

What I hope we achieve at this Workshop

Inspired by Kruegersdorp

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Albert-Einstein-Institut

Goals

- Better understanding of EE's
 - Combination of theoretical and experimental work
 - Prepare for Caltech meeting this fall
- Start process of community building
 - Introductions
 - Bring community together
 - *The problems we face are too hard for one group!*
- Develop better evolution codes: community stamp of approval!
 - Make available to community
 - Open code(s), with half-dozen groups behind them
- Publish paper if possible (either real or "white" paper)
 - New results
 - Tests/procedures we found useful
- Ideal Schedule
 - Week 1: understand each other's formulations, iron out practical details
 - Week 2: make real progress in experiments, reformulations, etc

Focus here on Evolutions

- Keep matter out for now
- Compare different formulations, keeping as much as possible the same
 - Compare, discuss, change, compare, discuss
 - Draw some conclusions, write paper, make code available
- Questions
 - What does hyperbolicity do for you?
 - Why are some schemes better?
 - Are they really better? (Can we test now?)
 - How to separate numerical method from formulation?
 - How to separate BC issues from evolution issues?
 - How about gauges?

Initial Data

- We want to study evolutions of cauchy data!
 - This includes many things beyond BHs
 - Also want to use BHs, but they provide special complications
- Problems generating initial data from different formulations
 - Conformal approach vs standard 3+1
- Suggest something!
 - If exact solution, could add it to "thorn exact"!

Documentation to circulate

Let's do this today

- Thorn guide (add yours!)
- Initial data (Denis)
- Gauges (Miguel)
- Papers from other groups

- Anyone have anything to add?

Building a Community (through) Code:

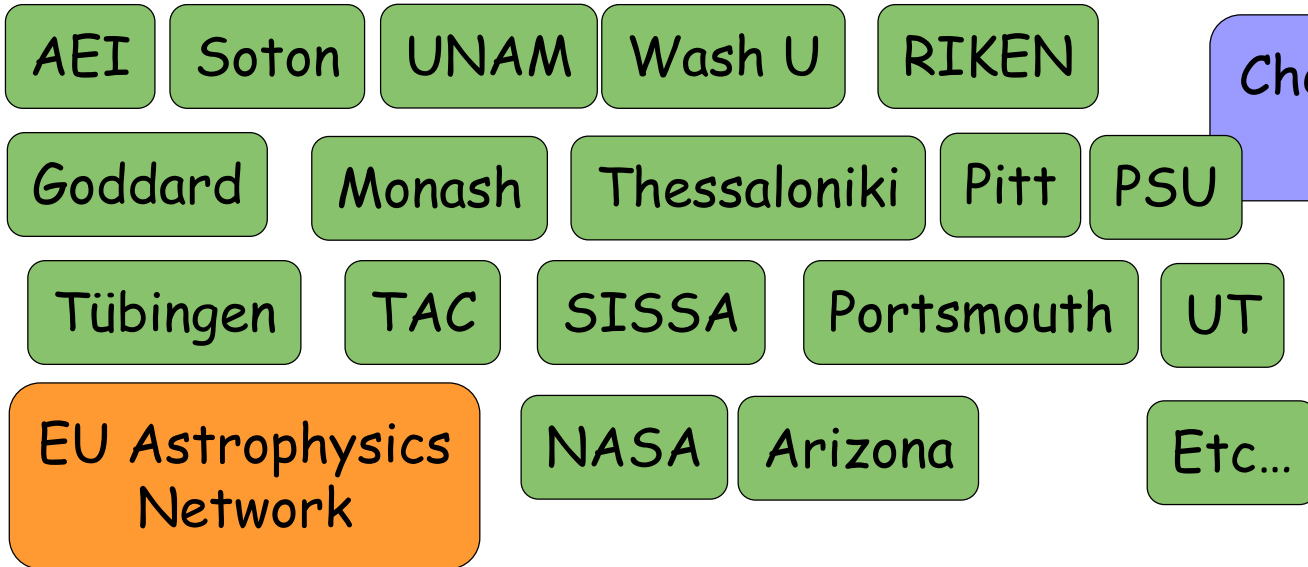
- Sharing Expertise: No single group/community can do these problems
- Sharing of Code among projects
 - Infrastructure
 - BH routines apply directly to NS work, etc...
 - But free to keep routines in group as long as desired
- Better Code
 - Open source encourages people to be more careful in coding!
 - Encourages documentation
 - Encourages deeper thinking about how it interfaces to another code
- More trusted code, results
 - When code becomes open, and people can run it for themselves, they will begin to believe the results
- Improvements propagate quickly through community

Other communities are doing this! Plasma, Earthquake, climate, supernova, etc...

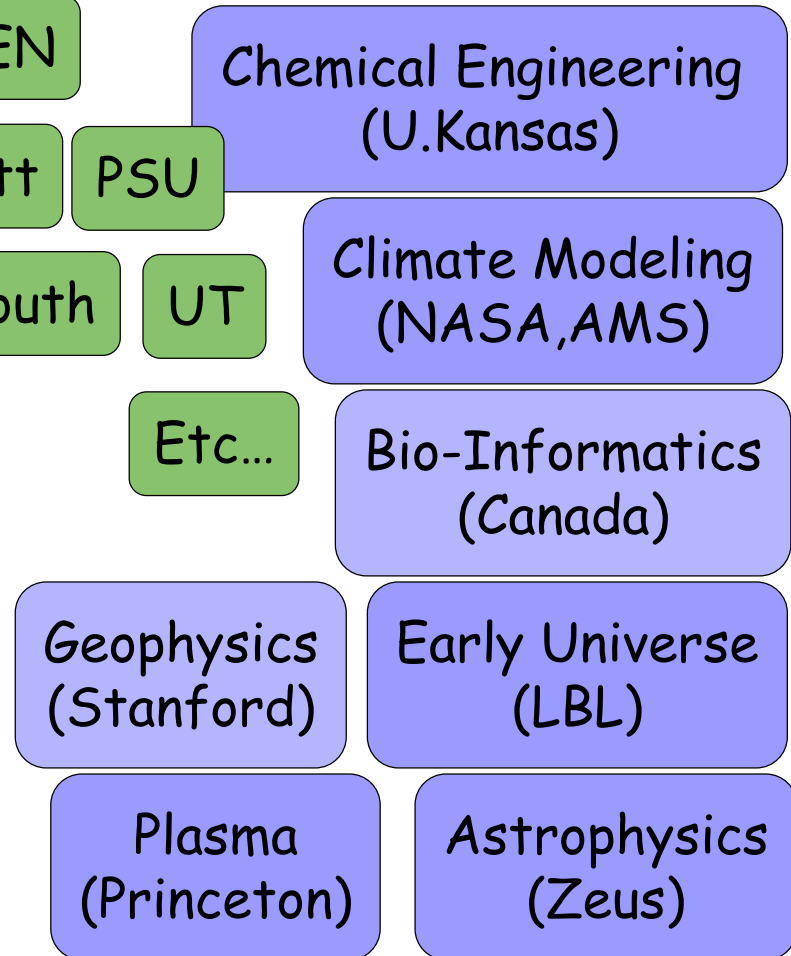
Cactus User Community

Using and Developing Physics Thorns

Numerical Relativity/Astrophysics



Other Applications



Meeting in May:
Theoretical Foundations of Einstein's Equations for Numerical Relativity
(Using Cactus to investigate and compare different implementations)

Using Cactus

- Group has worked very hard to support community
 - Last month spent retooling/organizing codes to make easier for community to work together
 - Tom, Gab talks, Dave here to help people
- Philosophy
 - Take what you want, give back what you want
- What you'd get
 - Thorns developed by larger community
 - Most advanced CS technologies
 - Grid Computing
- Questions/Suggestions?
 - Reasons for not doing so?
 - Things you need that aren't there?
 - Email cactuseinstein@cactuscode.org
 - Start a web site: www.numericalrelativity.org ?
 - Everyone gets cvs commit rights
 - Put in your links
 - NOT a Cactus website!

Beginning Experiments

- Take Inventory, plan next days
- For each group, what is status?
 - Who can share thorns with AEI?
 - Who can read in data?
 - If no code, help us improve existing codes, analyze results
- What Initial Data can we begin with?
 - Analytic, so all codes should work
 - "Flatty" (anyone should be able)
 - Linearwaves (anyone)
 - Schwarzschild/Kerr (isotropic and Kerr-Schild)
 - Misner/Brill Lindquist
 - Random
 - Numerical
 - Brill waves (Dave to fix? Use SOR?)
 - Distorted Schwarzschild/Kerr

Experiments

- Analysis Tools

- Constraints
- Wave extraction
- Weyl scalars, Riemann Invariants, etc
- Convergence tests (Tom has script)
 - Order
 - Coefficients
- Time to crash
 - Instabilities
 - Gauge/slicing problems

Final thoughts

- Try to be open!
 - AEI group is giving all mature thorns to community
 - Supporting Cactus especially for relativity and astrophysics
- Questions/suggestions for format
 - Few talks as possible
 - All 1 hour talks should be 30 minutes!
 - Take 30 minutes each morning to look at results
 - 60 minutes to have open discussions of results, then talks
 - Afternoons generally free for work
- Practical Issues
 - Accounts
 - Computers
 - Wireless cards (but please, listen to the talks!)
 - Papers, documents to read from other groups

Miscellaneous

- Talks you want to hear?
- Issues you want to bring up?
- Scott will take notes!
- ???