NDIA 21st Annual Sys Eng Conf

Sensors Open Systems Architecture (SOSA)

Sensor Integration Simplified™

25 October 2018

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AFLCMC/EZAC

http://www.opengroup.org/sosa

Problem Statement

- **The threat is evolving faster than our architectures and processes can adapt**
- **The issue is NOT a lack of innovation, but the inability of our systems to exploit innovation to restore combat advantage before it's countered**
- **Cost growth for Sensors is outpacing our ability to pay for them**

The reality is that, at best, our combat advantage is being eroded for both symmetric and asymmetric adversaries

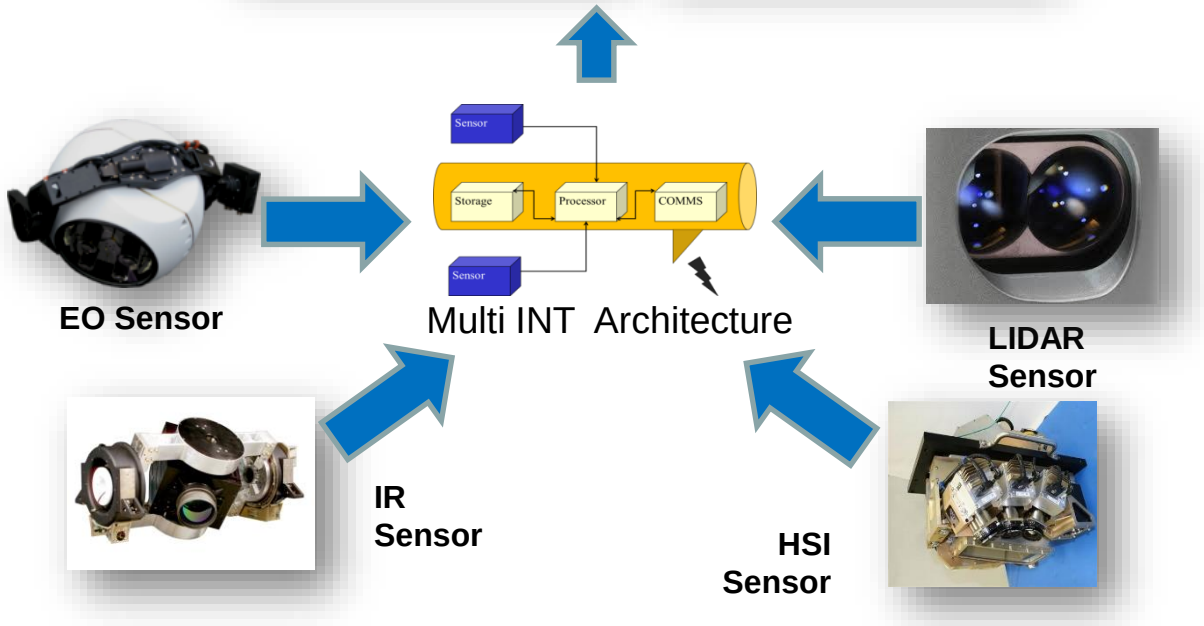
Why Open Systems Approach?

Previous ISR Systems:

- Quick Reaction Capability(QRCs)
- Proprietary and application centric
  - Expensive to procure
  - Expensive to maintain
  - Expensive to modify

Advantages of Open Architectures:

- Getting Capability to the Field faster
- Quicker tech refresh
- Drives competition
- Agile for evolving threats



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Open Occurs at Interfaces

- **Systems are generally open *(or closed)* at interfaces**
- **Interfaces typically have <u>multiple layers</u>**
  - ✓ **Common physical connector, e.g., RJ-45**
  - ✓ **Common protocol stack, e.g., TCP/IP over Ethernet**
  - X **Vendor proprietary message set**

- **Openness must be assessed at <u>each layer</u>**
- **Target key interfaces (choose your battles)**

Make key interfaces available

SOSA Consortium Objectives

Develop

- An effective Sensor Open Systems Architecture (SOSA) for use across the C^{4}ISR community to include DoD and other government agencies

Maximize

- Platform and system affordability, reconfigurability, performance, and re-use

Define

- Open interface standards for multiple sensor modalities: Radar, EO/IR, SIGINT, Comms, EW

Publish

- Technical Standard, Conformance guidance, and Contracting guidance

SOSA™
Sensor Open Systems Architecture

SOSA addresses key operational needs across sensors

SOSA Technical Standard

- **Sensor-to-Platform Standardization**
  - Promotes rapidly integrated sensor systems
  - Includes electro-mechanical, physical/environmental, and C^2/payload interface standardization (e.g., OMS/UCI, NATO STANAG 4586 (UCS))

- **Intra-sensor Standardization**
  - Promotes readily composable sensor systems
  - Promotes interchangeable hardware and software components within a sensor (e.g., FACE™ standard, OpenVPX, VITA)
  - Promotes innovation for "Multi-INT" sensors

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SOSA™ Sensor Open Systems Architecture

SOSA Vision

VISION - Business/acquisition practices and a technical environment for sensors and C^{4}ISR payloads that foster innovation, industry engagement, competition, and allow for rapid fielding of cost-effective capabilities and platform mission reconfiguration while minimizing logistical requirements

Open	*Standardized*	*Harmonized*	*Aligned*	*Cost Effective*	*Adaptable*
Vendor and platform agnostic open modular reference architecture and business model	Software, hardware, and mechanical module interface standards	Leverage existing and emerging open standards such as: CMOSS, FACE, OMS, SPIES, VICTORY, VITA	Consistent with DoD acquisition policy guidance	Affordable C4ISR systems including lifecycle costs	Rapidly responsive to changing user requirements

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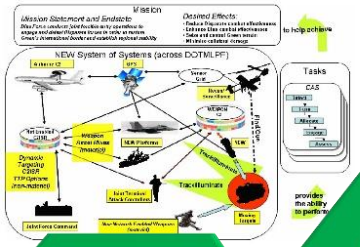
http://www.opengroup.org/sosa/vision

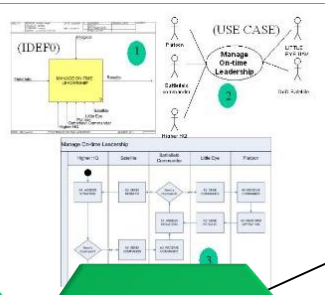
SOSA Scope and Working Groups

Data Rights
IP
Contracting Guide

SOW
CDRL
DID
Section L, M Support

Marketing
Outreach
Business Development
Open Acquisition Guide





Business

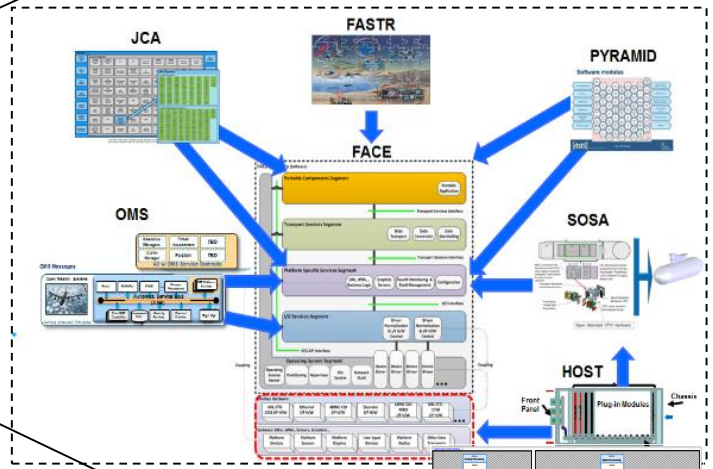
Architecture
Sub-WG
Cyber Security

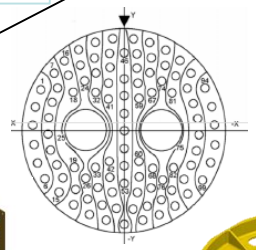
Software

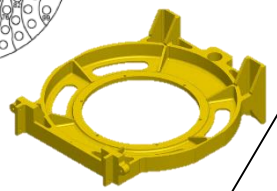
SOSA

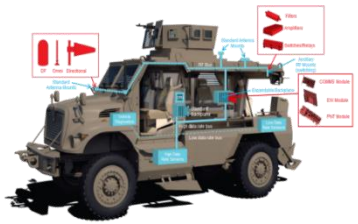
Electrical
Mechanical

Hardware
Sub-WG
System
Management
Drivers

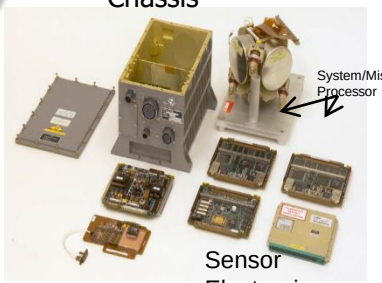


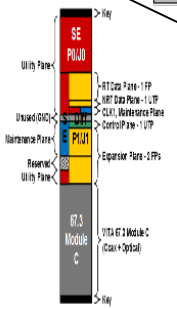






Chassis





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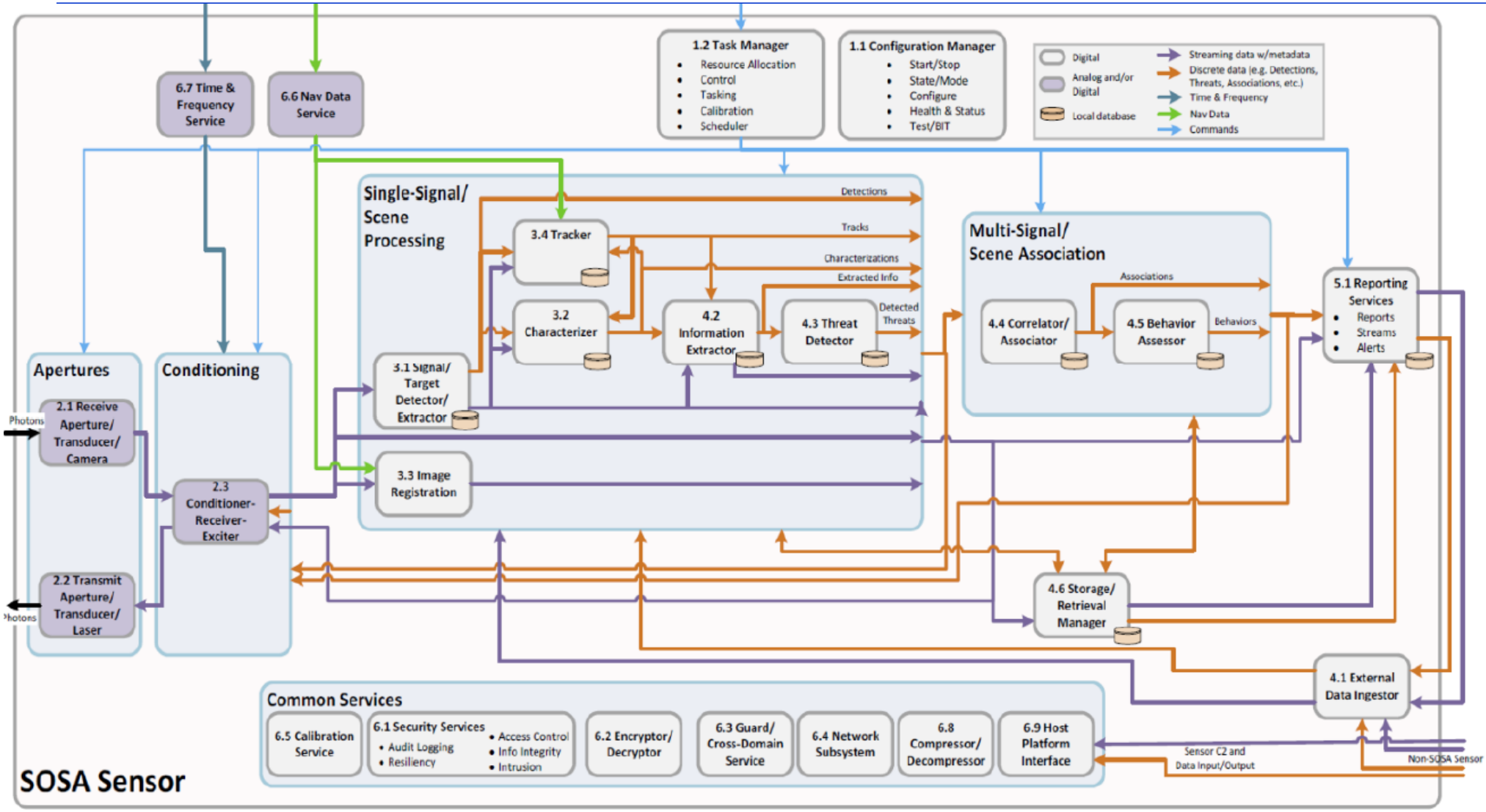
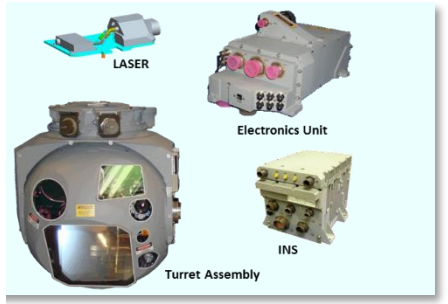
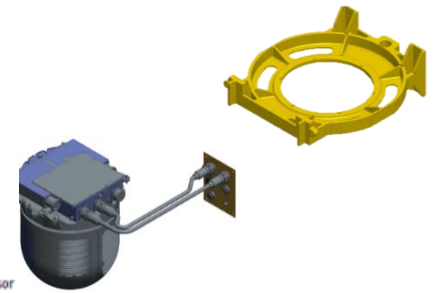
SOSA Architecture



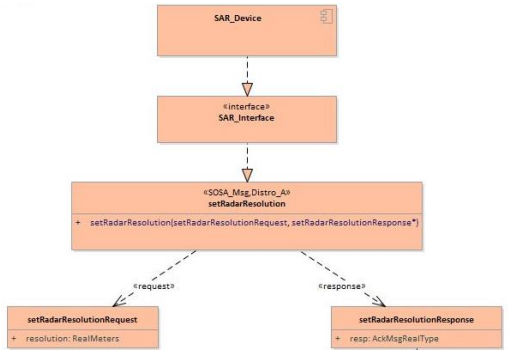




Each Module is Designed to be Competitively Procurable and Translatable to Selected OSAs

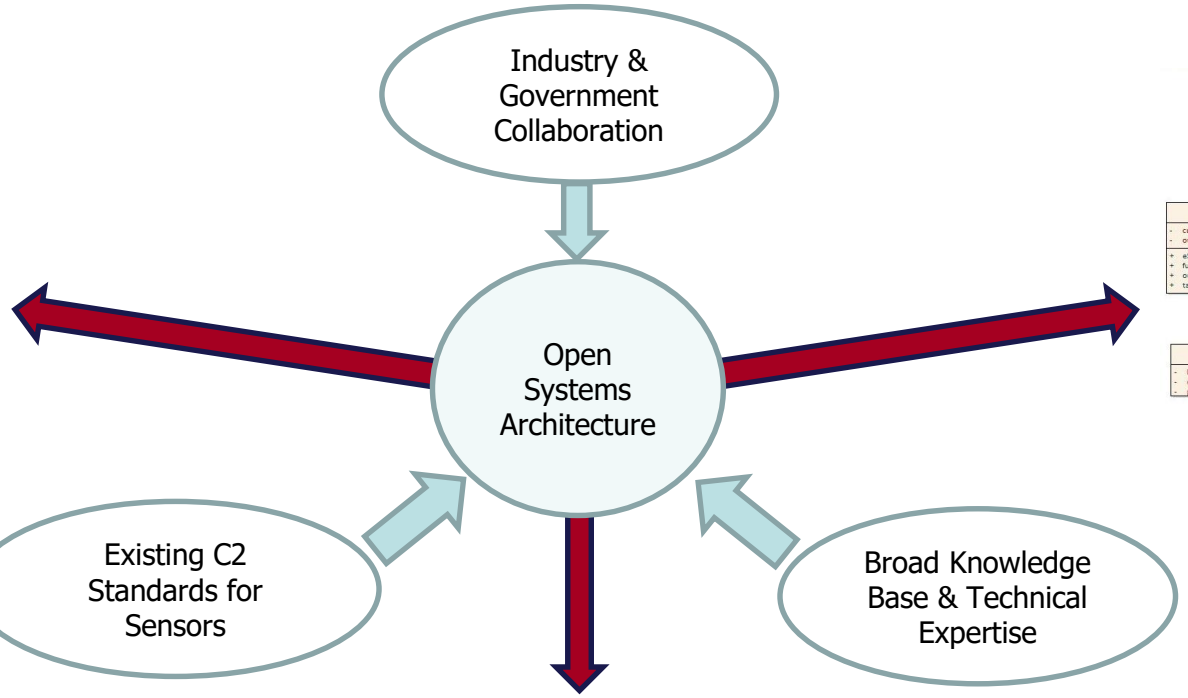
Common C⁴ISR Data Modeling

Interoperable C² Messages for Sensors



UCI
VICTORY
STANAG 4586

SOSA Consortium

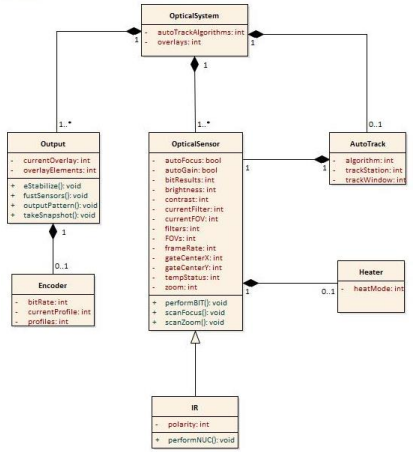


C² Message Browser

Radar
SIGINT
EW
Comms
EO/IR

Radar
AMTI
SMTI/GMTI
SAR

Universal Payload Interface



Sensor Systems
Software
Data Analysis
Physics

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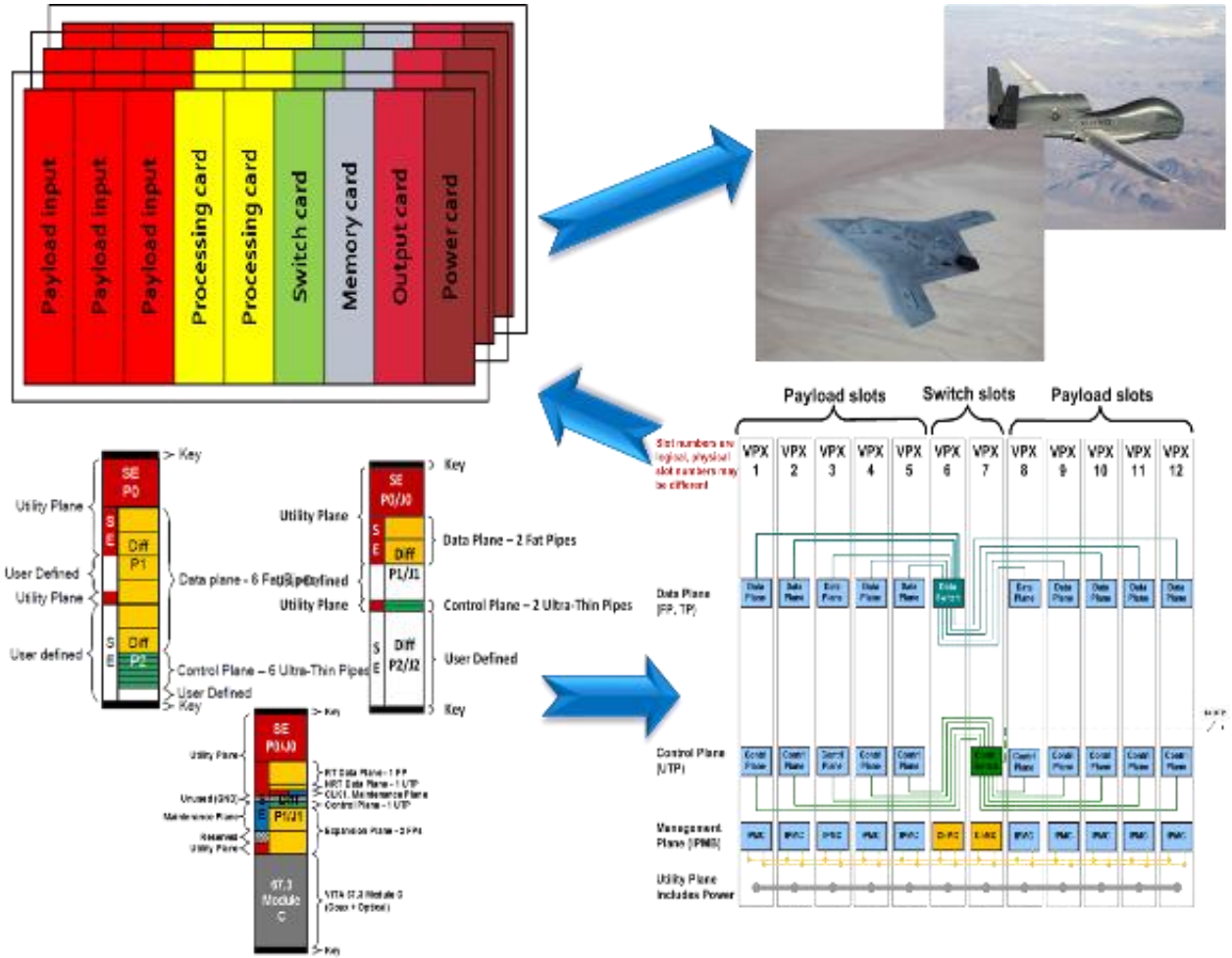
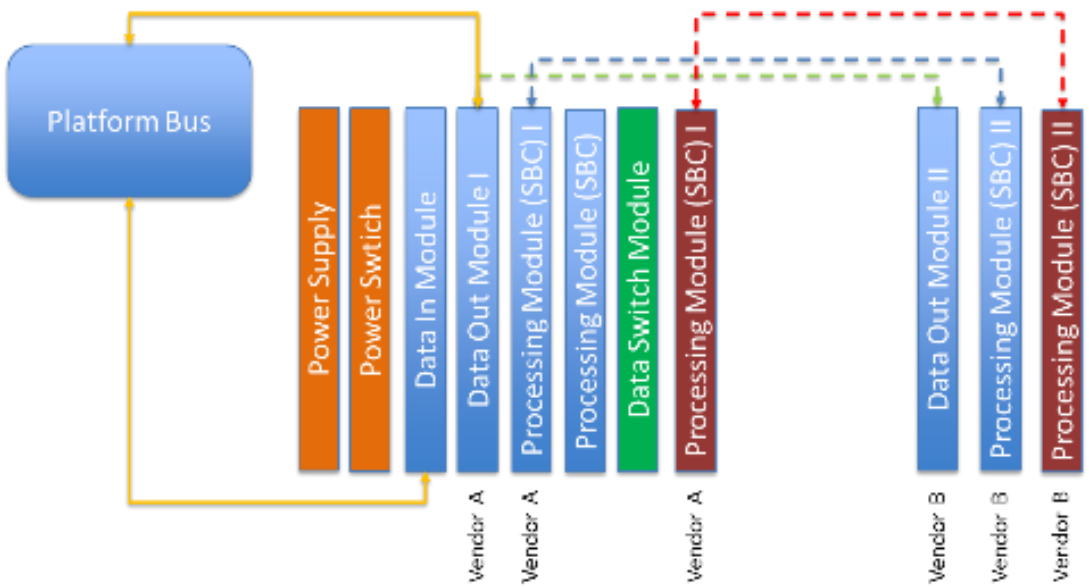
SOSA™
Sensor Open Systems Architecture

SOSA Common Multi-INT Processing





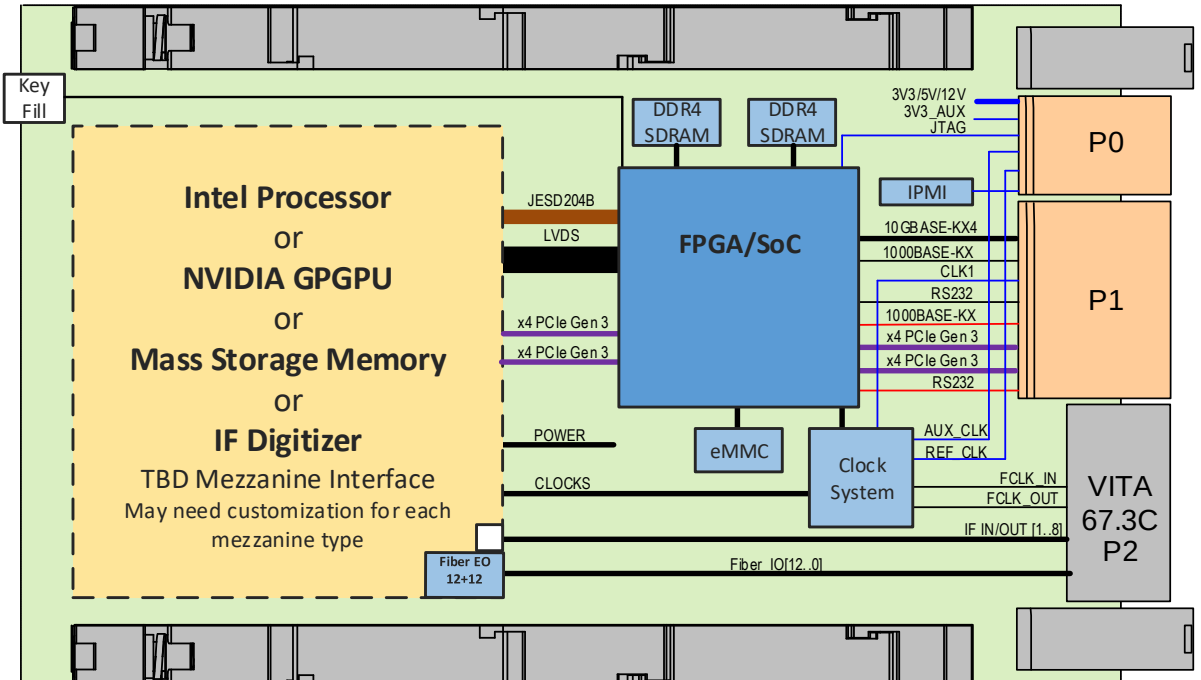
Note: Colored arrows indicate a module change – same slot and module profile, different vendors

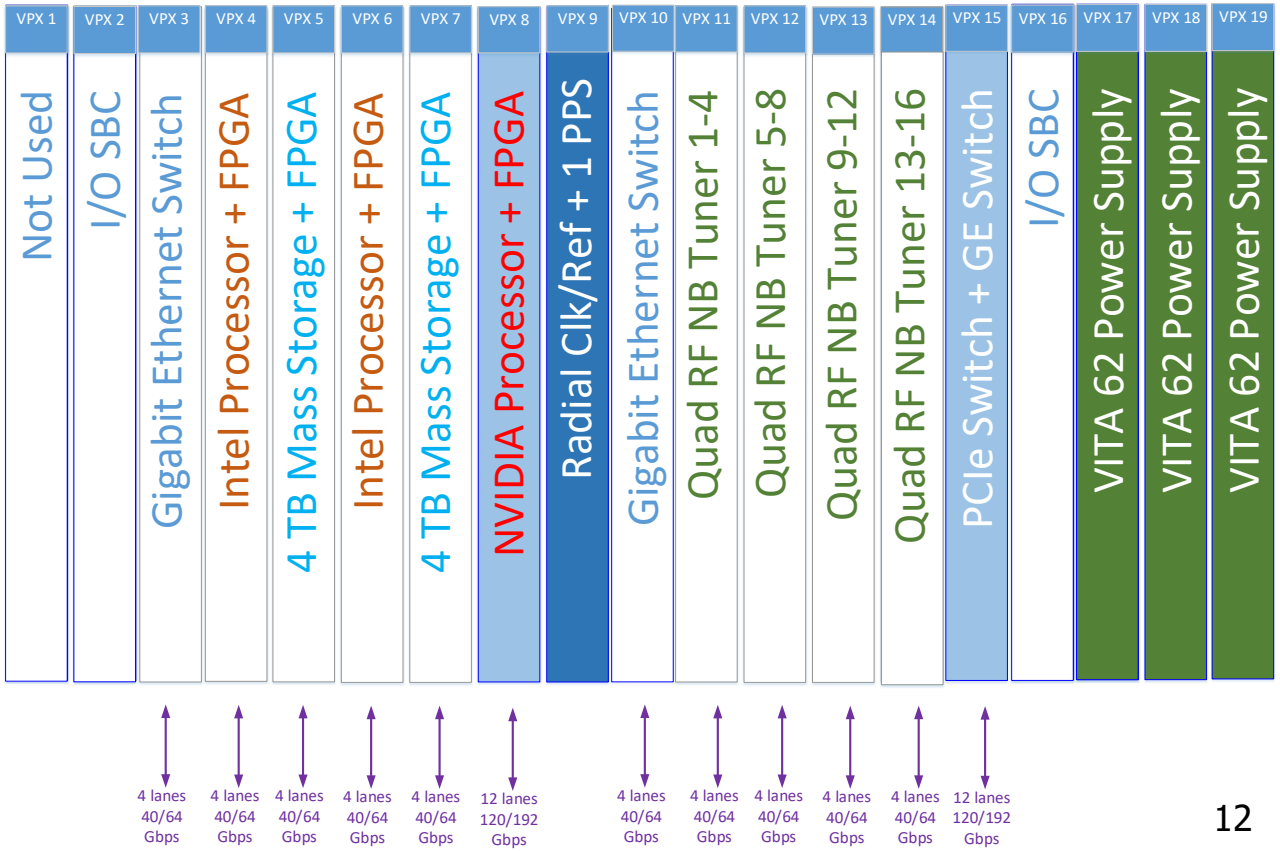
SOSA™
Sensor Open Systems Architecture

Common Hardware Specifications across Multi-INTs drive many commonality decisions for component layout

SOSA Common C⁴ISR Processor

- **Uses SOSA specification connectors, like AgilePod®**
- **Implements generic interfaces for growth capabilities**





CERDEC CMOSS/SOSA Alignment

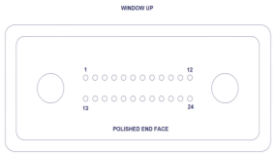
- **Common "cards" increase competition and economies of scale**
  - CMOSS/SOSA abstracts software from hardware
  - Reduces sustainment costs
  - Eliminates need for "End of Life" buys for a 30+ years sustainment
  - Enables hardware modernization on 5 to 10-year cycle, perhaps faster
- **Establish a Universal A-kit for Army vehicles**
  - Revolutionizes sustainment by defining standardized interfaces into which both common and specific modules can be easily replaced, swapped, or upgraded
  - Reduces logistics tails by enabling common sparing (both within and across systems)
    - Examples include single board computers and switch cards

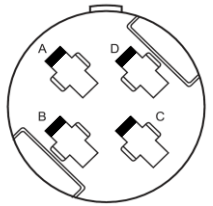
NAVAIR HOST/SOSA Alignment

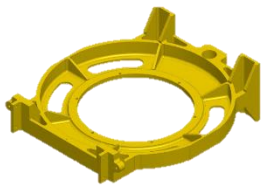
- **Hardware Open Systems Technologies (HOST) standard**
- **Create a hardware technical reference framework**
  - Used for developing embedded computing systems
- **Improve affordability**
  - Enables reuse
  - Increasing economies of scale opportunities
- **Enable effective and timely technology refresh cycles**
  - Abstract hardware from software
    - Acquisition community can pre-plan tech refreshes even during initial system acquisition program
    - Vendors know specified interfaces, mitigating risk in new product investment
- **Initial focus on airborne mission processing**

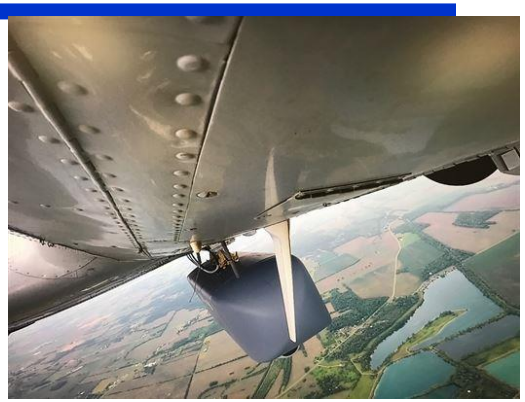
Electrical/Mechanical Interfaces

- **SOSA specifications for Common Sensor Interconnects were successfully tested with AFRL AgilePod®**
  - Performed first ever flight of AgilePod® with 8 different sensors
  - Follow on testing for DARPA (June 18) and AFRL (July 18)
  - FMV / SAR / MTI tested with common interfaces
  - Test flights at Wright Patterson AFB OH, Homestead FL, and SOUTHCOM location
- **Working on next generation high-density/high-performance non-proprietary fiber connectors**
- **Planning to add a 5 inch Gimbal connector and mounting standard for small UAS systems**









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SOSA Membership

- As of 23 October 2018 – 42 members
- Sponsor-level Members (6)
  - AFLCMC, Lockheed Martin Corp, NAVAIR, Raytheon, Rockwell Collins Inc., US Army PEO Aviation
- Principal-level Members (7)
  - BAE Systems Inc., GE Aviation Systems, General Dynamics Mission Systems, Harris Corporation, Leonardo DRS, U.S. Army RDECOM CERDEC I^2WD, UTC Aerospace Systems
- Associate-level Members (39)
- More than 400 industry and government personnel on-board

http://www.opengroup.org/sosa/members

Takeaways

- **OSA for multiple sensor modalities (RADAR, SIGINT, EO/IR, COMMS, EW) requires careful thought from both technical and business perspectives for what makes sense for decomposition**
- **Key to OSA success is to think of long-term sustainment up-front in support of realistic acquisition timelines and schedules**
- **The SOSA Consortium is focused on leveraging existing standards in order to create an open systems architecture that is widely applicable to both military and commercial sensor systems with a business model that balances all stakeholders' interests**
- **Government funded SOSA prototypes are currently providing programs of record with risk reduction, both near term (within 2 years) and long term (within 10 years)**