

Our technology starts with you

# STMicroelectronics PFE Book – Tunis 2020

# STMicroelectronics

At STMicroelectronics, people shape the world of the future, creating innovative, impactful, and responsible technologies. We provide semiconductor solutions that help our customers make a positive contribution to people's lives.

We place people at the heart of everything we do. Employees realize their potential through a culture of autonomy, creativity and personal development. We invest in people and provide them with a strong sense of meaning.

# Our DNA: the 4 pillars that define us



**One ST  
everywhere**

- Proud of our global, multicultural, diverse team and our open and connected environment



**Shaping  
tomorrow's  
world**

- Admired for our innovation, market-leading technology, products, customers and our collective impact on peoples' lives



**Embracing  
our values**

- Respected for our resilience, stability and loyalty, driven by strong values and ethics



**Growing  
people**

- Committed to empowering all our people to realize their potential through a culture of autonomy, creativity and personal development

# WHO WE ARE



## One ST

At STMicroelectronics, we are proud to be an international company, proud to offer an open and connected work environment, and above all, proud of our team's diversity:

- 45,000 people. One family.
- 105 nationalities. One culture
- 35 countries. One world.

# WHAT WE DO



## Shaping tomorrow's world

When we invent new technologies, we shape the world.  
 When we push the boundaries of innovation, we shape the world.  
 When we put peoples' energy into a project, we shape the world.  
 When we use our sustainability expertise into responsible products,  
 we shape the world.

**We enable customers, consumers and employees to get more from technology so everyone can get more from life.**

# HOW WE DO IT



## Embracing our values

Throughout its history, our company has been respected for its resilience, stability and loyalty, and driven by strong values and ethics.

**Every day we been living the same values since the creation of ST in 1987.**

**PEOPLE**

**INTEGRITY**

**EXCELLENCE**

We believe that conducting our business with empowered people delivering the highest standard of integrity is essential to provide quality and customer satisfaction, and contribute of our long-term success.

# WHO DOES IT



## Growing people

Nothing matters more for us than people. People are the source of innovation, design, production and sales. Everyone can be proud of the technologies they bring to life.

ST is committed to empowering everyone to realize their potential through a culture of autonomy, creativity and personal development.

**We promote learning, feedback, team development and recognition.**

# Our vision: how we see the future

Our technologies exist because of the people who make them.

It is by constantly listening to our employees and giving them the means to use their knowledge to foster innovation that we succeed in moving forward together.

We trust in the synergy of our talents to think, create, and develop solutions for the world in which they would like to live. We are counting on our employees' ability to express their ideas to make our company a springboard to the future.

**At STMicroelectronics, we believe that technology is powered by people for people.**



# Our promise: what we deliver

## OUR TECHNOLOGY STARTS WITH YOU

**Our Technology:** We're at the core of cutting-edge innovation that is changing the way people live and work. Thanks to our advanced fabs and design centers, we master the development of new technologies. We are continually creating new solutions like Smart Driving, the Internet of Things, among many other applications.

**Starts:** We make each person the origin of our various innovative projects. By valuing everyone's contribution, we offer a clear role within our teams. Each of our technologies starts with passion, commitment, and dedication that together are the force behind our world- and life-changing work.

**With You:** People here are empowered at every level to make good choices, work collaboratively, think forward, and change the world, developing their own potential along the way. There is no prescribed ladder to climb or pathway to follow rigidly. We value any kind of diverse profiles.

# 2020 – PFE Graduation project subjects

From February to August 2020  
6 months



# Tunis R&D Center



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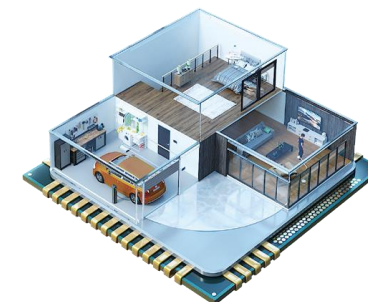
To Apply for a PFE, please select a project before : **13<sup>th</sup> December** with **PFE\_XX** as e-mail subject & send your application to :

**[sttunis.recrutement@st.com](mailto:sttunis.recrutement@st.com)**

# New plugin implementation to support partner IDE in STM32CubeMX

Study the specific existing solutions based on already supported toolchains, then to Specify and Implement a generic STM32CubeMX Plugin interface allowing the support of new Third Party Toolchains.

OOP, JAVA, STM32, STM32CubeMX

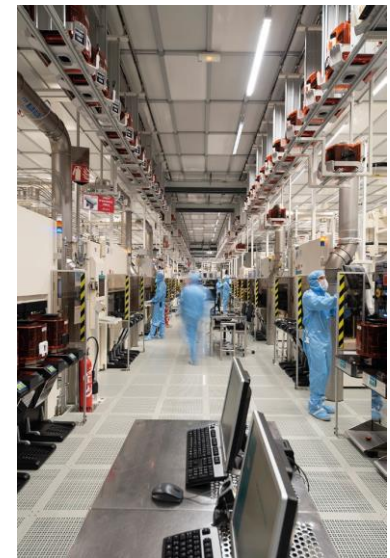


# Functional verification of a digital IP

The work consists in verifying a set functionalities of a digital IP.

The candidate will use one of the methodologies used by the team: the formal or the dynamic.

Key words/Technology: Functional Verification, formal, SVA, UVM, System Verilog, Cadence, Synopsys, IP.



Microelectronics, IP, Verification



# Jenkins - Tuleap Integration

New tuleap plugin for Jenkins integration that automatizes the deployment of new Jenkins instances

- Propose the architecture to be designed for the PoC
- Drive and validate the PoC outcome
- Develop the tuleap plugin for the deployment of the new Jenkins service on demand



DevOps, Jenkins, ACI, REST API, Kubernetes, Tuleap

# OCTOSPI peripheral timing characterization, performance validation and board development.

This internship project aims to define a new OCTOSPI interface characterization and performance validation methods using a dedicated test board. The project include also the definition for timing margin calculation using simulation tools during board development.

STM32, OCTOSPI, Altium design , Hyperlynx,





# STM32 Applications Step by Step

This internship project aims to develop several applications for new comers using STM32 ecosystem with a Tutorials/Guides for :

Analog Application from the capture chain to the data processing

Motor control application



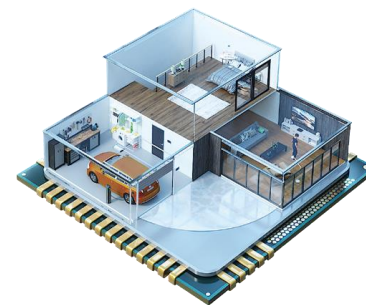
STM32, Education, step by step

# Automation of the certification process NIST (SP800-22b) for STM32 TRNG module

This internship project aims to python/Perl scripts implementation for dataset formatting in rand1, rand2, rand4 et rand8.

Test suite porting of NIST SP800-22b from Linux to Microsoft OS Windows.

Development of different extraction methodologies of raw data to ensure the continuous binary stream from the TRNG module to : USART, USB, SDIO, USB



STM32, TRNG, NIST SP800-22b, Scripting

# STM32 Open Bootloader Tests Automation

Develop project's requirements, specification and test plan.

Develop BxCAN and Mass storage interfaces.

Deploy USART, BxCAN, SPI, I2C and USB Bootloaders on STM32F7, STM32F4 and STM32L4 devices.

Develop test plan according to specification and provide test reports.

Follow STM32Cube FW development process and quality (Coding Rules, Git, Reviews, Validation flow...)

Integrate the development in a demo using STM32CubeProgrammer and STM32 evaluation boards with STLinkv3.



**Bootloader, SPI, I2C, USART, USB, BxCAN, MassStorage,**

# FreeRTOS/CMSIS-RTOSv2 Tests Automation

Understand the FreeRTOS/CMSIS-RTOSv2 stack and its integration in STM32 devices.

Define the validation scenarios and the coverage targets and define the automation strategy, Define the test strategy and test plan, Define the reporting interface (USB, UART, SDCard)

Develop the test suite, Develop the automation process, Develop the reporting platform

Run automated test suite on 2 versions of FreeRTOS stack on 2 STM32 devices.



TestSuite, FreeRTOS, STM32, USB

# STM32 Bootloader Tests Automation

Develop & Integrate new HW-adapter (I2C, SPI, USART) based on appropriate API.

Develop new automation platform features, and ensure proper integration to the overall project.

Define test plan according to specification and provide test reports.

Develop python scripts, to be used in ST's Continuous Integration tools.

Develop unitary, integration and system tests.



STM32, Bootloader, Automation, C++, Python, I2C, SPI, Git.

# STM32 USB Device Classes Tests Automation

Based on existing automation bench, develop and deploy specific USB Device classes Tests Automation.

Develop project's requirements, specification and test plan.

Develop automation tests for USB MSC, CDC, HID, DFU, Audio, CustomHID, ECM, RNDIS, Video, Printer and MTP classes.

Integrate the automated tests in the existing automation platform

Develop test plan according to specification and provide test reports.

Demo: Integrate the full automation suite in the existing automation platform and extract full validation report.



USB, STM32, Automation, C++

# STM32Cube PWR HAL Tests Automation

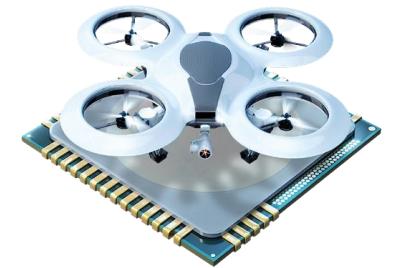
Develop an automatic validation environment based on current manual tests for power controller peripheral (PWR).

Integrate all tests based on human actions: Power consumption measurement, Power-off / Power-on handling tests, Low power tests, Reset tests.

Run tests customized by validator.

Run test plan and provide test reports.

Enhance validation plan coverage



PWR, Automation, HAL, STM32

# STM32Cube RTC/TAMPER HAL Tests Automation

Develop an automatic validation environment based on current manual tests.

Integrate all tests based on human actions: Intrusion tests, Tamper tests, Low power tests, Reset tests.

Run test plan and provide full test reports.

Enhance validation plan coverage.

Ensure code coverage enhancement after analysis

Measure effectiveness of the tests



RTC, Tamper, Automation, HAL, STM32



# STM32CubeProgrammer : Implement SWO and Clock Viewer

Develop project's requirements, specification and test plan.

Develop command line interface functionalities using C++.

Develop the API interface in existing DLL to export developed functionalities to user interface.

Develop the corresponding user interface (Java/JavaFX).

Deploy developed functionalities on new STM32 families (STM32WB and STM32L5).

Develop test plan according to specification and provide test reports.



STM32CubeProgrammer, SWO, C++,Java , STM32

# STM32CubeProgrammer Automatic Validation

Study of the existing Graphical automatic tests

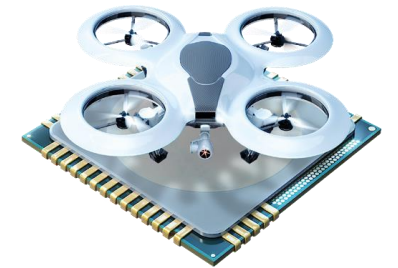
Deployment of the existing automatic tests for graphical interface in automatic platform, and HW settings.

Implement tests enhancements for the existing graphical automatic tests

Implement new graphical validation tests

Generate automatically the corresponding test report

Good communication and collaboration with team members.



Flash, MCU Programming, Python, Jubula, STM32

# CodeGeneration Settings automation

Conception and implementation of automatic tests to validate de code generation/Project manager settings on mutliOS platforms

Find a generic solution to validate the code generation settings

Test cover all the series

Solution on mutliOS



STM32, CubeMX, MultiOS, Jubula, UFT

# Automation of MCU Finder validation on Web and Mobile

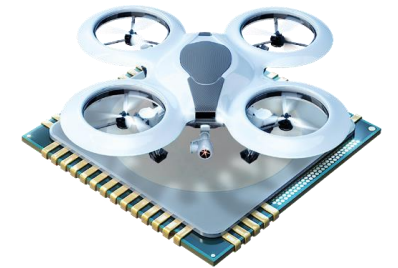
Conception and implementation of auto tests to validate the applications web and Mobile :

Study of the existing automation tools

Dev automatic test for web Finder validation on mutli browser

Dev automatic test for mobile Finder validation

Possibility to use selenium/katalon studio



Automation, Mobile, selenium, web, multiOS, groovy, katalon studio

# Automation of Middleware Validation on STM32CubeMX

Develop an automated validation testsuite for set of Middleware (FreeRTOS/LWIP/USB) in STM32CubeMX tool.

Understand each Middleware features and its integration in STM32CubeMX, Define the validation scenarios and Define the automation strategy, Define the reporting process

Develop the test using Microfocus UFT tool (former HP Tool)

Develop the automatic report generation

Run and validate the automation process

Integrate the testsuite in automatic Validation Framework.

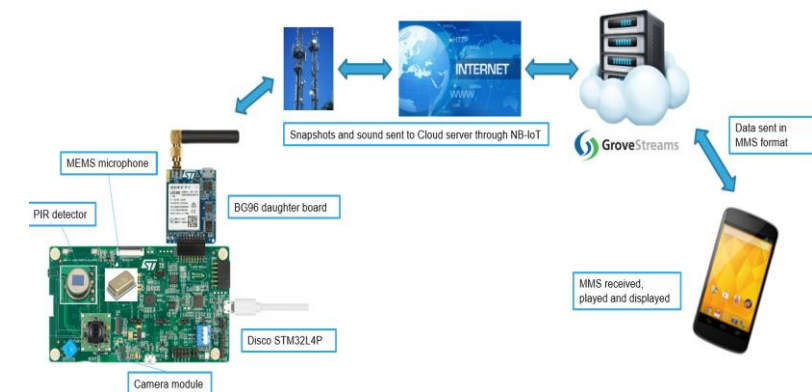


Automation, UFT, STM32CubeMx, USB, LwIP, FreeRTOS

# Development of IoT application

Develop an application that ensures the following:

- The movement detection.
- Video acquisition and audio recording.
- Processing of the captured images.
- Transmission (Audio , Video) via the Cloud.
- Send the data to the smartphone.



DCMI, JPEG, DFSDM, Cloud, HAL, STM32

# STM32F4/7 HAL Drivers Tests Automation

Put in place an STM32F4/7 HAL/LL validation bench based on the automation board, integrate and develop specific IP's auto validation environments

Put in place an STM32F4/7 validation bench based on the automation board and Jenkins platforms.

Integrate the automated HAL validation environment already supporting STM32F4/7 on this platform: LPTIM,

Port the others automated HAL validation environment to support STM32F7 and integrate them on this platform: TIM, UART, USRAT, SPI, I2C, ADC, RTC, GPIO...

Automate specific HAL validation environment on this platform: DAC,

Develop test plan according to specification & Generate full validation report for each peripheral



Automation, C++, Jenkins, HAL, STM32

# CMSIS Pack Generation Automation

Develop a platform for MDK-ARM platform allowing an automatic :

Generation of PDSC file for Device Pack:

Addition of New RPNs into an existing PDSC

Check the PDSC supported RPN vs those of STM32CubeMX



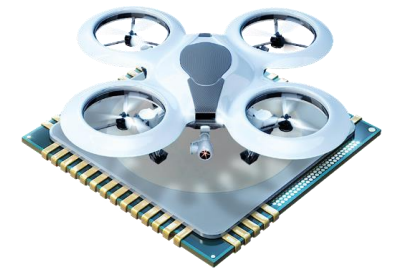
C++, Automation, XML, STM32



# OpenOCD Tests Automation

Develop validation environment to test STM32 support (Flasher, OB..) within OpenOCD

Run test plan and provide full test report

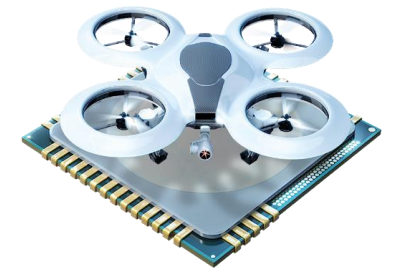


C++, OpenOCD, STM32

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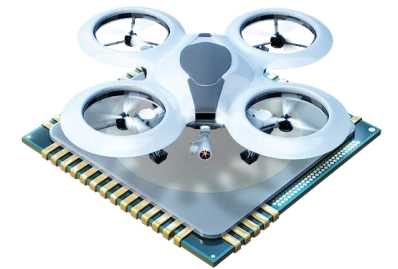


C++, OpenOCD, STM32

# OpenOCD Tests Automation

Develop validation environment to test STM32 support (Flasher, OB..) within OpenOCD

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C++, OpenOCD, STM32

# QuickStep Tool Test Automation

Setup an automatic test environment for the QuickStep tool. QuickStep is a tool to migrate examples and application from one reference IDE project or STM32CubeMX project to another IDE project.



OOP, JAVA, JUnit, STM32, STM32CubeMX

Our technology starts with you

Thank You & Good Luck !



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