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Joint All-Domain Command and Control (JADC2)

What Is JADC2?

Joint All-Domain Command and Control (JADC2) is the Department of Defense's (DOD's) concept to connect sensors from all of the military services—Air Force, Army, Marine Corps, Navy, and Space Force—into a single network. Traditionally, each of the military services developed its own tactical network that was incompatible with those of other services (i.e., Army networks were unable to interface with Navy or Air Force networks). DOD officials have argued that future conflicts may require decisions to be made within hours, minutes, or potentially seconds compared with the current multiday process to analyze the operating environment and issue commands. They have also stated that the Department's existing command and control architecture is insufficient to meet the demands of the National Defense Strategy (NDS). Congress may be interested in the concept because it is being used to develop many high-profile procurement programs.

DOD uses ride-sharing service Uber as an analogy to describe its desired end state for JADC2. Uber combines two different apps—one for riders and a second for drivers. Using the respective users' position, the Uber algorithm determines the optimal match based on distance, travel time, and passengers (among other variables). The application then seamlessly provides directions for the driver to follow, delivering the passenger to their destination. Uber relies on cellular and Wi-Fi networks to transmit data to match riders and provide driving instructions.

Figure 1. Visualization of JADC2 Vision

Source: https://www.monch.com/mpg/news/ew-c4i-channel/7334-saic-and-usaf-partner-for-jadc2.html.

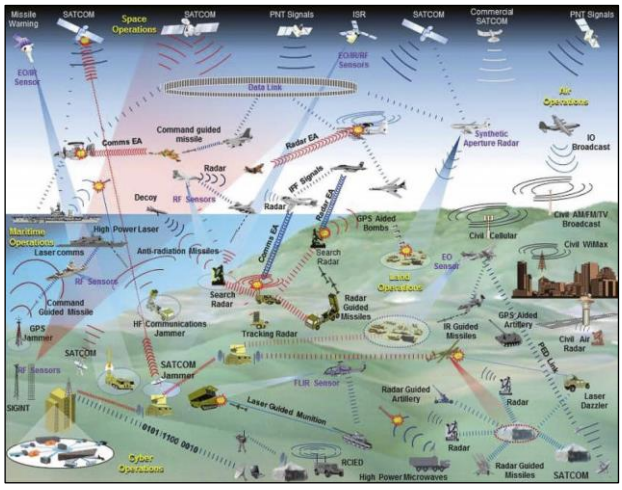
JADC2 envisions providing a cloud-like environment for the Joint force to share intelligence, surveillance, and reconnaissance data, transmitting across many communications networks, to enable faster decisionmaking (see **Figure 1**). JADC2 intends to enable commanders to make better decisions by collecting data from numerous sensors, processing the data using artificial intelligence algorithms to identify targets, then recommending the optimal weapon—both kinetic and nonkinetic (e.g., cyber or electronic weapons)—to engage the target.

Some analysts take a more skeptical approach to JADC2. They raise questions about its technical maturity and affordability, and whether it is even possible to field a network that can securely and reliably connect sensors to shooters and support command and control in a lethal, electronic warfare-rich environment. Analysts also ask who would have decisionmaking authority across domains, given that, traditionally, command authorities are delegated in each domain rather than from an overall campaign perspective. Some also question how much a human will be needed for JADC2 to make decisions in real time, and whether it is appropriate to reduce the amount of human involvement in military-related decisions.

Why Change Current C2 Structures?

The future operating environment articulated by the NDS, the NDS Commission, and other sources describes how potential adversaries have developed sophisticated anti-access/area denial (A2/AD) capabilities (see **Figure 2**). These capabilities include electronic warfare, cyber weapons, long-range missiles, and advanced air defenses. U.S. competitors have pursued A2/AD capabilities as a means of countering traditional U.S. military advantages—such as the ability to project power—and improving their ability to win quick, decisive engagements.

Figure 2. A2/AD Environment



Source: https://www.japcc.org/electronic-warfare-the-forgotten-discipline/.

Senior DOD leaders have stated that access to information will be critical in the future operating environment. In addition, these leaders have stated that to challenge potential peer adversaries, a multidomain approach is required (where U.S. forces would use ground, air, naval,

space, and cyber forces to challenge an adversary's targeting calculus). The Joint All-Domain Operations concept, thus, provides commanders access to information to allow for simultaneous and sequential operations using surprise and the rapid and continuous integration of capabilities across all domains—to try to gain physical and psychological advantages and influence and control over the operational environment.

DOD argues that current C2 programs, like the Air and Space Operation Centers, E-8C Joint Surveillance and Target Attack Radar System, and E-3 Airborne Warning and Control System are not optimized for the speed, complexity, and lethality of future conflict; that the decades-old platforms cannot adequately leverage new technology; and that the supporting structures to enable future C2 either do not exist or require maturation. Air Force officials have argued that a JADC2 architecture would enable commanders to (1) rapidly understand the battlespace, (2) direct forces faster than the enemy, and (3) deliver synchronized combat effects across all domains.

DOD Lines of Effort

DOD. DOD is leading a Joint Cross-Functional Team to explore JADC2 as the concept evolves. The team includes representatives from the offices of the DOD Chief Information Officer (CIO), the Under Secretary of Defense for Research and Engineering, and the Under Secretary of Defense for Acquisition and Sustainment. The DOD CIO has stated it plans to use 5G technologies to enable JADC2.

Joint Staff. The Joint Staff is leading efforts to move JADC2 from a concept to policies, doctrine, and requirements, and has designated the Air Force as the executive agent for JADC2 technology development. According to press reports, JADC2 is a component of the upcoming released Joint Warfighting Concept.

Air Force. To implement JADC2, the Air Force is developing the Advanced Battle Management System (ABMS). ABMS is a network intended to provide data to pass information across all domains. Air Force leaders stated that ABMS has been used to help facilitate DOD support during the COVID-19 pandemic. Throughout FY2020, the Air Force has held at least three ABMS demonstrations, connecting Army and Navy systems.

Army. The Army's modernization strategy identified network modernization to enable multidomain operations. Army Futures Command is the service representative developing the JADC2 concept. As part of an exercise called Project Convergence, it has conducted a series of experiments demonstrating the service's ability to provide access to joint and coalition networks. The Army tested several concepts transmitting targeting information using nontraditional methods in September 2020 in Project Convergence's first demonstration.

Navy. On October 1, 2020, the Navy announced it would start Project Overmatch, which it plans to integrate into the overall JADC2 concept. The Navy states that Project Overmatch is intended to develop a new fleet architecture using artificial intelligence and manned/unmanned teaming to enable Distributed Maritime Operations. The Navy has stated one of its primary focus to support the JADC2 effort is to remove proprietary network standards, thus enabling interoperability with the other services. According to recent press coverage, the Navy has focused on its own networks but plans to integrate with the Army and Air Force.

JADC2 Experimentation

DOD has held at least two major JADC2 exercises. The first, held in Florida in December 2019, focused on a simulated cruise missile threat. The exercise represented the first demonstration of ABMS. Air Force and Navy aircraft (including F-22 and F-35 fighter jets), a Navy destroyer, an Army Sentinel radar system, a mobile artillery system, plus commercial space and ground sensors demonstrated being able to collect, analyze, and share data in real-time to provide a fuller picture of the operating environment.

DOD performed a second test of JADC2 in July 2020. During this test, Air Force aircraft connected with naval vessels positioned in the Black Sea, along with special operations forces and eight other NATO nations, in a simulated environment to counter a potential Russian threat.

JADC2 FY2021 Legislation and Funding

The FY2021 National Defense Authorization Act (NDAA) has two provisions focused on JADC2. Section 157 requires the Joint Requirements Oversight Council to produce validated requirements by April 2021. Section 1076 requires the Vice Chairman of the Joint Chiefs of Staff to provide a quarterly briefing. DOD requested $302.3 million for ABMS in FY2021; the FY2021 NDAA (H.R. 6395) authorizes $216.3 million (an $85 million decrease) due to unjustified growth. DOD also requested $207 million for 5G Congested/Contested spectrum research and development, which looks to develop spectrum-sharing technologies and new network security architectures.

Potential Questions for Congress

- What is the relative priority for JADC2 compared with other major DOD programs?
- Have all of the military services embraced the JADC2 concept, or is there some resistance within DOD?
- What personnel, equipment, facilities, and training resources would be required to achieve JADC2?
- What is the estimated cost for force-wide implementation and lifecycle upkeep of JADC2? When could the network become operational?
- What role would AI have in JADC2 development? How much human-in-the-loop is necessary if sensors are linked to shooters in real-time?

CRS Products

CRS Report R46564, *Overview of Department of Defense Use of the Electromagnetic Spectrum*, by John R. Hoehn, Jill C. Gallagher, and Kelley M. Sayler

CRS In Focus IF11654, *The Army's Project Convergence*, by Andrew Feickert

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