Joint Tactical Networking Center (JTNC)

Enabling Commercial Technology for DoD Open Systems Architecture Platforms
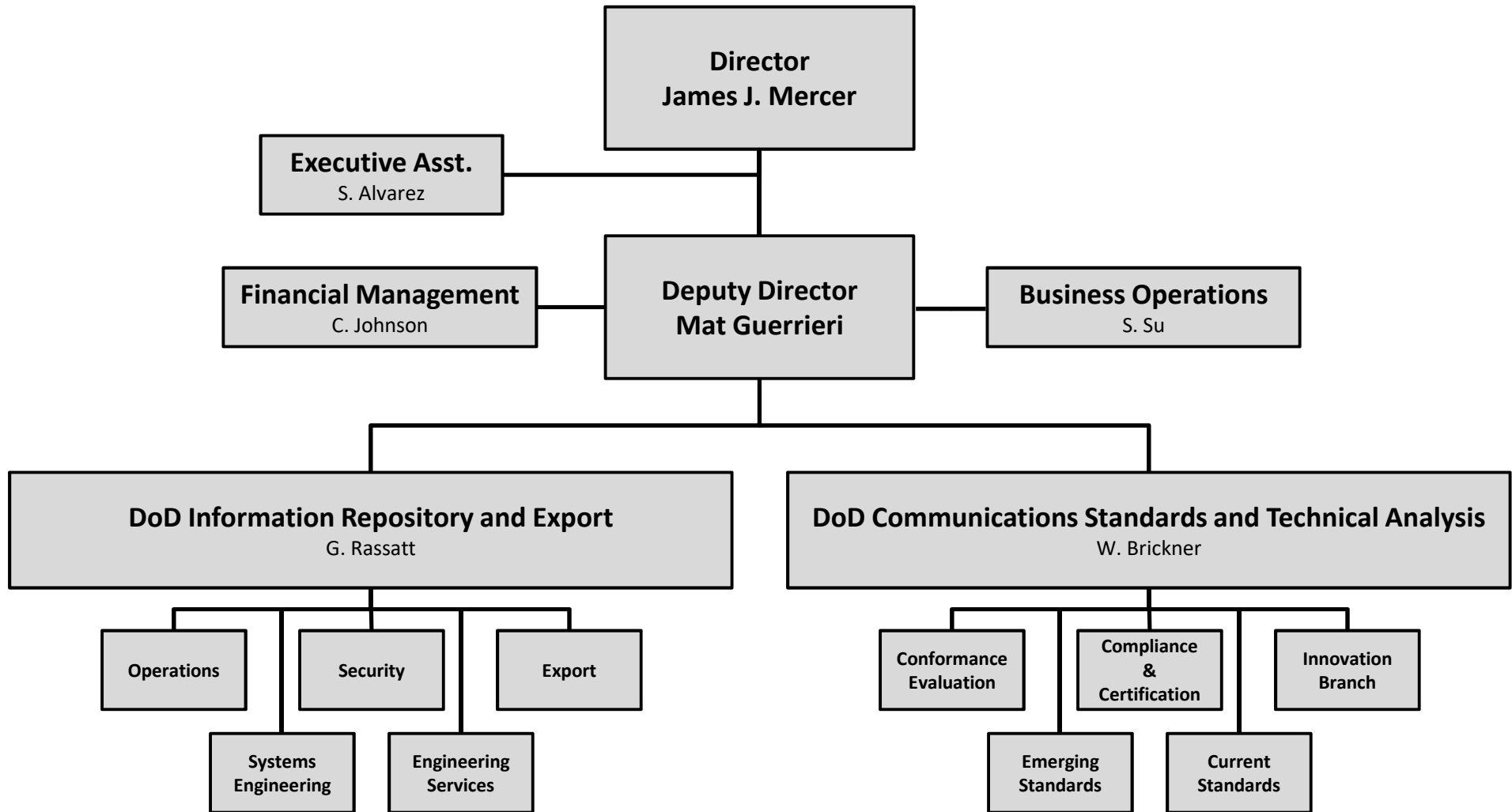
Overview Topics

- JTNC Org and Mission

- Rise of the Modular Radio Architecture (MRA)

- MRA Key Interrelationships

- Intended Benefits of MRA

- Next Steps

JTNC Organization

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                        │      Director        │
                        │   James J. Mercer    │
                        └──────────┬───────────┘
┌──────────────────┐              │
│ Executive Asst.  │──────────────┤
│   S. Alvarez     │              │
└──────────────────┘   ┌──────────┴───────────┐
┌──────────────────┐   │   Deputy Director    │   ┌──────────────────────┐
│Financial Mgmt    │───│    Mat Guerrieri     │───│ Business Operations  │
│   C. Johnson     │   └──────────┬───────────┘   │       S. Su          │
└──────────────────┘              │               └──────────────────────┘
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Director
James J. Mercer

Executive Asst.
S. Alvarez

Financial Management
C. Johnson

Deputy Director
Mat Guerrieri

Business Operations
S. Su

DoD Information Repository and Export
G. Rassatt

- **Operations**
- **Security**
- **Export**
- **Systems Engineering**
- **Engineering Services**

DoD Communications Standards and Technical Analysis
W. Brickner

- **Conformance Evaluation**
- **Compliance & Certification**
- **Innovation Branch**
- **Emerging Standards**
- **Current Standards**

JTNC Core Functions

- **DoD Information Repository (IR)**
  - Maintain a cyber-hardened DoD Information Repository (IR) providing controlled access for proprietary and non-proprietary waveforms
  - Maintain government configuration control of assigned IR products and data documents

- **Technical Analysis**
  - Perform capability characterizations/technical analyses on tactical communications products assessing the degree to which products meet their advertised capabilities and align with DoD wireless communications, cybersecurity, and interoperability standards and policies

- **Open Systems Architecture Standards**
  - Provide expertise, configuration management, and interface development for non-proprietary open systems architecture standards and interfaces that enable common radio, waveform, and network management functionality, and allow for rapid integration of enhanced technology/innovative capabilities

- **Exportability Analysis & Licensing Review**
  - Perform analyses to determine issues affecting potential exportability of tactical communications products. Review Software Defined Radio (SDR) and Waveform (WF) export license requests

- **Technical Advisor to Command, Control, Communications Leadership Board (C3LB**
  - Provide subject matter expertise on tactical communications products and/or Joint enterprise tactical networking as requested or identified in support of the DoD, the Services, and Program Offices
  - Assist Lead Services in the identification of potential tactical networking innovative technology solutions
  - Support the Principal Staff Assistant (DoD CIO) in oversight of Lead Service activities

Emerging Open Systems Requirements for Communications

- ## The US DoD has developed or sponsored several open system architectures

  - Future Airborne Capability Environment (FACE™)
  - Open Missions Systems (OMS)
  - REDHAWK
  - Software Communications Architecture (SCA)
  - Sensor Open Systems Architecture (SOSA™)
  - And others …

- ## Must instantiate communications on native open systems platforms

- ## Must meld tactical communications with software defined networking

  - Earlier generation of MANETs did not achieve expectations

- ## Must rapidly repurpose commercial technology

  - Adversaries adopting and modifying cheap, reliable, commercial communications

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What is the Modular Radio Architecture?

The Modular Radio Architecture (MRA) is an overlay of messages, behaviors, information security, and design patterns to extend DoD open system architectures such as CMOSS, SCA, REDHAWK, SOSA™, and FACE™

Why MRA?

- Assist the development of architecturally independent tactical wireless communications systems
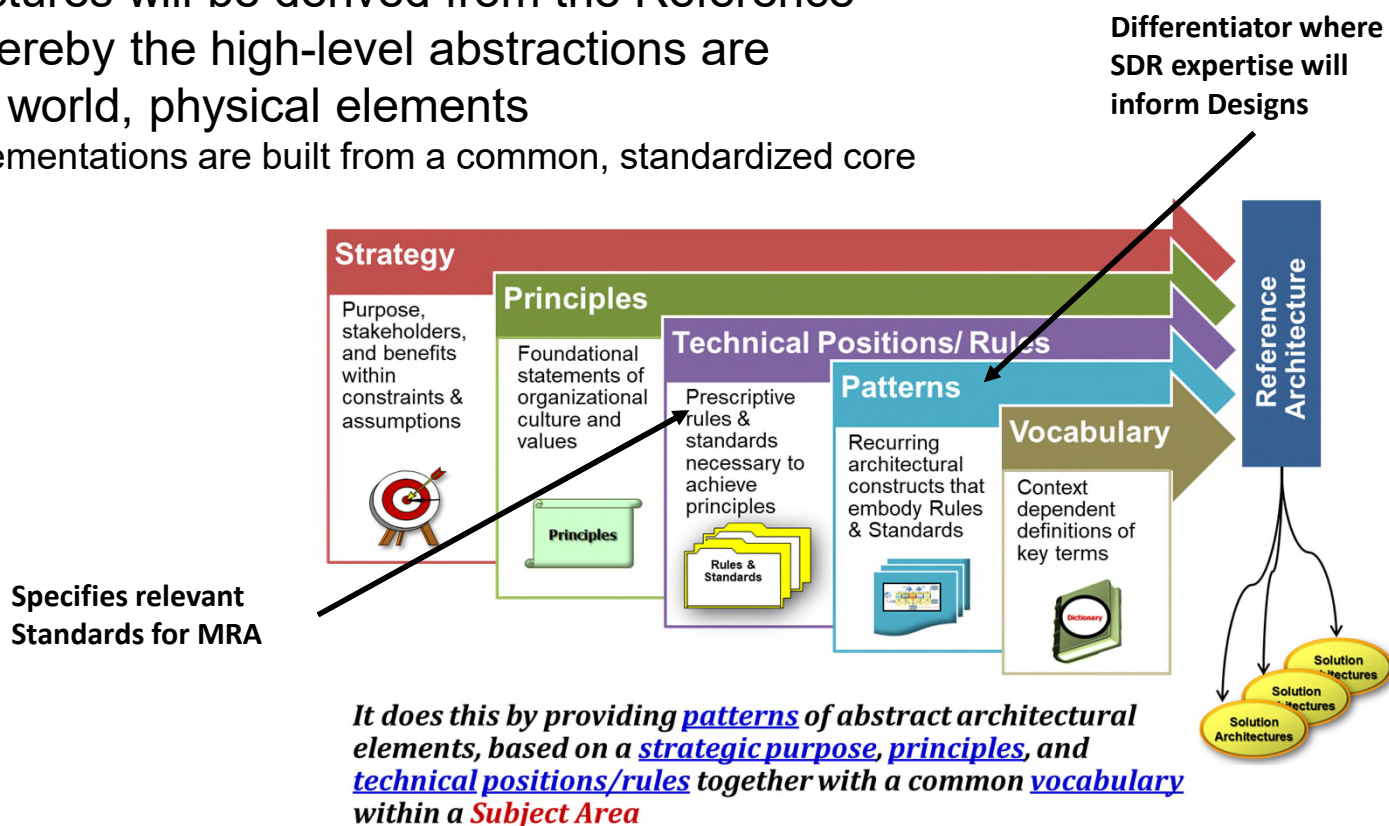- Provides efficient system integration of interoperable and secure capabilities
- Enables secure and reliable communications upon that host system or framework

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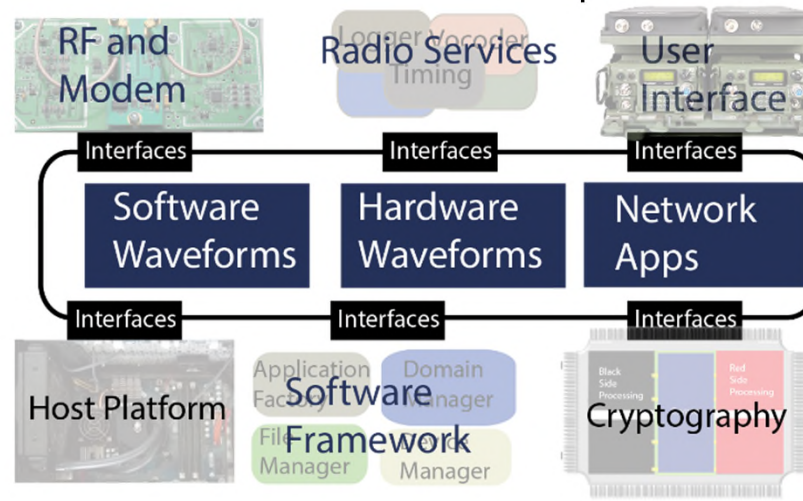
How will MRA be Defined?

- MRA will be developed in accordance with the DoD Reference Architecture principles[1]
  - Allows for a high degree of implementation freedom
- Solution architectures will be derived from the Reference Architecture, whereby the high-level abstractions are replaced by real world, physical elements
  - Individual implementations are built from a common, standardized core definition

Differentiator where SDR expertise will inform Designs

Specifies relevant Standards for MRA

Strategy
Purpose, stakeholders, and benefits within constraints & assumptions

Principles
Foundational statements of organizational culture and values

Technical Positions/ Rules
Prescriptive rules & standards necessary to achieve principles

Patterns
Recurring architectural constructs that embody Rules & Standards

Vocabulary
Context dependent definitions of key terms

Reference Architecture

It does this by providing patterns of abstract architectural elements, based on a strategic purpose, principles, and technical positions/rules together with a common vocabulary within a Subject Area

Solution Architectures

1. https://dodcio.defense.gov/Portals/0/Documents/DIEA/Ref_Archi_Description_Final_v1_18Jun10.pdf

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Relationship Between SCA and MRA

- MRA defines external system interfaces
- SCA defines internal communication systems interfaces

SCA-compliant radios can be built independent of the MRA

MRA-compliant radio cards can be built independent of the SCA

MRA-compliant radio cards can be built using the SCA

MRA

SCA

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SCA – specifies how to implement a communications system

MRA – specifies how to manage and control communications within a system

Relationship Between MRA and Other On-going OSA Efforts

A primary customer for MRA is terrestrial vehicle systems

- Enables portability of software applications across hardware platforms
- Software framework selected based on mission area
- Allows for sharing of RF resources such as antennas and amplifiers
- Defines interfaces between RF functions and components
- Enables capabilities to be fielded as cards in a common chassis
- Common form factor including physical, electrical, and environmental specifications
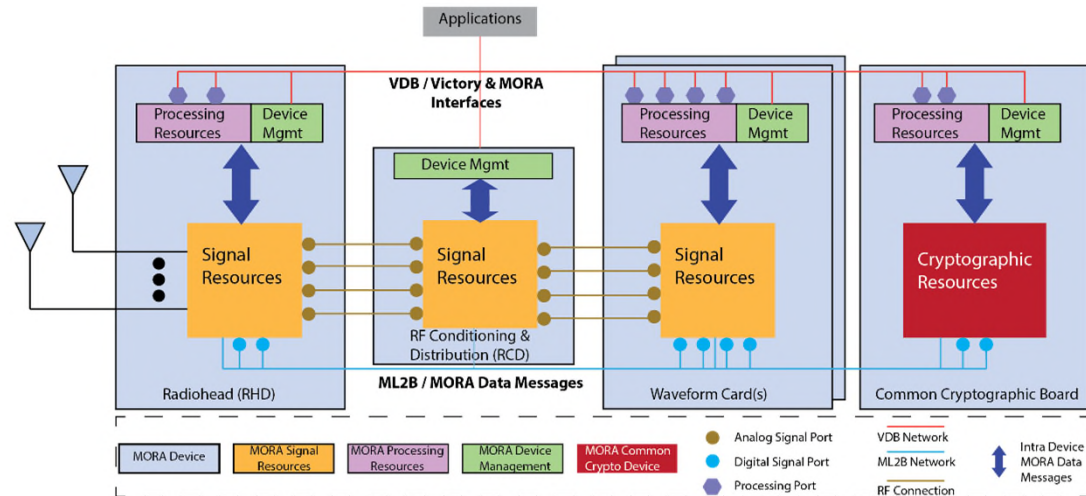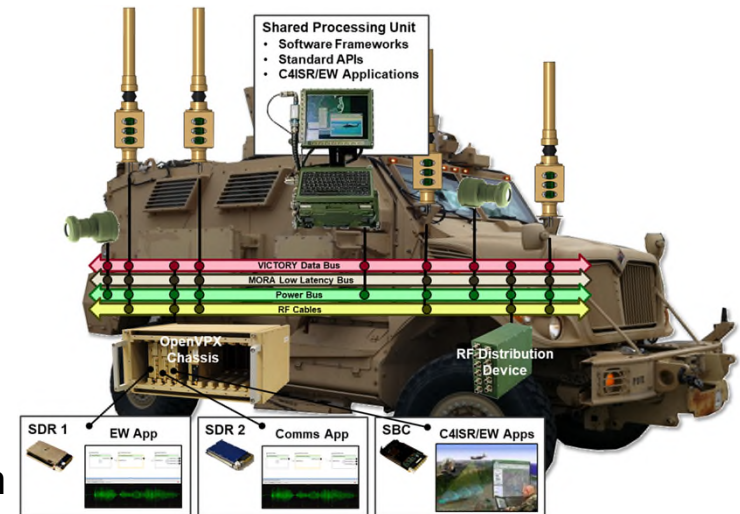
Improved Communications System Integration on Airborne Platforms

The DoD has invested heavily in airborne avionics frameworks such as Open Mission Systems (OMS) and Future Airborne Capability Environment (FACE™)

Intent of the frameworks:
- Reduce lead times
- Promote reuse of software
- Promote competition

MRA provides common validated messages and design patterns for instantiating communications systems natively on airborne avionics frameworks

Rapidly Repurposing Commercial Communications Technology

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- Commercial technology companies have a different business model than traditional military suppliers
- Their development and release tempo is not matched to DoD development processes
- Need to 'shim' or adapt commercial software systems to DoD open system architecture frameworks

- MRA promotes message-level communications between disparate waveform/radio cards and chassis services
- Cards and services can be readily replaced, matched to commercial release tempo
- Capabilities such as 5G can be made available in DoD systems much more quickly than traditional hardware and software porting

Next Steps

- Collaborate with DoD consortia and open architecture groups

  – Ensure architectural consistency of DoD solutions and requirements

- Solicit industry participation and feedback

  – Obtain better understanding of "art of the possible" and incorporate best practices

  – Extend solution to have alignment with coalition solutions

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- Address scenarios beyond terrestrial vehicle systems

  – Patterns and abstractions should address additional domains and form factors, e.g. how will the system architectures differ if the applications do not reside on cards?

- Identify non-technical activities required to promote MRA adoption

  – How much industry buy in is required?

  – What infrastructure elements would compel organizations to evaluate a new technology or approach?

  – What programmatic items would compel organizations to implement a new technology?

MRA Roadmap

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