WInnComm 2021: Sensor Open Systems Architecture V1.0 Overview

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The SOSA Approach in a Nutshell*

SOSA™
Sensor Open Systems Architecture

The SOSA Consortium is a C5ISR-focused technical and business collaborative effort…

What

- **Develop** a unified technical Open Systems Architecture standard for **RADAR, EO/IR, SIGINT, EW, and Communications** – and the supporting business models

Why

- **Improve** sub-system, system, and platform affordability, re-configurability, upgradability, and hardware/software/firmware re-use – and to shorten cycle times to counter emerging threats

Who

- The Air Force, Navy, Army, other government agencies, industry and academia

How

- **Developing** an OSA via modular decomposition (defining functions and behaviors) and associated interfaces (including physical, protocol, and data structure) between the modules

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* Based on abstract of "Sensor Open System Architecture (SOSA) Evolution for Collaborative Standards Development," SPIE Open Architecture/Open Business Model Net-Centric Systems and Defense Transformation 2017

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Building with SOSA

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- SOSA provides a set of tools to build a system with
  - System designers choose what tools to use
    - For Example: only use the SOSA Modules necessary to achieve the Sensor's Mission
  - Systems are built with SOSA Components, Systems are not SOSA in and of themselves

- All SOSA Compo ts (o tools) are ba rdized interfaces
  - Some compone
  - Other compone
  - Yet other comp

Interface		
Physical (Medium)	Protocol (Method)	Signal/Data Structure

Example builds coming up

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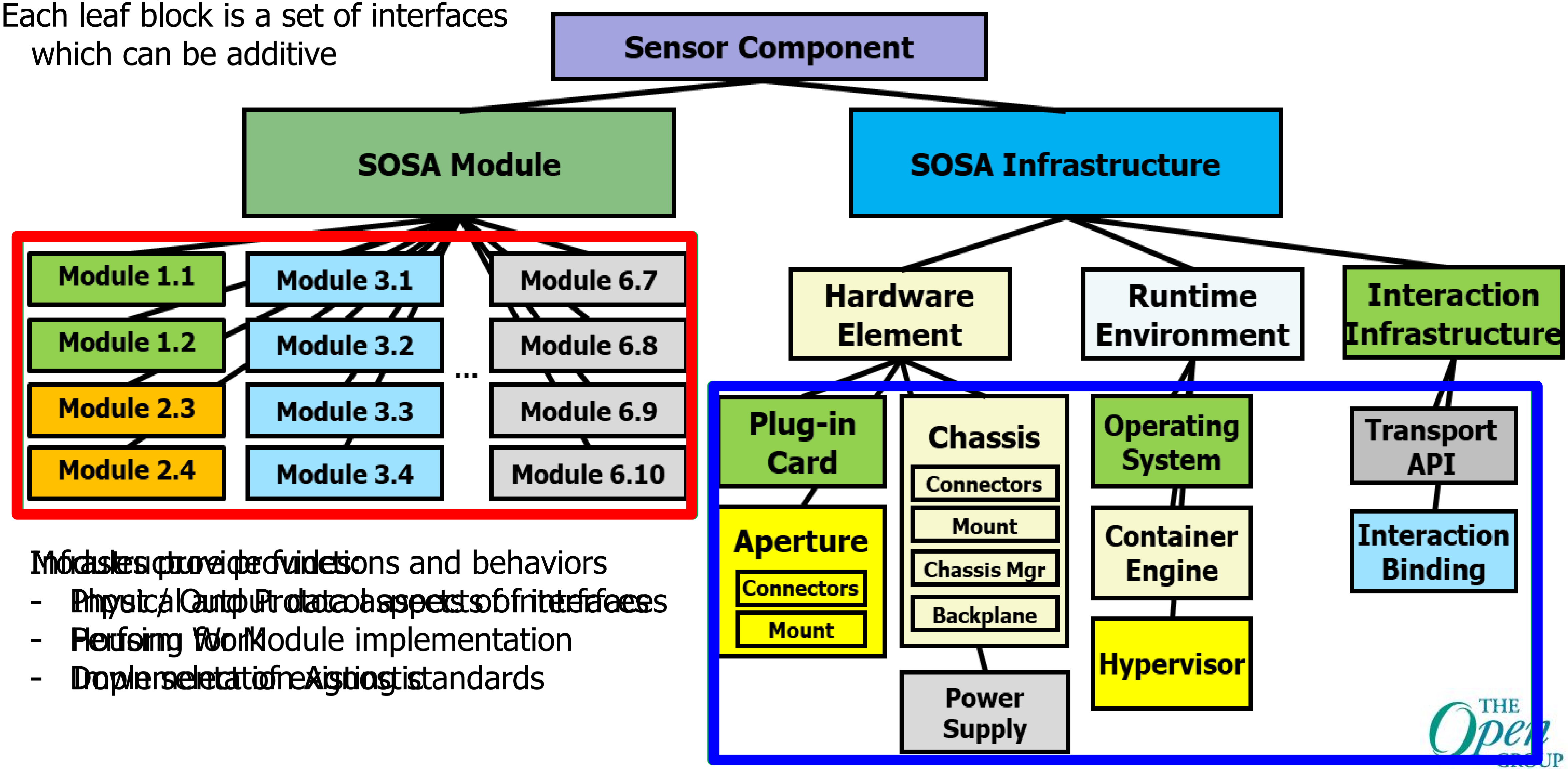
SOSA V1.0 Taxonomy

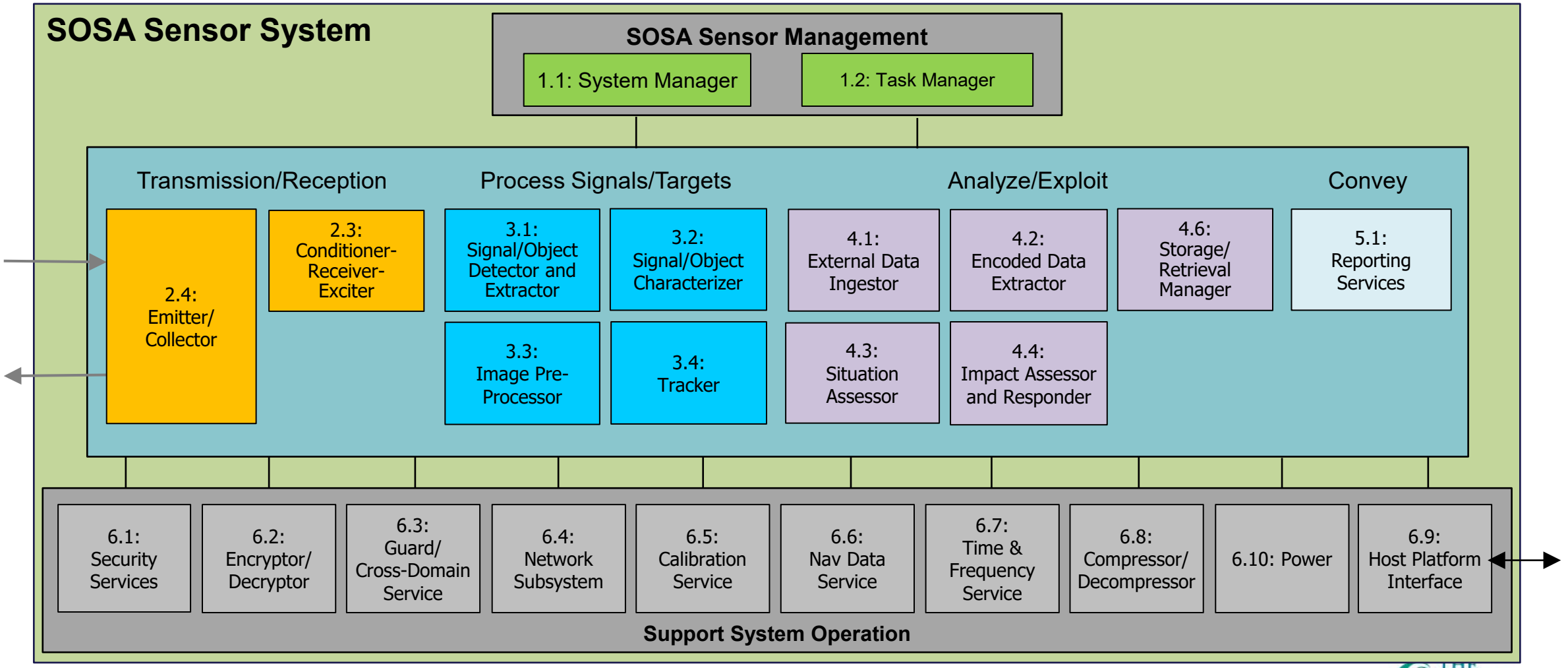
Each leaf block is a set of interfaces which can be additive



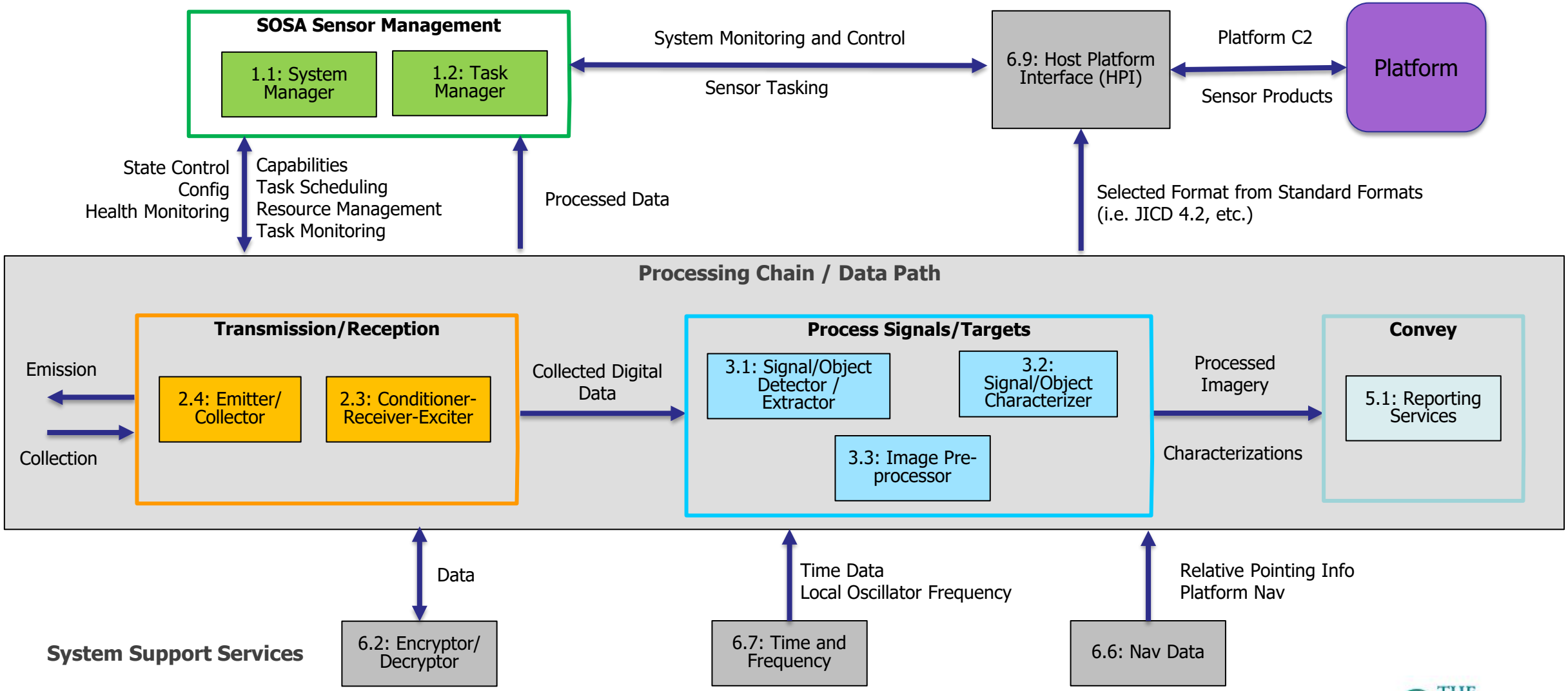
Modules provide functions and behaviors
- Input / Output data aspects of interfaces
- Perform Work
- Implementation Agnostic

Infrastructure provides:
- Physical and Protocol aspects of interfaces
- Housing for Module implementation
- Down selection of existing standards

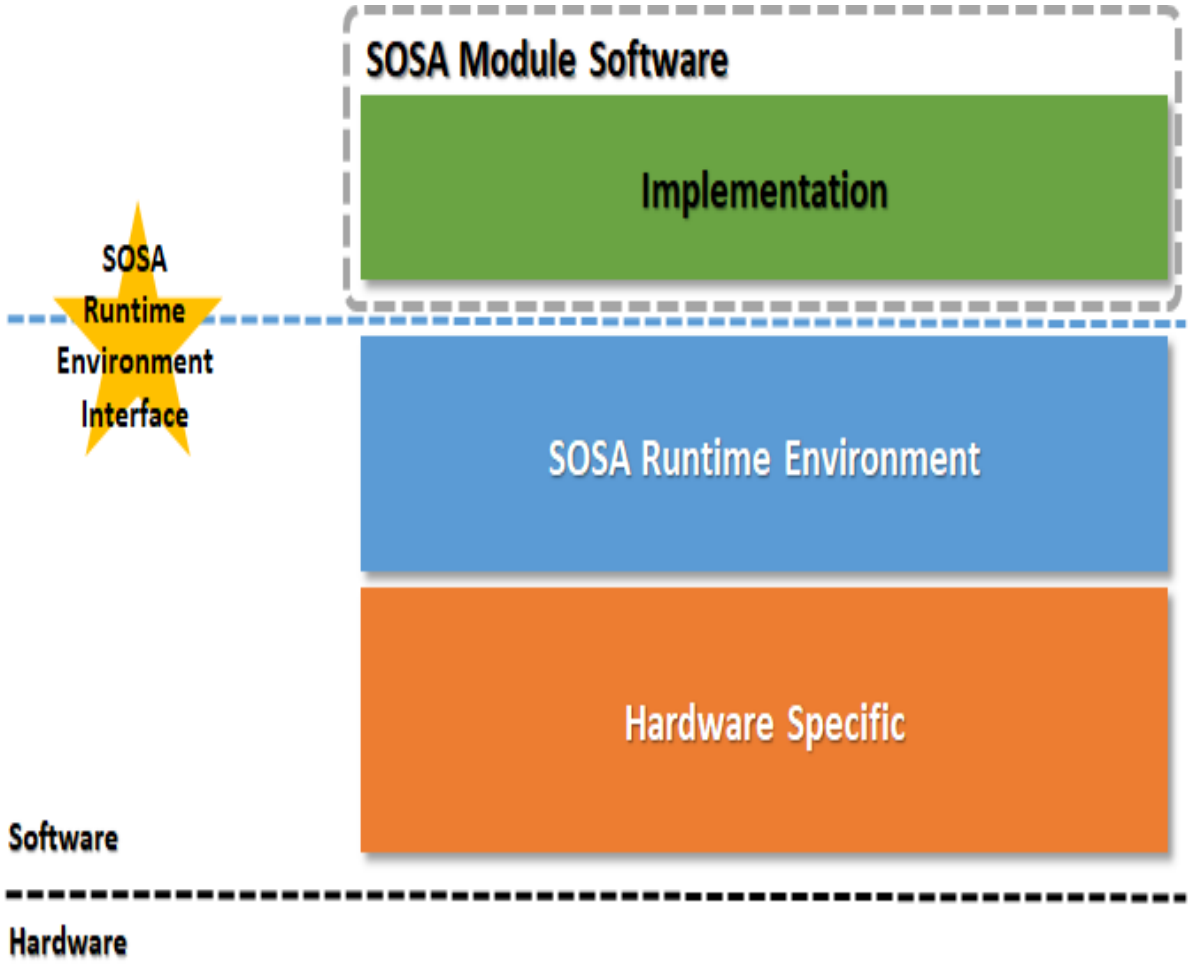
SOSA V1.0 Modules



SOSA V1.0 Module High Level Data Flow



SOSA Software Runtime Environments (RTE)



The Runtime Environment provides an executable software infrastructure with defined profiles and interfaces which promote interchangeability, portability, and reuse.

The profile choices are:

- FACE
- Containers (conforms to Open Container Initiative)
- Virtual Machines (conforms to Open Virtualization Format)

SOSA Plug-In Cards

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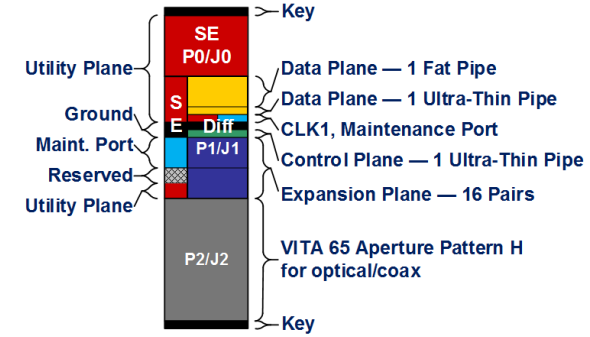
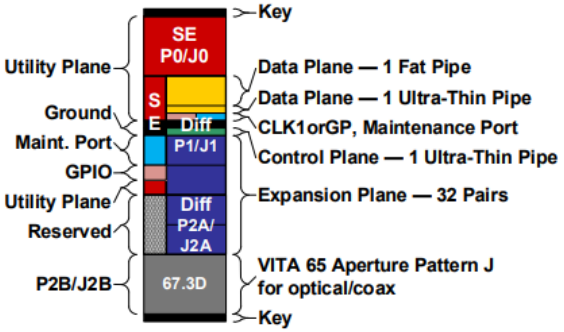
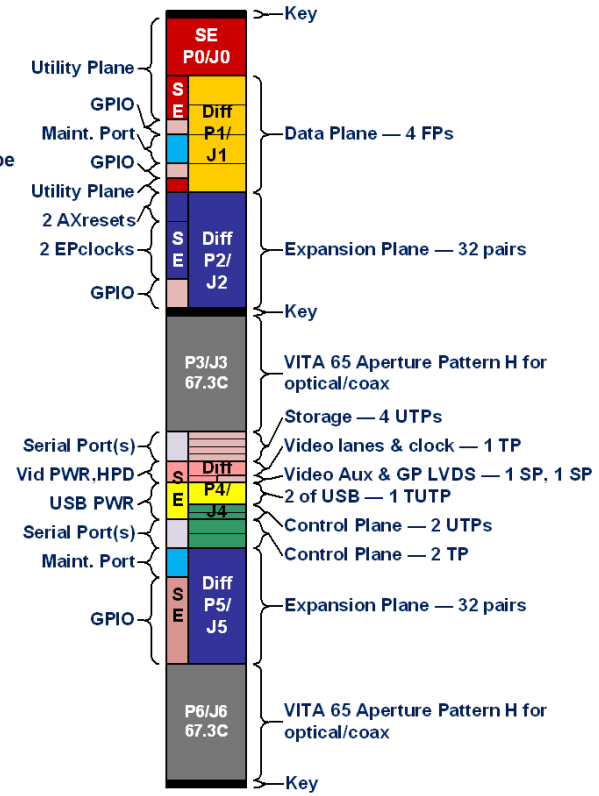
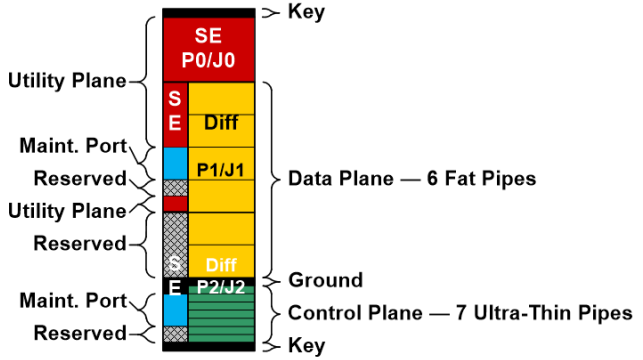
RF/Optical Payloads

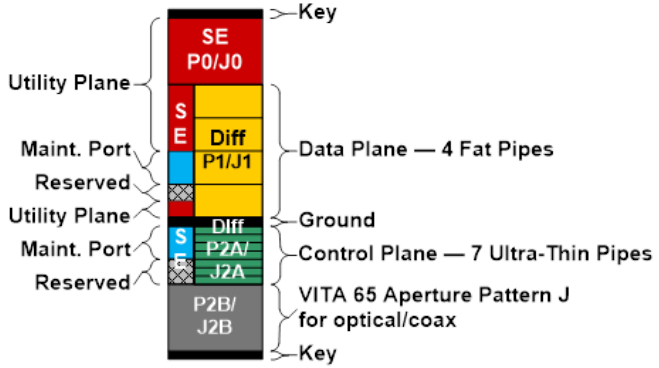


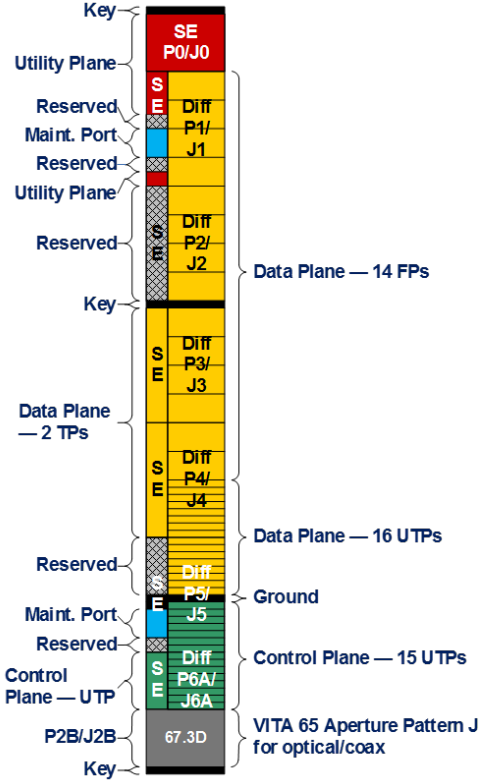




Data/Control Plane Switches







Key Interfaces Provided:

- Mechanical
- Electrical Signaling
- Some Layer 2 Protocols

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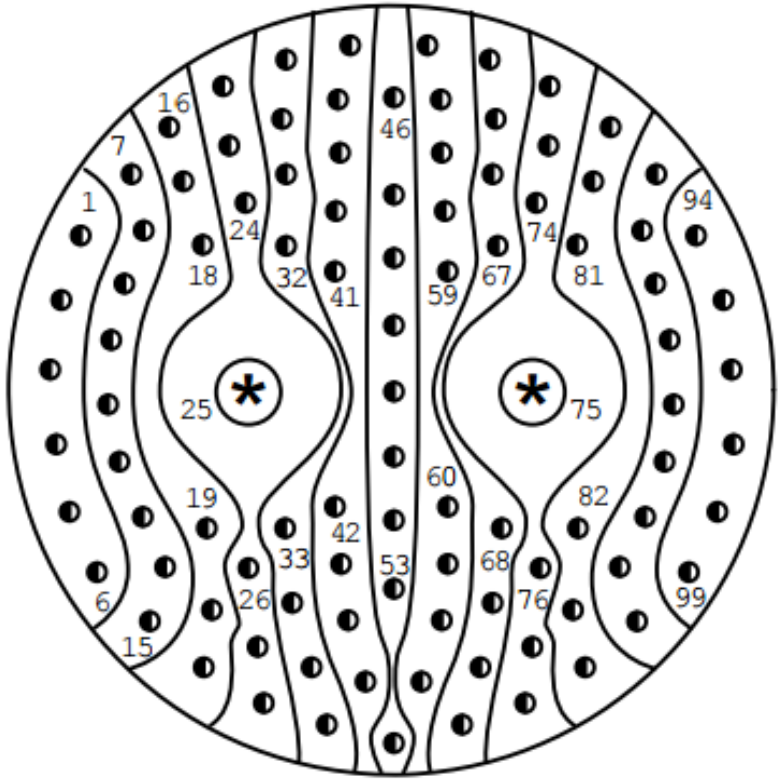
Electrical/Mechanical: Sample Output



SOSA Electrical Interface Recommendations J2-Signal (25-7 insert, N-Keying) For Part Numbers insert receptacle choice (20 or 24) and relevant plating finish Sensor MIL-DTL-38999/***J7SN (receptacle with socket inserts) Platform Umbilical MIL-DTL-38999/26*J7PN (plug with pin inserts)						EO-IR Turreted Sensor	Radar/SAR Turreted Sensor	EW Sensor	SIGINT Sensor	Comms
Conn/ Desc.	**Pin**	**Wire Type**	**Signal Name**	**Signal Source**	**Signal Type**	**Used**	**Used**	**Used**	**Used**	**Used**
Ethernet	28	100Ω STP - AWG24, CAT 6A, SAE AS 6070/6	DA+	Platform/ Sensor	1000BaseT	✓	✓	✓	✓	✓
	35		DA-							
	36		DA Shield							
	44		DB+							
	53		DB-							
	62		DB Shield							
	45		DC+							
	54		DC-							
	63		DC Shield							
	70		DD+							
	71		DD-							
	78		DD Shield							
Serial Comms 1	7	100 Ohm STP 2419	TX1+	Sensor	RS422	✓	✓	✓	✓	✓
	8	100 Ohm STP 2419	TX1-	Sensor						
	17	SC-AWG24	422_1_RTN							
	16	100 Ohm STP 2419	RX1+	Platform						
	23	100 Ohm STP 2419	RX1-	Platform						
Serial Comms 2	22	100 Ohm STP 2419	TX2+	Sensor	RS422	✓	✓	✓	✓	✓
	30	100 Ohm STP 2419	TX2-	Sensor	RS422					
	29	SC-AWG24	422_2_RTN		RS422					
	37	100 Ohm STP 2419	RX2+	Platform	RS422					
	38	100 Ohm STP 2419	RX2-	Platform	RS422					
Emi-ssion Arming	2	AWG22	MASTER_ARM	Platform	open/closed ckt	✓				
	95	AWG22	MASTER_ARM_RET	Platform	open/closed ckt	✓				

Inter-Module Interaction Bindings

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- Specific Communications Technology choices to enable the following:
  - Interchangeability
  - Upgradeability
  - Portability
  - Reuse

- Provides protocol structure and low-level data encodings for information exchange

Current Binding List:

- MORA
- OAS REST
- OMG DDS
- ZMTP
- AMQP
- NVMe (PCIe)
- NVMe over RoCEv2

SOSA Component Usage
AKA Instantiation Examples

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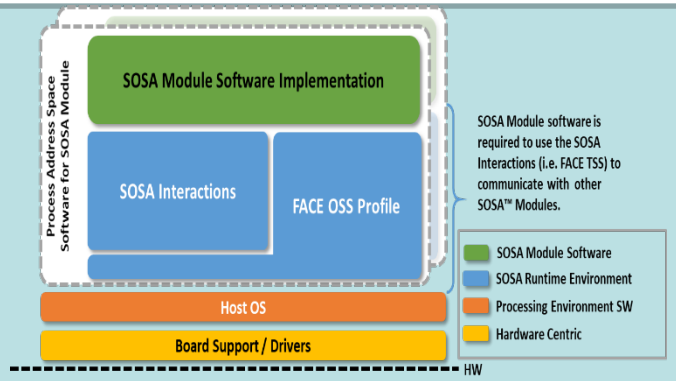
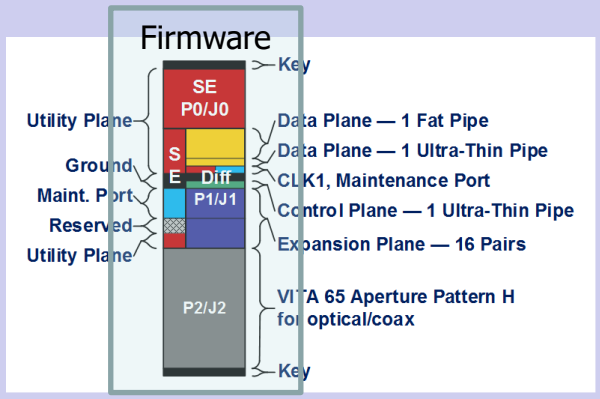
3.1: Signal/Object Detector and Extractor

Or



SOSA Interaction Infrastructure Bindings

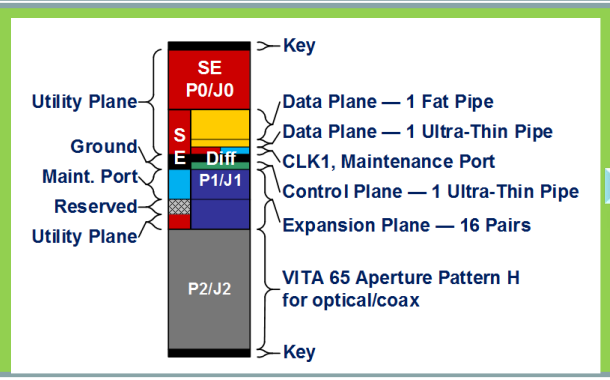
2.4: Emitter/ Collector

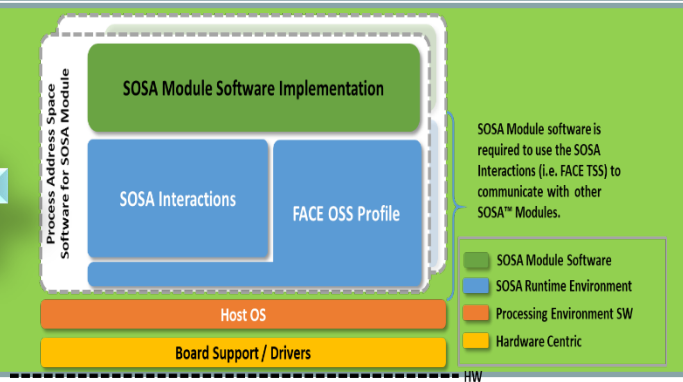


SOSA Interaction Infrastructure Bindings

Or

4.6: Storage/ Retrieval Manager





SOSA Interaction Infrastructure Bindings