>3h 30min</td>
<td>Introduction to LoRa and SigFox implementations with hands on sessions</td>
</tr>
<tr>
<td>Graphics with STM32</td>
<td>4h</td>
<td>An overview of STM32 based graphics application creation using STemWin library, ST free toolchain and STM32F469I microcontroller</td>
</tr>
<tr>
<td>STM32 in Application Programming with NFC</td>
<td>1h</td>
<td>Demonstration of various data transfers to STM32 devices via NFC (ST25) chips</td>
</tr>
<tr>
<td>Motor Control Part 1 : Theory and Motor Profile</td>
<td>40min</td>
<td>First steps in the Motor Control – introduction to FOC motor control and measurement of motors parameters</td>
</tr>
<tr>
<td>Motor Control Part 3 : Troubleshooting and fine tuning</td>
<td>1h</td>
<td>How to solve runtime issues and tune PI regulator</td>
</tr>
<tr>
<td>Motor Control Part 4 : Select the right product</td>
<td>1h</td>
<td>Identify the components that best fit your embedded solution.</td>
</tr>
<tr>
<td>Moving from 8 to 32bit workshop - first steps in STM32</td>
<td>4h 30min</td>
<td>Recorded &quot;8to32bit migration&quot; workshop session. Step by step into STM32 world</td>
</tr>
</tbody>
</table>

**Note:** For more details about the ST trainings please click on the chosen session.

**All sessions are FREE**
Scheduled face-to-face training sessions details
This training is dedicated to the top class members of the wide STM32 microcontroller family, STM32F4 and STM32F7 lines. The training starts with the Arm® Cortex®-M4 and Arm® Cortex®-M7 cores and introduction to the new bus architecture. Main part of the training focuses on the rich set of peripherals, such as GPIOs, RTC, ADC, DAC, FMC, SPI/I2S, USB FS and HS, Crypto, Camera interface, Ethernet and new peripherals such as TFT/LCD controller and SDRAM interface. Numerous hands-on examples are designed to practice most of the peripherals and device features. The graphics will be demonstrated on STemWin or TouchGFX library with practical hands-on, too.

What are the benefits for you?

• You will learn the features of Arm® Cortex®-M4 and Arm® Cortex®-M7 cores and architectures
• You will discover the new peripherals and system blocks of STM32F4 and STM32F7 series
• You will practice the device functionality and performance in several hands-on examples

Agenda:
• STM32F4 and STM32F7 overview
• Cortex-M4 and Cortex-M7 presentation
• STM32F4 and STM32F7 system architecture, system IP’s and performance
• STM32F4 and STM32F7 flash, DMA, DCMI
• Standard peripherals (GPIO, RTC, watchdogs)
• Connectivity peripherals (USB FS/HS, Ethernet, SPI, I2C, USART)
• Dedicated peripherals (Camera interface, Quad-SPI, TFT)
• Hands-on exercises (Practical examples – selected peripherals, device performance, STemWin)

Available Sessions:

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<tr>
<td>W45</td>
<td>6th of November</td>
<td>8th of November</td>
<td>Intermediate</td>
<td>English</td>
<td>ST Prague</td>
</tr>
</tbody>
</table>

Prerequisites: technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights.

Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.

This training introduces two ultra-low-power STM32 microcontroller families. It starts with the presentation of Arm® Cortex®-M cores and architecture, which those STM32s are based on. It follows with the memory organization, reset block, interrupts, low power modes and all peripherals, such as IO ports, ADC, timers, RTC, SPI, USART, I2C, DAC and all low-power peripherals for both families. Most of the theoretical presentations are combined with practical hands-on examples. Part of the training focuses on the software and hardware development tools.

**What are the benefits for you?**

- You will familiarize yourself with Arm® Cortex®-M0+ core, STM32L0 peripherals and development tools
- You will familiarize yourself with Arm® Cortex®-M4 core, STM32L4 peripherals and development tools
- You will be able to start-up a new project and use the development tools
- You will be able to present the STM32 family with all its technical features (for FAE’s mainly)

**Agenda:**

- STM32 family overview
- Arm® Cortex®-M0+ and Arm® Cortex®-M4 cores architectures
- STM32L0 system architecture (Embedded Flash, DMA, Power control, Backup domain, Reset block, Clock)
- STM32L0 peripherals (IO, Timers, RTC, ADC, SPI, UART, I2C, DAC, LPTIM, firewall)
- STM32L4 system architecture (Embedded Flash, DMA, Power control, Backup domain, Reset block, Clock)
- STM32L4 peripherals (IO, Timers, RTC, ADC, SPI, UART, I2C, DAC, LPTIM, firewall)
- Hardware tools (SWD, eval boards, kits)
- Hands-on exercises (Practical examples)

**Available Sessions:**

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<tbody>
<tr>
<td>W43</td>
<td>23rd of October</td>
<td>25th of October</td>
<td>Intermediate</td>
<td>English</td>
<td>ST Munich</td>
</tr>
</tbody>
</table>

**Prerequisites:** technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights.

**Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.**

More about this STM32 series: [www.st.com/stm32l0](http://www.st.com/stm32l0)  [www.st.com/stm32l4](http://www.st.com/stm32l4)
USB Training – 2 days

Intention of this training is to improve your knowledge of USB interface in terms of hardware and software on the basis of STM32F4 implementation (USB OTG). There will be information about Device and Host classes in the practical use, demonstrated on various hands-on sessions.

What are the benefits for you?

- You will improve your knowledge of USB standards
- You will improve your knowledge of types of transfers
- You will improve your knowledge of USB electrical specifications and requirements
- You will improve your knowledge of ST libraries for STM32 USB peripheral (Device and Host)

Agenda:
- General USB theory
- USB on STM32
- USB classes and drivers
- Cube HAL library for USB device
- USB device hands-on
- Cube HAL library for USB host
- USB host hands-on

Available Sessions:

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<tbody>
<tr>
<td>W47</td>
<td>20th of November</td>
<td>21st of November</td>
<td>Intermediate</td>
<td>English</td>
<td>ST Munich</td>
</tr>
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</table>

Prerequisites: technical English, basics of C programming, own PC (notebook) with Windows, USB and administrator rights.

Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.

2x USB A/B micro cable, USB flash stick and USB micro to USB A female adapter.
The training first covers the general basics of BLDC/PMSM motors and their drive using Field Oriented Control (FOC). The training is covering the FOC control method and its implementation on STM32, including the different current sensing methods, sensors and sensor less topologies and other dedicated functions which are part of the STM32 motor control library. All theoretical presentations are combined with practical hands-on examples using the Motor Control Starter Kits, GUI, motor control libraries and real motors.

**What are the benefits for you?**

- You will learn about the common BLDC/PMSM motor types.
- You will first familiarize yourself with the Field Oriented Control basics and its implementation on STM32.
- You will practice the tools and motor control libraries of ST solutions.
- You will be able to present the STM32 main technical features and demonstrate it using the Starter Kit (for FAE’s mainly).

**Agenda:**
- BLDC/PMSM motors basics
- FOC drive theory
- STM32 general overview
- STM32 FOC implementation
- STM32 FOC library
- Motor Profiler, HFI, OTF
- Tools, Starter kit, GUI
- Hands-on sessions

**Available Sessions:**

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<tr>
<td>W40</td>
<td>2nd of October</td>
<td>4th of October</td>
<td>Intermediate</td>
<td>English</td>
<td>ST Prague</td>
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</table>

**Prerequisites:** technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights.

Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.

Sessions on demand

Possible face-to-face training sessions details
Intention of this training is to improve your knowledge of C language and to focus on embedded applications for microcontrollers. We will show you advanced programming techniques, give you an overview of common programming mistakes and show you some tips & tricks. Main theme is to improve robustness of embedded software.

**What are the benefits for you?**

- You will improve your C language programming skills.
- You will learn several ways to avoid common mistakes and problems in embedded software.
- You will improve your skills to write robust application.

**Agenda:**

- C language tips & tricks
- Writing robust C programs

**Prerequisites:** technical English, basics of C programming, own PC (notebook) with Windows, USB and administrator rights

```c
/* Private functions ---------------------------------------------*/
void RCC_Configuration(void);
TextSetupBufferOut(uint8_t pBuffer1, uint8_t pBuffer2, uint16_t BufferLength);

SPI_InitTypeDef SPI_InitStructure;
GPIO_InitTypeDef GPIO_InitStructure;

/**
 * @brief Main program
 * @param None
 * @param None
 */
int main(void)
{

/** System clock configuration --------------------------------------*/
RCC_Configuration();

/** Initialize the SPI EEPROM driver --------------------------------*/
SPI_InitConfig(SPI0_Enable, SPI0_FullDuplex, SPI0_Mode, SPI0_ModeAF_PP);
GPIO_InitStructure.GPIO_Pin = GPIO_Pin_9 | GPIO_Pin_4 | GPIO_Pin_5;
GPIO_InitStructure.GPIO_Mode = GPIO_Mode_AF_PP;

Please send us expected date and location message to microsupport.europe@st.com
We will check possibility of organizing the session and come back to you.
```
STM32F0,F3 Technical Training – 3 days

This training introduces the STM32F0 and STM32F3 microcontroller series. It starts with the presentation of Arm® Cortex®-M3 and Cortex®-M4 cores and architectures on which the STM32 is based. It follows with the memory organization, reset block, interrupts, low power modes and selected peripherals, such as IO ports, ADC, timers, DAC, embedded comparators and Op-Amps. Biggest impact is on High Resolution timer features. Most of the theoretical presentations are combined with practical hands-on examples. Part of the training focuses on the software and hardware development tools.

What are the benefits for you?

• You will familiarize yourself with Arm® Cortex®-M3 and Cortex®-M4 cores, development tools
• You will be able to start-up a new project and use the development tools

Agenda:

• STM32 family overview
• Arm® Cortex®-M3 and Cortex®-M3 cores architecture
• STM32F0 and F3 system architecture (Embedded Flash, DMA, Power control, Backup domain, Reset block, Clock)
• STM32F0 and F3 selected peripherals (IO, Timers, ADC, DAC, Comparator, Op-Amp, HR timer)
• Hardware tools (JTAG, SWD, eval boards, kits)
• Hands-on exercises Practical examples

Available Sessions:

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Prerequisites: technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights.

Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.

More about STM32F0 series: [www.st.com/stm32f0](http://www.st.com/stm32f0)
More about STM32F3 series: [www.st.com/stm32f3](http://www.st.com/stm32f3)
STM32L0 Standard Training – 2 days

This training introduces the low power STM32 microcontroller family series. It starts with the presentation of Arm® Cortex®-M0+ core and architecture, which the STM32 is based on. It follows with the memory organization, reset block, interrupts, low power modes and all peripherals, such as IO ports, ADC, timers, RTC, SPI, USART, I2C, DAC and all low-power peripherals. Most of the theoretical presentations are combined with practical hands-on examples. This training explains ultra-low-power approach and setup, recommended for experts!

What are the benefits for you?

- You will familiarize yourself with Arm® Cortex®-M0+ core, STM32L0 peripherals and development tools
- You will be able to start-up a new project and use the development tools
- You will be able to present the STM32 family with all its technical features (for FAE’s mainly)

Agenda:

- STM32 family overview
- Arm® Cortex®-M0+ core architecture
- STM32L0 system architecture (Embedded Flash, DMA, Power control, Backup domain, Reset block, Clock)
- STM32L0 peripherals (IO, Timers, RTC, ADC, SPI, UART, I2C, DAC, LPTIM, firewall)
- Hardware tools (SWD, eval boards, kits)
- Hands-on exercises (Practical examples)

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Prerequisites: technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, STM32CubeMx with up-to-date STM32CubeL0 library and STM32STLink Utility application installed. Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.

More about this STM32 series: www.st.com/stm32l0
This training introduces the ultra-low-power STM32 microcontroller family series. It starts with the presentation of Arm® Cortex®-M4 core and architecture, which this STM32 is based on. It follows with the memory organization, reset block, interrupts, low power modes and all peripherals, such as IO ports, ADC, timers, RTC, SPI, USART, I2C, DAC and all low-power peripherals. Most of the theoretical presentations are combined with practical hands-on examples. Part of the training focuses on the software and hardware development tools.

What are the benefits for you?

- You will familiarize yourself with Arm® Cortex®-M4 core, STM32L4 peripherals and development tools
- You will be able to start-up a new project and use the development tools
- You will be able to present the STM32 family with all its technical features (for FAE’s mainly)

Agenda:

- STM32 family overview
- Arm® Cortex®-M4 core architecture
- STM32L4 system architecture (Embedded Flash, DMA, Power control, Backup domain, Reset block, Clock)
- STM32L4 peripherals (IO, Timers, RTC, ADC, SPI, UART, I2C, DAC, LPTIM, firewall)
- Hardware tools (SWD, eval boards, kits)
- Hands-on exercises (Practical examples)

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Prerequisites: technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, STM32CubeMx with up-to-date STM32CubeL4 library and STM32STLink Utility application installed.

Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.

More about this STM32 series: www.st.com/stm32l4
This training introduces the STM32F334 microcontroller series. It starts with the presentation of Cortex-M4 core and architecture on which the STM32 is based. It follows with the memory organization, reset block, interrupts, low power modes and selected peripherals, such as IO ports, ADC, timers, DAC, embedded comparators and Op-Amps. Biggest impact is on High Resolution timer features. Most of the theoretical presentations are combined with practical hands-on examples. Part of the training focuses on the software and hardware development tools.

**What are the benefits for you?**

- You will familiarize yourself with Cortex-M4 core, development tools and HR timer of STM32F334
- You will be able to start-up a new project and use the development tools

**Agenda:**

- STM32 family overview
- CORTEX M4 core architecture
- STM32F3 system architecture (Embedded Flash, DMA, Power control, Backup domain, Reset block, Clock)
- STM32F3 selected peripherals (IO, Timers, ADC, DAC, Comparator, Op-Amp, HR timer)
- Hardware tools (JTAG, SWD, eval boards, kits)
- Hands-on exercises Practical examples

**Available Sessions:**

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**Prerequisites:** technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, STM32CubeMx with up-to-date STM32CubeF3 library and STM32STLink Utility application installed. **Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.**

More about STM32F3 series: [www.st.com/STM32F3](http://www.st.com/STM32F3)
This training is dedicated to the top class member of the wide STM32 microcontroller family, the STM32F7. The training starts with the Arm® Cortex®-M7 core and introduction to the new bus architecture. Main part of the training focuses on the rich set of peripherals, such as GPIOs, RTC, ADC, DAC, FMC, SPI/I2S, USB FS and HS, Crypto, Camera interface, Ethernet and new peripherals such as TFT/LCD controller and SDRAM interface. Numerous hands-on examples are designed to practice most of the peripherals and device features. The graphics will be demonstrated on STemWin or TouchGFX library with practical hands-on, too.

**What are the benefits for you?**

- You will learn the features of Arm® Cortex®-M7 core and architecture
- You will discover the new peripherals and system blocks of the STM32F7 serie
- You will practice the device functionality and performance in several hands-on examples

**Agenda:**

- **STM32F7 overview**
- **Cortex-M7 presentation**
- **STM32F7 system architecture, system IP’s and performance**
- **STM32F7 flash, DMA, DCMI**
- **Standard peripherals (GPIO, RTC, watchdogs)**
- **Connectivity peripherals (USB FS/HS, Ethernet, SPI, I2C, USART)**
- **Dedicated peripherals (Camera interface, Quad-SPI, TFT)**
- **Hands-on exercises (Practical examples – selected peripherals, device performance, STemWin, TouchGFX)**

**Available Sessions:**

<table>
<thead>
<tr>
<th>Week</th>
<th>Start</th>
<th>End</th>
<th>Level</th>
<th>Language</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Please send us expected date and location message to <a href="mailto:microsupport.europe@st.com">microsupport.europe@st.com</a> We will check possibility of organizing the session and come back to you.</td>
<td></td>
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</tbody>
</table>

**Prerequisites:** technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, STM32CubeMX with up-to-date STM32CubeF7 library and STM32STLink Utility application installed.

**Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.**

More about this STM32 series: [www.st.com/stm32f7](http://www.st.com/stm32f7)
This training is dedicated to the high performance member of the wide STM32 microcontroller family, the STM32F4 serie. The training starts with the refresh of the Arm® Cortex®-M3 core and introduction to Cortex-M4 core main capabilities. The advanced STM32F4 system architecture including dedicated system IPs is deeply covered. Main part of the training focuses on the rich set of peripherals, such as GPIOs, RTC, ADC, DAC, FMC, SPI/I2S, USB FS and HS, Crypto, Camera interface, Ethernet and new peripherals such as TFT/LCD controller and SDRAM interface. Numerous hands-on examples are designed to practice most of the peripherals and device features. The graphics will be demonstrated on STemWin library with practical hands-on, too.

What are the benefits for you?

- You will refresh the Cortex-M3 core details and learn the features of Cortex-M4 core
- You will discover the new peripherals and system blocks of the STM32F4 line
- You will practice the device functionality and performance in several hands-on examples
- You will be able to present the STM32F4 line (for FAE’s mainly)

Agenda:

- STM32F4 overview
- Cortex-M3 and Cortex-M4 presentation
- STM32F4 system architecture, system IP’s and performance
- STM32F4 flash, DMA, DCMI
- Standard peripherals (GPIO, RTC, watchdogs)
- Connectivity peripherals (USB FS/HS, Ethernet, SPI, I2C, USART)
- Dedicated peripherals (Camera interface, Crypto module, TFT)
- Hands-on exercises (Practical examples – selected peripherals, device performance, STemWin)

Available Sessions:

<table>
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<tr>
<th>Week</th>
<th>Start</th>
<th>End</th>
<th>Level</th>
<th>Language</th>
<th>Location</th>
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<tbody>
<tr>
<td></td>
<td>Please send us expected date and location message to <a href="mailto:microsupport.europe@st.com">microsupport.europe@st.com</a> We will check possibility of organizing the session and come back to you,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prerequisites: technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, STM32CubeMx with up-to-date STM32CubeF4 library and STM32STLink Utility application installed.

Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.

More about this STM32 series: www.st.com/stm32f4
STM8 Technical Training – 2 days

This training is introducing the STM8 microcontroller family from bottom to top including the STM8S and STM8L devices. It starts with a detailed description of the STM8 core, memory organization, reset block, interrupts, low power modes, watchdog and low level programming protocol - SWIM. It continues with detailed description of the STM8S and STM8L peripherals: IO ports, ADC, timers, SPI, SCI, I2C, CAN, LCD, RTC and DAC. All theoretical presentations are combined with the practical hands-on examples. Part of the training also focuses on the software and hardware development tools.

What are the benefits for you?

- You will familiarize yourself with the STM8 core, peripherals and development tools.
- You will be able to start-up a new project and use the development tools.
- You will be able to present the STM8 MCU with all its technical features (for FAE’s mainly).

Agenda:

- **STM8 architecture** (Core, memory, reset, SWIM)
- **STM8 peripherals** (IO, Timers, ADC, SPI, SCI, I2C, CAN, LCD, RTC, DAC)
- **SW toolchain** (STVD, Cosmic, IAR)
- **HW toolchain** (In-Circuit Debuggers, Emulators)
- **Hands-on session** (Practical examples)

**Available Sessions:**

<table>
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<tr>
<th>Week</th>
<th>Start</th>
<th>End</th>
<th>Level</th>
<th>Language</th>
<th>Location</th>
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</table>

**Prerequisites:** Technical English, Basics of MCU programming, PC with USB and Admin rights

**Information about the toolchain and additional software to be installed will be provided in the confirmation email in 1 month before the session.**

More about this STM8S series: [www.st.com/stm8](http://www.st.com/stm8)
We can recommend one of the six hotels near the ST Office in Prague:

- **Jurys Inn** (3 minute walk) – 92EUR/night, breakfast and internet included [http://praguehotels.jurysinns.com/](http://praguehotels.jurysinns.com/)
- **Ibis Hotel Old Town** (10 minute walk or 2 tram stops or 1 metro stop) [http://www.ibishotel.com/ibis/fichehotel/gb/ibi/5477/fiche_hotel.shtml](http://www.ibishotel.com/ibis/fichehotel/gb/ibi/5477/fiche_hotel.shtml)
- **Design Hotel Elephant** (5-10 minute walk across main street) [http://www.hotel-elephant.cz/?lang=EN](http://www.hotel-elephant.cz/?lang=EN)

Hotels information in other ST locations will be provided to you in the training confirmation email. Only few parking lots are available after prior reservation! Use hotel parking where available!
MOOC sessions details
Welcome to Cube basic training.
In this course we want to present you how to work with STM32 ecosystem.
The course is focused on explanation of STM32CubeMX tool, how to handle basic tasks and use tool for basic project creation.

What are the benefits for you?

- You will learn about STM32CubeMX tool, its main functions and configuration.
- You will learn how to prepare application skeleton and generate is using STM32CubeMX.
- You will learn how to start your development using Hardware Abstraction Layer libraries (HAL).

Agenda:

- Introduction (prerequisites, STM32 Nucleo, STM32CubeMX Installation)
- STM32CubeMX (pinout, clock configuration, configuration, power consumption calculator tabs and project settings)
- HAL usage in hands-on sessions (GPIO, EXTI, UART, SPI, TIM, ADC, DMA)
- Summary

Prerequisites: technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, NUCLEO-F401RE board, mini-USB cable.
Information about the toolchain, additional software to be installed and additional hardware used during the sessions is provided within Lecture 2 (Prerequisite).

Course landing page
STM32L4 hands-on workshop

Experience the Industry’s first ALL INCLUSIVE, industrial, both High-Performance and Ultra-Low-Power features combining Arm Cortex-M4F based microcontroller. Discover and practice all the key features of the new STM32 L4 family.

This is an offline version of STM32L4 workshop session which demonstrates:
• new peripherals implemented within this new microcontroller line from STM32 family
• low power modes with hands on exercises
• an extended hands-on part where you can create an energy efficient audio player (using FreeRTOS, FatFS, USB)

What are the benefits for you?
• You will understand the STM32L4 architecture including a Cortex-M4 core and new peripherals
• You will manage the MCU to achieve lowest possible current consumption
• You will start from a full-feature use case to implement your own applications

Agenda:
• STM32L4 introduction
• Architecture
• System operating modes (with hands-on sessions)
• New peripherals and BOM reduction
• Audio Player – hands-on session
• Tips and Tricks

Prerequisites: technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, 32L476GDISCOVERY board, mini-USB cable, multimeter with current range below 1uA.

Information about the toolchain, additional software to be installed and additional hardware used during the sessions is provided within description of the course of its landing page.

Course landing page
STM32L4 hands-on training

This training demonstrates how to work with STM32L4 MCUs peripheral by peripheral. It introduces the ultra-low-power STM32 microcontroller family series. It starts with the presentation of Arm® Cortex®-M4 core and architecture, which this STM32 is based on. It follows with the memory organization, reset block, interrupts, low power modes and all peripherals, such as IO ports, ADC, timers, RTC, SPI, USART, I2C, DAC and all low-power peripherals.

Most of the theoretical presentations are combined with practical hands-on examples. Part of the training focuses on the software and hardware development tools.

Low power and Serial Audio Interface hands-on sessions are done within our other session "STM32L4 workshop MOOC". Here we are demonstrating only basic theory information about those topics.

What are the benefits for you?

• You will familiarize yourself with Arm® Cortex®-M4 core, STM32L4 peripherals and development tools
• You will be able to start-up a new project and use the development tools

Agenda:
• Introduction
• System and memories (Core, CRC, SYSCFG, FLASH, QSPI)
• Standard peripherals (RCC, GPIO, EXTI)
• Analog peripherals (DAC, ADC, OPAMP, COMP)
• Communication peripherals (USART, SPI, I2C, USB, CAN)
• Timers (TIMx, LPTIM, RTC, IWDG, WWDG)
• Advanced peripherals (DFSDM, LCD)
• Closing

Prerequisites: technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, 32L476GDISCOVERY board, mini-USB cable, multimeter with current range below 1uA.

Information about the toolchain, additional software to be installed and additional hardware used during the sessions is provided within description of the course of its landing page.

Course landing page
Ultra Low Power STM32 extras

This MOOC provides additional information and extra hands-on exercises to help boost the performance of your application with our ultra-low-power STM32L4 MCUs and our user-friendly development ecosystem.

**What are the benefits for you?**

- Understanding of how you can improve ultra-low-power performance in embedded applications
- Hands-on exercises using the STM32 Power shield (X-NUCLEO-LPM01A) for measuring power consumption as well as real-time analysis
- Tips and tricks to strengthen your expertise of ultra-low-power MCU design

**Agenda:**
- Introduction
- Marketing
- RUN mode and external SMPS – hands-on session
- Conclusion

**Prerequisites:** technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, NUCLEO-L452RE-P board, micro-USB cable.

**Information about the toolchain, additional software to be installed and additional hardware used during the sessions is provided within description of the course of its landing page.**

Course landing page
Basic of security in STM32

Security is required in every connected devices and we see that Security issue are now on News headlines and this is why we think that this is the next challenge of IoT products.

**What are the benefits for you?**

- Get necessary system security background
- Understand how ST provide enablers for designing secure system and application
- Get familiar with STM32 hardware feature and package

**Agenda:**

- Introduction
- Security principles
- Lab – Secure Engine principle
- Secure Boot, Secure Firmware Update (SBSFU)
- Conclusion

**Prerequisites:** technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, 32L476GDISCOVERY board.

**Information about the toolchain, additional software to be installed and additional hardware used during the sessions is provided within description of the course of its landing page.**
STM32F7 hands-on workshop

Get the most of the new STM32F7 Cortex-M7 based MCU. The session is an introduction to STM32F7 word. It starts from the CortexM7 core description and its most important features, then new peripherals of STM32F7 are demonstrated. Further there will be an introduction to Digital Signal Processing and its usage within STM32F7 architecture using available C libraries. At the end of the session there is an extended hands-on part demonstrating how to build an oscilloscope on the given discovery board. The session ends up with graphical library demonstration.

What are the benefits for you?

• Having complete overview of STM32F7 architecture including a Cortex-M7 core and new peripherals
• Understanding of how you can achieve high performance
• Being able to start from a full-feature use case to implement your own applications

Agenda:
• Introduction
• CortexM7 core
• Architecture and New Peripherals
• DSP corner
• USB oscilloscope with STM32CubeMX
• Embedded graphics demo
• Summary

Prerequisites: technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, 32F746GDISCOVERY board.

Information about the toolchain, additional software to be installed and additional hardware used during the sessions is provided within description of the course of its landing page.
This MOOC includes 3 different hands-on training sessions directly from an STM32 expert on how to connect your application to the cloud via a long-range network. Each hands-on session is prepared using Keil uVision tool on B-L072Z-LRWAN1 board.

Hardware and software engineers working on applications looking to provide cloud connectivity via a low-power wide-area network (LPWAN).

Engineers looking to design applications using a user-friendly development ecosystem

**What are the benefits for you?**

- know how to set up an STM32 development environment
- gain technology guidance to connect your STM32-based application to a long-range network
- discover basics of LoRa® and Sigfox technologies
- get some practical experience and examples to replicate at your premises

**Agenda:**

- Introduction
- AT-Slave hands-on
- LoRa theory
- AT-Slave theory
- STM32L072 – key peripherals
- Number guess hands-on
- Temperature sensor hands-on
- Introduction to SigFox
- Introduction to Azure cloud
- Conclusion

**Prerequisites:** technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, B-L072Z-LRWAN1 board.

**Information about the toolchain, additional software to be installed and additional hardware used during the sessions is provided within description of the course of its landing page.**
In today’s world, almost each application is equipped with fancy user interface. Most of those interfaces is based on LCD TFT display with touch controller. At ST, we are committed to using our technologies and expertise to help our customers make their IoT solutions more attractive. ST offers a set of interesting solutions for designers and makers of smart things to develop or enhance the attractiveness of their solutions using graphical user interfaces based on LCD TFT displays.

**What are the benefits for you?**

- Understand how STM32 can contribute to your graphic user interface
- Determine which STM32 microcontroller is best suited for your graphics design
- Get practical knowledge about STemWin graphics library for STM32
- Discover how to benefit from STM32’s unique graphic accelerators

**Agenda:**

- Overview of the attack surface of IoT systems with examples of attack vectors and vulnerable points
- How ST provides the tools and means required for designing secure systems and applications
- Hands-on experience with real-life application scenarios for protecting embedded devices using STM32 hardware features and software libraries
- Tips and tricks to improve the design and performance of secure embedded applications

**Prerequisites:** technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, 32F469GDISCOVERY board.

Information about the toolchain, additional software to be installed and additional hardware used during the sessions is provided within description of the course of its landing page.

Course landing page
Learn how to implement in-application programming (IAP) for your applications via NFC. This MOOC shows you how to perform wireless parametrization, diagnosis and firmware updates using ST25 NFC dynamic tags.

**What are the benefits for you?**

- Understanding of how you can build your own NFC interface to wirelessly set parameters, perform diagnostics and update firmware
- Hands-on exercises focusing on using the STM32 ecosystem to implement IAP in your application via an NFC interface
- Tips and tricks on how IAP via NFC can improve your system’s performance

**Agenda:**

- Overview of Near Field Communication (NFC) technology.
- NFC portfolio
- Hands-on experience with real-life application scenarios and operating modes using the STM32 microcontroller environment.
- Putting together a complete IAP via NFC solution

**Prerequisites:** technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, ST25DV-DISCOVERY and optionally ST25R3911B-DISCO boards.

**Information about the toolchain, additional software to be installed and additional hardware used during the sessions is provided within description of the course of its landing page.**
This is an introduction to Field Oriented Control (FOC) motor control training session. It covers basic theory used in FOC motor control and it helps to measure parameters of the motors before regular Motor Control training session.

**What are the benefits for you?**

- The attendees will know all the basic vocabulary and concept of Motor Control and Motor parameter.
- At the end of this workshop the attendees will have the pre requisite on the basic of motor control and should be able to follow the session of the WS (we need to have a test for the one who think they know enough motor control).

**Agenda:**
- Theory Chapter
- Measurements of Motor Parameters

**Prerequisites:** technical English,
This is an introduction to Field Oriented Control (FOC) motor control training session. It covers some tips useful in FOC motor control and it helps to run your own motors after regular Motor Control training session.

**What are the benefits for you?**

- The attendees will find useful tips for solving runtime issues within BLDC motor control applications
- The attendees will find useful tips for tuning PI regulators within BLDC motor control applications

**Agenda:**

- Few words on motor control application validation process
- Tips for BLDC motor control applications (solving runtime issues)
- Tips for tuning PI regulators

**Prerequisites:** technical English,
Identify the components that best fit your embedded solution.

**What are the benefits for you?**

- Designed for hardware engineers that have validated their final design and are ready to connect the embedded control system, this online course provides useful information on selecting the low- and high-voltage components that best fit your Motor Control application.

- This is the fourth part of a series of online courses designed to help developers get the most out of their Motor Control applications.

**Agenda:**
- Low Voltage portfolio - product solution for motor control applications
- High Voltage portfolio - product solution for motor control applications

**Prerequisites:** technical English,
Moving from 8to32bits - first steps in STM32

How to start with STM32 microcontrollers and create first application

This course is recorded "8to32bit migration" workshop session. It guides participants step by step into STM32 world starting from information sources and hardware getting started. Main part of the workshop demonstrates different coding methods which are available for STM32 starting from assembly language, using C with direct register access (to minimize code usage) and finalizing on STM32CubeMX and Cube Low Layer libraries which could speed up the development process.

What are the benefits for you?

- Set up of STM32 development environment using STM32CubeMX and MDK-ARM toolchain
- Understand the STM32 start up process
- Understand how to use STM32Cube Low Layer and HAL Libraries
- Practical experience and examples to replicate it at your premises

Agenda:

- STM32 hardware getting started
- STM32 startup process
- STM32 software getting started
- STM32 application processing theory
- STM32 application development using registers access
- Introduction to STM32CubeMX and STM32 libraries
- STM32 application development using STM32CubeMX and Low Layer library

Prerequisites: technical English, MCU programming in C language, own PC (notebook) with Windows, USB and administrator rights, NUCLEO-F072RB board.

Information about the toolchain, additional software to be installed and additional hardware used during the sessions is provided within description of the course of its landing page.
Our training partners
In order to extend the offer of ST MCU trainings (STM32 family mainly) we would like to present our Training Partners:

**Sessions provided by our Training Partners offer you several services and extended flexibility in terms of:**

- Coverage and available sessions
- Language options
- Combined sessions with RTOS, tools, communication protocols, etc.

All Training Partners are using up-to-date training materials and product information provided by ST.

The Training Partners are professional training companies and most of them are known as leader and top quality service providers on their market. In addition, to ensure the quality of the ST Microcontrollers training, ST has put in place a certification program. The certified partners have been asset on their technical Knowledge on the ST microcontrollers, their facilitation skills, logistic and registration.

For more details about each partner please see next page. Prescheduled sessions provided by our Training Partners are present in the Trainings Calendar overview inside this catalog. For more details about Training Partners sessions please visit their webpages or contact them directly.

We are looking for new design consulting and training partners!
## Trainings Partners offer overview

<table>
<thead>
<tr>
<th>Training Partner</th>
<th>Contact info</th>
<th>Coverage</th>
<th>Languages</th>
<th>Certified</th>
<th>Trainings Options and Expertise</th>
</tr>
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<tr>
<td>ac6 training</td>
<td><a href="mailto:info@ac6-training.com">info@ac6-training.com</a> +33 (0) 141 168 010 <a href="http://www.ac6-training.com">www.ac6-training.com</a></td>
<td>Worldwide</td>
<td>French English</td>
<td>Yes</td>
<td>• STM processors • USB, PCI, PCIeExpress, RapidIO, Etherent • VHDL – FPGA • C, C++, Real time and industrial grade Ethernet • Real Time OS: Linux, Android, Windows</td>
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<tr>
<td>cynetis embedded</td>
<td><a href="mailto:info@cynetis-embedded.com">info@cynetis-embedded.com</a> +33 1 85 08 70 69 <a href="http://www.cynetis-embedded.com/formations/">http://www.cynetis-embedded.com/formations/</a></td>
<td>France</td>
<td>French English</td>
<td>Yes</td>
<td>• STM32 / Arm Cortex-M4 • RTOS (FreeRTOS, Keil RTX, CMSIS-RTOS) • TCP/IPx &amp; IPv6, SSL/TLS, Crypto • Development Tools: KEIL, Arm, GCC</td>
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<tr>
<td>DOULOS</td>
<td><a href="mailto:info@dooulos.com">info@dooulos.com</a> +49 511 277 1340 <a href="http://www.dooulos.com/">http://www.dooulos.com/</a></td>
<td>Worldwide</td>
<td>German English</td>
<td>Yes</td>
<td>• STM32 • Arm Architecture Fundamentals, Arm embedded software • Arm Cortex-Mx processors • C/C++, SystemC, Perl, VHDL, Verilog, System/Verilog</td>
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<tr>
<td>exelen</td>
<td><a href="mailto:education@exelen.ch">education@exelen.ch</a> +41 26 422 48 42 <a href="http://www.exelen.ch/">www.exelen.ch/</a></td>
<td>Central Europe, France, Italy</td>
<td>English French Italian</td>
<td>Yes</td>
<td>• STM32 • RTOS (SafeRtos, FreeRTOS, uc/0s-III), Development tool chains, hardware design tools • VHDL, FPGA design</td>
</tr>
<tr>
<td>HandsOnTraining</td>
<td><a href="mailto:ContactUs@HandsOnTraining.co.il">ContactUs@HandsOnTraining.co.il</a> +972-52-5816791 <a href="http://www.handsontraining.co.il">www.handsontraining.co.il</a></td>
<td>Israel, Europe, U.S.</td>
<td>English Hebrew</td>
<td>Not yet</td>
<td>• STM32 • Arm cores as Arm certified training center in Israel • Keil MDK, DS5 • FreeRTOS, Android/Linux</td>
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<tr>
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<td><a href="mailto:masters@masters.com.pl">masters@masters.com.pl</a> +48 58 69 10 691 <a href="http://www.masters.com.pl">http://www.masters.com.pl</a></td>
<td>Central &amp; East Europe, Benelux</td>
<td>German English</td>
<td>Yes</td>
<td>• STM32F0 • STM32F4xx • STM32F4x9 + TFT/LCD controller</td>
</tr>
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<td>hitex</td>
<td><a href="mailto:masters@masters.com.pl">masters@masters.com.pl</a> +48 58 69 10 691 <a href="http://www.masters.com.pl">http://www.masters.com.pl</a></td>
<td>Poland</td>
<td>Polish</td>
<td>Yes</td>
<td>• STM32, Cortex Mx, Arm7/9/11, VHDL • C, C++, Java, Perl, UML, TCL/TK, Python C • Embedded C++ Software Engineering RTOS • TCP/IP, VOIP, SIP, CAN • Project management, testing</td>
</tr>
<tr>
<td>MicroConsult</td>
<td><a href="mailto:p.siwon@microconsult.de">p.siwon@microconsult.de</a> +49 (0) 89 45061744 <a href="http://www.microconsult.de">www.microconsult.de</a> <a href="http://www.microconsult.de">www.microconsult.de</a></td>
<td>Worldwide</td>
<td>German English</td>
<td>Yes</td>
<td>• STM32, Cortex Mx, Arm7/9/11, VHDL • C, C++, Java, Perl, UML, TCL/TK, Python C • Embedded C++ Software Engineering RTOS • TCP/IP, VOIP, SIP, CAN • Project management, testing</td>
</tr>
<tr>
<td>MVD TRAINING</td>
<td><a href="mailto:training@mvd-fpga.com">training@mvd-fpga.com</a> +33 (0) 5 62 13 52 32 <a href="http://www.mvd-fpga.com">www.mvd-fpga.com</a></td>
<td>France Worldwide</td>
<td>French English</td>
<td>Yes</td>
<td>• STM32, STR7xx, STR9xx • Arm7/9/11, Cortex-M1/M3/R4/A8 • USB2.0, PCI Express 2.0, Ethernet, TCP/IP, IEEE1588, CAN • Embedded and real-time software development • FPGA Design, VHDL language</td>
</tr>
<tr>
<td>TecnoLogix</td>
<td><a href="mailto:bruno.coppi@tecnologix.it">bruno.coppi@tecnologix.it</a> +39 02 48954230 <a href="http://www.tecnologix.it">http://www.tecnologix.it</a></td>
<td>Italy</td>
<td>Italian English</td>
<td>Yes</td>
<td>• STM32 • Keil Development Tools (Advanced, Keil Realtime Library) • CANopen, J1939, DeviceNet, LIN protocols • Ethernet, EtherCAT, Modbus/TCP, Profinet</td>
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<tr>
<td>TECHDAYS</td>
<td><a href="mailto:techdays@techdays.pl">techdays@techdays.pl</a> +4227673424 <a href="http://www.techdays.pl">www.techdays.pl</a></td>
<td>European Union countries</td>
<td>Polish, English</td>
<td>Yes</td>
<td>• Practical aspects of using ethernet interface in STM32 • Practical aspects of using USB in STM32 • STM32 in low power applications • STM32 + GSM/3G/4G/5G communications • Tips &amp; Tricks in STM32 programming</td>
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</table>
Thank you