# Digital Engineering Information Exchange (DEIX) Challenge

## What is the DEIX Challenge?

As the industry migrates into Digital Engineering, the amount of data that must be managed, correlated, and exchanged easily overwhelms. In order for the transformation to Digital Engineering to be worth the cost, actionable knowledge has to be synthesized from various kinds of models and other sources of digital information.

The INCOSE/NDIA Digital Engineering Information Exchange Working Group (DEIXWG) is soliciting participants for its Digital Engineering Information Exchange Challenge kicking off in July 2020 and culminating in the unveiling of challenge submissions at the 2020 NDIA Systems and Mission Engineering Conference.  The DEIX Challenge is an opportunity for anyone interested in Digital Engineering/Transformation from across Government, Industry, and Academia to help shape the future of Digital Engineering.  DEIX Challenge Submissions are to be built upon a DEIXWG-provided Digital Viewpoint Model and should include proposed notional Digital Views that could be used for providing and consuming Digital Information pulled from multiple Digital Artifacts. Successful DEIX Challenge Submissions will involve developing novel ways to synthesize and fuse Digital Information from a collection of SysML, Matlab, MCAD, FEA, and other types of Digital Artifacts into a Digital View that addresses a participant-created scenario of specific perspectives and needs.

## Challenge Objective

While the DEIXWG and its stakeholders are excited to see what Challenge Participants propose in their specific submissions, the real objective of the DEIX Challenge is to drive the elicitation and analysis of requirements for the exchange of Digital Information and the creation of Digital Views. It is the hope of the DEIXWG that this challenge will lead to a set of guiding desires, driving requirements, and needed standards that will help inform organizations seeking to develop the necessary elements of a complete, holistic Digital Engineering ecosystem.

## Participants will use:

1. Platform Independent Digital Viewpoint Model (PI-DVM), provided by the DEIXWG, which includes high-level concepts related to Perspectives, Digital Artifacts, etc.
2. Defined System Phases
3. Defined Perspectives
4. Defined Stakeholders
5. Standards and Success Criteria

## Participant will choose:

Decision Point: From two dissimilar phases, one for early development and one for mature design, in order to frame the context for their proposed Challenge scenarios

* Architecture Development
* System Design and Analysis
* Integration and Synthesis
* Validation and Verification
* Deployment Readiness
* Sustainment Operations

Perspectives: Two dissimilar perspectives to develop the information needs during the two chosen phases

* Mission Assurance
* Program Management
* Cost Engineering/Finance
* Cybersecurity
* Human Systems Engineering
* Reliability, Availability, Maintainability and Safety
* Etc.

Stakeholder: choose one Stakeholder for the information needs.

* Acquirer (can be Defense or Commercial)
* Prime/Integrator
* Program Management
* OEM
* Supplier
* Regulator (Federal Aviation Administration, Nuclear Regulatory Commission, etc.)

## Participants will submit:

At a minimum, Challenge Participants are asked to propose one or more notional ***Digital Views*** that provide a self-consistent, authoritative view of ***Digital Information*** culled from a heterogeneous set of ***Digital Artifacts***. Additionally, we will accept Challenge proposals that include prototype Digital Views implemented using the tool(s) of their choice, but this is not a requirement. Submissions will include two scenarios involving the exchange of one or more Digital Views by identified ***Stakeholders*** with specified needs (or ***Perspectives***). The first scenario will involve exchange of Digital Views during an early phase system development, while the second scenario should involve exchange of Digital Views during a later, mature system design phase. Challenge Participants are also asked produce a proposed SysML-based ***Platform Specific Digital Viewpoint Model (PS-DVM)*** that extends the concepts in the DEIXWG-provided ***Platform Independent Digital Viewpoint Model (PI-DVM)*** and conceptually models the specific types of Digital Artifacts, Digital Information, Stakeholders, Perspectives, and Digital Views represented in their proposed scenarios.

**Submissions may be emailed to: Sean McGervey (**[**Sean.McGervey@jhuapl.edu**](mailto:Sean.McGervey@jhuapl.edu)**)**.

### Contents of Participant Submissions:

* **Platform Specific Digital Viewpoint Model** (PS-DVM) specifying:
  1. Proposed extensions to the concepts specified in the DEIXWG-provided Platform Independent Digital Viewpoint Model (PI-DVM)
  2. Types of Stakeholders and Perspectives involved in the exchange of the Digital Views
  3. Types of Digital Artifacts (e.g. SysML models, SQL databases, MATLAB models, etc.) that contain the Digital Information (e.g. SysML instances, SQL query results, MATLAB model output parameters, etc.) used to generate the Digital Views
  4. Identification of the Authoritative Source of Truth (ASOT) for Digital Information (i.e. which Digital Artifact) and specification of related ASOT metadata:
     + Baseline, Provenance, Trustworthiness
  5. Required formats and any standards employed for the exchange of Digital Views to occur
* **Proposed Digital View(s)**, including information for each view regarding:
  1. Form, Function, and Purpose of their proposed Digital View
  2. Digital Information represented by Digital View
  3. Traceability to Digital Artifacts providing Digital Information
  4. Standards used to feed and create the Digital View
  5. Tool Chain used to feed and create the Digital View
* **Scenarios/User Stories** providing the story for the problem solution
  1. Who is the Stakeholder?
     + What is their Perspective (e.g. Interface Design Compliance)?
     + What is their Discipline (e.g. Systems Engineering)?
  2. What does the Stakeholder wish to do with the Digital View?
     + What kinds of decisions and analyses do they need to do?
  3. What is the level of maturity (Decision Point) of the product design during which the exchange of the Digital View is occurring?

## Challenge Schedule

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| July 24, 2020 | DEIX Challenge Posted on the DEIXWG Page on the OMG MBSE Wiki, and announcements |
| August 14, 2020 | DEIX Challenge Virtual Q&A Zoom Session #1 |
| September 11, 2020 | DEIX Challenge Virtual Q&A Zoom Session #2 |
| October 09, 2020 | Deadline for Submission of DEIX Challenge Submissions |
| October 19-22, 2020 | Outbrief on Challenge and Submissions at the 2020 NDIA Systems and Mission Engineering Conference |

## Appendix A: References

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| Glossary of Key DEIX Terms | [DEIX Topical Encyclopedia Entries (DEIXPedia)](https://www.omgwiki.org/MBSE/doku.php?id=mbse:topical_encyclopedia_for_digital_engineering_information_exchange_deixpedia) |
| Digital Engineering | [Digital Engineering References on the OMG MBSE Wiki Page](https://www.omgwiki.org/MBSE/doku.php?id=mbse:digital_engineering) |
| DEIXWG on OMG MBSE Wiki | [OMG Wiki Page for DEIXWG](https://www.omgwiki.org/MBSE/doku.php?id=mbse:deix) |
| INCOSE DEIXWG Page | [INCOSE WG Page for DEIXWG](https://www.incose.org/incose-member-resources/working-groups/transformational/digital-engineering-information-exchange) |

## Appendix B: System Phases (correlated to the *INCOSE SE Handbook v4e*)

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| Architecture Development | Based on Concept Stage (3.3.1):  Defining product concept based on customer based on stakeholder needs |
| System Design and Analysis | Based on Concept (3.3.1) and Development (3.3.2) Stages:  The development of the system based on analysis of overall performance and design within overall system constraints |
| Integration and Synthesis | Based on Concept (3.3.1) and Development (3.3.2) Stages  Integration planning of subsystems and supplied parts through production of initial units for integrated testing |
| Validation and Verification | Based on Concept (3.3.1) and Development (3.3.2) Stages:  Early validation done in the concept stage through final verification of the system to the customer |
| Deployment Readiness | Based on Development (3.3.2) and Production (3.3.3) Stages:  Proof to stakeholders the readiness of a system to fully enter into service (can be from LRIP to full production rate) |
| Sustainment Operations | Based on Utilization (3.3.4) and Support (3.3.5) Stages:  Operations for maintenance and upgrade as part of system sustainment |