STM32
CubeMX

1. Description

1.1. Project

Project Name	CDHboarde
Board Name	custom
Generated with:	STM32CubeMX 6.16.0
Date	11/24/2025

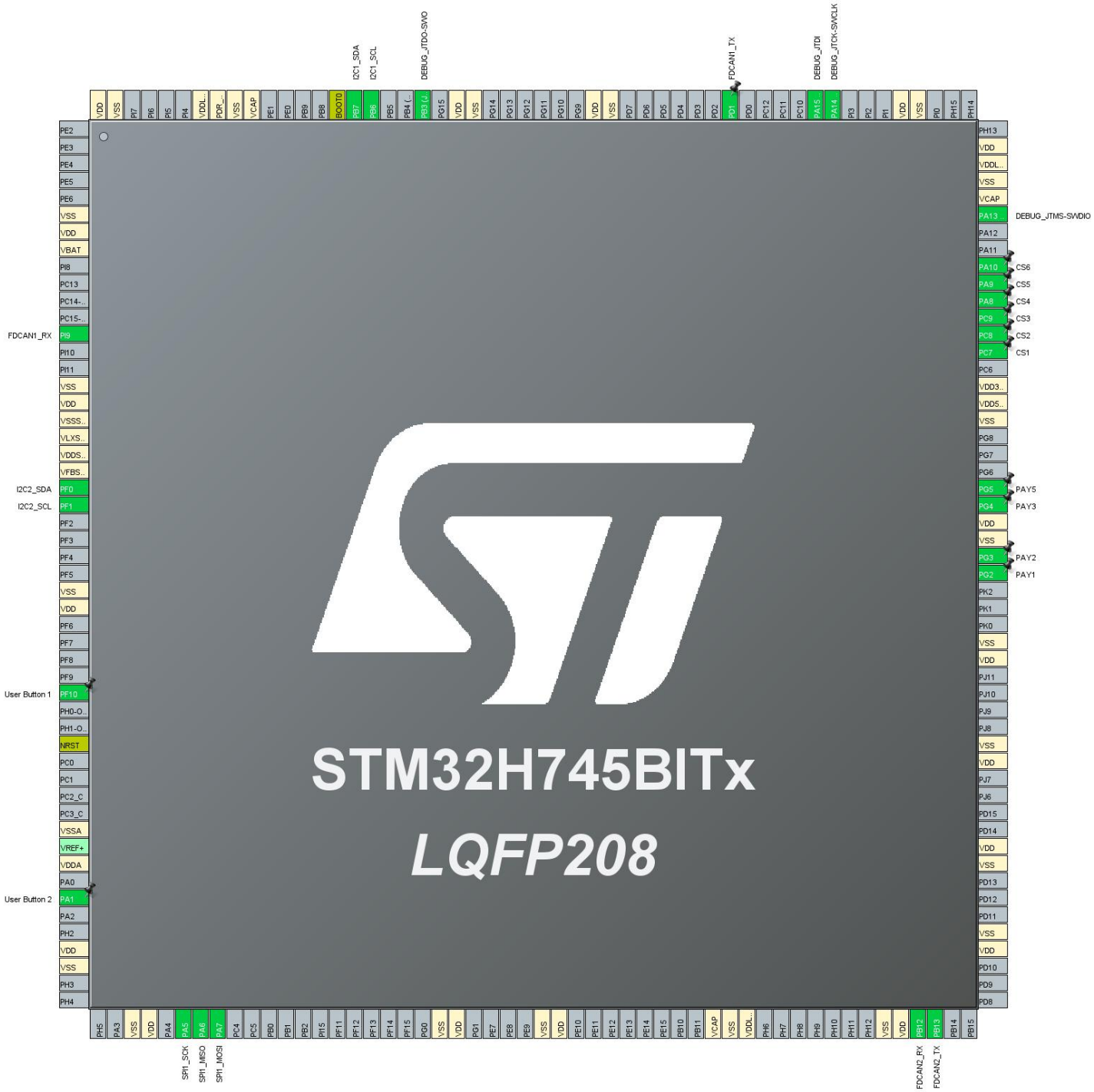
1.2. MCU

MCU Series	STM32H7
MCU Line	STM32H745/755
MCU name	STM32H745BITx
MCU Package	LQFP208
MCU Pin number	208

1.3. Core(s) information

Core(s)	ARM Cortex-M7 ARM Cortex-M4

2. Pinout Configuration



3. Pins Configuration

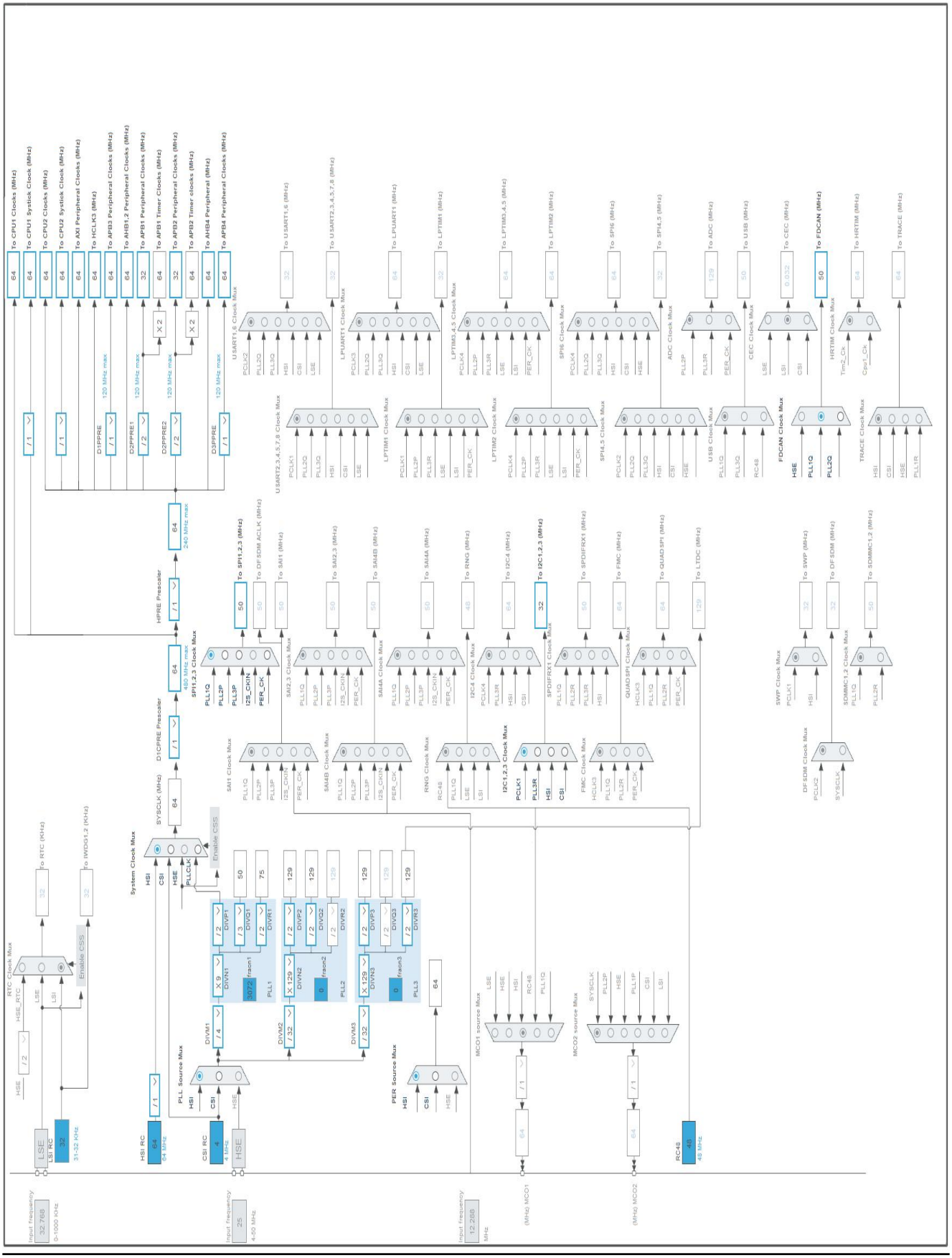
Pin Number LQFP208	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
6	VSS	Power		
7	VDD	Power		
8	VBAT	Power		
13	PI9	I/O	FDCAN1_RX	
16	VSS	Power		
17	VDD	Power		
18	VSSSMPS	Power		
19	VLXSMPS	Power		
20	VDDSMPS	Power		
21	VFBSMPS	Power		
22	PF0	I/O	I2C2_SDA	
23	PF1	I/O	I2C2_SCL	
28	VSS	Power		
29	VDD	Power		
34	PF10 *	I/O	GPIO_Input	User Button 1
37	NRST	Reset		
42	VSSA	Power		
44	VDDA	Power		
46	PA1 *	I/O	GPIO_Output	User Button 2
49	VDD	Power		
50	VSS	Power		
55	VSS	Power		
56	VDD	Power		
58	PA5	I/O	SPI1_SCK	
59	PA6	I/O	SPI1_MISO	
60	PA7	I/O	SPI1_MOSI	
73	VSS	Power		
74	VDD	Power		
79	VSS	Power		
80	VDD	Power		
89	VCAP	Power		
90	VSS	Power		
91	VDDLDO	Power		
99	VSS	Power		
100	VDD	Power		
101	PB12	I/O	FDCAN2_RX	

Pin Number LQFP208	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
102	PB13	I/O	FDCAN2_TX	
108	VDD	Power		
109	VSS	Power		
113	VSS	Power		
114	VDD	Power		
119	VDD	Power		
120	VSS	Power		
125	VDD	Power		
126	VSS	Power		
130	PG2 *	I/O	GPIO_Output	PAY1
131	PG3 *	I/O	GPIO_Output	PAY2
132	VSS	Power		
133	VDD	Power		
134	PG4 *	I/O	GPIO_Output	PAY3
135	PG5 *	I/O	GPIO_Output	PAY5
139	VSS	Power		
140	VDD50_USB	Power		
141	VDD33_USB	Power		
143	PC7 *	I/O	GPIO_Output	CS1
144	PC8 *	I/O	GPIO_Output	CS2
145	PC9 *	I/O	GPIO_Output	CS3
146	PA8 *	I/O	GPIO_Output	CS4
147	PA9 *	I/O	GPIO_Output	CS5
148	PA10 *	I/O	GPIO_Output	CS6
151	PA13 (JTMS/SWDIO)	I/O	DEBUG_JTMS-SWDIO	
152	VCAP	Power		
153	VSS	Power		
154	VDDLDO	Power		
155	VDD	Power		
160	VSS	Power		
161	VDD	Power		
165	PA14 (JTCK/SWCLK)	I/O	DEBUG_JTCK-SWCLK	
166	PA15 (JTDI)	I/O	DEBUG_JTDI	
171	PD1	I/O	FDCAN1_TX	
178	VSS	Power		
179	VDD	Power		
186	VSS	Power		
187	VDD	Power		
189	PB3 (JTDO/TRACESWO)	I/O	DEBUG_JTDO-SWO	

Pin Number LQFP208	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
192	PB6	I/O	I2C1_SCL	
193	PB7	I/O	I2C1_SDA	
194	BOOT0	Boot		
199	VCAP	Power		
200	VSS	Power		
201	PDR_ON	Power		
202	VDDLDO	Power		
207	VSS	Power		
208	VDD	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration



1. Power Consumption Calculator report

1.1. Microcontroller Selection

Series	STM32H7
Line	STM32H745/755
MCU	STM32H745BITx
Datasheet	DS12923_Rev1

1.2. Parameter Selection

Temperature	25
Vdd	3.0

1.3. Battery Selection

Battery	Li-SOCL2(DD36000)
Capacity	36000.0 mAh
Self Discharge	0.08 %/month
Nominal Voltage	3.6 V
Max Cont Current	450.0 mA
Max Pulse Current	1000.0 mA
Cells in series	1
Cells in parallel	1

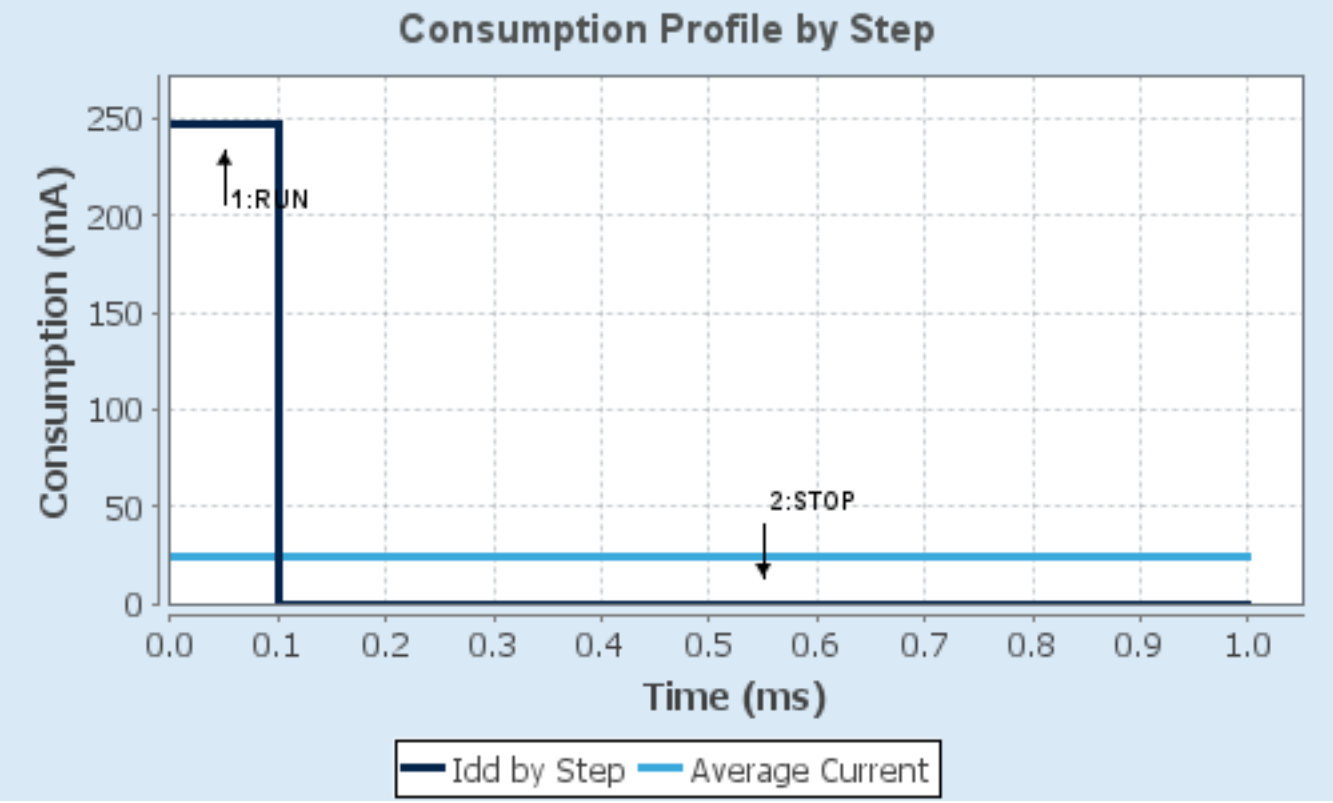
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	VOS0: Scale0	SVOS5: System-Scale5
D1 Mode	DRUN/CRUN	DSTANDBY
D2 Mode	DRUN/CRUN	DSTANDBY
D3 Mode	DRUN	DSTOP
Fetch Type	CM7: ITCM/Cache / CM4: FLASH_B/ART	CM7: NA / CM4: NA
CM7 Frequency	480 MHz	0 Hz
Clock Configuration	HSE BYP PLL ALL_IPs_ON	LSE Flash-ON
CM4 Frequency	240 MHz	0 Hz
Clock Source Frequency	25 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	247 mA	145 µA
Duration	0.1 ms	0.9 ms
DMIPS	1027.0	0.0
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	24.83 mA
Battery Life	1 month, 29 days, 21 hours	Average DMIPS	1027.2001 DMIPS

1.6. Chart


Consumption Profile by Step
Consumption (mA)
250
200
150
100
50
0
1:RUN
2:STOP
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Time (ms)
Idd by Step
Average Current

2. Software Project

2.1. Project Settings

Name	Value
Project Name	CDHboarde
Project Folder	C:\Users\peyto\OneDrive - purdue.edu\Documents\CubeSat\CDH
Toolchain / IDE	EWARM V8.50
Firmware Package Name and Version	STM32Cube FW_H7 V1.12.1
Application Structure	Advanced
Generate Under Root	No
Do not generate the main()	No
Minimum Heap Size	0x200
Minimum Stack Size	0x400

2.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	Copy all used libraries into the project folder
Generate peripheral initialization as a pair of '.c/.h' files	No
Backup previously generated files when re-generating	No
Keep User Code when re-generating	Yes
Delete previously generated files when not re-generated	Yes
Set all free pins as analog (to optimize the power consumption)	No
Enable Full Assert	No

2.3. Advanced Settings - Generated Function Calls ARM Cortex-M7

Rank	Function Name	Peripheral Instance Name
1	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_FDCAN1_Init	FDCAN1
4	MX_I2C1_Init	I2C1
5	MX_SPI1_Init	SPI1

2.4. Advanced Settings - Generated Function Calls ARM Cortex-M4

Rank	Function Name	Peripheral Instance Name
1	MX_GPIO_Init	GPIO

Rank	Function Name	Peripheral Instance Name
2	MX_FDCAN2_Init	FDCAN2
3	MX_I2C2_Init	I2C2

3. Peripherals and Middlewares Configuration

3.1. CORTEX_M7

3.1.1. Parameter Settings:

Core(s) Settings:

Context(s):	Cortex-M7
Initialized Context:	Cortex-M7
Power Domain:	D1

Speculation default mode Settings:

Speculation default mode	**Enabled ***

Cortex Interface Settings:

CPU ICache	Disabled
CPU DCache	Disabled

Cortex Memory Protection Unit Control Settings:

MPU Control Mode	Background Region Privileged accesses only + MPU Disabled during hard fault, NMI and FAULTMASK handlers

Cortex Memory Protection Unit Region 0 Settings:

MPU Region	Enabled
MPU Region Base Address	**0x0 ***
MPU Region Size	4GB
MPU SubRegion Disable	**0x87 ***
MPU TEX field level	level 0
MPU Access Permission	ALL ACCESS NOT PERMITTED
MPU Instruction Access	DISABLE
MPU Shareability Permission	ENABLE
MPU Cacheable Permission	DISABLE
MPU Bufferable Permission	DISABLE

Cortex Memory Protection Unit Region 1 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 2 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 3 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 4 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 5 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 6 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 7 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 8 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 9 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 10 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 11 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 12 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 13 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 14 Settings:

MPU Region	Disabled

Cortex Memory Protection Unit Region 15 Settings:

MPU Region	Disabled

3.2. DEBUG

Debug: JTAG (4 pins)

3.2.1. Core(s) Settings:

Context(s):	Cortex-M7
Initialized Context:	Cortex-M7
Power Domain:	

3.3. FDCAN1

mode: Activated

3.3.1. Parameter Settings:

Core(s) Settings:

Context(s):	Cortex-M7
Initialized Context:	Cortex-M7

Power Domain:	D2

Clock Calibration Unit:

Clock Calibration	Disable

Bit Timings Parameters:

Nominal Prescaler	16
Nominal Time Quantum	**320.0 ***
Nominal Time Seg1	1
Nominal Time Seg2	1
Nominal Time for one Bit	**960 ***
Nominal Baud Rate	**1041666 ***

3.4. FDCAN2

mode: Activated

3.4.1. Parameter Settings:

Core(s) Settings:

Context(s):	Cortex-M4
Initialized Context:	Cortex-M4
Power Domain:	D2

Clock Calibration Unit:

Clock Calibration	Disable

Bit Timings Parameters:

Nominal Prescaler	16
Nominal Time Quantum	**320.0 ***
Nominal Time Seg1	1
Nominal Time Seg2	1
Nominal Time for one Bit	**960 ***
Nominal Baud Rate	**1041666 ***

3.5. I2C1

I2C: I2C

3.5.1. Parameter Settings:

Core(s) Settings:

Context(s):	

	Cortex-M7
Initialized Context:	Cortex-M7
Power Domain:	D2

Timing configuration:

Custom Timing	Disabled
I2C Speed Mode	Standard Mode
I2C Speed Frequency (KHz)	100
Rise Time (ns)	0
Fall Time (ns)	0
Coefficient of Digital Filter	0
Analog Filter	Enabled
Timing	**0x00707CBB ***

Slave Features:

Clock No Stretch Mode	Disabled
General Call Address Detection	Disabled
Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
Primary slave address	0

3.6. I2C2

I2C: I2C

3.6.1. Parameter Settings:

Core(s) Settings:

Context(s):	Cortex-M4
Initialized Context:	Cortex-M4
Power Domain:	D2

Timing configuration:

Custom Timing	Disabled
I2C Speed Mode	Standard Mode
I2C Speed Frequency (KHz)	100
Rise Time (ns)	0
Fall Time (ns)	0
Coefficient of Digital Filter	0
Analog Filter	Enabled
Timing	**0x00707CBB ***

Slave Features:

Clock No Stretch Mode	Disabled
General Call Address Detection	Disabled
Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
Primary slave address	0

3.7. RCC

3.7.1. Parameter Settings:

Core(s) Settings:

Context(s):	Cortex-M7 Cortex-M4
Initialized Context:	Cortex-M7
Power Domain:	D3

Power Parameters:

SupplySource	PWR_DIRECT_SMPS_SUPPLY
Power Regulator Voltage Scale	Power Regulator Voltage Scale 3

RCC Parameters:

TIM Prescaler Selection	Disabled
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000
CSI Calibration Value	32
HSI Calibration Value	64

System Parameters:

VDD voltage (V)	3.3
Flash Latency(WS)	1 WS (2 CPU cycle)
Product revision	rev.V

PLL range Parameters:

PLL1 clock Input range	Between 8 and 16 MHz
PLL1 clock Output range	MEDIUM VCO range

3.8. SPI1

Mode: Full-Duplex Master

3.8.1. Parameter Settings:

Core(s) Settings:

Context(s):	Cortex-M7
Initialized Context:	Cortex-M7
Power Domain:	D2

Basic Parameters:

Frame Format	Motorola
Data Size	4 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	2
Baud Rate	**25.0 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSSP Mode	Enabled
NSS Signal Type	Software
Fifo Threshold	Fifo Threshold 01 Data
Tx Crc Initialization Pattern	All Zero Pattern
Rx Crc Initialization Pattern	All Zero Pattern
Nss Polarity	Nss Polarity Low
Master Ss Idleness	00 Cycle
Master Inter Data Idleness	00 Cycle
Master Receiver Auto Susp	Disable
Master Keep Io State	Master Keep Io State Disable
IO Swap	Disabled

3.9. SYS_M4

Timebase Source: SysTick

3.9.1. Core(s) Settings:

Context(s):	Cortex-M4
Initialized Context:	Cortex-M4
Power Domain:	

3.10. SYS

Timebase Source: SysTick

3.10.1. Core(s) Settings:

Context(s):	Cortex-M7
Initialized Context:	Cortex-M7
Power Domain:	

*** User modified value**

4. System Configuration

4.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label	Context	Power Domain
DEBUG	PA13 (JTMS/SWDIO)	DEBUG_JTMS-SWDIO	n/a	n/a	n/a		Cortex-M7	Cortex-M7
	PA14 (JTCK/SWCLK)	DEBUG_JTCK-SWCLK	n/a	n/a	n/a		Cortex-M7	Cortex-M7
	PA15 (JTDI)	DEBUG_JTDI	n/a	n/a	n/a		Cortex-M7	Cortex-M7
	PB3 (JTDO/TRACESWO	DEBUG_JTDO-SWO	n/a	n/a	n/a		Cortex-M7	Cortex-M7
FDCAN1	PI9	FDCAN1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low		Cortex-M7	D2
	PD1	FDCAN1_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low		Cortex-M7	D2
FDCAN2	PB12	FDCAN2_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low		Cortex-M4	D2
	PB13	FDCAN2_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low		Cortex-M4	D2
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	Low		Cortex-M7	D2
	PB7	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	Low		Cortex-M7	D2
I2C2	PF0	I2C2_SDA	Alternate Function Open Drain	No pull-up and no pull-down	Low		Cortex-M4	D2
	PF1	I2C2_SCL	Alternate Function Open Drain	No pull-up and no pull-down	Low		Cortex-M4	D2
SPI1	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Low		Cortex-M7	D2
	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Low		Cortex-M7	D2
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Low		Cortex-M7	D2
GPIO	PF10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	User Button 1	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	User Button 2	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4
	PG2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PAY1	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4
	PG3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PAY2	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label	Context	Power Domain
	PG4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PAY3	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4
	PG5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PAY5	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4
	PC7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS1	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4
	PC8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS2	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4
	PC9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS3	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4
	PA8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS4	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4
	PA9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS5	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4
	PA10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS6	Cortex-M7* Cortex-M4	Cortex-M7* Cortex-M4

* Initialized context

4.2. DMA configuration

nothing configured in DMA service

4.3. BDMA configuration

nothing configured in DMA service

4.4. MDMA configuration

nothing configured in DMA service

4.5. NVIC configuration

4.5.1. NVIC1

Interrupt Table	Enable	Preenmption Priority	SubPriority
Non maskable interrupt	true	0	0
Hard fault interrupt	true	0	0
Memory management fault	true	0	0
Pre-fetch fault, memory access fault	true	0	0
Undefined instruction or illegal state	true	0	0
System service call via SWI instruction	true	0	0
Debug monitor	true	0	0
Pendable request for system service	true	0	0
System tick timer	true	15	0
PVD and AVD interrupts through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
FDCAN1 interrupt 0	unused		
FDCAN1 interrupt 1	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
SPI1 global interrupt	unused		
FDCAN calibration unit interrupt	unused		
CM4 send event interrupt for CM7	unused		
FPU global interrupt	unused		
HSEM1 global interrupt	unused		
Hold core interrupt	unused		

4.5.2. NVIC1 Code generation

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Non maskable interrupt	false	true	false
Hard fault interrupt	false	true	false
Memory management fault	false	true	false
Pre-fetch fault, memory access fault	false	true	false
Undefined instruction or illegal state	false	true	false
System service call via SWI instruction	false	true	false
Debug monitor	false	true	false
Pendable request for system service	false	true	false
System tick timer	false	true	true

4.5.3. NVIC2

Interrupt Table	Enable	Preenmption Priority	SubPriority
Non maskable interrupt	true	0	0
Hard fault interrupt	true	0	0
Memory management fault	true	0	0
Pre-fetch fault, memory access fault	true	0	0
Undefined instruction or illegal state	true	0	0
System service call via SWI instruction	true	0	0
Debug monitor	true	0	0
Pendable request for system service	true	0	0
System tick timer	true	15	0
PVD and AVD interrupts through EXTI line 16	unused		
Flash global interrupt	unused		
FDCAN2 interrupt 0	unused		
FDCAN2 interrupt 1	unused		
I2C2 event interrupt	unused		
I2C2 error interrupt	unused		
FDCAN calibration unit interrupt	unused		
CM7 send event interrupt for CM4	unused		
FPU global interrupt	unused		
HSEM2 global interrupt	unused		
Hold core interrupt	unused		

4.5.4. NVIC2 Code generation

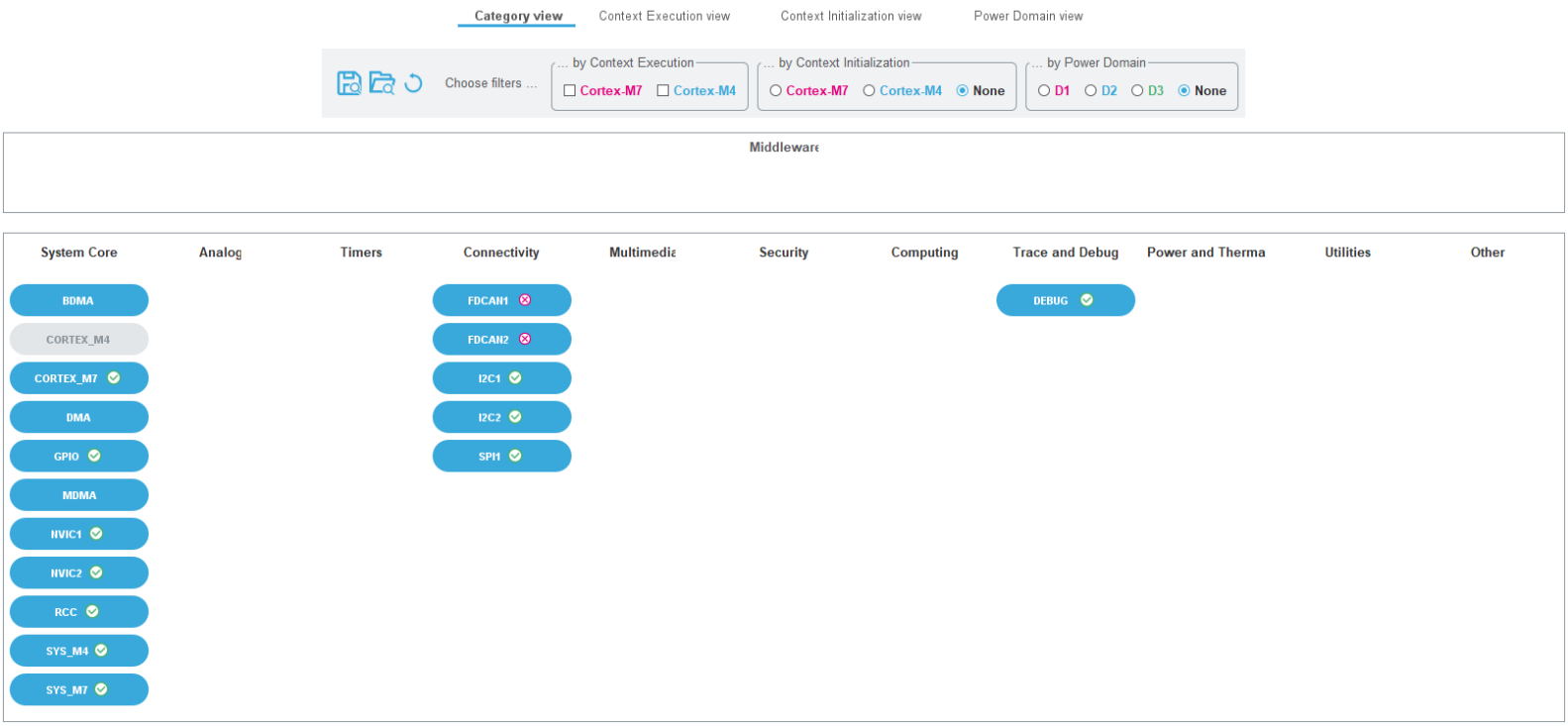
Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Non maskable interrupt	false	true	false
Hard fault interrupt	false	true	false
Memory management fault	false	true	false
Pre-fetch fault, memory access fault	false	true	false
Undefined instruction or illegal state	false	true	false
System service call via SWI instruction	false	true	false
Debug monitor	false	true	false
Pendable request for system service	false	true	false
System tick timer	false	true	true

*** User modified value**

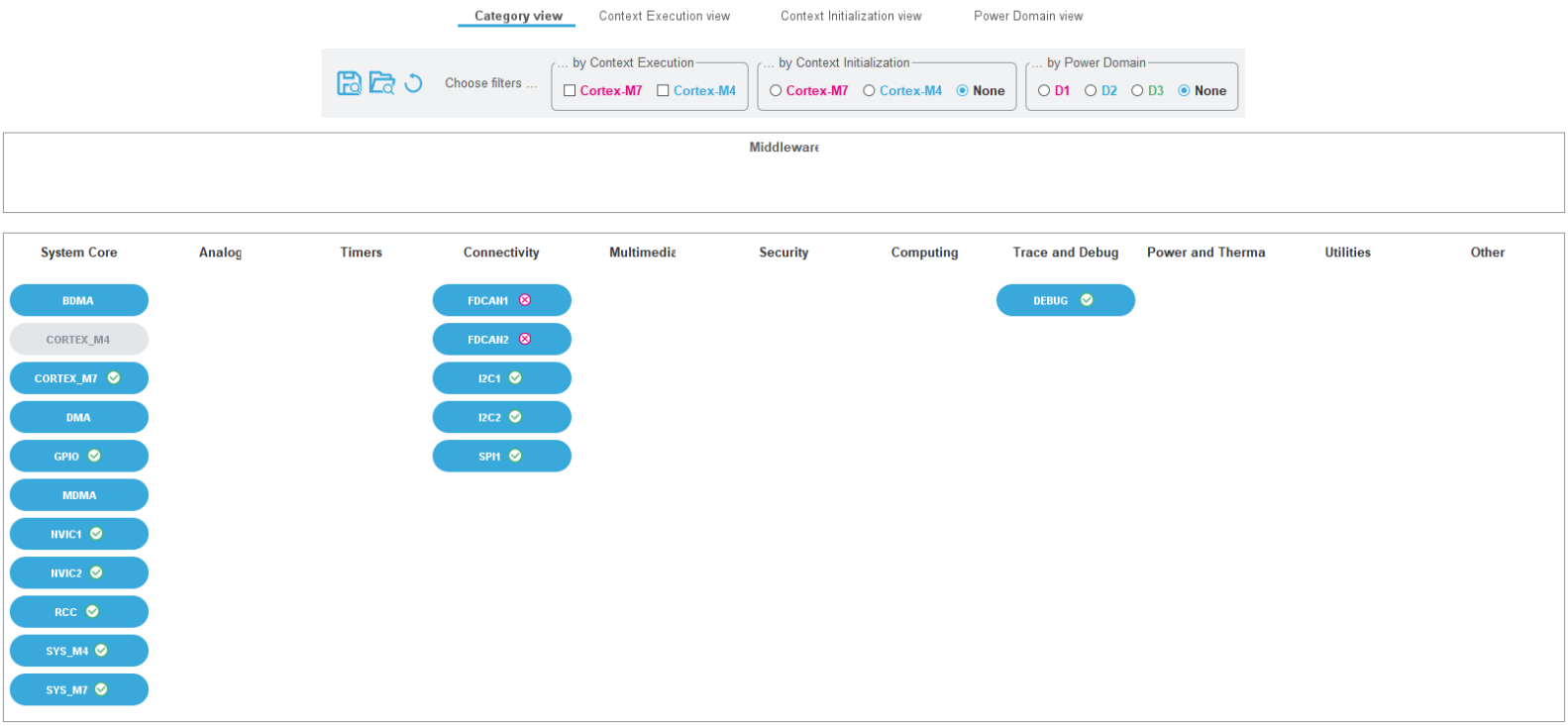
5. System Views

5.1. Category view

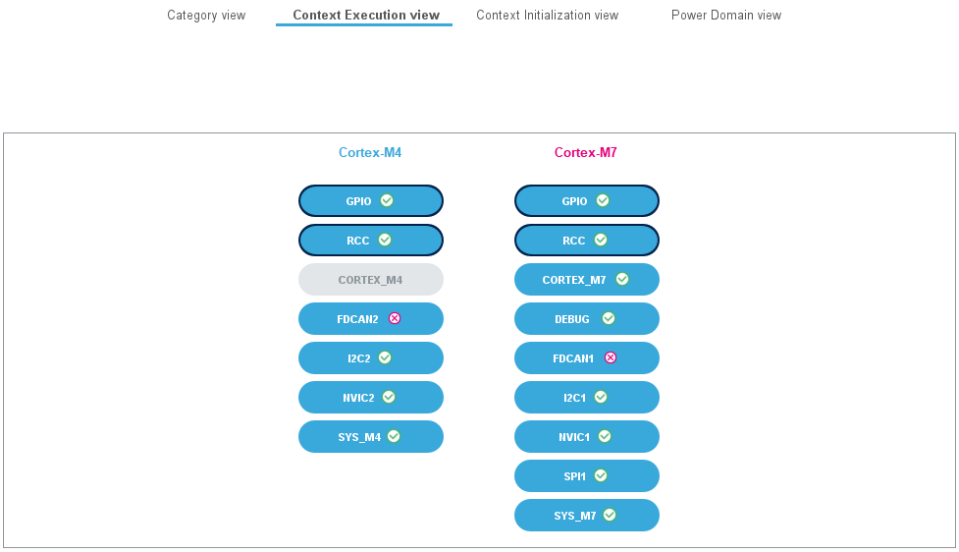
5.1.1. Current



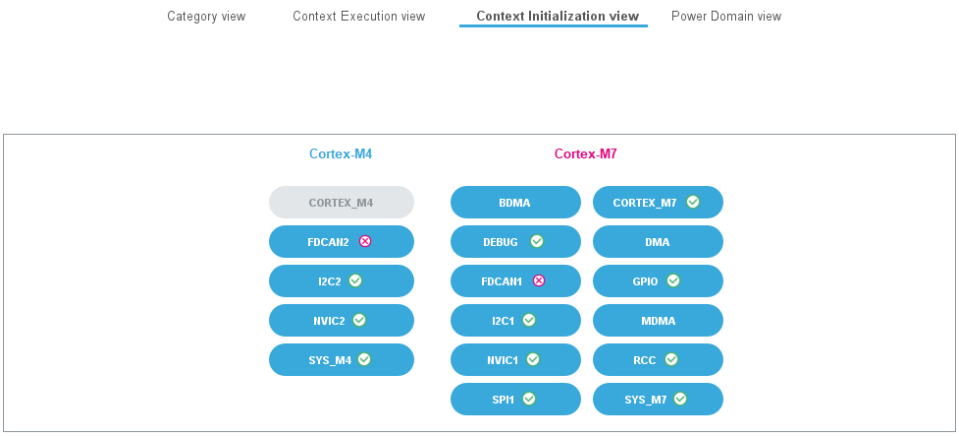
5.1.2. Without filters



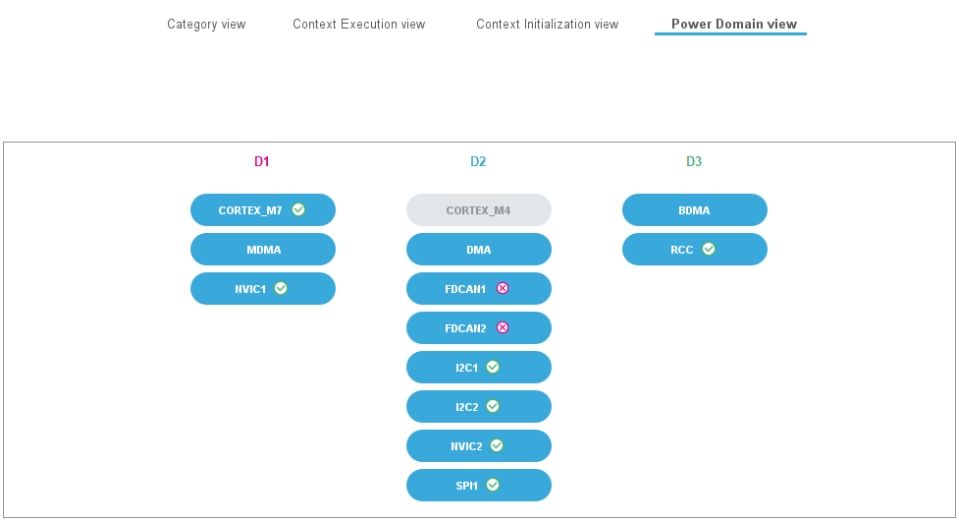
5.2. Context Execution view



5.3. Context Initialization view



5.4. Power Domain view



6. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32h7_bsdl.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32h7_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32h7-svd.zip
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers_stm32h7_series_product_overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf
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Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32h7rs-lines-overview.pdf
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Application Notes for related Tools	https://www.st.com/resource/en/application_note/an5360-getting-started-with-projects-based-on-the-stm32mp1-series-in-stm32cubeide-

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