# System of Systems Engineering Collaborators Information Exchange (SoSECIE)

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**Digital Engineering: From Toolchain to Platform**

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#### Abstract

This presentation documents MITRE’s Digital Engineering (DE) Platform, an effort to build a set of reusable digital engineering assets that connects people, processes, tools, and data across an end-to-end digital enterprise. This work makes use of models to digitally represent the system or System of Systems (SoS) of interest throughout the life cycle. The approach is motivated by the DoD Digital Engineering Strategy1 (DES) which is intended to guide the planning, development, and implementation of the digital engineering transformation across the DoD.

The Digital Engineering Platform is a MITRE internal capability development effort that aims to break silos of engineering and acquisition disciplines by enabling reliable, repeatable, standards-based digital exchange of authoritative information on systems and SoS design, missions, and relevant operational environments. DE Platform partners with multi-disciplinary efforts focused on specific systems and SoS to document existing engineering workflows and identify portions of the workflow where data are repeatedly exchanged between specialists from different technical and acquisition domains.

In 2020, the DE Platform replaced the prior DE Toolchain effort, and the name change reflects an important expansion of scope. Integrating tools across disciplines is not enough to establish a mature digital engineering capability. Processes, training, knowledge sharing, infrastructure and digital engineering support are all necessary to achieve the goals of digital engineering. The aim of the effort is to evolve from a culture of engineering disciplines working on their own to one where collaboration is enabled by a digital engineering environment. In addition, as the projects and programs that MITRE supports become more DE-savvy, they work to stand up their own DE environments where the government and their partners, like FFRDCs and UARCs, can connect and collaborate. In order to support these demands, MITRE is learning to stand up new digital engineering environments quickly in on-premise, cloud, and hybrid environments.

To accomplish the above goals, the DE Platform has been subdivided into five capability areas: (1) Tools and Integration, (2) Processes, (3) Training, (4) Knowledge Sharing, and (5) Infrastructure. Tools & Integration area provides the tools that disciplinary experts use to accomplish their domain-specific tasks. Integrations between the tools across domains enable digital engineering. Processes specify how users perform tasks within their domain and how software tools are leveraged to accomplish the tasks. Training teaches users how to execute the processes and use the tools and the integrations within their domain. Knowledge sharing manages information on tools and integration, infrastructure, and processes, along with best practices and examples. It helps build community around domains and tools to further best practices and share digital engineering knowledge. Infrastructure provides computing and security foundation to support tools and integrations.

This presentation details how the DE Platform is partnering with several large-scale digital engineering programs within the Depart of Defense and is being used by a number of other projects to incorporate successful digital engineering practices from the trailblazers. Several success stories will be included.

[1] https://www.acq.osd.mil/se/docs/2018-DES.pdf

#### Biographies

Dr. Aleksandra Markina-Khusid leads the Systems and Mission Analysis Department at MITRE Corporation. Her organization focuses on analytical and quantitative Systems Engineering and Mission Engineering (ME), including Systems of Systems (SoS) engineering, trade space analysis and decision support under uncertainty, as enabled by the modern Digital Engineering (DE) approaches. Dr. Markina-Khusid supports a variety of SoS and ME modeling and analysis efforts for the Department of Defense and civilian US Government agencies. Dr. Markina-Khusid holds a BS degree in Physics, MS and PhD degrees in Electrical Engineering, and an MS in Engineering & Management, all from Massachusetts Institute of Technology.

Greg Quinn is the Chief Engineer of the Emerging Systems Engineering Technologies Department at MITRE Corporation. He has over 20 years of experience across the software development lifecycle, from business modeling to requirements modeling to deployment, support and maintenance. His roles have ranged from hardware-level software development and debugging in assembly language to technical project manager and lead architect for multi-million dollar enterprise information system development efforts. Greg Quinn holds a BS degree in Applied & Engineering Physics from Cornell University and a MS degree in Systems Engineering from Worcester Polytechnic Institute (WPI).