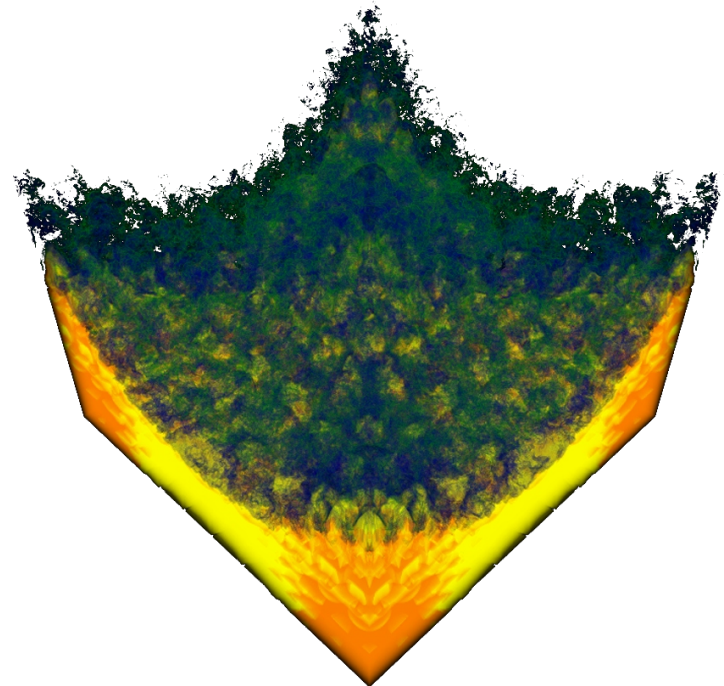
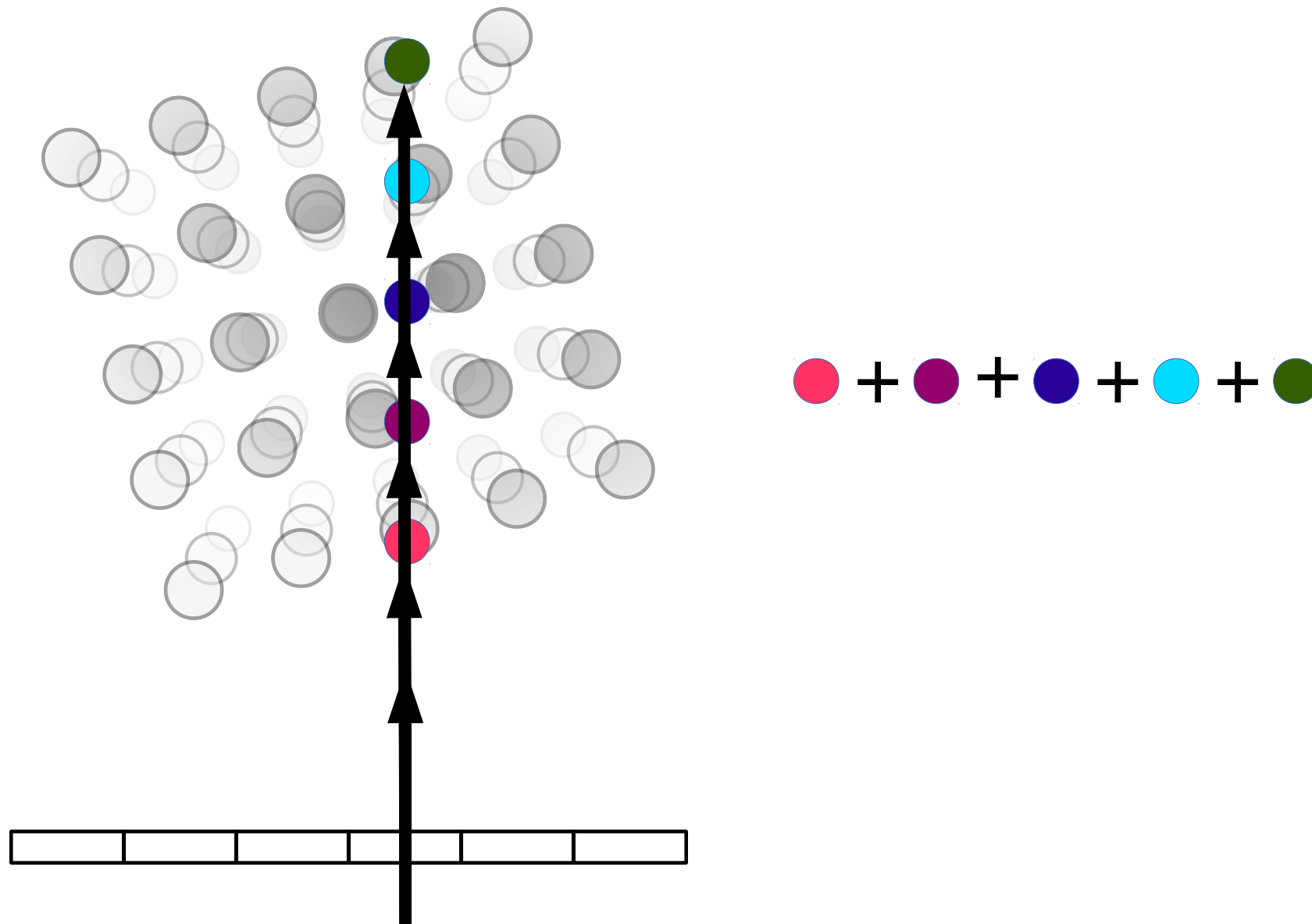


# Analysis of Ray-Guided Volume Rendering

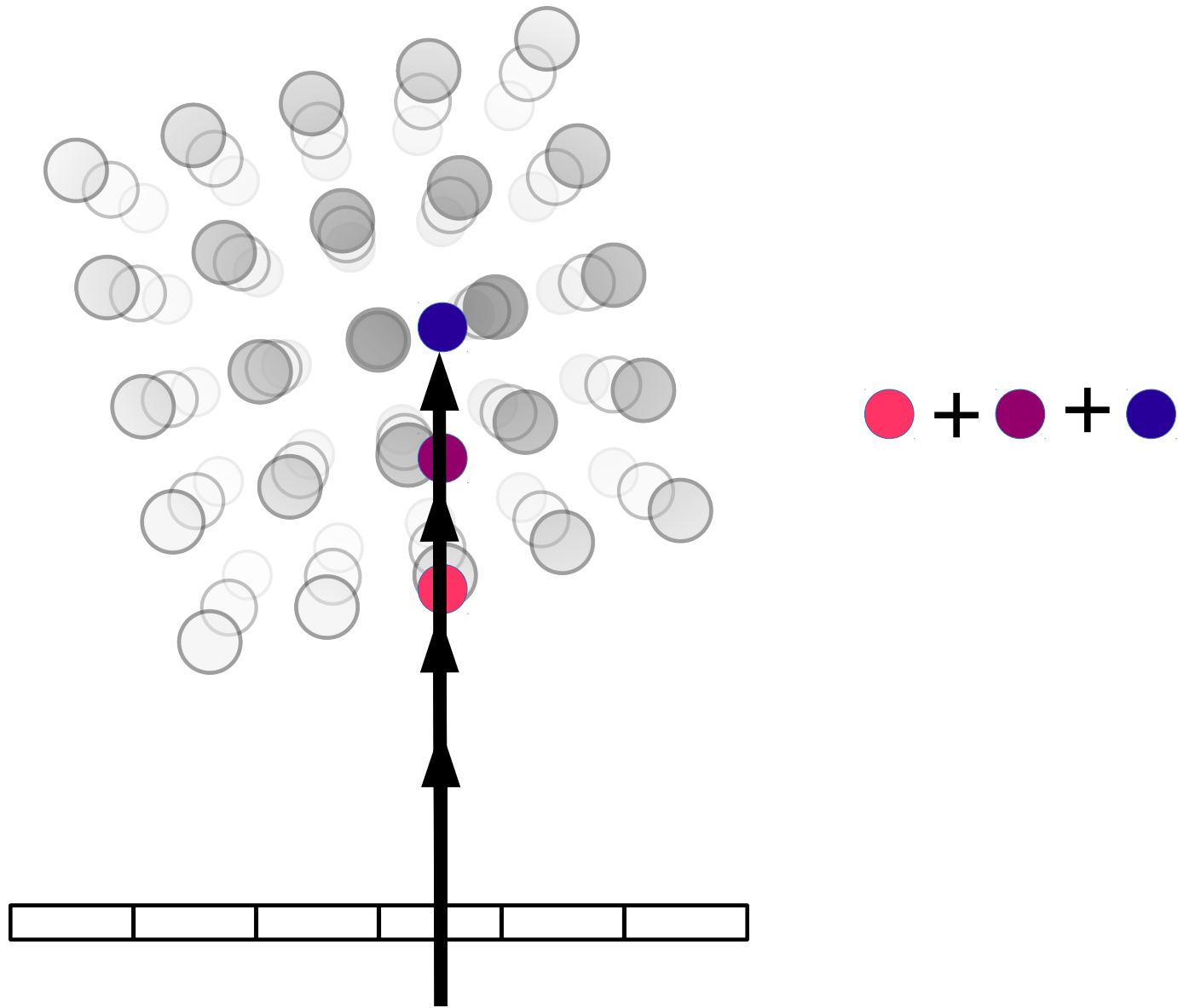
*Thomas Fogal, Alexander Schiewe, and Jens Krüger*



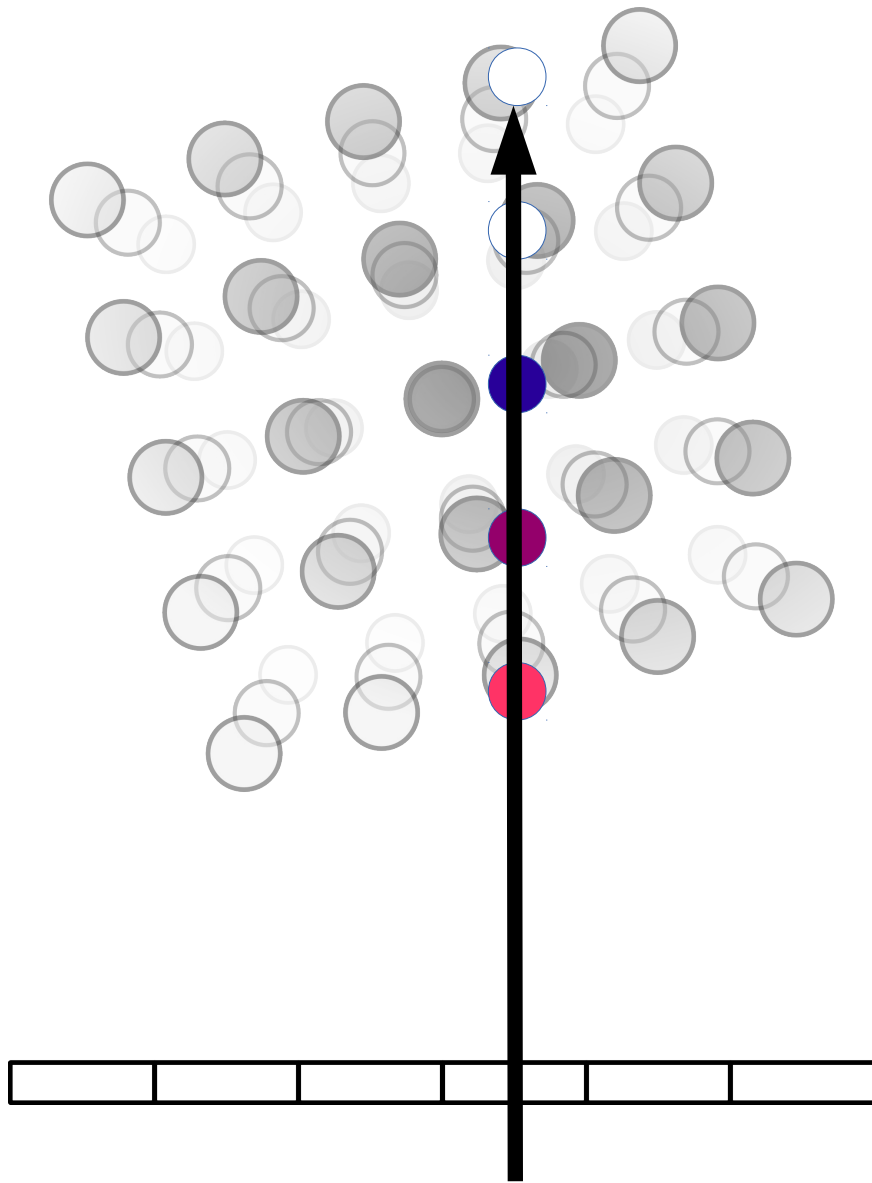
# VolRen Background



# VolRen Background

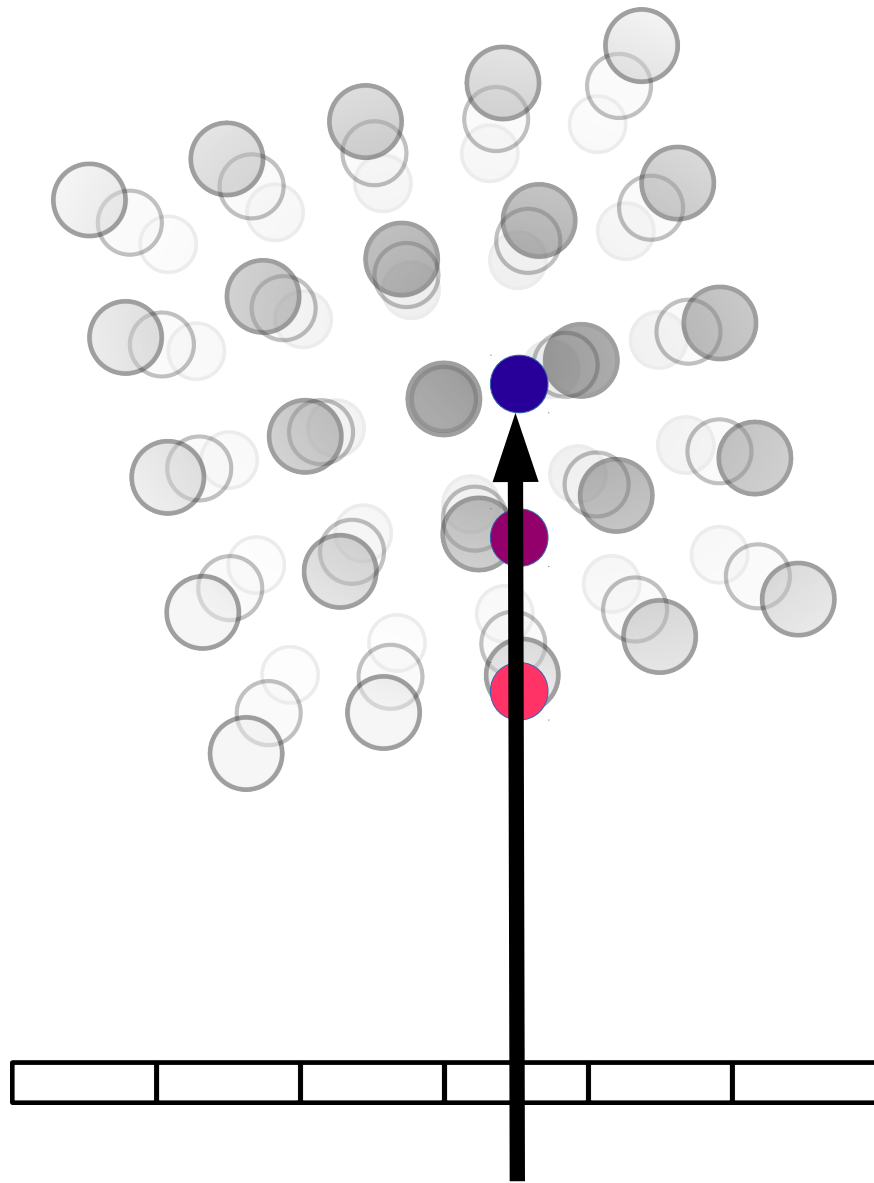


# Full Alpha



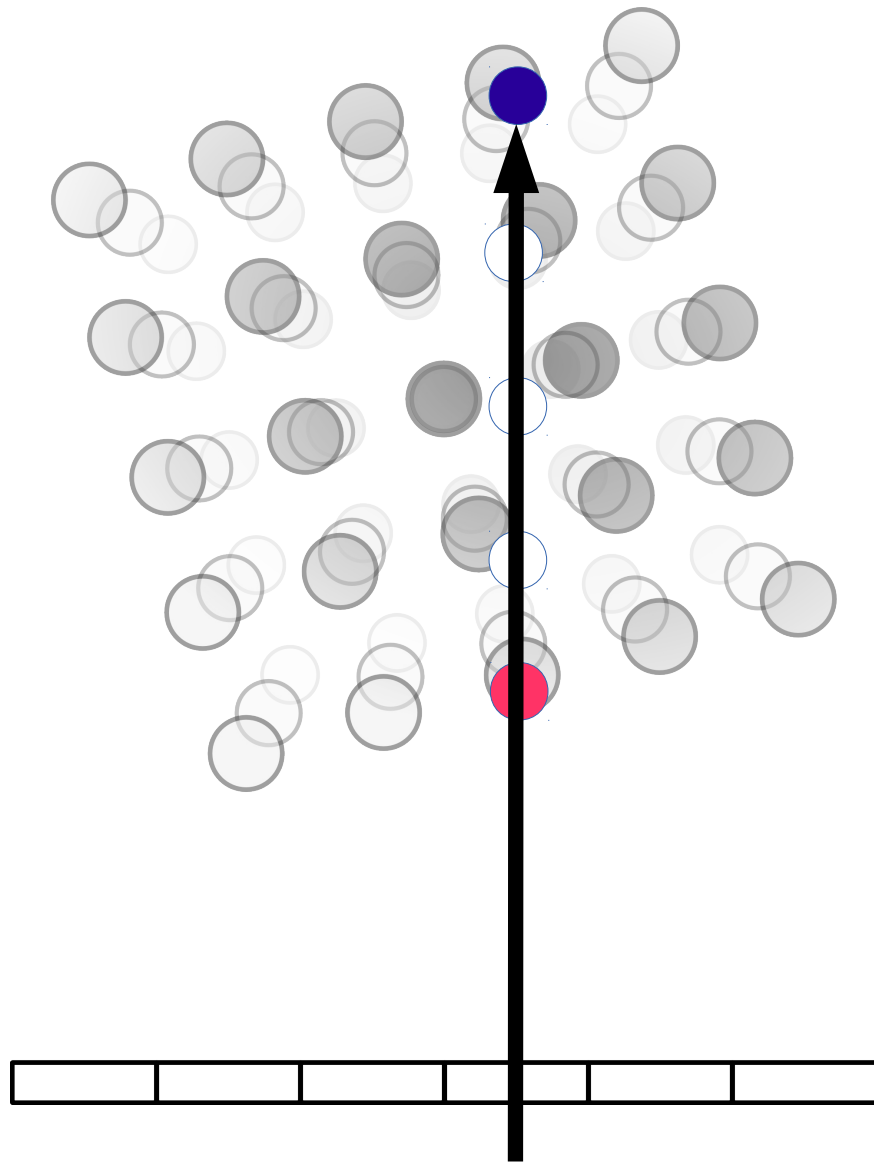
● + ● + ● + ○ + ○

# Early Ray Termination

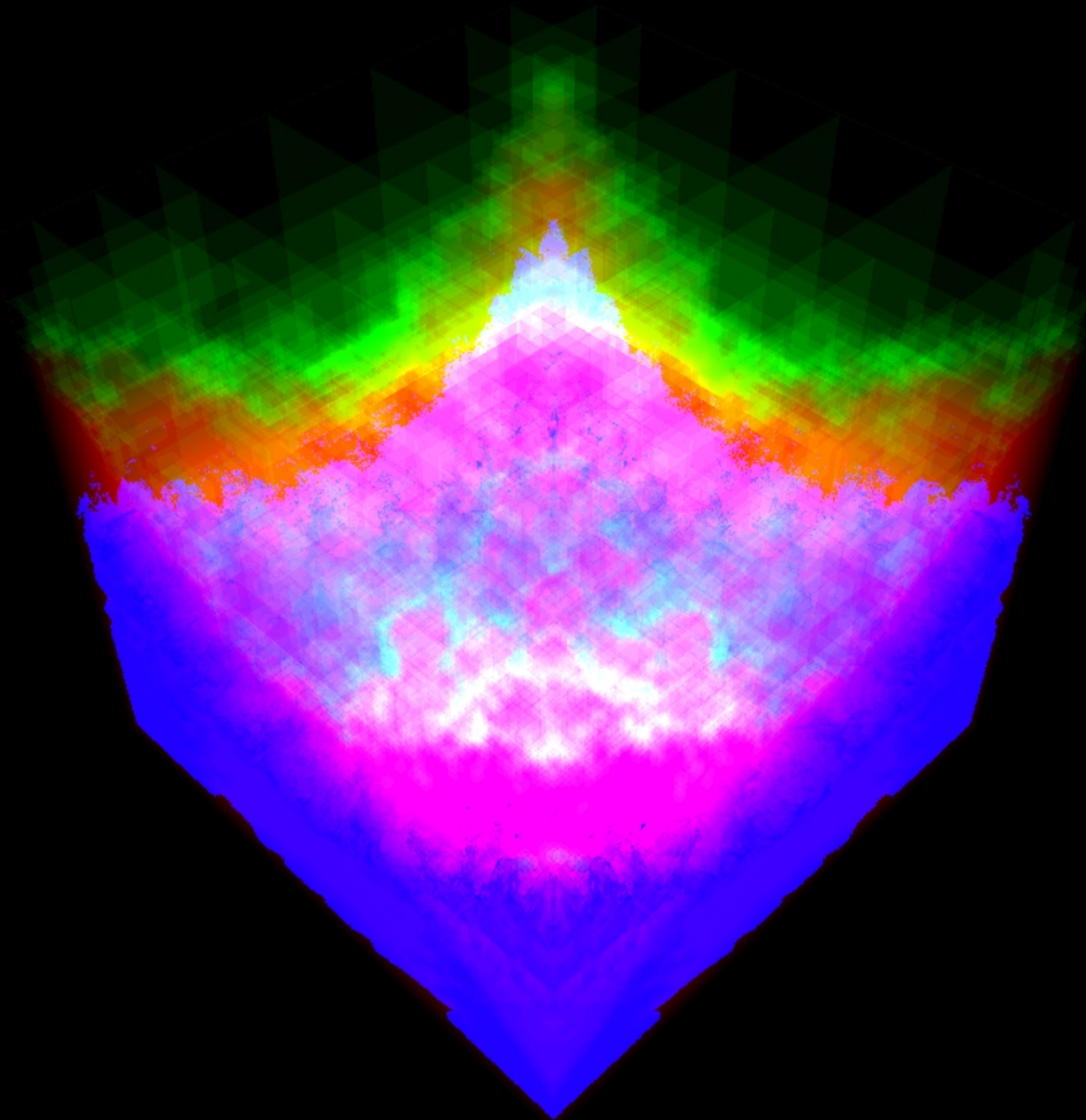


$$\text{●} + \text{●} + \text{●} = \text{VRI}$$

# Empty Space Leaping

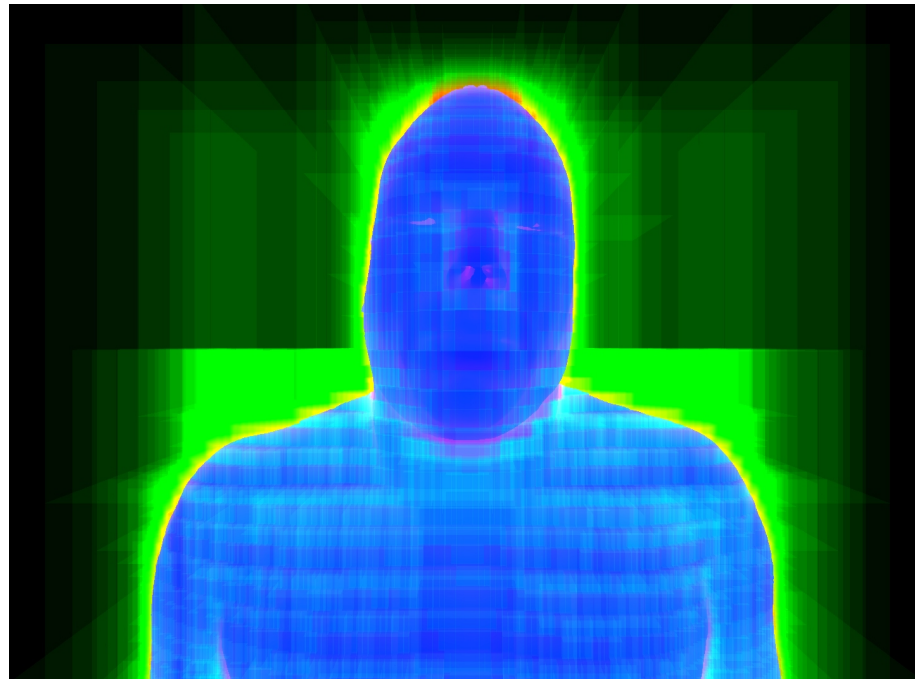


● + ● = VRI



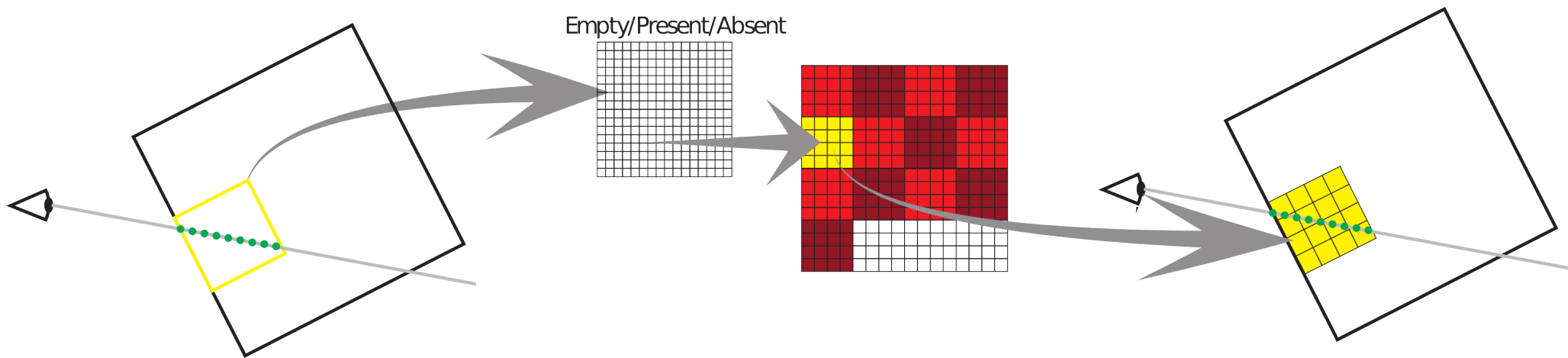
# What's Important for Performance

- Identifying densely-sampled regions
- Transition to coarse sampling quickly
- Communicate data needed to IO

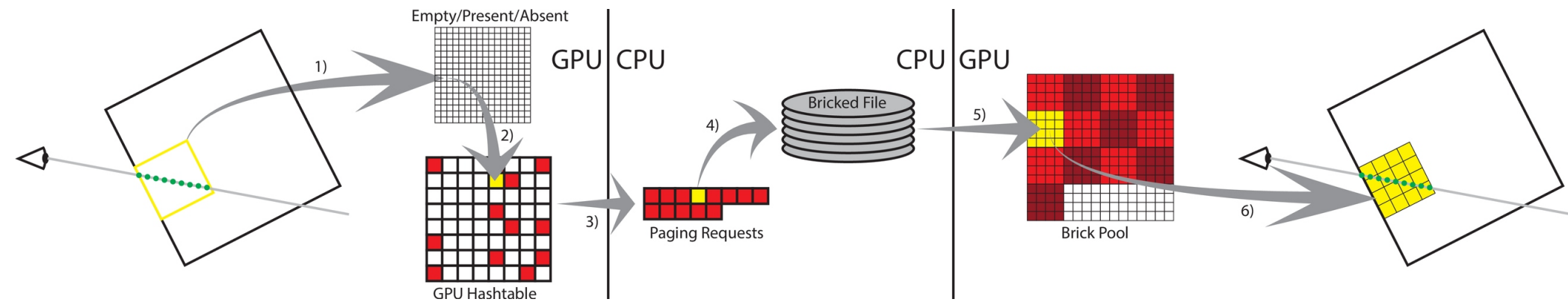




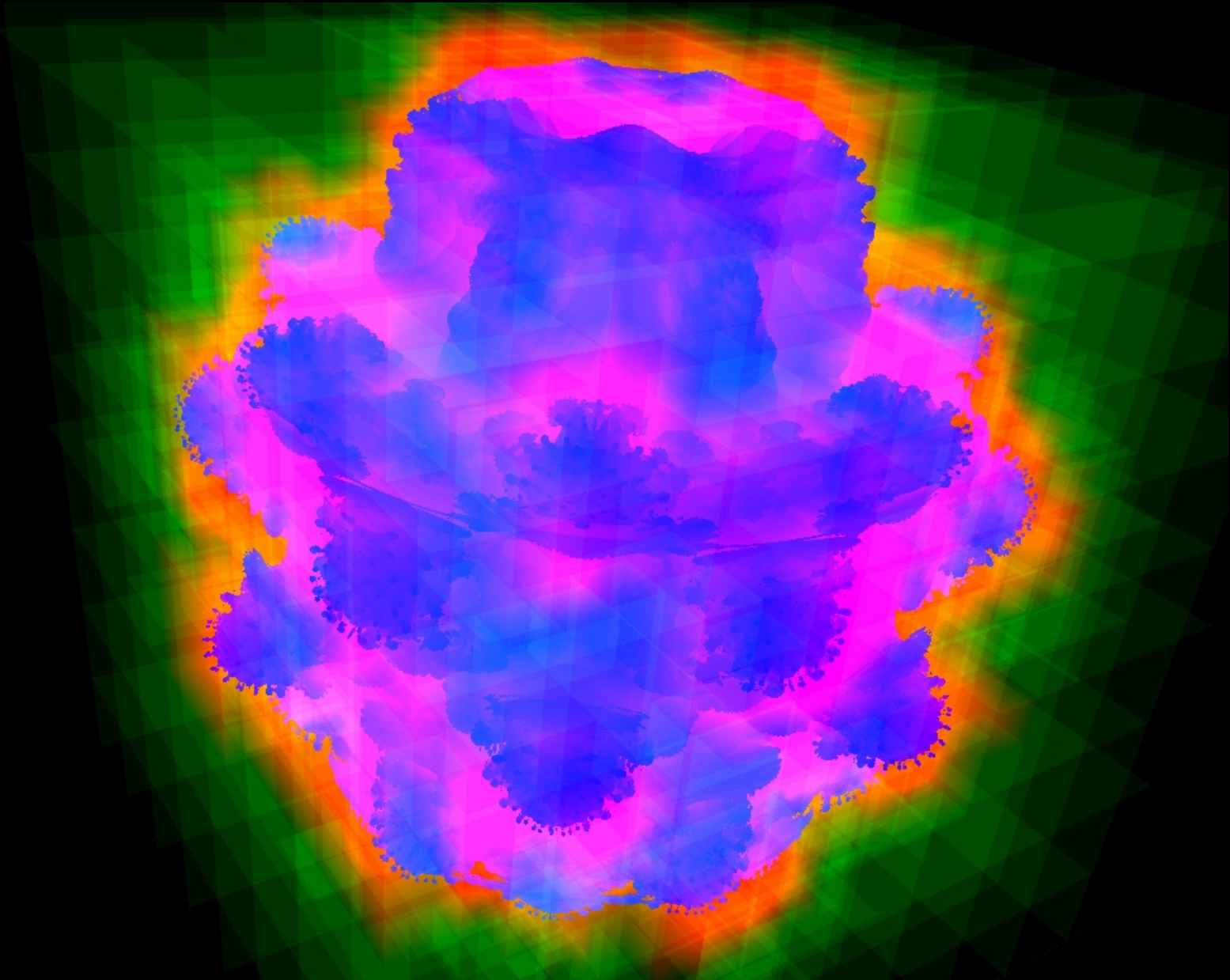
# Ray-Guided Rendering



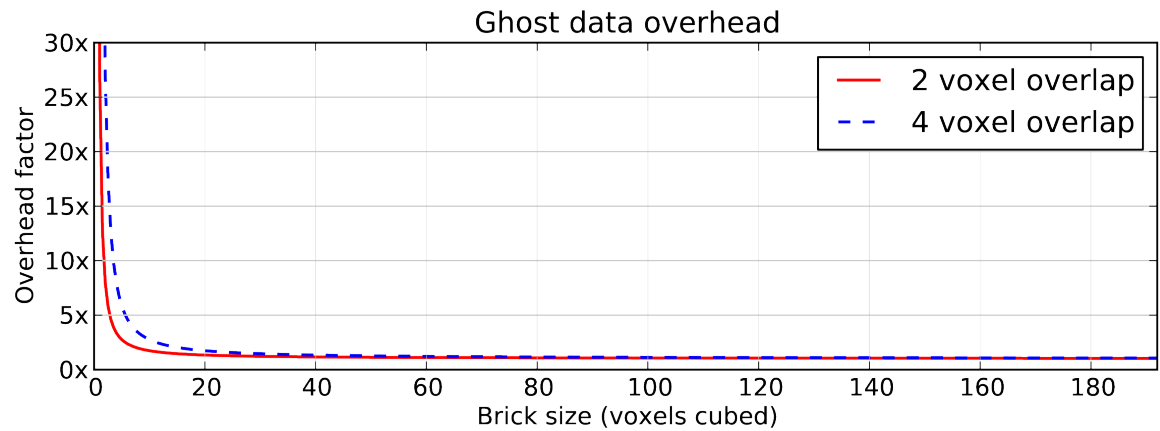
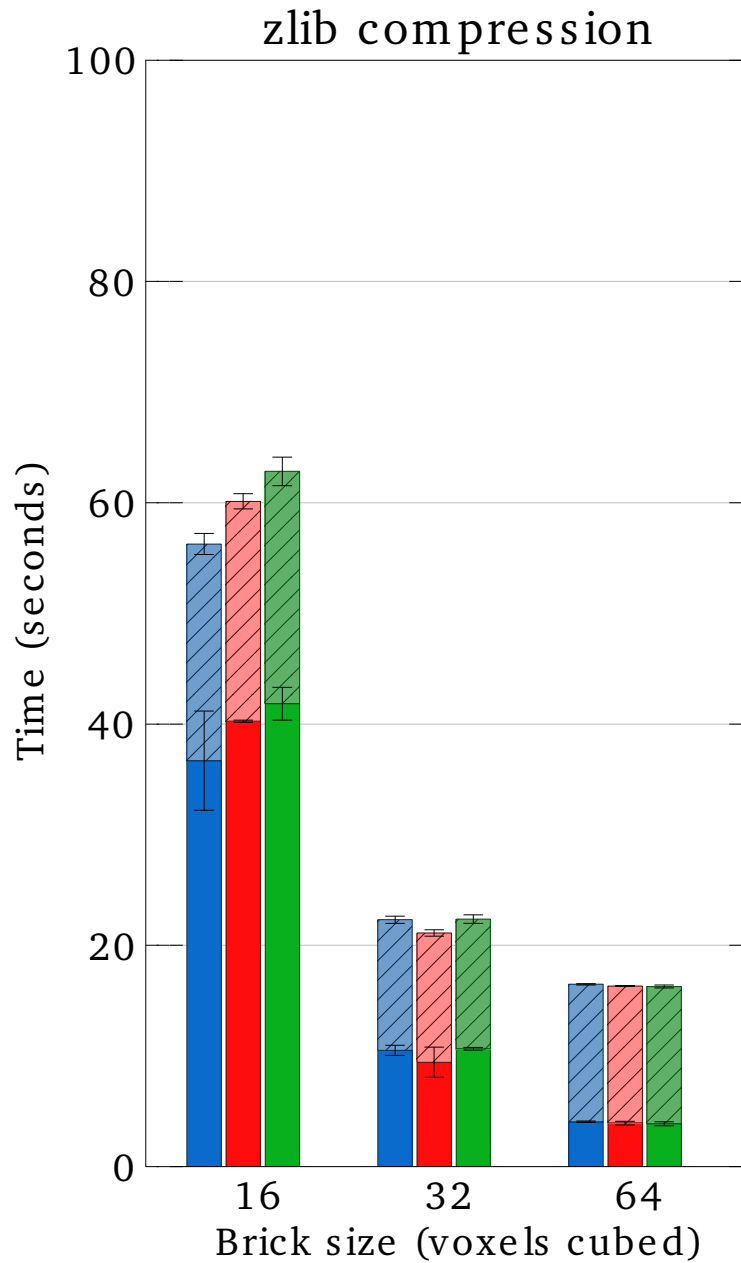
# Ray-Guided Rendering



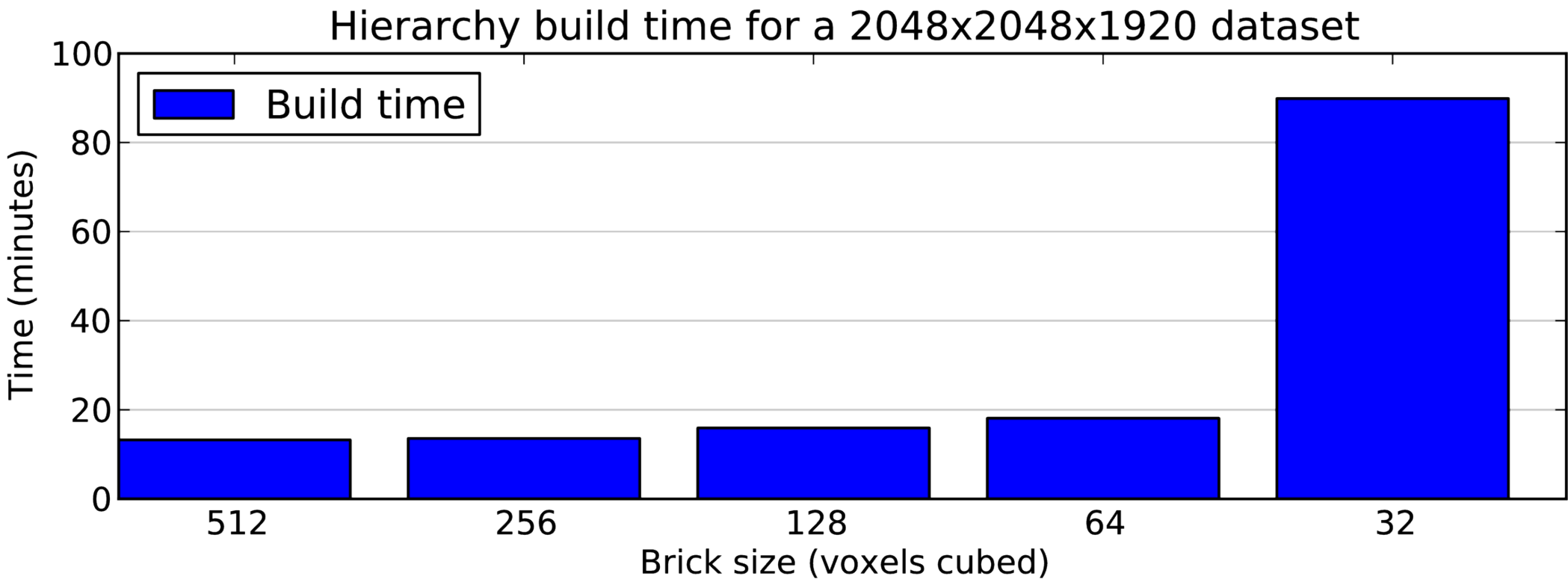
# Brick Size



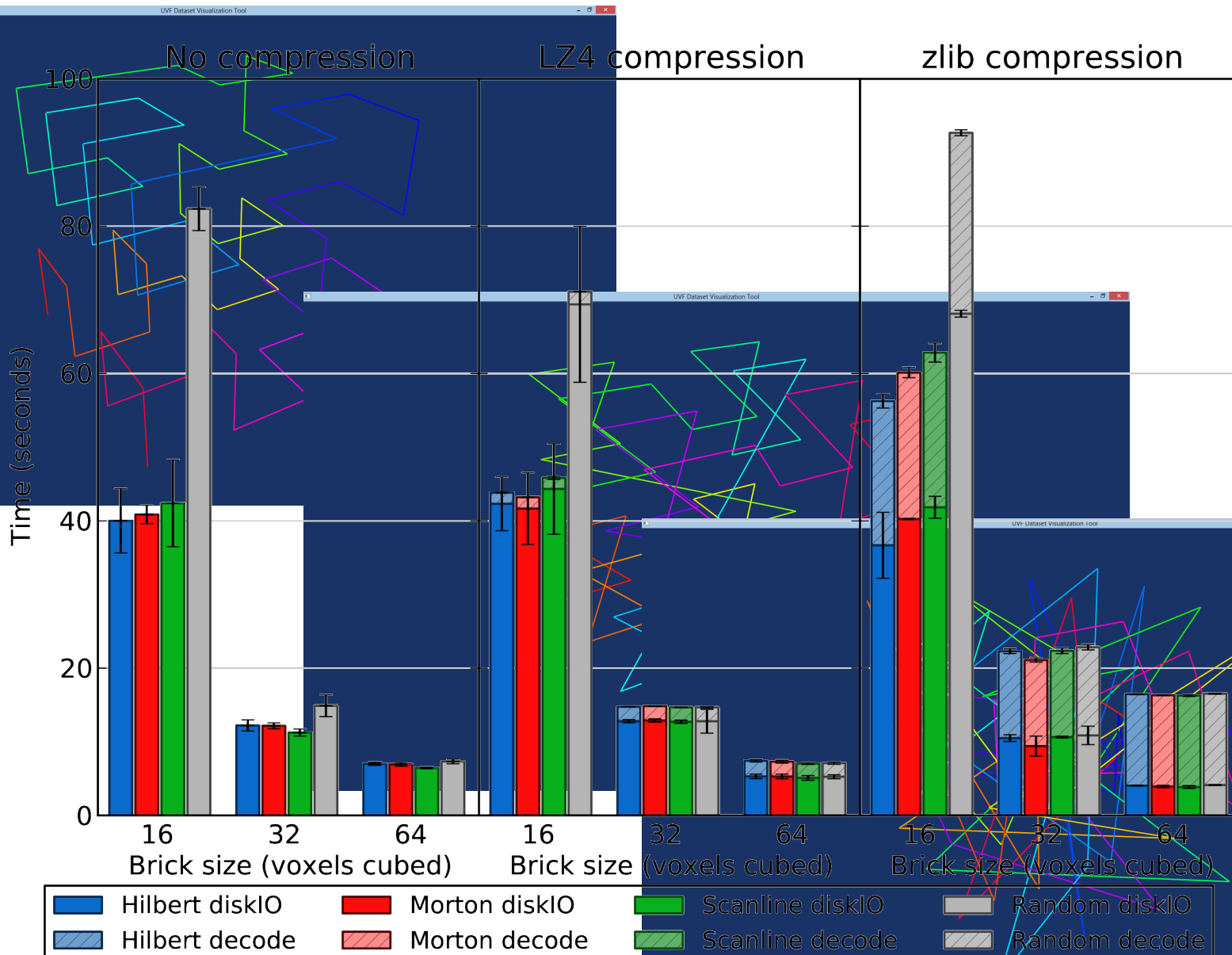
# Brick Size: IO



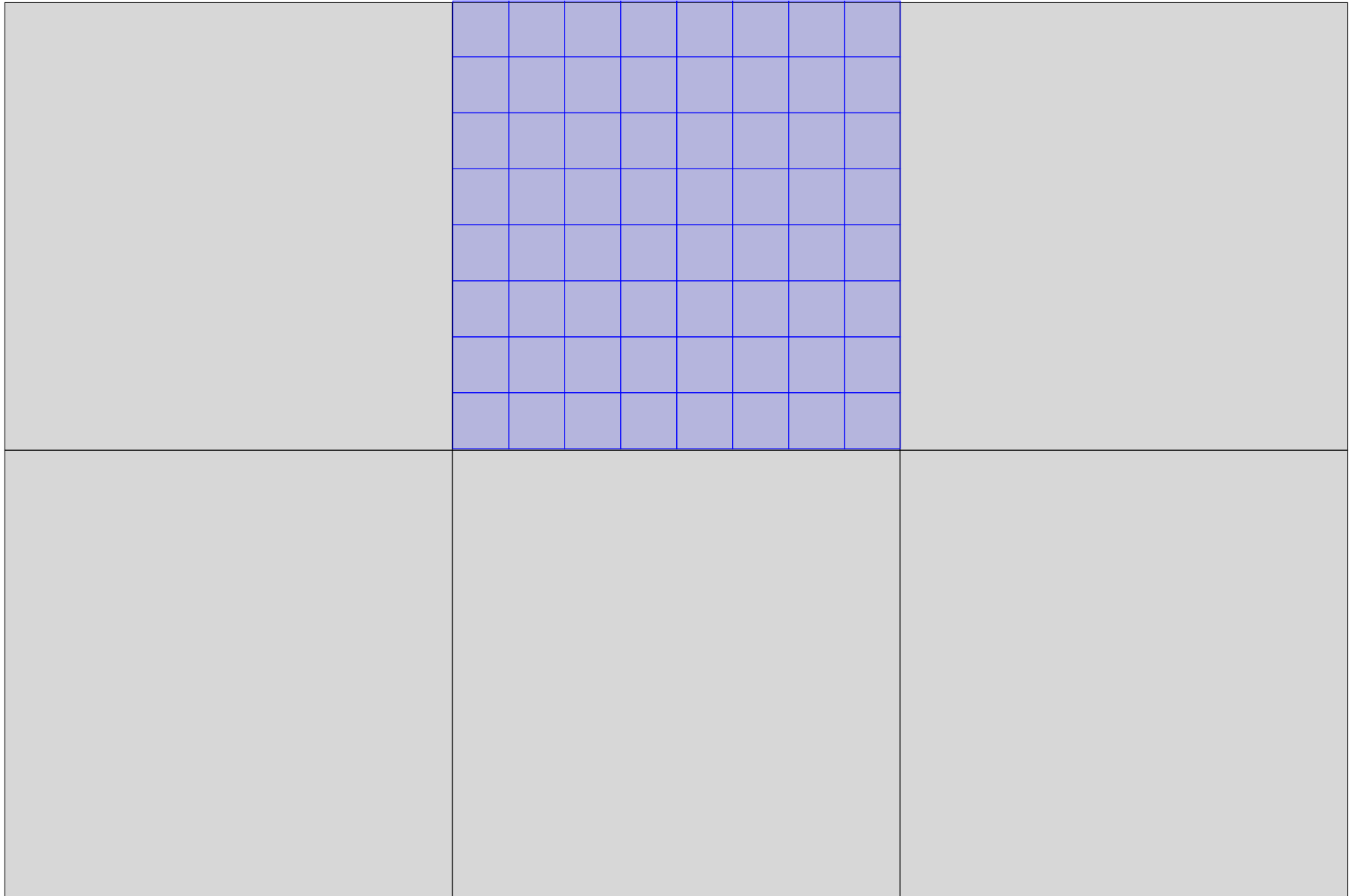
# Brick Size: Reorganization



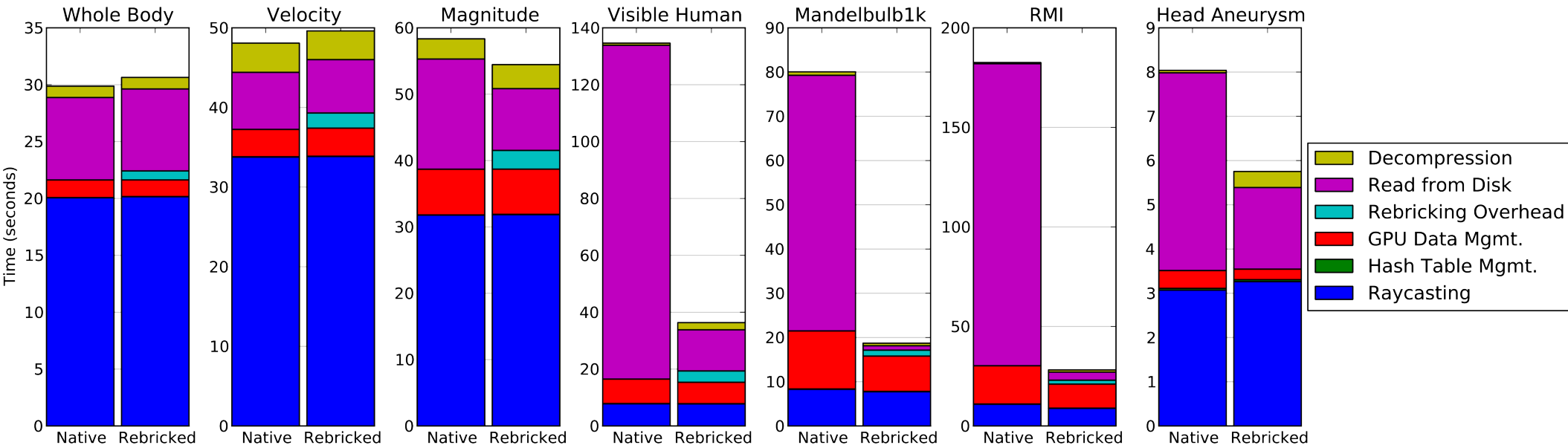
# Space-Filling Curves



# Dynamic Bricking



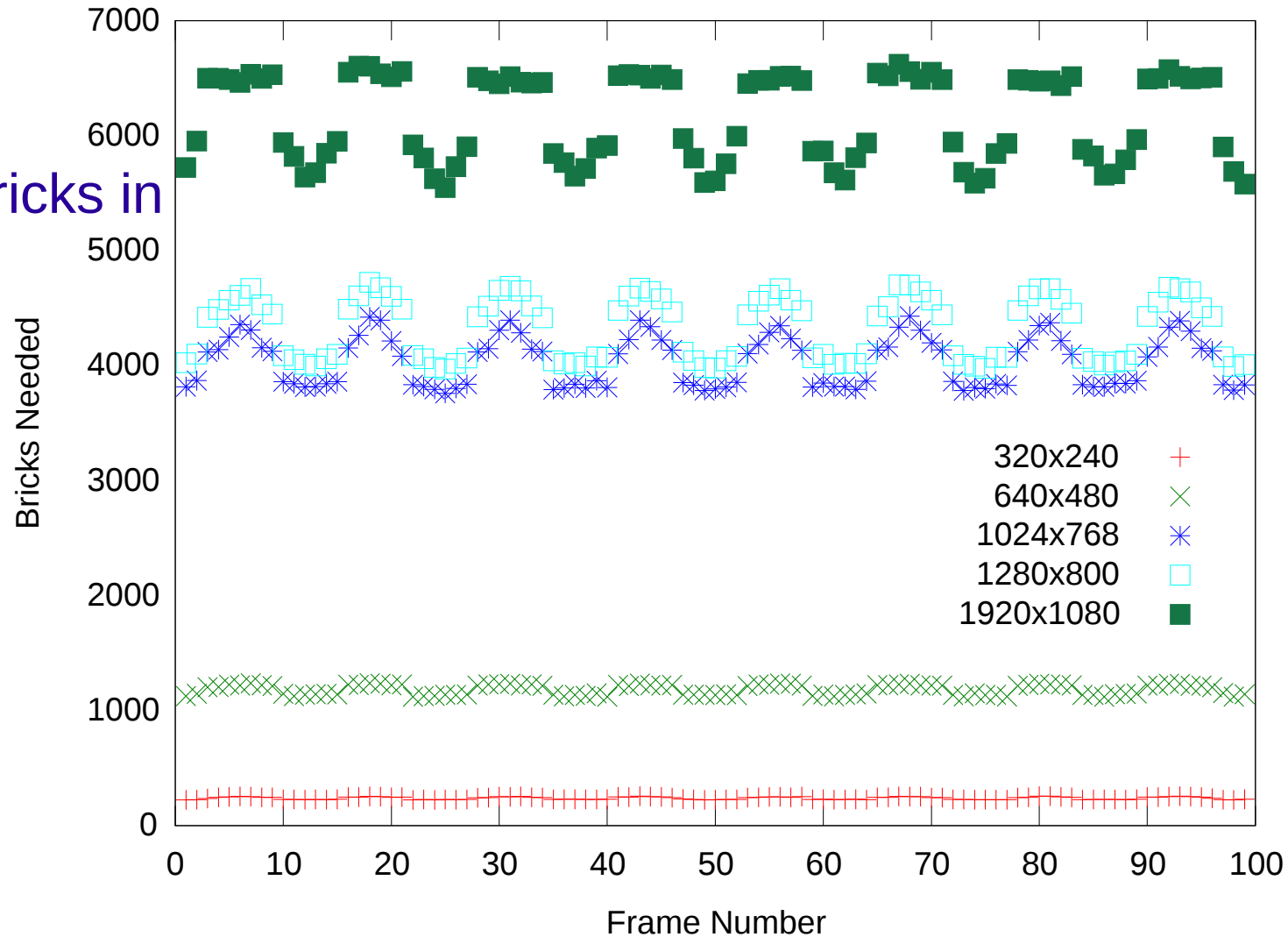
# Where Does the Time Go?





# Dynamic Sampling

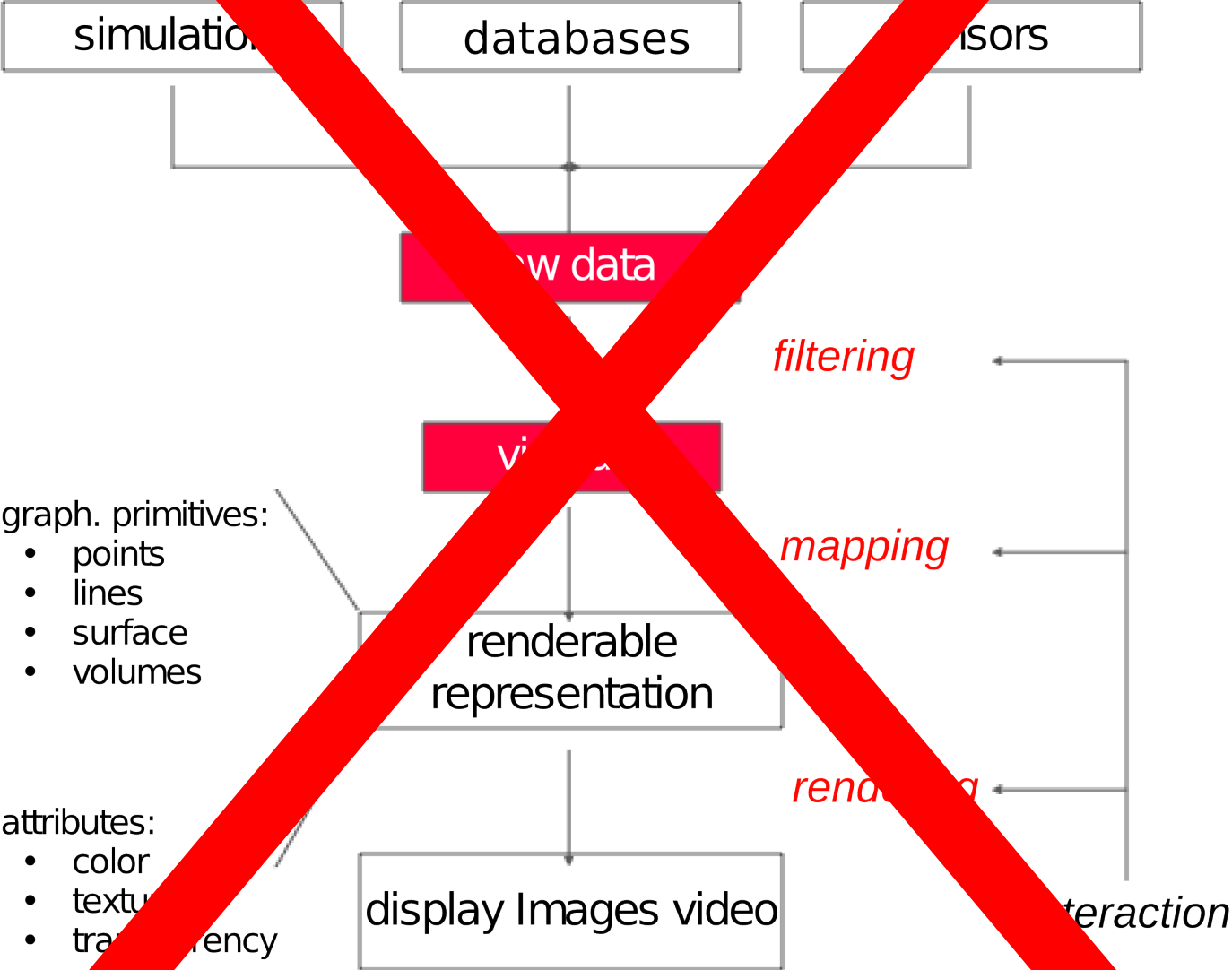
Bricks needed per frame at varying resolutions, RMI Rotation



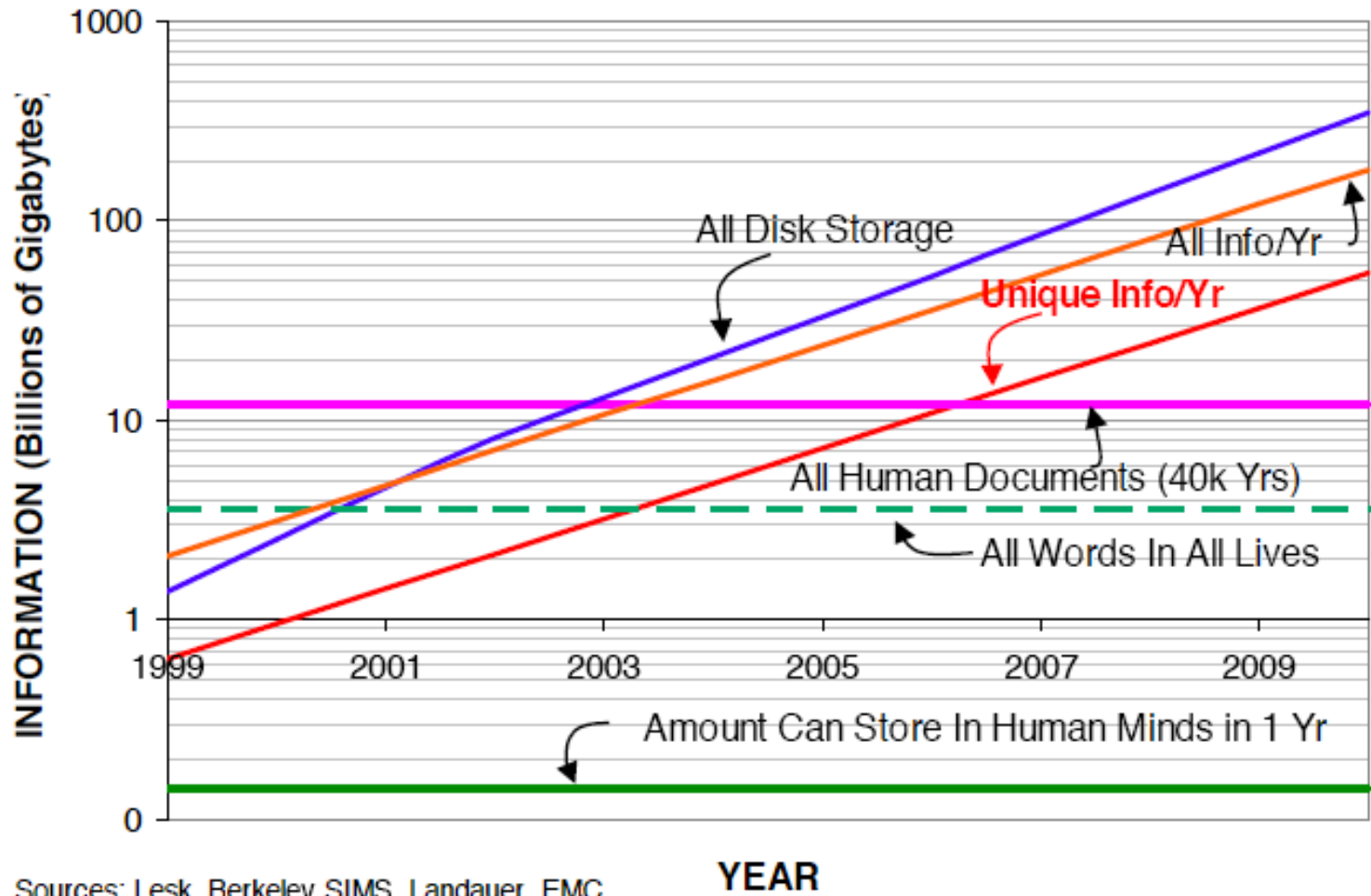
32<sup>3</sup> brick size

~250k bricks in Dataset!

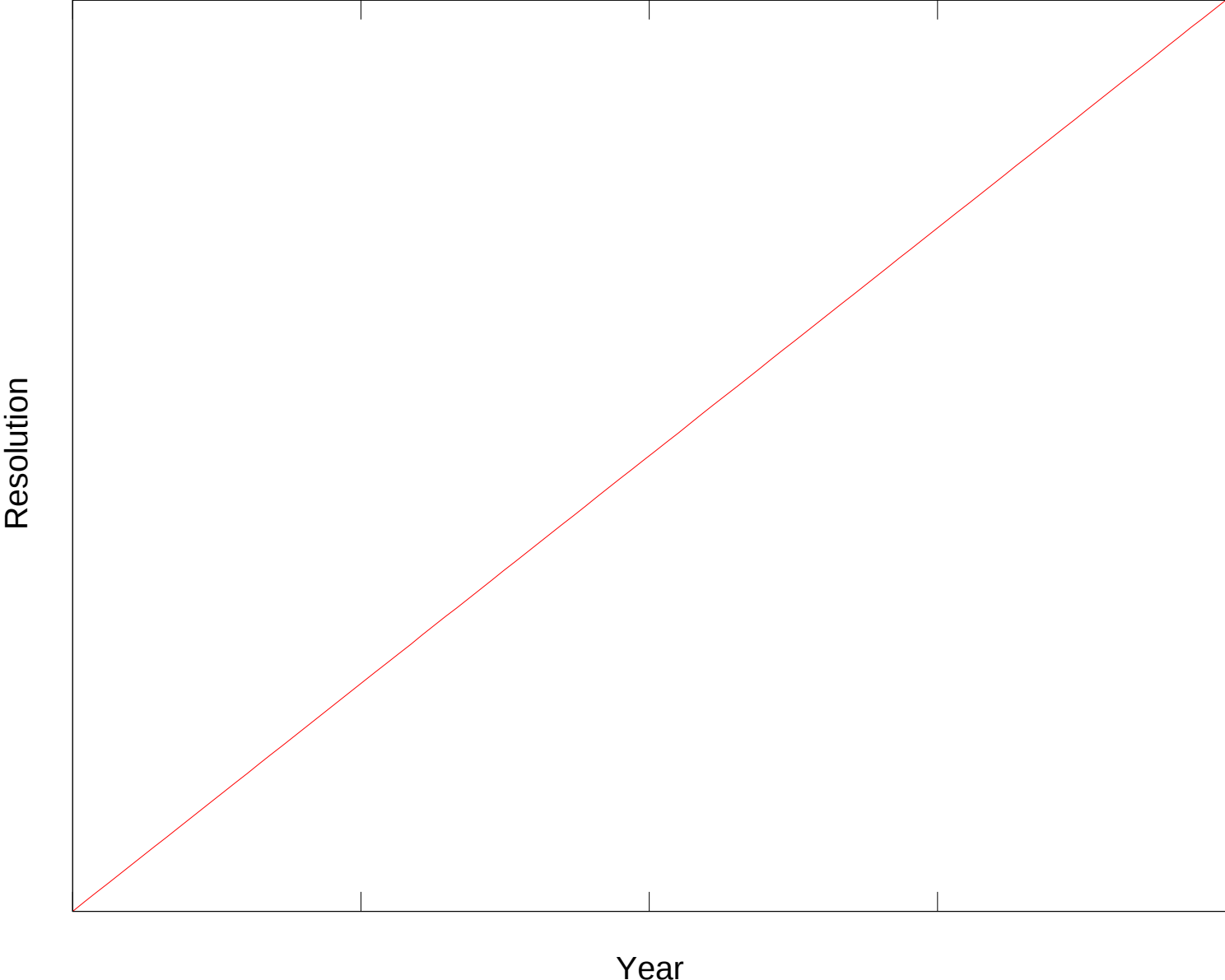
# Vis Pipeline



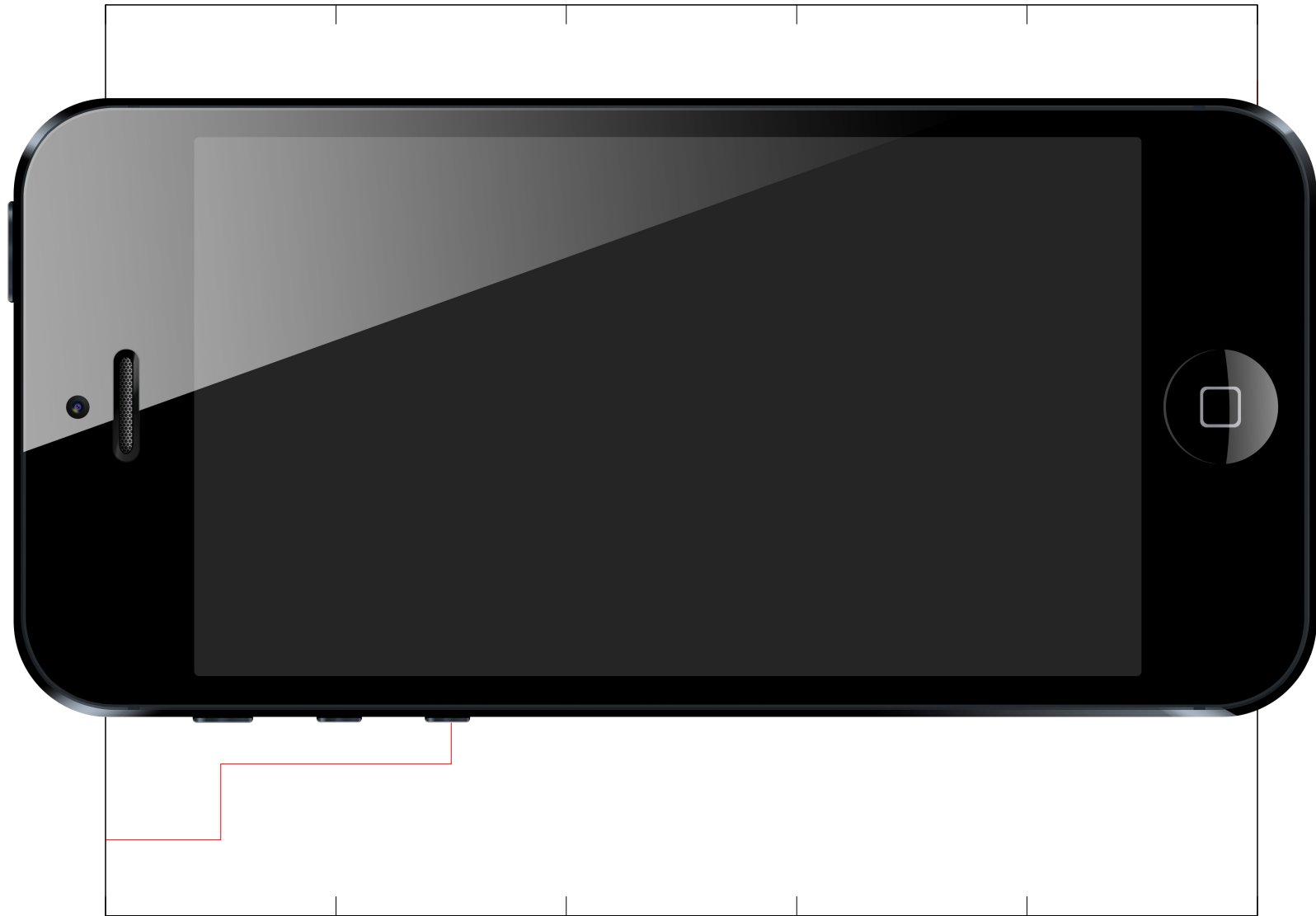
# Growth of Data



# Growth of Display Devices

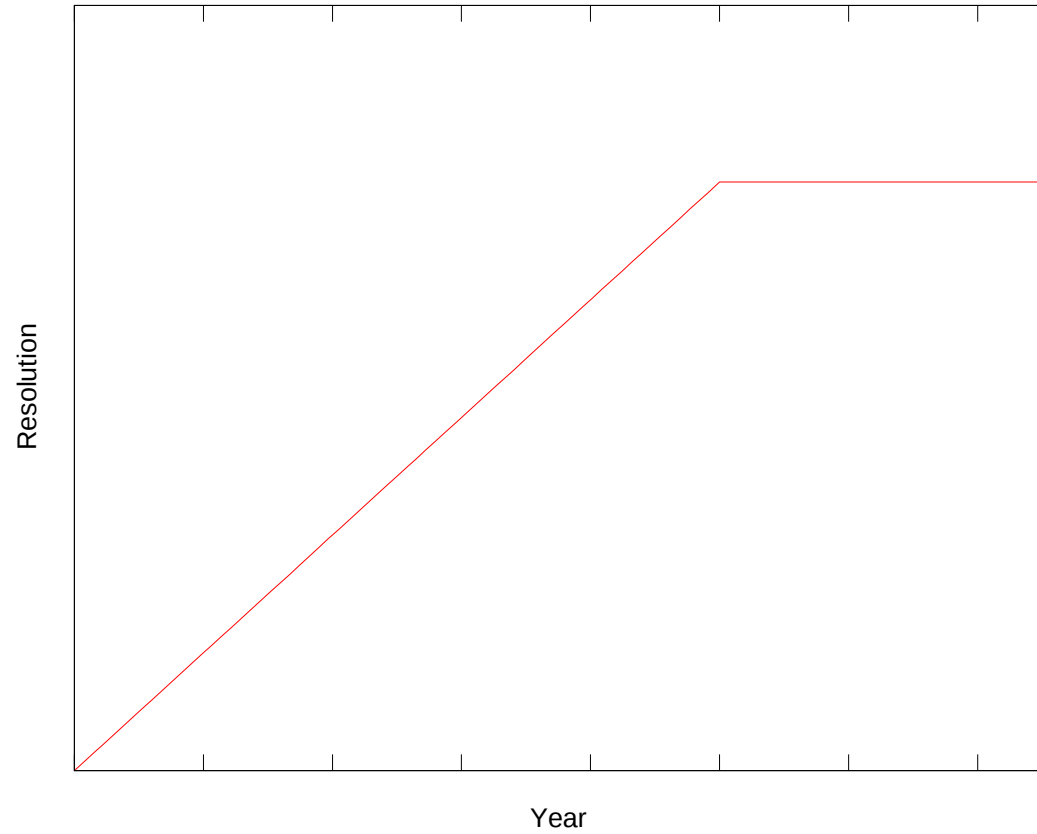
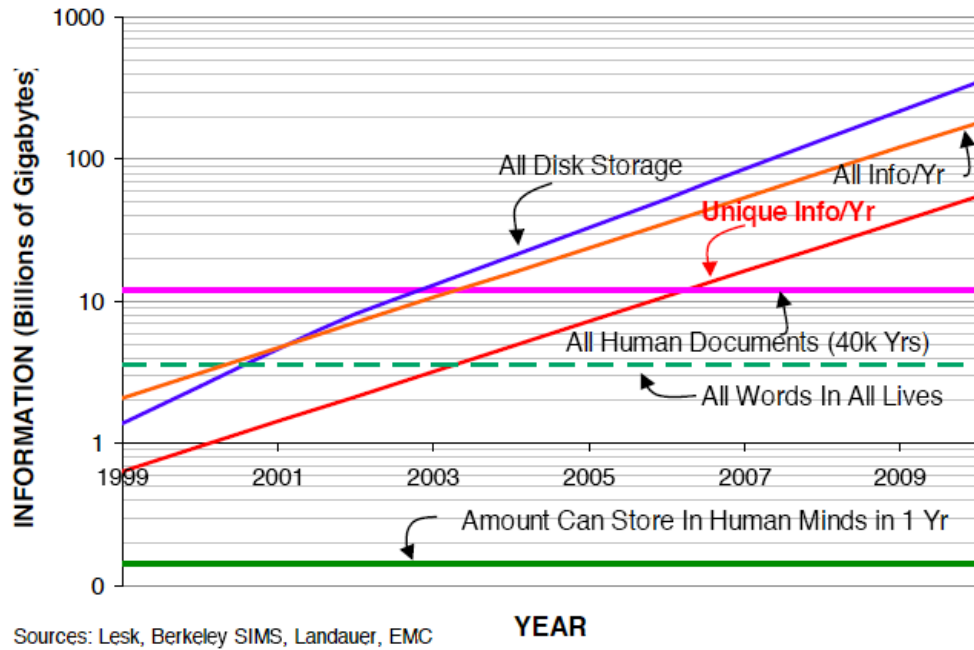


# Growth of Display Devices



Year

# Growth



# Data



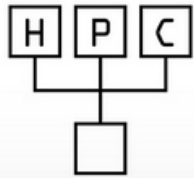
rendering

# Rendering

==

# Filtering





High  
Performance  
Computing

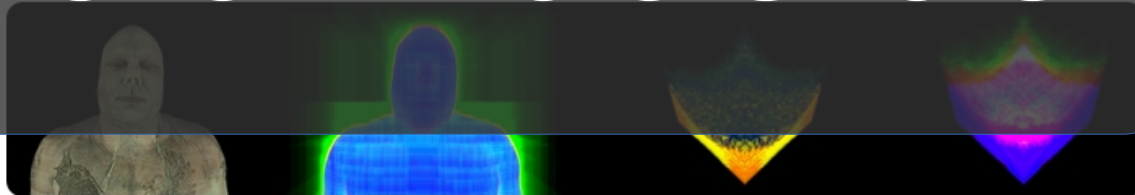
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## AN ANALYSIS OF SCALABLE GPU-BASED RAY-GUIDED VOLUME RENDERING

hpc.uni-due.de



### ABSTRACT

Volume rendering continues to be a critical method for analyzing large-scale scalar fields, in disciplines as diverse as biomedical engineering and computational fluid dynamics. Commodity desktop hardware has struggled to keep pace with data size increases, challenging modern visualization software to deliver responsive interactions for  $O(N^3)$  algorithms such as volume rendering. We target the data type common in

***Questions?***