USD(R&E)

Application Programming Interfaces Enabling Artificial Intelligence and Big Data Interoperability

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Outline

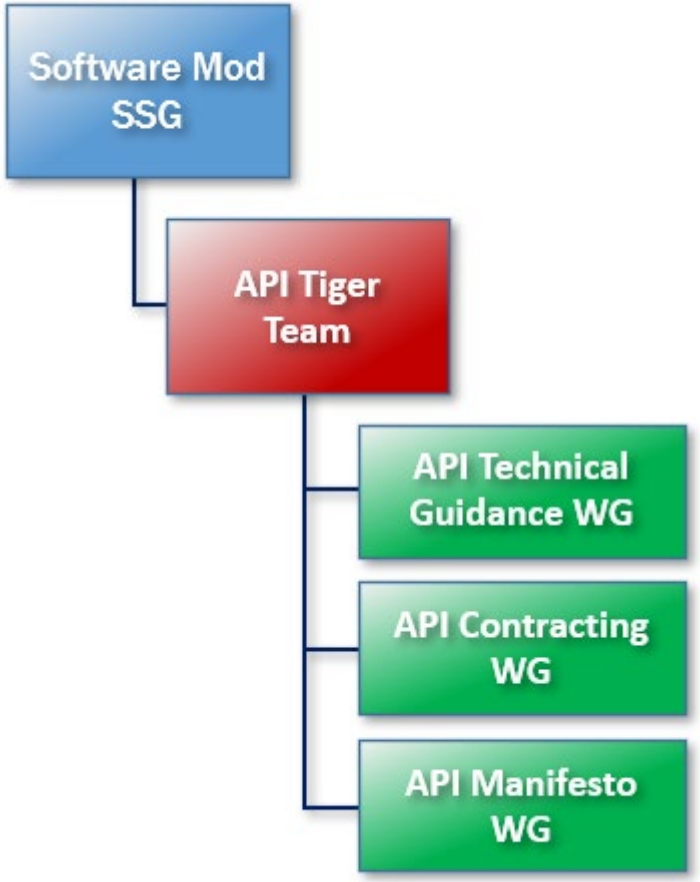
- DoD API Tiger Team
- Challenges for Data Centricity and Interoperability in DoD
- Current Approach to API
- Benefits of APIs
- AI, Big Data and APIs
- To-Be API Ecosystem
- DoD & NATO API Strategy & Technical Guidance
- API Path Forward
- Conclusion
- Q & A

Driving Enterprise Change through API Tiger Team

API Tiger Team

- Directed by DoD Software Modernization Senior Steering Group (Software Mod SSG) and its Action Officer Working Group (AOWG)
- Strives to establish a “Data Centric,” and “API First” approach to share data and services to achieve ubiquitous interoperability across the Department
- Strives to establish a thriving DoD API ecosystem to enable and support joint warfighting capabilities in the 21st century

Tri-chaired by CIO, A&S and R&E



DoD Challenges for Data Centricity and Interoperability

- Interoperability is critical to the Department of Defense (DoD) to support joint warfighting, and artificial intelligence (AI) superiority
- Programs must focus on development of modern and adaptable software

APIs will align consumers to curated data through federated data exchanges, enhancing data collaboration and supporting modernization.

DoD Challenges (continued)

Software modernization challenges:

- Siloing
- SAPing
- Hoarding
- Acquisition barriers
- Tight coupling between systems
- Non-standard/proprietary interfaces
- Lack of a coherent, cohesive, large-scale approach for interoperability across DoD

DoD IT Advancement Strategy

Current Approach to APIs

- Interface Control Document (ICD) driven
- Not discoverable
- Proprietary protocols with lack of data standard, or open standards
- Tightly coupled, compile-time integration
- Limited adaptability to change or new technologies (e.g., AI/ML)
- Limited modularity, or monolithic architecture
- Costly “Lift and Shift” required for Cloud adoption
- Limited scalability with performance bottlenecks
- Lack of Zero Trust (ZT) cybersecurity and modern authentication capabilities
- Low reliability with ever-increasing high sustainment costs and overhead

- **The Department needs to leverage modern software development practices and Agile**
- **The Department needs to reduce sustainment costs**

APIs Support Legacy System Modernization

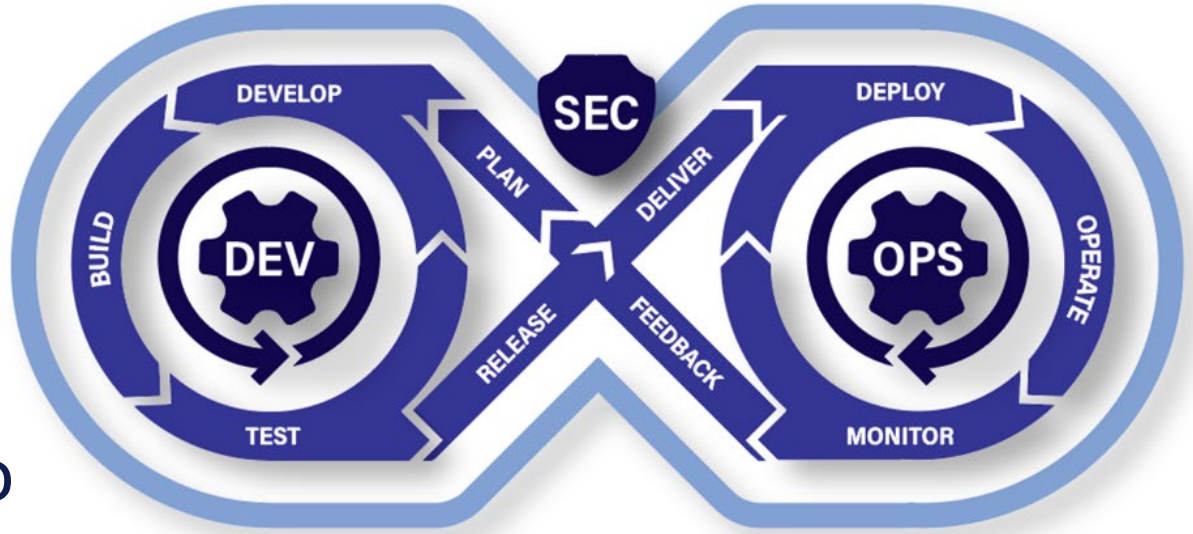
- The DoD has many decades-old legacy systems in its mix that are too important to fail
- Big bang replacement of these legacy systems would be too expensive and time consuming
- Seeking path forward with the gift of APIs through a range of innovative tactics (e.g., Strangler Pattern, Adaptors)

Benefits of APIs

- Standardization
- Encapsulation
- Error handling
- Scalability
- Versioning
- Security
- Automated Testing
- Continuous Monitoring, and Logging

APIs Enhancing Reliability

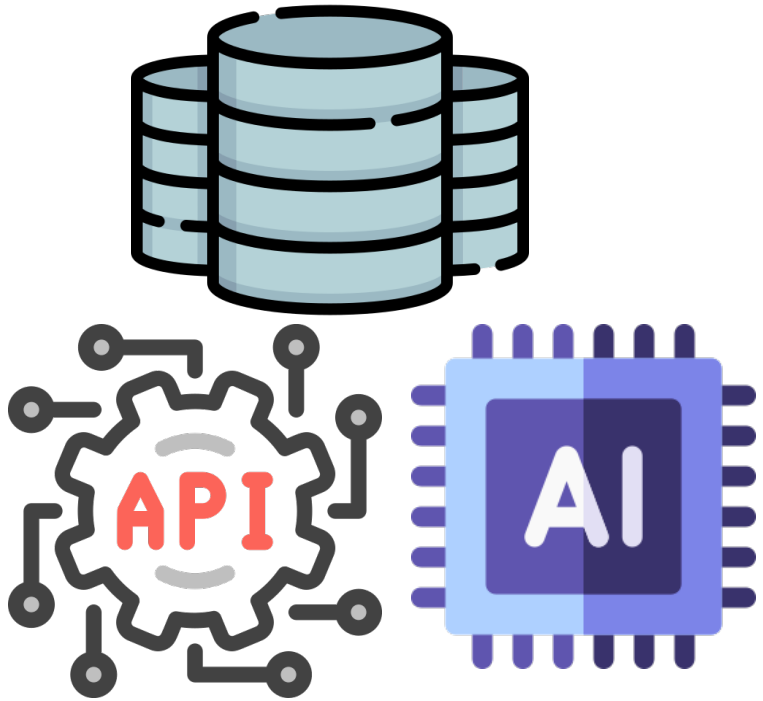
- Develop APIs using DevSecOps
- Software Factories
- Microservice Architectures
- Collect API Metrics
- Provide SDKs and Libraries to enable rapid adoption
- Establish API Governance



AI, Big Data and API Symbiosis

Together, AI, Big Data and APIs form a symbiotic relationship that drives innovation across various domains.

- **AI** provides the intelligence and reasoning
- **Big Data** provides the large datasets that are complex and difficult to process using traditional tools
- **APIs** enhance integration by:
  - Acting as the application nervous system
  - Enabling rapid integration of AI models and Big Data
  - Facilitating secure data exchange and functionality between systems
  - Enhancing discoverability between systems



AI APIs and AI Libraries

- AI services typically have prompt support for simple tasks, but most AI ecosystems also provide an AI API or library for integration into your own applications
- Google for example provides a dozen different multi-modal AI-related APIs e.g., Gemini
- Department of Air Force (DAF) just released their NIPRGPT Beta supporting CUI
- Ask Sage just received their ATO and is now available up to GovCloud IL5 and supports CUI level data
- Other AI systems are working to provide capabilities within the CUI IL5 environment for the DoD as well

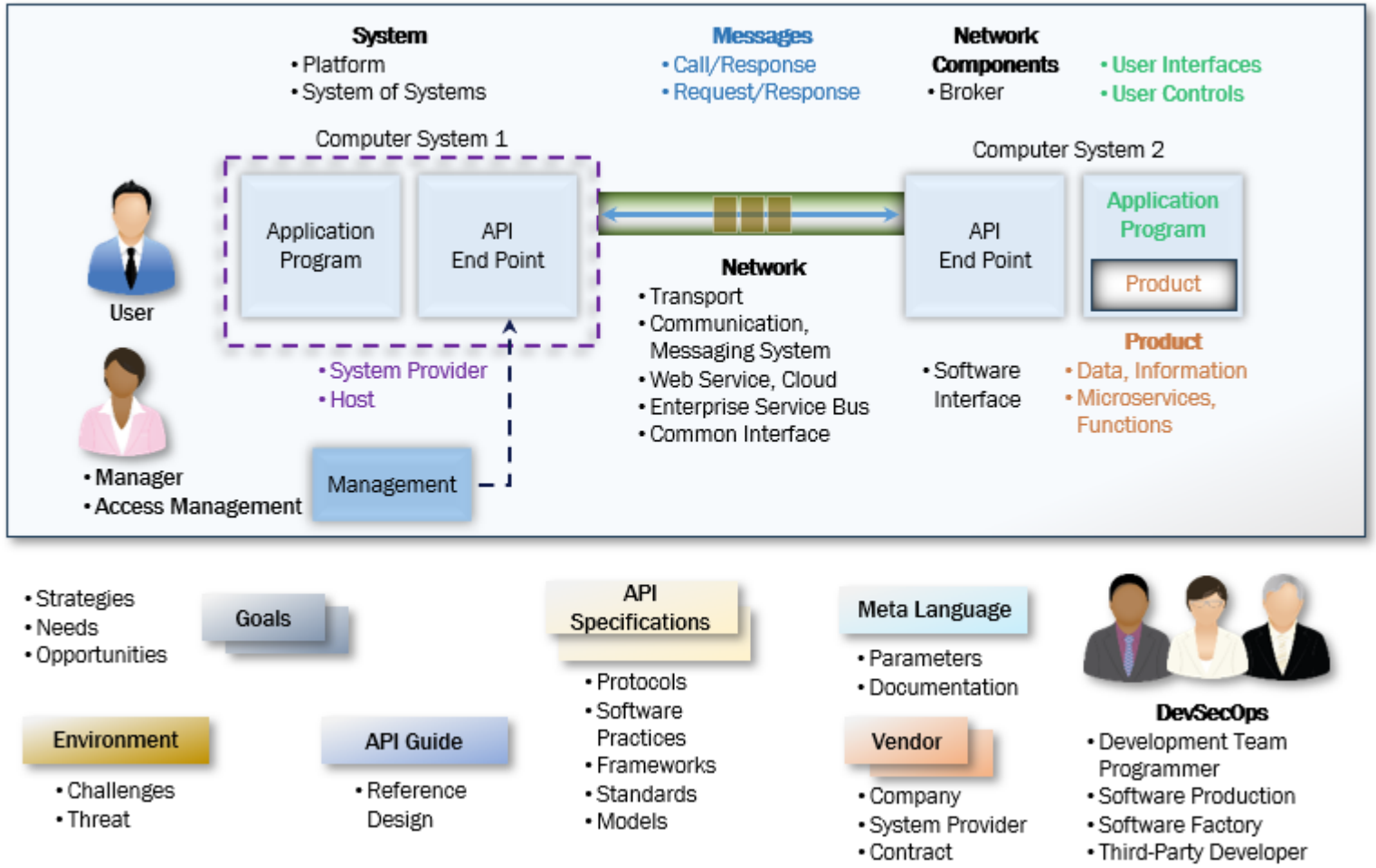
Why Does DoD Need to Adopt APIs?

- APIs will improve security, and scalability of data integration
- APIs will provide benefits to Modular Open Systems Approach (MOSA) which allows legacy systems to more rapidly integrate with modern capabilities (e.g., AI/ML) and data
- APIs are a building block for the new CJADC2 reference architecture and will be fundamental to implementing system to system interoperability at scale across the DoD, NATO and coalition partners
- The API Tiger Team is chartered under the DoD Software Modernization Strategy and Implementation Plan which is into year 3 and providing guidance focused on helping programs address API acquisition and technical implementation.
- APIs will be a journey for the DoD but one that will provide significant benefits when mature

To-Be API Ecosystem

Top characteristics of an interoperable API ecosystem

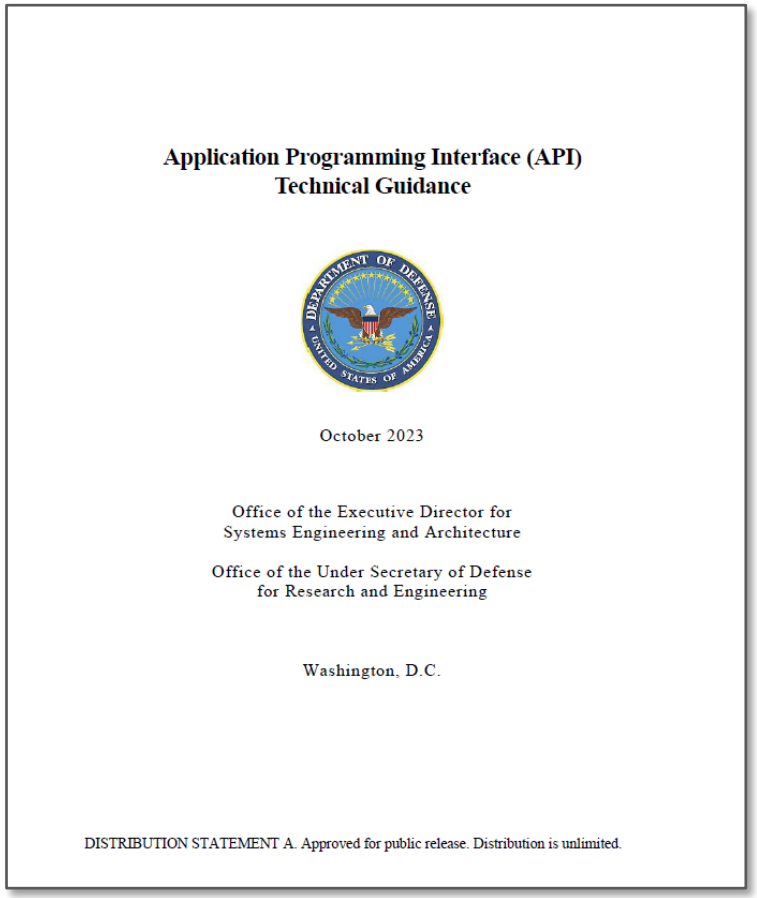
- Discoverable
- Adheres to common standards
- Platform and language independent
- Zero-Trust Secured
- Loosely coupled between producers and consumers
- Resilient



Typical API Ecosystem

API Technical Guidance – Completed Work and Next Steps

- Minimum Viable Product (MVP) completed Oct 2023
- Minimum Viable Capability release (MVCR)-1 expected July 2024
- Planned MVCR-2 release planned Oct 2024



Application Programming Interface (API)
Technical Guidance

October 2023

Office of the Executive Director for
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Office of the Under Secretary of Defense
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Washington, D.C.

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https://www.cto.mil/wp-content/uploads/2023/11/API-Guide-2023.pdf

NATO Technical and Implementation Directive for APIs

- R&E leading bi-weekly Working Group meetings with NATO
- Initial draft outline complete
- Expected MVP release Oct 2024

Contents

API Path Forward

- The API Tiger Team will continue to solidify program guidance and best practices for APIs
- APIs are essential to the success of the DoD in delivering new and innovative capabilities to the warfighter at the speed of need

Conclusion

- **API implementation with open standards**
  - ➢ Fosters data-centric mind-set
  - ➢ Enables integration with new technologies
  - ➢ Supports ubiquitous communication paths
  - ➢ Enables warfighter dominance
- **API Tiger Team**
  - ➢ Leverages collaboration across Services & OSD
  - ➢ Promotes enthusiastic coalition of the wiling
  - ➢ Continues to look for new members

Questions & Answers

API Technical Guidance Topic Areas

- Introduction
- Governance
- Cybersecurity
- Design and Implementation Principles
- DevSecOps
- Testing
- Real-time Warfighting Systems
- Conclusion

API Design and Implementation Principles

- **Common Data Model** - Establish a Common Data Model (CDM) early in the design and implementation phase that can be used across all API endpoints.
- **Open Standards and Protocols** - Leverage open standards and protocols to ensure compatibility and interoperability with other systems and applications.
- **Design for Security Compliance** - Incorporating security measures from the outset protects the API from unauthorized access and potential data breaches.
- **Developmental Testing and Validation Processes** - Establishing a robust testing and validation process to ensure the quality and reliability of the APIs is also essential.
- **Collaboration and Communication** - Collaboration and communication among developers, architects, and other stakeholders are essential elements in the successful development and implementation of APIs.
- **API Parameters for Pagination, Sorting, and Filte**ring - Pagination is essential when dealing with large result sets; Sorting empowers clients to organize and analyze the data according to their requirements; Use of filtering is critical for harnessing the power of APIs.
- **API Metrics** - Several key metrics should be considered when measuring API performance and effectiveness (Response Time, Error rate, Availability, Usage and traffic, Latency, Rate limiting, Authentication and Authorization, SLA Compliance)

High Quality API Attributes and Benefits

Attribute	Benefit
Reusable	Can reuse existing components. Developers only have to build components once and won't end up duplicating code. They can spend more of their time on tasks that benefit the business, like building new services.
Reliable	The APIs reliably are available and function as documented.
Interoperable	Can be used with approval in all type of use scenarios by the applications that would benefit operations.
Discoverable	Developers can easily find existing API artifacts and reuse them in future designs.
Scalable	Can have small or large number of elements and the APIs can serve many diverse users.
Consistent	API remains consistent even when implemented by different developers and across the entire DoD solution space.
Easy to Use	The API is easy to understand and implement in many and diverse use cases.
Clear	The API vision, design and documentation are clear. Helps keep everyone involved in the API program. When stakeholders have misunderstandings about API goals or designs, it can cause API programs to fail.
Secure	Security is built into the foundation of the API development and deployments. API interfaces includes classification metadata support (NSA Access rights and handling, information security metadata, NSA Guidance for implementation of REST – in DISR).
Compliant	Well-managed and visible exception pathways (Sindall 2020)
Complete	Lifecycle use of API is well thought through and provisioned (Sindall 2023).