Chronicles From the Book of MOSA: The Journey Continues

Ken Grob – Elma Electronic

Embedded Tech Trends 2023

Living La Vida MOSA! ETT 2023

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- **Chronicling the MOSA Journey**
  - A little bit of background
  - Initiatives that the Services are conducting
  - Efforts of the SOSA Consortium & industry to support those initiatives
- **Trends**
- **What's next**

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At A Glance

- Founded in 1960
- 800+ employees worldwide
- Annual revenue of $150 Million (2021)
- Global leader in embedded computing solutions, chassis, embedded boards, enclosures, 19” cabinets
- Worldwide manufacturing, design, and sales
- Solution partner of choice: technical expertise, precision engineering, reliability, and long-term support

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Bringing Rugged High-Performance Computing and Networking to Challenging Applications

- Rugged standards-based systems
- Extended temperature operation
- IP67/69 safe against water, sand, dust, and salt-fog intrusion
- High shock and vibration environment
- High-performance sensor processing, automated control, and deep learning

Modular Open Systems Approach

Fundamental Building Blocks

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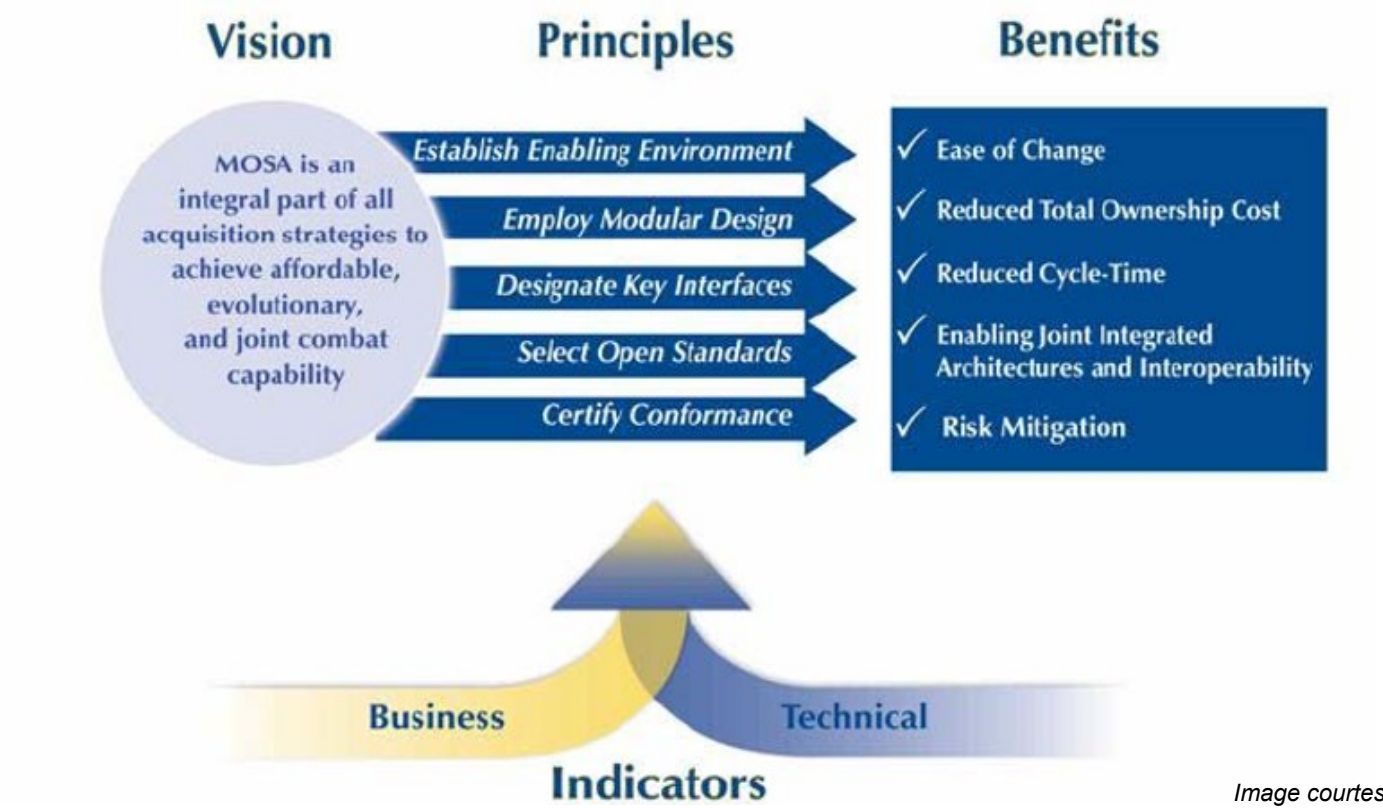

Image courtesy Open Systems Joint Task Force Program Manager's Guide

SOSA by the Numbers

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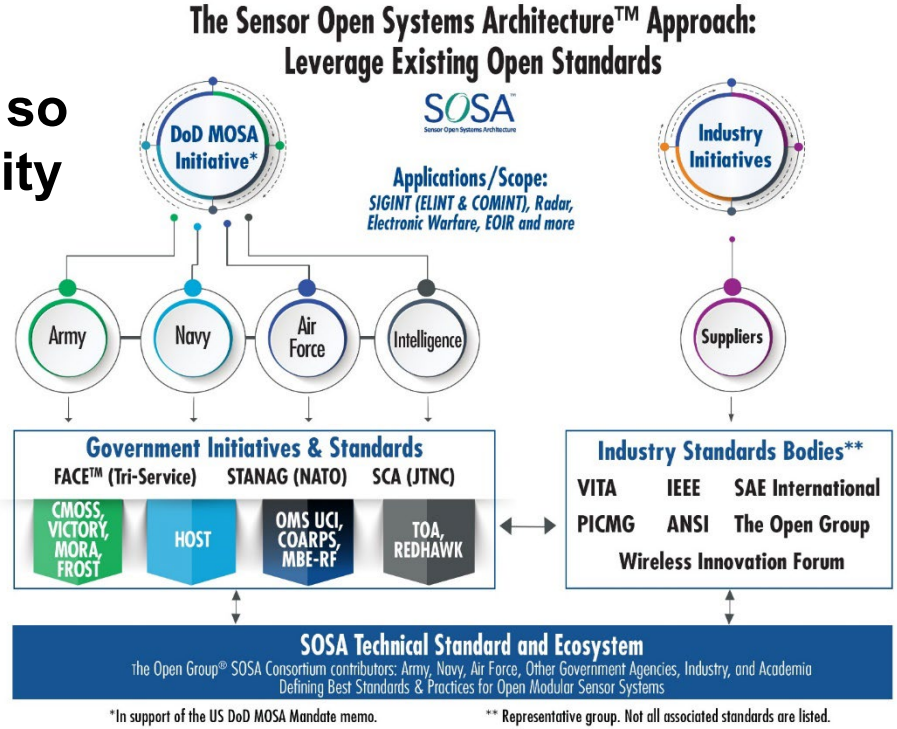
- **144 members as of January 2023 (74 members in 2019)**
  - Includes the Air Force, Navy, Army, other government, agencies, industry and academia
- **How and why these initiatives are so important to the defense community**
  - Building better platforms
  - Collaborative environment between government and industry
  - Ensure interoperability
  - Mix and match vendors



SOSA Consortium Recent Milestones

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SOSA™
Sensor Open Systems Architecture

SOSA Technical Standard

Published:

- Edition 1.0 - Sept 2021
- Snapshot 1 v. 2.0 - Aug 2022

In process:

- Snapshot 2 v. 2.0 in process

Support Documents

Published:

- Business Guide
- Supplier Guide
- Marketing Guide

In process:

- Reference Implementation Guide
- Acquisition & Contracting Guide

Elma's Participation in SOSA

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- **Valerie Andrew**
  - Senior Strategic Marketing
  - SOSA BWG Outreach Chair
- **Mark Littlefield**
  - Senior Manager, Embedded Computing Solutions
  - SOSA TWG SFF SC Chair
- **Ken Grob**
  - Director of Embedded Technology
  - SOSA TWG Hardware Committee
- **Other members and staff:**
  - Dave C., Ovidiu M., Gary Hanson, Ram R., etc.

Elma Partnering with the SOSA Ecosystem

Technologies, customer collaborations

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EIZO Rugged Solutions

(Pentek)

2022 MOSA Technology Demonstrations

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Showcasing an ecosystem of implementations of products aligned to the SOSA Standard at multiple events

TSOA-ID February 2022

FACE SOSA TIM & Expo - September 2022
12 Slot SOSA Aligned CMOSS-2 ATR and E-Frame with TrMA6x
Ethernet Performance & AI Multifunctional Demos

AUSA - October 2022
Ethernet Performance Demo

AUSA - October 2022
AI NVIDIA GPGPU Demo

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MOSA New Initiatives -

The Cavalry is in the Lead!

CMOSS Mounted Form Factor (CMFF)

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US Army CMFF Reference Architecture for Vehicles and Aircraft

- **US Army Technical Exchange Meetings** (TEM 8 and TEM 9)
- **CMFF RFI: CMOSS Mounted Form Factor (**RFI March-May 2022)
- **SAVE IDD for Box Envelope**
  - Focus on Block One System Requirements CS 25
  - Primes engaged in developing CMFF solutions
  - Programs will adopt CMFF RA as Block Point milestones are accomplished
- **U360:** 360 Degree Situation Awareness and Targeting Program, TEM March, 2022, B-Kit
- **Xtech Competitions**
  - PNT/Chassis/Switch in fall of ’21; CMFF- A-KIT in fall of ’22
- **Precision Navigation and Timing – Open Innovation Lab (PNT OIL)**
  - APG facility hosts industry suppliers to support test and integration of MOSA solutions

CMFF Phased Development Approach

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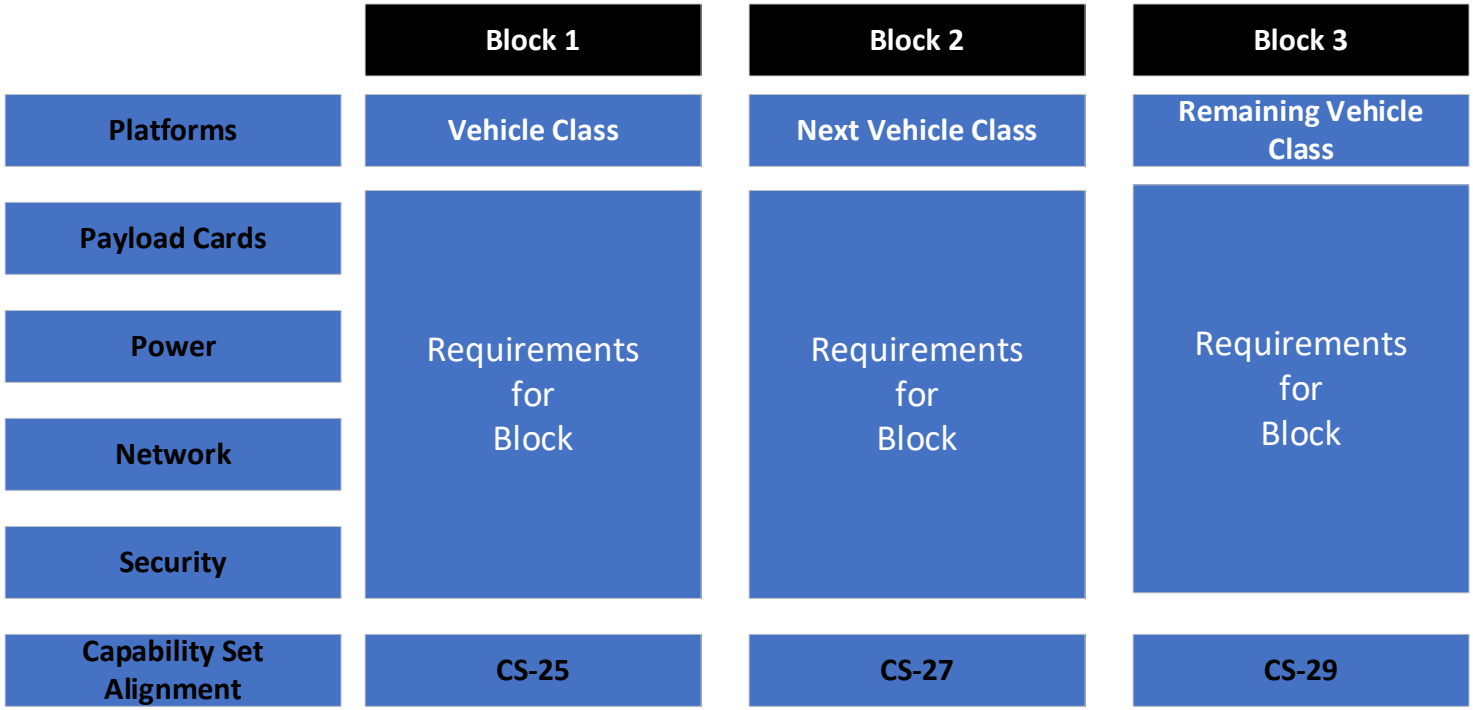

Incremental Approach Presented by the ARMY at the TSOA-ID 2022

CMFF Forward Path for Ground Vehicles

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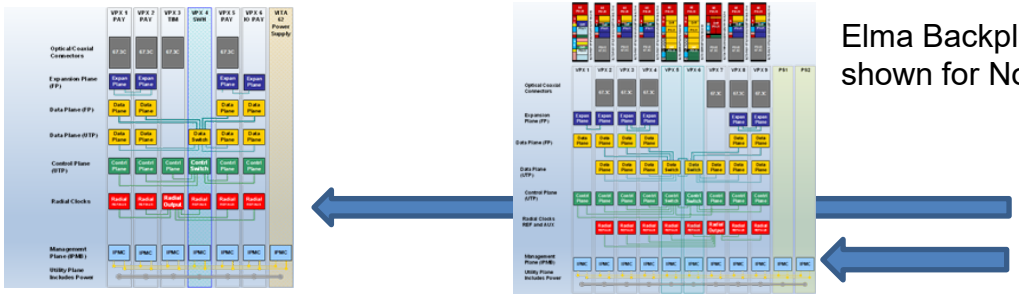
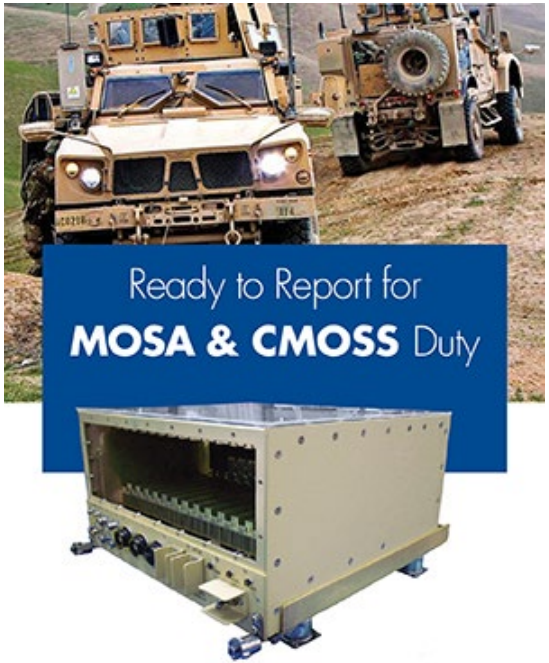
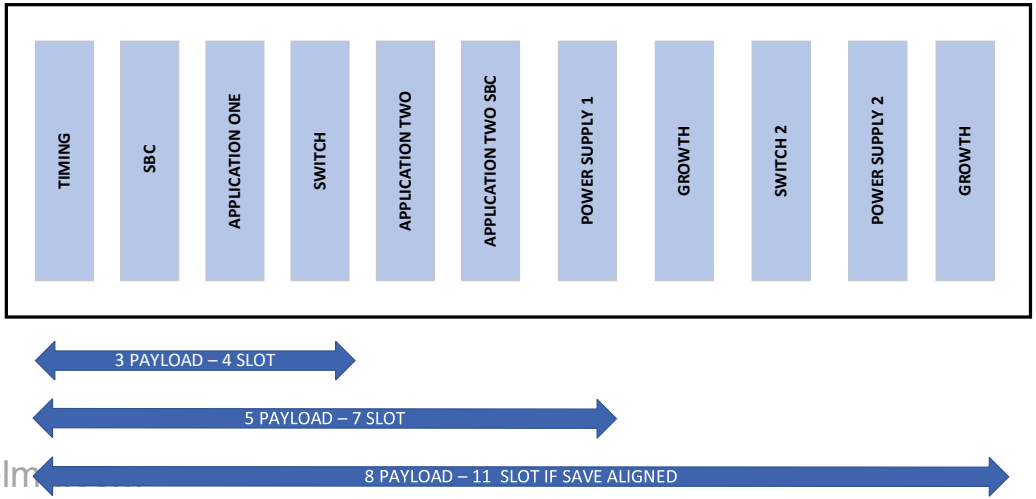


Elma Backplane Topology Drawings shown for Notional Chassis:

6 slot +
1 PSU
or;
9 Slot +
2 PSU



Scalable CMFF Chassis



SAVE Format CMOSS ATR Chassis Solutions

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- SAVE IDD CMOSS ATR with Tray
- CMFF Scalable BP Architecture
- 12 Slot CMOSS-2 Reference Backplane
- Wide Range - VITA 62 Power Supply
- Useful for CMFF Payload Testing
- Interim Step towards a fully compliant CMFF chassis

CMFF Challenges

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- **SWaP-C**
  - Constrained space
- **TDP constrained to 600 watts total**
- **Wide environmental requirements**
- **Stringent power supply requirements**
  - Must support a wide input voltage range
  - PS filtering for mixed environments
  - Hold-Up required
- **Boxes to be very rugged → driving requirements for:**
  - Shock, vibration, immersion, etc.

VPXtra® 400DW-IQI 3U

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MOSA New Initiatives – AI Applications in Vehicle Sensors (U360)

Technology Enabling Vehicle Vision Applications

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- **AI Object Recognition Demo**
  - Eight Slot CompactFrame integrated with EIZO GR2 RTX5000 GPGPU with CCT TrMA6x Ice Lake D Multi-Core Compute Intensive SBC
    - System runs an AI Application including a trained neuro-network

EIZO
EIZO Rugged Solutions

NVIDIA

- **Ethernet Performance Demo**
  - Comparison of Ethernet Performance: 1/10/40Gb vs 1/10/40/100Gb
    - Six Slot CompacFrame
    - TrK9 I/O Intensive Tiger Lake SBC
    - 4590A Ethernet Switch → 4682e Ethernet Switch

CONCURRENT TECHNOLOGIES

AI Demo - Implemented

Trend: GPGPUs Moving from Turing to Ampere Architecture

Ethernet Performance Demo

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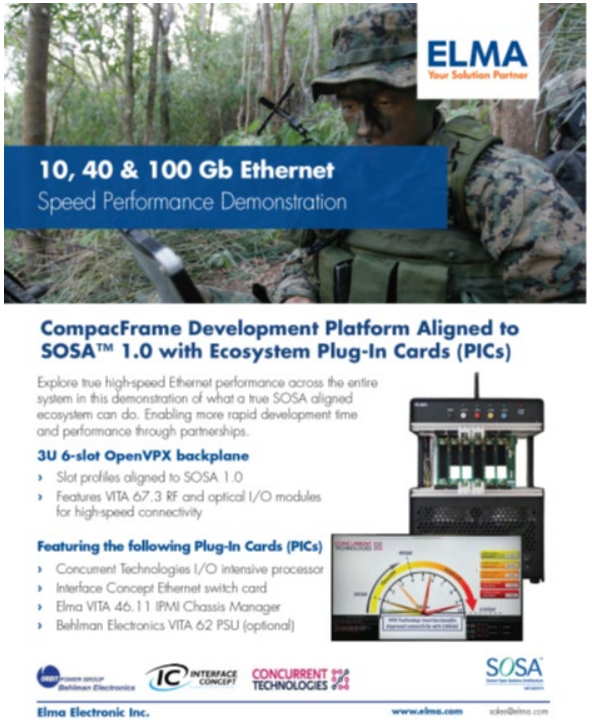
Trend: Ethernet Moving from 1/10/40Gb to 1/10/25/40/100Gb



Ethernet Performance:

40 Gb - 2.8 GB/sec -> 100Gb – 5 GB/sec

RDMA – 9 GB/sec

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What's Next?

SAVE Aligned Chassis Progression

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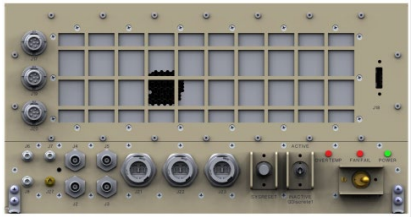
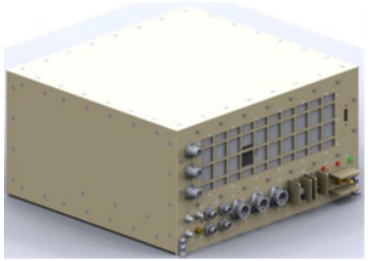
Existing SAVE
CMOSS ATR

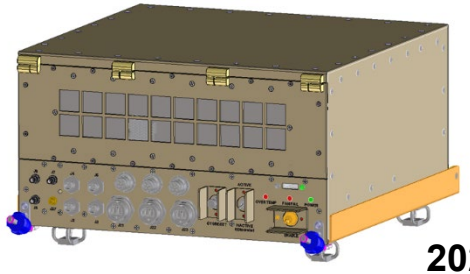


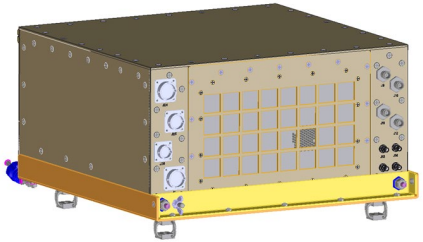
CMOSS



2022
Near Term

Ruggedized
CMFF ATR Test Chassis





Now

2023
Next Gen CMFF

Scalable, Sealed,
Rugged CMFF ATR

Notional

CMFF Aligned Backplanes

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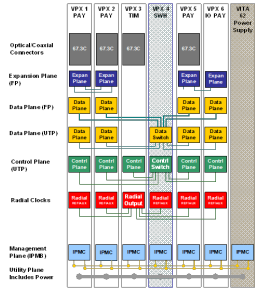
Scalable Backplane Architecture

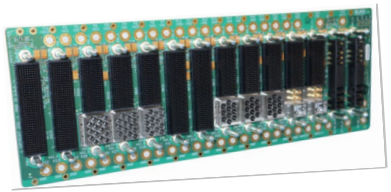
SAVE format ATR
Small-Medium BP
7 to 11 slots



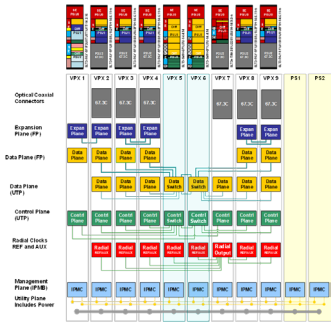
One VITA 62 PS

Six Slot + 1 PSU

CMFF Large
format ATR
Medium-Large
BP 11 to 13



Elma CMOSS-2 backplane shown



Two VITA 62 PS

Nine Slot + 2 PSU

Summary

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- **Release SOSA 1.0** is enabling ecosystem to produce payload PICs, switches, power supplies and other cards to develop modular open systems
- **Active demos** can now be integrated in record time using aligned PICs and Reference Chassis
- **Service branches** are adopting and beginning to deploy available product developed in alignment to the SOSA 1.0 Technical Standard
- **Benefits** of adopting MOSA is being proven by the increase of vendors producing products to support the effort
- **Over 50 vendors** demonstrated products at 2022 FACE / SOSA TIM & Expo
- **Stay tuned** for another exciting chapter from the Book of MOSA…

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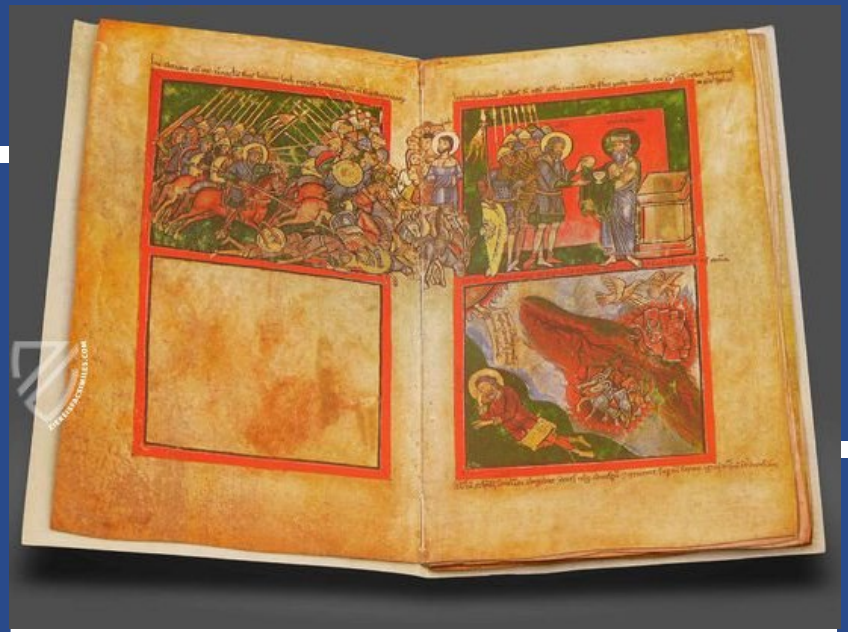

12th c. Mosa Psalter fragment

Thank you for your time!

Questions?