DiME and AGVIS: A Distributed Messaging Environment and Geographical Visualizer for Large-scale Power System Simulation

Nicholas Parsly, Jinning Wang, Nick West, Qiwei Zhang, Hantao Cui, Fangxing Li
The University of Tennessee, Knoxville

DiME

- A high-concurrency, high-volume, and real time messaging environment.

- Utilizes a shared workspace model or data transfer.

- Compatible with MATLAB, Python, and JavaScript clients.

- Clients are maintained in groups.
  - *send()* function sends variables to specified groups.
  - *broadcast()* function sends variables to all clients.
  - There is a variable table for each group.

- Variables are retrieved by clients using the *sync()* function.

- There are additional *sync()_r, broadcast()_r,* and *send_r()* functions that send and update variables without updating the table.
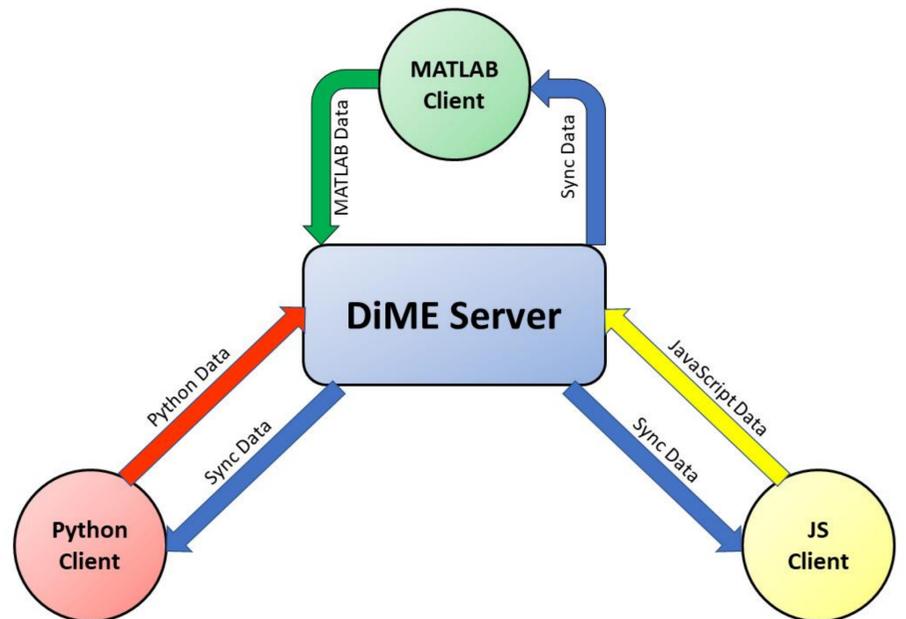

Diagram depicting how DiME passes and receives information to its clients.
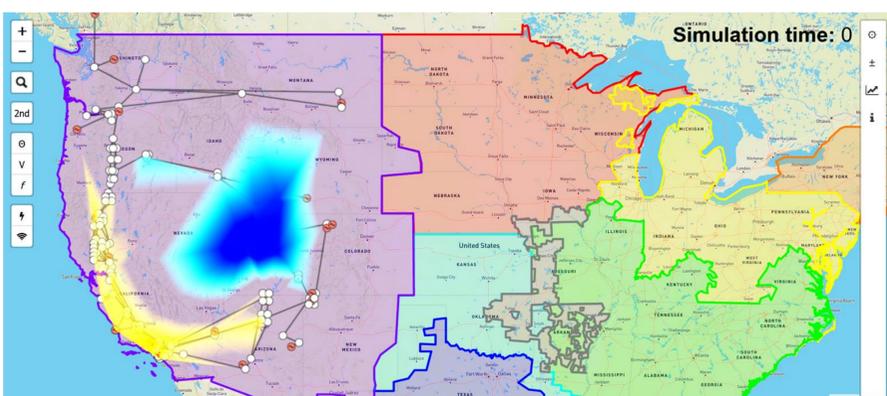
AGVis

- A grid-based JavaScript tool for visualizing power system simulations.
  - Runs in browser.

- Works in tandem with ANDES and DiME to animate simulations as they run.

- Can also now be run as an independent program using user-provided data.
  - Referred to as the "MultiLayer" implementation.

- Creates animations using Delaunay Triangulation and heatmapping between nodes on the map.

- MultiLayer provides additional customization options over the initial federated use.
  - Node and line coloring.
  - Node and line sizing.
  - Node and line opacity.
  - Rendering toggles.
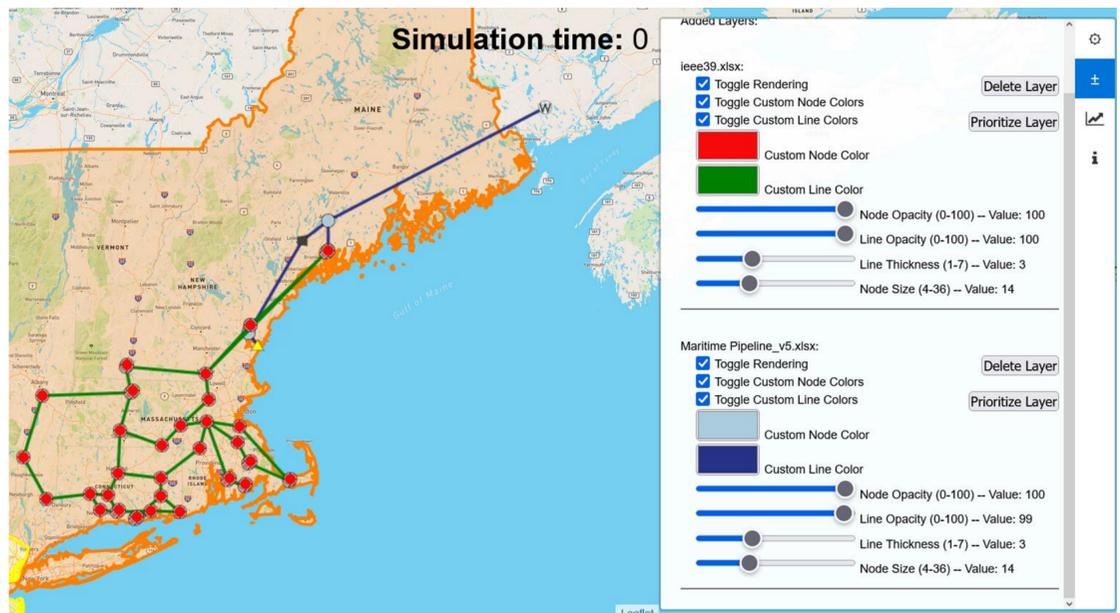
MultiLayer display of an IEEE 39 bus system and a test gas pipeline, using customized node and line parameters.

FEDERATED USE

- DiME passes simulation data from ANDES to AGVis.

- Allows for convenient and efficient prototyping of power system simulations.
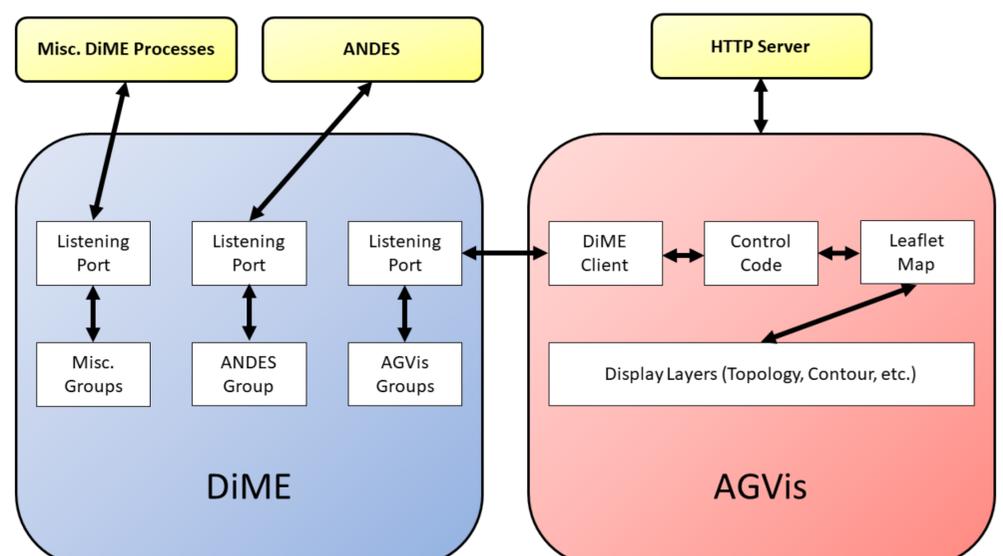

AGVis animating the simulation data from the WECC system.

Diagram depicting the interactions between DiME, ANDES, and AGVis.