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

Michael Kennerly

One area for consideration os the use of Digital Twins for transportation networks. This is an area already receiving a lot of attention and would benefit from this effort:

- *Artificial Intelligence (AI):* The growth of AI in the transportation sector presents enormous potential to improve our ability to maximize our investment in reconstruction and rehabilitation. In addition, it has the potential to allow more precise identification of safety issues and mitigation strategies. AI can be deployed to assist or perform real-time traffic management functions reducing congestions and delays on our networks. Combined with advances in computer aided design software AI can be used to evaluate the effectiveness of design alternatives to ensure the selected alternate will address the transportation issue in question.
- *Business: Business Case Analysis:* Transportation agencies like the Iowa DOT are developing processes to that require development of a Business case for investment decisions. Transportation agencies the create Digital Twins of their network, that is combined with additional meta-data including, pavement condition, traffic volumes, crash statistics and other key evaluation data can more effectively develop the Business Case Analysis for investment strategies. This has the potential to maximize limited funds for highway improvements, potentially resulting in a safer more efficient highway system. Depending on how far this was taken it could allow for multi-state analysis for the interstate system.
- *Data:* With the move toward digital delivery and enterprise wide at most transportation agencies there is a much greater emphasis on data management best practices, data stewardship, and data governance that at any point it the past. The creation of digital twins of the network and the corresponding use of digital models that incorporate data from construction projects that can be utilized to update the digital twin makes the creation of data standards critical in order to be successful. Those standards need to be based in national standards to facilitate data transfer as well as maximize efficiency. Again, the ability to use real time data on traffic conditions that can be shared with the public through direct vehicle communication enhaces mobility and allows drivers to make better decisions.
- *Ecosystem:* The case has been made that the use of digital models in design has the potential to make significant improvement in our carbon footprint, and minimize our impact on the natural and human environment. This is accomplished by not only maximizing the design as noted above, but also providing the contractor with a tool that allows them to make better decisions on how to construct the project. These decisions will result in more effective staging of the project resulting in reduced construction time, resulting in lower emissions associated with delays from congestion. It allows designers to review and evaluate more alternatives to minimize the impact on the human and natural environment. When you take the project level benefits and multiply that over the network through the use of Digital Twins the potential impact is far more profound.
- *International:* Transportation agencies are already working to collaborate with international partners on digital delivery and the use of international standards to leverage what is being done n the global transportation market. The growth and use of Digital Twins expands that and creates new opportunities for collaboration.
- *Long Term:* Long term research in how to better utilize vehicle to vehicle communication to provide real time traffic and road condition information. How to utilize AI to make better system wide infrastructure investment decisions. Connecting Highway Digital Twins with those created in other areas to enhance the concept of smart cities. There are a number of avenues that could be explored.
- *Regulatory:* Regulatory Science Challenges associated with the use of Digital Twins

- *Responsible:*
- *Standards:*
- *Sustainability:*
- *Trustworthy:*
- *VVUQ:* Develop Rigorous Methods for Verification, Validation, and Uncertainty Quantification for Digital Twins:
- *Workforce:*

I apologize, there is so much more I could add in each of the areas where time did not permit me to comment or expand. However; I hope this will at least merit consif-deration as this project modves forward. Feel free to contact me if you have any questions.

Mike