SAND2011-6794P

Large-Scale Interactive Visualization with ParaView

Interactive Handling of Large Data Sets Minisymposium ICCE 2011

October 4-6, 2011

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Sandia National Laboratories

Release Marking (e.g. Not Approved for Release, SAND XXXX, etc.)

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What is ParaView?

ParaView is a Visual Analysis Tool

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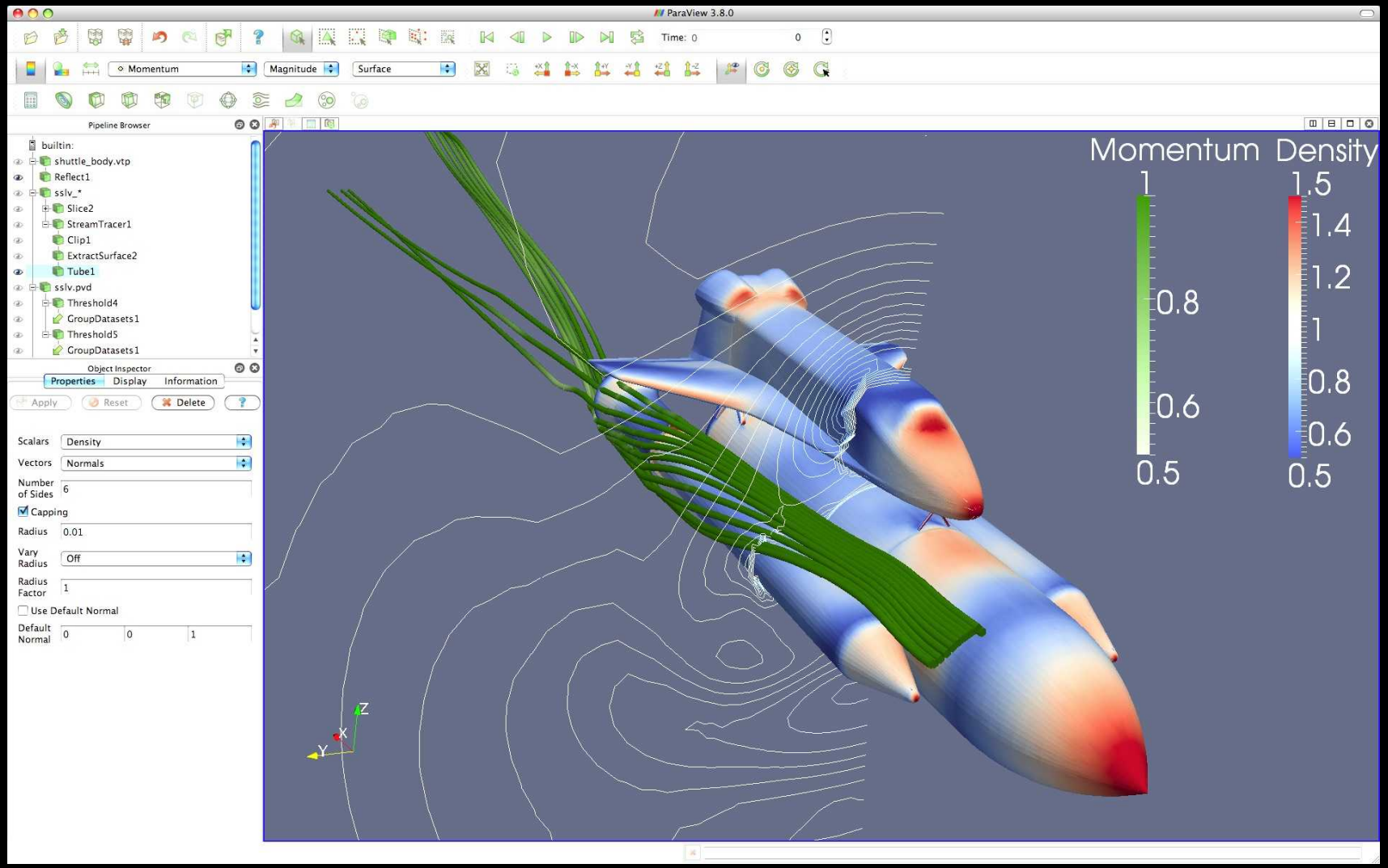

Example Uses of ParaView

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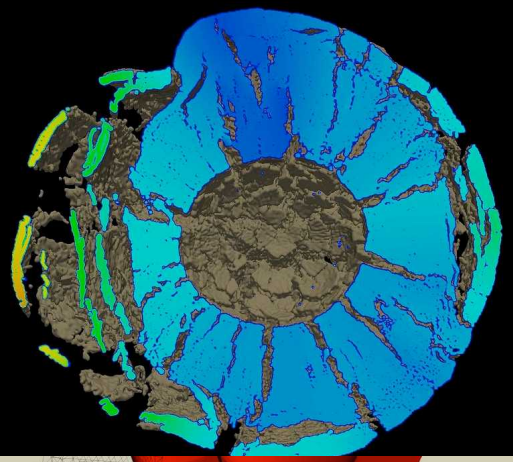
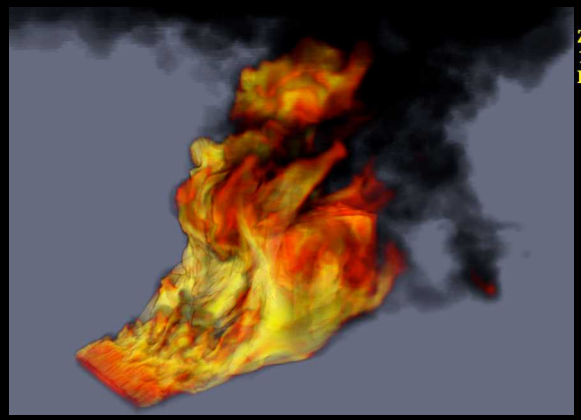
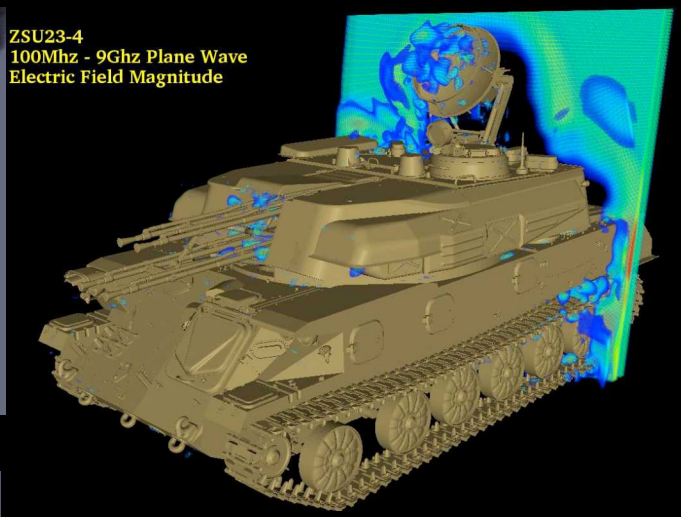
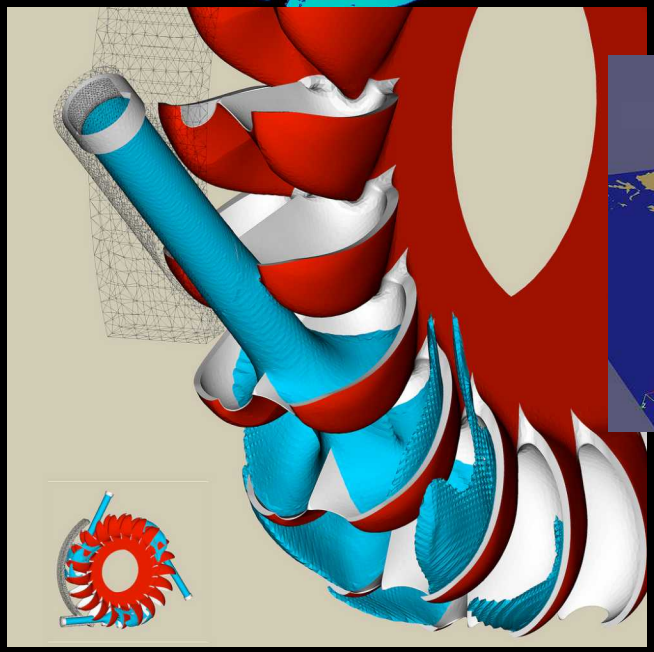


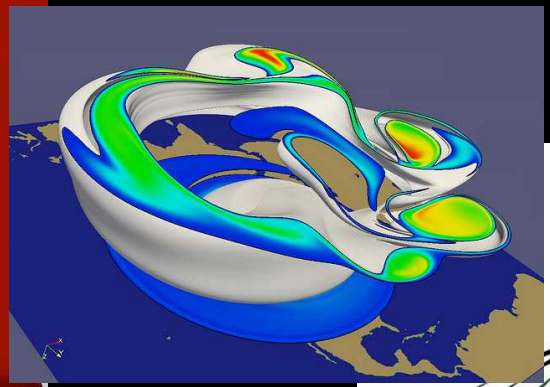


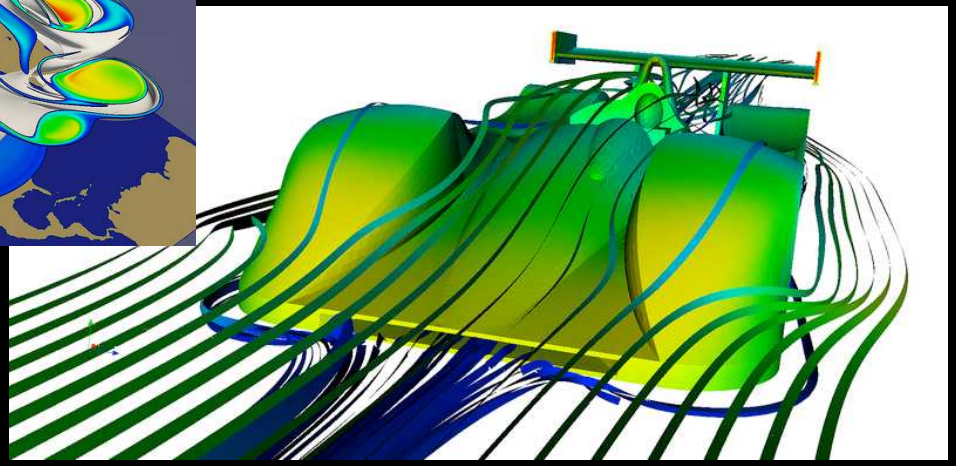


Jerry Clarke, US Army Research Laboratory



Swiss National Supercomputing Centre





Renato N. Elias, NACAD/COPPE/UFRJ, Rio de Janerio, Brazil

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What is Interactive?

At a minimum, interactive is accessible.

Interactive is Accessible

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Interactive is Accessible

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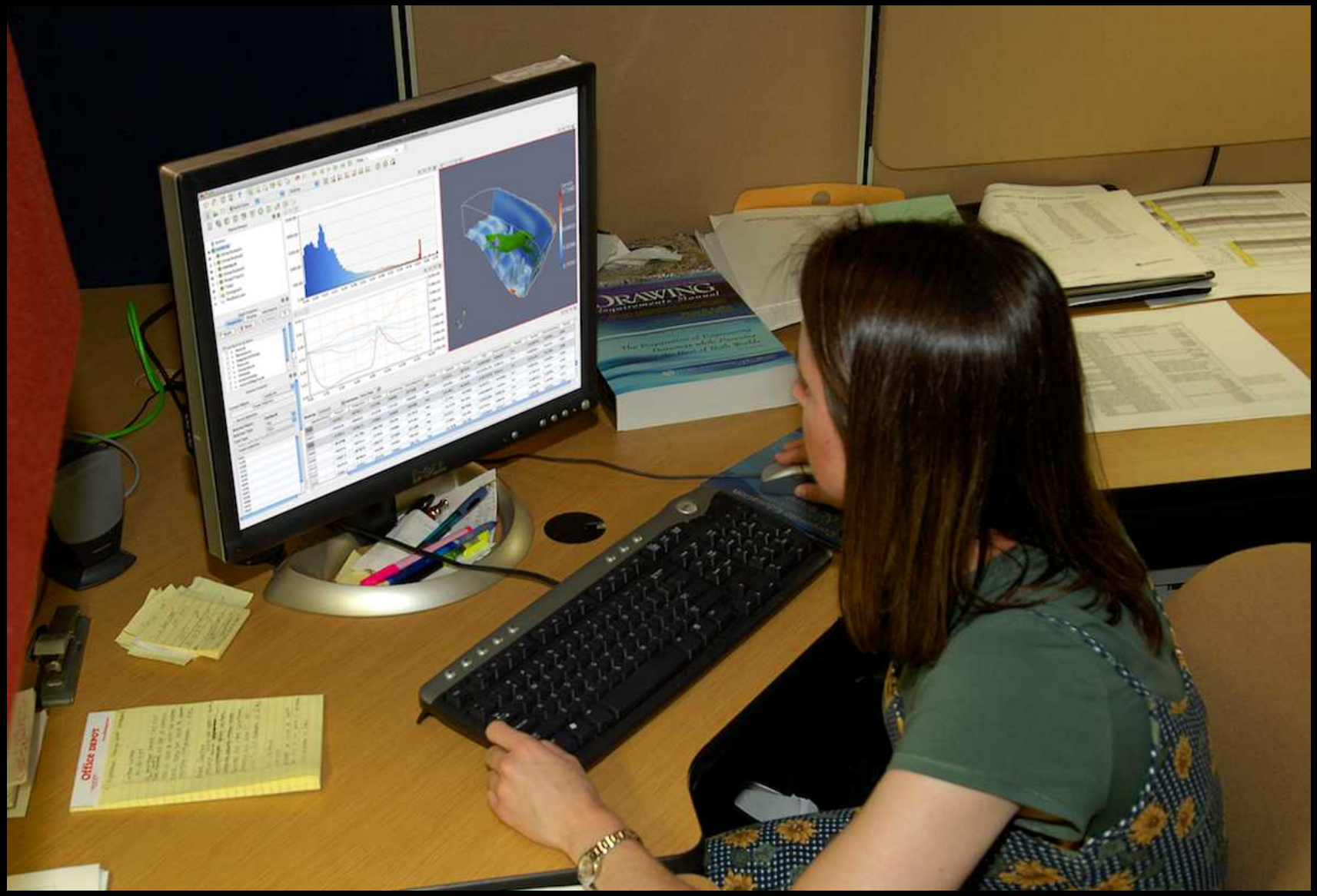
Interactive is Accessible



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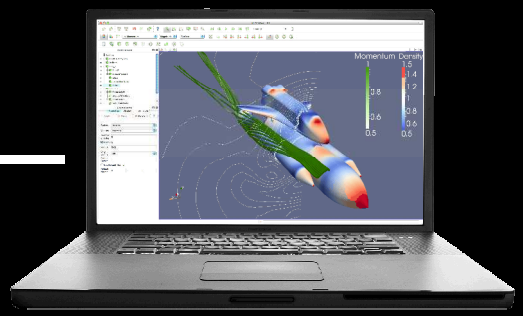
Client-Server Architecture Makes Large Data Computation Accessible

pvserver

LAN/WAN



ParaView GUI
(client)

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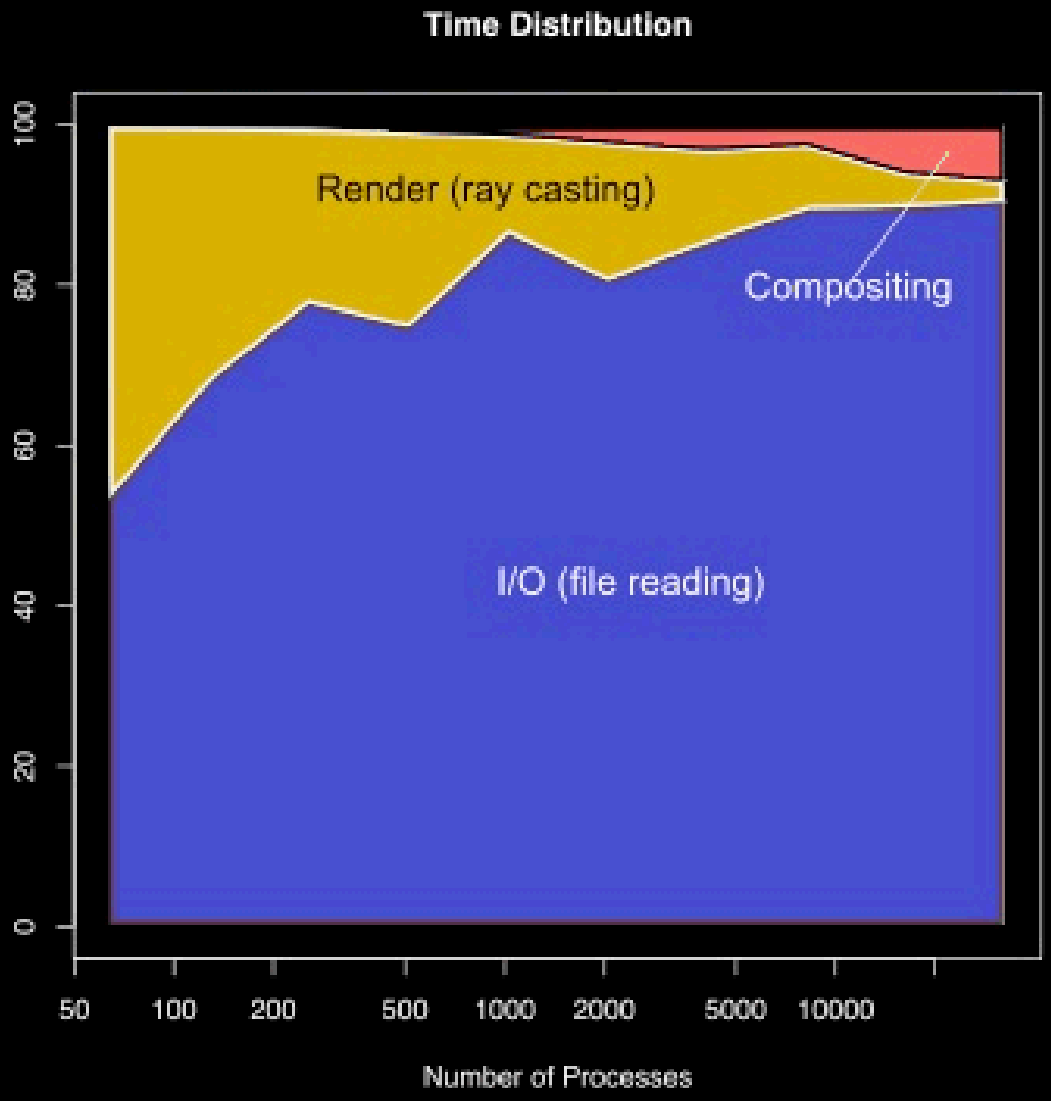
What is Interactive?

Interactive is “fast”

Fast Data Loading



Source: “Parallel Volume Rendering on the IBM Blue Gene/P,” Tom Peterka et al.

Fast Data Processing

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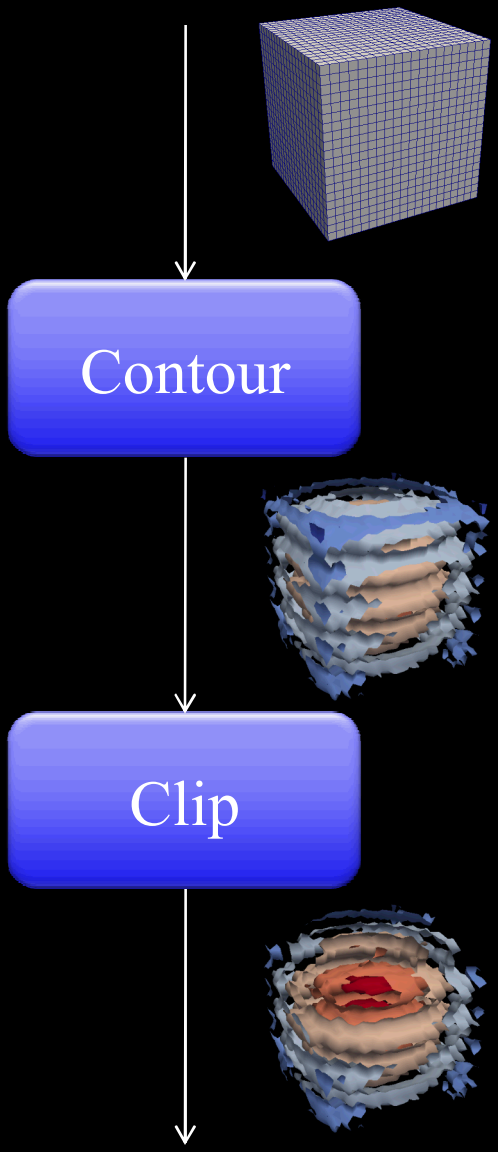
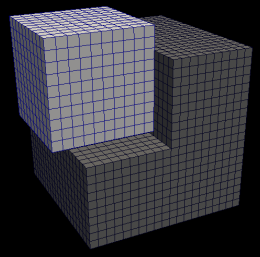
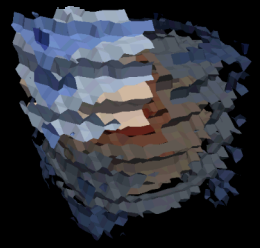


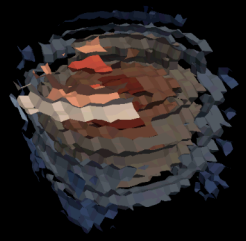
Fast Data Processing



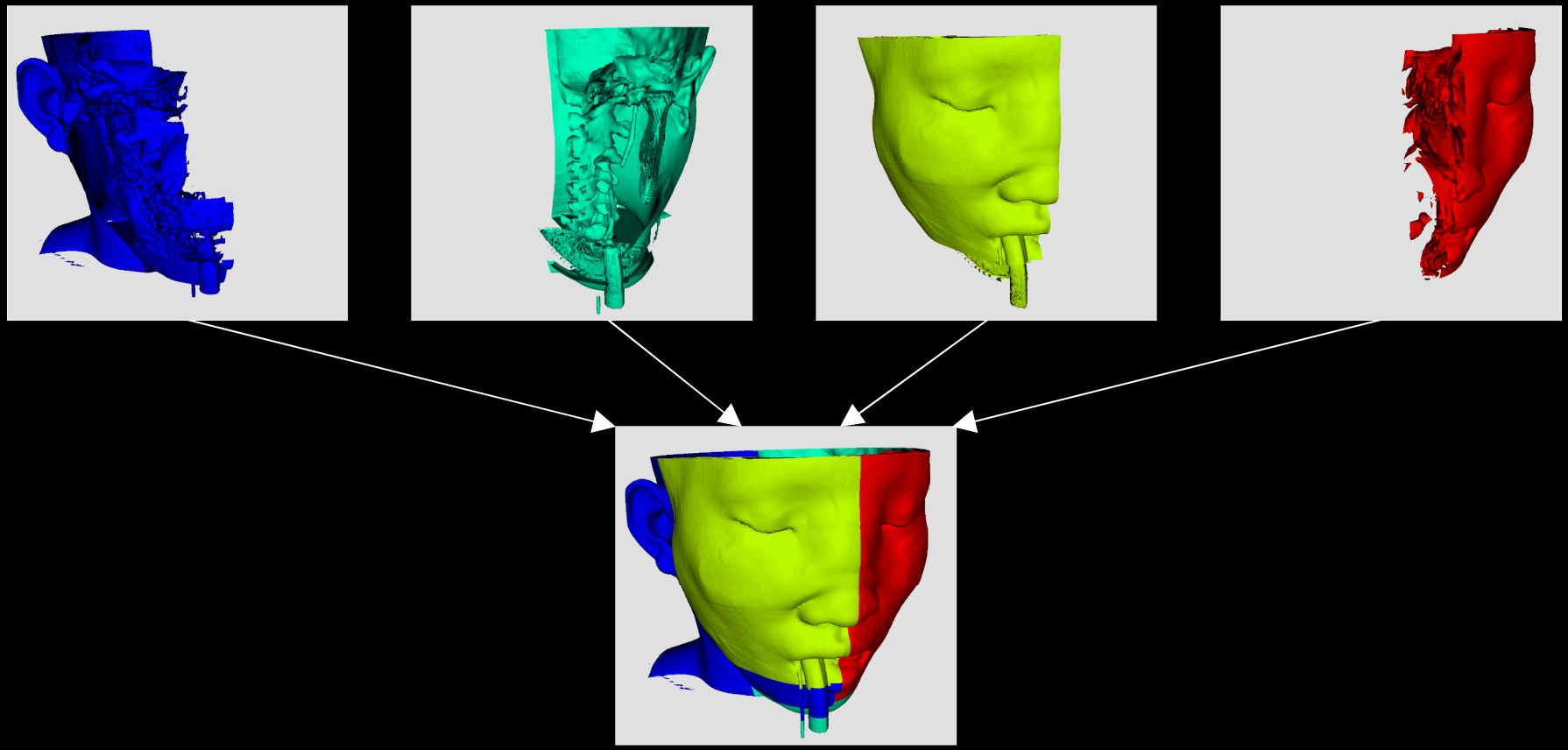
Contour | Contour | Contour



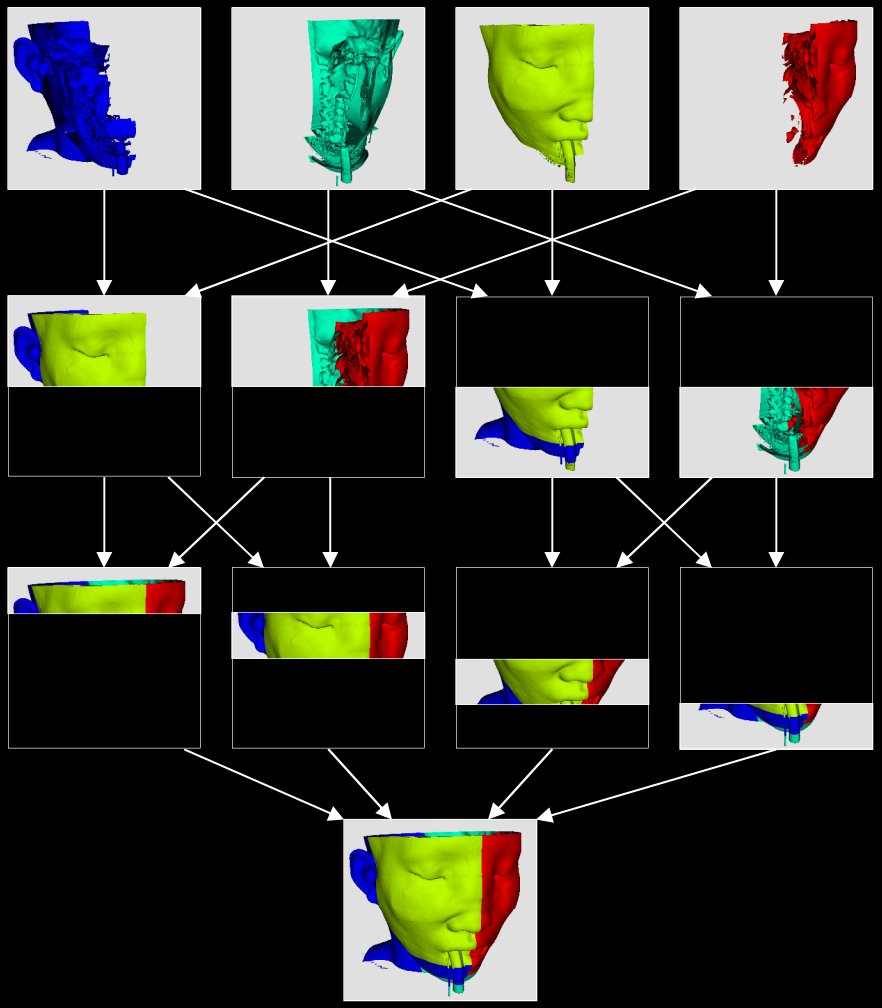
Clip | Clip | Clip



Fast Parallel Rendering



Parallel Rendering



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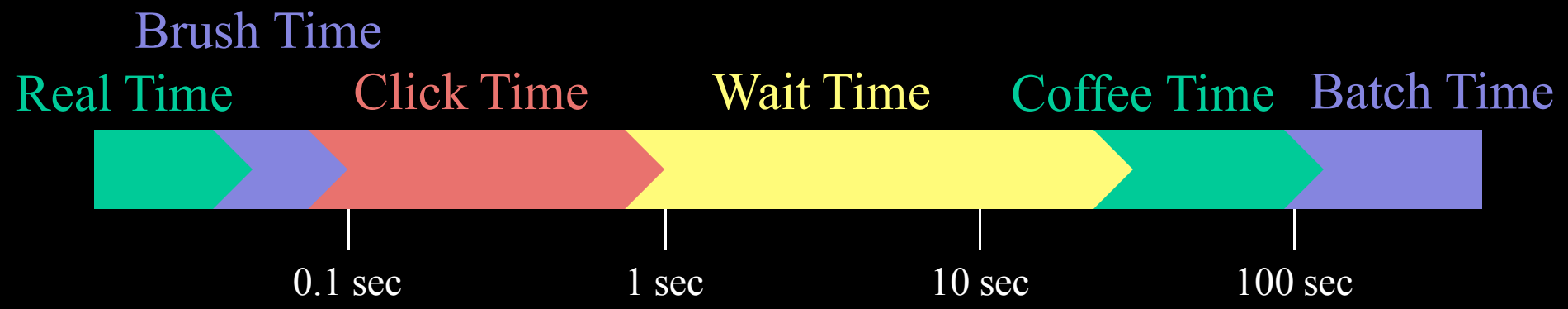
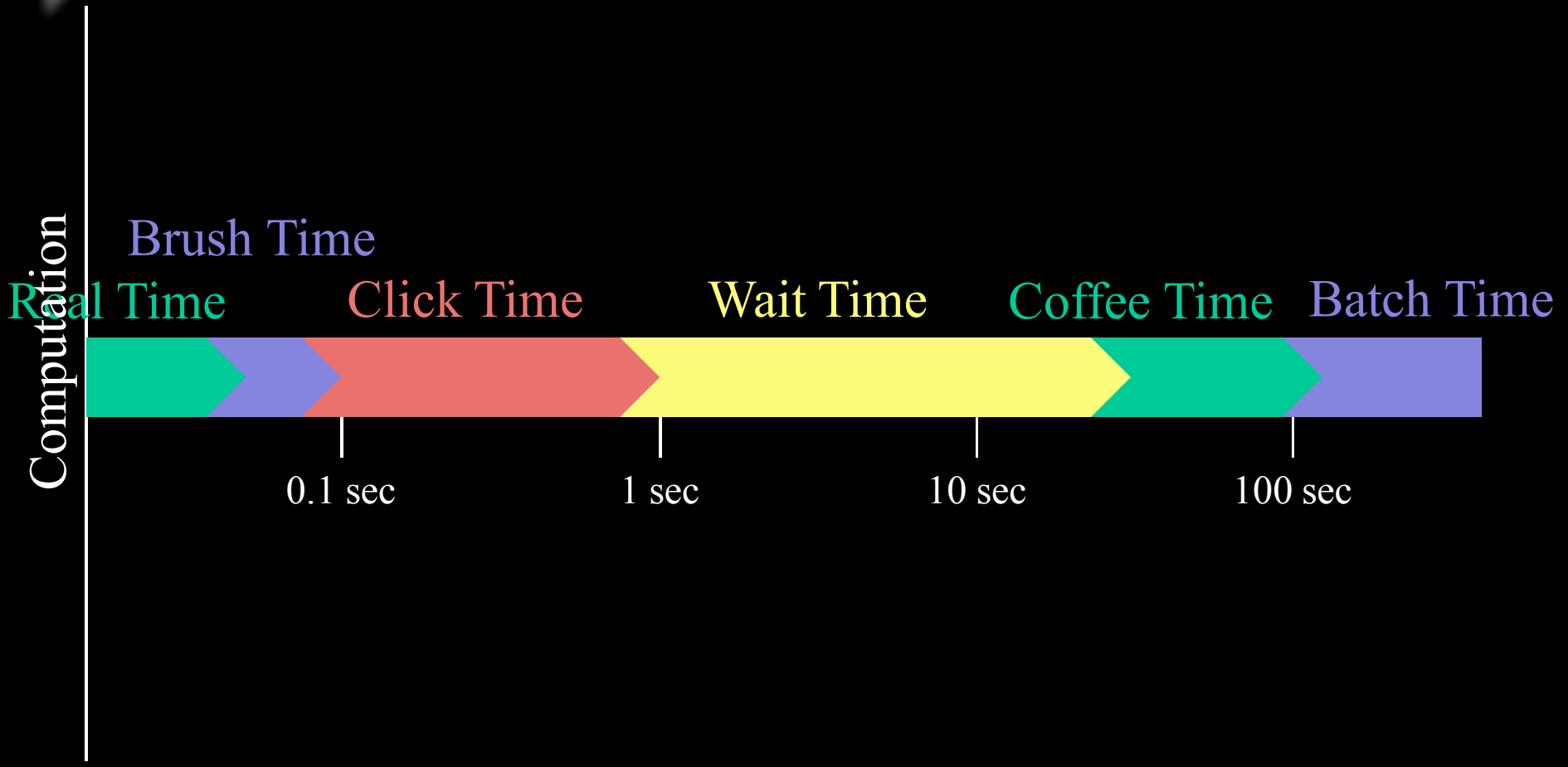
What is Interactive?

Interactivity demands responsiveness

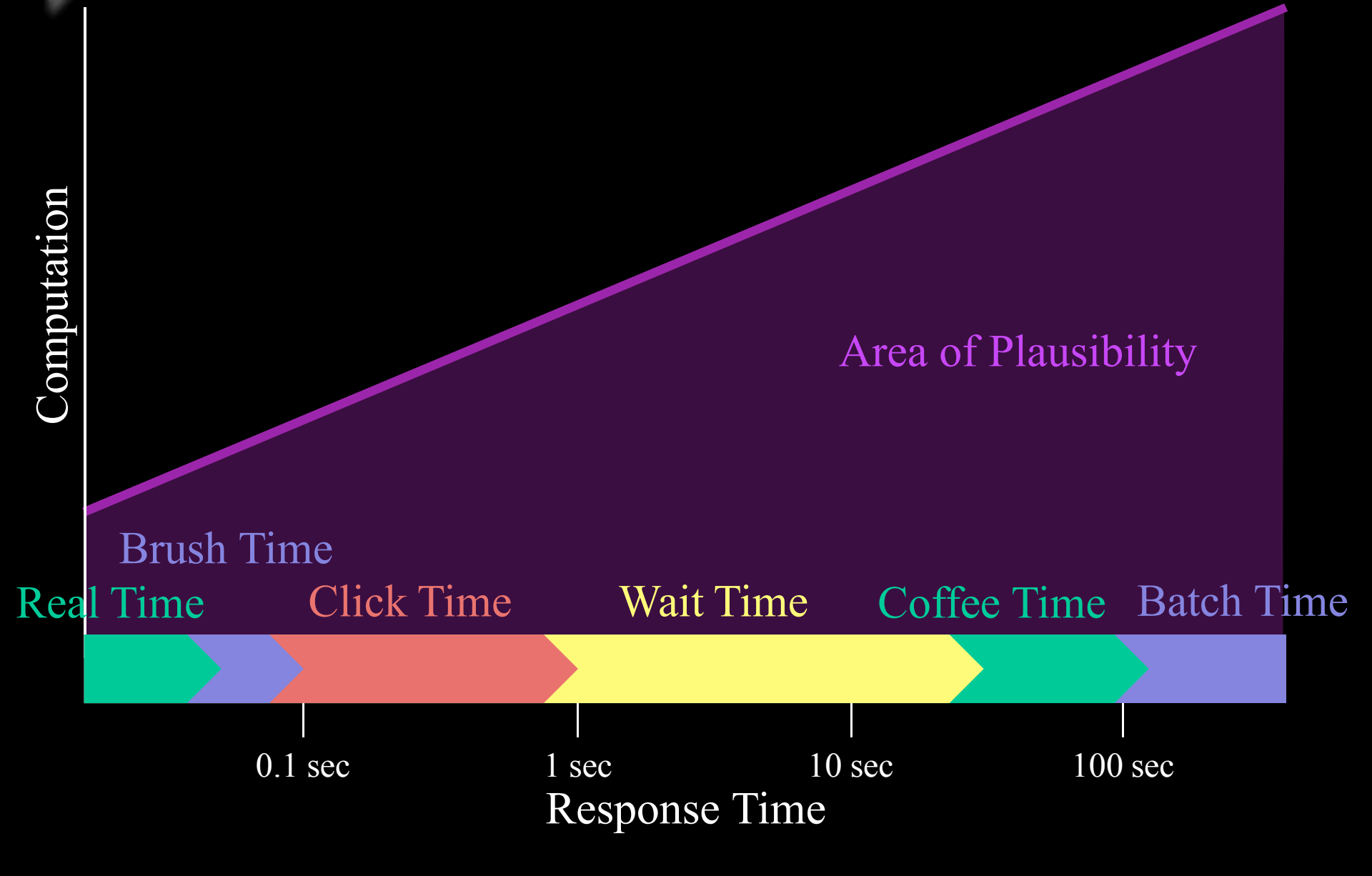
Interactive is Responsive



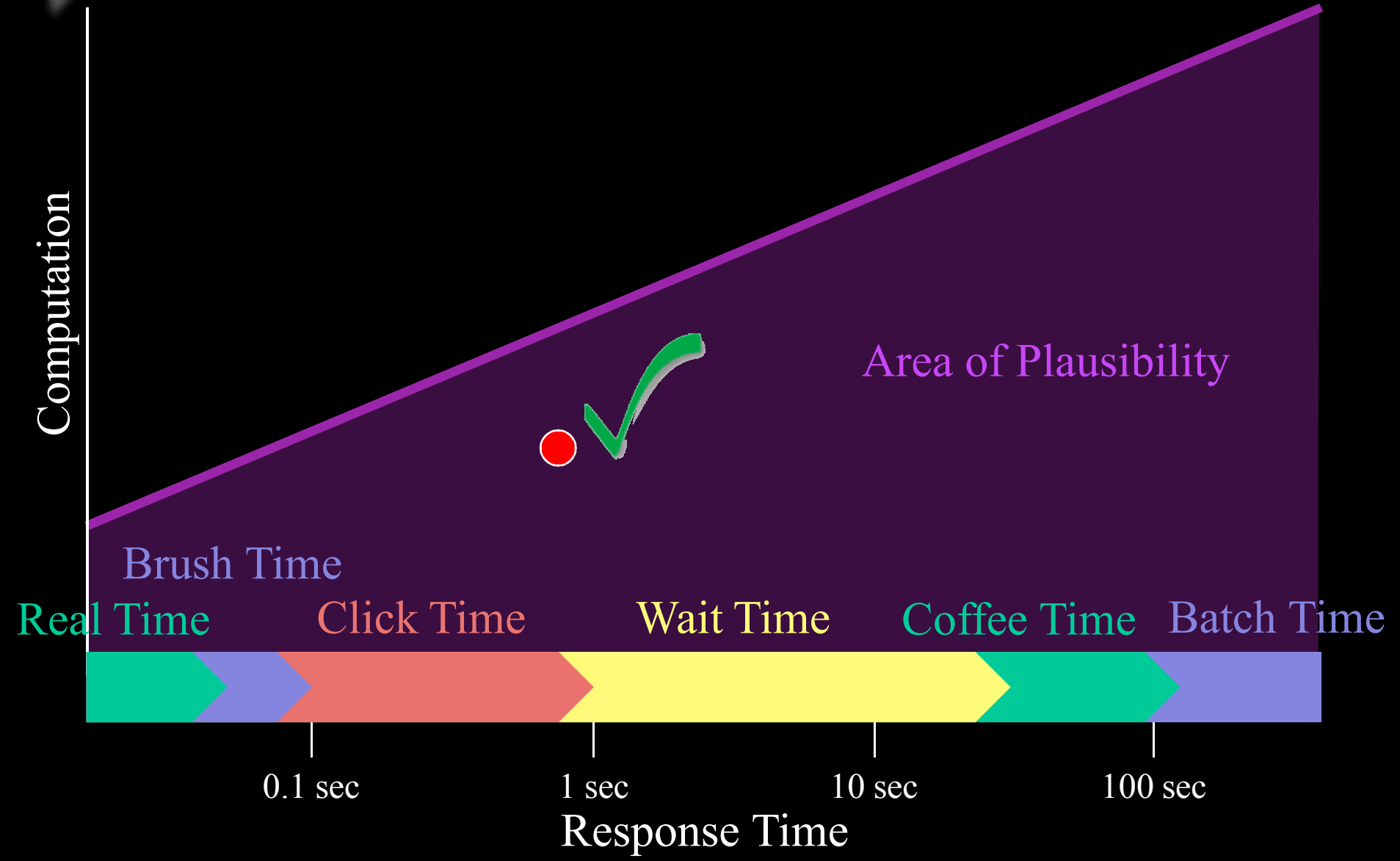
Interactive is Responsive



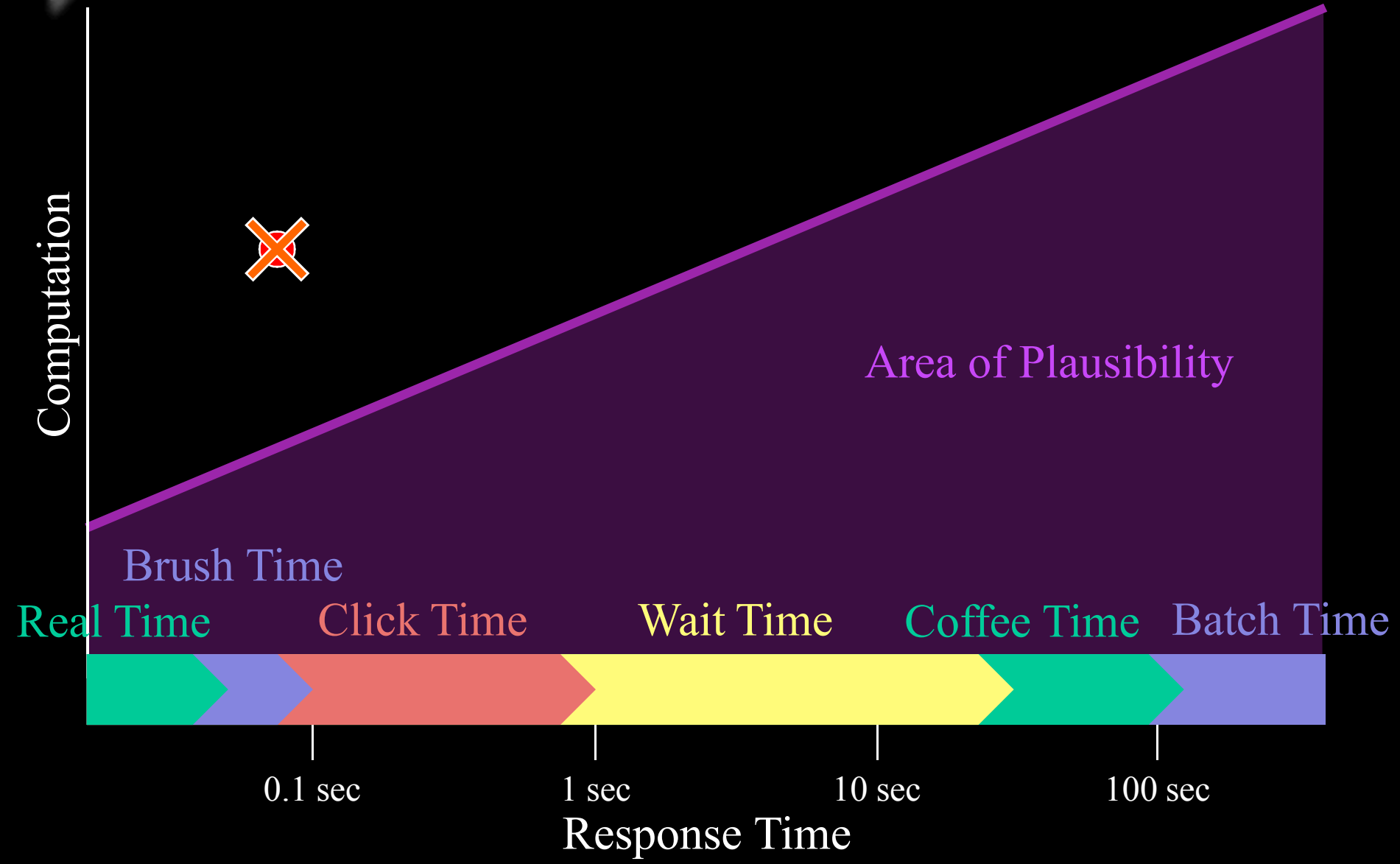
Interactive is Responsive



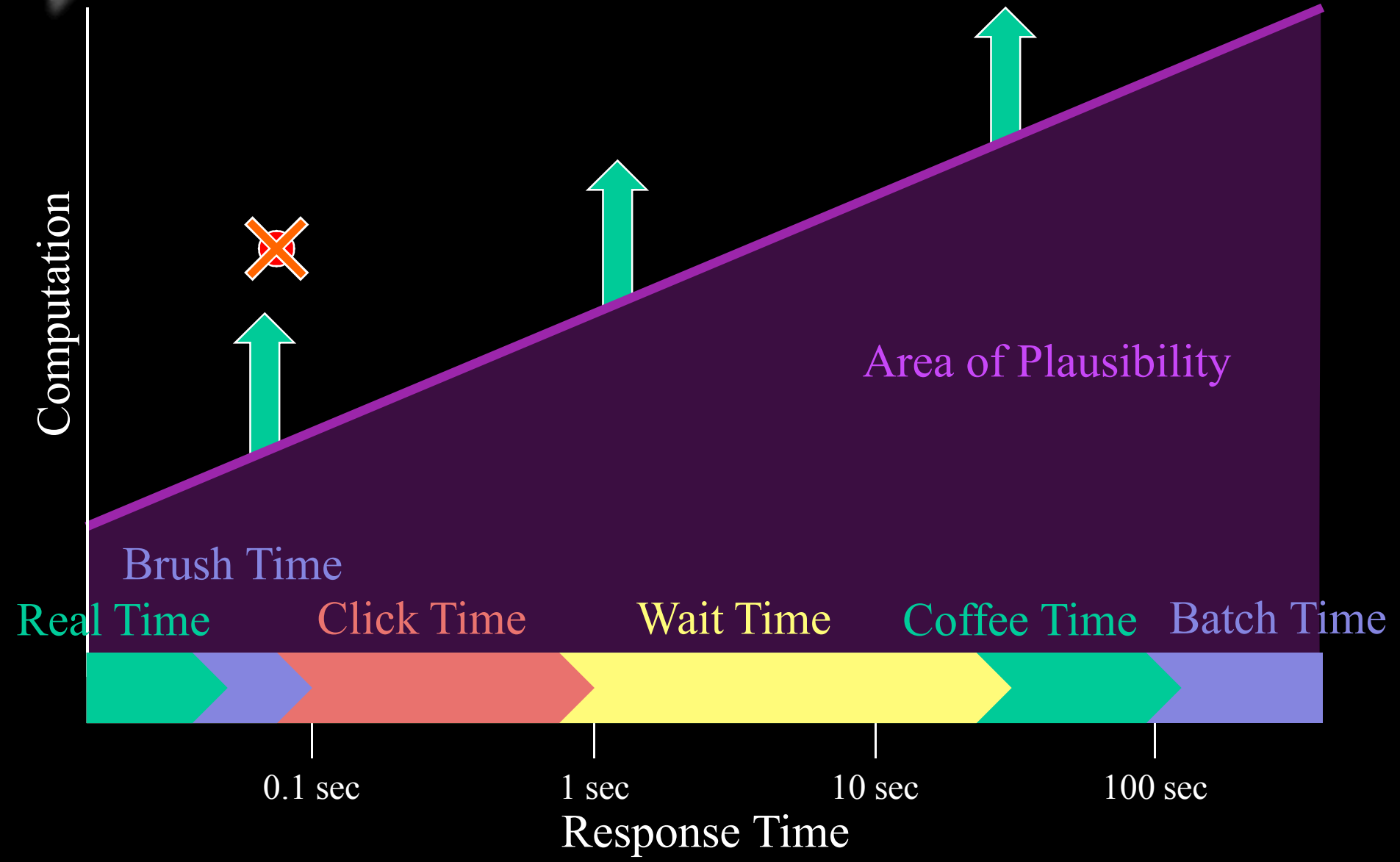
Interactive is Responsive



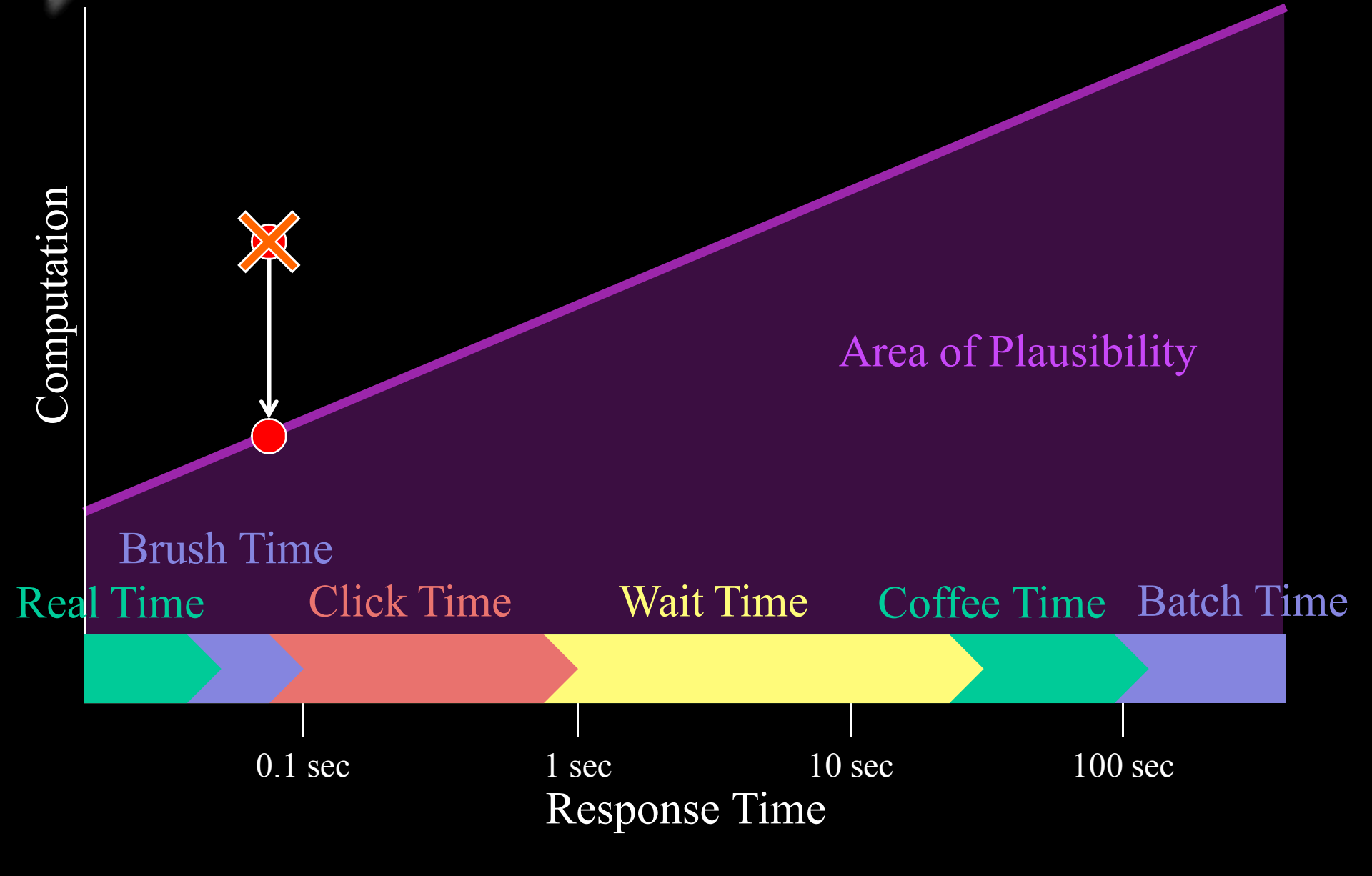
Interactive is Responsive



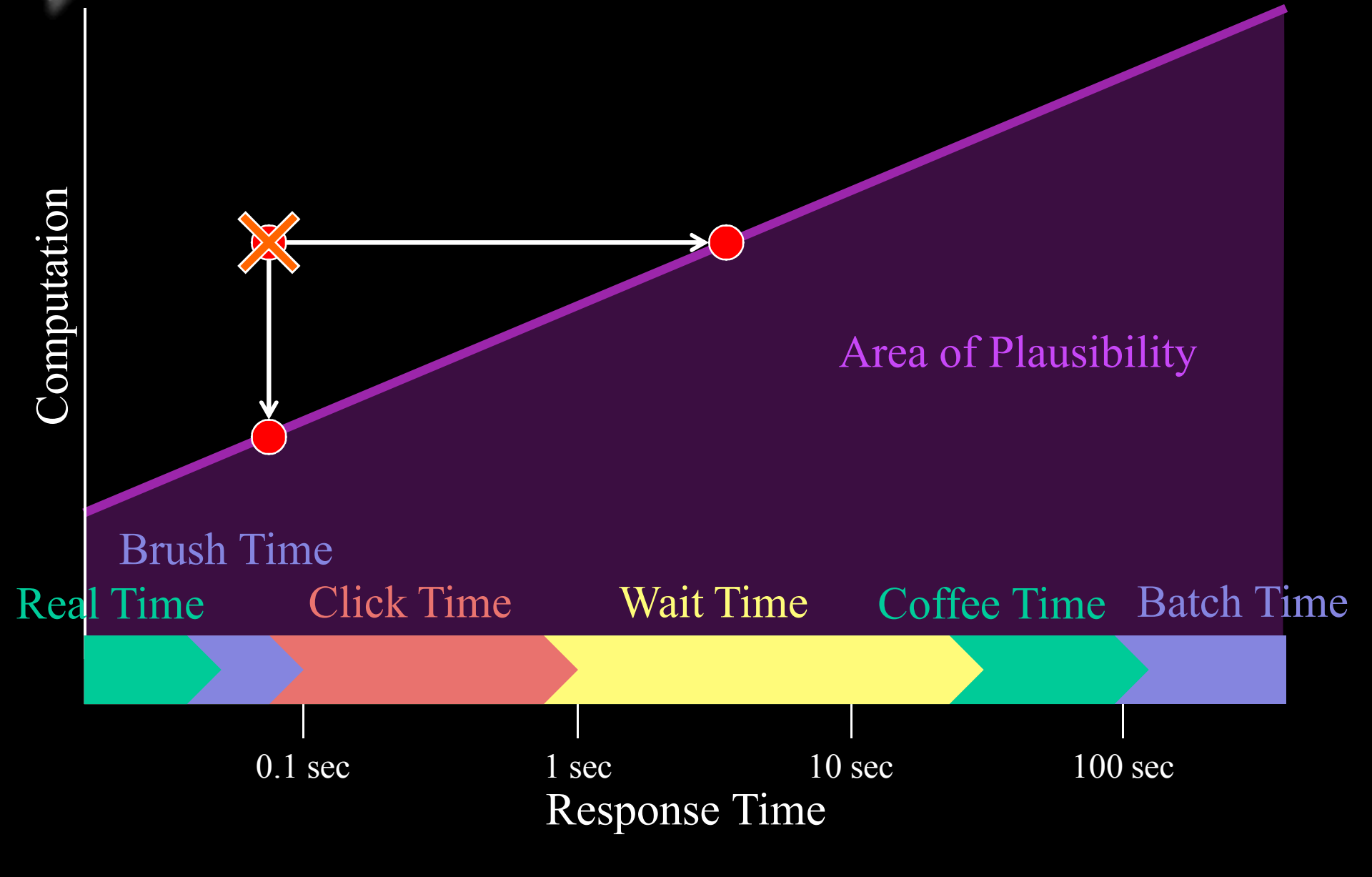
Interactive is Responsive



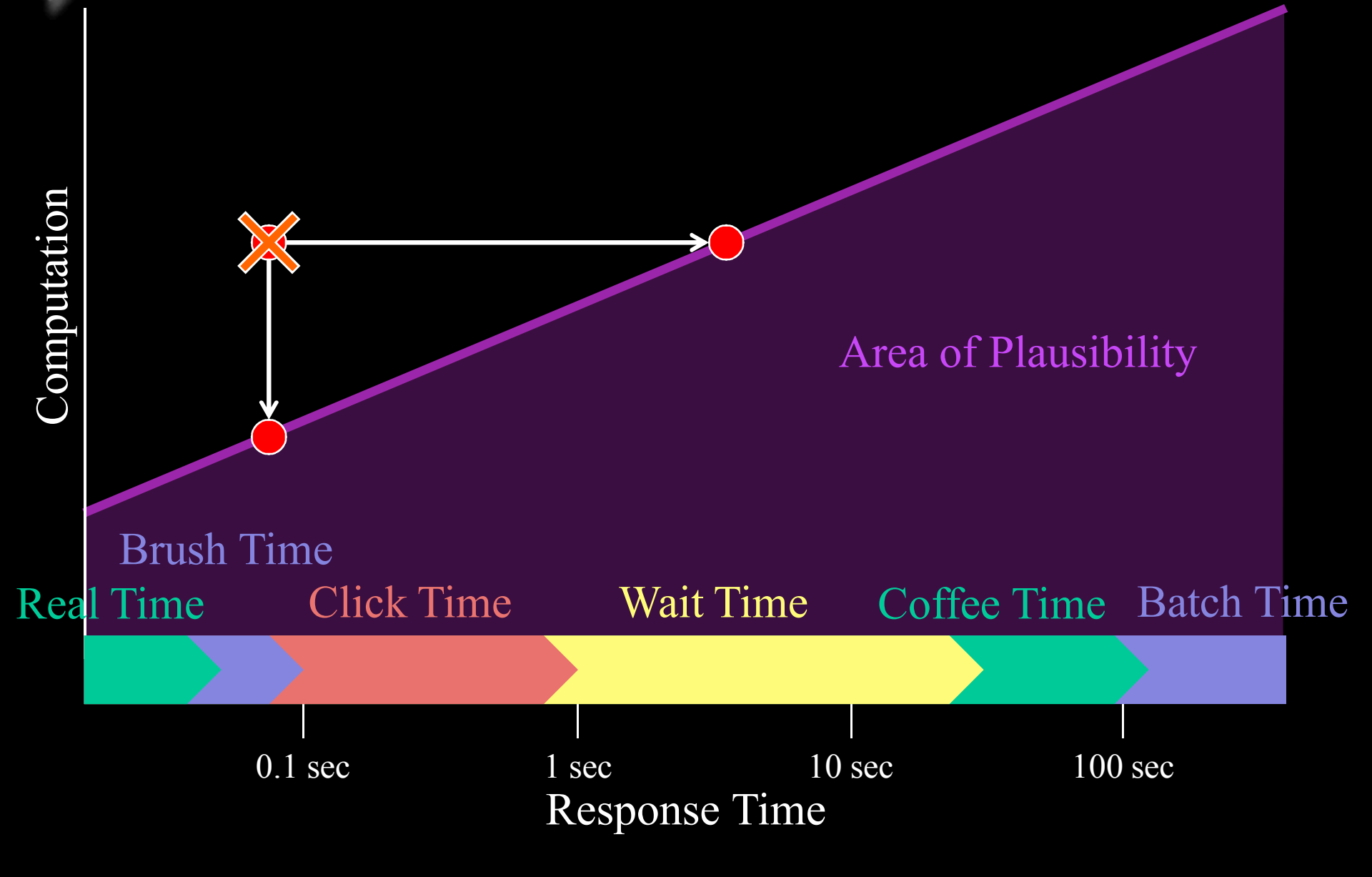
Interactive is Responsive



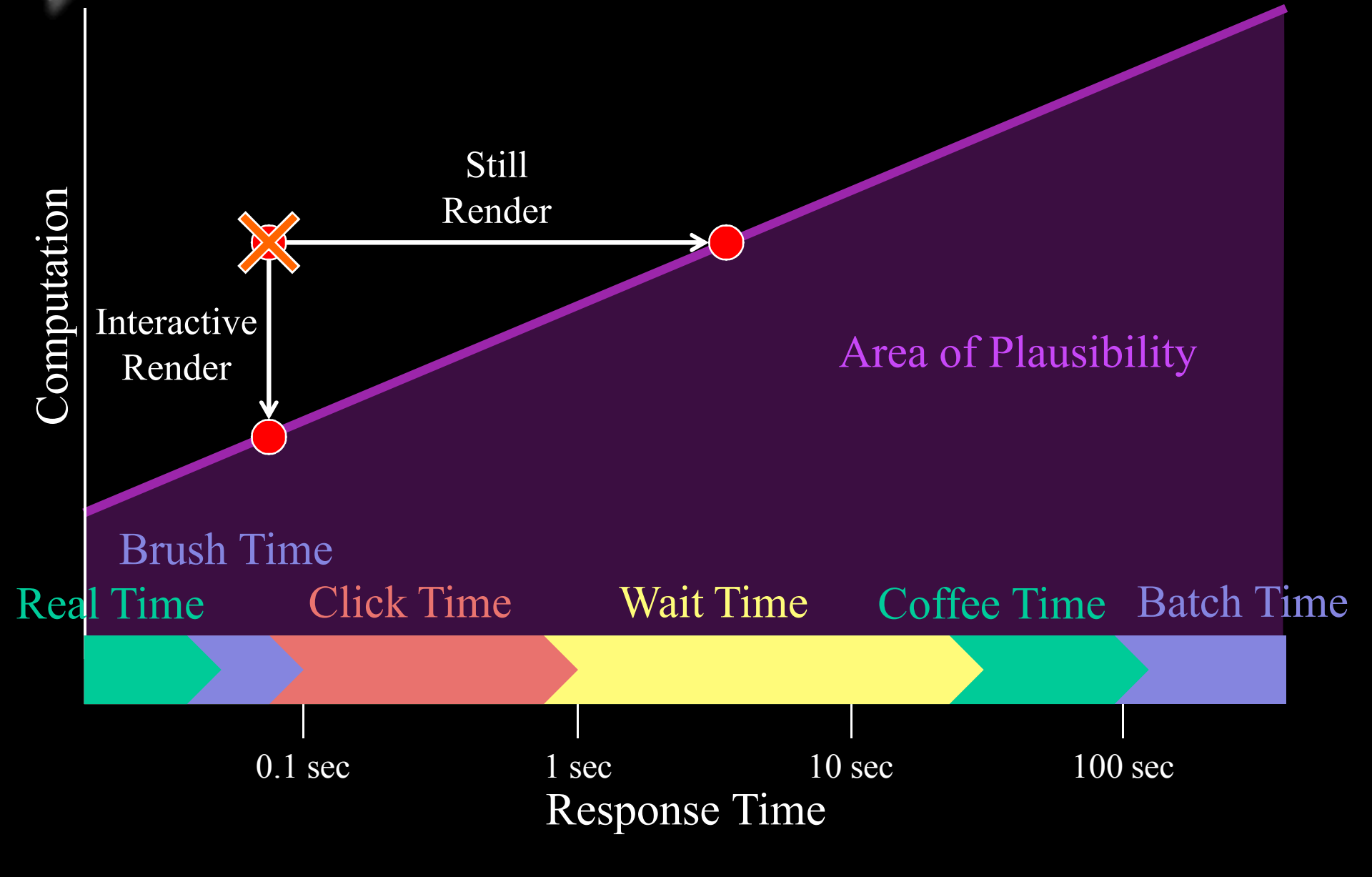
Interactive is Responsive



Interactive is Responsive



Interactive is Responsive



Rendering Levels of Detail

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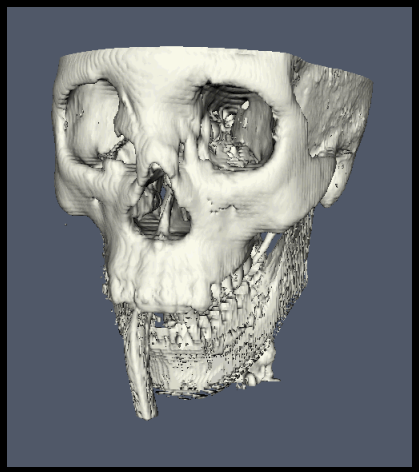
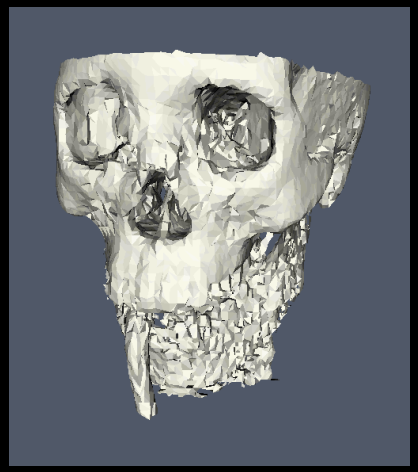


Original Data

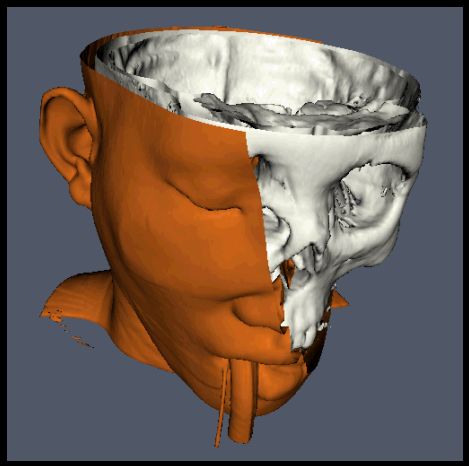


Divisions: 50x50x50

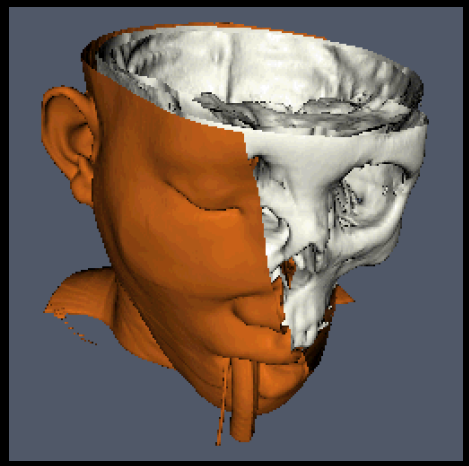
Divisions: 10x10x10

Geometric

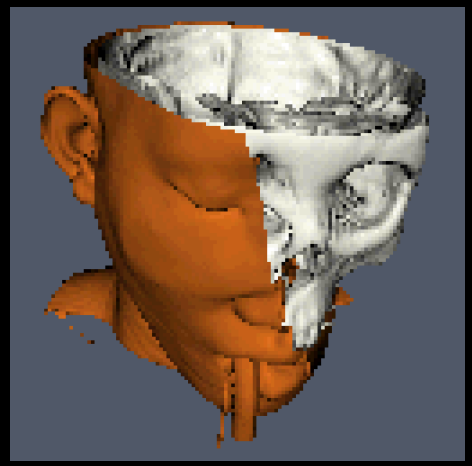
Image



Original Data

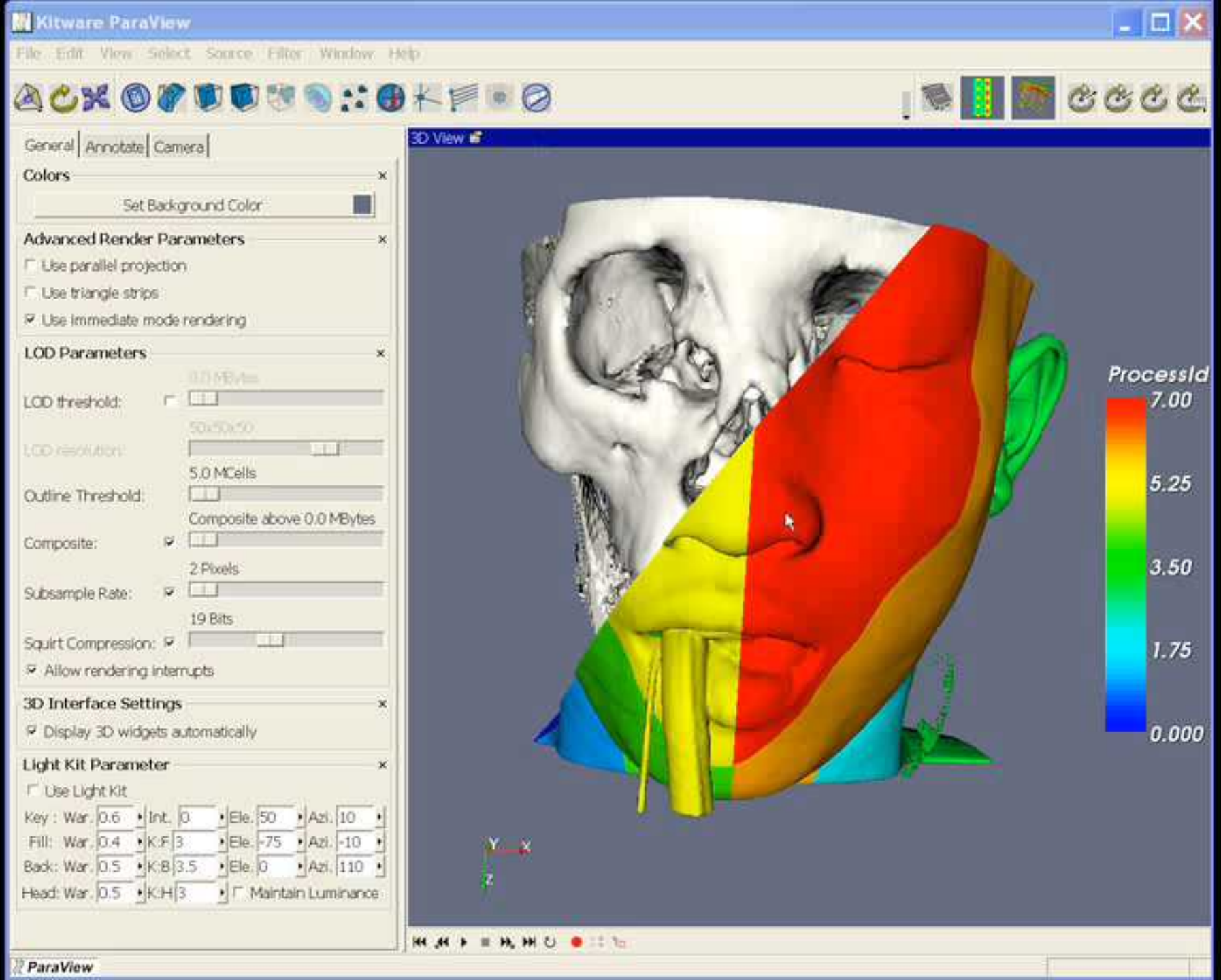


Subsample Rate: 2 pixels

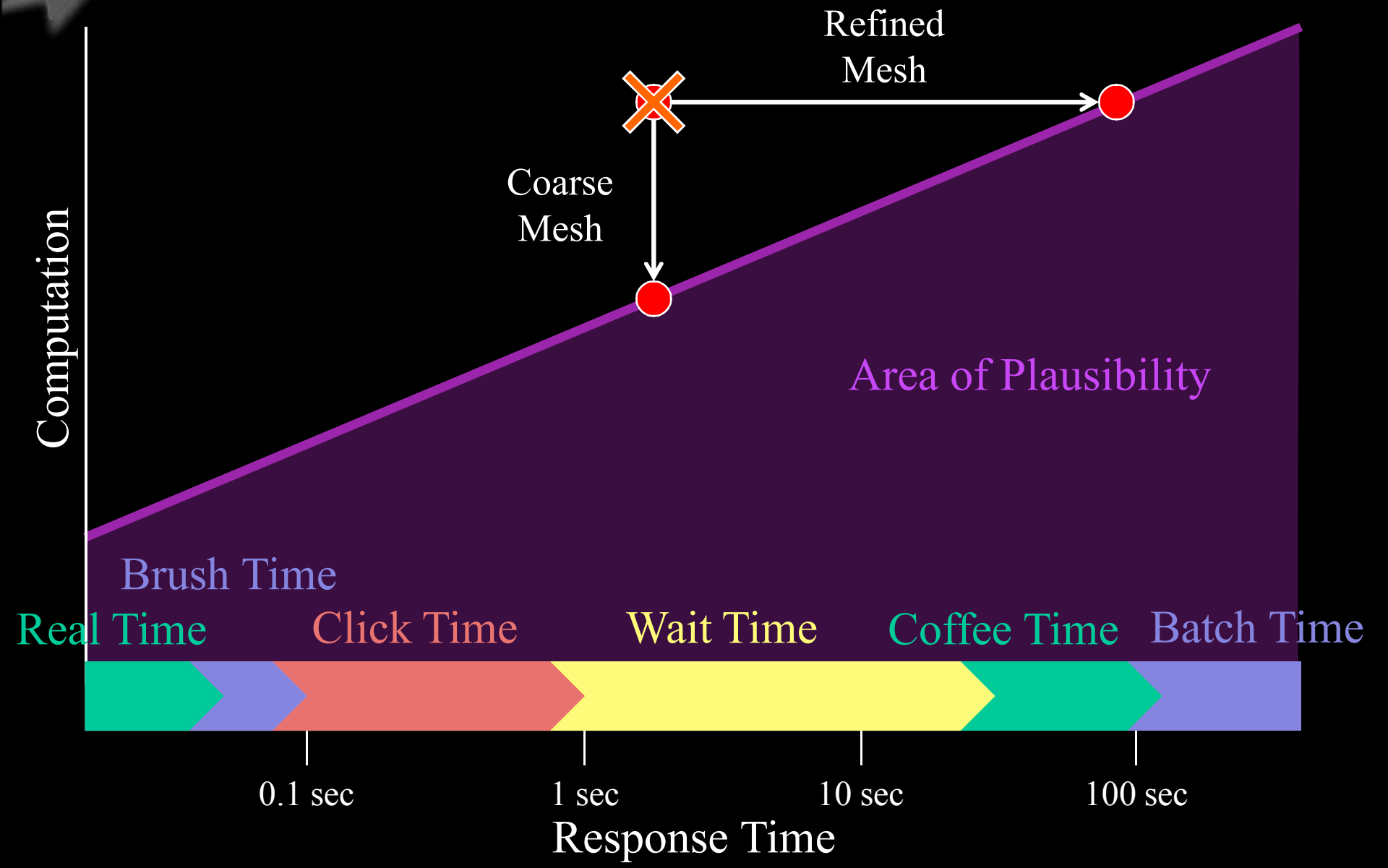


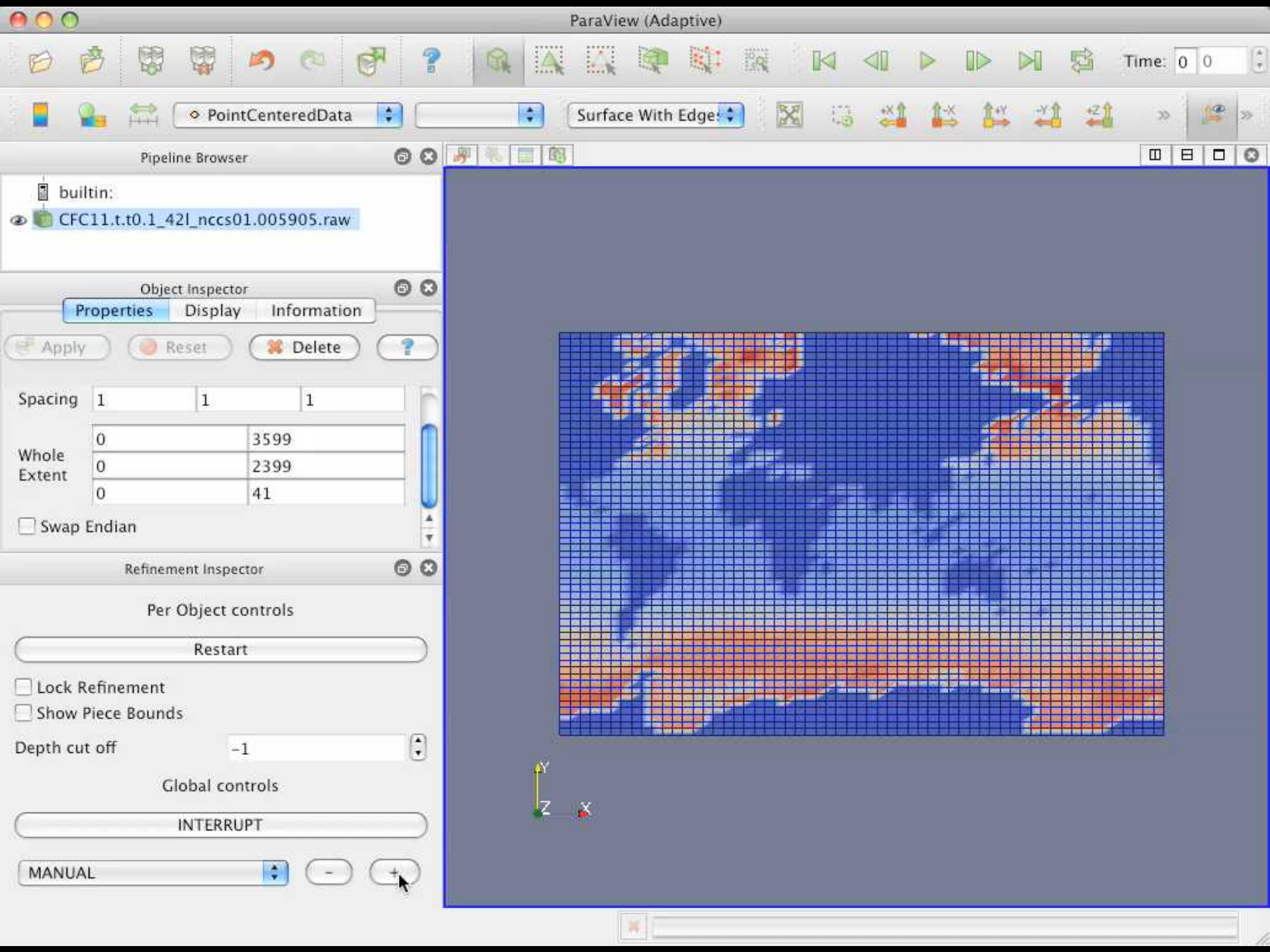
Subsample Rate: 4 pixels

Subsample Rate: 8 pixels


Kitware ParaView
File Edit View Select Source Filter Window Help
General Annotate Camera
Colors
Set Background Color
Advanced Render Parameters
Use parallel projection
Use triangle strips
Use immediate mode rendering
LOD Parameters
LOD threshold:
LOD resolution:
5.0 MCells
Outline Threshold:
Composite above 0.0 MBytes
Composite:
2 Pixels
Subsample Rate:
19 Bits
Squirt Compression:
Allow rendering interrupts
3D Interface Settings
Display 3D widgets automatically
Light Kit Parameter
Use Light Kit
Key : War. 0.6 Int. 0 Ele. 50 Azi. 10
Fill: War. 0.4 K:F 3 Ele. -75 Azi. -10
Back: War. 0.5 K:B 3.5 Ele. 0 Azi. 110
Head: War. 0.5 K:H 3 Maintain Luminance
3D View
ProcessId
7.00
5.25
3.50
1.75
0.000
Y
X
Z
ParaView

Interactive is Responsive




ParaView (Adaptive)
Time: 0 0
PointCenteredData
Surface With Edges
Pipeline Browser
builtin:
CFC11.t.t0.1_42l_nccs01.005905.raw
Object Inspector
Properties
Display
Information
Apply
Reset
Delete
Spacing 1 1 1
Whole Extent 0 3599 0 2399 0 41
Swap Endian
Refinement Inspector
Per Object controls
Restart
Lock Refinement
Show Piece Bounds
Depth cut off -1
Global controls
INTERRUPT
MANUAL
-
+
Y
Z
X

Summary

- Interactive is **Accessible**
  - Large scale needs HPC.
  - Deliver that to your user's desktop.
  - Make it work on small data too.
- Interactive is **Fast**
  - You're all over this, right?
- Interactive is **Responsive**
  - Know your time constraints.
    - They change depending on what you are doing.
  - Have a contingency plan.
    - Use levels of detail to hit time constraints.