USD(R&E)

Fundamentals of Cross Domain Solutions (CDS)

US Department of Defense Perspective

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NDIA Systems and Mission Engineering Conference
Norfolk, VA
October 2024

Agenda

- Department of Defense Instruction (DoDI) 5000.83
- Problem Statement
- CDS Polices
- CDS Key Concepts
- CDS Acquisition Process
- Summary
- Points of Contact

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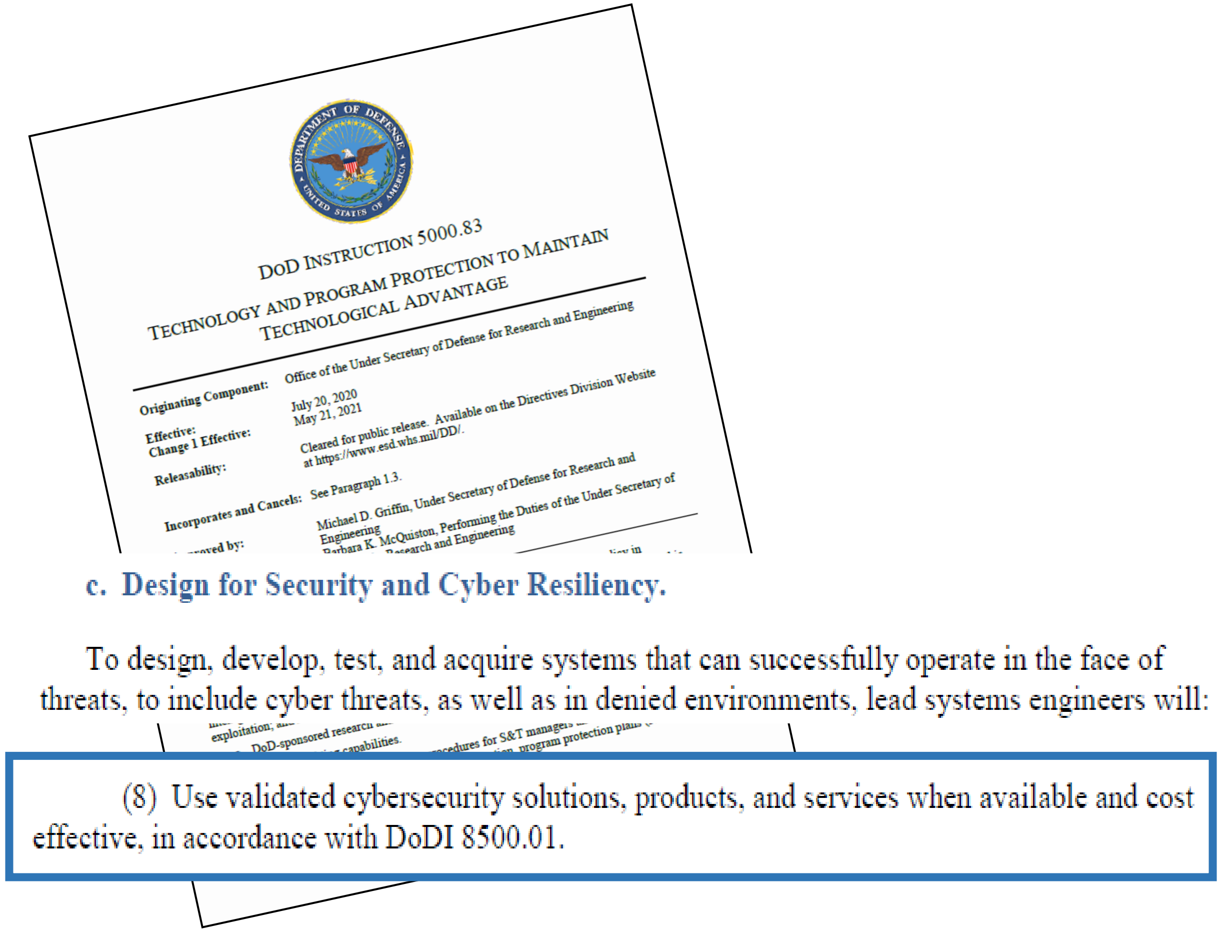
DoDI 5000.83, Technology and Program Protection to Maintain Technological Advantage



DoD Instruction 5000.83

Technology and Program Protection to Maintain Technological Advantage

Originating Component: Office of the Under Secretary of Defense for Research and Engineering

Effective: July 20, 2020
Change 1 Effective: May 21, 2021

Releasability: Cleared for public release. Available on the Directives Division Website at https://www.esd.whs.mil/DD/.

Incorporates and Cancels: See Paragraph 1.3.

Approved by: Michael D. Griffin, Under Secretary of Defense for Research and Engineering
Barbara K. McQuiston, Performing the Duties of the Under Secretary of Research and Engineering

c. Design for Security and Cyber Resiliency.

To design, develop, test, and acquire systems that can successfully operate in the face of threats, to include cyber threats, as well as in denied environments, lead systems engineers will:

(8) Use validated cybersecurity solutions, products, and services when available and cost effective, in accordance with DoDI 8500.01.

- **Establishes responsibilities and procedures for *S&T managers and engineers* to manage system security and cybersecurity technical risks to:**
  - DoD-sponsored research and technology
  - DoD warfighting capabilities
- **System security and cybersecurity technical risks include:**
  - Hardware, software, supply chain exploitation
  - Cyber vulnerabilities
  - Reverse engineering, anti-tamper
  - Controlled technical information / data exfiltration
- **Design for security and cyber resiliency**
  - Secure Cyber Resilient Engineering (SCRE)

Establishes responsibilities for S&T managers and engineers on technology and program protection, includes pre- and post-acquisition protection activities

Problem Statement

- **Todays warfighting requires secure information sharing and collaboration across all types of boundaries including international, coalition partners, inter-governmental, non-governmental agencies**

  – Require technologies that enable warfighting communities and mission partners to share information across physically, logically, and administratively separated networks (known as security domains) in a reliable, secure and interoperable manner

  – Warfighters increasingly need to expand information sharing capabilities without introducing security vulnerabilities to their most sensitive systems and data/information

  – Interconnecting systems increase complexity in support of Joint All-Domain Command and Control (JADC2)

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CDS Technologies Address this Problem…

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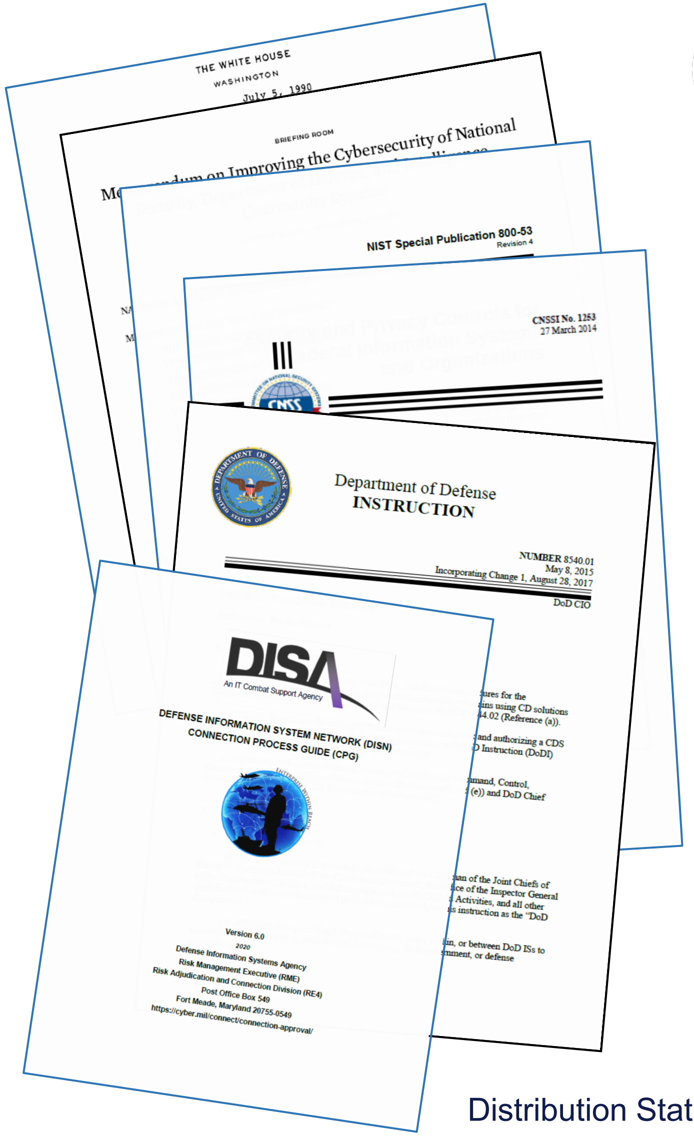
CDS Policy


THE WHITE HOUSE
WASHINGTON
July 5, 1990

BRIEFING ROOM

Memorandum on Improving the Cybersecurity of National

NIST Special Publication 800-53
Revision 4

CNSSI No. 1253
27 March 2014

Department of Defense
INSTRUCTION

NUMBER 8540.01
May 8, 2015
Incorporating Change 1, August 28, 2017
DoD CIO

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DISA
An IT Combat Support Agency

DEFENSE INFORMATION SYSTEM NETWORK (DISN)
CONNECTION PROCESS GUIDE (CPG)

Version 6.0
2020
Defense Information Systems Agency
Risk Management Executive (RME)
Risk Adjudication and Connection Division (RE4)
Post Office Box 549
Fort Meade, Maryland 20755-0549
https://cyber.mil/connect/connection-approval/

- **White House:**
  - *Memorandum on Improving the Cybersecurity of National Security, Department of Defense, and Intelligence Community Systems*, National Security Memorandum 8 (NSM-8), White House, 19 January 2022
    - Assigns National Cross Domain Strategy and Management Office (NCDSMO) its CDS authorities at a national level
  - National Security Directive 42 (NSD 42)
    - Assigns the National Security Agency (NSA) its information assurance authorities and designates NSA as the National Manager for National Security Systems (NSS). Document is confidential
- **DoD:**
  - DoDI 8540.01, Cross Domain Policy, Change 1, dated August 28, 2017
    - The DoD policy governing how to authorize and deploy CDS
  - Defense Information System Network (DISN) Connection Process Guide (CPG), Version 6.1, dated August 11, 2023, Defense Information Systems Agency (DISA)
    - Defines the process for connecting a CDS to DoD networks
- **National Institute of Standards and Technology (NIST):**
  - NIST SP 800-53 Revision 5, *Security and Privacy Controls for Federal Information Systems and Organizations*, dated September, 2022
    - Defines the security controls used by the U.S. Government (USG) to assess IT systems.
- **Committee on National Security Systems (CNSS):**
  - CNSS Instruction (CNSSI) No. 1253, *Security Categorization and Control Selection for National Security Systems*, dated March 27, 2014
    - Applies the NIST-800 53 Security controls to NSS
  - CNSSI No. 1253, Appendix E, Attachment 3, *Cross Domain Solution Overlay*, dated February 08, 2023
    - Applies the CNSSI No. 1253 controls to CDS

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National Cross Domain Strategy and Management Office (NCDSMO)

- **Formally stood up on 15 February 2019 by a joint DOD and IC CIO memorandum**
  - Replaces the Unified Cross Domain Services Management Office (UCDSMO)
  - Has been operating since 2017 and operates under the NSA's National Security Directive (NSD) 42 authorities

- **National Security Memo 8 (NSM-8) clarifies the authorities of Director, NSA (DIRNSA) as the National Manager, and designates NCDSMO to:**
  - Serve as the principal advisor to National Security System (NSS) owners for cross domain capabilities
  - Develop and maintain community outreach programs and forums
  - Develop and establish improved security solutions, remote management and monitoring, cyber defense, filtering requirements, and standards and technologies for CDS
  - Operate the USG CDS security testing program to ensure uniform comprehensive testing

NSA Guidance and Documents

- ***CDS 101: An Introduction to Cross Domain Solutions*, v1.0, NCDSMO Doc ID: NCDSMO-G-00032-001_00**
  - Describes CDS concepts, terminology, and the authorization process
- ***Cross Domain Solution (CDS) Design and Implementation Requirements: 2021 Raise the Bar (RTB) Baseline Release*, v4.1, July 11, 2022, NCDSMO Doc ID: NCDSMO-R-00008-004_01**
  - Establishes the requirements for the design, implementation and deployment of CDS
- ***Security Assessment of Cross Domain Solutions (CDS): Process and Requirements*, v4.1, NCDSMO Doc ID: NCDSMO-R-00003-004_01**
  - Describes key concepts and terminology related to the assessment (e.g., security testing) of CDS
- ***Cyber One-Way Taps Technical Requirements*, v1.0, NCDSMO Doc ID: NCDSMO-R-00016-001_01**
  - Describes the requirements for the design, implementation, and testing requirements of one-way taps and diodes
- ***CDSE 101: Guidance and Requirements*, v1.0, NCDSMO Doc ID: NCDSMO-R-00015-001_00**
  - Describes the certification process for Cross Domain Support Office/Elements and their functions
- ***Cross Domain Solution (CDS) Development and Testing Environment Security Requirements*, v1.1, 12 January 2022, NCDSMO Doc ID: NCDSMO-R-00011-001_01**
  - Defines the isolation and security requirements for networks used to development, test, evaluate and integrate CDS

NCDSMO Documentation can be obtained from Intelink-U at https://intelshare.intelink.gov/sites/ncdsmo

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CDS Design and Implementation Requirements (Raise the Bar)

- Raise the Bar (RTB) is the NCDSMO’s security requirements for the design, development, assessment, and deployment of CDS to improve the security and capabilities for the protection of NSS
- RTB is updated annually to address new threats, new technologies, new knowledge and any issues/vulnerabilities found
- Applies to all USG-operated CDS
- Applies to all CDS developed for sale as part of a Foreign Military Sales (FMS) activity
- NCDSMO Documentation and Requirements can be obtained from Intelink-U at:
  - https://intelshare.intelink.gov/sites/ncdsmo

Cross Domain Support Office/Element (CDSO/E)

- **Each USG agency has an associated CDSO/E**
  - The list of CDSO/Es is available on the NCDSMO NIPRnet Portal
- **CDSO/E certification and responsibilities are described in the NCDSMO publication *CDSE 101: Guidance and Requirements***
- **CDSO/E responsibilities include:**
  - Provides the primary interface between the agency and the NCDSMO
  - Works with agency personnel on the Buy, Modify, and Build (BMB) process for selecting a CDS
  - Provides support on the authorization process for the agency's CDS deployments

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What is a Security Domain?

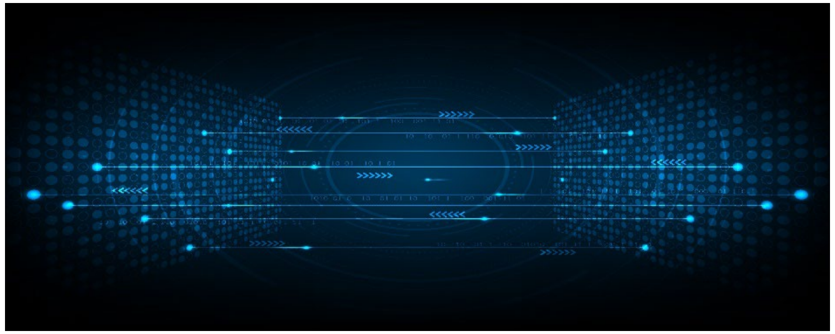
“A domain operating at a single security level (which includes a unique combination of classification, releasabilities, and dissemination controls) that implements a security policy and is administered by a single authority.” – Committee on National Security Systems Instruction 4009

- **Security domains are identified by their security marking**
  - A security marking is a combination of a classification level in combination with any stated releasabilities, dissemination controls, compartments/Special Access Programs (SAPs), and some handling caveats
  - Examples of security domains in the US include:
    - NIPRnet, SIPRnet, JWICS, any of the Secret Releasable CENTRIXs networks
    - Controller Area Network Bus (CANbus) in a vehicle

Cross Domain Solutions

What is a CDS?

- “A form of controlled interface (a boundary with a set of mechanisms that enforces the security policies and controls the flow of information between interconnected information systems) that provides the ability to manually and/or automatically access and/or transfer information between different security domains.” - National Institute of Standards and Technology (NIST)
- A Controlled Interface is “A boundary with a set of mechanisms that enforces the security policies and controls the flow of information between interconnected information systems.” - NIST SP 800-37 Rev. 1



Source: Getty Images

Why use a CDS?

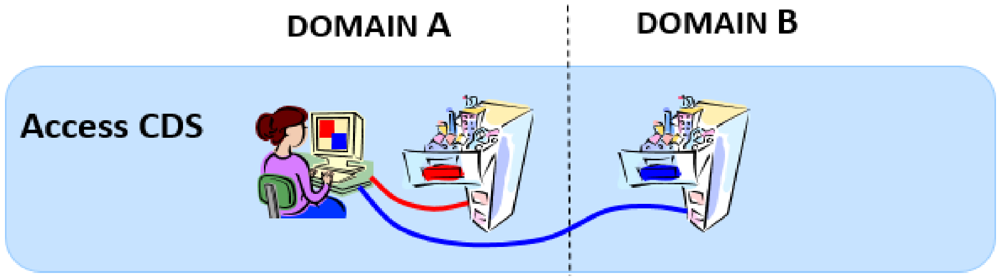
- Transfer data between different systems operating in different system domains
- Reduce accidental release of information from classified networks
- Enable Command & Control (C2) and status communications between components of a weapon system
- Desktop Reduction
  - Reduce the number of networks and PCs of different classification levels on users’ desks
- Increased Information Sharing
  - Enhance exchange of information with coalition and external partners
- Reduction in Data Spills, Malware Infection/C2, and Data Exfiltration from use of removable media to transfer data

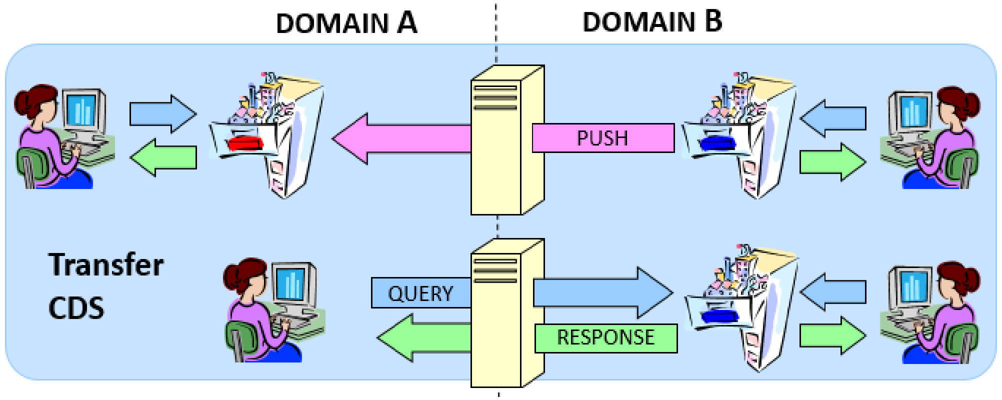
Cross Domain Solutions Types

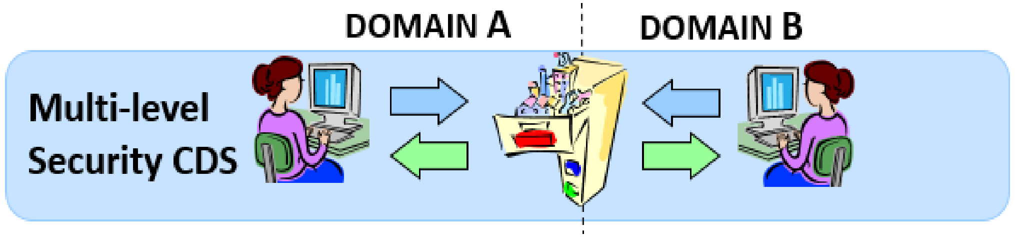
- **Access CDS**
  - Provides access to computing platforms residing in lower security domains without transfer of user data between the domains. The access function is implemented by transferring keyboard and mouse data down to the lower security domain and sending video/image data up to the higher security domain
  - Largest number of units deployed
  - Two sub-types:
    - Virtual machine-based
    - Remote Virtual Desktop Infrastructure (VDI)-based

- **Transfer CDS**
  - One-way or bidirectional data transfers
  - Transfers data between systems operating in different security domains Filters the data being transferred to remove malicious content and reduce data spills
  - Used in Human2Human, Human2Machine, and Machine2Machine data transfers

- **Multi-Level Security (MLS) CDS**
  - Stores and provides access to labeled data
  - Primarily used for multi-level database or file storage
  - Usually integrated with a transfer CDS to change the label on the data (e.g., a regrade operation)







CDS Applicable Environments

- **Enterprise**
  - CDS operated by specially designated General Purpose Enterprise Cross Domain Service Providers (GP-ECDSP) or Mission Specific Cross Domain Service Providers (MS-ECDSP)
  - List of ECDSPs are on the NCDSMO Portal
    - USG-contracted Cloud Service Providers are operating ECDSP capabilities
    - DISA
- **Point 2 Point (P2P)**
  - Local installation of a CDS in a non-tactical environment
  - Strong push by USG authorizing officials to transition P2P CDS deployments to ECDSPs to reduce long-term security and sustainment costs
- **Tactical**
  - CDS operating in communications and Size, Weight, Power, and Cooling (SWaP-C) constrained environment
  - Typical deployments include satellites, human-wearable, aircraft, ground vehicles, and naval vessels
  - Requires active anti-tamper and TEMPEST
  - Can be integrated with NSA-approved encryption devices

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CDS Acquisition Process

- **Evaluate if your project or system needs any of the following:**
  - The need to transfer data between different security domains or systems operating at different security levels?
    - If so, do you have the specifications for your protocols and data formats?
  - The need to combine data from multiple sources at different levels into a single system for analysis and visualization?
  - The need to access low security domains from a high security domain?
  - Does the system have a red/black separation problem that is not related to encryption?
- **Contact your CDSO/E and the NCDSMO as early in the process as possible**
- **Conduct a Requirements Analysis**
  - Functional / Security
- **Conduct Analysis of Alternatives (AoA)**
  - Includes BMB determination for the CDS or changing the system to eliminate the need for a CDS
  - Consider technology listed in NCDSMO CDS Baselines
- **Selection and procurement of a solution**
  - May include development and testing of a new CDS or modification of an existing CDS
- **Executing the DOD CDS Approval Process**
  - Request for authorization to deploy
  - Installation and accreditation testing
- **Managing, monitoring, and maintaining your CDS**

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Summary

- **This presentation has addressed the basic concepts and key topics to help gain a foundational understanding of CDS**
- **The need to interconnect complex and critical weapons systems/systems of systems (SoS) and their security domains often necessitates the deployment of CDS**
  - CDS are required to support connections between different security domains
  - A CDS will enforce a security policy, developed to meet an organization's information sharing requirements, whilst upholding the security and risk acceptance assumptions of the security domains involved
- **The DoD acquisition engineering and technical community need to master how to define requirements for CDS; develop CDS architecture and design; and integrate, test, and deploy CDS**
  - Understand governing policies and processes

Points of Contact

If you believe you may have a CDS requirement or intend to buy, modify, or build a CDS contact your Cross Domain Support Element or the NCDSMO

NCDSMO can be reached at:

- Email: ncdsmo@nsa.gov
- NIPRnet: https://intelshare.intelink.gov/sites/ncdsmo (CAC/PIV required)

Further questions about the training courses:

- Mr. Burhan Adam
  burhan.y.adam.civ@mail.mil
- Ms. Singi De Silva
  singithi.n.desilva.ctr@mail.mil

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