Salsa

Visualizing Large Particle Datasets using Charm++

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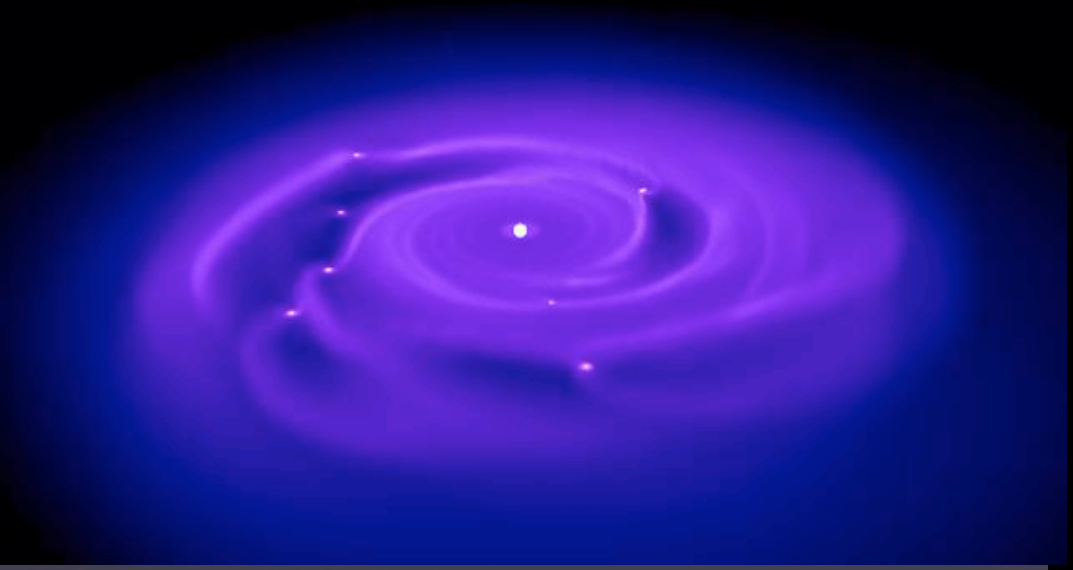
Outline

- Our simulations
- Parallel Visualization Tool
- Features
- Goals

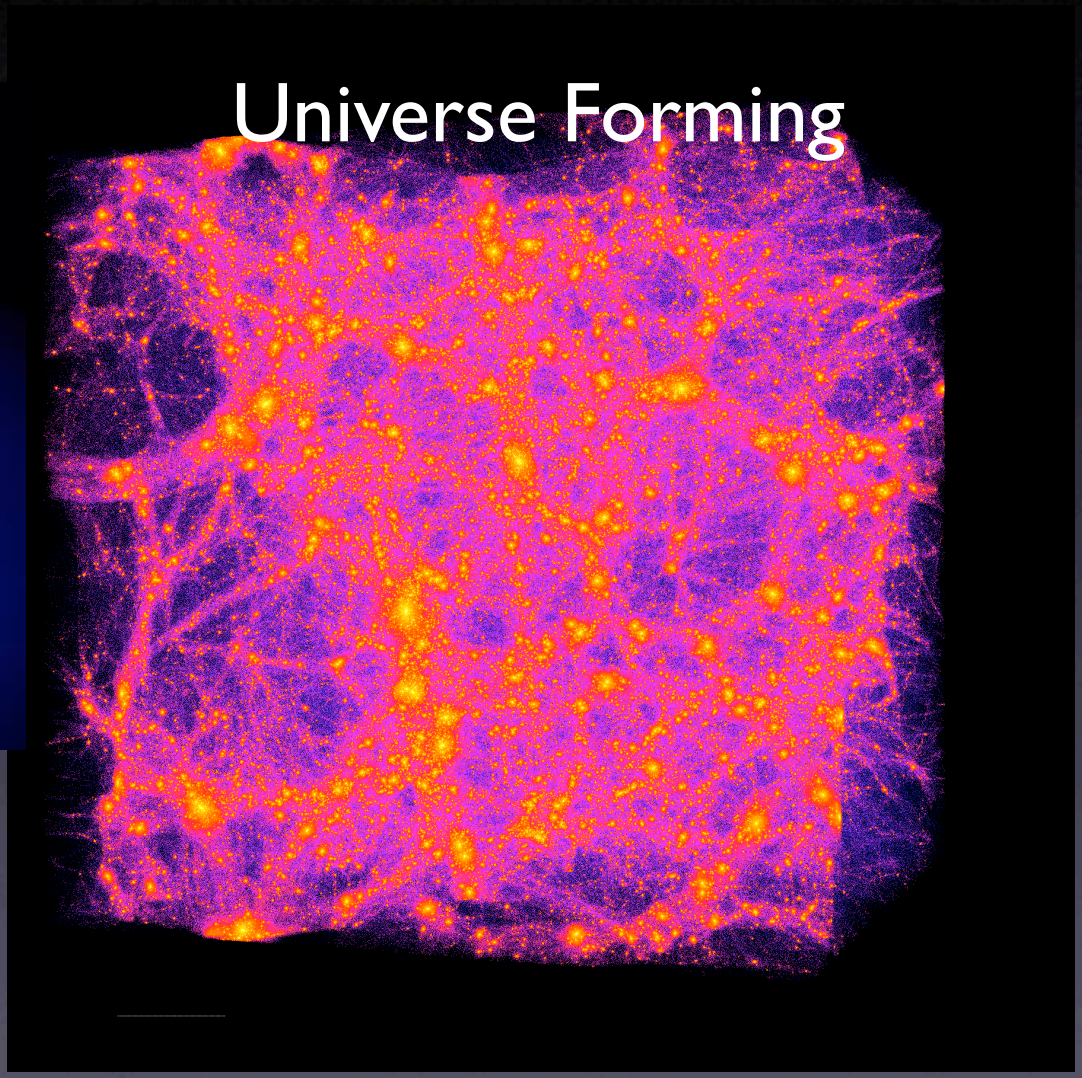
Our NBody Data

Planets Forming



1,000,000 particles

Universe Forming

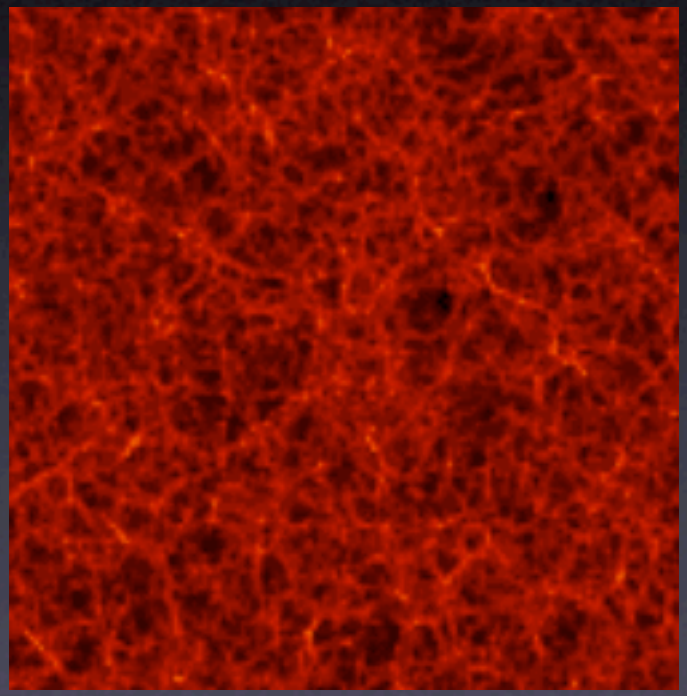


80,000,000 particles

Galaxy Forming

The Extreme Case

- Evrard, et al. (2002): 1 billion particles to represent the universe
- Run on 512 node T3E with 64 GB of memory
- Snapshot with minimal information: 12 GB



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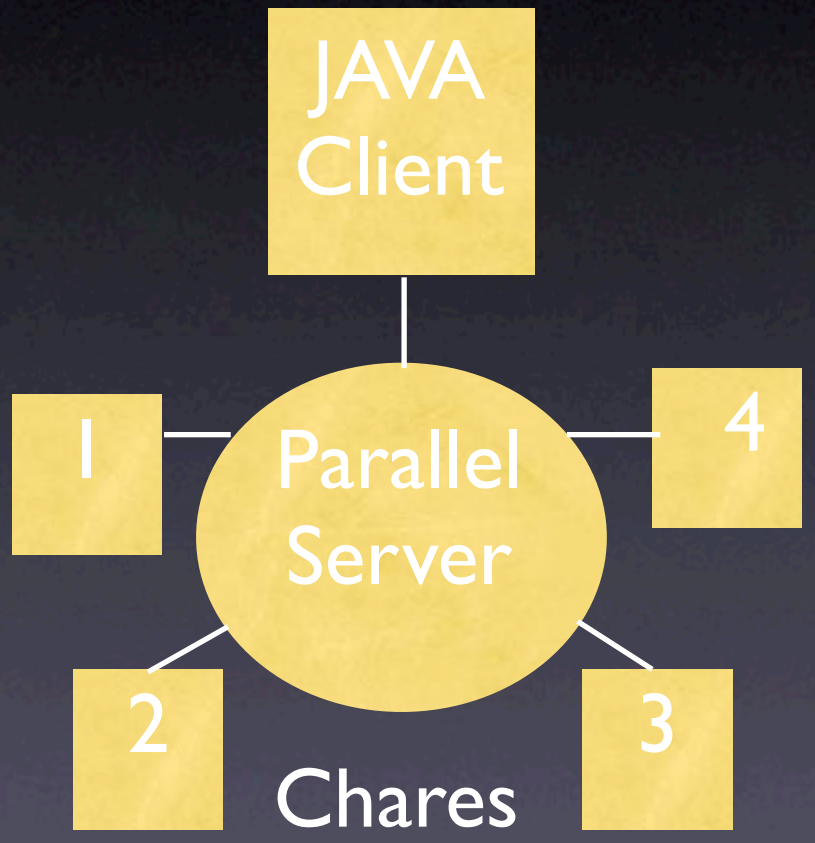
Charm

- C++ parallel programming framework
- Abstract "chares" move between physical processors to enhance scalability
- http://charm.cs.uiuc.edu/

Charm Solution

- LiveViz provides image generation scalable to many processors



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Scripting

- The questions are always changing in research
- Repetitive tasks like movie making
- Scripting provides the extensibility to let users do what they want beyond what a GUI provides

Python Interface

- High level: User calls charm methods from command line
- Low level: User manipulates particle attributes

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Virtual Observatory

- Large observational surveys
  - SDSS (1 million galaxies, 100s million stars)
  - LSST (20 TBs of images every night)
- Databases exposed to internet as webservices that return XML formatted tables
- Salsa can be the powerful tool to display these large data sets

Non-trivial analysis

- Group finding
- Now there are lots of separate tools for doing analysis
- Parallel group finding is complicated, but this will give the user an easy way to access the functionality

Testing Algorithms

- ParallelGravity is a first attempt at writing a tree based gravity solver in Charm
- Eventually, we will add the capability to run gravity on the data loaded into Salsa
- Then, there will be other algorithms to compare performance with
- And we will have

The Whole

http://hpcc.astro.washington.edu/nchilada