xTech Waveform Challenge
Sidekiq VPX425 CMOSS/SOSA SDR & SCA<->MORA Bridge

Program Overview for SDS Tactical Comms Group
November 2022

Epiq Solutions - Meaghan Zorij and John Orlando

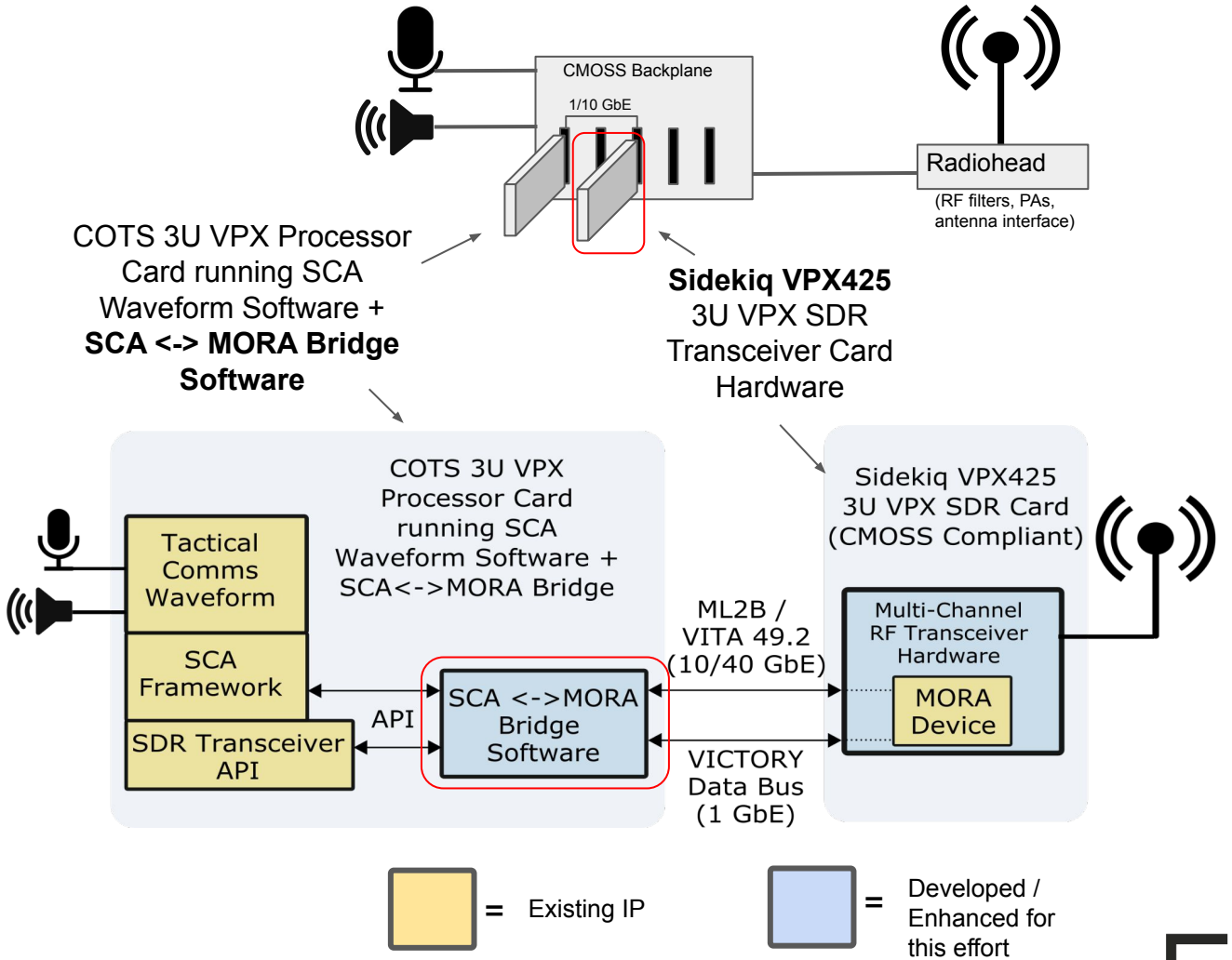
Viavi/Nordiasoft - Steve Bernier

Sciens Innovations - Travis Doll

Program Overview - What Problems are we Solving

1. Leverage existing Epiq-funded hardware/firmware building blocks to develop and deliver a prototype multi-channel CMOSS-compliant 3U VPX SDR card focused on tactical comms requirements (**Sidekiq VPX425**)

2. Architect, develop, and deliver a prototype **SCA <-> MORA Bridge** software component to allow existing SCA compliant tactical waveforms to interface with CMOSS-compliant SDRs supporting MORA 2.4



What Problems are we NOT Solving

- **Not meant to be a waveform porting effort**
  - Focusing on waveforms well-supported in SCA to serve as demonstration vehicles (AM, FM, DMR, and P25)
  - VPX425 is architected with sufficient resources to support both legacy and modern waveforms including SINCGARS, LINK16, TSM 6, and 4G/5G

- **Not tackling Red/Black separation on VPX425 card**
  - VPX425 is assumed to be black all the time
  - Full stack of waveform processing spread across VPX425 card and CPU processing card (where SCA waveform is run)
    - In theory, red/black separation could be pushed up to the CPU card
  - Future version of VPX425 may include full red/black separation with both thin + fat pipe interfaces to backplane for both red and black side

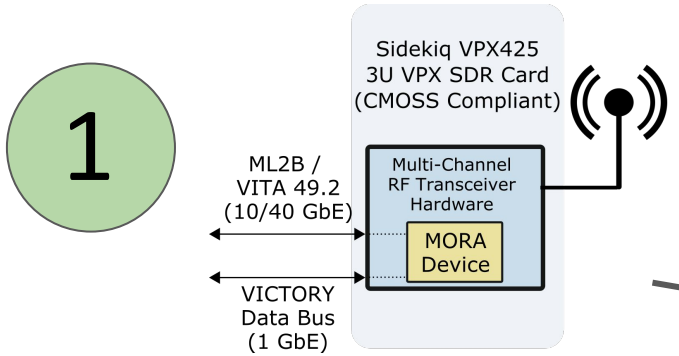
Team Background / Expertise

- In business since 2009 with a team of 60 full-time employees and >350 SDR customers to date
- Product-focused business delivering more than 15K SDRs since 2014
- Dedicated engineering, sales, and tech support team to ensure customer success
- Engineering and production in 20K sq ft headquarters in Rolling Meadows, IL capable of delivering 10K SDRs per year
- **Responsibilities:** Prime contractor, system architecture, Sidekiq VPX425 hardware development, system integration/testing
- Meaghan Zorij (Technical Lead)

- In business since 2013
- World recognized experts with SCA framework and architecture
- Existing customer-driven engagement with Epiq to provide an SCA layer on top of Epiq's SDR portfolio
- **Responsibilities:** Sub-contractor, architecture and development of SCA <-> MORA Bridge software, SCA waveform porting, system integration/testing
- Steve Bernier (Senior Engineering Manager)

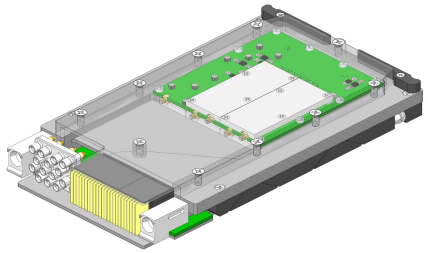
- In business since 2018
- Expertise with MORA implementation and validation
- Existing partnership with Epiq to provide MORA device functionality on Sidekiq VPX400
- **Responsibilities:** Sub-contractor, architecture and development of SCA <-> MORA Bridge software, system integration/testing
- Travis Doll (CEO/President), Patrick Wolfram (CTO), Kyle Velez (MORA Product Lead)

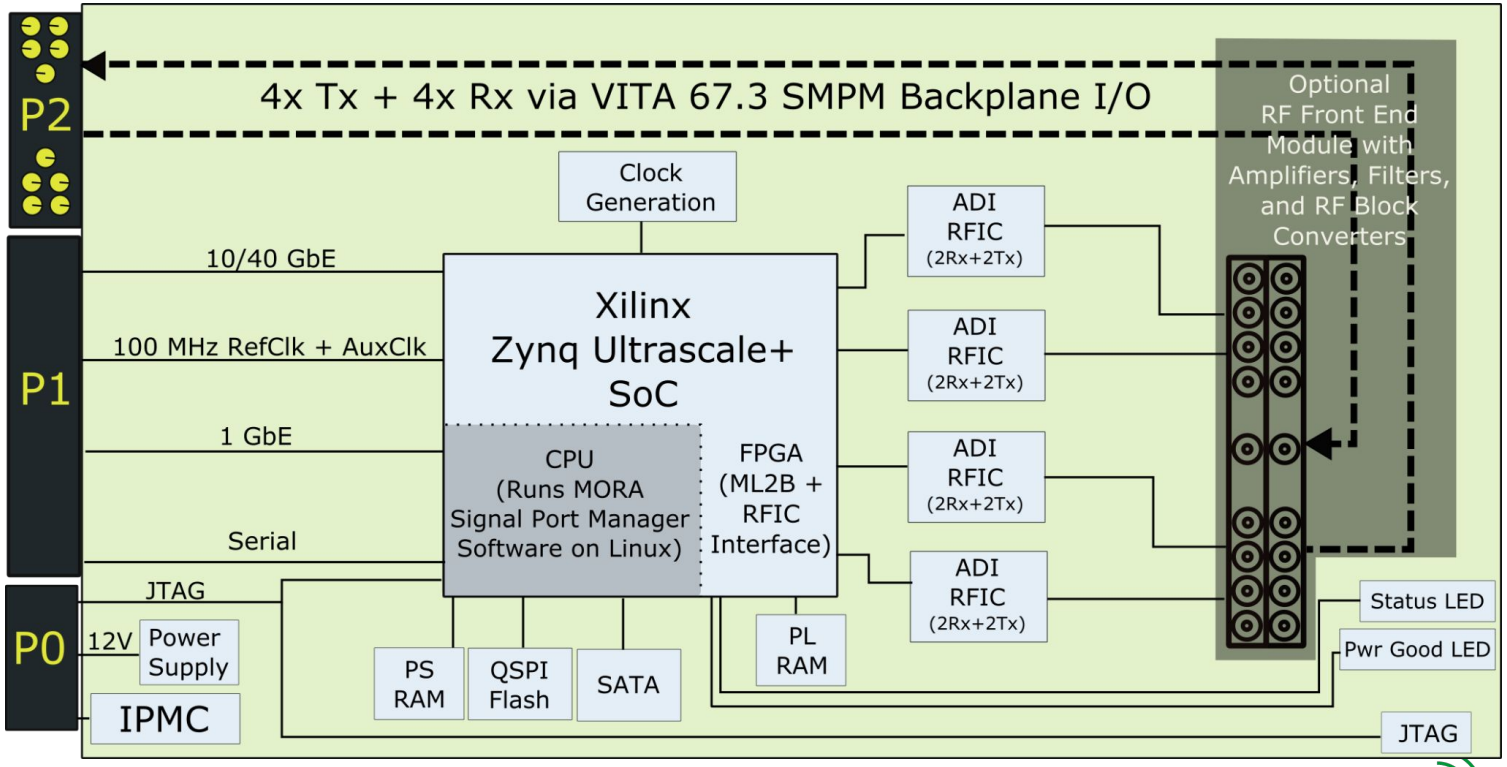
Technical Elaboration - VPX425



Elaboration of Sidekiq VPX425
Hardware + Firmware Concept

Sidekiq VPX425
3U VPX SDR
Concept Rendering

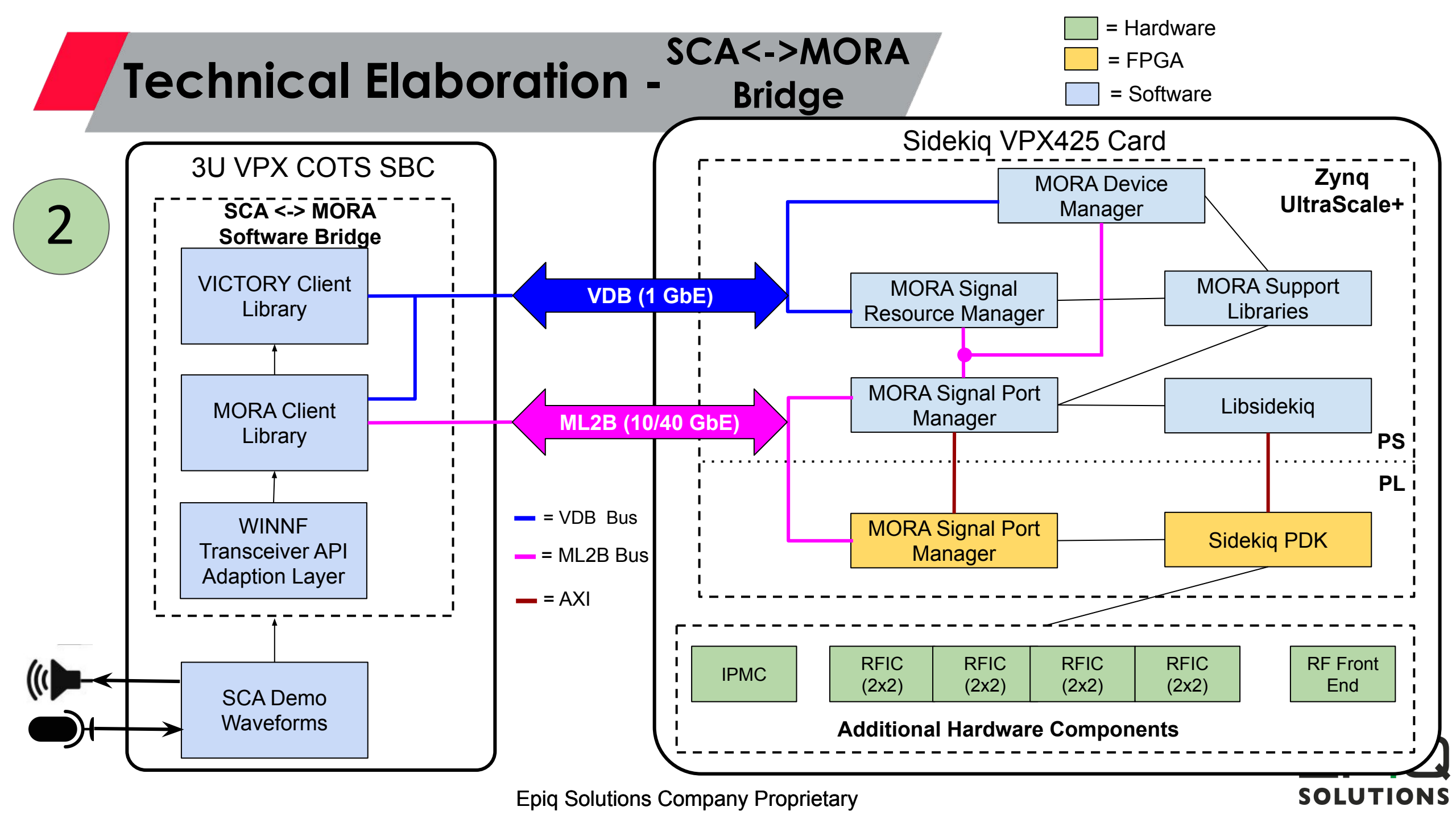




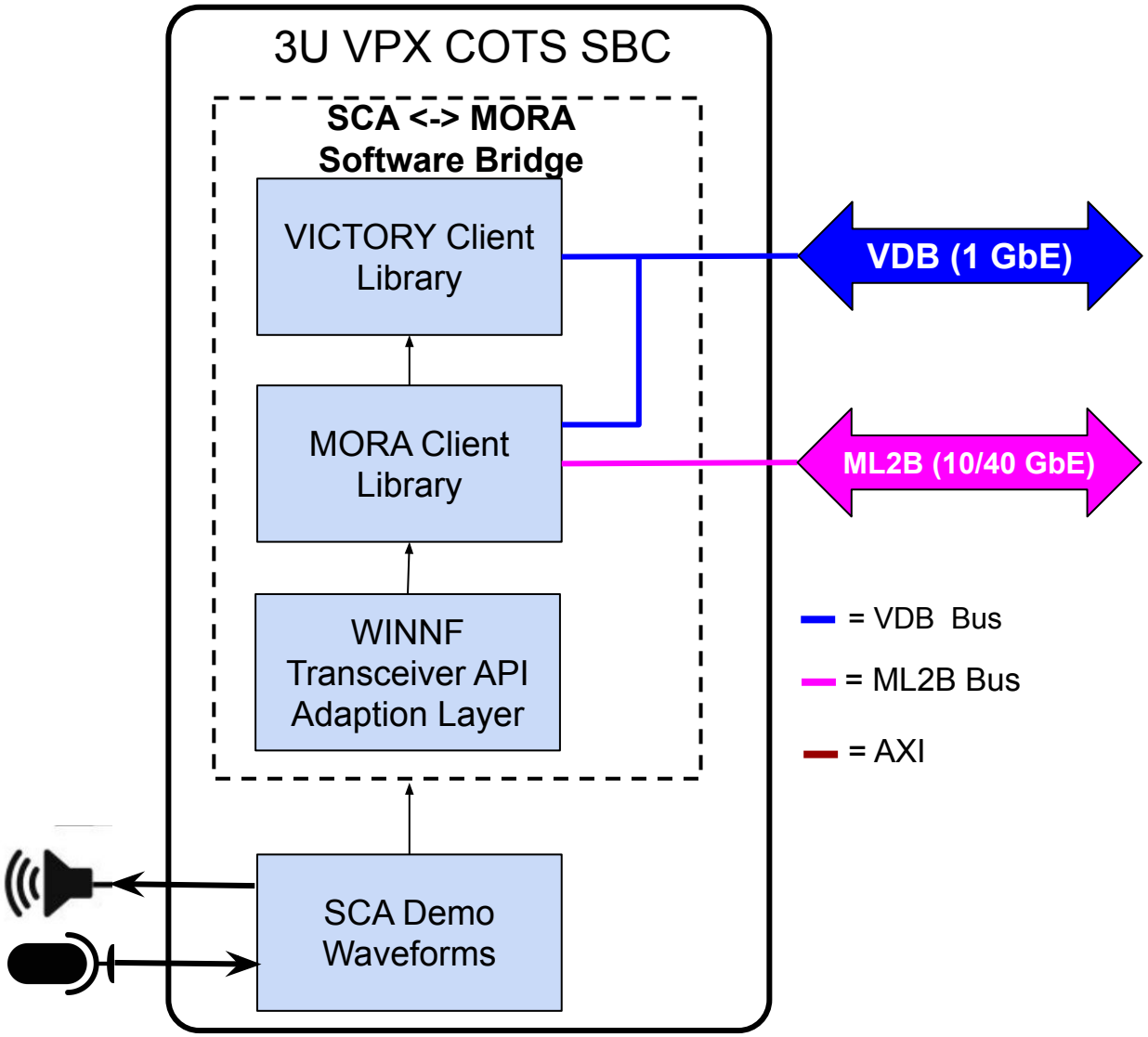
Benefits to the Army/Warfighter

- First multi-channel CMOSS compliant 3U VPX SDR transceiver card focused on tactical comms requirements
- Supports up to four simultaneous independently tunable tactical comms links (RF bandwidths ranging from 12 kHz to 40 MHz) through a single open architecture SDR card
- Open architecture enables tactical comms, SIGINT, EW, & CYBER on the same hardware
- Broad RF tuning from 10 MHz to 6 GHz on a single card to ensure wide range of spectrum access for comms
- Optional RF front end module for filters, amps, RF block conversion to extend tuning range to 18 GHz (all still within the 1” pitch 3U VPX card envelope)
- Cost optimized for volume deployments

Technical Elaboration - SCA<->MORA Bridge



MORA Side of the SCA<->MORA Bridge



The MORA Side of the SCA<-> MORA Bridge is built on helux Client Core which consists of two client-side libraries that exercise the MORA interfaces of the VPX425.

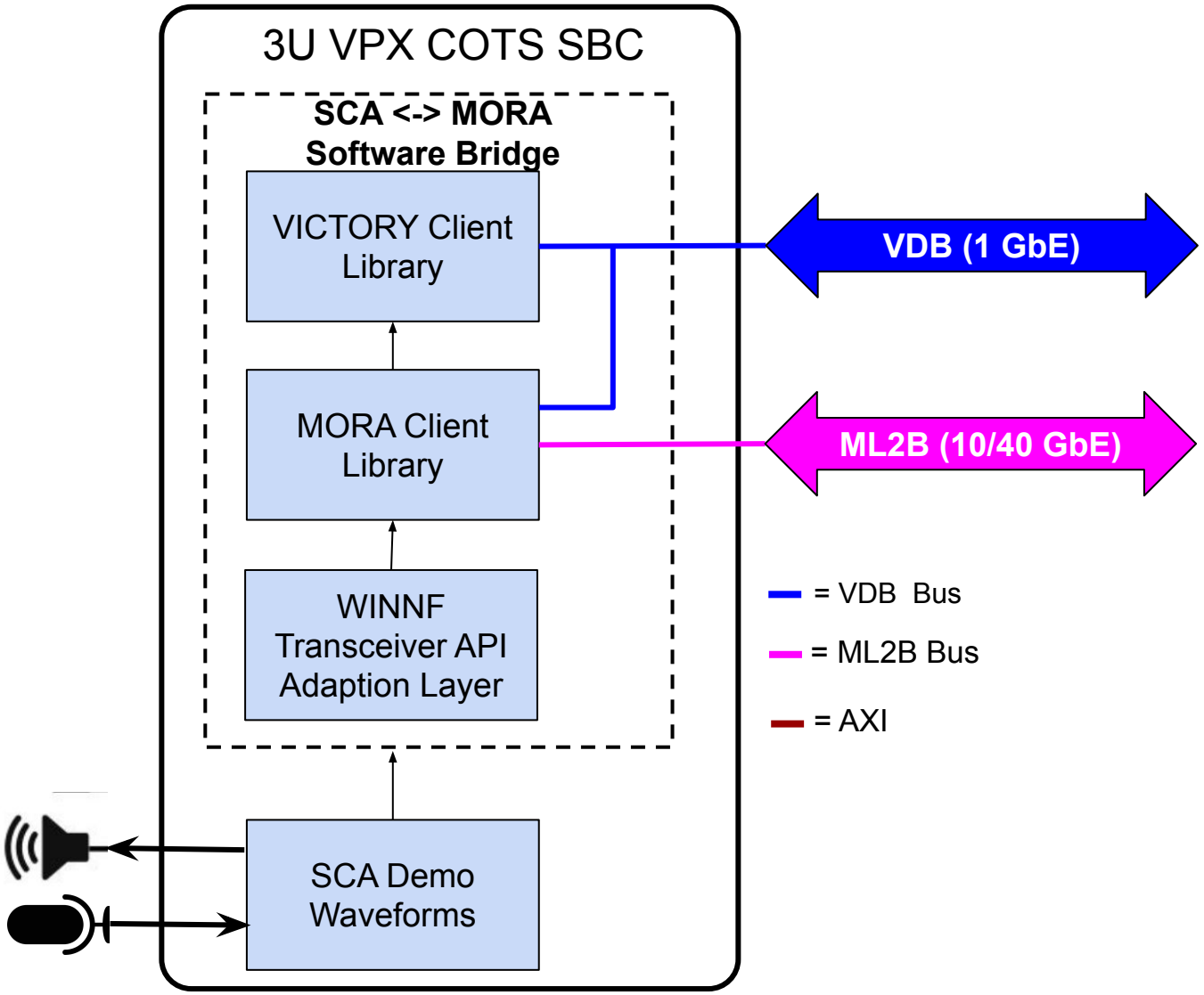
VICTORY Client Library

- Provides utilities for sending/receiving SOAP messages across the VICTORY Data Bus (VDB)
  - Device discovery
    - Find available devices
    - Query communication endpoints for VPX425
  - Query health and status information

MORA Client Library

- Provides utilities for sending/receiving MORA defined SOAP messages across the VDB
  - Query VPX425 Signal Ports and perform reservation over VDB
    - Reservation also sets destination endpoints for Data/Context packets
  - Send Device commands to VPX425 over ML2B
    - Operate, Standby, Transmit Inhibit, etc
- Provides utilities for sending/receiving MORA Data Messages (MDMs) across the ML2B
  - Configure VPX425 with MDM Control Packets over ML2B
    - Set Center Frequency, Bandwidth, Sample Rate, Gain Control, etc.

MORA Side of the SCA<->MORA Bridge



MORA Client Library (cont)

- Provides utilities for sending/receiving MORA Data Messages (MDMs) across the ML2B (cont)
- **Receive IQ Data**
  - Enable the flow of Rx streaming data from VPX425
  - Receive and parse VITA49 data and context packets from the VPX425 over the ML2B
- **Transmit IQ Data**
  - Create VITA49 Context Packets with signal metadata and send over the ML2B
  - Take IQ samples from the application
    - Encapsulate in VITA49 Data Packets and send to the VPX425 over the ML2B

SCA Side of the SCA<->MORA Bridge

NordiaSoft
now part of VIAVI Solutions

The SCA side will be based on the NordiaSoft eCo suite for Linux:

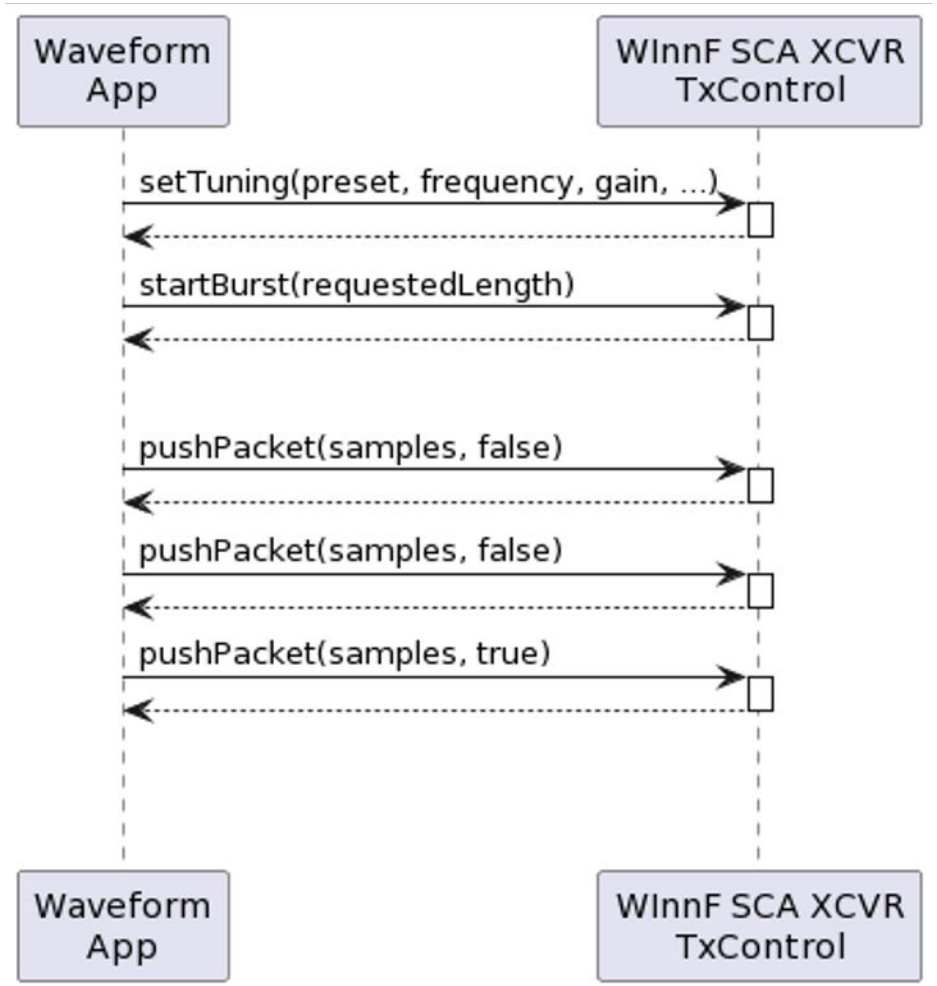
- eCo Hub : Core Framework for SCA version 4.1 with backwards compatibility unit of functionality
- eCo Architect : Graphical modeling and C++ source code generation
- eCo Inspector : Graphical runtime monitoring and control of SCA platforms
- eCo DSP: Library of DSP SCA components along with SCA waveform apps for Analog AM/FM as well as digital waveforms like DMR and P25
- JTNC devices/services and the Wireless Innovation Forum standard Transceiver Device

EPIQ SOLUTIONS

SCA Side of the SCA<->MORA Bridge

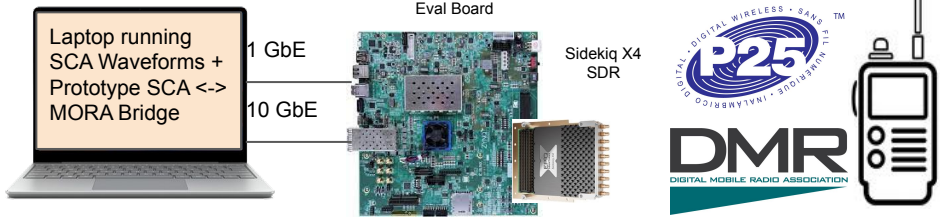
NordiaSoft
now part of VIAVI Solutions

- All 4 demonstration waveform apps will rely on the JTNC Audio Device and the WInnF standard transceiver API: AM, FM, DMR, and P25
- Waveforms use the immediate burst mode
- Waveforms will run unmodified from when they are used with other transceiver cards



EPIQ SOLUTIONS

Technical Execution Plan



Award of Contract

Month 2

Develop System Requirements + ATP

Month 3

Develop System Architecture

Develop first prototype of SCA <-> MORA Bridge software on eval hw

Month 6

Port AM, FM, DMR, and P25 waveforms for eval hw

Month 10

Port SCA <-> MORA Bridge + waveforms to Sidekiq VPX400 SDR for demonstration

Month 13

Month 10

Design and build revA prototypes of VPX425 (**Deliver q2 prototypes**)

Month 18

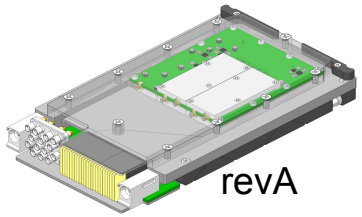
Update design and build revB prototypes of VPX425 (**Deliver q4 prototypes**)

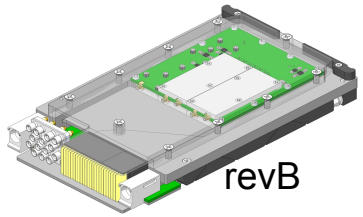
Month 20

Port SCA <-> MORA Bridge + waveforms to Sidekiq VPX425

Month 22

Final SCA<->MORA Bridge + SCA Demo Waveform Software Delivery for Sidekiq VPX425 revB Prototypes





Questions?

Thank you for the time today!