IETF Hackathon: Software Updates for IoT (SUIT)

IETF 102

3-4 Nov, 2018

Bangkok

The Group

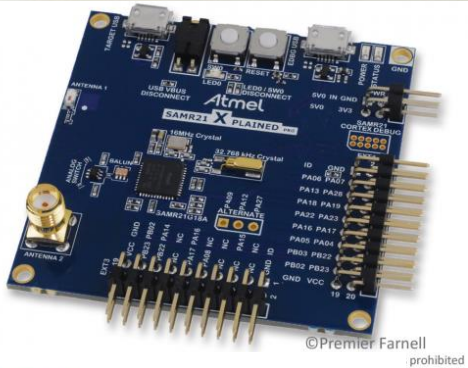
Team:

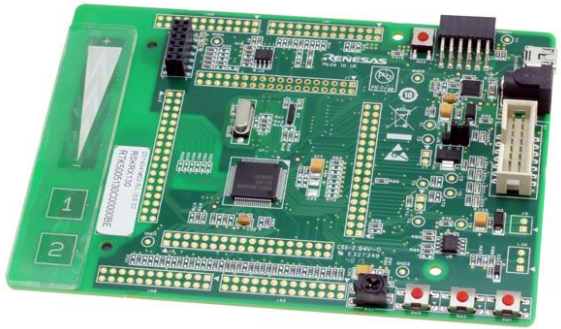
- Hannes Tschofenig
- Jaime Jiménez
- Tadahiko Ito
- Yohei Kaieda
- Yuichi Takita
- Dan Petrie
- Emmanuel Baccelli
- Henk Birkholz
- Chris Inacio
- Laurence Lundblade

- 1st time IETF
- 1st time SUIT Hackathon

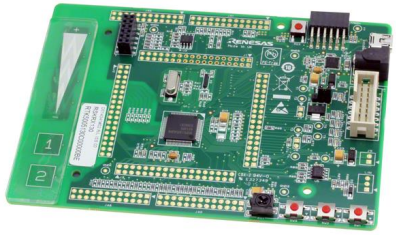
Lots of Hardware

1. STM32F4-DISCOVERY
2. NUCLEO-F207ZG
3. SAMR21 xpro
4. Renesas Starter Kit for RX231
5. MCBSTM32F400
6. Custom SUIT Hackathon Board





Laptop



Renesas

USB

JLINK

STM

1
Create
Firmware & Manifest

2
Transport
Firmware & Manifest

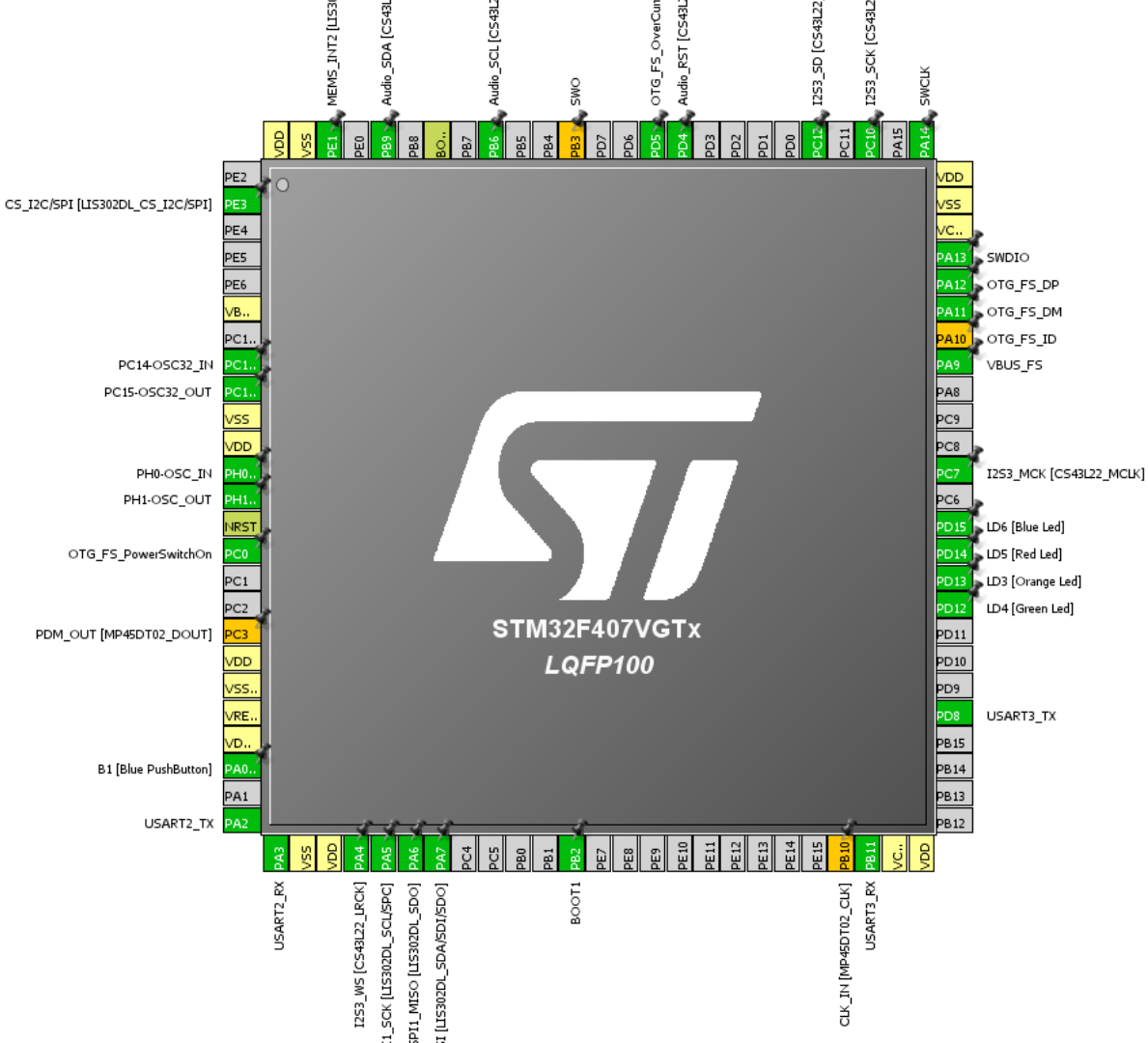
0
Dockerized development
environments
(Mbed OS & RIOT)

CoAP

SAMR21 xpro

MCUs…

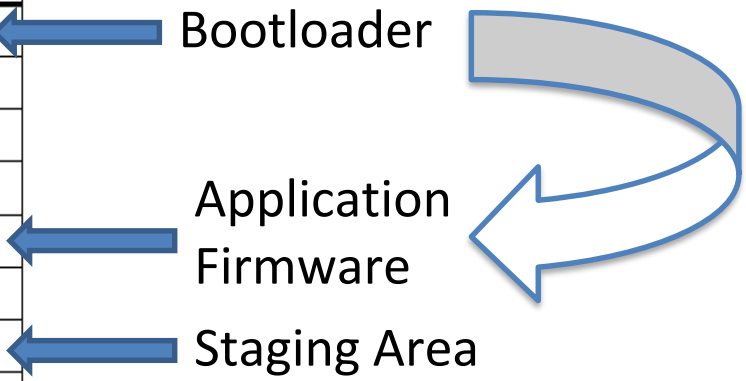
- Configuring MCUs is often necessary to have only those features enabled that are needed.
- This helps to keep the bootloader as small as possible.
- Example shows a screenshot of configuring the pin layout of the STM32F407 MCU via the STM32 CubeMX utility.
- Reading through the reference manual is obviously useful when configuring low level features. Example can be found here.



❸ Verifying and booting

Table 5. Flash module organization (STM32F40x and STM32F41x)

Block	Name	Block base addresses	Size
Main memory	Sector 0	0x0800 0000 - 0x0800 3FFF	16 Kbytes
	Sector 1	0x0800 4000 - 0x0800 7FFF	16 Kbytes
	Sector 2	0x0800 8000 - 0x0800 BFFF	16 Kbytes
	Sector 3	0x0800 C000 - 0x0800 FFFF	16 Kbytes
	Sector 4	0x0801 0000 - 0x0801 FFFF	64 Kbytes
	Sector 5	0x0802 0000 - 0x0803 FFFF	128 Kbytes
	Sector 6	0x0804 0000 - 0x0805 FFFF	128 Kbytes
	. . .	. . .	. . .
	Sector 11	0x080E 0000 - 0x080F FFFF	128 Kbytes
System memory		0x1FFF 0000 - 0x1FFF 77FF	30 Kbytes
OTP area		0x1FFF 7800 - 0x1FFF 7A0F	528 bytes
Option bytes		0x1FFF C000 - 0x1FFF C00F	16 bytes



Vector Table

Table 61. Vector table for STM32F405xx/07xx and STM32F415xx/17xx

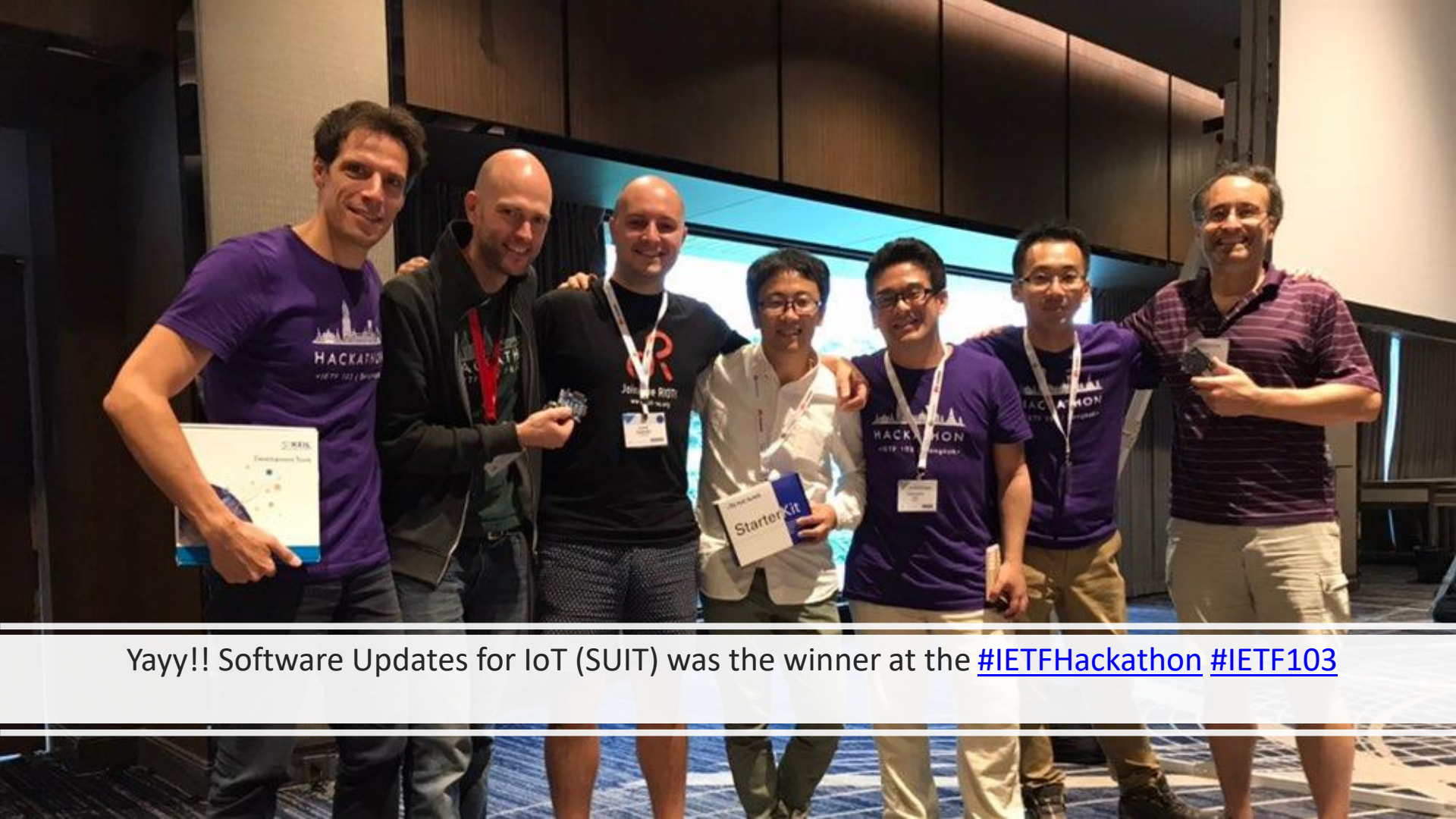
Position	Priority	Type of priority	Acronym	Description	Address
	-	-	-	Reserved	0x0000 0000
	-3	fixed	Reset	Reset	0x0000 0004
	-2	fixed	NMI	Non maskable interrupt. The RCC Clock Security System (CSS) is linked to the NMI vector.	0x0000 0008
	-1	fixed	HardFault	All class of fault	0x0000 000C
	0	settable	MemManage	Memory management	0x0000 0010
	1	settable	BusFault	Pre-fetch fault, memory access fault	0x0000 0014
	2	settable	UsageFault	Undefined instruction or illegal state	0x0000 0018
	-	-	-	Reserved	0x0000 001C - 0x0000 002B
	3	settable	SVCall	System service call via SWI instruction	0x0000 002C
	4	settable	Debug Monitor	Debug Monitor	0x0000 0030

```
// Declare function pointer
void (*firmware_reset_handler)(void);

// Configure MSP
uint32_t msp_value =
*(volatile uint32_t *)FLASH_BASE_ADDRESS;
__set_MSP(msp_value);

// Configure reset handler
uint32_t resethandler_address =
*(volatile uint32_t *) (FLASH_BASE_ADDRESS + 4);

firmware_reset_handler = (void*) resethandler_address;

//Jump to reset handler of application firmware
firmware_reset_handler();
```

Bootloader 101

What we learned

- First day of a Hackathon is always pain.
  We always get something wrong and forget stuff at home…
  - Power adapter killed → Shop visit
  - Missing Serial-to-USB cable → Shop visit
- Help is nearby
  - CDDL is hell → Ask Carsten
  - COSE is hell too → Ask Jim
- SUIT manifest draft needs an update (CDDL and examples)



Yayy!! Software Updates for IoT (SUIT) was the winner at the #IETFHackathon #IETF103

More Info

IETF SUIT Working Group: https://datatracker.ietf.org/wg/suit/about/

Manifest draft used:
https://tools.ietf.org/html/draft-moran-suit-manifest-03

Poster:

http://jaimejim.github.io/docs/suit_poster.pdf

Detailed write-up available at
https://etherpad.tools.ietf.org/p/FUIETF103