Parallel Volume Rendering
Volume Rendering Scalability

- Need lots of cores to render at acceptable speeds

Figure: Howison, Bethel, Childs, *MPI-hybrid Parallelism for Volume Rendering on Large, Multi-core Systems*, EGPGV 2010
Longhorn
Performance

![Graph showing performance vs dataset size for different GPU configurations.]

- 64 GPUs, 1 GPU/node
- 64 GPUs, 2 GPUs/node
- 128 GPUs, 2 GPUs/node
- 256 GPUs, 2 GPUs/node

Times are measured in seconds and dataset sizes are given in voxels.

Dataset Size (voxels):
- $1024^3$
- $2048^3$
- $4096^3$
- $8192^3$
Brick Size

NVIDIA Quadro FX 5800's

Rendering Time

Brick Size (voxels, cubed)

4096³ Dataset
Dynamic Load Balancing
Load Balancing

Time Spent Rendering

- Static
- Muller
- Marchesin - 0.1
- Marchesin - 0.3
- Marchesin - 0.4

Rendering Time (seconds)

Frame number

Frame

Process 0
Process 1
Process 2
Process 3
Process 4
Process 5
Process 6
Process 7
Future Work - AMR

- "Adaptive mesh refinement" data
  - some spatial regions have higher-resolution
  - coarse/fine boundaries: sampling
  - uneven load distribution
Thanks

- Funding
  - VACET
  - CIBC
  - C-SAFE
  - MMCI (Saarland University)
- Resources
  - TACC
  - ORNL
- Open source communities: GLEW, Mesa, VisIt
- Anonymous reviewers
- You!
Questions?