



SOSA™ Consortium Update: Progress and Outlook

*Embedded Tech Trends
Atlanta, January 2020*

*Rodger Hosking
Pentek, Inc.*



Tri-Service Memo – Jan 2019

- From U.S. DoD Offices of:
 - Secretary of the Navy
 - Secretary of the Army
 - Secretary of the Air Force
- To: Service Acquisition Execs and Program Executive Officers
- Subject: Modular Open Systems Approaches (MOSA) for our Weapons Systems is a Warfighting Imperative
- Each of the services, industry, and academia have been developing common open systems standards
 - OMS, UCI, SOSA, FACE, and VICTORY
- Acquisition Executives will ensure that MOSA is reflected in our requirements for acquisition programs to the maximum extent possible

Office of the Secretary of the Navy
1000 Navy Pentagon
Washington, DC 20350-1000

Office of the Secretary of the Army
101 Army Pentagon
Washington, DC 20310-0101

Office of the Secretary of the Air Force
1670 Air Force Pentagon
Washington, DC 20330-1670

JAN 7 2019

MEMORANDUM FOR SERVICE ACQUISITION EXECUTIVES AND PROGRAM EXECUTIVE OFFICERS

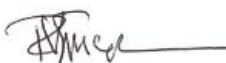
SUBJECT: Modular Open Systems Approaches for our Weapon Systems is a Warfighting Imperative


Victory in future conflict will in part be determined by our ability to rapidly share information across domains. Sharing information from machine to machine requires common standards.


For the past several years, each of the Services has been developing, demonstrating, and validating common data standards through a cooperative partnership with industry and academia. This work has resulted in the establishment of Open Mission Systems/Universal Command and Control Interface (OMS/UCI), Sensor Open Systems Architecture (SOSA), Future Airborne Capability Environment (FACE) and Vehicular Integration for C4ISR/EW Interoperability (VICTORY) among other standards.

We have reviewed the capabilities of these common standards. We determined the continued implementation of these standards, and further development of Modular Open Systems Approach (MOSA) standards in areas where we lack them is vital to our success. As such, MOSA supporting standards should be included in all requirements, programming and development activities for future weapon system modifications and new start development programs to the maximum extent possible.

In an effort to formalize our approach to MOSA, Service Acquisition Executives will publish specific implementation guidance for our acquisition programs. Additionally, Standardization Executives should continue standards development efforts where we have gaps. Lastly, requirements and programming functions will ensure MOSA is reflected in our requirements and programs to ensure our future weapon systems can communicate and share across domains.


Richard V. Spencer
Secretary of the Navy

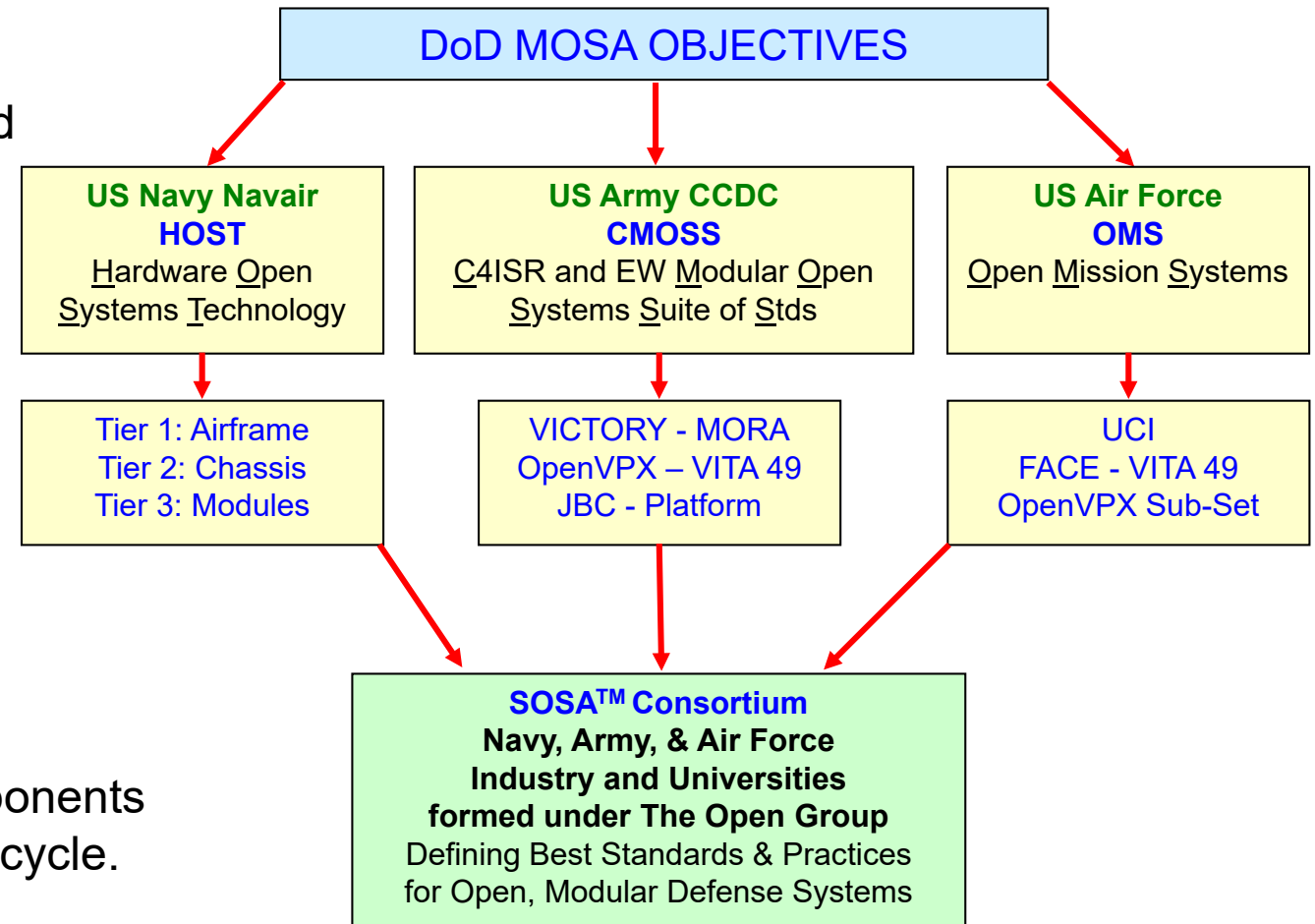

Mark T. Esper
Secretary of the Army


Heather Wilson
Secretary of the Air Force



MOSA Objectives and Tri-Service MOSA Initiatives

- Enhance Competition
 - Open architecture with severable modules, allowing components to be openly competed
- Facilitate Technology Refresh
 - Delivery of new capabilities or replacement technology without changing all components in the entire system.
- Incorporate Innovation
 - Operational flexibility to configure and reconfigure available assets to meet rapidly changing operational requirements.
- Enable Cost Savings/Cost Avoidance
 - Reuse of technology, modules, and/or components from any supplier across the acquisition life cycle.
- Improve Interoperability
 - Open architecture with severable software and hardware modules to be changed independently



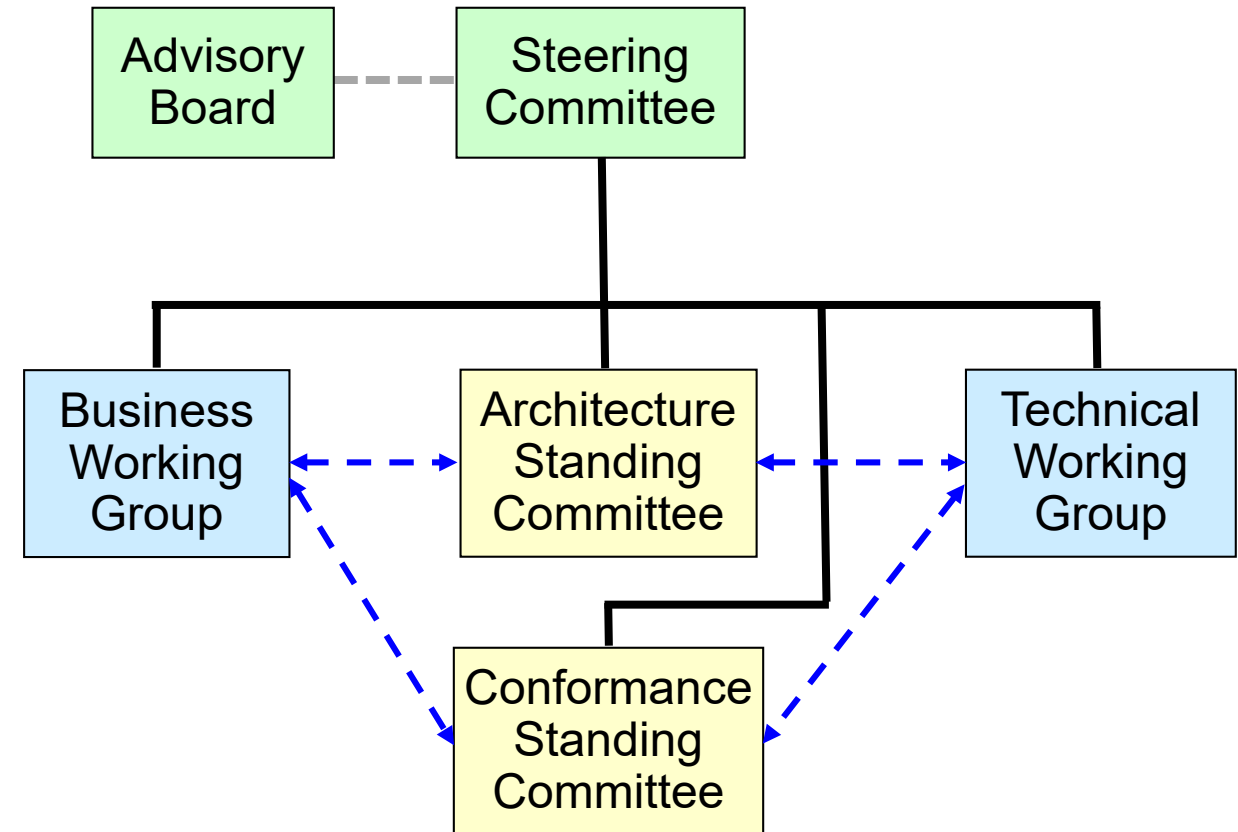
Pentek acknowledges The Open Group for permission to include text/figures derived from its **Sensor Open Systems Architecture: A Primer SOSA™ 101™**. SOSA is a trademark of The Open Group in the United States and other countries.



SOSA™ - Sensor Open System Architecture



- Managed by The Open Group standards organization
- Consortium of Air Force, Navy, Army, DoD, Industry, & other Government Agencies
- Develop & Adopt Open Systems Architecture standards for C4ISR
- Common multi-purpose backbone architecture for Radar, EO/IR, SIGINT, EW, & communications
- Platform affordability, rapid fielding, re-configurability & overall performance
- Re-purposing of hardware/software/firmware
- Business/acquisition practices to foster innovation, industry engagement and competition

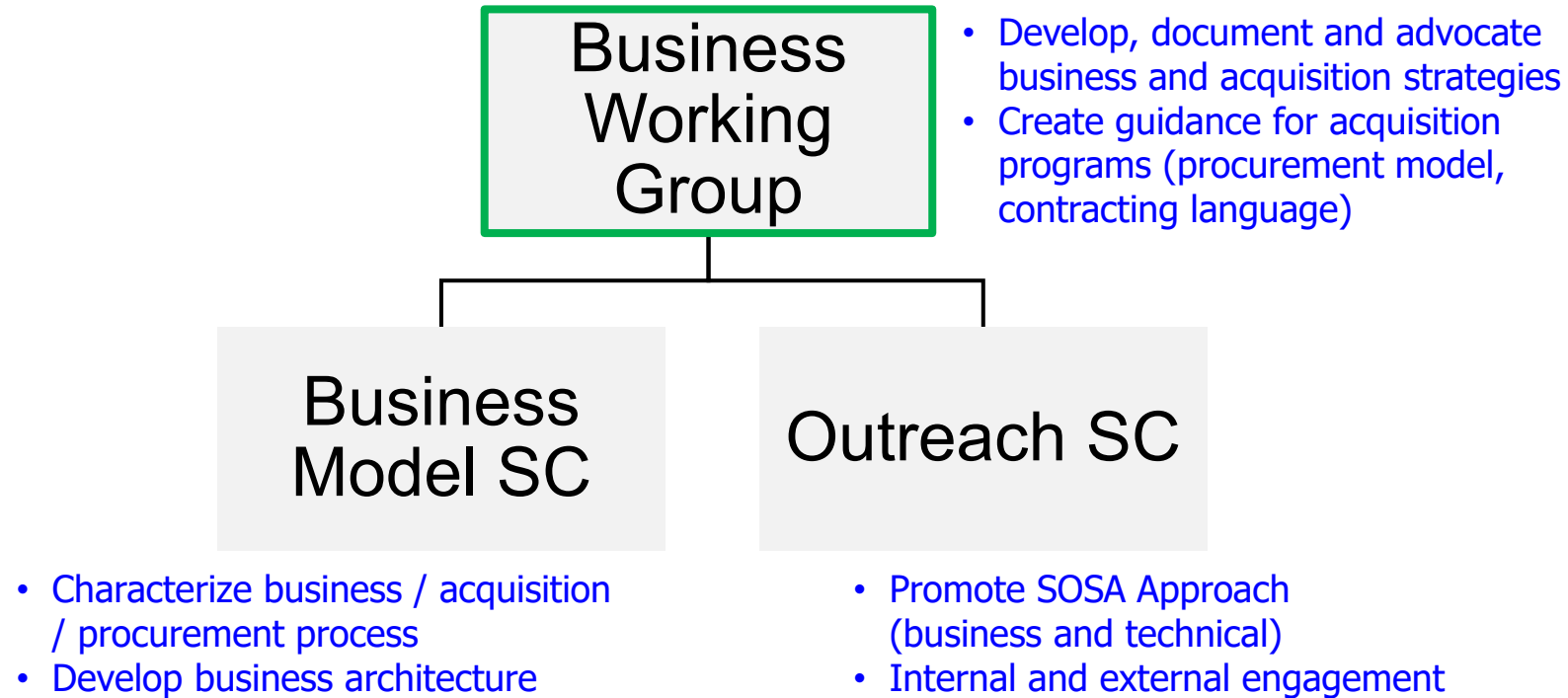




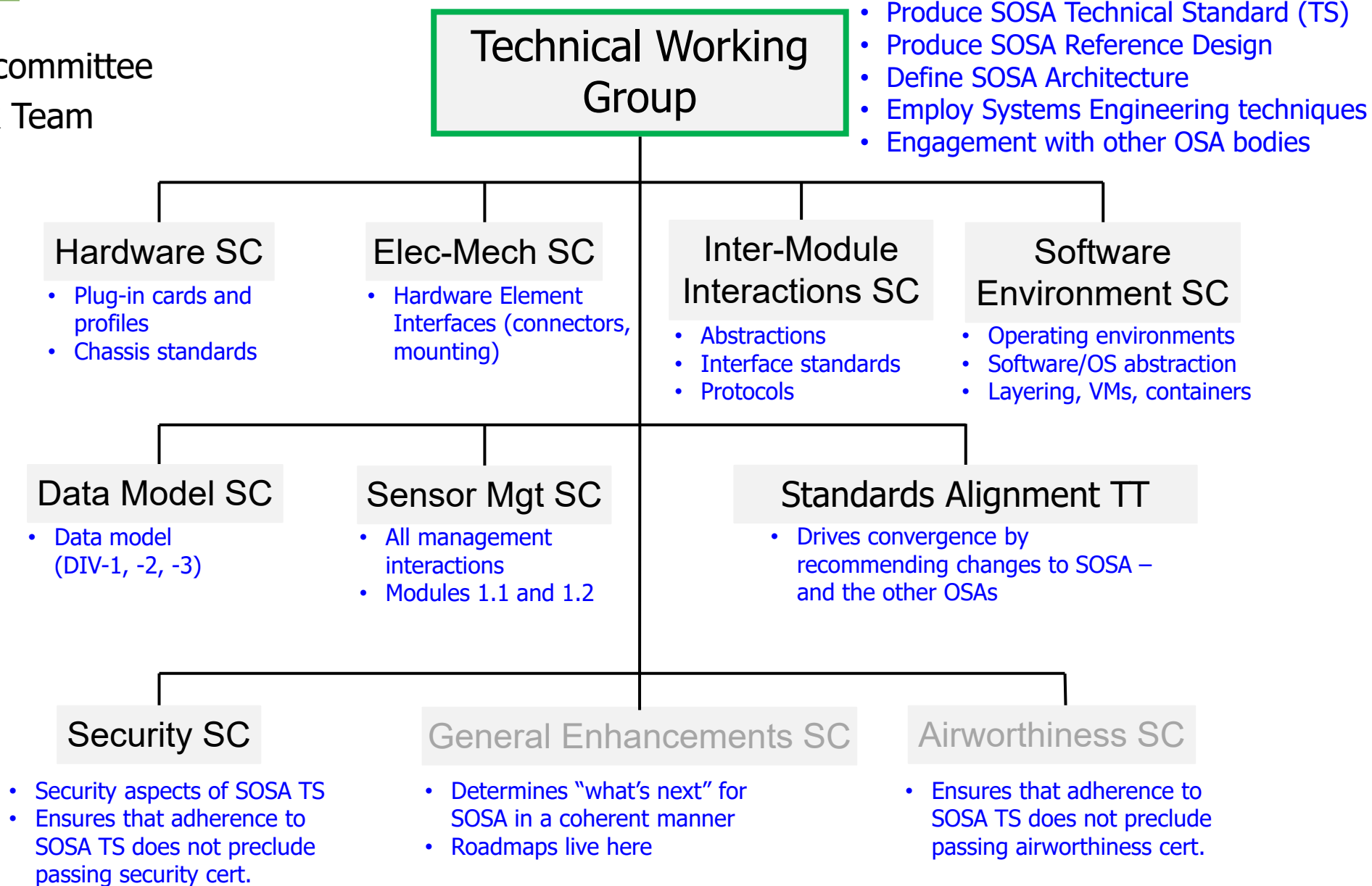
SOSA™ Consortium Organization: BWG Focus



SC = Subcommittee



SC = Subcommittee
 TT = Task Team





SOSA Consortium Member Organizations



Sponsor Level

Air Force Life Cycle Management Center
Collins Aerospace
Lockheed Martin
NAVAIR
US Army CCDC C5ISR Center
US Army PEO Aviation
US Army Project Manager Electronic Warfare and Cyber

Principal Level

BAE Systems
GE Aviation Systems
General Dynamics Mission Systems
L3Harris Corporation
Mercury Systems
Northrop Grumman
Raytheon Company
Sierra Nevada Corporation
UTC Aerospace Systems

Associate Level

Abaco; Acromag, Inc.; Ampro ADLINK Technology, Inc.; Annapolis Micro Systems, Inc.; AREA-I, Inc.; Ascendant Engineering Solutions; Behlman Electronics, Inc.; Bliley Technologies; CACI International, Inc.; Concurrent Technologies Inc.; COTSWORKS, LLC; Crossfield Technology; Curtiss-Wright; Delta Information Systems; DornerWorks; DRS Signal Solutions; DRTI; Elma; FEI-Elcom Tech, Inc.; Epiq Solutions; FiberQA LLC; Georgia Tech Research Institute; Interface Concept Inc.; Great River Technology, Inc.; Herrick Technology Laboratories, Inc.; iRF Solutions; Joint Technical Networking Center; KEYW Corporation; Kontron America; L3 Technologies, Inc.; LCR Embedded Systems, Inc.; Lead Dog Technologies, LLC; Leidos; LGS Innovations; Meritec; Micro Focus (US), Inc.; Milpower Source; North Atlantic Industries, Inc.; OAR Corporation; Orion Technologies, LLC; Pentek, Inc.; QRC Technologies, LLC; Rantec Power Systems, Inc.; Real-Time Innovations; Reflex Photonix Corp.; Riverside Research; RTD Embedded Technologies, Inc.; Samtec; Selex Galileo Inc.; SimVentions; Skayl LLC; SMART Embedded Computing, Inc.; Southwest Research Institute; Spectranetix, Inc.; SRC, Inc.; SR Technologies; Star Lab Corp.; SV Microwave; TE Connectivity; Technology Service Corporation; Telephonics; Tucson Embedded Systems; University of Dayton Research Institute; VITA; VTS, Inc.; W.L. Gore; Wolf Advanced Technology, Inc.





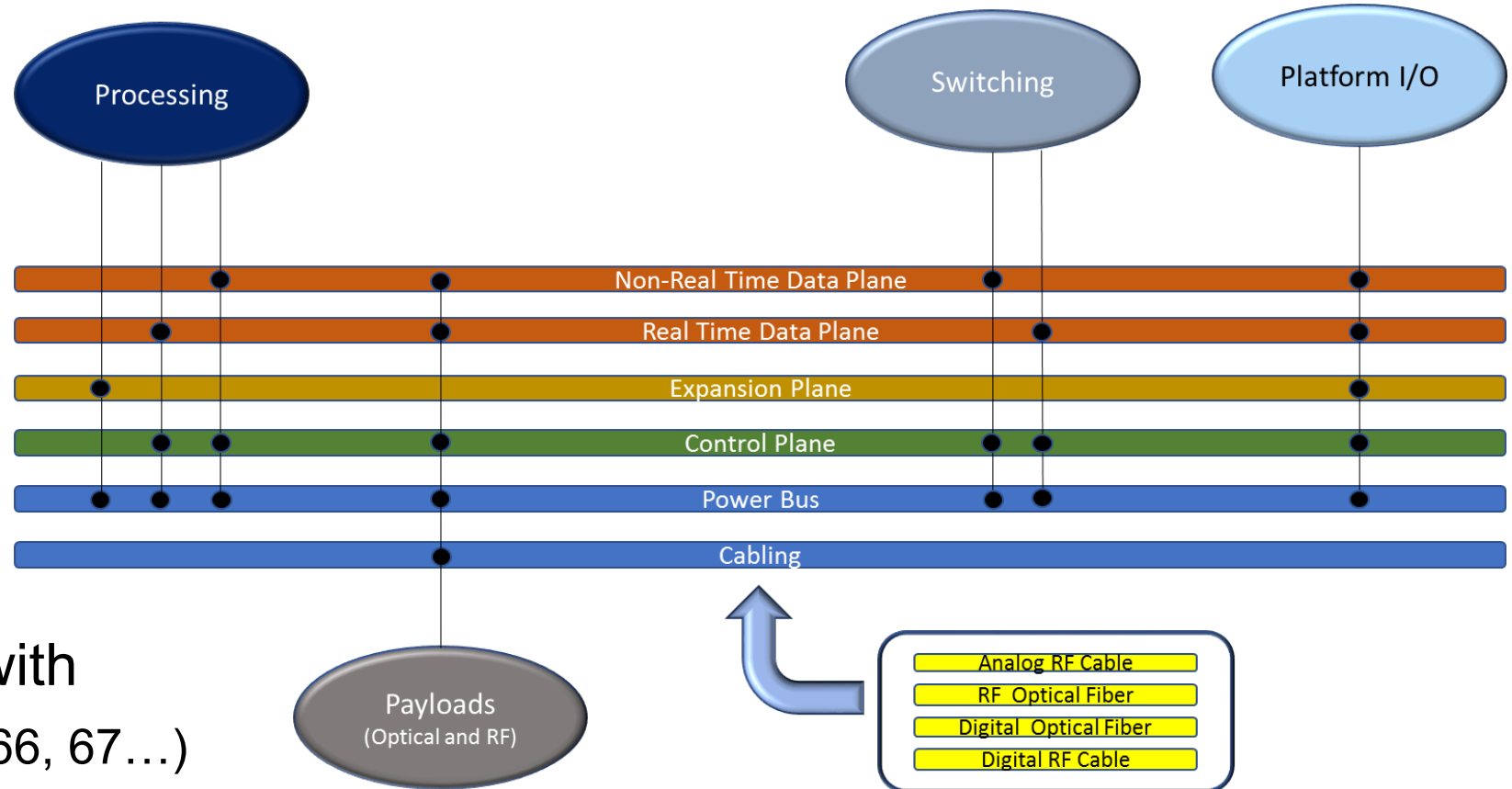
SOSA™ Technical Architecture: Modular and Open Systems



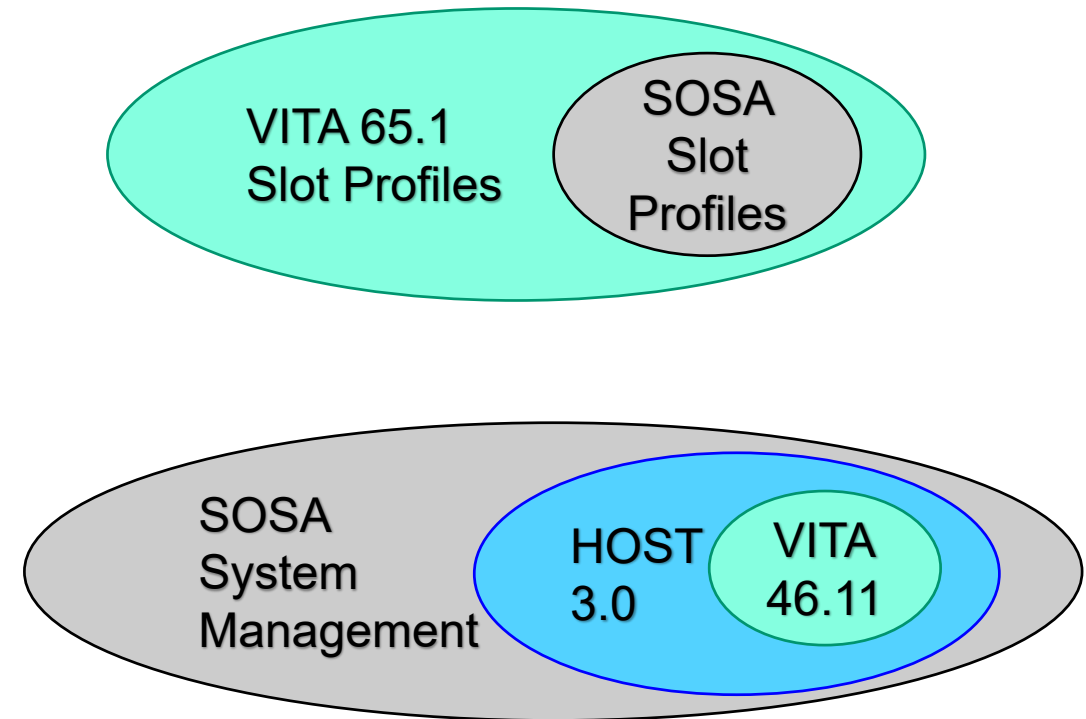
- Modular
 - Has encapsulated functionality and behaviors, with well-defined interfaces
 - Tightly integrated/cohesion within modules, loosely coupled with other modules
- Open: All Three Criteria Required
 - Widely-available, published definitions
 - Consensus-based (“interested parties” can shape it) with a governance process to enable stakeholders to influence and effect the development and evolution
 - Has conformance/compliance validation process
- Modules are defined per the OSA/MOSA Gray Box Concept
 - Defines what the box does
 - Defines interfaces between boxes
 - Does **NOT** define how the box performs its functions within the box
 - Does **NOT** define the intellectual property (IP) inside the box



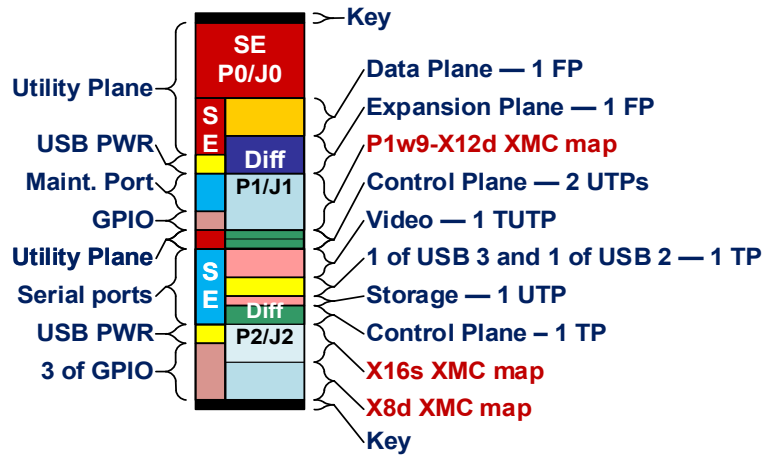
- Plug-in Card Profiles
- Network partitioning
- Backplane layout
- Chassis management
- Power (12V, 3.3V Aux)
- Cooling
- Maintenance ports
- Compatibility/alignment with
 - VITA standards (e.g., 65, 66, 67...)
 - HOST
 - CMOSS
 - Others



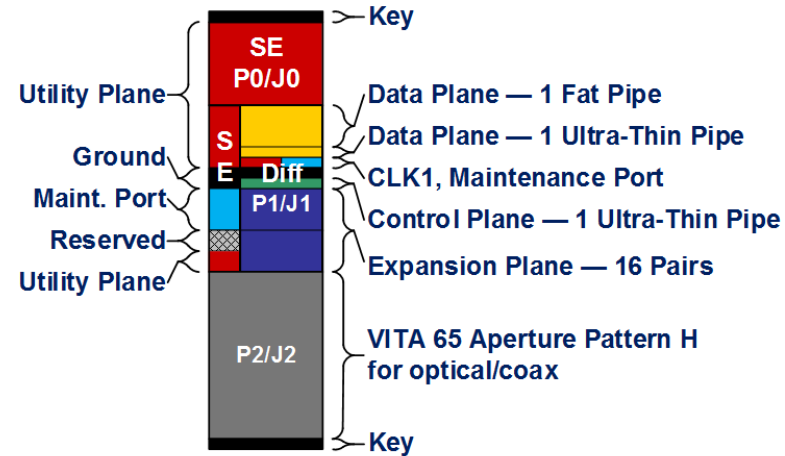
- SOSA Technical Standard leverages VITA standards and then builds on them
 - Example 1 – SOSA requires following several VITA standards in plug-in card construction and sets an order of precedence for those standards
 - Example 2 – Some rules (requirements) in SOSA are only recommendations in VITA
 - Example 3 – Some rules in SOSA are more restrictive extensions of VITA standards, such as limiting the selection of slot profiles
 - Example 4 – Some rules in SOSA are derived from other standards that are themselves based on VITA standards, such as system management
 - Example 5 – Some recommendations from SOSA may result in new or extended VITA standards that may become rules in SOSA



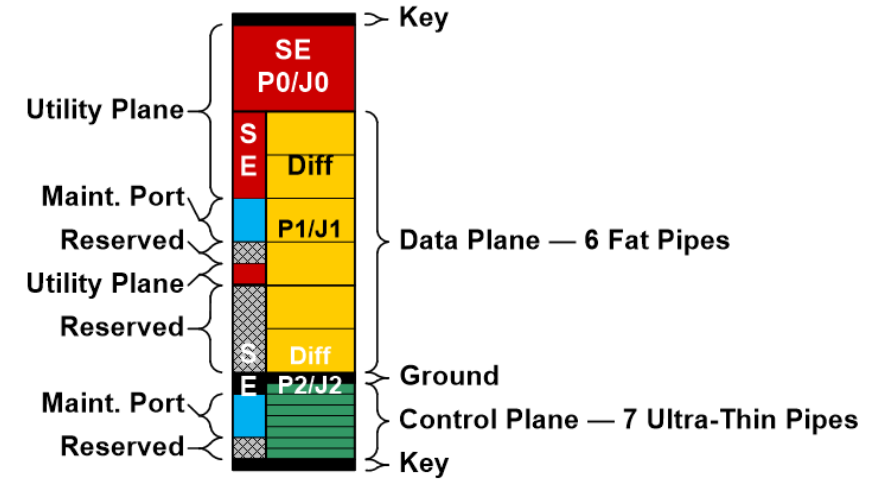
I/O Intensive SBC



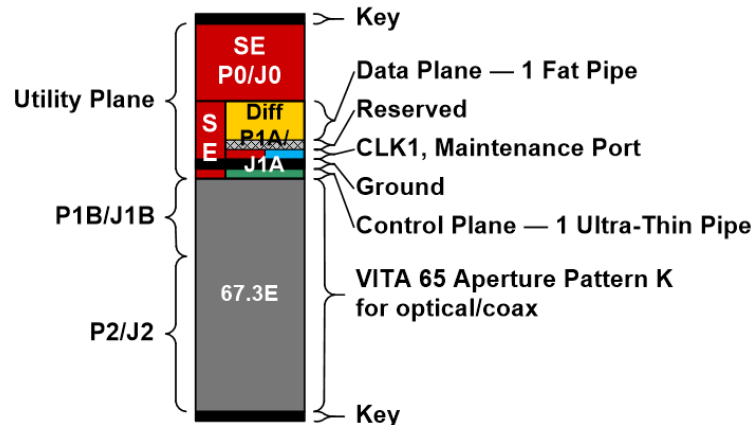
RF/Optical Primary Payload



Data/Control Plane Switch



RF/Optical Switch

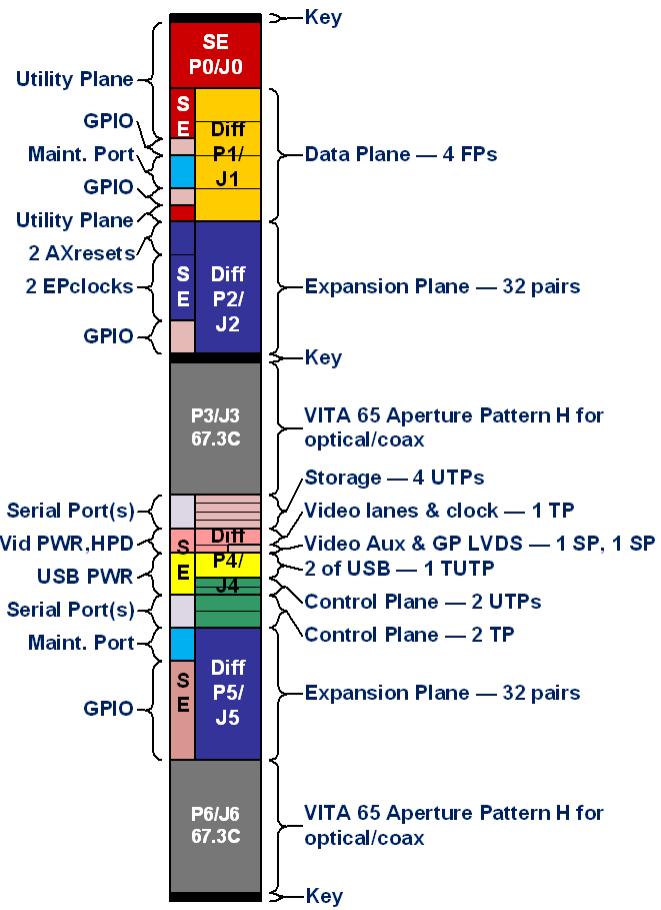




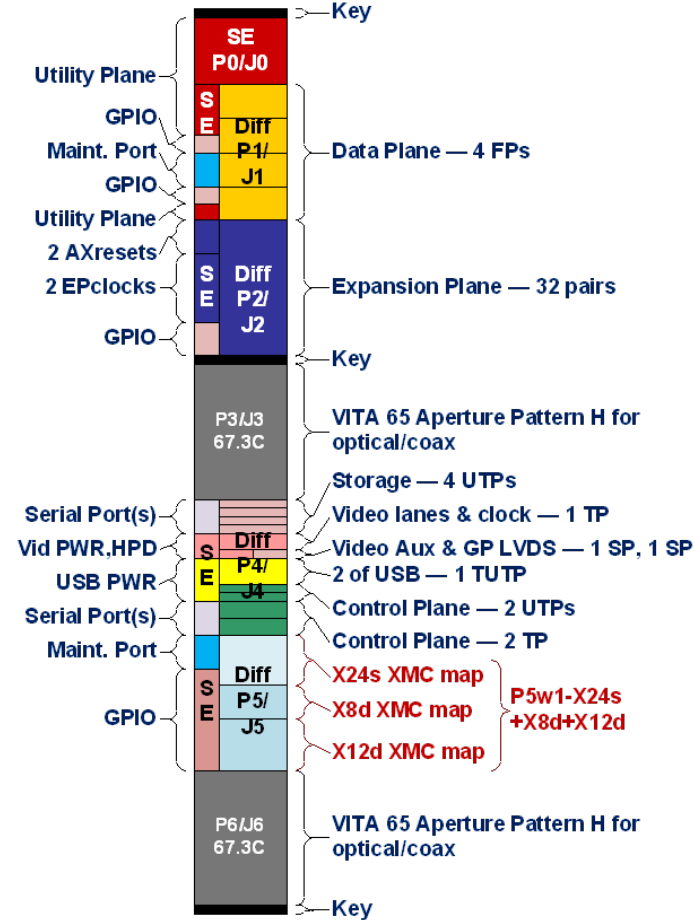
SOSA™ 6U Plug-In Cards (Samples)



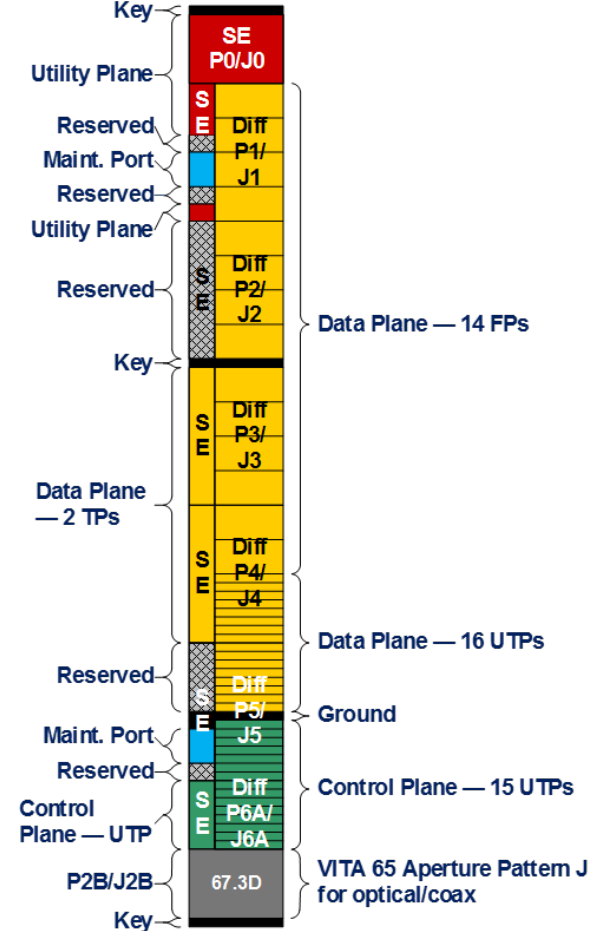
RF/Optical Payload



RF/Optical (XMC) Payload



Data/Control Switch

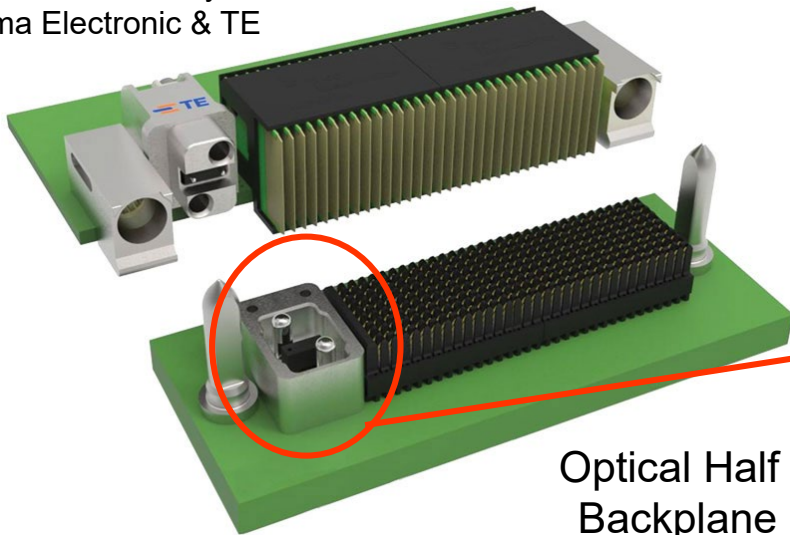




OpenVPX Backplane RF and Optical I/O for SOSA™ Standard

- One or both halves of VPX P2 connectors are removed from the VPX backplane
- Backplane apertures accept housings for coaxial RF connectors and/or optical MT housings
- Allows a single backplane to be configured by system integrator to suit system needs

Photo Courtesy
Elma Electronic & TE

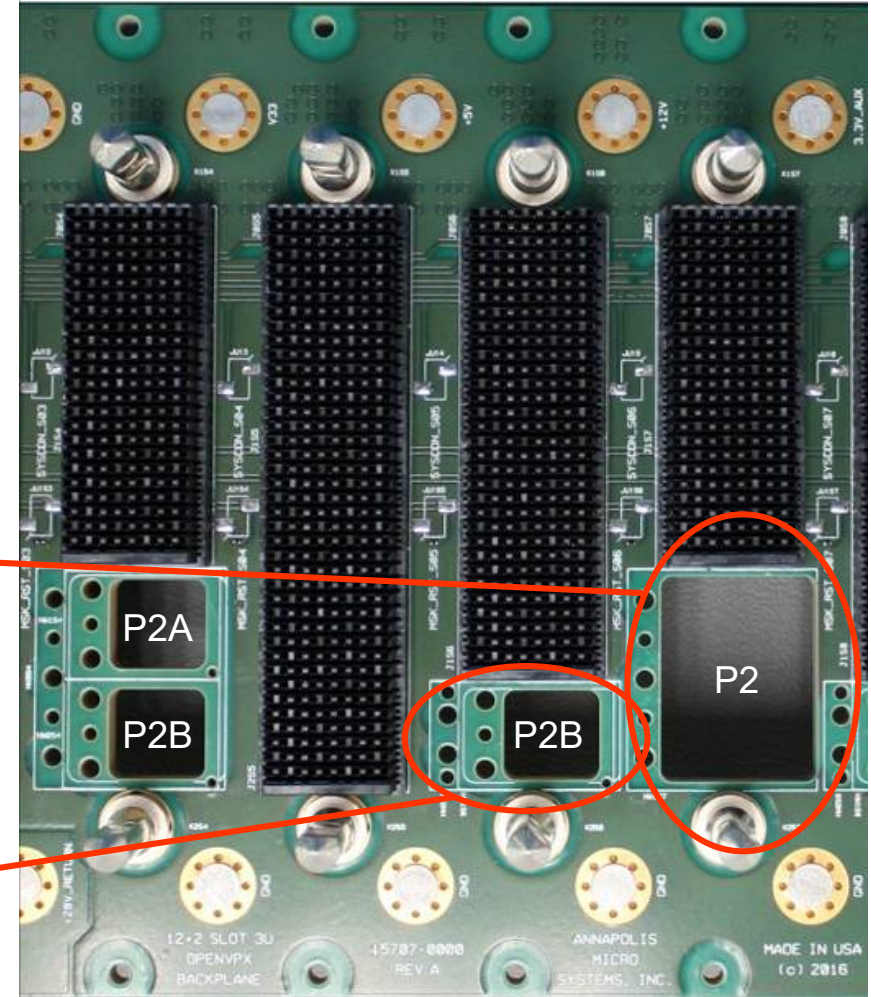


Optical Half Width P2
Backplane Housing

Photo Courtesy
SV Microwave



Coaxial RF Full Width
P2 Backplane Housing

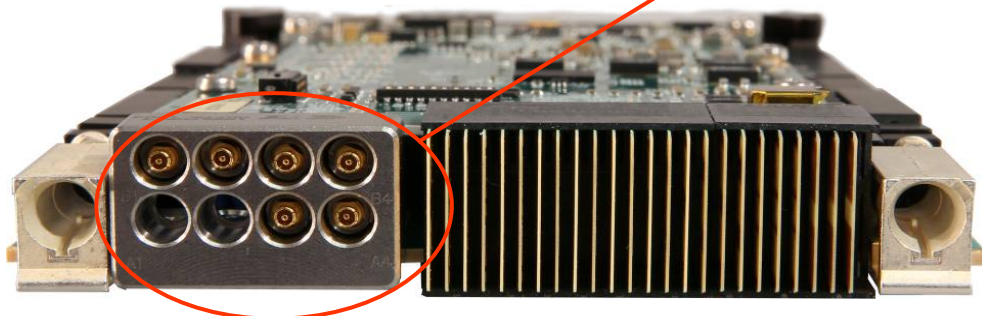


3U VPX Backplane with
Apertures for RF & Optical I/O
Photo from ANSI/VITA 67.1

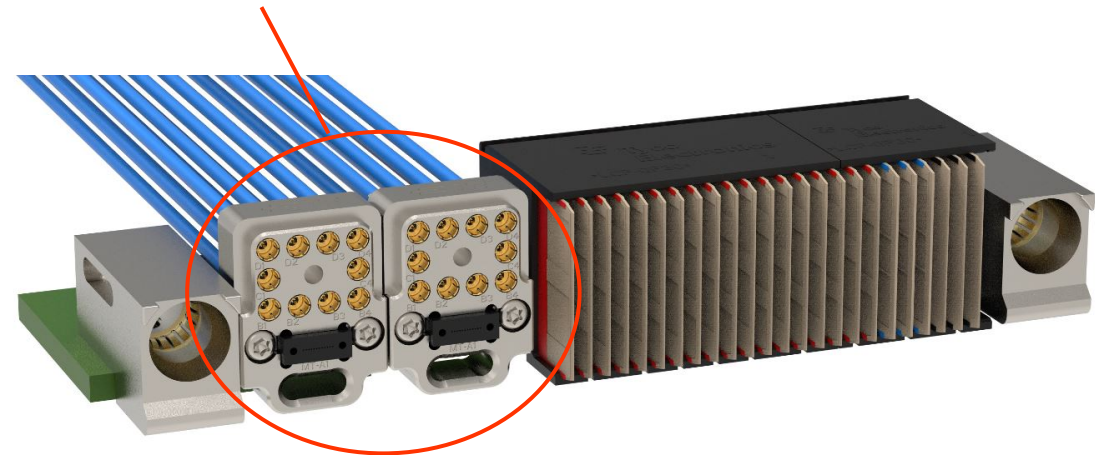


VITA 67.x RF Coaxial Backplane I/O for SOSA™ Standard

- Eliminates front panel RF Connections
 - Easier maintenance and improved reliability
 - RF Signal bandwidths to 40 GHz
 - Several connector types
 - Up to 4 coax signals in half-width P2A or P2B
 - Up to 8 or 12 coax signals in full width P2
- New VITA 67.3 Types
 - Both full and half width P2 versions
 - Various diameters of coaxial connectors
 - Mixed Optical and RF connectors in full width and half width P2
 - Up to 20 coax plus 48 optical MT lanes in P2A and P2B



VITA 67.2 – Rear View of 3U VPX Module
Pentek Model 54851 Dual Channel A/D & D/A

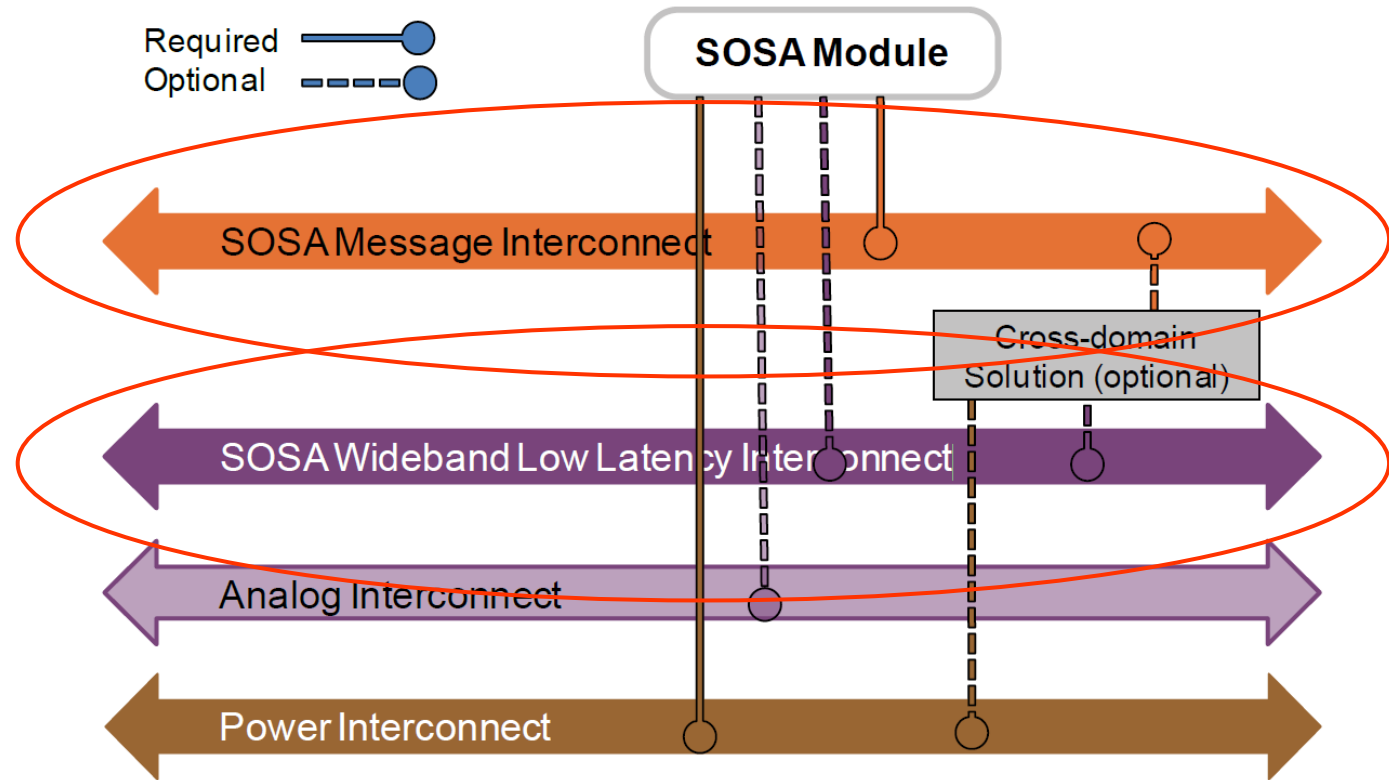


VITA 67.3D – Rear View of 3U VPX Module
RF & Optical used in Pentek Model 5550 RFSoc
Courtesy TE Connectivity



SOSA™ Message & Wideband Low-Latency Interconnects

- Message Interconnects
 - Supervisory and informational transfers, typically over Ethernet
- Wideband Digitized Signal Streams
 - Point to point or multi-cast
 - Digital RF or IF Signals, Digital Video
 - Supports very high data rates
 - Ensures deterministic and low latency
- Digital Signal Context
 - Metadata describing digital signal stream
- Signal Layer Control
 - Adjust parameters for signal processing
- VITA 49.2 VITA Radio Transport
 - Satisfies many of these requirements
 - Already adopted by MORAs, OMS and other standards



Courtesy The Open Group from SOSA Snapshot 2



OpenVPX and Classified Military Technology

- The Open Group restricts membership in SOSA Consortium to U.S. citizens
- VITA membership is worldwide
- Discussions within SOSA Consortium can explore classified or sensitive technologies more deeply than VITA standards organizations
- However, sanitized recommendations for enhancements can be passed along to VITA Standards Organization for consideration
- SOSA Consortium can then easily incorporate those new OpenVPX as appropriate





SOSA™ Industry Member Product Participation

- Many SOSA industry members have announced products developed in alignment with the SOSA™ Technical Standard
- These products include boards, chassis, connectors, components and services
- Conformance to SOSA is not possible until the Technical Standard is approved and products have passed SOSA certification
- NO COMPANY CAN CLAIM CONFORMANCE YET

- Abaco Systems
- Annapolis Micro Systems, Inc.
- Concurrent Technologies
- COTSWORKS, LLC
- Crossfield Technology
- Curtiss-Wright Defense Solutions
- Elma Electronic Inc.
- Herrick Technology Laboratories, Inc.
- Interface Concept Inc.
- Kontron America
- Lead Dog Technologies, LLC
- Leidos
- Mercury Systems
- Pentek, Inc.
- Reflex Photonics Corp.
- Selex Galileo Inc.
- Spectranetix, Inc.
- SV Microwave
- TE Connectivity
- Wolf Advanced Technology Inc.

Apologies for any missing or incorrectly listed companies



Anticipated Benefits of the SOSA™ Approach



Government

- Faster/more efficient and more cost-effective acquisition
 - Adherence to the NDAA'17 MOSA mandate
 - Standardized system composition, known interfaces
 - Easier tech transition
- Improved Lifecycle and supportability
 - Commonality and reuse of components across systems
 - Tech insertion (new capability)
 - Tech insertion (obsolescence)
- Interoperability
 - Between SOSA systems
 - Within SOSA systems
 - Across DoD deployed Product Families

Industry

- Reduces development cost, risk and time
 - Leverage proven modular decomposition
 - Leverage known interface definitions (no need to invent)
 - Leverage standards-based tooling
- Creates opportunities for strategic sourcing
 - COTS vendors
 - Small businesses can integrate components into prime systems
- Facilitates Product Family Development
 - Base Product Family Architectures on the SOSA Architecture
 - Leverage inherent composability
 - Tremendous reuse opportunity





- Documents the SOSA Reference Architecture
- Contains normative and non-normative content
- Major Sections
 - Architecture Overview
 - **Architecture Definition**
 - **SOSA Technical Standard**
 - Appendices
 - StdV-1 (Applicable Standards)
 - AV-2 (Integrated Dictionary)
 - DIV-2 (Logical Data Model) and Data Dictionary
 - Host Platform / Sensor Connector Details
 - Slot Profiles
 - Backplane Examples
- Snapshot 3 currently under review and expected to be released in April 2020



Key SOSA™ Take-Aways



- Open Architecture Ecosystem is ready NOW!
- The SOSA Consortium is developing a unified modular open reference architecture – and associated business model – for radar, EO/IR, SIGINT, EW, and communications
 - Following MOSA principles and gray box model to protect IP and encourage innovation
 - Structured, top-down approach: Quality Attributes, Architecture Principles per DoD Architecture Framework
- Using a consensus standards-body approach to balance interests of all parties
 - Business and Technical Working Groups
 - Tri-Services are working together and aligned
 - Industry members are working together, partnering, and moving forward
 - Tri-Service Open Architecture Interoperability Demonstration on January 29, 2020
- SOSA Published Products include SOSA Technical Standard Snapshot 2 and SOSA Business Guide
 - Technical Standard Snapshot 3 should be released in April 2020
- DoD Acquisition Commitment to Open Architectures (OA)
 - OAs are being adopted for major ACAT acquisition programs
 - OAs are being specified on programs of record
- Get Involved – To Join, Contact The Open Group: ogsosa-admin@opengroup.us

