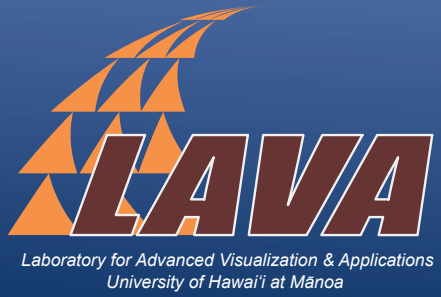
Birds of a Feather Meeting
2014

www.sagecommons.org



Laboratory for Advanced Visualization & Applications

University of Hawai‘i at Mānoa

Electronic Visualization Laboratory

University of Illinois at Chicago

SAGE BOF 2014

www.sagecommons.org

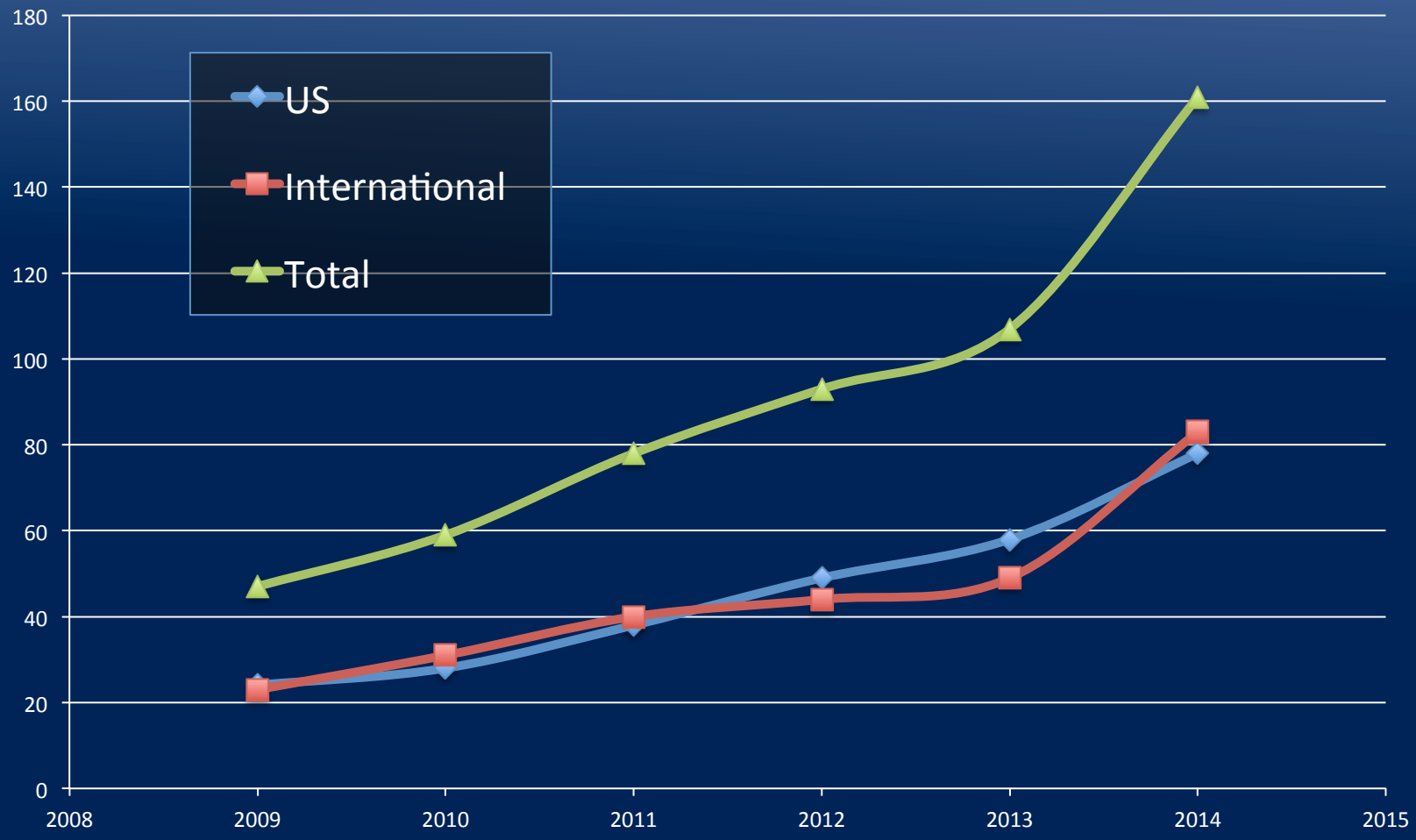
What is SAGE?

- SAGE – Scalable Adaptive Graphics Environment
- Operating System software for organizing visualizations and information on scalable display walls to help researchers deal with problems of scale and complexity in their data.
- Specializes in streaming visualizations from remote rendering servers / supercomputers.

Funding

- Began with NSF ITR (OptIPuter) grant in 2002.
- Supported with NSF STCI grant 2009-2013.
- New support with NSF SI2-SSI grant 2013-2018.
- Additional support from NTT Network Innovation Laboratories, Argonne National Lab, King Abdullah University for Science and Technology, Sharp Lab of America and Monsanto Research.

SAGE Sites from 2009-2014



SAGE User Community

107 Sites in 2013 (58 U.S. and 49 International)

161 in 2014 (78 U.S. and 83 International)

SAGE User Sites 2014 (161 = 83 international + 78 U.S.)

Argentina
National Technological University

Australia
AARNet
Australian National University
CSIRO Discovery Center
CSIRO Info & Comm Tech, Marsfield
Monash University – Caulfield
Monash University – Clayton
Monash University – Clayton, CAVE2
RMIT University, AICAUSE VITELab
Swinburne Univ. of Technology
University of Melbourne
University of Queensland, RCC
University of Queensland, RDSI DaSh

Belgium
Image Matters
Katholieke Universiteit Leuven, IBBT

Brazil
Bahiana Medical School
Fluminense Federal University
Mackenzie University
National Institute for Space Research
Paraíba Federal University, LAViD
RNP (Brazilian R&E Network)
Santa Izabel Hospital
University of Sao Paulo, LARC
University of Sao Paulo, LASSU (2)

Canada
CANARIE
Ciena Networks (2)
Communications Research Centre
Simon Fraser University

China
Beihang University
Chinese Academy of Sciences, CNIC
Univ of Science and Technology China

Colombia
Comp Biology and Bioinformatics Center

Czech Republic
Acision
CESNET
Comprimato Systems
Czech Technical Univ in Prague
Masaryk Univ, Institute of Computer Science (2)

France
Consultant for IT and Services

Germany
Bonn-Rhein-Sieg Univ Applied Sciences
Braunschweig Univ of Technology

Guatemala
Universidad Francisco Marroquín

India
Monsanto Research Centre

Italy
University of Urbino "Carlo Bo"

Japan
Cybernet Systems Co., Inc.
Knowledge Capital, VisLab Osaka (2)
Kyoto University
Nat'l Institute of Adv. Industrial Science and Technology (AIST)
National Institute of Information and Communications Technology (NICT) (4)
NTT Advanced Technologies Corp
NTT Network Innovation Labs, Yokosuka
Osaka University, CyberMedia Center
University of Electro-Communications

Korea
Gwangju Institute of Science & Tech
KISTI

Malaysia
Telecom Malaysia R&D

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

Netherlands
SURFsara
SURFsara Collaboratorium
University of Amsterdam (2)

New Zealand
REANNZ
Univ of Auckland, Centre for e-Research
Victoria University of Wellington

Poland
Poznan Supercomputing Center

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

Saudi Arabia
King Abdullah Univ for Science & Tech

South Africa
SAP (2)

Switzerland
Alkol Biotech

Taiwan
- National Center for High-performance Computing (NCHC)
- National Central University, GeoComputing Laboratory

Turkey
HAVELSAN

United Kingdom
Imperial College London, Data Science
Newcastle upon Tyne

Vietnam
ITC

United States
A.E. Wood and Associates
Adler Planetarium & Astronomy Museum
Argonne National Laboratory, Center for Nanoscale Materials (2)
Argonne National Laboratory, Math and Computer Science
Argonne National Laboratory, Transportation Research and Analysis Computing Center
Calit2/UC Irvine
Calit2-QI/UC San Diego (7)
Casa Familiar
Case Western Reserve University, Kelvin Smith Library
Extreme Networks
Florida International University, CIARA
Freedom National Insurance Company
Gearbox Software
Hadron Industries, Inc.
Internet2
Jacobs ESSSA Group (Eng & Science Services and Skills Augmentation)
Lakota Technical Solutions Inc
Louisiana State University, Center for Computation and Technology
Lucasfilm, Information Technology
Marquette University
Michigan Technological Univ.
Monsanto (3)
NASA Ames Research Center, Lunar Science Institute
NASA Goddard Space Flight Center, Space Visualization Studio
NASA Marshall Space Flight Center
Naval Postgraduate School (7)
Northwestern University, iCAIR
Purdue University, Envision Center for Data Perceptualization
PwC Emerging Tech Lab (3)
Rincon Research Corporation
Rochester Institute of Technology
San Diego Supercomputer Center
Sharp Laboratories of America
South Metro Career Center
Texas A&M University, Computer Science
University of Arkansas at Little Rock, Emerging Analytics Center
University of Buffalo, NYSCEDII
Univ California Davis, Institute for Ultra-Scale Visualization
Univ California San Diego, NCMIR
Univ California San Diego, SIO
Univ. of Hawai'i at Manoa, C-MORE (2)
Univ. of Hawai'i at Manoa, LAVA
University of Illinois at Chicago (UIC), ACM Student Chapter
UIC, Electronic Visualization Lab (EVL), CAVE2
UIC, EVL, Cyber-Commons 3D
UIC Graham Clinical Performance Center
UIC Innovation Center
UIC Ophthalmology Dept (2)
UIC Pathology Department
UIUC National Center for Supercomputing Applications
Univ of Michigan, Dept. of Atmospheric, Oceanic & Space Sciences
Univ of Michigan, Dig Media Commons
University of Michigan, Medical School
Univ of Michigan, School of Information
University of Texas at Austin, Texas Advanced Computing Center (TACC)
University of Washington
USGS Earth Resources Observation and Science
Vadiza, Inc.
Zoom Digital Signage

SAGE2

Scalable Amplified Group Environment


JS

Scalable Adaptive Graphics Environment

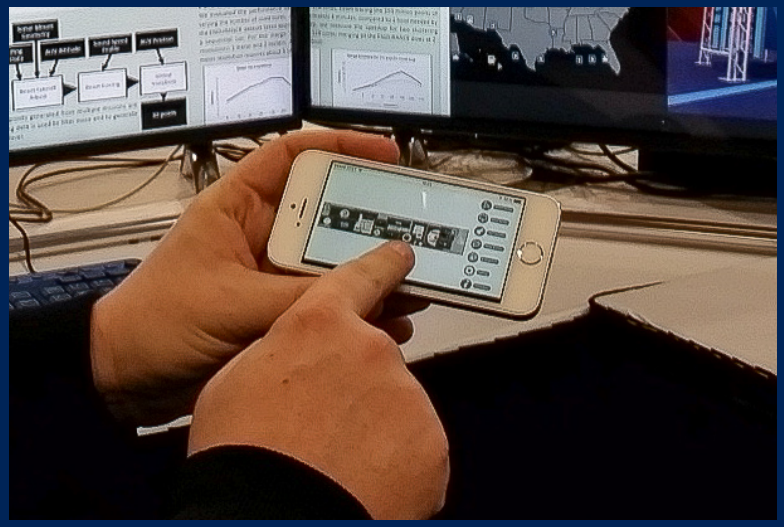
What You Just Saw

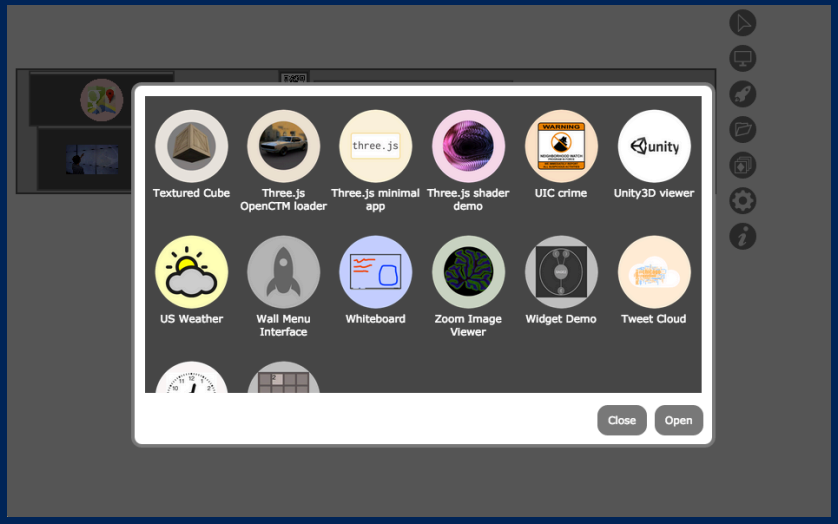
New Interface

- Display Wall, Desktop, and Mobile interface
- Radial Menu - open anywhere interface

Launching Media and Applications

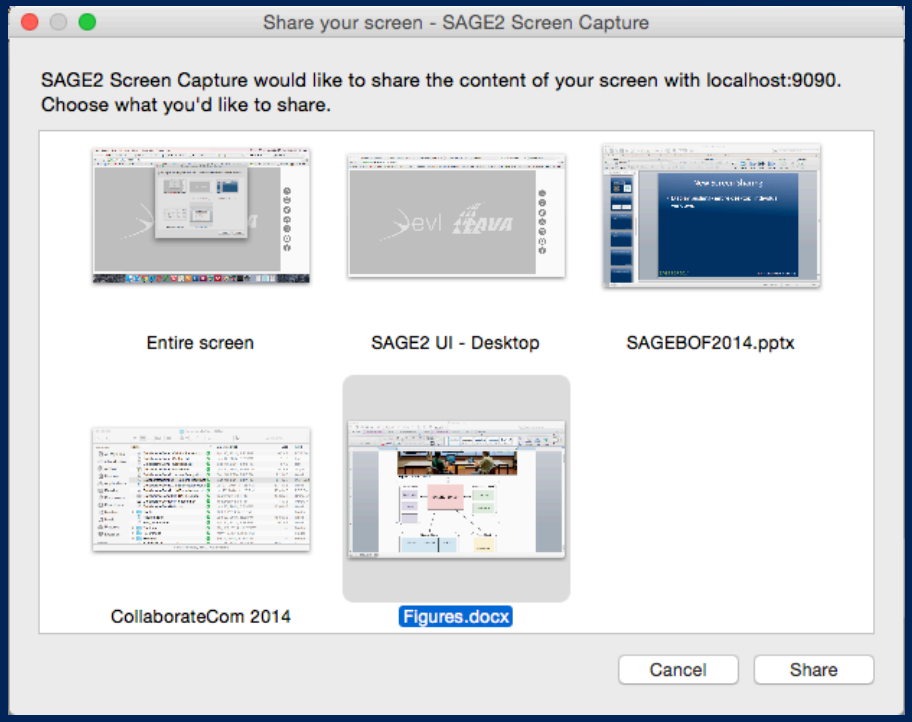
- Application and Media browser
- Drag and Drop documents
- Also via phones and tablets
  - Access photo library and camera





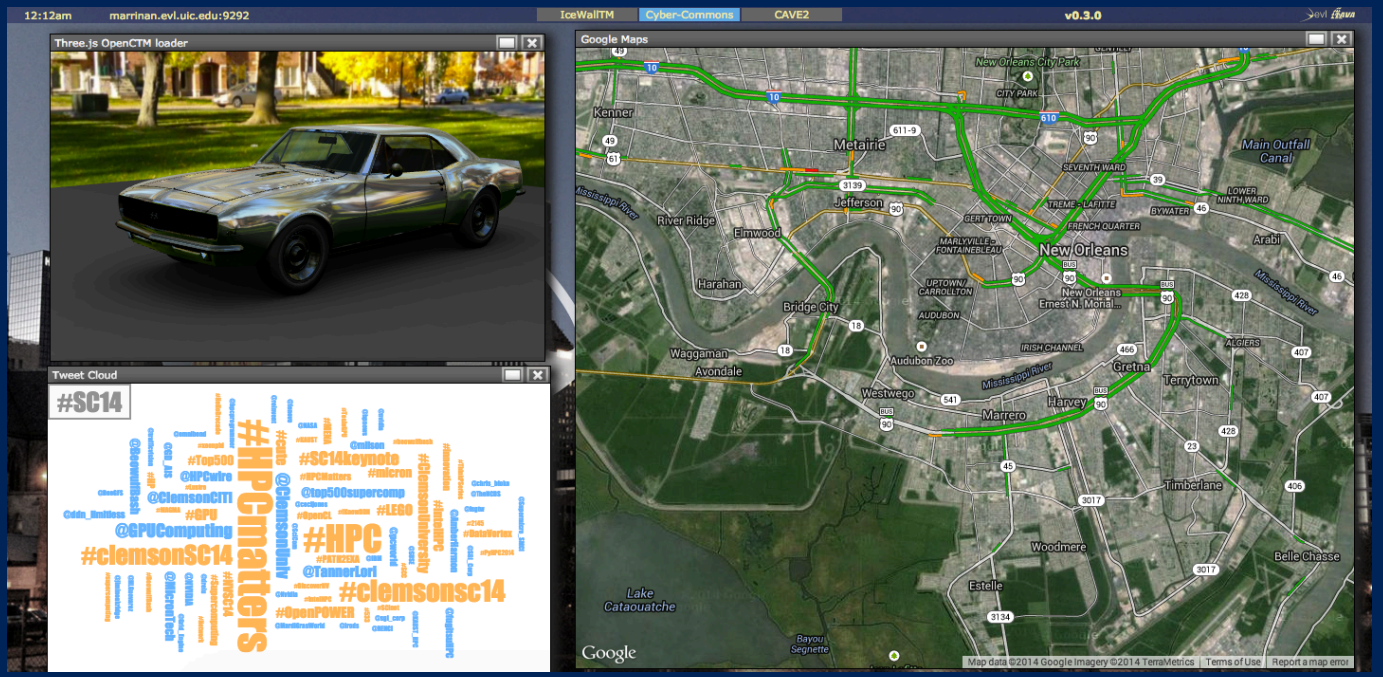
New Screen Sharing

- Display pushing
- Entire desktop
- Individual windows
- Dynamic stream quality



Custom JavaScript Apps

- Maps viewer (Google, Modest Maps)
- Multi-res image viewer
- D3
- Three.js/WebGL
- REST API (eg. Twitter)

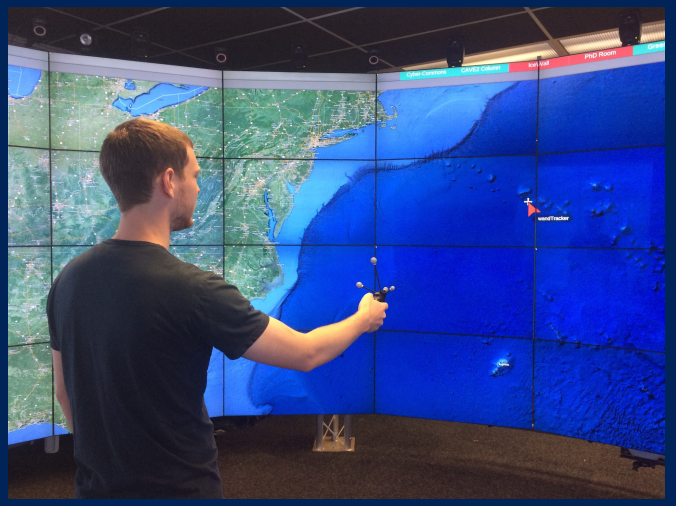


New Distance Collaboration Features

- Content sharing
  - Documents
  - Desktop sharing
  - Applications
- Mirroring
  - Access a remote display by URL

Cluster Mode

- Cluster mode is driven by multiple web browsers
  - Full screen with a separate index
- Synchronized through the SAGE2 server
  - Draw calls
  - Application states
  - Event pushing
  - Audio/video synchronization



SAGE2 Architecture


JS


node
JS


HTML
5


Web RTC

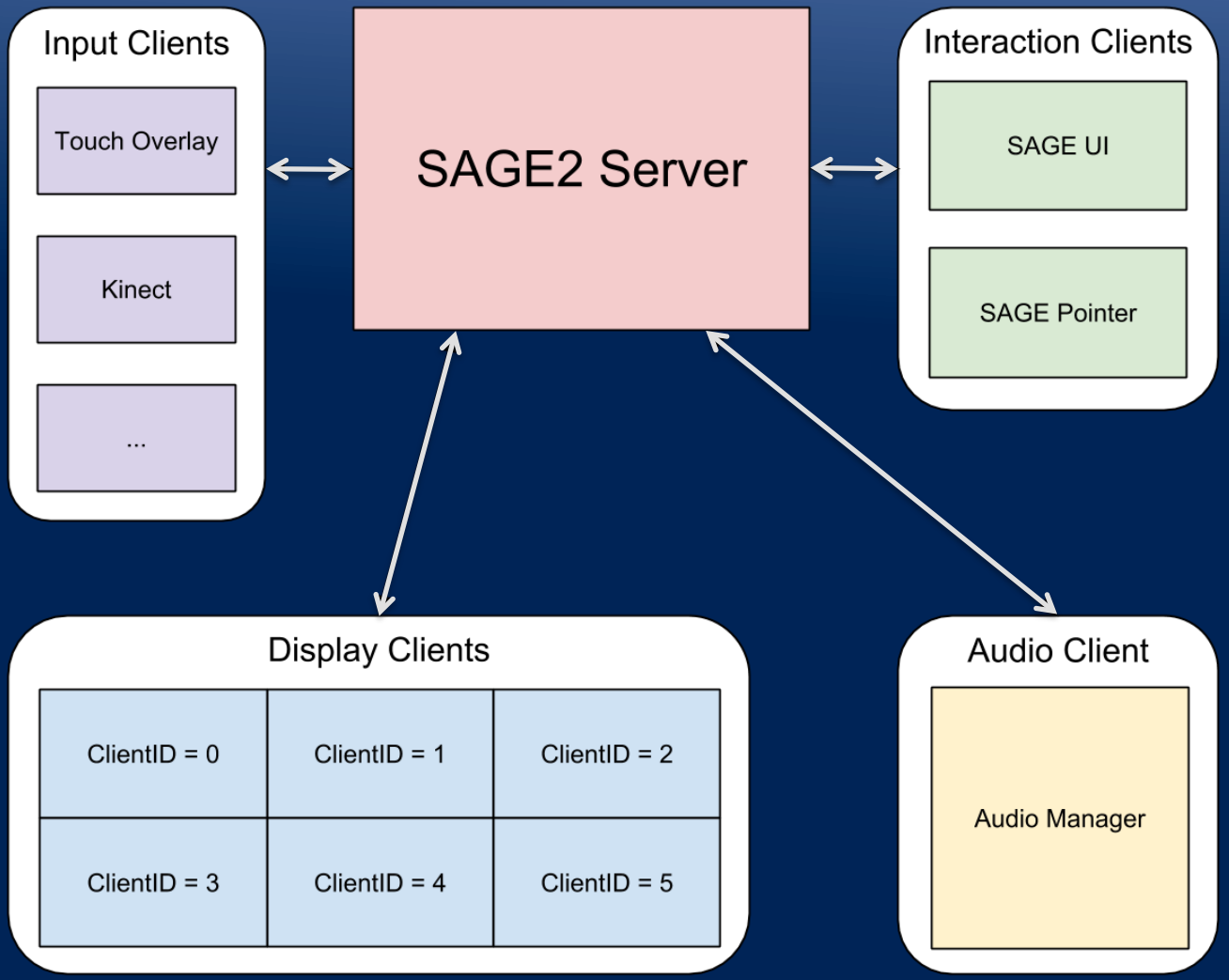

WebGL

...

Architecture

- Web Server and Web Browsers
  - New web features provide access to high performance graphics and networking
  - Customized web server is “core” of SAGE2
  - Browsers act as clients for rendering and interaction
  - HTTPS and Secure Websockets
  - High performance networking
    - Tested with 10Gigabit HD RGB streaming

Architecture



Beta Release: Nov. 24, 2014

- Site:
  - **sagecommons.org**
- Packages
  - Windows 64bit (7 / 8)
  - Mac OSX Yosemite 64bit
  - Linux openSUSE 13.x
- Single node system
  - Cluster beta release at later date

Beta Release

- Feedback
  - Sharing
  - User interface
  - Bugs
- Developers
  - Starting to develop apps
  - API feedback

Steps

1. Start here:
   http://sagecommons.org
2. Report a problem? Go to Issue Tracker:
   https://bitbucket.org/sage2/sage2/issues
3. For the Code:
   https://bitbucket.org/sage2/sage2
4. The Wiki:
   https://bitbucket.org/sage2/sage2/wiki

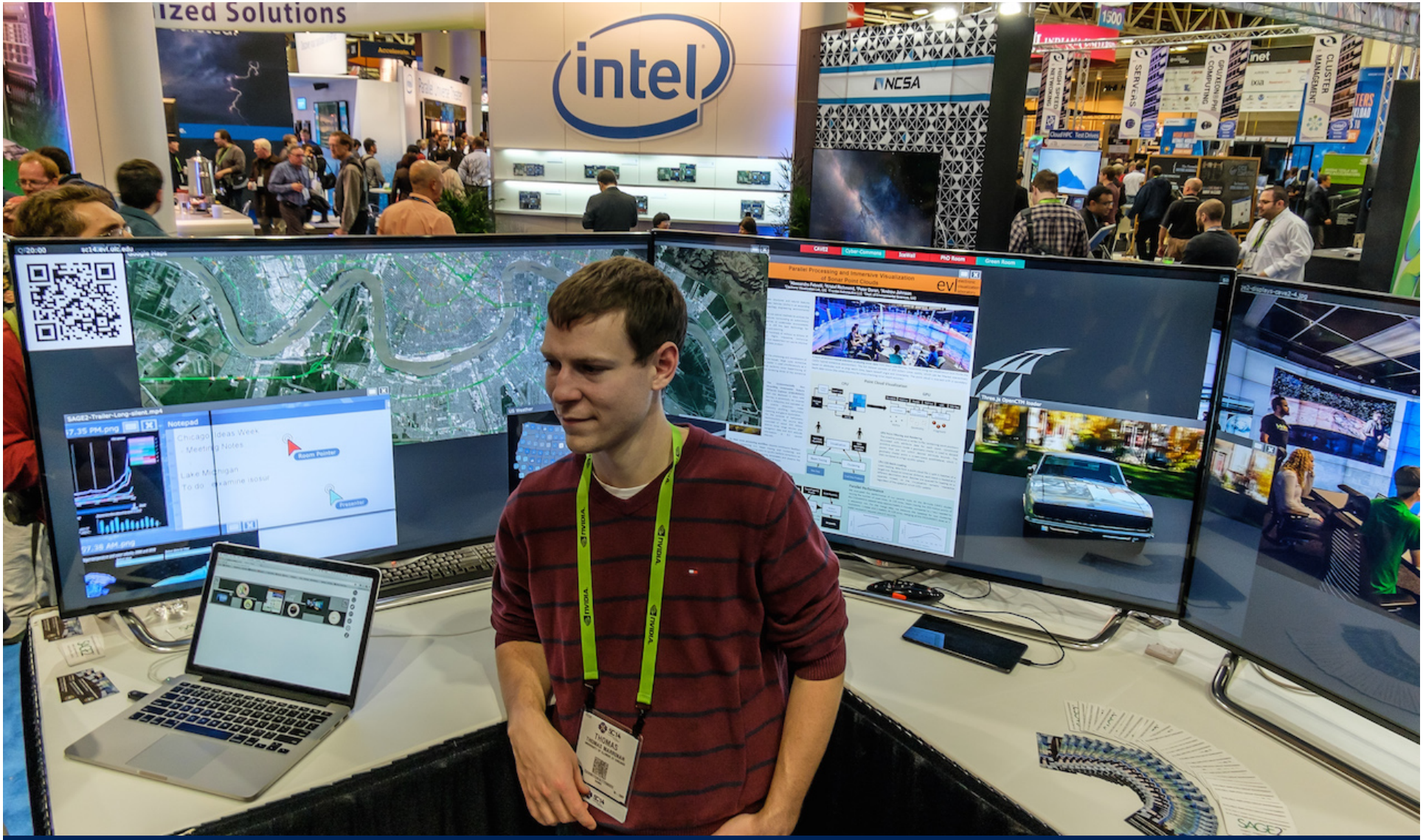
Recommended Hardware

- Single desktop PC
  - Mid-range GPU
  - >= 16GB of RAM
- Windows, Mac, Linux
- A few 4K monitors
  - ~50” TVs
  - Large 84” monitors
- Tablet

At the booth

- 3x 4K screens at $1,300 (LG TVs)
- $2,500 small gaming PC with new GPU
  - HDMI2.0 with NVIDIA GeForce 980
- **$6,500 total**

➢ 25 Mpixels on your desk



NCSA Booth 1621

SAGE BOF 2014

www.sagecommons.org

Thank You

Please Evaluate this BOF

http://bit.ly/sc14-eval

Architecture

- SAGE2 Server
  - Built upon Node.js
  - Hosts web content
  - Creates WebSocket server for persistent communication
- Display Clients
  - Full screen web browsers
  - Unique ID to determine position in tiled wall grid

** Can be run by one or multiple machines each connected to one or multiple monitors*

Architecture

- Interaction Clients
  - Accessed from personal devices (visit URL)
  - View overview of content on SAGE2 display
  - Upload new content to SAGE2
  - Move and resize content on SAGE2 display
  - Interact within application on SAGE2 display

** Multiple users can utilize their personal devices to interact with SAGE2 simultaneously by streaming keyboard, mouse, or touch events*