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Big Geo Data: Standards and Best Practices

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Story

COM.Geo 2014 Data Publication for Data Science and Metaknowledge

Two students (UCTID and GWU) asked for mentoring and piloting. I would like to do data mining and integration.

Organization of Meta-knowledge in the Form of 23-Bit Templates for Big Data Processing

Metaknowledge Templates for On-the-Fly Clustering of Big Data Streams

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Spotfire Dashboard

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Message from General Chair and Program Chair

PDF

It is our great pleasure to welcome you to the COM.* Conferences and Summits 2014; in short form, COM.* 2014, which takes place in Washington DC, U.S.A. on August 4-6, 2014 as well as the online COM.* Virtual Conference (COM.* VC).


The COM.* 2014 is an exclusive cross-disciplinary and inter-disciplinary event. COM.* starts with a focus on COM.Geo 5 years ago. COM.Geo has been playing a guiding role in geospatial computing since 2010. This year, it has expanded to COM.BigData, COM.DriverlessCar, COM.Geo, and online VC. Innovative research and technologies are the brightest spotlights at the event. There are more innovative programs and world-wide people to attend the event physically or virtually. Besides government agencies and top industries, many other institutions not only show their latest technologies but also explore tech and market potentials at the event. COM.* 2014 is a much more exciting 3-in-1 event for Big Data, Driverless Cars, and geospatial computing research and technologies!

COM.* 2014 has exciting and high quality technical program sessions including brainstorm plenary keynotes, emerging tech panels, tech shows, workshops, research papers, practice papers, tech talks, posters, hot short talks, and onsite and online exhibits. COM.* 2014 provides diverse opportunities for all decision-makers, engineers, researchers, developers, and users, across industrial companies, government agencies, and academic institutions, to present or demonstrate their latest work or share their latest visions and ideas at the event.

Furthermore, keynote speakers from U.S. DOT, U.S. DOE, Oracle, NVIDIA, Northrop Grumman, COMStar, Federal Big Data Working Group, etc. will not only give the key insights for future impacts and challenges, new perspectives, further innovation, trends for Big Data, driverless cars, and geospatial computing, but also reveal the interrelations between these technologies.
COM.Geo 2014

COM.Geo conference is a leading-edge conference with a focus on the latest computing technologies for multidisciplinary research and development that enables the exploration in geospatial areas. It is an exclusive event that builds a bridge between computing and geospatial fields. It connects decision makers, researchers, developers, scientists, and application users from government, academia, and industry in all related fields. The attendees were from more than 50 countries all over the world. COM.Geo publications by IEEE and ACM, read and cited worldwide, have broad impact on the development of theory, method and practice in geospatial computing.

COM.Geo 2014 is the 5th International Conference on Computing for Geospatial Research and Application. The conference topics include all the geospatial research and application technologies. The conference of this year highlights Big Data Computing, Cloud Computing, and Mobile Computing in geospatial fields.

COM.BigData 2014

Big Data is now invading in every aspect of our daily life and promise to revolutionize our existence. It is “the next frontier for innovation, competition and productivity” as said McKinsey Global Institute.

Big data provides an opportunity to find insight in new and emerging types of information constructions. How will you take advantage of this opportunity? Big Data definitely presents a number of challenges related to its complexity, heterogeneity, and immensity. Many of these novel challenges necessitate rethinking various aspects of information processing philosophy, data management platforms, and computing methodologies in science, engineering, medicine, and business.

We believe that appropriate investment in Big Data will not only lead to a new wave of fundamental technological advances that will be embodied in the next generations of Big Data management platforms, systems, and products, but also has the potential to create huge economic value in the world economy for years to come.

COM.BigData 2014 is the International Summit on Big Data Computing. The summit offers a timely venue for researchers, government decision-makers, and industry partners to present and discuss their latest insights, challenges, and results in big data computing.

COM.DriverlessCar 2014

Driverless cars, also called self-driving cars or robot cars, are one of the great technological advances for the future transportation. With the investments by the U.S. government and innovative companies in recent years, several companies and research institutions working in the field have fully demonstrated that self-driving vehicles are technically viable nowadays. Moreover, the last decade has shown a great leap in public interest in driverless car technologies. There is a common goal of making driverless cars a reality by 2020’s.

Although driverless car technology has become more and more viable recently, we still have a long way to go for self-driving in public. No matter how smart self-driving cars are, safety is the most important thing. Driverless cars do have the potential to positively benefits humanity. Car manufactures have continually added automation features to improve vehicle safety since many decades ago. A full 90 percent of accidents are caused by human errors, such as loss of focus, sleepiness, etc. But robot cars have great technology strengths on safety over human weaknesses. They
can react in milliseconds to avoid accidents. This is why the first thing every advocate of driverless cars brings up is the technology's safety benefits.

Additionally, a variety of non-technical issues, such as legal, liability, regulatory, culture, privacy concerns, need to be addressed. These will help consumers trust the capability of driverless cars to give up control and embrace many potential benefits that driverless cars present.

Both tech and non-tech issues will impact driverless vehicle integration into tomorrow's roadway, in particular, the ecological problems because self-driving cars would be mostly propelled by electricity. Of especial importance would be the humanitarian aspect of this technology since driverless cars could significantly improve the quality of life of handicapped people.

Making a strategic decision for automotive innovation is top priority. Both federal governmental policymakers and technology leaders may need to work together for these. So this is why we advocated the COM.DriverlessCar summit to build a bridge between two sides.

COM.DriverlessCar 2014 is the premier forum featuring with a mixture of inspiring presentations and interactive discussions on driverless car technology and non-technical challenges. Researchers, practitioners, Policy-makers, decision-makers, and managers from government agencies, industry, and academia are invited to discuss the latest trends, strategies, challenges, research and applications as well as policies and business potentials for driverless cars.

Special thanks to Keynote Speakers, Mr. Tim Schmidt, Dr. Brand Niemann, Dr. Xavier Lopez, Mr. Danny Shapiro, Dr. Ray Renner, and Dr. Robinson Pino for their insightful vision to be delivered to our attendees. We appreciate the generosity of sponsors and partners: COMStar Computing Technology Institute, U.S. DOT, U.S. DOE, Oracle, NVIDIA, Northrop Grumman, Federal Big Data Working Group, MIT, George Washington University, and IEEE & CPS. We also would like to acknowledge the invaluable efforts and contributions of COM.* team and volunteers.

We look forward to an exciting week of sharing technical ideas and visions with colleagues from around the world. We thank you for attending the onsite & online conferences and being a part of this very important event.

Lindi Liao, Ph.D.

General Chair and Program Chair

COM.* Conferences and Summits 2014

President & CEO

COMStar Computing Technology Institute

Washington DC, U.S.A.

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**Keynotes**

[PDF](#)
On the Interrelation between Big Data, Driverless Cars, Geospatial Computing, and Visual Computing

Lindi Liao, Ph.D.

President & CEO

COMStar Computing Technology Institute

The rapid development of visual computing and geospatial computing in the past few years has revolutionized the way we live, work, and play. No doubt, Big Data is now invading every aspect of our daily life and promise to revolutionize our existence. Connected systems of vehicles and self-driving cars have been are among the great technological advances for the future transportation.

What's the interrelation between these cross-disciplinary and inter-disciplinary technologies?

Big data provides an opportunity to find insight in new and emerging types of information constructions. How will we take advantage of this opportunity to improve different computing technologies? Big Data definitely present a number of challenges related to their complexity, heterogeneity, and immensity. Many of these novel challenges necessitate rethinking various aspects of information processing philosophy, data management platforms, and computing methodologies in science, engineering, medicine, and business.

How does such Big Data revolution affect numerous computing applications?

Although driverless car technology has become more and more viable recently, we still have a long way to go for selfdriving in public. No matter how smart self-driving cars are, safety is the most important thing. Both tech and non-tech issues will impact driverless vehicle integration into tomorrow's roadway, in particular, the ecological problems because self-driving cars would be mostly propelled by electricity. Of especial importance would be the humanitarian aspect of this technology since driverless cars could significantly improve the quality of life of handicapped people.

Making a strategic decision for automotive innovation is top priority for both federal governmental policy-makers and technology leaders.

How do geospatial and visual computing become eyes of driverless cars?

We believe that appropriate investment in the Big Data development and driverless cars will not only lead to a new wave of fundamental technological advances that will be embodied in the next generations of technical management platforms, systems, and products, but also has the potential to create huge economic value in the world economy for years to come.

The upcoming discussions will reveal these interrelations and give the key insights for future impacts and challenges, new perspectives, further innovation, trends for Big Data, driverless cars, geospatial computing, and visual computing.

Dr. Lindi Liao is the President & CEO of COMStar Computing Technology Institute. She also serves as General Chair of COM.* Conferences and Summits (COM.Geo, COM.BigData, COM.DriverlessCar) and a technical advisor to several federal agencies. Dr. Liao has 10 years of management experience and 20 years of in-depth technical experience on 3D.
graphics, data visualization, virtual reality, GPU computing, highway driving simulators, air traffic management, GIS, multi-core architectures, real-time embedded systems, etc. She has broad interests in various latest technologies: Big Data computing, self-driving cars, wearable computing, heterogeneous computing, mobile clouds, etc. Dr. Liao advocated COM.* and founded in 2009 with a focus on COM.Geo at the early stage, which has been playing a guiding role to advancing the technologies in geospatial computing. Prior to founding COM.*, she worked at Federal Aviation Administration (FAA) and Federal Highway Administration (FHWA) of U.S. Department of Transportation (U.S. DOT) for years. She was an adjunct professor at George Mason University. She also worked at ESRI and developed the first version of Stereo Viewer for ArcGIS. In 1996, she pioneered the product development of the PC-based quad-buffered 3D stereographic accelerators with 3D Labs’ chips. Dr. Liao has authorized nearly 100 publications and 2 technical books on GPU-based research and OpenGL programming. She is a member of ACM and IEEE and serves as a technical reviewer for conferences and journals. She received a Ph.D. and a M.S. in computer science from George Washington University and Purdue University, respectively.

**Big Data - A System Integrator's Perspective**

Ray Renner, Ph.D.

Technical Fellow at Northrop Grumman

Adjunct professor at The George Washington University

Northrop Grumman Corp.

Big data/data science/advanced geospatial analytic technologies and tools are advancing and proliferating rapidly, adding to the complexity and challenges of effectively bringing together COTS, OSS, GOTS in ways that are adaptive to the latest innovations in the field and effective for our missions. System integrators need to find the right balance between applying latest technologies and the discipline/domain expertise to address mission needs. Big Data has the potential to revolutionize the way that our customers collect, consume, analyze and visualize data. As these capabilities move out of Research and Development and into large development and integration projects, system integrators are faced with challenges and concerns with successfully realizing the potential and impact of big data for our customers. These challenges include what does big data mean for specific customers, good test data, open source software licensing and others. We will discuss these challenges, concerns and some approaches to them.

Dr. Ray Renner is a Technical Fellow at Northrop Grumman and an adjunct professor at The George Washington University. Northrop Grumman is a leading system integration company providing innovative systems, products and solutions in unmanned systems, cyber, C4ISR, and logistics and modernization to government and commercial customers worldwide with over 65,000 employees across 25 countries. Ray is the Chief Engineer on a big data productization effort at Northrop Grumman and the Chairperson for the Northrop Grumman Information System Software Engineering Center of Excellence. He has 25 years of experience in software and systems development and software R&D. His research interests include geospatial analysis and visualization, big data analysis and visualization, software engineering and Agile software development.

**The Federal Big Data Initiative: Where it has been and where it is going**

Brand Niemann, Ph.D.
Former Senior Enterprise Architect & Data Scientist, U.S. Environmental Protection Agency (EPA)

Co-organizer, Federal Big Data Working Group Meetup (FBDWG)

Director and Senior Data Scientist, Semantic Community

Since the White House announced the Big Data Initiative in 2010, there have been a series of activities for government agencies, academia, and industry to participate in to develop data scientists, perform research, and to develop applications, which this presentation will summarize. The work of the Federal Big Data Senior Steering Work Group, the NSF Big Data Funding Opportunities, and the Federal Big Data Working Group Meetup will be described and specific examples will be shown.

The roles of the Presidential Digital Government Strategy and Open Data / Open Government Policy, the new Congressional Data Act, and the Open Research Data Policy will be described and specific examples of their implementation will be given. Attendees should be able to see where they might participate in the Federal Big Data Initiative as a result of attending this presentation.

Dr. Brand Niemann, former Senior Enterprise Architect & Data Scientist with the US Environmental Protection Agency (EPA), works as a data scientist, produces data science products, and publishes data stories for Semantic Community, AOL Government, & Data Science & Data Visualization DC. He is the co-organizer of the Federal Big Data Working Group Meetup and the Director and Senior Data Scientist for Semantic Community.

Oracle Keynote

Dr. Xavier Lopez

Senior Director of Product Management for Oracle Spatial

Oracle

Today’s business and government organizations are challenged when trying to manage and analyze information from enterprise databases, streaming servers, social media and open source. This is compounded by the complexity of integrating diverse data types (relational, text, spatial, images, spreadsheets) and the entities they represent (customers, products, suppliers, events, and locations) - all of which need to be understood and re-purposed in different contexts. Identifying meaningful patterns across these different information sources is non-trivial. Moreover, conventional IT tools, such as GIS, data warehousing and business intelligence alone, are insufficient at handling the volumes, velocity and variety of content at hand. A new framework and associated tools are needed. Dr. Lopez outlines how developers are applying "linked data" concepts to make sense of these Big Data sources. He will describe new approaches oriented toward search, discovery, linking, and analyzing information on the Web, and throughout the enterprise. The key take away is use of spatial and linked open data concepts to enhance content alignment, interoperability, discovery and analysis of Big Data.

Dr. Xavier Lopez is Senior Director of Product Management for Oracle’s Spatial products group. For the past sixteen years, he has led Oracle’s efforts to incorporate spatial technologies across Oracle’s database, application server, and application business. He has over twenty years of experience in the area of GIS and spatial databases. He is currently
focusing on high performance spatial computing and linked open data. He holds advanced degrees in engineering and planning from the University of Maine, MIT, and the University of California, Davis. He is currently a member of the US National Geospatial Advisory Committee (NGAC). Xavier is a past member of the Mapping Science Committee of the National Academy of Science, which advises the nation on mapping activities.

**Extreme Computing and Data Challenges**

Robinson E. Pino, Ph.D.

Computer Scientist and Program Manager

Advanced Scientific Computing Research, Office of Science

U.S. Department of Energy (U.S. DOE)

The Office of Science Advanced Scientific Computing Research Program underpins DOE's world leadership in scientific computation by supporting research in applied mathematics, computer science, high-performance networks, computational partnerships and educational programs. In particular, our Computer Science research portfolio fills a critical gap in scientific computing. The computing resources required to fulfill the Office of Science mission exceed the state-of-the-art by a significant margin. Furthermore, the software tools, libraries and the distributed software environments needed to accelerate scientific discovery through modeling and simulation are beyond the realm of commercial interest. Yet, the computing resources and the applications that run on them are vital to maintaining the United States' competitiveness in the world economy. Our Computer Science research program supports research that enables computing at extreme scales and the understanding of extreme scale data from both simulations and experiments. It aims to make scientific computers as easy and effective to use as possible. This talk will focus on challenges for computing and data.

Dr. Robinson E. Pino is a Computer Scientist and Program Manager for the Advanced Scientific Computing Research (ASCR) program office in the Department of Energy’s (DOE) Office of Science. In his portfolio, Dr. Pino focuses on revolutionary basic research and development efforts for high performance computing and applications that will enable our continued leadership through exascale and beyond computing and energy efficient technologies. Dr. Pino has expertise within technology development, program management, government, industry, and academia. He previously worked as Director of Cyber Research at ICF International advancing the state of the art in cybersecurity by applying autonomous concepts from computational intelligence and neuromorphic computing for the U.S. Department of Defense (DoD) Army Research Laboratory (ARL) and various DoD and U.S. Department of Energy (DoE) collaborators, industry and academia. Dr. Pino’s research and development program focused on the development of intelligent, autonomous, and cognitive applications toward network, host, and mobile security solutions. In addition, Dr. Pino was a Senior Electronics Engineer at the U.S. Air Force Research Laboratory (AFRL) where he was a program manager and principle scientist for the computational intelligence and neuromorphic computing research efforts. He also worked at IBM as an advisory scientist/engineer development enabling advanced CMOS technologies and as a business analyst within IBM's photomask business unit. Dr. Pino served as an adjunct professor at the University of Vermont where he taught electrical engineering courses.
Dr. Pino has a Ph.D. and M.Sc. degrees in Electrical Engineering with honors from Rensselaer Polytechnic Institute and a B.E. in Electrical Engineering with honors from the City University of New York, City College. He is the recipient of numerous awards and professional distinctions; has published over 50 technical papers, including three books; and holds six patents, three pending.

**How Talking Cars Will Transform the Way We Travel**

Tim Schmidt

Senior Technology Advisor

Turner-Fairbank Highway Research Center

Federal Highway Administration (FHWA)

U.S. Department of Transportation (U.S. DOT)

Imagine a transportation system where cars can see things that you can’t. Such cars could warn of a potential crash or icy roads ahead, advise of a traffic jam ahead, or help find a parking space. Imagine if buses could tell if you will make your next connection, mapping software could indicate the greenest travel route, and cell phones could communicate with traffic signals so disabled pedestrians can safely cross an intersection. These developments are closer than you think through the U.S. Department Transportation (USDOT) connected vehicle research. Connected vehicles combine leading-edge technologies (GPS, Wi-Fi, wireless sensors, and dedicated short-range communications) to enable highspeed, real-time communications among vehicles, roadside infrastructure, and mobile devices. The USDOT is investing in connected vehicles because of their promise to save lives, as well as improve traffic flow, reduce environmental impacts, and make our communities safer and more livable.

Mr. Tim Schmidt has served the U.S. Department of Transportation in multiple senior executive capacities involving technology advocacy, strategic planning and thought leadership, and has been involved with various aspects of connected and automated vehicle activities. His keynote will outline various aspects of the federal government’s vision and future roadmap for self-driving cars. Mr. Schmidt is currently the Senior Technology Advisor at FHWA’s Turner-Fairbank Highway Research Center. He was formerly the U.S. DOT’s Deputy Chief Information Officer (CIO) and Chief Technology Officer (CTO). He has also held technology and corporate leadership positions at the FAA, IRS, White House and multiple private sector corporations. Mr. Schmidt is a retired Army officer having served over 20 years within the U.S. Department of Defense.

**NVIDIA Keynote**

Mr. Danny Shapiro

Senior Director of Automotive

NVIDIA

The art and science of computing has been dramatically transformed by the invention of the graphics processing unit or GPU over a decade ago. Not only are GPUs used extensively in industries such as video games, movie production,
product design, medical diagnosis, scientific research, and energy exploration, but they play a vital role in the automotive industry. From concept styling and design, to engineering and simulation, to advertising and point of sale marketing, the GPU helps designers and engineers make better, safer, more energy efficient and more affordable cars.

However while these applications of graphics and parallel processing have focused on the creation of cars, we are now seeing the need to increase the computing power inside the vehicle as well. Many cars today have numerous microcontrollers and run millions of lines of code, however tomorrow, your car will be the most powerful computer you will ever own. High-performance mobile computing and innovative sensing technology has both automakers and Silicon Valley re-thinking what the promise of a car means to consumers.

Developments in computer vision, image processing, machine learning and augmented reality - all fields that rely heavily on the GPU - will help define the automotive experience of the future and pave the road to the self driving car. In vehicle supercomputing and connections to the cloud will forever change owning, driving and riding in a car.

Mr. Danny Shapiro is NVIDIA's Sr. Director of Automotive, focusing on solutions that enable faster and better design of automobiles, as well as in-vehicle solutions for infotainment, navigation and driver assistance. He is a 25-year veteran of the computer graphics and semiconductor industries, and has been with NVIDIA since 2009. Prior to NVIDIA, Danny served in marketing, business development and engineering roles at ATI, 3Dlabs, Silicon Graphics and Digital Equipment. Danny holds a BSE in Electrical Engineering and Computer Science from Princeton University and an MBA from the Hass School of Business at UC Berkeley. He lives in Northern California where his home solar panel system charges his electric car.

Emerging Tech Panels+Workshops

PDF

Panel+ I: Federal Big Data Working Group

The Federal Big Data Working Group Panel will feature these members who will discuss their involvement in the working group, research applications, use cases, publications, solutions, and technologies:

Moderator
Dr. Katherine Goodier, Data Sciences Practice Leader, Xcelerate Solutions
Dr. Goodier is the practice leader for Data Science and Enterprise Architecture at Xcelerate Solutions. She is a computational linguist who is a published researcher in the areas of cognitive neural networks, big data, cloud analytics, and standards. She has over 30 years of practical experience.

Panelists
Dr. Kirk Borne, Professor of Astrophysics and Computational Science, George Mason University
Dr. Chuck Rehberg, CTO, Trigent and Semantic Insights
Dr. Joan Aron, Independent Consultant Climate Data, Aron Environmental Consulting
Dr. Tom Rindflesch, Information Research Specialist at Cognitive Science Branch, National Institutes for Health (NIH)

Ms. Mary Galvin, Managing Principal, AIC & Semantic Community

Federating Uses Cases:
- Data Science: Brand Niemann
- Privacy and Security: Katherine Goodier
- Environmental and Earth Science: Joan Aron
- Astronomy: Kirk Borne

Federating Data Publications:
- Structured Scientific Content: Papers, journals, books, reports, etc.
- Data FAIRports: Findable, Accessible, Interoperable, and Reusable
- Data Stories That Persuade: Claims and Evidence

Federating Solutions & Technologies:
- Semantic MedLine: Tom Rindflesch
- Reading and Reasoning: Katherine Goodier and Chuck Rehberg, Semantic Insights on Elsevier Content Text Mining
- Social Media and NodeXL: Marc Smith
- Hand-Crafted by Individuals and Teams: Mary Galvin, STEM
- Data Mining Standards and Products: Brand Niemann, Data Publications in Data Browsers
- Machine Processing: Fredrik Salvesen, Semantic Data Publications on Yarc Data Graph Appliance
- Data Curation at Scale: Michael Stonebraker, Tamr on 1000s of Spreadsheets

**Panel+ II: Challenges and Solutions for Big Data in the Cloud**

Moderator

Dr. Shyam Parhi, Computer Scientist, Airport Engineering Division, Federal Aviation Administration (FAA)

Panelists

Mr. Tim Schmidt, Senior Technology Director at FHWA-TFHRC, U.S. Department of Transportation (U.S. DOT)
Dr. Xavier Lopez, Senior Director of Product Management for Oracle Spatial, Oracle Corp.
Dr. Simon Berkovich, Professor of Computer Science, George Washington University
Dr. Robinson E. Pino, Computer Scientist and Program Manager, U.S. Department of Energy (U.S. DOE)
Dr. Shawana P. Johnson, President, Global Marketing Insights, Inc.

Mr. Joseph Obernberger, Principal investigator, Northrop Grumman Corp.
Hosting legacy Airport Layout Plans and airport imageries in Cloud

Shyam Parhi Airport Engineering Division, Federal Aviation Administration

Airports GIS is a web portal which hosts a few application modules. It allows authorized Airports GIS users to submit changes to airport data. One of these modules in Airports GIS is electronic Airport Layout Plan (eALP). This application helps airports create their digital Airport Layout Plans. The layout view capability in this module is provided by ESRI’s ArcGIS server. The initial phase of testing a few eALPs across the nation as a pilot program initiative is over and valuable lessons are learned from this activity. We expect this application will go to production sometimes next year. It will take several years before most or all airports in USA have their digital Airport Layout Plans. During this transition period we are storing legacy Airport Layout Plans in Cloud. These Layout Plans are basically in pdf form. Plans to catalogue these Layout Plans and provide access to users are being implemented.

Airports GIS also hosts another Survey module. As part of this module requirement, we collect airport imagery for almost every submitted airport project to Airports GIS. We have already archived some of these ortho images in Cloud. This gives the ability to users to take advantage of ESRI’s ArcGIS viewer to analyze and manage these imageries. These ortho images are large in size. In future, we will receive a lot more ortho images because the number of airports who submit this data is growing and the size of each ortho image is also growing. Hence, it needs special care to organize and access these imageries. Once completed, this will have significant impact on airport planning and budgeting.

Intelligent Software Defined Storage

Simon Berkovich

Department of Computer Science, The George Washington University

The Big Data situation requires a qualitatively different type of information processing. This problem brings in a new type of a computational model that explicitly works only with a relatively small portion of the available data, while the rest of the data just implicitly affects selection of the given working portion [1]. The unavoidable restrictions on the operations with overabundant data translate into the design of the brain in accordance with the fundamental Freud’s idea of unconsciousness. This design is contemplated in our paper [2]. Diversified information in overwhelming amounts appears ambiguous, volatile, and unreliable. So, the contents of Big Data systems cannot be treated with confidence as in traditional searching and data mining. Instead, Big Data should be utilized essentially through what can be seen as “knowledge formation”. In other words, processing of Big Data must be performed by what can be considered as “scientific method”. Namely, besides simple extraction of references as from regular information systems the full exploitation of Big Data necessitates formulating testable hypotheses and creating prediction models. A classical illustration presents usage of the observational data of Tycho Brahe through transformation of Kepler’s laws into Newton’s model of “Universal Gravitation”. Thus, employing Big Data falls into the realm of Artificial Intelligence. As a
matter of fact, the intelligence facilities of the brain can be considered as a necessary condition to deal with the Big Data challenge. A special type of holographic memory is a pivot point in the realization of these facilities [2]. To implement such kind of Big Data processing facilities in practice we introduce a particular construction of Software Defined Storage. This construction emulates the basic features of the suggested memory organization of the brain: multi-attribute cortical map, content-addressable access, and stream resolution of multiple responses. The envisioned Software Defined Storage incorporates two developments: memory device for multi-attribute items that can be accessed by any combinations of attributes using Fuzzyfind procedures [3] and massive distributed streaming for resolution of multiple responses [4].

Dr. Shawana P. Johnson’s Talk Abstract

Dr. Shawana P. Johnson, GISP, President, Global Marketing Insights, Inc.

Will provide a brief overview of Enablers and Challenges to Big Data in the Cloud which will touch on the following key topics:

- Connectivity
- Signaling
- Device Detection
- Data Ownership
- Standards
- Security
- Bandwidth
- Battery Life
- Collaboration
- Government Role

Big data leads to “big topics for discussion and action geospatially” which are being thoughtfully addressed.

Panelists’ Bios

Mr. Tim Schmidt has served the U.S. Department of Transportation in multiple senior executive capacities involving technology advocacy, strategic planning and thought leadership, and has been involved with various aspects of connected and automated vehicle activities. His keynote will outline various aspects of the federal government’s vision and future roadmap for self-driving cars. Mr. Schmidt is currently the Senior Technology Advisor at FHWA’s Turner-Fairbank Highway Research Center. He was formerly the U.S. DOT’s Deputy Chief Information Officer (CIO) and Chief Technology Officer (CTO). He has also held technology and corporate leadership positions at the FAA, IRS, White House and multiple private sector corporations. Mr. Schmidt is a retired Army officer having served over 20 years within the U.S. Department of Defense.

Dr. Xavier Lopez is Senior Director of Product Management for Oracle’s Spatial products group. For the past sixteen years, he has led Oracle's efforts to incorporate spatial technologies across Oracle's database, application server, and application business. He has over twenty years of experience in the area of GIS and spatial databases. He is currently focusing on high performance spatial computing and linked open data. He holds advanced degrees in engineering and
planning from the University of Maine, MIT, and the University of California, Davis. He is currently a member of the US National Geospatial Advisory Committee (NGAC). Xavier is a past member of the Mapping Science Committee of the National Academy of Science, which advises the nation on mapping activities.

Prof. Simon Berkovich received MS in Applied Physics from Moscow Physical-Technical Institute (1960) and PhD in Computer Science from the Institute of Precision Mechanics and Computer Technology of the USSR Academy of Sciences (1964). He played a leading role in a number of projects on the design of advanced hardware and software systems. He has several hundred professional publications in various areas of physics, electronics, computer science, and biology. In 2002, Professor Simon Berkovich was elected a member of the European Academy of Sciences “for an outstanding contribution to computer science and the development of fundamental computational algorithms.

Dr. Robinson E. Pino is a Computer Scientist and Program Manager for the Advanced Scientific Computing Research (ASCR) program office in the Department of Energy’s (DOE) Office of Science. In his portfolio, Dr. Pino focuses on revolutionary basic research and development efforts for high performance computing and applications that will enable our continued leadership through exascale and beyond computing and energy efficient technologies. Dr. Pino has expertise within technology development, program management, government, industry, and academia. He previously worked as Director of Cyber Research at ICF International advancing the state of the art in cybersecurity by applying autonomous concepts from computational intelligence and neuromorphic computing for the U.S. Department of Defense (DoD) Army Research Laboratory (ARL) and various DoD and U.S. Department of Energy (DoE) collaborators, industry and academia. Dr. Pino’s research and development program focused on the development of intelligent, autonomous, and cognitive applications toward network, host, and mobile security solutions. In addition, Dr. Pino was a Senior Electronics Engineer at the U.S. Air Force Research Laboratory (AFRL) where he was a program manager and principle scientist for the computational intelligence and neuromorphic computing research efforts. He also worked at IBM as an advisory scientist/engineer development enabling advanced CMOS technologies and as a business analyst within IBM's photomask business unit. Dr. Pino served as an adjunct professor at the University of Vermont where he taught electrical engineering courses. Dr. Pino has a Ph.D. and M.Sc. degrees in Electrical Engineering with honors from Rensselaer Polytechnic Institute and a B.E. in Electrical Engineering with honors from the City University of New York, City College. He is the recipient of numerous awards and professional distinctions; has published over 50 technical papers, including three books; and holds six patents, three pending.

Dr. Shawana P. Johnson, President, Global Marketing Insights, Inc. (GMI) is an expert in the usage and application of Global Commercial Geospatial Imagery and associated technologies. Her organization is the largest provider of highly customized product and technical market research in the world with sole source access to a database developed under contracts with NOAA and the USGS. GMI is also a leading technology transfer specialist assisting the US government with access to geospatial technology platforms and tools as well as providing commercial geospatial organizations knowledge concerning global buying habits and technology trends. She speaks regularly on the topics of Big Data and how to move Geospatial Imagery in the cloud and on sophisticated platforms and has recently spoken at MIT on the Internet of Things and at an LES Summit- to Intellectual Property and Licensing Executives focused on Big Data and Geospatial Computing and the Challenges faced with new Business Models (per use basis in the cloud) and Licensing and Standards.

Mr. Joseph Obernberger is Principal investigator on R&D projects at Northrop Grumman involving big data processing and analytics. Involved in software development and architecture design for a system that ingests and performs
analytics on large amounts of unstructured text, video and audio data using a combination of COTS and open source software.

Prof. Chaowei Phil Yang is a Professor at George Mason University, where he founded and directs the center for intelligent spatial computing and NSF spatiotemporal innovation center. His research focuses on utilizing spatiotemporal principles to optimize computing infrastructure to support science discoveries and engineering development. He proposed and consolidated as a leader several geocomputing research directions including distributed geographic information processing, geospatial cyberinfrastructure, spatial computing, and spatial cloud computing. Exemplified by $25M research funding and 100+ articles, his activities are widely recognized through awards from the White House, NASA, Nobel Intent Blog, MOST, CPGIS, and many others. His latest endeavor is to lead the building of the national and international spatiotemporal infrastructure to advance a) human intelligence through spatiotemporal thinking, b) computer software and tools through spatiotemporal computing, and c) human capability of responding to deep scientific questions and grand engineering challenges through spatiotemporal applications.

Dr. Durmus Cesur has more than 20 years of experience in Engineering, Information Technology, and Project/Program/Strategic Management fields. He has been working as GIS/Database/Web Administrator (Program Manager) at DCHC MPO currently. He has worked in private, public and academic sectors nationally and internationally at various roles and capacities including analyst, program manager, adjunct professor, consultant and Sr. Consultant. He worked at Space Imaging, Intera Inc., Natural Resource Ecology Lab, and National Park service, Colorado State University, Front Range Community College and KMaras University (International, Turkey). He has been licensed as Professional Engineering (PE) in the State of Texas, and have project management professional (PMP), Certified Floodplain Management, Geographic Information Systems Professional, and ESRI Authorized and Certified Instructor, ESRI Enterprise Associate and ArcGIS Desktop Associate and Professional and CompTIA - Certified Technical Trainer Certifications (CTT+) certifications. He is a reviewer in Several Journals, and Committee Member and Advisor in GIS/IT/Water related national/international organizations such as Journal of American Water Resources AWRA, Air and Waste Management Journal, GITA, HarmonIT, Floodsite etc. He is being awarded various awards in GIS including Special Achievement in GIS in 2004 and being listed in Who’s Who in America List since 2009. Dr. Cesur holds a Ph.D. Civil/Environmental Engineering, a M.S. in Computer Information Systems & Civil Engineering, and a B.S. Civil Engineering.

Panel+ III: Big Data and Geospatial Computing

Moderator

Dr. Ray Renner, Technical Fellow, Northrop Grumman Corp.

Panelists

Dr. Xavier Lopez, Senior Director of Product Management for Oracle Spatial, Oracle Corp.

Dr. Shawana P. Johnson, President, Global Marketing Insights, Inc.

Dr. Peter Baumann, Professor of Computer Science, Jacobs University

Dr. Chaowei Yang, Professor of GIScience, George Mason University
Dr. Shawana P. Johnson’s Talk Abstract

Dr. Shawana P. Johnson, GISP President, Global Marketing Insights, Inc

Big Data and Geospatial computing – The Internet of Things (IoT) is impacting geospatial computing. The IoT is not really about just a collection of personal connected devices but the ability of my devices to communicate with the sensors in everything that I want to connect with or know about in other words connecting to (more) intelligent or “smart” devices. This requires complex networking as well as location based intelligence in order for each device to understand my location and the location of other devices as well. Location data is many times geographic in nature and requires a great deal more bandwidth and compute ability to move and connect the information. Currently we have about three connected devices to each person and this is expected to double by 2018 and cloud computing provides real-time communication network connections to many computers and the Internet which allows many users to avoid expensive hardware that can only hold small amounts of imagery and focus more on the ability to manage imagery. Being able to manipulate and process imagery in the cloud allows you to grab that imagery from any location whenever necessary as simple as email. Currently, the cloud is a major key to the use and Big Data as it relates to Geospatial Computing.

Panelists’ Bios

Dr. Ray Renner is a Technical Fellow at Northrop Grumman and an adjunct professor at The George Washington University. Northrop Grumman is a leading system integration company providing innovative systems, products and solutions in unmanned systems, cyber, C4ISR, and logistics and modernization to government and commercial customers worldwide with over 65,000 employees across 25 countries. Ray is the Chief Engineer on a big data productization effort at Northrop Grumman and the Chairperson for the Northrop Grumman Information System Software Engineering Center of Excellence. He has 25 years of experience in software and systems development and software R&D. His research interests include geospatial analysis and visualization, big data analysis and visualization, software engineering and Agile software development.

Dr. Xavier Lopez is Senior Director of Product Management for Oracle’s Spatial products group. For the past sixteen years, he has led Oracle’s efforts to incorporate spatial technologies across Oracle’s database, application server, and application business. He has over twenty years of experience in the area of GIS and spatial databases. He is currently focusing on high performance spatial computing and linked open data. He holds advanced degrees in engineering and planning from the University of Maine, MIT, and the University of California, Davis. He is currently a member of the US National Geospatial Advisory Committee (NGAC). Xavier is a past member of the Mapping Science Committee of the National Academy of Science, which advises the nation on mapping activities.

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Internet of Things and at an LES Summit- to Intellectual Property and Licensing Executives focused on Big Data and Geospatial Computing and the Challenges faced with new Business Models (per use basis in the cloud) and Licensing and Standards.

Dr. Peter Baumann is Professor of Computer Science at Jacobs University, Bremen, Germany. He researches on scalable multidimensional array databases and their application in earth, space, and life sciences. Peter Baumann has pioneered Array Databases. He has authored and co-authored 100+ books, chapters, and papers on array databases and related fields. He has architected the rasdaman system which is today's only fully implemented and operationally used raster database worldwide. For the commercial support of rasdaman, he has launched and is CEO of a dedicated spinoff company. He holds international patents on array databases and has received a series of national and international innovation awards for his work. In the Open Geospatial Consortium (OGC) standardization body he is chairing the "Big Geo Data" working groups and editor of 12 standards. In ISO, he is working on the forthcoming SQL/MDA, an SQL extension for multi-dimensional arrays and is member of the SC32 Study Group on Big Data. In RDA, he co-chairs the Big Data Analytics Interest Group and the Geospatial Interest Group.

Prof. Chaowei Phil Yang is a Professor at George Mason University, where he founded and directs the center for intelligent spatial computing and NSF spatiotemporal innovation center. His research focuses on utilizing spatiotemporal principles to optimize computing infrastructure to support science discoveries and engineering development. He proposed and consolidated as a leader several geocomputing research directions including distributed geographic information processing, geospatial cyberinfrastructure, spatial computing, and spatial cloud computing. Exemplified by $25M research funding and 100+ articles, his activities are widely recognized through awards from the White House, NASA, Nobel Intent Blog, MOST, CPGIS, and many others. His latest endeavor is to lead the building of the national and international spatiotemporal infrastructure to advance a) human intelligence through spatiotemporal thinking, b) computer software and tools through spatiotemporal computing, and c) human capability of responding to deep scientific questions and grand engineering challenges through spatiotemporal applications.

Dr. Durmus Cesur has more than 20 years of experience in Engineering, Information Technology, and Project/Program/Strategic Management fields. He has been working as GIS/Database/Web Administrator (Program Manager) at DCHC MPO currently. He has worked in private, public and academic sectors nationally and internationally at various roles and capacities including analyst, program manager, adjunct professor, consultant and Sr. Consultant. He worked at Space Imaging, Intera Inc., Natural Resource Ecology Lab, and National Park service, Colorado State University, Front Range Community College and KMaras University (International, Turkey). He has been licensed as Professional Engineering (PE) in the State of Texas, and has project management professional (PMP), Certified Floodplain Management, Geographic Information Systems Professional, and ESRI Authorized and Certified Instructor, ESRI Enterprise Associate and ArcGIS Desktop Associate and Professional and CompTIA - Certified Technical Trainer Certifications (CTT+) certifications. He is a reviewer in Several Journals, and Committee Member and Advisor in GIS/IT/Water related national/international organizations such as Journal of American Water Resources AWRA, Air and Waste Management Journal, GITA, HarmonIT, Floodsite etc. He is being awarded various awards in GIS including Special Achievement in GIS in 2004 and being listed in Who’s Who in America List since 2009. Dr. Cesur holds a Ph.D. Civil/Environmental Engineering, a M.S. in Computer Information Systems & Civil Engineering, and a B.S. Civil Engineering.
Oracle Workshop

Learn to Build an Analytics Solution with Oracle’s Spatial Tools and Platform

Daniel Geringer
Senior Manager, Software Development
Oracle Corp.

Whether it's marketing analysis to send customers mailers from their closest store, or to find the closest repair depots to a portion of rail that needs to be serviced, very often the result is based on drive time analysis, not as the crow flies analysis. Learn how to optimize strategies and solve these network based requirements, without computing every possible point to point drive time calculation. This hands-on workshop will walk you through building an end to end application that maximizes performance, and optimizes hardware resources to solve massive drive time analysis requirements. The application will be based on Oracle Spatial and Graph's geocoder, router, and network graph technologies, and on Oracle Fusion Middleware MapViewer.

Attendees will be expected to provide their own laptops; the virtual machine will be available for download in advance of the workshop. Attendance is limited - preregistration is required.

Prerequisites:

Attendees should have some knowledge of Java, SQL and PL/SQL. The workshop will use an Oracle Virtual Box Linux based image pre-configured with the required Oracle software and HERE sample data for San Francisco. The image will be available for download by attendees prior to the workshop. It uses Oracle Enterprise Linux so some experience with invoking scripts and using text editors on Linux (vi or gedit) will be beneficial.

Hardware and software requirements:

* Laptop (quad-core preferred)
* Virtual Box 4.2 or later (https://www.virtualbox.org/)
* Minimum 8Gb RAM (16Gb preferred): The VM requires 6GB and two processors to run.
* Minimum 100Gb free disk space (the image is approximately a 17Gb download that requires an additional 60 Gb of disk during import)

SPEAKER BIO

Daniel Geringer graduated with a Bachelor of Science degree in Computer Science and Applied Mathematics and Statistics from the State University of New York at Stony Brook in 1987. He worked at General Dynamics Electric Boat
Division, a US defense contractor, from 1988 through 1993 as a senior software engineer. While at General Dynamics, he completed his Master of Science degree in Computer Science at Rensselaer Polytechnic Institute in 1992. In 1993, he started working for The Analytic Sciences Corporation (TASC) as a senior software engineer. Through research and development projects at TASC, he began to explore and help solve customer GIS interoperability issues.

In 1994, Geringer was exposed to an Alpha version of Oracle Spatial. This brought him to Oracle in 1995, as a key member of the Oracle Spatial development team. His primary tasks include working with GIS and Image Processing partners to help integrate Oracle's Spatial technologies, test and develop Oracle Spatial enhancements, work with customers, provide customer/partner feedback to the Oracle development team, write material for Oracle University (OU) spatial courses and help train OU instructors to teach Oracle's spatial technologies.

OGC & ISO Workshop

Big Geo Data: Standards and Best Practices

An Introduction to OGC and ISO Big Data standards - and why you should know

Dr. Peter Baumann

Professor, Computer Science at Jacobs University, Germany

Co-Chair/Founder, OGC Domain Working Groups (BigData, WCS, (Coverages, Temporal)

Leading Member, ISO Arrays SQL;

Charter Member, OSGeo

Abstract

Big Data pose special challenges on geo data, touching upon all the V keywords, like Volume, Velocity, Variety, and Veracity. Simultaneously, demands are massively increasing, from the traditional file download to allowing customers to build their own spatio-temporal product on the fly.

This seminar introduces to the key Big Geo Data standards of OGC and ISO. It explains their mechanics, use, and scalability capabilities by way of many illustrations as well as hands-on test services. An outlook will be given to current discussions and future directions in several relevant standardization bodies.

The seminar is suitable for both beginners with some background in geo Web services, as well as for experts and implementers.

Introduction

Big Data pose special challenges on geo data, touching upon all the V keywords, like Volume, Velocity, Variety, and Veracity. New data types arrive – beyond traditional 2D maps, 3D x/y/t image timeseries and x/y/z geophysical voxel models, 4D x/y/z/y climate and ocean simulation output, as well as point clouds need to be considered today, including
their dynamic fusion. Simultaneously, demands are massively increasing, from the traditional file download to allowing customers to build their own product on the fly.

OGC and ISO standards provide support for key categories in the Big Data arena, such as regular and irregular rasters, spatio-temporal grids, point clouds, and general meshes. However, while concise standards are available to offer scalable services based on the technical state of the art, it is not always straightforward to understand these from reading the specifications alone. Frequently, questions arising can easily be addressed in direct exchange.

This seminar provides the opportunity of a direct exchange with a core writer of many of the OGC Big Data standards, and to understand the mechanics of key standards through hands-on examples. The seminar introduces to the key Big Geo Data standards of OGC and ISO. Starting with the ISO/OGCC coverage concept (ISO 19123, OGC GMLCOV), service standards such as WCS, WCPS, and WPS will be addressed and put into context with related standards like WMS, WFS, and SWE.

The seminar explains their mechanics, use, and scalability capabilities by way of many illustrations as well as hands-on test services (note that the course focuses on Big Data aspects, hence addresses metadata only in conjunction with data issues). An outlook will be given to current discussions and future directions in several relevant standardization and policy bodies, including US NIST, ISO SC32 Big Data Analytics Study Group, RDA, and Belmont Forum.

By the end of the workshop, participants know which are the main data categories contributing to Big Geo Data, know about their characteristics and variations, understand the new qualities (in particular, temporal aspects) that contribute to the challenge, know relevant standards in the field, and have gained own hands-on experience in standards-based access to Big Data. This will enable them to pursue own research, make informed decisions on standards and tools, and elaborate Big Data solutions based on an informed tool choice.

The seminar is suitable for both beginners with some background in geo Web services, as well as for experts and implementers. Although the course in places dives down to XML level, to accommodate expert users, this will not be essential for understanding the concepts; beginners in the field likewise can harvest a solid overview and introduction. To this end, examples of implementations and services from different Earth science domains will be discussed and demonstrated live, with an option for participants to access them.

List of Topics to Be Covered

The course will be organized as follows, with ample opportunity for interaction: ? Big Data: information categories; classification attempts by standardization bodies; challenges; select use cases from 1D – 4D geo services. ? OGC standards: the data: coverage; the services: WCS, WCPS, WPS, SWE, WMS, etc.; ? Further standardization activities: ISO, RDA, etc. ? Architectural issues: How to build scalable services; REST and the rest; requests versus queries; adding in temporal dimensions; MapReduce or Array Databases or something completely different? ? Wrap-Up: data & service concepts synopsis; ongoing discussions in standardization bodies; possible future directions; open discussion and reflection

Acknowledgment

Discussions with and contributions by the OGC and ISO team members, as well as manifold stakeholders inside and outside the bodies, are greatly appreciated. This work has been supported by EU FP7 EarthServer and PublicaMundi.
The Presenter

As the leader of standardization activities in various bodies Peter Baumann is the optimal choice to explain and summarize the Big Geo Data standards landscape in an easy to follow, yet technically concise way, for which his presentation style is known.

Dr. Peter Baumann is Professor of Computer Science at Jacobs University and hitech spinoff founder and CEO. He is researching on Big Data in Science and has coined the research field of Array Databases and architected the pioneer Array DBMS, rasdaman. He has authored and co-authored 100+ books, chapters, and papers on array databases and related fields. He has architected the rasdaman system which is today’s only fully implemented and operationally used multi-dimensional Array DBMS worldwide. He holds international patents on array databases and has received a series of national and international innovation awards for his work. In the OGC standardization body he is chairing the raster-relevant working groups on raster services, and is editor of the “Big Geo Data” standards. In ISO, he is leading working on Arrays SQL.

SAML Workshop

SAML for OGC, OpenLayers, Google Earth SAML Best Practices Workshop

Dr. Andreas Matheus

Senior Research Scientist Department of Computer Science

University of the Bundeswehr, Germany

Introduction

A geospatial Access Management Federation is a network of trusted partners that allow sharing of protected geospatial services and data among each other. In order to enable access to a protected resource, a user must prove that she belongs to a trusted partner. It is therefore essential to have secure and interoperable authentication in place. One standards based approach is leveraging the OASIS Security Assertion Markup Language (SAML).

The standard defines a framework to securely exchange assertions about users. The resulting challenge is to use the best combination of the different profiles and bindings to suit best a particular need. It is in particular important to know the best practice that fits best the computing environment and the services provided.

When making OGC Web Services available in an Access Management Federation, it is important to understand the requirements that are introduced by the geospatial domain; for example by the client and the data format exchanged.

This workshop introduces the OASIS SAML standard and introduces a best practices, which combination of profiles and bindings fits best the use of OGC Web Services and OpenLayers based web-mapping applications as well as Google Earth and other desktop applications.

Workshop Outline

This ½ day workshop aims to cover the following topics:
Leading-Edge Tech Shows

PDF

USDOT-FHWA Tech Show, Lab Tours, and Test Drives

FHWA Intelligent Transportation Systems
Connected Vehicles / Vehicle-to-Infrastructure (V2I)
Big Data Computing in Transportation
Human Center Systems, Highway Driving Simulator (HDS)
Transportation Safety, Geometric Design, Crash Analysis and Simulation
Transpiration GIS/GPS/LiDAR

The FHWA Tech Show, Lab tours, and test drives will take place at Federal Highway Administration (FHWA) Turner-Fairbank Highway Research Center (TFHRC) on Wednesday afternoon Aug. 6, 2014.

On July 15, 2014, U.S. President Obama visited FHWA-TFHRRC and tested a self-driving car at a simulator of Highway Driving Simulator (HDS) Lab, then gave a speech on "the Importance of Our Nation's Infrastructure". The news was reported by the White House, U.S. Department Transportation, The Washington Post, and FHWA, respectively.

LAB TOUR REGISTRATION

Only a limited number of attendees for the tour is available. Please register first.
Please Note: All participants 18 and older will need a government issued pictured identification card to gain access to the facility. Also, please keep in mind we have over 20 indoor and outdoor laboratories and weather can be a factor. There will be a lot of walking and standing; comfortable clothes and shoes are recommended.

**TFHRC BACKGROUND**

The Turner-Fairbank Highway Research Center (TFHRC) is the Nation’s premier federally owned and operated highway research and development facility. Located in McLean, VA as the research center for the Federal Highway Administration (FHWA), TFHRC coordinates and conducts an ambitious program of innovative highway research and development to address critical needs of the national highway system. Through its three research and development (R&D) offices – Infrastructure, Safety, and Operations – along with the Exploratory Advanced Research Program, FHWA engineers, scientists, and psychologists conduct applied and exploratory advanced research in vehicle-highway interaction, nanotechnology, and a host of other types of transportation research in safety, pavements, highway structures and bridges, human-centered systems, operations and intelligent transportation systems, and materials. With more than 20 laboratories, the center provides a vital resource for advancing the body of knowledge that has been created and developed by our researchers.

TFHRC provides the world highway community with advanced and applied research and development related to new and existing highway technologies. The center reviews, tests, studies, researches, and finds solutions to complex technical problems through the development of more economical, environmentally sensitive designs; more efficient, quality controlled construction, operational, and safety practices; and more durable materials. The end result is a safer, longer-lasting, more reliable highway transportation system.

At times, when our expertise is requested, we also work with FHWA’s Federal Lands Highway to test new solutions specifically for Federal lands and parks, to make transportation facilities, roads, or structures more aesthetically in tune with nature, yet still function with the same high standards of other highway structures and materials. We collaborate with other national laboratories and agencies to address the needs of the Nation and to keep American citizens safe in all parts of the world.

**MIT Driverless Vehicle Tech Show**

**The Future with Self-Driving Cars**

This work demonstrates work at SMART, the Singapore-MIT Alliance for Research and Technology, focused on development and testing of a new mobility-on-demand paradigm. This work, led by Professor Emilio Frazzoli of MIT, consists of a fleet of fully autonomous vehicles that can be summoned via smartphone by users to take them to a desired destination. The vehicles respond rapidly due to state-of-the-art backend software that positions the vehicles based on analysis of historical demand data. Analysis of transport data by the SMART researchers have shown that all of Singapore could be effectively served by such a mobility-on-demand paradigm, even while substantially reducing the overall number of vehicles on the road.
The Intelligent Co-Pilot: a Path toward Fully Autonomous Vehicles

This tech show demonstrates the "Intelligent Co-Pilot," a practical, near-term pathway to autonomous vehicle development. In this framework, the human driver and the autonomous control system share control authority, with the autonomous system generally only assuming control when the threat of an accident is significant. The system could also be tuned, however, to provide a greater degree of assistance. Such a system represents an attempt to reap the safety benefits of full autonomy, while ensuring that the operator remains attentive and responsible for high level decisions.

COMStar OfficeMap Tech Show

Save Time and Achieve the Best Map Results with OfficeMap for MS Office!

COMStar OfficeMap is the latest Microsoft PowerPoint Add-in. It provides a fast and easy way to directly create various kinds of maps on PowerPoint slides.

OfficeMap offers many map templates. The map templates for MS Office is an impressive collection of dozens of categorized maps with appropriate projections for PowerPoint slides. They include world maps, continental maps, country maps, US state maps, and US county maps. All boundary maps and some satilliate maps are provided. OfficeMap offers three different symbol collections for simple symbols, color ramp symbols, and point symbols (i.e., markers, icons, and fonts).
The maps created by OfficeMap are composed of PowerPoint shapes, texts, and pictures. All of operations for texts and illustrations in PowerPoint can be directly employed to those maps within PowerPoint.

OfficeMap provides a friendly and powerful graphics user interface for users to easily insert the maps, select the symbols for the maps, and set the features for map shapes, texts, and pictures.

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