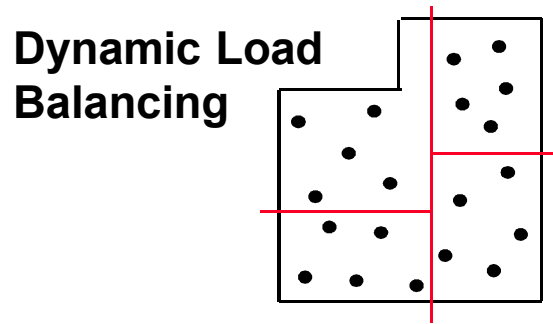


Dynamic Services (Zoltan)

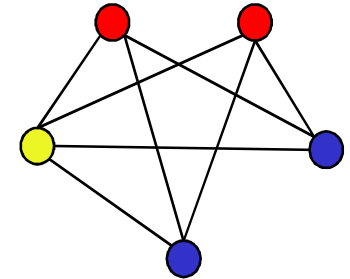
Vitus Leung and Karen Devine
Sandia National Laboratories



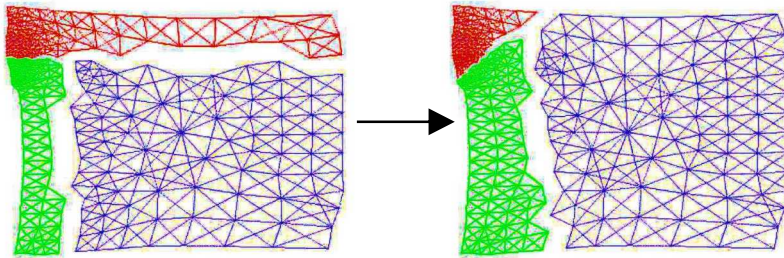
Zoltan Toolkit: Data Services for Dynamic Applications



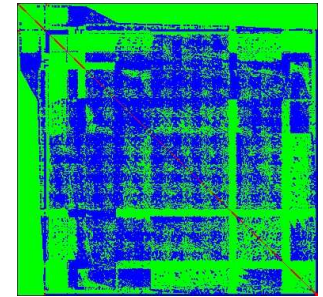
Graph Coloring



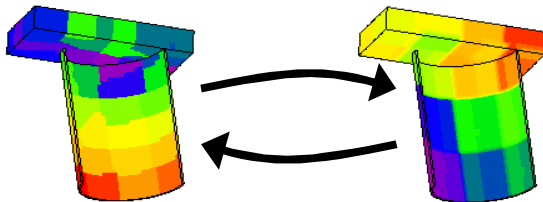
Data Migration



Matrix Ordering



Unstructured Communication



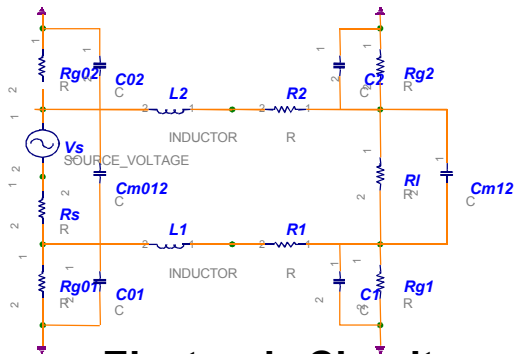
Distributed Data Directories

A	B	C	D	E	F	G	H	I
0	1	0	2	1	0	1	2	1

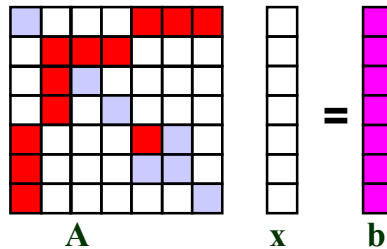
Dynamic Memory Debugging



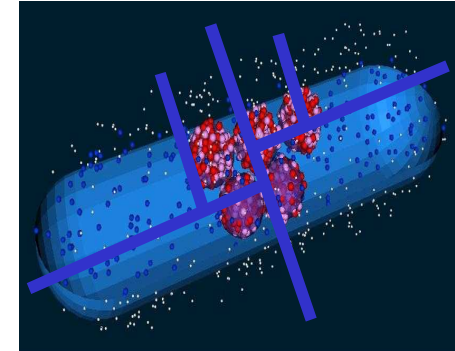
Applications using Zoltan



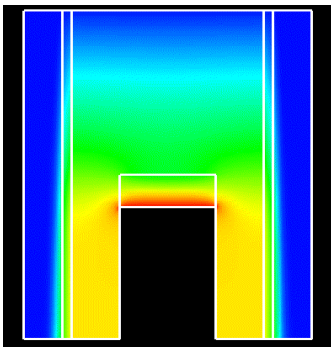
Electronic Circuit Simulations



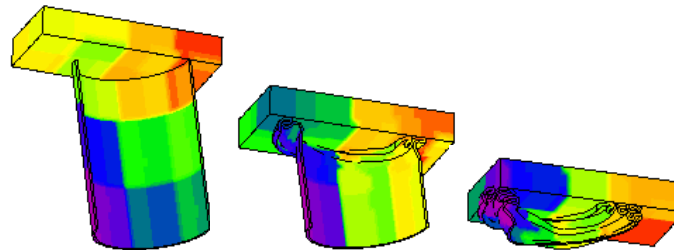
Linear Solvers & Preconditioners



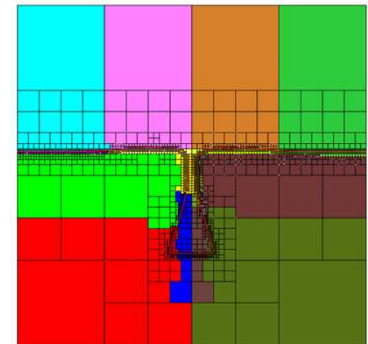
Particle-based Biological Cell Simulations



Multiphysics Simulations



Contact Detection & Crash Simulations

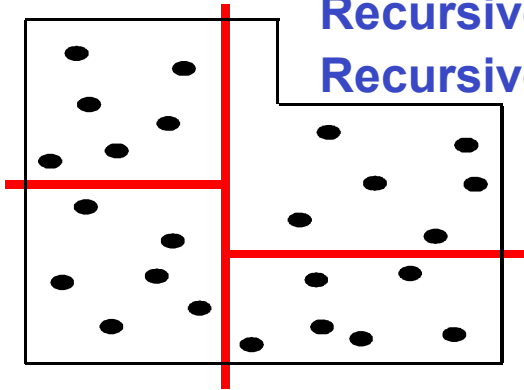


Adaptive Mesh Refinement

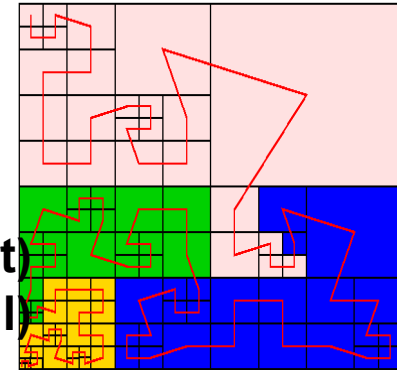
Zoltan Suite of Partitioners

Geometric (coordinate-based) methods

Recursive Coordinate Bisection (Berger, Bokhari)
Recursive Inertial Bisection (Taylor, Nour-Omid)

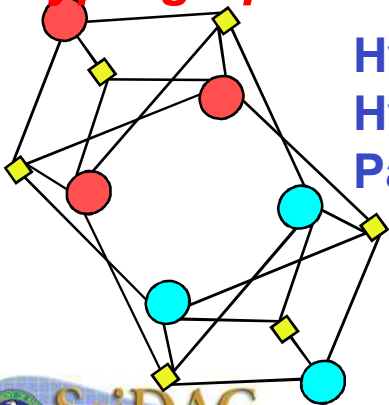


Space Filling Curves (Peano, Hilbert)
Refinement-tree Partitioning (Mitchell)

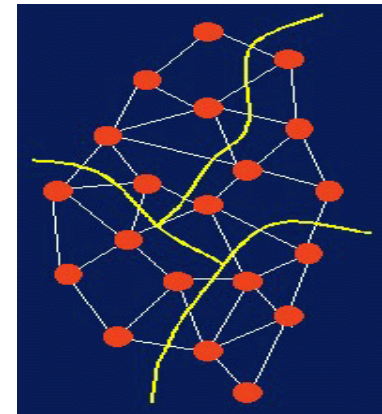


Hypergraph and graph (connectivity-based) methods

Hypergraph Partitioning
Hypergraph Repartitioning
PaToH (Catalyurek)



Zoltan Hypergraph Partitioning
ParMETIS (U. Minnesota)
Jostle (U. Greenwich)



ITAPS C Interface to Partitioners

- Given a loaded iMesh_Instance, mesh
- Construct ITAPSZoltan object, itapsz
- Call partitioner from itapsz with number of partitions, method, sub-method
- Partitions contained in mesh as tagged entity sets upon return from partitioner
- Compile and run with MPI

iMesh Functions Used 1/3

To do partitioning, these functions must be provided by the user of the dynamic services, either the application or the mesh database

- iMesh_getNumOfType()

iMesh Functions Used 2/3

- iMesh_getEntities()
- iMesh_getDfltStorage()
- iMesh_getEntAdj()
- iMesh_getVtxArrCoords()
- iMesh_getEntArrAdj()
- iMesh_getEntSets()
- iMesh_getAllEntSetTags()

iMesh Functions Used 3/3

- iMesh_getTagName()
- iMesh_rmvEntSetTag()
- iMesh_createTag()
- iMesh_createEntSet()
- iMesh_setEntSetData()
- iMesh_addEntToSet()
- iMesh_setArrData()

Obtaining (ITAPS)Zoltan Software

- Files provided on disk
or
- Zoltan downloads from
<http://www.cs.sandia.gov/Zoltan>
and
- ITAPSZoltan downloads from ITAPS
repository

Future Work

- Support for more partitioners
- Support for partitioning other types of entities
- Mesh and field migration
- Performance evaluation of the interface on petascale systems