

From consumer mapping to branch location to fraud detection, major banks and financial institutions worldwide are betting big on location technology | P. 24

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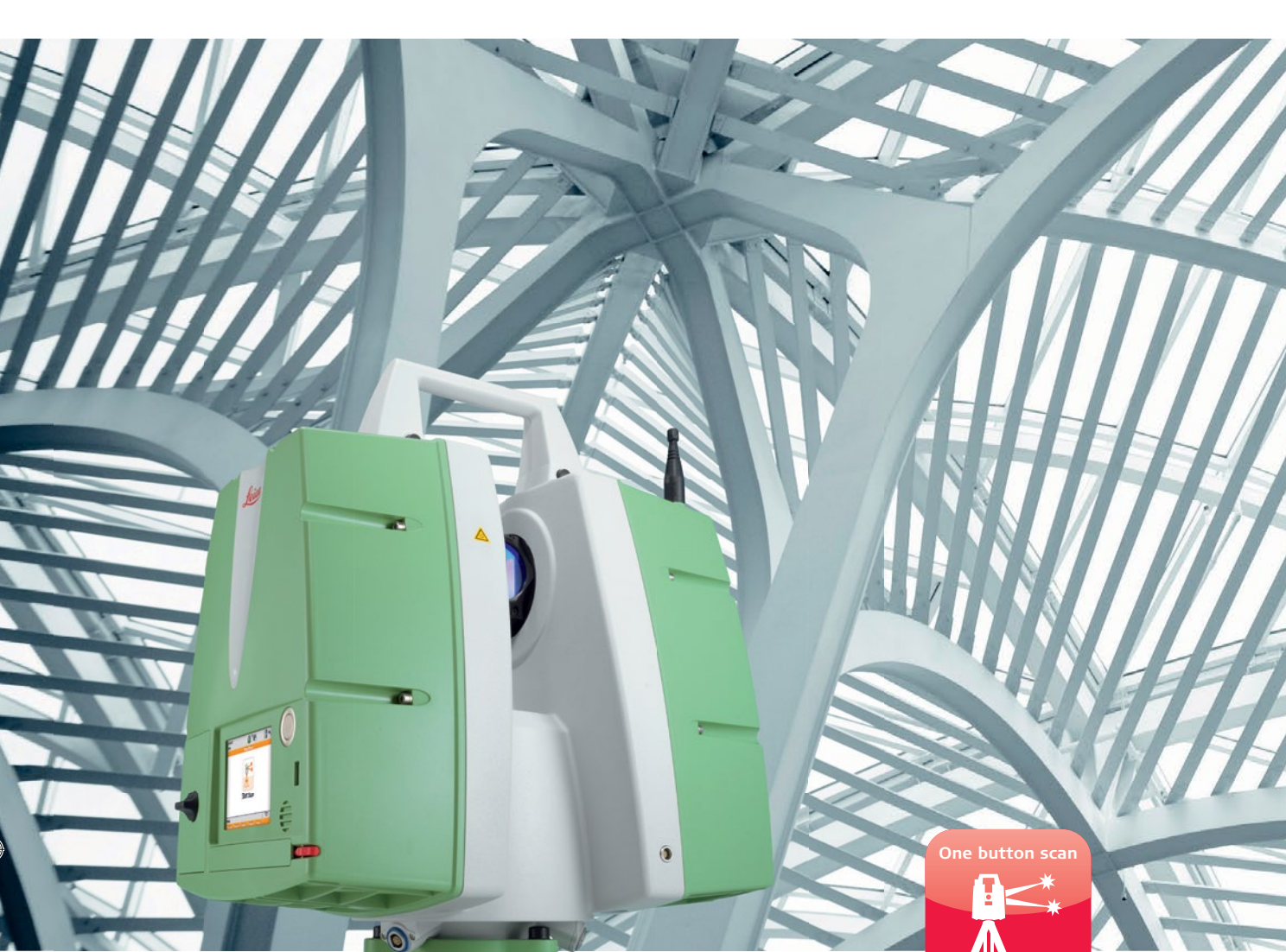
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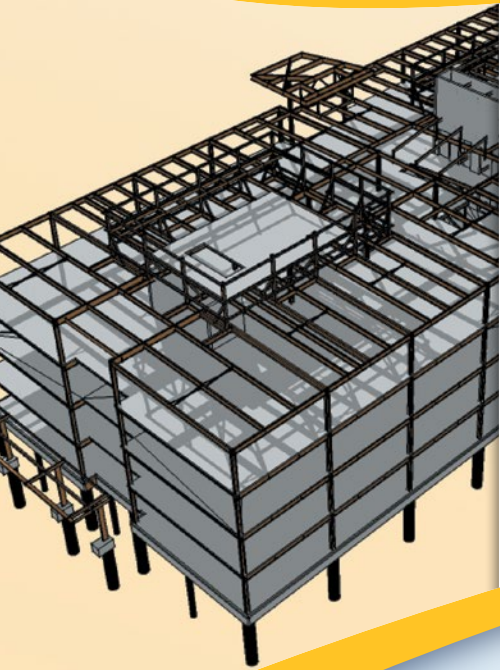
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Disruptive and How!

Do you remember the last time you visited your bank? Chances are you do not, because online banking, just like online shopping and online payments, has eliminated the need for visiting the banks physically or even exchange physical objects like bank notes. In the event that you do need these physical objects, there are the ubiquitous Automatic Teller Machines (ATMs) around the corner. In short, the banking world has embraced electronics and communications in a way that has made banking operations easy and efficient. What is the next step? The next disruptive technology to hit the banking industry is the power of 'G' — geospatial technology.

But what has geospatial got to do with bankers? A lot, apparently. In a series of articles, case studies and interviews in this edition, we look at the emergence of geospatial applications in the financial sector, from credit card and bank frauds, to tracking consignments and prices, looking at suitable locations of bank branches and profiling areas based on customer preferences. Such applications are not just about maps and remote sensing but about using these as tools along with others like Big Data analytics, data warehousing and artificial intelligence to help non-traditional application areas like banking. For example, Big Data analytics is needed to extract patterns from a huge number of transactions over time and space to winkle out the fraudulent ones; for example, the use of the same credit card in different geographical locations at the same time.

Another disruptive technology that is making waves and is covered in this edition is Laser Scanning. Since the early '90s, when the first Airborne Laser Scanners made their appearance, the technology has grown and matured manifold, and so have the applications. Laser scanning has also found use in terrestrial applications. Major applications in urban modelling, terrain analysis, engineering, heritage preservation and crime forensics have introduced a new dimension in data capture and analysis. Here too, integration with conventional imagery has resulted in unique applications as well as enhancement of existing applications.

As I write this, India's PSLV has put into orbit France's SPOT-7 and four other satellites from Canada, Germany and Singapore. In a stirring address to the Space community delivered after the successful launch, Indian Prime Minister Narendra Modi reiterated the importance of space technology and technology in general for the benefit of humanity and in particular, the developing nations. He has proposed a SAARC satellite to serve all the SAARC nations. Of interest to our community is the importance given to the geospatial technologies, which is an indication of the market opportunities likely to open up in this region.



Business

Google acquires Skybox Imaging

Google has entered into an agreement to buy Skybox Imaging for \$500 million in cash, subject to adjustments. The deal value is exactly half of what the industry experts and grapevine sources had suggested in June. According to the announcement made by Google, Skybox's satellites will help Google Maps deliver more accurate data with up-to-date imagery. In the announcement, Google also clarified that Skybox might also be used for Google's ambitious Internet via satellite project.

\$500 mn

Deal value

First FAA-approved commercial UAV used

BP Exploration recently selected AeroVironment to provide mapping, GIS and other commercial information services at its Prudhoe Bay oil field, the largest oil field in North America, for a five-year period. Commercial UAS operations began on June 8, 2014. The contract marks the first time an unmanned aircraft systems (UAS) will be performing routine commercial services over land in compliance with Federal Aviation Administration (FAA) regulations. AeroVironment is currently performing photogrammetry and LiDAR analysis to survey Prudhoe Bay infrastructure including the gravel roads, pipelines and a gravel pit. The LiDAR-produced maps delivered by AeroVironment's Puma AE, along with GPS guidance systems, will assist driv-

DigitalGlobe gets green flag to sell 25cm imagery

DigitalGlobe has received a nod from the US Department of Commerce on its application to allow the company to sell higher resolution commercial satellite imagery. Effective immediately, the approvals will permit DigitalGlobe to sell imagery to all of its customers at up to 25cm panchromatic and 1.0m multispectral ground sample distance (GSD) beginning six months after its next satellite WorldView-3 is operational. WorldView-3 will provide even higher resolution at 31cm, and the GeoEye-2 satellite, which is substantially complete, will capture similarly sharp images when it is launched to replace a satellite currently in service or as an expansion to the constellation once warranted by market demand.



WorldView3 being prepared for test phase

ers in keeping moving drill rigs centred on the roadways, even in low visibility conditions.

Trimble acquires MAYBIM

Trimble has acquired the assets of Utah-based MAYBIM. MAYBIM is one of the leading 3D building information modelling (BIM) services providers with a focus on mechanical, electrical and plumbing (MEP) contractors across the US. MAYBIM provides contractors customised project deliverables that can include 3D modelling, BIM Coordination, 3D Laser Scanning and 3D modelling from scanned point clouds.

OmniEarth joins forces for small sat constellation

OmniEarth has forged an alliance with Draper Laboratory, Dynetics

and Harris Corporation to build, launch and operate a constellation of 18 small satellites to provide global, high-resolution earth imagery on a daily basis. The team is currently seeking additional partners, investors and customers for the business venture. In addition to imagery, OmniEarth plans to offer change-detection products and analytics to commercial, research and government organisations. Potential applications include agriculture, oil and natural gas exploration and production, mapping and geospatial services, emergency response, national security and mobile device support. The estimated cost of the venture is \$250 million.

\$250 mn

Cost of venture



Hexagon acquires North West Geomatics

Hexagon AB has acquired the remaining 90% of the shares in North West Geomatics, making the company a fully owned subsidiary of Hexagon. Hexagon acquired 10% of North West Geomatics' shares in 2012. North West Geomatics, provides aerial mapping and related spatial data services. Together with advances in sensor capabilities and the acquisitions of AHAB, Aibotix, Geosoft and Tridicon, North West will be an instrumental part in Hexagon's plan of selling data content as a service (CaaS).

Drone maker Skycatch raises venture capital fund

Startup Skycatch has raised \$13.2 million in a new round of venture funding to build data-collecting drones. Skycatch offers autonomous drones for capturing 2D and 3D data. Entrepreneur Christian Sanz said that there is a dearth of such service providers, and thus, holds a huge market potential. The new funding will go into building out its existing business, but also into an ambitious new plan that would see the startup build new high-altitude unmanned gliders that could fly perpetually and gather data on demand in specific locations per client requests.

\$13.2 mn

Funds raised

Intermap signs agreement with 10 global reinsurers

One month after announcing the commercial availability of InsitePro, Intermap Technologies, a leading

provider of location-based solutions, has signed an agreement to license InsitePro to 10 global reinsurers for use in a specific Latin American country. InsitePro is a Software-as-a-Service (SaaS) product that is purpose-built to visualise and analyse location-specific risks. InsitePro provides reinsurers with a tool to evaluate locations one-by-one or thousands at a time using risk models and analytics.

Miscellaneous

Free ArcGIS accounts for ConnectED initiative

Responding to President Barack Obama's call to help strengthen STEM education through the ConnectED initiative, Esri will provide free ArcGIS Online account to the more than 100,000 K-12 schools in the United States. The ArcGIS Online accounts will run on cloud infrastructure provided by Amazon Web Services (AWS). ConnectED is a government education programme developed to prepare K-12 students throughout the United States for digital learning opportunities and future employment. Because each ArcGIS online account is valued at more than \$10,000, the potential value of the contribution to the initiative is estimated around \$1 billion.

\$1 bn

Value of contribution

MDA expands imaging modes for RADARSAT-2

MDA's Information Systems group launched a new imaging mode for

RADARSAT-2. The Extra-Fine mode provides the ability to capture high resolution imagery over large areas, which will help monitor large areas and identifying detailed changes. The Extra-Fine imaging mode is able to provide single polarisation synthetic aperture radar (SAR) imagery at a 5-metre resolution, over a 125x125 km area (or 15,625 sq km per scene).

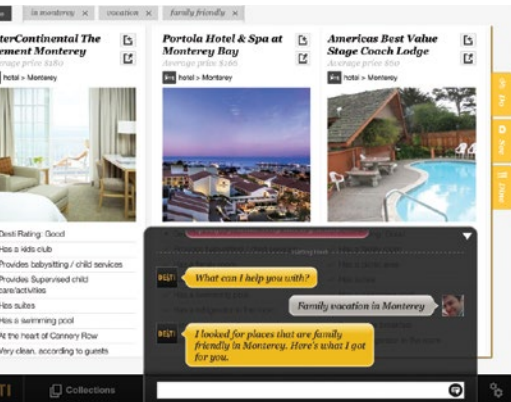
Roger Easton, father of GPS, dies at 93



Roger Lee Easton, Sr., the father of GPS and pioneer of modern day navigation, died on May 8 at his New Hampshire home. Easton retired from the Naval Research Laboratory, where he was Head of the Space Applications Branch, in 1980 and moved to Canaan, New Hampshire where he continued improving GPS technology. Easton held 11 United States patents, was inducted into the American Philosophical Society, won the National Medal of Technology in 2004 and was inducted into the National Inventors' Hall of Fame in 2010.

Finland

HERE acquires Medio Systems, Desti



Desti app offers personalised search results based on an algorithm that analysis your preferences

HERE has announced plans to acquire Medio Systems, real-time predictive analytics solutions providers. Building on Medio's 'smart data' asset, HERE plans to create contextual maps and location services that would provide personalised and predictive experiences for people and businesses. HERE has also acquired mapping startup Desti, a spinout from SRI International — the same group responsible for Apple's Siri. It's not clear exactly how Desti will be incorporated into HERE, but experts believe that it will make HERE maps more intuitive.

Tornator, Blom join hands to offer forestry services

Tornator and Blom's Finnish subsidiary, Blom Kartta, have signed an agreement of cooperation for remote sensing-based forest inventory. The project will cover about 200,000 hectares of forest, owned by Tornator in various parts of Fin-

land. The agreement will last until 2016. The project includes aerial photography, laser scanning and forest inventory analysis.

Greece

Greece guaranteed access to Sentinel data

ESA and Greece have signed a first arrangement that establishes access to Sentinel data. Under the agreement, National Observatory of Athens (NOA) intends to set up a national mirror site for hosting and distributing Sentinel data, ensuring the access, archiving and redistribution of Sentinel data and products for the derivation of value-adding environmental services and information. The objective of this activity is to provide data for priority national activities between Greece and neighbouring southeastern Mediterranean and Balkan countries, as well as the Black Sea Region.

UK

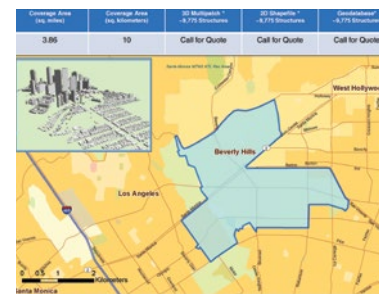
Military eyes Quantum compass to replace GPS

Scientists say they are three to five years away from creating a new navigation system that would not rely on space-based technologies. A 'quantum compass' might replace the US' widely-used GPS, first in military and then on smartphones. MoD is so keen to develop a quantum compass because GPS doesn't work under water. The Defense Science and Technology Laboratory has developed a quantum navigation system resembling a '1-meter-long shoe box'. Scientists

are now focusing their efforts on miniaturizing the device.

CyberCity 3D, Bluesky to develop 3D city models

CyberCity 3D, a provider of advanced geospatial smart building data, has teamed up with aerial mapping company Bluesky International to create 3D city models. The 3D models will be created using CyberCity 3D's 3D building production solution with Bluesky's stereo aerial imagery. Access to



A representative 3D image and map of Beverly Hills produced by CyberCity 3D. Bluesky's data library, covering 150,000 sq km of off-the-shelf aerial photography, would allow CyberCity 3D to gain access to urban centres across the UK for 3D Smart Building production. In addition, Bluesky's will meet CyberCity's need for aerial imagery for updating its database.

Sweden

Hexagon acquires iLab for smart agriculture

Hexagon AB has acquired iLab Sistemas, a provider of planning and optimisation solutions for the agro-business sector, with special focus in the sugar and ethanol industries. iLab will, together with Arvus and Leica Agriculture, form the backbone of Hexagon's Smart Agriculture Solution.



Costa Rica

BlackBridge supports REDD-GIZ initiative

Using the BlackBridge RapidEye imagery different forest types are being located and quantified, which would help in the identification of



Satellite imagery of Costa Rica

major carbon reservoirs in Costa Rica. The project has been developed by SINAC, the National Forest Fund — both units of the Environment and Mining Ministry of Costa Rica — and with the technical and financial support of the regional program REDD/CCAD-GIZ from GIZ. Additionally, by the end of 2014, the first forest map of Central America will be available at a scale of 1:50,000.

Germany

DLR, TBE partner for earth observation mission

The German Aerospace Centre, DLR and US-based company Teledyne Brown Engineering (TBE) have signed an agreement to install and operate the imaging spectrometer DESIS (DLR Earth Sensing Imaging Spectrometer) on board the International Space Station (ISS). This DLR-built instrument will be one of four camera systems for remote sensing fitted to the MUSES (Multi-User System for Earth Sensing) instrument carrier. DESIS will be able to detect changes in the land surface, oceans and atmosphere. The platform with the DLR DESIS instrument is scheduled to commence operations in 2016.

Bulgaria

Bulgaria joins European Space Agency

The government endorsed a draft agreement with the European Space Agency and authorised the Minister

of Economy and Energy to sign it. Currently, Bulgarian companies have no right to take part in projects the Agency financed, even if they are only subcontractors.

Denmark

INSPIRE to focus on engaging user communities

At the recently held INSPIRE conference, co-organised by Joint Research Centre (JRC) of the European Commission and Aalborg University, Henrik Studsgaard, Secretary, Danish Ministry of the Environment mentioned that listening to consumers and understanding user requirements is the key for success of INSPIRE in Denmark. Other key topics addressed include open data, accessibility, licensing, coordination and communication issues, users' needs and resources. INSPIRE 2015 will be jointly organised with Geospatial World Forum on 24-29 May 2015 in Lisbon, Portugal.

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Russia

Military functions of US GPS blocked

Russia has “taken under control” the operation of 11 American GPS sites and ensured they cannot be used for military purposes, as Washington and Moscow showed no progress in negotiations on setting up Russian GLONASS stations on US territory. May 31 was the last day when Russia and the US could have reached a deal on the issue. The Differential GPS (DGPS) ground stations located on Russia’s soil will continue to operate under existing agreements to fulfill civil purposes. DGPS provides differential corrections to a GPS receiver in order to improve position accuracy. The correction is received by the roving GPS receiver via either a radio signal or a satellite signal, depending on whether a source is land-based or satellite-based, and applied to the position it is calculating.

Russia, Iran partner on earth observation satellites

Russia and Iran have reportedly signed a contract to cooperate in space exploration, ranging from training Iranian cosmonauts in Russia to possible production of earth observation and telecommunication satellites for Iran. The alleged deal was boosted by the West’s sanctions targeting Russia in retaliation for its position on the Ukrainian crisis. The satellite part of the agreement is of greatest interest for Tehran. Russia pledged to provide sample images of earth gathered by its Resurs-DK and Resurs-P satellites, which allow

taking photos with resolution up to 70 cm per pixel.

Philippines

Geohazard mapping of 19 municipalities expedited

The Mines and Geosciences Bureau (MGB) is set to embark on the intensive information, education and communication (IEC) campaigns on several barangays and the distribution of geohazard maps on all provinces, municipalities and barangays by 2015. MGB expects to complete the geohazard assessment and mapping of the 19 priority local government units (LGUs) in the region before June-end. MGB is also set to carry out vulnerability and risk assessments next year to an initial 35 highly critical and priority areas. The agency is seeking an additional budget of approximately \$10 million for its maintenance and other operating expenses and capital outlay to support activities such as groundwater resources and vulnerability assessment, national small-scale mining programme, anti-illegal mining, and purchase of technical and scientific equipment, among others.

\$10 mn

Budget sought

Malaysia

Raw satellite data of MH370 released

The Malaysian government has released 45 pages of raw satellite data it used to determine that the missing jetliner crashed into the southern In-

dian Ocean, responding to demands for greater transparency by relatives of some of the 239 people on board. The technical data released consisted of data communication logs from the satellite system operated by the UK’s Inmarsat Company. However, few experts are of the opinion that the data didn’t include key assumptions, algorithms and metadata needed to validate the investigation team’s conclusions, and consists of what can at most be determined as ‘noise’.

South Korea

Northrop signs \$9-million Scalable SIRU contract



A model of the Scalable Space Inertial Reference Unit (Scalable SIRU)

Northrop Grumman has been awarded a contract from the Korea Aerospace Research Institute (KARI) to provide space inertial reference systems for the GEO-KOMPSAT-2 space satellite program. Under a firm-fixed-price contract worth nearly \$9 million, Northrop Grumman will provide its Scalable Space Inertial Reference Units (Scalable SIRU) for the GEO-KOMPSAT-2A and -2B satellites. The Scalable SIRU supplies rotation rate data that enable the stabilisation, pointing and attitude control of satellites and space vehicles. The contract includes

an option for one additional unit to be exercised by July 2015 for the KOMPSAT-6 programme.

UAE

Dubai, EIAST sign MoU

The Dubai Municipality (DM) has signed a Memorandum of Understanding with the Emirates Institute of Advanced Science and Technology (EIAST), which would facilitate sharing of satellite imagery and applications for the purpose of scientific studies in the field of remote sensing in different sectors between the organisations. The MoU will help DM to use the facilities of EIAST in remote sensing, geographical designing and analysis such as controlling of urban development, earthquakes, distribution of green areas, water resources, environment applications to monitor the desertification, beaches, pollution etc. The clauses of the agreement also include exchange of experiences, human resources development in relevant fields,

strengthening the GIS database, and increasing the efficiency of sand storm prediction system and water quality in the emirate of Dubai.

Singapore

Land Authority's 3D Map project underway

AAM and JTRS Registered Surveyor have completed the data acquisition phase of Singapore Land Authority's (SLA) 3D Map project. AAM recently deployed two of its survey aircraft in Singapore to capture the required base data. One aircraft was fitted with a LiDAR sensor using laser technology to measure the ground at 40 cm intervals and produce a detailed terrain model of Singapore. The second aircraft was fitted with an Oblique survey camera. This five camera system captured nadir photographs over Singapore to produce a high resolution photomosaic. AAM will utilise this imagery to add photorealism to 3D building wireframes created from LiDAR and photography.

Pakistan

Sindh region's first remote sensing lab established

The first satellite remote-sensing laboratory of the country was inaugurated at the Crop Reporting Services Centre functioning in the agriculture extension division office in Hyderabad. The laboratory would monitor crop, forecast and estimate the area and production of agricultural crops round the year through satellite remote sensing technology. It would ensure accuracy of agricultural data. The initial

activities would be restricted to monitoring the main cash crops such as wheat, rice, cotton and sugarcane. Its functional domain could be enhanced in future.

Japan

Daichi-2 satellite launched

Japan has launched its second Advanced Land Observation Satellite, Daichi-2 – better known as ALOS-2 on an H-IIA rocket. The lift-off took place from Tanegashima Space Centre on 24 May. Daichi-2 (ALOS-2) is a radar imaging spacecraft which will be operated by the Japan Aerospace Exploration Agency (JAXA). It will be used for land and resource studies, disaster monitoring and environmental research. The ALOS-2 mission follows on from the original ALOS, which was launched in 2006 and operated for five years until mid-May 2011. Unlike its predecessor, which carried both optical and radar imagery payloads, Daichi-2 will be used only for radar imaging.

GNSS can be used to predict earthquakes: study

A new study conducted by experts of the Japan Earthquake Science Exploration Agency (JESEA) shows that Global Navigation Satellite System (GNSS) signals can effectively be used as a means of earthquake prediction using the 2011 Great East Japan Earthquake as a case study. Previously academic community claimed that prediction of forthcoming seismic events was impossible with existing measuring techniques. This study succeeded in detecting pre-signals several months, weeks and days before the Great Earthquake through the GNSS data.



Abdullah Mohammed Rafi, Dy General Manager of Engineering & Planning, Dubai Municipality and Salem Humaid Al Marri, Assistant Director General for Scientific and Technical Affairs, EIAST

India

Govt promises 100 new smart cities by 2020

India plans to focus on developing 100 new smart cities by 2020. The new mission will replace Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and focus on building modern concept cities using GIS-based planning. Urban Development and Housing and Poverty Alleviation Minister (HUPA) Venkaiah Naidu has said his ministry would give priority to linking of twin cities

and infrastructure development of satellite towns and cleaning of religious cities across the country.

Tribals use GPS to claim forest land rights

Tribals of Gujarat have started using GPS devices to mark and measure the lands to substantiate their claims over the land under the Forest Rights Act. The people started geotagging the areas after their claims were challenged by officials. The Gujarat High Court then had stated that satellite imagery other than that by

Bhaskaracharya Institute of Space Applications and Geo-Informatics (BISAG) will be admissible. The reason for discrediting the BISAG's images was that it was collected via an agency and the work was not convincing. The tribals have so far measured 25,000 plots in this manner in over 250 villages. As many as 36 GPS instruments costing about INR 14,500 (\$241) each have been put into use for the process. To offset the cost, a claimant of land has to pay a mere INR 60 (\$1) to get the land surveyed using GPS.

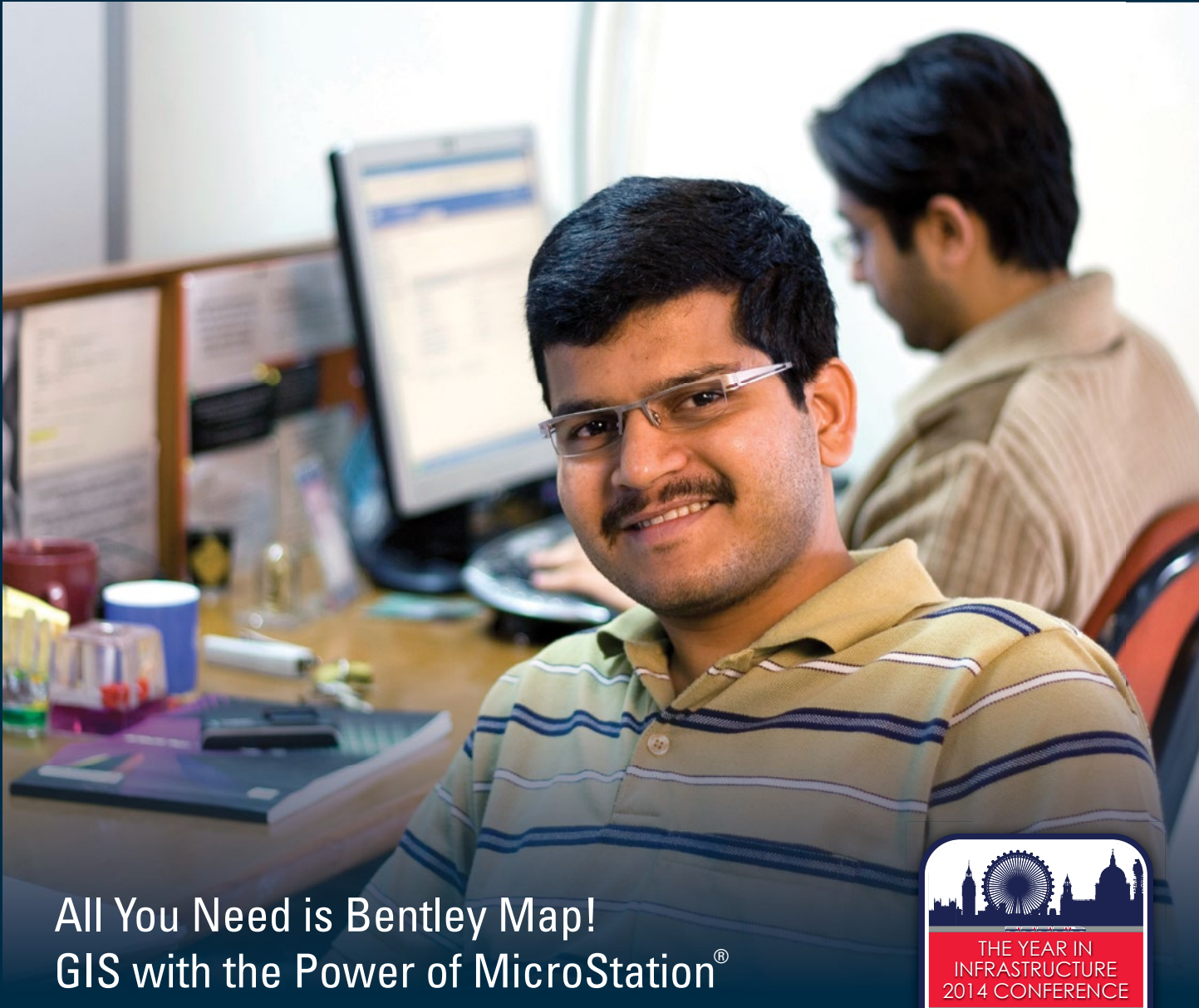
The world of intelligence is all about gathering information

"Defence industry needs to come up with innovative and economical solutions which cater to the complexity of today's warfare," said Gen Bikram Singh, Chief of Army Staff, Indian Army, as he delivered the inaugural address at the eighth edition of Geointelligence India 2014. The conference which was organised by Geospatial Media and Communications was held at New Delhi, from June 12 - 13, 2014. The theme for this year was 'Geoint: Enhancing Combat Potential'. The event which is renowned for its keynote, educational sessions and exhibition, provided an excellent opportunity

for networking to the geointelligence community. "The goal is to meet today's intelligence requirements and predict tomorrow's future threat," said Dr MR Bhutyani, Director, Defence Terrain Research Laboratory, while talking about empowering the armed forces with advanced geospatial intelligence. John Day, Director, Global-Defence, Esri, shared his vision of empowering users by increasing collaboration, agility and responsiveness. He explained the need for seamless, online foundation data for all environments. Raising the issue of private players in the Indian defence sector, JD Patil, Director, Heavy Engineering, Larsen & Toubro, said a relationship of trust between government and private industry was an absolute necessity today and hence encouragement should be given to PPP model. Meanwhile, Prof Todd Bacastow, Dutton e-Education Institute Penn State University, US, who delivered the guest address talked about the concept of geospatial intelligence. The conference also witnessed sessions on contemporary topics like disaster management, border security, remote sensing and image analysis, coastal and maritime security, intelligent logistics and an exclusive session on 'Internal Security & Police Modernisation'.



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Bring a new level of intelligence to your project with Bentley Map. Be the know-it-all everyone wants on their team.



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Australia

MH370 search: Fugro to map the sea floor

The Australian Transport Safety Bureau (ATSB) has awarded Fugro a contract to conduct bathymetry survey of the search area using its survey vessel Fugro Equator, fitted with multibeam echosounder equipment. The seabed data thus obtained will assist in the production of maps of the seabed offshore Western Australia. This area is relatively uncharted and the maps will assist in planning subsequent stages of the MH370 search. Fugro and ATSB expect the Fugro Equator to begin its operation by mid-June. The decision is part of the next phase of the search, where the authorities have decided to handover the operations from the military to the private sector. The search would take up to a year, covering some 60,000 sq km of ocean at a cost of \$56.16 million or more.

\$56 mn
Project cost

Duties of OSP transferred to Dept of Communication

The Government has decided to transfer the functions of the Office of

Spatial Policy from the Department of Industry into Communications. The government said that Department of Communications is a better fit for the spatial data management functions, which can now be leveraged alongside its support for the e-Government agenda and the rollout of the National Broadband Network. In a different development, Geoscience Australia announced the release of the Australian Government's new spatial data catalogue FIND. FIND provides better access to a network of open government data, in conjunction with data.gov.au. The site will replace the 'aging' Australian Spatial Data Directory (ASDD) which will be pulled down in August 2014.

Trimble acquires MIS

Trimble has acquired privately held Mining Information Systems (MIS), headquartered in Perth, Australia. The acquisition will add enterprise-level information management capabilities to Trimble's portfolio of mining solutions. MIS provides information systems for data required for enterprise-wide monitoring and management of mining and ore processing operations. Trimble claims that this capability combined with Trimble's geospatial solutions can provide increased mine productivity through the aggregation, analysis and presentation of information that enables better decision-making for mining customers.

White Star Resources to buy stake in Spookfish

White Star Resources, a small cap mineral exploring company, has signed a conditional exclusive

\$1.35 mn
Capital raised

agreement to acquire imagery service provider Spookfish. Spookfish is a geospatial company focused on high resolution imagery solutions, and has developed technology with potential to deliver linear and 3D image solutions. White Star has received firm commitments for a \$1.35 million capital raising that will give it a cash balance of over \$4 million. White Star also has the right to acquire a 12.5% equity interest in Spookfish for \$1 million. Spookfish is in the process of testing the first phase of its linear-asset capture capability, which is expected to represent a technical proof-of-concept step that will confirm the viability of future development stages.

New Zealand

LINZ announces its positioning strategy

LINZ recently released its Positioning Strategy, setting the direction for how its geodetic system will be developed over the next 10 years. LINZ provides New Zealand's positioning or geodetic infrastructure through its network of survey marks, continuously operating Global Navigation Satellite System (GNSS) stations, and through systems such as the national geodetic datum. The strategy also includes goals for New Zealand to contribute to the international geodetic frames and support geodetic development in the South-West Pacific.

This is a Beta Version, made available for testing and public comment. Your feedback is welcome.



Transport, CaP

STANDARD Advanced

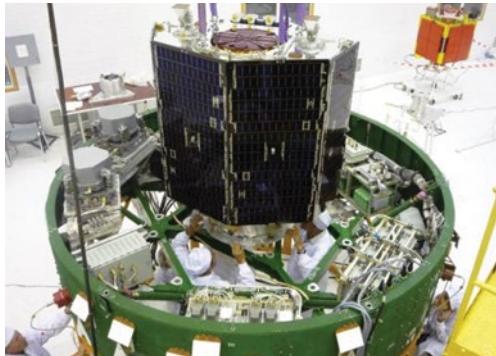
ND is the Australian Government's spatial data catalogue and in conjunction with data.gov.au provides access to a network of government data. FIND allows you to search and download a wide range of spatially referenced datasets created by both Australian and State and Territory Governments.



Nigeria

Made-in-Nigeria satellite by 2018

The National Space Research and Development Agency (NASRDA) is aiming develop and build a Nigerian satellite by 2018. "The agency is expected to achieve the development and building of made-in-



NigeriaSat-2 lowered onto the launcher platform surrounded by the rocket control systems.

Nigeria satellite in 2018, while 2025 is for the development of rocketry or propulsion system. NASRDA aims to accomplish the launch of a Nigerian satellite from a Nigerian launch pad by 2030," Director-General Prof. Seidu Mohammed said. The agency is working on the legal framework of the Nigerian space programme with a view to enhance the nation's Space Science and Technology Administration.

NIS urges govt to invest in digital mapping

The Nigerian Institution of Surveyors (NIS) has urged the federal and state governments to invest heavily in surveying and digital mapping initiatives in the country to stimulate a sustainable development model of growth. Addressing members at the 49th Annual General Meeting in Benin, the NIS President, Bode Adeaga, also called for private and public stakeholders to collaborate and adopt a holistic approach to the nation's challenges. He also cautioned that there is a dearth of credible maps of various regions of the country and that the ones designers and policy makers rely on are already obsolete, having been prepared almost 50 years ago.

South Africa

SACAA to crackdown on illegal drone flying

The South African Civil Aviation Authority (SACAA) is set to clamp down on illegal flying of Unmanned Aircraft Systems (UAS) in civil airspace. In collaboration with member states, including South Africa, the International Civil Aviation Organisation (ICAO) is working towards providing a regulatory framework through Standards and Recommended Practices (SARPs), with supporting Procedures for Air Navigation Services (PANS) and guidance material, to underpin routine operation of UAS in a safe, harmonised and seamless manner comparable to that of manned operations.

Rwanda

AidData, AfDB launch MapAfrica

The African Development Bank (AfDB), in partnership with AidData, has launched an online platform that enables citizens, government officials and donors to view the geographic location of AfDB's investments in development projects throughout Africa at its annual meetings in Kigali. The platform called MapAfrica was developed using Esri's ArcGIS platform, specifically ArcGIS API for Javascript and ArcGIS for Server technology. Currently, MapAfrica contains more than 6,000 geocoded project locations and users can filter those project locations by country, sector and year. Users will also be able to select one project and view all implementation locations.

Tanzania

GIS census report released

At least 45% of Tanzanians live within 5 kilometres of a financial access point, according to a latest GIS census report released by Financial Sector Deepening Trust (FSDT). The report overhauls the National Financial Inclusion Framework launched in December 2013 by the Bank of Tanzania (BoT) that set a proximity target of 25% of Tanzanians living within 5 km of a financial access point by 2016. Launching the GIS Census financial access points 2013, Lila Mkilli Deputy Governor at the Bank of Tanzania said BoT is now moving to ensure quality delivery of financial services.



Leica Pegasus: Two the next-gen mobile mapping solution

Leica Geosystems has launched Pegasus: Two, a vehicle independent mobile mapping platform. By calibrating imagery and LiDAR point cloud data, it delivers accurate and economical geospatial data in a 360° spherical view while providing two methods for extracting data — either through LiDAR or via photogrammetry. The platform uses six horizontal cameras, plus an optional rear camera and a skyward view camera, a single high speed LiDAR sensor, and an external output for an additional sensor.

Key features:

- Light sensor for auto brightness and balance control for image capture.
- Most advanced GNSS receiver leverages global constellations.
- Full calibrated spherical view through optional dome camera to enable city modelling.
- Marries imagery and point cloud data into a single calibrated, user-intuitive platform.
- Capture and edit 3D spatial objects from images or within the point cloud.



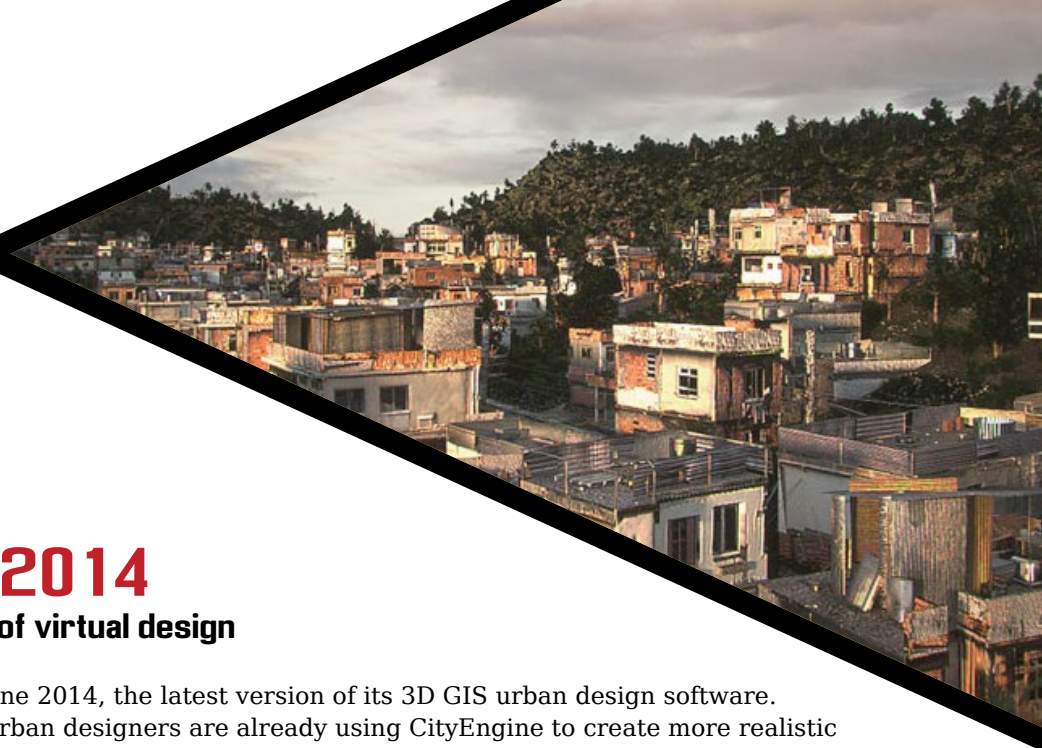
GHX2 RTK Rover for demanding environments

Sokkia has announced the addition of the GHX2 network rover to its GNSS product family of surveying solutions in the North American market. The GHX2 is designed to pair with the Sokkia SA300 external antenna to provide enhanced positioning accuracy and RTK performance in the most demanding of environments.

Key features:

- Integrated RTK GNSS receiver.
- Internal GPS 2-5m accuracy (non RTK).
- Large 5.7 inch VGA color touchscreen.
- 806MHz processor, 256MB RAM, 4GB flash storage.
- 3.2MP camera.
- 3.5G cellular module.
- Built-in wireless Bluetooth and WiFi connectivity.





CityEngine 2014

increasing the power of virtual design

Esri has released CityEngine 2014, the latest version of its 3D GIS urban design software. Architects, planners and urban designers are already using CityEngine to create more realistic city models and share them on the Web with the decision-makers and the public.

Among the new features in CityEngine is the library of design rules for facades, buildings, and streets. These preconfigured rules make it possible for users to spend more time designing models and less time coding the rules for them. Developers can use CityEngine SDK sample plug-ins to interact with the popular game engine Unity or other 3D software such as Maya. Developers can find these samples and download the CityEngine SDK at GitHub.

eBee RTK: the survey-grade mapping drone

Swiss UAS manufacturer senseFly has released the eBee RTK, a fully integrated, fully compatible survey-grade mapping system. The eBee RTK will offer surveying and engineering professionals a highly accurate and flexible mapping solution that works alongside their existing base stations and does not require any third-party software.

It offers surveying and engineering professionals the very highest positional accuracy, without the need for ground control points. It is compatible with customers' existing base stations, and each mission's entire workflow — including the transmission of GNSS corrections to the drone — is integrated within the system's software.

Key features:

- Absolute orthomosaic / Digital Elevation Model accuracy of down to 3 cm (1.2 in) without the need for GCPs.
- It is compatible with most leading brands of base station, working seamlessly alongside your existing portfolio of instruments.
- It flies, acquires images and lands itself.
- It weighs just 0.7 kg (1.5 lbs) -- minimising its power usage (optimising its flight time) and ensuring the safety of people and objects on the ground.



'I Want GIS to be as Easy as iPhone'

Esri President **Jack Dangermond** believes in making GIS easier to use and available everywhere, much like the iconic iPhone. He says the company is constantly advancing its methods to innovate and stay ahead in a competitive world

You once said that “ArcGIS Online is to the geospatial industry, what Apple is to the music industry”. How do you see ArcGIS creating a revolution of sorts for the GIS industry?

Yes, there are some similarities. Today, ArcGIS Online is being used to make millions of maps daily, using shared Web maps and geospatial datasets that are available as services. These geoservices are like music, in the sense that they can be immediately consumed in apps that are easy to use. This content and these apps are making GIS increasingly pervasive both within and across organisations.

Why are you so excited about the Web GIS architecture?

This new pattern is creating a revolution in the market — opening up the world of GIS to everyone through the use of web maps and related apps. Simple apps allow users to visualise, integrate and analyse geospatial data of all types. This capability, combined with the federated architecture of Web GIS, allows for integration of distributed databases from across an organisation.

ArcGIS Online represents the first complete Web GIS platform. It has been engineered to integrate everything that Esri and our users have done in the past and also incorporate emerging technology trends in computing and the geospatial world. It represents a transformational shift of GIS into a services-based platform. This form of Web GIS is an open and flexible architecture. It means users can easily configure the system and collaborate across, and between organisations.

Why do you think Web GIS is becoming so popular?

Why is it growing so fast?

Fundamentally, this new pattern makes GIS easier, more accessible and more affordable. It also delivers whole new

capabilities that are attractive to enterprise users. For example, people can easily make maps of their data as well as access and share these maps across an organisation. This is enabled by the fact that geospatial data is shared as services that can be immediately consumed in ready-to-use apps.

WebGIS also supports easy integration with other enterprise systems such as MS Office, SharePoint, and a host of ERP, BI, and CRM systems. Other capabilities include a built-in content management system, strong system administration tools, full identity management and security through enterprise security support. Finally, WebGIS includes a large and growing library of ready-to-use basemaps, image services and thematic overlays describing environmental, physical and cultural geography.

Esri seems to be slowly moving into consumer space with increased emphasis on Web and mobile solutions.

Your comments?

Our technology is definitely getting easier with a series of apps that are easy to use and consumer like. However, our primary business remains with geospatial professionals and enterprise users who leverage our platform for their organisations.

One of the big trends is that our users in large organisations are beginning to use ArcGIS platform as a location platform for spatialising and mapping their enterprise data. This pattern is part of our strategy to support enterprise-wide geo-enabling for business professionals, field workers, decision makers and even citizens and consumers.

Esri is a private firm. Have you ever felt that this has limited the scope of your company?

We believe we can be far more effective in our mission of advancing GIS and serving our users by remaining a private organisation. It gives us time and resources to do what is right for our customers.

Clearly we are not as well-known as if we were a publicly traded or venture capital based company. However, I think our business structure has been helpful in our ongoing relationship with users. They trust us and work collaboratively because they know we are focused primarily on serving their interests.

How does Esri approach acquisitions such as Geoloqi, GeoIQ and Procedural?

Over the past several decades we have acquired a number of small technology companies that both enrich our core technology and also add great people to our development team. We do not approach these acquisitions as ways to make our business grow but rather as ways to improve our product and our development teams.

What, according to you, are the potential vertical markets for Esri?

We track over 50 user communities that one could traditionally think of as markets. We organise these into the broad categories of state and local governments, national governments, utilities, education, NGOs, commercial business and international organisations. Over the years, we have organised teams to support these vertical communities. This helps us communicate and better understand the requirements of our users. We also associate with business partners in these markets who leverage our technology and help our users in these segments be more successful.

Recently, we have been developing vertical application templates that help our users as well as partners configure our generic platform with focused solutions. We now have several hundred of these templates that are free, ready-to-use and supported by our technical support division. These apps include templates for utilities, local government

health, transportation, forestry, emergency management, environment and military.

What distinguishes you from your competitors?

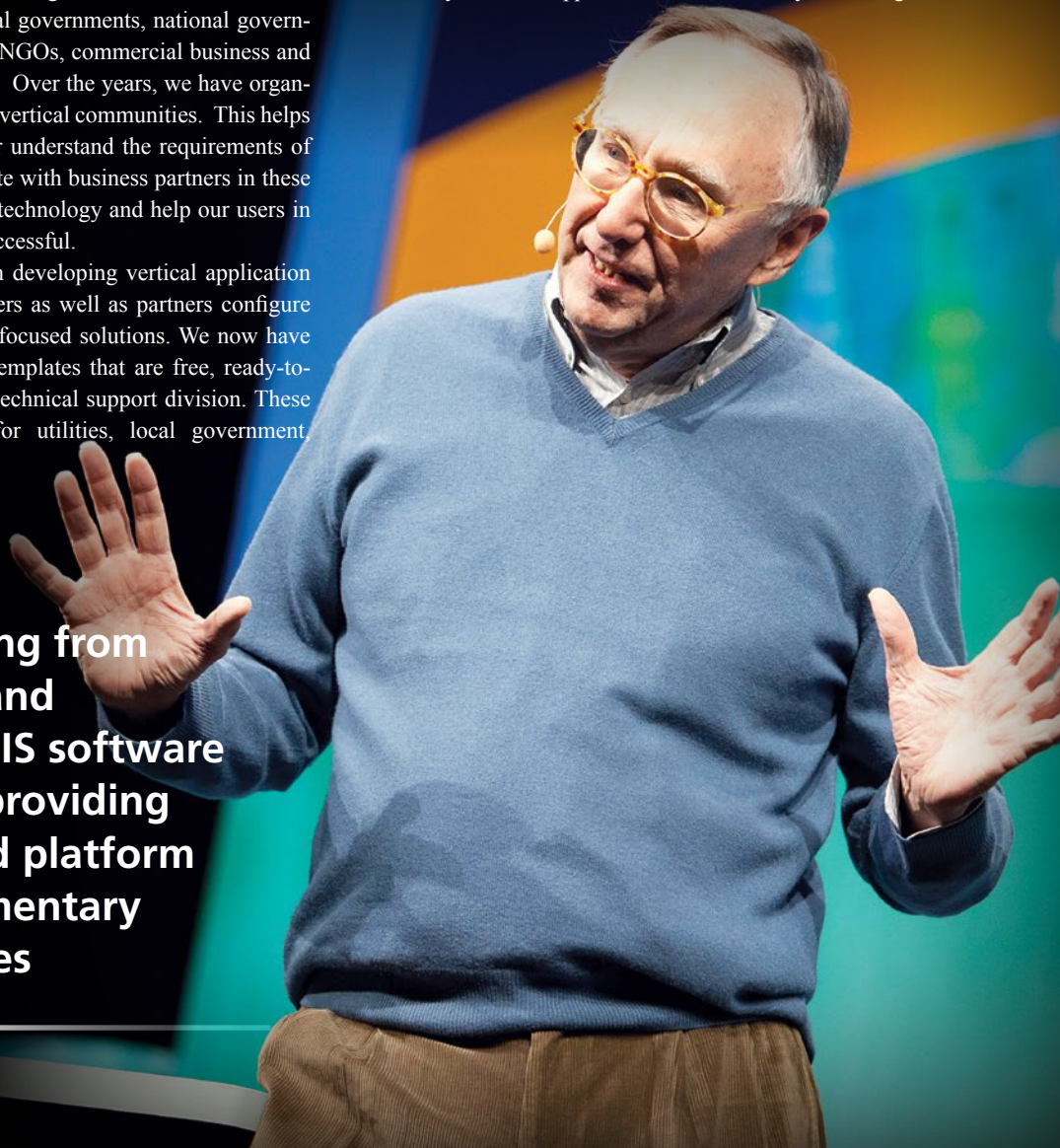
The geospatial industry continues to be a rich and evolving ecosystem of highly competitive technologies, data and solution providers with lots of smart people working hard. This is what makes it so dynamic and exciting.

While we work hard to be a successful independent company, we also believe in partnering. Over the years we have developed a rich and powerful ecosystem of software and technology partners who collaborate with us to serve our users.

Therefore, we are strong believers in supporting an open platform and embrace open standards to ensure interoperability with other technologies. We have also opened our platform for developers who are building thousands of end user solutions.

In terms of products, our traditional desktop and server technologies are distinguished because they have very rich functionality, are well supported, and are constantly advancing.

“We are moving from only selling and supporting GIS software products to providing an integrated platform with complimentary online services





While there are some overlaps between ArcGIS Online and consumer Web mapping systems, our platform is distinguished because it is part of a complete system and because of its ability to perform high quality analytics, data management and cartography.

Would you want to elaborate on the R&D?

Esri spends about 22% of our revenue on R&D. This is about two to two-and-half times more than most of the technology companies. We can do that because we are not a public company.

How is your product and business changing?

We are moving from only selling and supporting GIS software products to providing an integrated platform with complimentary online services. This has meant consolidating our software product into a single platform that is fully integrated with cloud services.

Going forward, our technology is delivering many new capabilities, including more integration of real-time and 3D data. Our desktop product, which is one of our premier products, will soon make a huge advance with the release of 10.3. This will make the desktop experience much easier; more like apps and embrace the Windows-8 user pattern.

Would you say Esri is evolving from being a software provider into a content company?

In some ways, yes. Clearly, we are investing heavily in creating ready-to-use content for our users. We are also making content a fundamental part of our platform. Some of this content is being built by partnering with our users. This includes thousands of organisations who work with us to create ‘community base maps’. We are also integrating data from a number of commercial content companies such as Digital-Globe, RapidEye, Airbus Defence and Space, HERE, Accu-weather, etc. into our system so that their content is more directly available to users.

You brought out an analogy some time back on earth as a living system and Internet as the nervous system, and you said GIS can give rise to a new intelligence.

Yes, this is a useful metaphor for understanding what is happening. Certainly the evolution of the Internet, the increasing advancements of sensor networks together with Web GIS will increasingly help us know and understand our world in real time.

Our new Geo Planner App available on ArcGIS Online is the first example of this. It is based on the concepts of geodesign and encapsulates the steps of measuring, analysing, and modeling geography with the design, evaluation and decision making process. This app is the first major example of the nervous system in action. The app requires systematic geographic data and we are aggressively building this out for the planet.

I am hopeful that we will continue to digitise and wire up the planet with more measurements and those measurements will be used to help us make better decision making everywhere.

Do you see GIS is on its way to becoming a very pervasive technology just like GNSS/GPS has become?

Yes, that is exactly what we are trying to accomplish with Web GIS. These efforts are making the GIS easier to use and available everywhere. I want it to be as easy as the iPhone. GIS has evolved enormously from the mainframe days and it keeps getting simpler. As this technology evolves, it will have a huge impact on creating our future.

What has been the key to your success in translating your ideas into a sustainable business?

Staying focused on both our customers’ needs as well as what it takes to create a sustainable business. Organisationally, we are very conscious of managing the resources of our company carefully. Going forward, I believe that by working hard and innovating on behalf of our users, we will continue to be successful.

Where do you see Esri five years down the line?

We are pretty grounded in continuing to evolve our technology and supporting our users. The market is transforming, and we have an opportunity to collaborate and affect a much larger community with our innovation. We are partnering with our users and evolving our organisation to be more responsive to this.

We do not take our position in the market for granted. We recognise it is a competitive world and we are constantly advancing our methods to innovate and stay ahead. ☺



SMART GEOSPATIAL EXPO 2014

Aug. 26-28. 2014 | coex, Seoul Korea


Main Program

Opening Ceremony

- Performance for Pre-ceremony Smart Geospatial Expo 2014, Opening address, Prize giving

Exhibition

- All-around exhibition where visitors can see the whole global industry trend and diverse technologies/products/services of spatial information. Approximately 300 booth & 150 Exhibitors.
- Previous exhibitors such as Google, Trimble, esri, Leica, Topcon, Sokkia, Samsung, LG, SK etc.

 Registration for exhibition ends 25th July 2014

 Free Entry for visiting the exhibition

High-Level Forum

- High Level Forum where ministers and vice ministers from 20 countries around the world make international exchanges to consolidate cooperation between nations and seek for mutual prosperity in the Spatial Information Industry.
- 2013 Participating Countries: Russia, Bulgaria, Algeria, Tanzania, China, Malaysia, Uzbekistan, Vietnam, Nepal, Chile, Jordan, Saudi Arabia, Greenland etc.

Conference

- Conference and seminar participated by those involved in the spatial information industry all over the world to discuss industrial trend and future directions.
- 17 Conferences e.g FOSS4G Korea 2014, 2014 International Conference on Geospatial Information Science (ICGIS)

 Free Entry for conferences



Banking on Location

From consumer mapping to branch location to fraud detection, major banks and financial institutions worldwide are betting big on location technology.

By Ridhima Kumar

- ▶ *When Bank of America needed to identify current and future locations of its banking centres in low-income neighbourhoods, it turned to mapping and geographic analysis application.*
- ▶ *Virginia-based SNL Financial utilised analytics and location technology to provide accurate and up-to-date financial data to its client.*
- ▶ *Central Bank of Nigeria relied heavily on GIS mapping to mark the financial access points of the entire country.*

Such is the scenario worldwide where banks and financial institutions are increasingly turning towards new-age technical solutions. With technological revolution continuing to shape the nature and face of the global banking landscape, tech-savvy banks are leaving no stone unturned to woo their potential customers. Banking strategies are no longer in silos, but are increasingly linking information across operations so that the same information products used for improved customer service can detect mobile phone base fraud in real time. From customer mapping they are breaking into new barriers and adopting new solutions. And 'location' is the all new magic word for them.

Agrees Simon Thompson, Director, Commercial Solutions, Esri, "Today GIS and location analytics is used across the full spectrum of financial services industry applications

from customer-centric business functions to the facilities themselves." The chief driver of this is the power of models, particularly predictive models, which allow a bank to design, test and optimise its strategies — refining old ones and creating new ones.

According to a Capgemini report, *Trends in the Global Banking Industry 2013*, IT spending within the banking sector is expected to grow by 3.4% in 2013 to reach \$179.2 billion and touch \$192 billion by 2015. The majority of this growth is expected to come from the Asia-Pacific region, where spending by banks is expected to grow at 5.8% in 2013 to reach \$62.8 billion. "New technology innovations and the constantly changing consumer dynamics, especially after the global slowdown, mean that banks, credit card companies and other FSI institutions need to be more agile and make better use of information assets," says Thompson.

Location, the catchphrase of the real estate and construction industry is paving new roads for the banking and financial sector. From fraud detection to branch optimisation and customer loyalty to product segmentation, location analysis is helping financial services companies in a big way. "With location intelligence, financial institutions can visualise and analyse critical market characteristics such as concentrations of demographic/lifestyle profiles, product demand and growth characteristics — from consumers. These variables

can easily be combined with customer data to make more informed decisions and develop effective marketing campaigns for new prospects and current customers and analyse the current trends,” says Suresh A. Shan, Head, Mahindra & Mahindra Financial Services Limited (MMFSL) Business Information Technology Solutions, India.

No wonder the *Global GIS Market in BFSI 2012-2016* report foresees a CAGR of 4.95% for the global GIS market in the banking and financial services industry (BFSI) over the period 2012-2016.

Naming big banking clients in geospatial domain is difficult since banks have some of the strictest client confidentiality norms, but service providers unanimously agree that location analytics and GIS has become a must for all big banks across the world.

“We have seen a number of studies which have shown that geospatially enabled banks reduced their cost to asset ratio by more than 10% compared to their peers. Profitability can be up to twice that of competitors and the number of clients served per branch, with the same or higher levels of customer service and satisfaction, can be almost two-and-a-half times of others,” adds Thompson.

Banks are enhancing their Big Data technology capability and are increasingly investing into analytics to understand customers’ needs, improve risk management and boost efficiency. Big Data capabilities, especially in the geospatial context, deliver banks the capability to recognise their clients at a more granulated level and help in delivering targeted, personalised offers in a much faster way. This helps enhance customer profitability, satisfaction and retention. Concur Thompson: “By using big data and location analytics, some Esri clients have achieved as much as 90%-plus accuracy in modelling deposits per branch, operational performance and net return on assets.”

Branch optimisation and expansion

GIS systems allow banks to measure the reach of each branch; understand where their networks may have gaps and where they have excess redundancy. They can define a trade area around the branch and identify its market potential. “Using their own customer data, conflated with third party information, banks must develop an understanding of the to-

The Global GIS Market in BFSI 2012-2016 report foresees CAGR of 4.95% in banking and financial services industry in 2012-2016

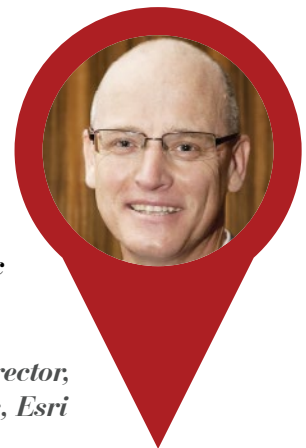
tal financial wallet opportunity that all households in a given geography represent. By combining their understanding of network coverage and gaps with market opportunity, banks can confidently frame their long term distribution strategy,” says Manish Chaudhary, Vice President, WW Engineering, Pitney Bowes.

The branches are one of the most expensive assets and as teller transactions continue to decrease, banks need to discover ways to make better use of those branches. “We are seeing a lot of use of location technology to look at in branch services and staffing, to optimise space utilisation, reduce footprint and maximise returns per square foot,” explains Thompson. This is driving a whole new level of indoor mapping which is on the micro scale but linked to macro geographies like catchments and financial segmentation.

For instance, Wescom Credit Union, one of the largest credit unions in the United States, with assets over \$2 billion and 22 branches in Southern California, doubled its branch network utilising analytics technology. Adopting

“GIS and location analytics are used across the financial services industry applications, right from customer-centric business functions to facilities themselves

Simon Thompson, Director, Commercial Solutions, Esri



Problem #1 for banks: How to Increase Customer Satisfaction



55% of consumers think banks are poor at meeting their needs.



56% of customers are more likely to switch banks due to bad service than to get a better deal.



Provide real-time customer information across all channels.

Using their own customer data, conflated with third party information, banks must develop an understanding of the total financial wallet opportunity that all households in a given geography represent
Manish Chaudhary,
Vice President, WW Engineering, Pitney Bowes



analytic technology allowed Wescom to gain new insights from its business data and provide unique and differentiating member service. These included informing members of their nearest no-fee ATMs, understanding usage patterns with Branch Membership maps, and measuring performance based on member lifestyles and life stages. Wescom has, in fact, recently refocused its attention on member engagement and branch optimisation which provide a wider range of interactive and personal banking services while remaining readily accessible to members.

For banks and financial institutions, finding the best new bank location for business expansion is also important. Strong understanding of the marketplace in which financial institutions function, or would like to operate, are integral to profitable growth.

Bank of America, which serves approximately 57 million consumer and small business relationships in the United States adopted mapping technologies to identify current and future locations of its banking centres in low-income neighbourhoods to meet its Community Reinvestment (CRA) needs. The geographic analysis application helped the bank gain important insights into target markets and strengthen its commitment to CRA compliance, while impacting site selection decision-making in those areas. “MapInfo Professional cuts the time by 25% that it takes to audit our network of banking centres, along with easily mapping and analysing

their geospatial measurements,” revealed Scott Weston, AVP for Retail Distribution Analytics, Bank of America.

The United Bank for Africa (UBA) — one of the largest financial institutions across Africa — is all set to implement an ambitious GIS-based solution to support a multi-billion Naira branch expansion and optimisation project. The bank aims to have a geographic approach to analyse where new branches and ATMs should be located and what factors affect either positively or negatively their operations and profitability. “In this way the bank could have a structured approach using geographic intelligence to analyse the geographic location of competitors’ branches and ATMs to evaluate the effectiveness of all UBA branches in the face of competition,” says Ireti Ajala, Managing Partner, Spatial Technologies Ltd.

In the banking industry, branch performance is measured in part by the customer-to-back-office space ratio. A 70:30 split, with 70% being space allocated to customer sales functions and 30% being space allocated to back office administrative functions, indicates a good use of space. London-based Barclays Bank utilised Bentley’s facilities planning software to track assets at 1,733 branch properties. With a more accurate picture of the entire UK branch network, Barclays was able to understand customer likes and dislikes, which branches have an optimal customer-to-back-office ratio, and where changes should be made to improve the return on investment in the UK branch network.

The new-age technology can provide ‘what if’ scenarios and dynamic segmentation to locate multiple classes of assets. “These technologies allow us to bring together diverse datasets to build a global view of rapidly changing dynamic markets,” says Albert Lojko, Global Head, Eikon, Thomson Reuters.

Customer is the ‘king’

The pride and joy of every business is a loyal customer; therefore a 360-degree view of the user is necessary. In such a competitive scenario, banks need to be closer to their customers, understand them better to deliver more relevant and timely services. According to a 2013 survey done by Bloomberg Businessweek Research Services among banking executives around the world, more than 70% say customer eccentricity is very important to them. Tapping on this concept, Italy-based UniCredit Group,

Problem #2 for banks: How to Increase Customer Revenue



Less than a third of a customer’s wallet is held by the average bank.



Deepen relationships with significant revenue potential.



Create a single view of customer to manage opportunities, relationships and risk.



6 Focus Areas

Across all segments of the financial services industry, the **2014 Banking Industry Outlook Repositioning for Growth** rely on a new structure, providing insights aligned to the following:

Competition and Markets: Evaluates existing industry structure, competitive landscape, or market composition.

Clients and Products: Explores emerging trends in retail or institutional customer behaviors, attitudes, and needs.

Governance, Risk and Compliance: Reviews industry risk management practices and regulatory mandates, and their potential financial and strategic impacts on industry participants.

Financial Management: Highlights how finance leaders can better organise and deliver needed insights to their firms.

Organisational Effectiveness: Analyses how firms have responded to talent, process and other operational challenges.

Technology Dynamics: Examines the evolving role of technology in the industry.

Source: Deloitte Center for Financial Services

one of Europe’s largest banking institutions, implemented a geolocation system that displayed bank location and services information on maps for customers and users via desktop or mobile devices. It selected Google Maps API Premier for its geolocation technology. The integrated system allowed customers to make appointments with branch agents, at the same time promoting the bank’s products.

Similarly, SNL Financial, a Virginia-based company whose clients include leading investment banks, asset managers and regulatory agencies, utilised Esri technology to offer detailed GIS and analytic functionality to the customers. The functionality lets their clients view various types of data, including street information and aerial images, and gives them the ability to create new data, such as adding new market areas, and incorporate information on demographics and business data. “Using SNLi Mapping, subscribers have been able to better evaluate companies’ mergers and acquisitions and make more informed decisions. They are performing their own market analyses and integrating demographic data with geographic information such as the location of major cities, interstate highways, and company buildings. Many subscri-

ers also use SNLi Mapping for making presentations because of the high quality of the mapping capabilities,” reveals Dan Sheets, Project Manager, SNL Financial.

“In this age of the customer, banks need to ‘act local’ so that their messages are relevant to each customer, or at minimum a group of customers at the local level,” says Choudhary. CIMB Bank implemented an end-to-end customer communication management system, which helped the bank achieve

“The new-age technology can provide ‘what if’ scenarios and dynamic segmentation to locate multiple classes of assets. These technologies allow us to bring together diverse datasets to build a global view of rapidly changing dynamic markets

Albert Lojko, Global Head, Eikon, Thomson Reuters



Problem #3 for banks: How to Increase Expense Reduction



71% of consumers still say they prefer to open an account in the branch



On an average 2.9 channels are used to purchase a product



Need more relevant offers with high acceptance rates to increase sales and lower costs.

Source Pitney Bowes

“With location intelligence, financial institutions can visualise and analyse market characteristics like concentrations of demographic and lifestyle profiles, product demand and growth characteristics

Suresh A. Shan, Head, Mahindra & Mahindra Financial Services Business Information Technology Solutions



greater customer satisfaction while improving operational efficiency, realising production cost savings and increasing marketing value. The bank basically needed a customer communication management solution for its retail banking business. Its consolidated statement engine could only handle accounts hosted on its mainframe. It also lacked system robustness and was unable to support personalised 1:1 marketing communication. These deficiencies resulted in customers receiving multiple monthly statements and wastage of marketing hard copy. The bank turned to Pitney Bowes Software for a customer communication management solution that integrated and consolidated data from a variety of source systems, consolidated statements, and enabled 1:1 marketing.

Citibank, as a part of worldwide Rainbow Project — Citibank Customer Management Repository — utilised Pitney Bowes solutions to develop a unique customer ID so that regardless of where in the world a customer is engaged /transacted with the bank, he would be recognised and given “right”

Citibank utilised Pitney Bowes solutions to develop a unique customer ID so that regardless of where in the world a customer is engaged /transacted with the bank, he would be recognised and potentially given “right” level of service



level of service based on their relationship with this bank.

Fraud detection

Detecting frauds and defaulters is also one of the major concerns of banking and financial institutions worldwide. Payment providers have developed fraud detection tools that depend on massive datasets containing not only financial details for transactions, but IP addresses, browser information, and other technical data that will help these companies refine models to predict, identify, and prevent fraudulent activity. “Financial institutions are also considering using big data solutions to leverage publicly available data such as Property Deed and Assessments, to identify mortgage fraud such as equity stripping schemes. This would go above and beyond the current Know Your Customer initiatives, watchlist screening, and the application of fundamental rules. Correlating heterogeneous datasets has the potential to dramatically improve fraud detection, and could also significantly decrease the number of false positives,” explains Shan.

Fraud against bank deposit accounts cost the industry \$1.744 billion in losses in 2012, according to American Bankers Association (ABA) estimates. Debit card fraud accounted for more than half of 2012 losses (54%), followed by cheque fraud (37%). Online banking and electronic transactions such as wire and ACH accounted for the remaining 9% of losses. In such a scenario, remedial measures are not enough. Banks have to resort to preventive actions, too. Portuguese scientists in collaboration with the European Space Agency (ESA) have developed a software, Feedzai, which can process a huge number of banking transactions a customer has made for the last four years to detect fraud. By applying both ‘machine learning’ and ‘big-data techniques’ to look at all the data, the software learns to distinguish fraudulent-looking from non-fraudulent-looking transactions.

Carlos Cerqueira from Instituto Pedro Nunes, the Portuguese broker in ESA’s Technology Transfer Network part of ESA’s Technology Transfer Programme, believes, “Feedzai’s machine learning models and Big Data science are able to detect fraud up to 30% earlier than traditional methods, and illustrate how the competencies developed at ESA research centres can be useful to other sectors.”

The importance of Big Data is that it is linking a lot of different types of structured and unstructured data, delivering massively scalable analytics from real time and transactional data and allowing FSI organisations to create new data assets. “This is creating new ways of looking at fraud and money laundering and automatically scheduling cash pickups. Merchants are also provided with new understanding of their clients’ demographics, segmentations and financial needs,”

says Thompson.

The Central Bank of Nigeria (CBN) is determined to reduce fraud or what is locally called 419 by connecting location data with every bank account. CBN mandates banks to validate addresses submitted as part of the new procedure for opening new bank accounts. Banks are currently committing huge resources to the implementation of this requirement by making physical house visits for confirmation. The actual cost of address validation runs into billions and this substantially adds to the operational cost and subsequently impacts the annual profits for the industry.

“STL’s address geocoding data can greatly reduce the cost of address validation and still empowers banks to comply with this directive from the Nigerian financial regulator. This is the area we are currently investing in. We are now rolling out accurate and intelligent base data for address geocoding and validation,” says Ajala.

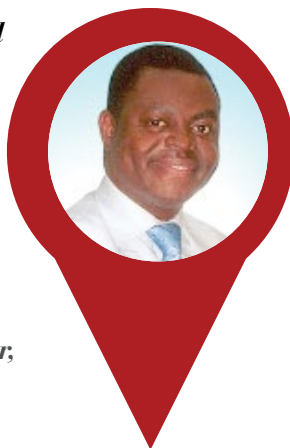
Agents of change

The race for market supremacy is compelling banks across the globe to adopt the latest technology on the circuit in a bid to capture new markets and customers. “Perhaps the Holy Grail for retailers is to have a truly intimate, individualised understanding of consumers’ online and offline shopping behaviour. We are seeing an increased use of location based data and location analytics by financial service companies to help address this need,” adds Thompson.

Also, mobility is transforming e-commerce by enabling comparison shopping in stores and delivery of personalised offers based on shoppers’ location and preferences. “As a result, near field communication (NFC) proximity payments will close the loop between advertising and execution,” points out Shan. Rise in mobile banking has been coupled with location-based analytics, thereby making smartphones a ubiquitous geospatial technology in the financial services industry. Banks have lever-

Banks can have a structured approach using geographic intelligence to analyse the geographic location of competitors’ branches and ATMs to evaluate the effectiveness of all their branches in the face of competition

Ireti Ajala, Managing Partner, Spatial Technologies



Bank of America adopted mapping technologies to identify current and future locations of its banking centres in low-income neighbourhoods to meet its Community Reinvestment needs.

License: Ryantongwestra, CC BY-SA 3.0

aged this feature to create ‘geospatial’ banking apps, which the customer can download on their smartphones.

“With NFC, GPS, beacons or WiFi, we can validate the presence of the customer and the payment method at the merchant location,” underlines Thompson. Touchless payments, scan to deposit cheques and alternative payment technologies are all using location technologies to connect the banks to consumers. From those technologies, one can get a wide range of insights on consumer behaviour, intent and desire, which banks are putting to good use.

Cashless systems will become much more prevalent based on GIS and smartphones/embedded chips. For example, there are many places in Europe, Asia and South America where one can pay for public or private parking, highway tolls and vending machines all with the same smart device. This is much better than requiring multiple devices, and the inconvenience of having to transfer payments or cash across accounts.

No matter how tech-savvy a bank gets, it still runs high on risks. Internally, the biggest challenge for the technology implementation would be data maintenance. GIS is closely related to the use of spatial data, therefore if the latest data is not updated to the system, wrong information will be passed on to the user. “The coding process of GIS has a high technology requirement, therefore maintaining and updating spatial data would become the biggest challenge especially in terms of expertise,” explains Shan. That and further awareness remain as the biggest challenges. 🌐

Ridhima Kumar, Assistant Editor,
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GIS Provides Insights into complex Datasets

As the cost of processing large datasets at speed falls, geospatial technology has a lot to offer the banking, financial services and insurance industry, says **Albert Lojko, Global Head, Eikon, Thomson Reuters**

How is mapping/location technology helping in shaping the banking and finance industry?

This technology allows us to create a visual picture of complex data which can be easily interpreted by financial professionals. With this technology, we're able to bring together diverse datasets to build a global view of rapidly changing dynamic markets, like global commodities. For our commodities market clients especially, this means we're able to build a global picture of key elements in the supply chain for a particular commodity — from production, processing, transportation, storage and other associated 'real world' assets. GIS technology allows us to bring together complementary and complex datasets in a way that provides customers with immediate insight into factors that will drive the supply and ultimately the price of commodities. Supplementing this information with real-time alerts for multiple news and other information sources covering production outages, natural disasters, geopolitical news, and specialist industry analysis content can help decision makers more quickly react to situations.

What kind of solutions do you provide to banking, financial services and insurance (BFSI) markets vis-a-vis geospatial technology?

Thomson Reuters Eikon is our powerful and intuitive next-generation desktop for financial markets professionals,



GIS brings together complex and complementary datasets in a way that provides customers with immediate insight into factors that will drive the supply and ultimately the price of commodities

providing news, analytics and data visualization tools to help them make more efficient trading and investment decisions. The Interactive Map tool in Eikon provides financial markets professionals with a global map of the commodities markets including vessels, vessel movements and history, ports/berths/anchorages, shipping zones (eg Suez Canal), oil refineries and oil storage, coal mines, power stations, LNG facilities, metals mines and facilities, and agriculture facilities.

In addition, we supply data visualisation overlays giving an aggregate picture of supply and demand, as well as a variety of weather overlays containing satellite and radar data, global conditions and severe weather. We also give the user the ability to upload their own proprietary data in geospatial format to view alongside our provided content, with the data remaining securely within the client's own infrastructure.

Who are your big clients? Which geographies do you cater to?

Our biggest clients for Eikon generally span the gamut from large global banks and trading firms to regulatory bodies to hedge funds and even academic professionals. Our prima-

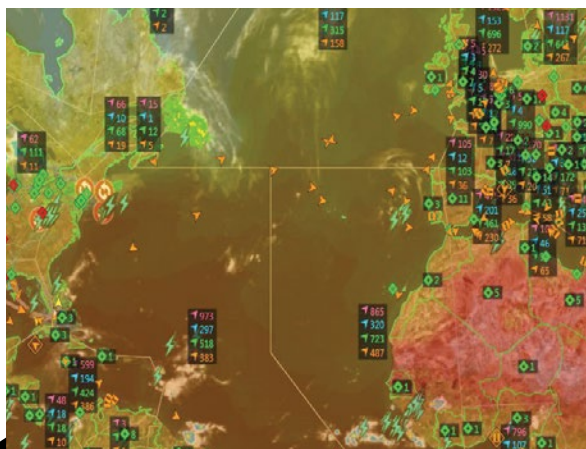
ry customers that use the Interactive Map tool within our Eikon desktop are major commodity producer and consumer organisations, including many of the leading global oil companies, agricultural firms, metals mining and refining companies, power and gas organisations and commodity trading firms.

How is Thomson Reuters delivering big data to financial markets? How are you utilising geospatial tools and applications for this?

Our largest physical asset dataset from a GIS perspective is the shipping data we use in Interactive Map in Eikon. We maintain a current vessel database of around 100,000 active ships, with movement history for each vessel dating back to 2010. We receive the vessel position via satellite and ground-based receivers, meaning that we can receive multiple updates from a vessel on its position per hour, depending on line of sight to satellite or shore-based receiver. When you combine this with historical paths of each vessel, it adds up to a lot of data, very fast. To make better sense of this data, we also record a vessel's interaction with events such as entering ports and store a history of these events. We then provide tools for a user to be alerted to these important events and to easily see that vessel's history. This is turned into a four-year long vessel trail displayed right in Interactive Map, so a user can quickly see which routes a vessel frequents. All of the data behind this specific capability can be pulled into spreadsheets for a user to further analyse.

Weather data is probably our next largest dataset, to the extent that we onboard and process hundreds of gigabytes of weather data daily to generate terabytes of forecast model outputs for power, gas and carbon markets and to generate new layers of weather data as overlays for map-based displays.

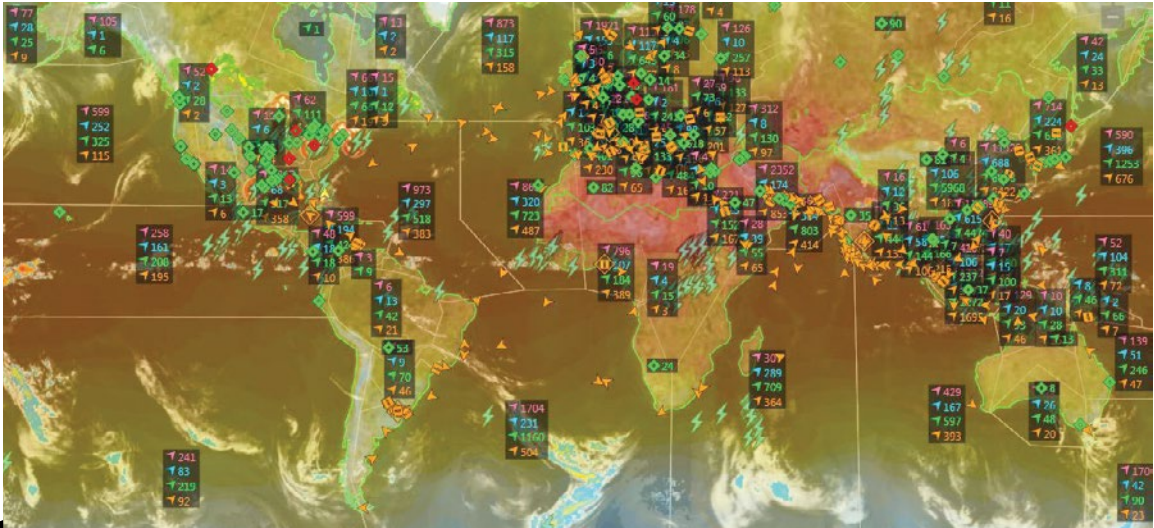
Weather layers containing data such as wave height



Global weather, vessel data and oil refinery information accompanied by real-time news alerts in Interactive Map in Eikon



Vessel paths in the U.S. Gulf coast region tracked in real-time with global weather conditions layered on top



Innovative visualisation technology provides a real-time picture of the commodities supply chain for metals, energy, and agriculture alongside weather, news, and detailed vessel data

can then be overlaid on vessel data, to give an idea of how rough weather could affect shipping. Users can also combine this with market intelligence gleaned from news. We have a process using natural language processing technology that searches all news stories for references to named oil tankers, oil refineries or power stations, allowing us to automatically tag that news story with identifiers for those assets and then display them as alerts directly attached to those items in the map.

One example of insight gained here is during an event such as a major tropical storm. Even as the storm can be seen brewing on Interactive Map, we can also alert users of major cargoes that are planning specific actions to avoid these storms, as well as alerting them to refineries or power stations that go offline along the predicted path of the storm. All of these cues will drive the price of oil, gas, electricity and other commodities around the globe so this information is critical to our customers. In this way we create a compelling and unique visual display to keep our customers informed and provide them with the tools they need to create or adjust their trading strategies.

What are the main challenges for big data analytics in Eikon?

When it comes to big data analytics for Interactive Map in Eikon, the biggest challenges we faced were in quickly making the logical connections between disparate-sourced datasets of varying quality and then delivering that to our customers in an easily-digestible format. Our customers are not looking for the fire hose of big data; they want the tools to find the signal from the noise. They

are looking for real-time information that gives them an advantage in a competitive market. We have found that one key to producing analytics tools to find this signal is in the team we have built. This team has deep domain knowledge and can thus quickly understand the meaning of any new or incoming data and just as quickly extract its unique value for end users. That, in the end, is how we transform big data into information that is rich in value for our customers.

How do you see geospatial technology changing the way BFSI industry works in the years to come?

As remote sensing technologies advance and the cost of processing large datasets at speed falls, geospatial technology has a lot to offer the finance industry. Banks or insurance companies could use it to quickly come to a better understanding of the likely risks and events that impact their clients. They could thus make better decisions on profitable pricing of loans or insurance policies they offer — or to rapidly respond to situations like the recent UK floods by pre-positioning resources where need is likely to be greatest. Food producing organisations may be able to make better forecasts of crop production on a global level, visualising the way weather and logistics will impact how production and consumption plays out over time. That would allow them to immediately see the geographies they need to focus upon and what the precise nature of the shortages or excesses will be. Major commodity producers or consumers will be able to fluidly merge their own proprietary data about the ‘real world’ with publicly available content on map-based displays, understanding immediately where information gaps could impact them. 🌐

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Each year, \$11.4 billion is lost to credit card fraud. As cybercriminals grow more sophisticated, that number is likely to grow. Portuguese scientists have created a 21st-century way of detecting banking fraud with the help from the European Space Agency and today, every electronic purchase in Portugal runs through their software. Globally, Feedzai products screen about \$229 billion-worth of payments every year.

But what do space missions and software designed to find thieves have in common? More than you might think — in addition to high-tech hardware, space missions require a great deal of sophisticated software.

Fraud detection and space mission software face similar challenges. For one thing, both need to process huge amounts of information in real time. “If we talk about a bank, you need to process thousands of transactions every single second,” says Paulo Marques, who was an ESA consultant before founding Feedzai in 2009.

At ESA, Paulo and Feedzai’s Nuno Sebastiao called on high-performance computing techniques to create virtual

satellites: “Clusters of computers pretend to be everything involved. A computer acts like a spacecraft.”

In bank fraud detection, as in space, the software must recognise anything that is out of the ordinary. In space, an unexpected change in temperature could indicate a crack in the wall. In banking, anomalies often point to fraud: if a petrol station suddenly starts generating sales figures like those of a luxury car dealership, it is a sign of trouble.

However, there are differences. While hard-and-fast rules are set to detect an anomaly in space, fraud requires decisions on a case-by-case basis. A sudden temperature change in a spacecraft is always a problem, but each bank customer has his own, individual habits.

As a result, the software must recognise what is normal for a business-owner and what is normal for a teacher, based on the past practices of each, before it can identify any odd behaviour. To make this possible, Feedzai came up with an artificial intelligence software system.

“We developed software that can process a huge number of transactions,” said Paulo. This software can look at every

transaction a customer has made for the last four years.

By applying both ‘machine learning’ and ‘big-data techniques’ to look at all the data, the software learns to distinguish fraudulent-looking from non-fraudulent-looking transactions. “The software creates the rules,” adds Paulo.

As world continues to adopt electronic payments, our lives increasingly migrate to the Internet. As a result, customers (and criminals) leave behind a growing trail of digital exhaust. Using geo-location data from mobile devices or IP addresses, Feedzai can determine each consumer’s spending pattern and predict normal behaviour. While techniques like velocity rules that rationalise time and physical distances between purchases are not new, Feedzai adds modern big data computing and data science techniques, which allow for machines to learn from the data. Consequently, clients like banks, retailers and payment networks are able to keenly focus on their customers in order to provide a happy commerce journey, whether that is online or in a store.

Feedzai’s software is robust. Tracking over 300 variables per person, it creates a very detailed, individualised spending profiles for as many as 20 million credit cardholders per system. “In total, we are tracking over 5 billion variables continuously.”

“It is like having 500 very intelligent people looking at every single transaction and making a call based on their experience if that is fraud or not. It is a huge amount of computing power.”

Cerqueira from Instituto Pedro Nunes, the Portuguese broker in ESA’s Technology Transfer Network part of ESA’s Technology Transfer Programme, believes Feedzai’s technology will mean savings for banks, as well as improved customer loyalty: “Feedzai’s machine learning models and Big Data science are able to detect fraud up to 30% earlier than traditional methods, and illustrate how the competencies developed at ESA research centres can be useful to other sectors.”

Improving fraud detection by 27%

A European processor serving the commercial banking industry (name withheld owing to client confidentiality) sought to quickly deploy a solution that would stop a greater percentage of fraudulent transactions, while reducing false positives whose manual reviews are costly and frequently time consuming. With 5 million transactions per day to validate, the company’s general manager understood that a new solution’s time to market would significantly impact the business.

With Feedzai, the company achieved the fraud prevention results they sought, and more. The fraud protection was improved by 27% while limiting false positives to 20%. “Card not present” transactions, always a challenging use case for payment processors, were validated against a year’s worth of customer, card and merchant behavioural data in 20 milliseconds. The company also found that with the software’s extra large

Feedzai enables the processor to stream real-time transactional data, allowing each transaction to be evaluated from multiple dimensions

datasets and powerful engine, they were able to halt instances of ‘first fraud’, adding value to its financial institution customers.

Feedzai Fraud Risk Prevention was deployed on premise at the processor within two weeks using existing off-the-shelf hardware, assuring that processing and energy costs were kept to a minimum. Capable of processing up to three years of historical data for cards, cardholders, and merchants, Feedzai also enabled the processor to stream real-time transactional data, allowing each transaction to be evaluated from multiple dimensions. Machine learning classifications were then applied to the system, eliminating the need for the costly and time consuming manual updating process of other rules-based solutions. With real-time transactional data continually updating each record, the processor is now able to automatically retrain its fraud algorithm based on up-to-the-second information, positively impacting the detection of fraudulent “card not present” transactions, as well as card-cloning and merchant fraud schemes.

Feedzai Fraud Prevention now allows the processor to bring together past data, present anomalies, and future predictions to uncover, prevent and manage 80% of fraudulent transactions for a tenth of the cost of competitors’ solutions. Its false positives rates are now consistently at 20%, trimming the costly review process for its client companies while enhancing the experience of its cardholders. “Feedzai prevents \$9.5 million per year in credit card fraud losses for us by uncovering and cancelling fraud in real time,” says the processor’s general manager. The company now analyses years of historical data, applies machine learning classifications, and determines whether a transaction is fraudulent in under two milliseconds. Because Feedzai classifies and delivers fraud scores so quickly, it means a fraudulent transaction can be blocked even before the bank authorises it. By detecting and preventing these ‘first time fraud’ transactions, the processor realizes a benefit previously unheard of in the industry. The bottom line for processor was that Feedzai delivered a two-month return on investment. 🌐

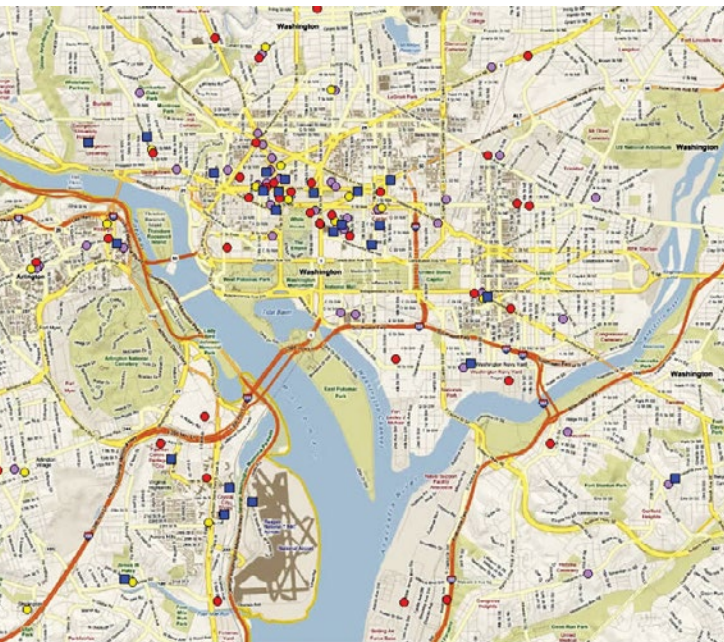
Courtesy: ESA & Feedzai

Mapping the Market to Create Healthy Banks

SNL Financial incorporates location and mapping technology to give its customers a better view of financial practices and analytics functionality

For the past two decades, SNL Financial (SNL) has built a strong reputation for providing accurate and up-to-date financial data, news, and insight. Clients of the Charlottesville, Virginia-based company include leading investment banks, asset managers, banks and thrifts, and regulatory agencies.

SNL collects, standardises, and disseminates specialised business information for the banking, financial services, insurance, real estate, and energy industries through its SNL Interactive (SNLi) Web portal. The portal includes SNLi Mapping, a mapping application delivered to subscribers of the portal. SNLi Mapping uses Esri's ArcGIS software to view and analyse information on a map.



SNL Financial's clients can quickly visualise their branch locations against the locations of competitors and see the possibility for growth through mergers and acquisitions

Mapping business worth

SNL started to incorporate ArcGIS software and Esri data in its product in order to offer the customers detailed GIS and analytic functionality. The analytic tools SNL's customers wanted were readily available in ArcGIS. The functionality lets its clients view various types of data, including street information and aerial images, and gives them the ability to create new data, such as adding new market areas, and incorporating information on demographics and business data. SNLi Mapping incorporates these features, creating intuitive market analysis and visualisation tools for the subscribers. The website services allow the subscribers to identify locations of assets, perform competition searches, and generate in-depth or ad hoc analyses as needed.

"Clients find visualising information on a map to be very useful," says Dan Sheets, project manager, SNL Financial. "Using this tool, the information they need really pops out at them."

Using SNLi Mapping, subscribers have been able to better evaluate companies' mergers and acquisitions and make more informed decisions. They are performing their own market analyses and integrating demographic data with geographic information such as the location of major cities, interstate highways, and company buildings. Many subscribers also use SNLi Mapping for making presentations because of the high quality of the mapping capabilities.

"Having all this information integrated makes it easy for them to understand market valuation and why a particular location or company may be more attractive than another," adds Sheets.

GIS analytics moves to banking

Based on the success of SNLi Mapping, the company incorporated GIS visualisation and analysis into Branch Analytics, a different Web-based application that was created specifically to analyse bank markets. Branch Analytics allows customers to quickly perform in-depth market studies,

integrating bank branch deposit and demographic data. SNL expanded its use of ArcGIS software to create and deliver the geographic visualisation and analysis.

Users can quickly see their branches plotted with hundreds of demographic variables, helping them to better understand their markets and opportunities for growth.

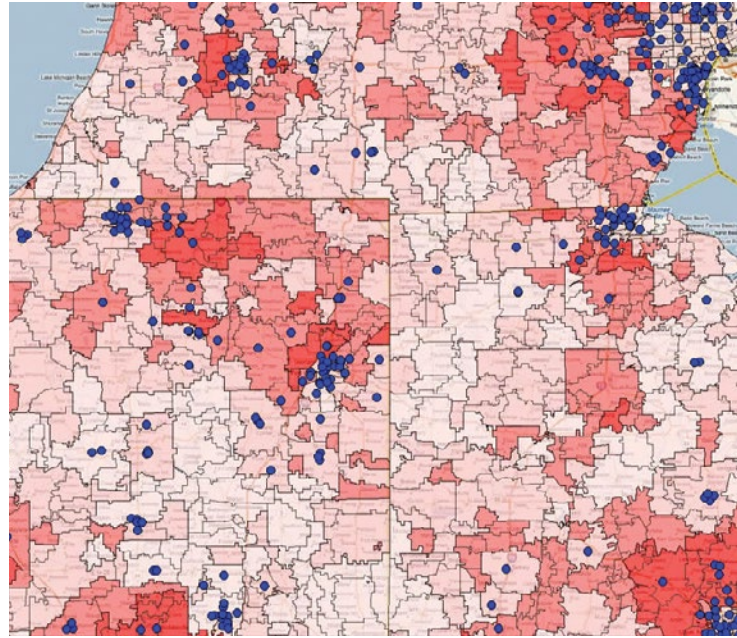
Clients for the application range from newly chartered banks to superregional institutions that cover large areas of the United States. They use SNLi daily to make important strategic decisions such as where to locate new branches, how to increase market share, and what products to offer to customers. Using Branch Analytics, clients can access SNL's database filled with detailed profiles on more than 20,000 United States financial companies, including all publicly traded banks and thrifts, privately held institutions, and credit unions. Subscribers can quickly search for 150,000 branch locations and plot them on maps using the latitude and longitude of the bank location, which is derived from the reported branch address and validated by SNL's Branch Data Management team using a variety of sources. Demographic and business summary data is provided annually by Esri.

"SNL is the trusted information partner for all of the top 50 depositories in the [United States] as well as hundreds of regional and community banks," says Elizabeth Rouse, product manager for branch and geographic intelligence at SNL Financial. "And 100% of investment banks with any substantive financial institution industry practice are SNL subscribers."

Powerful GIS analytics on the web

Subscribers can use Branch Analytics to delve deep into the marketplace and find the best solution for maintaining a healthy balance sheet. Changes in market deposit concen-

Using SNLi Mapping, users are able to better evaluate companies' mergers and acquisitions and make more informed decisions. They perform their own market analyses and integrate demographic data with geographic information



Users can quickly see their branches plotted with hundreds of demographic variables

tration can be viewed using the service, allowing them to model 'what-if' scenarios such as what would happen if they opened new branches, offered different services, or closed underperforming sites. They can use the application to model such bank-specific activities as the acquisition of other bank branches and change of attributes on the fly, including adjusting ownership for recently announced business transactions. Custom geographic markets can be created as well, to see the effects of all these activities in the real world.

Banking professionals can create maps using SNL data and customise them for use in professional documents and presentations. This is easily accomplished by creating a report with Branch Analytics.

Maps can also be created after generating a report. Subscribers simply create a Branch Analytics report, for example, looking at market share of a particular company in an area, and the application automatically exports the analysis to a map. As information is updated, or the analysis is customised, the maps dynamically absorb the changes to reflect the adjusted report.

"This has been a powerful tool for our customers," says Rouse. "Visualising and modelling business practices helps our customers make the best strategic decisions and better understand the markets they operate in." 🌐

Karen Richardson, Writer, Esri
krichardson@esri.com



James Buckley, Sr Vice President & General Manager – Customer Data and Location Intelligence, Pitney Bowes

Having built a powerful network of data suppliers across the globe, Pitney Bowes now takes pride in being one of the few companies which provide both reverse and forward geo-coding capability.

James Buckley and **Mitch Rowe** talk about how this gives them an upper hand in the global market

The core strength of Pitney Bowes products and solutions is creating a powerful analytics around the location concept while also trying to simultaneously incorporate other aspects of context. Why was this necessitated and how is this achieved?

James Buckley: In our portfolio there are two core offerings. First is MapInfo for professionals, which is fairly horizontal GIS desktop product. We have seen substantial increase in the adoption of this product, and we have received overwhelming feedback from the market. We feel that it's going to help us capture more of the core GIS market. It also has lot of capabilities specifically targeting key markets such as telecommunications, natural resource exploration, insurance, etc. We also have a strong presence in the international market.

The second product, which is again relatively new, is Spec-

'Geo-coding is Critical to Put Location Info Inside Anything'



Mitch Rowe, Sr Vice President – Sales & Solutions, Customer Information Management & Location Intelligence, Pitney Bowes

trum Spatial. It has all of the capabilities that you expect in a GIS product. Our strength and key differentiation lies in geo-coding products. We are one of the only two companies which provide reverse geo-coding on a global basis. We provide both reverse and forward geo-coding capability, which gives us particular appeal in the global markets. In US, the top 25 insurance carriers and all of the major insurance underwriters use this product. The reverse geo-coding product has helped us carve out a special space in social media as well. Spectrum Spatial is made especially focusing on enterprise customers.

How are solutions integrated with other enterprise processes such as ERP etc.

JB: Since it is a new product, the architecture is modern. The key strengths of the product are not only power and

performance but also ease of integration. The way we view the world today — and where we think the markets is going to head — is that technology like Spectrum Spatial will be required to sync and integrate spatial information with existing enterprise systems. That was the key vision based on which we have added value to our products. For example, in business intelligence systems' integration, we were supporting eight BI systems; plus, smart result was a key part of this strategy. Then, the other important thing is the relationship with SAP. We believe the partner should be inside of everything. Gone are the days where enterprise GIS deployments worked in silos. We believe the market needs to change and Spectrum Spatial is about how we hope the market to change. It's putting location intelligence right inside business systems and workflows.

From architecture and technology standpoint, we have a very strong line of products. In terms of differentiation, we have the best in class geo-coding. If you think about CRM system, being able to provide the capability to locate customers and then apply a digital contextual data to that to answer a question for our client, this is what geo-coding fundamentally does. The same can be said about ERP or other systems. The fact that we have the best geo-coding in the world gives us the edge over the others. This is followed with the need to provide a powerful Web mapping interface across organisation.

Another important part of our business is data quality and helping enterprises manage customer information across organisations. We think the key differentiators in markets like insurance is communication with customer, and adding context and location information to that. For instance, if someone wants to know the risk of insuring a property, the geo-coded location would give the agent an idea about the challenges and risks; and that would influence the premium. Spectrum Spatial has delivered great results in such situations.

Mitch Rowe: Spectrum has allowed us to build businesses. It provides us a platform through which we can now extend data to our customers. There are various types of data that organisations demand such as reference data, business data, data that is relevant to the customers for operational challenges within their business. Spectrum allows us to extend that data to the customer in a consumable format.

What are the organisational challenges that it can handle?

JB: In insurance, it is critical to automate underwriting process. Spectrum Spatial helps in automating it to a large extent. In telecommunication industry too, it has been an effective tool. How can you chain-up the whole portfolio right from RF planning for cellular networks? That is done either using mapping solutions natively or through partners. Then the output is taken back into the system, reference data and geo-coded

customer data, etc. are added, and business owners are then able to see the data from a much broader perspective with geospatial elements attached to the information.

Pitney Bowes is also into data; and software without data is not very good for your customers. So are you also collecting, generating and becoming a data provider? Or is it that you take data from your providers such as TomTom and add value to it?

JB: One of the key things that differentiate us is that over the years we have built a powerful network of data suppliers. So we don't go out and do physical data capturing in the field but our relationship with key organisations around the world help us in that. We work with few partners like TomTom, which provide us with data, and work with several government organisations like the one in Australia, Ordnance Survey in UK etc.

In a way, we are aggregating the data and then adding value to it. So if we take the world census data, then take consumer data, bring that together at various levels, apply that geographically, then our demographers add population projections, look at composition of different communities, etc. All these are adding value and a spatial dimension to the data. We have done that in Canada, US, Australia etc. Geocoding is the other example, where we bring multiple different datasets from postal services, from mapping providers like TomTom, and then we geo-code that data.

MR: We strongly believe that data enrichment is one of our key core competences and differentiators. Another example is Point of Interest data.

Location intelligence is also catering to the industry you have talked about, are you adding more industry verticals to your portfolio?

JB: Those are just examples of the markets where we already enjoy considerable success but our product portfolio includes horizontal location intelligence. We enjoy strong market positions in multiple vertical markets and geographies in the world.

Domain expertise is where our wide network of partners pitch in. Many of those create new applications using our data and add value to it. Sometimes they develop their own data. These products are used in markets where we do not operate directly. The rationale behind the SAP alliance is that both companies can drive, add and create digital value for SAP customers.

Who are your important customers in geo-coding space?

JB: All the markets I have mentioned buy geo-coding from us. The biggest customer probably would be insurance. It's a mature market which understands the use of this technology.

MAPPING RISK

HELPING INSURERS TO ACCURATELY ASSESS WILDFIRE RISK

Location intelligence can help insurers map out the high risk areas for wildfires, such as this view of the San Francisco Bay Area.



The benefits go beyond insurance risk analysis. Government agencies can analyse all kinds of data (including wildfire risk) to establish the best locations for new departments and services. Fire departments, for example, can use location intelligence to scientifically assess where they should place a new fire station to best fight wildfires.



Analysts can drill right down to the street level, enabling them to assess the risk for individual properties. Some properties on the same street may be at risk, while others may not, due to the range of airborne embers from wildfires. Accurate risk assessments mean fairer policy pricing



Created using Pitney Bowes MapInfo Professional technology and Pitney Bowes Risk Data Suite: Fire Risk Pro Bundle

Several companies such as Google Maps have further brought this to the attention of other verticals. But the relation we share with Facebook, Twitter and other social media company got them to realise how powerfully this technology can be integrated with their systems. Mobile advertising business, too, has seen a surge.

Can you elaborate on the concept of master location database which will be released soon?

JB: Master location database can be explained as centrally taking the largest dataset of US and pre-geo-coding it. Therefore, instead of you geo-coding the data, we pre-geo-code and maintain it for you. We see it as a foundation as once you have this master location database you can then add contextual data relevant to your needs on top of it and add value to it. The initial release of master location data would be focused on US but we would be extending it to other countries where it would be relevant.

Are you looking at geo-coding the indoors?

JB: Yes, but it is part of our long-term strategy. What we plan to offer can be loosely defined as 'vertical geo-coding'. Which means that we can add the elevation aspects to the data. So if I am on the ground floor of the roof, the data would have a different geo-code for that. We are working actively with companies in that space including TomTom. We are examining how we can create products around such mapping. When it comes to indoor location, I am not sure if anyone has solved the issues yet. There are different ways these can be done. While, Apple uses IP, others might use something else. We are watching the space, and I am sure that someone is going to crack this and come out with a brilliant way of doing it properly, effectively. Once that happens, the market will explode.

Pitney Bowes has a range of partners enhancing its products and offerings. Are you exploring more partners for providing more solutions?

JB: We have a pretty extensive partner network. In Asia, especially, we are mostly represented by our partners. In Australia, we have a substantial presence with over 300 people. It's the third largest geography for us after the US and UK. We have a good presence in Japan too but the bigger share of business comes from the US and Western Europe.

SAP is one of them. Initially, it is around HANA business objects. But we are actively exploring new opportunities with SAP. We would be working with a number of different teams in SAP around specific solutions. We will also work as the geospatial partner to spatially enable SAP's ecosystem. We are talking indirectly with several of their partners, but since we are in the middle of discussions, we cannot talk specifics. However, in coming months you will see what exactly we would be doing with SAP.

We did some projects around IBM's BlueMix. IBM was a better programme so we put some capabilities that we already had in that marketplace on top of it. You will see us releasing some new products in the API market place later this year. It's an experiment which has been very successful for us. But as we roll out those location based service APIs you will see us participating in multiple different API market place. This is one of the key routes to market. We have a number of products which I feel would be market-appealing; IBM BlueMix would be one of them.

MapInfo had started as a core GIS software but has found its niche in location intelligence. Similarly, Bentley was a core GIS provider, but now it has developed its niche in engineering and infrastructure. Do you see a complementing aspect with other software providers? Are you working with them?

JB: In the broader marketplace, we co-exist with multiple geospatial vendors and clients. We see complementing strengths in some of these players. We do and will continue to work with newer companies which provide differentiating capabilities and overlapping technologies.

MR: With these significant mature GIS companies, the opportunity to cooperate and partner is little prohibitive; competitive overlap and conflicting strategies being the reason. That being said, we have recently upgraded our membership with OGC with the vision to participate in the development of the industry for the benefit of the clients.

JB: We recently joined founding members AT&T, Cisco, GE, IBM and Intel as a member of the recently formed Industrial Internet Consortium (IIC). The group catalyses, coordinates and manages the collaborative efforts of industry, academia and government to accelerate growth of the Industrial Internet. It also defines requirements for open interoperability standards and develops common ar-

chitectures to connect smart devices, machines, people, processes and data. From the perspective of Pitney Bowes, location intelligence is critical to those because one of the biggest drivers of future growth of location intelligence market is going to be the power to remain connected with the Internet of Things. Pitney Bowes is a traditional enabler of commerce in the physical world through its postage business. We are moving towards helping organisations drive revenue, postal service and communications through our digital technologies and location solutions. In all these efforts and initiatives, geospatial will remain the primary driver of our business.

What is the share of your location intelligence revenue coming from US? And are you looking aggressively at developing and capturing the emerging markets such as China and India?

MR: A little over 50% of the business comes from US, 30% from AMEA, 20% from rest of APAC region. The point to be noted here is that ofz the 20% from APAC region, Australia has the biggest share. We have a good install base with the local state government in Australia.

We have a direct presence in India. We have a sales team of less than 10 people focusing on pre-sales, channel sales etc. For China, our model has primarily been channel partner dependent, and we support their activity from Singapore. We are working on some strategic initiatives to invest in some of these emerging markets such as China. We are going to have more direct presence in these emerging markets. We have been going through due diligence process for last six months to put together what our next five years' growth initiatives would look like. We are also assessing some of the emerging geographies where we can invest. We are ascertaining the regions which warrant investment on a priority basis.

Who do you consider as your biggest competitor in location intelligence space?

JB: We compete in horizontal GIS location intelligence marketplace, and the largest company in that space is Pitney Bowes. We are a Fortune 500 company. We compete with other horizontal players in the market. The other players, however, get a fragmented share of the market. So companies like Intergraph, Bentley etc, in their earlier incarnation would have competed with Mapinfo, but today, they coexist with us in this market. We have been integrating with others such as Microsoft Bing and HERE because we see opportunity in that. It is a complex landscape. It is one of the benefits of providing the opportunity to the industry to come together. 🌐



LASER SCANNING AN EYE ON FUTURE

The global 3D laser scanning market is set to expand from an estimated \$2.06 billion in 2013 to \$4.08 billion by 2018, says a report from market research firm MarketsandMarkets. The report, which pegs the market growing at an annual rate of 14.6%, credits the big growth in 3D scanning adoption to lower hardware and software prices and their increased efficiency as well as the fact that it is easier these days to convert point clouds to CAD models. 3D scanning has found its use in a wide range of applications. While it has completely turned the AEC industry on its head in the recent times, areas such as heritage, oil and gas, energy and power utilities, forensics, automotive and transportation, manufacturing and services (reverse engineering, inspection and others), which need real-time imaging, has also found benefits in 3D laser scanning.

FARO: Leading from the front

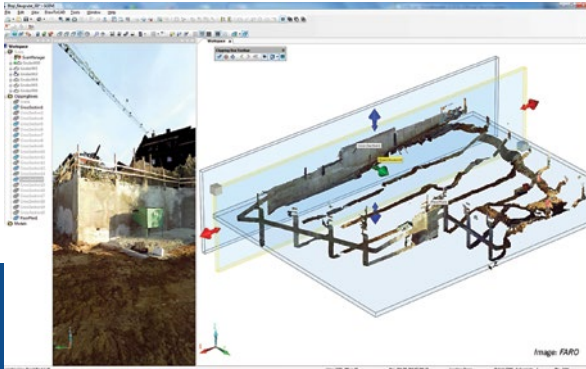
FARO is a known player in 3D imaging devices for over 30 years now, bringing excellence into the marketplace. Through its wide array of products and the innovations that come with them, the 3D imaging landscape has been changed forever. Technology from FARO permits high-precision 3D measurement, imaging and comparison of parts and compound structures within production and quality assurance processes. The devices are

used for inspecting components and assemblies, production planning, documenting large volume spaces or structures in 3D, and more. FARO's 3D measurement technology allows companies to maximise efficiencies and improve processes.

FARO Laser Scanner Focus^{3D} X 330: The smallest and lightest laser scanner in the market — Focus^{3D} X 330 is the ideal tool for surveying applications. With a size of only 240 x 200 x 100 mm, the scanner, weighing all but 5.2 kg, offers extra long range — 330m, integrated GPS and the possibility to perform scanning even in bright sunlight. Remote scanning as well as almost limitless scan data sharing via FARO SCENE WebShare Cloud make the solution truly mobile. Its state-of-the-art features, multiple sensors, and revolutionary price make it the preferred option of many small, medium and large companies in different industries.

FARO SCENE: They say it takes two to tango. The usefulness of Focus^{3D} is magnified with the speed and simplicity of FARO's scan processing software SCENE. It processes and manages scanned data easily and efficiently by using automatic object recognition as well as scan registration and positioning. The SCENE software can generate high-quality coloured scans quickly, while providing the tools for automated target-less scan positioning.





The flexible interfaces of the SCENE software enable connection to AutoCAD Architecture or Revit as well as many other CAD applications software such as Rhino, Microstation, Nemetschek, ArchiCAD and CAFM solutions, Gexcel, 3D System, and kubit.

FARO SCENE WebShare Cloud: Scan projects can even be published on a Web server at the touch of a button with SCENE WebShare Cloud. It is a secure cloud-based solution for storing and sharing scanning data with different project partners.

3D documentation using the FARO Focus^{3D} forms the basis for the planning and execution of building projects as well as for the management of properties. Yet the Focus^{3D} has even more to offer: it supports quality assurance for building work, brings down costs, and simplifies the everyday work professionals.

FARO's goal is to be highly disruptive in terms of technology and price. Disruptive companies have always won the market. Focus^{3D} was an instant hit because of the ease of use, portability and price. We plan to continue to bring in new technology to simplify operations, reduce price and improve portability.

– **Jay W. Freeland,**
President and CEO
FARO Technologies, Inc.



Use Case Scenarios

From 'Scrap-and-Build' to 'Maintain-and-Preserve'

Urban structures are monitored so that they are reinforced or repaired before a breakdown occurs, lengthening infrastructure lifespan.

Aisei, a professional structural inspection company, is involved in the preservation of Tokyo's urban landscape, with a focus on bridges and tunnels. In the course of its work, Aisei team had to assess many bridges without an original design blueprint in hand. These documents were important especially for earthquake-resistance construction work because crucial information such as precise dimensions and measurements of the structure were required. To overcome that, Aisei would physically take measurements of the structure using instruments such as tape measures, and manually transfer the information onto 2D blueprints. However, the task of manual

Regardless of the industry sector, we believe that the use of 3D source data will become a standard in the future. That is why we decided to introduce the Focus^{3D} into our workflow. We also felt that it would enhance safety and quality management, adding value to the work we are doing.

– **Koichi Iwasa, Aisei, President**

measurements was found too risky, and there were often inaccessible areas as well, posing problems for inspection works.

Consequently, the company decided to invest in a Focus^{3D} to perform measurement tasks using 3D Documentation technology. 3D laser scanning enabled capture of structural dimensions

Construction



replacing conventional hand tools.

At Aisei, Focus^{3D} is especially useful for restoration projects for structures that do not come with original blueprints; or projects that involve measurement of depositions and changes in shapes of urban structures; as well as interference simulation projects. For instance, the team had to 'earthquake-proof' a pedestrian bridge which did not have a blueprint. With the Focus^{3D}, Aisei managed to capture data from a distance, transfer the data onto a computer, and drew up a design blueprint easily — the drawing was then used for maintenance and project management.

Preserving a Piece of Human History

LaoSiCheng is a historical location in China. In 2011, Beijing Urban Construction Exploration & Surveying Design Research Institute (Beijing UCESD) was engaged by Beijing University of Civil Engineering and Architecture to produce a comprehensive documentation archive for LaoSiCheng.

The inscription of LaoSiCheng as a heritage site was a complex process that involved proper documentation. To acquire cultural historical status, accurate digital models were required as supporting documents in the application. UCESD could not wholly rely on total stations for this purpose as they record data for only one point at a time, which would be time consuming.

The company found the FARO Laser Scanner Focus^{3D} to be the perfect solution: the team completed data collection for the 400-sq-metre site within a day. Scans were taken at a variety of angles and standpoints to ensure comprehensive coverage in the documentation. Beijing UCESD managed to cover all required areas with only 12 scans, and each taking around 10 minutes.

Aside from saving time, portability and fuss-free set-up of the Focus^{3D} was also a huge plus.

The Focus^{3D} enabled us to work much more efficiently than total stations. It collected large volumes of point cloud data, which could then be post-processed into meaningful models or images. With the total stations, the drawings had to be manually produced."

—Long Gong, Survey Engineer, Beijing UCESD.

The scan data could easily be transferred via an SD card to a computer back in the office for post-processing using the FARO SCENE 5.0 Software. Precise 3D representations of the ancient city could be reproduced on paper, facilitating a variety of requests in the setting up and maintenance of a heritage site. Since purchasing the Focus^{3D}, Beijing UCESD has expanded its repertoire of services and capabilities.

Evaluating Curved Shell Plates Using

The 'curved shell plates' made from large, thick plates of steel, covering the entire ship from stern to bow with complex 3D curves gives a ship its shapely exteriors. Hundreds of shell plates are utilised in the structure of a ship, but only two of them are made to be similar, one used on each side of the ship body. Under a joint research programme supported by ClassNK, the University of Tokyo and Sumitomo Heavy Industries Marine & Engineering (SHIME) came together with ClassNK to develop a new method of evaluation for curved shell plates. The new approach involves a 3D laser scanner, and is a stark improvement from the wooden templates, providing users with higher levels of accuracy and speed.

The workflow of the new approach involved comparing CAD data of design plans with measurement data obtained with the Focus^{3D}, as well as preparing and feeding collected data through Pulpit (provided by UNICUS), a large point cloud processing platform. On top of that, the team also generated colour maps to chart the accuracy levels of the shell plate under inspection; problem-solved issues linked to laser scanner deployment; and reviewed the usage of measurement data during this study.

With the new approach, SHIME managed to increase efficiency and achieve higher accuracy





levels in its curved shell plates. Since implementing the new system, the time expended on revising errors have decreased significantly, demonstrating the efficacy of the laser scanner for the evaluation process. SHIME can now scan curved shell plates instantly by simply narrowing the scan range and changing the resolution to suit the plate size. The colour maps provide convenience, as it lets us pick out the points that require more curvature easily.

With the assistance of the Focus^{3D}, we are able to scan curved shell plates instantly by simply narrowing the scan range and changing the resolution to suit the plate size. The colour maps provide convenience, as it lets us pick out the points that require more curvature easily.

—Akiyoshi Sugawara, Construction Management Division, SHIME

Reconstructing accident sites

Accident reconstructionists generally agree that four factors are at play when analysing any given collision: human, vehicle, road and environment. The availability of precise, comprehensive data is fundamental to the accurate analysis of the accident. Traditional accident analysis depended on manual drawn diagrams, tape measure and estimated distances by eye.

With these methods, there was an inherent lack of accuracy and a huge margin for error.

For the faculty and research students at the College of Automotive Engineering in Tongji University in Shanghai, the discovery of the Focus^{3D} was practically a dream come true. The prowess of Focus^{3D} translated to several benefits for the research team — they had a lot more

The primary motivation behind studying traffic accidents is to improve safety. With in-depth analysis, the cause of accident and injury can then be established.”

—Professor Wang Hongyan, College of Automotive Engineering, Tongji University, Shanghai

data to work with than before, allowing more in-depth study of a traffic accident. The speed at which scans were made also significantly reduced the number of hours required outdoors on field work. Time saved on collecting data onsite was then utilised more efficiently back in the lab for analysing data instead.

In addition, it was easier to capture time-sensitive evidence from accident sites. Given that the Focus^{3D} can produce a virtual copy of an accident vehicle and its surroundings within minutes, the digitised reality can be revisited at any time. Focus3D also facilitates faster clean-up of accident scenes, preventing undesired traffic congestion. Importantly, when comparing reports generated by AutoCAD to hand-drawn diagrams, the Focus^{3D} evidently gave a more complete picture in higher precision.

FARO Focus^{3D} also enables capture of accurate 360° all-round views of accident vehicles for further analysis. With just six successive scans, each taking a mere 10-15 minutes, the research team can acquire all necessary data to reproduce reality on paper.

When shared with automotive manufacturers, the results of the study would help provide basis and direction for enhancements in future generations of vehicles. In cases where accident vehicles have been shifted to the impound yard, the research team would gain access to study those cars up close.





High-speed laser scanners such as the Leica ScanStation P20, combined with a rolling tripod base and intuitive processing software, allows agencies to quickly scan crash scenes and create accurate documentation for the courtroom

Solving ‘Who dunnits’ with 3D laser scanners

State-of-the-art surveying technology is capturing the attention of criminal justice professionals and revolutionising the science of forensics.

By **Michael Cunningham**

Surveyors and engineers have been using 3D laser scanning to document as-built conditions of structures since the late 1990s. Surveyors, especially, were quick to appreciate the laser scanner’s ability to capture highly accurate measurements of complex environments. Now this state-of-the-art surveying technology is capturing the attention of criminal justice professionals and not only revolutionising forensic investigation but also the way evidence is presented in court.

Advantages on crime and crash scenes

Conventional forensic investigation methods are time-intensive and dependent on a subjective human decision-making

process. Photographs are taken. Measurements are made — usually with tape or other manual devices. Drawings and diagrams are sketched. Evidence is documented and collected, and the scene is released. Hours in the field are followed by days or sometimes weeks in the office analysing data and creating exhibits for courtroom use. It is a slow, cumbersome and inexact process.

“When I saw what laser scanning can do, I was completely convinced that this was the way to go for the future,” says Steve Holloway, Deputy Director of the Wyoming Crime Laboratory, which adopted laser scanning technology over two years ago. “It’s a tremendous piece of technology,” says Holloway. “It has so many benefits that

it is hard to comprehend them all in a single conversation.”

► **Speed and accuracy:** While investigators can collect perhaps dozens of measurements over the course of an investigation, the latest state-of-the-art laser scanners can capture millions of highly accurate data points in minutes. When combined with fast, easy-to-use software and knowledgeable support, the technology provides a comprehensive solution for quickly documenting and mapping crime and crash scenes.

“I have been a sworn officer now for almost 34 years, and over that amount of time, I have seen very simple crime scenes that take 30 minutes to an hour and you are done with everything that can realistically be done. I have seen crime scenes that we have had to hold on to and work on for weeks,” says Holloway. “But I have never seen a crime scene that, using this technology, could not be completed (as far as all the scanning and capturing of data) in a matter of one, two days at the most — if it was some horrific thing — because it is so fast.”

When one talks about that kind of speed in gathering this data, the amount of time and effort saved is so great that it’s hard to get your mind around how thorough this is and how quickly it’s done.

► **Objectivity and comprehensive data capture:** Experienced crime scene investigators are highly observant and very good at picking up on small clues. Yet even the best investigators cannot measure everything or predict what might become significant after a crime scene has been released and new facts develop. In contrast, a laser scanner is objective, not subjective, about what gets documented, which protects investigators from overlooking key evidence. It impartially and comprehensively captures everything in its line of sight and within its range, even areas surrounding the main crime scene, which may later come into play.

Say, for example, a person unexpectedly comes forward claiming they “saw the whole thing” from a motel room down the street. “Well, you would not have captured that data in your diagrams and measurements of what windows were where in a building down the street that is not involved,” says Holloway. Whereas, this technology, if it was within the range of it, may allow one to turn around and look back and see if they could have seen what they are claiming. That is why this technology is so valuable — it captures everything in the vicinity so that one has that information in the future when something new becomes important that was not anticipated.

► **Ongoing virtual access to the scene:** A bedrock principle of forensic investigation is that you only get one shot at the crime scene. However, if the scene has been laser scanned, it remains pristine forever in a virtual environment. With intuitive visualisation software such as the Leica TruView free-ware, investigators and other criminal justice professionals can revisit the as-scanned crime scene to re-analyse and con-

Laser scanning is taking the science of forensics to a new level. It is going to affect forensic investigation very much like DNA affected the world of biology

fidently extract survey-quality measurements long after the scene has been released, even decades in the future.

“We need to keep our evidence pristine, and if we have to bring a battery of detectives through a scene just so they can get a feel for the scope of it, we are risking contamination and cross-contamination,” says CSI Section Supervisor Ryan Rezzelle, of the Johnson County Sheriff’s Office Criminalistics Laboratory in Olathe, Kan. “By scanning the crime scene, we can bring the scene to them.”

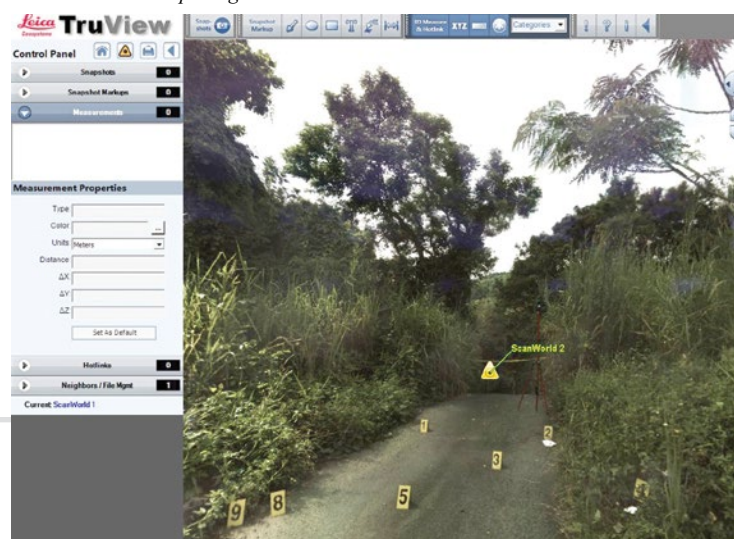
Laser scanning is taking the science of forensics to a new level. “It is going to affect forensic investigation very much like DNA affected the world of biology,” adds Holloway. “Laser scanning is going to become the gold standard for processing crime scenes across the country in perhaps 10 years. It may not even take that long.”

Advantages in the courtroom

Laser scanning technology is also revolutionising the way in which evidence and exhibits are presented in the courtroom. For decades, juries have made life-altering decisions based, in part, on static two-dimensional photography and diagrams. Today, highly accurate 3D visualisation software transforms scan data into an informative, interactive and compelling alternative.

In California, a jury is transported virtually into a vivid 3D crime scene along a rural country road. They are shown unde-

3D visualisation tools can transform scan data into informative, interactive and compelling scene reconstructions





A mock crime scene demonstrates the use of a laser scanner to quickly and accurately capture all the details of the scene

niable forensic evidence that leads them to convict a known gang member for the assassination of a sheriff's deputy. In a New Jersey court, a homicide detective uses a single 3D image to utterly destroy the defendant's claim of self-defense in the killing of his neighbour.

Virtual scene reconstructions such as these are made possible with 3D, 360-degree visualisation software. The software combines panoramic scene photography with millions of data points and acts as a canvas onto which text, measurements, and links to things like scene photos, audio and surveillance video files can be positioned exactly where they were found on the crime scene.

Users can view, pan, zoom, measure and markup the point cloud data over the Web on their Internet browser. If, during the trial, an attorney wants to know the distance from a doorway to a body, the measurement can be instantly displayed in the courtroom on a computer screen. Regardless of what data someone may request, it has all been captured. "So you are not in a situation where somebody says, 'Gee, we didn't measure that when we were at the scene' or 'It's approximately this far just based on this scale drawing'," says Holloway. "We can know exactly. We can pop it up right there on the computer, and it tells you instantly what those measurements are — which might be very critical to supporting or disproving the theory of a crime."

And with the advent of CSI-based television entertainment, today's juries expect to see physical evidence that supports the argument the attorneys are making. "It is a question of having an increased reliance on the information being the truth and not being swayed by a possibility argument," Holloway explains. As a result, lawyers are becoming increasingly reliant on compelling images and scientific 3D animations created with the laser scan data and visualisation software to make their case. It is a powerful way to communicate what really happened at the crime scene.

"One of the best things that we can use this technology for is creating perspective views," says Rezzelle. "When we are

able to display it in both two and three dimensions, you get much more of a feel for the texture of that scene, the placement of items, and the spatial relationship of them to each other."

Meeting admissibility standards

Despite all the benefits of 3D laser scanning, even the most compelling evidence is useless if it fails to be admitted in court. As any crime scene investigator knows, data must present a fair and accurate representation of the scene to be accepted as evidence. These considerations are especially important in a criminal trial where lives hang in the balance.

Any technologies used on a crime scene must meet the criteria established by the criminal justice system. In the US, for example, guidelines created by the National Forensic Science Technology Center recommend on-the-scene measurements to be accurate to within 0.25 inch, and the accuracy of all measuring devices, including laser scanners, to be ensured by comparison to a measure of certified accuracy such as a National Institute of Standards and Technology (NIST) traceable ruler.

In 2013, Leica Geosystems introduced a new NIST-traceable twin-target pole that definitively validates the accuracy of 3D laser scans captured with the Leica ScanStation P20.

Verifiable accuracy helps ensure that scan data evidence will hold up in court against rules of evidence such as the Daubert Standard which governs the admissibility of expert testimony regarding scientific evidence in US federal legal proceedings. One such ruling took place September 30, 2013. Federal Magistrate Judge Gregory Wormuth, presiding over the US District Court for the District Of New Mexico, issued an order granting a Daubert Motion to affirmatively admit Leica Geosystems ScanStation evidence and related expert testimony in the case of *Stephan Cordova vs. City of Albuquerque, et al.* "The provable accuracy of 3D laser scanner measurements to a known standard is key to forensic credibility in the courtroom," says Tony Grissim, Public Safety and Forensic Account Manager, Leica Geosystems.

State-of-the-art 3D laser scanning is quickly becoming the new standard for documenting crime and accident scenes with accuracy, objectivity and fidelity and then presenting those findings in court. With highly accurate scan data and sophisticated 3D visualisation tools, criminal justice professionals and jury members can be confident that justice has, in fact, been served. 🌐

Michael Cunningham, Training and Service Operations Manager, Leica Geosystems Public Safety Group
 Global: http://www.leica-geosystems.com/en/Forensics-Public-Safety_79312.htm US: <http://psg.leica-geosystems.us/mike.cunningham@leicaus.com>

SENSOR FUSION is the way AHEAD

Sensor and data fusion is giving way to uni-modal sensors, says **Max Elbaz, President, Optech, Inc.** He also sees LiDAR technology as a natural fit for exploiting the exploding UAV platforms

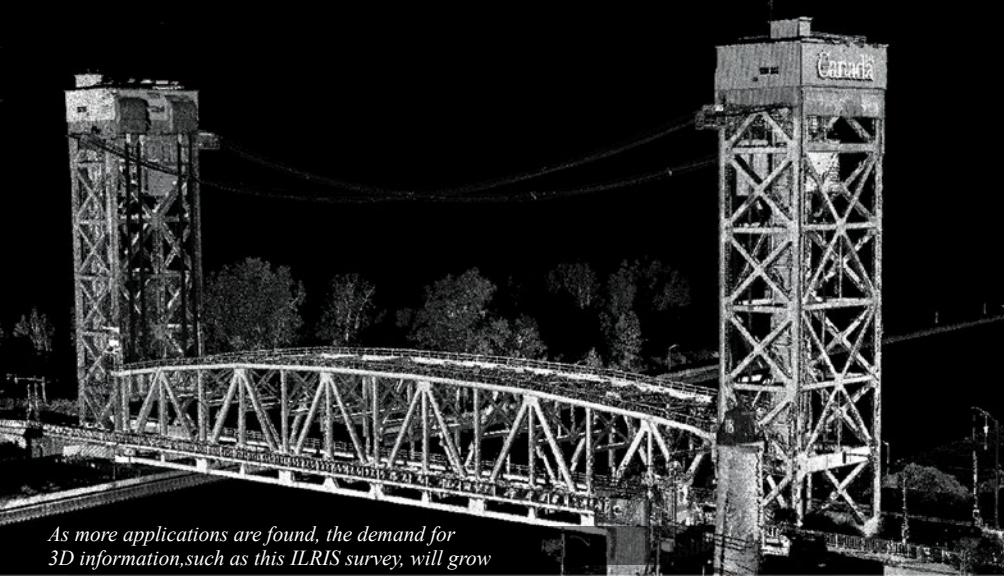
How do you see the demand for LiDAR technology shaping up?

It took many years for LiDAR systems to reach this threshold. Optech has been a LiDAR pioneer since the early 1970s, when our founder, Dr. Allan Carswell, also the current chairman of the board of Optech, was a Physics professor at York University in Toronto, Canada. He saw LiDAR's potential for solving terrestrial problems beyond atmospheric ones. It was a very astute decision: Optech was among the first to develop a technology for measuring ice fields and ridges from the air, and we also led the way in LiDAR bathymetry. We then applied that early expertise to terrestrial mapping applications, and there have been many improvements over the years since then. What we are seeing now is a strong move towards a 3D world, where a full solution includes the hardware and software workflows necessary to support the needs of customers and the markets they need to serve. More recently the world has seen an explosion in UAV technology and applications, which is transforming the remote sensing markets and generating new business models that are pushing the miniaturisation of related technologies. LiDAR is a natural fit for UAV platforms, and the integration of the two is here to stay.

Which are the industries propelling this demand?

Construction and infrastructure expansion are important drivers, especially in developing countries such as India and China, and regions such as Southeast Asia and Latin America. Another growing area is the urgent requirement to map and understand coastal waters. With climate change and





As more applications are found, the demand for 3D information, such as this ILRIS survey, will grow

Moving to the mobile LiDAR side, we have introduced the mapping grade Lynx MG1 product to complement the award-winning survey grade Lynx SG1, which lets us meet the specific needs of both the surveying and mapping markets. While the Lynx MG1 leverages the power of the Optech LMS workflow, the Lynx SG1 introduces a new paradigm to high volume and complex 3D

rising populations — up to 40% of the population lives near the coast — coastal mapping is now critical for many countries. Bathymetry data and flood plain mapping are essential for understanding and managing near shore habitats and handling disaster planning, environmental impacts and the challenges from growing populations and rising sea levels.

As for our regional strengths, North America is our stronghold and we also have a good presence in Europe. Optech is now focusing on Asia in particular, where the ratio of GIS business to GDP is rising fast. China is currently a growing market for us, and Optech's acquisition by Teledyne Technologies is enabling us to further expand our operations in the region, thanks to their already strong presence in the region with offices in major cities. We will soon have our own office in China co-located in one of the Teledyne offices.

Which are the latest innovations from Optech?

Optech has long been a leader in LiDAR technology and data quality, but we have now refined our technology even further. Our aim is to achieve the accuracy that our clients require without sacrificing productivity of mapping projects. Optech is focusing on a full system workflow solution, not just on hardware, enabling clients to deliver data that meets project specs and deadlines faster and more economically.

In terms of products, our road maps support the introduction of new products designed to meet many of the needs mentioned above — but that is all I can say at this point! Our line of airborne LiDAR mappers branded ALTM includes our flagship model, the Orion. It was the first LiDAR mapper specifically designed for UAV operations, thanks to its very small footprint and is being successfully deployed in-theatre. It is also used for commercial mapping projects using standard airborne platforms (fixed wing or rotary). We recently introduced the Pegasus ALTM, the first dual-laser system, which delivers highly accurate and dense data at higher altitudes.

data processing with Optech LMS Pro. This has taken the dedication to efficiency and accuracy of LMS to a new level, enabling blazing fast speeds through distributed processing while using complex optical and mathematical models to rectify LiDAR data files to such a level of accuracy and quality that they require no further refinement, independent of the operator of the software.

In LiDAR bathymetry, an important but highly technical and challenging sector, we continue to advance our coastal mapping and imaging system, CZMIL, which was developed by Optech for the US Army Corps of Engineers and US Navy for their bathymetric needs. With CZMIL, we feel that airborne bathymetry has come of age. Previously, airborne bathymetry had been limited to fairly clear waters, but with the development of new electronics and algorithms our system can now extract information from muddy bottoms and turbid waters that were previously impenetrable to airborne platforms. This unique sensor system is opening several opportunities for us in other fields, as well.

How has the acquisition by Teledyne helped Optech?

It has been a big help. Teledyne comprises of several technology companies that are well-aligned in various market segments. In particular, Teledyne has a strong marine segment, and Optech technology and products are complementing nicely their current product portfolio by providing our customers with a full spectrum of solutions to meet their needs from the efficiency of an aerial platform as well. Like Optech, some Teledyne companies are involved in the geospatial industry, which generates the opportunity for synergy between sister companies and their technologies. For example, not long ago a ship sank off the coast of Italy. Sonar technology from a Teledyne sister company and LiDAR mapping technology from Optech were used to map the ship above and below the water simultaneously.

Another advantage of being part of Teledyne is that it facilitates “not-for-profit” research and development, and

whenever a technology of interest is developed, it can be shared and deployed by all sister companies.

Optech has a very good presence in software and hardware market. How have you maintained this balance?

Everyone talks about “solutions,” though that is an over-used term. A solution is only useful if it really meets a need, and this means different solutions for different applications. We have a tremendous depth in LiDAR and related technologies, and we have leveraged that to focus on developing relevant solutions to serve specific vertical markets, ranging from terrestrial and marine to space. A complete solution for the rail industry is different from what is needed for marine or engineering, and the Optech advantage is that our core technology platform focuses on providing collection efficiency while maximising data accuracy, enabling customers to achieve their business goals. The CZMIL HydroFusion software, for example, integrates data and imagery from three different sensors, using a common workflow from flight planning and acquisition to data processing and the production of bathymetric data products. For simpler applications, we also provide software that efficiently parses and processes LiDAR point data for easy ingestion by industry-standard software.

What are your plans of diversification?

Our focus on client needs gives us two main drivers. First, we bend over backwards to ensure that the delivered system performs to its maximum. Second, we adapt systems to meet their project requirements. This focus means we continuously innovate to provide our clients with system solutions that meet their business needs. Optech has a history of firsts since our founding over 40 years ago: first laser terrain profiler, first airborne bathymeter, first terrestrial system, first multisensor airborne systems, first mobile mapping system, etc. This has been achieved by incorporating new technology while making

systems simpler and more efficient, which has contributed to the growth of the industry.

What, according to you, has been the biggest change in the fields of terrestrial and mobile mapping?

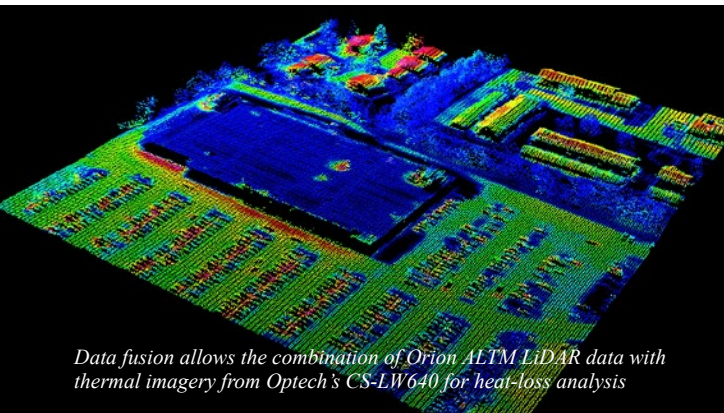
Clearly, the biggest change has been the need for multispectral LiDAR systems (not just the hardware side) for specific applications such as infrastructure building, forestry and bathymetry. To develop the right solution, we have been developing different types of lasers along with complementary software that enables the extraction of accurate information in an efficient manner. We have moved from what I call uni-modal sensors — one LiDAR or one camera system — to true sensor fusion, in which different sensors are coupled together in a fully co-registered manner. CZMIL, for example, uses a bathy/topo LiDAR, RGB camera and hyperspectral imager, and most of our airborne and mobile systems also incorporate both LiDAR and cameras. The result of this has been the successful development of software that can process, visualise and fuse the data. Sensor and data fusion is an area where Optech has made enormous strides, winning numerous awards for software suites such as Optech LMS (airborne and mobile data/imagery), and HydroFusion (bathymetric data/imagery).

Optech has been the first in many areas. We were the first to develop commercial airborne bathymetry systems, compact ALTM LiDAR systems, sensor fusion software with processing automation, sensor fusion systems, and other key innovations. Of course, innovation is only good when it can be useful. Innovation that helps our clients meet their needs faster and more efficiently is technology with a purpose, and is what we strive for.

How do you see the market changing in the next few years?

I see the miniaturisation of applications, which will drive the development of new technology and new ways to disseminate location-based information. For example, we see that mobile phones incorporate miniaturised GPS devices, though not with the highest accuracy. However, going small doesn't mean you have to sacrifice quality — a product can be smaller but it must offer the same or better quality than customers are accustomed to. When you put these trends together, you get an emphasis on more information from more sensors in smaller packages. That is quite a challenge, and one that Optech is already tackling every day.

The need and demand for 3D information is only going to grow, resulting in the democratisation of location-based information. These trends are pushing the development of new technologies and applications, and that is where Optech excels. There is nothing but opportunity ahead for Optech. ☺



Data fusion allows the combination of Orion ALTM LiDAR data with thermal imagery from Optech's CS-LW640 for heat-loss analysis

REVEALING UNRECORDED PRE-HISTORIC CARVINGS

Laser-scan and visualisation tools help in revealing extraordinary Bronze Age art at UK's Stonehenge World Heritage Site

While the mysteries of Stonehenge, constructed in England between 3000 BC and 2000 BC may never be truly revealed or understood, a recent examination of the historic monument using cutting-edge visualisation tools has unearthed some fascinating carvings that date to the Bronze Age. It is not yet known what questions about Stonehenge these carvings will answer, but the project did uncover the potential for using laser-scan and visualisation technology on the world's antiquities.

The plan to examine the stone structure more closely began in November 2011 when English Heritage, the UK government's statutory adviser on the historic environment, commissioned the most detailed laser scan survey of Stonehenge ever undertaken. During the project, each stone was recorded in unparalleled detail with point spacing of 0.5 mm by the Greenhatch Group survey company. This huge data resource, comprising more than 850 gigabytes, would lead to new discoveries about the monument.

The enormous task of examining the data was awarded to ArcHeritage, part of the York Archaeological Trust, in April 2012, whose Geomatics and Visualisation team examined the laser scan survey. One challenge was to visualise a large amount of information and identify and isolate very subtle features. Preliminary examination of meshed models showed promising signs of useful information in the dataset. For example, individual tool marks more than 5,000 years old could be seen and identified, but there were also tantalising hints that the data contained prehistoric artwork carved onto the surfaces of the stones.

Detailed examination of data

Examining the meshes alone was not sufficient to draw out these ancient carvings from the data and a different method needed to be employed. The team decided to visualise the original point-cloud data and created a workflow using Bentley Pointools, which enabled large datasets to be loaded, which facilitated the examination of the full 0.5 mm

resolution data. In addition, the shading functions proved instrumental in visualising the most subtle features.



The tool created a greyscale band 7.5 cm wide, which was moved at 1 mm intervals through the data to make a high-quality rendering of the plane shaded image. The process was repeated 75 times to complete a full colour change for every point in the data. Depending on the position in relation to a preset camera plane, each point would be assigned a greyscale value, which creates the potential to see very subtle features hidden in the data.

The team combined all 75 images into an animation, which proved astounding; as the greyscale band was moved

through the data, prehistoric carvings could be seen fading in and out of view.

With the help of visualisation capabilities it was possible to see the eroded prehistoric artwork for the first time in possibly thousands of years. Once the team identified the extent of the carvings, they used measuring and point-location tools to accurately plot the carvings to the Ordnance Survey grid.

Technology enables major discoveries

When the examination was completed, the team had made some major discoveries. For a start, 72 previously unknown prehistoric carvings had been uncovered — almost double the number of known carvings at Stonehenge. The carvings of Bronze Age axes are estimated to be made

Fast Facts

- English Heritage commissioned the most detailed laser scan survey of Stonehenge ever undertaken.
- The 850 gigabytes of laserscan data was visualised and analysed by Arc Heritage using Bentley Pointools.
- 72 previously unknown prehistoric carvings were discovered thanks to the visualisation capabilities of Bentley Pointools.

Marcus Abbott, a member of the ArcHeritage Geomatics and Visualisation team that worked on this project says, “English Heritage presented us with over 800 gigabytes of



from 1750 BC to 1500 BC, roughly a thousand years after Stonehenge was constructed.

It is hoped the carvings will help archaeologists understand the type of civilisation that existed there more than 3,000 years ago. Moreover, these discoveries, exciting in their own right, illustrate how project teams can use laser scan data to make ground-breaking discoveries on the world’s ancient wonders. In addition, using laser scan visualisation techniques on other sites has the potential to greatly impact how archaeologists perceive and utilise technology on future heritage projects.

data; we needed a software solution that could handle and visualise vast quantities of survey data. Bentley Pointools is capable of loading both 3D mesh data and point-cloud data; furthermore Bentley Pointools has a full suite of measuring tools and unique visualisation tools.” This functionality was crucial to the success of the Stonehenge project, and the discovery of unrecorded prehistoric rock art on the stones was first realised in Bentley Pointools. 🌐

Courtesy: Bentley Systems

‘We live in a 3D world, hence 3D tech will only grow’

As a pioneer in LiDAR industry, RIEGL has been responsible for many cutting-edge technological innovations. **Dr Andreas Ullrich**, Chief Technical Officer, RIEGL talks about the company’s future plans and strategies

Instrumentation and software to collect 3D data have changed significantly in the past 10 years. Your comments?

Over the years, the instrumentation has increased in range, precision and speed while the corresponding systems have decreased in size and weight. This has facilitated more efficient systems and more applications for our end users, which increases the value of the technology and improves our customer’s capabilities.

The past 10 years have seen an explosion of LiDAR related software within RIEGL, as well as in third party software solutions. This has facilitated the use of 3D data in applications that were unforeseen at the time. The RIEGL software development has been dramatic in terms of creating the perfect point cloud. In other words, the company has been focused on the challenging aspects of acquisition, processing and registering the 3D data so that its placement in the real world is as precise as possible. We have set a state-of-the art standard in sampling the world in 3D, spatially and radiometrically, through the best use of waveform information and thorough system calibration.

LiDAR/laser scanning from the air and the ground is the biggest of the developments and has become the most preferred technique of collecting 3D data. How do you see its demand shaping up?

Research has shown that growth and demand for LiDAR/ laser scanning technology is expected to grow exponentially over the coming years. LiDAR is still a disruptive technology, which means it will continue to replace existing technology and 3D capabilities. We live in a 3D world and therefore, consumer expectations for 3D technology will certainly continue to grow.

Cutting-edge technological capabilities available today are allowing users to explore new markets and services. Which, according to you, have been the biggest breakthroughs in terms of technology in this field — both airborne and terrestrial?

RIEGL has been an innovator in the LiDAR industry for almost 20 years. In 2004, RIEGL was the pioneer in offer-

ing full waveform acquisition and processing for commercial airborne laser scanning, a feature that offers users unrivalled accuracy, complete data information and operational competitiveness. Full waveform analysis and online waveform processing are today employed in almost all our products — not only airborne but also mobile and terrestrial scanning. Last year, we introduced the LMS-Q1560 airborne laser scanning system, the first fully integrated high performance LiDAR system for ultra wide area mapping, allowing operating altitudes up to 11,000 feet above ground level while still providing an unrivalled high pulse repetition rate of 800 kHz. Another significant development on our airborne side was the introduction of the VQ-820-G bathymetric laser scanner in 2012, combining topographic and hydrographic laser scanning at high speed acquisition rates and, of course, also offering the full waveform processing. The sensor is, compared to other offerings on the market, extremely compact and affordably priced. In terrestrial laser scanning, we have continuously raised the bar with regard to maximum measurement range and performance, resulting in a complete VZ-line product family offering ranges of up to 6,000 meters, allowing users to perform their operations in an extremely efficient and safe manner.

How do you see the market heading, in say, 10 years?

Our customers can rely on the fact that we will continue developing LiDAR instruments that are at the cutting edge of technology. In the next 10 years, LiDAR will even more commonly be accepted as an important surveying method. We will continue to offer the market more innovative LiDAR sensors in combination with the necessary software tools, resulting in a smooth, powerful and efficient workflow.

Which are the new areas of operation that these innovations have opened up?

The VQ-820-G topo-bathymetric laser scanner has opened up bathymetric scanning to a wider user group, due to its compactness and price. It has become easier and affordable for smaller companies to enter the interesting markets of shoreline and topo-bathymetric mapping. Another

example is our proven VZ-400 terrestrial laser scanner, in combination with our new software RiSOLVE. This powerful combination helps users to register static laser scans and generate the necessary surveying results in record-breaking time. This is helping police forces around the world to clear crash scenes on motorways more efficiently and effectively. RiSOLVE can also be used in a variety of other applications, such as city modelling, culture heritage documentation or architecture.

RIEGL is continuously providing the LiDAR markets with innovative products. Our customers can profit from an increased efficiency, due to higher performing instruments and improved workflows, which brings down acquisition and processing time to a minimum for the desired deliverable.

Who would you say is your closest competitor in this field?

I believe that the issue of competition is one which is very fluid. There are the well-known competitors in our principal fields but what is not always recognised is the role of related technologies and their impact on the laser scanning markets. An example is the explosion in the ability of smartphones and structured light devices to map interior rooms. This is a disruptive force for interior laser scanning.

This leads to the importance of RIEGL being clearly focused on innovations and pushing our technology to the limits necessary to meet the requirements of market demand and in fact, trying to anticipate some of those requirements due to our unique vantage point. This guides the product development philosophy of the company and forces the business model to follow.

Once reserved for cutting edge engineering and creative industries, 3D visualisation is finding new and innovative uses across a number of industrial sectors. Your comments?

LiDAR has become a standard tool for a large number of industries. One interesting example which I would like to highlight is a scientific case. Geomorphology is the study

of the changes of the earth. Knowing how the melting of glaciers affects sea level rise helps secure a safer future for mankind. Right now, an ongoing project in the Arctic is making use of our ultra long range VZ-6000 terrestrial laser scanner to monitor the flow of ice into the sea, which gives the ability to predict flooding and inundation rates for coastal cities around the world. This is one of many examples of LiDAR changing the world in an established



“We will continue to offer more innovative LiDAR sensors in combination with software tools, resulting in a smooth, powerful and efficient workflow”



RIEGL VZ-6000 Terrestrial Laser Scanner for extremely long-range measurements up to 6,000 metres

industry. There are many others and we will continue to see them develop with time.

How is the UAV segment emerging for airborne data collection?

UAVs, or the more commonly used term UAS, are a new generation of aircraft about to enter the civil airspace. These airborne systems open up new, complex surveying applications. As previously discussed, RIEGL has been providing innovative LiDAR solutions for airborne and static surveying for more than 15 years. We have been monitoring the rise of UAS very closely and were quick to recognise that a laser scanner specifically designed and developed for UAS was not yet available in the market. As a result of this need, RIEGL developed the world's first survey-grade UAS LiDAR sensor, the RIEGL VUX-1. We introduced this game-changing instrument at ILMF in Denver earlier this year and received overwhelmingly positive feedback from the market. The VUX-1 is a very compact and lightweight scanner, weighing less than 4 kg, and provides ultra high performance with 550 kHz and an accuracy/precision of 10mm/5mm. We expect tremendous demand in UAS LiDAR scanning and we are proud to be

the first LiDAR manufacturer worldwide to provide the market with such an advanced, survey grade solution.

But there are still major restrictions on UAVs for commercial use, with a complete ban in some countries. How can this issue be addressed?

National rulemaking for the integration of UAS into civil airspace is currently an active discussion. So called 'road maps' have been published to harmonise the legislation and classification of aircraft and airspace legislation. Of course, UAS are a new airspace member and it is therefore of utmost importance to proceed with the necessary diligence with regard to drafting registration procedures and airworthiness certificates.

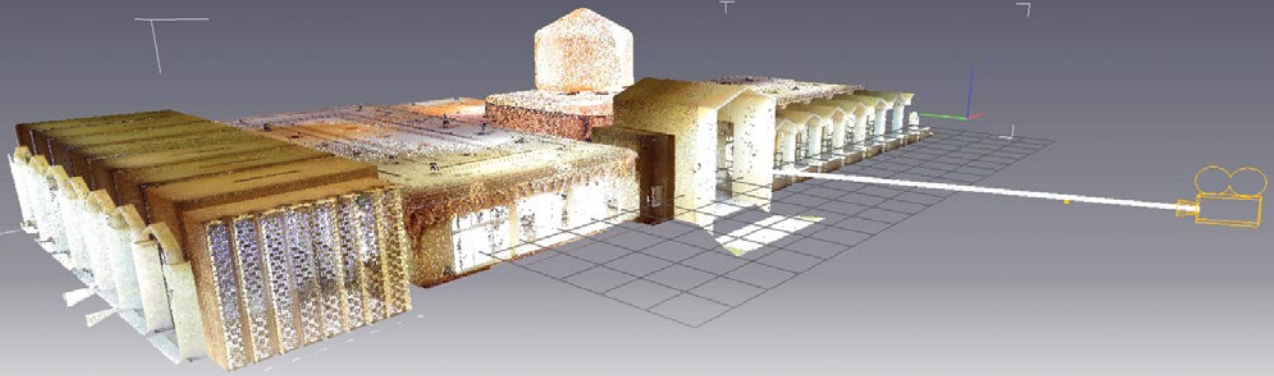
From the surveyors' perspective, the benefits for using UAS are obvious: they can be employed where helicopters and airplanes reach their limitations, as well as in difficult-to-access areas or dangerous zones. But socially, the use of UAS is still questioned. It is critical that the social acceptance for UAS is gained. This can be accomplished by disclosing the social benefits of using UAS in civil applications such as in disaster management, environmental research or natural resources monitoring.

RIEGL has a leading presence in hardware and software. Do you have plans to enter analytics or services?

No, we do not plan to enter the mentioned markets of analytics or services. Our business model is to develop and produce the best performing LiDAR sensors possible for all our main product divisions, namely airborne, mobile, terrestrial and industrial, as well as for our newest segment, unmanned laser scanning. Our slogan is 'Innovation in 3D'. It is our ultimate goal to provide our customers with competitive advantages, to put them into a position to carry out their various surveying missions at industry leading efficiency.

What technological innovations can we expect from RIEGL in the coming times?

We will continue to offer our customers the most advanced LiDAR systems the market has to offer. As discussed, we have just recently introduced a new class of LiDAR for UAS usage and released the first app for the visualisation of LiDAR data on the iPad — RiALITY. Using this app, it is now easier and more convenient to demonstrate LiDAR projects than ever before. It also comes with an impressive augmented reality mode. There will be more exciting releases from RIEGL at Intergeo in Berlin in autumn, and at our next international user conference, RIEGL LiDAR 2015, taking place in Hong Kong and Guangzhou in May 2015. ☺



Restoring Union House Dubai

Using 3D laser scanning technology the historical Union House in Dubai was restored to its old glory

Located at the western end of the Al Diyafah Street, not very far from the sandy Jumeirah Beach, the Union House holds an extremely vital place in the contemporary history of the United Arab Emirates. It was on the historic day of the 2nd of December 1971 when the Union House witnessed the signing of the Treaty that established the first federal state of the Arab world, United Arab Emirates, by joining the Emirates of Abu Dhabi, Dubai, Sharjah, Fujairah, Umm Al Quwain and Ajman. The seventh Emirate of Ras Al Khaimah joined later.

The Union House is also renowned as the location of the United Arab Emirates' second largest flag, which stands atop a 120-metre high reinforced column and measures a staggering 40m X 20m. Today, the Union House is considered to be one of the foremost destinations for celebrating the country's National Day, where citizens and residents from around the country congregate to mark the momentous occasion.

The project

Towards the end of last year, Dubai's Roads and Transport Authority announced a project, which entailed the restoration of this historic building in order to revive and preserve its heritage. The task of documenting the contents of the building and its engineering using three dimensional technology was given to GEOTECH 3D, a Sharjah based company. A 3D model of the building created by laser scan data would help to reconstruct the building accurately in its original dimensions, after demolition.

The mission

Construction work in the first phase of the project involved preparing the site, shifting and protecting artefacts and exhibits, demolishing the old buildings on the site, inspecting and treating the soil and shifting the utility lines. GEOTECH 3D's mission was to 3D scan and extract an as-is 3D model for the Union House. The accurate model was intended to be used as a digital archive and to carry out the renovation plans.

The execution

To carry out this complex task seamlessly, GEOTECH 3D used Leica C10 Pulse laser Scanner, in addition to 360° cameras to digitally record all the internal contents. The primary aim was to accurately record the dimensions of the main building. The 3D digitising system used in the task emits millions of points called point cloud, and the received points are subsequently converted into one point model. During the processing stage, the company generated an accurate 3D reverse model of all the architectural details, dome and decorative templates on the ceiling.

Apart from that, GEOTECH 3D also created a web interface documentation, which presented a panoramic view integrated with the list of building parts and a flash animation video. Some of the deliverables from the project included panoramic images, flash animation web interface, set of high resolution images, 3D Point Cloud Model, 3D Reverse Model as (such as DWG, DNG, 3DS, OBJ) and a video walkthrough. 🌐

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Building the Old Carlsberg

Laser scanning technology was extensively used to transform the historical Brewery of Carlsberg into a sustainable area for living, recreation and business



High density point-cloud in RGB, consisting of billions of XYZ-points.

The historical buildings of the Carlsberg Brewery were founded in 1847 on the outskirts of Copenhagen. Today these buildings stand as a national heritage with 150-year old architecture. Production continued until 2008 and the area is now being transformed into a sustainable area for living, recreation and business. During the transformation process, it was a top priority to preserve and protect the unique qualities of the old architecture. Hence, knowing the exact geometry of the existing structure became vital.

In 2012, Landmålergården I/S (now LE34 A/S) performed a building registration of the historical Brewery of Carlsberg. The registration was delivered as a BIM model that was constructed on top of an extensive point-cloud produced by laser-scanning. The project was carried out for the building owner, Carlsberg Brewery A/S, with Wilkinson Eyre Architects as professional advisors. Magnasoft Consulting India performed as a sub-contractor constructing the parametric BIM-geometry on top of the point-cloud.

Performing the task

The job was carried out using a high speed laser scanner. Scanning was performed with a density of 5-15 points per sq cm of the building surface and took about roughly 400 individual laser scans to cover the 6,000 sqm building floors, including a total cover of the building surface both inside and outside. The resulting point cloud could count 15 billion RGB-colored points.

To obtain a high level of absolute accuracy, the point-cloud was calculated on top of a reference network counting about 200 fixed reference points and numerous moving targets. The reference network was constructed by observations from a high precision total station using the lesser square method, to obtain and estimate the level of precision.

The Big 3 Challenges

Visual quality: Laser scanning automatically picks up colorisation, with only small possibilities to improve the quality. For the production of the BIM geometry this has little impact, but it should be considered a high priority for the forward going usability of the point-cloud.

Quality of classification: Once the BIM-geometry is produced, it will be regarded as the final truth during the design and planning phases. Hence, the classification must be literally free of errors.

Accuracy: The geometry will be considered as the final truth about the building as well. However, one would want the BIM-geometry to be parametric and general rather than exact to the last millimeter. Walls should be vertical and dimensions should be fixed.



Precision of geometry

The precision of the BIM-geometry is affected by three factors:

- The precision of the initial survey.
- The desired level of precision of the BIM.
- The precision of the definition of the building object.

sion down to a few millimetre on each reference point.

Points clouds were then filtered using both automatic and manual methods. Automatic filtering removed stray points and dark points, and manual filtering was performed to remove the obstacles and unwanted objects from the point-cloud. Finally, the refined point-cloud was delivered for Magasoft to build up the BIM-geometry. This geometry was built using a detailed list of specifications on object types and accuracies. The final model that was delivered in the IFC-standard and was evaluated through extensive quality assurance procedures.

Challenges

As the job was performed during the winter season, covering the exterior of the construction involved a number of challenges. The project suffered weeks of delay because of continuous snowfall and rainfall making laser scanning impossible. Snow and ice-cover on the surfaces made scanning and any other kind of registration difficult to the level of impossible. The weather conditions also made access to the construction a risky business with icy and slippery surfaces.

When this problem was somehow overcome, the point clouds turned out to have another disadvantage. When the

weather finally changed from clouds to sunshine, the low sun of the winter produced very deep shadows and overexposed bright areas in the sunshine. This not only affected the BIM geometry, but also was a big disadvantage for visualisation purpose.

Another challenge is the interpretation of the point-cloud, especially when BIM geometry is classified and defined by the staff who don't have on-location understanding. Using the digital images produced during laser-scanning, offers a great support in this task. However, mistakes were still present. An illustrative example was the presence of a steel thermos on top of a boiler that was mistaken for a valve. To minimise this kind of mistakes, first of all, highly trained staff was put on the task and, secondly, all geometries and classifications were quality assured by the local staff. Errors did occur even with such precautions. As an example, openings closed by light material and then covered by one sealing together with the original walls were missed. The only way to catch such errors was to examine each section of every constructive object on-location and comparing the resulting geometry with the old building drawings. On this project, this kind of quality assurance kept the errors of classification down to less than 0.1%. Still with thousands of objects, a number of errors were discovered.

The evaluation of the project basically covered three areas of challenges to the quality: ☺

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Oman Moves Ahead with New Geodetic Datum



Established by the National Survey Authority of Oman, the Oman National Geodetic Datum seeks to create a homogenous horizontal survey control for the country and provide the GPS user community with modern surveying infrastructure

The National Survey Authority (NSA) of Oman has embarked on a novel project to establish the Oman National Geodetic Datum (ONGD14). The primary objective of the ONGD is to create a homogenous horizontal survey control for the country and also provide the GPS user community with modern surveying infrastructure. The project would be carried out by strengthening the existing national geodetic control through the enhancement of the old control network and further establishment of GPS Oman National CORS Network (ONCN) stations. Although the NSA has been working in this direction for a number of years now, it was realised that a new geocentric datum based on the latest global ITRF system solution was the need of the hour in the country. The existing WGS84 (ITRF89) system had to be updated so that NSA could provide the country with the latest global and accurate geocentric datum of ITRF2008 epoch 2013.

The task began with selection of 20 existing GPS primary and first order control stations covering the entire country. The campaign covered seven primary stations and 13 first order

GPS stations. A total of five GPS field teams were deployed by the NSA for the campaign with five stations being occupied per session by each team. For each of the stations, the GPS observations were carried out between seven to 23 days using five GPS receivers. Subsequently, a main network was created comprising an initial 56 selected IGS stable stations.

GPS observations were carried out for 20 NSA stations between January 26 and March 25, 2013. Data in T01 format were converted to Rinex Version 2.11. Downloading of Rinex Data from IGS Global Data Center (GDC) was carried out using customised file transfer protocol script for 59 stations. Verification of Rinex header for all stations (NSA and IGS) was done using TEQC program from UNAVCO. Marker names, receiver type, antenna type and antenna height are the main parameters for verification purposes. Downloading of IGS final orbit and IGS final earth rotation parameters (ERP) from IGS central bureau were also carried out. On-Line Ocean Loading computation from Onsala Space Observatory (OSO) was carried out for 20 NSA stations using FES2004 model. IGS final orbit was used

in all computation with final IGS earth rotation parameter (ERP) from IGS central bureau. Two programmes associated with the orbit computation in Bernese 5.0 are PRETAB and ORBGEN. Ocean tides correction OT-SCRC model was introduced at this stage with development planetary ephemeris (DE200). RMS error of 1–2 cm for each satellite was achieved, which showed that the final IGS earth rotation parameter is consistent with the weekly pole information from the IGS final orbit.

From the initial 56 planned IGS stations, seven stations had data outage for the entire observation campaign. Daily data availability for all the IGS stations



courtesy: NOAA

Selected IGS stations

was more than 50 days except for DAEJ with 46 days, ZAMB with 25 days and KUNM with 6 days. GPS observations for NSA stations were between seven to 23 days. However, due to corrupted data, the observation data for only four days is available for NSA 1066. Daily observation data for NSA stations spanned from a few hours to 24 hours. Most of the short data came from the first and last days of the observation campaign.

Combination of solutions

Normal equations in Bernese Software may be stored by the programmes GPSEST and ADDNEQ2 for a sequence of solutions, including a large number of parameter types (coordinates, troposphere, orbit parameters, etc.). The special features of normal equation stacking methods allow for extremely rapid and flexible computation of many solution types, without going back to the original observations. Normal equation from daily solutions can be combined in a multi-session solution with ADDNEQ2 program.

A total of 59 daily normal equations were divided into eight multi-session solutions with the first seven combinations comprising of 7 and the last one 10 daily solutions. The combination of solutions from DoY 026 to DoY 032 coded as Block 01 consisted of 52 stations including four NSA stations, namely NSA1058, NSA 1066, WPC3 and WPD1. Number of solutions for each station was between two to seven days with 17 station solutions eliminated due to high residuals in one of the components.

Final combination solution

The geodetic datum of the network must be defined based on some reference sites with well-known coordinates, especially for non-global networks. To ensure consistency with the orbits and earth orientation parameters, it is recommended to include some nearby stations from the global IGS network as reference sites. The precise IGS coordinates and velocities for these stations may then be used for datum definition purposes. A no-net-translation condition or tight constraints on the single reference stations is well-suited for a final coordinate solution. It is advisable to check the performance of the fiducial sites and, if necessary, to remove problematic stations from the list of reference sites. Using coordinates of one or several reference sites given in a well-defined reference frame, the estimated coordinates can be aligned to that frame. In contrast to the absolute geometry, the internal geometry of the network is very well determined by GNSS measurements because a shift of a single station in a network cannot be compensated by simply adjusting the clock and ambiguity parameters. The final combination of solutions was carried out as follows:

- Combination of eight multi-session normal equations was achieved.

- 48 selected IGS stations were held fixed with the coordinates transformed to an epoch of the middle of the campaign
- Free network adjustment with the introduction of 3-parameter Helmert's transformation was applied to the campaign solution
- Results were analysed statistically for coordinate repeatability and RMS of residuals
- Bad solutions were excluded at this stage
- The RMS of campaign solution noted to be less than 10 mm in the horizontal and height components

Results and analysis

The final combined solution consists of eight multi-session solutions with 68 stations (20 NSA stations and 48 IGS stations). Minimal constraint adjustment using free network solution with 3-parameter Helmert's transformation was used to adjust the daily normal equation freely and transform them using initial 48 selected IGS stations. With short data span, the introduction of reference velocity for the fixed stations is not possible; hence, the final coordinates for all stations were fixed at the middle of the observation epoch. RMS of residuals was 2.00 mm, 2.90 mm, and 4.26 mm for northing, easting and height components respectively. It can be concluded that the internal accuracy of all stations from the free network adjustment is less than 5 mm in all components.

Comparison of IGS station coordinates was done in order to determine the accuracy of the network with respect to the IGB08 reference frame. The RMS of fitting came out at 3.9 mm, 5.5 mm and 8.3 mm for the northing, easting and height components, respectively. It can be concluded that the accuracy of NSA stations with respect to the IGB08 reference frame with free network strategy is 5.9 mm to 8.4 mm in the horizontal component and 12.56 mm in height.

In closing

The revision of a geocentric datum is inevitable considering that satellite positioning systems would have widespread use in this millennium and the positions referenced to the existing datum would not be compatible with the updated satellite-derived positions. The revision of a global geocentric datum based on the current reference frame would allow the implementation of Network Based Real-Time GNSS Services (RTKNET) for a single standard for the acquisition, storage and the use of geographic data, thus ensuring compatibility across various GIS applications. 🌐

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Data Models and GML Application Schemas: Key to Interoperability

People involved in geospatial data sharing are familiar with geospatial data models. Because the OGC Geography Markup Language (GML) is so widely implemented in GIS and other geospatial software products and solutions, it is also important for data sharing decision makers to understand GML application schemas and profiles.

Data models and data coordination

An information community is an industry, profession, academic discipline or other domain that shares a set of spatial information communication requirements. The data model used by an information community is an expression of their spatial information communication requirements.

Information communities have been doing ‘data coordination’ for decades to develop common data models. A data model details how to make information about real world objects useful as digital data. Domain experts in agriculture,

weather or hydrology create data models by representing geospatial features and feature relationships in a conceptual language, such as Unified Modeling Language, which is then used to design tables in databases and encodings.

Different information communities work on different kinds of problems, and so they have different data models; yet they still need to share information with other organisations.

GML: International data encoding standard

The OGC Geography Markup Language (GML) Encoding Standard, a widely implemented international open standard, was developed to support the sharing of vector data as well as raster images and other kinds of spatial data. OGC Web Service interface standards, such as the OGC Web Feature Service (WFS) Interface Standard, provide the basis for operations to request GML-encoded data and to respond to such requests. The WFS standard is implemented in nearly all commercial GIS products and applications.

Electrical Utility Constructs

Logistical Constructs

Transportation Construct

Forestry Constructs

Location Service Constructs

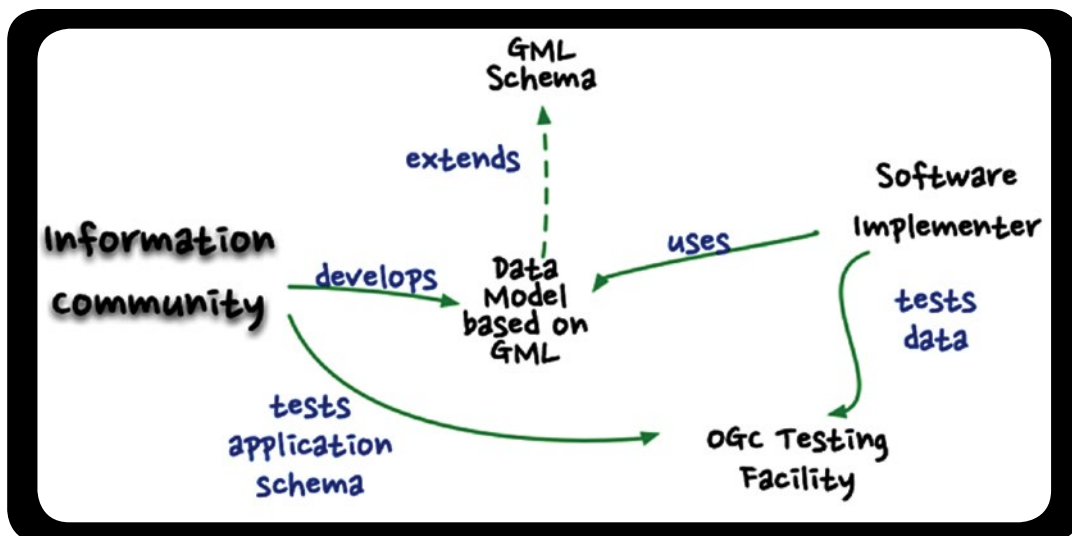
Hydrographic Constructs

APPLICATION SCHEMAS

Common Geographic and Geometric Construct

GML Core Schemas

Numbers, Strings and other Digital Data Primitives



GML provides the basis for domain- or community-specific ‘application schemas’ and ‘profiles’ that support data interoperability within a community of interest. These tailored, streamlined versions of GML require no change in any system that already implements OGC Web Service interface standards.

A profile is an implementation case of a more general standard or set of standards. An application schema is a profile that only implements one standard. The difference between application schemas and profiles, however, is not important for the purpose of this article.

GML contains a rich set of constructs for encodings: feature, geometry, coordinate reference system, time, dynamic feature, coverage (including geographic images), unit of measure, map presentation styling rules, etc. This set of constructs includes many elements that are not needed for a particular data model, and so they can be excluded from an application schema or profile. An extreme example, the GML Point Profile contains only a single GML geometry, namely a <gml:Point> object type.

In designing an application schema or profile, an information community includes only what is necessary to encode their information model. This results in much simpler, ‘lighter weight’ GML encodings that require less storage, less bandwidth and less processing time. They also require less time for developers to learn and implement the encodings. There are more than 30 GML profiles and application schemas across multiple communities documented on the OGC Network in a list that has not been updated lately. The current actual number of profiles and application schemas is much larger.

When an information community implements their data model in GML using a GML application schema and/or profile, they realise tremendous gains in interoperability. Data encoded in two different GML application schemas by two different communities of interest may be integrated in a map or further conflated in ways that account for semantic inconsistencies.

The Ordnance Survey of Great Britain and the U.S. Census Bureau (in its TIGER data) provide data as GML application schemas. Also, the International Association of Oil & Gas Producers’ (OGP) Seabed Survey Data Model (SSDM) is implemented as a GML application schema. In Europe, the Cultural Heritage data model built under the auspices of the European INSPIRE Directive uses a GML application schema to capture the content and structure of the georeferenced cultural heritage data set.

Testing GML application schemas

The OGC Compliance Program provides an online free testing facility that information communities can use to validate GML 3.2.1 instances or GML Application profiles. Several Reference Implementations are also available in the Compliance wiki. Implementations that pass a compliance test can get certified using the OGC certification process.

The OGC Compliance Program enables Governments to easily and effectively mandate GML in procurement language. It also provides a way for developers to gain market visibility.

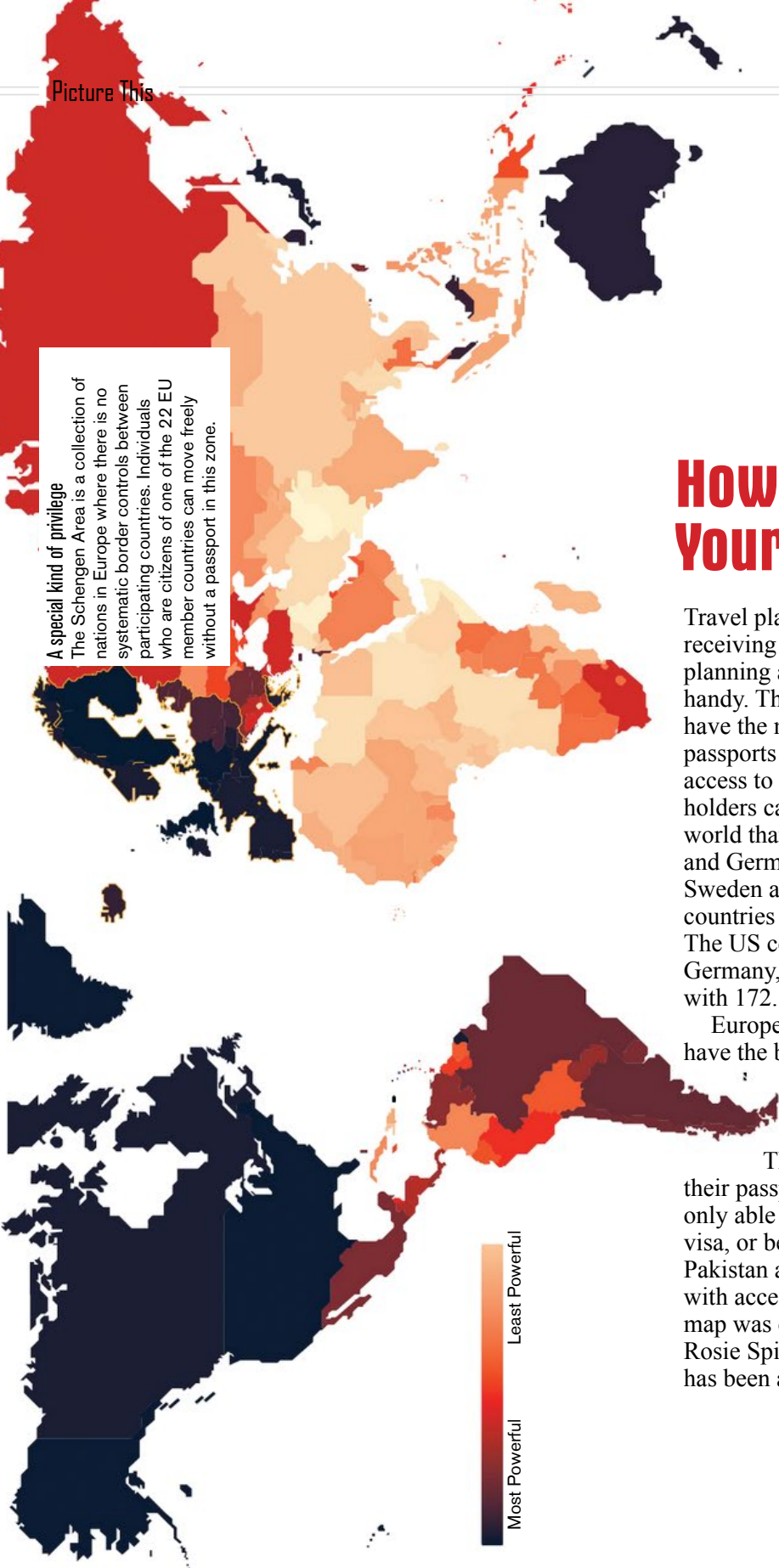
Summing up

After information communities create agreed-upon data models, they can then create GML application schemas and profiles based on those data models. OGC validation tools are available that communities can use to be sure their schemas and profiles are implemented correctly. Because the OGC GML Encoding Standard is implemented in the software of so many geospatial product providers and solution providers, it is an extremely useful encoding standard and an essential enabler for intra-community and inter-community interoperability. 🌐

Luis Bermudez, Director of Interoperability Certification, OGC, and **Ron Exler**, Senior Consultant

A special kind of privilege

The Schengen Area is a collection of nations in Europe where there is no systematic border controls between participating countries. Individuals who are citizens of one of the 22 EU member countries can move freely without a passport in this zone.



How Powerful is Your Passport?

Travel plans spoiled because of not receiving visa in time? Next time, while planning a holiday this map might come handy. The map shows which countries have the most powerful and least powerful passports in terms of gaining visa-free access to other countries. British passport holders can enter more countries in the world than America, Canada, Australia and Germany. The United Kingdom, Sweden and Finland top the list with 173 countries granting them visa-free access. The US comes in second along with Germany, Luxembourg and Denmark with 172.

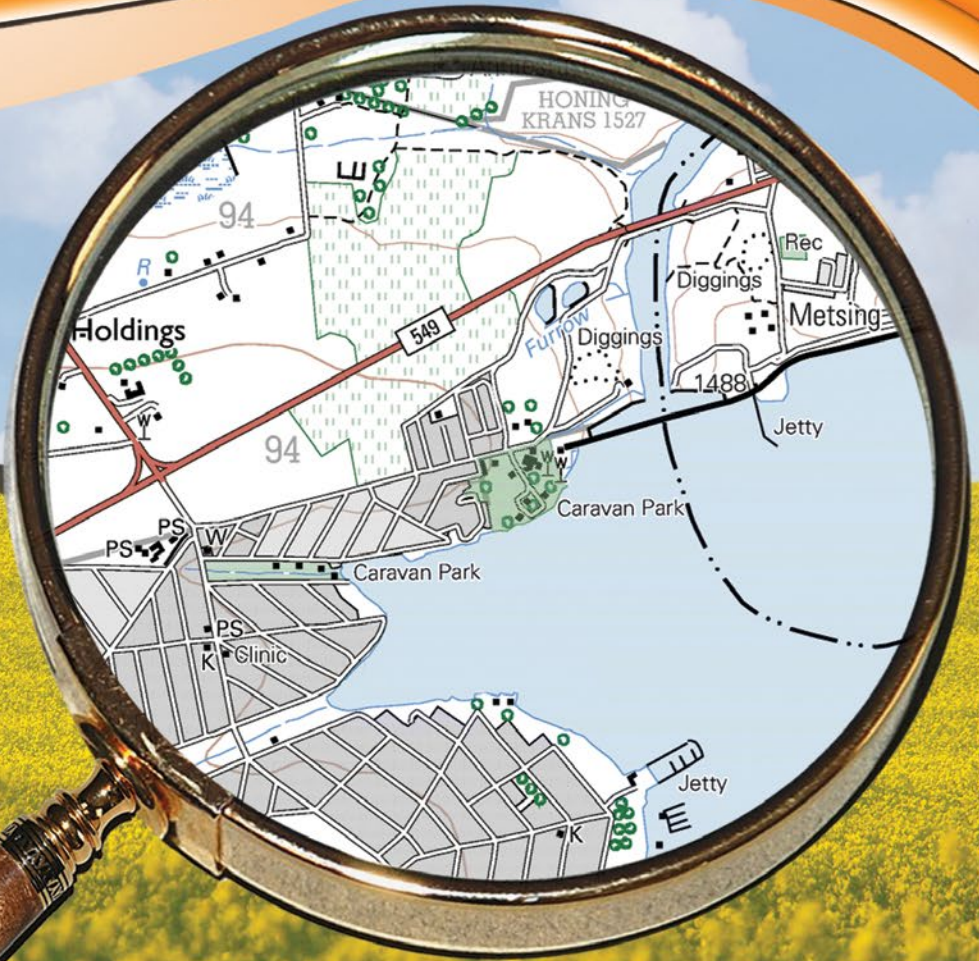
Europe, North America and Australasia have the best access to the world. While, South America has moderate access and people in Asia and Africa struggle to travel at all.

The nation with the least power in their passport is Afghanistan, with citizens only able to visit 28 countries without a visa, or being given a visa on arrival. Iraq, Pakistan and Somalia also come bottom, with access to just 31 or 32 countries. The map was originally designed by Rosie Spinks for GOOD Magazine and has been adapted by MoveHub.



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	<p>August 6 -8 UN-GGIM4 New York, US ggim.un.org</p>	<p>August 11 -13 Geo for Higher Ed Summit 2014 California, US geoforhighered2014.earthoutreach.org</p>	<p>August 19 -20 Africa Geospatial Forum Nigeria www.africageospatialforum.org</p>	
August	<p>September 2 -3 Open Source GIS 2014 UK www.nottingham.ac.uk/osgis/home.aspx</p>	<p>September 8 -9 GIS Forum MENA Abu Dhabi, UAE www.gisforummena.com</p>	<p>September 8 -13 FOSS4G 2014 Oregon, US 2014.foss4g.org</p>	
	<p>October 7 -9 INTERGEO 2014 Germany www.intergeo.de/intergeo-en</p>	<p>October 20 -23 From Imagery to Map China www.racurs.ru/?page=75</p>	<p>October 21 -24 Geo for Good User Summit California, US geoforgood2014.earthoutreach.org</p>	
September	<p>September 22 -25 Latin America Geospatial Forum Mexico lagf.org/2014/index.aspx</p>			
October				

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