Application Programming Interfaces (APIs) Enabling Data Interoperability in the Department of Defense

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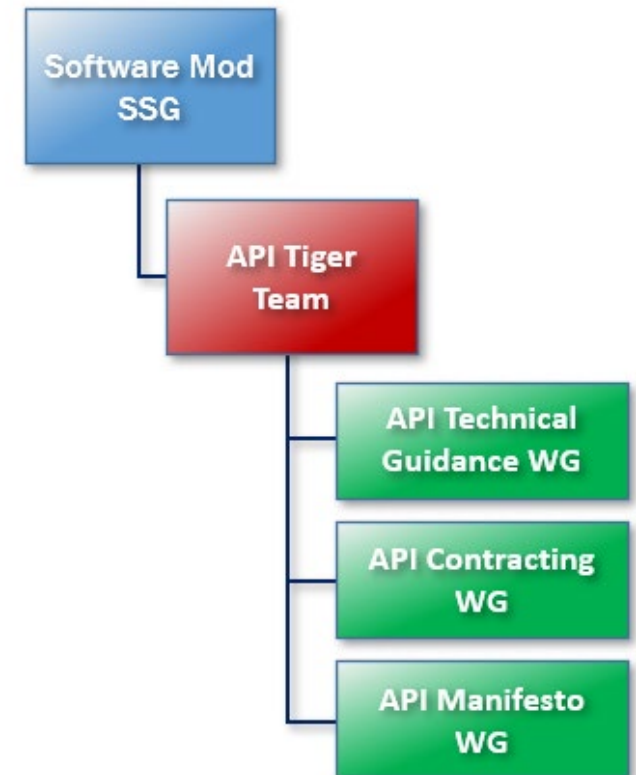
Norfolk, Virginia
October 2024

Outline

- DoD API Tiger Team
- DoD Info Technology Advancement Strategy
- Challenges for Data Centricity and Interoperability in DoD
- Current Approach to APIs in DoD
- Benefits to Adopt APIs in DoD
- DoD & NATO API Strategy & Technical Guidance
- Leverage of AI for APIs Enabling Data Interoperability/Centricity
- API Path Forward
- Conclusion
- Q & A

Driving Enterprise Change through 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

- Endeavors to establish a thriving DoD API ecosystem to enable and support joint warfighting capabilities in the 21st century

- Engages with more than 24 organizations and 200 members (and still growing) including the Chief Digital and Artificial Intelligence Office (CDAO), Joint Staff (JS), Deputy Secretary of Defense, Services, API evangelists, and subject matter experts across DoD

APIs will be a journey for the DoD but one that will provide significant benefits when mature

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

Software Mod SSG

API Tiger Team

API Technical Guidance WG

API Contracting WG

API Manifesto WG

- Combined warfighting IT capabilities enables rapid, widespread sharing of information with mission partners and provides interoperability of our Joint Forces

- Proprietary interfaces must be replaced with modern Application Programming Interfaces (APIs) that are built to commercial industry standards

- Broaden DoD Cyber Workforce Framework to include data, AI/ML, software engineering, transitioning into the digital workforce

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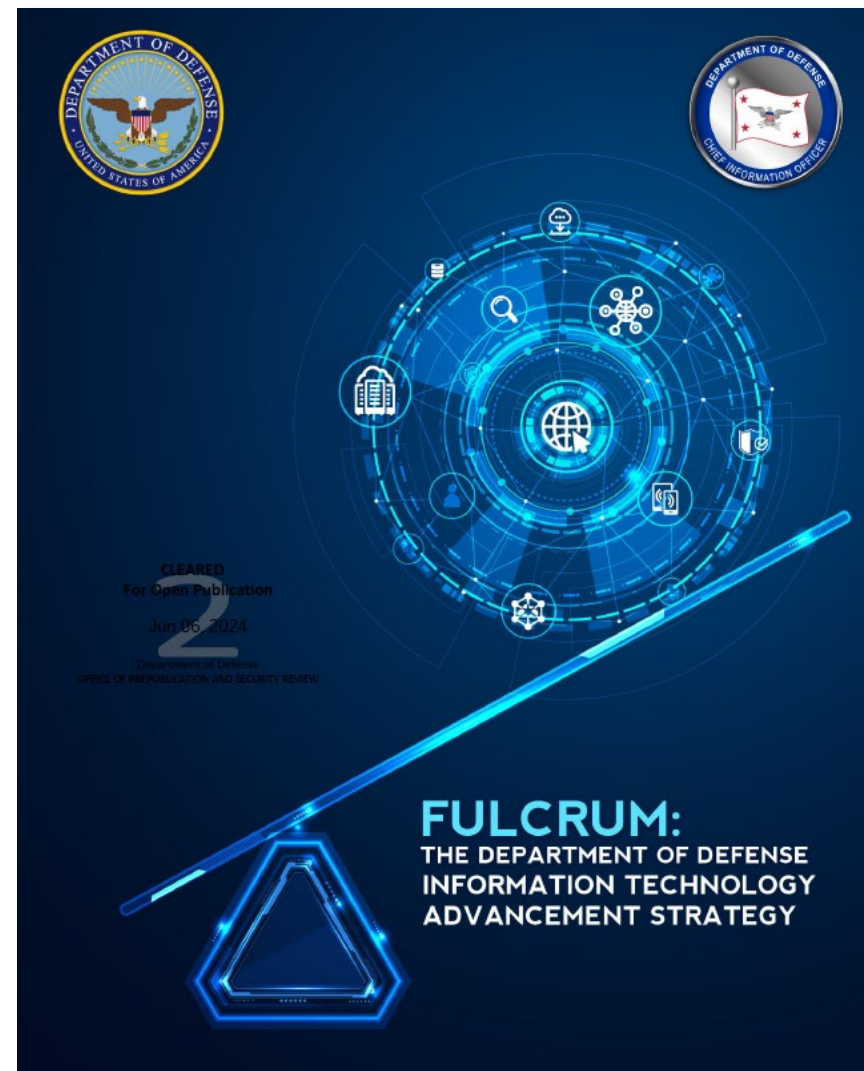
DoD Challenges for Data Centricity and Interoperability

- 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 data interoperability across DoD

Image generated by ChatGPT/DALL-E

DoD Legacy Challenges to Overcome

- Interface Control Document (ICD) driven

- Not discoverable

- Proprietary protocols with lack of 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 will benefit from leveraging modern software development practices and Agile**

- **The Department will be able 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)
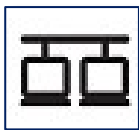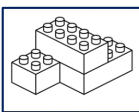
Benefits to Adopt APIs in DoD

- APIs will drive data interoperability, scalability, accessibility, and security

- APIs will provide benefits to Modular Open Systems Approach (MOSA), which allows legacy systems to be more rapidly integrated with modern capabilities such as AI/ML

- APIs are a building block for the new CJADC2 reference architecture & design, and will be fundamental to implementing system to system interoperability at scale across the DoD, NATO and coalition partners in the Mission Partner Environments (MPE)

- APIs will be a journey for the DoD but one that will provide significant benefits when mature

DoD APIs Ecosystem under Zero Trust Architecture

- **API Catalog:** a centralized, searchable repository of all the APIs, with metadata and documentation for each API

- **Identity Credential & Access Management (ICAM):** centralized authentication and authorization (i.e., RBAC/ABAC) services

- **API Gateway:** a router & load-balancer for requests from consumers to the appropriate API endpoints

- **API Endpoint:** point of interaction with the data and functionality the API provides

- **Software Development Kit (SDK):** "glue code libraries" to connect API Catalog, ICAM and API Gateway

- Minimum Viable Product (MVP) completed October 2023

- Minimum Viable Capability Release (MVCR)-1 completed August 2024

- MVCR-2 release planned 1st Quarter Fiscal Year 2025

Application Programming Interface (API) Technical Guidance

Minimum Viable Capability Release (MVCR) 1
July 2024

Office of Systems Engineering and Architecture

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for Research and Engineering

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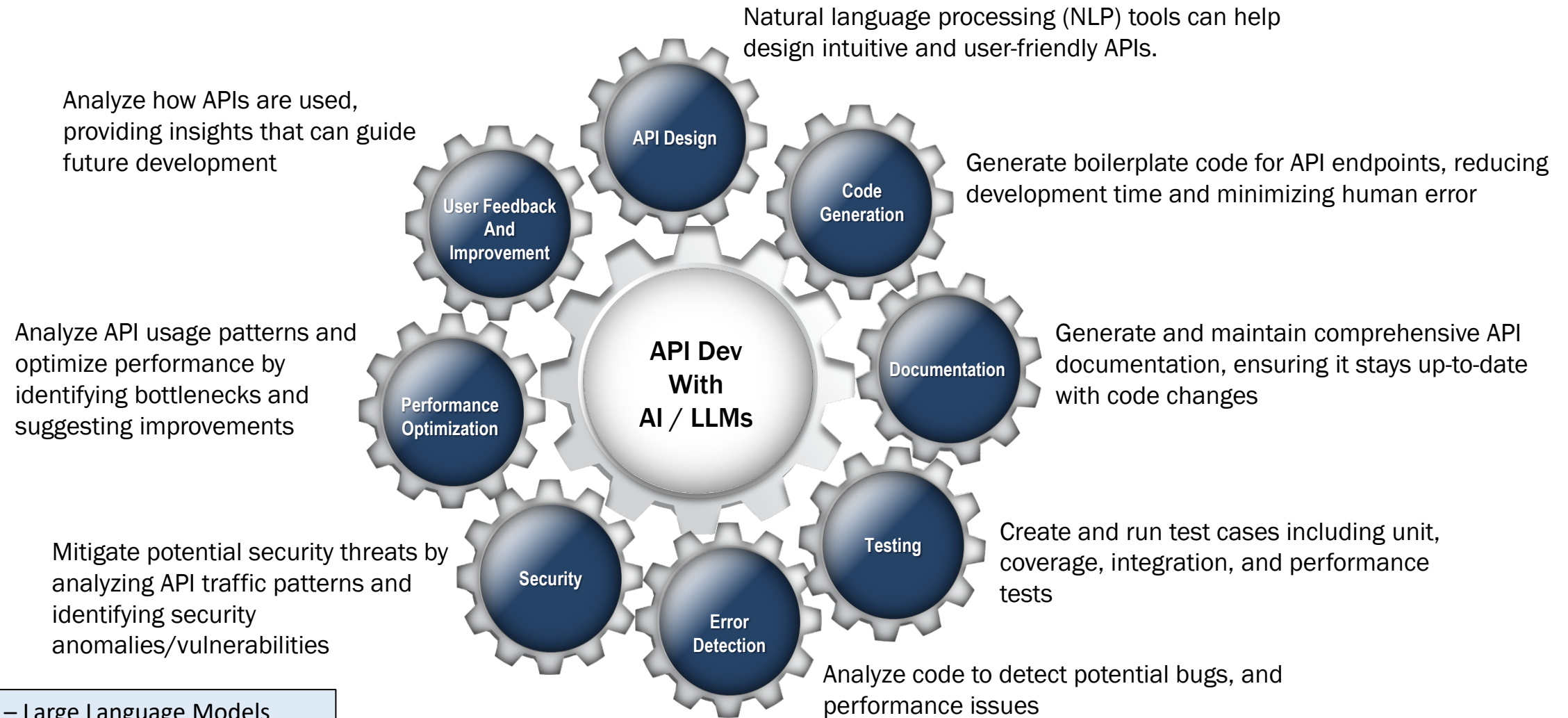https://www.cto.mil/wp-content/uploads/2024/08/API-Tech-Guidance-MVCR1-July2024-Cleared.pdf

- DoD R&E leading bi-weekly Working Group meetings with NATO

- Initial draft outline completed

- Expected MVP release 1st Quarter Fiscal Year 2025

Contents

Leverage Artificial Intelligence (AI) for Development of APIs

Natural language processing (NLP) tools can help design intuitive and user-friendly APIs.

Analyze how APIs are used, providing insights that can guide future development

Generate boilerplate code for API endpoints, reducing development time and minimizing human error

Analyze API usage patterns and optimize performance by identifying bottlenecks and suggesting improvements

Generate and maintain comprehensive API documentation, ensuring it stays up-to-date with code changes

Mitigate potential security threats by analyzing API traffic patterns and identifying security anomalies/vulnerabilities

Create and run test cases including unit, coverage, integration, and performance tests

Analyze code to detect potential bugs, and performance issues

API Dev With AI / LLMs

- API Design
- User Feedback And Improvement
- Code Generation
- Performance Optimization
- Documentation
- Security
- Error Detection
- Testing

LLMs – Large Language Models

Leverage AI/LLMs for Data Interoperability / Centricity

- **Data Standardization:** standardize data from different sources, ensuring consistency and compatibility across systems

- **Semantic Analysis:** analyze the context and meaning of data, enabling more accurate data merging and interoperability

- **Data Mapping:** map data fields between disparate systems and automate the integration process, reducing the need for manual intervention

- **Data Quality:** monitor data flows, detect anomalies, and ensure data quality and integrity throughout the integration process

API Path Forward

- API Tiger Team will continue to solidify program guidance and best practices for APIs

- API Tiger Team will leverage AI/ML for APIs development, data interoperability and centricity

- 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 such as AI/ML
  - ➢ 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

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