

Birds Of a Feather Meeting

SC 2010

Agenda

- Introductions
- User Community Updates
- SAGE Improvements
- Designing Usable Wall Display Environments



Introductions

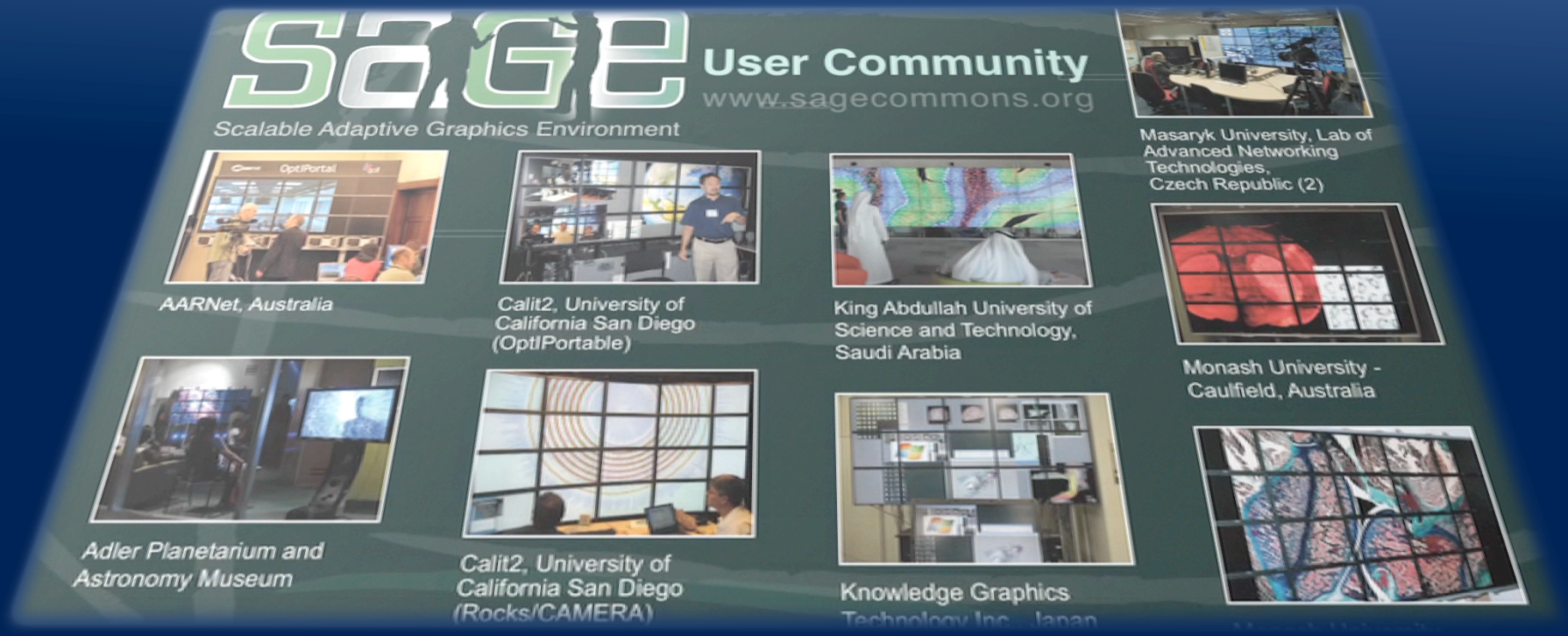
- SAGE Research and Development Team (Jason, Luc, Maxine, Ratko, Sungwon)
- Sign-in sheet

What is SAGE?

- Scalable display walls are *the* lenses that bring large complex scientific data into focus.
- SAGE – Scalable Adaptive Graphics Environment.
- SAGE is software for organizing visualizations and information on scalable display walls to help researchers deal with problems of scale and complexity in their research.
- It specializes in streaming visualizations from remote rendering servers / supercomputers.
- Originally began with an NSF ITR grant (OptIPuter) in 2002.
- Now supported by NSF STCI grant (OCI-0943558) through 2012 and King Abdullah University for Science and Technology (KAUST).



~40 SAGE OptIPortals in 2009



12 New OptIPortals in 2010

Australia
- AARNet
- Australian National University
- CSIRO Discovery Center
- CSIRO Information and Communication Technologies, Marsfield
- Monash University – Caulfield
- Monash University – Clayton
- University of Melbourne
- University of Queensland

Canada
- Ciena Networks
- Simon Fraser University

China
- Chinese Academy of Sciences, Computer Network Information Center

Czech Republic
- Masaryk University, Laboratory of Advanced Networking Technologies (2)

Germany
- Braunschweig University of Technology, Institute of Computer and Network Engineering

India
- Monsanto Research Centre

Japan
- Knowledge Graphics Technologies (KGT), Inc.
- Kyoto University
- National Institute of Advanced Industrial Science and Technology (AIST)
- National Institute of Information and Communications Technology (NICT), Koganei, Japan
- Osaka University, CyberMedia Center

Korea
- Gwangju Institute of Science and Technology (GIST)
- Korea Institute of Science and Technology Information (KISTI)

Mexico
- Ensenada Center for Scientific Research and Higher Education (CICESE)

Netherlands
- SARA Computing & Networking Services
- University of Amsterdam, System and Network Engineering Research Group
- University of Amsterdam, e-BioScience Laboratory

New Zealand
- Victoria University of Wellington

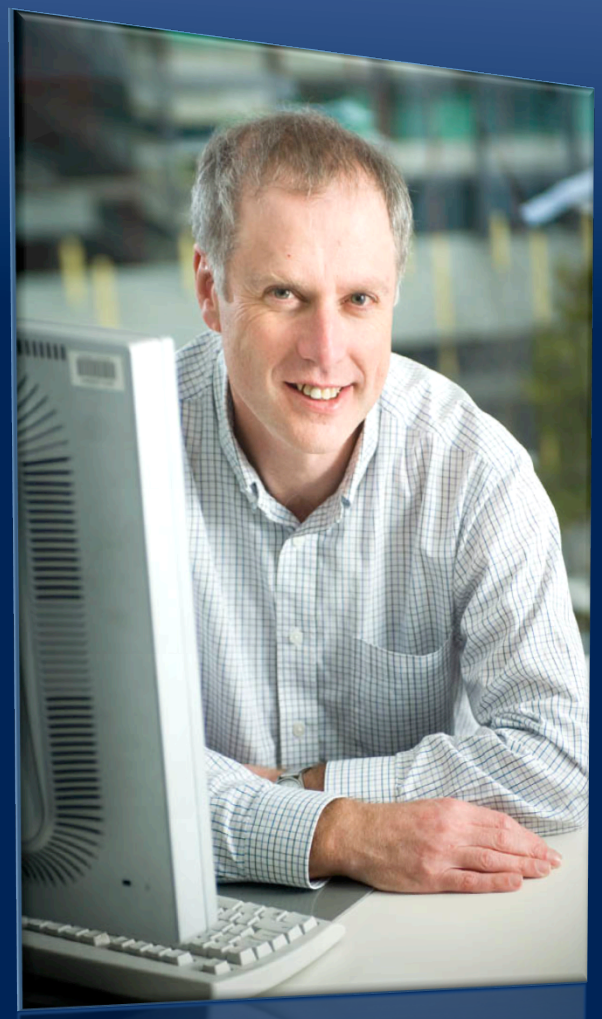
Russia
- Russian Academy of Sciences, Science and Innovation Center
- Russian Academy of Sciences, Space Research Institute

Saudi Arabia
- King Abdullah University for Science and Technology (KAUST)

Taiwan
- National Center for High-performance Computing (NCHC)

United States
- Adler Planetarium & Astronomy Museum
- Argonne National Laboratory, Center for Nanoscale Materials
- Argonne National Laboratory, Transportation Research and Analysis Computing Center
- Calit2/Univ. of California, Irvine
- Calit2/Univ. of California, San Diego (4)
- Florida International University, Center for Internet Augmented Research & Assessment (CIARA)
- Louisiana State University, Center for Computation and Technology
- NASA Goddard Space Flight Center, Space Visualization Studio
- Northwestern University, International Center for Advanced Internet Research (iCAIR)
- Purdue University, Envision Center for Data Perceptualization
- Rincon Research Corporation
- Sharp Laboratories of America
- Texas A&M University, Computer Science
- UCSD-National Center for Microscopy and Imaging Research
- UCSD-Scripps Institution of Oceanography
- University of Hawaii, Center for Microbial Oceanography: Research and Education
- University of Illinois at Chicago, Electronic Visualization Lab (2)
- University of Illinois at Urbana-Champaign/National Center for Supercomputing Applications
- University of Michigan-Department of Atmospheric, Oceanic & Space Sciences
- University of Michigan, Digital Media Commons
- University of Michigan, School of Information
- University of Texas at Austin, Texas Advanced Computing Center (TACC)
- University of Washington
- US Geological Survey (USGS) Earth Resources Observation and Science

User Community Highlights

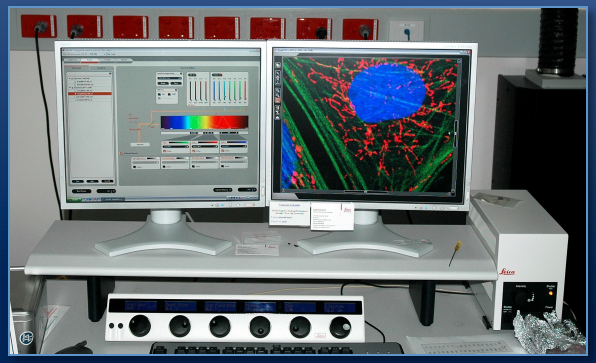


David Abramson

Australian Research Council Professorial Fellow & Science Director

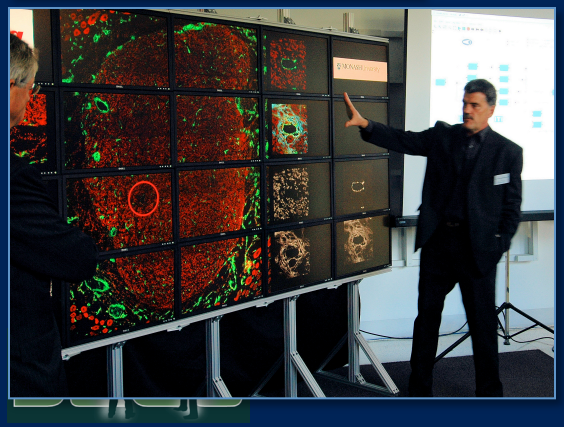
Monash e-Research Centre

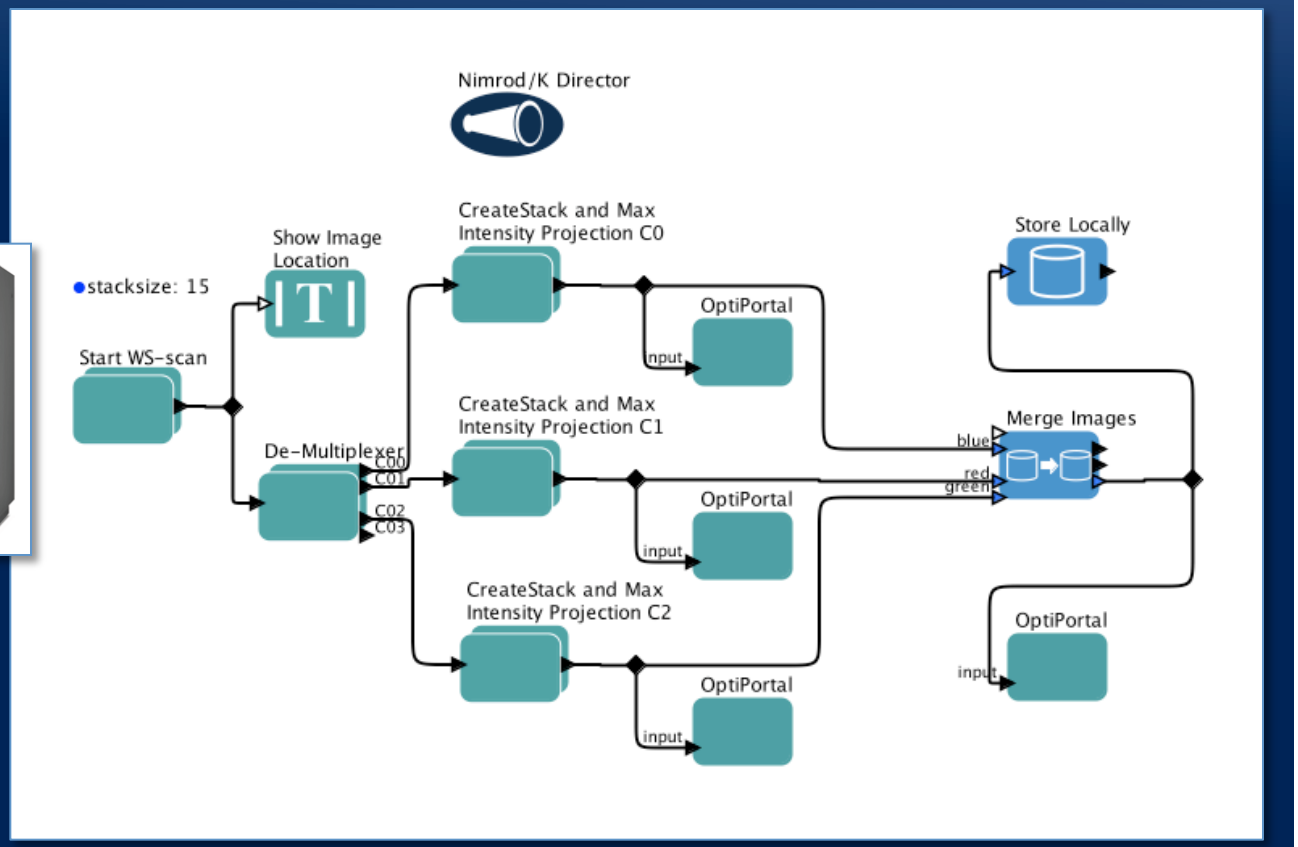
Optical Microscopy Driver







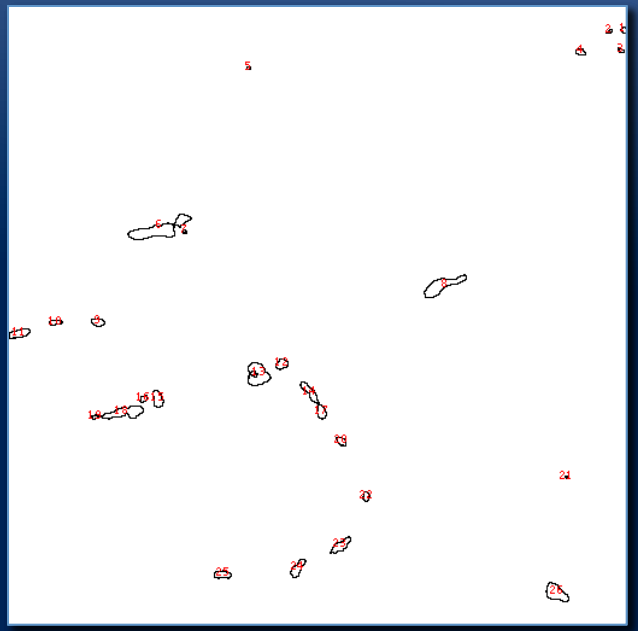


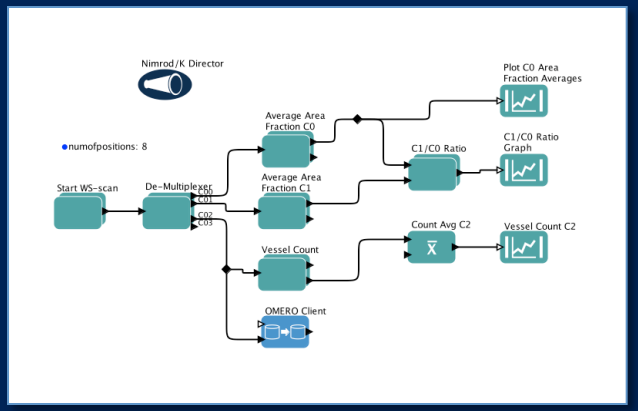


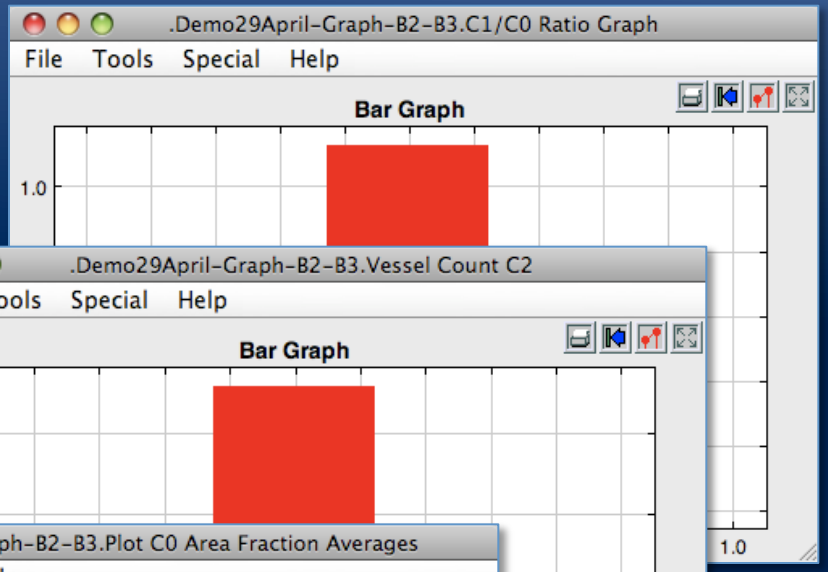
www.sagecommons.org

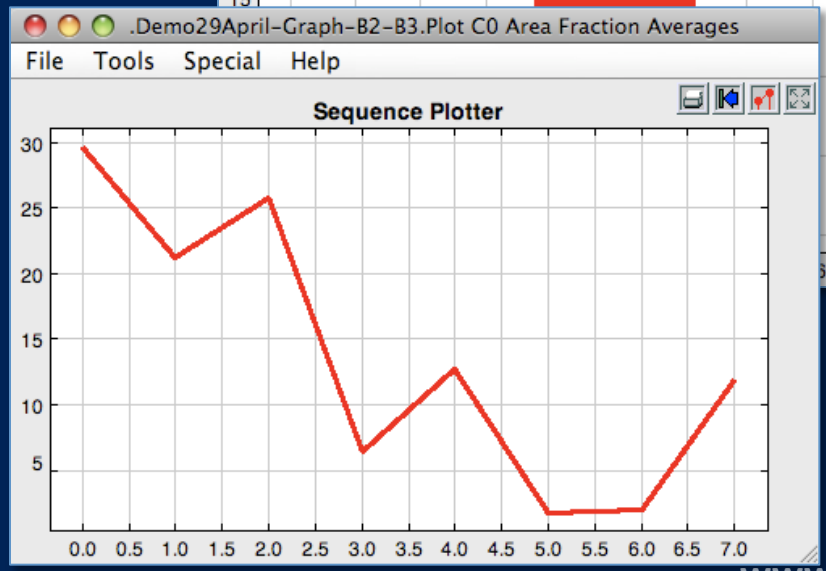
Optical Microscopy Driver





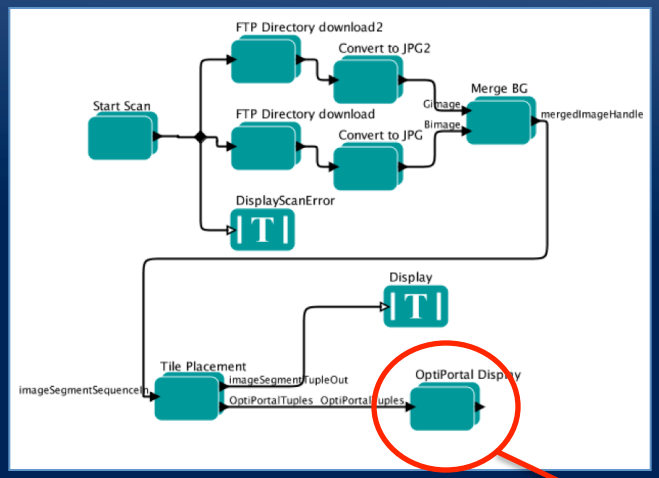


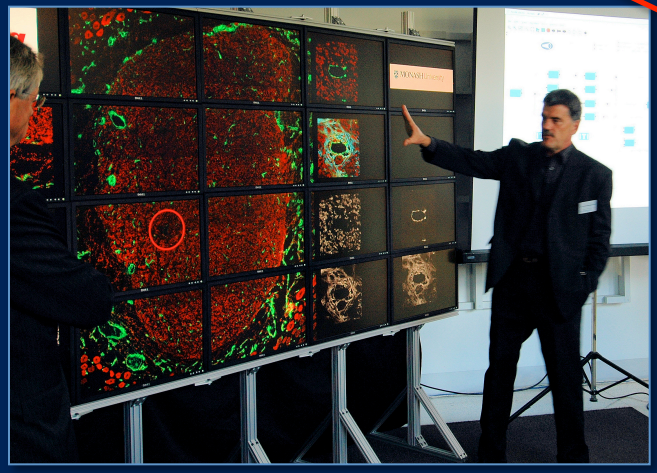


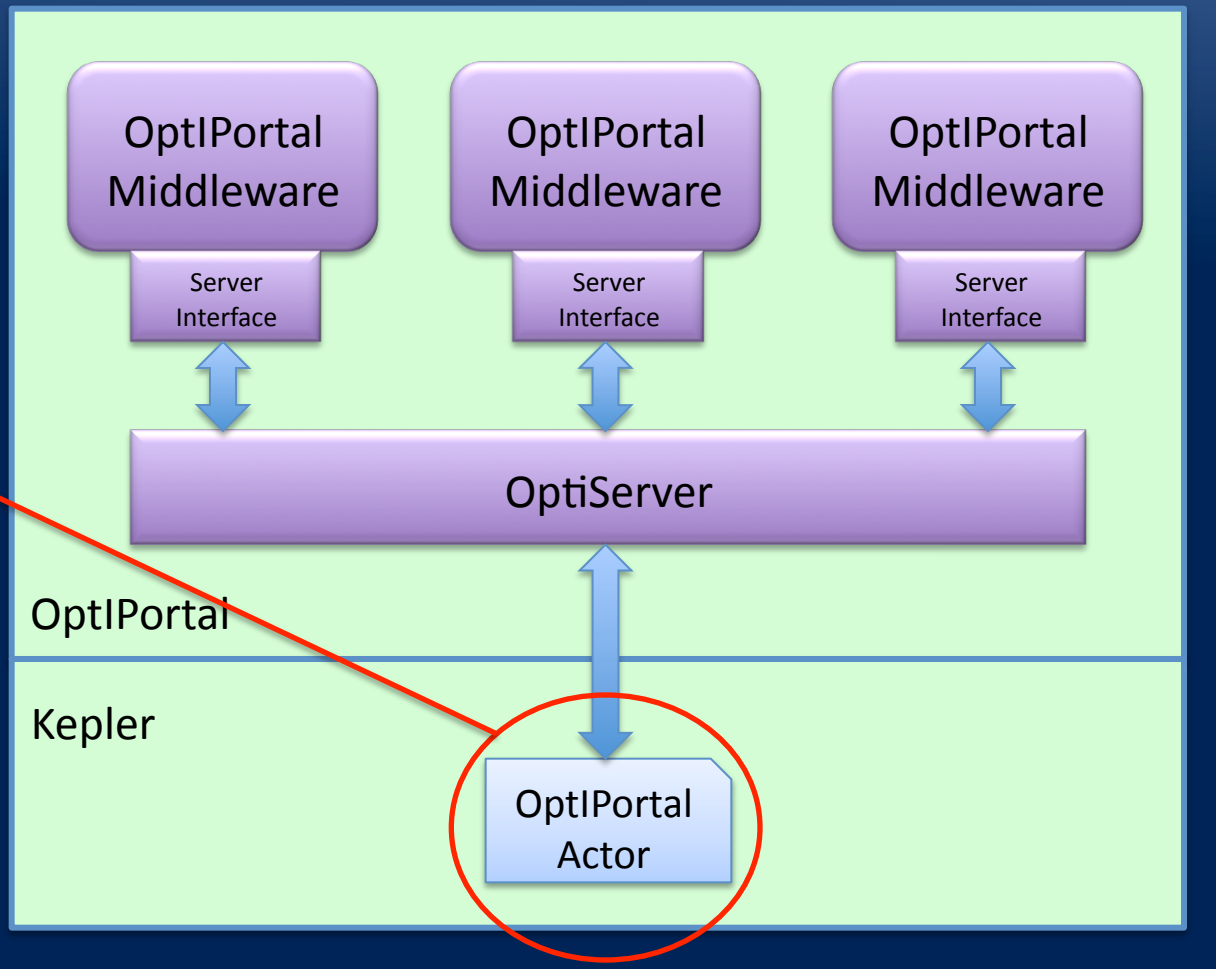


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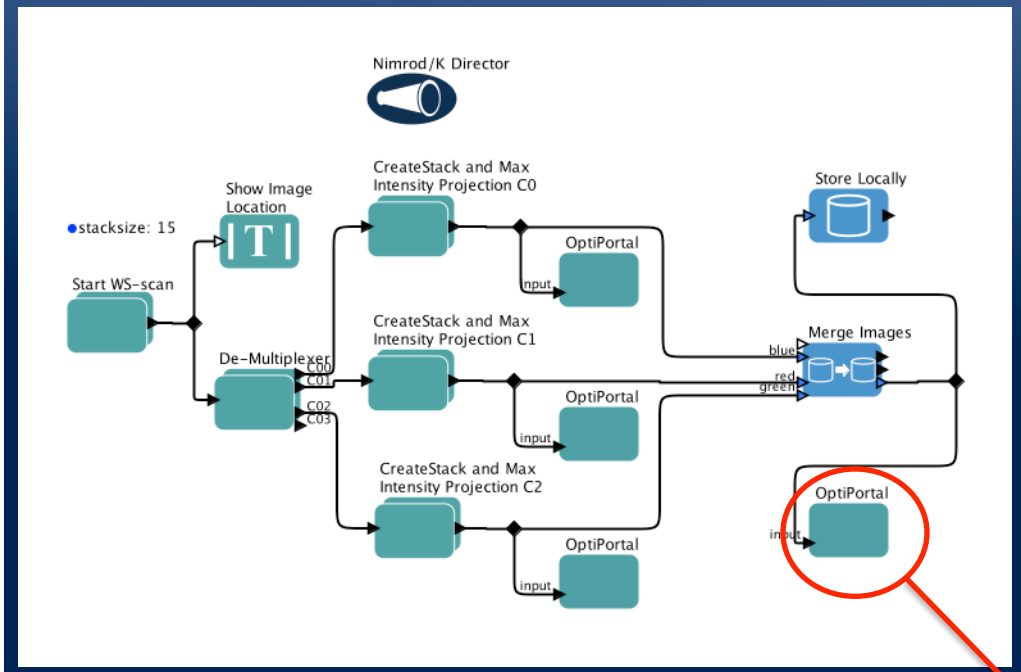
Linking Workflows and Visualization

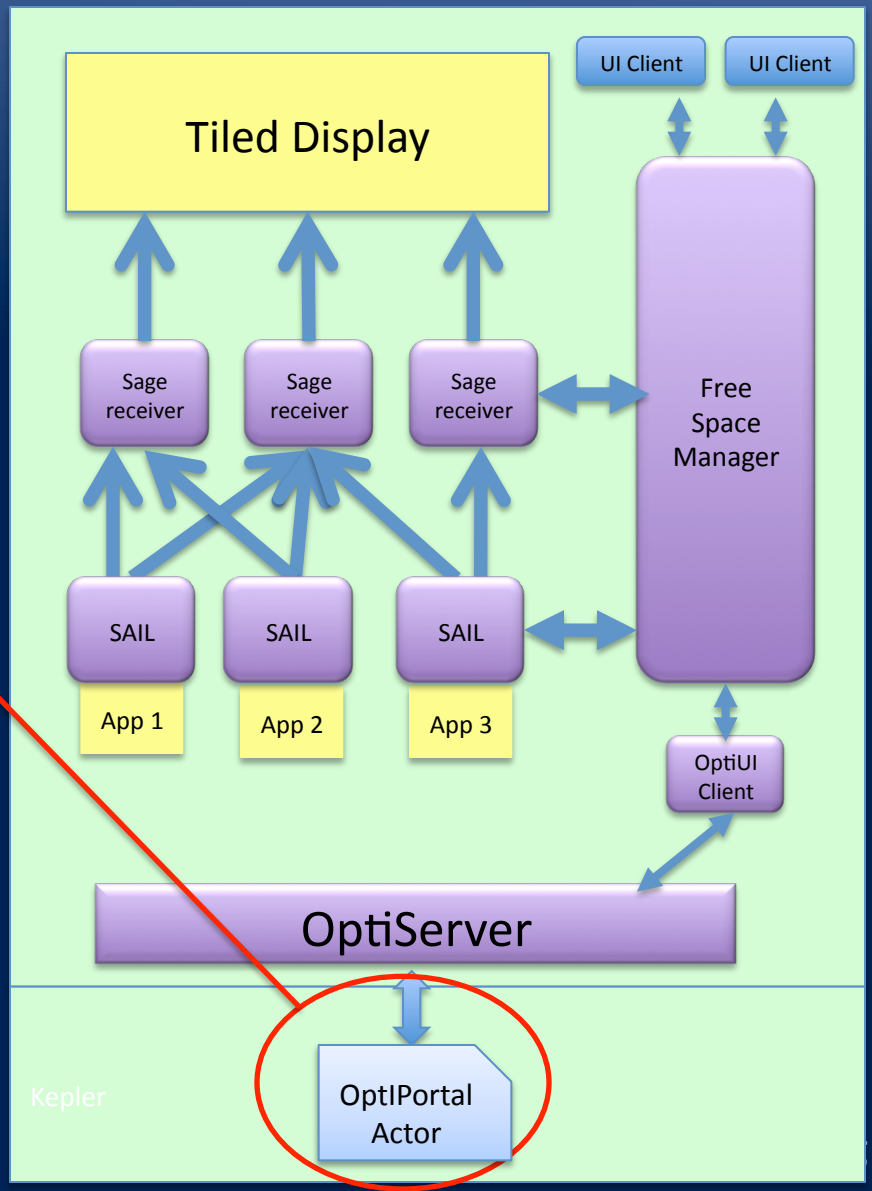






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Nimrod/K Director
Show Image Location
stacksize: 15
Start WS-scan
De-Multiplexer
C00
C01
C02
C03
CreateStack and Max Intensity Projection C0
CreateStack and Max Intensity Projection C1
CreateStack and Max Intensity Projection C2
OptiPortal
input
Store Locally
Merge Images
blue
red
green
OptiPortal
input
OptiPortal
input
OptiPortal
input


UI Client
UI Client
Tiled Display
Sage receiver
Sage receiver
Sage receiver
Free Space Manager
SAIL
SAIL
SAIL
App 1
App 2
App 3
OptiUI Client
OptiServer
Kepler
OptIPortal Actor



IEEE

e-Science 2010

6th IEEE International Conference on e-Science

www.escience2010.org

Brisbane, AUSTRALIA

7-10 December 2010

General chairs
Jim Hogan, QUT
Paul Roe, QUT

PC Chair
David Abramson,
Monash University

Where leading minds of e-Science connect

Keynote Speakers

Thom Dunning (NCSA)



Guy Steele (Oracle)



John Mattick (UQ)



Jürgen P. Schulze (UCSD)



Ian Foster (Argonne)



S. George Djorgovski (Caltech)





sgi Microsoft Research MONASH University redhat Griffith UNIVERSITY qcif



User Community Highlights



Andrei Hutanu

IT Consultant

Center for Computation & Technology,

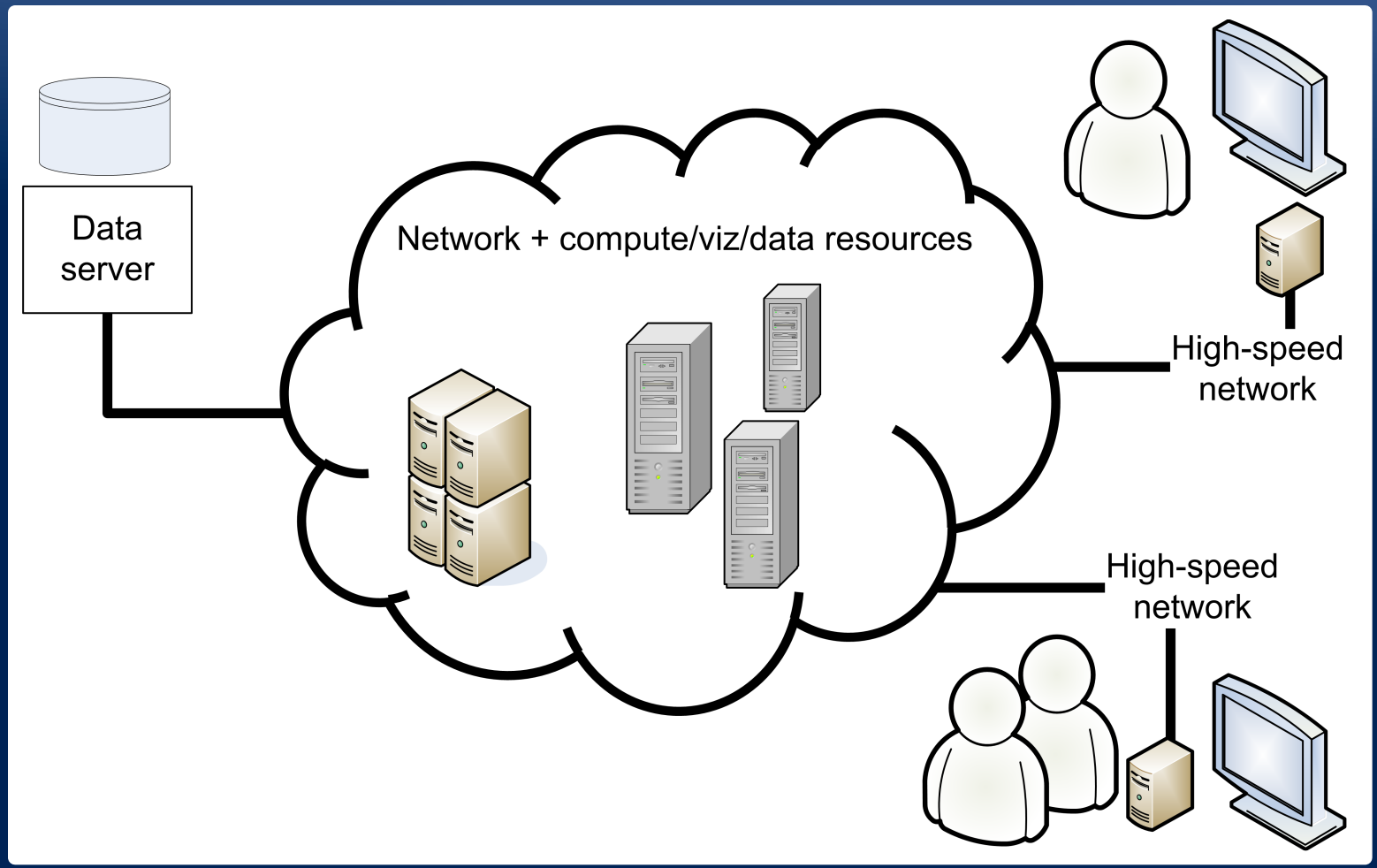
Louisiana State University

eaviv
Distributed Visualization & Testbed

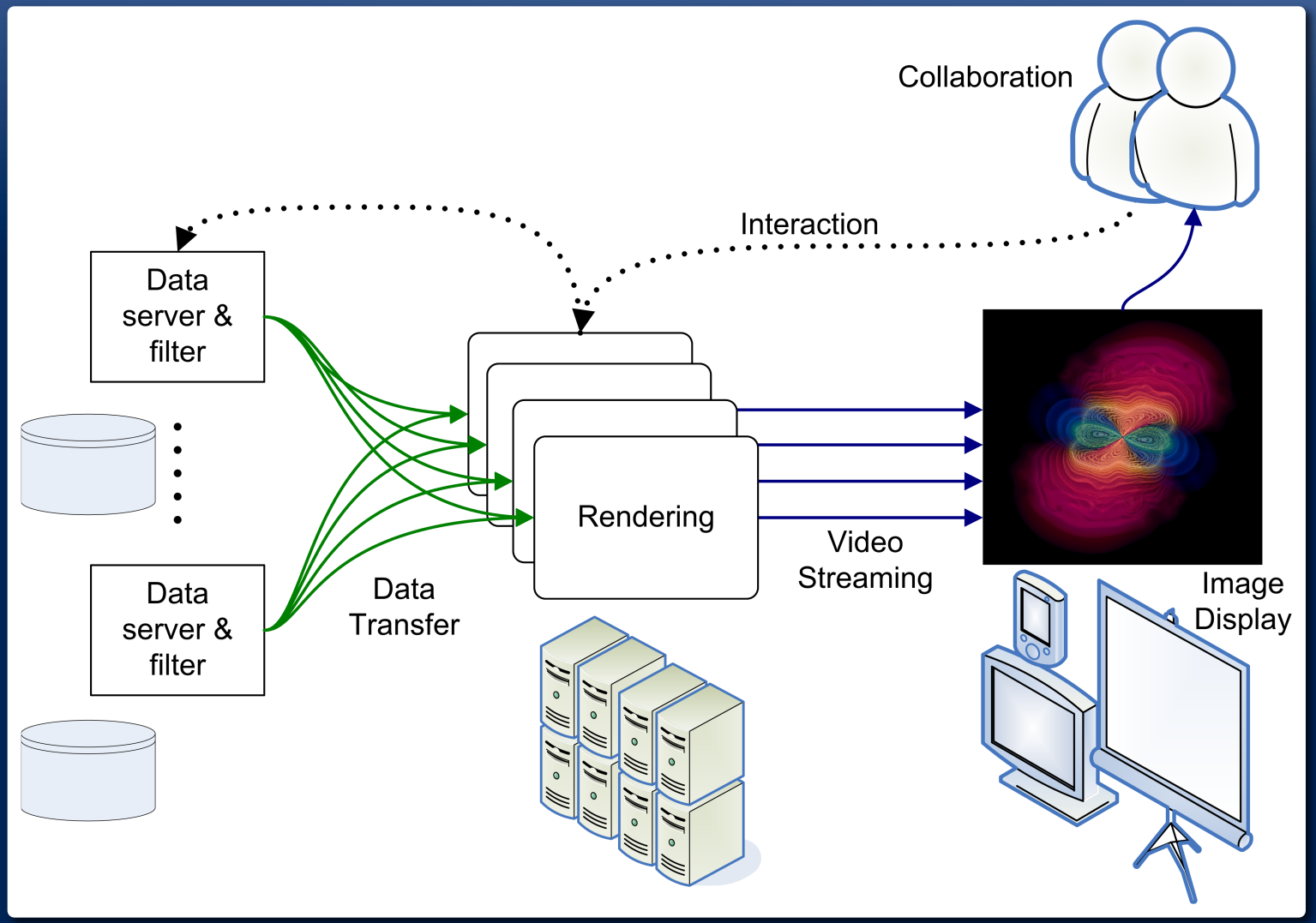
Andrei Hutanu, Jinghua Ge,
Cornelius Toole, Sandeep Nimmagadda,
Gabrielle Allen (all CCT),
Kenny Welshons (LONI),
Patrick Dorn (NCSA),
Petr Holub (Masaryk University),
John Vollbrecht (ex-Internet2)



Motivating Scenario

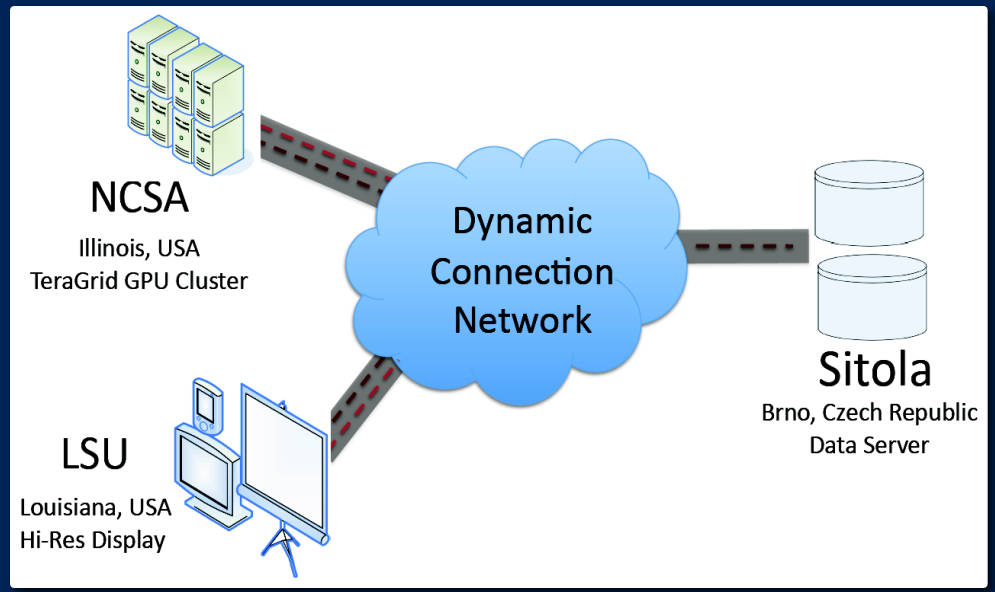


System Architecture



Testbed Scenario

- Testbed implemented to develop distributed viz apps
- Data on tchor high-speed data server (Sitola, Czech Rep)
- Parallel rendering on Lincoln (NCSA)
- Allocate ION network between NCSA and LSU
- Video stream to LSU 4k projector – SAGE!
- Interaction wit visualization from LSU



User Community Highlights



Seung-Hee Lee

KISTI

Seunghee Lee
leeseunghee@kisti.re.kr

Project for Cyber Lecture and Cooperative Research with SAGE in KOREA



2010. 11. 15

Cyber Infrastructure for Research and Education

Project Overview

University (WCU, Engineering Center)



Domestic Institute



Hospital / CDC



Internal Cooperation

KREONET (High Speed R&D Networks)

Overseas University



International Cooperation



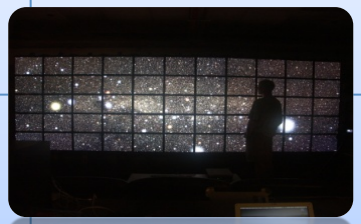
International Cooperation



Education Service and Contents



Cooperation Research



National Issue handling



Cyber Discipline Research Environment

www.sagecommons.org

SAGE with HDS (High Definition Streaming)



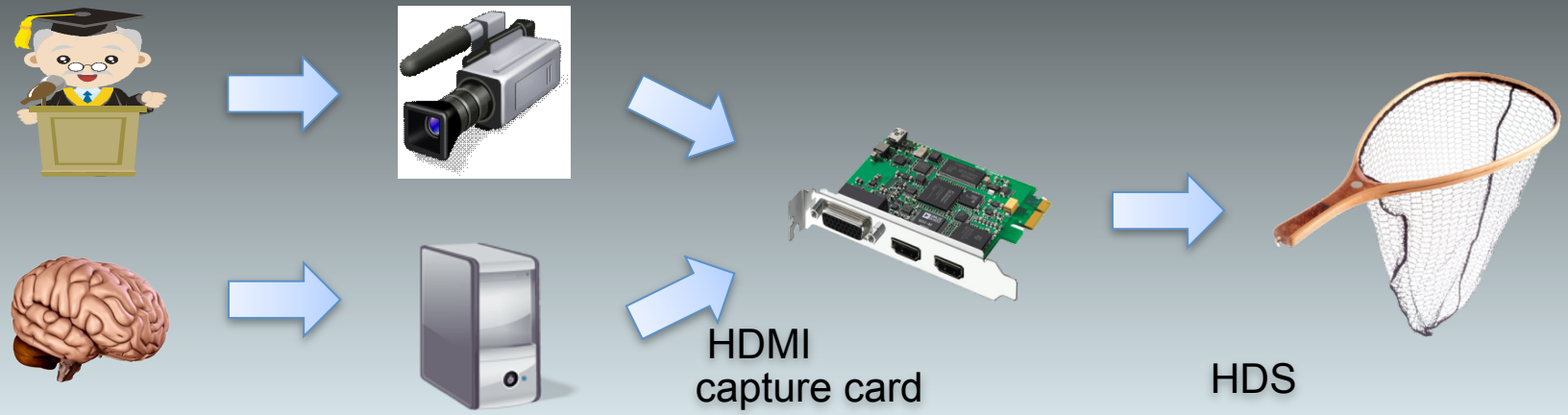
HDS

- SAGE decklinkcapture application
- Stream full-resolution high-definition video
- Use HDMI capture card (Blackmagic Intensity Pro PCI-express)



HDMI capture card + HDS

- Capture screen for sharing graphics as VNC
- Simple and **Cost-effective** solution



User Community Highlights



Shinji Shimojo

Executive Researcher

National Institute for Information and Communications Technology

Professor

Cybermedia Center, Osaka University

SAGE for Digital Museums

Shinji Shimojo, Masaki Chikama,
Rieko Kadobayashi, Kaori Fukunaga

NICT (Booth #1521)



SAGE for e-heritage
Giotto+TeraHerz+TDW



Kadobayashi, Chikama, Fukunaga

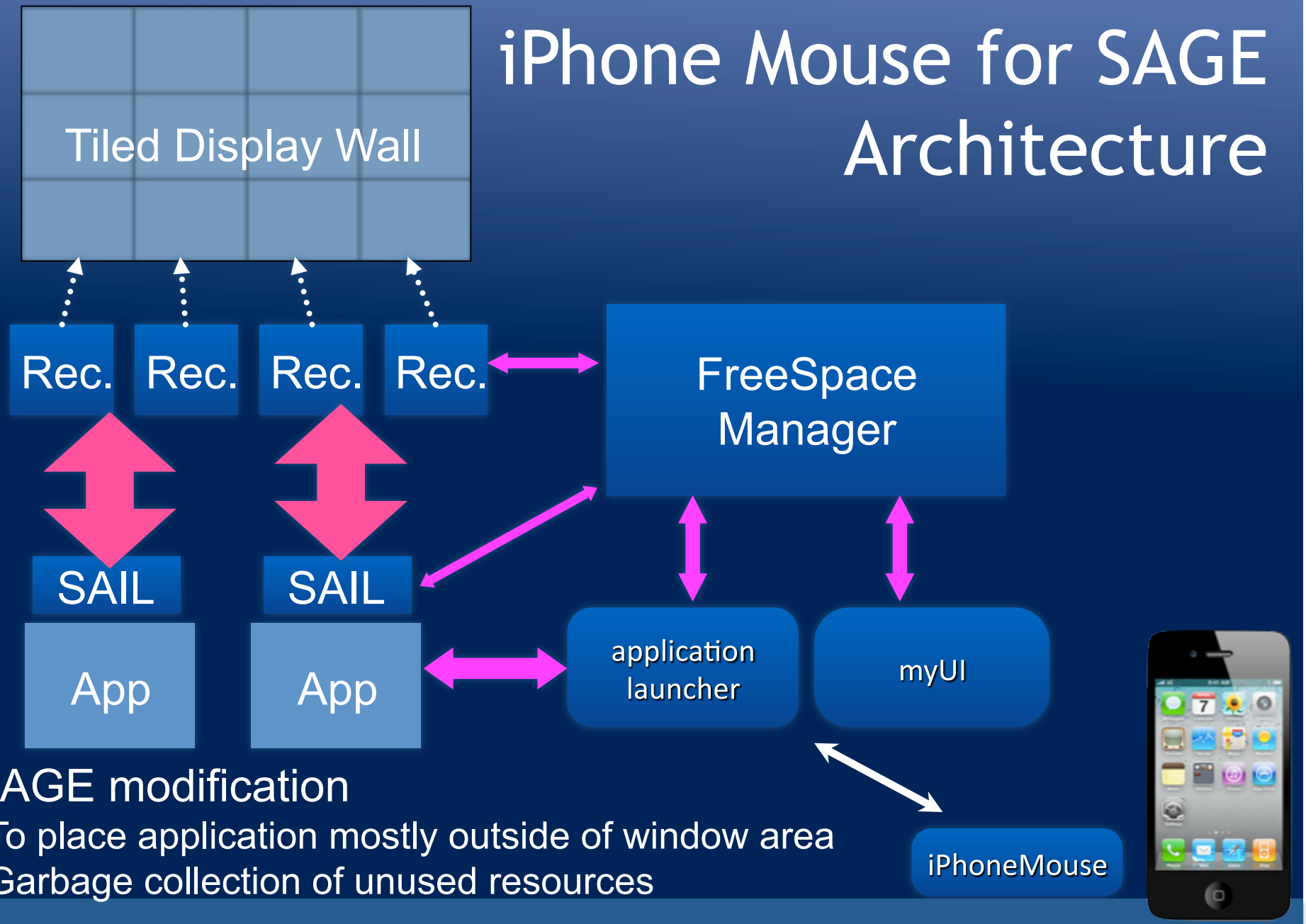
SAGE for Digital Museum





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iPhone Mouse for SAGE Architecture



SAGE modification

- To place application mostly outside of window area
- Garbage collection of unused resources

Takamatsuzuka（高松塚）



User Community Highlights



Paul Wielinga

Manager Networking

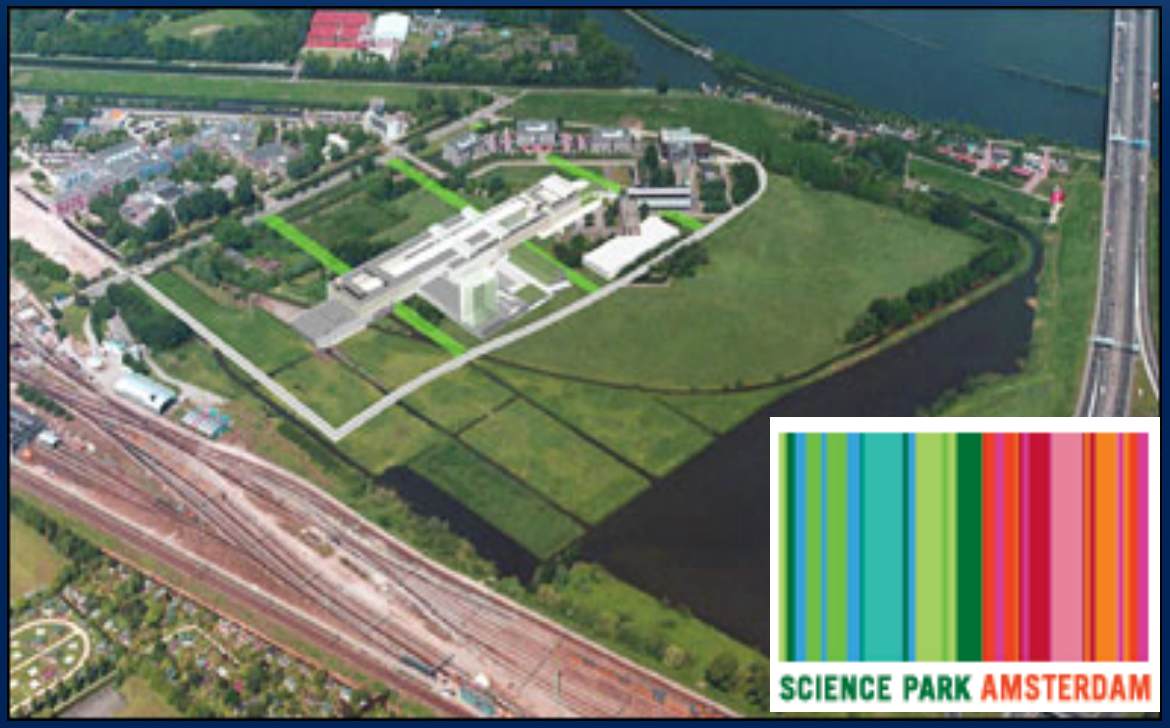
Visualization & Data Services

SARA Computing & Networking Services

SARA Computing and Networking Services

Dutch Supercomputing and

e-Science Support Center



Paul Wielinga/Tijs de Kler/Ronald van der Pol

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Highlight 2010: WCIT @ Amsterdam







- World Congres on ICT - Amsterdam
  - Demonstrations of Supercomputing Applications
  - Green IT @ SARA
  - Greening by IT
  - New SAGE User Interface
  - Public was very excited about the TPD and possibilities of SAGE



Highlight 2010 – GLIF @ CERN
40 Gbps Wide Area Bandwidth Challenge

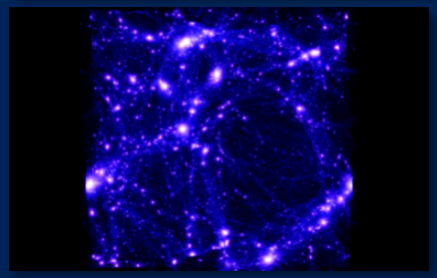




- Demonstration @ GLIF annual meeting CERN Geneva
  - Demonstration of 40 GE streaming of various ultra-high resolution video's of Cosmological Data
  - Single server in Amsterdam to Tiled Panel in Geneva
  - Resolution 12800*4800 Pixels
  - 22 Frames/second
  - 1650 KM 40 Gbps lambda over SURFnet dark fiber
  - Bandwidth used >32 Gbps with frame syncing, >38 Gbps without – using a special (very simple) streaming application
  - With SAGE we reached 16 Gbps with all sophisticated features of SAGE UI

SARA Demonstrations at SC10 @ Dutch Research Consortium booth









- Overview of Supercomputing Applications – Dutch Supernode in Amsterdam @SARA (SAGE)
- 6*10GE streaming of Scientific data from Single Server Disk to Network to 60 MPixel Tiled Panel
  - Preliminary result: 43 Gbps from single application

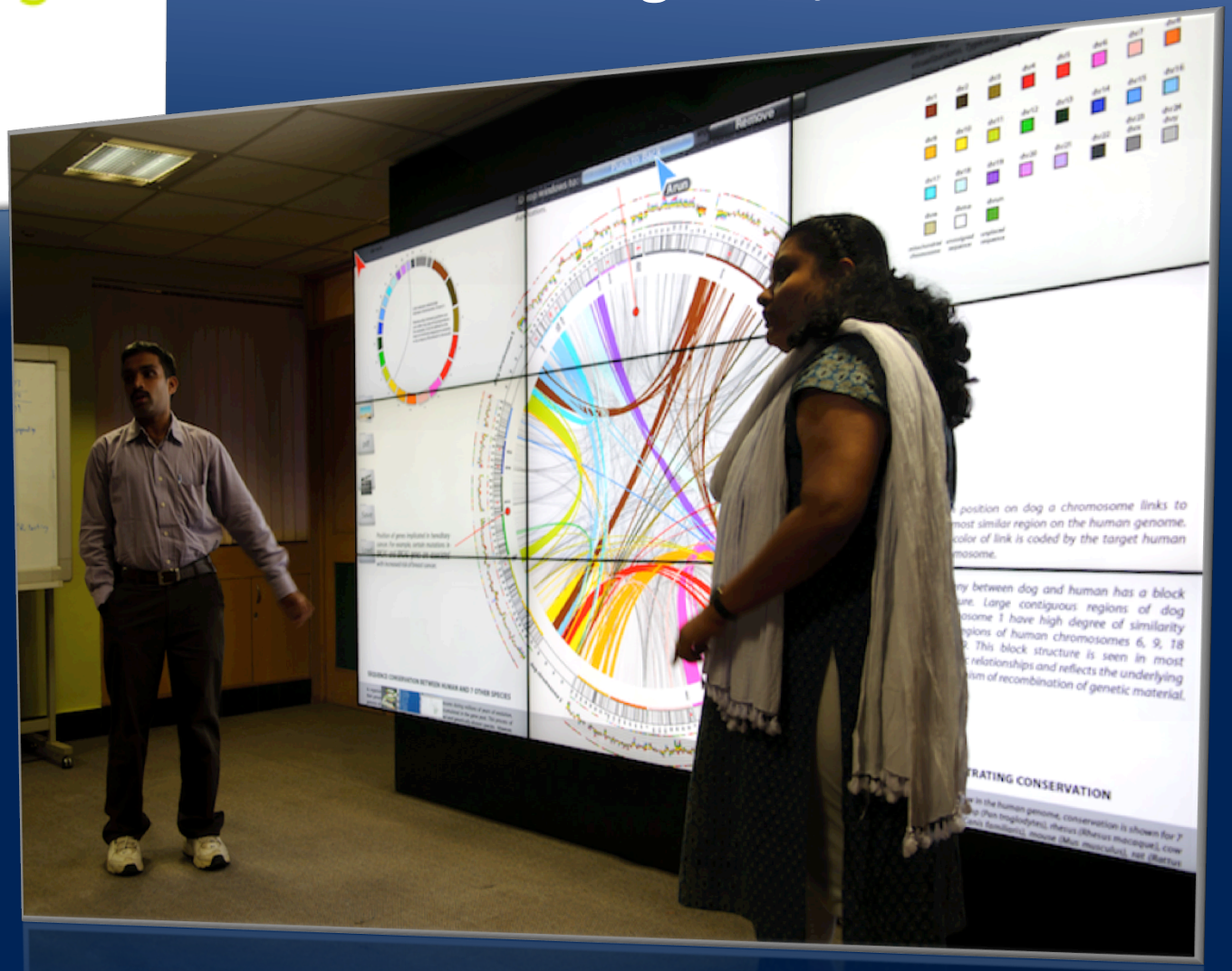


Come visit us at booth 4049

www.sagecommons.org

MONSANTO imagine®

Monsanto Research Center
Bangalore, India



SAGE

www.sagecommons.org

The Walt Disney Company

Walt Disney Studios
Burbank, California



CineGrid

it²

i2

SAGE

www.sagecommons.org

SAGE Improvements



Luc Renambot

Research Assistant Professor

Electronic Visualization Lab,

University of Illinois at Chicago

SAGE: Website

- *sagecommons.org*
- News and events
- Downloads
- Documentation
- Community
  - Photos
  - SAGE map
- Support
  - Forums



SAGE: Binary Distribution

- RPM and DEB based
  - 64bit versions
  - Centos 5.5
  - openSUSE 11.3
  - Ubuntu 10.04 LTS
- Make a case for other OS distributions
  - Survey online ?



SAGE: Documentation

- Chapters
  1. Introduction
  2. Getting Started
  3. Applications and services
  4. User Interaction
  5. Writing applications
  6. Reference guide
  7. FAQ



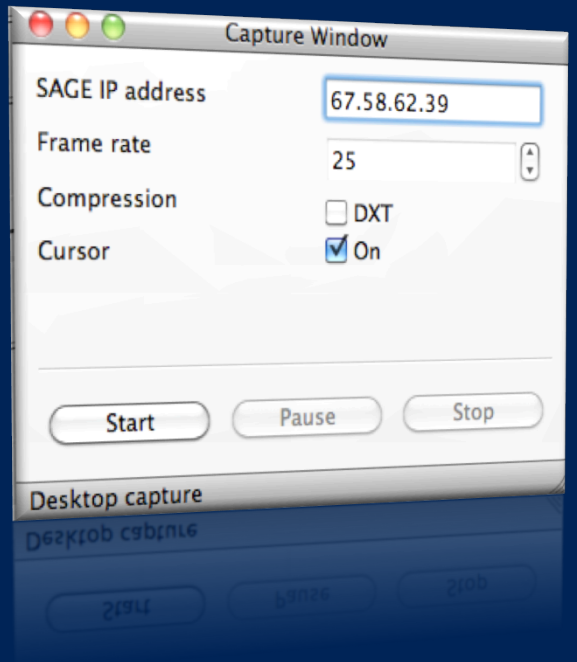
SAGE: Improvements

- Reliability
  - Used several classes per week at EVL
- Configuration
  - Global and user-level configuration files
  - Per-run configuration file
- Launcher
  - Most of controls can be edited from the launcher



Improvements: Applications

- PDFviewer
  - Based on ImageMagick on legacy system
  - Based on Poppler on 'modern' Linux distribution
  - Basic navigation control
- Qshare
  - 'High-speed' desktop sharing
  - 15 to 20 fps on laptop / mini
  - Need a gigabit (~ 800 Mbps)



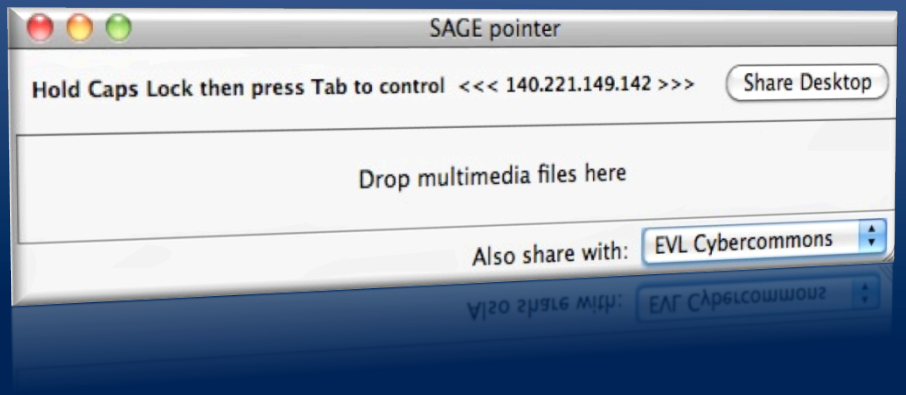
Improvements: Applications

- "Blackmagic" capture
  - Digital and analog capture
    - HDMI and HD-SDI
    - Video-conference unit
    - Laptop and console
  - YUV 422 capture
  - GPU conversion to RGB for display
- Mplayer movie
  - Package and script to rebuild
  - Included in binary package



Improvements

- SAGE Pointer
  - Pointer on the wall
    - Name, color
  - Share desktop
    - Launches VNC-viewer on the wall
  - Multimedia drop-zone
    - Image, movies, PDF, …
  - Multiplatform
    - Mac and Win binaries (XP, 7)
    - Linux in source mode (python)



VisualCasting

- Maintenance on VisualCasting
- Compatible to UI version
- Fixing bugs

- Document and pointer sharing through SAGE pointer

SAGE: Content Organization

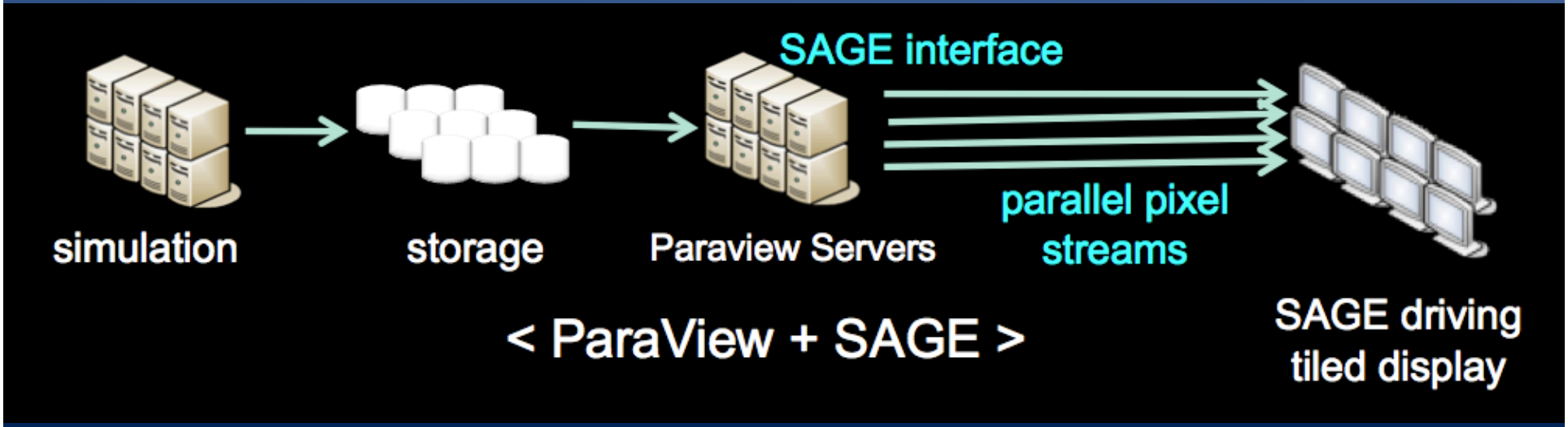
- Layout and partition of the space
  - Pointers, gyro-mouse, touch-screen
  - Initial work with Apple *Magickpad*
  - See Ratko's presentation
- Support for documents
  - New PDF viewer
  - Office support through OpenOffice
    - Converts documents to PDF on the fly
    - Works best on ppt, doc and xls formats



ParaView Integration

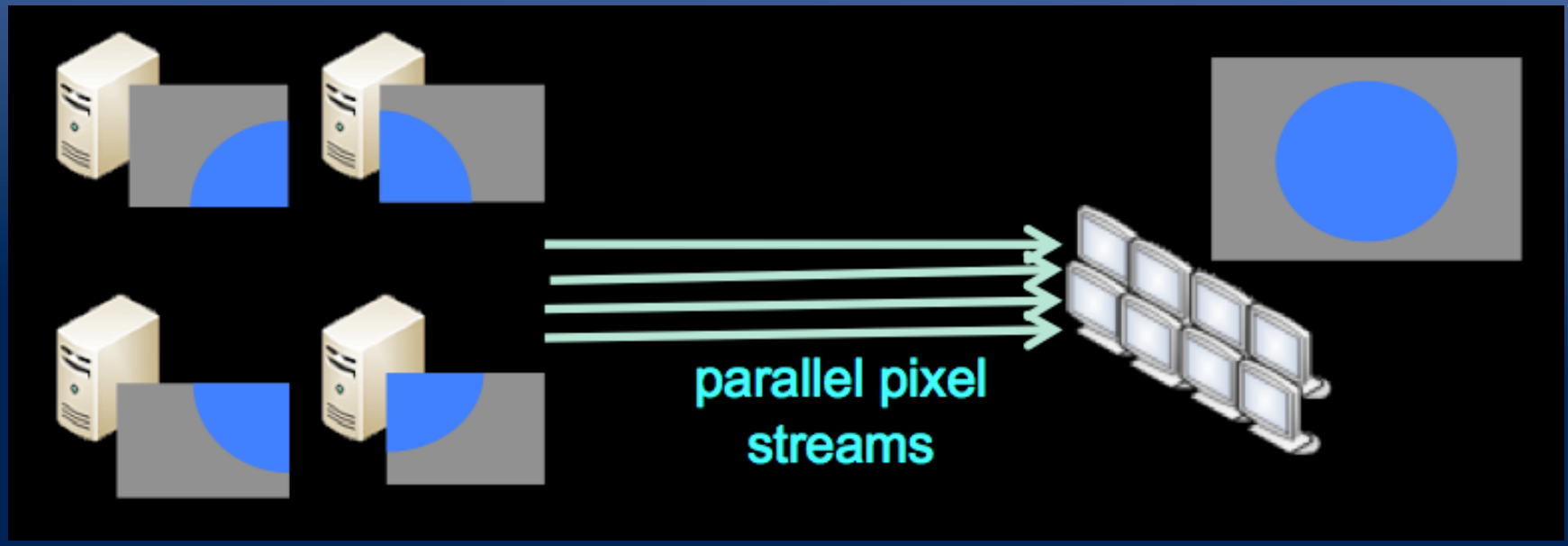
- ParaView
  - Well fit to the cyber-infrastructure model
  - Designed for large-scale parallel visualization
- SAGE
  - Assuming ultra-speed network (at least gigabits per second)
  - High-resolution display helps scientific discovery
  - Enable remote visualization on ultra-resolution tiled display
  - Allow users to juxtapose multiple high-resolution visualizations
- ParaView and SAGE integration
  - Enable remote visualization of multiple large-scale data-sets in ultra-resolution display environments

ParaView Integration



- ParaView servers visualize large-scale data in parallel
- Resulting imagery generated on each server is composited and streamed as a single image to the client (ParaView only)
- SAGE interface captures the pixel data from each server and streams in parallel

ParaView Integration



- ParaView tiled-display mode
  - ParaView servers do sort-last rendering and compositing for each tile
- Integrated inside “vtkIceTRenderManager” class
  - IceT compositing library
  - Minimal changes
  - Get tilling info, copy pixels, pass buffer to SAGE

Paraview Video

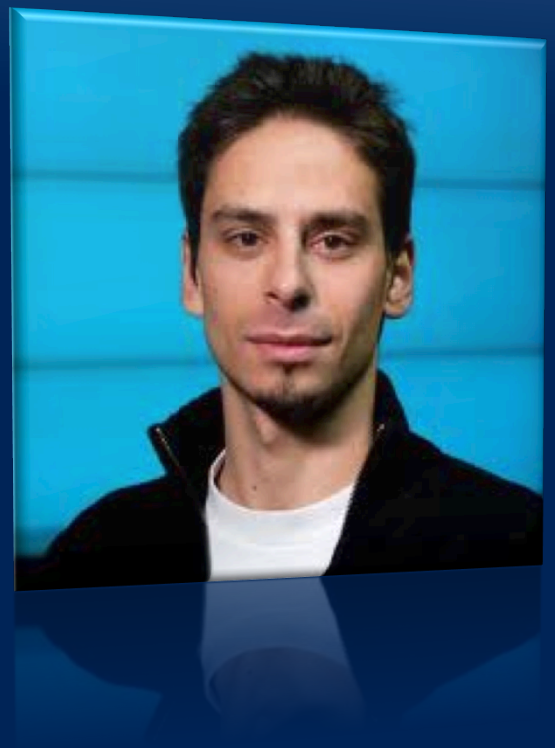
Paraview–SAGE Integration

July 2010





Designing Usable Wall Display Environments



Ratko Jagodic

Graduate *Research Assistant*

Electronic Visualization Lab,

University of Illinois at Chicago

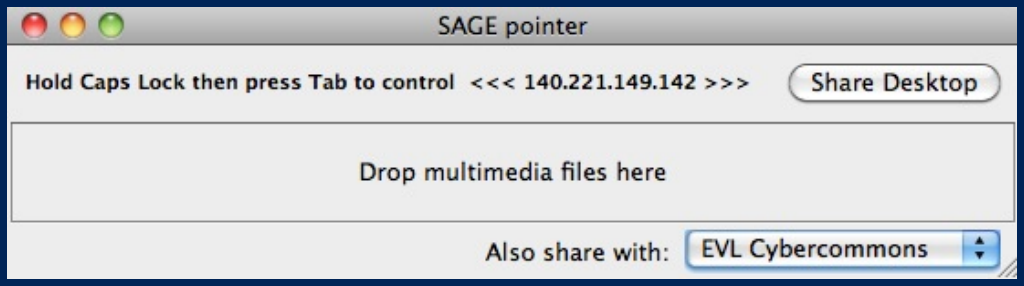
Designing Usable Wall Display Environments

- 50+ SAGE walls
- At EVL
  - 2 SAGE walls
  - Used for 4 years
  - Use cases:
    - Classrooms, meetings (local and remote), presentations, demonstrations
- SAGE displays transformed every use case!
- What have we learned from this?
- How to design for user experience?



Number of Users

- Give control to everybody!
- Devices: Touch, Gyromouse, Laptop, Apple trackpad
- 1 user
  - Touch (PQ Labs)
- Few users
  - Touch, Gyromouse
- Many users
  - Laptops
  - Come and go… no need to pass controllers around



stics



han high-rez

(text!)

- Versatility (Tile M
- *Reachable* areas
- *Visible* areas for



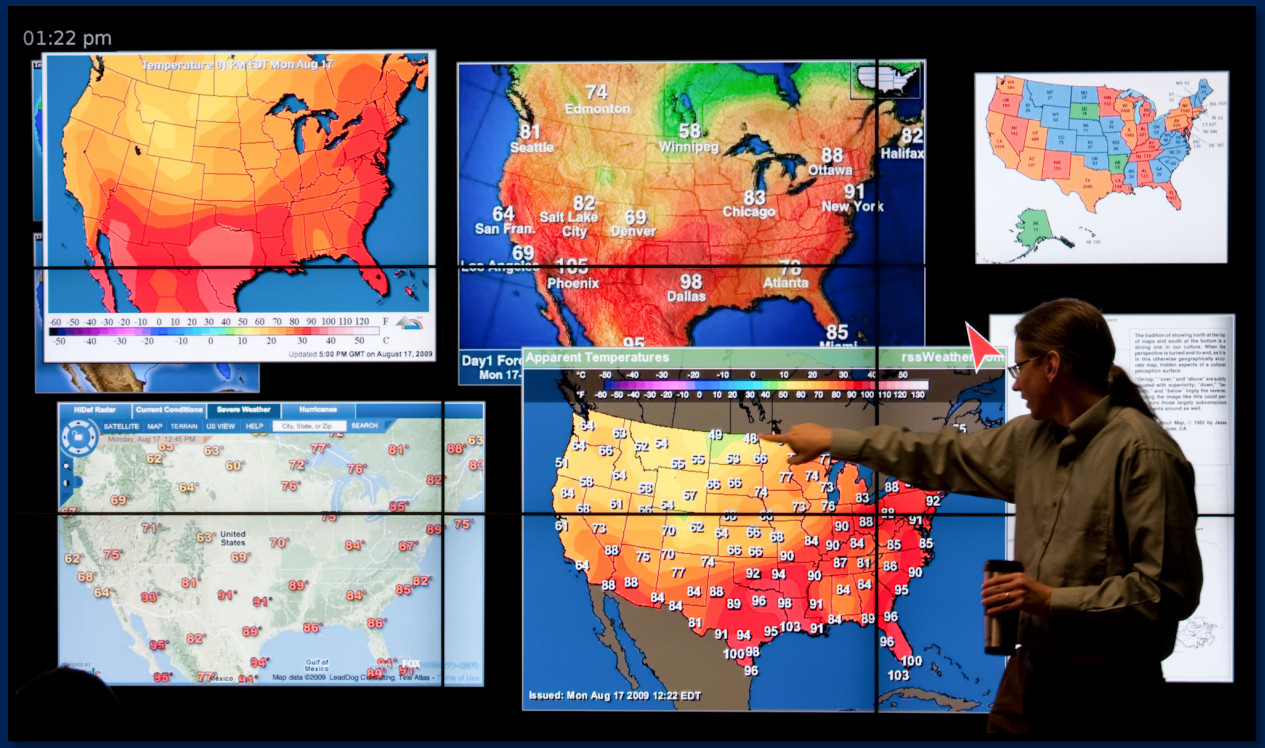
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Display Size

- Resolution vs. size vs. bezels
- Reality: budget driven
- Thin-bezel may be more useful than high-rez (text!)
- Versatility (Tile Matrix of NEC screens)
- *Reachable* areas for touch screen
- *Visible* areas for larger audiences

Distance from Display

- Up-close - mobility
  - Touch screen
  - Better for detail, localized interaction
  - But tiring for longer work



www.sagecommons.org

Distance from Display

- Walking - mobility
  - Gyromouse / Touch
  - Standing but no need to walk back and forth with Gyromouse
  - Less intuitive



Distance from Display

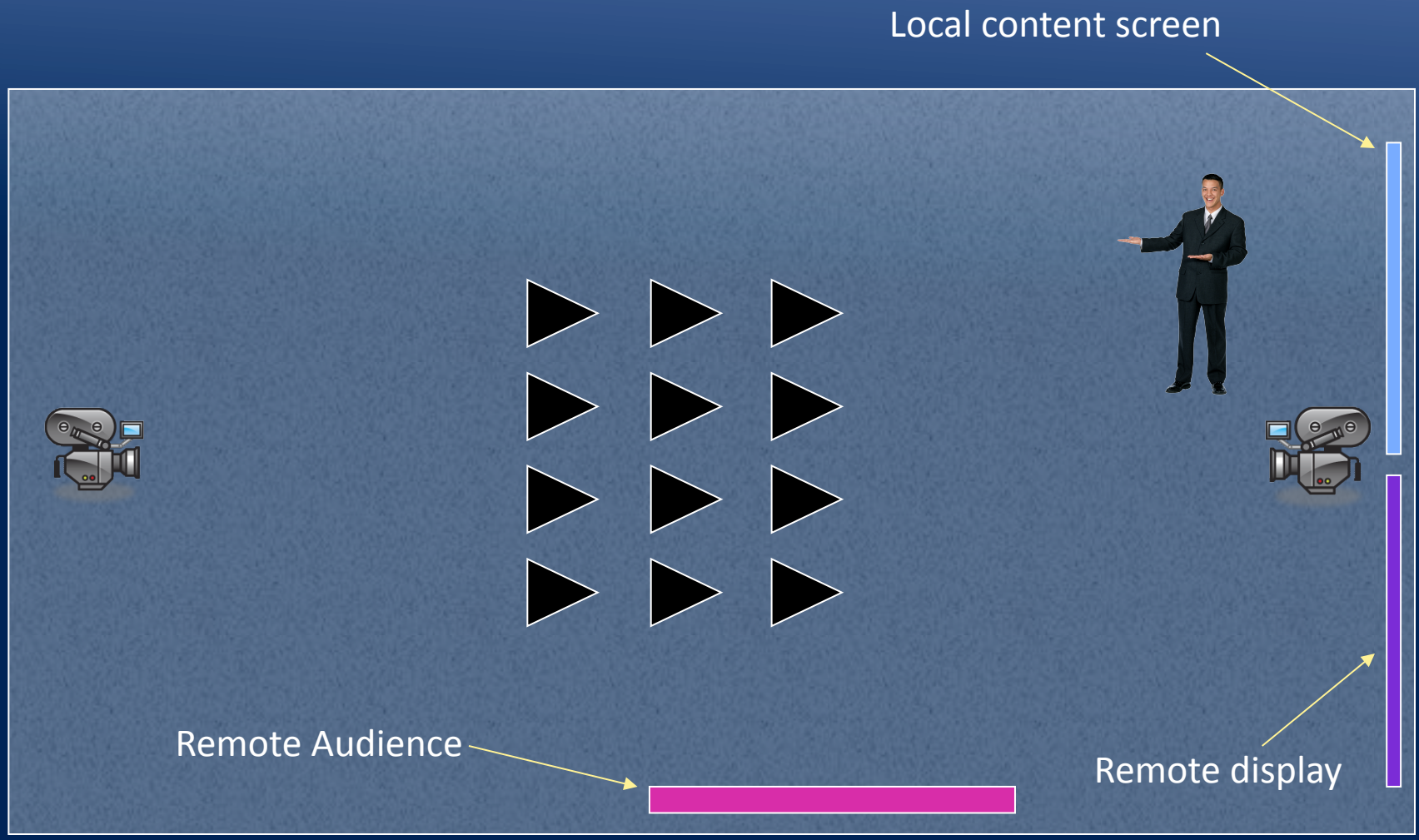
- Sitting - comfort
  - Laptop
  - Better for context
  - Comfortable, personal, private vs. public



Videoconferencing

- Lifesize/Polycom -> HD capture card -> SAGE
- Camera placement
- Remote site display placement
- Microphones
  - Who needs to hear what?

Remote Instruction Example



SAGE @ EVL

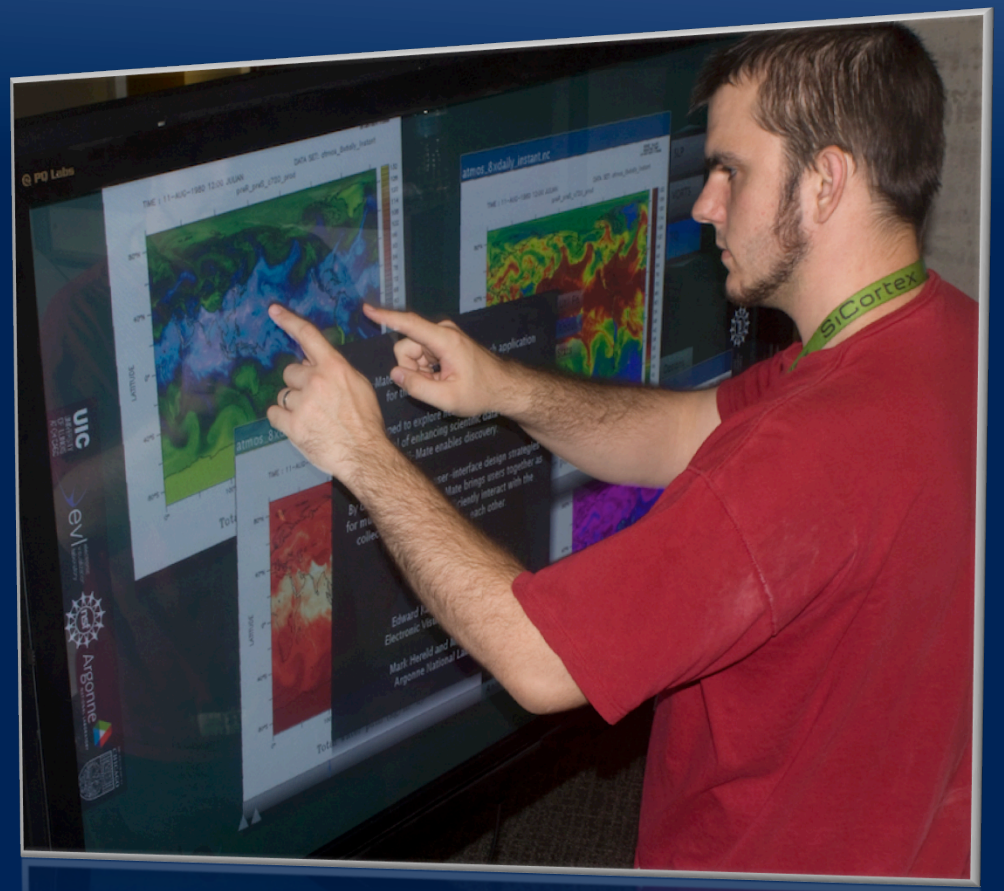


SAGE @ Argonne by Hyejung Hur (EVL)



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One More Thing…

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SAGE*NEXT*

- Leverages trend toward single node multi-processing for greater affordability, reliability & lower maintenance
- Enables Cloud Applications – E.g. Google Services
- Custom Native Applications
- Compatible with previous SAGE Streaming Applications
- Full open source
- Beta release SC 2011

Thank You! For Your Participation!

