



SYSTEMS ENGINEERING & ARCHITECTURE

TECHNICAL HIGHLIGHT:

JANUARY 2024

APPLICATION PROGRAMMING INTERFACE (API) INTEROPERABILITY

API

In the rapidly evolving landscape of modern warfare, the Department of Defense (DoD) relies on advancements in technology to maintain a competitive edge in joint warfare capabilities. Central to these advancements are software application programming interfaces (APIs).

❖ APPLICATION PROGRAMMING INTERFACE

An API is a system access point that allows application programs to provide well-defined functionality and to promote interoperability, security, and scalability. Interoperability, “the ability to act together coherently, effectively, and efficiently to achieve tactical, operational, and strategic objectives” (CJCSI RSI 2019), is a priority of the Joint Staff (Brady and Dianic 2022). Interoperability is crucial to modern software, joint warfighting, and artificial intelligence (AI) superiority and to achieving the Deputy Secretary of Defense Data Decrees (DepSecDef 2021).

❖ API STRATEGY

An API project team should create an API Strategy to communicate its approach to interoperability before starting system development. The strategy document should establish a vision and initial plans to facilitate understanding by stakeholders. The plans include envisioned near-term capability and possible evolutions for the future. The strategy should include a definition of the scope of the API, describing what would be considered valid solution space for the API now and in the future. The strategy should be updated as the program evolves. Figure 1 shows an API-related notional ecosystem, terms, and relationships that might be reflected in the strategy.

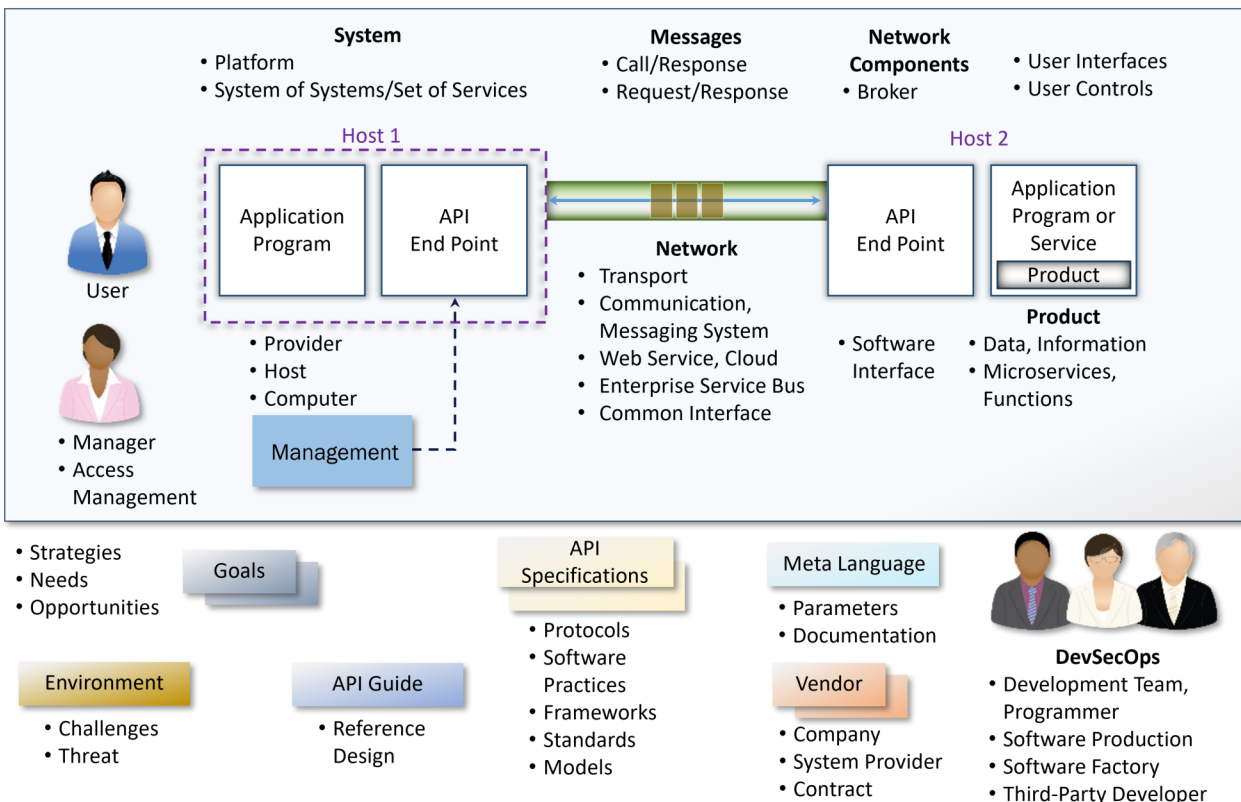


Figure 1. Notional API Ecosystem, Terms, and Relationships



SYSTEMS ENGINEERING & ARCHITECTURE

TECHNICAL HIGHLIGHT: API INTEROPERABILITY cont'd

❖ API DESIGN SCOPE

APIs are used commercially and in DoD, Joint, and Service-designed systems. Figure 2 provides a context diagram of DoD and commercial systems and scope for future system design.

DoD-specific warfighting systems can be categorized into four groups: non-real-time, real-time, back-end, and capability development; however, the commercial API systems such as business systems, social networks, transport systems, or other frameworks also are partially in scope. Each such system contains one or more open or proprietary API socket interfaces connecting with other systems. APIs enhance the security by delivering data to consumers instead of exposing the producer's entire database. APIs provide data producers and consumers with extensible and secure pathways to interact with applications and data.

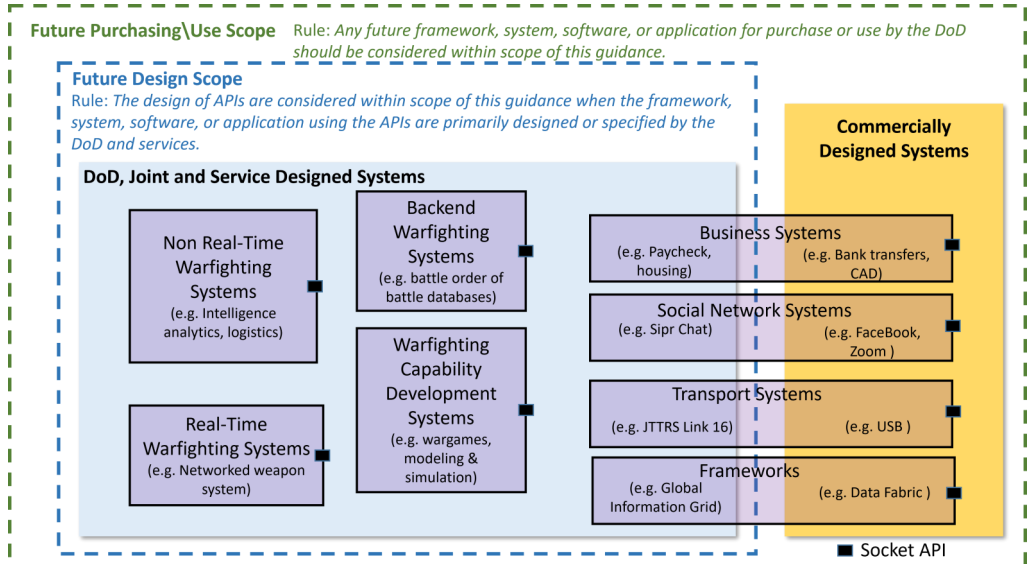


Figure 2. API Design Scope for Future Systems

The future design scope of APIs includes the four DoD systems and, in part, the four commercial systems. In the future, with the exception of proprietary APIs, any API developed for or used by the DoD will be considered within scope.

❖ INTEROPERABILITY

Figure 3 illustrates an API from the system-of-systems (SoS) perspective. This API serves as a framework for different software providers to exchange data with consumers, enabling developers to build applications that harness the capabilities of API services.

In the context of APIs, an “application” refers to any software with a specific function, while an “interface” can be seen as a contract between two applications. This contract outlines the communication protocol between the two, involving requests and responses. For instance, when your phone retrieves the weather forecast, it uses an API to connect with an external weather service. The API documentation provides details on how developers should structure requests and handle responses.

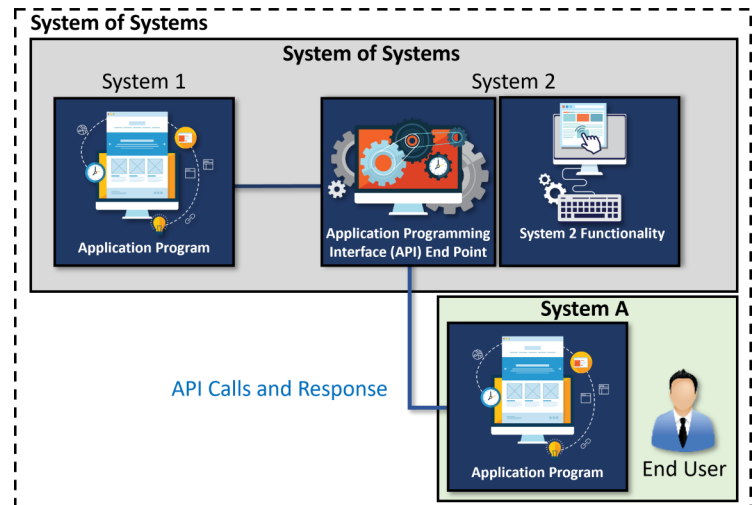


Figure 3. API in a System-of-Systems Context

❖ RESOURCES

OUSD(R&E) SE&A: <https://www.cto.mil/sea/>

See SE&A Software Engineering web page for more information and references: <https://www.cto.mil/sea/swe/>

[API Technical Guidance Intelink](#)



An API may be used in or developed for a single system or for an SoS environment.