Laboratory for Advanced Visualization & Applications
University of Hawaiʻi at Mānoa
Jason Leigh, Dylan Kobayashi

Electronic Visualization Laboratory
University of Illinois at Chicago
Maxine Brown, Luc Renambot, Lance Long, Tommy Marrinan, Arthur Nishimoto, Krishna Bharadwaj
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.
• Academy for Creative Media, University of Hawaii system
What is SAGE2?

SCALABLE AMPLIFIED GROUP ENVIRONMENT
# SAGE2 User Community 2015

## 55 Sites: 32 International + 23 National

### AUSTRALIA
- RMIT, (VX)Lab
- University of the Sunshine Coast, Mechanical Engineering (3)
- University Southern Queensland

### BRAZIL
- Federal University Paraíba, LAViD
- Federal University of Rio Grande do Sul, PRAV
- Mackenzie University, LabCine
- National Institute of Space Research
- RNP, Rio de Janeiro (2)
- University of Campinas, Cinema
- University of Sao Paulo, LARC
- University of Sao Paulo, LASSU (2)

### CANADA
- Ciena Research Labs
- Simon Fraser University, IRMACS

### CZECH REPUBLIC
- CESNET and Czech Technical University, SAGelab
- CESNET, Mobile SAGE
- Masaryk University, Cyber Exercise & Research Platform Project
- Masaryk University, Laboratory of Adv. Networking Technologies (2)

### ITALY and SWITZERLAND
- University Urbino and ETH Zürich

### JAPAN
- NTT Network Innovation Laboratories, Yokosuka
- Osaka Univ., Cyber Media Center

### KOREA
- Gwangju Institute of Science & Technology, Networked Computing Systems Lab

### NETHERLANDS
- SURFsara, Scientific Visualization Group, Collaboratorium
- University of Amsterdam, SNE

### NEW ZEALAND
- REANZ

### SOUTH AFRICA
- University of Cape Town, Informatics and Visualisation Laboratory

### TAIWAN
- National Center for High-performance Computing

### UNITED KINGDOM
- Imperial College London, Data Science Institute

### UNITED STATES
- Catherine Cook School
- Digital Manufacturing and Design Innovation Institute (DMDII)
- Jackson State University, ECE
- NASA Marshall Space Flight Center, SPoRT
- Northwestern University, iCAIR
- University of California, San Diego, Calit2-QI, VROOM
- University of Hawai’i at Mānoa, C-MORE
- University of Hawai’i Mānoa, HIGP
- University of Hawai’i Mānoa, i-LAB
- University of Hawai’i at Mānoa, LAVA (3)
- University of Hawai’i West Oahu, Academy for Creative Media
- University of Illinois at Chicago, ACM/LUG Student Chapters
- University of Illinois at Chicago, EVL (5)
- University of Illinois at Chicago, Ophthalmology
- University of Illinois at Chicago, Pathology (2)
- University of Illinois at Urbana-Champaign, NCSA

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**SAGE BOF 2015**

[www.sagecommons.org](http://www.sagecommons.org)
SAGE2 User Community 2015

• From November 2014
• 890 binary downloads
• Not counting sources download
• 32 registered developers
  – bitbucket.org/sage2
• 143 forum members
  – https://groups.google.com/forum/#!forum/sage2

- Windows 63%
- Linux 20%
- MacOS 17%
## SAGE2 User Sites Examples

### International

<table>
<thead>
<tr>
<th>Location</th>
<th>Site Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUSTRALIA, RMIT</td>
<td>Virtual Experiences (VX) Lab</td>
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<tr>
<td>BRAZIL, Mackenzie University, LabCine</td>
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<td>NEW ZEALAND, REANNZ</td>
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<tr>
<td>SOUTH AFRICA, Univ. Cape Town, Informatics and Visualisation Laboratory</td>
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<tr>
<td>TAIWAN, National Center for High-performance Computing (NCHC)</td>
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<td>National Sites Examples</td>
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<tr>
<td>USA, Catherine Cook School</td>
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<tr>
<td>USA, Digital Mfg &amp; Design Innovation Institute</td>
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<td>USA, Jackson State University, ECE</td>
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</tr>
</tbody>
</table>
Koʻolau
Koʻolau • NEW Features

• Installer – all-in-one for Windows (add Chrome & stir)
• Easy Launcher – web interface, meeting participation id
• Shared application synchronization
• Improved WebGL support
• 3D image support
• Automatic user-interface resizing for wall size (beta)
Koʻolau Features

- Client Interface
  - File manager
  - Mobile
Koʻolau Features

• Asset management
  – Multiple asset folders
  – Compatibility with Cloud providers - generally any folder-based synchronization technology

Dropbox

Google Drive
Documentation

- Manuals
  - Installation
  - Configuration
  - App. Developer
- Videos
  - How-to videos created by NSF REU students in Hawaii
Starting and Connecting to Sage
Use Cases

• Clinical Informatics
• RNP and Universities
• Ciena Vector Summit
• Osaka University
• CESNET SAGElab
Clinical Informatics (CI) – Virtual Case Conference
Bruce Levy and John Manning, UIC Pathology

• National online conference
  – 13 CI fellowship programs (from CA to MA)
  – 50 attendees (fellows + faculty)

• Format
  – SAGE2 Wall
  – Hangouts on Air
  – YouTube video (private link)

Courtesy John Manning
Clinical Informatics (CI) – Virtual Case Conference
Bruce Levy and John Manning, UIC Pathology

SAGE2 Wall

Hangouts “on Air”

Attendees (if > 15 users, extras see YouTube video)
Clinical Informatics (CI) – Virtual Case Conference
Bruce Levy and John Manning, UIC Pathology

Analysis of Patient Care Workflows
Virtual Case Conference #1

Host:
University of Illinois
Hospital & Health Sciences System
Changing medicine. For good.

Presentation
Google Docs (users type ?’s)
Misc

SAGE BOF 2015
www.sagecommons.org
Technical people from all Brazilian SAGE sites learn to install and configure SAGE2. Each “student” brought a hard drive from their SAGE2 server, which was placed in a machine of equal specification.
Using ExoGENI/SDN technologies, a single slice was provisioned on the UvA ExoGENI rack, where a slice is defined as a virtual machine (VM) interconnected via a dedicated private network and accessible from a public internet address – the VM ran the SAGE2 server. Ciena participants could open a Chrome browser on their laptops to the public address of the VM and drag and drop content or share their desktop to the tiled display, in addition to manipulate content already on the display, all through the SAGE2 server in Amsterdam.
Osaka University
PRAGMA 28 (Osaka) SAGE2 Presentations – April 2015

SAGE2 used in several demonstrations by Osaka University: disaster mitigation by real-time analysis of TSUNAMI using federated supercomputers, meteorological big data visualizations, and a collaborative demo with NCHC, Taiwan.

Thank you very much for SAGE2. Easy to install. Easy to use. Awesome desu!
Osaka University and Tohoku University
Remote Lectures Using SAGE2 to Share Slides and Video – Aug 2015

Courtesy Shinji Shimojo
SAGE lab: CESNET, Czech Republic
GLIF Meeting, Prague – September 2015

SAGElab
Network Visualization Laboratory

8K+ large-scale LCD wall
(8600 x 4520 pixels)
High-speed network connection
(20+ Gbit)
Interconnection with computing and storage facilities of CESNET e-infrastructure
Driven by the SAGE/SAGE2 system for flexible use by multiple concurrent applications
Available for students, teachers, and researchers for projects, R&D and courses in visualizations, computer networks, advanced applications in science, engineering, culture, and humanities
Events for public Graphical Thursdays, Open Days, Nights of Science, etc.

Joint Laboratory of CESNET, CTU FIT, CTU FEL

SAGE BOF 2015

Courtesy Maxine Brown

www.sagecommons.org
Future Plans

• Application repository for contributors
• Domain-specific tools
  – Bioinformatics: BioJs, CytoScape, Emperor, ...
  – Chemistry: ChemDoodle, ...
  – Geoscience: cesiumjs, webglearth, openLayers, ...
  – Information: D3, NVD3, C3, JIIT, ...
  – Scientific: ParaviewWeb, IPython, Jupyter, ...
  – Network: perfSonar, vis.js, ...
• Shared portals (currently beta)
• Post-it and annotations (currently beta)
• Collaborative whiteboard (alpha)
Emperor Integration (in progress)
UC San Diego, Calit2-QI

- Emperor is an interactive next-generation tool for the analysis, visualization and understanding of high-throughput microbial ecology datasets.
- Its tailor-made graphical user interface makes it easy to delve into a new dataset to elucidate patterns hidden in the data.
- Python with Web output using WebGL and HTML user interface.
CESNET and Czech Technical Univ, Czech Republic
SAGE2 Extension for Mobile Devices – In Development

SAGE BOF 2015
Developed by Jiri Kubista
www.sagecommons.org
Whiteboard Application
University of Illinois at Chicago – Class Project

SAGE BOF 2015

www.sagecommons.org
And more to come ...

- **Open-Scenegraph JS**: Garry Keltie, Australia
- **Better WebGL**: Garry Keltie
- **VNC**: Michal Hečko (Czech), Ian Peake, RMIT- Australia
- **Scripted images**: Bernard Meade, University of Melbourne
- **Content Espresso Media Distribution**: Daisuke Ando, Keio U
- **RemoCop collaboration**: Daisuke Shirai, NTT Network Innovation Lab
- **Stereo 3D graphics**: Simon Orsborn, University of the Sunshine Coast
- **Birch Aquarium**: Joe Keefe, UCSD
- **Network monitoring and visualization**: John Graham at UCSD
Wall Construction Guides

• Small
  – Laptop, RaspberryPI, Nvidia TX1
  – Node.js popular on IoT platforms
  – Anything with a decent browser
    • Limitation: memory
Wall Construction Guides

- Medium
  - Cyber-Commons
  - CyberCANOEs

- Single Gaming PC
  - Several screens
Wall Construction Guides

• Large
  – LAVA
  – CAVE2

• Many screens
• Cluster might be required
Wall Construction Guides


Upgrading EVL’s 18-screen wall to a single PC

This summer, EVL updated their classroom wall computer. Here is a short report about it (PDF version: single-pc-report).

SAGE2 on a 18-screen display with one PC

Luc RENAMBOT and Lance LONG
Come see Koʻolau on Showfloor - NCSA
Booth 1733
2 x 65” 4K OLED Displays
Meanwhile in Cees de Laat’s hotel room...

Cees, je bent zo'n geek!

Cees’ wife, Emelie