High-Resolution Data Visualization Using Rocks Clusters

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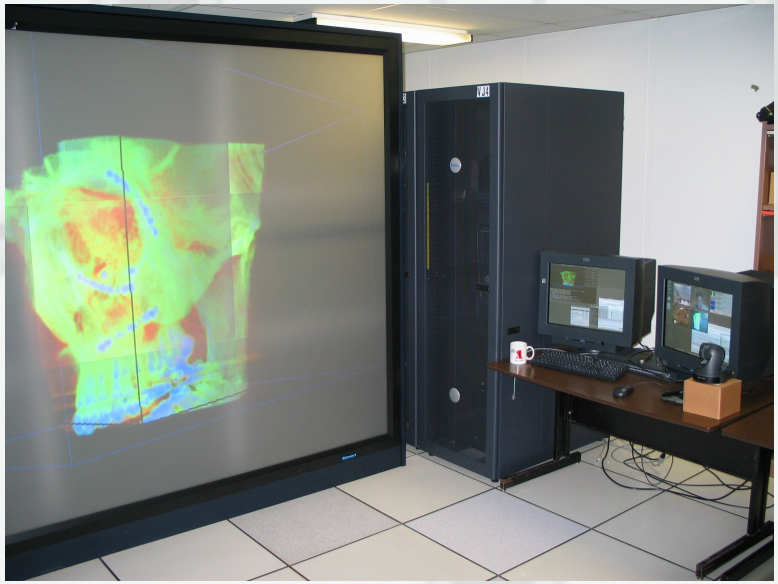
Introduction

- Need for visualizing larger data sets
  - Scientific Modeling
  - Medical Imagery
- Rocks Cluster
  - Open source Linux cluster distribution
  - Provides easy cluster administration
  - Provides visualization roll

Related Works

- LionEyes Display Wall (Penn State)
  - Resolution: 4096x2304
  - 12 projectors
  - 12 dual Xeons w/ NVIDIA Quadro 900 XGL (render)
  - 2 Xeons w/ NVIDIA Quadro 900 XGL (application)



Related Works Cont.

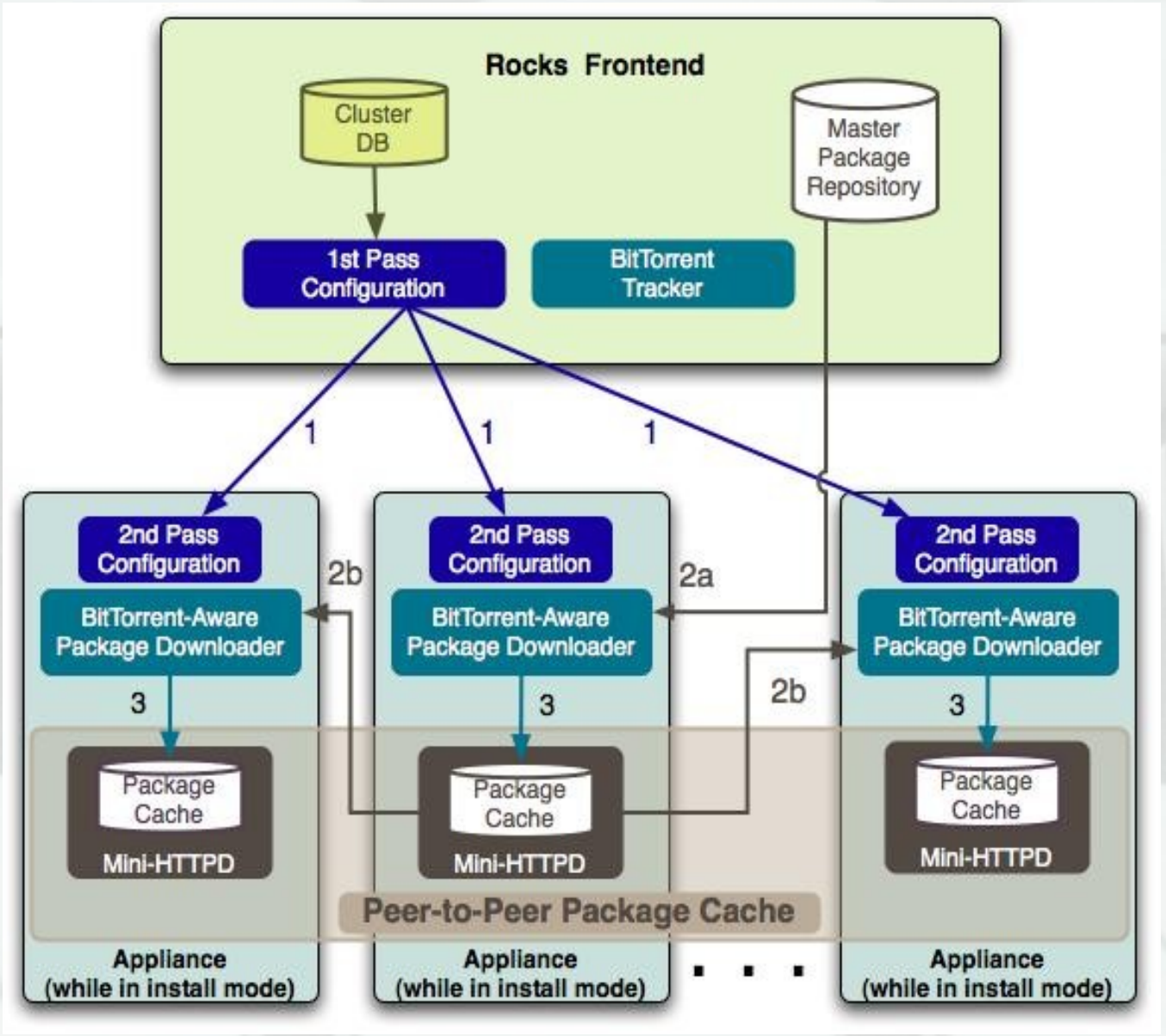
- Hyperwall-2 (NASA Advanced Supercomputing)
  - Estimated Resolution: 25600x8192
  - 128 LCD screens
  - 128 GPUS
  - 1,024 cores
  - 74 teraflops

Two Considerations

- Physical Display
  - Back Projection
  - Liquid Crystal Displays
- Rendering Technique
  - Rendering and displaying on the same machine
  - Rendering and displaying on separate machines

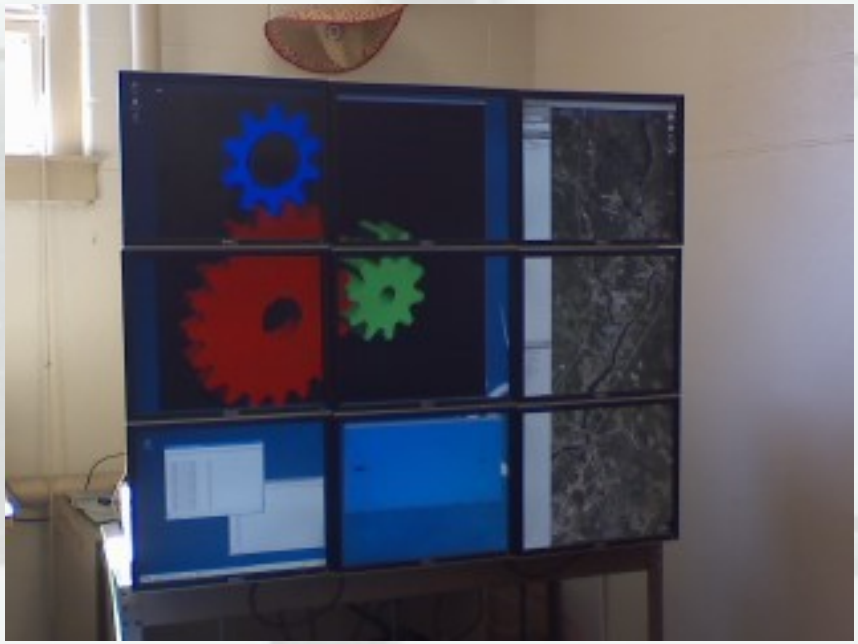
Rocks Clusters

- SQL Database & Master Repository
- Back-end nodes connect via PXE or CD
- Red Hat Kickstart
- Package downloading via torrent
- New nodes exchange packages without front-end
- Cluster DB used for propagating configuration changes

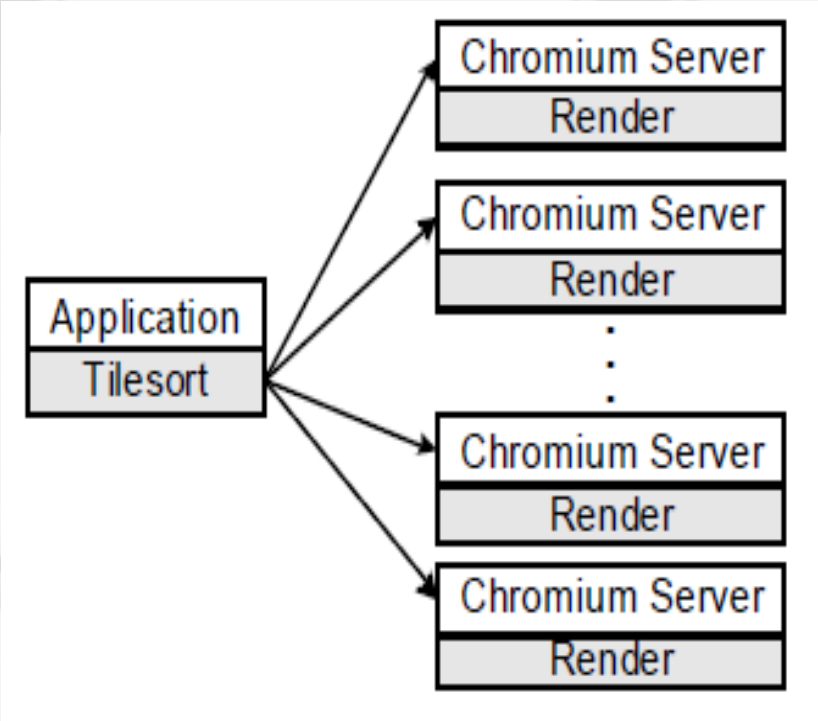

Rocks Frontend
Cluster DB
Master Package Repository
1st Pass Configuration
BitTorrent Tracker
1
1
1
2nd Pass Configuration
BitTorrent-Aware Package Downloader
3
Package Cache
Mini-HTTPD
2b
2a
2b
Peer-to-Peer Package Cache
Appliance (while in install mode)
Appliance (while in install mode)
Appliance (while in install mode)

DMX & Xinerama

- DMX (Xdmx) - multiple displays from multiple machines
- Xinerama - multiple displays unified as single screen



Chromium



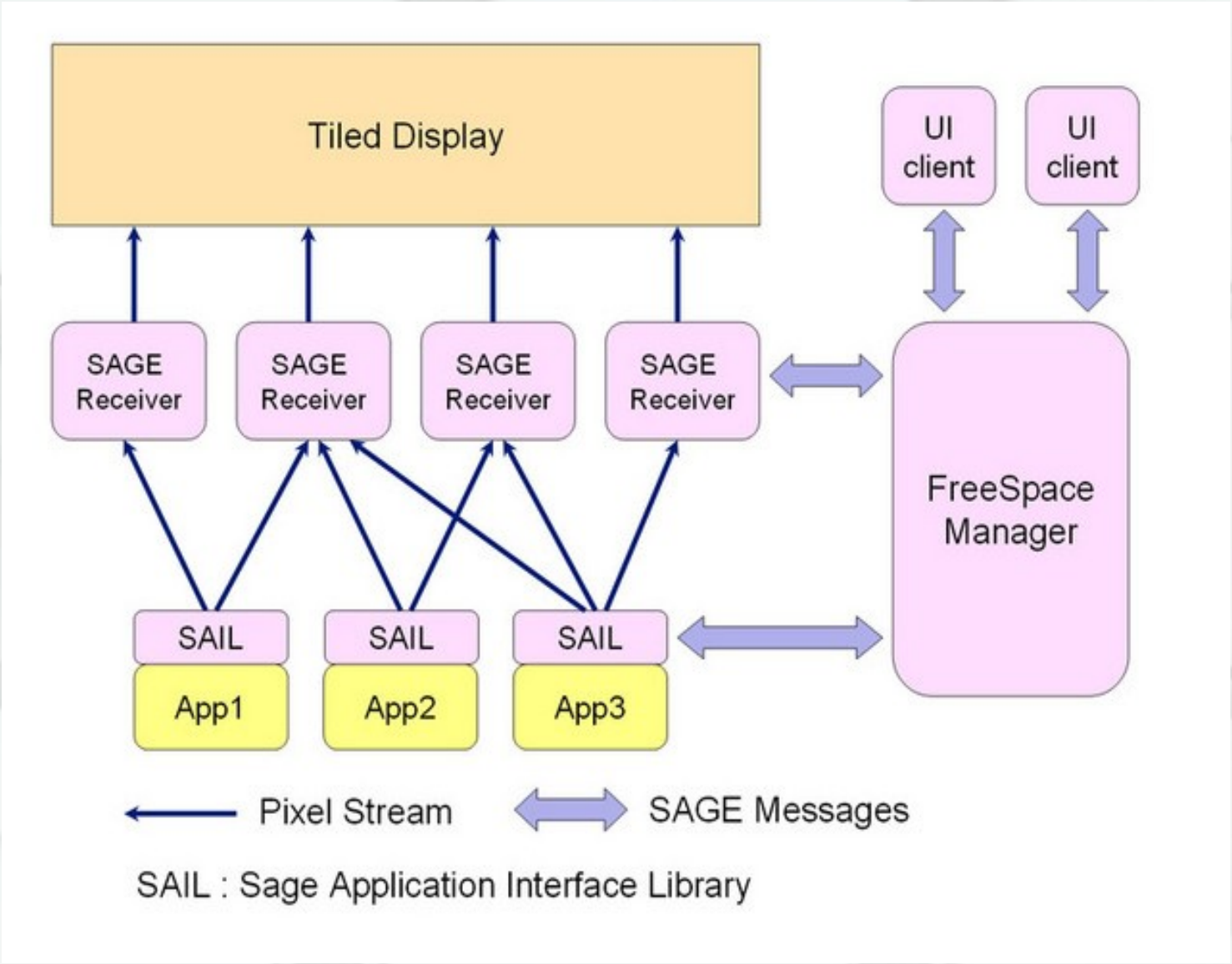
- Manipulates OpenGL for graphics cluster
- Stream Processing Unit (SPU)
- *Mothership*
- *Tilesort* SPU
- *Render* SPU

SAGE

- Stream graphics from rendering cluster
- Collaborative environment

Components:

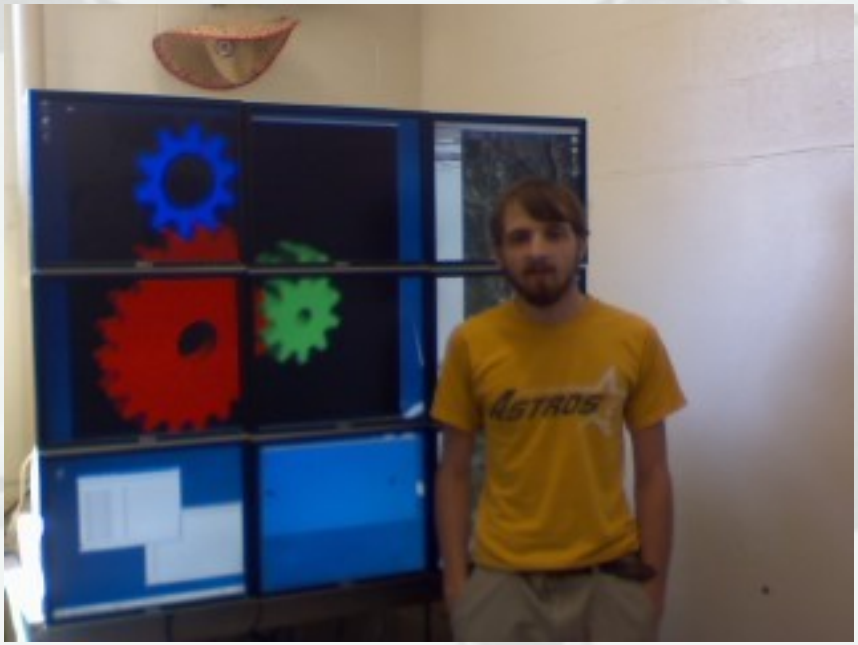
1) Free Space Manager
2) SAGE Application Interface Library (SAIL)
3) SAGE Receiver
4) User Interface (UI)


Tiled Display
UI client
UI client
SAGE Receiver
SAGE Receiver
SAGE Receiver
SAGE Receiver
FreeSpace Manager
SAIL
SAIL
SAIL
App1
App2
App3
Pixel Stream
SAGE Messages
SAIL : Sage Application Interface Library

Results

- Ubuntu 9.04
  - Xdmx seg fault (xdmx_1.6.1.901-3_i386.deb)
  - Chromium only locally
- Rocks 4.2.1
  - Limited Viz Roll
- Rocks 5.0
  - Full-functional Viz configuration
  - Latest version for i386
  - Last roll containing Xdmx

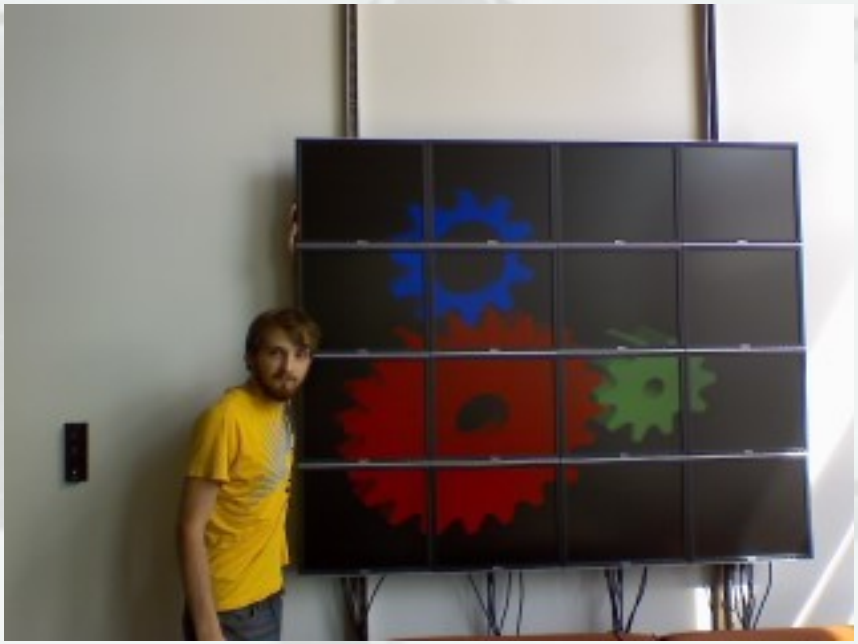
UMaine 3x3 Display Wall



- Dual Pentium 3s (Application/Head-node)
- 3 Dual Pentium 3s (Render)
- 3 Geforce4 MX 4000s 128MB (per render)
- 3840x3072 resolution
- 60 Frame Per Second

UMaine 4x4 Display Wall

- Dual Xeon Quad-Core (Application/Head-node)
- 2 Core 2 Quad-Core (Render)
- 4 nVidia 8600GT Dual-DVI 256MB (per render)
- 5120x4096 resolution
- 60 Frame Per Second



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Questions