



RP-SMARF

Software that enables research on smart structures and machines for improved safety and reduced cost of Canada's infrastructure

Maintaining public infrastructure is essential and yet over 40% of the 55,000 bridges across Canada are close to the end of their design lifetime. As bridges age they become costly to inspect, maintain, and repair. Research that could predict or extend the lifespan of our bridges is complicated because it's difficult for researchers to collect, share, and analyze crucial sensor data. This need for effectively sharing scientific resources applies to other crucial infrastructure components too, such as wind turbines and dams for hydro generation.

But it isn't just civil engineering that could benefit from better data and resource sharing. Mechanical engineers can find research collaboration essential whenever equipment and tools are unique or costly – for example, in jet turbine or rocket engine research. In fact, many disciplines where data collection is expensive and resources for data analysis are scarce could benefit from better collaboration platforms.

Researchers at Carleton University have been working on just that – tools and techniques for managing smart facilities that will help civil engineers keep the risk of failure to an acceptably low level throughout the life cycle of a bridge, help mechanical and aerospace engineers build tools and techniques for remote monitoring of jet engines, and help architectural researchers manage smart buildings.

Academic/industrial collaboration

A new cloud-based Research Software Platform, RP-SMARF (Research Platform for Smart Facilities Management), is the result of a long-time collaboration between Carleton University researchers and their industrial partner, Solana Networks. The first of its kind, it allows geographically dispersed researchers to share data-analysis tools, sensor data, and expertise to manage smart facilities. Two projects currently using RP-SMARF are sensor-equipped bridges and aerospace machinery.

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RP-SMARF provides engineers with the ability to collect information from sensors and analyze huge real-time data streams. In the bridge research project for example, RP-SMARF allows researchers to verify model simulations against the real-life performance of bridges under extreme weather and load conditions, and to proactively identify potential breakdowns before they become catastrophic.

Reduced costs and increased safety

RP-SMARF stands to benefit all Canadians by helping facilities researchers more efficiently develop civil and mechanical engineering processes. Better engineering methodologies improve public safety by creating stronger systems that can withstand harsher environments, and by extending design lifespans. Better facilities with fewer replacements create shorter construction delays and lessens the impact on our environment.

Contributions to the software registry

In addition to the RP-SMARF Platform itself, two reusable Software Services used within it have been made available to other researchers via the CANARIE Software Registry, including the RP-SMARF cloud storage service and the RP-SMARF meta-data search service. Additionally, RP-SMARF has been designed with generic software components so that it can be re-used by researchers across many scientific disciplines.

Technical Details

Platform: Research Platform for Smart Facilities Management (RP-SMARF)

Description	The Research Platform for Smart Facilities Management (RP-SMARF) is a software platform that facilitates resource and data sharing among researchers. Within the context of this project, a resource may refer to a computing resource (physical or virtual computer), a data storage resource, files or folders located on a computer, or software tools. By sharing resources, researchers are able to access a large and diverse tool set through a network, which leads to higher productivity and effectiveness for collaborative efforts.
Creator(s)	Carleton University
Research Subject	Multi-discipline
Managed Versionⁱ	Yes – Requires registration with RP-SMARF here: rpsmarf.ca/#access
Self-deployed Versionⁱⁱ	Yes – Source available via a bitbucket repository. See bitbucket.org/rpsmarf/python_repo
Cloud Support	Yes – Runs on OpenStack
Host OS	Linux
Licence	GNU General Public Licence
URL	canarie.ca/software/smarfplatform

Contributed Services:

	RP-SMARF Cloud Storage	RP-SMARF Metadata Search
Description	Provides a resource abstraction layer for working with multiple cloud data sources via a RESTful interface.	Allows the integration of metadata storage and retrieval into research software.
Category	Resource/Cloud Management	Data Storage and Retrieval
Research Subject	Multi-Discipline	Multi-discipline
Managed Versionⁱ	Yes – RESTful access available via RP-SMARF website, see ow.ly/X0vge	Yes – RESTful access available via RP-SMARF website, see ow.ly/X0vge
Self-deployed Versionⁱⁱ	Yes – source code available via a bitbucket repository. See ow.ly/X0vWr	Yes – Source code available via a bitbucket repository. See ow.ly/X0w8f
Cloud Support	Yes – runs on OpenStack, EC3	Yes – Runs on OpenStack
Host OS	Linux	Linux
Licence	GNU General Public Licence	GNU General Public Licence
Details	canarie.ca/software/smarfcloud	canarie.ca/software/smarfmetadata

Funding for the development of RP-SMARF was provided through CANARIE's Research Software Program.

ⁱ Managed version: Creators host a live instance of the software on their infrastructure, available for use by others

ⁱⁱ Self-deployed version: Users host a private instance of the software on their own infrastructure