Plan Overview

A Data Management Plan created using DMP Tool

DMP ID: https://doi.org/10.48321/D1MH3V

Title: Smart Structures Demonstration Project

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Funder: United States Department of Transportation (DOT) (transportation.gov)

Funding opportunity number: SMARTFY22N1P1G45

Grant: https://www.transportation.gov/sites/dot.gov/files/2023-03/FY22%20SMART%20Project%20List.pdf

Template: Digital Curation Centre

Project abstract:

As the infrastructure industry advances into the digital age, the availability of emerging technologies coupled with digital access to data holds the opportunity to streamline infrastructure workflows and processes. With a focus on structural inspections, the NYS Thruway Authority intends to reimagine the way data is accessed and integrated for its infrastructure.

Using Unmanned Aerial Systems (UAS) to supplement inspections and making this data accessible on-site, coupled with a mobile inspection reporting app providing access to historic reporting information, our goals are to increase efficiency, safety of inspection personnel, and ease and completeness of reporting.

This proposed project, which is fully aligned with the Authority’s strategic goals, will utilize the

most advanced technology available to develop much more robust condition-rating capability.

With the application of seamless data integration, more efficient workflows, more detailed datasets, and better access to historical data, the concept is scalable to any application where repeatable photos and form data are used for condition reporting.

Significant benefits from use of UAS and implemented IT solutions will supplement the Authority’s asset management systems, which will improve the safety, efficiency, reliability, and resiliency of the transportation system. The Stage 1 project will be conducted for immediate benefit for the Authority and the New York State Department of Transportation and will also be fully scalable to other entities locally within New York State and nationally. This demonstration project will also serve the UAS industry by demonstrating areas of proven capabilities and identification of areas where opportunities exist for further technology enhancement.

Start date: 09-01-2023

End date: 03-21-2025

Last modified: 07-08-2024

Copyright information:

Smart Structures Demonstration Project

Data Collection

What data will you collect or create?

Datasets may include:

1. Bridge Data for Inspectors (+/- 350 MB): The “Bridge Folder”. Currently each bridge on the Authority system has its own physical folder which contains paper copies of every important informational detail about the bridge. The Authority's inspectors would like to have this information available digitally onsite. Much of the information is already digitally stored but spread into different locations with varying levels of access. A goal of this grant is to build a digital warehouse for this data into an app that will supply the inspectors with all of the information for any bridge, without the need to revisit the office to retrieve the paper files. Data involved with this effort includes:

- 3 past inspection reports (100 MB).
- Load Rating Data (minimal +/- 10 MB).
- Contract Plans (+/- 50 MB).
- As Built Plans (+/- 50 MB).
- Adjacent Utility Info (Not currently digital, minimal file sizes when scanned).
- Maintenance History (minimal +/- 10 MB).
- Recent Photos (100 MB).
- Misc. Email History regarding the Bridge (minimal +/- 10 MB).
- Red Flag Items (minimal +/- 10 MB).
- Vertical Clearance Data (minimal +/- 10 MB).

2. Bridge Inspection Mobile App (Unknown Size): Data relating to the creation and hosting of the proposed feature-rich inspection mobile app includes photo cataloguing and annotation features, note taking, and integrating access to the new digital bridge folder mentioned above. Quantification of this data will determine the volume of space needed to host the app.

3) Imagry associated with bridge inspection (+/- 5 GB) includes digital images that are collected by the inspectors during their inspection. At some point, while maintainaing conformance with state and federal laws relating to bridge inspecitons, old photos may be purged. However, the duration of time anticpated to retain data is lengthy as there is a need to access several years of photos of the same locations to track long term degradation in the field during the inspection. [jpeg].

4) Scan Data for Digital Twin Model Creation (Estimated +/- 10 GB): This represents all of the data collected in the field to create the digital twin (images and georeferencing information, up to approx. 5 GB) as well as the files created by the image processing software that creates the model (estimated at an additional 5 GB). This number would represent one bridge for the purpose of testing the concept. Some files may be purged after the model is finalized to save space in the future when more bridges are modeled. Should data constraints become an issue, the Authority will develop a criteria to prioritize which bridges should be modeled, (at scale, estimate approx. 30 bridges being monitored.) [jpeg/tiff/geotiff]

How will the data be collected or created?

Images for the project will be collected by inspectors using UAS devices or tablet based digital cameras. Condition ratings will be logged to the tablet devices and connected to Thruway servers. Historic records relating to the structures will be compiled from digital files that reside on our current servers within the Thruway system. Information relating to structures for GIS purposes already exists on our GISWeb system.

File naming conventions will conform to standards required by AASHTO for upload to BDIS (Bridge Data Information System).

Data used to create and analyze digital twins will flow through 3D modeling software (Bentley Context Capture, Pix4D or equivalent) to create and display the models.

Documentation and Metadata

What documentation and metadata will accompany the data?

Much of the data being generated for this project will be centered around images and documents; ie: .jpeg, .tiff, .pdf, .xls, .docx. See data description above for delineations of file types across data classifications. These data formats are non-proprietary.

For 3D modeling and mapping, the industry standard file formats include; .las, .laz, .kml, dxf, .shp. Generally speaking, all of these file formats referenced above are non-proprietary and platform independent.

Any identified need for interfaced metadata will be in will be in JSON format adhering to DCAT-IS V1.1.

Image data will contain EXIF header information which includes file type, file size, data created, latitude, longitude, altitude, camera type and flight height (Z Value) for imagery processing when necessary to import into ArcGIS.

Ethics and Legal Compliance

How will you manage any ethical issues?

No sensitive data is antiicpated to be collected during the course of the project. Any secure sensative infrastructure within the Authority's system t(ie: The Governor Mario M. Cuomo Bridge) will be excluded from the project.

No PII data will be collected. The nature of our system as a controlled access superhighway ensures that pedestrians are restricted from occupying the highway outside of enclosed vehicles limiting the opportunity for images to include faces or identifying information. Our project focuses on structures with no human participants present in the data collected. Any data relating to traffic or the traveling public is generic and does not contain any personal information

How will you manage copyright and Intellectual Property Rights (IP/IPR) issues?

Data collected during the term of this project will be classified in accordance with NYS-S14-013, , IT Standard Account Management and Access Control, issued by NYS Office of Information Technology Services. Said standard defines the “Information Owner” as follows:

“Information Owner: Information owners are people at the managerial level within an SE who:

- Delegate Account Managers to ensure the appropriate level of information access is provided. Delegation can be to individual users, groups, or third parties (e.g., another SE).
- Define roles and groups, as well as the corresponding level of access to resources for that role or group.
- Determine who should have access.
- Determine the identity assurance level for the application or data via the NYS-P20-001 Digital Identity Policy.

- Review that accounts and access controls are commensurate with overall business function and that the associated rights have been properly assigned annually, at a minimum.

- Require business units with access to protected resources to notify Account Managers when accounts are no longer required, such as when users are terminated or transferred and when individual access requirements change."

The above mentioned policy can be found at NYS-S14-013, IT Standard Account Management and Access Control, issued by NYS Office of Information Technology Services. The purpose of this standard is to establish the rules and processes for creating, maintaining, and controlling the access of a digital identity to New York State (NYS) applications and resources for means of protecting NYS systems and information.

All data used or collected during the course of the project will have been generated or owned by the NYS Thruway Authority (No 3rd party data anticipated). No licensing for data citations are expected to be required.

Storage and Backup

How will the data be stored and backed up during the research?

Sufficient storage space to host the data for this grant exists on Thruway servers.

The Authority does not anticipate archiving any data during the course of this demonstration project as all data collected will need to be accessible to inspection teams in perpetuity for continued tracking and monitoring of structures.

Data handling for this project will be managed by, and conform to standards set forth by, the NYS Thruway Authority's Department of Information Technology.

How will you manage access and security?

Data collected during the term of this project will be classified in accordance with NYS-S14-013, IT Standard Account Management and Access Control, issued by NYS Office of Information Technology Services.

This standard applies to all "State Entities" (SE) defined as "State Government" entities in Executive Order 117, established January 2002, or "State Agencies" as defined in Section 101 of the State Technology Law. This includes employees and all third parties (such as local governments, consultants, vendors, and contractors) that use or access any ITS resource for which ITS or the SE has administrative responsibility, including systems managed or hosted by third parties on behalf of ITS or the SE. While an SE may adopt a different standard, it must include the requirements in this one. This standard covers all systems developed by or on behalf of NYS, which require authenticated access. This includes all development, test, quality assurance, production, and other ad hoc systems.

Relating to data security, access to data, safe data transfer from the field into our main secured systems, please reference NYS-S13-001, IT Standard: Secure System Development Life Cycle, issued by the NYS Office of Information
Technology Services.

"...Information security is a business requirement to be considered throughout the System Development Life Cycle (SDLC). This Secure System Development Life Cycle Standard defines security requirements that must be considered and addressed within every SDLC. Computer systems and applications are created to address business needs. To do so effectively, system requirements must be identified early and addressed as part of the SDLC. Failure to identify a requirement until late in the process can have major repercussions to the success of a project and result in project delivery delays, deployment of an inadequate system, and even the abandonment of the project. Furthermore, for each phase through which a project passes without identifying and addressing a requirement, the more costly and time-consuming it is to fix problems that occur because of the omission. Information security must be adequately considered and built into every phase of the SDLC. Failure to identify risks and implement proper controls can result

in inadequate security, potentially putting New York State Entities at risk of data breaches, reputational exposure, loss of public trust, compromise to systems/networks, financial penalties and legal liability."

"Security is a requirement that must be included within every phase of a system development life cycle. A system development life cycle that includes formally defined security activities within its phases is known as a secure SDLC. Per NYS Information Security Policy, a secure SDLC must be utilized in the development of all SE applications and systems. This includes applications and systems developed for SEs."

Regarding digital identities and ensuring that the access being granted is being used by the actual account that has been authorized, please reference NYS-P20-001, IT Policy: Digital Identity, issued by the NYS Office of Information Technology Services.

"This policy establishes a framework for issuing and managing trusted identity credentials to allow citizens, businesses, and government employees to conduct business online with New York State (NYS). A trusted identity credential is one in which a State Entity (SE) has sufficient confidence that the identity credential represents the person named in it and that the person engaged in the electronic transaction is the person to whom the identity credential was issued. This policy benefits users of systems and e-Government services by providing a framework that creates and issues NYS electronic identity credentials that can be universally trusted by ensuring alignment with the National Institute of Standards and Technology (NIST) Digital identity guidelines. SEs will be able to participate in shared identity solutions and reduce the need to issue and manage their own electronic identity infrastructure for e-Government services; resulting in reduced costs of providing online services that require user authentication."

Selection and Preservation

Which data are of long-term value and should be retained, shared, and/or preserved?

The value of this data can be most appropriately measured in the long term. Having access to this data in the field has benefits in efficiency leading to cost savings realized immediately. In the long term, hosting this level of detailed information will be valuable for tracking and monitoring structural life cycles of our assets.

Most of the data collected will be stored and accessed by inspection teams in perpetuity and will therefore not be archived or destroyed.

In the future it may be feasible to eliminate some background data used to create 3D models or digital twins (image files collected for the specific purpose of modeling) once the models are complete. The models themselves will be maintained in perpetuity. We expect to make a decision about this data elimination at a later point when the value of such background data can be more accurately assessed based on how frequently it is accessed or required.

What is the long-term preservation plan for the dataset?

Currently, we expect all data (excluding in some instances background data as described above) to exist in perpetuity on secure Thruway servers. These servers are managed by the NYS Thruway Authority's Department of Information Technology. No additional charges for data storage beyond what the Authority has already procurred for its enterprise systems is expected to accrue during the proof-of-concept.

Data Sharing

How will you share the data?

The main repository for data collected, being the servers managed by the Department of Information Technology within the NYS Thruway Authority, will be accessed by end users through individual accounts, in conformance with

NYS-S14-013. Inspection teams will update the data as inspections are completed and reports are filed.

Said IT standard referenced above outlines account types and access, creating a framework for which entities have access to which data, including roles, responsibilities, and permissions.

With data being hosted on site by the Authority, a persistent identifier is not anticipated to be required.

At the end of the research term, data collected and created will be shared to "figshare". “figshare” is on the list of repositories that NTL team has evaluated and are conformant with the USDOT’s Public Access Plan.

Are any restrictions on data sharing required?

As this project does not anticipate collection of PII or secure sensitive data, the Authority does not expect any restrictions on sharing.

Responsibilities and Resources

Who will be responsible for data management?

The data management plan will be executed by the Department of Information Technology within the NYS Thruway Authority in conformance with all NYS standards for data management previously cited.

Regarding roles and responsibilities, please reference NYS-S14-013, IT Standard: Account Management and Access Control, issued by NYS Office of Information Technology Services.

As the Thruway Authority will be the only collector of data and the sole managing agency for the data, consortiums or partnership contracts with regards to data ownership are not expected to be necessary.

What resources will you require to deliver your plan?

The Authority staffs its own Departmen of Information Technology and has assigned necessary IT experts and planned the procurment of hardware and software systems that are expected to be necessary for successful implementation of this prototype project.

No charges for data repositories are anticipated during the prototyping of this project.

Planned Research Outputs

Workflow - "Smart Structures Demonstration Project - Infrastructure Inspection"

As the infrastructure industry advances into the digital age, the availability of emerging technologies coupled with digital access to data holds the opportunity to streamline infrastructure workflows and processes. With a focus on structural inspections, the NYS Thruway Authority intends to reimagine the way data is accessed and integrated.

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Planned research output details

Title	Type	Anticipated release date	Initial access level	Intended repository(ies)	Anticipated file size	License	Metadata standard(s)	May contain sensitive data?	May contain PII?
Smart Structures Demonstration Project - Infrastru ...	Workflow	2024-12-01	Open	Figshare	20 GB	Creative Commons Zero v1.0 Universal	DCAT (Data Catalog Vocabulary)	No	No