GEOSPATIAL WORLD FORUM™

23 - 27 APRIL 2012

THEME - GEOSPATIAL INDUSTRY AND WORLD ECONOMY

ABSTRACTS

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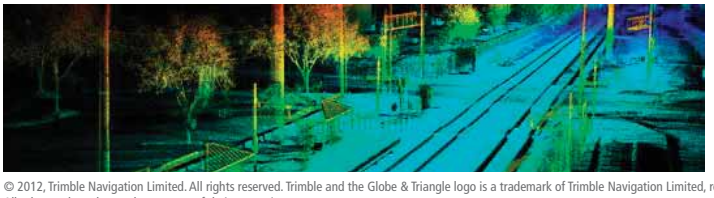

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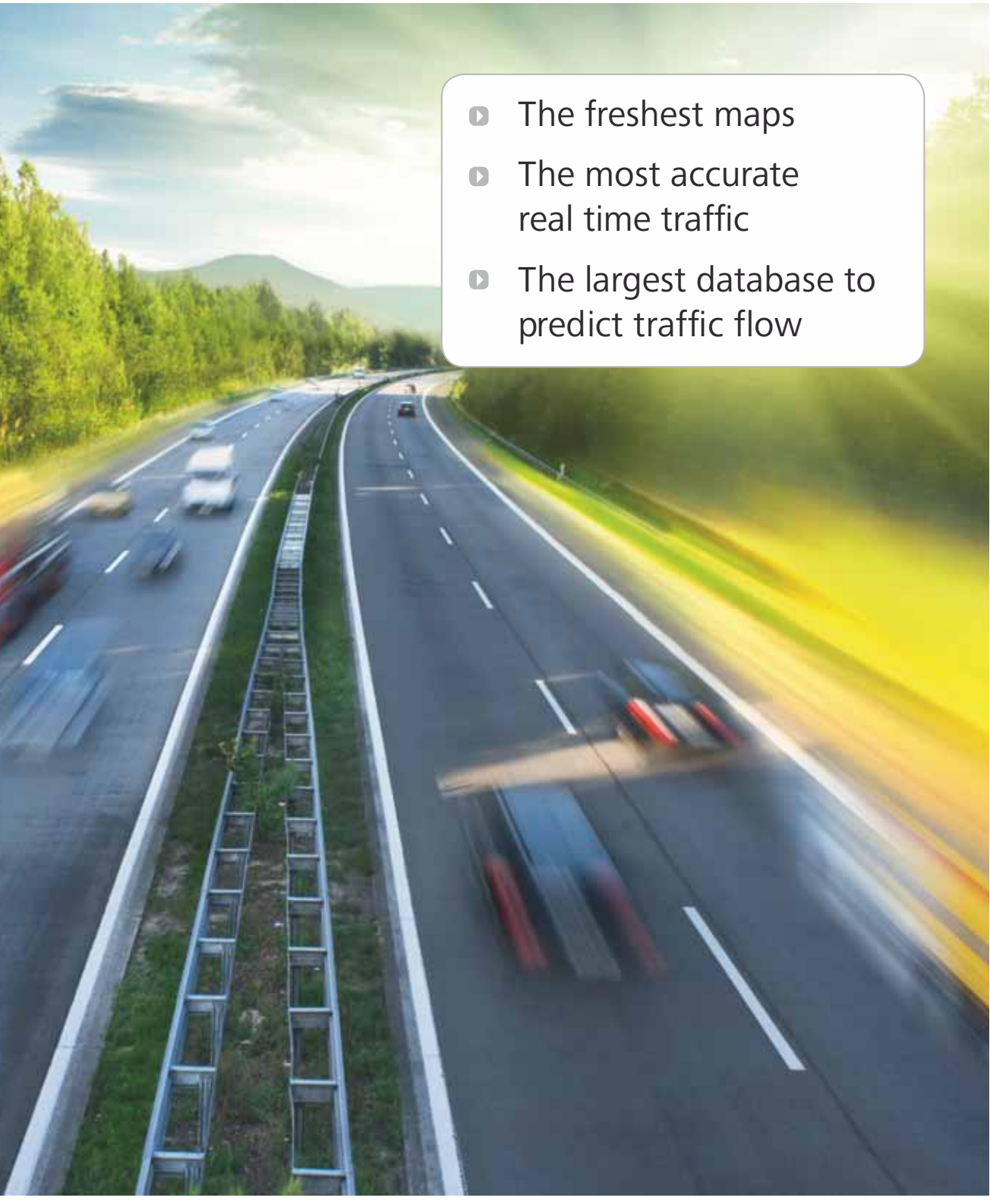

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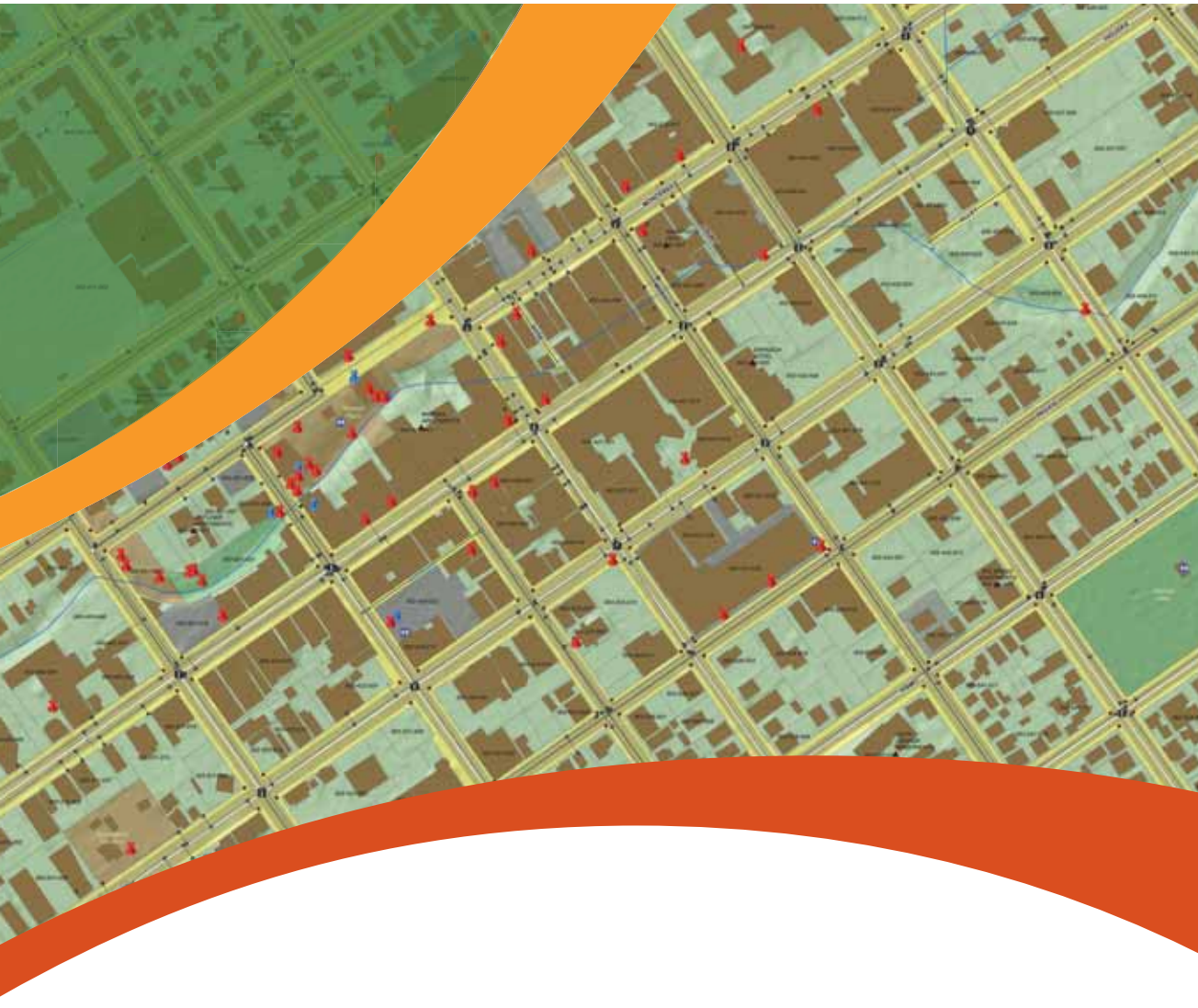

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FOREWORD

Over the last 20 years, geospatial technologies have evolved and dramatically converged with a variety of disciplines ranging from Urban development, Natural Resource Management, Construction & Engineering, Infrastructure & Utilities etc. The discrete, even esoteric pursuits we referred to as GIS, Earth imaging, GPS, AM/FM, location based services and navigation systems are no longer discrete. Now, they are very well integrated into variety of developmental planning activities.

From being a highly specialised scientific endeavour, geospatial industry has evolved and grown significantly over the past five decades to become a full fledged specialised industry. Today, it is on its way to become part of a larger consumer industry. This transformation has been made possible by the vision, competence, dedication and commitment of many professionals, programmes, institutions, associations, companies and above all geospatial thought leaders who have provided direction to this industry.

With an aim to facilitate the development of the geospatial industry and to bring together all the stakeholders, Geospatial World Forum is being organized by Geospatial Media & Communications and co-organised by Kadaster, The Netherlands from 23-27 April 2012. With this year's theme as "Geospatial Industry & World Economy", the conference shall touch upon the dimensions and directions of geospatial industry and shall attempt to bring forward and project its utility, contribution and relevance to several important industries contributing to the economy of the world.

On behalf of the organiser and the co-organiser, I would like to thank all our partners, sponsors, speakers and delegates for believing in us and supporting us in our attempt to bring together the global geospatial community. I am sure that the event would provide you a perfect business, learning and networking platform.

We wish you all a very rewarding and productive conference. We sincerely hope that each one of you would take away some good experiences and memories of this opportunity.

Dr. M P Narayanan
Chairman
Geospatial Media and Communications

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Geospatial Industry: Creating Our Future

Jack Dangermond, *Founder and President, Esri Inc., USA*

These are exciting times for the geospatial industry; technical advancements in software and hardware together with an ever increasing amount of (open) data means that literally everyone, professionals and citizens, knowingly or unknowingly , is being exposed to GIS. Professionals will be able to optimise their workflows to be more productive and make smarter decisions. Citizens will be able to better interact with local, regional or national governments as well as enjoy the convenience of having GIS enabled apps on their smartphones. This exponential growth of the use of GIS is good for the GIS related software vendors and the many partners related to these companies. However, it also stresses the importance of educating people in geospatial technology and applications; currently there is a shortage of students in this field compared to the number of potential job opportunities. Further cooperation between the commercial and academic world together with governments is needed to improve this situation. Meanwhile we are facing many challenges at a global scale in terms of energy, water, food, and security that are being driven by population growth and climate change. Gaining a better understanding about the scale and scope of these changes, and how they are interrelated, is a big job that requires a strong methodology with interconnected systems and monitoring approaches. Improved GIS capabilities coupled with the ability to collaborate via cloud-based applications and social media makes us optimistic that more can be done to find answers to these challenges.

Igniting the "Dynamic Geospatial Ecosystem": Bringing Geospatial Information to the World

Ola Rollen, *President and Chief Executive Officer, Hexagon, Sweden*

The Dynamic Geospatial Ecosystem – it's the next paradigm of the information revolution, and it commands a new equilibrium in the geospatial industry. This new ecosystem not only integrates geospatial technologies and data into mainstream business enterprise systems but now also extends geographic information and its unlimited applications to consumers – not just the GIS user. However, geospatial data usage by everyone demands widespread access and distribution. Furthermore, extending geospatial information's utility and relevance beyond the few and to the many requires a shift in thinking, to look beyond today and towards a new set of applications. The ability to digitally describe and understand the real world in 5D with faster tools that not only measure accurately but also provide more frequent and real-time updates will open new doors for the development of real-world applications. The exploitation and usage of such data for personal benefit will bring about a new era in socialising geography beyond the traditional geospatial genres of surveying, photogrammetry, remote sensing, GIS and CAD. Hexagon is uniquely positioned to bring about such change by leveraging all of these geospatial ingredients to extend the geospatial ecosystem to the world, and, in turn, transform the economics of the industry by empowering a billion+ people.

The Geospatial Opportunity for Sustaining Infrastructure

Greg Bentley, *Chief Executive Officer, Bentley Systems, USA*

With the world's population topping 7 billion, there is both an urgent need and a tremendous opportunity to leverage digital "infrastructure" in the development of physical infrastructure, with the goal of creating sustainable communities. The resulting intelligent infrastructure will deliver higher performance, which, in turn, will sustain both the economy and the environment. Over the last 20 years, the methods for representing design and engineering information have expanded from 2D schematics to include 3D physical models, and now "semantic" models, which simulate behavior and performance, and which represent the next leap forward. Information modeling has transcended the old boundaries between "geospatial" and "engineering" data and has enabled a richer, federated content strategy that can span infrastructure performance from design through operations. This is equally important in the developed and the developing world, where creating a sustainable environment requires a performance-based model that simulates relationships of interdependent systems for water, energy, transportation, safety and resilience. With the mainstreaming of connected devices like the iPad, the value of information modeling increases exponentially, delivering information mobility wherever it is needed, from the office to the construction site and from initial planning through construction and into operations. Bentley System's CEO, Greg Bentley will present real-world scenarios in which information modeling and information mobility are being leveraged to enhance infrastructure performance over its lifecycle, for improved quality of life.

UNGGIM and the Geospatial Industry: Working Together to advance a Global Agenda

Paul Cheung, *Director, United Nations Statistics Division and GGIM Secretariat, USA*

The geospatial industry has done a great deal to provide the technology, the privately sourced information, and the dissemination platforms to meet the needs of global users and to enhance the availability of global geospatial information. As a result, the profile and value of geospatial information is now increasingly recognized by the users and policy makers. However, many governments are struggling to deal with the privately sourced geospatial information with respect to their credibility, accuracy, legitimacy and their status vis-à-vis official geospatial information. The governments realize that they have the mandate and responsibility to guarantee a steady and reliable flow of geospatial information to the public within their national regulatory frameworks and to safeguard the interest of the public in the production and dissemination of such information. They also realize that there is a need for the governments to consult with each other and to evolve a community of practice on the use and development of geospatial information with respect to institutional arrangements, legal frameworks, common standards, and code of conduct. Consequently, the UN initiative on Global Geospatial Information Management (GGIM) was established as the inter-governmental mechanism for the countries to make joint decisions on the production and use of geospatial information within national and global policy frameworks. The government and the industry must find a complementary modality of working together in this joint effort to build a global geospatial information system.

Managing World Resources through Imaging Technologies

Matt O'Connell, *Chief Executive Officer, GeoEye Inc., USA*

Today, consumers, businesses, and governments whether they realize it or not, are both users and influencers of the commercial remote sensing industry. They increasingly define how services are consumed and how the industry's leaders operate on a daily basis. The industry's broader mandate and its strength come from the combined needs of countless people in many nations. The commercial remote sensing industry is complex yet highly visible due to the increasing demand for the services the industry provides. As a result, companies like+B55 GeoEye must increasingly invest in innovative technologies that enable them to operate seamlessly. See how commercial remote sensing companies like GeoEye are using Earth imagery, geospatial expertise and enabling technologies to make the invisible visible, whether uncovering human rights abuses, aiding in emergency disaster relief and damage assessment, or monitoring and managing the world's resources. GeoEye will highlight examples of how they created geospatial solutions to help people see, understand, anticipate and respond to change.

Fred Hagman, *Managing Director, Aerodata International, Belgium*

Based on the needs of the information society the PASCO Group is dedicated to spatial data collection of the earth's surface and to process these data into geo-information products for a variety of applications. Since PASCO is a major innovative remote sensing company ("World's Leading Geospatial Group") data collection is mainly based on the use of spaceborne, airborne and other remote sensing methods. The projects are executed all over the world and contribute to a safe and well organized society. To be successful and sustainable PASCO works in a responsible way towards people and the environment. The presentation will focus mainly on the deployment of aerial survey systems. It will highlight some example projects that have been executed by companies from within the Group in different parts of the globe. It shows the ever increasing and massive amounts of spatial data that are collected, managed and processed into various products. It mentions applications like land registration, disaster and risk assessment, natural resource management, producing base maps and more. Also education and training of local staff is touched upon. Next to this some emphasis will be put on using synergies and individual strengths of all members of the Group that are aimed to increase the effectiveness and general capabilities. The presentation will also deal with some general trends and developments that we can observe in our geospatial industry, showing the increasing importance of imaging technologies.

Brian L. Soliday, *Vice President of Sales, Branded Products, Intermap Technologies, USA*

The Living Planet report calculates that humans are using 30% more resources than the Earth can replenish each year, which is leading to deforestation, degraded soils, polluted air and water, increased demands for energy, and dramatic declines in numbers of fish and other species. By 2030, if nothing changes, humankind will need two planets to sustain its lifestyle. Digital imaging our planet through remote sensing technologies will allow us to move closer toward solutions to manage our world's natural resources. This presentation takes a look at a few examples of how remotely sensed elevation and Image data are impacting the management of sustainable natural resources such as precision agriculture, renewable energy sources such as oil palm, wind and solar energy, water and natural hazard risk assessments, and managing our forests and reducing carbon emissions.

Geospatial: The Past and the Future by TomTom

Alain De Taeye, *Board Member, TomTom BV., The Netherlands*

2012 marks the 500 year anniversary of the birthday of 16th century Flemish cartographer Gerardus Mercator. The invention of paper maps based on years and years of survey became a revolution in which the paper maps were used for in-car navigation and were eventually succeeded by advances in technology that enable a range of applications for the map. The debut of the digital map 30 years ago literally brought the map to life as it became a more dynamic asset. With the invention of the digital map came demands for additional content and more up-to date maps that reflect the reality of the world around us. With significant expertise in developing a digital map database of the world, TomTom uses a hybrid approach to map-making that includes the combination of authoritative sources, such as field collection, government data or satellite imagery, with community input, enables TomTom partners to refresh location aware applications and GIS solutions with the most up-to-date map and enhanced attribution available. Alain will show the development of innovative tools that enable freshness in the map, reflecting reality on the roads. This new and fresh data is not only essential for new generations of navigation solutions but also for business intelligence, transportation and logistics, government planning, and many more markets and use cases.

Changing World and Changing Priorities: Enabling a Geospatial World

Ben Semmens, *Group Operating Officer, Pitney Bowes Software, USA*

We live in a changing world, rich with spatially-relevant phenomenon, data and activities. This new spatially rich world created new challenges, realties, and opportunities for both business professionals and policy makers. The spatial nature of many of today's challenges and the global economic downturn warrant new ways of thinking and applying geospatial and non-geospatial technologies to solve urban and environmental problems. This also warrants a paradigm shift in the way we conduct business to leverage location intelligence to create an infrastructure for everyday collaboration and communication in all of its forms and various stakeholders. Spatial information provides context, enables relevance and enhances understanding of critical issues such as smart development and customer experience to allow sustainable growth. This understanding can be augmented with non-geospatial information and the new ways of interaction, such as social media. The conversion of both geospatial and non-geospatial technologies makes location intelligence enabled thinking and application to yield desired outcomes for customers, communities and other stakeholders possible.

Mining Industry in World Economy: Prospects and Directions

***Prof Jozef Dubinski**, President IOC, World Mining Congress, Poland*

Intense economic and technological world development has resulted in the increase of the consumption of the raw minerals. It has been estimated, that the value of 47 ÷ 56 billion Mg of the raw materials has been extracted annually around the world, and this value continues to grow. As the consequence the natural resources have already become the goods of the highest importance and because of this they have become the tool of the international politics. The 20th century, particularly after the World War II, was characterised by dynamic increase in the extraction and processing of the raw materials. This increase has been visible in a various extent, both in case of the energy and non-energy raw materials. The crucial problem has then been the efficient use of the natural resources – especially those non-renewable. Mining and investment in mineral's extraction have been the driving force for the economic and social development of many economies around the world; e.g. in highly developed countries such as Australia, the USA as well as in dynamically developing-ones like China, India, Brazil etc. Strong interest in the investments in mining was caused by the global raw materials market associated with the need to meet both: the growing resources' needs of the individual countries as well as with ensuring the stability of the supply and availability of these raw materials for the external customers.

Co-creation: Combining Open Data with Open Software to Create Information

***A J Baayen,** Managing Director, Deltares , The Netherlands*

With the recent advent of modern sensor technologies the water sector is overwhelmed by valuable measurement data. This is known as the digital data deluge. Mankind faces the challenge to turn this wealth of data into useful information. Yet the previous data deluge, the overwhelming output from numerical models, was not even solved yet. Combining both data deluges is known as the fourth paradigm. It is the great challenge for this century and has fundamentally changed all aspects of sharing of data and software. Only players exchanging data and information freely, can benefit from clients and users that are working together within communities. Information and software is increasingly made open source so communities can work together on data and information enhancement. Not only is software and data made available, by working together in communities information and software is enhanced and strengthened by interaction between scientists, data providers, software developers and clients. Furthermore, we are working together with many clients within communities on a mutually beneficial "co-creation" cooperation basis. We have for instance co-developed the Open Earth community in which we have streamlined the exchange data, information and software tools between scientists, governments, clients (e.g. the major dredging companies) and citizens. Open Earth is being used extensively in large projects, such as the Sand Engine and Building with Nature. Other examples are OpenMI, OpenDA. Why is this essential? There are many issues facing us. Global and local water scarcity, pollution, overpopulation and salinization to name a few. To tackle these issues, we need to work together and exchange our information. Within the Netherlands we are already tackling this by the forming of the NMDC and closer co operations between the knowledge institutes. Data and technology providers need to think about making data and software more freely available and work together in communities to create improved information products.

Ocean Resources in World Economy – A Geospatial Point of View

Mitrasen Bhikajee, *Executive Secretary, Inter-governmental Oceanographic Commission, UNESCO, France*

Recent decades have witnessed an increasing use of geospatial technology in the management and exploitation of marine resources. Emerging technologies assist in providing a global perspective of, what was earlier, a fragmented and incomplete view of the ocean resources. Satellite imagery is now widely accepted and used as a tool for determination of potential fishing zones (PFZ). A combination of seas surface temperature, ocean colour and altimetry data obtained by satellites allow the determination of areas which potentially have a higher concentration of fish. This technology is now used by several countries for more efficient fishing, thus saving on fuel and time. To counteract the argument that this increased efficiency can lead to overfishing, Vessel Monitoring Systems (VMS) allow controlling agencies to keep a close watch on the fishing effort of individual licensed vessels. An emerging issue is the newly acquired marine resource base of some countries as a result of the recommendations of the United Nations Commission on the Limits of the Continental Shelf (UNCLCS). Not only the delineation of the new marine territories but their exploitation also rely heavily on geospatial technology. Ocean research provide important inputs to the sustainable exploitation of marine resources. Satellite technology through online tide gauges and drifting and fixed buoys help in studying ocean processes which provide the information for predicting climate – an important factor in food production. Ocean data transmitted through remote systems allows the monitoring of cyclones and tsunamis, both of which have an impact on our economic resource base.

Contribution of Geospatial to the Infrastructure Sector

Geoff Zeiss, *Director Utility Industry Program, Autodesk, USA*

Worldwide, it is anticipated that there will be a massive spend on infrastructure, on the order of $24 trillion over the next two decades. Infrastructure engineering companies are discovering the benefits of the convergence of model–based design, 3D visualization, and integrated geospatial information and technology in order to increase productivity. When large industries face a serious business challenge such as low or declining margins, they invest in technology to help them dramatically increase productivity. This transformation as essential if infrastructure owners are to attract the private investment they so urgently require. An important trend in engineering design technology is reality capture using new techniques for geospatial data acquisition. Laser scanning (terrestrial, mobile, and LiDar), satellite photography and radar, high-resolution aerial photogrammetry and radar, oblique photogrammetry, and street-level photography, to name a few of the new geospatial data acquisition types that are being used by infrastructure engineers and designers to improve the productivity throughout the plan, design, build, and maintain infrastructure lifecycle.

Capacity Building of Future Leaders: Geospatial Data to Empower Young People in Global Issues

Prof. Henk Scholten, *Chief Executive Officer, Geodan, The Netherlands*

In an ever more connected world, where technical barriers crumble upon imagination, citizens demand to be part of the solution. That is a new role for institutions, to give voice and tools to society in solving the world's problems. Crowd-sourcing, citizen science, human computation, collaborative intelligence are all hot keywords in the research arena, but are the findings mature enough to allow everyone to play a role in the solution? We believe so! Imagine a school where the students actively work on solving a global problem as big as deforestation or climate change. Sounds farfetched? Not anymore. By networking industry and institutions a new approach rose that builds upon the strengths of each one. Let us show you the birth of such a breakthrough. Education institutions teamed up with technology industry leaders to create a life changing experience for students: the possibility to access, interact and protect the old growth forest of Borneo in real time. Nobody can do it alone, so the key word is cooperation. Geodan developed a high performance geo-spatial viewer, satellite providers (Astrium Infoterra, e-GEOS, DMC and ESA) provide near real time imagery, Microsoft Partners in Learning and Taking it Global engaged educators and learners from all over the world and the results are breathtaking. Threaten high-value forest was split into millions of cells, which are allocated to students who monitor it as updated imagery becomes available. Suspicious changes in the forest are reported in the web system and, operating in a crowd-sourcing approach using social media, all participants can confirm or not the findings (collaborative intelligence). Suspected areas are visited by a special team on the ground who involves the local authorities to stop illegal activities. We see a new role for industry and institutions: to empower citizens with real data and an active voice.

A Case Study of Industry-Institution Capacity Building in the Emerging Economy of India

Preetha Pulusani, *Chief Security Officer, ROLTA India Ltd., India*

India is one of the youngest nations in the world. About one quarter of the world's youth live in this vast, diverse and complex democracy. In the current dynamic environment of this country, an innovative partnership has been created between the Central Board of Secondary Education (CBSE) of India and the nation's leading Geospatial Solutions Company. For the first time ever in this country, this unique collaboration seeks to equip high school youngsters in 11th and 12th grade with education and knowledge about geospatial technology and its many, varied functions for building and safe guarding the nation. This talk will examine the magnitude of the commitment and investment by the parties. It will also discuss the ambitious goals of this program that will drive anticipated benefits to society, the future work force and the nation.

Geospatial Information Sciences after 3.11 crises in Japan and Action Program for Our Common Future

Prof. Hiromichi Fukui, *Director of International Digital Earth Applied Science Research Centre, Chubu University, Japan*

The tragic predicaments of the victims of the Great East Japan Earthquake and Tsunami Disaster, and of the resulting Fukushima Daiichi Nuclear Power Plant accident, are unparalleled in the recorded modern history of Japan. GIS is firstly helping the relief of victims and recovery of disaster-stricken areas in a number of key ways such as dynamic emergency mapping of critical information,sharing and mashup related services.Up-to-date field data and information through the social media as citizen's sensorswas brought into the GIS so that everyone coordinating the relief response was working from the same map-based platform, for example, ALL311, sinsai.info, Emergency Mapping Team activities and so on. On the other hand, transmission of information related to the emission and spread of the radioactive substances and handling of the accident of Fukushima Daiichi Nuclear Power Plant have generated significant insecurity among people. It is clear that for authorities to take an ambiguous stance for uncertainty undermines the safety of the citizens and create problems such as damage caused by harmful rumors of misinformation.Being faced with the present situation, we realize once again the necessity and significance of the Digital Earth or CyberGIS as an information commons of understanding and communicating understanding of the earth for our common future. It would be a comprehensive facility dedicated to environmental issues and disaster prevention, equipped with information and telecommunication infrastructures like Digital Earth orCyberGIS and with the capacity to supply the necessary staff and equipment at times of disaster.

Cooperation between Academia and Industry in the Pursuit of Scientific Excellence – A German Example

Dr. Ing. Christian Heipke, *Managing Director, Institute of Photogrammetry and GeoInformation Leibniz, University of Hannover, Germany*

IPI is a university institute doing research in photogrammetry and remote sensing with overlap to geospatial sciences and computer vision. The aims of IPI research are to create and communicate new and useful ideas and concepts in our field, which are relevant to society at large, and to support critical and self-critical independent thinking in our staff. IPI is involved in teaching the university courses Geodesy and Geoinformatics and Navigation and Field Robotics. IPI staff has ample experience in industry cooperation, among them in the mapping, the space and the car industry. Over the years we have found a research structure composed of three elements to be useful: (a) Basic/fundamental research, providing a "playing field" to create new ideas and concepts. This area needs to be funded by society, e. g. national or international scientific organisations such as DFG (German Science Foundation) or ESF (European Science Foundation), industry funding in this area is rare. (b) Applied research and development, e.g. the development of prototype systems. Here, we often cooperate with industry or public bodies, e. g. within the EU Research Framework Programmes. Funding partly comes from the government, partly from industry. (c) Pilot projects, e.g. software development and empirical studies.

According to the experience at IPI all three elements are important for successful research. Ingredients to successful cooperation with industry are regular, often informal meetings at high level, projects with clear rules with respect to funding, intellectual property rights and a publication schedule, staff exchange in the form of guest lectureships and internships for students and staff.

Geospatial Knowledge Transfer at LIESMARS

Prof. Li Deren, *Wuhan University, China*

This presentation gives a short description about geospatial knowledge transfer at the State Key Laboratory of Information Engineering in Survey, Mapping and Remote Sensing (LIESMARS) of Wuhan University. The mission of Geomatics lies in two aspects: (1) in the meaning of recognition science to automatically realize geospatial data-information-knowledge transfer; (2) and in the meaning of service science to effectively provide right geospatial data-information-knowledge to the right person at the right time and the right place. These are also the aim and task of LIESMARS. Some productions from LIESMARS including Software for Chinese Mapping Satellite ZY3, web GIS software GeoGlobe and OpenRS are the examples for illustration.

How can Education Contribute to Spatial Literacy?

Chris Gibson, *Vice President, Executive Committee Member, Trimble, USA*

Why is exploring with digital spatial data an added value besides regular geography lectures and using ordinary geography books? The hypothesis is that the added value of using GIS is based on 5 senses: Sense of reality When students userealistic data of their own environment and when they use recent information, students easily become curious to investigate more. They want to zoom in to their house or to their neighbours... Sense of urgency When using realistic data and thematic items, which are in the news, it is easy to get students interested. Geography addresses serious questions, which matter for their future. Sense of experience GIS makes it possible for students to get the experience of having influence on the situation. You feel the power of being in charge when deciding where a new village is going to be built, or how the country can best be protected against future flooding. Sense of fun In general people learn more easily when they are enjoying what they are doing. Using GIS is fun. GIS makes geography almost a game, the way for kids of having fun. Sense of location Using GIS in combination with GPS routes, tracking and tracing games or doing field work gives an extra dimension, location (x,y,z coordinates) becomes an exciting thing to explore.

Role of GeoFort: A Science Center

Willemijn Simon van Leeuwen*, Director, GeoFort, The Netherlands*

On the principle that "Investing in spatial literacy means saving lives and preventing disasters" it was thought a good idea in the Netherlands to let children be able to explore the world of geo-ICT in an exciting environment. Therefore a 'living lab' is being developed. It is called GeoFort. GeoFort emphasizes the importance of spatial thinking to a broader audience and stimulates younger people to choose a geo study. GeoFort does this by creating a science center where visitors can experiment together with geo companies in the area of cartography, navigation and geo simulations. This means maximizing the sense of experience and urgency at GeoFort. The pupils can press the buttons and decide which dikes should be reinforced. Depending on the scenario's they choose, the Netherlands will partly flood or not. GeoFort makes students aware in a captivating way of the bigger challenges for the Netherlands in the near future plus the surprising role of the XYZ-factor.

Commercial Satellite Remote Sensing and Geo-Intelligence

Capt. Ibrahim Alzaabi, *UAE Air Force, Space Reconnaissance Center, UAE*

One of the most striking space based Earth Observation developments of the past decade has been the growth of private sector developers and users of satellite imagery. The appearance of commercial observation systems has ended government monopoly on such information but they also broadened the options for government and private users around the world. The military services have come to rely intensely on space-based assets for imagery Intelligence. The military uses both dedicated military and commercial capabilities for many of their needs and it is obvious that Geo-spatial Intelligence is not marginal to the military; it is integral to their operations. The introduction of high-resolution commercial satellite imagery and advanced imagery analysis software has greatly expanded the military's use of commercial imagery. Although these satellites are, for most users, under foreign civilian and government agencies' control, the Falcon Ground Station was an early adapter by establishing the first regional Ikonos Ground station in 1999. As a result, the growing commercial presence in space is drawn, inexorably, into the "picture", because business and the military share some of the operating environment, and even some of the tasks. As the resolution of space borne sensors increases, so is the utility of the data. The broad area coverage, agility and frequent revisit capabilities of these satellite sensors enables to monitor numerous areas of interest simultaneously. In fact this ability is not limited to war fighting use, since many of the techniques used to support military operations have in fact supported disaster relief and humanitarian operations as well.

PPP and SDI – EU Level Context and Opportunities

Hugo DeGroof, *DG Environment-F-4 & Chief Scientist, Research & Innovation Unit, European Commission, Belgium*

The added-value of Public-Private Partnership as an approach to implement SDIs was discussed and documented extensively over the last decade. Many good reasons are listed for having PPPs as part of SDI implementation strategy such as: increased political support, bringing funding to the SDI, sharing of risks and rewards, enhanced implementation, local participation, data democratization, involvement of key stakeholder groups, efficient service delivery, reduction of bureaucratic hierarchies etc. The question then arises if there any EU level policy obligations or incentives for establishing such PPPs? - The European Commission, in the context of the EU Single market, recognizes the importance of PPP. In particular because in the current economic climate, cooperative ventures between public authorities and private enterprise can provide effective ways to, deliver infrastructure projects, provide services to the public or finance innovation. Public-private partnerships are being used in many Member States to deliver services of general interest and improving the environment for PPPs is a key objective of the work set out in the Commission Communication on PPP of 2009. However, under no circumstance does EU law oblige authorities in the Member States to organise a service of general interest in the form of a PPP. Where a public service is delivered through a PPP it is always the relevant public authorities in the Member States that have decided to use this form of organization. EU legislation may however contain strong incentives for establishing PPP for SDI. A good example can be found in the Environmental Liability Directive, ELD for which, despite of their high societal relevance and mutual benefit potential, PPP-SDI's as crucial data infrastructure for environmental risk assessment are still in their infancy. Based on the ELD and two examples of major industrial accidents, the 1998 Doñana Disaster in southern Spain with damages ranging at 240 million and the 2010 'red sludge disaster' with fines of over 400 million in Hungary, a case will be built for SDI partnerships between private industrial operators and governmental SDIs.

Guidelines for Geospatial Data Sharing

Dr. Robert F Austin*, Enterprise Applications, Integration Manager, Technology & Innovation, City of Tampa, USA*

Why are we concerned with data sharing and data integration? Other issues contribute to the failure to share data effectively. Recognize users need information, not just data. Look at "data sharing" systemically rather than individually. Data sharing should serve multiple objectives, when possible, to reduce redundancy. Identify the most important data sources and build an environment, workflow and funding mechanisms to sustain data creation, maintenance and sharing. As data are repurposed through sharing arrangements, document and communicate the value or return on investment to help ensure continued data sharing efforts. Identify standards to access, share and integrate data. Establish data sharing agreements. Mission specific data. Agency policy issues may be barriers to data sharing. Address issues of access to data, by data type, while ensuring certain data security and system availability. Use of the data. Value of the data. Define and clarify the expectations and requirements for data sharing. Data sharing versus data giving. Avoid unilateral data transfer arrangements. Coordinate data sharing efforts between and within agencies. Identifying data stewards is a valuable first step. Communicate the power of data sharing. Develop the community of sharing.After data sharing methods are established, the process of data integration can be addressed.

Keys to Collaboration: An SDI Success Story

***Daniel Shannon**, Senior Program Manager, Telus, Canada*

Data Sharing and integration is a particularly daunting challenge for firms with geographically distributed assets, whose operating territories span numerous administrative boundaries. In Canada, communications companies and utilities that span provincial boundaries have a unique opportunity to work with several provincial and regional jurisdictions who have each approached the challenge of establishing Spatial Data Infrastructures intended to enable inter-entity sharing and collaboration. Some have focused strictly on providing a common cadastre base using a Not For Profit with joint private public governance. Others have evolved from a public private partnership into a strictly for profit private enterprise. Perhaps the most interesting and innovative approach to a Spatial Data Infrastructure has been in British Columbia where a not for profit society called ICIS, the Integrated Cadastre Information Society has employed an evolutionary approach and achieved success through a relentless commitment to collaboration. ICIS has been able to overcome the a lack of actual data sharing; a deficiency that defeats so many Public Private Partnerships in their attempts to establish an effective Spatial Data Infrastructure. It is challenging to develop a commonly supported vision with identifiable value for private sector partners as well as provincial, regional, local, and first nations governments.

Realizing Benefits of Spatial Data Infrastructures – A User's Perspective from Environment Agency - Abu Dhabi

***Anil Kumar**, Acting Director, Environment Information Sector, Environment Agency - Abu Dhabi, UAE*

The Environment Agency – Abu Dhabi (EAD) was established in 1996 to preserve Abu Dhabi's natural heritage and raise awareness about environmental issues. As the Emirate's environmental regulator, it strives persistently to provide a clean and healthier environment to its residents. The rapid rate of development and associated socio-economic changes in the Emirate have increasingly brought to the fore the need for making better informed decisions. Geospatial technologies have been an integral part of the decision making process at EAD right from its inception. It is widely accepted that most environmental challenges faced at local levels are manifestations of global issues, and in order to effectively address these challenges, it is important to understand the global issues, and act upon locally. Substantial volumes of data and information spanning multiple disciplines are required to tackle such growing complexities. This requires local and global communities to share and make available relevant data and services, and Spatial Data Infrastructures (SDI) play a major role in this. EAD is one of the seven founding members of Abu Dhabi's Spatial Data Infrastructure (AD SDI), an initiative championed by the Abu Dhabi Systems & Information Centre (ADSIC) – an Abu Dhabi government entity. The presentation will focus on how Geospatial technologies are leveraged to protect, manage and conserve the environment of Abu Dhabi, role of SDIs, and the benefits realized by the Agency from being part of the AD SDI.

Providing Data to SDI: The Role of the Public and Private Sectors

***Dr. Luiz Paulo Souto Fortes PhD**, President of PC-IDEA, Brazilian Institute of Geography and Statistics –IBGE, Brazil*

At the core of any Spatial Data Infrastructure (SDI) is data availability. No SDI will evolve without the proper provision of updated and comprehensive geospatial data covering its geographic domain. This comprises, at least, reference (i.e., framework) and thematic data. Complementary, private companies have been participating in different phases of the geospatial data production process, more often on demand, as data service contractors. Nowadays the high demand for geospatial data and information is unquestionable. In the fast changing environment of our planet, as the high cost of geospatial data production is still an issue, governmental data providers have been struggling to meet the demand in a timely fashion, especially in continental-size countries or regions of the globe, like Brazil and the Americas. Under the above scope, this presentation shows the efforts of IBGE in terms of providing data to the National Spatial Data Infrastructure (INDE, in Portuguese) and the challenges associated with its completion and continuous update. In this scenario, new business models that could make government institutions and private companies work in tune and more synergetically, as in Public-Private Partnerships (PPP), must properly address the constraints and rules that generally govern the relationship between these parties.

Changing the Paradigm for Traffic Engineers

***Maarten van Gool**, CFO, Automotive Enterprise & Government, TomTom, The Netherlands*

TomTom has over 60 million customers worldwide contributing to the largest car centric GPS database in the world. This database currently contains over 5 trillion anonymous measurements and grows with an astonishing 5 billion measurements a day. TomTom started using this data in 2006 to be able to create even more accurate maps and a more reliable ETA in its navigation devices (IQ Routes). The revolutionary routing did not stay unnoticed by governments, concerned with improving mobility and a growing problem of congestion. Maarten will present how - together with the region of Amsterdam and the Dutch Ministry of Transport - a solution has been developed that enables road authorities and traffic engineers to get the most comprehensive overview of their road network they have ever seen before. This solution is now in use by governments and traffic engineers around Europe and the US, giving them a cost effective solution in difficult economic times. The development of the online tool NOT was done in a traditional way: by specifications of the civil servants and custom development by the supplier. In close cooperation and several iterations, a solution was created that was scalable, answering the needs of engineers around the globe.

***Jean-Philippe Grelot**, Deputy Director General, IGN France*

From a national mapping agency perspective, users' expectations about spatial data are developing simultaneously in various ways, mainly more datasets, higher accuracy and faster up-to-dateness. Responding without additional means and budget is impossible without dramatic technological changes and/or structural changes such as collaborative processes widely open to organisations and individuals. Having this in mind, the first expectation of a mapping agency for the national spatial data infrastructure in the information era could be: all organisations and individuals should consider the infrastructure as a common good, and thus contribute to its completion and updating as they will receive a larger return from the many contributions. The mapping agency has public service responsibilities, for instance continuity and equal access services, in addition to technical responsibilities such as homogeneity, completion, accuracy and up-to-dateness. It has basically a custody role to compile and give access to authoritative datasets, neutral in their contents, all consistent in their taxonomy, geometric accuracy and topology, and well documented through unambiguous and opened metadata. Maintaining and developing datasets in this respect requires to face a number of challenges. The first one is economical sustainability at a time of budget costs in government administration: the economic model associated with the initial funding and appropriate licensing rules has to be challenged against sustainability criteria. The second challenge is more technical and organisational. It deals with the capacity of collecting information from a huge number of sensors and contributors, to assess and use them either directly for completing and updating purposes or indirectly as indicators for further completions and updates. IGN has experienced a first collaborative tool with fire departments and other local public authorities. It is currently looking for new and wider opportunities in conjunction with the third version of its geoportal to be launched next summer.

The European Location Framework: Brining Harmonised Geospatial Reference Data Together

***Antti Jakobsson**, Programmes Manager, EuroGeographics, Belgium*

EuroGeographics is a not-for-profit organization representing 56 national mapping, land registries and cadastral agencies in 45 countries. It has a long experience on building harmonized datasets based on its member's data. Currently we provide data for Global and European usages through our products. Completed in February 2011, the eContentplus funded ESDIN project was collaboration between 20 consortium partners. It successfully showed how data from European NMCAs can be harmonised to meet INSPIRE obligations whilst also addressing issues such as generalisation, quality evaluation, edge-matching and access control. Even with INSPIRE-compliant data users can suffer from an unreliable reference if the pan-European or cross-border data is not: Edge-matched correctly at a national boundary; Quality assured Generalised consistently; orLifecycle managed effectively The E.L.F is based on a set of specifications for reference data. These specifications support interoperability across resolutions and themes and between countries for topographic, administrative and cadastral reference data. The E.LF is not a paper exercise, we need to build reference data services and ensure that these services are funded from Member States, the European Commission and users.

NSDI Policy Framework of Japan

Hiroshi Murakami, *Director General – Geospatial Information Department, Geospatial Information Authority of Japan, Japan*

The policy framework on NSDI in Japan is largely formed by two legal instruments: the Survey Act and the Basic Act Utilizing Geospatial Information (called "NSDI Act"). The Survey Act was enacted in 1949 to rebuild the country quickly after WWII by regulating the surveying and mapping work that is to be conducted by public organizations, ensuring the accuracies of and reducing duplicated efforts in surveying and mapping. In the early 2000's when digital geospatial information has matured to play a vital role in the country, particularly combined with the satellite positioning technology and its sophisticated applications, a number of political leaders considered it necessary to have new legislation to address the national agenda in making maximum use of geospatial information by taking advantage of the synergistic combination of the GIS and satellite positioning technologies. Their vision was materialized by the legislation of the NSDI Act in 2007, which has a provision of developing a nation-wide standard geospatial framework data for the first time in the country. This paper/presentation briefly summarizes the overview of these two Acts as well as the roles of Geospatial Information Authority of Japan in enforcing them, and addresses some outstanding challenges for the furtherance of NSDI in the country.

Bing Maps & Public-Private Partnerships

Ricky Brundritt*, EMEA Bing Maps Technology Solution Professional, Microsoft Corporation, UK*

The Bing Maps Platform brings location data to life by making it easier to visualize, understand, and analyze. The rich imagery, quality geospatial data, and leading-edge technology of Bing Maps is already being used by thousands of organizations, governments, and developers worldwide. With a wide range of tools and API's and an Enterprise focus, Bing Maps makes for an ideal solution for Enterprise companies. In this presentation we will review the different API's and functionalities available in Bing Maps and will take a quick look at how it is being used to solve real world problems.

Eye on Earth: A Global Public Information Service

Guenther Pichler*, Business Development Manager EMEA, Esri Europe, Germany*

Eye on Earth is a cloud computing-based, global public information service for sharing and discovering data and information on the environment from diverse sources. It promotes the principles of public data access and citizen science allowing to manipulate this data for collective usage. Initial contributors to the Eye on Earth Network include (in alphabetical order) the Abu Dhabi Systems & Information Centre (ADSIC), the Afghan Geodesy and Cartography Head Office (AGCHO), the Environment Agency – Abu Dhabi (EAD), the EEA, Jane Goodall Institute (JGI), the Joint Research Centre of the European Commission (JRC), the Kuwait Environment Protection Agency (KEPA/eMISK), the United Nations Environment Programme (UNEP) and the United States Environmental Protection Agency (USEPA). The Eye on Earth functionality includes an integrated "Watches" application, which combines WaterWatch, AirWatch and NoiseWatch. These bring together water quality information from more than 22,000 bathing sites, air quality data from around 2,000 monitoring stations as well as previous noise pollution levels in Europe's largest cities. The Eye on Earth Network is also contributing to and supporting the Global Network of Networks, one of the collaborative special initiatives announced at the Eye on Earth Summit.

Portray Your Geography to the World

***Mladen Stojic**, Senior Vice President, ERDAS, Intergraph, USA*

Geospatial organizations need to use and distribute volumes of geospatial data, but disparate legacy information systems may hinder data-sharing. When departments use different geospatial software and data formats, data silos result, forming obstacles to effective collaboration within the enterprise. Additional problems arise when trying to share data with outside organizations. Intergraph's Spatial Data Infrastructure (SDI) solution removes the obstacles associated with distributing and using copied data. Adherence to industry standards, including INSPIRE, Open Geospatial Consortium (OGC®), and International Organization for Standardization (ISO), not only breaks down barriers, but also allows organizations to comply with government mandates. With GeoMedia SDI Portal and its powerful browser application, you can easily visualize and share accurate geospatial data to collaborate internally, and with government agencies, commercial businesses, and the public.

Public Private Partnership based on the NSDI of Spain: Regulation and Examples from the National Geographic Institute

***Sebastian Mas-Mayoral**, Director, National Centre for Geographic Information, Spain*

In Spain public private partnership to get added value on data and services provided by public sector is regulated by Law 37/2007, of November 16th, on Public Sector Information reusing that transposes the European Directive 2003/98/CE, of November 2003, from the European Parliament and Council. On the specific case of geographic information, Ministry of Infrastructures and Transports, according the Law 37/2007, has approved Order FOM/956/2008, of March 31st, setting up policy for public diffusion of geographic information produces by the National Geographic Institute. This policy sets up that non commercial use of the digital geographic data and geographic information services provided by National Geographic Institute through Internet will be licensed free of charge, whenever it is mentioned the origin and property of the data. This paper provides some information on this geographic information access and downloading web services using by non commercial users. Commercial use of digital geographic information with direct, indirect or differed economic profits is also possible and it is regulated by agreement between the National Centre for Geographic Information and the company providing added value according a commercial activity. The Law has set up geographic information services organization and general regulations and standards to set up spatial data infrastructures in Spain. This paper provides several examples on public private partnership to provide added value SDI services from public SDI services.

Playground and challenges for Public Private Partnerships in the Netherlands

***Rob van de Velde**, Director, GeoNovum, The Netherlands*

The Dutch government has the bold ambition to emerge stronger from the present financial crisis and wants to invest in an innovative and resilient economy. Proper provision and re-use of geospatial information is essential in this respect. The national eGovernment strategy and the specific geospatial information strategy, GIDEON, have resulted in major progress and tangible results in access, harmonisation and usebility of public funded geospatial dataregisters. The private geospatial sector has a long history in innovation and value-adding with geospatial information. With the growing maturity of the public funded national spatial data infrastructure, the growing impact of open data policies and the ongoing focus on data-harmonization and data-quality (national policy of key registers and INSPIRE directive), the floor is open for new strategic and operational partnerships between the government and the private sector. In our presentation we will present a general overview of the geospatial landscape and the potential benefits of increased public-private collaboration.

PPP and International Open Standards

***Steven Ramage**, Executive Director Marketing and Communications, OGC International , Norway*

The goal of the Exchange Forum is to bring together industry leaders from across the world and assess key challenges and opportunities for Public Private Partnerships (PPP). The Open Geospatial Consortium (OGC) could be described as an organization that has been facilitating this activity for many years. The very nature of the OGC working groups is based on consensus and collaboration, two key elements of PPP. During his presentation Steven will explain some of the activities involving the OGC, including some emerging activities specifically relating to organizations involved in PPP, such as the European Commission Future Internet Public-Private Partnership Programme (FI-PPP) and the Telecommunication Standardization Sector (ITU-T) of the United Nations International Telecommunication Union.

Partnering for SDI implementation: Victoria, Australia

***Bruce Thompson**, Chief Information Officer, Corporate and Business Services, Department of Sustainability and Environment, Australia*

Victoria has a long record of partnering for SDI implementation, at micro and macro levels. Over the last decade a series of partnerships have delivered parts of the picture – spatial data maintenance, mapping production, state-wide commercial real-time high precision positioning services. The governance model has also been a partnership, with the multi-sectoral Victorian Spatial Council delivering a 'whole-of-Victoria' spatial strategy covering the public, private and academic sectors, rather than the Victorian Government producing a separate public sector strategy. The Victorian Government works closely with the private sector in developing value-add opportunities based on improving access to public sector information, and is a core participant in the Cooperative Research Centre for Spatial Information, Australia's principal spatial research body. This simple partnering model is now well established and supported by all sectors, with well defined, complementary roles for each sector, and an effective governance model in place through the Victorian Spatial Council. The presentation reviews the history of partnering for SDI in Victoria, before focussing on the Australia New Zealand Spatial Marketplace proposal, and testing the potential for broadening the partnership.

SDI for Whom and by Whom?

***Dr. Arup Dasgupta**, Managing Editor, Geospatial World, India*

SDI efforts around the world raised hopes for a geospatially enabled world. In reality SDI has not lived up to its promise. In most cases SDI is turning out to be an effort of government agencies, by government agencies and for government agencies. The very underpinnings of SDI are partnerships between government, industry, academia and citizens. Most applications of SDI are citizen-centric but the citizen is treated as a passive beneficiary. In today's interconnected and spatially enabled world this approach is anachronistic. The average citizen is well equipped in terms of communications and information processing through web enabled mobile services. SDI has to take into account this growing importance of neo-geographers and volunteered geographical information. Most government agencies lack adequate human resources and are therefore unable to implement the SDI in the manner intended. It is seen that industry is very successful in providing back-office services to government agencies, particularly in IT enabled services. Industry can therefore play a major role in the realisation of SDI. It could be through a Build-Own-Operate model which can later be transformed to a Build-Own-Operate-Transfer model as the staffs of government agencies acquire the necessary skills. In sum, SDI needs to look beyond standards, policies and capacity building and address issues of implementation and effective use.

Potential for Public-Private Partnership for SDI in Malaysia

***Fuziah Bt Abu Hanifah**, Director, Malaysia Centre for Geospatial Data Infrastructure (MaCGDI), Malaysia*

While NSDI has been established in Malaysia, the full potential can further be realized. To a large degree many users are hopeful that they can get access to the system and start finding and using data. Some users expect NSDI to provide them readily available data without the necessary step of requesting the data from the data providers as well as the step for them to process and prepare the data for their use. Some further argued that the usability of the system can be improved if appropriate combination between data sharing and focused application is found in the services. To address the current challenges and to enhance the effectiveness of the NSDI in Malaysia, there is possibility of establishing a collaborative business venture between the government and private entities. In this respect, partnership between government entity and business enterprise is important to realize the full potential of NSDI with user-oriented services as the focus. Close links between both sectors will result in the more optimal utilization of geospatial information, and create the synergy to spur the NSDI growth. Such strategies of collaborative partnership will be unique not only because of the type of relationship binding the private sector to the public sector, but also in how they ensure the successful implementation of the NSDI initiative.

A View on Policy for National Spatial Data Infrastructure

Dr. Derek Clarke, *Chief Director: Surveys and Mapping, Chief Director: Natioanl Geospatial Information, Department of Rural Development and Land Reform, South Africa*

The national spatial data infrastructure (NSDI) is a significant mechanism for managing geo-spatial information within a country. It impacts on role-players in both the public and private sectors and the ultimate beneficiary, the citizens of the country. The NSDI must serve the national programmes of Government. The significance of the NSDI requires it to be guided by and managed within a policy framework. For a policy to be effective it is necessary for the policy to be formulated through a particular process, ensuring commitment to and buy-in from all the key role-players. A policy may require compliance by specified groups and so it is necessary to have compliance monitoring and reporting. A policy is put in place to address a specified problem or need and so the impact of the policy on the problem area should be monitored. This could result in adjustments to the policy being made. The policy environment can be contentious terrain and will need support at the appropriate levels, including the highest political level. For NSDI this is probably the most challenging to achieve. Although policy making for NSDI in South Africa is still in its infancy, experiences to-date are shared. These include the process of policy making.

Olaf Magnus Ostensen*, Director, Norwegian Mapping Authority, Norway*

The national geospatial information infrastructure in Norway evolved from the standardization activities, first by the development of data content standards, data modeling methodologies, and data exchange formats. In the late 1990s, we saw the emerging of a service orientated geospatial data infrastructure by many government agencies deploying web services for viewing and downloading geospatial information over the internet. This infrastructure was founded on ISO and OGC standards. Today, every government, regional and local authority with an interest, as provider or user, of geospatial information participate in this partnership. More than 600 public sector institutions participate thus closely in the joint venture. Private sector and industry have been involved from the start, initially by pushing for the standards development, later by providing the tools underpinning the infrastructure. Industry and government is working closely to develop tools for integrating geospatial information into other sectors, e.g. geo-enabling public authorities through simple interfaces so that geospatial information can be utilized in the public decision workflows. The latest activity is a joint development between the government and all the main GI solution providers of a geosynchronization service to support the requirements from the INSPIRE directive, and allowing industry to build solutions on top of authoritative and continuously updated information. Norway has a broad interest in international affairs and development, and we thus also want to follow and contribute to the UN initiative on global geospatial information management.

The Role of PPP's in UNSDI

***Jan Cees Venema**, Head, UNSDI-NCO, The Netherlands*

The United Nations Spatial Data Infrastructure (UNSDI) can be seen as a global SDI. By developing, distributing and implementing two UNSDI building blocks, consisting of the Geospatial Data Warehouse and the corresponding Visualization Facility, a global infrastructure comes into place, allowing for making a vast amount of geo-information discoverable, available and accessible. From peacekeeping to humanitarian relief, from climate change to disaster reduction, response and recovery, from environmental protection to poverty reduction, food security, water resources management and sustainable economic development, the agencies of the UN produce complementary data and information that needs to be shared between them and their Member States. The UNSDI partners within the UN system are on the verge of putting 26 TB, or 300.000 layers, of geo-information on-line as soon as the UNSDI Geospatial Data Warehouse and the Visualization Facility are in place. This shared data and information will reduce costs, raise operational efficiencies and improve the quality of services for everyone. In order to keep UNSDI manageable, one interface per Member State is foreseen, dubbed 'National Coordination Offices' or NCOs in short.

Implementation of National Spatial Data Infrastructure (NSDI) In Bahrain

***Dr. Khalid Al Haidan**, Director, Central Informatics Organisation – CIO, Bahrain*

The GIS Directorate of the Central Informatics Organization - CIO, Kingdom of Bahrain, in concordance of a Government Decree and directives of National GIS Steering Committee (NGISSC) officially implemented National Spatial Data Infrastructure (NSDI) for the Kingdom of Bahrain, in February 2005. Bahrain Spatial Data Infrastructure (BSDI) Portal is a manifestation of NSDI meant to fulfill the mandates of NGISSC and thereby NSDI. Bahrain Spatial Data Infrastructure (BSDI) Portal-that operates on a GIS database of geospatial data layers such as Street Centerlines, Addresses, Electricity & Water Transmission and Distribution, Telecommunications Infrastructure, Gas & Oil Pipelines, Sewerage & Drainage, and others, serves Government Organizations, Private Sectors and Academic Institutions of the Kingdom of Bahrain. Bahrain Spatial Data Infrastructure (BSDI) build with an infrastructure conforming to the stipulations of ISO, OGC, Inc. functions as a powerful tool for economic and social development, and environmental management, enabling the full potential of GIS technology. BSDI facilitates and co-coordinates the exchange and sharing of spatial data among the stakeholders in Government, Business Sectors and with Citizens (G2G; G2B and G2C), resulting in substantial reduction in the cost of development and arresting duplication of data. This endeavor reflects and promotes recommendation of the use of the corporate database concept to integrate GIS data for all units of local government participating in a cooperative Corporate GIS program, under the auspices of NSDI.

Indonesia-geoSpatial Data Infrastructure (Ina-SDI): Integrates Sectors And Regions In Acceleration And Extensification Of National Development

Dr. Ir. Yusuf Surachman Djajadiharja M.Sc., *Deputy for Spatial Data Infrastructures, BAKOSURTANAL, Indonesia*

President of the Republic of Indonesia has signed the Law Nr. 04 year 2011 on the regulation and assurance for the implementation of availability and access to geospatial information in Indonesia. The Regulation of the President of the Republic of Indonesia Nr. 85 year 2007 has implemented for the establishment of the Network of National geoSpatial Data. In order to enforce the Law and Regulation, the Government of Indonesia has developed Indonesia-geoSpatial Data Infrastructure (Ina-SDI), which consists of: policies, institutions arrangement, technologies, standards, and human resources. Main goals of the Ina-SDI is to enforce a single geospatial reference which required for the national programme, to integrate sectors and regions in acceleration and extensification of national development through a common reference map, to ensure and share integrated geospatial data and information nationally without violating the property rights, to facilitate people, industry, or institution in changing preference from geospatial data keeping to geospatial information production and community, to simplify cooperation, coordination, collaboration, and synchronization of national resources and programmes, to improve public services and also enhance the competitiveness of national economy. Ina-GeoPortal able to reduce duplication of effort among agencies, improve quality and reduce costs related to geospatial data and information, to make geospatial data more accessible to the public, to increase the benefits of using available geospatial data.

Geospatial To Counter Future Threats

Col. John Kedar, *Commander Joint Aeronautical & Geographical Organisation (JAGO), MoD, UK*

Geospatial Intelligence is becoming increasingly important to decision makers. It is driven forward year by year as a result of technology, new sources of data and the passion and drive of analysts in a 'bottom-up' approach. As a result the geospatial community in Defence tends to look two or three years out. However, the World will change significantly in the next decades and so too will the geospatial support required by decision makers at all levels. We must start planning now. The presentation will examine how the World will change over the next 20 to 30 years based on UK MOD strategic thinking, where conflicts are likely to arise and the nature of these very conflicts. Drawing on recent operational lessons through personal experience and his analysis of the future, he develops pointers that identify how geospatial support might change and how it must develop to counter future threats. This talk is equally relevant to policy makers, industry and the Defence and Security geospatial community.

Digital Sand Model Room: Benefits, Future and Challenges

Sanjay K Agarwalla, *Chief Executive Officer, Integrated Digital Systems, India*

Sand Model or tables has been used for military planning and War Gaming as a field expedient and in training for military actions. This kind of classroom exercise allows model manipulation through possible scenarios in military planning. Sand Model Room is an integral part of almost all military training establishments as well as operational units of the Indian Army. Today, with improved maps, aerial and satellite images as well as high performance 3D Visualization and GIS software, Sand Model Rooms are going digital. This presentation analyses architecture of a digital Sand Model Room, its benefits, integration in overall enterprise wide geo intelligence system, its future and the challenges faced.

Assymetric Warfare Geospatial Requirements to Counter Threats to Internal Security

Air Cdre Mark Ashwell (Retd), *Managing Partner, MLA Consultancy Services, USA*

Of the many elements that contribute to instability, and offer challenges to internal security, I will focus on examples Terrorism, Insurgency and Drugs. As Professor Keith Grint has identified each of these challenges pose a Wicked Problem. Such problems do not respond to simple solutions but require collaboration and sharing of intelligence and between people, to knit together actions that drive long term and iterative responses. Imagery provides a Geospatial Foundation upon which to bring together and fuse vital information into the knowledge and understanding necessary to react to complex challenges. As a core tenet of Geospatial Intelligence (GEOINT), and as the Director of NGA emphasized in her first keynote presentation, human terrain must be effectively mapped to enable patterns of activity to be understood. From this GEOINT platform anomalous behaviour may be effectively identified and used as a cue for appropriate and timely responses. Vast amounts of community sourced data are now available and need to be exploited using the GEOINT foundation to support the understanding of, and for shaping counters to, asymmetric challenges. In his work at IBM with the G2 platform, innovators such as Jeff Jonas are showing how such data can be managed and used advantageously. Combining such processing with the power of the visual platform of GEOINT offers the potential to build environments where knowledge can be shared and exploited successfully. In such places effective sensing of, and reaction to, the Black Swan of evolving asymmetric challenges may, as recent events in Abbottabad appear to attest, be possible?

Case Study of AM/FM/GIS in South Africa's Electrical Utility, Eskom 1996-2012

Adri de la Rey, *GIS Manager, ESKOM, South Africa*

Eskom is the vertical integrated Electricity Utility in South Africa with the following challenges but not restricted to them alone: Electrify customers in the vast previously disadvantage area; Ensure that there is enough electricity generation capacity for economic growth; Refurbish and extend the electrical network to keep up with the growth and maintain service levels; Develop the human capacity to maintain and grow the system. During the late 1980's Eskom was only a wholesaler of Electricity and the previous government instructed Eskom the Electrical Utility to start with the electrification of previously disadvantage areas. At that stage the municipalities were providing the service to the proclaimed towns and Eskom was not geared to handle 300 000 new household customers per annum. Top management made a decision to use information technology (IT) as one of the enablers to perform the electrification program. An Automated Mapping/Facility management system was selected as one of the enablers. The author was involved in the selection of the system, then the collection and capturing of core and proprietary geospatial data sets that are needed for the system. In a developing country there will be challenges in collection and maintenance of core and proprietary spatial data sets. The need for a robust core dwelling frame data set for South Africa, a developing country, to enable physical infrastructure planning, development and maintenance become apparent and the SPOT BUILDING COUNT (SBC) was developed. The development of this "new data set" will be discussed with all the lessons learnt. The benefits of having an annual update of the dwelling frame also support the organic growth away from AM/FM to a true Geographic Information section was slow but steady. The activities that are being performed by the section will be discussed and it could have some lessons for other developing countries and entities. The talk will be concluded with what is seen as the biggest challenge for the geosciences in South Africa and for that matter any developing country. 1) The developing of the human capital; 2) The sharing and creating of sustainable core date sets to eliminate duplication; 3)The keeping up with Technology developments. The usage of Google Maps and Bingmap as the marketing tools for real GIS.

Geospatial Data and Analysis for the Global Business Process of Shell Exploration and Production

Jack Verouden, *Data Management & Geomatics Manager, Shell International Exploration & Production, The Netherlands*

The portfolio is changing considerably for a Commercial International Energy company. Jack will outline what role Geomatics, Geospatial data and Geospatial technologies play and should play. He will also discuss the importance of open data and the co-operation between commercial and government organizations, where possible at global level.

How Geospatial Technology Supports Operations and Maintenance Workflows in Energy Utilities

Richard Zambuni, *Global Marketing Director, Geospatial and Utilities, Bentley, UK*

This presentation will look at the role that a GIS-based asset register plays in supporting optimized operations and maintenance workflows in energy and multi-utilities. This presentation is based on real-world case studies from utilities such as Essent Local Energy Services in the Netherlands and other utilities elsewhere in Europe. We will demonstrate the deep value utilities find in being able to manage network connectivity, maintenance records, and operational data to map, plan, optimize, design, and operate energy and multi-utility infrastructure.

Enterprise GIS : Delivering Competitive Advantage for Offshore Wind Farm Development

John Shaw, C*hief Information Officer and Head of Information Services, Mainstream Global, Ireland*

The presentation will emphasize on the business technology strategy at Mainstream with a focus on the Europe's Offshore Wind Industry. Mr Shaw will further talk about the Smart Energy Reference Architecture and will discuss the IT strategy; the vision of integrated systems. He will further talk on delivering competitive advantage with ESRI technology and will throw light on the future plans of Mainstream Global

Utilities GIS Application Put to the Ultimate Test: Southern Company's Innovative TransView Application Enables Efficient Response to Devastating Storms

James Weninegar, *Manager Line Routing and Survey, Alabama Power, USA*

On April 27, 2011 a series of devastating storms swept through the southern U.S. In particular, the state of Alabama suffered substantial damage. The power and flexibility of the TransView platform was demonstrated by enabling the Alabama Power subsidiary to execute rapid Storm Response measures. TransView provided access to mission critical data so management and field crews could coordinate efforts and respond quickly to those areas most affected by the storms. In the days following the storm, Alabama Power staff was then able to monitor and assess their restoration efforts in an efficient and coordinated manner to speed the restoration of power to the area. The presentation will recount those critical hours leading up to the storm and how the company leveraged the TransView application to efficiently and effectively execute its Storm Response measures.

Evolution of Smart frameworks in Power Utilities

Prasanta Saha, *Head - Business Development of Engineering Solutions, Tata Consultancy Services, UK*
Joe Coldrick*, Principal Business Advisor, Tata Consultancy Services, UK*

Power Utilities are embracing the recent SmartGrid technologies to establish a complete Command-and-Control environment for electric distribution. A Command-and-Control center integrates with Supervisory Control and Data Acquisition (SCADA) and Distribution Network Analysis (DNA) to create an advanced Distribution Management System (DMS). DMS transcends traditional outage management systems (OMS) by delivering outage analysis, integrated workforce management, advanced visualization, and real-time monitoring. TCS Smart Frameworks deal with the technological advancements in this field and provide new dimensions to enhancing their potential.

GIS Project: Business Process Optimizations with GIS System in GDF SUEZ

Radu Negoita, *GIS Manager – IT, GDF, Romania*

GDF SUEZ Energy Romania has a leader position in utility segment of distribution and delivery of gas. In the late of year 2009, because of changing of many processes in the company one of the requirements was to implement a GIS solution and capture all data related of gas network from the field.

Main Goals for implementing a GIS Solution: There was a few targets in the scope of implementing this kind of project. 1) Develop a reliable system for managing, maintaining and sharing gas network and geographical information to the internal user; 2) Increase efficiency related to access of data and eliminates redundant data; 3) Single software platform; 4)Increase value of services to internal user; 5)

Easy access via enterprise solutions of critical business processes like interventions, investment, and network development.

GIS platform: We chose Autodesk platform Map3D Enterprise and AIMS base on Oracle Spatial Database; After testing few solution, the reason behind this choosing was taken based on some factor in the evaluation process: open platform , open database model, web based application with editing possibilities, low bandwidth requirements, fat client with workflows, SAP integration possibility. Main functionality covers by the application: 1) Navigation and easy access to information and graphical information; 2) New creation of feature with editing geometrical and technical attribute; 3) Network analysis; 4) Easy search for a feature; 5) Custom reports,

Challenges Faced by the Utility Industry: Moving Towards a GIS-Centric Enterprise

Joep Luijten, *Senior Manager, Technology Services, Geographic Information Systems, Capgemini, Belgium*

Many network operators nowadays encounter difficulties or limitations with their GIS implementations. The most common issues that are raised to management come from different parts of the operation and include, but are not limited to: Unavailability of single source of reliable and accurate network information throughout the company; Missing or inaccurate end-to-end connectivity of the network model including customer connections; A variety of graphical and non-graphical applications describe parts of the network at different stages of its lifecycle; Full lifecycle management of the network infrastructure tends to be impossible with this inconsistent set of applications; Heavy paper-based update cycles of network information resulting in unacceptable backlogs between actual field situation and network documentation; Inaccurate or poorly updated topographic base maps (including address positions). This requires utility operators to address and upgrade their network information systems and implement systems for exchanging project information with external systems.

Spatial Information - Enabler for Smart Grid

Anirban Acharya, *CM, Infotech Enterprises Europe Limited, Senior Consultant, UK*

After a long period of relative stability, the electricity industry is undergoing a major disruption of its traditional business model. The electrical meter is no longer the network end point, home appliances are becoming the new touch point for residential customers. Power generation is coming from multiple sources, including wind, solar and hydro. Homes and business, the traditional customers of the grid, are becoming generators themselves, supplying energy back to the grid. All these changes are triggering multi-fold increase in the data than what is presently available to utilities. On the other side, utility companies own a number of critical systems to support its day-to-day operations, including Geographical Information, Outage Management, Distribution Management, Meter Data Management, Asset Management, Customer Information Management etc. But most of these systems operate independently. In this scenario, are the utility enterprise systems ready to handle the "explosion" of information after implementing Smart Grid solutions? Industry experts believe that given the nature of a GIS, it has the potential to unify various software applications in streamlining business processes. In this paper, let us discuss how GIS can enable enterprise IT systems for smart grid and what are the critical characteristics of GIS that one has to ensure to make this happen.

Improving Efficiency of Water Utilities: Practical Examples

Slavco Velickov, *Water Industry Sales Director EMEA, Bentley, The Netherlands*

The presentation will feature examples of how engineers from public and private water utilities companies including the consulting ecosystem are currently dealing with reducing water losses and energy consumption, demand management, and other efficiency-related topics. The first part of the presentation will address the efficiency trends in the water utilities industry, followed up by a brief description of the Bentley geospatial and hydraulic modeling and management water solutions addressing these key efficiency topics. Finally, practical examples of case studies (from Europe and the Middle East), regarding asset information management, active leakage management, complex pumping scheduling optimization and demand forecasting will be presented outlining the ROI and the data requirements aspects of these solutions.

International Joint Commission Canada-US (Project 1594)

Michael T. Laitta, *Physical Scientist/GIS Coordinator, International Joint Commission Canada and the U.S.*

The International Joint Commission, in coordination with Environment Canada, Natural Resources Canada, U.S. Geological Survey, Agriculture and Agri-Foods Canada has made unprecedented progress with the harmonization of the shared fundamental hydrographic datasets along the Canadian-U.S. interface. Phase I and II of this effort; the alignment and editing of sub drainage areas within the major Trans-boundary Basins and the first pass connection of the fundamental hydrographic layers is complete. In 2012, this effort will focus on the delineation and refinement of smaller drainage units within these now harmonized sub drainage areas as well as the development of bi national water quality and quantity applications. This presentation will touch upon the basic technical methods employed to facilitate the negotiation of bi national delineations, impacts to the federal stewarding agencies, and potential opportunities for sustainable regional based hydrologic applications. This bi-national, multi-agency approach to spatial data creation, sharing and maintenance is an unprecedented step forward towards the development of truly seamless and interoperable bi-national data resources.

Water Information and Environmental Intelligence

Warwick McDonald, *Head-Environmental Information Services Branch, Australian Bureau of Meteorology, Australia*

In the face of rapid population growth and extensive human-induced changes in our ecosystems, it is becoming essential that environmental observations and models are used to provide 'environmental intelligence' which directly informs and guides decisions and actions by government, businesses and individuals. Hence the Bureau of Meteorology is transforming its role to become the provider of environmental intelligence that will ensure the safety, sustainability, wellbeing and prosperity of all Australians. This presentation will outline the challenges, experiences and solutions for harmonising the nation's water information within a geospatial framework, including the critical role of standards and evolvable information systems to help account for and determine the changes in the availability of Australia's water resources.

Mapping of Resource Water Quality Objectives in the Department of Water Affairs, South Africa

Helena Fourie, *Sub-Directorate Geographic Information & Archiving, Department of Water Affairs, South Africa*

In South Africa water is a scarce and unevenly distributed national resource. It is the responsibility of the Department of Water Affairs to ensure the sustainable use and protection of water quality for the benefit of all users. Remote sensing, GIS and cartography play an important role in the integrated spatial management of water resources. The quantity, quality and reliability of water must achieve optimum long term environmentally sustainable socio-economic benefit for South African society, as well as neighbouring countries of shared river systems. This presentation focuses on the mapping of water quality according to Resource Water Quality Objectives (RWQO's). Information from various sources, especially the Water Management System (WMS), is processed, analysed and verified utilising scientific techniques. RWQO maps enable managers to visualise the status of water quality against predefined objectives. In association with this remote sensing and GIS tools play an important role in the siting of RWQO points, deciding on the level of protection that should be afforded, analysing possible causes of non-compliance and determining remediation requirements.

Remote Sensing in Operational Water Management in The Netherlands

Dr. Ir. J.M. (Hanneke) Schuurmans, *Advisor, Hydrologie DHV, The Netherlands*

More and more data becomes available about the state of the watershed thanks to remote sensing data. Good news on one hand but this leads also to the challenge to process this data and to translate it into useful information. Water managers become more and more information managers. DHV supports water boards and local authorities about watershed management, advising how to translate data into information. Thereby realizing that the amount of detail about this information depends on the type of end-user. Rainfall and evapotranspiration are the driving forces of the hydrological system. Remote sensing techniques like rainfall radar and remotely sensed evapotranspiration provide better insight in the current state of the hydrological system than traditional measurements due to its spatial variability. The last years both the accuracy as well as the availability of these data has increased. At this moment more and more water authorities decide to implement these remote sensing data. This information together with weather forecasts helps water managers to have a solid ground on which they can make either operational or strategic decisions. In this presentation examples from practice are given showing the added value of remote sensing data in watershed management from recent projects. Cases from last year (2011) will be presented. The spring and early summer of 2011, was extremely dry. On the other hand, there were several water excess problems, mainly at the end of 2011 in the Nothern part of the Netherlands. Attention will also be given to the process of implementing relatively new and unknown data. Innovative solutions to combine the individual data sources in order to create information and to be able to diagnose the functioning of the hydrological system will be presented.

Space Technology Applications for Socio-Economic Benefits: the Case for Sustainable Water Management

Levent Canturk, *Office for Outer Space Affairs, United Nations Office at Vienna, Vienna International Centre, Austria*

Over the past two decades, space technology has become a significant part of our daily lives. Owing to the rewards and opportunities afforded by space technology and science and their use in promoting social and economic development, and looking at possibilitiesto enable developing nations to have access to space technology tools by strengtheningtheir indigenous capacities in this field, the United Nations, through its Office for Outer Space Affairs, facilitated the establishment and operation of the Regional Centres for Space Science and Technology Education, affiliated to the United Nations (http://www.unoosa.org/oosa/en/SAP/centres/index.html). The United Nations Office for Outer Space Affairs (UNOOSA) has been organizing workshops to promote space tools and solutions for sustainable development. These workshops addressed the benefits and applications of space technologies in enhancing the management of water resources as well as the challenges to sustainable development in other areas. The observations and recommendations of these workshops will be presented to provide better understanding of how the space technology can be utilized effectively for sustainable development, especially in the areas of water. In 2010, UNOOSA started organizing a series of workshops to promote the use of space technology and its applications for socio-economic benefits, particularly in developing countries. The first workshop was held in Istanbul, Turkey in 2010 (http://www.tubitak.gov.tr/spaceworkshop). The second workshop was held in Hanoi, Vietnam in 2011 (http://www.sti.vast.ac.vn/spaceworkshop_UN_VAST-2011/). The third workshop will be held in Santiago, Chile, from 12 to 16 November 2012. One of the specific objectives of this workshop is to demonstrate the benefits of various space technology applications covered by the RIO+20 United Nations Conference on Sustainable Development: energy, cities, food, water, oceans, and disasters (http://www.uncsd2012.org/rio20/7issues.html).

Water and satellites and have no boundaries

Ruud Grim, *Senior Advisor Applications, Netherlands Space Office (NSO), The Netherlands*

Water is essential to society and nature. The climate is changing however. Long periods without rain can ruin crops and affect other functions that rely on a fresh water supply. Extreme rainfall can also cause dangerous floods. Every year hundreds of thousands of people are affected by water-related disasters. The Dutch water, food, space and geo-information sectors have joined forces to help countries deal with these climate-related problems.To minimise the effects of drought and flood in order to promote a safe living environment, the first step is to create an effective data infrastructure. Yet most countries do not have an extensive monitoring network. And it usually requires large-scale investments to set up an effective data infrastructure. A recent Dutch initiative, the Netherlands Cooperation on Water and Climate Services, aims to find solutions to this data scarcity problem using remote sensing as innovative monitor and map technology. Spatial thematic information will be integrated in hydrological/agricultural models and GIS to create specific information services. The Dutch cooperation started in 2011 and is now active is various countries. The cooperation is presented and project examples will be shown.

The Need and Contribution of Spatial Data for the Management of Renewable Water Resources

Prof. Wim Bastiaanssen (Ph.D.), *Co-founder & CTO, eLEAF, The Netherlands*

The availabiliby of sufficient amount of fresh water resources at certain locations and moments is dwindling rapidly. The competition in water allocation and water use is getting fiercer. Decision makers need to have up-to-date access to the water conditions in river basins and reservoirs for making smart decisions. Operational systems at the regional scale should provide daily updates on rainfall, evapo-transpiration, soil moisture, reservoir storage, aquifer storage and withdrawals to agricultural and environmental water use sectors. The presentation will demonstrate the state-of-the-art technology to make this geospatial data available through web-based services using satellite measurements and pixel intelligence mapping technologies. Examples of Asia, Africa and Europe will be demostrated. The necessity and the solution for reliable spatial data will be advocated.

Autocad Map3D for New Application Architecture of Evides Waterbedrijf

Wouter Verburg, *Project and Integration Manager, Ideas to Interconnect BV, The Netherlands*

The presentation will explain the way Autocad Map3D fits in the new application architecture of Evides Waterbedrijf. This new application architecture is realised in the 'Waterkracht' programme. The presentation will consist of a few short topics for setting the scene. Followed by the more in-depth topics of fitting Autocad Map3D and the Utility Design module into the application architecture. The roundup will share the challenges and key success factors in the programme

GIS at Brabant Water

Daan van Os, *Advisor, Brabant Water, The Netherlands*

Brabant Water is the second largest drinking water company in the Netherlands. Its distribution area covers the province of Noord Brabant. Fresh water is delivered to 2.4 million people through the 84,500 kilometers of main pipes. A GIS system is used for the registration of these pipes. All apertures in the water network are also registered in the GIS application. Brabant Water is one of the few water companies that has all 1.1 million house connections geographically correctly registered in the GIS . Advantage of this registration is the easy access of analysts to the distribution network data from source to customer. The challenge Brabant Water is facing, is to keep all this information up-to-date on a high quality standard. In addition to the daily changes in the network, Brabant Water recently started to add maintenance data to their GIS. Using a GIS intensively results in a series of change requests by different user groups. Managing these request is another challenging task. The GIS information is accessible to 300 web users at Brabant Water and to another 160 mobile users. Connections to the customer information system and the "call before you dig" system makes GIS the main source of geographical information at Brabant Water.

The Benefit of Integrated ICT-Systems in a Disaster Situation

Patrick Vercruyssen, *Director - Customer Relations, Geo-Information Science and Pidpa, Belgium*

As a Belgian water utility, Pidpa uses a complete SAP, GIS, SCADA and Office landscape for operational & tactical and strategic purposes. In december 2010, the drinking water network in two municipalities was heavily bacteriologically polluted. As a consequence, 18.000 people couldn't use the drinking water any more during 11 days. This paper gives a description of how integrated ICT systems can help a utility company in a difficult and stressfull situation. During the different phases of the calamity , several ICT-systems such as SAP logistics, Portal-technolgy, GIS, ISU, CRM, SCADA and internet where deployed. Although Pidpa had a disasterplan, it was never tested on such a large scale. This presentation describes the role and importance of these ICT-components in each phase.

Integrating Hydraulic Modeling & GIS Improving Water Efficiency & Network Operations

Eng. Atif A Karrani, *Head - GIS Department, General Directorate of IT, Sharjah Electricity & Water Authority, UAE*

This paper is based on the practical experience gained in the implementation of an enterprise GIS for Sharjah Electricity and Water Authority, Sharjah, UAE. The first part of the presentation will discuss the importance of reliable and up-to-date GIS asset registry for the water distribution network at SEWA, including description of the process and the experience of building this GIS repository using ArcGIS software from ESRI. The next part of the presentation will outline the integration aspects of the underlying GIS data for hydraulic modeling using WaterGEMS modeling package from Bentley. The Model Builder module ensures bi-directional synchronization between the GIS features and the hydraulic modeling attributes, keeping always updated hydraulic models. The last part of the presentation will focus on the potential use of the hydraulic model for operational management and improving the efficiency of the water distribution network, in particular for leakage hot-spots detection, pressure and energy optimization and pipe renewal planning process. The results of these hydraulic analysis can be stored back in the underlying GIS asset registry for further presentation and operational use.

Watermanagement to the next level, powered by spatial information

Ir. René van der Velde*, Programmanager Spatial Information, Het Waterschapshuis, The Netherlands*

More than 80% of the population lives in delta's and about 40% of the Netherlands lies below sea level. Our national airport Schiphol is over 4 meters below sea level. Proper management of the water and our defenses is crucial. The need for spatial data is evident. Even more important is the transformation of these massive datasets into immediately usable information. The Netherlands have become a leader in developing new unique data sets (airborne data, sensor data, imagery, satellite data). The challenge is to exploit its full potential and to combine these datasets in a smart way. This leads to better decision making, strategy and policy and costs savings. The presentation gives an overview and presents the challenges which come along.

Impact of a Pipe Burst on the Surrounding Area – Integrating GIS and Hydraulic Modelling in a Risk Based Approach

Kim van Daal, *GIS specialist, KWR Watercycle Research Institute, The Netherlands*

Pipe bursts can result in unwanted effects. Pipe bursts typically result in a deficient supply interms of quantity and pressure or the introduction of pollutants. In January 2004 an incident took place in the Netherlands where a dike of a main transportation canal was leaking and almost collapsed. Leakage stopped after closing valves in a water main. This incident raised the awareness of the risks of pipe bursts to third parties (or so-called external effects). The Dutch drinking water branch initiated an inventory of water mains at risky locations and prepared to take corrective measures if deemed necessary. Pipe bursts can for example cause pits in the street surrounding the pipes, associated remediation costs, and the potential for damage to the public image of the water company. Managing risks in water supply networks requires an understanding of the risks of pipe bursts related to both the drinking water supply and the surrounding area. KWR has established a method to realistically quantify the effects of pipe leakage on the surrounding area. The analysis involves a combination of hydraulic modelling and risk analysis of the distribution network using GIS. A case study shows that using a hydraulic network solver leads to a smaller estimation of the area affected by a pipe burst compared to earlier calculation methods. Combining the results within GIS resulted in fewer mains requiring full risk consideration. This illustrates that the combination of GIS with other analytical tools can provide valuable information for the management regime of water supply networks.

Geospatial Powering Business Intelligence Capabilities

Daniel Shannon, *Senior Program Manager, Telus, Canada*

Geospatial Information Systems (GIS) in utilities present unique challenges including managing complex connected networks across a broad geography. But GIS connectivity is about more than network connectivity. Organisations today need their spatial information to connect their businesses in much more dynamic and far reaching ways. However most enterprise geospatial systems in service today carry with them limitations inherited from their initial design from years ago when they were stand alone asset management applications. Meanwhile geospatial applications are being developed and employed throughout the business community, many of them agile, affordable and effective. Overlaying Business Intelligence capability that truly integrates with and augments legacy geospatial capabilities requires careful planning, and a GIS Technology Road Map that can provide a framework to justify investment to realise a GIS strategy that truly supports a firm's business objectives. Data often proves to be the biggest impediment to the modernisation of legacy GIS. Many of the more elaborate capabilities of newer geospatial systems remain beyond reach due to the barrier created by the deficit of the geospatial data required to power those business intelligence capabilities. Therefore a modern GIS Technology Road Map must treat spatial data as an enterprise resource, independent of any one application. GIS Data architecture must evolve with enterprise requirements in hand, ideally to be interacted with Business case development supporting deployment of new GIS capabilities will need to rely more upon intangible strategic benefits. Compared with quantifying the benefit of automating a manual CAD function for one department or a single business unit, articulating the value of deploying Business Intelligence capabilities functionality across multiple departments requires an extra level of organisational effort and savvy and collaboration. The payoff will be a GIS that manages a connected network, but one that enables a more connected organisation.

Geospatial Information – The Vital Ingredient for Insurance Decision-Making

Nigel Davis, *Executive Director, Willis Group, UK*

As we understand more about the features of the world and the complex processes within it, our dependency on geospatial information continues to grow. Geospatial information is used every day to influence the way the communities are designed and reverse-engineered in order to minimise loss of life and establish sustainable habitats for our population. In a society that strives to become more resilient to the strains of natural and man-made influences such as climate change or urbanisation, the role of the insurance sector becomes increasingly important as a mechanism to offset risk, to change the way risk is considered and to drive behavioural change. In particular, natural catastrophes and their associated risks are implicitly spatial in their composition and the insurance market increasingly relies on the a deep understanding of these phenomenon in relation to insured assets as part of each companies daily financial decision-making. This presentation provides an overview of the diverse uses of geospatial information within insurance decision-making from the perspective of Willis - one of the world's leading insurance brokers.

Introduction of Spatial Enabled Data Warehouse Technology Across the Enterprise

Joachim Figura, *Chief Executive Officer, CISS TDI GmbH, Germany*

Data Warehouse and Business Intelligence has been well established. The data warehouse concept is proven and fundamental. The increasing interdependence between GIS and other operational IT systems, and the fact that databases like Oracle Spatial allow spatial queries, now facilitate the introduction of spatial enabled data warehouse technology across the enterprise. Fundamental requirements such as flexible ad hoc analysis and configurable reports are in many cases difficult if not possible, in a pure GIS implementation. Oracle database environments facilitate a broader set of queries and allow an easier data management scenario. This presentation illustrates two use cases how geodata, extracted from different GIS applications based on diverse GIS-technologies and then transformed into an Oracle-based geodata warehouse, can provide extensive and enhanced value.

Analysis of the Geography of Competition between Telecommunication Infrastructures

Bert Klaassens, *Senior Advisor at Independent Post and Telecommunications Authority (OPTA), The Netherlands*

Developments in European and national case law force national regulatory authorities (NRA's), like OPTA in the Netherlands, to make more detailed and elaborate analyses of the telecommunications markets. Ex-ante regulation of telecommunication markets, where necessary, need to be tailor made with respect for regional differences between areas with different competitive conditions. The European Commission requires analysis of the presence of operators, their regional or national pricing schemes, regional market shares etcetera. OPTA was one of the first NRA's to apply GIS in its decision making. This was possible because of the availability of accurate data on the topology of the networks and actual supplies by the operators. In 2005 OPTA's analysis was based on information from KLIC, now part of Kadaster. The data processing was done by Bentley. Now, since 2010 OPTA makes its own analyses, from data gathering to mapping and calculating. OPTA's analyses are unique in Europe because of the availability of accurate data and the relatively small size of the country. This presentation will show the possibilities of GIS that help to analyze the geographical dimension of market assessment. In its most recent market decisions OPTA made analyses of regional competition differences by mapping actual supply and demand factors, pricing schemes etcetera, with a forward looking perspective by mapping potential demand and potential coverage of telecommunication networks. Without the GIS tools this detailed analysis would be much more difficult, if not impossible.

An Effective Convergence of Analytics and Geography

Tony Boobier, *EMEA Insurance Leader IBM Business Analytics, IBM, UK*

According to a recent survey, analytics is at the top of the agenda for most executive and businesses. Analytics transforms data into information and providing actionable insight into issues such as customer retention, risk management and growth, asset management and operational effectiveness – to name but a few areas. There is increasing recognition of the impact of 'location' in analytics and, linked to this, the geospatial industry is going through a transformational period, increasingly embedding analytic capability into its offerings. This presentation will review the use of analytics across all industries in 2011, discussing implementation strategies, give examples of the effective convergence of analytics and geography, and provide a call to action for the geospatial industry going forward.

Geo-Analytics; Harnessing Your Business Intelligence and GIS Systems to Business Benefit

Karl Mullins, *Principal Consultant, Assimil8 Limited, UK*

Assimil8 have taken Geo-Analytics, the process of integrating and utilisising Business Intelligence with GIS, to the next level and formulated a number of out of the box applications. Developed closely with industry sectors these applications will undoubtedly bring new business insights to information which typically exists in disparate business systems in your organization. The presentation will introduce how the collaboration of the technology can bring real gains to organization and explore the solutions in more depth such as Networking (wireless Communications) Retail, Events Industry, Insurance , Petroleum to name but a few.

Local Service, Global Response: Challenges and Success Stories in Supplying VHR data in Europe

Adrian W. Zevenbergen, *CM 1st, European Space Imaging, Managing Director, Germany*

European Space Imaging has been running for 10 years and has consistently worked together with institutional partners in Europe providing geospatial data to assist in the research and development of existing and new applications for VHR imagery. Some of the success stories include rapid response imagery production for aid and security agencies in the event of natural disasters to aid action plans; and multiple stereo imaging over cities or impenetrable landscapes such as the high Himalayas. Case studies will be presented which highlight the challenges faced at being at the forefront of image supply and explore the successful use of VHR imagery into emerging fields of research and business models. For example, the production of a 3-D model of K2 in Himalayas to assist climbing parties, and stereo-modeling to assist the development of security and crowd flow plans for the London Olympics. Other instances to be included cover rapid response and disaster mitigation, agricultural monitoring and analysis.

Business Enterprise GIS: "Where Business and GIS meet"

Ing. A A M (Bart) Kusse, *Manager Competence, Center Geo-ICT, Capgemini, The Netherlands*

Since the beginning of GIS "we" have always anticipated that GIS would be used at the boardroom level. ("We" in this case are the GIS-professionals with an enterprise-wide view). The good news is: we are getting there! The sad news is: this may still take a decade or more to achieve. Why does it take so much time to really integrate the use of GIS in the information management of companies? The presentation will give an overview of my experiences why it has taken so long for GIS to get adopted by the business and what were the reasons behind this. Secondly it will focus on areas (business issues) that need attention in order to assure proper implementation and adoption of GIS. It is of course not just GIS, but the notion of Geo-ICT that is important and determines what strategy will be the most successful.

Actionable Intelligence for the "Enterprise": Best Practices and Future Directions

Ahmed Abukhater PhD, *GISP, Global Director of Product Management, Pitney Bowes Software, USA*

The need to establish a centralized operational and collaboration platform that ties the internal employees and external customers, partners, and citizens emerges as one of the top business needs and government concerns today. Although the concept is not new, its implementation is still not fully mature. This presentation will illustrate the idea of the 'enterprise' in the context of business and governmental organizations and will further provide a practical framework for successful adoption and implementation. Web 2.0, location intelligence and geospatial technology are critical elements in the transformation of any organization from an isolated entity to a fully networked enterprise as part of a well connected business ecosystem. To do this, more comprehensive end-to-end solutions are warranted to provide the ability to analyze scenarios, visualize results, and share outcomes throughout the entire planning, design, building, and management process of any project. By utilizing these enterprise capabilities that Pitney Bowes Software and Autodesk partnership brings to life today, both governments and businesses will be able to establish bidirectional channels of communication with citizens and customers respectively and open the company to greater interaction with the outside world.

Enterprise Applications of GIS in the City of Tampa

Dr. Robert F Austin Ph.D., GISP, *Enterprise Applications Integration Manager Technology & Innovation, City of Tampa, USA*

The City of Tampa, Florida first deployed GIS technology in 1978. Subsequent adoption has been widespread as the City moved from SYMAP to Genamap to a heterogeneous environment featuring multiple GIS platforms. The City currently manages 227 "layers" of information; additional layers are added regularly in response to the definition of detailed business requirements. Tampa has adopted a data-centric view toward geospatial information management and has migrated all geospatial data into a single data repository. Although the repository is accessible via multiple platforms, the City has defined a path forward that will provide similar or identical functionality through a single interface. The paper presents examples of applications from the areas of crime prevention, disaster planning and utility service provisioning, discussing both the tangible and the intangible benefits afforded by geospatial analysis. Particular attention is given to the issue of support for business functions.

Flexible and Usable WebGIS for the Organisation

Karolina van Schrojenstein Lantman – Orlinska, *Geospatial Advisor, Grontmij Nederland B.V., The Netherlands*

In most organisations, WebGIS is an organisationwide application of GIS. However, in its essence it has to be far from being a typical GIS. Since WebGIS is used by the whole organisation, it has to fulfill two important needs: flexibility and usability. WebGIS needs to be flexible because of the constant changes in an organisation. New tasks and new projects arrive that can and should be facilitated by already existing WebGIS. On the other hand, usability of the system is crucial for a successful growth and adoption of any WebGIS. It is not possible to train all the employees of an organisation to become GIS technicians. Combining these two aspects in a traditional WebGIS seems almost impossible. The solution to this problem lays in purpose specific WebGIS applications. During this presentation I will discuss the most common problems with the current approach to WebGIS and propose solutions that will help many organisations use more fully their Webgis potential.

Incentive for Economy, Environment and Quality of Life

***Jan-Willem Weststrate**, Head of Contract Management,Maasvlakte 2 Project, Port of Rotterdam, The Netherlands*

The Port of Rotterdam is going to become twenty per cent bigger. The extra 1,000 hectares of port and industry area of Maasvlakte 2 will be in full use in 2035, and the largest ocean giants in the world will unload their cargo for the European market efficiently and swiftly. What will the Port for Rotterdam look like then? Where do the benefits for the economy, environment and quality of life come from? The Port of Rotterdam is and will remain a port of global importance, and there will also remain a long-term demand for square metres directly by the sea. Since container ships keep getting larger and larger, all around the world the transhipment of containers is concentrating increasingly on large ports with deep waterways and good logistic connections. Maasvlakte 2 makes Rotterdam totally ready for the growth in worldwide transport flows. In 2035, the port expansion will have achieved extra transhipment capacity of 17 million containers annually. The first ships can already moor at the quays of Rotterdam World Gateway (RWG) and Stevedore APM Terminals in 2014 with the commissioning of the terminal on Maasvlakte 2. According tot expectations, in a later phase of the project the expansion of the Euromax Terminal (ECT) will be established. Until 2014, the Port of Rotterdam Authority is working on the first phase of Maasvlakte 2. By that time, 240 million cubic metres of sand will have been applied, and the hard and soft seawalls will be ready. The first 700-hectare port area then has 2.5 km of deep sea quay (-20 metres), the port basins are at their proper depth and the roads, railways and pipelines are ready. In every stage of the project, from environmental impact assessments to construction and exploitation, geo-spatial data have played an important role.

Prevention of Damage and Incidents with a Nationwide SDI for Exchange of Cable and Pipelines Information

***Caroline J. Groot MSc**, Product Manager KLIC, Kadaster, The Netherlands*

The lack of knowledge of the location of underground networks resulted in the Netherlands in 20% damage to cables and pipes during excavation activities with all the risk related tot the damage. Together with a careful way of digging, actual and complete information on the spot could help to prevent this. The government of the Netherlands decided to make it mandatory for all excavators to dig carefully and to ask for all available information of the location before start to work. The exchange of that information of cables and pipelines is legally based on the Underground Cables and Pipelines Information Exchange Act which has taken effect in the Netherlands since July 2008. Since December 2010 the exchange is fully digital and based on international and national standards. Standardization was essential due to the fact that the information is owned and distributed by more than 1100 different public and private companies and used by more than 14000 users. Since 2008 the electronic information exchange process is managed by the Kadaster and more than 500.000 packages of digital information are successfully collected and made available. The succes and fail points are discussed together with the challenging opportunities and innovations for the future.

Geo-information in Infrastructure: The Use of Generic and Specific Datasets in the Processes of Rijkswaterstaat

Yvette Ellenkamp, *Senior Advisor, Department of Policy on Geo-information, Ministry of Infrastructure and the Environment, The Netherlands*
Hans Nobbe*, Senior Advisor, Department of Policy on Geo-information, Ministry of Infrastructure and the Environment, The Netherlands*

In the past decade the Dutch national policy on geo-information has invested in creating the Dutch Spatial Data Infrastructure. Key registers on Addresses, Buildings, Cadastral information and small scaled Topography have been created. Nowadays key registers on large scaled Topography and Subsoil are being developed. Implementation of European directives such as INSPIRE and PSI help improving the availability of geo-information and the statement of the Minister of Infratsructure and the Environment that in 2015 all data in the domain of Infrastructure and the Environment should be "open, unless" helps breaking down barriers in using geo-information. In the presentation a short introduction into these objectives of the policy on geo-information will be given after which the presentation will focus on the use of geo-information in the processes of Rijkswaterstaat. Rijkswaterstaat uses geo-information in all phases of the construction, maintenance and management of infrastructural works. For example: roads, bridges, dikes and works for the protection of land against water.

Implementing an Integrated Enterprise-wide Geospatial Data Service and How It will Become Part of Crossrail's BIM and Asset Data Strategy

Wayne Marsh, *GIS Manager, Crossrail, UK*

Crossrail, currently the largest infrastructure project underway in Europe, is a significant addition to London's public transportation network that will enhance connectivity between the capital and the south east of England, carrying over 200 million passengers each year. Part of the project includes twin-bore 21-kilometer tunnels under central London with interchanges to the existing transport network. The project is creating a unique 3D asset model, bringing together CAD/BIM and geospatial information from numerous sources, incorporating spatial analysis into all of it's operational and design processes. Oracle Spatial 11g serves as the master repository for this geospatial data, and is being utilised as a platform for a variety of 2D and 3D design, maintenance and management applications. As part of this presentation you will learn how Crossrail currently uses Oracle and how it enables management, query, analysis and integration of 3D geospatial data for enterprise-scale applications. Finally you will see Crossrail's vision of the future, how the asset database, CAD/BIM and GIS integrate, and the role Oracle performs within this structure.

Why Should a Municipal Organization Evolve to 3D GIS and 3D Design?

***R. (Rick) Klooster**, Coordinator Team Visualization, Department of Spatial Information Public Works Apeldoorn, The Netherlands*

The geospatial department of Apeldoorn, a city of about 150.000 inhabitants in the centre of the Netherlands, is using an online 3D virtual city since 2004 to communicate urban plans with stakeholders. In cooperation with the spatial planning and the civil departments multiple projects were visualized and communicated in a standardized approach throughout the years. As a result, many of the spatial developments within the city are available through www.virtueelapeldoorn.nl←http://www.virtueelapeldoorn.nl/→ now. A lot of experience has been gained building and using the 3D city model, so what were the lessons learned and why should a municipal organization evolve to 3D GIS and 3D design? What are the do's and the don'ts? What are the benefits and what were the difficulties? What is the best to work in 3D at this moment and what are the plans for the future? New developments like CityGml, pointclouds, BIM are great promises but how should they be introduced? In short, the urban planning process often already is in 3D, just not properly streamlined and only partially digital. If this process is properly aligned and digitalized in 3D, the benefits are numerous and the possibilities are endless!

Moazanah – A "Geo-innovative" Solution for Capital Project Requests and Budgeting

***Shafik Jiwani,** Executive Vice President-Global GIS Business Development, Orion Technology (A Division of Rolta Canada Ltd), Canada*

The presentation is on the Capital Project Request Management System (CAPRMS) called Moazanah, for the public works agency Ashghal in the State of Qatar. Until 2010, Qatar's capital budget application process was quite complex, with multiple submitting agencies, multiple reviewers, and endless emails, attachments and paper submittals. Ashghal, Qatar's public works agency charged with coordinating the process, sought to significantly improve the process, and therefore began canvassing for bids to build an automated Capital Project Request Management System. Requirements naturally included the ability to consolidate all the applications and their supporting materials, and to be rid of the endless stream of emails and paper. This project was awarded to Rolta in 2009, and today Moazanah is fully operational, and provides Qatar Ashghal with an efficient, streamlined, and geo-centric solution. Moazanah has been adopted by all of the 25+ agencies involved. At a glance, senior executives can now view their Moazanah dashboard to recognize the total number of capital budget requests, broken out by agency, and their status.

Intelligent 3D City Models

***Ton de Vries**, Solutions Executive Government, Bentley, USA*

With more than 50% of the world's population living in cities, and the proportion of the world's population living in cities growing to an astonishing 70% by 2050, cities and city infrastructure become an even bigger factor in the quality of life. This presentation focuses on how we can better and more efficiently plan, design, construct, and operate city infrastructure, to be better prepared for the future. A city's infrastructure is inter-related geospatially, physically and logically as networks, and visually as we see it in real life. Modeling infrastructure in 3 dimensions allows for virtually any type of planning, design, construction, and operations workflows to be addressed in an environment that is highly intuitive and closely related to our human perception of the world and it also expands the realm and effectiveness of what we as infrastructure professionals do. This session will discuss technologies for 3D city and infrastructure modeling and present case studies illustrating its benefits across several infrastructure disciplines. The presentation also covers the creation, management and applications for 3D city models and the benefits for users in transforming their traditional 2D GIS systems into powerful 3D city models. The presentation will focus on why 3D city models are valuable and how they can be created by extending existing GIS systems, not replacing them. Ton de Vries, Bentley's Solution Executive for Government will show some real life examples of how organizations have improved their process and their results by embracing 3D intelligent modeling within their workflows. Examples from North America and Europe in the public and combined public-private sector show how the quality of services can be improved while reducing risks and improving efficiency.

BIM and GIS: Reducing Costs in Lifecycle Asset Management

***Ir. H. (Henri) Veldhuis**, Manager Asset Management Software, Grontmij Nederland B.V., The Netherlands*

Each year in the Netherlands large investments are done in the design, construction, maintenance and renewal of road, water and rail infrastructure. Especially during large-scale projects, where infrastructure needs to be renewed and possibly expanded, high failure costs arise because of the lack of up-to-date information about the infrastructure and its environment. This presentation focuses on a study carried out by Grontmij on the possibilities of using Geographic Information Systems (GIS) and Building Information Models (BIM) in these projects. As a result a business case will be presented which makes clear that GIS and BIM play a key role in the reduction of failure costs.

Drive for Construction Productivity Spurs Intelligent Infrastructure Models

Geoff Zeiss, *Director Utility Industry Program, Autodesk, USA*

Currently 52% of the world's population lives in cities. Recently, McKinsey singled out poor construction productivity as one of the most important factors in eroding returns on infrastructure and making infrastructure less attractive for investment and suggested a 30% improvement in construction productivity was feasible. The utility and telecommunications industries developed intelligent digital models of their infrastructure networks starting in the 1980's and accelerating in the 1990's. In the building industry, which began trialling a digital-model based process or building information modeling (BIM) in the late 1980's, model-based design has accelerated in the last decade. Motivated by the potential for roughly 20% in savings across construction projects, the US General Services Administration in 2007 mandated BIM for Federal building projects, Singapore's Building and Construction Authority (BCA) implemented a BIM Roadmap in 2010 with the aim that 80% of the construction industry will use BIM by 2015, and the UK Government is requiring all publicly funded infrastructure projects to move to BIM curve by 2016. The convergence of BIM and GIS when put together with intelligent digital models of infrastructure networks and 3D visualisation technology originating in the gaming industry not only improves productivity but also enables a more holistic approach for addressing the major problems associated with increased urbanisation. Improving transportation while reducing pollution, increasing energy availability while reducing emissions, providing greater access to clean water while improving the quality of surface waters, and improving the liveability of our buildings while reducing emissions and the energy and water requirements are just some of the areas where technology convergence can enable new solutions which we could not even imagine several years ago.

Heathrow Map Live

Nigel Stroud, *Geometry Information Manager,Knowledge & Information Management, Heathrow Airport Limited, UK*

Heathrow Map as launched in July 2011. The application is web based and allows users to view geometry information relevant to their business activity. All the information is attributed and is stored in a central GIS database. Since its launch the application achieves at least 1700 hits per month. Contractors can easily coordinate all new work lessening the risk of a of a service strike. The quality and status of each service can be viewed by a single click. Our planning teams can extract information about the surrounding properties allowing informed decisions to be made. Sensitive issues like noise pollution can be analysed and managed by interrogating the external intelligent mapping layers. Building models are integrated which can be viewed in context with the airfield infrastructure. This also extends into the rooms where commercial have linked property database enabling instant themed views showing revenue and occupancy Airport-Collaborative Decision Making utilises the GIS base information to plot real time aircraft positions. Stand and taxiway status can also be viewed allowing better planning and action management.

Government Perspective on Building Information Management

James Brayshaw, *Director, Customers and Markets, Ordnance Survey, UK*

Approximately 40% of all UK construction work takes place in the Public Sector and the UK Government has decided that it wishes to adopt Building Information Management (BIM) as part of its Construction Strategy. As a member of the BIM Implementation Group, James Brayshaw of Ordnance Survey will present on the UK Government's Strategy for building information management, how it is being implemented across all government construction projects by 2016 and how the adoption of data standards and processes is essential to accomplish the necessary industry changes. This will include the use of information exchange (COBie) and will feed into the use of BIM to support the UK infrastructure plan. The UK Government is looking to make a step change in the use of BIM to make construction cost savings of around 20%, whilst improving the supply chain and better use of data throughout the lifecycle of all projects. This will allow significant further savings throughout the building/asset lifecycle.

Virtual Engineering

Gerwin Duine*, Team Manager Roads, Manager Infrastructure Innovation, DHV BV, The Netherlands*

Virtual Engineering is the concept of DHV to work on integral design challenges from the objects within the building and infrastructure sector. The concept is based on lifecycle-approach of Building & Infrastructure objects from the initial phase to the maintenance; generated design and construction data will be used in later stages of the lifecycle of a project/object. The key is an integral approach to develop building & infrastructural objects by using the VDC (Virtual Design & Construction) methodology with consists of three aspects:Product (BIM), Organization and Process.

LandBase: An Example of Spatial Database Creation and Exploitation Using Trimble's eCognition

Andrew Tewkesbury, *GIS and Remote Sensing Specialist, Astrium Services, UK*

Remotely sensed images have been automatically classified to land cover maps for decades providing crucial information relating to land use patterns and climate change. Recent advances have bought very high resolution images and digital surface models detailed enough to characterise land cover at large scales suitable for urban planning, forestry and vegetation management. Traditionally the output of an automated image classification is a static map depicting class labels only. This type of output may confine its use to one application and limit the potential for analysis and data integration. Modern spatial databases on the other hand record data at an object level with a multitude of attribution allowing both spatial and thematic queries to be implemented. Trimble's eCognition provides a means of segmenting remotely sensed imagery into a series of objects approximating real world features. These objects can form the basis of high level classifications involving shape, texture and context but also act as the framework of a spatial database. In essence modern image analysis is no longer confined to the production of static, single application maps but can generate object level databases rich in information ready for future analysis and auxiliary data integration. Using Astrium GEO-Information Services LandBase product as a case study this paper will demonstrate how Trimble's eCognition can be used to build powerful, cost effective spatial databases from remote sensing data and analyse them for a range of different applications. Application examples will include urban change detection, forestry and land use mapping.

Making use of spatial information in BUILDING INFORMATION MODELING (BIM)

F M (Fred) van der Weijde, *General Manager, Geodan Van den Berg, The Netherlands*

In the process of constructing infrastructures and other building objects more information is required than just a representation of the objects that have to be constructed. In the planning stage other information above and under the ground can be very useful. Like: the quality and type of the soil, the groundwater levels, presence and location of cables and pipes, permits, city plans, traffic volumes, location of archeological objects or ammunition. In the construction and maintenance stage you will be interested in the actual location of building related objects, machinery and colleagues and the effects of the building process on nearby living citizens and on nature and wildlife. Next to the building and environmental aspects the management process can be greatly improved by showing the impact on the budget and the planning of the decisions made during the construction stage. How can the information be organized and made easy accessible? What techniques and technologies are available to help you out? What are the advantages of using this information? Where would you use a particular type of information source in the total building and construction cycle? Answers to these questions will be provided during this presentation that will show the latest developments in the Netherlands on this subject.

Geospatial Automation for Holland Fiber Rollout – A Case Study

Kiran Kumar Solipuram, *Consultant – Telecom, Network & Content Engineering, Infotech Enterprises Ltd, India*
Frans Van Surksum*, Manager Registration, Landbase Volker Wessels, Belgium*

Deployment of glass fibre to the home (FttH) is beginning to make a clear advance in the Netherlands. Dutch fiber to the home (FttH) market has started to take serious shape recently supported by many local telecom operators, utility providers and infrastructure companies. Local major telecom and infrastructure operators such as Reggefiber and KPN believed Fiber-to-the-Home (FttH) is the long-term superior technology which will enable digital Dutch lifestyle. To speed up the FttH rollout in Netherlands, there was a need for several software packages which should cover all the aspects of market analysis, costing, planning, design and building the network by integrating wit geo-spatial and database systems. The key need was to automate the software packages within planned budget which was a big challenge till the GIS based automation software was introduced to Dutch market. This case study will share the experiences of its great value addition in automating and optimizing the glass fiber deployment across the cities in Netherlands. It will be explaining about the challenges and solutions of various Netherland's Geo-spatial mapping systems, its positions, accuracy, analysis of public-private properties, natural boundaries, needs for automation, integration with existing enterprises GIS and database systems and how the landbase was customized to solve these problems to fit for faster FttH deployments and great cost savings.

The Significance of 3D Topology in Construction Activities

Dr. Sisi Zlatanova, *Associate Professor, GIS Technology, Section OTB, Delft University of Technology, The Netherlands*

Demand driven growth of construction activities in the rapidly expanding urban areas has become a global phenomenon. With the advancement of technologies, expectations are increased where valid 3D volumes can be calculated with least errors. Can 3D topology and topological data structures help in achieving better accuracy and facilitate the maintenance of 3D models? Complex constructions get immense support if the data structures are 3D compatible and thus can be visualized in a 3D environment. It is important to have accurate alignments of the adjoining objects in 3 dimensions since errors will not only affect the horizontally adjacent objects but also the objects on the surface below or above it. Future cities conceptual designs are increasingly focused to create entire cities as part of one single large multi-dimensional structure including utility networks wiring through the entire framework other space usages. Such a large multi-functional city will thus require tight integration of objects to allow the maximized usage of available space in horizontal and vertical directions. In geo-engineering industry, an integral modeling of the subsurface geological bodies, subsurface engineering excavations and surface buildings is of great importance. Meanwhile, the spatial topology description on subsurface objects as well as on the spatial relations between subsurface engineering and surface spatial objects is also meaningful.The paper aims to highlight the significance of 3D topology for the applications where we need to work with spatial datasets of 2D and 3D nature both and 2D topology is insufficient to validate their objects consistency.

Geospatial in Mining & Exploration

Ashok Kumar Singh, *Chairman-cum-Managing Director, Central Mine Planning and Design Institute (CMPDI), India*

Mining sector has great economic potential and contributing significantly in raising the global GDP. There is an urgent need to ensure that along the mineral sector growth, environment and sustainable mining issues should also be addressed by the stakeholders constructively. Geospatial technology played a very vital role in mineral exploration as well as in mining sector and closely associated with all the three stages of mining i.e, pre-mining, syn-mining and post-mining. Space/airborne remote sensing data are very vital in mineral resources assessment. The remote sensing data has been used in two ways: delineation of features favorable for localization of mineralisation such as folds, faults and fractures and secondly identifying features directly related to mineralisation such as alteration zones, gossans and specific host rock association. High resolution, multispectral satellite data in association with airborne geophysical data are very useful in locating the new mineral deposits. Satellite based GPS technology has completely changed the pattern of ground surveying. Boreholes drilled for exploration can be surveyed very rapidly and accurately using GPS. Further study and research in the field of geospatial technology is required for locating the sub-surface mineral deposits, its accurate lay and disposition for mine planning and rapid and accurate surveying in underground mines where satellite signals are not available due to ground cover.

Contribution of Earth Observation in Monitoring the Environmental and Societal Impact of Mining

Stephane CHEVREL, *Project Co-ordinators, EO-MINERS, France*

Contribution of Earth Observation in Monitoring the Environmental and Societal Impact of Mining Earth Observation (EO) offers a unique opportunity to collect necessary spatial parameters that play a key role in better assessments of mining-related environmental and societal impacts. Cumulative impacts must be adequately addressed at regional scale (valley, district...), including induced impacts (population migration, agriculture and livestock impacts) with respect to the concept of heavily exploited area. Mining companies, regulatory bodies and stakeholders need various EO-based tools and methods adequately juxtaposed regarding the local contexts and applications. Objective, reliable and affordable products, tools and methods must be developed to feed a sound "trialogue" between industrialists, regulatory bodies and the civil society. The current developments carried out during the EO-MINERS FP7 to assess the societal and environmental footprint of three mining sites in Czech Republic, South Africa and Kyrgyzstan will be presented and discussed there.

Collaborative GIS framework for Global Mining Conglomerates

Sathya Prasad Nanjundaiah, *Global Practice Head - Geospatial Technologies, Tata Consultancy Services (TCS), India*

M&A in Mining industry has lead the global mining conglomerates to address the challenge of disparate GIS tools and applications. The presentation is focused on adopting standard GIS frameworks that can work across different lines of business in multiple countries.

Advanced Decision Making Centre

Patricia Procopio, *GIS Manager, Advance Decision Making Centre, VALE, Brazil*

Vale is the second biggest mining company in the world and the largest private company in Latin America. Headquartered in Brazil and operating in 38 countries, is the global leader in iron ore and the second biggest nickel producer. Vale also produce copper, coal, manganese, ferroalloys, fertilizers, cobalt and platinum group metals. In addition, we operate in the logistics, steel and energy sectors. Vale developed and set up this Advanced Decision Making Centre to motivate its teams and prepare them for a change in paradigm that the Virtual Reality environments will bring to the activities of project and plannig. In the Ferrous Planning and Development Department, this technology will be used in the stages of risk evaluation, safety action plans, and geological, geotechnical and environmental studies, in addition to interaction in a dynamic manner for their presentation. This Advanced Decision Making Centre is equipped to provoke visual, audio dynamic stimuli, which assure a high degree of immersion and interaction in scenario building, which represent the bases for the company's operations.

Taking GIS Beyond Its Conventional Limits

Sajjad Sameer, *GIS Coordinator, Qatar Petroleum*

Process plants in Oil & Gas Industry are characterized by myriad of pipelines and cables running between process batteries, storage tanks and pumping stations. Lack of up-to-date record of location of buried pipelines / cables can lead to safety related incidents and poor response during emergencies. Qatar Petroleum embarked on a challenging and unique project to map process and utility networks in one of its industrial plants into GIS based spatial networks. The project involved review of thousands of as-built engineering records, user needs study, development of data models, topographic survey, buried services mapping, geodatabase and network design and gathering and populating spatial and descriptive data. Impressed by the value of the system, it is now decided to extend the GIS implementation to cover all the process systems in the same plant and to implement similar systems in other industrial plants. This project extends the domain of GIS to include process plants with only the process batteries as exclusion zones. This presentation outlines the process of GIS implementation, challenges faced, lessons learnt and future prospects.

Actionable Intelligence - Pixels to Decision Making

Dr. Kumar Navulur, *Director - Product Management, DigitalGlobe, USA*

As we see a deluge of data from variety of sensors, what are the key technoligies and trends DigitalGlobe is working towards, to ensure that we are solving customer needs in the field. The paper will talk about DigitalGlobe satellites and sensors, processing and delivery infra-structure, advanced image analysis and epxloitation methods, to quickly process and deliver actional intelligence to the end user. The paper will discuss various geospatial technologies including elevation models, crowd sourcing, taking advatnage of geocoded information from mobile devices, etc. to gather additional information to cretae a common operating picture on the ground.

Exploration and Mining

Chris Jenkins, *Pre-Sales - Natural Resources EMEA, Pitney Bowes Software, UK*

Exploration and mining companies frequently handle vast quantities of data - from historical maps to laboratory results. To determine whether or not a property contains an economically viable mineral deposit or not requires an enormous amount of data gathering, geological research, collection of samples and processing of information. Data will usually come in multiple formats and can be pushed through many different applications in the quest to map, analyse, target, model and visualise intuitive and decisive results. As there are multiple data types encountered during the exploration process; there are as many solutions for processing and analysing this data. The challenge can often be finding one single environment that allows the exploration geologist to carry out the necessary compilation, analysis and modelling they require for exploration planning and decision making. Time can be wasted importing and exporting data between applications along with the added complications of multiple license pools and installation rollouts of various different applications.

Remote Sensing for Excavated Volume Measurement in Open Pit Coal Mines in India

N. P. Singh, *GM- Remote Sensing, CMPDI, India*

In the present study, Cartosat-I Stereo data, ALTM and TLS were used concurrently to acquire the excavation data from number of coal mines to compute the volume of excavation having different mining conditions. The objective of study was to evaluate the accuracy of excavation measurement and time cost effectiveness against the conventional methods under practiced. Methodology was developed to resolve the low reflectivity problem of coal benches. Digital terrain model (DTM) for two spells of each mines were generated and volume was computed using â ˜Difference Modelâ. Study reveals that variance in the excavation volume ranges from 0.80% to 1.3% against the conventional method in case of ALTM whereas it ranges from 1.18% to 1.40% in case of Terrestrial Laser scanner (TLS). In case of satellite data, variance is abnormally high because of poor vertical accuracy of the sensor (4.00m). Further, it was also observed that ALTM operation is cost intensive but much faster than TLS. At present due to poor availability of ALTM facility in India, excavation measurement is not possible on demand. TLS measurement reduces 75% time and 50% manpower with respect to conventional survey

SDI & KM in Petroleum Industry

Elfatih Wadidi, *GIS Manager, Sudan National Petroleum Co., Sudan*

The success of oil and gas exploration as a business venture has always depended on the availability of new ideas and supportive initiatives and technologies. Recently, knowledge management (KM) concepts glare the need and necessity for Spatial Data Infrastructure (SDI) and lead to efficient business decisions. This paper reflects the concepts and values in petroleum industry activities.

Hyperspectral Technology and Mining; Trends and Prospects

Prof. Dr. F D (Freek) van der Meer, *Chairman & Vice-Dean Dept of Earth System Science, University of Twente, (ITC), The Netherlands*

Geologists have used remote sensing data for since the advent of the technology for regional mapping, structural interpretation and to aid in prospecting for ores and hydrocarbons. In the the early days of Landsat Thematic Mapper, geologists developed band ratio techniques and selective principle component analysis to produce iron oxide and hydroxyl images that could be related to hydrothermal alteration. With the advent of the Advanced Spaceborne Thermal Emission and Reflectance Radiometer (ASTER) mission these products could be further detailed into qualitative surface mineral maps of clay minerals, sulfate minerals, carbonate minerals and silica (quartz) which allowed to map alteration facies. (propylitic, argillic etc). The step toward quantitative and validated surface mineralogic mapping was made with the advent of hyperspectral remote sensing. The products derived from hyperspectral sensors have found their way to the mining industry and are to a lesser extent taken up by the oil and gas sector. The main threat for geologic remote sensing lies in the lack of (satellite) data continuity. There is however a unique opportunity to develop standardized protocols leading to validated and reproducible products from satellite remote sensing for the geology community. By focusing on geologic mapping products such as mineral and lithologic maps, geochemistry, P-T paths, fluid pathways etc. the geologic remote sensing community can bridge the gap with the geosciences community. Increasingly workflows should be multidisciplinary and remote sensing data should be integrated with field observations and subsurface geophysical data to monitor and understand geologic processes. However there is also a wealth of new hyperspectral imaging techniques that are coming up in field imaging, core logging with hyperspectral technology and ore sorting. In this presentation some of the trends will be sketched as well as an outlook for the near future for use of optical remote sensing in particular hyperspectral remote sensing in and for the mining industries. Also new and potentially interesting areas of exploration will be discussed.

Transforming Surveying in the Australian Coal Industry with Airborne LiDAR

Matthew Mccauley, *Managing Director, Atlass (Aust) Pty Ltd, Australia*

In the 2006/07 just prior to the GFC, the Australian Coal Industry was experiencing the largest boom in its history. However the rush to development in order to take advantage of the unprecedented coal prices was starting to take a toll on Australia's limited professional resources. A shortage of mining engineers to design the expanding list of projects resulted in the cannibalisation of the professional ranks. Mining surveyors were being targeted for mining engineering roles and qualified engineers were being promoted beyond their experience levels. The internal supply of accurate survey data to mining operations had been compromised by this situation. However, the need for this data was greater than ever. After 5 years of operations, Atlass now conducts regular aerial LiDAR surveys for 30 different mining sites. During this presentation it will take you through: 1) The major factors that led to this success; 2) The lessons learned while starting a new business and introducing a 'new' technology to the Australian Coal Industry; 3) How aerial LiDAR is transforming surveying in the Australian Coal Industry.

Image-based Infoclouds – A Tool for Mining and Exploration?

Ruedi Wagner, *Head -Product Management Airborne Imaging, Leica Geosystems, USA*

In 2011, once again Leica Geosystems has led the way and expanded its workflow capabilities by introducing a high performance digital surface module. Based on semi-global matching technology, this new module facilitates the generation of highly accurate and highly dense point clouds from airborne imagery, all inside one workflow. In addition to the location and elevation information, these multidimensional info clouds can be attributed with spectral (RGBN), time and classification information, which is directly derived from the imagery and thus offers a perfect fit. The accuracy and quality of these info-clouds combining elevation with imaging information provides a very reliable data source for mining and exploration applications.

Hyperspectral Change Detection General Framework for Mining Areas

Eyal Ben-Dor*, Professor, Porter School of Environmental Studies at Tel Aviv University, Israel*

Change detection of hyperspectral remote sensing data is an ongoing research branch for environmental monitoring. In past years there has been a lot of research in designing similarity measures, which take as an input two hyper-spectral images, and return a "heat image" where the value of each pixel represents the similarity of the corresponding pixels in the input images. To automate the analysis of such heat images, one needs a way of determining which values represent actual environmental change. In this paper we introduce a new automated method, named "Spectral Overlapping Threshold", to derive an objective threshold to distinguish between "change" and "no change" areas. The method consists of two steps. First, similarity measures are applied to the overlapping areas. This process is demonstrated for a mosaic of 9 overlapping flight lines of HyMAP sensor data acquired in 2009 and 7 flight lines acquired in 2010 over Sokolov mining area, Czech Republic. Our results show that by using the SOT approach, better discrimination results of changes are obtained.

Best Practice Examples for Innovative Geospatial Methods in Exploration and Monitoring of Mining Areas

Norbert Benecke*, Senior Consultant Mining, DMT, Germany*

Any mining activity, from exploration to abandoning as well as underground and open pit mining, has an impact to the environment and the public community. Therefore monitoring of areas affected by mining is mandatory all over the world. However the regulations are depending from country to country. Even today, in all mining phases, both ground-based collections of data such as geological mapping and practices of engineering surveying as well as remote sensing data from aircraft and satellites such as airborne laser scanning, digital aerial cameras, multispectral scanners and radar systems are common tools. What is missing so far, is an integrated and combined use of these sensor systems e.g. hyperspectral data, multispectral mulitsensoral data or radar data in the context of concrete usage scenarios. That covers examples from using GIS and remote sensing to support geophysical deposit exploration as well as laser scanning, GPS, radarinterferometry and GIS-based analysis tools for monitoring of deformation and ground movements caused by mining.

The Role of Geological Surveys in Building Geoscientific Spatial Data Infrastructures

***Francois Robida**, Deputy Head Information Systems & Technologies, BRGM, France*

In order to create safe, healthy and wealthy places to live in, it is vital that we understand our planet. At national level the collection of information on the state of the solid Earth and its processes is normally mandated to Geological Surveys. In fact, a Geological Survey is the national institution responsible for the geological inventory, monitoring, knowledge and research for the security, health and prosperity of the society. In Europe, EuroGeoSurveys (EGS) is the organisation representing the Geological Surveys from 33 countries around Europe. EGS 'principal purpose is to provide geoscientific knowledge that underpins European policies and regulations for the benefit of society. EGS has been involved in the preparation and development of INSPIRE since its inception, and is contributing to its technical design. At the global scale, two Geological Surveys, BGS (British Geological Survey) and BRGM (French Geological Survey) are coordinating the OneGeology global initiative that promotes access and interoperability of geological information around the world with 116 countries involved. OneGeology has been recognized as a GEO/GEOSS flagship project delivering global coverage consistent with GEO principles. In Europe, the OneGeology project is coordinated by EGS and sets up the foundation of the EGDI (European Geological Data Infrastructure), in line with INSPIRE. The community of geological surveys around the world is also deeply involved in the development of interoperability standards in the field of geosciences through the IUGS/CGI international organisation.

Emerging Geospatial Technologies and their role in the Mineral Exploration and Mining Industries

Norman Banks, Chief Executive Officer, Southern Mapping, South Africa

Satellite and aircraft mounted sensors are capable of providing a wide variety of information sets that are of great value to the mineral exploration and mining industries. In recent years a number of new sensors have become operational. These technologies, including Lidar, hyperspectral and thermal mapping, subsidence monitoring and spectrally based geological mapping will be introduced and their application areas will be discussed. Operational examples of these products will be presented, based on Southern Mapping's own experience in these fields.

Supporting Mineral Resources Management - Towards Standards and Protocols for both Visible and Thermal Hyper-Spectral Data

Christoph Ehrler, Research Team, German Remote Sensing Data Center, Germany

Since the quick developments of remote sensing techniques involved a huge increase of the available data, it becomes more and more important to establish standards and protocols. From this point of view, within the EO-Miners project, the German Aerospace Center (DLR) has been striving towards establishing and implementing a standardized processing and archiving facility (PAF) for airborne hyper-spectral sensors including the newly available thermal ones. Areas of interest have indeed grown from the 'classical' reflective-domain datasets towards including thermal information. However this extension imposes to establish generic protocols adapted to domains dominated by very distinct physical processes. These developments have furthermore been combined with quality assessment techniques in order to comply with national and international guidelines, e.g. under development with EUFAR or based on initiatives like QA4EO. The presentation will present important steps of these developments and their applications on different mining environments within the EO-Miners project.

Assessment of Environmental Impact of Mineral Resources Exploitation Using High and Very High Resolution Optical Satellite Imagery

GOOSSENS Marc, *Owner & Chief Executive Officer, Ursus-Airborne, The Netherlands*

Assessment of environmental impact of mineral resources exploitation using high and very high resolution optical satellite imagery. Multispectral imagery is used in the ImpactMin project, co-funded by the European Commission under the umbrella of GEOSS. The Project aims to explore ways of monitoring the environmental impact of mineral resources exploitation. Optical high and medium resolution satellite imagery among other earth observing equipments were tested on different demonstration sites. Reflectance spectra of vegetation and soils were collected region of the Karabash smelter, Central Urals, and were correlated with WorldView-2, GeoEye and Landsat imagery. The results demonstrate that these types of satellite imagery can effectively be used to identify and monitor trends in vegetation and soil cover over distances more than 15 km away from the smelter that appear to be diagnostic for environmental changes resulting from severe aerial pollution.

OSGeo - Delivering Professional Open Source Geospatial Software

Arnulf Christl, *Geospatial Systems Architect and Project Manager-Metaspatial President, OSGeo Germany*

The Open Source Geospatial Foundation (OSGeo) was created to support and build the highest-quality Open Source geospatial software. The goal is to encourage the use and collaborative development of community-led projects. The kenyote of the Open Source seminar will introduce to the concepts behind Free Software licenses, highlight the driving forces of Open Source development and outline the role of the OSGeo Foundation in the geospatial domain. The Open Source Geospatial Foundation, or OSGeo, is a not-for-profit organization whose mission is to support and promote the collaborative development of open geospatial technologies and data. The foundation provides financial, organizational and legal support to the broader open source geospatial community. It also serves as an independent legal entity to which community members can contribute code, funding and other resources, secure in the knowledge that their contributions will be maintained for public benefit. OSGeo also serves as an outreach and advocacy organization for the open source geospatial community, and provides a common forum and shared infrastructure for improving cross-project collaboration.All of the foundation's projects are freely available and useable under an OSI-certified Open Source license. They have been packaged in a special distribution called OSGeo Live and is available as DVD at the OSGeo desk and also for download at http://live.osgeo.org. It contains a bootable Linux operating system, more than 50 Open Source tools plus sample data and is all ready to play.

The OSGeo Live-DVD – Exploring the Wealth

Just van den Broecke *– Open Source Geospatial Consultant, Director at Just Objects BV, Trailblazer at OSGeo Dutch Chapter, The Netherlands*

OSGeo-Live is a Self-Contained Bootable DVD, USB Thumb Drive or Virtual Machine based on Linux (XUbuntu), that allows you to try out a wide variety of open source geospatial software without installing anything. It is composed entirely of free software, allowing it to be freely distributed, duplicated and passed around. It provides pre-configured applications for a range of geospatial use cases, including storage, publishing, viewing, analysis and manipulation of data. It also contains sample datasets and documentation. This lightening presentation covers the breadth of this open source geospatial software from OSGeo-Live.

MapMint: A Commercial Open Source Solution for Managing Geospatial Contents and Services

Dr. Nicolas Bozon*, CEO at Cartogenic, Researcher at Osaka City University, France*

With GIS evolving rapidly into Geospatial Web Services, there is an increasing need for intuitive software tools that can be used by non-GIS experts for creating, processing and publishing geospatial contents online. MapMint, developed by Cartoworks Inc., was born in such a context, as a commercial open source Web GIS solution that provides a comprehensive service-oriented framework for creating and managing Web-GIS applications. MapMint is designed to easily deploy Spatial Data Infrastructures without any programming, using an intuitive and versatile administration interface made of several interconnected modules. This presentation aims to demonstrate the technical innovations provided by the MapMint platform. Some real examples and future enhancement plans will also be discussed.

INSPIRE Network Services with Deegree

Markus Schneider, *Chief Executive Officer, Occam Labs UG, Germany*

Implementing compliant and scalable INSPIRE Network Services can be tough. This presentation outlines the major challenges of this task and shows how deegree 3 webservices can help you overcome them. As deegree is an OSGeo project, these components are Open Source and available free of any license fees.INSPIRE has high requirements with regard to support for ISO/OGC standards, quality-of-service and data conformity. The deegree project has a long tradition of providing advanced implementations of OGC web services. Version 3 has been designed based on INSPIRE requirements and implements INSPIRE Discovery Service, INSPIRE View Service, INSPIRE Download Service and INSPIRE Processing Service specifications. These implementations aim for full standard compliance and are highly scalable

Recent Developments in Web Cartography

Edward Mac Gillavry*, Cartographer and Director, WebMapper, The Netherlands*

The look and feel of maps on the Web has long been determined by the likes of MapQuest, Yahoo,Microsoft, and Google. OpenStreetMap and Natural Earth Data are international efforts to create global data sets that are available and free to use for anyone. Furthermore, an increasing number of government agencies across the world are making their geographic data available to the public. Add to this an expanding range of Open Source software to render maps and the rules of the game in the online mapping industry change completely.This presentation charts the currents that have led up to the recent revolution in web mapping, making the cartographic presentation of geographic information a unique selling point for mobile and web applications.

Geocat Bridge - The Easiest Way to Publish (Open) Data through Open Standards

Jeroen Ticheler, *Director, GeoCat BV, The Netherlands*

GeoCat Bridge, an extension for Esri ArcGIS® Desktop, has been designed to make the process of publishing geospatial data on the internet as easy as hitting the Publish button. From your project in ArcGIS Desktop, you are literally only one click away from publishing your geographic data and metadata on the Internet using an open source server platform. The resulting geospatial services are based on open standards and allow users of these (open) data services to combine and analyze data or develop innovative applications quickly.

Supporting Open Source Geospatial Software

Chris Holmes, *President, OpenGeo, USA*

This talk will look at building business models to support core open source development. We will focus on the experiences of OpenGeo, and its progress in creating a 'whole product' around a stack of geospatial software. This is centered around the OpenGeo Suite, a stack of software combining PostGIS, GeoServer and OpenLayers and building on top of them to create a coherent product, which is bundled with professional support services. We will also examine the path of GeoNode, OpenGeo's bottom up SDI solution, which has been a project funded by several early clients and will soon be the basis of a fully supported OpenGeo product.

The Value and Effectiveness of Open Source Software and Open Standards to Government Business – The Case of London Borough of Hackney (LBH) in UK

Anthony Tuffour, *GIS Technical Manager, Master Data Management, Finance and Resources, ICT London Borough of Hackney, UK*

Open Source Software (OSS) and Open Standards (OS) have become ubiquitous and the most talked about technology concepts and paradigm shift not only in the geospatial industry but across the whole software industry spectrum. The success of some of the OSS products such as Linux, Apache, PostGIS, OpenLayers, GeoServer, MapServer, QGIS etc plays a part.This has therefore forced the software industry to rethink their business models to stay competitive. They have therefore begun the process of value creation and capture on OSS & OS and offering to the government sector whilst at the same time the government sector has been slow to adopt OSS & OS. It is in the view of this growing dominance and acceptance of OSS products and OS that this presentation will explore their value and effectiveness to the government sector especially local authorities in the UK to aid in service provision, citizen participation, transparency, innovation and obtaining value for money of its ICT infrastructure.The presentation will further examine the adoption of and barriers to OSS & OS and recommend how governments can support OSS products and OS through research and development to reach a critical mass, thereby creating employment, whilst at the same time generating revenue. Finally, all these processes will be reviewed with existing theories of value and effectiveness of OSS & OS using the case of LBH's implementation of a web mapping application based on OSS stack and OS.

PDOK: The Dutch National SDI

Ir. Pieter G. Meijer, *Program Manager Publieke Dienstverlening op de Kaart (PDOK), Dutch Ministry of Infrastructure and the Environment, The Netherlands*

In a close cooperation different departments within the national Dutch government are constructing PDOK, the dutch national SDI. This SDI is a services-based infrastructure aimed at the dissemination of all important geo basedata in The Netherlands. part of the infrastructuire is the "NGR" the national geodata catalogue which also serves as the Dutch INSPIRE hub. The INSPIRE legislation, dutch legislation about the use of base data within the government and the policy for open data made it easier to raise the funds and commitment necessary to drive the development of this SDI forward. Backbone of this infrastructure are OGC-complient web-services, for images, vectordata and metadata. PDOK relies heavily on different open source components such as GeoNetwork and GeoServer.

OSS as a Backbone for Education in Geo-Informatics

Dr. Javier Morales, *Assistant Professor, Faculty of Geo-Information Science and Earth Observation University of Twente, The Netherlands*

Education in geo-informatics has always been an interesting subject for both educators and students because most methods and good practices in this discipline are closely associated with a given technology. These days, at the forefront of (geo)data transformation and dissemination lies the field of geo-webservices. This means that todays geo-informatics curriculums have a significant number of components dealing with the concepts and the technology behind geo-webservices. Since the technology to support web services in both proprietary and open source has matured significantly, it is now possible to train students to choose the best tool to solve their problem rather than having to compromise. This combined with the usage of open standards has resulted in nice hybrid implementations that provide great value to organisations and communities. This presentation will provide an insight, particularly, on the open standards and the usage/development of open source software in education, research and professional training at the Faculty of Geo-Information Science and Earth Observation of the University of Twente. Areas in which open source is used include, a.o., spatial databases, spatial data services, workflow management and system design.

Open Source SDI at the Dutch Ministry of Infrastructure and the Environment

Drs. Thijs van Menen, *Senior Advisor, Rijkswaterstaat, The Netherlands*

GeoServices stands for a SDI (Spatial Data Infrastructure) based upon OGC standards and open source. It's a framework existing solely of open source components. It is this framework that provides the ability to publish many datasets existing within RWS. But it also provides the ability to build web applications while reusing generic functionalities. GeoServices is used to provide webGIS applications for primary and secundary RWS tasks.

Waterfowl Feeding Strategies

Marc Vloemans, *Partner, Age of Peers, The Netherlands*

Ever wondered why various birds are able to peacefully cohabit in the same duck pond and thrive? If the answer is 'No', you probably have just started out as an entrepreneur, you are plain lucky that you are still in business or are desperately struggling for survival. In case the answer is 'Yes', there is the potential for a profitable future. But where lies the analogy? You probably have seen ducks stroll the banks and swim around, while sticking their necks under the surface or diving further below. Unfortunately, your view does not extend well below the surface; a world unknown to many. And that's where it gets interesting in terms of business strategy!Relatively small market places such as the GIS sector can be compared to a duck pond in which the various inhabitants resemble the many professionals, SME's and larger service suppliers. All feeding on the available plants in that same pond: the market. Once the interaction between these ducks and their environment is understood, service suppliers can more effectively compete for the increasingly more scarce resources. Darwin's 'Survival of the fittest' has become a survival of the smartest. This presentation will give an insight in what happens below the market surface and is an introduction to Marc's upcoming book on open source strategies.

From Inspiring Technology to Valuable Applications

Prof. Dr. Ir. A K (Arnold) Bregt, *Professor Geo-information Science Centre for Geo-Information, Wageningen University, The Netherlands*

Mobile mapping is traditionally associated with vehicles collecting geospatial data of streets and buildings. Notable examples are the data-collection vehicles of Tele-atlas and Google. Recently, however the concept and practice of mobile mapping has been expanded to all forms of mobile data collection with mobile devises such as mobile phones and UAV's. It is also not an exclusive domain for professionals any more as amateurs play an increasing role in mobile data collection. Another recent development is the direct use of the collected data as input for in field decision making. In the presentation the current developments with associated examples are presented. As food for discussion during the symposium on mobile mapping research and application challenges are presented.

Sensors and Learning Maps

Dr. Sytze de Bruin, *Assistant Professor-GIS, Wageningen University, The Netherlands*

Recent disasters such as the Fukushima nuclear accident have shown that (informal) sensor data are an important source of information for citizens and professional decision makers. Typically, the information content of sensor data changes with time while it depends on the measured values, which are in turn dependent on the locations where observations are made. Decisions about where to measure require timely integration of available data and prompt feedback as soon as new information becomes available. The expected value of information is a measure of the relevance of future observations within the context of decision making and it is proposed as a tool for automated selection of new measurement locations. On the other hand, human decision making about where to measure and which places to avoid is expected to benefit from real-time mapping using geostatistical methods and live feedback of up-to-date information. In this session we will look at simulated examples of automated mobile sensors exploring a contaminated environment and students mapping (1) an invasive species in a natural park and (2) a fictive dynamic toxic plume over Wageningen campus. The focus is on server side processing of sensor data and decision making.

Mapping Grade Vs Survey Grade: Managing Expectations of Mobile Mapping Systems

Graham Hunter, *Chief Executive Officer, 3D Laser Mapping Ltd, UK*

The paper explores the concept of mapping grade mobile data collection vs survey grade.It highlights how individual components of a mobile data collection system are integral to the overall performance; after all can 'the whole be greater than the sum of its parts?' or in other words based on individual system components what levels of accuracy can a mobile data collection system obtain. And finally, introduces ways of presenting system performance information to the end user. Mobile data collection has come a long way over the last twenty years with system suppliers claiming huge advances in speed, range, accuracy and repeatability to such an extent that the end user may believe they can replicate the results of more traditional surveying techniques 'on the go'. However, as with most technology 'mobile mapping' systems have their limitations and trade-off between performance criteria may be necessary. Realistic representation based on a solid understanding of the system components, operating environment, data processing methodology and end user requirements is therefore preferable.

From Spatial Variation Data of Agricultural Fields to Site Specific Crop Management

Dr. Corné Kempenaar, *Wageningen UR – Plant Research International, The Netherlands*

Precision agriculture technology offers opportunities for site specific optimization of crop management, allowing reduction of inputs, costs and environmental effects while crop yields increase. Site specific crop management strategies consist of (1) a sensing unit for detection of site-specific variation in crop, weed, pest, and/or soil conditions, (2) a decision making unit that translate sensor readings into need and intensity of treatment, and (3) an actuator or implement unit that carries out management activity (soil cultivation, seeding, crop protection, weed control, fertilizer treatment, irrigation, harvest). To be successful in practice, the strategy must be competitive with current methods and strategies in terms of costs, efficacy and ease of use. Recently, progress has been made in site specific crop management using remote sensing data on crop biomass in combination with ground sensors for biomass and soil properties. Results are presented and challenges discussed.

The Gatewing X100 system : Unmanned Airborne System for Fast and Flexible Mapping

Laurent Geeraerts, *Aerial & Mobile Solutions & Services, Couderé b.v.b.a., Belgium*

Imagine being able to do highly accurate mapping, whenever and wherever you need to, even in weather conditions that are not considered optimum for conventional photogrammetry, whilst staying with both your feet on the ground! There is now a valuable alternative for LIDAR and topographic surveying: The X100 unmanned aerial vehicle allows to automatically take pictures from the air at an altitude of between 100 and 750 meters. The images are positioned with GPS and achieve a high precision by the large overlap. This raw footage is the basis for the creation of high quality orthophoto's and accurate digital surface models. Make your own recent and high quality images whenever and wherever you need to. The lightweight drone with a wingspan of only 1 meter is easy to transport and to launch (by catapult) from every possible location. The system is ideal for mapping areas of medium size (1-4 km2). While the operator stays safely on the ground, the aircraft autonomously flies its pre-programmed flight lines.

Avenza PDF Maps Mobile App and Digital Map Distribution Solution: Moving Towards Digital Map Delivery for the 21st Century

Ted Florence, *President and Chief Executive Officer, Avenza Systems, Canada*

In an age in which paper maps are being used less and less frequently and an increasing number of maps are being used digitally on GPS devices, cellular phones and in-car navigation systems, the challenge for all map publishers, whether academic, public sector or commercial, is how to address this new market and medium and to ultimately continue the life of their map assets and products within these new media platforms. This presentation/discussion will focus on the relatively new geospatial PDF and other technologies, how they are changing the cartography industry and will feature the innovate Avenza PDF Maps app and digital map distribution solution which will demonstration on how geospatial PDF technology is currently being used in cartography and map delivery and how it can be incorporated into your own workflow. Included in this presentation will be the use of PDF maps on Apple iPhones and iPads in combination with the GPS and location based abilities of such devices.

National Spatial Data Infrastructure for Better Planning & Governance

***Bas Kok** , Director, TU Delft Knowledge Centre Open Geo Data, The Netherlands*

The accurate use of governance abilities and well-functioning National Spatial Data Infrastructures are key elements for an adequate legal, organizational and institutional national spatial planning system. I will illustrate this statement with an example of how the Dutch spatial planning authorities are using key elements of the Dutch National Spatial Data Infrastructure to prepare, to establish and to execute spatial planning at local, provincial and national levels. During the conversion process over the last ten years of the Dutch legal spatial planning system, geo spatial planning experts and authorities have made use of geo information policy instruments as laid down in the Dutch National Spatial Data Infrastructure system to optimize the exchange of digital spatial plans among municipalities, provinces and the Ministry of Spatial Planning. This successful approach became part of the new Spatial Planning Legislation Act that came into force on January 1st 2010. The impact was more effectiveness in the decision process by responsible geo spatial planning authorities and more transparency to citizens during the preparation and design phase of the spatial planning process.

Building Spatial Data Infrastructure to Support the Achievement of a Spatially Enabled Society

***Bruce Thompson,** Chief Information Officer, Department of Sustainability and Environment, New Zealand*

A spatial infrastructure technology project founded on services orientated architecture (SOA) and world-leading technologies, has significantly improved and streamlined the mechanism for collection, assembly and delivery of fundamental geospatial information for Australia. The PSMA Systems project has been effective in reducing delivery times, improving data quality, providing greater flexibility in access to Australia's authoritative datasets and providing a framework that promotes the extraction of the value inherent in these datasets. PSMA Australia—a company wholly owned by Australia's federal, six state and two territory governments and responsible for partnerships with industry—has developed PSMA Systems to provide a powerful and flexible automated information management environment.

The Potential Tragedy of the Market: The Spatial Information Imperative in Administering Land, Water and Carbon

Dr. Rohan Bennett, *Assistant Professor, UNU School of Land Administration Studies, University of Twente, The Netherlands*

Unbundling of interests in land and resources, and development of complex commodities, have opened up new economic activities. New markets have emerged to effectively allocate and manage scare resources such as water, the natural environment, and carbon. New markets involve new taxable commodities and transactions, and changes to the availability and supply of money in the economy. Effective fiscal and monetary policies, to manage these new markets will need national, authoritative market information. In Australia, current state based administrative arrangements make it difficult for central governments to access, in a timely manner, the information required to manage markets in land. The Property Market Tree and information flow lifecycle can be used to study and map the flow of tenure (ownership) and value (market transaction) information. Here, the framework is applied to three state land agencies in Australia and two federal policy departments (ATO & RBA). The focus is on carbon and water trading regimes. Results of the study show that these new markets do not possess the strong administrative institutions associated with traditional land administration. Moreover, the new markets are not tied to traditional land administration and associated information repositories: a new breed of siloâ™-like approaches appears to be emerging. Information asymmetries resulting in poorly functioning markets is the likely outcome. New options for enabling more cohesive and integrated land, water and carbon information flow needs to be explored.

Consolidation and Distribution of Infrastructure Data Using Geospatial PDF

Richard McKay*, Senior Vice President-Sales, Terrago Technologies, UK*

Given the many varied software and data formats in use for infrastructure design and maintenance, it is almost impossible to effectively share this information, particularly in an emergency. There is, however, a format that has been expressly deigned for this role – the geospatial PDF and PDF/E, as defined in ISO 32000. This format specifies a geo-registered, multi-layer, vector and raster data file that can be displayed by the free Adobe Reader, with additional functionality provided by other free Adobe plugins. With these products, users may manage layers, display and zoom to coordinates, measure distances and areas, interact with GPS devices, collect field data with forms and markups and import and export the forms and markup results. Perhaps more importantly, software exists for consolidating various file formats to produce geospatial PDFs containing layers from many different softwares which can then be distributed to users needing this consolidated view. Two case studies for the use of geospatial PDF in emergency response and underground facility damage prevention will be reviewed. After the 2011 Japanese Tsunami, Hitachi Systems was asked by the Japanese government to provide a way to rapidly disseminate information for use in damage assessment. Geospatial PDF was used to assemble the cadastral, image and infrastructure data needed for this effort. Similarly the state of Pennsylvania's One Call system has chosen geospatial PDF to consolidate the many utilities data sets needed to insure that construction excavation does not damage critical underground infrastructure.

Potential of Public Private Partnership for NSDI Implementation in Pakistan

Asmat Ali, *Assistant Director, Survey of Pakistan, Pakistan*

Special characteristic of spatial information is that it can be shared and used for many other purposes than the one, for which, it was originally produced. To facilitate its efficient sharing and reuse, it needs to be properly managed. This is one of the reasons that many countries are developing National Spatial Data Infrastructure (NSDI). But the challenge of developing a successful NSDI depends largely on its implementation which is so significant that none of the two key stakeholder groups i.e. public or private sectors can address it at their own. However, Public-Private Partnership (PPP) seems to be a means of addressing this most fundamental challenge as many physical infrastructures such as transportation networks, health facilities, education, wired and wireless communication networks are being implemented through PPP approach in countries like Pakistan. Yet the scenario poses the question, what is the potential of PPP for NSDI implementation in Pakistan.

The Cadastre of Real Estate as a Part of eGovernment and SDI in the Czech Republic

Eva Pauknerova, *ICT Department, Czech Office for Surveying, Mapping and Cadastre, Czech Republic*

The Czech Office for Surveying, Mapping and Cadastre (COSMC) provides the guaranty and maintenance of the Cadastre of Real Estate in the Czech Republic. The current Cadastre was established in 1993 and it integrates the registration of rights and the records of real estate. The Cadastre has been administered with help of the Information System of the Cadastre of Real Estate (ISKN) which is an integrated information support system for both, the state administration of the Cadastre and for providing user services of the Cadastre. The central database and related e-services enable to search up-to-date data of the Cadastre throughout the whole Czech Republic by means of the Internet service â •Remote Access to the Cadastre of Real Estateâ œ. Since June 2006, the electronic outputs can be signed by the electronic mark and have the same significance as the public documents issued by cadastral workplaces. The strategy to cut costs of administration through the electronization resulted in a continuous decrease of requests at desks in cadastral offices and an increase of outputs provided via verifiers (the public contact points - CzechPoint, notaries). Since 2001, the ISKN, related e-services and their interconnection with other eGovernment tools have increased the quality, accessibility and reliability of data and services. The ISKN is an important source of data for the Register of Territorial Identification, Addresses and Real Estate (RUIAN) being under construction since 2010. RUIAN outputs will be available for the public via Internet. The data set Parcels compliant with the INSPIRE requirements has been published by COSMC since 2011. The INSPIRE compliant datasets regarding adrresses, administrative units and buildings will also be generated from RUIAN and published in 2012.

National Spatial Data Infrastructure (NSDI) Feasibility Study in Turkey and Some Important Recommendations

***Bilal ERKEK**, Section Manager, Land Registry& Cadastre, Turkey*

Turkish National Spatial Data Infrastructure activities have been started by the motivation of Circular No. 2003/48 which was declared by Turkish Prime Ministry in 2003 within the context of e-Transformation of Turkey Short-term Action Plan. Action No.47 in the mentioned action plan implies that "A Feasibility Study shall be made in order to establish the Turkish National Spatial Data Infrastructure" whose responsibility has been given to General Directorate of Land Registry and Cadastre. In 2005, by the coordination of State Planning Organization, e-Transformation Turkey 2005 Action Plan has been declared with the Supreme Planning Council decision of 2005 / 5. In that action plan, the responsibility of Action 36 with the subject of "Preliminary Works for Establishing The Turkish National Spatial Data Infrastructure" has been assigned to General Directorate of Land Registry and Cadastre. The implementation works of TR NSDI has been started with Modernization of Public Administration - 75 (KYM-75) and Geographic Information System - Infrastructure" project in 2007-2008. Feasibility report of NSDI has been completed in 10th of Dececmber 2010. This paper perents some headlines and preliminary results of feasibility report as an indicator during implementation phase.

Obviating Spatial Data Needs in Advance by Using Intelligent Agents (IA) (Case Study: Tehran Regional Electric Company)

***Arash Gharibi**, Researcher, Azad University of South Tehran Branch Department of Geomatics, Iran*

Access to up-to-date, well-defined and accurate data is the most important factor which plays a critical role in decision making and management for any level of communities. Due to reported statistics, more than 80 percent of data, which organizations operate within, are spatial. But current situation shows that the infrastructure which should be used for obtaining the spatial and non-spatial data in an organization almost is not built, so spatial or non-spatial data users must pass a significant amount of time in order to find the source of their needed data (that may be not found), send their request to them (that they may not respond in a timely manner) and finally prepare the obtained data (both spatial or non-spatial). Regardless of the problems in finding and acquiring the needed data, after preparation, the usability data to availability and accessibility of it, decreases. So in order to obviate the mentioned problems, an infrastructure and mechanism should be made to identify the data sources, retrieve the meta-data, prepare the data and finally present the needed data as services to the right person. This mechanism could be referred to as Intelligent Agents (IA), which is the latest technologies and concepts in Information Technology (IT) and Software Engineering. The aim of this paper is to present and design an Intelligent Agent (IA) based on SOA architecture for Tehran Regional Electric Company (TREC) in order to facilitate and ease of accessing spatial and non-spatial data for decision making and planning.

Automatic Generation of Metadata with Natural Language Processing

***Elisabeth Verhelst**, Student, Alterra Centre for Geo-Information, The Netherlands*

The creation of metadata is an essential part of publishing geographical information in a Spatial Data Infrastructure (SDI). Despite its importance, metadata is not always available. If this is the case, the geographical data cannot be properly validated for quality, itâ ™s search ability decreases, and it becomes less (re)usable as information. This paper will present research to investigate the possibilities of automatic metadata generation by means of Natural Language Processing (NLP). The materials used for the research are reports that were created during acquisition and/or analysis of spatial datasets. Although the creation of proper metadata for the datasets is often neglected, reports from the geo data acquisition or analysis are mostly available as they are common deliverable of research projects. Our research is aimed at answering the following questions: to which extent can NLP bridge the availability gap between no metadata and high quality metadata for spatial datasets. In what manner can we tune an existing NLP script for key phrase extraction in order to improve language processing of the reports of the spatial datasets. What are the evident benefits and misses and how to overcome these. We have adopted the following methodology: using the International Standards Organizationâ ™s ISO19115 metadata standard as a baseline, an existing NLP key phrase extraction script was optimized to find text fragments that are related to the relevant metadata fields according to this standard. The identified text fragments have been analysed, formatted and eventually parsed into the ISO19115 template. An overview of the results will be given in the paper.

Fast INSPIRE Compliant Services for Provinces of The Netherlands

***Herman Assink**, Director, IDgis Bv, The Netherlands*

Dutch GIS software developer IDgis delivered on time INSPIRE View Service and Download Service for the Central Data and Services environment of the joint Dutch Provinces. The deegree 3 service engine which is used in this project is developed by the German GIS company lat/lon which participated in this project. The View Service meets the Quality of Services requirements with flying colors. The INSPIRE Download Service meets the currently available INSPIRE requirements.

Key Registers for enhance Planning in The Netherlands

***Ir. R.P.E. van Rossem**, General Programme Manager BGT, Ministry of Infrastructure and the Environment, The Netherlands*

In The Netherlands a system of key registers is under construction. The ideas developed in the last decennium of the previous century have received political approval around the turn of the century and an ambitious development started some 10 years ago. Aim is to have a number of high quality registers available for all levels of administration in order to save costs, improve service and reduce fraud and evasion. The ministry of Infrastructure and Environment is responsible for a number of key registers in the field of geo-information. At this moment some of these are operational, others are in the phase of design or realization. The development has posed several complex challenges. The most important ones and the way the Dutch have dealt with them will be presented.

Vision on Dubai Utility and Soil Maps

Adib Tayeb AlMadani, *Head of GIS Data Section, GIS Department, Dubai Municipality, UAE*

GIS Department, Dubai Municipality is presently executing the strategic projects Dubai Cadastral Program, Dubai Base Map, Dubai Utility and Analysis System program (UMAS) which includes Dubai Utility Map and Dubai Soil Map to maintain and serve the data in digital form to various government and all the stakeholders. This initiative is in the process of automation of various business processes to synchronize the day to day workflow across various departments. One of the aims is to maintain single repository of data for Emirate of Dubai for access, Query and also for production purposes so that the data always matches with ground truth. Dubai Base map is being executed on frequent basis to update the various feature updates of Dubai along with the Ortho-Rectified imagery with higher resolution. Dubai Cadastral Program is aimed to publish cadastral maps and implement various cadastral procedures to manage and maintain the parcel data with day to day processes. Dubai Utility Maps is an initiative to digital conversion of various utility data as per the standards and automate the construction project management to synchronize the day to day data production to GIS repository of the utility data. This program also includes digital conversion of utility corridors for all utilities of Emirate of Dubai as per standards which can be used in automating No Objection Certificate for utility construction projects. Innovative steps are under progress in generating the Soil Map and Land use decision making system using the borehole strata which is first of its kind. The overall aim of these programs is to synchronize the business workflows of various government and private organizations by maintaining single repository of all the data and single window system to handle all the governmental workflows.

Improving Groundwater Governance using Spatial Intelligence

Dr Zaffar Sadiq Mohamed-Ghouse, *Practice Head - Spatial Data Management*
Sinclair Knight Merz, Australia

Spatial information is ubiquitous to disparate groundwater data such as bore well locations, stratigraphy information, licensing, water quality, storage levels, ecosystems dependence on groundwater. The data is collected, maintained and consumed by a variety of organisations – from government, academic and research organisations to the private sector. Spatial domains such as: remote sensing technology, spatial data models, web mapping, spatial databases and spatial analysis are able to bring this heterogeneous data together and transform it into useful information for decision-making (eg management, forecasting and reporting) at national and local level. Stratigraphic and hydrological data are important inputs to mapping hydrogeological information. Mostly the primary data (Bore information, well information, drillers log, lithology log; and existing stratigraphy) required to interpret stratigraphy are stored in various formats (for example, text files, spread sheets, ...) which makes it difficult for interpretation. Representing 3D geometry from a spatial database perspective for groundwater data has been a challenge. Although 3D geometry has been well represented for above surface features (3D city models), there are limitations in representing subsurface features such as aquifer which contain groundwater. Absence of remote sensors to depict the reality below ground and limited data models across the 3rd dimension for sub surface features is the problems across this area. There are data models such as ArcHydro groundwater with 2.5 D representation, still the true 3D geometry which includes 3D topology for groundwater related features from a spatial database perspective has to be explored. By representing true 3D geometry the decision makers will be able to analyse (query) the spatial data from a 3D perspective and generate better visualisation from true 3D. Another interesting problem in groundwater related 3D features is the spatial semantics.

***Martin Salzmann**, Director of Strategy and Policy, Cadastre, Land Registry and Mapping Agency (Kadaster), The Netherlands*

The digital agenda for Europe is the leading policy document for the digital single market, openness, interoperability and access to information. At the national level this agenda has been transposed into an national digital agenda for the Netherlands. At the same time the Cadastre, Land Registry and Mapping Agency of the Netherlands has been engaged in digital registration, data, services and transactions for almost a decade. Part of these developments originated from our tradiditional domains (land market and mapping) or newly developed services as the cables and pipeline information centre. Many of these services are embedded in the national eGovernment program. This presentation discusses the issues we have encountered in implementing in first implementing our cadastral digital agenda, our national eGovernment agenda and now the European digital agenda. The question arises whether is digital agenda is the driving force for these and future developments or that is conditional in realising our objectives. We will go into how the elements and concepts of the Digital Agenda for Europe are of help for achieving benefits for our customers and society at large and vice versa how our current developments shape the outline of the realisation of the Agenda. What is the driving force in achieving our goals?

Towards a European Union Location Framework

***Francesco PIGNATELLI**, European Commission, Joint Research Centre, Institute for Environment and Sustainability, Digital Earth and Reference Data Unit, Italy*

Location information plays a pivotal role in all stages of the modern policy cycle and at all levels of government. Currently too few public administrations exploit the potential of a consistent and integrated use of location-based information for their activities. It will give tangible benefits in policy and operational areas of the public and private sector, where shared location-based information and services are valuable for decision making - at citizens, communities and government levels, including the environment, health, security, planning and construction, transport, crime prevention, energy, climate change, agriculture, employment and statistics. It will help the Union to streamline its policy-setting and implementation activities, and to reach the Europe 2020 targets more effectively. The objective of the European Union Location Framework (EULF) is to address EU-wide, cross-sectoral interoperability framework for the exchange and sharing of location data and infrastructure services, compatible with the European Interoperability Framework (EIF) and the Digital Agenda for Europe (DAE), based on the information infrastructures implemented through the INSPIRE Directive 2/2007 and the related daughter legislation.

The Netherlands and the European Digital Agenda

***Noud Hooyman**, Department of Policy on Geo-information, Ministry of Infrastructure and the Environment, The Netherlands*

The ambitions in the European Digital Agenda and the Dutch ambitions on geo-information match very well. The ambitions of Ms. Neelie Kroes have raised the awareness of the necessity of properly organized digital information. Calculations and statements that around 80% of all information has a geo-component make clear that there is an important relation between the Dutch policy on Geo-information and the European Digital Agenda. In the Netherlands the Ministry of Infrastructure and the Environment is the coordinating ministry in the field of geo-information. The Dutch Vision and Implementation Strategy on Geo-information (GIDEON) states the goals in the field of Geo-information in the Netherlands. With programmes on Key Geo Registers ((Addresses, Buildings, Cadastral Information, small- and large scaled Topography and Subsoil) the ministry contributes to standardized national datasets on important and broadly used themes. These Key Geo Registers are also part of the National E-Governent programme. In the presentation the Dutch policy on Geo-information and its relation to the EuropeanDigital

Agenda will be explained.

***Tanguy De Lestré**, Senior Public Affairs/Policy Advisor and Coordinator, AGORIA, Belgium*

The European Citizen is reshaping democratic society and expresses itself through digital platforms. The Digital Agenda is underlining the role of ICT in moving forward in increasing the civic participation through internet and social media. Public sector is reshaping itself to allow citizen to interact on democratic processes. Te presentation will focus on the ICT tools, including geo, in the hand of citizen to shape and direct also cross boundary challenges in Europe.

Barriers, Benefits and Conditions for Successful Implementation of E-Government Solutions

***ir. A.A. Kwitowski**, Manager Geo-informatics, BGT, Land Registration and Cadastre, DHV, The Netherlands*

The new ICT technology creates new E-Technology solutions, like E-commerce, E-Government, E-economy, etc. The EU societies demand the new style of governmental services, especially "One Stop Shopping" approach, therefore many governmental organizations facing the need of development and implementation of E-Government. Barriers: Barriers as experienced by the organizations: e.g. security and confidentiality, high set-up costs, etc and From the individual user's perspective: like: use ability of the websites – navigation, incomplete information, etc.

Benefit: The benefits of implementation are real available, but they are requesting more especially fundamental reorganization processes. Factors affecting benefit realisation: with focus on measuring and managing benefits. Lessons learned from successful implementations: various lessons as well from the management point of view as from the technology point of view are presented. The key conclusions: as consistent methods of demand and value assessment; mechanisms for tracking e-government service delivery, etc. are listed.Check list for successful E-Government implementation: There is no any checklist that will guarantee 100% success of E-government project development and its implementations, and it will be never available. However, it is important to follow the 10 important conclusions: 1)"Many ways how to go to Rome" 2)Redesign of the working processes; 3) Transparency, Knowledge sharing; 3)Users/employees involvement; Use of the standards; Co-operation, Co-operation, Co-operation; Financing; ICT Technologies and the "serving the user principle"; Training of employees/users; Necessary investment in marketing; Finally, analyzing, planning, doing, learning and improving is always good for the E-Government implementation strategies.

Lobbying for Digital Earth through the Digital Agenda for Europe: Challenges, Prospects and Proposals

***Karl Donert**, President, EUROGEO, UK*

In 1998, former US VP Al Gore presented a farsighted Digital Earth concept, whereby detailed geo-spatial information could be accessed from any place, at anytime, by anyone. Subsequent scientific and technological developments have made this vision a reality today. I argue that to meet the needs of society and stimulate further development in the geospatial sector, strong vertically integrated, Digital Earth education and training developments are necessary. European policy makers have to be made much more aware of these needs and then actively encouraged by stakeholders to respond to them in policy terms. This presentation explores how activities undertaken by an education network project (digital-earth.eu) and the work of a European association (EUROGEO) led to political engagement with the European Commission Digital Agenda for Europe initiative. It identifies a four point plan if Europe is to take full advantage of initiatives like the INSPIRE Directive and calls for support from geospatial stakeholders to help us create "Digital Earth education for all".

Geology: 3D Space Meets Time

***Dr. Michiel van der Meulen**, Chief Geologist, TNO Geological Survey, The Netherlands*

Our subsurface is modeled in 3D to represent the various geological components. No other discipline has such as long tradition in 3D modelling. Various types of models have been applied; both voxel-based and volumetric vector-based representations. In addition geology has also always include the temporal dimension as part of the interpretation. In this presentation the possible advantages and disadvantages of integrated 3D space and time representations will be analysed.

Ground Movement Analysis and Requirements for 4D Software

***Wouter Brokx**, Managing Director, Imagem BV, The Netherlands*

In this presentation the practical / business side of this matter is discussed. What is the (market) demand for 4D analysis? What are the current limitations? What are the requirements for the development of new (4D) software? A visual example will be used to illustrate a 4D case study and the elaboration of the performed 4D analysis. In addition this presentation might include, depending on the product development, a preview of new 4D software from ERDAS-Intergraph.

Principles of 5D modeling

***Prof. Dr. Ir. P J M (Peter) van Oosterom**, Professor, Delft University of Technology OTB Section GIS Technology, The Netherlands*

This paper proposes an approach for data modelling in five dimensions. Apart from three dimensions for geometrical representation and a fourth dimension for time, we identify scale as fifth dimensional characteristic. Considering scale as an extra dimension of geographic information, fully integrated with the other dimensions, is new. Through a formal definition of geographic data in a conceptual 5D continuum, the data can be handled by one integrated approach assuring consistency across scale and time dimensions. Because the approach is new and challenging, we choose to step-wise studying several combinations of the five dimensions, ultimately resulting in the optimal 5D model. We also propose to apply mathematical theories on multidimensional modelling to well established principles of multidimensional modelling in the geo-information domain. The result is a conceptual full partition of the 3Dspace+time+scale space (i.e. no overlaps, no gaps) to be realised in a 5D data model implemented in a Database Management System.

5D Data Modeling: From Theory to Practice

Dr. Jantien Stoter, *Associate Professor & Consultant Geo-ICT, TU Delft & Kadaster & Geonovum, The Netherlands*

This presentation will explain how 5D data models and data structures may solve the issues of redundancy and inconsistency caused by unconnected data sets about the same location at several scales and time periods. This presentation will translate the 5D data approach to practical cases and will also show how the intermediate 3D models (2D+scale; 2D+time) and 4D models (2D+scale+time;3D+time) already yield fundamental improvements compared to current independent management of 2D/3D multiscale and spatiotemporal data.

True Vario-scale Maps

Dr. Ir. Martijn Meijers, *Postdoc Researcher, Delft University of Technology, The Netherlands*

In this presentation the first true vario-scale structure for geographic information will be presented: a delta in scale leads to a delta in the map (and smaller scale deltas lead to smaller map deltas until and including the infinitesimal small delta) for all scales. The structure is called smooth tGAP and its integrated 2D space and scale representation is stored as a single 3D data structure: space-scale cube (SSC). Some uses of the SSC will also be presented.

The Next Step is Interoperability in Processes. A Dutch Example of Process Interoperability Between Asset Management and Surveying

***Ron Bloksma**, Consultant / Information architect, Grontmij Nederland B.V., The Netherlands*

Asset management is a systematic process of operating, maintaining, and upgrading public and infrastructural assets in a cost-effective way. It requires adequate information and knowledge of asset features and conditions. Location is a vital aspect of these assets. So asset management as a business process relies -on up to date- topographical base information. But how to the processes of maintaining the large scale base map and asset management interact which each other? The new base registration on large scale base mapping in the Netherlands, is semantically tailored on the needs of public and infrastructural assets. So instead of digitizing new objects on CAD-drawings, asset management can use the topographical objects of the surveyors. But maintaining and renewal of roads, signs, green areas and playgrounds are more dynamic then the half years topographical surveying. How can you fine-tune these processes in the near future? Can asset managers of green areas make updates on geometry in the base maps? What is the role of IT-components as brokers, ESB and none geo-information standards from the W3C? The next step is interoperability on all levels.

Geospatial Intelligence Support to Decision Makers

***Jürgen Wahlen**, Image Analyst, European Union Satellite Centre (EUSC), Spain*

The European Union Satellite Centre (EUSC) is an Agency of the Council of the European Union. Geospatial information is often derived from open source data prepared for a particular purpose. The difficulty of sharing, understanding and analysing this data is a hurdle for success. Therefore, a continuous development of new ideas to improve geospatial data production and to facilitate data exchange and data understanding is essential for the support of operational activities in a multinational users and systems environment. The EUSC is currently working on a new geospatial data production model. This new model will enable a better interoperability and understanding of the EUSC produced vector data. The scale and detail of these features is not yet considered by the MGCP data model. For this reason, the EUSC suggests new feature models based on DFDD (DGIWG Feature Data Dictionary) standards. This presentation outlines technical issues towards a new way of geospatial data production and representation for civilian and defence related applications supported by the EUSC.

Development of a Mine Action SDI

***Olivier J. Cottray**, Information Services Coordinator, Geneva International Centre for Humanitarian Demining, Switzerland*

This talk will focus on current work currently being undertaken to develop a Humanitarian Mine Action Spatial Data Infrastructure. The objective of this initiative is twofold: 1) Improve vertical integration of Mine Action data from field data collection to high-level reporting. Currently, the main Mine Action Information Management System (IMSMA) is very effective at collecting and storing data on Mine Action activities. Improvements are sought in making this information more easily consumable by operational and strategic decision-makers; 2) Improve horizontal integration of Mine Action data with the wider humanitarian community. More efficient data exchange between the communities will allow Mine Action operators to better prioritise their actions based on humanitarian and development needs. Conversely, humanitarian operators require up-to-date information on anti-personnel mine hazards in order to better plan and target their activities.The presentation will first review the current status of Mine Action Information Management. It will move on to reviewing the current trends towards better vertical integration within the Mine Action community and horizontal integration with the wider humanitarian community. The talk will then examine the various technical options under consideration, with a focus on the Mine Action XML format (maXML) and the Humanitarian Exchange Language (HXL) prototyped by OCHA.

Be Interoperable Beyond Geospatial

***Peter ter Haar**, Director of Products, Ordnance Survey, UK*

Over the past decade Ordnance Survey has heavily invested into the development and implementation of geospatial standards across its product portfolio and production systems. While at the beginning of this journey geographic information was largely utilised by geospatial professionals, we have seen an increasing uptake of digital location information in mainstream information technology and by consumers. This presentation highlights the challenges this changed landscape presents and discusses how the geospatial community needs to harness and relate to information standards that are developed outside of the traditional geospatial information domain. Examples are the availability of new analytical techniques and processing power to exploit very large data holdings (big data). Location-enabling any kind of large data holdings offers a tremendous opportunity to the industry alongside new information management approaches such as Linked data, which is capable of creating additional value by interconnecting data. Concerning more visual technologies the rise of 3D in consumer technology is mirrored by 3D geospatial which, in turn, is heavily influenced by an expectation of enhanced user experience, in-situ information mash-ups in augmented reality as well as the dynamics of real-time computer gaming.

Interoperable 3D City Models for Urban Information Fusion

***Prof. Dr. Thomas H. Kolbe**, Chair of Geoinformation Science, Berlin University of Technology, Germany*

Smart Cities and similar initiatives propagate a systemic view on cities, their structures, their citizens, and the utilization of resources by the latter. In order to support planning, decision making, and control of the system of a city, detailed information about the urban fabric are required. Virtual 3D city models decompose the urban space into its elements like buildings, infrastructure, vegetation, and water bodies. These elements can be understood as an inventory of urban assets which are represented both spatially by 3D geometries and semantically by thematic classifications, relations, and attributes. But only if the models are structured in a well-defined interoperable way, municipal development tasks in different domains like environmental planning, architectural planning, traffic planning, and strategic energy planning can utilize the same core data and make mutual use of it. The talk shows how the OGC standard CityGML facilitates this approach and how diverse applications like energy assessment, environmental simulations, and others make use of 3D city models and 3D GIS become an integration platform for detailed urban information. Examples for applications developed and implemented by municipalities or local governments in the EU or Germany will be given, among them are the Energy Atlas Berlin (incl. solar potential analyses, estimation of energetic rehabilitation states of buildings), noise dispersion simulation, micro climate simulation, and the simulation of failures of interdependent critical infrastructures. Attention will be given to cost reductions by demonstrating the reuse of models and tools for the diverse tasks.

3D in Mobile Augmented Reality

***Martin Lechner**, Chief Technical Officer, Wikitude, Austria*

3D on mobile devices in inherently different from 3D on desktop PCs. 3D plays an important role in Mobile Augmented Reality applications, however, most of the 3D models available are not useful to mobile AR, mostly due to size, complexity, many different data formats and structures. In my talk, I analyze what the current hurdles and challenges for applying Augmented Reality applications to existing 3D models.

Concepts and Cases for Realtime Geoinformatics

***Prof. Josef Strobl**, Director Centre for Geoinformatics, University of Salzburg, Austria*

Sensors today are ubiquitous. Sensors monitoring our environment, people as sensors leading to collective sensing, plus the worlds of volunteered and involuntary Geographic Information. More importantly, or societies, businesses and environments are increasingly managed based on the real-time paradigm: we are not collecting geospatial data to better understand our world and to facilitate more informed decisions in the future, but rather to manage and control processes NOW. The information feedback loop has been shortened towards 'real-time' by positioning and mobile communications technologies. Concepts, technologies and application domains today converge into a major new development trend for matters geospatial. Emergency management, using recent earthquake events as case studies, is used to demonstrate the power of geosocial sensing in a connected world, effectively creating 'live' geospatial flows of information supporting individual decisions as well as management of response and mitigation efforts.

Real-Time Geo-information for Everyone

***Prof. Henk Scholten**, Chief Executive Officer, GEODAN, The Netherlands*

The last decade witnessed a revolution in the geo-information world, especially in terms of citizen expectations. Hearing turn-by-turn road directions, virtually visiting places in foreign cities and even producing and sharing their own geo-data within social media, are now trivial tasks for citizens gained who gained the ability to interact and benefit from geo-informatics, a field which was unknown to most of them before. Consequently, we see increased expectations and demands, from students to professionals, for their tools to incorporate geo-information in order to improve their work. This is especially true for real time geo-information as location sharing has become common practice. The geo-community recognized this opportunity and is embracing this challenge. In this talk, we will discuss how different activities use real-time geo-information. We start with the very demanding disaster management professionals where every minute is precious to save lives. Real time geo-information plays a crucial role in the operational decisions (where are the fire-fighting units), in the tactic decisions (which area to evacuate according to the current weather and the gas spread model) and in the strategic decisions (how large is the impact and which regions/countries should be involved). Beyond theory, we will present the experience with the crisis management system "Eagle", which integrates real-time geo-information in operational, tactical and strategic decision making. On the other side of the spectrum, we find students and activists who can use near-real time remotely sensed imagery of tropical forests in order to detect ongoing land use changes. This is the goal of the DeforestACTION EarthWatchers project, where a crowd of students can monitor in real time the state of the forest and alert ground authorities of illegal activities. Very different target groups with one common need: accurate real-time geo-information. Live Geography is here now.

Understanding Urban Dynamics: Unlocking the Power of Networks as Collective Sensors

***Euro Beinat**, Vice President Location Solutions, Zebra Technologies, The Netherlands*

What if an entire city could be visible in real-time? Not buildings and squares, but the activity of people who populate it: public gatherings, traffic patterns, commuting patterns, neighborhood activity, people flows. All sorts of new services for the public good would be enabled, from emergency planning to traffic management, from the efficient allocation of utilities to impact assessment of new city infrastructures. Whereas most sensors deployed in cities are aimed at monitoring traffic or pollution levels, positions and activities of mobile phones can be used to "sense" people presence and mobility. When aggregated at the highest level possible mobile location data don't impinge upon privacy of individuals, but can return important information on concentration and relative weights of human activities in the urban environment, as well as flows and patterns of city use. The presentation illustrates results of selected projects in this sector, and provides evidence of how this information can stimulate new safety management systems, inform city managers about tourism patterns and city use, and provide a basis for innovative services

Open Standards in Real-time

***Steven Ramage**, Executive Director Marketing and Communications, OGC International , Norway*

An increase in natural hazards means the ability to access, share and transmit geospatial data in real-time has become incredibly important. Today, communication networks and distributed computing paradigms depend on standards. However, this is just one example where open standards from the OGC can add value. The OGC operates through a large number of working groups covering thematic areas, as well as specific requirements around standards themselves. This presentation will highlight several areas where real-time data sharing is facilitated through open geospatial standards. It will introduce concepts around Open GeoSMS, a location encoding for the global Short Message Service. As well as discuss some of the challenges and opportunities associated with the Sensor Web applied to areas, such as emergency and disaster management and environmental monitoring.

Live Geography - Towards Pervasive Sensing

***Dr. Bernd Resch**, Visiting Professor, University of Osnabrueck, Germany*

Real-time monitoring of urban processes is still widely unexplored and has recently received a lot of attention due to the fast rise of inexpensive pervasive sensor technologies, which made ubiquitous sensing feasible and enriches research on cities with uncharted up-to-date information layers. However, the urban context poses a number of specific challenges to pervasive real-time monitoring. These range from interoperability issues and physical sensor mounting to social and privacy implications. Furthermore, the sensitive urban political landscape including heterogeneous interests of a variety of stakeholders has to be accounted for. Another central issue in deploying sensor networks in the city is the impact of fine-grained urban monitoring, as terms like "air quality" or "pollutant dispersion" are only surrogates for a much wider and more direct influence on people, such as life expectation, respiratory diseases or quality of life.

Session: Cartography

Modern Cartography – Technologies and Implications

***Prof. Georg Gartner**, Institute of Geoinformation and Cartography, Vienna University of Technology, Austria*

Cartography is seen by many as facing a change of paradigms currently, triggered by technological challenges. As a result of innovative available technologies like the Internet, Multimedia and telecommunication infrastructure it becomes considerable, that cartographic communication processes can be realized which deliver user-tailored information to a specific user everywhere and anytime. This paper reviews the enormous diversity of fundamental questions which are appearing in modern cartography based on new technologies. It argues that a theoretical fundament is necessary to be able to define the core elements of a discipline. The role of international efforts in this respect is discussed and will be highlighted. By discussing the existing Research Agenda of the International Cartographic Association (ICA) and other existing bodies of knowledge in related disciplines the vision of further development of a Body of Knowledge for the domain of Cartography & related disciplines is discussed.

VGI AND MODERN CARTOGRAPHY

***Prof. William Cartwright,** School of Mathematical and Geospatial Sciences, RMIT University, Australia*

Blais (1992) wrote almost two decades ago that paper maps and charts and their electronic counterparts generally fall short of expectations to provide different perspective views, to display spatial and thematic changes over a period of time, to characterise the behaviour of natural processes, and to exhibit the topological relationships between classes of geomorphological features. The world of 'neocartography', that loosley-linked and organised community of collaborative cartographer - individuals that volunteer geographic information – and social software, delivered via Web 2.0, might be a prospective partner for 'mainstream' surveying and mapping. This paper addresses how neocartography, and the use of social software on everyday consumer electronic devices might be integrated with mainstream surveying and mapping practices to provide products that might be otherwise impossible to deliver due to economic and logistic situations. Neocartographyis not about further developing / improving existing approaches, but looking altogether differently at how data is collected, assembled, analysed and presented. It first provides an overview about how those involved in neocartography collect, store and generate cartographic products that supplement / complement their more conventional counterparts. It then addresses the opportunities, issues and challenges for the cartography / giscience community that neocartrography poses.

Multi-scale cartography: models, maps, tools and processes

***Paul Hardy**, Esri, Cambridge, UK*

This paper reviews the multi-scale cartography capabilities of a desktop, server, and cloud GIS (Esri ArcGIS). It discusses the tiered scale data models and cloud resources used for whole-world basemaps that show increasing content down to detailed scales. It shows examples from different countries contributing to a community topographic basemap. It explains a range of contextual generalization tools that can derive abstractions from feature data that is otherwise too detailed, and how they can be used to produce intermediate scale bands, or families of cartographic products. Finally it covers cartographic representation functionality and its application to multi-scale cartography.

An Integrated GIS based Agro/forestry Software Technology

***Walter H. Mayer**, General Manager, Progis Software GmbH, Germany*

In the seventies before the PC-revolution, the world was dominated by mainframes and dumb terminals. The mapping content was dominated by military considerations also top down oriented. Not only because of technology but also because of the fears to loose power based on the old thinking Information is power. From the point of information-management we have to understand that changes in maps do NOT happen in the office, they happen outside. Being provocative: If we do not have a bottom up link of information, the map on top is always history! The future needs a clear understanding and related technology of top down AND bottom up needs, of ownership of information also in relation to the ownership of a piece of land, public duties and private ones, public-private cooperation models etc.; we know from the history the problem of the commons nobody takes care, everybody is using overusing them what is after a while the end of them. Better public private models that share activities and responsibilities based on exact plans, controllable implementations and measurable facts have to be implemented. This also needs to share power better between top-down and bottom up related organisations. PROGIS technology, models and experience in agro-related chain-management show such possibilities, nevertheless much work has to be done and lots of understanding and change is necessary within the stakeholders.

Mapping the Green Infrastructure

***Jarlath O'Neil-Dunne**, Assistant Director, University of Vermont's Spatial Analysis Laboratory, USA*

Urbanized areas around the world are facing numerous environmental pressures, from rising temperatures to stormwater runoff to poor air quality. Traditionally, environmental challenges have been addressed through "gray" solutions, such building new water treatment plants or expanding transportation networks into the suburbs. Our mapping efforts have mirrored the solutions; data on structures, roads, and property boundaries is typically excellent in the developed world. With water treatment plants at maximum capacity, multi-hour commutes from the suburbs getting longer, and summer after summer of record temperatures it is clear that the limits of "gray" solutions are being reached. Cities are making investments in their "green" infrastructure in an effort to provide ecosystem services to their citizens and make the urban environment more livable in the push towards sustainability. Fortunately, novel solutions are being developed to provide actionable intelligence to decision makers. Automated feature extraction techniques allow sub-meter resolution land cover data sets to be developed from billions of remotely sensed data points with accuracies nearly approaching that of manual interpretation.

Analyzing the Factors of Deforestation using Association Rule Mining

Prof. S. Jyothi, *Head(I/C) CSE/IT, BOS Chairperson, Dept. of Computer Science, Sri Padmavati Mahila University, India*

The socio – demographic factors plays dominant role in any country's development which directly or indirectly affects natural resources. The growth of demography leads to developments in various directions like Urbanization, Road networks and other Infrastructural developments. The growing needs of minerals and other natural resources that is present in the forest area leads to mining industries which in turn results into construction of roads to the nearest accessible towns. The socio-demographic factors and the land use patterns are identified and derived from the remote Sensing images using GIS. Given these elements, the main objective of this paper is to analyze the role of different driving factors for deforestation and the relationship among these factors in the study area. For that an association analysis on deforestation factors is done. The widespread use of spatial database and spatial data mining technique can be used to understand inter – relational nature of spatial data. The algorithm searches for associations between spatial objects, or spatial objects and attributes. In this study, rules are expressed by spatial and non-spatial predicates. Typically, the analysis reveals the positive association of each of the above specified factors for deforestation.

Optimization of the Route of the Forest Logging Road

Dr Safiah Muhammad Yusoff, *Coordinator/Senior Lecturer Urban Studies & Planning Programme, Faculty of Arts and Social Sciences, Universiti Malaya, Malaysia*

Effective forest management very much depends on the construction and maintenance of an appropriate forest road network. Road building is essential to the extraction of multiple-use forest resources; hence, roads must be designed to satisfy a whole range of needs. However, careless logging and road building have been the main causes for environmental degradation in many forest regions. The aim of this study is to optimize the forest road network so that it is aligned based on results of the determination of the Net Production Area (NPA) and the identification of harvestable trees, while being constrained by information on soil loss prediction and hydrological flow direction. In optimizing the road routing, there are several matters that have to be considered, namely that the road should be: (1) as near as possible to clusters of harvestable trees, (2) away from the rivers and their buffers, (3) avoid high erosion risk areas, and (4) avoid relatively steep land. A number of software problems are experienced in implementing this procedure, but the results obtained in this chapter show how the final timber harvesting plan might be constructed for the study area, which is ready to be implemented in the forest.

Using GIS-based Database in Promoting Sustainable Management of Lakes and Reservoirs in Malaysia

Bashirah Fazli, *Research Officer, Research Centre for Water Quality and Environment, NAHRIM, Malaysia*

Lakes are critical "storage tanks" for freshwater. More than 90% of all available liquid surface freshwater is contained in lakes and reservoirs. Despite their importance, many of the world''s lakes are facing a serious health threat, coming from both within and outside their watershed. Hence, establishing a comprehensive, centralised and visualised database will facilitate the management to address the issues arising from degradation with a view of developing and instituting appropriate remedial measures. A GIS-based national lake database with the main purpose of providing a centralised platform for information and data keeping of lakes and reservoirs is pertinent to avoid ambiguous data, data redundancy and scattering as well as to ensure continuous update and data validation. By collecting data and information of all lakes, will facilitate stakeholdersâ ™ decision making process. A pilot system on alaysia GIS-based lake database is consisting of spatial and aspatial data collected from authorised and various parties. The main features include online information updates, overseeing data through spatial layers and ability to define and obtain information based on theme. The access is through GIS web publishing software to support the database where the system is accessible to stakeholders and interested parties through internet.The scientific community and the public perceptions about management of lakes and reservoirs may differ without the data generation, sharing and disseminating of knowledge and information. Thus, the human and financial resources mobilised in lakes and reservoirs management is a futile effort if the differences are not bridged to the lake database established.

Detection and Delineation of Coal Fire Affected Area of Jharia Coalfields Using Remote Sensing Techniques and Differential Global Positioning system (DGPS)

Dr. Dheeraj Kumar*, Associate Professor, Department of Mining Engineering, Indian School of Mines, India*

Coalfield, Jharkhand, India, is known for being the exclusive storehouse of prime coking coal as well as for hosting the maximum number of known coal fires among all the coalfields in the country. In the present paper an attempt has been made to map the coal fire of Jharia Coalfield using medium resolution satellite thermal IR night time Landsat-5 TM (band 6) data (acquired in 10.4â ¨12.5 Âµm spectral regions). Radiant temperature images were produced from the raw digital data using their calibration parameters like minimum and maximum spectral radiance values and using the Plankâ ™s radiation equation. Coal mine fire map was prepared using Landsat -5TM satellite image data. The highest temperature found from satellite image was 69.68. The coal mine fire map reveals that the coal fires are distributed mostly in eastern part of the JCF. The coal mine fire map was classified into three category i.e. (1) satellite image temperature → 52 Â°C were of high intensity of coal mine fire /surface fires, (2) satellite image temperature → 43 Â°C and ← 52 Â°C were of low intensity of coal mine fire/ sub-surface fires and (3) satellite image temperature

Relationships between Wind Fields and Nitrogen Dioxide Concentration :A Case Study of the Inner Bangkok

Pannee Cheewinsiriwat, *Department of Geography, Faculty of Arts, Chulalongkorn University, Thailand*

Nitrogen Dioxide (NO2) has been considered as one of the major air pollution components. Although the NO2 concentration in the inner Bangkok areas is still below the standard, the levels have constantly been monitored by the 13 stations set up by Pollution Control Department (PCD) to cover the whole areas. The highest levels of NO2 concentration have been detected in the busy inner-Bangkok areas. This work aims to verify a suggestion made by a few previous research works that the wind fields variable could be incorporated into the land use regression model to improve the NO2 concentration prediction by using the data collected from the inner areas of Bangkok. Data of wind directions and wind speeds measured at the metrological stations located in the wider Bangkok area have been spatially interpolated by using a geographic information system to obtain wind directions and speeds for each PCD station at selected dates and times. The resultant data reveal that at the 0.01 significant level wind direction has a weak positive correlation (0.11) while wind speed has a small negative correlation (-0.232) with NO2 concentration. Although the wind fields factor has a very small influence on the level of NO2 concentration in the inner Bangkok areas, the results seem to underline the influences of the wind directions created by urban area physical configuration that divert the NO2 from its normal paths to the PCD stations.

Modeling Climate Change Influence on Green Economy of Thermal Power Plants in Iran

A Monemjoo, *GIS Analyser, MAPNA Groups, Iran*

Thermal Power Plants (TPP) are one of the highest industrial consumers of fuel gas which has a specific role in energy economy. In this paper, it has been tried to generate two new spatial distribution maps which assist to show land potentially for construction TPP in each cell of Iran. These maps can be used by decision makers and spatial analyzers to optimize the procedure of TPP site selection in each one of the common Spatial Multi Criteria Decision Making methods, by a Value focused approach and caused to improve the identification of suitable locations (with most ignition efficiency and minimum environmental impacts) and prevent the elimination of many high potential places (in two mentioned factors) previously missed in Alternative focused approaches. To generating these two maps, it needs to produce spatial distribution map of mean temperature, mean relative humidity and air pressure (monthly and annually) and also the trend of climate change for whole of Iran. These three maps were generated by using observation data gathered from 340 meteorological stations in Iran since 1951. "Temperature trend" is the second new GIS thematic map which was produced by calculating the temperature drift from a linear correlation between temperature-year in each cell. As the result, using these maps and also analysing Iran and its TPPs status in a SWOT classification, by considering some of the internal and external factors, assisted to evaluate possible development scenarios and improve the land preparation process for identification of suitable places with optimum environment impacts, investment risk, compatibility with sustainable development and climate change.

Vulnerability Assessment of Indian Sundarbans

***Venkata Ravibabu Mandla**, Associate Professor, VIT University, India*

The Sundarbans (Longitude- 30Â°24'' to 30Â°28'' N; latitude: 77Â°40'' to 77Â°44'' E) lie at the interface of Bay of Bengal where the Ganges, Brahmaputra and Meghna rivers meet forming the largest delta in the world. Almost 60% of the area lies in Bangladesh and the remaining 40 %, also known as Western Sundarbans, lies in the Indian Subcontinent. Mangroves are most dominant features of the Sundarbans. The Sundarbans derives its name from a particular species of Mangroves known as Sundari tree (Heretiera Fomes). However, today, the Indian part of Sundarbans is almost devoid of the Sundari trees except a few stunted trees that are present at the core region of the Sundarban Tiger Reserve ,thus reducing the natural resilience of this region. Over the years , global warming and climate change has affected this sensitive ecosystem tremendously. Due to anthropogenic pressure land cover has altered and shore line has decreased which is of great concern. The objective of this paper is to design a possible vulnerability index for the Indian Sundarbans based on certain parameters that have been identified and evaluated based on various literature reviews over the years. This work aims at integrating primary data collected from site , secondary data available on public domain along with satellite imageries ,remote sensing and GIS tools to develop a vulnerability index for Indian Sundarbans.

GIS Revealed the Relation of Tectonics and Mineralization in Chahargonbad Area, Iran

***Reza Derakhshani**, Student, Department of Geology, Shahid Bahonar University of Kerman, Iran*

The objective of this study is to find relationship between faults and Copper potential in Chahargonbad area in Iran. Fault map of the area is prepared by studying of aerial photographs and after field checking of photogeological map of the region. Also remotely sensed data from Landsat 7 helped us to provide a lineament map of the study area which was also controlled in the field for establishment of faults. Then 17 porphyry copper deposits in the study area are detected, mapped, digitized and finally rasterized using GIS advantages. Some buffers are determined around them for measuring the situation of deposits within them. Then weight of evidence modeling is applied to quantify the spatial association between faults and porphyry copper deposits and it is recognized that porphyry copper deposits in the study area, are concentrated through 1 Km buffers around faults.

Vineyard Mapping Using Remote Sensing Technologies

***Dr Elif Sertel**, Associate Professor, Isttanbul Technical University, Turkey*

Remote sensing technology can be used to derive information about vineyard areas regularly, rapidly and cost-effectively. Satellite images have been extensively used to estimate biophysical variables of vine like shape, size and vigor which are potential indicators of fruit quality and yield. Accurate identification of vineyard parcels is important for vineyard mapping, supporting agricultural policies and creating Land Parcel Identification System (LPIS) to provide information for area-based subsidies. This study investigates the usage of different satellite images namely SPOT-5, IKONOS and Worldview-2 for vineyard mapping and proposes the best method and data for vineyard parcel identification. The spatial distribution of vineyards was determined in Sarkoy county of Tekirdag, Turkey by using different satellite images. Sarkoy has an area of 555 km2 providing the highest amount of grape production in Tekirdag city. With its mild climate near the shores of the Sea of Marmara, its topographic and climatic conditions are similar to Bordoux, France. Yearly grape production for winemaking is around 52000 tones and for table fruit is approximately 12.000 tones in Tekirdag. Several grape types namely Alphonse, Cinsault, Sauvignon Blanc, Semillon, Gamay, Riesling, Cardinal, Merlot and Shiraz have been growth in Sarkoy district. The results of this study illustrated the importance of remote sensing technologies to monitor and map vineyard areas accurately. Spatial information about vineyard areas derived from satellite images could be valuable input for vineyard management, precision viticulture and farmer registries.

Technology Disruption and Unpacking Google's Cloud Platform

***Koert Haoltgreve**, Regional Head of Sales, Google, UK*

With Google's Geo products and services, Google is using location to find results the user wants and presenting it to make it visually useful and relevant. Google is committed to provide Geo products via a powerful technological stack that includes solutions like Google Earth Builder, Google Maps, Google Earth and Google Maps for Mobile, providing the fastest, most interactive, and most visually compelling mapping experience available, wherever the user is located and whatever device they use.

Who Put My Printer in the Cloud?

***Albert Serra**, Designjet SW Solutions Director, Hewlett Packard, Spain*

HP is furthering its commitment to providing the highly mobile GIS community with solutions that connect them to HP's web-connected, large-format Designjet ePrinters and eMFPs for printing on the go, whether at a partner's office, in a taxi or on site. HP ePrint & Share enables easy printing of large-format documents from the cloud so you can print from virtually anywhere, using your laptop, HP ePrinter touchscreen, or iOS or Android mobile devices.

Bringing Spatial Context into the Cloud; How Oracle's Spatial Capabilities fit in Oracle's Enterprise Cloud Computing Strategy

***Han Wammes**, Public Sector Market Development Manager, ORACLE Nederland B.V, The Netherlands*

The mystification of Cloud Computing sometimes makes people think that Cloud Computing is a new technology, which will solve all our current IT problems. In reality we are dealing with the evolvement of SOA, GRID and Virtualization technologies, which brought together, can define a Cloud Infrastructure. The major advantage you then have, once the prerequisites for this Cloud Infrastructure are met, is a more agile infrastructure with a more flexible cost model. Other advantages are dependent on the innovations vendors will introduce and how much their technologies are compliant to interoperability standards. In this presentation it will be shown what innovations Oracle has introduced in its Enterprise Cloud Infrastructure to meet the Cloud needs of enterprises in terms of scalability, performance, security, governance, agility, provisioning, manageability and interoperability. It will also shown how Oracle's Spatial Strategy, although over 15 years old, still fits seamlessly in Oracle's Enterprise Cloud Computing Strategy, which includes federation of W3C and OGC interoperability standards and bringing business applications in a spatial context. Use cases will be discussed in a e-Government context both private and extended, hosted and on premise. Recent developments like Big Data or Real Time Analytics in combination with Complex Event Processing, extend the Cloud to the Sensor Web for spatial aware real-time decision-making.

Cloud Computing

***Martijn van Zoeren**, Chief Executive Officer, Dutch Cloud B.V., The Netherlands*

The presentation will touch down on the difference between Private- and Public Clouds in which the level of Control for customers, is de most important driver. The other part that will be addressed is the integration with Business Processes and the Key performance Indicator's in order to protect investments in Cloud Solutions. I use multiple customer cases in my presentation. Martijn's view on Cloud Computing is that a lot is possible; but there are still some concerns which needs to be addressed upfront in order to realize successful Cloud Implementations

Towards Mainstream 3D Geographical Data

***Dr. Jantien Stoter**, Associate Professor & Consultant Geo-ICT, TU Delft & Kadaster & Geonovum, The Netherlands*

3D geo-information is becoming increasingly important for planning and managing our densely populated and intensively used environment. This shows from the growing number of government agencies that build and use 3D information. Due to the absence of a 3D standard and a generic 3D approach every agency had to discover its own approach until recently.To coordinate these 3D initiatives the Dutch Kadaster, Geonovum, the Netherlands Geodetic Commission and the Ministry of Infrastructure and Environment initiated a 3D Pilot. In this pilot, nearly 70 organizations collaborated between March 2010 and March 2011. Based on use cases performed on a test area the four main aspects of the use of 3D geo-information were studied: generation of 3D information; 3D standard; 3D data management& distribution; and 3D applications. The achievements in this pilot showed that 3D geo-information is ready for intensive and wide use in practice.The recommendations of the 3D pilot that fit within regular tasks are being picked up by the four initiators of the pilot. For example the existing 2D information model on large scale topography has been integrated with the 3D OGC standard â ˜CityGMLâ ™ for optional extension into 3D. For this effort the 3D Pilot was awarded with the OGC 3D award. In addition it is studied how a 3D topographical base data set covering the whole country can be generated in an automatic manner. In a follow-up pilot, that runs from September 2011 till June 2012, about 120 participants (see http://www.geonovum.nl/dossiers/3d-pilot/deelnemersvervolg) are developing tools and instruments to support further 3D implementation in the Netherlands. Specific attention is paid to the alignment of geo-information standards and standards from the BIM domain (Building Information Model).The paper presented at Geospatial World Forum will focus on the achievements of the second phase of the 3D Pilot and will be co-authored by the 6 work package leaders.

Internet based 3D GIS Provide New Opportunities for Collaboration and Communication in Urban Development

***Hakan Engman**, Vice President Sales & Marketing, Agency9 AB, Sweden*

Efficient collaboration and communication is fundamental in building and managing sustainable cites. Leveraging the benefits of clarity of 3D illustrations, internet based visualization tools provided as a cloud service, allow easy distribution of information and collaborative work in projects teams internally within city organisations but also external architects, experts, builders, politicians and other stakeholders involved in the project. All members assigned authorisation and editing rights under a role-based access structure. An interactive project model can easily be published externally on the website allowing the user to navigate freely and to make comments in the virtual 3D model. The tools are focused to be intuitive and to easy to use to maximize the usability among persons without 3D expertise. Large terrain and 3D city models can now be used as a tool by a wider audience. As a cloud services the service does not require any install or maintenance. This presentation will provide several examples as online demos and explain the benefits learned in projects with municipalities and city governments.

Creating Value through Imagery

***Wolfgang Walcher**, Director – Business Management, Microsoft, USA*

***Kevin Bullock**, Product Manager, DigitalGlobe, USA*

Imagery users often struggle with a patchwork of satellite and aerial content with different vintage, quality, clarity and detail. Whether online or offline, the experience can be inconsistent at best, varying by location and the age and quality of the imagery displayed. In response to this, Microsoft Bing Maps and DigitalGlobe formed a strategic partnership to introduce a unique, leading edge Global Ortho program in the spring of 2010. This endeavor provides the first coast to coast coverage of the United States and continental Europe with current, highly accurate, 30 cm resolution aerial imagery with cutting edge clarity and detail. This leap in resolution and consistency vastly improves the experience and derived value for consumers and enterprise users accessing the content. The first phase of the project is scheduled for completion by June 2012. After the first phase, the content will be strategically updated by focusing on metropolitan and high interest areas. In parallel, coverage will extend to other regions.

3D Modeling software for Urban Environments

***Joris Bak**, Product & Project Manager, Esri Nederland B.V., The Netherlands*

This presentation will focus on 3D content creation for Urban Environments (with Esri CityEngine & ArcGIS). CityEngine provides a unique procedural design and modeling solution for the design, planning and modeling of urban environments in 3D. Procedural modeling means that 3D geometries and textures are constructed using rules (procedures) instead of labor-intensive manual modeling. A single procedural rule can be used to generate many 3D models. For example, the rule can make use of feature attribute information stored in GIS data—such as the number of floors, roof type, wall material type, etc.—to generate a series of alternate 3D models that accurately represent the properties of each feature. The more attributes you have, the more accurate the generated model can be. Furthermore we will illustrate how to export the generated 3D city models to other software tools, such as data management/analysis packages (like ArcGIS), 3D editing software (like Maya or 3ds Max), geo-visualization tools (like ArcGlobe or Google Earth), game engines (like Unity or Unreal), high-end rendering solutions (like RenderMan), or web-ready cloud rendering services (like RealityServer).

Robust Construction of 3D Building Models Through Stable Planar Extraction in DSM Data

***Dr. B. Babu Madhavan**, Remote Sensing and GIS Center, Sultan Qaboos University-Muscat, Oman*

An automated approach to construct 3D building models through Hough transformation and stable planar regions extracted from Digital Surface Model (DSM) data is described. The methodology has been applied to two DSM data produced from a low resolution LIDAR and ADS40 images. The approach is three pronged. First, Hough transformation is applied to the DSM data to extract edge features. Secondly different planes are constructed by stable planar region extraction technique. Roofs edges are formed by adjoining planes which are computed by using the topologic relations and geometries of planar regions. Finally, a polyhedral description of the data is derived using the geometries of the stable planar regions, line segments of jump and/or boundary edges, and roof edges. The algorithm is able to construct and examine each and every building expediently.

Development of Web Based Natural Resource Data Sharing and Decision Support System Using Open Source Tools

***Dr. M.P Punia**, Head ,Remote Sensing Division, Birla Institue of Technology Extension Centre, India*

The degree of development is a function of natural resources, its utilization and sustenance for future population needs. For better and scientific management all resource information, spatial and non-spatial data is to be kept in a well organized manner in digital forms usable through GIS, decision support systems(DSS) and other analysis tools available which are inter operable systems. This DSS provides good facility to analyze spatial and non spatial data sets and to form scientific decision rules to arrive at logical conclusions. The research on GIS and DSS have emerged a new solution for Spatial DSS (SDSS).In the series of DSS development a new node called Web, has enhanced the capability over traditional SDSS. As preventive measure to attentive natural resource management and unsustainable natural resource use, web based data sharing and decision support system (WDSS) have been developed using open source tools.WDSS is cost effective. The outcome produces interactive and multifunctional WDSS solving complex natural resource management problem. WDSS provides framework for spatial analysis of various layers as groundwater,lithology etc. The results help in i) Thematic information for natural resource. ii) Analysis of natural resource information. iii) Facilitates access, retrieval and updation of natural resource information.

3D Modeling for City Planning

***Kilian Ulm**, Business Development Manager, COWI, Switzerland*

COWI has extensive experience in the creation of visual appealing 3D city models for urban planning and city marketing as well as the sustainable use in Geographic Information Systems and Spatial Data Infrastructures (SDIs). In the past three years we have been awarded considerable international 3D projects in Monaco, Doha, Zurich, Geneva etc. At the Geospatial World Forum we will focus on various international 3D projects and its applications. The presentation will highlight the importance of topological correct 3D city models structured for the sustainable use in Geographic Information Systems (GIS). Furthermore we will illustrate through interactive 3D visualization how photo-realistic texturing of facades and roofs turn these valuable topological 3D models into visual impressive models for urban planning and marketing. A special focus is also put on one of our most challenging projects, the 3D model of Monaco. This project combines state-of-the-art aerial photography for the creation of the model by photogrammetric means and terrestrial mobile mapping data to enhance the 3D model with all required facade details like balconies, arcaded sidewalks, stairs etc. COWI generates reality-based 3D city models using in-house developed software tools on top of Microstation, which is a significant advantage in case the production method has to be adjusted according special client- or market-related requirements. Furthermore a large number of automatic quality check tools are developed to meet highest quality expectations for reliable 3D data.

Korean 3D Cadastre

***Dr. Jeong**, Spatial Information Research Institute (formerly CARI), South Korea*

This is the project to construct infrastructure of 3D cadastre introduction that aimed on tree-dimensional land management. The "3D Cadastre" has been studied continuously in the international academic world but it is not realized yet in Korea because it is not yet legally supported nor by a systematic approach. But considering the current situation that the three-dimensional use of land is increasing continuously, the introduction of 3D cadastre is needed; not only for the management of public facility but also for the preservation of people's ownership. Thus, in this project, we suggested a systematic improvement scheme for preparation and introduction. And a future action plan is prepared for the stable settlement of a 3D cadastre. Also learned from the experiences of the introduction at 8 sites, in these sites there are difficulties using the current 2D cadastre for management and also there are difficulties when people want to register rights. We surveyed all sites and made surveyor's manual to maintain consistency of survey methodology. Results of survey are processed (adjusting, editing, object modeling) and inserted into the database, and displayed on the full 3D cadastre prototype system. That system was developed adopting to the land management task of the Seoul government. It has functions such as inquiring, 3D viewing and space analysis. Through this project, we could meet to ask by the land administration part to serve 3D cadastral map, preserve people's property rights, and increase utilization of land information services.

Smart Eco-path Finder for Mobile GIS Users

***Dr. Ko Ko Lwin**, JSPS Postdoctoral Researcher, Division of Spatial Information Science, Graduate School of Life and Environmental Sciences, University of Tsukuba, Japan*

The increasing popularity of the Internet and user-friendly web based GIS applications such as Google Maps/Earth and Microsoft Bing Maps Platform have made GIS an integral part of life today for finding the nearest facilities, driving routes and so on. However, choosing an eco-friendly walking route is a big challenge for local residents because of the lack of GIS analytical functions and environmental data available online. Although analysis of route paths has been widely used in GIS applications, the integration of green factors with the analysis of the route path is still lacking in the GIS arena. In this paper, we have presented an integrated methodology, Remote Sensing, GIS and Spatial Web Technology for identifying an eco-friendly walking routes (Smart Eco-path Finder) by providing web-based GIS analytical functions using Tsukuba City in Japan as a case study. This web-based, Eco-friendly route path finder enables users to choose a walking route for green exercise by using their Smart phone or Ultra-mobile PC (UMPC).

Identification and Delineation of Oil Spill Area By Means of MODIS Satellite Imagery Analysis

Isfariani Ismet, *Student, Centre for Remote Sensing, Bandung Institute of Technology, Indonesia*

The wellhead platform Montara, located in Timor Sea and operated by PTTEP Australasia Proprietary Limited, started leaking oil on 21 August 2009. The oil continued to spill for the next ten weeks. It released 400 barrels of crude oil per day which caused marine pollution. This phenomenon can be monitored using satellite observation. Optical satellites which are equipped with MODIS sensor in their system, take images from the Timor Sea daily. These images can help in monitoring, detecting and identifying the distribution of the oil spill continuously. The appearance of oil spills in optical image is usually shown in darker tone than its surrounding area. The images used in this research are Terra/ Aqua MODIS which cover the area of the oil leakage in Timor Sea. Detection and identification using these satellite images is done by visual interpretation, unsupervised and supervised classification.

A Comparison of Sparse and Dense Point Approach To Photogrammetric 3D Modeling for Stone Textured Objects: A Case Study of Archeological Sites

Arnadi D. Murtiyoso, *Remote Sensing & Geographic Information Science Research Group, Bandung Institute of Technology, Indonesia*

Dr. Deni Suwardhi, *Remote Sensing & Geographic Information Science Research Group, Bandung Institute of Technology, Indonesia*

Three dimensional (3D) modeling has been an important process in documenting archeological sites. Unlike conventional 2D drawings, 3D models provide both archeologists and future reconstruction workers with accurate geometrical data of the object in digital form, thus enabling various experiments and research. For this cause, archeological institutions usually employ either the terrestrial laser scanner, or cameras using photogrammetric techniques. Photogrammetric techniques are usually employed due to their relatively low cost, simple equipments and quick data acquisition. Photographs can then be processed into sparse point 3D model. However, with the introduction of advanced image matching algorithms, this technique can also generate dense point clouds similar to results from laser scanners. A prerequisite for this technique however is that the object in question possesses a texture with patterns in order to allow automatic image markings. In nature, stone textures in general provide a perfect example of this requirement. Dense point cloud generation is very useful especially to model intricate architectural details from objects such as roofs and reliefs. This process was adopted to document shrine No. 72, Sewu Temple Complex in Central Java, Indonesia. The purpose of this research is to determine whether the dense point approach is more effective and generates an altogether better result when compared to the sparse point approach that is used to model a stone structure which is less intricate.

Automatic Generation of 3D City Models

Jan Tischer, GTA Geoinformatik GmbH, Germany

In the last years the market for 3D data has been growing continuously. The users of many applications benefit a lot from extending their data basis from 2D to 3D. This presentation will show what concepts can be used to generate 3D buildings automatically, fast and cost-efficient from stereo aerial or satellite imagery and/or LiDAR data. New software algorithms use point clouds generated from stereo imagery or from laserscanning as data source for automatic 3D mapping. For this, algorithms of SGM (semi global matching) type are implemented and adapted. The acquisition of stereo imagery as well as laserscanning is carried out in remote sensing projects on mobile carriers such as aeroplanes, helicopters, unmanned aerial vehicles, cars and high resolution satellite sensors. These source data from remote sensing systems are more and more available for many regions and can be used to generate 3D data automatically, fast or even in realtime as well as cost-effective even though very large data volumes need to be processed. In a further step, aerial or terrestrial digital close-range photography is processed to do an automatic facade analysis in order to texture roof and wall faces photorealistically or to reconstruct facades from meta information deduced from the source. Parametric building reconstruction is used for high optical quality combined with low data volume.

Land Administration and Development Planning

***Sajeli Bin Kipli**, Director, Land and Survey Department, Malaysia*

The Land and Survey Department, Sarawak, Malaysia is a multi-discipline Government agency comprising land, survey, planning and valuation services. The Department maintains a well established and unified land cadastral and land registration system for the State of Sarawak. The land and cadastral information which formed the core data for land administration and land management has been converted into digital and geospatial application as an integrated land information system, known as LASIS (Land And Survey Information System) which records land ownership, land values, land use and other land-related data. The Land and Survey Department has now embarked on utilizing LASIS for the Urban and Regional Planning purposes. Since 2007, the Department has implemented in stages the use of LASIS in planning applications in the regional (Divisional) Offices which provide frontline services to the public and are responsible for all ground and basic data on land. All 11 Divisional Offices have been brought to the fold by 2010 and hence, processing of most planning applications are now handled within the Department using LASIS. The application of Geographic Information Systems (GIS) technology has helped provide the necessary datasets of various land information to facilitate the work of planners. The immediate advantage is seen in the handling of various planning applications for development and in the formulation of master plans, structure plans and local plans. GIS has allowed multiple-information such as land use, land commitment, aerial photographs, topography, land tenure and other land-related information to be overlaid with the cadastral layer, making the work of planners more effective and efficient. The availability and use of spatial data via GIS technology coupled with the land administration and tenure data and other relevant information in the Department's database have much more potentials and applications in development planning. The Department is continuously leveraging on such information and technology, and exploring possibilities to be applied in this important task.

Cadastre Information System (FBSIC)

***Luís Mata Pires**, Chief Executive Officer, Ferbritas SA, Portugal*

***Fernando José Pereira Gil**, Geographical Information Officer, Ferbritas SA, Portugal*

The Cadastre Information System (FBSIC) was designed to meet the needs and activities of entities or organizations to whom is important to ensure the dynamic control of cadastral and land management. In a simplified view the key benefits include: improved efficiency of business processes, more cost effectiveness, best customer service, best decision making, greater efficiency in information sharing. The presentation will consist on a brief description of project life cycle and its main milestones, business requirements, scalability, interoperability and standards issues. It will proceed with a demonstration of the solution focusing on key business processes and activities, including quality control, tracing and a platform for the approval process by the client. The demonstration will show the different map management capabilities focusing geographical, alphanumeric and imagery handling as well as associated documents and business outputs.

Optimizing the Real World Geocoding Issues of Unstructured Addresses in Developing Countries

Nishant Sinha *Senior Project Manager, Pitney Bowes Software, India*
Madhumita Rao*, Director, Pitney Bowes Software, India*

The most commonly used approach to geocoding employs a street network data model, in which addresses are placed along a street segment based on a linear interpolation of the location of the street number within an address range. In developing countries where the availability of GIS data infrastructure is limited or not existing in structured manner, the major challenge to an accurate geocoding remains in nonexistence of reference datasets or GIS data infrastructure (Croner 2003, United Nations Economic Commission 2005). The development of basic GIS reference datasets face challenges with existence of slums that are mobile in nature, containing features that are not street addressable, and lack of addressing system or schemes (Davis 1993, Oppong 1999, Davis et al. 2003, United Nations Economic Commission 2005). These challenges are not limited to developing countries but exists with developed countries as well such as United States, the existence of rural address and post box addresses are the major challenges for developing a robust Geocoder (Gregorio et al. 1999, Boscoe et al. 2002, Hurley et al. 2003, McElroy et al. 2003, Schootman et al. 2004, Gaffney et al. 2005, Oliver et al. 2005).

Height Accuracy Assessment of Total Station versus Digital Level

Ismat El Hassan, *Professor, King Saud University, Iran*

It is well known that Differential levels are mainly designed for leveling operations. Leveling process is essential for many engineering applications requiring high height accuracy. The main purpose, however for Total stations is the three-dimensional positioning, setting out and collection of data for topographic data and digital elevation models. In this paper, the height determination accuracy by Total Stations is evaluated and compared to that of a digital level tested in the same environment. Two level lines of different lengths were tested using three total stations and one digital level. The closure error for test 1 (level line length is 250m) achieved by the digital level is 1.6mm, for the tested total stations are 2.3mm, 2.5mm and 2.3mm. For the second test (level line is 450m) digital closure error obtained is 1.2mm, while for the tested total stations 1.3mm, 1.2mm and 1.2mm. For a short level line of length 250m the digital level accuracy is noticeably higher, while for the longer level line (450m) the accuracy of the total station compete well with the digital level. It can then be concluded that total stations can very well replace digital levels for leveling work required for level lines longer than 450m.

A Land Price Prediction Model using Multi-scale Data and Urbanism

***Hyejung Kwon**, Student, University of Seoul, South Korea*

Along with the increased attention to low-carbon and pedestrian-oriented development, urban analyses focusing on finer scale are required increasingly. Land values, one of the key factors for urban socio-economic analyses, have long been dealt with in larger scales such as administrative zones. However, for pedestrian-level analyses, coarse scale data from different sources need to be converted to integrated micro-level data. In the study, we suggest a method to integrate such multi-source, multi-level data into a single unit data. We used geo-statistical and spatial analysis approach in order to construct synthetic cell-based data resolving the heterogeneity. On the other hand, urban models that provide integrated analysis for both land and transportation are getting attention recently. UrbanSim, one of such integrated models, provides different analytical functions including micro cell-unit analysis and dynamic time-series analysis. The suggested processes are tested in Seoul City and the resulting predicted land values are illustrated.

Using Ant Colony System to Produce Session Schedules for GPS Surveying Networks

***Sahar Abolhasani**, Student, Tehran University, Iran*

A GPS network can be defined as a set of stations which are coordinated by a series of sessions formed by placing receivers on the stations. The problem addressed is to determine the order in which each GPS receiver should be moved between the points giving the cheapest schedule using heuristic techniques within the field of Operational Research. Solving large networks to optimality requires impractical running time. To avoid this, the Ant Colony approach tries to provide near-optimal solutions when an acceptable amount of computational effort has been implemented. Computational results are presented to show the effectiveness and performance of the developed Ant Colony technique with respect to solution quality and the computational effort using a GPS network in Tehran.

GIS Based Tectonic Map of Kouhpayeh of Kerman, Central Iran

***Masoumeh Moradali**, Student, Department of Geology, Shahid Bahonar University of Kerman, Iran*

Kouhpayeh region in NE of Kerman is one of the most complex tectonic areas in Iran. Various morphotectonic features with their complicated geotectonic set-up influence the area to be tectonically very active. In order to obtain a comprehensive idea about tectonic settings of this area, it is essential to prepare a tectonic map based on geological field observations. Most parts of the study area are highly inaccessible and difficult for geological field survey. So, we made the first attempt to produce the regional geology map of the study area as well as of the adjoining region with the help of remotely sensed data available via satellite imagery, aerial photographs, studied in conjunction with available geologic maps of the area. All morphotectonic lineaments were drawn and their significance evaluated later by comparing the available information on ground truth. Then the tectonic map of the study area prepared and used for correlation with geologic study. It was desired to develop a new tectonic map incorporating all the major faults and lineaments that exist in geologic maps with the help of GIS.

UltraCam and UltraMap: The All in one Photogrammetric Solution

Alexander Wiechert, *Business Director, Microsoft Vexcel Imaging, Germany*

This paper gives a brief overview about the UltraCam aerial camera family, highlighting the ultra-large format camera UltraCam Eagle. Then the new upcoming version of UltraMap 3.0 is discussed in detail. UltraMap 3.0 implements the famous dense matcher, developed since years by Vexcel Imaging in Graz for Microsoftâ ™s Bing Maps project, into the commercially available UltraMap software. That represents a revolutionary step in digital photogrammetry. The dense matcher generates digital surface models (DSM) and digital terrain models (DTM) automatically out of a set of overlapping UltraCam images. The models have an outstanding point density of several hundred points per square meter and sub-pixel accuracy and are generated automatically. UltraMap 3.0 features also an additional step which is presented in this paper, a complete automated true-ortho and ortho workflow. For this, the UltraCam images are combined with the DSM or DTM in an automated rectification step and that results in high quality true-ortho or ortho images as a result of a highly automated workflow. The paper presents the new workflow and first results.

Aggregation of LiDAR, RADAR and Optical Terrain Data for a 30 Meter Sampled Global DEM

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For various parts of the world, digital maps of Earth''s topography are limited, inaccurate, or nonexistent. For example, many mountain chains, inhospitable deserts, and dense tropical rain forests have topographic coverage that is totally inadequate mainly because of the difficulty in getting to these locations. Even where topographic maps exist, they may have been created in such a way as to limit their usefulness. Neighbouring countries may generate topographic data using entirely different methods. This lack of standardization effectively limits the scope of regional or global studies where precise topography is important. The vertical accuracies of ICESat reference data is within 25cm RMSE on (relatively) flat and open areas. The positional accuracy is published to be about 4m. The impact of vegetation cover and terrain slope on the vertical accuracy of the 30 m elevation data were assessed. Results indicate that the high resolution 30 m DEM performs better in barren low sloped terrain, than in vegetated and slopes greater than 10 degrees. The vertical accuracy results offer an improvement over the SRTM V4 and ASTER V2 near global elevation data sets. This data set has great implications for national governments, who now have a high resolution seamless DEM for their entire country.

High Resolution Stereo Satellite Mapping is Beginning to Replace GPS and Conventional Surveying on Resource Development Projects in the Developing World

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Resource development feasibility studies, project planning and construction always require accurate, reliable, 3D mapping of surface features. Accurate locations of drill hole collars and surface geological features are critical to the correct interpretation of mine geology. With improvements in the accuracy and reliability of stereo satellite mapping we are beginning to see stereo satellite mapping replacing GPS and conventional surveying in determining and verifying locations of surface features on resource development projects in the developing world. With 50cm resolution WorldView and GeoEye stereo satellite photos and new developments in stereo satellite processing systems, better than 50cm in horizontal and vertical accuracy can now be achieved with approximately one ground survey point for each 200km2. With this improvement in mapping accuracy, stereo satellite mapping is now being used to replace much of the ground surveying on many projects and to quality control the remaining ground surveying. We will show a number of commercial applications of stereo satellite elevation mapping projects with better than 50cm horizontal and vertical accuracy and the identification of a variety of ground survey errors with stereo satellite mapping.

Using Nonlinear Image Processing Techniques for Revealing Hydrothermal Alterations in Mineralized Regions of Eastern Azerbaijan/Iran

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Remotely sensed data usually contain a large amount of information critical for hydrothermal mineralization. A processed photomap is however not a type of â œready-to-useâ œdata for assessing mineral potentials only if the coherent components of multisource diffusions could be divided to threshold and anomalous reflections. The fractal filtering technique, as recently-developed tool for assigning coherent signatures, is able to extract meaningful sequences of digital numbers as physical indications related to altered regions. The research has been introduced to interpolating of the meaningful digital numbers after analysis of the principle components due to Fourier transformations and fractal grids. Considering to casual experiences, frequency interpolations give rise to appearing a set of decomposed but coherent reflections which most of them are in spatial associations with encouraged mineralized regions. From geological points of view, hydrothermal alterations originated from post magmatic differentiation processes can be revealed geometrically and prioritized to mineable targets by applying spectrum area models to remotely sensed quantitative dataset. In practice, a Crosta photomap has been selected and processed nonlinearly in order to prognosis of solution related alterations which are finely hosted by Neogene extrusives in Armudaq region, Eastern Azerbaijan, NW of Iran.

LASzip - Lossless Compression of LiDAR

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Airborne laser scanning technology (LiDAR) makes it easy to collect large amounts of point data that sample the elevation of the terrain beneath. The LAS format has become the de facto standard for storing and distributing the acquired points. As the sampling density of LiDAR increases so does the size of the resulting ?les. Typical LAS ?les contain tens to hundreds of millions points today, but soon billions will be commonplace. We describe a completely lossless compression scheme for LiDAR in binary LAS format versions 1.0 to 1.3. Our encoding and decoding speeds are around one to three millions points per second and our compressed ?les are only 7 to 25 percent of the original ?le size. Compression and decompression happen on-the- ?y in a streaming manner and random-access is supported with a default granularity of 50,000 points. A reference implementation unencumbered by patents or intellectual property concerns is freely available with an LGPL-license, making the proposed compression scheme suitable to become part of the LAS standard.