



# November Infrastructure Update

Matt Thompson  
November 15 2023



# Last month's infrastructure roadmap goals in review



Planned for significant progress in last update:

- QCSubmit updated for QCFractal “next” release → Completed
- Get full fitting stack updated and running with latest software → Progressed but not complete
- Update virtual site and topology loading example → Progressed but not complete
- Generalized benchmarking conformer analysis validation → Completed
- Generalized benchmarking physical property prototyping → Progressed but not complete
- Release OpenFF NAGL charges in public API in OpenFF Toolkit → Completed
- Other releases
  - *Interchange 0.3.16-17*
  - *OpenFF NAGL 0.3.2*
  - *OpenFF ForceFields 2023.11.0*
  - *Toolkit 0.14.5*
  - *ff14SB port 0.0.4*
  - *BespokeFit 0.3.2*

Not planned for significant progress since last update:

- Alchemiscale F@H interface prototyped → Progressed but not complete

Completed   Progressed but not complete   Not progressed

[Brackets and italics] = Non-roadmap items



# Next two months' infrastructure roadmap goals



Planned for significant progress in next two months:

- Get full stack working with “new” QCArchive interface
- Get full fitting stack updated and running with latest software
- Update virtual site and topology loading examples
- Generalized Benchmarking Evaluator interface for physical property benchmarking
- Alchemiscale: Folding@Home interface, new features, optimizations, targeted refactors (0.3.0 release)
- Initial runs of Alchemiscale on Folding@Home
- Prepare topics and materials for virtual workshops
- Improved Amber support in Interchange

Notes

- Jeff Wagner will be offline most of November

## Year 5 +

### FORCE FIELDS

- **Sage:** A minor release of Sage (OpenFF-2.1.0) with improved chemical perception handling and initial parameters, and fixes for specific functional groups
- **Rosemary** (OpenFF-3.x.x): Rosemary will be the first self-consistent Open Force Field for biopolymers and small molecules.
- **Graph charges:** A convolutional neural network model for assigning fast, conformer-independent AM1-BCC partial charges will enable custom macromolecule support
- **Thyme** (OpenFF-4.0.0): Thyme will be the first Open Force Field incorporating virtual sites
- **Alternative nonbonded handling:** future Open Force Fields will pursue improvements in accuracy using alternative nonbonded handling, such as polarizability and non-12-6 interactions

### INFRASTRUCTURE

- **OpenFF Toolkit:** Implement broader support for polymer and macromolecule loading. Reduce technical debt, improve documentation, and implement bugfixes.
- **OpenFF Interchange:** Implement parameterized-molecule importers from common biomolecular formats to allow for combination of components sourced from different simulation ecosystems.
- **OpenFF Bespoke:** Expand to other valence terms and generate pre-computed torsion scan database of common fragments.
- **Benchmarking tools:** Refactor benchmarking tools and improve their functionality to handle a wider range of datasets and metrics. Streamline use and standardize datasets to accelerate force field releases.
- **Protein-ligand benchmarking:** Enable routine force field benchmarking against large, curated protein-ligand binding free energy datasets using Folding@home infrastructure.

### DATA

- **QC data:** Generate targeted QC data for training force fields parameters, focusing on electrostatics.
- **Physical properties:** Additional experimental data are required for refitting non-bonded parameters to higher accuracy. Commissioning experiments might be needed to create relevant training datasets.

