

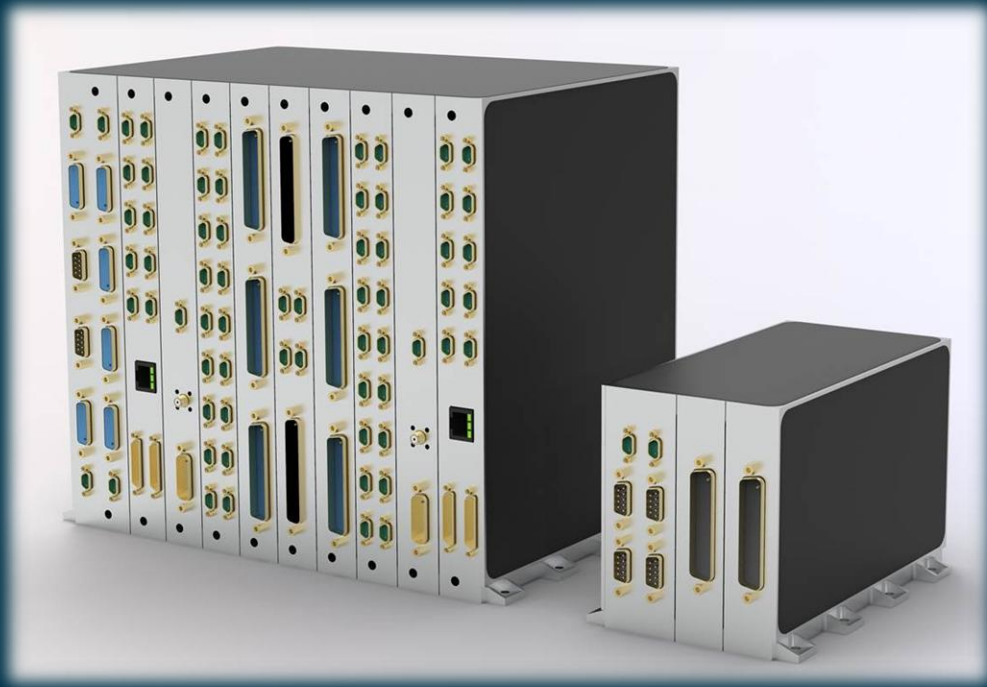
ADHA Architecture and module profiles

ADHA use cases

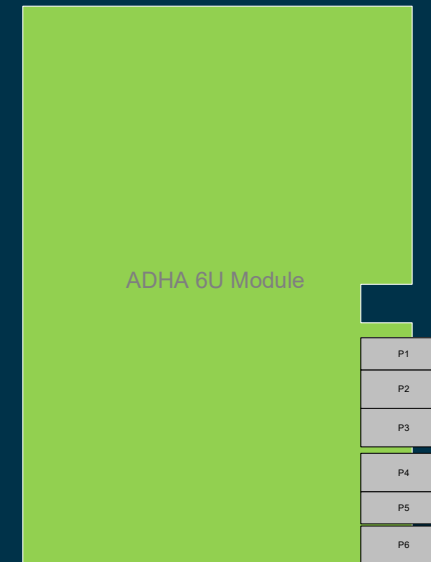
Unit internal implementations

1- Overview of ADHA Units (ADHA-Ux)

ADHA support 6U and 3U ADHA-Ux units



ADHA-Unit:
ADHA mechanical housing + Backplane
+ ADHA Modules



ADHA-6U Module:
6HP, 220x233mm

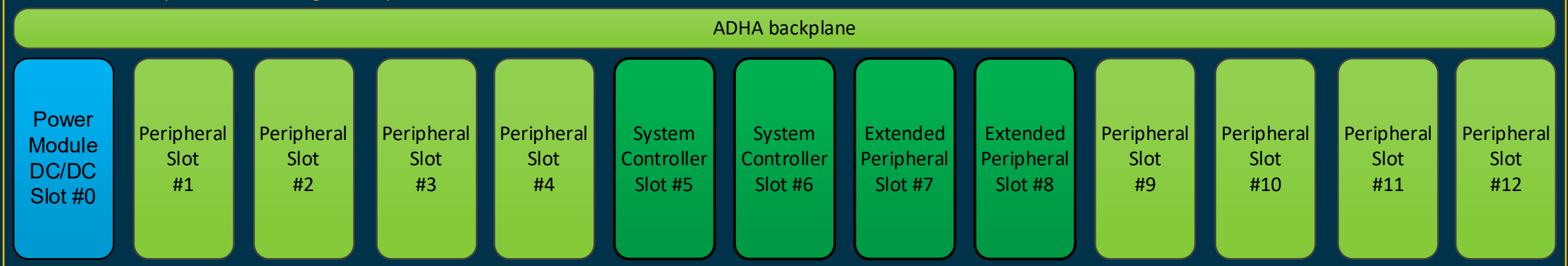


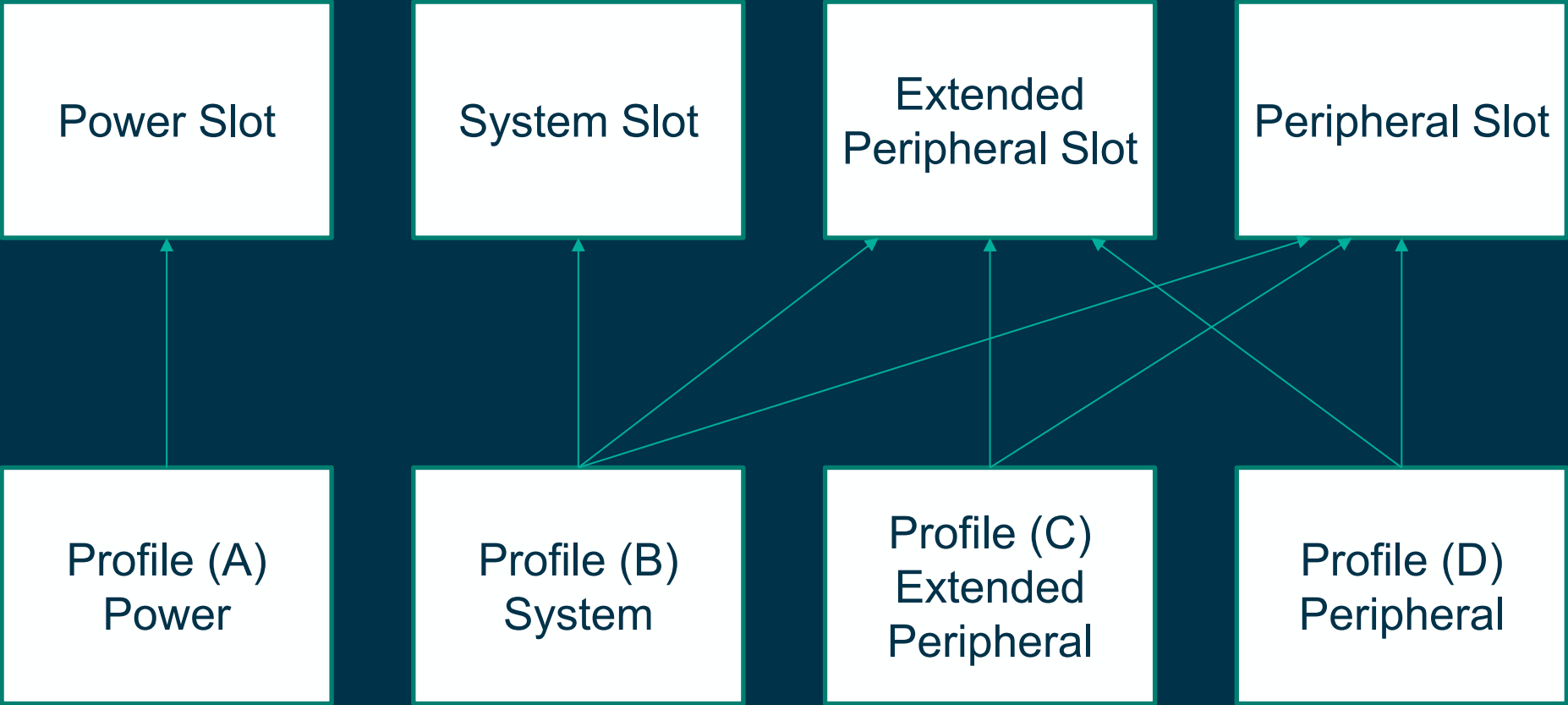
ADHA-3U Module:
6HP, 3U: 220x100mm

An ADHA unit in maximum configuration can host up to 13 ADHA modules:

- One Power Module (internal redundant, one board)
- A redundant System Controller Module (two boards, N & R)
- A redundant Extended Peripheral (two boards, N & R)
- Up to eight Peripheral Module

6U ADHA Unit (maximum configuration)

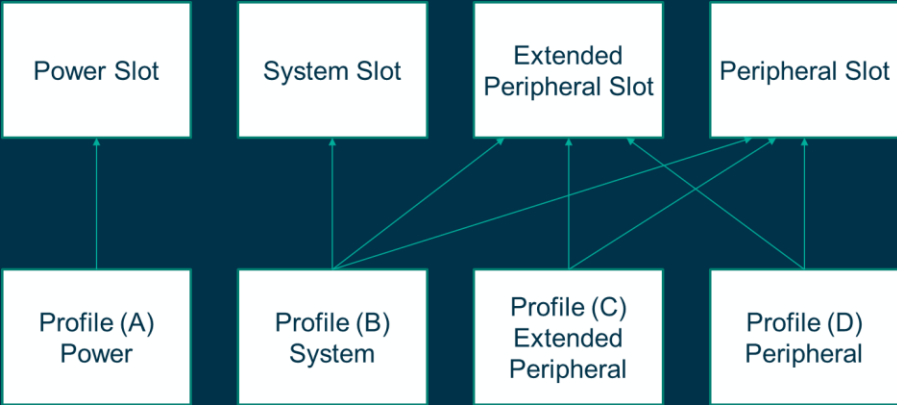




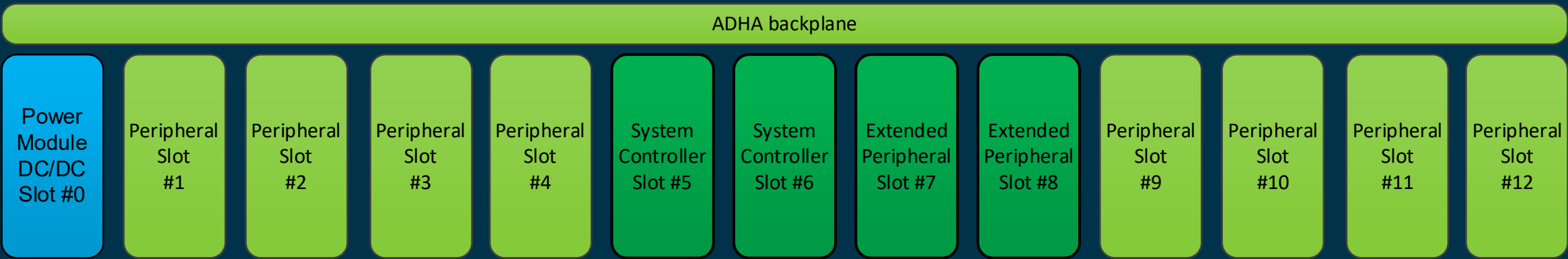
Unit Concept & Architecture

An ADHA unit in maximum configuration can host up to 13 ADHA modules:

- One Power Module (internal redundant, one board)
- A redundant System Controller Module (two boards, N & R)
- A redundant Extended Peripheral (two boards, N & R)
- Up to eight Peripheral Module



6U ADHA Unit (maximum configuration)

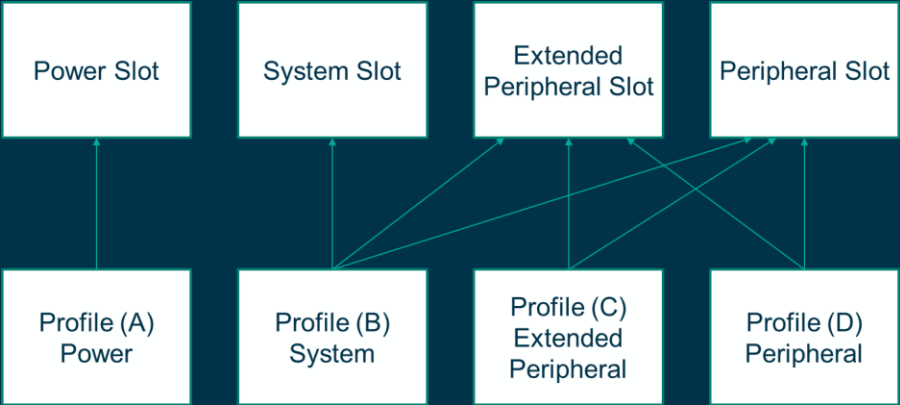


Unit Concept & Architecture

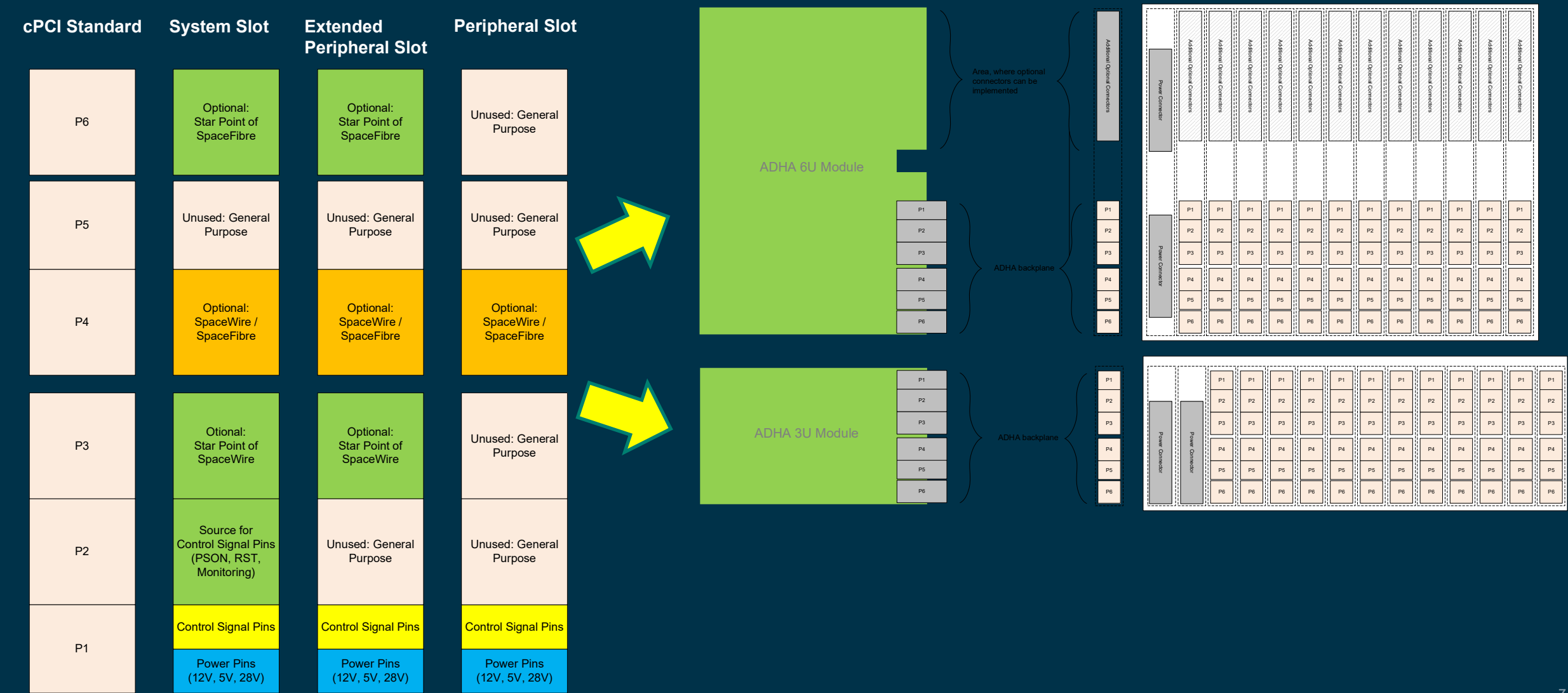
cPCI Standard	System Slot	Extended Peripheral Slot	Peripheral Slot
P6	Optional: Star Point of SpaceFibre	Optional: Star Point of SpaceFibre	Unused: General Purpose
P5	Unused: General Purpose	Unused: General Purpose	Unused: General Purpose
P4	Optional: SpaceWire / SpaceFibre	Optional: SpaceWire / SpaceFibre	Optional: SpaceWire / SpaceFibre
P3	Optional: Star Point of SpaceWire	Optional: Star Point of SpaceWire	Unused: General Purpose
P2	Source for Control Signal Pins (PS_ON, RST, Monitoring)	Unused: General Purpose	Unused: General Purpose
P1	Control Signal Pins Power Pins (12V, 5V, 28V)	Control Signal Pins Power Pins (12V, 5V, 28V)	Control Signal Pins Power Pins (12V, 5V, 28V)

Support functions and links
via standardized backplane:

- SpaceFibre
- SpaceWire
- Internal Monitoring System
- CAN-Bus
- PS_ON
- Reset
- Sync
- Power supply (12V, 5V, 28V)

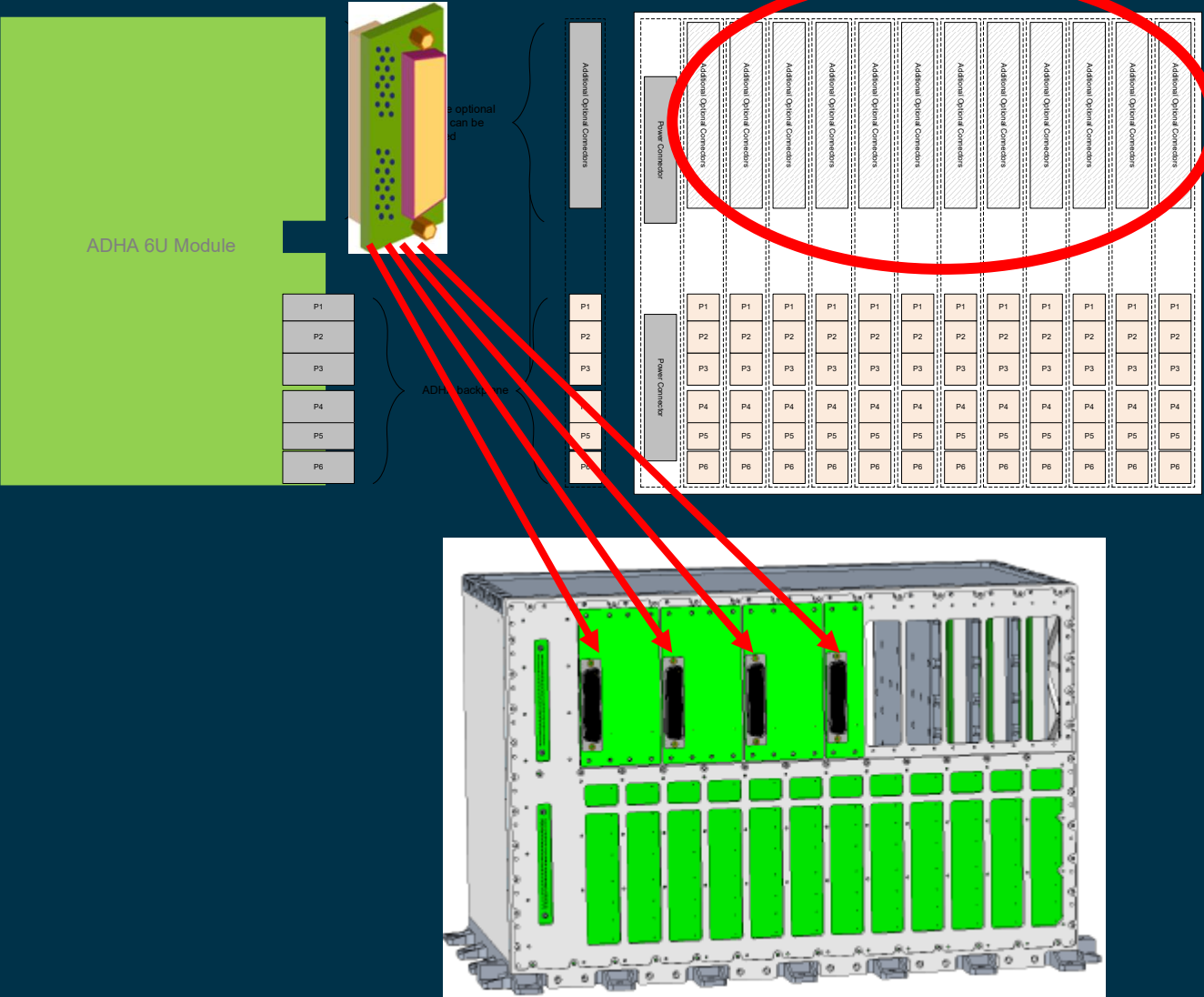


Module Profiles: Compatible pinning for 6U and 3U ADHA Units

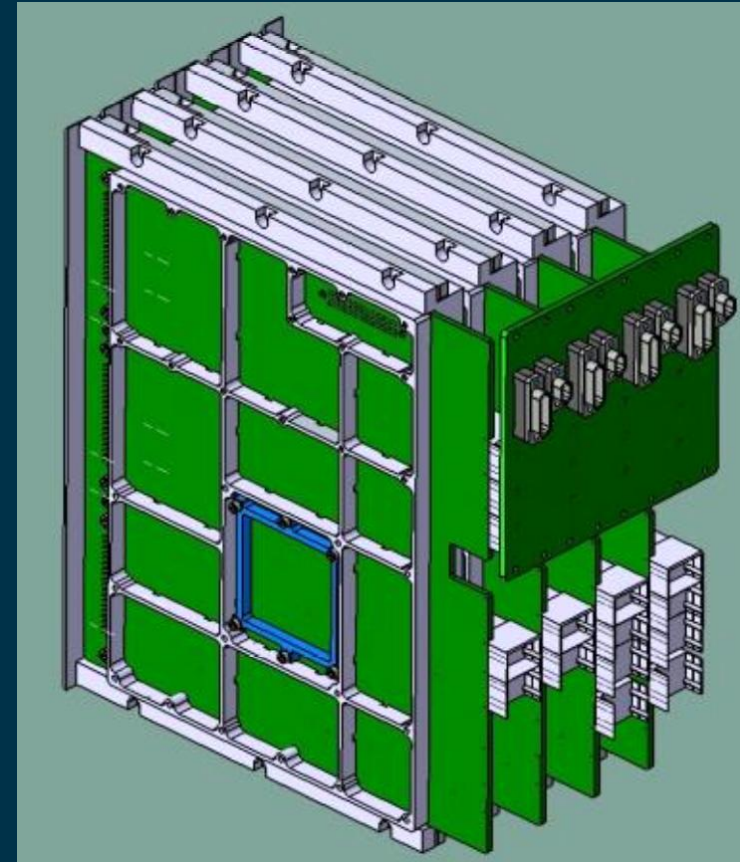


Module Profiles: Additional connectors

cPCI Standard	System Slot	Extended Peripheral Slot	Peripheral Slot
P6	Optional: Star Point of SpaceFibre	Optional: Star Point of SpaceFibre	Unused: General Purpose
P5	Unused: General Purpose	Unused: General Purpose	Unused: General Purpose
P4	Optional: SpaceWire / SpaceFibre	Optional: SpaceWire / SpaceFibre	Optional: SpaceWire / SpaceFibre
P3	Optional: Star Point of SpaceWire	Optional: Star Point of SpaceWire	Unused: General Purpose
P2	Source for Control Signal Pins (PSON, RST, Monitoring)	Unused: General Purpose	Unused: General Purpose
P1	Control Signal Pins Power Pins (12V, 5V, 28V)	Control Signal Pins Power Pins (12V, 5V, 28V)	Control Signal Pins Power Pins (12V, 5V, 28V)

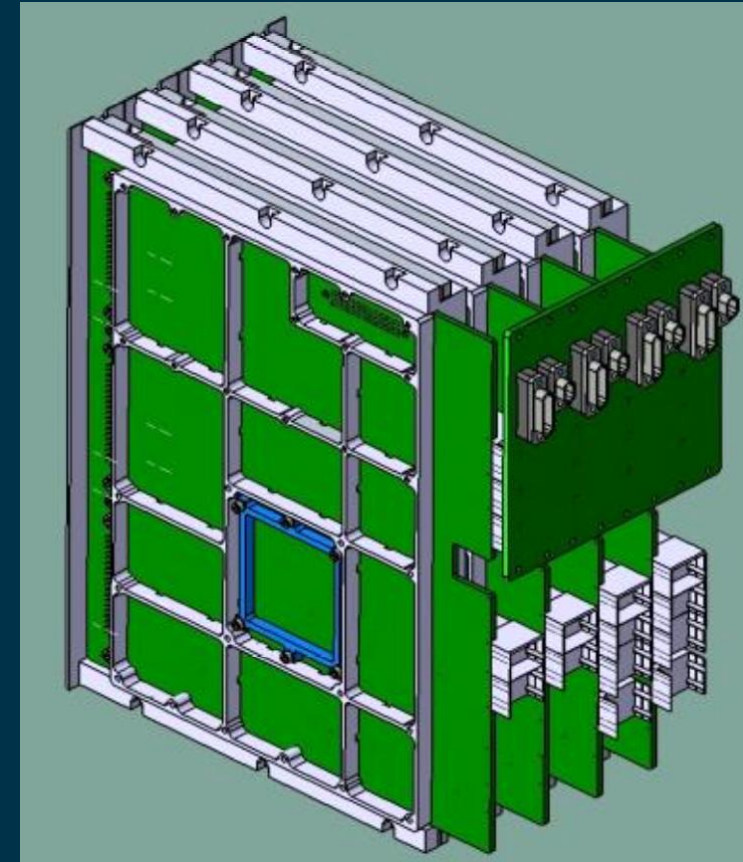
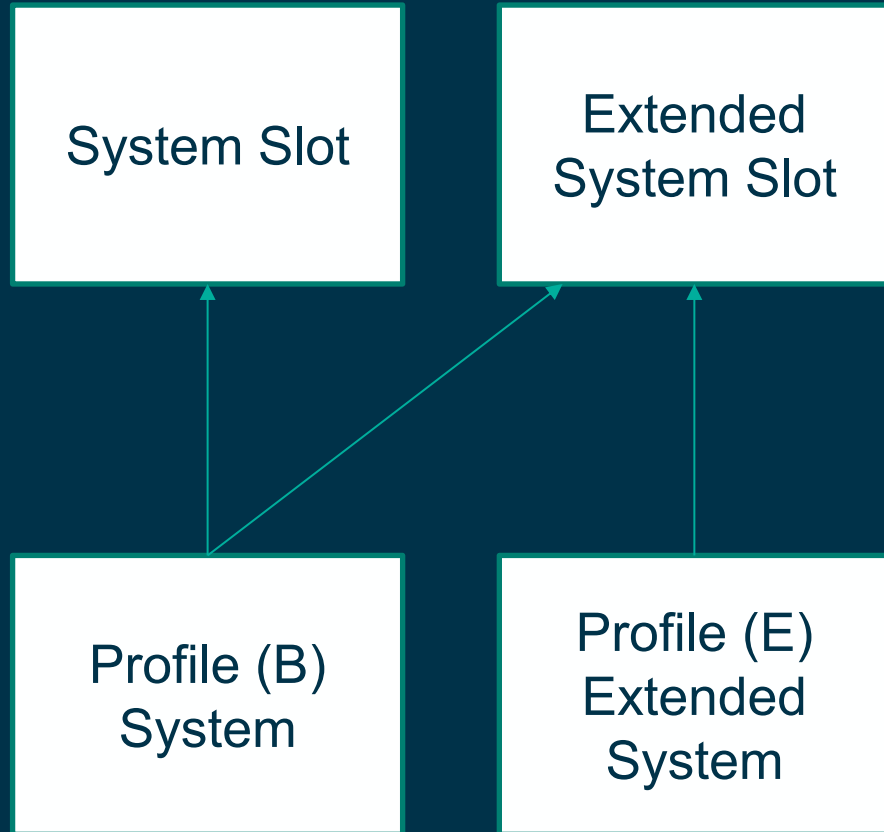


Module Profiles: Extended System Slot (e.g. OBC)



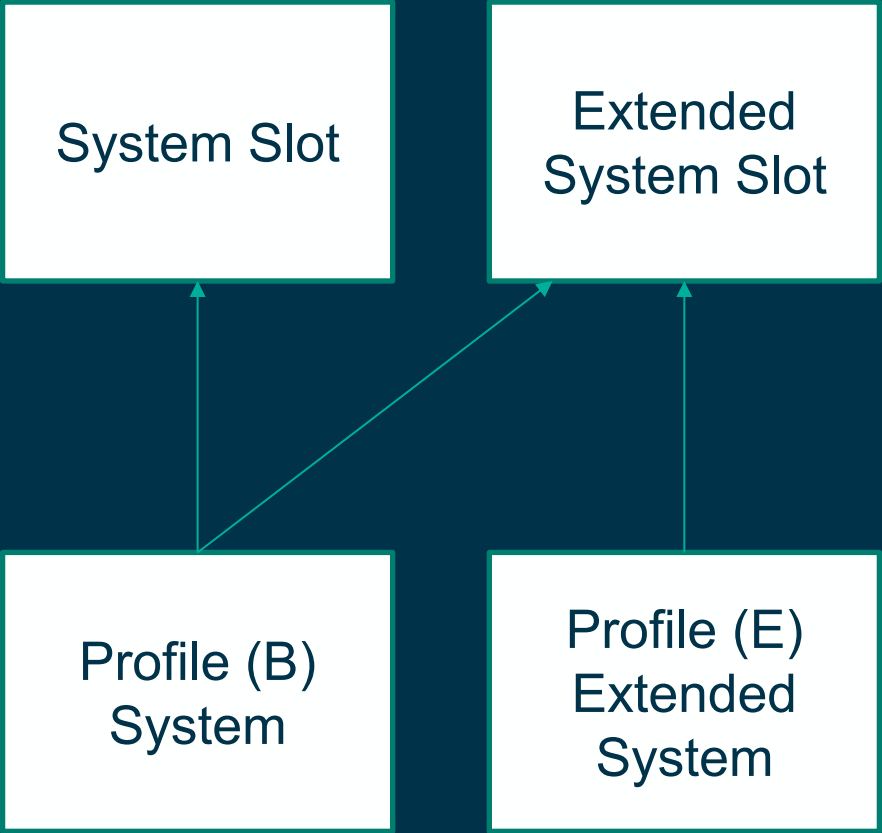
Picture source: ADCSS 2024, TAS-I ADHA OBC

Module Profiles: Extended System Slot (e.g. OBC)



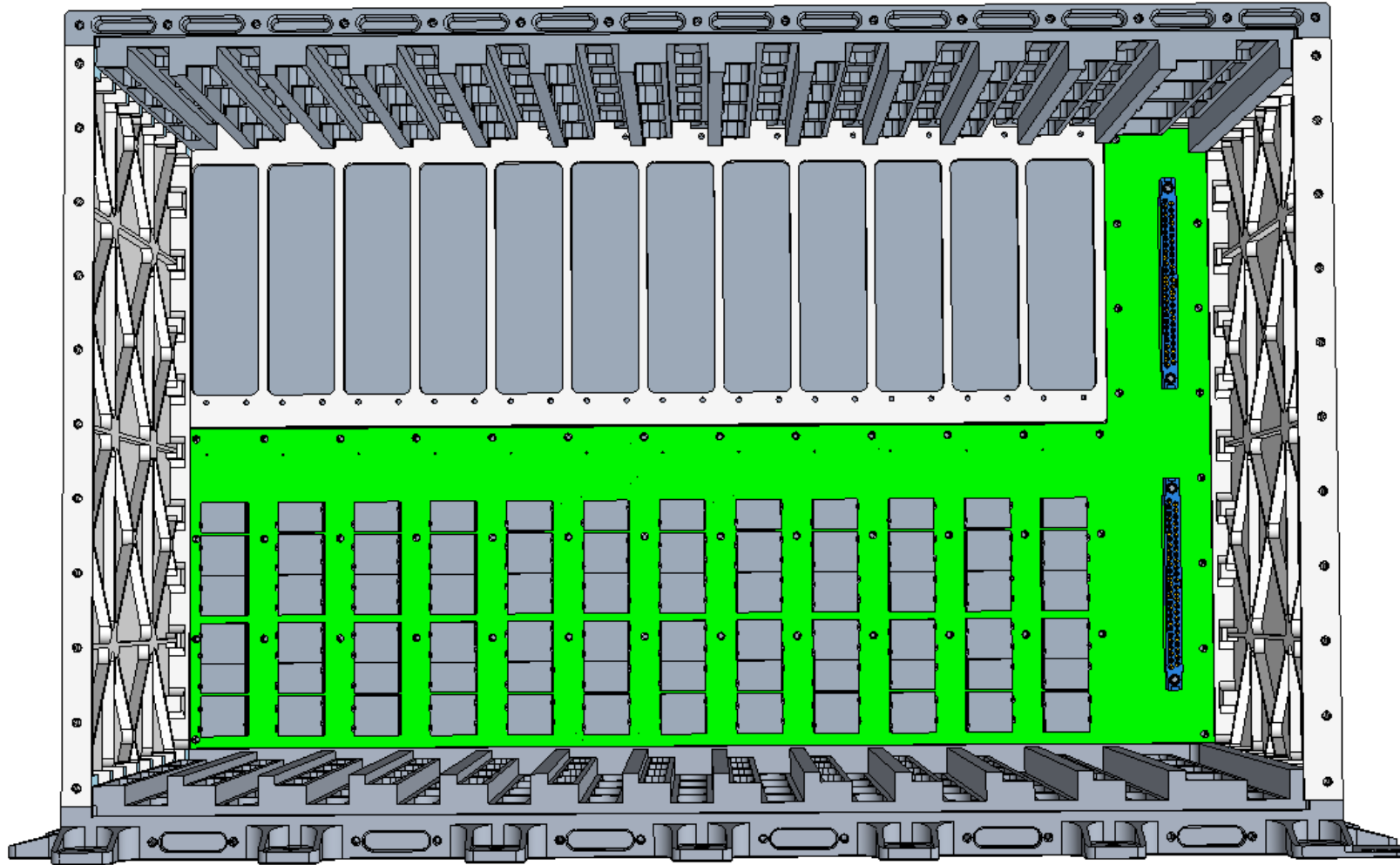
Picture source: ADCSS 2024, TAS-I ADHA OBC

Module Profiles: Extended System Slot (e.g. OBC)



	Profile B System Controller	Profile E (*) Ext. System Controller		Profile B System Controller	Profile E Ext. System Controller
P6	Optional: - star point of SpFi	Unused: - general purpose		P6	Optional: - star point of SpFi Unused: - general purpose
P5	Unused: - general purpose	Unused: - general purpose		P5	Unused: - general purpose Unused: - general purpose
P4	Optional: - SpW connections - SpFi connections	Optional: - SpW connections - SpFi connections		P4	Optional: - SpW connections - SpFi connections Optional: - SpW connections - SpFi connections
P3	Optional: - star point of SpW	Unused: - general purpose		P3	Optional: - star point of SpW Unused: - general purpose
P2	Mandatory: - PS_ON source - RST source - HMS collector Optional: - geographical addressing	Optional: - geographical addressing		P2	Optional: - geographical addressing Mandatory: - PS_ON source - RST source - HMS collector Optional: - geographical addressing
P1	Mandatory: - Power lines - HMS Optional: - CAN bus - Sync - I2C bus	Mandatory: - Power lines - PS_ON - RST - HMS Optional: - CAN bus - Sync - I2C bus		P1	Mandatory: - Power lines - PS_ON - RST - HMS Optional: - CAN bus - Sync - I2C bus Mandatory: - Power lines - HMS Optional: - CAN bus - Sync - I2C bus

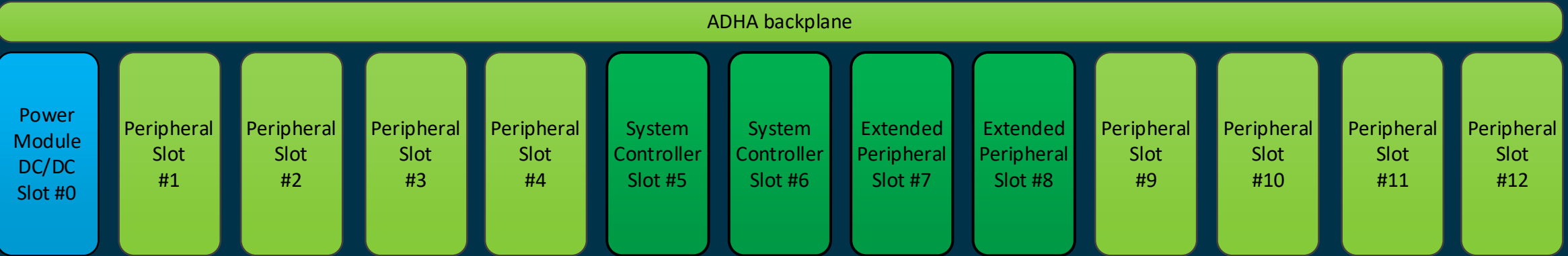
Source: ADHA DP iss1rev1



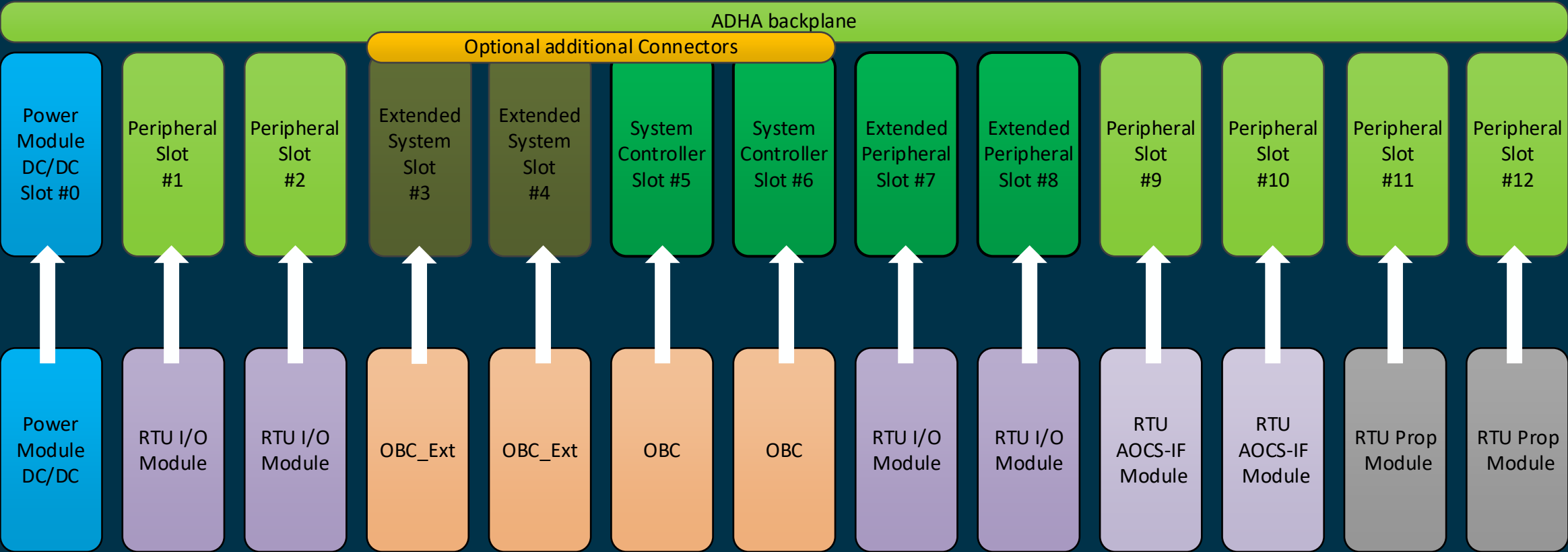
ADHA Architecture and module profiles

ADHA use cases

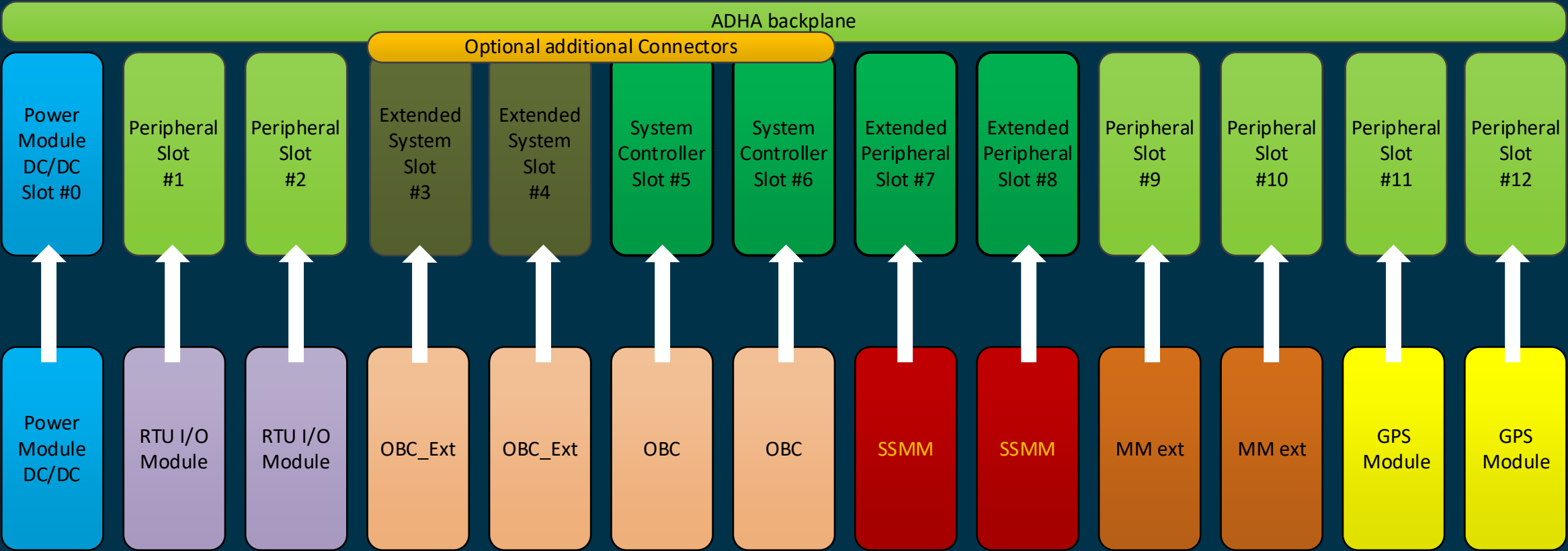
Unit internal implementations



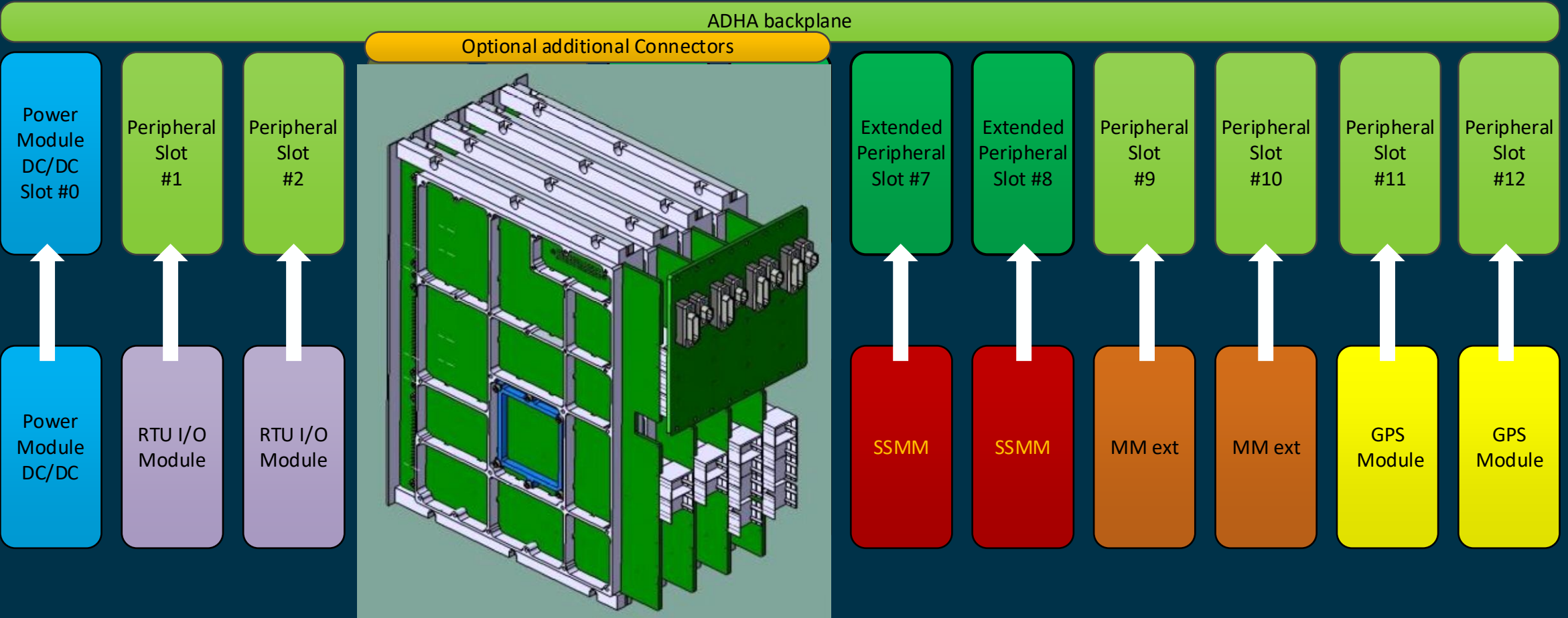
ADHA Use Cases: CDHU (Central Data Handling Unit)



ADHA Use Cases: Platform Controller

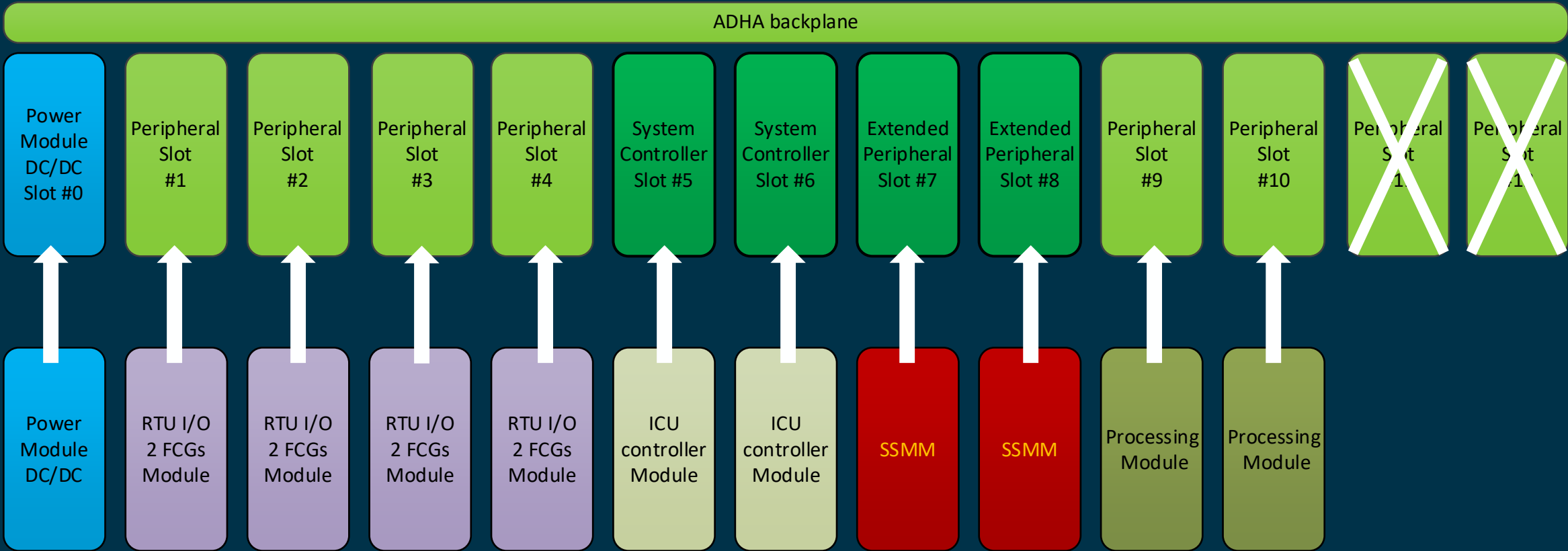


ADHA Use Cases: Platform Controller

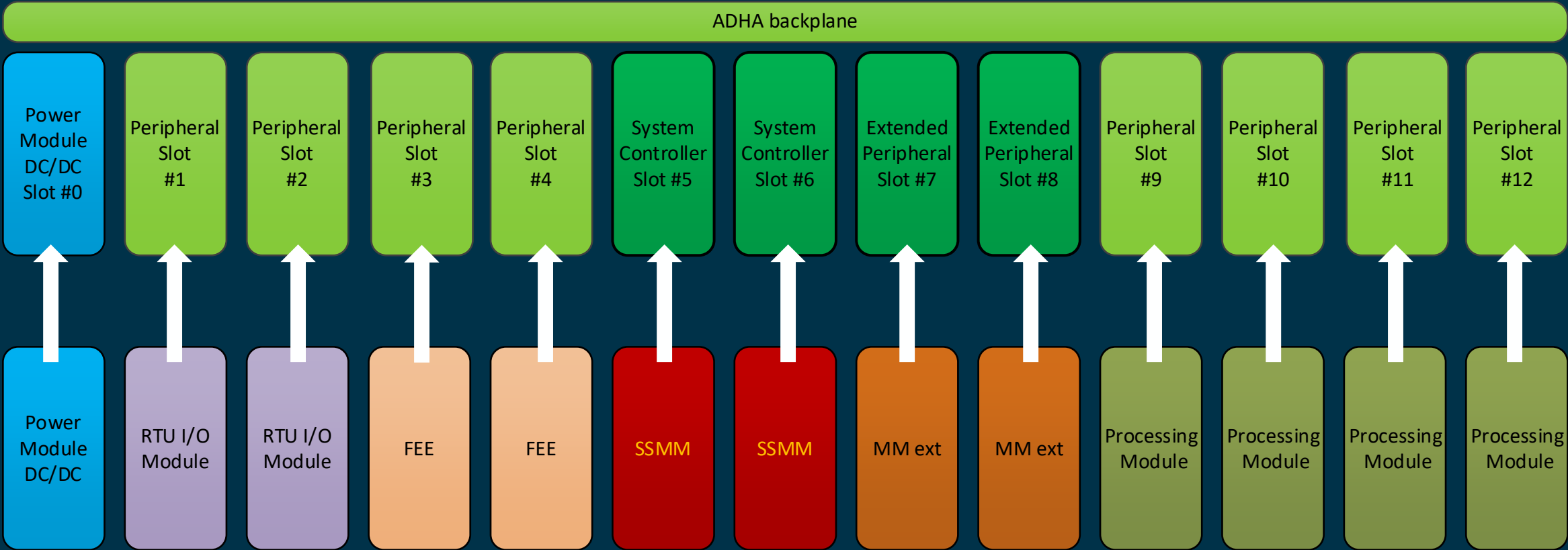


Picture source: ADCSS 2024, TAS-I ADHA OBC

ADHA Use Cases: PDHU Controller



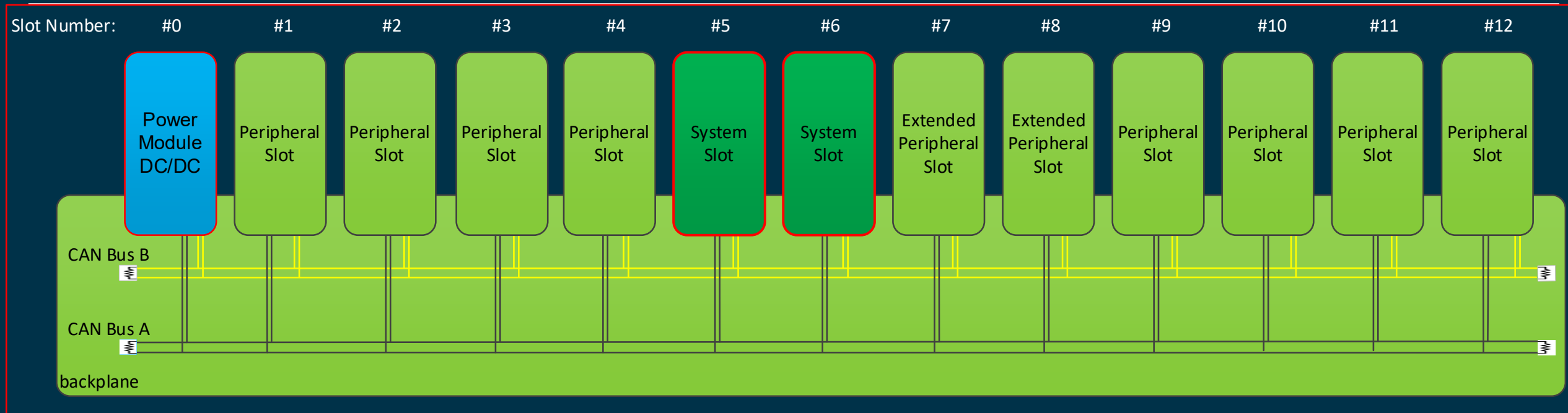
ADHA Use Cases: Data Processing Unit



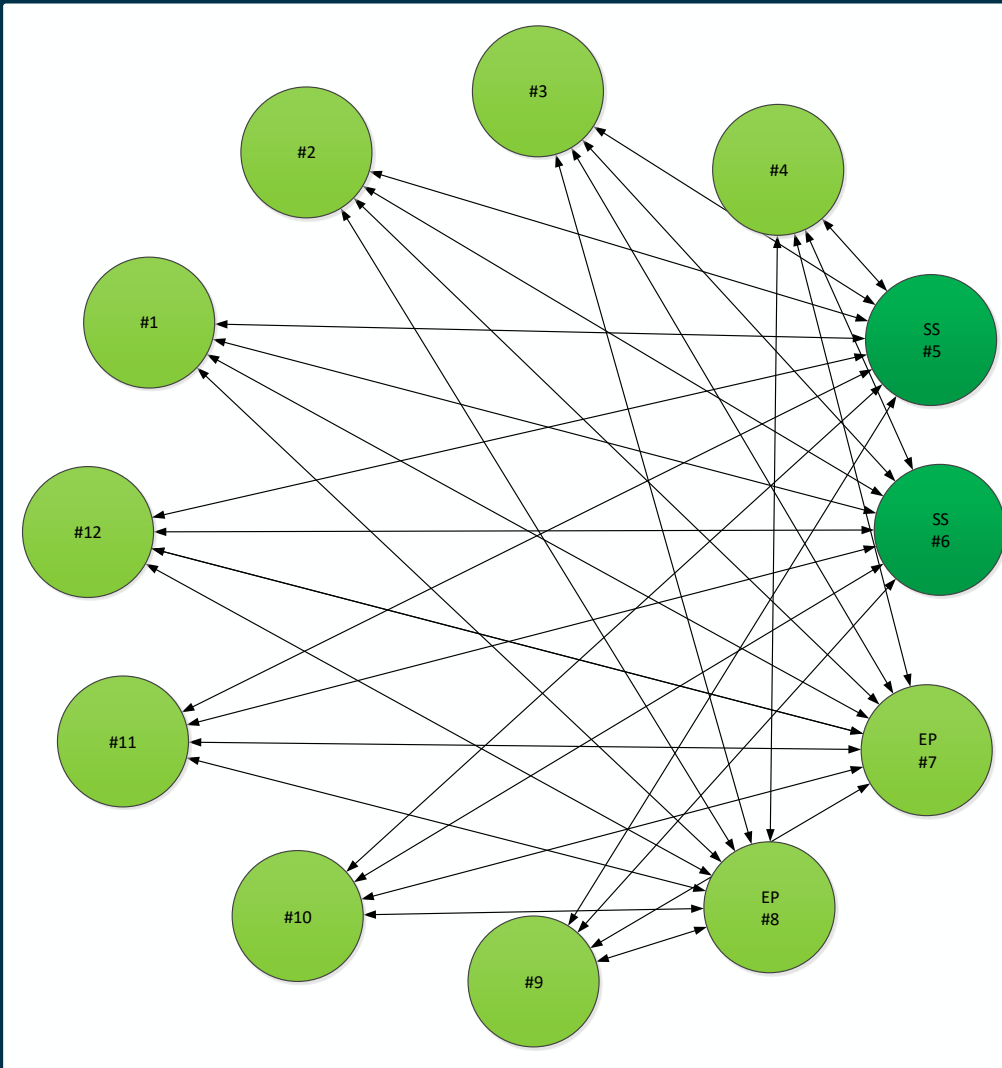
ADHA Architecture and module profiles

ADHA use cases

Unit internal implementations

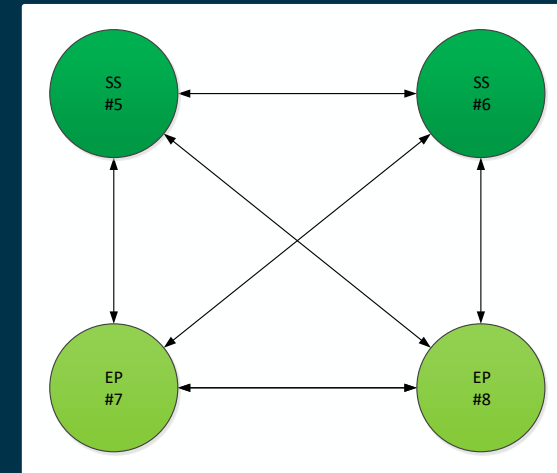


- ADHA CAN Bus is specified in ADHA-RS-021 ADHA CAN Bus Specification.
- Module on System Controller Slot controls the CAN-BUS.
- All Modules can be connected to the internal CAN-Bus.
- Termination of the Bus is implemented on the Backplane.

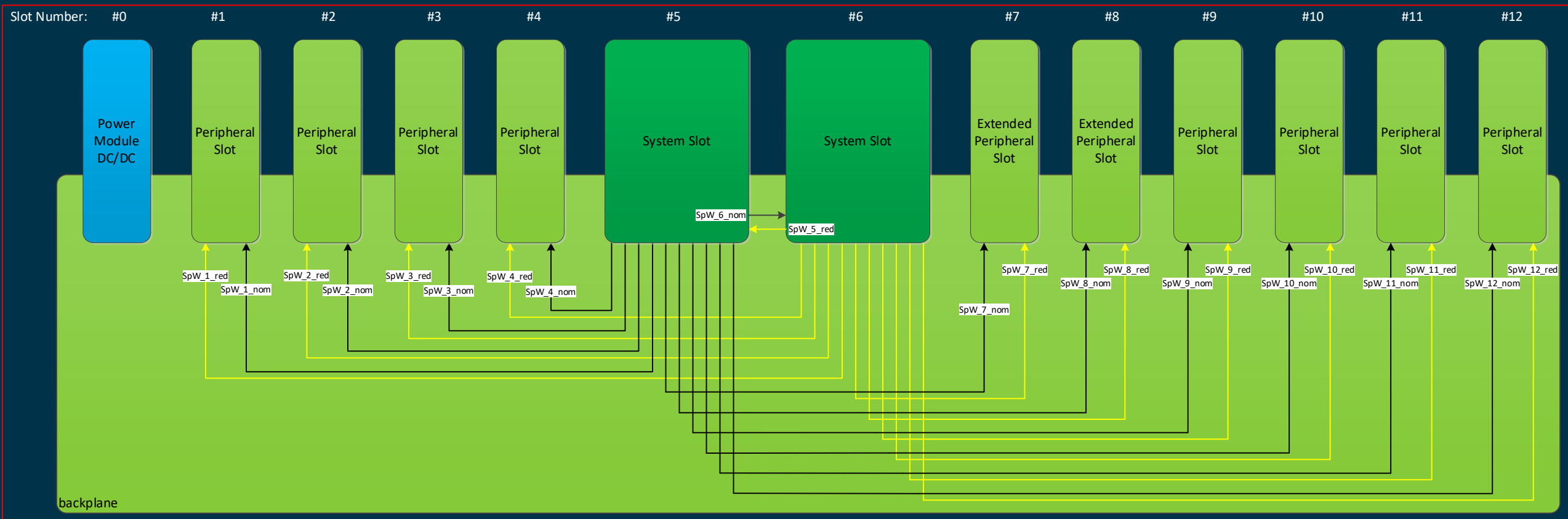


- ADHA SpaceWire is specified in ADHA-RS-019 SpaceWire Spec
- ADHA SpaceFibre is specified in ADHA-RS-020 SpaceFibre Spec
- In a full implementation with two dual stars, each peripheral has four connections to the central hubs.

The system slot and extended peripheral can be in a full mesh configuration

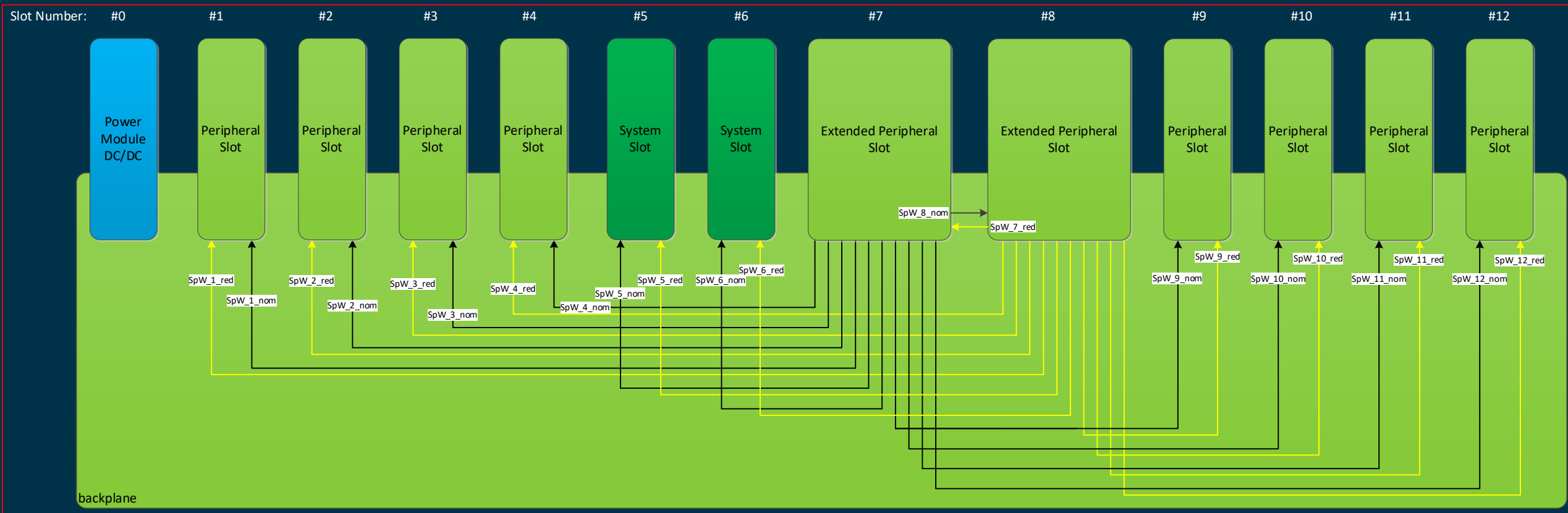


ADHA SpaceWire Dual Star in the System Controller



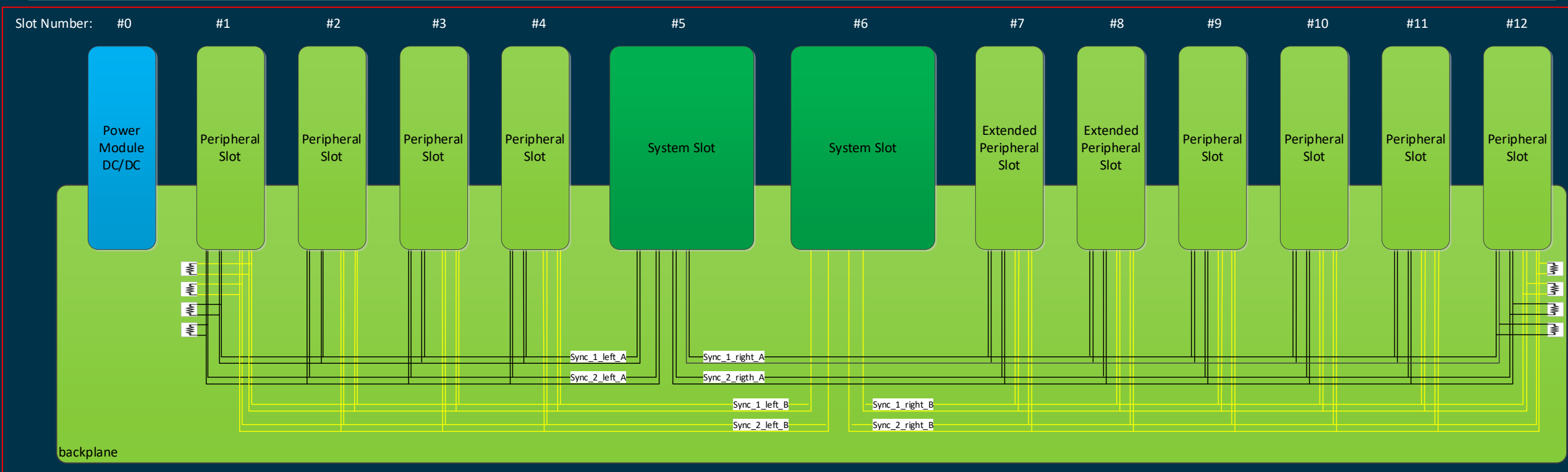
- Modules on System Slots host the Space Wire Stars.
- All Modules can be connected to the internal SpaceWire starpoints of System Slot Modules.

ADHA SpaceWire Dual Star in the Extended Peripheral



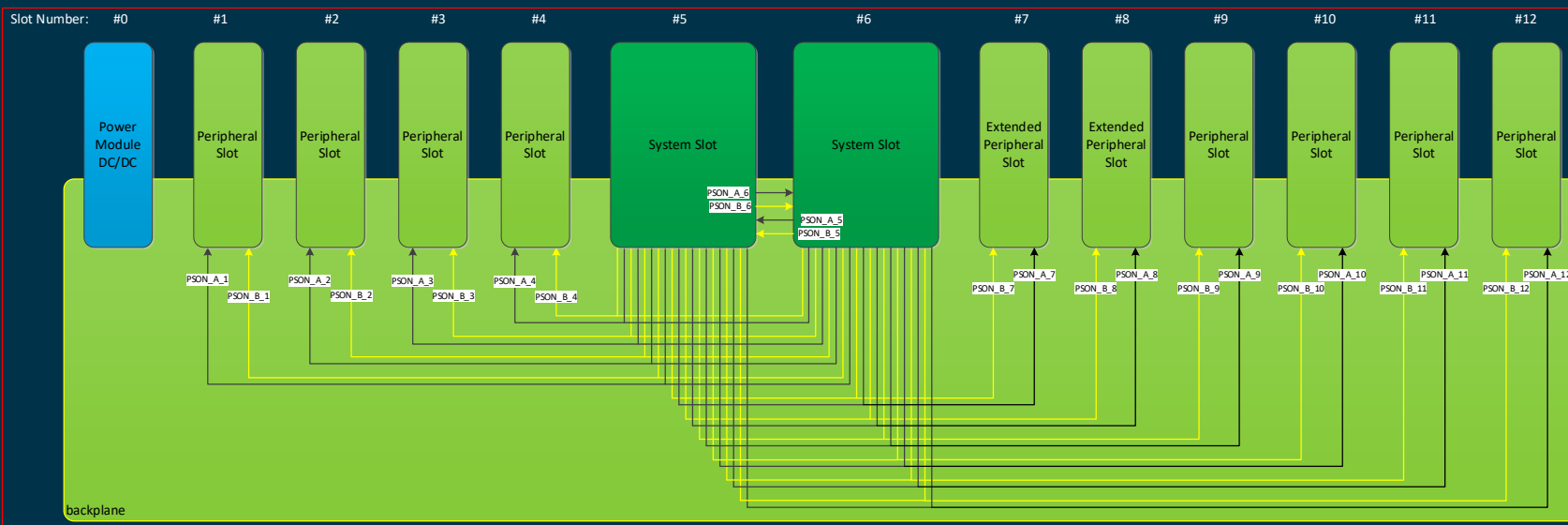
- Modules on Extended Peripheral Slots can host a Space Wire Stars.
- All Modules can be connected to the internal SpaceWire starpoints of Extended Peripheral Module.

ADHA Sync Signals



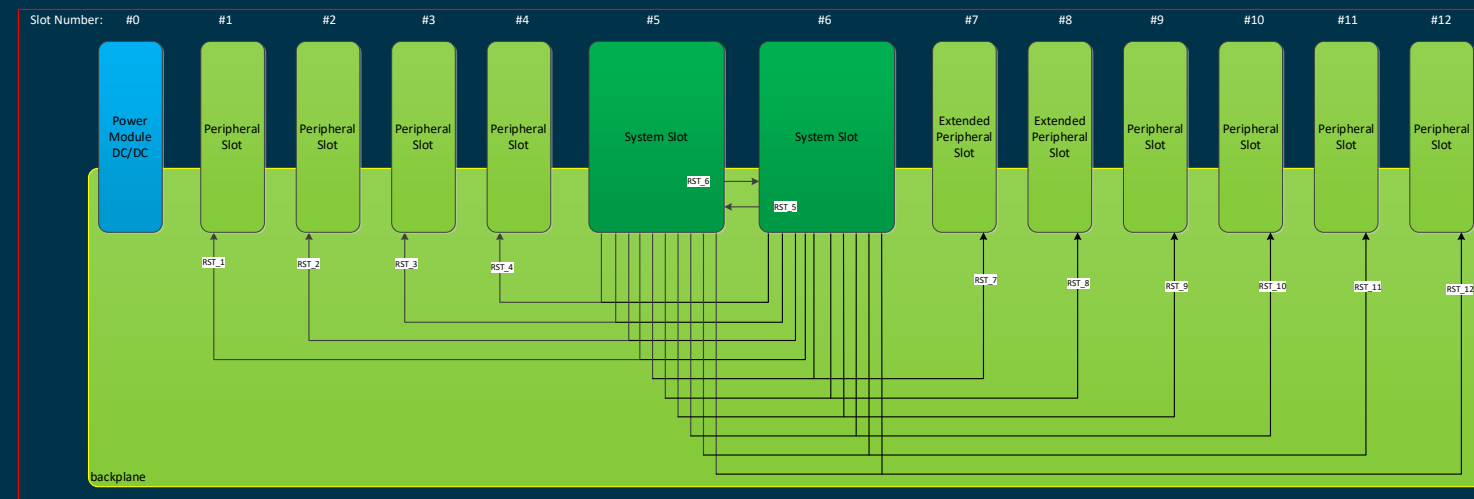
- ADHA Sync Signals are specified in ADHA-RS-006 ADHA Module Design Interface Requirements.
- Modules on System Slot distribute the Sync Signals (synchronized to the On-Board Time).
- All Modules can be connected to the internal Sync Signals.
- Termination for multi-drop bus are implemented on the Backplane.

ADHA PSON- and RST-Signals



PSON-Signals

- Motivation: Discrete line for Module on System Slot to commands ON and Reset of other modules.
- ADHA PSON and RST Signals are specified in ADHA-RS-006 ADHA Module Design Interface Requirements
- All Modules will be connected to the internal PSON and RST except vital modules.



RST-Signals

ADHA User defined interfaces

- Motivation: Spare General Purpose interfaces on backplane for user defined functions
- In total six backplane connectors. Number of connectors reserved for General Purpose Interfaces:
 - System Controller Slot: 1
 - Extended Peripheral Slot: 2
 - System Controller Extension Slot (slot 3&4): 3
 - Peripheral Slot: 4

System Slot

	A	B	C	D	E	F	G	H	I	J	K	L		
6 08	GND	1.SpFL Tx1+	1.SpFL Tx1-	GND	3.SpFL Tx1+	3.SpFL Tx1-	GND	10.SpFL Tx1+	10.SpFL Tx1-	GND	12.SpFL Tx1+	12.SpFL Tx1-	6 08	
6 07	1.SpFL Rx1+	1.SpFL Rx1-	GND	3.SpFL Rx1+	3.SpFL Rx1-	GND	10.SpFL Rx1+	10.SpFL Rx1-	GND	12.SpFL Rx1+	12.SpFL Rx1-	GND	6 07	
6 06	GND	1.SpFL Tx2+	1.SpFL Tx2-	GND	3.SpFL Tx2+	3.SpFL Tx2-	GND	10.SpFL Tx2+	10.SpFL Tx2-	GND	12.SpFL Tx2+	12.SpFL Tx2-	6 06	
6 05	1.SpFL Rx2+	1.SpFL Rx2-	GND	3.SpFL Rx2+	3.SpFL Rx2-	GND	10.SpFL Rx2+	10.SpFL Rx2-	GND	12.SpFL Rx2+	12.SpFL Rx2-	GND	6 05	
6 04	GND	2.SpFL Tx1+	2.SpFL Tx1-	GND	4.SpFL Tx1+	4.SpFL Tx1-	GND	9.SpFL Tx1+	9.SpFL Tx1-	GND	11.SpFL Tx1+	11.SpFL Tx1-	6 04	
6 03	2.SpFL Rx1+	2.SpFL Rx1-	GND	4.SpFL Rx1+	4.SpFL Rx1-	GND	9.SpFL Rx1+	9.SpFL Rx1-	GND	11.SpFL Rx1+	11.SpFL Rx1-	GND	6 03	
6 02	GND	2.SpFL Tx2+	2.SpFL Tx2-	GND	4.SpFL Tx2+	4.SpFL Tx2-	GND	9.SpFL Tx2+	9.SpFL Tx2-	GND	11.SpFL Tx2+	11.SpFL Tx2-	6 02	
6 01	2.SpFL Rx2+	2.SpFL Rx2-	GND	4.SpFL Rx2+	4.SpFL Rx2-	GND	9.SpFL Rx2+	9.SpFL Rx2-	GND	11.SpFL Rx2+	11.SpFL Rx2-	GND	6 01	
5 05	GND	GP 5_17+	GP 5_17-	GND	GP 5_18+	GP 5_18-	GND	GP 5_19+	GP 5_19-	GND	GP 5_20+	GP 5_20-	5 05	
5 04	GND	GP 5_13+	GP 5_13-	GND	GP 5_14+	GP 5_14-	GND	GP 5_15+	GP 5_15-	GND	GP 5_16+	GP 5_16-	5 04	
5 03	GP 5_09+	GP 5_09-	GND	GP 5_10+	GP 5_10-	GND	GP 5_11+	GP 5_11-	GND	GP 5_12+	GP 5_12-	GND	5 03	
5 02	GND	GP 5_05+	GP 5_05-	GND	GP 5_06+	GP 5_06-	GND	GP 5_07+	GP 5_07-	GND	GP 5_08+	GP 5_08-	5 02	
5 01	GP 5_01+	GP 5_01-	GND	GP 5_02+	GP 5_02-	GND	GP 5_03+	GP 5_03-	GND	GP 5_04+	GP 5_04-	GND	5 01	
4 08	GND	5.SpFL Rx1+	5.SpFL Rx1-	GND	6.SpFL Rx1+	6.SpFL Rx1-	GND	7.SpFL Rx1+	7.SpFL Rx1-	GND	8.SpFL Rx1+	8.SpFL Rx1-	4 08	
4 07	5.SpFL Tx1+	5.SpFL Tx1-	GND	6.SpFL Tx1+	6.SpFL Tx1-	GND	7.SpFL Tx1+	7.SpFL Tx1-	GND	8.SpFL Tx1+	8.SpFL Tx1-	GND	4 07	
4 06	GND	5.SpFL Rx2+	5.SpFL Rx2-	GND	6.SpFL Rx2+	6.SpFL Rx2-	GND	7.SpFL Rx2+	7.SpFL Rx2-	GND	8.SpFL Rx2+	8.SpFL Rx2-	4 06	
4 05	5.SpFL Tx2+	5.SpFL Tx2-	GND	6.SpFL Tx2+	6.SpFL Tx2-	GND	7.SpFL Tx2+	7.SpFL Tx2-	GND	8.SpFL Tx2+	8.SpFL Tx2-	GND	4 05	
4 04	GND	5.SpW Sin+	5.SpW Sin-	GND	6.SpW Sin+	6.SpW Sin-	GND	7.SpW Sin+	7.SpW Sin-	GND	8.SpW Sin+	8.SpW Sin-	4 04	
4 03	5.SpW Din+	5.SpW Din-	GND	6.SpW Din+	6.SpW Din-	GND	7.SpW Din+	7.SpW Din-	GND	8.SpW Din+	8.SpW Din-	GND	4 03	
4 02	GND	5.SpW Sout+	5.SpW Sout-	GND	6.SpW Sout+	6.SpW Sout-	GND	7.SpW Sout+	7.SpW Sout-	GND	8.SpW Sout+	8.SpW Sout-	4 02	
4 01	5.SpW Dout+	5.SpW Dout-	GND	6.SpW Dout+	6.SpW Dout-	GND	7.SpW Dout+	7.SpW Dout-	GND	8.SpW Dout+	8.SpW Dout-	GND	4 01	
3 08	GND	2.SpW Sout+	2.SpW Sout-	GND	4.SpW Sout+	4.SpW Sout-	GND	9.SpW Sout+	9.SpW Sout-	GND	11.SpW Sout+	11.SpW Sout-	3 08	
3 07	2.SpW Dout+	2.SpW Dout-	GND	4.SpW Dout+	4.SpW Dout-	GND	9.SpW Dout+	9.SpW Dout-	GND	11.SpW Dout+	11.SpW Dout-	GND	3 07	
3 06	GND	2.SpW Sin+	2.SpW Sin-	GND	4.SpW Sin+	4.SpW Sin-	GND	9.SpW Sin+	9.SpW Sin-	GND	11.SpW Sin+	11.SpW Sin-	3 06	
3 05	2.SpW Din+	2.SpW Din-	GND	4.SpW Din+	4.SpW Din-	GND	9.SpW Din+	9.SpW Din-	GND	11.SpW Din+	11.SpW Din-	GND	3 05	
3 04	GND	1.SpW Sout+	1.SpW Sout-	GND	3.SpW Sout+	3.SpW Sout-	GND	10.SpW Sout+	10.SpW Sout-	GND	12.SpW Sout+	12.SpW Sout-	3 04	
3 03	1.SpW Dout+	1.SpW Dout-	GND	3.SpW Dout+	3.SpW Dout-	GND	10.SpW Dout+	10.SpW Dout-	GND	12.SpW Dout+	12.SpW Dout-	GND	3 03	
3 02	GND	1.SpW Sin+	1.SpW Sin-	GND	3.SpW Sin+	3.SpW Sin-	GND	10.SpW Sin+	10.SpW Sin-	GND	12.SpW Sin+	12.SpW Sin-	3 02	
3 01	1.SpW Din+	1.SpW Din-	GND	3.SpW Din+	3.SpW Din-	GND	10.SpW Din+	10.SpW Din-	GND	12.SpW Din+	12.SpW Din-	GND	3 01	
2 08	GND	#PSON Out A 1	#PSON Out B 1	GND	Mon in A/B 1	Mon in A/B 1	GND	Mon in A/B 11	Mon in A/B 11	GND	#PSON Out B 12	#PSON Out A 12	2 08	
2 07	#PSON Out A 2	#PSON Out B 2	GND	#RST Out 1	#RST Out FCG 1	GND	#RST Out 11	#RST Out 12	GND	#PSON Out B 11	#PSON Out A 11	GND	2 07	
2 06	GND	#PSON Out A 3	#PSON Out B 3	GND	Mon in A/B 2	Mon in A/B 2	GND	Mon in A/B 10	Mon in A/B 10	GND	#PSON Out B 10	#PSON Out A 10	2 06	
2 05	#PSON Out A 4	#PSON Out B 4	GND	#RST Out 2	#RST Out FCG 2	GND	#RST Out 9	#RST Out 10	GND	#PSON Out B 9	#PSON Out A 9	GND	2 05	
2 04	GND	#PSON Out A 5	#PSON Out B 5	GND	Mon in A/B 3	Mon in A/B 3	GND	Mon in A/B 7	Mon in A/B 7	GND	#PSON Out B 8	#PSON Out A 8	2 04	
2 03	#PSON Out A 6	#PSON Out B 6	GND	#RST Out 3	#RST Out FCG 3	GND	#RST Out 7	#RST Out 8	GND	#PSON Out B 7	#PSON Out A 7	GND	2 03	
2 02	GND	GP	#PVR RST Out A/B	GND	Mon in A/B 4	Mon in A/B 4	GND	Mon in Sg A/B 1	Mon in Sg A/B 1	GND	GP 2_08+	GP 2_08-	2 02	
2 01	GA(3)	GA(2)	GND	#RST Out 4	#RST Out FCG 4	GND	#RST Out 5	#RST Out 6	GND	GA(1)	GA(0)	GND	2 01	
1 06	+28VA	GND	CAN A+	CAN A-	#PSON In A	#RST In	SYNC 1 left A+	SYNC 1 left A-	SYNC 2 left A+	SYNC 2 left A-	GND	+28VB	1 06	
1 05	+28VA	GND	Mon AD 0	Mon AD 1	Mon AD 2	Reserved	PC A SCL	PC A SDA	PC B SCL	PC B SDA	GND	+28VB	1 05	
1 04	GND	GND	CAN B+	CAN B-	#PSON In B	Reserved	SYNC 1 right A+	SYNC 1 right A-	SYNC 2 right A+	SYNC 2 right A-	GND	GND	1 04	
1 03	+5VA STANDBY	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	+5VB STANDBY	1 03	
1 02	+5VA STANDBY	GND	+12VA	+12VA	+12VA	GND	+12VB	+12VB	+12VB	+12VB	+12VB	GND	+5VB STANDBY	1 02
1 01	+5VA STANDBY	GND	+12VA	+12VA	+12VA	GND	+12VB	+12VB	+12VB	+12VB	+12VB	GND	+5VB STANDBY	1 01

ADHA defined signals and link types

Motivation: Additional signal and bus types implementations aligned in the consortium and defined in ADHA-RS-006 ADHA Module Design Interface Requirements:

- Thermistor (ANY: YSI-44907/-44908, ANP: PT-1000, ANF: Fenwall/Betatherm)
- Relay Status Acquisition (RSA)
- Standard Balanced Digital Link (SBDL: RS422 - ECSS-E-ST-50-14C)
- Low Voltage Differential Signaling (LVDS: ANSI/TIA/EIA-644 - ECSS-E-ST-50-12C)
- Analogue Voltage Acquisition (AN: 0; +5V)
- External: Standard/Extended High Power Command (SHP/EHP), Low Voltage high Power Command (LVHP) (HPC: ECSS-E-ST-50-14C)

