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| Table Topic: Digital Threads |
| 1. Based on the following references, how would you succinctly define what a Digital Thread is? What are the strengths of each definition that need to be included in the updated definition? What other attributes should be included?    * 1. A digital thread is an extensible and configurable analytical framework that seamlessly expedites the controlled interplay of technical data, software, information, and knowledge in the digital engineering ecosystem, based on the established requirements, architectures, formats, and rules for building digital models [[DoDI 5000.97 Digital Engineering](https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/500097p.PDF?ver=bePIqKXaLUTK_Iu5iTNREw%3D%3D)].      2. A digital thread consists of a collection of linked authoritative digital information pertaining to a process, product, or system, whose consistency is actively managed throughout the life cycle. This enables accessibility, traceability, currency, applicability, and credibility of information, thus facilitating the capture, communication, and use and reuse of knowledge to efficiently inform decisions that realize value [AIAA, [Digital Thread: Definition, Value, and Reference Model](https://www.aiaa.org/resources/digital-thread-white-paper)]      3. A digital thread provides a communication framework that allows a connected data flow and integrated view of the asset’s data throughout its lifecycle across traditionally siloed functional perspectives [[Bukley and Birk, Leveraging Digital Engineering for Space Guardians and Space Explorers, Aerospace Corp., Dec 2021.](https://csps.aerospace.org/sites/default/files/2021-12/Bukley_LeveragingDigital_20211207.pdf)]   O  Of the three definitions it was conclusive that the DoDI 5000.97 definition was the least useful and it is recommended that the DoD revise its definition of a Digital Thread. The biggest reason it was selected as the weakest is because it did not frame the digital thread around its benefits. The group did say that the fact that this definition specified that the digital thread ***is extensible*** was this definitions greatest strength.  The group concluded that the AIAA Digital Thread was the strongest definition and the most descriptive about the benefits and outcomes of the digital thread. Further details about how the thread is governered, and maintained could be useful.  The Bukely and Birk definition was determined to be very similar to the AIAA definition but did not provide as much detail in the benefits of the digital thread.  Conclusion: The AIAA definition with added verbiage about extensibility, and specify that the digital thread is about the relationships between the data ontology, would be the ideal digital thread definition, and should be adopted by the DoD.   1. What are the Digital Threads (e.g., from supplier system to Gov't dashboard) necessary to realize an incremental and/or continuous Systems Engineering Technical Reviews (SETRs) process?  * What are the models and/or data types included?   The group discussion was centered around the fact that a digital thread centers around any and all data and models that provide value. Value is defined around what different data consumers use. An ideal digital thread would include all data that every type of persona and functional type can use to get their job done for an ideal outcome of the overall project. A VERY important concept was mentioned in our group and in several other out briefs: there needs to be a digital twin of the SETR process, so that you can map which aspects of the digital thread need to be built and fed into the SETRs to ensure optimal outcomes.  What are the sources and sinks?  One very important concept was the digital thread in an of itself. The digital thread was defined by many as the connection of data. There are many different ways to traverse the data connections to get to the sources and sinks that are of interest to you.   * What are the challenges that exist to enabling these Digital Threads?   It is really hard to build the digital thread for a variety of technical and administrative reasons. Companies are concerned about retaining IP. It is hard to know how to implement the digital thread- how far do you need the data to interoperate, is it the model level, file level, data level, or will a model approximation suffice? Many participants said that vendor lock is a major issue that inhibits the digital thread, especially in the realm of product lifecycle management tools. There needs to be a vendor neutral PLM data format that would allow better tool migtration and broader data interoperability.   * What technical approaches are (or would be) effective at enabling these Digital Threads?  1. A Vendor Neutral PLM data format for interoperability and prevent vendor lock 2. A SQL database that allows the creation of knowledge graph to tie together the relationships between the data across the digital thread 3. A single Common Integrated Development Environment, or multiple IDEs provided that are compatible 4. APIs and other automation mechanisms for moving data around the various tools and environments.  * What metrics could be used to evaluate the effectiveness of Digital Threads in the SETR process?   Reach, Speed, and Complexity were given as metrics for a good digital thread. In an ideally implemented digital thread, you could query the thread for a complex question, and it would return answers that had traversed the nodes of the thread quickly, pulling data from sources far (many nodes away), and would navigate the nodes of the digital thread in a nonlinear manner (complex) and gives you quality results. |
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