



VACCINE Kick-Off

Visual Analytics in Command, Control and Interoperability Environments (CCI CoE: VACCINE)

The VACCINE team gathered at Purdue University on November 9, 2009, to celebrate the official kick-off of this component of the new Command, Control and Interoperability Center of Excellence. Indiana Representatives Stephen Buyer and Mark Souder lent their voices in support of VACCINE and its mission. DHS officials Starnes Walker, Matthew Clark and Joe Kielman spoke at the event, emphasizing VACCINE's research to reality goals. Dr. Walker said the Center's projects will help Homeland

Security and emergency personnel prepare for, prevent and respond to terrorist attacks and other emergencies. "It's important for us to know where our enemies are and what they're doing," Walker said.

Law enforcement officials from the state, county and local levels were also in attendance, as were several state senators and representatives. VACCINE is working closely with the first responder community to evaluate their needs. "It is imperative that our homeland security personnel and emergency responders have the best possible tools to ensure public safety," said Purdue President France A. Cordova. "This Center will create tools to turn the sea of data generate during catastrophes into functional information to help emergency personnel perform their jobs more effectively."

"We are creating ways for people to get information interactively in an understandable format to help them make the right decisions



U.S. Rep. Mark Souder, R-Ind., speaks at Purdue on Nov. 9, to kick-off the new **Visual Analytics for Command, Control and Interoperability Environments (VACCINE)** center. VACCINE is funded by the U.S. Department of Homeland Security. (Purdue University photo/Andrew Hancock)

and take preventive measures," said Dr. David Ebert, Director of VACCINE. "For example, simulations to see what would happen if you were to quarantine a certain city to control the spread of pandemic flu or whether reallocating police patrols would reduce crime." The visualizations will show concise representations of the key information within massive data streams of information. The celebration concluded with a technology showcase, which engaged stakeholders with hands-on demonstrations of VACCINE's varied projects.

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VisMaster is a European Coordination Action Project focused on the research discipline of Visual Analytics. VisMaster intends to we want to push the limits of today's Visual Analytics. To achieve this goal, the approximately 40 project members, from 13 countries, engaged in a Coordination Action to join European academic and industrial research and development excellence from several individual disciplines, forming a strong European-wide Visual Analytics research community.

The VisMaster project is divided into an array of thematic working groups that focus on advancing the state of the art in Visual Analytics. Specifically, the working groups will extend excellence in the fields of data management, data analysis, spatial-temporal data, and human visual perception research with the wider visualisation research community.

The VisMaster Coordination Action is financed by the Future and Emerging Technologies (FET) programme within the Seventh Framework Programme (FP7) for research of the European Commission (EC). For more information on VisMaster, you may visit: www.vismaster.eu

The VisMaster Project's main goals:

- form & shape a strong European Visual Analytics community
- define the European Visual Analytics Research Roadmap
- texpose public & private stakeholders to Visual Analytics technology
- set the stage for larger follow-up Visual Analytics research initiatives in Europe.



Illustrated above are the geographic locations of the **VisMaster Partners.**

VisMaster

Visual Analytics - Mastering the Information Age

Country	Partnering Institution	Lead
Austria	Danube University Krems (DUK)	Dr. Wolfgang Aigner
	Know-Center Graz	Dr. Wolfgang Kienreich
	Vienna University of Technology (VUT)	Prof. Dr. Silvia Miksch
	VRVis Research Centre (VRVIS)	Dr. Kresimir Matkovic, Dr. Helmut Doleisch
Finland	University of Helsinki (UH)	Prof. Dr. Heikki Mannila, Dr. Kai Puolamaki
France	Institut National de Recherche en Informatique et Automatique (INRIA)	Prof. Dr. Jean-Daniel Fekete
	ILOG (ILOG), Dr. Thomas Baudel	Dr. Christian de Sainte Marie Baudel
	Business Objects (BOB)	Jean-Claude Grosselin, Christophe Favart
Germany	Fraunhofer Institut Graphische Datenverarbeitung (IGD)	Prof. Dr. Dieter Fellner, Dr. Joern Kohlhammer
	Fraunhofer IAIS (IAIS)	Dr. Gennady Andrienko, Dr. Natalia Andrienko
	HCU Hamburg	Prof. Jochen Schiewe
	Helmholtz-Zentrum Potsdam	Prof. Dr. Doris Dransch
	University of Konstanz (UKN)	Prof. Dr. Daniel Keim, Dr. Florian Mansmann, Dr. Enrico Bertini
	University of Rostock (UROS)	Prof. Dr. Heidrun Schumann, Dr. Christian Tominski
	German Research Center for Artificial Intelligence (DFKI)	Prof. Wolfgang Wahlster, Dr. Walter G. Olthoff
	Technical University Munich	Dr. Jukka M. Krisp
	University of Stuttgart (USTUTT)	Prof. Dr. Thomas Ertl, Prof. Dr. Daniel Weiskopf, Prof. Dr. Gunther Heidemann
	Greece	Centre for Research and Technology Hellas (CERTH)

Country	Partnering Institution	Lead
Ireland	L2 Ltd	Joe Parry
	Intel Ireland	John David Miller, Connor Upton
	National University of Ireland	Dr. Urska Demsar
	University College Dublin	Prof. Aaron Quigley
Italy	University of Roma (ROMA)	Prof. Dr. Giuseppe Santucci, Prof. Dr. Tiziana Catarci, Dr. Massimo Mecella
	University of Pisa (KDDL)	Fosca Giannotti, Dino Pedreschi
	University of Bari (UNIBA)	Prof. Maria F. Costabile, Prof. Paolo Buono, Prof. Donato Malerba
	University of Perugia	Prof. Dr. Giuseppe Liotta
The Netherlands	University of Technology Eindhoven (TUE)	Prof. Dr. Jarke van Wijk
	University of Groningen (RUG)	Prof. Dr. Jos B.T.M. Roerdink, Prof. Dr. Alex Telea, Dr. Tobias Isenberg
	Intl. Institute of Geo-Information Science and Earth Observation (ITC)	Dr. Otto Huisman
Norway	University of Bergen (UIB)	Prof. Dr. Helwig Hauser
Spain	University of Salamanca	Prof. Dr. Robert Ther-n
Sweden	University of Linköping (LIN)	Prof. Anders Ynnerman, Dr. Matthew Cooper
	University of VŠxjš	Prof. Dr. Andreas Kerren
Switzerland	University of Zürich (UZH)	Prof. Dr. Sara Irina Fabrikant, Prof. Dr. Robert Weibel
	University of Fribourg (UNIFR)	Dr. Denis Lalanne
United Kingdom	Lancaster University (ULANC)	Prof. Dr. Alan Dix, Dr. Geoffrey Ellis
	City University (CITY)	Dr. Jason Dykes, Prof. Jonathan Raper
	Middlesex University	Prof. William Wong
	University of Leeds (ULEEDS)	Prof. Ken Brodli, Dr. David Duke, Dr. Roy Ruddle, Dr. Jason Wood

Diffusion of Warnings

Command, Control, and Interoperability Center for Advanced Data Analytics (CCI CoE: CCICADA)

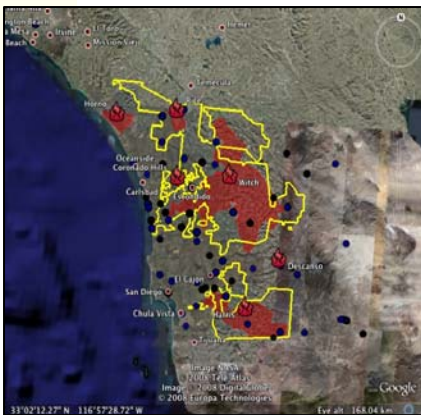
Warning systems play an essential role in notifying the population of the future danger and providing precautionary and safety information so that necessary



Witch Fire in Del Dios on Oct 23, 2007 (San Diego Wildfire Education Project, http://interwork.sdsu.edu/fire/photo_gallery/photo-gallery.htm)

actions can be taken. In addition to reliable warning systems, it is essential to make use of existing social communication networks in communities to diffuse emergency warnings in such a way that the warnings can

reach a larger audience and people at risk will act on the information. CCICADA's research in this area focuses on modeling the diffusion process of warnings



San Diego map showing the estimated fire perimeters (in red) and evacuation areas (in yellow) for October 24. The dots represent respondents from the survey data.

in a dynamic network. An axiomatic framework is formulated that incorporates the concept of trust, which quantifies the likelihood that individuals will believe the message being conveyed to them. The network is dynamic in a sense that individuals may leave the network and disrupt the flow of information as warnings are being diffused. An agent-based model can be used as a tool to gain insights and how

social communities and demographics may respond to various warning technologies.

The Rensselaer Polytechnic Institute (RPI)

team performed a case study using demographic and event data from the San Diego Firestorms that occurred in 2007. RPI applied its framework to model the diffusion process of the Reverse 911 evacuation warnings that were sent during the event. RPI mapped the network process and configure the parameters using survey data provided by Oak Ridge National Lab and the After Action Report released by the County of San Diego Office of Emergency Services following the event. RPI constructed a social network of one million households based on the demographics of San Diego County and con-



Steele Canyon High School evacuation site for **Harris Fire**. (San Diego Wildfire Slideshow on KPBS.org, <http://www.flickr.com/groups/sandiegofires/pool/>)

figure the household attributes using summary statistics from the survey data. RPI adjusted the parameters so that the number of evacuated households from the model is close to the actual number reported. This procedure enables RPI to configure the parameters in the model and use the model to investigate questions such as how social group structure, distribution of trust, and existence of weak ties affect the dissemination of evacuation warnings.

The framework demonstrates the ability to construct a large-scale social network that can be used as a basis for simulation, and simulate the warnings broadcast and the potential eventual evacuation behavior of the community in total. The parameters in the model can be calibrated to perform various scenario analyses. The results show the value of dynamic social network analysis and simulation in studying the diffusive processes.

What is Virtual USA?

Command, Control and Interoperability Division, DHS

Virtual USA creates a cost-effective nationwide capability that significantly improves information sharing and decision making during emergencies and day-to-day operations. Based on current and emerging technologies, Virtual USA integrates existing information sharing frameworks and technologies to enable collaboration at the local, tribal, state, and Federal levels by providing critical context for information - thereby making it actionable.



Developed by the U.S. Department of Homeland Security's Command, Control and Interoperability Division in partnership with the response community, Virtual USA improves emergency response by ensuring practitioners at all levels have immediate access to the information they need to make decisions, when they need it.

vUSA Strategic Resource Group

Command, Control and Interoperability Division, DHS

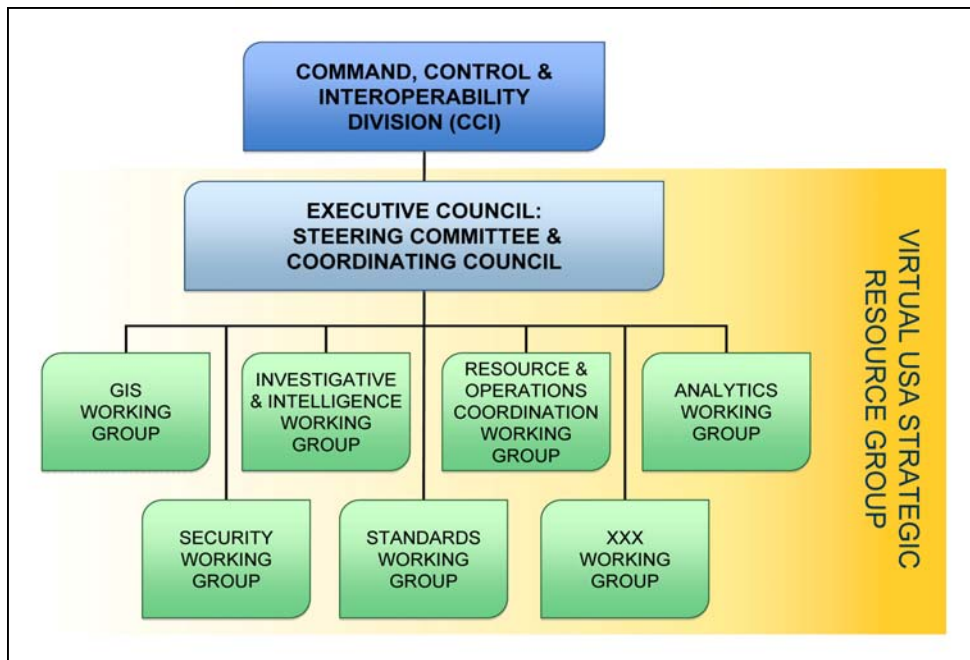
The inaugural meeting of the Virtual USA (vUSA) Strategic Resource Group (SRG) convened in Washington, DC, on November 17-18, 2009. Under Secretary Dr. Tara O'Toole welcomed attendees and affirmed her support for vUSA. The meeting provided experienced practitioners from the emergency response community with a structured platform for input and feedback to Command, Control and Interoperability Division (CCI). Breakout sessions with the six SRG working groups

(illustrated on the right) offered many opportunities to hear first-hand about this group's information sharing needs, and participants were encouraged to share comments on the work DHS is driving in this area.

Additionally, this forum helped

facilitate discussion surrounding the steps needed to make vUSA a reality. These included the identification of equipment needs, and technology research development needs, recommendations for prioritizing programs, and the development and launching of pilots.

Through in-person and virtual meetings, the working groups will continue to address issues related to DHS projects, existing state and local projects, training for public safety, and other issues as they arise.



Scalable Visual Analytics

University of Konstanz, Germany

In July 2008, the DFG (German Research Foundation) began funding a six-year strategic research initiative entitled “*Scalable Visual Analytics: Interactive Visual Analysis Systems of Complex Information Space.*” This is a Priority Program that covers a number of research projects

that develop visual analytics technology for a variety of application domains including life sciences and medicine, document analysis and geo-spatial analysis. Application domains incorporate:

- The analysis of gene expression experiments on microarrays, protein structures with microscopy images, tomographic medical images with varying spatial and temporal resolution and complex biological networks aims at innovative contributions enabling sustainable and significant impact to the life sciences.
- Efficient access to large electronic document collections, estimating economic consequences from high-quality patent analysis, feature vector representations for complex data types, characterization of multi-dimensional data, exploration of point-clouds, multimedia data analysis, spatiotemporal analysis of moving entities entail substantial work on scalable analysis and new



Featured above is a **density map** showing the popular places in Berlin. For every geo-tagged photo in a cluster, the cumulative sum of the influences of the other photos is calculated using the Gaussian. Thus, every photo gets a weight based on the proximity of other photos around, which then determines the coloring.

interactive visualizations.

The main purpose of the DGF is to fund fundamental research in almost all disciplines. Priority Programs are one of the largest coordinated funding instruments of the DFG. A particular feature of a Priority Program is the nationwide cooperation

between its participating researchers. The DFG Senate may establish Priority Programs when the coordinated support given to the area in question promises to produce particular scientific gain. Usually, a Priority Program funds up to 30 projects over 6 years with several funding periods.

The focus of this Priority Program is research covering the theoretical foundations of new visual analytics algorithms, the development and practical implementation of scalable visual analytics techniques, as well as their integration and evaluation. The new concepts and methods to be developed must fulfill present and future requirements. This can only be achieved by a close cooperation between scientists from different fields of computer science and beyond.

The Scalable Visual Analytics program funds 13 collaborative projects with an estimated budget of 12 Million Euros (about 18 Million Dollars) in the six year period 2008 - 2014. For more information, visit: <http://www.visualanalytics.de>

Precision Information Environments

National Visualization and Analytics Center (NVAC)

The Command, Control and Interoperability Division of DHS and the Pacific Northwest National Laboratory are hosting an upcoming workshop on the topic of *Precision Information Environments (PIE)*.

The goal of the workshop is to establish a research agenda for the next generation of information analysis, collaboration, and decision support technology for the emergency planning and response community. The PIE workshop will be held in Seattle, WA, on December 14-15, 2009.

The workshop will bring together researchers, practitioners, decision makers, and policy makers from across the VAC community and beyond to help define the research challenges in designing and developing future technology that will change the way emergency management stakeholders interact with each other and with information. The goal of Precision Information Environments is real-time synthesis, communication, and analysis of dynamically generated and collected information, tailored for the precise needs of a diverse user base that includes analysts, situation commanders, public safety personnel, and first responders, among others.

The output of the workshop will be a multi-disciplinary research roadmap that prioritizes the outstanding research problems and funding needs across the range of domains that will be central to the development of Precision Information Environments.

Special Issue: *Information Visualization*

Integrated Visualization and Analytics Community

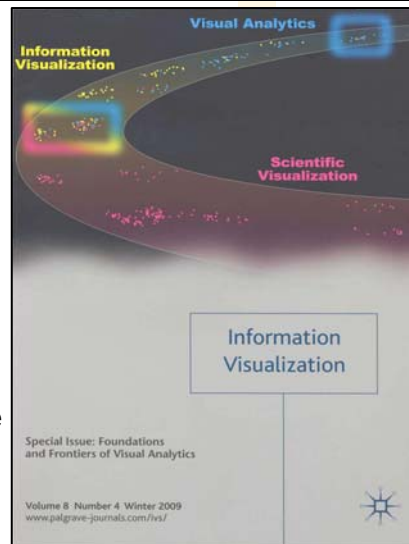
The Winter 2009 Edition of the *Information Visualization Journal* is dedicated to the research challenges in the field of visual analytics science.

This edition of the journal is the product of a workshop, hosted by the Basic/Futures Research (BFR) program area of the DHS Command, Control and Interoperability Division on March 4, 2009. This workshop focused on the first five years of the visual analytics enterprise, and looked into the proposed research challenges for the next five years. Joseph Kielman, the lead for BFR, along with the former Director of the National Visualization and Analytics Center, Jim Thomas,

were guest editors for this publication.

This fully peer-reviewed journal includes nine articles authored by personnel from the U.S. government, U.S. national laboratories, academia, industry, and the international science community.

The need to understand and manage massive amounts of data



This is the cover of the Winter 2009 Edition of the *Information Visualization Journal*, dedicated to the research challenges in visual analytics.

from diverse sources drives this area of research. The journal outlines how scientists and analysts working in visual analytics are partnering with government agencies and first responders to make this information accessible and actionable in order to save lives and prevent disaster. To access the articles of this journal, you may visit [http://](http://www.palgrave-journals.com/ivs/journal/v8/n4/index.html)

www.palgrave-journals.com/ivs/journal/v8/n4/index.html.

CCICADA Members Win DARPA Contract

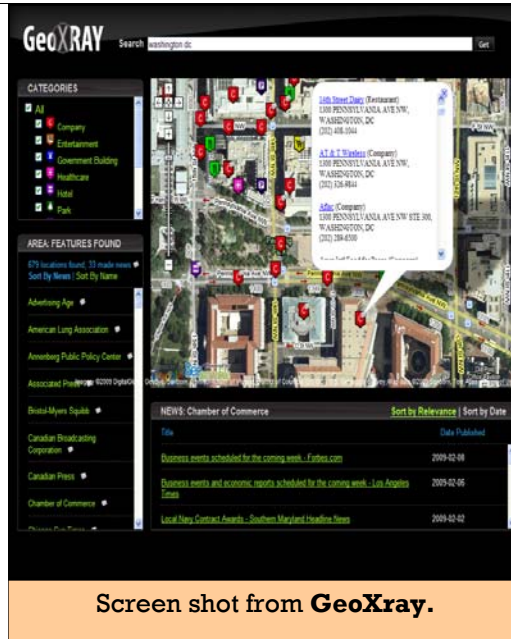
Command, Control, and Interoperability Center for Advanced Data Analytics (CCI CoE: CCICADA)

Geosemble Technologies, Inc. announced a Phase II development contract with the Defense Advanced Research Projects Agency (DARPA) that will enable its current GeoXray data integration software to display a greater range of location-specific information. Working with researchers at the University of Southern California's Information Sciences Institute (USC/ISI), GeoXray extends the company's capability for integrated processing of text and geo-spatial datasets.

The GeoXray solution is finding market acceptance as an information intelligence resource. In-

dustry applications for location-specific data include online publishing, real estate, high-way transportation, law enforcement, municipal redevelopment, and other government programs such as homeland security.

USC/ISI and Geosemble Tech-



nologies are members of the new CCICADA Data Analytics Center of Excellence.

Full press release available at: <http://www.24-7pressrelease.com/press-release-rss/geosemble-wins-darpa-contract-for-satellite-image-data-integration-119762.php>.

PNNL Computational Sciences Facility

National Visualization and Analytics Center (NVAC)

PNNL researchers who support the National Visualization and Analytics Center completed their move into the Laboratory's new 75,000 square foot Computational Sciences Facility. The building houses staff from PNNL's information analytics, cyber security, and high-performance computing capabilities. DHS provided financial and programming support for the new facility, which includes new research laboratories dedicated to



visual analytics, and DHS representatives attended the building's dedication on October 9th.

The new laboratory spaces include a 16 foot high-definition display, an interaction laboratory for developing new human-computer inter-

face concepts, and a reconfigurable demonstration center that can simulate operational environments such as emergency operations centers. The research underway in these laboratories will help introduce new technologies for the VAC community.

Visual Analytics at Boeing

Simon Fraser University, Canada

Industrial users face ever-mounting data volumes. With data volumes of hundreds of petabytes, industrial data characteristics are similar to the characteristics of data analyzed in government offices. Visual analytics offers an alternate way of gaining business intelligence from current and archived data stores. The questions companies, like Boeing, ask generally differ from those a government analyst might ask. Boeing collects terabytes of data that, if better understood, could provide new insight into anomalies that can help the company assess unexpected risks, improve its aerospace products in specific areas (e.g., maintenance, reliability and quality), understand and manage product costs, and concurrently manage and improve employee services.

Boeing has formed partnerships with Stanford University, the University of British Columbia and Simon Fraser

University. These joint company-university efforts build upon Boeing's subject matter and analysis expertise and the universities' expertise in new analytic approaches, existing tool assessments and graphical communication. The key to making such a program work is making real data available for experimentation and allowing access to Boeing subject matter experts to determine how they approach an analysis task today.

Boeing decided on this collaborative approach because the capabilities it needs are often unavailable in commercial off-the-shelf tools. Boeing's high-complexity problems require large-scale systems analysis across multiple components. Therefore, Boeing needs tools that are easily reconfigurable, flexible and usable by domain experts. A capability to explain the results to decision makers is essential. As Boeing personnel assessed the state of visual analytics, they realized that joint work with leaders like Stanford, SFU and UBC was critical for success.

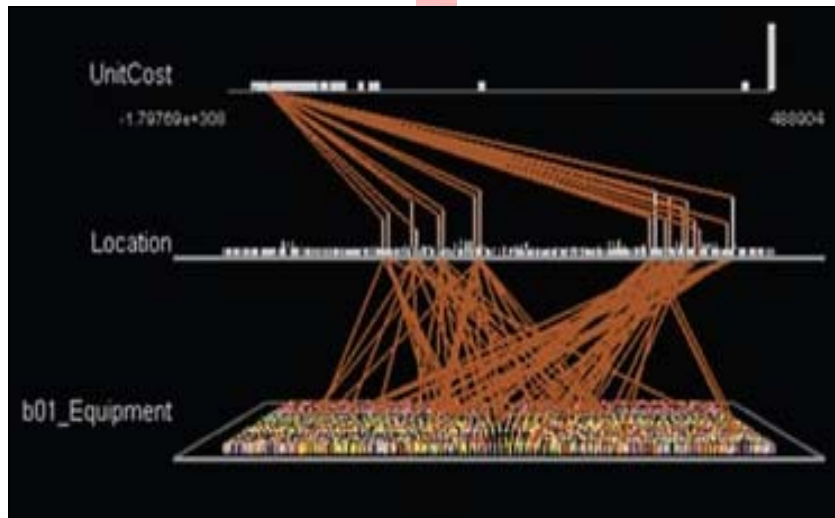
In addition to providing research funding for its

university collaborators, Boeing brings in real requirements from its large enterprise, experience from real users and a large volume of real data. Boeing is providing access to subject matter experts in multiple domains and large test data sets.

Furthermore, Boeing contributes its expertise in 3D

computer graphics, knowledge discovery, text analysis, statistical analysis and visual analytics.

Developing visual analytics in the context of Boeing's real-world users and applications helps focus university research and training programs. Boeing believes this collaborative effort will contribute directly to the methods Boeing uses internally and influence the capabilities and research direction in visual analytics tools for years to come.



Boeing compared the insight gained into production maintenance records from conventional statistical analysis, a 3D visual analytics tool (PNNL's Starlight) and a 2D visual analytics tool (Tableau).



VAC Newsletter

Integrated Visualization and Analytics Community

IVAC@dhs.gov

Volume 1, Issue 2

November 2009

Schedule of Key Dates

- **DHS Research Transition Workshop**
Newport, RI
December 1-2, 2009
- **FODAVA Review**
GA Tech
December 3-4, 2009
- **CCI CoE: CCICADA Kick-Off**
Rutgers University
December 9-10, 2009
- **PIE Workshop**
University of Washington
December 14-15, 2009
- **Hawaii International Conference on System Sciences**
Univ. of Hawai'i at Manoa
January 5-8, 2010
- **VisMaster Industry Days**
Darmstadt, Germany
January 20-21, 2010
- **Submission Deadline for EuroVAST**
February 15, 2010
- **IEEE Pacific Visualization**
Taipei, Taiwan
March 2-5, 2010
- **GeoVA(t) Workshop**
Guimarães, Portugal
May 11, 2010
- **EuroVAST 2010**
Bordeaux, France
June 8, 2010
- **EuroVis 2010**
Bordeaux, France
June 9-11, 2010

DECEMBER 2009

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