

# Salsa

Visualizing Large Particle Datasets using Charm++

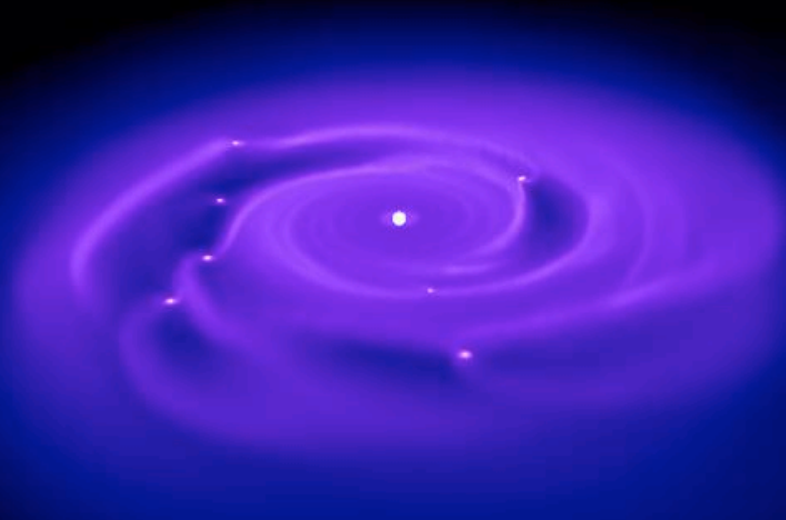
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# Outline

- Our simulations
- Parallel Visualization Tool
- Features
- Goals

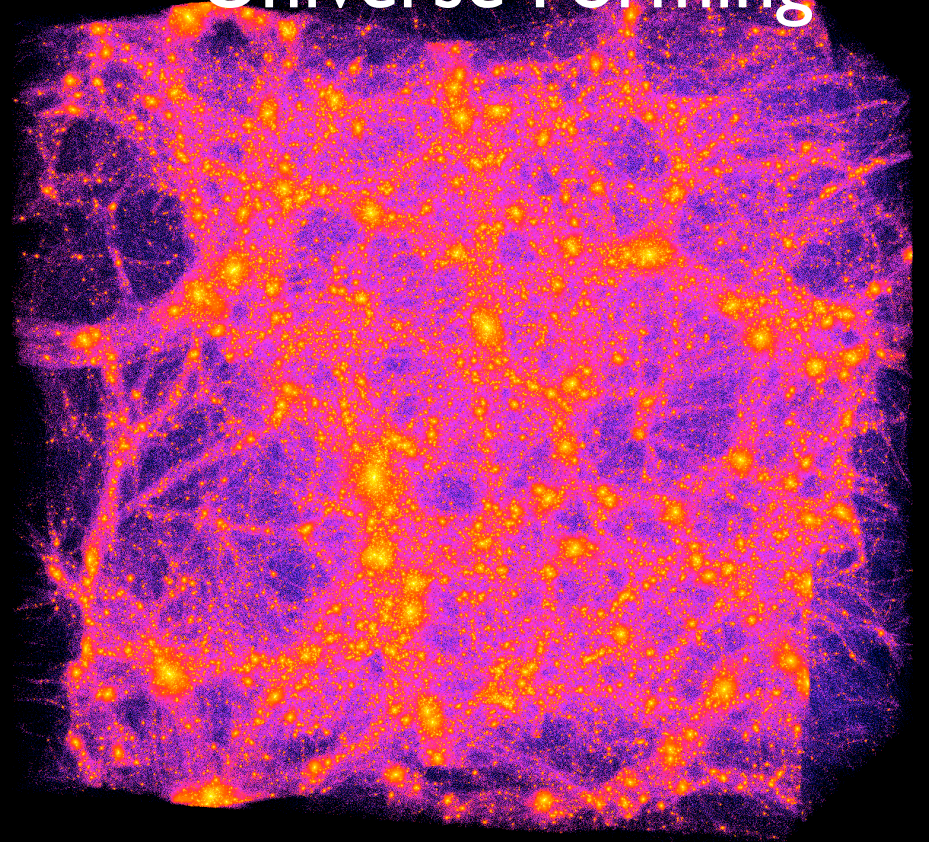
# Our NBody Data

Planets Forming



1,000,000 particles

Universe Forming



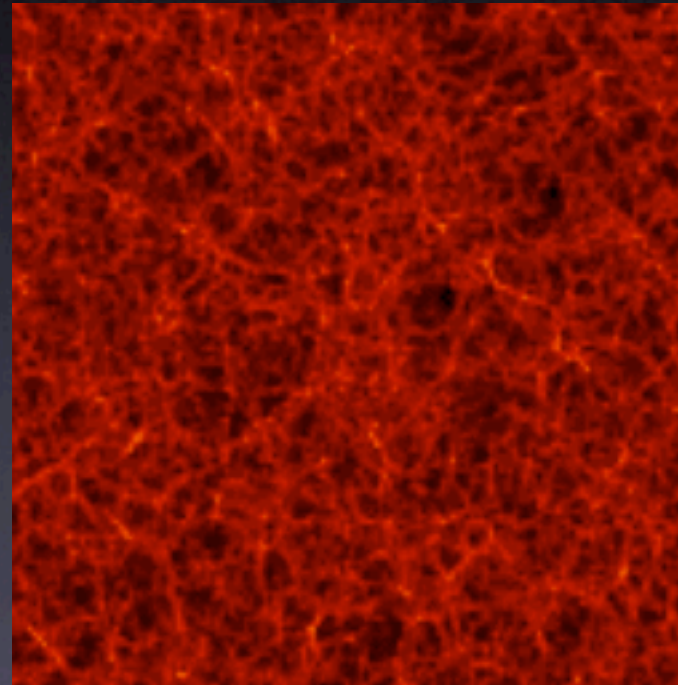
80,000,000 particles

# 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

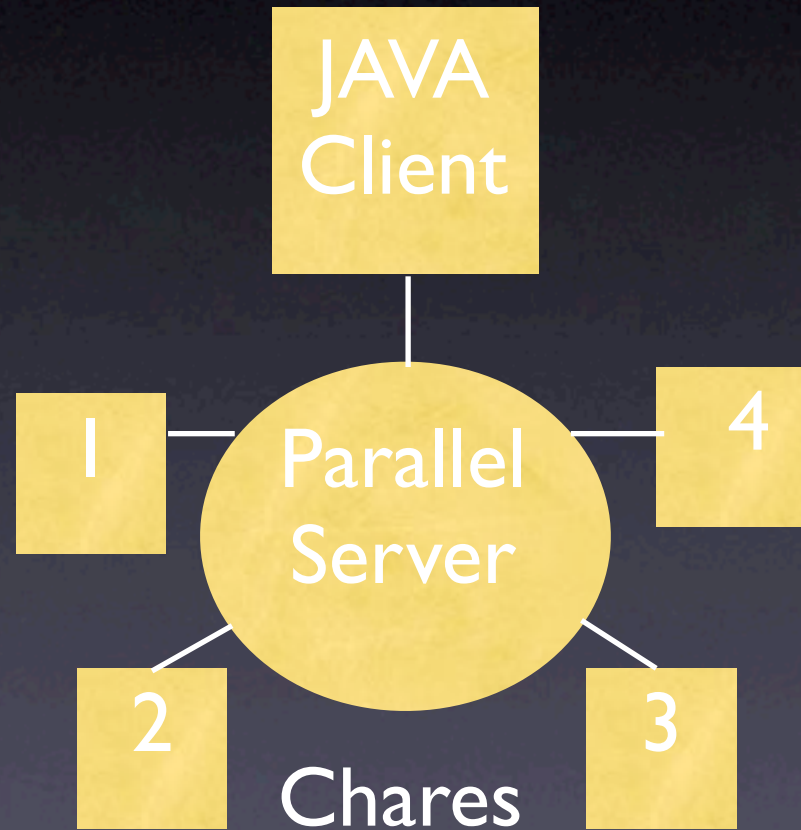


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- **Parallel Visualization Tool**
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# Charm Solution

- 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

# Charm Python Support

- [python] keyword on method exposes method to python (high level still under development)

```
entry [python] void getNumParticles();
```

- [python] keyword on chare exposes data (low level) to python

```
array [1D] [python] Worker {  
    entry Worker(const CkGroupID& metaID);
```

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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>