XiRel

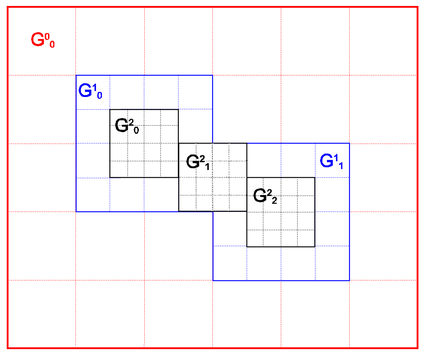
Next Generation Infrastructure for Numerical Relativity

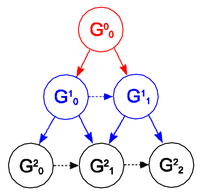
G. Allen[1] (PI), M. Campanelli[3], P. Laguna[2] (PI), C. Lousto[3], D. Shoemaker[2], E. Schnetter[1], E. Seidel[1]

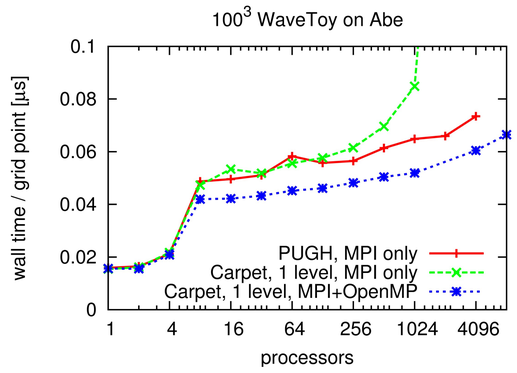
[1] Center for Communication and Technology, Louisiana State University, [2] Center for Gravitational Wave Physics, Pennsylvania State University, [3] Center for Computational Relativity and Gravitation, Rochester Institute for Technology

Introduction

XiRel is a collaborative project among researchers at **LSU**, **PSU**, and **RIT**. We will develop the basis for a next generation infrastructure for numerical relativity, building upon existing efforts with the **Cactus framework (http://www.cactuscode.org)** and the **Carpet driver (http://www.carpetcode.org)**, and experiences in developing and using the **Cactus** infrastructure for numerical relativity. With **XiRel** we will focus on providing a petascale-enabled adaptive mesh refinement package and will continue to work with partner projects to build a next generation community infrastructure for numerical relativity and computational astrophysics that will provide for enhanced physics/data-interoperability, annotation and archiving.

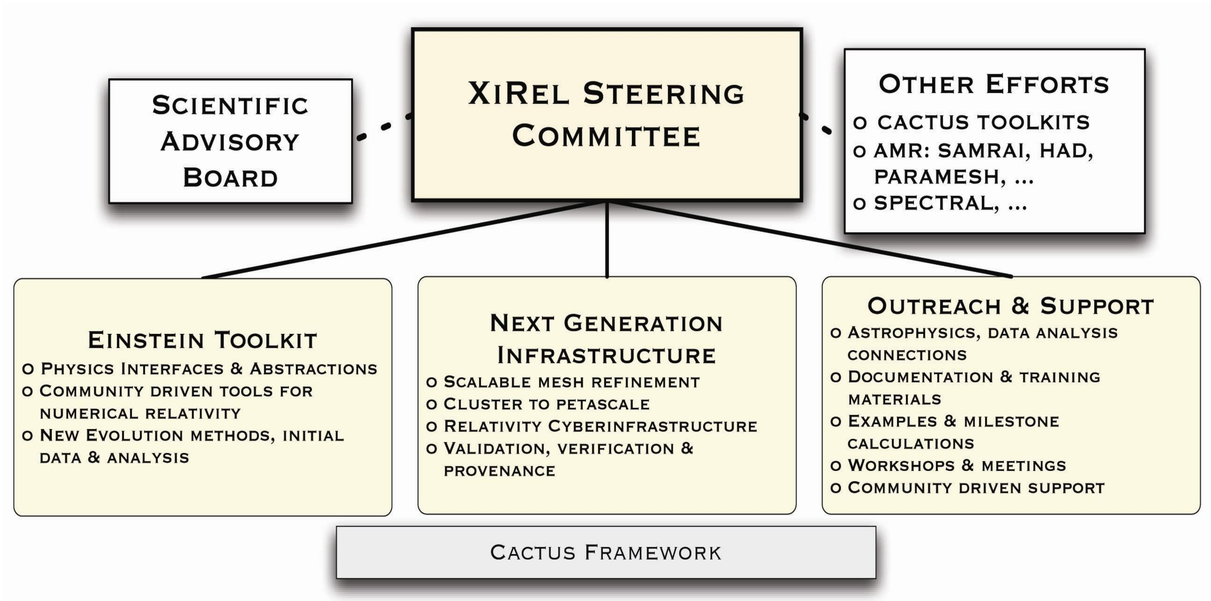






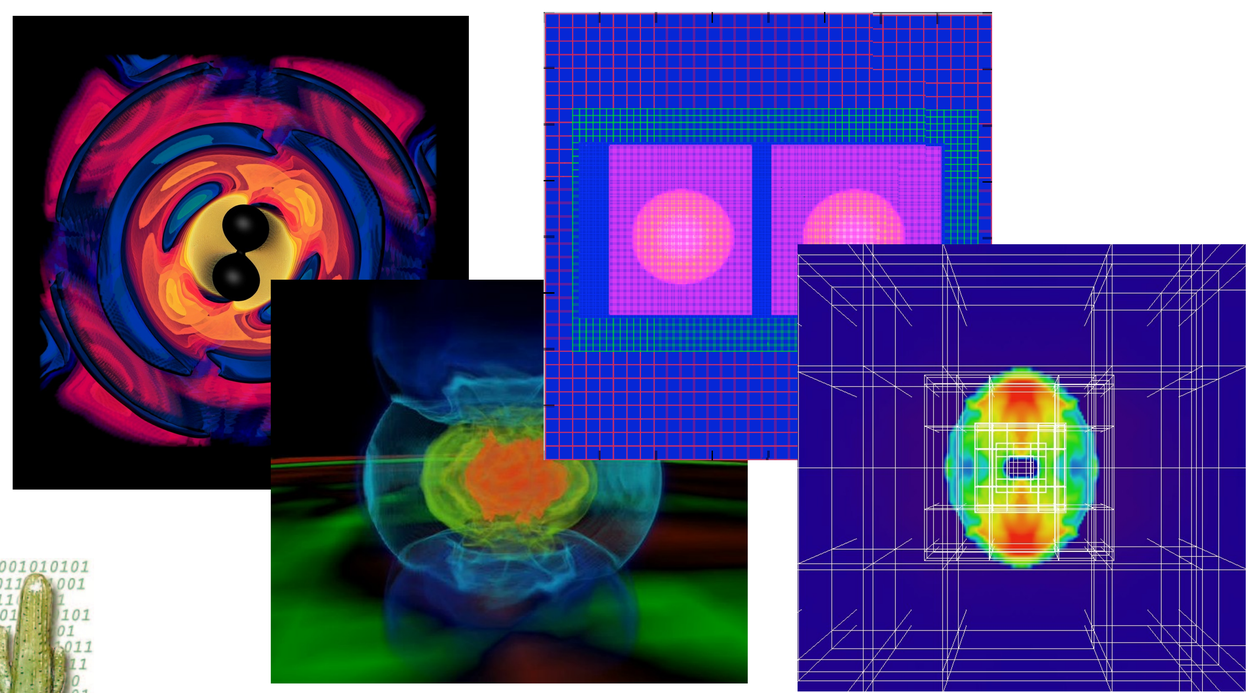
Adaptive Mesh Refinement

The central goal of **XiRel** is the development of a highly scalable, efficient and accurate adaptive mesh refinement layer based on the existing **Carpet** driver, which will be fully integrated and supported in **Cactus** and optimized for numerical relativity. Through the use of well defined interfaces in **Cactus** and well thought-out methods for writing physics modules, we will enhance current technologies to enable current science needs, working towards longer term goals for petascale machines, with minimal changes required to properly constructed physics modules. We will, (1) dramatically improve the scaling of Carpet and the numerical relativity codes for computation on at least 1000 processors or more; (2) enable automatic grid hierarchy adaptation and dynamic load distribution on architectures with deep communication hierarchies, and (3) collaborate with and provide expertise to the community.



Community Building and Outreach

XiRel will support and where necessary extend the existing **CactusEinstein** community toolkit for numerical relativity. The PIs of **XiRel** are committed to the community aims of the project, and will actively work to involve more sites in embracing and extending shared and community infrastructure. A scientific advisory board will be engaged during the project to identify current and future information technology needs of the relativity community.



NSF

LSU
CENTER FOR COMPUTATION & TECHNOLOGY

PENNSTATE 1855

R·I·T