DEVELOPMENT AND TESTING OF A MODERN CLOUD-BASED WORKFLOW FOR COASTAL HAZARD MODELING

Waves and Coastal Hazards Workshop

September 25, 2025

CHL COASTAL & HYDRAULICS LABORATORY

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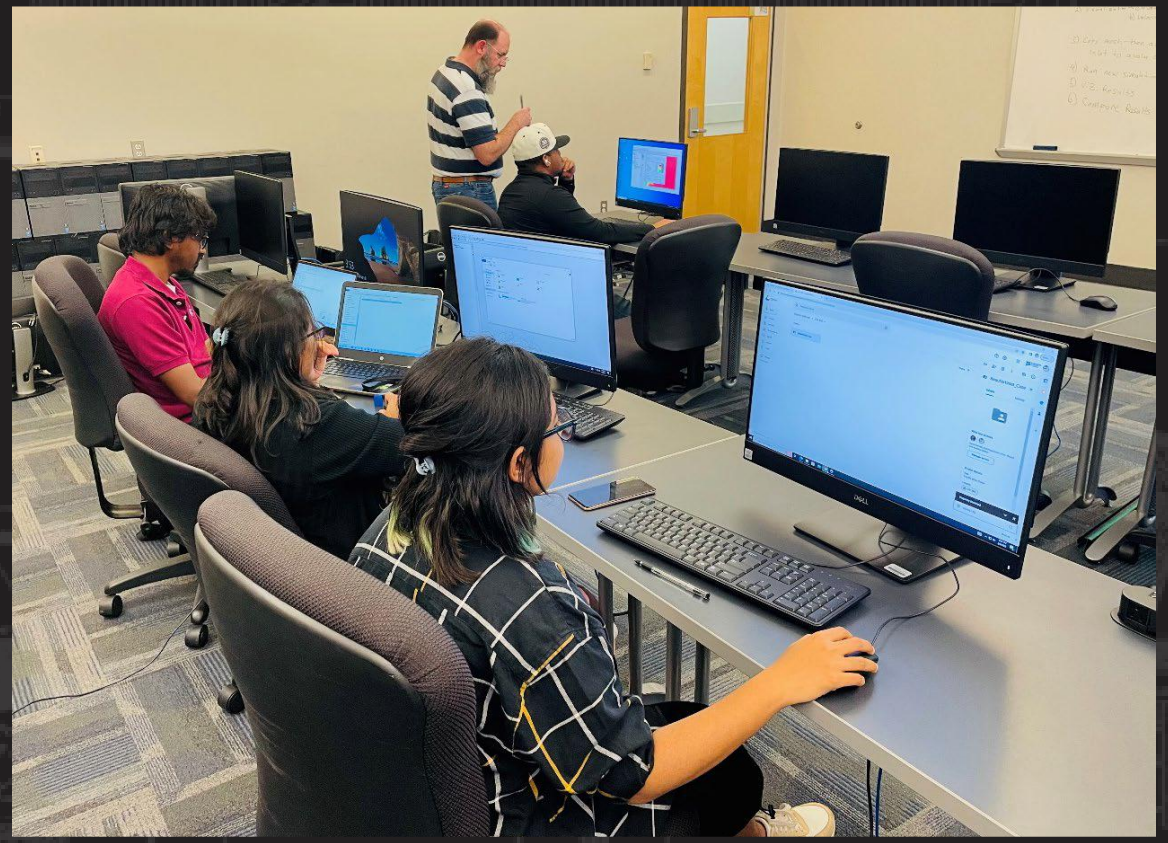
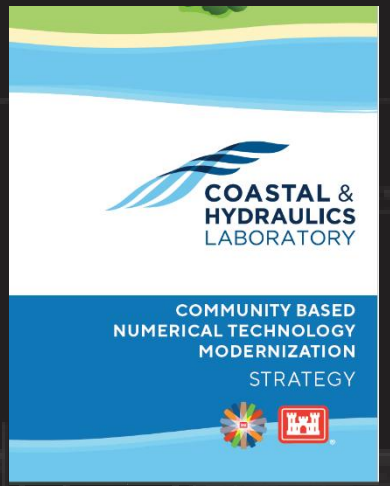
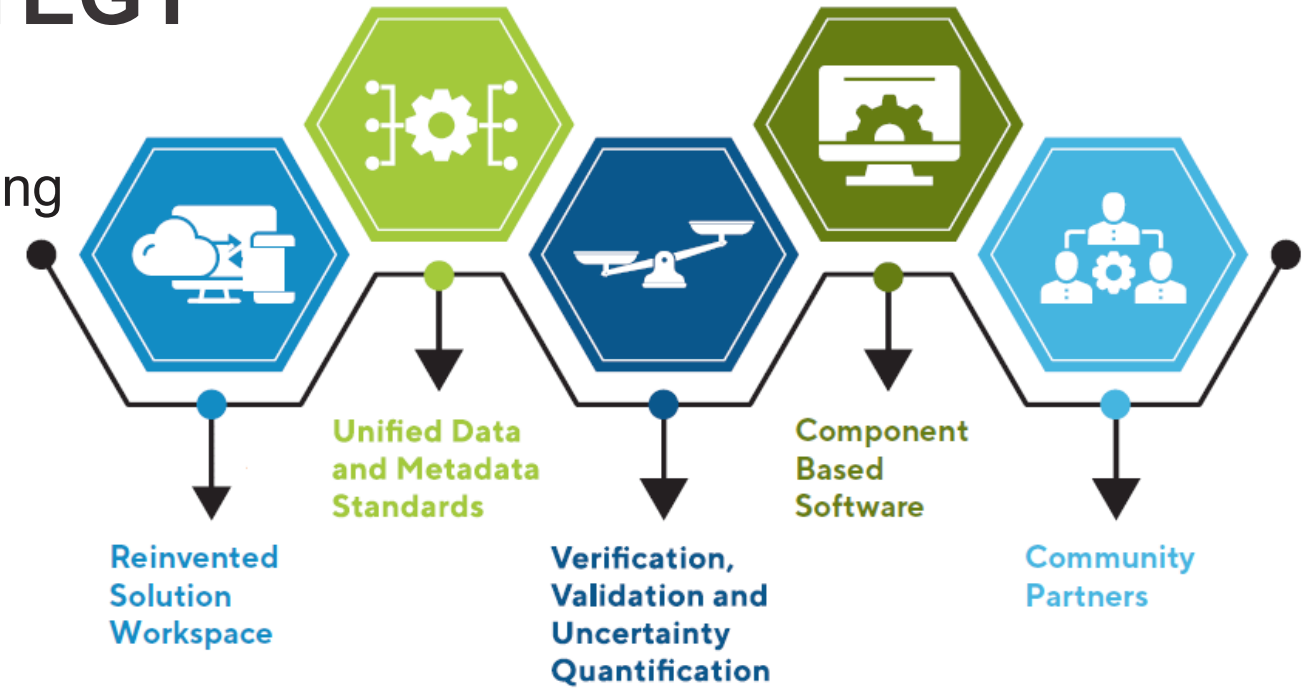


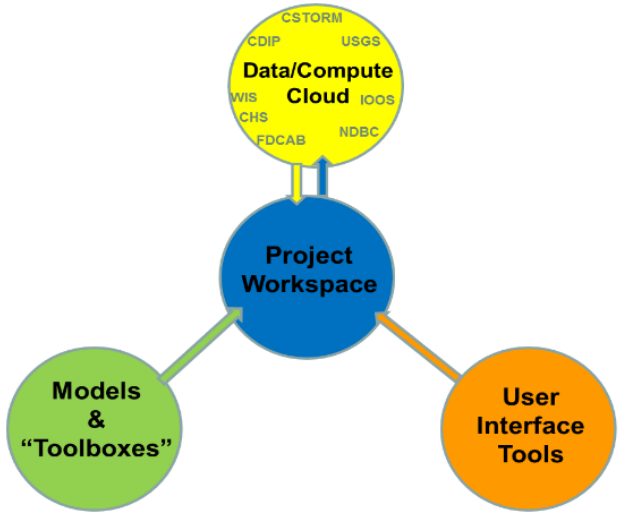


CHL'S NUMERICAL TECHNOLOGY MODERNIZATION STRATEGY

GOALS

- Guide numerical and data technologies funding
- Improve numerical modeling and data integration infrastructure
- Establish a common system for digital technology development and maintenance
- Improve and integrate relevant data and numerical technologies
- Make data and numerical technologies efficient to access/apply and cost less to use/maintain
- Foster ERDC, interagency, and academic collaboration and to leverage resources





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NUMERICAL MODEL MODERNIZATION RESULTS AND BENEFITS

Added Functionality

- Connects coastal models
- Provides a framework to add capabilities
- Creates flexible, user-defined workflows

Easier Use/ Easier Access

- Easy-to-setup approach
- Provides framework for university use
- Makes models more easily available
- Flexibility to balance Opex/Capex funds

Achieving Results Faster

- Automates formerly manual steps
- Scalable computational resources
- Runs models in parallel

Increased Collaboration

- Allows for shared input or output data
- Establishes catalog of analysis and creates metadata from analysis

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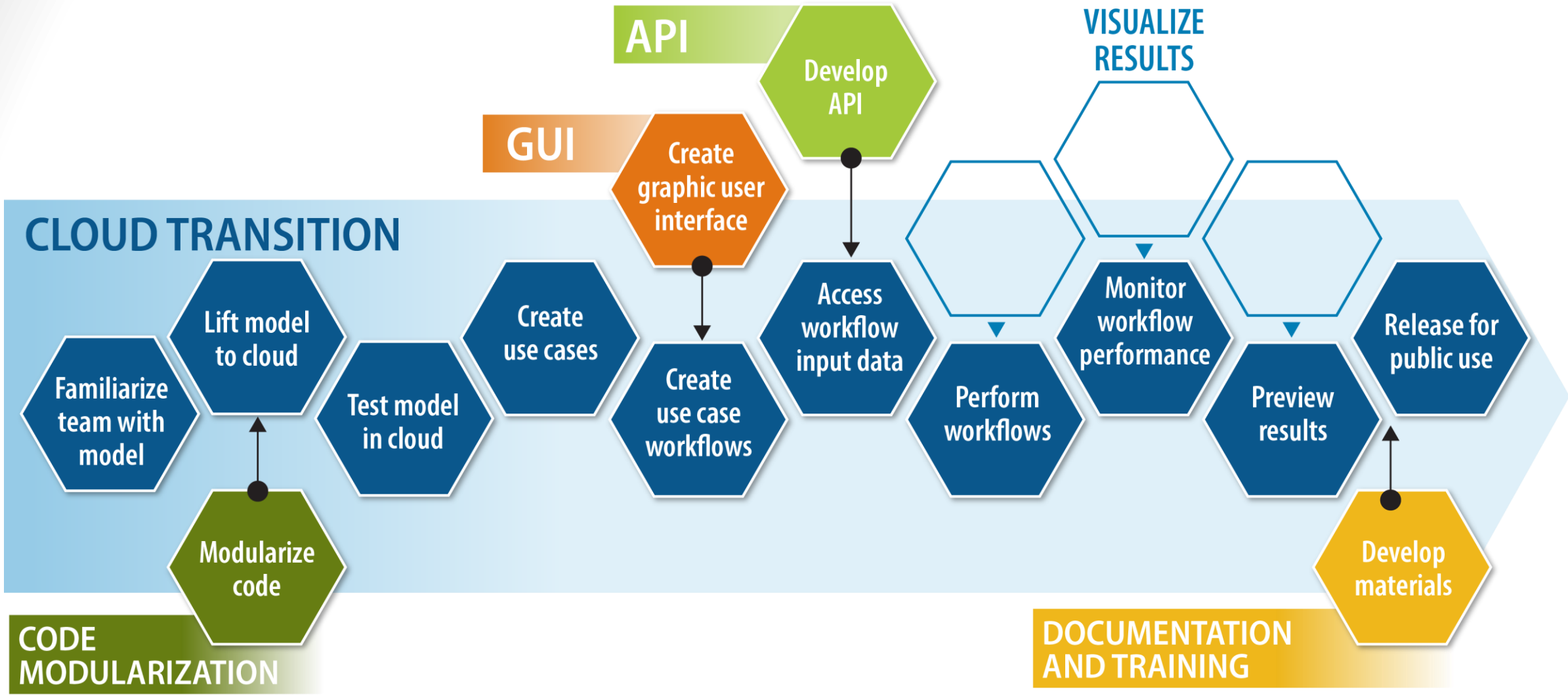
NUMERICAL MODEL MODERNIZATION PROCESS



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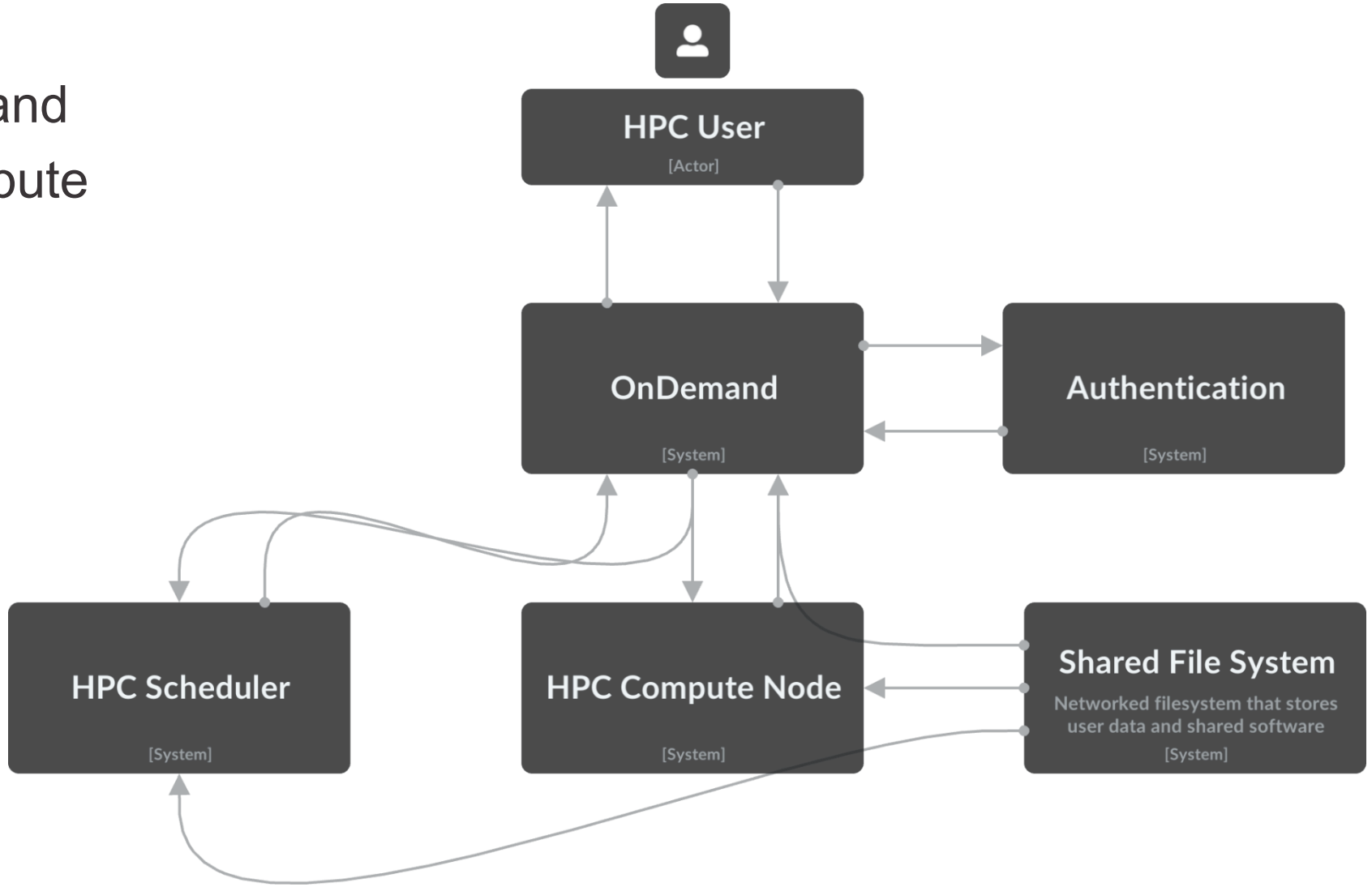
CLOUD ARCHITECTURE

Web based HPC portal based on Open OnDemand

- Access to launch compute and visualize jobs
- Guided Workflows
- Shared Storage



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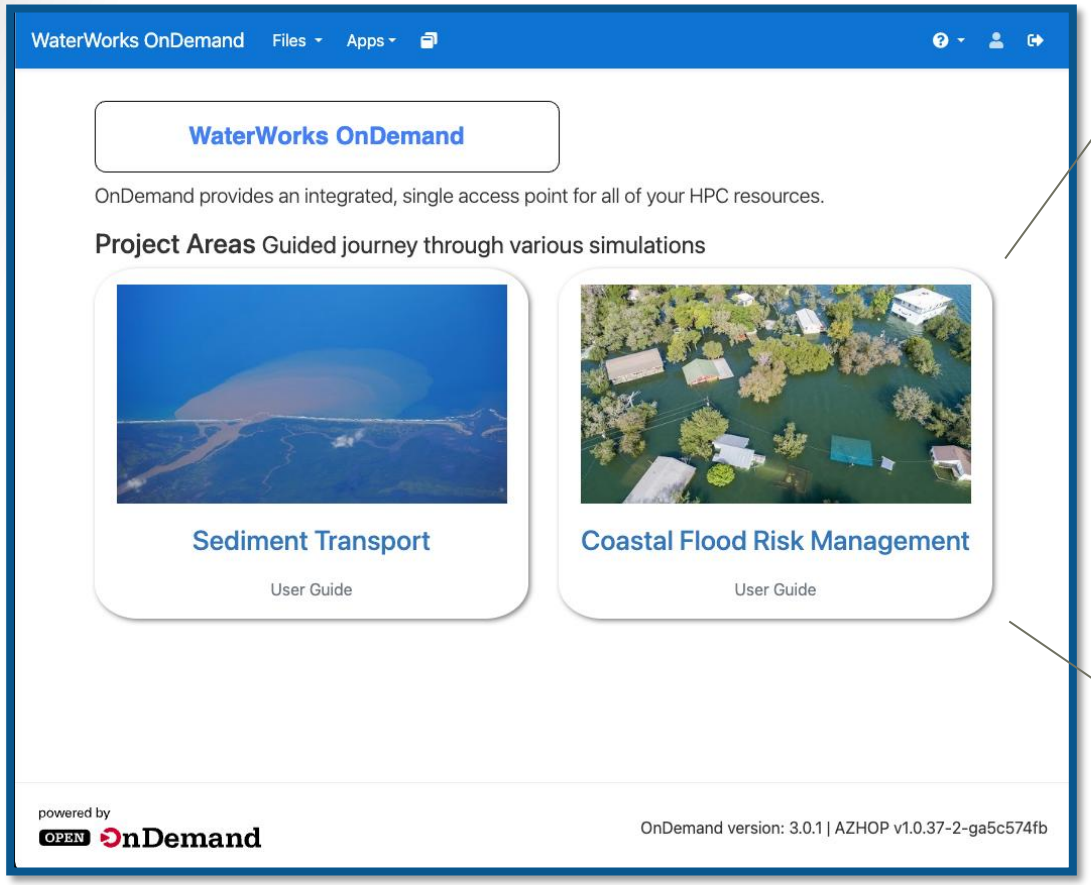
WaterWorks OnDemand



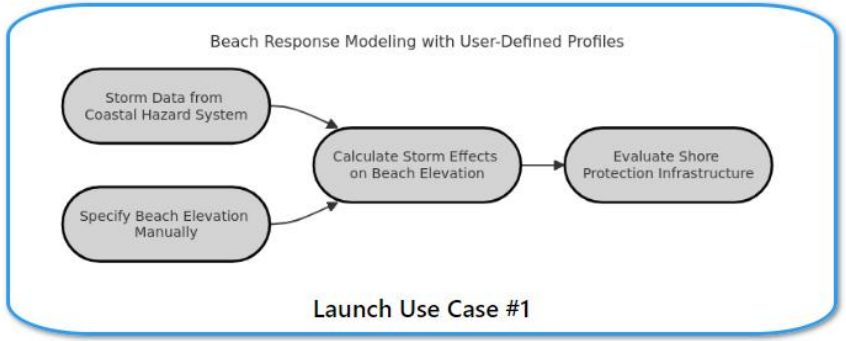
Coastal Flood Risk Management

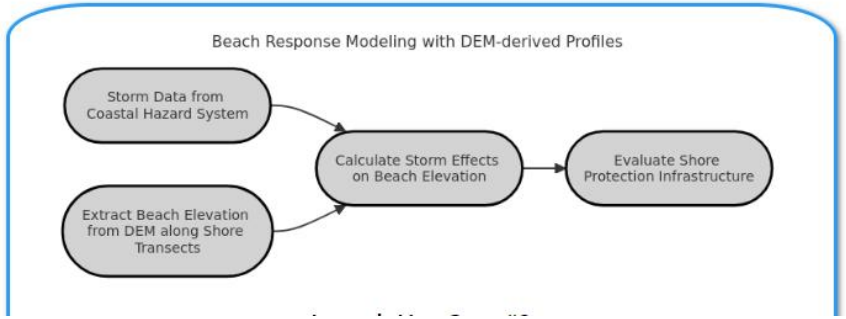
Coastal Storm Risk Management (CSRM) involves understanding and quantifying the storm impacts in coastal areas (erosion, flooding, etc.) and strategic planning to mitigate those impacts, reducing the vulnerability of communities, infrastructure, and ecosystems. Water Works On Demand offers a cloud-based platform utilizing computational resources and modeling tools to analyze these impacts.

Our platform enables the modeling of physical processes during storms to predict beach erosion, sediment transport, storm surge, and flooding patterns for various storm and topographic conditions through different use cases. By integrating consequence models, the platform can assess potential impacts including economic losses, property damage, and environmental changes. This modeling capability provides scientists, engineers, researchers, and stakeholders with the opportunity to study storm-driven processes and risks, facilitating informed decisions on coastal development, infrastructure planning, and emergency preparedness.

Use Cases

The platform provides workflows which define common use cases in the CSRM domain. The use cases capture steps which a user can interact with (providing input data, specifying modeling parameters, etc.) as the use case is running. The following use case scenarios are provided for CSRM.





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UNIVERSITY/COMMUNITY PARTICIPATION

Partnership with Jackson State University

- Summer internship program
- Training WWOD platform

Individual graduate student(s) activities:

- Gained access to the WWOD platform
- Went through training and intro to the platform capabilities
- Tested the workflows available on the platform
- Applied SMS and ADCIRC to investigate coastal conditions and models
- Provided feedback on use cases, cluster scaling and performance

Thank You!

Questions?