Octree Frontend for Enzo-E in YT

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Volumetric Simulations

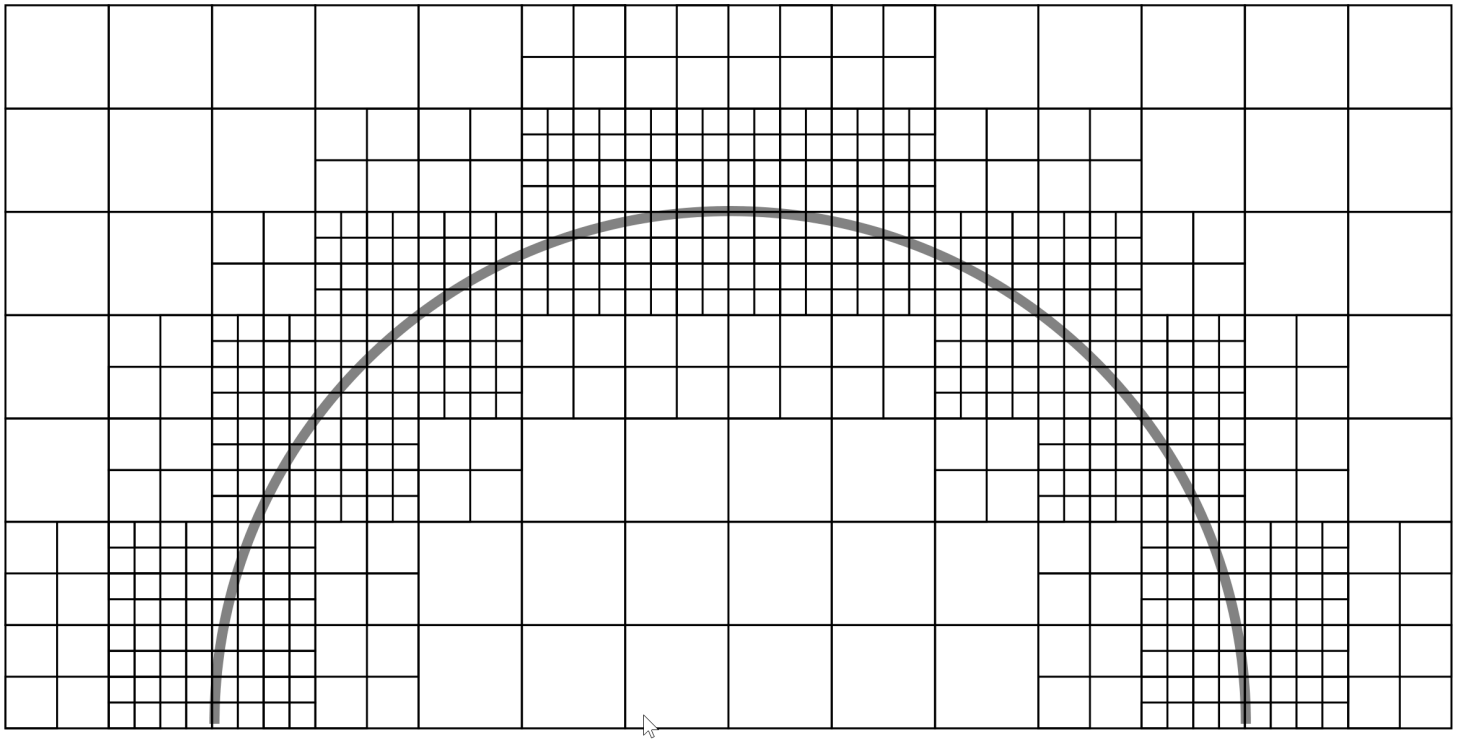
- Formation of stars and galaxies
- Nuclear reactor mechanics

Why?

Connects theories with data

What

- Enzo: **Adaptive Mesh Refinement** (AMR) astrophysical simulation code [1]
  - Multi-purpose Adaptive Mesh Refinement ~ Increase simulation accuracy in turbulent or interesting parts ~ Inconsistent



Block-based AMR with 596 cells

Enzo E

Problem

Enzo-E analysis in yt is slow!

Problem

- Slow on large datasets
- Can't practically analyze enzo-e datasets of over 256^3 blocks
  - 256^3 blocks -> multiple hours to load in the data
- Needs to analyze datasets of size 2048^3 blocks
  - ≈ 1 TB

Current Frontend

- Collection of grids
  - Each grid is a python object
    - ≈ 1 KB
- Largely single threaded

New frontend

- Array of Octree
- Multithreaded
- Each Oct is a c struct
  - at most 88 bytes