

# HiPAS GridLAB-D

EPC-17-046 - Final Production Release

*David P. Chassin*

*SLAC National Accelerator Laboratory*

*17 March 2023*

# Overview

## Open-Source Distribution and Resources

- GitHub
- CI/CD
- Docker
- AWS Cloud
- Online documentation
- Tutorials

## Packages, Services, and Utilities

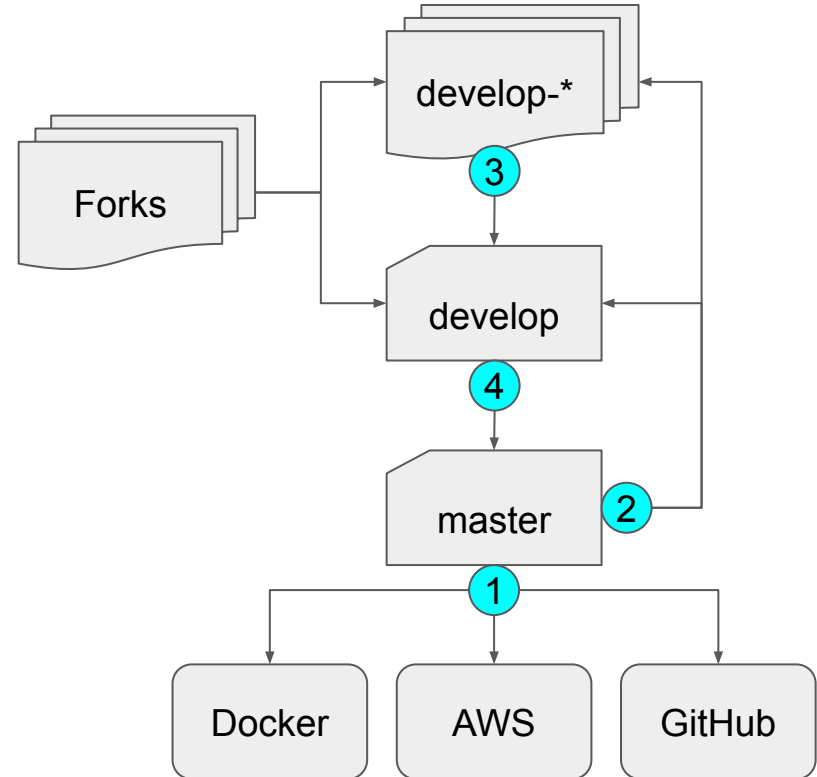
- Converters
- Geodata
- Modules
- Python
- Runtime
- Subcommands
- Tools

# GitHub Repositories

<a href="#">arras/gridlabd</a>	Source code and build system for simulation and support packages
<a href="#">arras/gridlabd-template</a>	Analysis templates, e.g., for ICA, tariff design, electrification, and resilience analysis
<a href="#">arras/gridlabd-utilities</a>	General purpose utilities for working with GridLAB-D models and data
<a href="#">arras/gridlabd-docker</a>	Support infrastructure for creating and maintaining Docker base images
<a href="#">arras/gridlabd-project</a>	Template for creating GridLAB-D projects in GitHub that use CI/CD automatically
<a href="#">arras/gridlabd-models</a>	Sample models for use in GridLAB-D projects, validation testing, and tutorials
<a href="#">arras/gridlabd-library</a>	Object libraries for distribution system assets, e.g., cables, transformers, regulators
<a href="#">arras/gridlabd-weather</a>	Weather data repository
<a href="#">arras/gridlabd-examples</a>	Example models and support code for various types of studies
<a href="#">arras/gridlabd-benchmarks</a>	Benchmark models for GridLAB-D performance tests
<a href="#">arras/gridlabd-converters</a>	Supplementary converter repository

# Continuous Integration and Continuous Delivery

1. Master branch validated and deployed
2. Development branches updated
3. Development branches validated
4. Main development branch deployed



# Docker

Primary docker organization "arras".

Image naming convention:

- arras/gridlabd:latest
- arras/gridlabd:develop
- arras/gridlabd:YYMMDD

# AWS Cloud

Main AWS account is "arras" with IAM logins.

AMI naming convention:

`arras-gridlabd-<VERSION>-<BRANCH>-<SYSTEM>-<ARCH>`

`<VERSION>`, e.g., "4.3.1"

`<BRANCH>`, e.g., "master", "develop"

`<SYSTEM>`, e.g., "LINUX"

`<ARCH>`, e.g., "x86\_64"

# Online documentation

Delivered at <https://docs.gridlabd.us/>

Main page:

- About GridLAB-D
- Developers
- Documentation
- Features
- Getting Started
- Home
- News
- Resources
- Sponsors

Sections:

- Cloud
- Command
- Converters
- Developer
- GLM
- Global
- Install
- Module
- Server
- Subcommand
- Tips and tricks
- Tutorials
- Use cases
- Utilities

The screenshot shows the web interface for the HiPAS GridLAB-D 4.2 User Documentation. The browser address bar shows `docs.gridlabd.us`. The page header includes logos for the U.S. Department of Energy, Office of Science, Stanford University, SLAC, and the National Accelerator Laboratory (Gismo). Below the header, there's a navigation bar with links: Home, Features, Getting Started, Documentation, Resources, Developers, Sponsors, About Us, and News. The main content area is titled "HiPAS GridLAB-D 4.2 User Documentation". It features a large blue banner with the text "FUNDING PROVIDED BY THE CALIFORNIA ENERGY COMMISSION" and the California Energy Commission logo. Below the banner, there's a paragraph stating: "This documentation is for HiPAS GridLAB-D, the high-performance commercial release of GridLAB-D developed by Stanford University at SLAC National Accelerator Laboratory under funding from the California Energy Commission." Another paragraph mentions: "The documentation for the current research version of GridLAB-D developed by Battelle Memorial Institute at Pacific Northwest National Laboratory under funding from the US Department of Energy is available from ShoutWiki." On the left side of the page, there's a sidebar with a "Table of Contents" section listing various topics: Cloud, Command, Converters, Developer, GLM, Global, Install, Module, Server, Subcommand, Tips and tricks, Tutorials, Use cases, Utilities, About Us, Developers, Documentation, Features, Getting Started, Home, News, README, Resources, and Sponsors. At the bottom of the sidebar, there's a copyright notice: "Copyright (C) 2019-2023, Regents of the Leland Stanford" and a link to "Display a menu".

# Tutorials

Online <https://tutorials.gridlabd.us/>

Topics:

User Tutorials

Developer Tutorials

- ✓ 1. Introduction
- 2. Building GridLAB-D
- 3. GridLAB-D Modeling
- 4. Testing and Validation
- 5. Modules and Classes
- 6. Solvers (core and thermal)
- 7. Solvers (powerflow)
- 8. Python Libraries and Extensions

The screenshot shows a web browser window with the URL `tutorials.gridlabd.us`. The page title is "HiPAS GridLAB-D Training Video Library". The main content area displays the title "HiPAS GridLAB-D Developer Training Session 1 Introduction" by David P. Chassin, Summer 2022, with the email [dchassin@stanford.edu](mailto:dchassin@stanford.edu). Below the title, it states "All registered trademarks are hereby recognized." and shows logos for the U.S. Department of Energy, Office of Science, and SLAC National Accelerator Laboratory. A video player interface is at the bottom, showing a progress bar at 0:00:27 / 1:56:10 and a "Session playing: 1. Introduction" status. A sidebar on the right shows a list of video thumbnails.

HiPAS GridLAB-D Training Video Library

HiPAS GridLAB-D  
Developer Training Session 1  
Introduction

David P. Chassin  
Summer 2022  
[dchassin@stanford.edu](mailto:dchassin@stanford.edu)

All registered trademarks are hereby recognized.

U.S. DEPARTMENT OF ENERGY  
Office of Science

SLAC NATIONAL ACCELERATOR LABORATORY

Session playing: 1. Introduction (View slides: [icon])

HiPAS GridLAB-D Version 4.3 Tutorials  
Copyright © 2022, Regents of the Leland Stanford Junior University



# Converters

Convert file formats and file semantics

Supported formats:

- CSV
- GLM
- GZ
- JSON
- MDB
- OMD
- PNG
- PY
- TXT
- XLS
- ZIP

Supported semantics:

- AMI
- SCADA
- Weather (NOAA, NSRDB, TMY)
- Cyme (CYMDIST)
- OMF (NRECA Open Model Framework)
- GridLAB-D (objects, classes, settings)
- Python (source code, data)
- Plots (voltage profiles, network graphs)
- Pole structure (SPIDACalc)
- File archives
- Compressed data files
- EMS log files (Schneider)

# Geodata

## Geographic datasets

- Address resolution
- Census tract geometry
- Distance calculations
- Ground elevation
- Powerline calculations
- Utility service territory
- Vegetation
- Weather

# Modules

## Integrated modeling and analysis modules

- commercial buildings
- generators and inverters
- industrial loads
- market models
- powerflow analysis
- reliability analysis
- residential buildings
- resilience analysis
- revenue analysis

## Integrated data and support modules

- assert (data validation)
- climate data
- connection for co-simulation
- influxdb databases
- mysql databases
- optimizer (goal seeker)
- tape (play, collect, and record data)
- tariff database (NREL OpenEI)
- transactive energy system support

# Python

Modules, packages, and libraries to use Python with GridLAB-D

- GridLAB-D package (pip installer)
  - Load, run, and interact with gridlabd simulations in python code
- GridLAB-D library (pip installer)
  - Modify gridlabd models in python code
  - Access subcommands, converters, geodata, and tools from python code
- GridLAB-D module (gridlabd installer)
  - Run python code in gridlabd simulations
  - Pre/post-process data in gridlabd simulations

# Runtime resources

Runtime files support simulation while they are loading and running

- Timezone support
  - All known timezones worldwide since 1970
- Unit support
  - All SI units
  - Many widely recognized/commonly uses non-standard units
  - Some emerging/new/convenience units
- Server support
  - Icons for powerflow objects
  - Dynamic KML output
  - Live HTML support (javascript)

# Subcommands

## Manage simulation environment

- Assert (data validation)
- AWS (cloud manager)
- Check (model validation)
- Compare (model diff)
- Contributors (credit to authors)
- Convert (data converters)
- Geodata (GIS access)
- Git (version control)
- Help (access to subcommand/tool help)
- Job (multitasking control)
- Json-get (JSON data access)
- Library (manage object libraries)
- Lock (simulation lock manager)
- Manual (branch documentation manager)
- Matrix (linear algebra support)
- Openfido (OpenFIDO CLI)
- Pandas (panel data manager)
- Plot (plotting tools)
- Python (GridLAB-D python access)
- Require (GridLAB-D python manager)
- Requirements (GridLAB-D python info)
- Template (analysis template manager)
- Timezone (timezone resolution)
- Trace (exception traceback/debugger)
- Validation (GridLAB-D validation)
- Version (GridLAB-D version manager)
- Weather (weather data manager)

# Tools

## Manage GridLAB-D data and models

- Create filter (generate a GridLAB-D filter from CSV data)
- Create player (generate a player object from CSV data)
- Create poles (generate pole models for a network)
- EIA RECS data loader (access EIA residential load data)
- Fit filter (generate a GridLAB-D filter from AMI data)
- Insights (download GridLAB-D usage statistics)
- Market data (download market data from ISO)
- Market model (generate a wholesale market model from ISO data)
- MDB info (extract data from an MDB file, e.g., CYME)
- METAR to GLM (get real-time weather data from FAA)
- NOAA forecast (get a weather forecast from NOAA)
- NSRDB weather (get historical weather from NREL Solar Radiation Database)
- UCAR weather (get real-time weather data from UCAR)

# Contact

David P. Chassin, *SLAC National Accelerator Laboratory*

Email: [dchassin@slac.stanford.edu](mailto:dchassin@slac.stanford.edu)