
Kitware
eyeing DATA
utkarsh.ayachit
understanding VTK data model


http://s192.photobucket.com/albums/z202/vendettachrncls/movie-shows/?action=view&current=matrixnumbersandletters.jpg&


elegance of structure
http://www.cepolina.com/tensile_structure_cone_column.html


0265640 132304 133732 032051 037334 024721 015013 052226
0265660 025537 064663 054606 043244 074076 124153 135216
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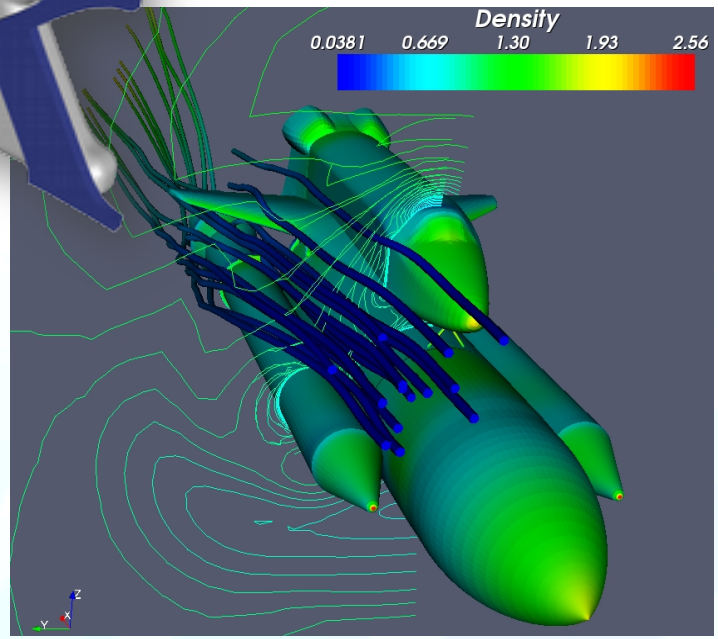
Density
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1.93
2.56

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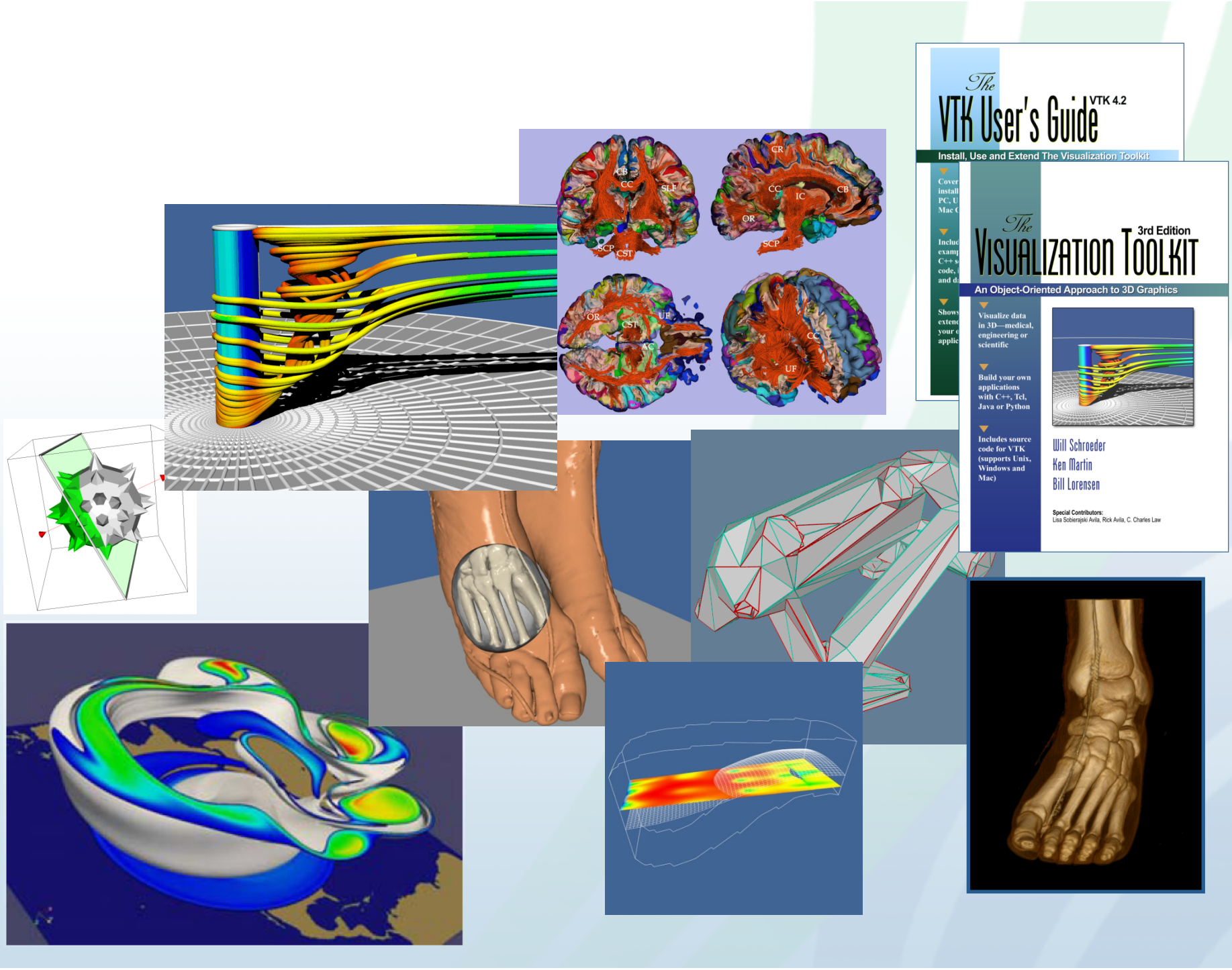
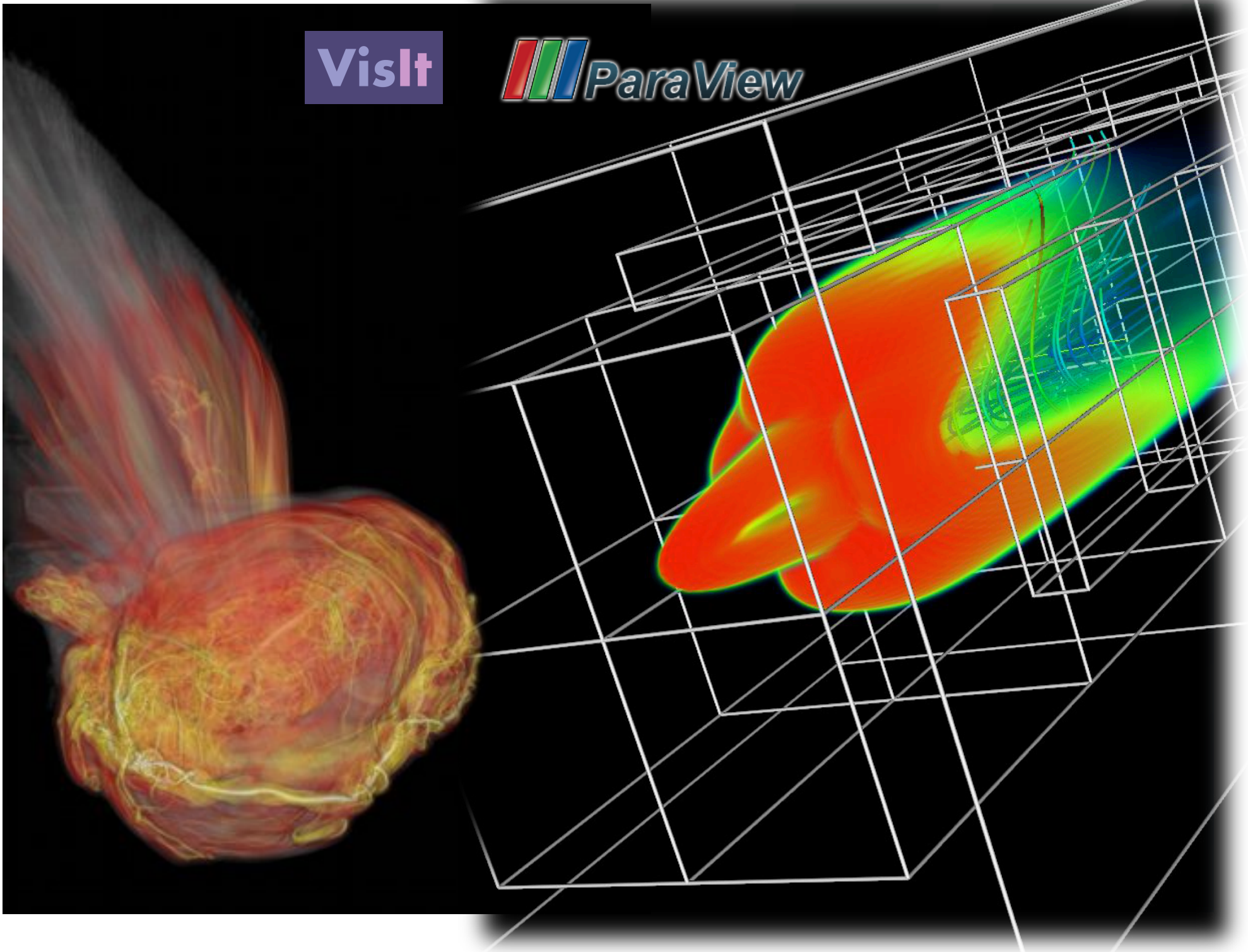
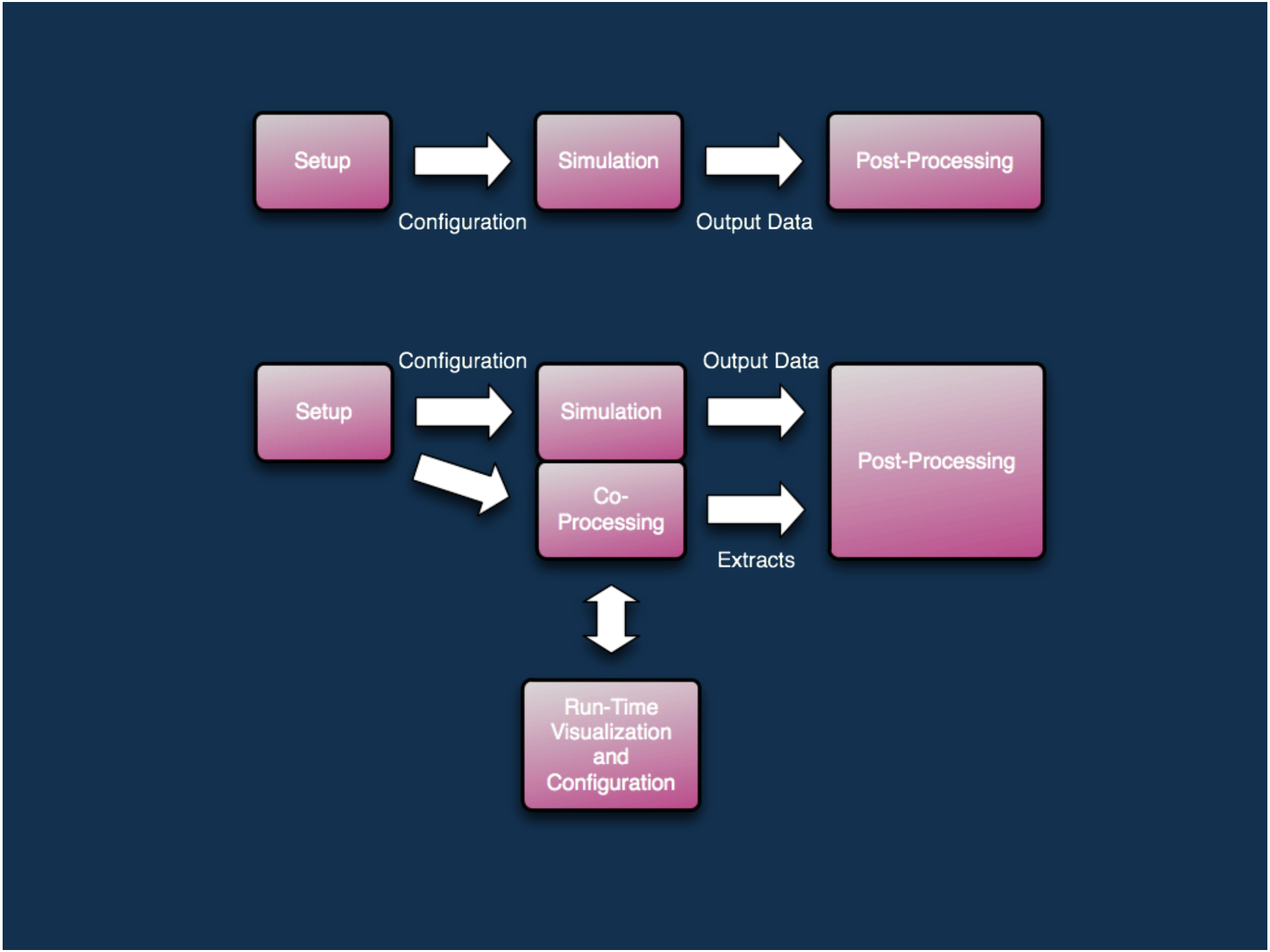

The
VTK User's Guide
VTK 4.2
Install, Use and Extend The Visualization Toolkit
The
Visualization Toolkit
3rd Edition
An Object-Oriented Approach to 3D Graphics
Visualize data in 3D—medical, engineering or scientific
Build your own applications with C++, Tcl, Java or Python
Includes source code for VTK (supports Unix, Windows and Mac)
Will Schroeder
Ken Martin
Bill Lorensen
Special Contributors:
Lisa Sobierajski Avila, Rick Avila, C. Charles Law
CB
CC
SLF
SCP
CST
CR
IC
OR
UF
AC

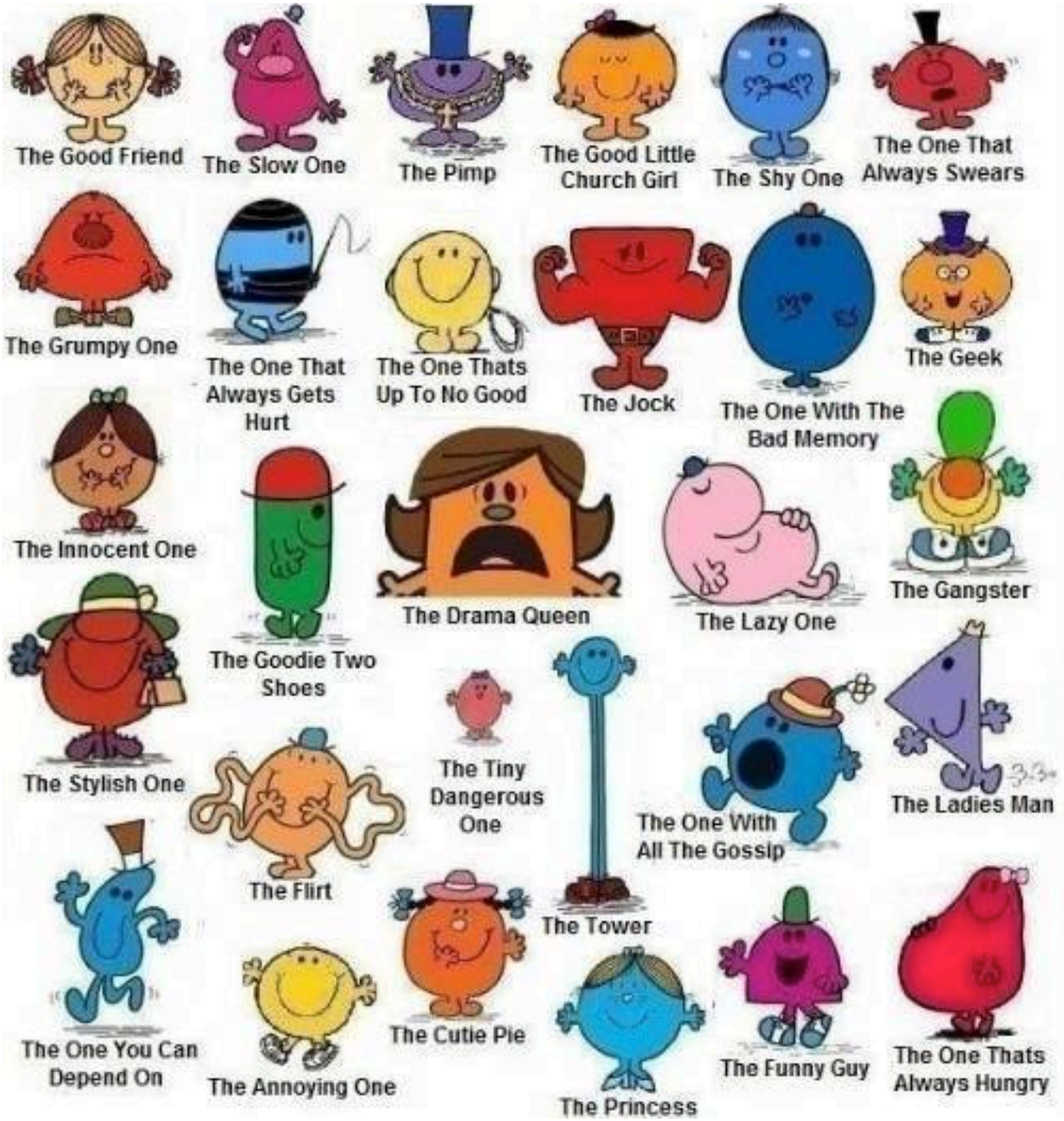
# DO-I-CARE-O-METER

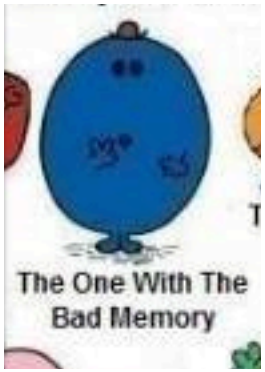

http://deliat.wordpress.com/category/thoughts-and-things-from-wonderland/

deliat.wordpress.com


VisIt
ParaView


Setup
Configuration
Simulation
Output Data
Post-Processing
Setup
Configuration
Simulation
Co-
Processing
Output Data
Post-Processing
Extracts
Run-Time
Visualization
and
Configuration


The Good Friend
The Slow One
The Pimp
The Good Little Church Girl
The Shy One
The One That Always Swears
The Grumpy One
The One That Always Gets Hurt
The One Thats Up To No Good
The Jock
The One With The Bad Memory
The Geek
The Innocent One
The Goodie Two Shoes
The Drama Queen
The Lazy One
The Gangster
The Stylish One
The Tiny Dangerous One
The Tower
The One With All The Gossip
The Ladies Man
The Flirt
The One You Can Depend On
The Annoying One
The Cutie Pie
The Princess
The Funny Guy
The One Thats Always Hungry


The One With The
Bad Memory

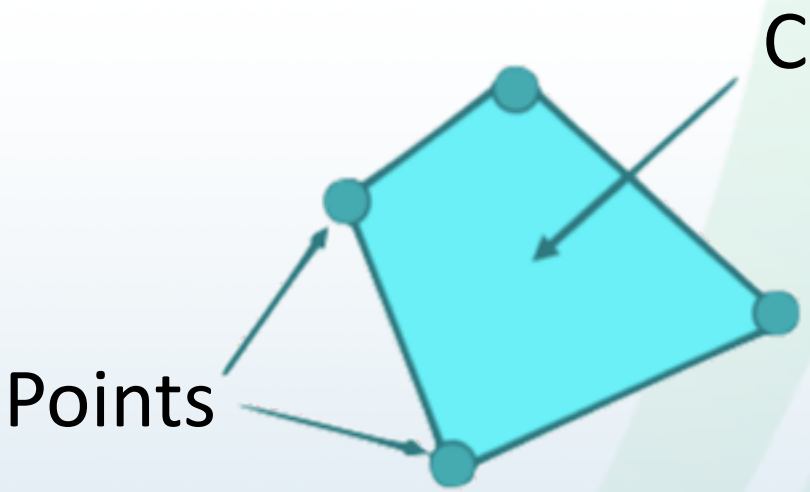

DIG IN
http://mychurchgraphics.com/slides.html

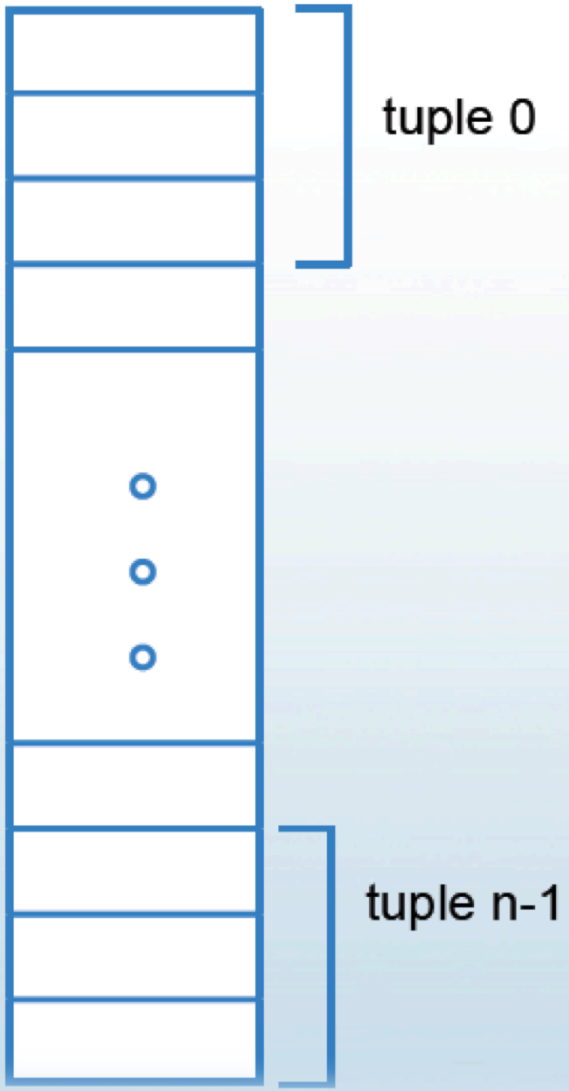
# VTK Layers

- Core
- Data Model
- Execution Model
- Components

# Execution Model


Sales DataBase
TimeKey
CustomerKey
ShipperKey
ProductKey
EmployeeKey
ItemFreight
ItemQuanity
ItemAll
Discount
Shipper
ShipperKey
ShipperID
ShipperName
Product
ProductKey
ProductID
CategoryID
Price
Employee
Title
Address
City
Region
PCode
Country
Phone
Mphone
Fax
Email
Data Model


Cell
Points

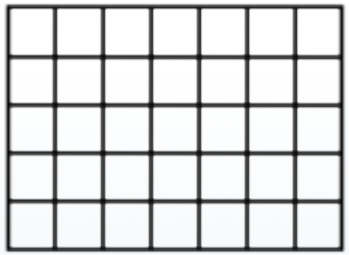



# vtkDataArray

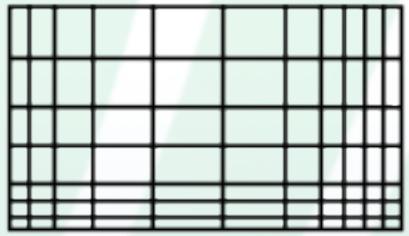
-array of *n* tuples
-each tuple has *m* components
-implemented as nxm C-array
-data-type determined by class

Kitware

vtkImageData

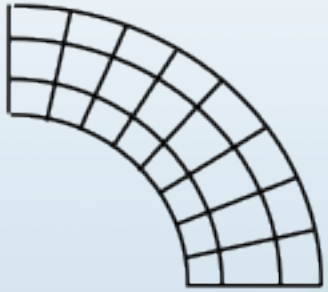


vtkRectilinearGrid

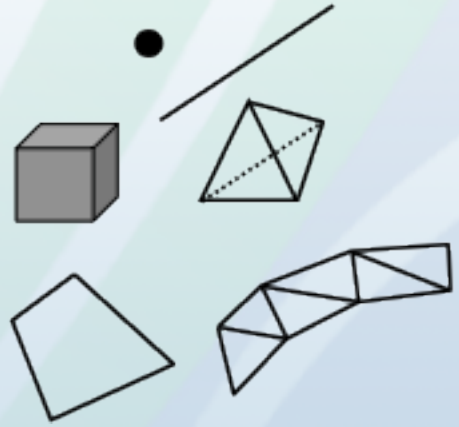


vtkPolyData

vtkStructuredGrid



vtkUnstructuredGrid

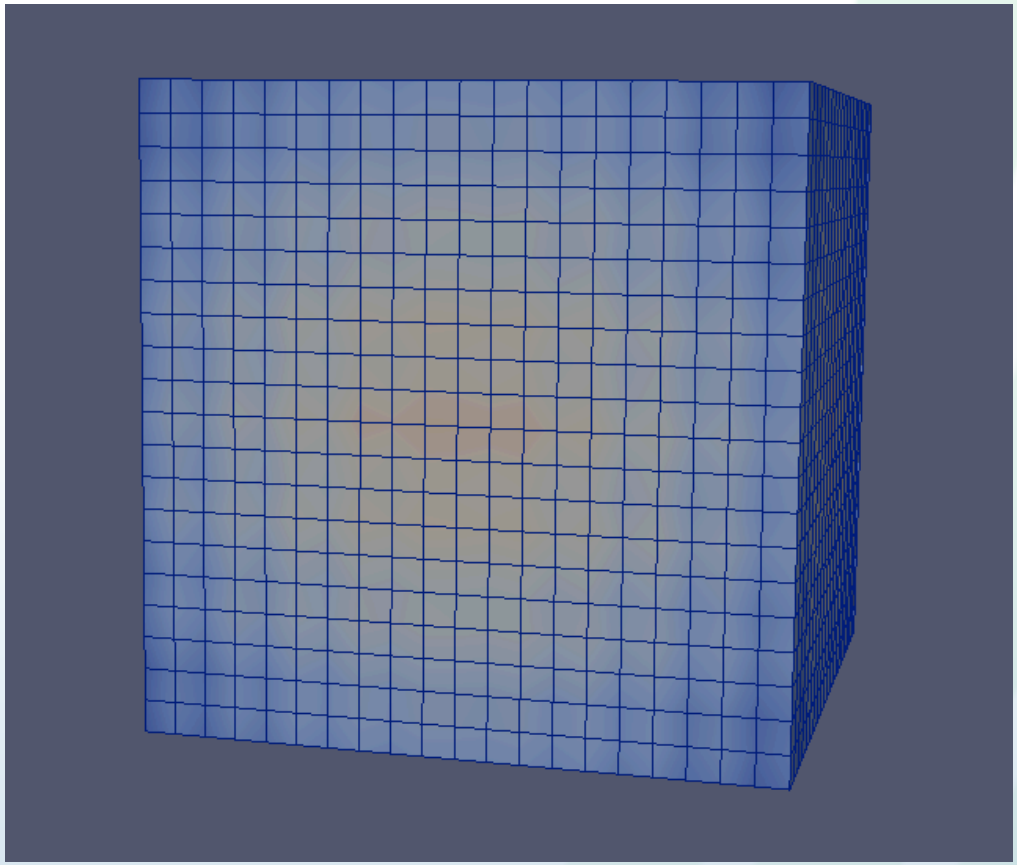


Kitware

# vtkDataSet

```
GetNumberOfPoints()
GetNumberOfCells()
GetPoint(…)
GetCell(…)
GetCellPoints(…)
GetPointCells(…)
GetCellNeighbors(…)
FindCell(…)
```

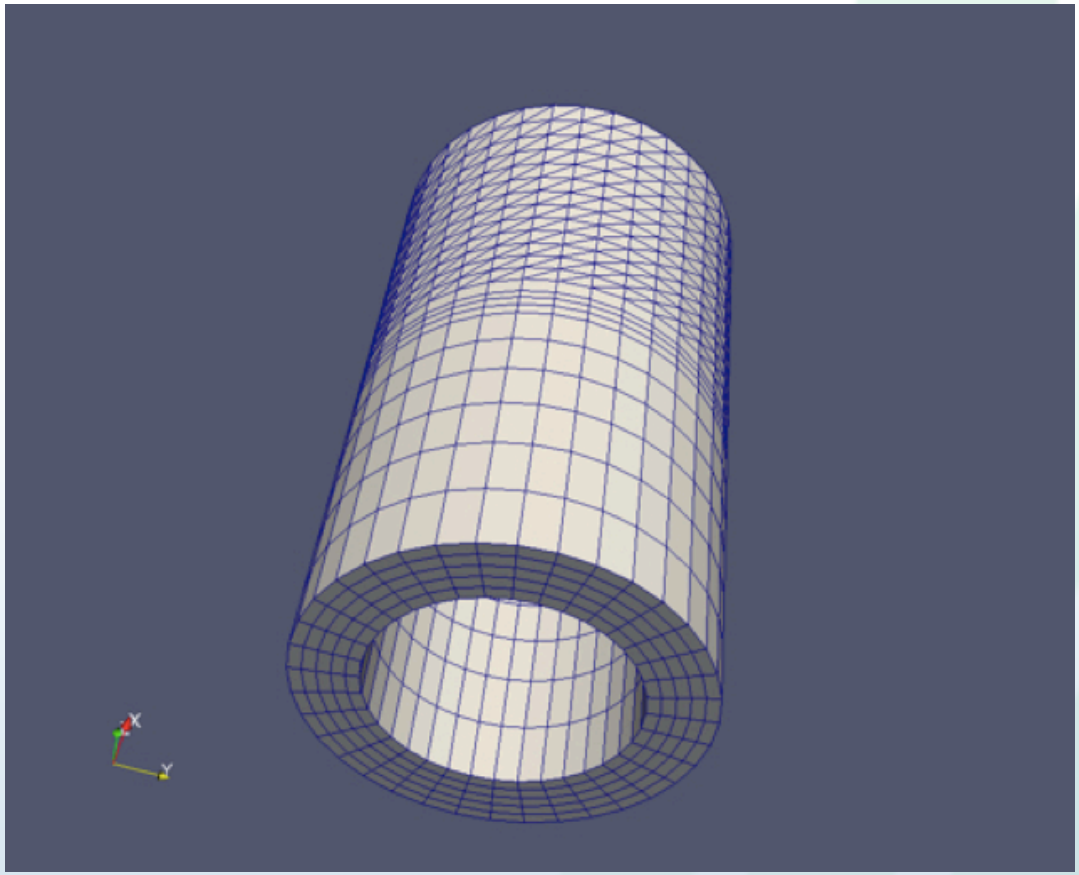
vtkImageData



-Dimensions
-Origin
-Spacing

Kitware

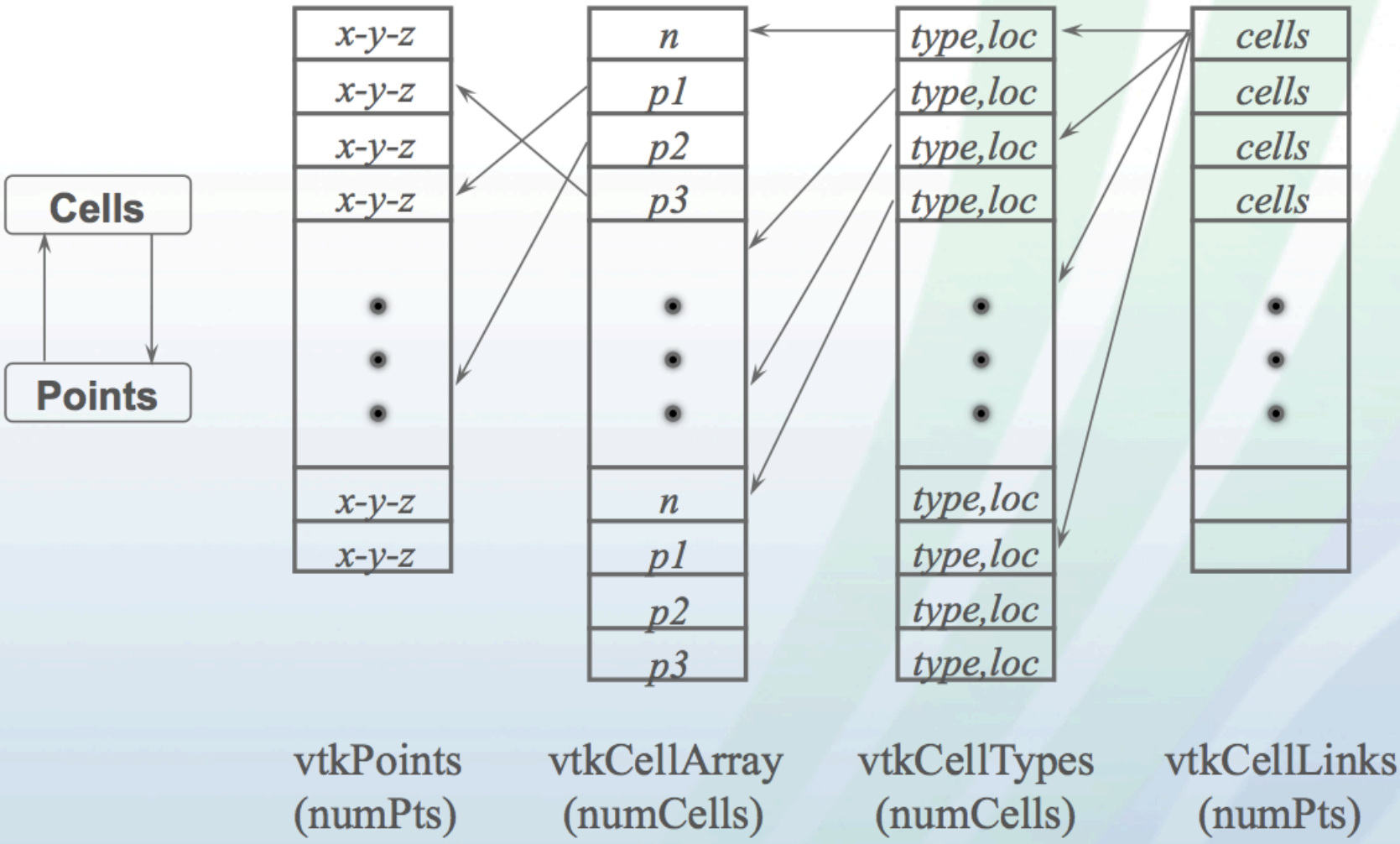
vtkUnstructuredData



(continued…)

Kitware

# Unstructured Data Structure




Kitware

# vtkDataSet

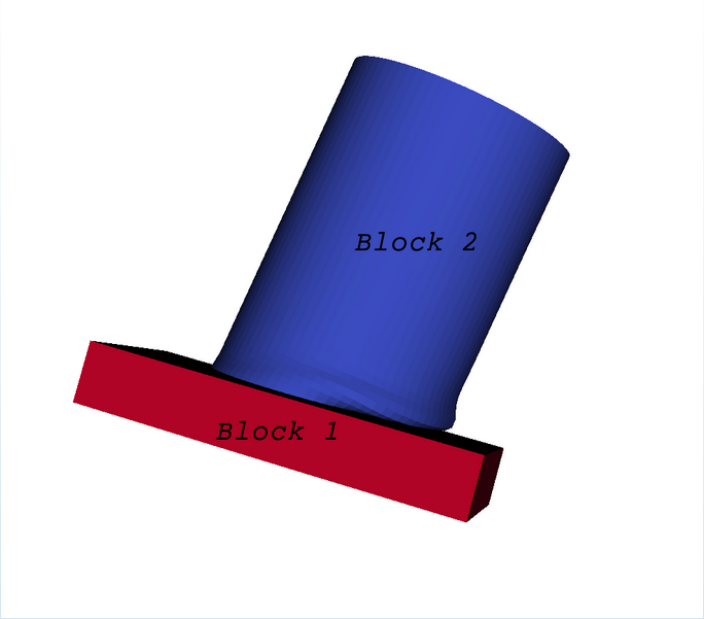
```
GetNumberOfPoints()
GetNumberOfCells()
GetPoint(…)
GetCell(…)
GetCellPoints(…)
GetPointCells(…)
GetCellNeighbors(…)
FindCell(…)
```

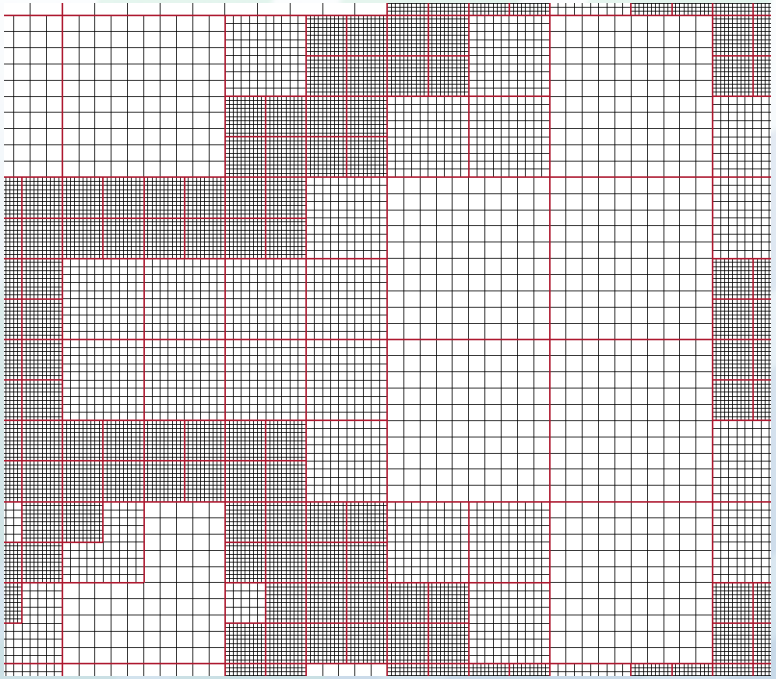
```
vtkIdType vtkImageData::FindCell(double x[3], ...)
{
  int idx[3];

    // Compute squared distance of point x from the boundary
   double dist2 = 0.0;

   ...

   for (int i=0; i<3; i++)
     {
     int minIdx = extent[i*2];
     int maxIdx = extent[i*2+1];
     int negSpacing = (spacing[i] < 0);
     double minBound = bounds[i*2 + negSpacing];
     double maxBound = bounds[i*2 + (1-negSpacing)];

     if ( idx[i] < minIdx )
       {
       idx[i] = minIdx;
       pcoords[i] = 0.0;
       double dist = x[i] - minBound;
       dist2 += dist*dist;
       }
     else if ( idx[i] >= maxIdx )
       {
       if (maxIdx == minIdx)
         {
         idx[i] = minIdx;
         pcoords[i] = 0.0;
         }
       else
         {
         idx[i] = maxIdx-1;
         pcoords[i] = 1.0;
         }
       double dist = x[i] - maxBound;
       dist2 += dist*dist;
       }
     }

   // Check squared distance against the tolerance
   if (dist2 > tol2)
     {
     return -1;
     }
    ...
  return this->ComputeCellId(idx);

}
```

```
vtkIdType vtkPointSet::FindCell(double x[3], ...)
{
  vtkIdType foundCell;


  // Check to see if the point is within the bounds of the data.  This is not
  // a strict check, but it is fast.
  double bounds[6];
  this->GetBounds(bounds);
  if (    (x[0] < bounds[0]) || (x[0] > bounds[1])
      || (x[1] < bounds[2]) || (x[1] > bounds[3])
      || (x[2] < bounds[4]) || (x[2] > bounds[5]) )
    {
    return -1;
    }

  if ( !this->Locator )
    {
    this->Locator = vtkPointLocator::New();
    this->Locator->Register(this);
    this->Locator->Delete();
    this->Locator->SetDataSet(this);
    this->Locator->BuildLocator();
    }


   ...



  // Now find the point closest to the coordinates given and search from the
  // adjacent cells.
  vtkIdType ptId = this->Locator->FindClosestPoint(x);
  if (ptId < 0) return -1;
  this->GetPointCells(ptId, cellIds);
  foundCell = FindCellWalk(this, x, gencell, cellIds,
                           tol2, subId, pcoords, weights,
                           visitedCells, ptIds, neighbors);
  if (foundCell >= 0) return foundCell;


  ...



  // Could not find the cell.
  return -1;
}
```

# vtkCompositeDataSet

-vtkMultiBlockDataSet
-vtkNonOverlappingAMR
-vtkOverlappingAMR



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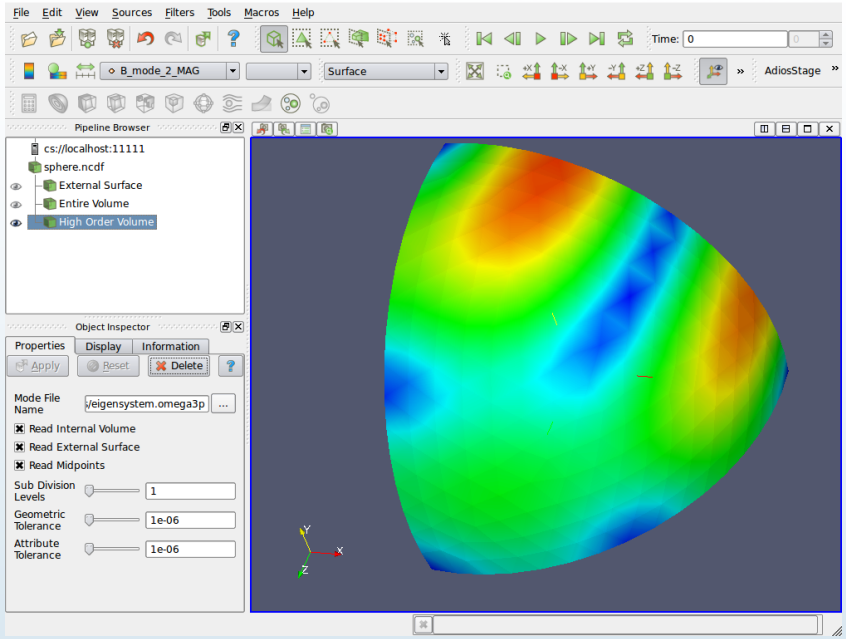
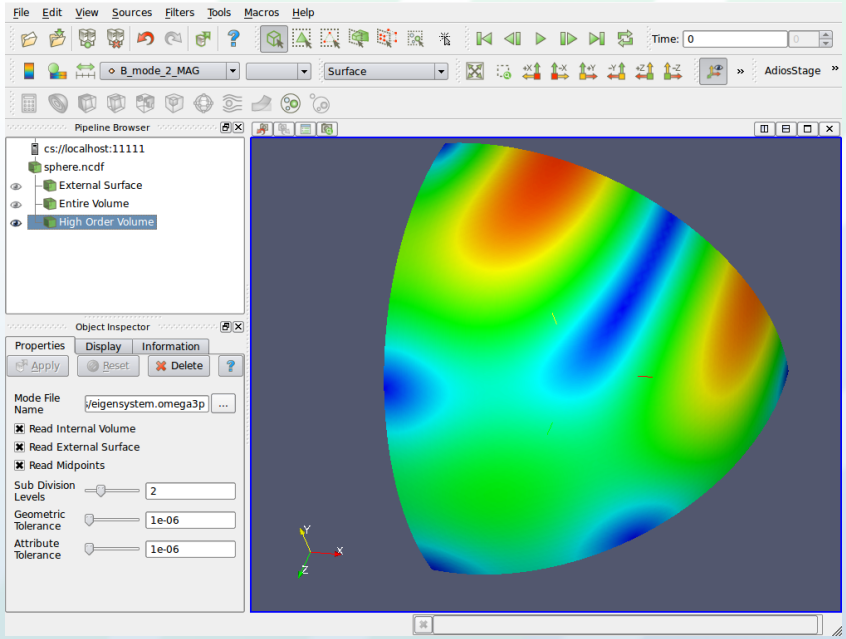
# vtkGenericDataSet

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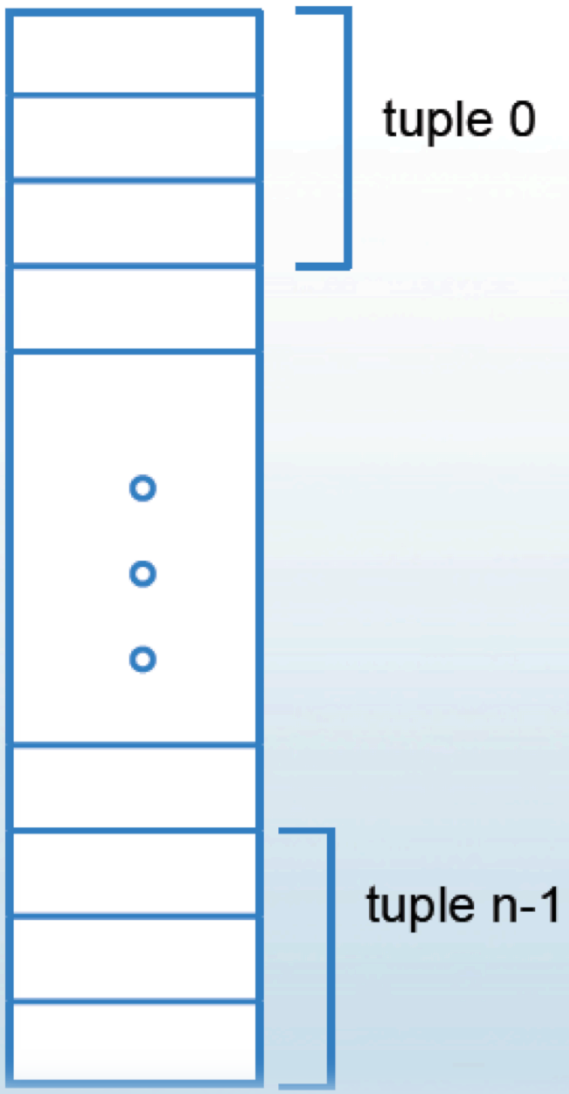
# Challenges / Ongoing Work

- Memory
  - Adaptable layout
  - Sharing data / Avoiding copy
  - Meta-data > Heavy-data

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*-what about mxn arrays?*

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# Challenges / Ongoing Work

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# Challenges / Ongoing Work

-Memory
    -Adaptable layout
    -Sharing data / Avoiding copy
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*that's all, folks!*

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