

## 4e – Large, Centralized Visualization Facilities

### Action Item Template Response

#### General Action Item Information

Lead Division/Office: Research Technologies

Action Item Number: 4e

Action Item Short Name: Large, Centralized Visualization Facilities

Dependencies with other EP Action Items: 4f (Distributed Visualization Facilities)

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#### OVERVIEW

Advanced visualization systems are an essential component of cyberinfrastructure, working in conjunction with high performance computing, research storage, and high performance networks to help researchers transform data into insights and knowledge. Visualization systems and the surrounding facilities and support staff are unique in that they provide technology environments that effectively support all aspects of the university's mission: research, education, creative activities, and community engagement. Over the past 12 years, IU has made strategic and fruitful investments in high-end visualization and virtual reality facilities, starting in 1997 with the CAVE at IUB and the ImmersaDesk at IUPUI, and followed by the virtual reality theater and ultra-resolution display wall, both at IUPUI, in 2004. This implementation plan looks to extend this successful trend while pushing for ever-greater levels of effectiveness, accessibility, and utility.

In addition to references in Action Item 4, other direct references to advanced visualization in EP include:

- Immersive technologies enable visualizing results in ways that afford paths to new insights. Faculty work routines move seamlessly between research and teaching activities. (Vision for Faculty and Scholarly Excellence)
- Another faculty member, a visual artist, designs on a high-resolution work surface, scaled for dimensional accuracy, and calibrated for color fidelity. This artist also requires enhanced network connectivity and bandwidth so that she can easily move and process with reduced latency the large datasets that she transmits to colleagues and external displays. (ibid)
- IU research and expertise in data informatics, advanced visualization, and networks has become more integrated with key health partners, such as Clarian Health, to improve the lives of Hoosiers.

Indirect references include:

- Application areas that have major impacts on the achievement of the university's missions related to research, creative activity, teaching, outreach, and engagement with the

community and beyond are much more likely to create paths to true leadership.

- IU scientists and research technologists provide students in primary and secondary school the opportunity to participate in authentic science learning opportunities. This engagement helps inspire students to pursue higher education and careers in science, technology, engineering, and math (STEM) in ever-greater numbers.

## **I. DESCRIBE YOUR PLANS FOR IMPLEMENTING THIS ACTION.**

Implementation of this goal requires focused activities and investments in three distinct areas: (1) facilities and hardware, (2) usability-enhancing software infrastructure, and (3) staffing and support structure to better support an ever-expanding user community. Specific activities and investments are as follows:

### **1. New facilities and hardware upgrades**

- a. Install and support a leading-edge visualization facility in the Research Commons in the Wells Library. The Bloomington campus has been without a major, central visualization facility since the CAVE was retired in 2006. The Research Commons represents an ideal opportunity and location to create a visible, accessible, and broadly utilized resource for IU's flagship campus. This facility will incorporate new ideas from both established and potential users as well as lessons learned by UITS staff in installing and supporting the first two generations of systems. Specific enhancements include: incorporating a lab of advanced workstations to enhance teaching and training opportunities, greater flexibility and more space to support a range of performances and some level of "black box" experiments, full integration of video conferencing and presentation tools to have space double as an advanced capability presentation and tele-collaboration space, and plans for evening and weekend access and staffing. (Research Technologies held a full-day faculty retreat in May 2009. The need for "black box" performance space was a strong and recurring theme among faculty in the creative and performing arts.)
- b. Upgrade facilities at IUPUI, including a new video switching system (2010) replacement for the tiled display wall (2011) and projector upgrade for the virtual reality theater (2012). These investments will keep these ICTC-based facilities at or near the leading edge through 2015.

### **2. Usability-enhancing software infrastructure and support.**

- a. Commercial software tools such as TechViz XL (from TechViz, Inc.) and Conduit (from MechDyne) allow common 3D desktop applications such as Maya, SketchUp, ArcGIS, Google Earth, Second Life, and 3D game engines to be automatically "VR-ized," thereby allowing users to realize the added benefits of immersive virtual reality with familiar tools and workflows, even running from their own laptops. While these tools are not a complete replacement for dedicated virtual reality software tools and toolkits, we estimate that up to 75% of current VR users and workflows could be satisfied with such a tool, which would also open the door for many more "off the shelf" users by effectively lowering the barrier of entry into high-end, immersive visualization. These tools should be rigorously evaluated, and the best one should be adopted with a limited site license, enabling use across the entire university.

- b. As the fields of visualization and virtual reality have matured over the last decade, research and creative projects have begun to transition from highly customized, one-off programming exercises to common (albeit, still evolving) workflows combining open-source and commercial software tools along with locally developed plugins, translators, and viewers. In concert with tools like TechViz or Conduit, we envision the need for the AVL to develop prescriptive workflows for specific communities, including geographic information systems, architectural visualization, visual arts and 3D printing, performance arts, scientific visualization, information visualization, spatial and motion analysis, and advanced medical visualization. Proper documentation and training around these workflows will allow faculty and staff to be more self-directed in performing routine activities, thereby freeing staff time to consult on the truly unique aspects of projects and uses.
3. **Restructure visualization hardware support and add staffing with major new facilities.**
- a. Systems and facilities have traditionally been managed as a small subset of the activities of the AVL. However, due to the number of facilities, the diversity of technologies (see also 4F - Distributed Visualization Facilities), and increased user demands and expectations of these systems, it is now appropriate and necessary to create a separate management group within RT-V to oversee experimentation, specification, installation, maintenance, and utilization of all hardware resources and facilities. This new organization will mirror the successful support dichotomy between RT-Systems and RT-Applications and will have the added benefit of narrowing the focus of the original AVL staff to consulting, software support, and custom developments, allowing greater efficiencies and responsiveness to user needs.
  - b. Initial staffing for the new visualization systems team will come from reallocation of existing AVL staff; however, investments in new centralized facilities and major distributed visualization resources (see 4F) must include provisioning for additional full or partial FTEs that would be added to this group.

## **II. WHAT ARE THE POLICY AND PRACTICE IMPLICATIONS OF YOUR PLANS?**

These plans require the adoption of select software tools for licensing across the IU system. We should consult with the Communication and Support division as well as the Stat/Math Center to learn and apply best practices. Likewise, the dividing of RT-V support into systems and applications is analogous to the divisions between RT-Systems and RT-Applications as well as Enterprise Infrastructure and Enterprise Software. We should consult with those groups and leverage their expertise and experiences to ensure successful coordination and processes.

## **III. IDENTIFY STAKEHOLDERS.**

Visualization resources are broadly applicable and touch on nearly all aspects of the university's mission. One way to effectively cluster this broad stakeholder community is by mission area: research, creative activity, education, and engagement. While we have ongoing conversations with all of these groups through individual projects or community initiatives (e.g., IDAH), certain proposed initiatives (Research Commons, TechViz, prescriptive workflows, distributed visualization) will provide opportunities to conduct open forums or infoshares with specific sub-communities to get feedback and input.

- Research community (visualization and analysis tools)
  - Scientific visualization (physical sciences)
  - Life sciences researchers
  - Information visualization
  - GIS user communities
  - Digital humanities researchers
  
- Creative activities communities (design review, VR, modeling/animation)
  - Visual arts
  - Architecture and design (UAO, construction technology, etc.)
  - Music and dance
  - Theater and lighting design
  
- Advanced teaching and learning communities (VR, simulation & training, immersive visualization)
  - Courses in telecommunications and informatics using or developing virtual worlds
  - Courses in the sciences using 3D/4D visualization tools
  - Training and simulation courses
  
- Outreach and community engagement