Displays & Building Blocks
Computing & Graphics Technologies
Key challenges in Open Architecture

• Hosts multiple software applications or functions in independent ARINC 653 partitions

• *Software Portability*, i.e. “immunity” to obsolescence, transferable to other platforms

• Flexibility in allocation of resources to applications (maintain performance integrity)

• Preservation of Intellectual Property in applications

• Reduced development cycle time

• Lowers risks on certification
MOSArt Pedigree

- Modular Open System Architecture for real-time avionics applications
- Over 10 years of Fielded Product
- Application (an internal) bridge to FACE™
MOSArt™ platforms in a nutshell…

• MOSArt™ renders Hosted applications agnostic from hardware platform
  – Supported by *application independent Video Integrity* and Health Monitors embedded in OpenGL Driver (Server)

• Platform API includes:
  – APEX (ARINC 653 standard) & MOSArt™ legacy

• Platform services include, among others:
  – Fault & event logging, BIT & health manager
  – Log book, file system
  – Memory & I/O management

• Hardware drivers include SATA, Ethernet, FPGA I/O (PCIe), etc.
• Supports OpenGL SC 1.01 with extensions
Platform Software & MOSArt™ Architecture

- System Startup
- System Error handling
- Platform parameters
- RTOS
- Configuration management

MDMA Controller

- Graphic Configuration
- GPU Scheduler
- Video Integrity Monitoring
- Composer & Windowing
- GLX and X-Window server

MOSArt Platform Management
MOSArt I/O Management
MOSArt Graphic Management
User Application

ARINC 653 Partitions

KERNEL MODE Services

CORE OS

Board Support Package

MOSArt CORE
(drivers, build-in-test)

User Application

MOSArt API
Application OS

MOSArt API
Application OS

Hardware
Latest Processing HW supported by MOSArt™

• CPM = Central Processing Module
  – Multi-core capability (up to 4) @ 1.5 GHz
  – Interfaces to today’s high speed busses (PCIe, Ethernet, USB…)
  – Green Hills tuMP Multi Core RTOS / Wind River Vxworks 653
  – Addresses increased certification expectations

• GPM = Graphics Processing Module
  – Up to 4 independent display heads per GPM (FHD@30Hz)
  – Can host mixed DAL inputs on single GPU
  – Based on OpenGL SC 1.01 with additions to optimize 3D graphics
  – Video integrity solution contained within GPM and OpenGL Driver
Unified platform development environment

MOSArt™ Platform Independent API & Services

Portable Application
Portable Application
Portable Application
Portable Application

PC
Reference platform with simulated interfaces
Target platform

Development cycle
Unified platform development environment

MOSArt™ Platform Independent API & Services

Portable Application
Portable Application
Portable Application
Portable Application

PC

No target HW needed
Rapid prototyping
Early validation of HMI and logic
Fast development & debug cycles
Test script development

Sensor Emulation
SIMphony™
Output

Portable Application
Portable Application
Portable Application
Portable Application

Early validation of HMI and logic
Fast development & debug cycles
Test script development
Unified platform development environment

MOSArt™ Platform Independent API & Services

Reference platform with simulated interfaces

Complements prototype HW
Early integration on target CPU/GPU
Early validation of realtime behavior
No other interface tooling needed

Development cycle

User Supplied Application

Simulated I/O as applicable
Physical I/O as applicable

Confidential & Proprietary data - Esterline Avionics Systems
Unified platform development environment

MOSArt™ Platform Independent API & Services

User Supplied Application

Development cycle

Target platform
- Short integration
- Debugged HW
- Focus on real-time aspects
- Pre-validated tests
Unified platform development environment

MOSArt™ Platform Independent API & Services

Portable Application
Portable Application
Portable Application
Portable Application

Reference platform with simulated interfaces

PC
No target HW needed
Rapid prototyping
Early validation of HMI and logic
Fast development & debug cycles
Test script development

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Development cycle
Development tools included with MOSArt™

• Configuration tools to ease setup of new projects for platform integrators and software applications developers
• Simulation tools to support early development of software applications by customers and other 3rd parties
  – SIMphony™, Software Test & Development Stations, etc.
• MOSArt development environment seamlessly integrates with many of today's SW development tools
  – Ansys’ Scade environment (Scade Display, etc.), Vaps, etc.

EAV supports platform integrators and application developers to reduce development cycles and certification risks
Software Applications
Variety of Apps available on Smart Platforms

- **Primary Flight Display**
  - Speed, Altitude, Attitude, ACFS modes, Alerts, etc.

- **Synthetic Vision System**
  - Terrain, Airports and Runways, Obstacles

- **Navigation Display**
  - Horizontal Situation Indicator, Flight Plan, Moving Map, TAWS, Weather Radar, other navigation information

- **EICAS**
  - Engine and systems indications, synoptic

- **Advanced Mission Capabilities**

- **Flight Management System**
Re-usable apps

MFD 3068 8x10 (6x8)

FDU 3138 (12x8)
Partitions 6x8, 12x8

Apps: PFD, ND, SVS, EICAS & Synoptics
Recent FACE™ program

- **US Navy C-130T**
  - 20 A/C. Program heading in ground test.
  - 3 units per shipset (plus two CMA-5024)
  - FRD RNP RNAV Rev A
  - FACE 1.0

- CMC Updated the CMA-4000 to be a FACE™ 1.0 conformant platform, being able to host FACE™ applications.

- The first application hosted is an RNP RNAV application, meeting the requirements of FRD RNP RNAV Rev A.

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* F-UoP – FACE Units of Portability
The Five Portable Components
Grouped Individually
FMF Application Overview Solution

FMF Functions Overview
- RNP/RNAV Common (DO-283B / DO-229D)
- Multi-sensor navigation modes with installed navigation sensors
- Approach Procedures, Supports SIDs and STARs
- Extensive flight planning and route creation, selection and modification capabilities
- Vertical Navigation for all phases of flight
- Tactical functions (SAR, Hover, Moving waypoint, Tactical Approaches...)

SFMS Technology Features
- Open Architecture
- Control and Display server which supports multiple control/display clients (i.e. ARINC 661, 702, 739)
- RTOS and MMI independent
- Portable, scalable and modular
- Model-Based development
- Low maintenance costs
- Components can evolve independently
- Better turn around time for new features on specific components
- Highly Configurable

FACE™
- Supporting FACE 2.1 Data model generation from the Design Model

Esterline CMC Electronics – Proprietary data