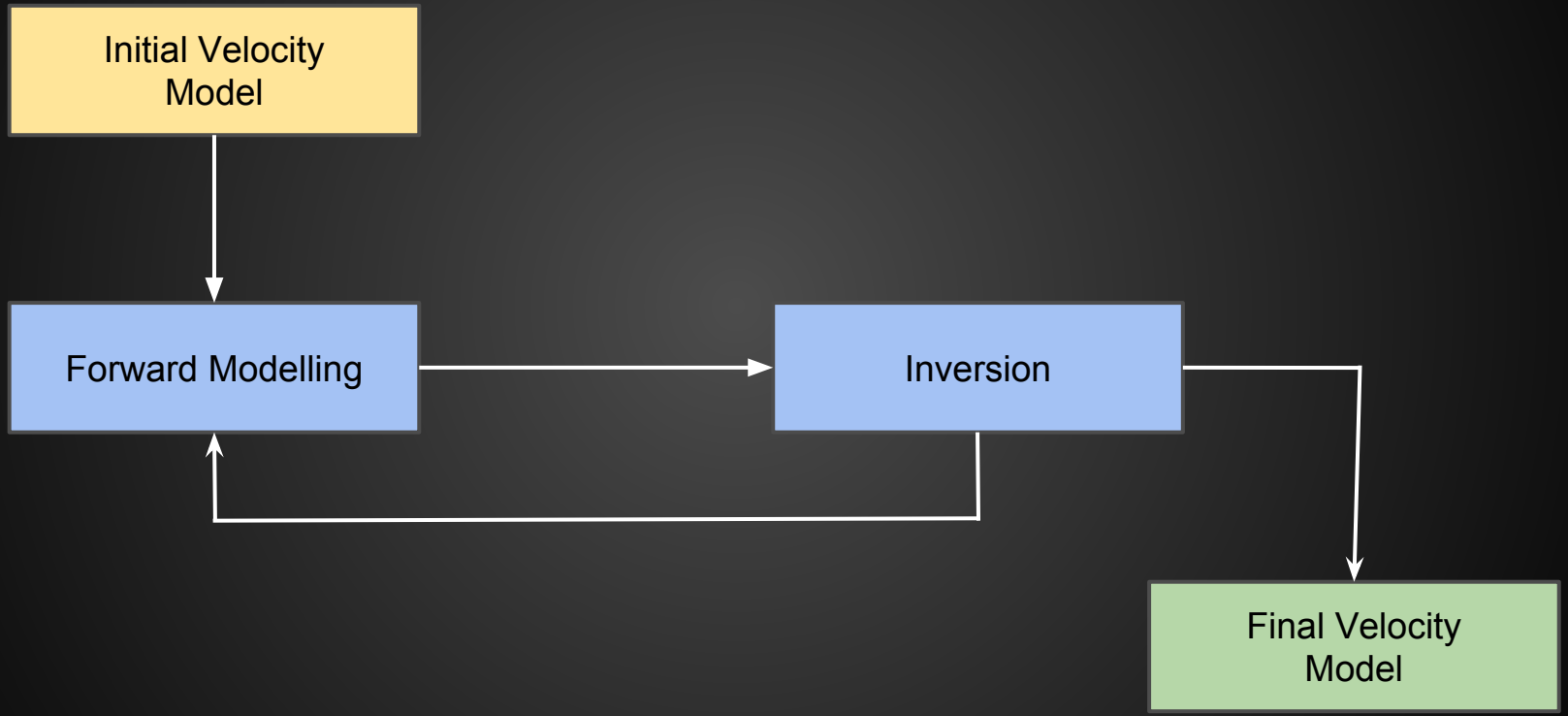
ESTUARY

Advanced GeoScience Imaging Solutions

Travel Time Tomography



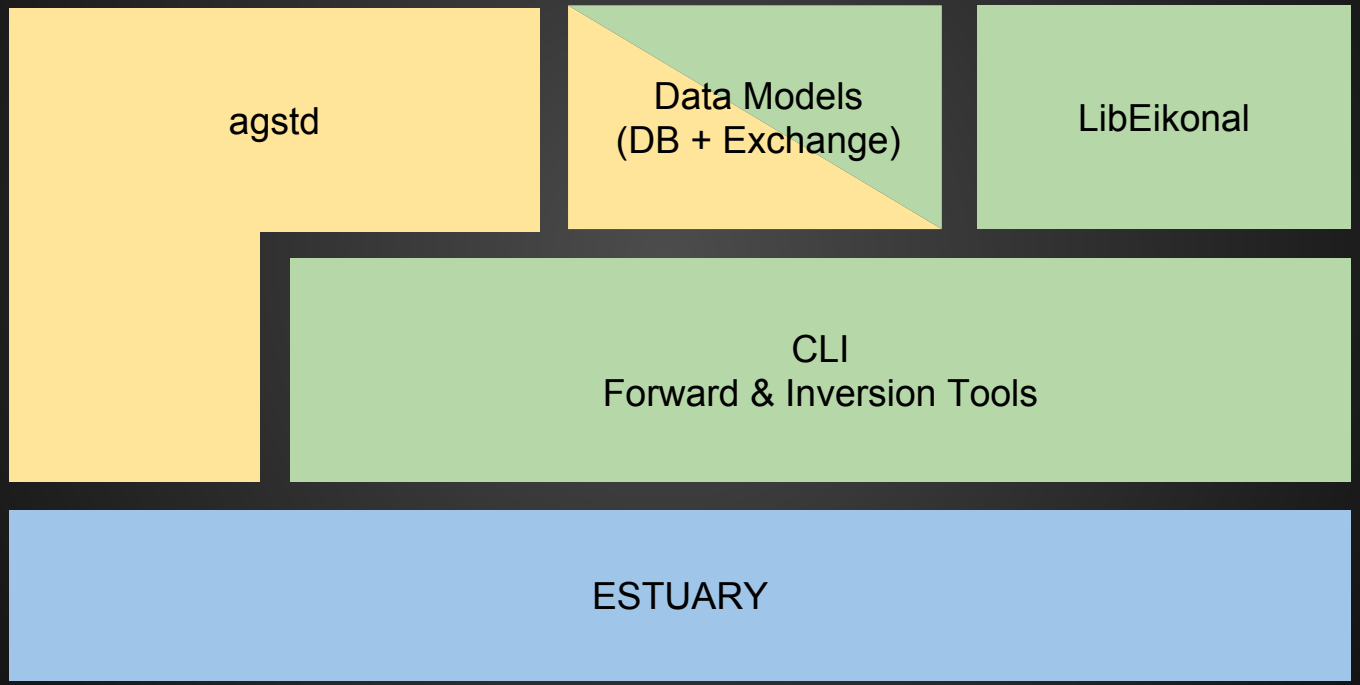
ESTUARY

Provides

- Proven and performance oriented tools for **Forward Modeling** and **Inversion**
- Modular Architecture
- A task-level based parallelization
- Minimal task/target set rebuilding when inversions parameters are modified
- A High Level Python API
- Highly Transparent Process

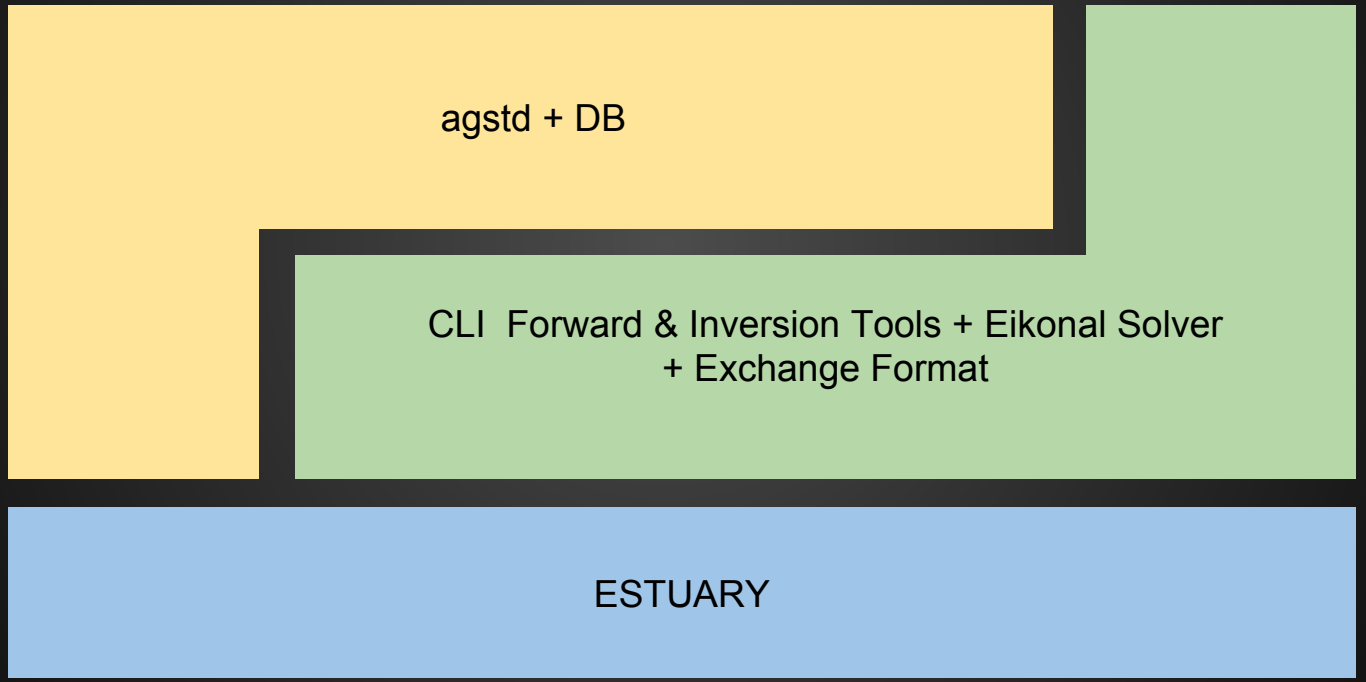
Software Structure

OR WHAT IT SHOULD BE

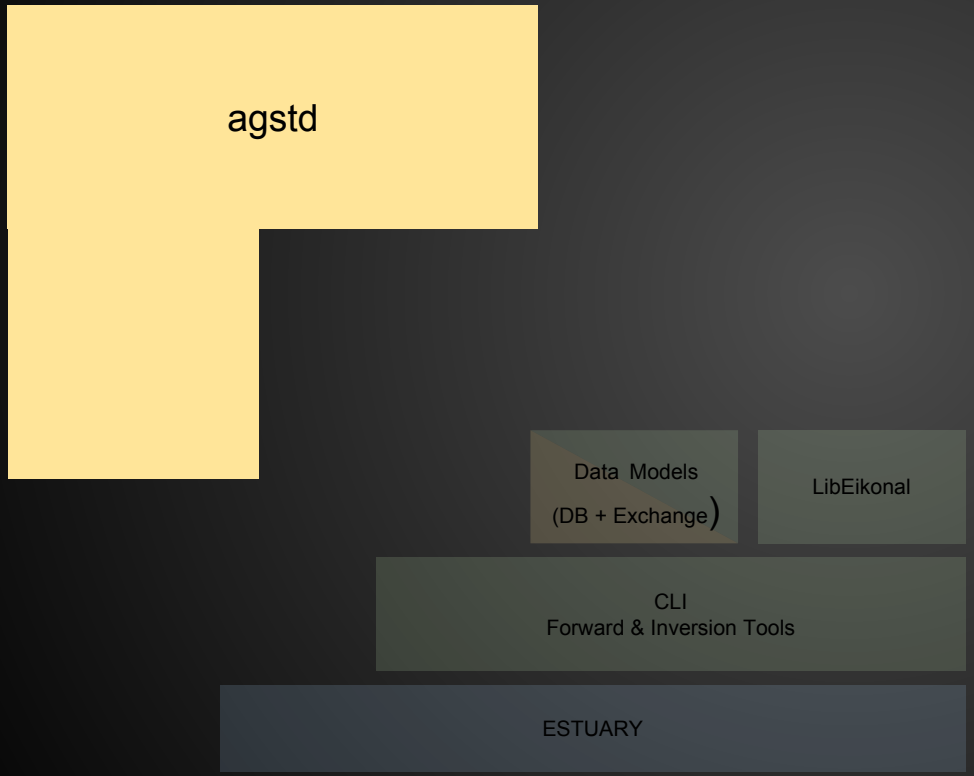


Software Structure

WHAT IT ACTUALLY IS



Software Structure

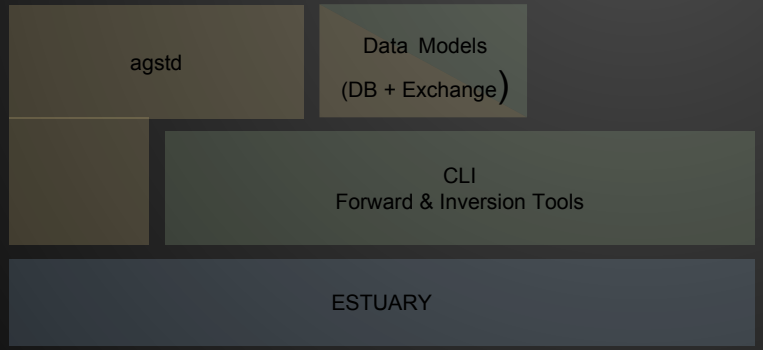


Python base library

- Decorators
- “Main” Utility
- Logging Primitives
- CLI Utility
- Async Programming Tools
- XML
- ...

Software Structure

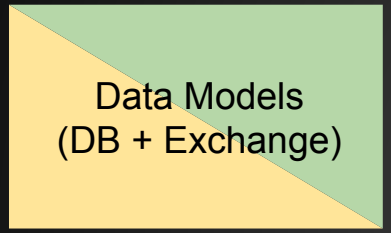
LibEikonal

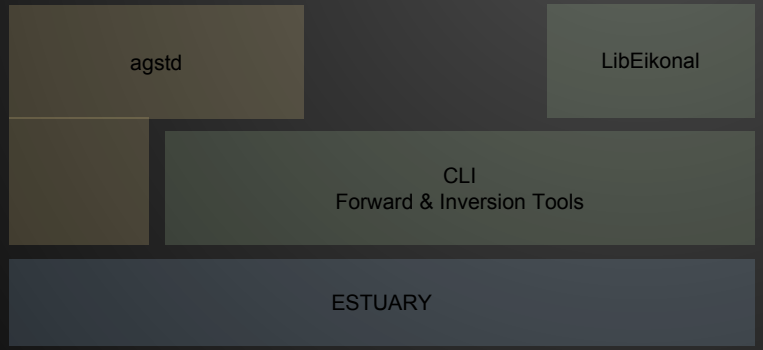


eikonal-ng/templates

- C++ / Python / Cython
- Fast Marching Method EK
- RayTracer
- Python Bindings (in cython)
- Templated Array Library (Homebrewed)
  - Schrodinger Equation Based Solver

Software Structure





Eikonal-ng (data.py)

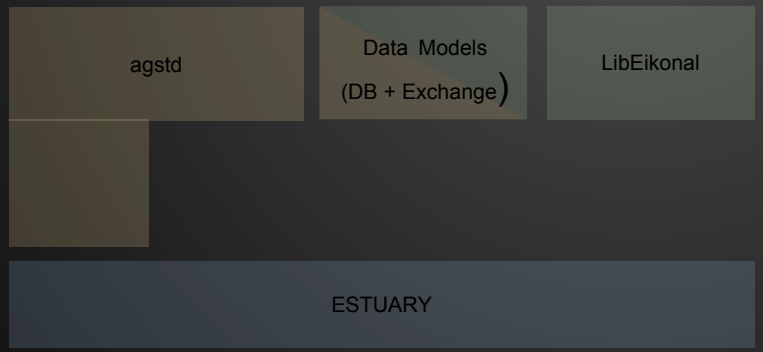
- Exchange Formats (EKTTTable, EKEventTable, EKStationTable, EKImageData)

agstd.sdb

- Database Models
  sqlite + h5f
- Database Query Builder

Software Structure

CLI
Forward & Inversion Tools

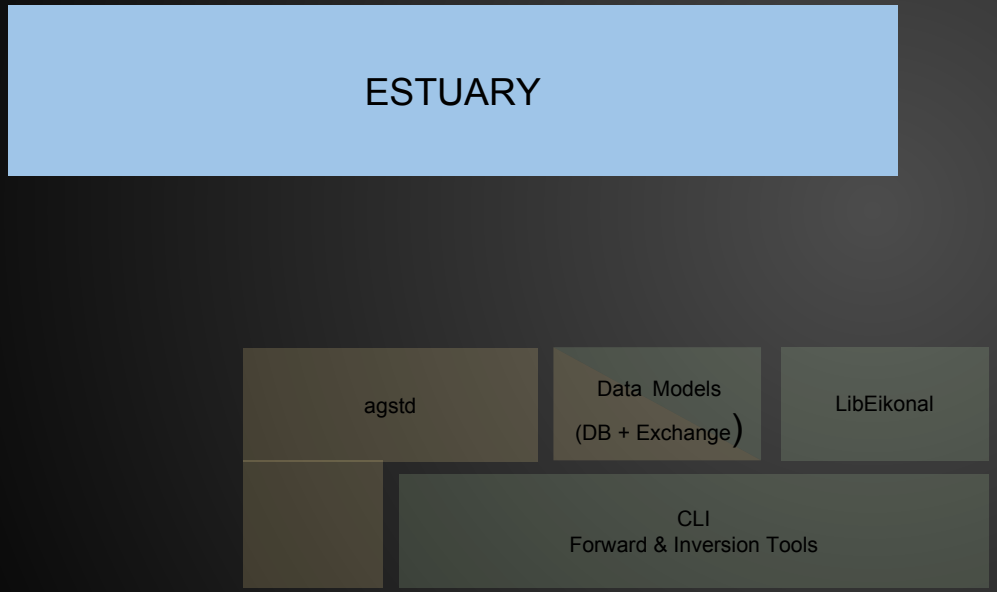


Eikonal-ng/bin

- Entirely in Python
- CLI utility following the UNIX philosophy

e.g. eikonal_solver, sensitivity, raytrace, double_difference, conjugate_gradient, checkerboard

Software Structure



Scons flow based dependency task scheduler

- Python
- Manage dependencies
- Manage Multi-threading
- Ensure Up-to-date target building
- Provide a Simplified Object Oriented Inversion API

ESTUARY - more details ...

Produce lots of data….

- ~ 450MB / inversions for 24 stations

Uses binary “pickled” structures to passes tables between inversion steps.

can be easily converted to .vtk/.vti as required

ESTUARY - more details ...

Lotic is

Amalgam of SCONS Low Level Target Building tools over the CLI level toolset

Slopes is

Object Oriented API over Lotic

ESTUARY - Modifications

Synthetic Model :

Good news, it is easy

MySQL/MariaDB

Good news, It is … Somewhat Easy

Using Arrival Time Instead of TravelTime

Have deeper implications … Could be Hard or Medium Hard (I don't know all the implications yet)

ESTUARY - Synthetic Model

Somewhat Easy Way

Use Scons Target and integrate your own API to create a DB target inside the SConstruct file.

Easiest Way

Build the DB Completely outside and use ESTUARY as usual.

SQLFetchDB - A case Study …

SQLFetchDB.py (as a template)

Slope.py (Modifications)

Lotic.py (Modifications)