

# CyberCANOE and SAGE2

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# Goals

- Introduction to Immersive Visualization
- Introduction to CyberCANOE hardware
- Interactive Session on SAGE2 usage
- Reflecting on how CyberCANOEs & SAGE2 can be applied in your organization

## CyberCANOE:

# Cyber-enabled Collaboration Analysis Navigation & Observation Environment



The Canoe is the Island, The Island is the Canoe



CyberCANOEes allow users to come to decisions with greater speed, accuracy, comprehensiveness & confidence

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# CyberCANOE

## (aka Scalable Resolution Shared Displays)

- Digital “lens” to big data
  - Ultra high-resolution display
  - Visualize large volumes of data
  - Collaborative environment
- Scalable Amplified Group Environment (SAGE) created in 2004
  - SAGE2 rewritten in 2014 leveraging on web browser and cloud technologies
  - Open-source middleware
    - Provides multiple users with a common operating environment
    - Access, display, and share heterogeneous, data intensive information
- Different from current video conferencing applications
  - WebEx, GotoMeeting, Skype, Hangouts, etc.
  - Enables parallel interaction with data

# Amazing Things Happen When You Put People In Front of Big Walls

- **See detail & context** simultaneously by reducing Window switching [Czerwinski03, Ball05]
- Helps **externalize the working memory of teams** [Andrews10]
- **Increases parallel processing** amongst team members [Park03]
- Improves **location memory** of information [Tan01]
- **Reduces gender performance gap** in navigation tasks in VR [Tan03]
- Helps user **performance keep pace** with increasing data size (perceptual scalability) [Yost07]
- Results in **greater confidence in conclusions** drawn when able to see all info at once [Ball05]
- Users **begin to look for higher level patterns** & relationships (i.e. they start to look for the bigger picture) [Reda12]

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## SAGE2 User Sites 2018 (100 = 47 International + 53 U.S.)

### AUSTRALIA

- Monash University
- RMIT, (VX)Lab
- University of Sunshine Coast, Mechanical Engineering (3)
- University Southern Queensland
- University of Technology, Sydney

### BRAZIL

- Bahia School of Medicine and Public Health
- Catholic University of Salvador (UCSal)
- Federal University Paraiba, 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

### CHINA

- Chinese Academy of Forestry
- Shanghai University
- Tianjin University of Technology

### 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)
- Mavenir, Network Operations Center

### FRANCE

- INRIA, ILDA

### ITALY and SWITZERLAND

- University Urbino and ETH Zürich

### JAPAN

- National Institute of Advanced Industrial Science and Technology (AIST) (2)
- NTT Network Innovation Laboratories, Yokosuka
- Osaka University, Cyber Media Center

### KOREA

- Gwangju Institute of Science & Technology, Networked Computing Systems Lab
- KISTI, KREONET Center

### NETHERLANDS

- Air France-KLM, CIO Group Technology Office
- SURFsara, Scientific Visualization Group, Collaboratorium
- University of Amsterdam, SNE

### NEW ZEALAND

- REANNZ

### SOUTH AFRICA

- University of Cape Town, Informatics and Visualisation Laboratory

### TAIWAN

- National Center for High-performance Computing
- National Chung Hsing University
- National Museum of Marine Science and Technology

### UNITED KINGDOM

- Imperial College London, Data Science Institute

### UNITED STATES

- Adler Planetarium
- Argonne National Laboratory, ALCF
- Caterpillar Inc.
- Catherine Cook School
- Chaminade University of Honolulu (2)
- Digital Manufacturing and Design Innovation Institute (DMDII)
- Hawaii State Energy Office
- Honolulu Community College
- Jackson State University, ECE

- Kamehameha Schools
- NASA Marshall Space Flight Center, SPoRT
- NOAA, National Weather Service, OPG
- Northern Illinois University, Computer Science
- Northwestern University, iCAIR
- Stanford University, HIVE
- University of Alaska Fairbanks, DTN
- University of California, Merced, Library
- University of California, San Diego, Calit2-QI
- University of California, Santa Cruz, CITRIS/Banatao Institute
- University of Chicago, RRC
- University of Florida Gainesville, ACIS
- University of Hawai'i at Hilo (3)
- University of Hawai'i at Mānoa, Applied Rsrch Lab
- University of Hawai'i at Mānoa, Data Science Inst
- University of Hawai'i Mānoa, HIGP
- University of Hawai'i at Mānoa, Information Technology Center
- University of Hawai'i Mānoa, i-LAB
- University of Hawai'i at Mānoa, LAVA (3)
- University of Hawai'i at West Oahu, Academy for Creative Media
- University of Illinois at Chicago, ACM/LUG
- University of Illinois at Chicago, Communications
- University of Illinois at Chicago, EVL (5)
- University of Illinois at Chicago, Engineering Maker Space
- University of Illinois at Chicago, Innovation Center
- University of Illinois at Chicago, Learning Sciences
- University of Illinois at Chicago, Ophthalmology
- University of Illinois at Chicago, Pathology (2)
- University of Illinois Urbana-Champaign, NCSA
- University of Maryland, Baltimore County, ARC
- University of Oregon, Library
- University of Pennsylvania, Idea Factory
- University of St. Thomas
- University of Texas, Austin, TACC

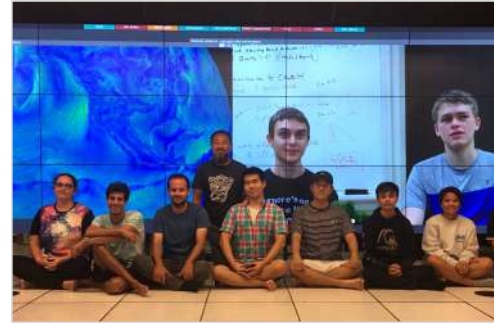
# SAGE2 User Sites 2018 Examples



JAPAN, National Institute of Advanced Industrial Science and Technology (AIST)



USA, University of Chicago



USA, University of Hawai'i at Mānoa, Data Science Institute



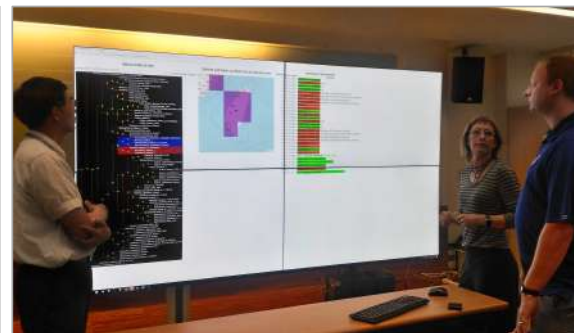
USA, Univ of California, Merced



FRANCE, INRIA, Interacting with Large Data/Human-Centered Computing (ILDA)



KOREA, KISTI, KREONET Center

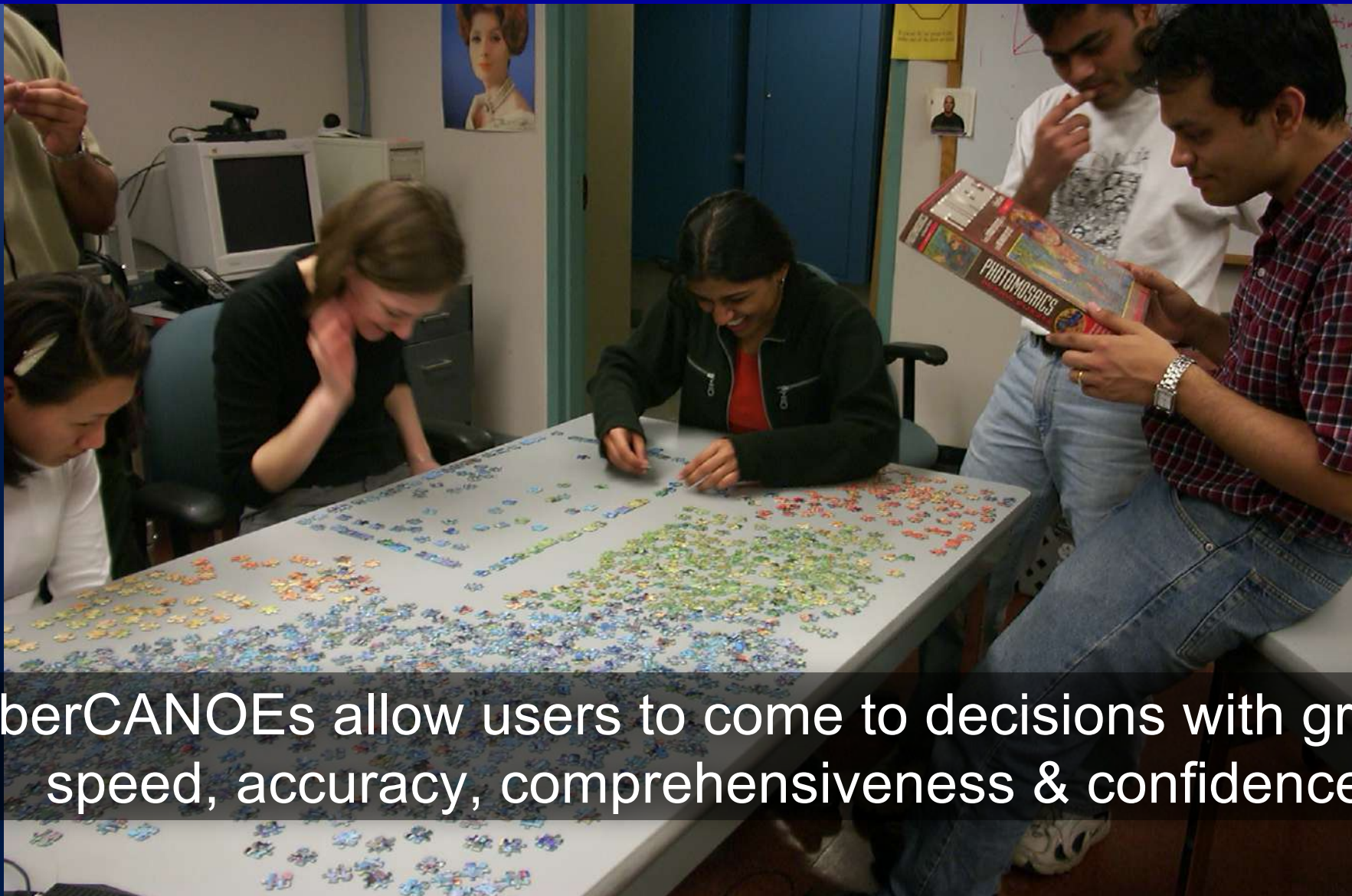


TAIWAN, National Museum of Marine Science and Technology



AUSTRALIA, Monash University





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# Videos

- SAGE2 video
  - <https://youtu.be/bcMz4vsBfN8>
- Quick User Tips for SAGE2
  - <https://youtu.be/Dn-k7wAhY-I>

## Main Types of Activities

- Brainstorming
- Classroom / Presentations
- Data Discovery/Exploration
- Collaboration (decision support systems)
- Applicable to a wide variety of domains

# CyberCANOE Hardware

- We are often asked for hardware recommendations
- Configurations are highly dependent on available space, budget, intended audiences, and usage scenarios
- The following are some examples



# CyberCANOE Hardware

- Lowest End
  - **Three 75-inch LCD TVs**
  - LG Electronics 75UJ6470 75" 4K UltraHD TV (~ \$2K each x3 = \$6K)



# CyberCANOE Hardware

- Low End
  - **Three 86-inch LCD TVs**
  - Sony XBR85X900F 85-Inch 4K TV (~\$5K each x3 = \$15K)



# CyberCANOE Hardware

- Mid End
  - **8 Small bezel LCDs**
  - Samsung UD55E-B UDE-B (~\$4K each x8 = \$32K)



# CyberCANOE Hardware

- High End
  - 12 or 18 Small bezel LCDs
  - Samsung UD55E-B UDE-B (~\$4K each x18 = \$72K)





# Additional Equipment

- PC budget is about \$5K
  - The number of graphics card and type will depend on which of the above configurations you go for
- Video Conferencing
  - Logitech Group Conferencing
  - Tripod
- Miscellaneous cables about \$500 (Amazon)
- Networking – 100Mb/s and up
- Warranty - 3 year warranty, 4 is better



## CyberCANOE Mobility

- Peerless 4x2 Display Stand  
~\$3,500
- Peerless 4x3 Display Stand  
~\$4,500



## CyberCANOE Hardware Summary

- Lowest - \$13K
  - Low - \$25K
  - Med - \$43K
  - High - \$60-100K (may need special installation)
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- Configurations are highly dependent on available space, budget, intended audiences, and usage scenarios