

Federal Register Notice: 89 FR 51554, [Federal Register :: Networking and Information Technology Research and Development Request for Information on Digital Twins Research and Development](#), June 18, 2024.

Request for Information on the National Digital Twins R&D Strategic Plan

Association for Computing Machinery (ACM), US Technology Policy Committee (USTPC)

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COMMENTS IN RESPONSE TO NITRD REQUEST FOR INFORMATION FOR THE CREATION OF A NATIONAL DIGITAL TWINS R&D STRATEGIC PLAN

July 18, 2024

The US Technology Policy Committee of the Association for Computing Machinery (USTPC)¹ is pleased to submit these comments in response to the recent Request for Information for the creation of a National Digital Twins R&D Strategic Plan issued by the Networking and Information Technology Research and Development (NITRD) National Coordination Office.² Specifically, USTPC recommends that:

1) A national digital twins strategy should emphasize the importance of developing open interoperability standards for digital twins.

Developing such standards early will benefit the research community, and ultimately the user community, by making it more likely that data will be compatible between multiple digital twins research and production systems. Digital twins interoperability standards should include both application-level interface (API) standards as well as data representation standards. NITRD should consider delegating this activity to the Information Technology Laboratory at the National Institute of Standards and Technology, which should be encouraged to involve other agencies that may have digital twins expertise.³

¹ 1 The Association for Computing Machinery (ACM), with more than 100,000 members worldwide, is the world's largest educational and scientific computing society. ACM's U.S. Technology Policy Committee (USTPC) serves as the focal point for ACM's interaction with all branches of the U.S. government, the computing community, and the public on policy matters related to information technology. This statement's principal authors for USTPC are Digital Government Subcommittee co-chair Simson Garfinkel and subcommittee members Ravi Jain and Arnon Rosenthal.

² *Networking and Information Technology Research and Development Request for Information on Digital Twins Research and Development*, 89 FR 51554 (June 18, 2024) <https://www.govinfo.gov/content/pkg/FR-2024-06-18/pdf/2024-13379.pdf>. This Request for Information, while soliciting alternatives, adopts the definition of "digital twins" specified in the U.S. National Academies' *Foundational Research Gaps and Future Directions for Digital Twins* <https://nap.nationalacademies.org/catalog/26894/foundational-research-gaps-and-future-directions-for-digital-twins>.

³ For example, there is currently substantial digital twins expertise within the US Department of Energy and at various national labs as evidenced by the Digital Twin Information Center at the Idaho National Laboratory, as well as specific digital twin initiatives such as the Digital Twin Hydropower Systems Project at the Oak Ridge National Laboratory. <https://www.ornl.gov/content/digital-twin-hydropower-systems-project>

2) The national strategy should underscore the importance of digital twins models being open source to the maximum extent possible.

The results of government-funded research on digital twins models should be open source so that they can be easily shared within the research community, as well as with government, industry, and the general public. This is especially important in domains with a broad research community given that research software will likely become the basis of production software from multiple sources. This recommendation accords with Federal Source Code Policy M-16-21.⁴

3) NITRD’s research strategy should emphasize the importance of federal digital twins researcher adherence to US Government’s Open Data Policy M-13-13.

Digital twins research models operated by the US Government should register their datasets with their agency data inventories and with data.gov. Moreover, to support search and discovery, we urge NITRD to work with GSA to expand the Data Catalog Vocabulary (DCAT) standard used by data.gov⁵ to include extensions specific for digital twins data. USTPC notes that useful areas of digital twins research are likely to include the development of:

- Digital twins runtime systems that can scale from a single computer to a cluster to a distributed system including many clusters of clusters;⁶
- High-performance digital twins systems that are cloud agnostic, so that they can be run on-site using technology like OpenStack or within cloud systems made available today by existing cloud providers; and
- Portable systems for establishing and implementing data labeling and access controls so that personally identifiable information, protected health information, proprietary data, and even classified data can be appropriately protected within the digital twins framework.⁷

4) Developers of the national digital twins research strategy should reach out broadly to a wide range of researchers whose work could fit a digital twins research agenda, but who may not consider themselves to be engaged in digital twins research.

Today many researchers in many disciplines are involved in efforts that could be described as “digital twins research.” It is likely that many of their specific research techniques could be productively shared within this community to inform and advance a national digital twins research strategy. These may include approaches for code and data curation, versioning, validation, replication, citation and distribution.

⁴ https://obamawhitehouse.archives.gov/sites/default/files/omb/memoranda/2016/m_16_21.pdf

⁵ <https://www.w3.org/TR/2024/PR-vocab-dcat-3-20240613/>

⁶ The former may be appropriate for monitoring one aircraft engine, for example, the latter for heavy analytic processing or optimization routines that explore the tuning space.

⁷ Research could productively develop ways, for example, for enforcing access controls using mechanisms provided by cloud infrastructure providers, as well as through advanced cryptographic approaches, such as secure multiparty computation and homomorphic encryption.

USTPC specifically recommends outreach to social science researchers. For example, DARPA's now completed Ground Truth, SocialSim, and NGS2 programs all could fall within the scope of a digital twins research program. Likewise, programs like the US Department of Veterans Affairs' effort to create the Synthetic Suicide Prevent Dataset with SDoH⁸ could be expanded into digital twins research platforms. We also recommend outreach to members of the urban planning research and modeling community, which has experience with simulations such as UrbanSim which can be used, for example, to model and predict the impact of taxation and infrastructure development programs.

5) A digital twins research strategy should include support for funding interdisciplinary workshops and conferences where researchers, advocates and activists can meet, exchange ideas, and plan approaches for maximizing the societal benefits of digital twins technologies.

Specifically, such efforts must include adequate financial allocations for publicity and marketing, as well as support for researchers to attend appropriate conferences either virtually or in-person. Opportunities also should be explored for international collaboration, especially with the United Kingdom, which is a leader in digital twins research. Finally, we encourage NITRD to create broadly available and promoted online digital twins resource centers.

⁸ https://www.data.va.gov/dataset/Synthetic-Suicide-Prevention-Dataset-with-SDoH/h5zp-pekf/about_data