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Fostering the Use of Scientific Water Models from Different Stakeholder Perspectives through the Sustainable Water Through Integrated Modeling (SWIM) Platform

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Abstract

The interpretation and use of scientific models are relevant to public discourse and decision-making about future water scenarios. Tools to use these scientific models aim to facilitate understanding water systems; however, the information in these tools can be so vast, complex, and prone to uncertainties that users may find using some of these tools a cumbersome task. Users can be presented with numerous outputs, visualizations, and vocabulary that are irrelevant or do not align with their perspective (i.e., user role) in the water system under study. To address these issues, the SWIM platform extends the capabilities of traditional Web-based graphical interfaces to foster the use of scientific models, in particular, water sustainability models. With the integration of a recommender system and a dynamic interface, SWIM provides users with a list of prioritized outputs (i.e., modeling results) based on their perspective, to reduce the overload of data presented to users. Users are also provided with a range of output visualization graphs and narrative elements (i.e., contextual natural language descriptions) to support the interpretation of model results. The SWIM interface design provides a seamless high-level workflow for models developed in different modeling software tools and languages. The SWIM platform is designed to foster interoperability by providing open APIs and knowledge bases to access data, metadata, and models (i.e., Model-As-A-Service). This presentation highlights the key elements of SWIM that enable the interpretation of scientific model outputs from different perspectives and the interoperability features of this platform.

Frontiers in Hydrology

Sustainable Water through Integrated Modeling

Fostering the Use of Scientific Water Models from Different Stakeholder Perspectives through the **S**ustainable **W**ater **T**hrough **I**ntegrated **M**odeling (SWIM) Platform

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Challenges of using and understanding Water-related scientific models

- Information Overload
- Complexity
- Uncertainty
- Different Perspectives

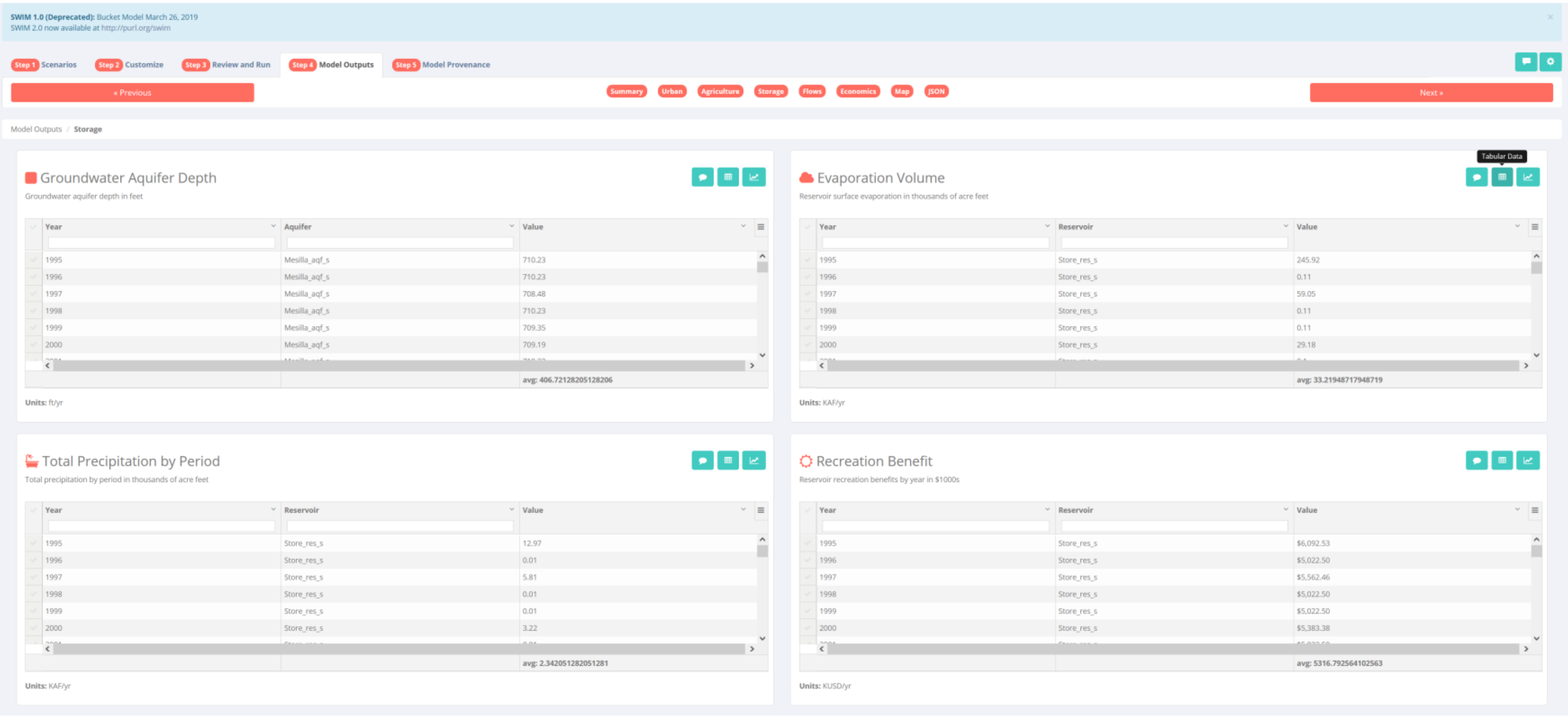

Fig. 1. Screenshot of SWIM 1.0 – Custom Model Scenario Results

https://water.cybershare.utep.edu

United States Department of Agriculture
National Institute of Food and Agriculture

Middle Rio Grande Basin Hydro-economic Model

Mitigation of Information Overload and Complexity

SWIM Recommender Service

Selected Model and Role

Output Recommendations

Interaction and Ranking Feedback

Third-Party Libraries:
LightFM. Kula, M. (2015). https://github.com/lyst/lightfm
Optuna. Akiba T., et al. (2019). https://optuna.org

SWIM NLNG Service (in development)

Selected Role and Output

Text Narratives

Natural Language Narrative Generator

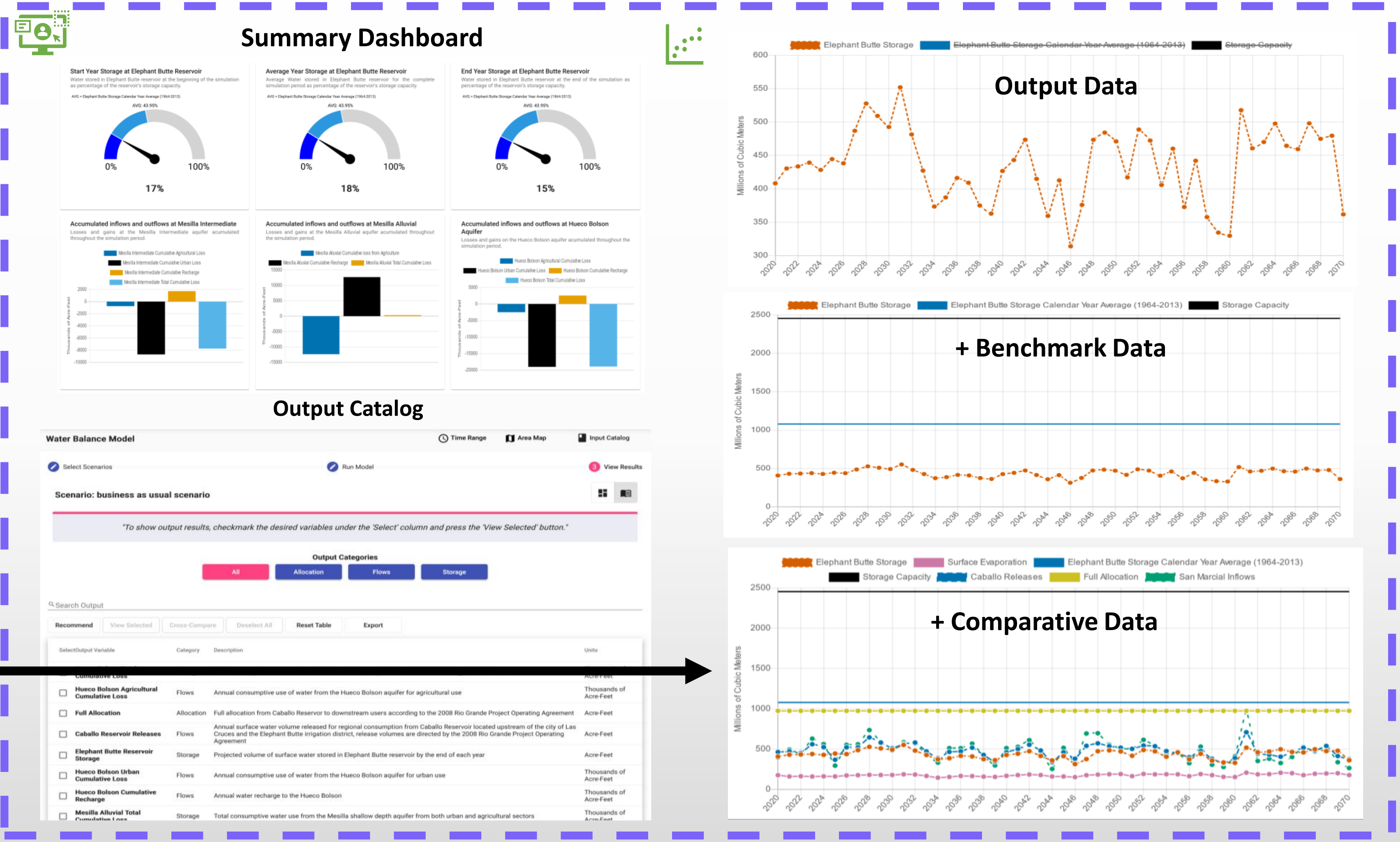

Fig. 2. Screenshot of SWIM 2.0 –Model Scenario Results

Synchronous message

Asynchronous message

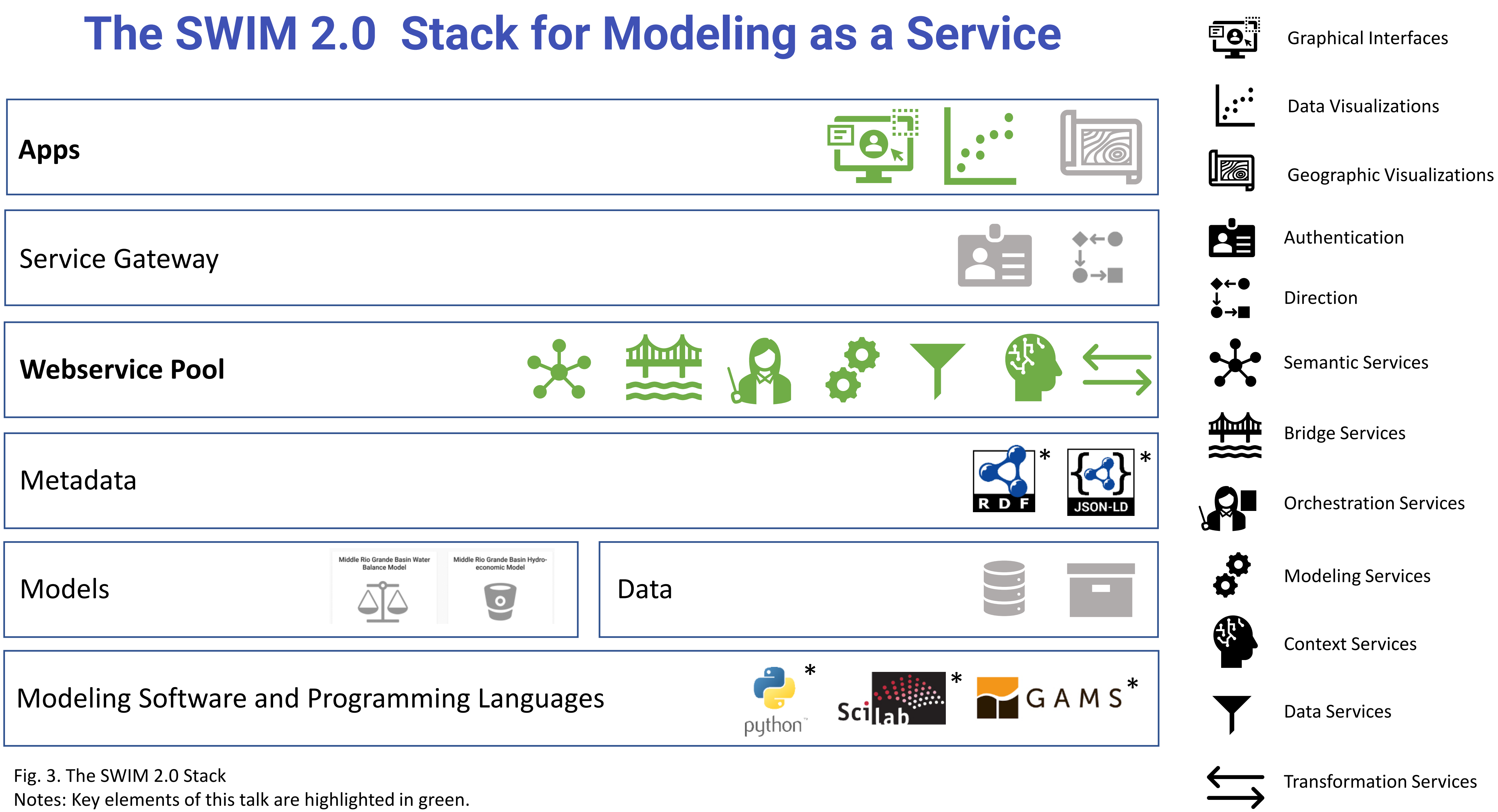

Fig. 3. The SWIM 2.0 Stack
Notes: Key elements of this talk are highlighted in green.

*Third party tools or languages leveraged.

Interoperability

SWIM Broker Service
(Modeling)

- Single Model Execution
- Model-to-model Integration
  - Automated workflow composition
  - Data Transformation
  - Workflow Provenance
- OpenAPI Specification 3.0

SWIM API
(Data)

- Models, inputs, outputs, catalogs.
- Scenario results
- Cross-scenario comparison
- OpenAPI Specification 3.0

HYDROSHARE

HydroShare Bridge
(Sharing)

- Integration with third-party CUAHSI HS services.
- Model Instance publication as a HS resource
- Seamless integration from the SWIM Web Interface
- Additional Metadata Capture

Hydroshare. Horsburgh, J. S, et al., (2016).
https://hydroshare.org

SWIM Broker Endpoints

https://services.cybershare.utep.edu/swim-broker/swagger

SWIM API Endpoints

https://services.cybershare.utep.edu/swim-api/api-docs/

SWIM - First Splash

http://purl.org/swim/splash

Thoughts about SWIM?

Contact us at swim@utep.edu

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Cyber-ShARE

United States Department of Agriculture
National Institute of Food and Agriculture

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