GIS PROFESSIONAL

OCTOBER 2017
Issue No 78

geomares PUBLISHING

WWW.GIS-PROFESSIONAL.COM

...joining the geospatial jigsaw

Opensource GIS – A disruptive force or a driver of innovation?

AGI ready to welcome GeoCom17

MapAction brings response to disasters

Reimagine INSPIRE by leveraging open data and Web GIS

Development of a symbol system for disaster management

The ZenoCollector

Ready to work when you are

Simplifying high accuracy data collection

The ZenoCollector combines the hardware excellence of Leica Geosystems with the world's leading GIS software from Esri to deliver high accuracy data collection in ArcGIS.

The solution delivers sub-metre or centimetre survey grade position accuracy into Esri's industry leading Collector for ArcGIS app. This uses the Leica Zeno 20, the world's first handheld with Android operating system, enabling field data collection and editing in a simple, user-friendly interface on an ultra-rugged device.

To find out more information about the ZenoCollector, please contact:

uk.sales@leica-geosystems.com

Or visit:

www.esri.com/zenocollector

Leica Geosystems Ltd
Hexagon House, Michigan Drive, Tongwell,
Milton Keynes, MK15 8HT

Tel:01908 513464
uk.sales@leica-geosystems.com
www.leica-geosystems.co.uk

PART OF HEXAGON

esri

Leica Geosystems

GiS PROFESSIONAL

GiS Professional is published bi-monthly by Geomares Publishing UK Ltd and endorsed by the UK's Association for Geographical Information. Our mission is to help grow the business for the whole GIS community by providing an effective, reliable and timely medium for news, information and comment.

Publisher: Durk Haarsma
Content manager: Joost Boers
joost.boers@geomares.nl
Advertising: Sharon Robson
sharon.robson@geomares.co.uk
Sub-editor: Jason Poole
jason.poole@geomares.co.uk

CONTACT DETAILS
Geomares Publishing UK Ltd
Unit 2A Mindenhall Court, High Street
Stevenage, Hertfordshire, SG1 3BG, UK
Tel: +44 (0)1438 352617
e-mail: editor@geomares.co.uk
web: www.gis-professional.com

Subscriptions: Yearly subscriptions (six issues) are £34.95 (UK) or £37.50 (worldwide). For more information visit https://www.gis-professional.com/magazine/subscribe or email circulation@geomares.co.uk

Publishers: Geomares Publishing UK Ltd
 ISSN 1748-3646

Printing: The Manson Group, St Albans

Design: ZeeDesign, Witmarsum, www.zeedesign.nl

COVER STORY

MapAction, on the image operating in Haiti, is a humanitarian mapping charity that works through skilled volunteers. See the article from page 20.

CONTENTS

Next Issue: December 2017
Copy Dates Editorial: 13 November
Advertising: 20 November

To subscribe to GIS Professional go to www.gis-professional.com/magazine/subscribe

Views of the GIS Professional Contributors

It's interesting to see how technology evolves and how important geospatial data has become. The difference between how simple it may look to link data together and how difficult it sometimes can be, are two different things. It's the technology – but we can overcome that hurdle. The most important challenge is often is in the organisation, or organisations. They may work together well, however it's eye opening if you hear about a project related to INSPIRE where a project manager saw a tweet related to the project along the lines: 'Thanks to INSPIRE I can use the data that is created in the office next door'. At the same time, I really am fascinated with autonomous learning, this leading to road maps being updated automatically with data collected and transmitted by self-driving cars in real time. I can't wait for this to be daily practice!

Joost Boers, content manager
joost.boers@geomares.nl

The past few months have been exciting ones in the geospatial world. From the 7th annual UN-GGIM conference in New York in August to the 10th annual INSPIRE conference in France and Germany last month, there has been lots of collaboration among the international geospatial community. The OGC hosted Location Powers: Underground Infrastructure event at the Geovation Hub in London was followed by its Technical Conference the following week. QGIS revealed some exciting new 3D features in advance of its upcoming QGIS 3 launch, Pitney Bowes announced some software updates and Big Data solutions which are sure to interest the business intelligence community, while Australia committed its future to Earth Observation and Remote Sensing by announcing that it will launch its very own national space agency.

Niall Conway,
contributing editor

Open data stimulates innovation and provides many opportunities for the development of new products and services. I am a happy user of open data, especially open satellite data such as Sentinel images (from the Copernicus programme) and the extensive Landsat archive. However, in my experience it can also be a real challenge to discover and use the right open data. Combined with potential political and commercial obstacles for open data in general, one can conclude: open data is definitely a great movement, but not as simple as it seems.

Sabine de Milliano, contributing editor

"The global **open data** movement has helped governments make inroads into solving problems with a data-driven approach. Open data provides a **new kind of glue** to bring governments and citizens together. It facilitates interaction, provides the means to rally around **shared objectives**, and helps everyone stay **connected** and informed as improvements take place."

Jack Dangermond, Satish Sankaran,
Roberto Lucchi, and Marten Hogeweg

Linked Open Data Tools Bring Victory

The European Space Agency (ESA) Space App Camp 2017 – the event where coding meets big data from space – awarded on 18 September in Frascati, Italy, ESA's centre for EO, the winning team: Limoncello and their app AiR that uses satellite imagery to give flight travellers an interactive, bird's-eye view of their routes. The developer team makes use of augmented reality and the Copernicus programme to display an interactive projection of the world for users to see information about cities and landmarks they fly over, without disruptions like clouds or the plane itself getting in the way.

• ***bit.ly/2fQh4aC***

Limoncello receives the Space App Camp award with their app AiR.

Alliander Receives Esri Netherlands Enterprise GIS Award

During the Esri GIS Conference in Rotterdam, The Netherlands, Walter van Boven, IT manager of utility company Alliander, received the 2017 Enterprise GIS Award for its implementation of geospatial information systems throughout The Netherlands. The two-day event on 20 and 21 September 2017 was packed with information, presentations by a wide range of organisations, case studies and workshops on various subjects.

• ***bit.ly/2fQtmzI***

Presentation of the Esri Enterprise GIS Award 2017 to Alliander.

Top 5

Most popular news and articles last month on www.gis-professional.com

Reimagine INSPIRE by Leveraging Open Data and Web GIS	bit.ly/2fQv1VY
GIS Challenges and Trends 2017	bit.ly/2w2ylCQ
3D Mobile Mapping Technology Inspires Positive Change	bit.ly/2fQ9FYT
Big Geospatial Data Helps Modernise the Statistical Field	bit.ly/2fOXLOO
The Revolution of GIS in Map-making	bit.ly/2fQG95i

Podcast Series on Contribution of Location Technology

Esri has launched 'Esri & The Science of Where', a weekly podcast that features executives, thought leaders, industry analysts, technologists, and Esri experts discussing how location-powered technology intersects with key trends such as the Internet of Things, big data analytics, artificial intelligence, smart communities and digital transformation.

• ***bit.ly/2fOoSJJ***

Ordnance Survey to Support Singapore

Ordnance Survey International (OSI) has been contracted to support the National University of Singapore and the Singapore Government with its continued vision to be a Smart Technology world leader. The two-year project will address the automation challenge of converting IFC-BIM, which is building and construction industry data, into CityGML, an open standardised data model and exchange format that stores digital 3D models of cities and landscapes.

• ***bit.ly/2fOoJpF***

Better Cooperation in Fibre Networks of Three Swedish Communities

Digpro has been selected to provide the three Swedish neighbouring municipalities Dorotea, Åsele and Vilhelmina with the geographic information system dpCom for their fibre networks. With one system installed the three neighbouring municipalities can interact and learn from each other.

• ***bit.ly/2fOWgQG***

Siemens Strengthens Technology Portfolio for Digital Buildings

The Siemens Building Technologies Division is incorporating infsoft's integrated solutions into its product portfolio. infsoft offers software solutions and system components for indoor positioning processes. The products enable accurate real-time positioning of objects and people inside buildings.

• ***bit.ly/2fPO6Yg***

Siemens enters into a partnership with Infsoft.

BY NIALL CONWAY

Talking to Dr Suchid Anand - Key Advocate of the Global Opensource Movement

Suchith Anand is chair of the ICA Commission on Open Source Geospatial Technologies. He is leading open source research at the University of Nottingham and he established the Open Source Geospatial Lab. He was one of founders of the Open Source GIS Summer School initiative and the Geospatial Open Source, Open Standards and Open Data e-learning initiatives. He is also the founder and co-chair of the Open Source GIS Conference Series. Dr Anand is passionate about GeoForAll, the Open Source Geospatial Foundation's Committee for Educational outreach – all reasons to talk with him.

How did you get into the geo-spatial world (i.e. through and interest in geography or technology) and how did this lead to your work at GeoForAll?

I come from a state called Kerala in India. I came across GIS by serendipity. Twenty years back, I was a student in Civil Engineering in India and by pure chance I came across a short article in a magazine in my college library on the amazing Geographic Information System that is used by town planners. That was the first time I heard about the wonderful technology called GIS!

At that time there was no GIS in the college where I did my degree. I still remember the struggles I went through to get access to GIS. I got some amazing opportunities later on to learn, so now it is my duty to support others in learning GIS. I am very grateful for the scholarships and help from lots of amazing people that helped me. My PhD was on automated generalisation for MobileGIS, which I did at the University of South Wales. I later joined the University of Nottingham in 2005. As of last month, I am very fortunate to get the opportunity to work for the Global Open Data for Agriculture and Nutrition (GODAN).

I was determined from the start to making geospatial education opportunities accessible to all. I volunteered for the Open Source Geospatial Foundation (OSGeo) and started working on the education committee. In 2010, I established the first Open Source Geospatial Lab in the UK at the University of Nottingham. I didn't even have any initial funding for starting the lab! But thanks to all my amazing colleagues and students who came forward to support this idea, we were able to put this into action. The idea from the start was to create a network of dedicated Open Source Geospatial Labs in universities worldwide to expand geo education and research opportunities. We did this by bringing together like-minded communities to support a common mission. In 2011, we worked to get a MoU between the International Cartographic Association (ICA) and the Open Source Geospatial Foundation (OSGeo) with the aim to establish 5 open source geo labs in 5 years time. We now have over 100 labs established in universities worldwide! I am actively contributing to wider initiatives in open data, open education and open science with the aim to build upon all these synergies in expanding our mission for Open Principles in GeoEducation.

Can you tell us a bit about the Community (structure, membership and aims)

GeoForAll is the Open Source Geospatial Foundation's Committee for Educational outreach and works in close collaboration with partners worldwide in our mission for making geospatial education and opportunities accessible to all. In September 2011, the Open Source Geospatial Foundation (OSGeo) and the International Cartographic Association (ICA) signed a Memorandum of Understanding with the aim of developing on a global basis collaboration opportunities for academia, industry and government organisations in open source GIS software and data. This MoU aims

to provide expertise and support for the establishment of Open Source Geospatial Laboratories and Research Centres across the world for supporting development of open-source geospatial software technologies, training and expertise. The International Society for Photogrammetry and Remote Sensing (ISPRS) joined the GeoForAll initiative in July 2014. We have an advisory board setup of eminent experts, Regional Chairs and Thematic Chairs who provide us the excellent leadership. Our strength is in our amazing volunteers around the world who are contributing to the mission. We are a global community and our members are from government organisations, academia, industry, startups, NGOs, teachers and students. All interested are welcome to join our community.

Do you have an example of how GeoForAll improves lives?
One example that I would like to share is the excellent work done by Sergio Acosta Y Lara and our colleagues in Uruguay. The amazing work that they have done through the gvSIG Batovi initiative to enable spatial literacy education opportunities to schools has been an inspiration for us all. This is an excellent example of a successful initiative and impact in Open Principles in Education. This empowerment of educators and students is the true essence and gift of Open Principles.

What is the role of GeoForAll considering the changing nature of the field - new markets, commercialisation of OS (e.g. Boundless Spatial) and the increasing developer-oriented nature of the field. Are we losing touch with the geographic foundations and how do we engage new communities?
It is very important that there are no monopolies created in GIS. Having lot of companies and start-ups in the geo domain will ensure healthy competition which will help drive down costs and help accelerate innovation opportunities for all. Having more options for reducing risks to any proprietary lock-in will be a key factor in achieving cost savings and improving efficiencies for governments and organisations worldwide. GIS is fundamental technology in infrastructure development and high cost proprietary GIS is unaffordable to governments, town planners and local authorities in developing and economically poor countries. In order to achieve United Nations Sustainable Development Goals by 2030, it is essential to provide free and open source geospatial tools and open data to universities and government organisations in developing countries for helping them achieve these targets.

Awareness among decision-makers policy - is it improving and what else should be done?
We have come a long way. I remember just 10 years back when I was sharing ideas about Open Principles in GIS, I was even laughed at by some! The pace of change in GIS in the last decade towards openness has been beyond even my expectations. GeoForAll was initially started by scientists and research active academics to build strong foundations for Open Geospatial Science. We are now seeing lots of support from governments, industry and academia who are seeing the benefits and are actively supporting us. In the United Kingdom, the UK Government Action Plan on Open Source, Open Standards and ReUse is a step in the right direction. It is important that national and local governments look at the big picture and long term view (and join forces and efforts) for mechanisms to train and support GIS teams in government and develop a robust innovation ecosystem. There should be immediate steps taken in the UK to create a National Centre for Open Government with expertise in Open Technologies and Open Data to build best practices in open source geospatial implementations and open data. There needs to be support and training facilities available in the local GIS departments. Investing in people is important for long term impact.

What are your thoughts on the potential of the current satellite data deluge (i.e. Sentines, Landsat, Planet etc.)?
Open data is a very important engine for economic growth as well as key for helping solve global challenges. I believe advances in geotechnologies will play a key role in helping us make use of all these amazing open data sources for delivering near real time actionable information to help us solve global challenges from food security to extreme weather events.

Advice for people thinking about getting involved in GeoForAll and to feel involved?
Access to quality education and opportunities is key for getting rid of extreme poverty and enabling broadly shared prosperity for all. I really hope colleagues will get ideas to work on solving global challenges based on some of the experiences that I shared. You need to have a strong commitment to a mission for this. Reflecting on our journey, I would say that it was a leap of faith and I believe that if you are doing something for the global good, things will somehow happen to make it possible. Please join our mailing list and be part of the community. We look forward to working and building collaborations with all interested in this education mission.

MORE INFORMATION
http://www.geoforall.org/

BY JOOST BOERS

AGI ready to welcome GeoCom17

The time is nearing: AGI's Annual Conference Smart Geospatial or #GeoCom17 is taking place on Thursday 26 October 2017 at the Royal Geographical Society in Kensington, London, UK. The programme is promising to be vibrant and inspirational at the same time. And of course, there's plenty of time to network with fellow GIS professionals throughout the day.

MORE INFORMATION
www.agi.org.uk/events/calendar/geocom17/

Registration is possible from 9am – morning sessions go into Talking Technology: what's shaping the need for, delivery of and use of geospatial information? This leads to the topic Perpetual Politics where the speakers are giving examples how policy changes have an impact on the industry and others! With the line-up of speakers this year, AGI aims to reflect the very diverse avenues that geospatial is exploring and the huge range of economic value that location intelligence represents for all aspects of Smart development, in both the private and public sector.

On stage will be Javier de la Torre, CEO of CARTO; Dr Helen Ferrier, Head of Policy at the NFU; Phil Graham, CEO of the National Infrastructure Commission; Tom Smith from the ONS; Professor Kate Jeffery, well-known for her work in advancing neuroscience using location, and Charlotte Jee, Editor at Techworld.

After the lunch break, there will be at least four Lightning Talks presented by members who share insights and experiences in just 7 minutes each! What is new? What is exciting? How did innovation solve problems? It's about challenges, about ideas and cases of the last year. Hands on!

And there's an interactive moment as well: what do you see in the future? What will you take away from this day?

The Conference will be closed with the traditional GeoBeers – a good time to catch up, make new plans, share your knowledge (or get your questions answered) and meet new people!

The support from the sponsors this year means that delegates will have every opportunity to quiz representatives from a dozen leading organisations in the geospatial industry – all with a view on the future of Smart Geospatial.

Figure 1: #GeoCom17 has scheduled a selection of interesting presentations by inspiring professionals.

Highlighted Partners

CADCORP

Cadcorp is a British software development company focused on geographic information system (GIS) and web mapping software. They maintain the Cadcorp Spatial Information System (Cadcorp SIS) - an integrated family of geospatial products comprising of desktop, web and developer products. They help organisations in the public and private sectors by making it easier to share and distribute spatial data between people and between systems. They achieve this by developing GIS and web mapping products that incorporate open and standards-based technologies. Cadcorp SIS is available worldwide through a network of Cadcorp partners and from their sales team serving UK and Ireland. www.cadcorp.com

CADLINE

Cadline is the industry expert in Geospatial Solutions with over 20 years' experience in developing web mapping and

GIS applications. Their proprietary software, DynamicMaps, offers a suite of GIS solutions including: WebGIS, ReportIt, GML Translator, BS7666 compliant LLPG & LSG Management, Street Naming & Numbering and INSPIRE Management software. Cadline are also specialists in Open Source GIS Solutions, with their training team providing QGIS, GeoServer and PostGIS courses which are accredited with the AGI for CPD points which can help towards gaining your Chartered Geographer (CGeog) status. As part of their commitment to providing dedicated support services, Cadline are registered as Service Providers for the OSGeo Community.
www.cadline.co.uk

VERISK ANALYTICS

Verisk Analytics is a leading global data analytics company operating in key vertical markets, particularly insurance, natural resources and financial services. It is listed on NASDAQ and as one of the Forbes World's Most Innovative Companies and Best Employer.

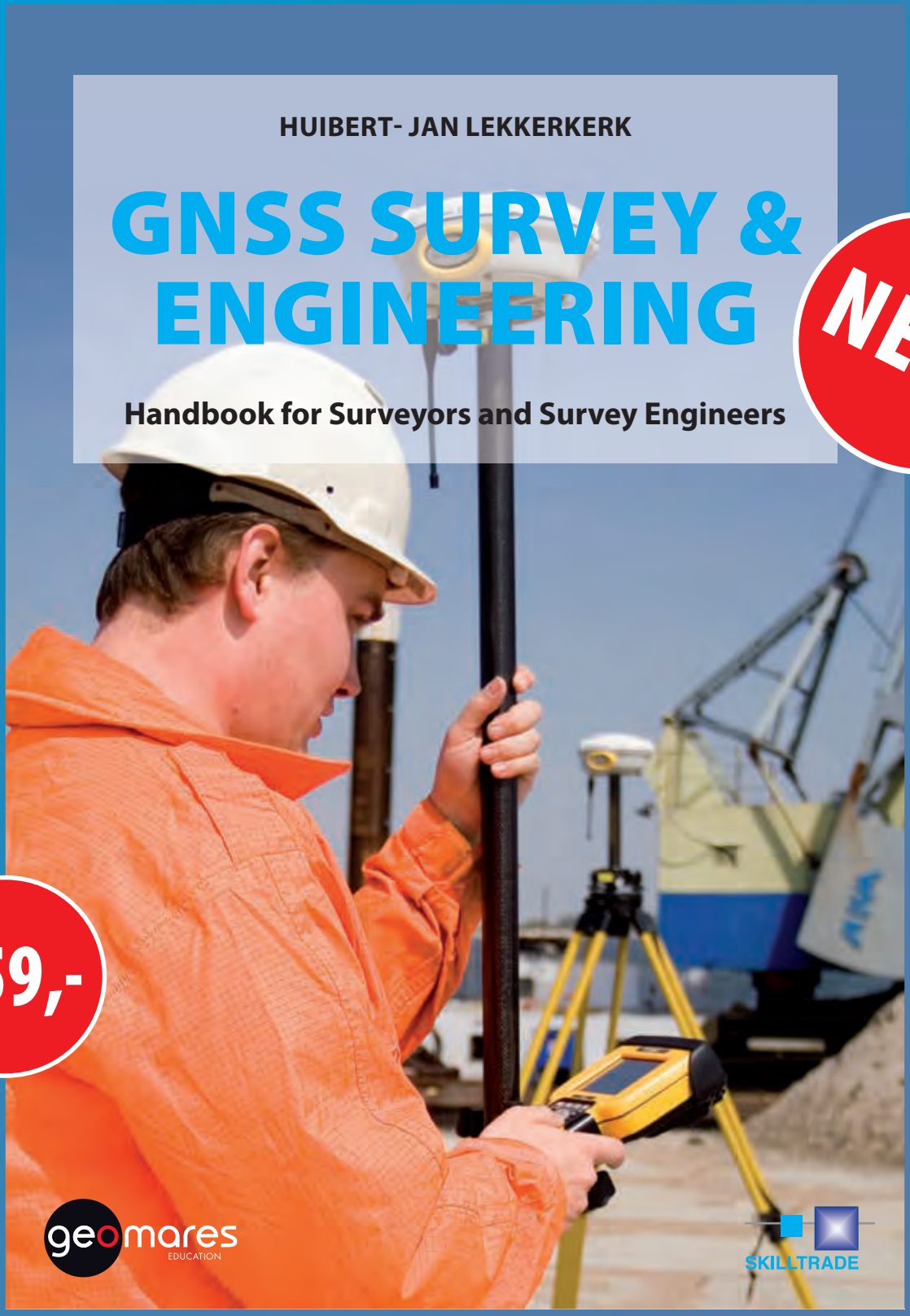
They acquired The GeoInformation Group in November 2016 and have ambitious plans to expand the coverage and detail of their geographic data products. These include:

- UKMap: topography, land-use, points of interest and retail information.
- UKBuildings: building characteristics
- UKLand: national land-use database.
- UKSurvey: aerial photography and custom mapping.

Their products are used by insurance companies, central and local government, utilities and commercial organisations.
www.verisk.com

GNSS SURVEY & ENGINEERING

Handbook for Surveyors and Survey Engineers



NEW!

€ 59,-

ORDER NOW!

geomares-education.com/shop/books/

BY ADENA SCHUTZBERG

Geospatial technology in 2017: 99% Invisible

To give credit where due, 99% Invisible is the name of one of my favorite podcasts. The title comes from a quote from Buckminster Fuller about people, but the show highlights the hidden aspects of design and architecture. The stories reveal that we see and interact with just the end-product of the design process; the rest is invisible. I've been collecting evidence that geospatial technology, and the design behind it, is also 99% invisible.

While out running, I saw another runner looking intently at the phone of a man in a suit. I asked if I could help them find a location. I learned that the man in the suit was trying to determine the address of the place so his friend could pick him up. The other runner pointed to a sign for the public beach, "You can just tell him to pick you up at Shannon Beach." The man shook his head; he needed an address. After looking at the phone a bit longer the runner said "It's 4 Mystic Valley Parkway." The man in the suit smiled and called his friend with the information.

I do not believe either man could have explained how the phone provided the answer, but both seemed to be confident that it could. Those in the industry would deduce the app reverse geocoded the GPS identified location. I believe they were using Apple Maps, but I suspect that was invisible too; it was just part of the phone's software infrastructure.

Back in June, Snap, the company behind Snapchat, announced Snap Map, an enhancement to the app. Snap Map allows users to see public snaps (photos) on a map or share their location with selected individuals. There was minimal buzz about the tool itself, since so many similar tools exist. However, there was considerable buzz about location sharing privacy concerns. In August, Hurricane Harvey prompted Houstonians and others to keep track of damage across the city as well as the locations of friends and family. Snap Map was one solution. But will it maintain its users? Another hot solution for tracking loved ones is not spatial at all; it's a walkie talkie app called Zello.

My final example involves our community. I was leaving the awesome FOSS4G reception at the MIT Sailing Pavilion in Cambridge, MA on a lovely August night. I asked a fellow attendee how he planned to get back to his hotel. He'd taken an Uber to the event and said he planned to do the same to get back. Uber is a company that relies on a lot of geospatial technology in the service of moving people and making money.

Adena Schutzberg has worked in geospatial technologies for more than 25 years. She is a member of the Esri Education Team.

What does all of this hidden geospatial technology, and society's relationship to it, mean? For one thing, we who work in the industry in 2017 are truly standing on the shoulders of giants including the pioneers of communication, GPS and the automotive industries to name a few. Second, we as an industry need to think hard about how we "expose" the technology we provide and the solutions we enable. Perhaps it's time to envisage a 2017 version of "Intel Inside" or "Navteq Onboard."

Finally, we need to see how far we've come. GIS and related technology moved from something no one knew about, to Google Maps, which everyone uses. We can even ask Siri to find a local barber shop with our voice without even thinking. I expect geospatial technology will become even more invisible going forward. I'm not sure how I feel about that.

NAVTEQ ON BOARD™

In the middle of the 2000s, a Navteq branding campaign aimed to make the company's data and technology less invisible.

BY NIALL CONWAY

Opensource GIS

A disruptive force or a driver of Innovation?

In order to better understand the increasing availability and emerging popularity of opensource GIS options, you first of all need to place it in a wider evolutionary context. From the 5th Century's Babylonian stone carving map, through to the creation of the Mercator navigational Projection, and later to the development of the printing press, the power of mapping has always been about its ability to communicate and disseminate knowledge and ideas about our world. GIS is the most recent phase of mapping evolution which carries on this tradition. Prior to its commercialisation in the 1980's and 1990's, GIS was a form of computer modelling and visualisation which was most often pioneered in university laboratories. It was only after maps experienced an emergence in mainstream thanks to Google Maps, that the opensource GIS movement really started to gain momentum.

Before discussing this movement however, it's important to be aware of what GIS is and what it is not. GIS is much more than just software. Rather, it is a system for working with maps and geographic information. A GIS therefore consists of 5 distinct but interdependent components. Along with the software, GIS refers to the hardware, the information which is used and captured by the software, the people who use GIS as well as the procedures for doing so.

Considering the above, although the opensource GIS era is a relatively recent one, the truth is, it is more than an organised movement. It reflects a very human need to form and to contribute to a community. While a big motivation of this community is to develop a technological counter-balance in a proprietary world, opensource GIS is, just as importantly, driven by a need to innovate and make required tools and systems available and/or accessible. One good example is the scientific spatial analysis software GRASS, (Geographic Resources Analysis Support System), which was initially developed to meet land management and environmental planning needs of the public, private and academic sectors in the United States during the early 1980's. In a similar regard, Global Mapper was initially an opensource project which was developed by the USGS before it was later commercialised in 2001.

Although opensource is a community-driven movement, it is important to point out that, just like the commercial arena, it is a dynamic and fast changing one which contains many different and often competing niches. Perhaps the most popular opensource GIS software is QGIS (formerly known as Quantum GIS), a cross-platform desktop GIS application which was founded by Alaskan native Gary Sherman in 2002. QGIS, which is written in C++, has a large and active user and developer community and an easy to use user interface which rivals commercial software alternatives. QGIS is commonly used in the fields of network design, spatial analysis and business analytics and includes many plugins which are developed by the community. The software integrates well with R and Python programming languages, Google Earth, Openlayers, GRASS GIS, and MapServer as well as with a range of databases such as SpatiaLite, PostgreSQL/PostGIS, SpatiaLite and MySQL. Austrian computer scientist, author and data visualization expert, Anita Graser, who serves on the QGIS Steering Committee, attributes the rise of the software to the project's focus on user needs, its welcoming and diverse community of volunteers and to the growing number of sponsors and donors who fund its continuous improvement. Looking forward to the release of QGIS version 3.0, Anita says big improvements will be phased in over time. "[A]mongst the most exciting [improvements] for me are faster spatial data analysis, further improved map design options and real 3D support."

However, QGIS is not the only option available to opensource enthusiasts. Another popular software is gvSIG ('gv' stands for Generalitat Valenciana, the Spanish regional authority which the system was originally developed for, while 'SIG' is the Spanish equivalent for GIS). The

association has clients in more than 30 countries, whose goal is to join together companies from all over the world in order to offer quality professional services related to free geomatics. Alvaro Anguix, the CEO of gvSIG Association, explains how the project goes beyond the initial development of a Desktop GIS to include a suite of programs. "Currently it is a catalog of products used in more than 160 countries including gvSIG Desktop, gvSIG Online (solution to implement Spatial Data Infrastructures), gvSIG Mobile (a mobile application for Android to take field data) and sectorial solutions like gvSIG Roads (roads management), gvSIG Crime (crime analysis) and gvSIG Educa (oriented to education)."

A NEW OPENSOURCE ERA?

While most opensource projects continue to uphold their inherent principles and underground edge, they are nevertheless run by communities which fully understand their potential in terms of delivering commercial solutions. US company Boundless is a good example of this. The company provides comprehensive commercial support and maintenance for the world's most popular opensource GIS applications (including PostGIS, GeoServer, OpenLayers and QGIS) at the database, server, desktop, web, mobile and cloud levels. Fresh from winning a massive contract with the National Geospatial Agency (NGA), Andy Dearing, the CEO of Boundless explains: "We're entering a new geospatial era in which countless organisations, from agriculture to government, are turning to open source software for their location-based data. Whether they're motivated by freedom from vendor lock-in, or the massive increase in location data resulting from the Internet of Things, open source is increasingly becoming the answer for companies across a broad range of industries. Opensource software offers modern geospatial professionals a platform that scales, both in technology performance and in price, and integrates with other systems through open and interoperable interfaces and standards."

GIS is now moving in new and exciting directions with the fields of big-data analytics and visualisation representing a major opportunity for geospatialists. In order to engage with these new fields, GIS is changing. The software is being augmented by a range of powerful new opensource online tools which help deliver deeper insights from data. GeoWave, for example, a tool which was initially developed by the NGA, is "an open-source library for storage, index, and search of multi-dimensional data on top of sorted key-value datastores and popular big data frameworks." Other emerging opensource projects include GeoTrellis, a geographic imagery and raster data processing engine for high performance applications, and GeoMesa, an opensource, distributed, spatio-temporal database built on a number of distributed cloud data storage systems for use with a variety of data storage and retrieval systems.

STANDARDS - THE SECRET BEHIND THE SUCCESS OF OPENSOURCE

Of course the popularity and success of the opensource movement would be nothing if it were not for the standards which have developed alongside it. Geospatial data interoperability standards, particularly those which have been developed by the OGC, have enabled opensource software to support a large number of geospatial data types and have contributed greatly to the development of Spatial Data Infrastructures (SDI) globally. The Java-based Geoserver software server is a good example of this. Widely considered the mapping equivalent to the opensource Apache HTTP Server, Geoserver publishes data to and from any major spatial data source (e.g. Google Earth, OpenLayers etc.) using open standards such as WMS and WFS.

Now that opensource is moving into the mainstream, the proprietary GIS software industry will naturally experience some disruption - particularly as certain organisations attempt to attract customers to opensource (or at least hybrid) alternatives. Although this is a legitimate concern, it is important for the GIS community as a whole to remember it still remains a niche field which is largely misunderstood by those operating outside of it. Furthermore, despite the increasing availability of 'commercialised' solutions and services, the opensource community in general does not offer the same level of support which proprietary vendors do. Opensource solutions cannot always be implemented as DIY solutions and very often users who wish to design opensource systems may need to move beyond online forums and hire expensive consultants in order to do so.

Looking forward, the most likely outlook for the industry is that as new markets for GIS tools and services start to emerge, both the opensource and proprietary fields will grow proportionately. Opensource GIS, for reasons such as cost, extensibility and openness will always exist, as will proprietary GIS software. The two will simply coexist within some complex and interdependent relationship. After all, just as humans possess a natural longing to form communities and to collaborate, they also possess the need to compete and create products which are valued by others.

Anita Graser

Alvaro Anguix

Andy Dearing

BY SABINE DE MILLIANO

Why open data is **not as simple as it seems**

Open data is undoubtedly a great movement in the world of GIS. OpenStreetMap and Copernicus are just two examples that open many doors and facilitate new applications. There are, however, also various challenges associated with open data. From technical obstacles to commercial objections and political concerns, open data is a much more complicated subject than some of us think. Why is open data still a topic of lengthy discussions?

The concept of open data is not restricted to geo-information, nor is it something new. Open data has its origins in the scientific world in the 1940s, long before the rise of the internet, when Robert King Merton explained the importance of sharing scientific results. He suggested making the results of scientific research freely available to all, in order to stimulate knowledge growth and innovation. That concept still applies today and has proven to be very successful in, for example, the domain of open source software. However, open data is much more complicated than simply collaborating on work and sharing results to help humanity move forward. There is a lot more at stake.

COMMON GOOD

One of the reasons open data has become the topic of many discussions is because the motivations and concerns for making data open to the public can be very different in nature. There are protagonists of open data that have similar motivations as Robert King Merton once described. Inspired by the concept of open source software (which is a clear win-win mechanism for software development), they consider open data as a common good that stimulates collaboration and innovation. OpenStreetMap is a beautiful example of open data that is co-created in a similar way as open source software and knowledge bases such as Wikipedia.

TRANSPARENCY

There are also advocates of transparency and openness,

Figure 1: OpenStreetMap and Sentinel-2 are two great examples of open data (credits: © OpenStreetMap contributors / Copernicus)

who believe that data should be available for everyone to view and use. Their motivations are mainly political and apply for governmental agencies and (semi-)public organisations. For example, one could state that data owned by the public sector has been funded by the public and should thus be freely accessible to the public. Another political motivation is to promote openness and transparency in an attempt to avoid or solve distrust in public-sector organisations. The majority of these organisations are still in the process of opening up their data treasure chest, with now still only a limited number of datasets being available.

LETTING GO

As motivations for joining (or trying to avoid) the open data movement differ greatly in terms of their origin and goals to achieve, it is no wonder that open data is subject to a lot of debate. And as if this is not complex enough, there are also various other challenges to overcome, ranging from ethical to practical. For example, there is a large grey zone on what data should actually be shared and what should remain private for whatever reason. Many organisations struggle with this question. In a time when openness has become the default, on what grounds can you decide not to share a dataset? Put simply, open data is not just about throwing your dataset out in the open. Open data is about letting go. Many organisations fear the concept of open data – for all or only a few of their datasets – simply because they are afraid someone will misinterpret or misuse the data. What if someone creates a map based on your dataset, distributes this map, and someone else makes a fatal decision based on an error in this derivative product? Sooner or later, this will raise the question: who is accountable? Some organisations thus decide to play it safe and keep some datasets behind locked doors.

RETURN ON INVESTMENT

A commercial objective commonly heard is that data represents value and costs money to produce, so it must be paid for. This point of view is understandable for data products made by private companies – especially those that build their business model on data and information. For public organisations, such a perspective typically raises the discussion: shouldn't this data be available at no cost, since citizens have indirectly already paid for it? Fortunately, more and more public-sector data is being made available in various countries these days. From an economical perspective there are also advantages of open data. Making public data accessible provides opportunities for commercial exploitation, which can create an indirect return on investment to the government.

ACCESSIBILITY

Finding the right open data can be quite a hassle, even when correct metadata is present. This brings me to, in my opinion, the biggest challenge of open data: its discoverability and accessibility. A data portal that offers all available data does not exist (yet), so users need to look for data in various online data repositories – each with their own policies, (often complex) user interfaces and limitations. In my view, there is still a lot of work to be done on this side of the data chain. There are a couple of online portals that have made a serious effort to disseminate large amounts of data. Examples for international use include Copernicus Open Access Hub, Natural Earth Data, USGS Earth Explorer and Esri's ArcGIS Hub. Many of the online portals have an intimidating user interface that probably discourages untrained and non-geo professionals to even have a go at it. Though some of them serve the professional GIS and remote sensing communities well, they will never reach a wide audience, simply because they are too complicated to understand and use. This greatly limits the potential of open data.

KNOWLEDGE INTENSIVE

No matter how discoverable and accessible, some datasets remain 'knowledge intensive'. This means that only a limited number of users have sufficient technical background to understand how to process, analyse and use them. Think of map layers showing certain specialised agricultural indicators, or remote sensing imagery such as Synthetic Aperture Radar (SAR). Those remain the domain of experts, at least for now.

A GREAT DEVELOPMENT

Open data is a great development, but much more complicated than it seems. Access to open data is only possible by solving the sum of technological, economic, political and communication challenges. Although we are certainly making progress, there are still a lot of things to do, many problems to solve and interesting discussions to have before we can really unleash the power of all the data that is out there and potentially open.

ABOUT THE AUTHOR

Sabine de Milliano is an entrepreneur and consultant specialised in developing user-friendly IT applications of geospatial data. She holds a M.Sc. in Geomatics from Delft University of Technology and combines her engineering background with technical communication and business expertise to bridge the gap between users and engineers. She is also a contributing editor of *GIS Professional* and *GIM International* (email: sabine@knalblauw.nl).

BY NIALL CONWAY

UN-GGIM 7th Conference - New York

A Time of Creation and Change

At the beginning of August 2017, the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) (the official United Nations consultative mechanism on global geospatial information management) hosted its seventh annual session at the UN Headquarters in New York. Despite it not being as well publicised as other UN conferences, the event outcomes were nothing less than ground-breaking.

Before going into detail about the conference, it's important to note that the recent achievements in New York were based on many years of hard work. Consensus and agenda building required bringing together geospatial users within various UN divisions, stakeholders from UN Member States (mainly

national mapping and statistical agencies), contributors from intergovernmental organizations (such as the Group on Earth Observation (GEO)), along with members from academia and the private sector. Industry and standards organisations such as the International Federation of Surveyors (FIG), the International Society for Photogrammetry and Remote Sensing (ISPRS), the International Organization for Standardization (ISO), the Pan-American Institute of Geography and History (PAIGH) and the Open Geospatial Consortium (OGC) also played an important role throughout the process.

And so, in August this year, 90 countries and international organisations active in the field of geospatial information management (including a less typical member of the geospatial community - the World Bank) met to discuss 17 substantive agenda items which were, in typical UN-GGIM fashion, as wide ranging as they come. However, if one was to break it down, the 7th conference in New York last August was essentially about two things - change and creation.

The conference was about changing existing systems, approaches and institutions so that they could become more responsive and resilient in the face of social, economic and environmental pressures. This change includes improving processes whereby regional committees and UN-GGIM networks contribute to the global agenda and management of geospatial information. The conference also included changing existing practices relating to land administration and management, the improvement of national institutions, and the refinement of legal and policy frameworks and data sharing arrangements between and among members.

The UN-GGIM conference was also about creating new systems, new approaches and new institutions. Participants discussed the establishment of two new Working Groups on Legal and Policy Frameworks, and Marine Geospatial Information as well as matters relating to the adoption of a Strategic Framework on Geospatial Information and Services for Disasters. Other areas of discussion included the endorsement of an overarching framework for national institutional arrangements on geospatial information; and a collaborative agreement with the World Bank to implement a new initiative to assist low-income countries to develop their national geospatial information systems. The conference also laid out the participating member's plans to promote the wider integration of geospatial information with statistics for the purpose of meeting the UN's Sustainable Development Goals (SDGs).

Going forward, significant emphasis will be placed on raising the bar in terms of geospatial data management practice and on ensuring that all relevant parties have the resources and capacity to improve their national systems. Future action by the UN-GGIM will focus on deeper engagement and consensus-building, better coordination of activities and on developing greater understanding among policy and decision-makers, planners and delivery agents of the potential which geospatial presents. Efforts will be focused on understanding the differing needs and requirements of member countries and on developing action plans, guidelines, and implementation tools which will help them to develop accordingly. This effort will include the establishment of a template framework and roadmap which members can reference and navigate when developing national geospatial systems which are tailored to their own requirements.

The recent UN-GGIM conference was, through the processes of creation and change, about bringing established bodies and institutions into the digital age and about creating modern and transparent data-driven systems of governance. It was about promoting the use of geospatial information in order to achieve the UN's Sustainable Development Goals and in so doing it was about regaining the public's trust in democracy. Since, as the world well understands, finance plays a key role in the well-being of the planet and its inhabitants, the inclusion of the Work Bank in this process should be welcomed as a milestone achievement in the history of the UN-GGIM.

Considering all of this, it's little coincidence that the 7th UN-GGIM conference was a lucky one.

ACKNOWLEDGEMENTS

The author would like to thank Steve Ramage and Adena Schwarzberg for their contributions in the preparations for this article.

BY DR BARBARA BOND

MapAction brings response to disasters

Volunteers working with geospatial information to update maps

MapAction is a leading humanitarian mapping charity that works through skilled volunteers. Its purpose is to provide rapid, on-the-ground mapping to humanitarian aid agencies, in response to a disaster or crisis to help save lives and minimise suffering. Since it was established in 2002, it has responded to 76 humanitarian emergencies which have impacted on the lives of tens of millions of people.

The charity is an essential part of a well-developed humanitarian programme responding in complex emergencies such as earthquakes, volcanoes, floods or tsunamis. Local communities are the first responders, national governments carry responsibility for action, local support systems can be activated, but international organisations such as the United Nations' Office for the Coordination of Humanitarian Affairs (UNOCHA) can also be called on (it is in this third area that MapAction usually operates). Whilst located in the UK, MapAction has a global reach with a small section of volunteers based in the Caribbean and representatives in New Zealand, Australia and the Middle East. In addition to its work with OCHA, the charity also works closely with the World Food Programme in Asia Pacific and with UNICEF in West Africa. It is also working increasingly with regional organisations such as the Association of South East Asian Nations (ASEAN)'s Humanitarian Assistance Centre (AHA).

The rationale and purpose for the creation of MapAction was to answer a few critical questions posed by the responding aid agencies. The provision of real time mapping data to assess the scale and scope of the disaster and to identify areas most affected where the population is most vulnerable remain its principal purpose. Ultimately the goal is to enable aid resources to be used as effectively as possible and maximise the benefit to affected communities so their recovery can begin as quickly as possible.

When disaster strikes, people's lives can be destroyed within a matter of seconds. The challenge for the aid agencies is to know where to start. Within hours of an alert, MapAction mobilises a team of highly skilled volunteers to map the needs of those affected and help coordinate the response. Its aim is to help the aid agencies, usually through OCHA, to get aid to

Figure 1: MapAction working in Haiti.

Figure 2: Locations where MapAction has been involved.

the right places quickly, so lives can be saved and suffering minimised. As the situation on the ground evolves, MapAction's analysis helps responders understand the changing needs of survivors, who may have been displaced by the crisis. The mapping is used to coordinate relief work and target relief (food, water, medical supplies) as effectively as possible. The mapping service helps responders understand the extent of the emergency i.e. who is doing what, where and how they can use their resources most effectively. The mapping essentially provides the glue which binds together the entire humanitarian response and ensures the sound disposition and deployment of those other resources.

MapAction usually deploys an initial 2 - 3 person team, sometimes up to 5, in less than 48 hours, for up to a 2 week deployment. Examples of volunteer deployments include both slow and sudden onset disasters, as well as complex conflict and population movements, of which the following are a few examples:

- The ebola outbreak in West Africa;
- Flooding disasters on 4 continents, the most recent of which was Peru;
- Earthquakes (e.g. Haiti and Nepal)
- Volcanoes (e.g Indonesia)
- Tsunamis (e.g. Sri Lanka, Japan)
- Conflict (e.g. Syria)
- Post-conflict (e.g. Sri Lanka)

In a natural disaster, the situation is generally one of recovery. MapAction's experience in Nepal exemplifies this and the type of mapping needed. Immediately following the earthquake, reported deaths were used as a proxy to identify the worst affected areas and building damage was used as a proxy of vulnerability and impact. This sort of mapping provides a basis for a plan, where best to target assessments and where the most vulnerable might be in the earliest days. It enables a forward direction of the delivery of assistance, although always requiring care to ensure that the situation is kept under review as new information emerges and the picture of vulnerability and unmet needs becomes better understood. The mapping has to reflect the emerging information and this is where GIS techniques come into their own.

MapAction has 13 salaried individuals at their HQ headed by a Chief Executive and complemented by 12 trustees and several other non-technical members. It is a uniquely volunteer-driven charity with some 85 volunteers, all of whom are supported by their employer in both the public and private sectors. All the volunteers are highly skilled GIS technology professionals in their day job: additional training in the nature of humanitarian relief work is provided. The selection process is rigorous and, to date, the charity counts itself fortunate in having more applicants than it needs. Over half the volunteers are on 24 hour standby to leave their jobs and families to deploy to an emergency. All the volunteers have arrangements with their employers so that, within limits, they can deploy at minimal notice. The volunteer pool is regularly refreshed and certainly at least annually.

Donors play a critical role each year in helping the charity raise approximately £1M in addition to the funding it receives from several institutions, including the UK Government's Department for International Development (DfID) and the Netherlands' Government, to ensure it can respond each time

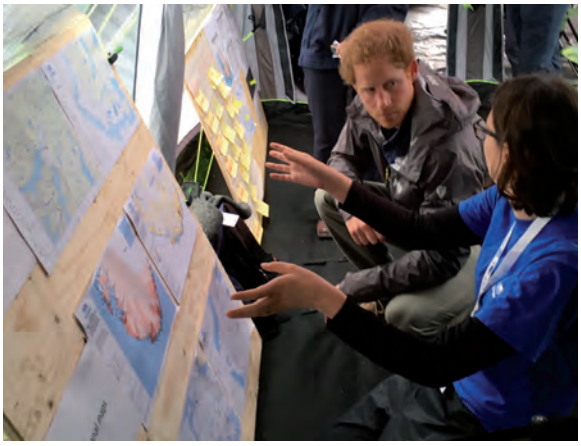


Figure 3: Prince Harry and Rachel Alsop discuss maps at Triplex.

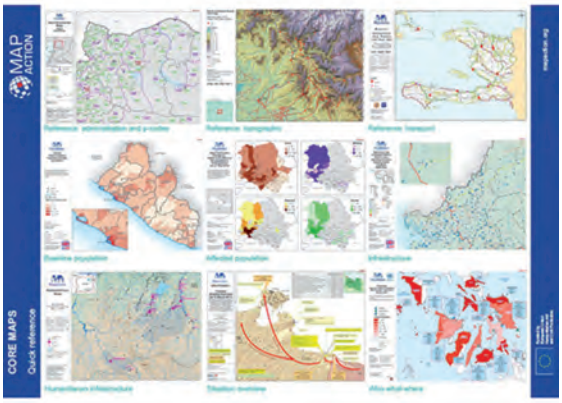


Figure 4: Examples of core maps.

it is called on. Money is raised through arranging community events, encouraging regular gift-aided donations, through emergency appeals; and two of the charity's own volunteers ran the Marathon de Sable in May 2017 and a number of their volunteers ran in the London Marathon. Ambassadors and advocates help to raise the charity's profile through their own professional and social networks. They seek to attract and engage other supporters and benefactors. MapAction is privileged to have HRH Prince Harry as its Royal Patron.

Further information about the charity is available at www.mapaction.org or by contacting the author by email bbond@mapaction.org

BY SILVIA MARINOVA

Development of a symbol system for disaster management

Spatial information plays a key role in disaster management. Upon occurrence of an emergency situation, crisis management actors need specialised maps to give them a clear idea of the emergency, localisation, distribution and characteristics. Effective representation of spatial information can be achieved by means of graphical symbols. Silvia Marinova describes how a symbol system should be associative and quickly perceived by map users even without the use of a legend, especially in an emergency.

A number of agencies and organisations related to disaster protection develop databases, geo-portals and cartographic products for crisis management and their own standards for symbols. In Bulgaria as well as in other countries there is no standard symbol system for disaster management. Such general standardisation could be done through: object classification, colours, symbol type and graphical variables. Taking into account the advantages and disadvantages of existing emergency symbol systems, a new symbol system for the needs of Disaster Management was developed at the Laboratory on Cartography, University of Architecture, Civil Engineering and Geodesy, Sofia.

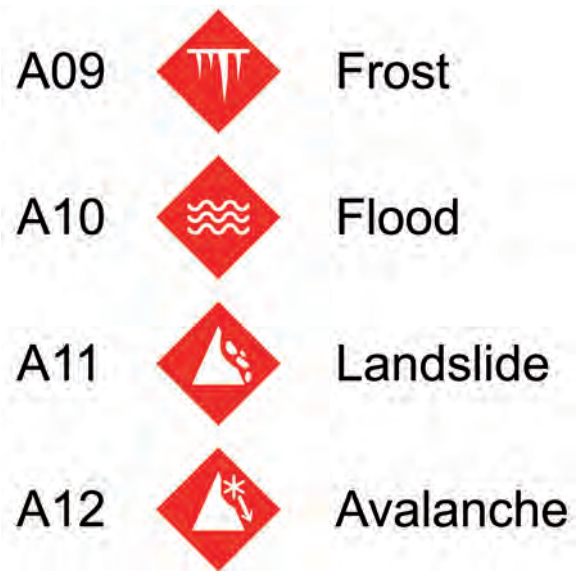


Figure 1: Symbols of category A: Disasters

The Symbol System for Disaster Management (SSDM) was developed to support thematic mapping for early warning and crisis management and operational work of all participants in the unified rescue system, regional and municipal authorities, as well as to help citizens understand specialised maps of emergency situations. The symbol system is designed not only for professionals but also the general public.

CLASSIFICATION STRUCTURE

The SSDM consists of a 4-level hierarchical classification of objects and phenomena concerning disaster protection and a set of 115 symbols. At the highest level, all objects are divided into 5 categories: Disasters; Infrastructure; Protection Services and Safety Infrastructure; Affected People and Infrastructure; Operational Sites and Activities. Each category is divided into classes, and they in turn are divided into subclasses, which consists of objects and phenomena.

DESIGN OF SYMBOLS

Design of the SSDM started with studying theoretical foundations of cartographic semiotics, considering the rules of construction and use of symbol systems, examining relations between objects and phenomena, their classification and specifics. The ability of symbols to transmit information as well as the way they can be perceived by map users are of great importance. The design process was accompanied by optimal requirements to achieve readability, expressiveness and visibility, taking into account modern technologies and techniques in cartography.

One of the main challenges in developing disaster protection maps is the choice of appropriate graphical variables in order for all the symbols to be quickly and easily perceived, to be associative and to be properly referred to their respective categories.

All categories of SSDM are distinguishable by their shape and colour. The symbols consist of pictograms in white colour and shapes with a particular coloured background. The pictograms have uncomplicated but not too simple designs as symbols should be associative and give information about concrete objects and phenomena. Similar elements in different symbols have equal width, length and the same general design. For each category a different shape is chosen as well as a different background colour to support rapid association of the symbols to the appropriate categories. The choice

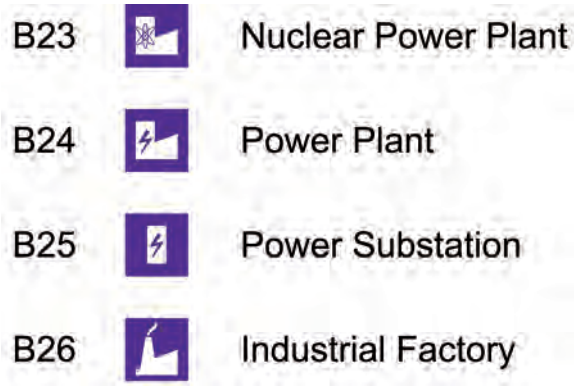


Figure 2: Symbols of category B: Infrastructure

Figure 3: Symbols of category C: Protection Services and Safety Infrastructure

of colours, except to achieve clear distinctiveness, also depends on the message that symbols should express to the users. There is also a psychological perception of the colours that has been taken into account. Colour specifications are expressed in RGB and CMYK values to achieve colour standardisation. Different shapes for all categories aim to avoid potential problems due to low light or black and white printing.

For easy identification each category has an individual letter code (A for Disasters; B for Infrastructure; C for Protection Services and Safety Infrastructure; D for Affected People and Infrastructure; E for Operational Sites and Activities). Each object and its respective symbol also gets an alphanumeric code formed by the category code and serial number of the object in its category.

Figures 1, 2, 3, 4, 5, present part of the symbol system including an alphanumeric code, a graphic symbol and a brief description.

PRESENTING AFFECTED INFRASTRUCTURE IN CRISIS SITUATION

The status of "Infrastructure" and "Protection Services and Safety Infrastructure" objects in crisis situations is performed by a combination of symbols of category B (Infrastructure) and C (Protection Services and Safety Infrastructure) with symbols presenting destroyed, affected and unaffected objects of category D. In this combination, the symbols of Category D have reduced size and they are located in the upper right corner of the symbols of categories B and C (Figure 6).

MAPPING FOR DISASTER PROTECTION

The SSDM is applied in the experimental development of a series of maps for disaster protection at local and regional levels and designs for training maps supporting actions in emergencies. The main tasks of local and regional disaster protection plans are analysis and assessment of disaster risks, prevention and mitigation, early warning, coordinating activities, etc. Depending on the role of participants in these activities, they need specialised geographic information to support their actions.

For the needs of activities described in the disaster protection plan of Troyan municipality, base maps of the municipality in scale 1:50 000 and the town of Troyan in scale 1:10 000 (Figure 7) were produced. They are compiled according to predefined elements of map content using the new map Symbol System for Disaster Management. The symbols of SSDM support the main features of hydrography; relief; settlements; infrastructure (including transport, telecommunication, energy, manufacturing and water infrastructure); administrative boundaries, as well as services and facilities (such as hospitals, shelters, >

Figure 4: Symbols of category D: Affected People and Infrastructure

Figure 5: Symbols of category E: Operational Sites and Activities

Figure 6: Symbols presenting affected objects.

Figure 7: Base map for Disaster Protection (fragment).

helicopter pads, etc.) related to disaster protection. The base maps are used for the creation of a series of maps for disaster management in case of earthquakes, floods, fires or industrial accidents as a part of the specialised plans for disaster protection in the municipality. Additional information is provided for some features including object name and description, number of beds in shelters, dangerous industrial objects, type of stored materials, fire-fighting equipment, etc. Infrastructure and services / facilities for protection are represented by the symbols of Category B and C. All these maps support pre-disaster activities including assessment and preparedness. In crisis situations, these maps can be processed into reference maps presenting type and location of the disaster/s through adding symbols of Category A and symbols for affected people and affected infrastructure of Category D. By adding information about operational sites and activities, (Category E) decision-makers can get maps for disaster response. In the post-disaster phase, the symbol system could support damage assessment and recovery.

Map content and displayed information of operational situations aim to support authorities and individuals in making quick and effective decisions. Maps allow identification of affected areas and give significant contributions to population protection, mitigation and planning evacuation operations.

Cartography plays a key role in all the main stages of disaster management. The efficient and cooperative preventive and protective activities of authorities require appropriate and easy to understand geographic information. The use of standard system of associative symbols can facilitate significantly in cooperative disaster management strategy at local, regional and international level.

ACKNOWLEDGEMENTS

Thanks to Prof. Dr. Temenoujka Bandrova, head of Laboratory on Cartography, University of Architecture, Civil Engineering and Geodesy, Sofia for supervising the thesis on thematic mapping and visualisation for early warning and crisis management and to City Government of Troyan and KartGeo Ltd. for providing data.

ABOUT THE AUTHOR

Dr. Eng. Silvia Marinova is a cartographer and serves as Chief Assist. Prof. at the University of Architecture, Civil Engineering and Geodesy, Sofia and Secretary General of Bulgarian Cartographic Association. She is involved in cartographic projects at KartGeo Ltd. Her scientific interests are focused on thematic mapping for disaster management, cross-border mapping and mountain cartography.
Email: marinova_silvia@abv.bg

BY KATIE DECKER

Mobile app makes urban mapping fast, easy and cheap

The process of completing street-level surveys and inspections on crucial infrastructure is time-consuming, expensive and error prone. It is typically a task that requires trained personnel to travel into the field, observe and report on traffic lights, stop signs, road conditions and more.

But advances in open data, mobile image technology and data analysis have made it possible for cities to drastically improve the efficiency and cost-effectiveness of their efforts to manage and maintain public assets. One solution comes in the form of an easy-to-use mobile app bringing all these innovations together. Harnessing the power of spatial analytics and 3D imagery, Mapillary is making municipal mapping a task that anyone with a smartphone and a car can do.

FEET ON THE GROUND

The City of Johns Creek, Georgia, needed to gather data on its streets. This wasn't merely a mapping exercise—it was an undertaking to collect public and private information on everything from traffic signal arms to power poles. But with limited time and a small number of staff, manually collecting the data with GPS units would have been unfeasible. However, the city had a team dedicated to GIS technology, and it sought out a new way to collect the data quickly and with less need for dedicated personnel.

ABOUT THE AUTHOR

Katie Decker is the Community Manager for the Esri Startup Program, a free three-year program that gives emerging businesses the tools to build mapping and spatial analytics capabilities into their products.

As Community Manager, Katie enables hundreds of startups to successfully leverage Esri's technology and global business network. She also helps to foster their collaboration with a wide array of organisations and industries such as - local, regional and national governments, utilities, transportation, natural resources companies, commercial organisations and more.

Email: KDecker@esri.com

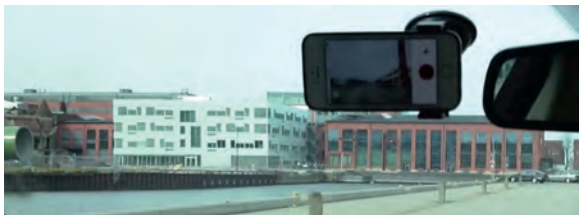


Figure 1: Employees can use Mapillary easily by mounting their smartphone on a moving car.

A SOLUTION FOR A STREAMLINED WORKFORCE

Mapillary provided the Johns Creek GIS team with an app (Mapillary for ArcGIS) enabling the creation of street-level imagery by using nothing but mobile phones. In an initial test, the team snapped photos at two-second intervals with an iPhone mounted on the windshield of a moving car. Back at the office, the photos were uploaded to Mapillary and, after being stitched together based on point clouds, formed comprehensive 3D street-level imagery. This imagery of the street and all its assets could be virtually walked through once all the data was uploaded. The city can now explore the app's automated detection tools for tasks such as extracting traffic sign data. This data is now available through the Johns Creek open data portal, accessible to the public and civic officials.

AUTOMATING INFRASTRUCTURE MAINTENANCE

Thanks to this user-friendly app, Johns Creek can now create street-level imagery in just hours rather than months. The team can keep all the imagery current without investing in expensive specialised vehicles, professional camera rigs, or manual inspections. The ease of collecting and updating data also means that locating vandalised signs or replacing outdated speed limit postings can be done quickly. Citizens accessing the Johns Creek open data site can browse interactive maps and information including address points, parcels, zoning, topology, street centrelines and public safety data sets.

With integrated data such as demographics, Mapillary functions as a resource for the entire community. Entrepreneurs can locate the best spots to open a business, and people looking for new homes can search neighbourhood data such as the amount of traffic or income distribution. Mapillary automates two of the more complex and labor-intensive tasks of a modern municipality: collecting data and using that data to make better-informed decisions.

BY JACK DANGERMOND, SATISH SANKARAN, ROBERTO LUCCHI, AND MARTEN HOGEWEG

Reimagine INSPIRE by leveraging open data and Web GIS

The Infrastructure for Spatial Information in Europe (INSPIRE) Directive has made good progress toward implementation by all member states. On the occasion of the INSPIRE Conference 2017 and in keeping with the theme INSPIRE a Digital Europe: Thinking Out of the Box, it seems fitting to comment on the current state of the directive compared to global geospatial technology trends.

INSPIRE represents the most complex spatial data infrastructure project ever attempted, with the goal of aligning the 28 member states of the European Union (EU). It may prove helpful to reflect on what works; what has changed; and what needs to change by the established end date of 2021, given the shifting technology landscape.

THE INITIATIVE HAS:

- Helped open what was largely a closed data environment by tackling data licensing.
- Created detailed structural guidelines for a set of 34 spatial data themes needed for environmental applications to improve our understanding of our planet.
- Set guidelines for making authoritative data web accessible and interoperable.

To date, much of the emphasis of the project has been focused on adoption of and compliance with the directive, which dictates the steps and means for sharing environmental spatial information across Europe to assist policy making across boundaries. With increasing environmental pressures, perhaps it's time to review the emerging technology delivery patterns that turn data access into data-driven solutions that can enable rapid response to threats.

MOVING TARGETS

Setting out to frame and tackle a complex spatial data infrastructure over a 14-year time period in a constantly changing technology environment has posed challenges.

At the time of the directive's adoption in 2007, who among us could have predicted that:

- Connected sensors would proliferate, ushering in an era of real-time mapping?
- Smartphones with increasing computing capacity and ubiquitous apps would become the major means of citizen engagement?
- Browsers and mobile apps would become the interface for most geospatial interactions?
- GIS platforms would migrate online, using the infinite computing capacity of the cloud and a software-as-a-service delivery model?
- Open data would become a global phenomenon for governments of all scales, ushering in new interactions with greater transparency and accountability?
- Drones would proliferate and greatly change surveying and aerial imaging workflows and outcomes?
- Machine intelligence would be adopted as a means to automatically classify imagery for quicker and more accurate geospatial basemaps and spatial analysis inquiries?

These major technology changes have all contributed to accelerated volumes of data at higher accuracy. This has made it much easier and more cost-effective for users to undertake geospatial projects, without the need to be concerned about where and how the data is delivered or the underlying infrastructure is configured.

These trends have forced authoritative data stewards to rethink how they make their data available to support the everyday decisions of their governments and citizens. As a collective force for data stewards, INSPIRE should not ignore the impacts.

OPEN DATA DISRUPTION

The INSPIRE Directive pioneered top-down, specification-driven spatial data infrastructure approaches, and since its establishment, bottom-up and citizen-focused open data initiatives have really taken off. There is a growing expectation that data

is readily available, usable and reliable. Most of the spatial datasets covered by the INSPIRE Directive have already been made available as open data.

The global open data movement has helped governments make inroads into solving problems with a data-driven approach. Open data provides a new kind of glue to bring governments and citizens together. It facilitates interaction, provides the means to rally around shared objectives, and helps everyone stay connected and informed as improvements take place.

The emerging concept of a hub supplements the open data patterns and addresses this trend—offering open data tools, mapping apps, and analytics that wrap around policy initiatives to tackle pressing issues. The approach gives communities the tools to combine data, visualization, analytics, and collaboration technology alongside well-defined goals to create data-driven results.

The Copernicus satellite imaging constellation program sets a precedent for open data in the European Union. Copernicus data and services are made available and accessible to any citizen and organization around the world for free, on a full and open-access basis. This decoupling of the data from its exploitation creates an environment that complements commercial operations and allows users to choose what they want to do with the data—aligning their tools and workflows with their task at hand.

The INSPIRE Directive faces many constraints in turning data into actionable information and could benefit from an open data approach. INSPIRE sets the bar with thorough technical guidance, but for many stakeholders, the bar is too high and prohibits many interested users from finding and using data as expected. A simpler, user-oriented INSPIRE implementation pattern with more flexibility on compliance would foster greater participation and sustainable implementation plans.

IMPROVING ACCESSIBILITY

At Esri, we see INSPIRE as a national and regional system of systems network with an enormous potential. However, the rigid framework has inhibited innovation and made it difficult to adapt to a constantly evolving technology landscape.

The predominant geospatial platform today is a distributed GIS that makes data accessible from anywhere, on any device. This pattern has evolved over the years from the desktop to the enterprise, with discoverability of data across teams and organizations. It's becoming increasingly easier to securely share data, maps and apps with a wide variety of stakeholders.

We call this new distributed pattern Web GIS, which we implemented in ArcGIS. We have realized returns of a far greater number of users and interactions by embracing this informal, loosely connected, and organic way of collaborating. It has expanded the number of engaged GIS users far beyond the prior, more formalized distributed patterns. For example, the software-as-a-service offering ArcGIS Online now has more than four million subscribers contributing new apps and maps every day, and it's serving billions of maps per day to consumers using their preferred devices, with more than 40 million open data downloads. Building on this pattern, Esri recently introduced a capability into the ArcGIS platform: ArcGIS Hub, which provides two-way engagement to connect government and citizens.

The Web GIS pattern contains:

- A system of systems architecture.
- Application programming interfaces (APIs) for flexible data and analytics interactions.
- Apps to deliver functionality for different purposes.
- The ability to deliver GIS content and functionality via mobile devices, the web or the desktop.

Web GIS facilitates brings together heterogeneous data that is dynamically extracted in layers and maps. Distributed data management and dynamic integration connects everyone, from the citizen and the fieldworker to government agencies and operations centres.

GETTING TO INTERACTION

The connected system of systems approach, which has been a goal of the geospatial industry for some time, has arrived. It allows dynamic replication and integration of information from all parts of governments and organizations. It also marks the evolution of the database from a single database to multiple databases with multiple data models.

The European Spatial Data Infrastructure has set in motion this system of systems approach across the 28 member states. The INSPIRE Directive's vision for an agile and crosscutting information exchange of environmental spatial information has provided a compelling goal. The next steps involve the creation of pathways for meaningful action with this data, centering on improving the quality of life for all.

Web GIS has the capability to rapidly respond to user needs and adapt to changes in technology by allowing

>

easy access to data and services. This pattern did not exist when INSPIRE was designed; however, it aligns with the spirit of INSPIRE to break down information silos.

INSPIRE can stay as it is, with a road map oriented to measure completeness, or it can evolve and become part of a more transparent open data approach with wide use in society. Our software users have guided us to view this change as inevitable, and we support them with changes to our products. EU citizens would benefit if the INSPIRE community of data providers and technical consultants took advantage of open data and Web GIS patterns.

All authors work at Esri. Jack Dangermond is founder and president, and Satish Sankaran, Roberto Lucchi, and Marten Hogeweg are all product managers.

INSPIRE invited to think Outside the Box

Starting with two days of workshops in Kehl, Germany, on 4 September 2017, the INSPIRE conference 2017 concluded with three days of conferences and sessions in Strasbourg, France, on Friday 8 September 2017. This international setting emphasised the invitation to the delegates to look beyond the box in order to work towards implementation of the European Spatial Data Infrastructure in 2020. At least, the 'cross-border' aspect of the conference was highlighted during these days.

That's how 'cross-border' was given shape with European countries and regions working together – and building a dialogue between each other. An international community was thinking of exchanging data between countries and even within an office using the same standards; how to map statistical data or how to visualise environmental aspects on a map. The experts in the opening plenary session on Wednesday 6 September were clear: "Geospatial data are essential. Wherever you look you have geospatial data. They should be available for people and travel across Europe", according to Roberto Viola, Director General of DG Environment. He added that there are some barriers and that the processing power is too reduced. There are no European supercomputers in the top-10 of computers in the world, which made him worry.

The availability also was a concern to Daniel Calleja, director general of the DG Environment, European Commission. He explained that delays in the implementation of the European Geospatial Data Infrastructure can cost up to 150 billion euros. This is due to differences in standards and legistation between countries. He was convinced INSPIRE could contribute.

CULTURE AND TERRITORIES

On Thursday, the thematic plenary discussed on the regions chaired by Martin Lenk. Knowing about more aspects of the territories are essential to succeed. Language, budgets are considerations for cross-border projects. However, he also asked the group to be aware of the expectations – what should be achieved after 10 years of INSPIRE? What can be done in the future? It certainly is a lot, according to Chair Allessandro Annoni. It's about how citizens can improve decision making. To emphasise this, during the plenary session there were presentations on data insights, statistics and how BMW is working with geospatial data.

INTERACTION AND EXHIBITION

The delegates gathered during workshops discussing a wide range of topics and training where an interactive setting invited the participants to contribute and exchange knowledge. Case studies and benefits were shared with the audience. In the foyer of the conference centre of Strasbourg, mainly during the lunches, exhibitors were available for further information and orientation to solve questions that may arise implementing the European geospatial data infrastructure on a local or regional level. Doing so, all delegates should have gone home with questions answered, new contacts made or even more challenges to take on.

BY ABIGAIL PAGE

The breadth and depth of Smart Geospatial

Over recent weeks, I'm reminded that our planet is breathtakingly beautiful the world over – but also incredibly fragile. It's impossible to avoid the news of environmental devastation wrought by hurricanes in the Americas, and life-taking earthquakes in both Mexico and Japan.

Unless you're involved first-hand in these events, the loss of life and damage is on a scale that's difficult to take in. As the UK is not on the edge of a tectonic plate, we do not have to suffer monsoon rains. However, we do co-exist on a planet that has a very delicate eco-system – one that's changing rapidly, and needs smarter and smarter solutions to help protect and preserve the lives that are affected by it.

In the geospatial industry we have some incredible tools, technologies (and people) that are providing much-needed support. Most recently, I was delighted to welcome delegates to the annual AGI Risk & Insurance SIG & RSPSoc breakfast briefing at Lloyds of London, with a focus on quantifying earthquake risk – fascinating! And of course there are many examples of geo-specialists helping to save lives - I'm so proud to know that a number of AGI Members are involved with supporting the work of MapAction for example, including recent deployments for hurricane relief.

Does it not seem strange then, that there's sometimes still such a disconnect between the application of benefits that our discipline can deliver so well 'in the worst of times', and the way we're managing to meet the needs of citizens sometimes 'in the best of times'?

We must be diligent. We must remember the importance of advocating greater and better use of geospatial across the board. The smartest use of geospatial intelligence doesn't always mean there's a technology-laden solution to a problem.

From the smallest of businesses who embed a map on their website, to the largest public sector organisations that are desperately trying to reduce costs and improve their asset management on behalf of the public purse – and from the outlying regions of wind-blown Dominican Republic to the hi-tech air-pollution sensors being deployed in the public areas of Smart Cities such as Glasgow, Peterborough or Manchester … geospatial is the discipline that knows no limits to scope, potential or boundaries. Smart is making sure it's part of the mix.

Abigail Page is Chair of the AGI's Council which is formed from elected members of the AGI. Its main role is to set the strategic direction for the organisation. www.agi.org.uk

Perhaps that's the reason we can find our role quite challenging sometimes, at the AGI, as the organisation that represents an entire industry.

We want to service the needs of all those working with geographic information at the same time – and our industry is now multi-talented, multi-directional, and multi-purpose in the extreme. And as I'm writing, I'm reminded of this fact – and of the great progress we're making across the board.

I'm looking forward to seeing who'll be joining us, from around the industry, at our annual conference – GeoCom. Our topic this year? You guessed it: Smart Geospatial. Our speakers will be almost as varied as the strands of expertise that go to make up our organisation's membership, and we'll have insights on the influence and importance of geospatial in everything from infrastructure, tech, agriculture, policies and decision-making, Big Data, and neuroscience.

At the AGI, we're determined to make ourselves heard: better use and greater integration of geospatial is essential, everywhere. The UK has a lot to offer the world in that regard. So, if you're curious about getting involved with our advocacy work, or you'd like to stay updated on what we're doing to support you, wherever and however you're using geo in your work, I urge you to stay in touch – and, of course, to come along to Smart Geospatial, #GeoCom17, in October.

Got an event to list?

Go to www.gis-professional.com/events

URISA GIS-PRO 2017
23-26th October 2017, Jacksonville, USA
http://www.urisa.org/education-events/gis-pro-annual-conference/

GEOCOM 2017
26th October 2017, London, United Kingdom
http://www.agi.org.uk/events/calendar/geocom17

EFGS CONFERENCE 2017
2-3rd November 2017, Dublin, Ireland
https://www.efgs2017.ie/

11TH INTERNATIONAL SYMPOSIUM ON GEOSPATIAL HEALTH GNOSISGIS 2017
3-5th November 2017, Maryland, USA
http://www.gnosisgis.org/index.php/meetings/

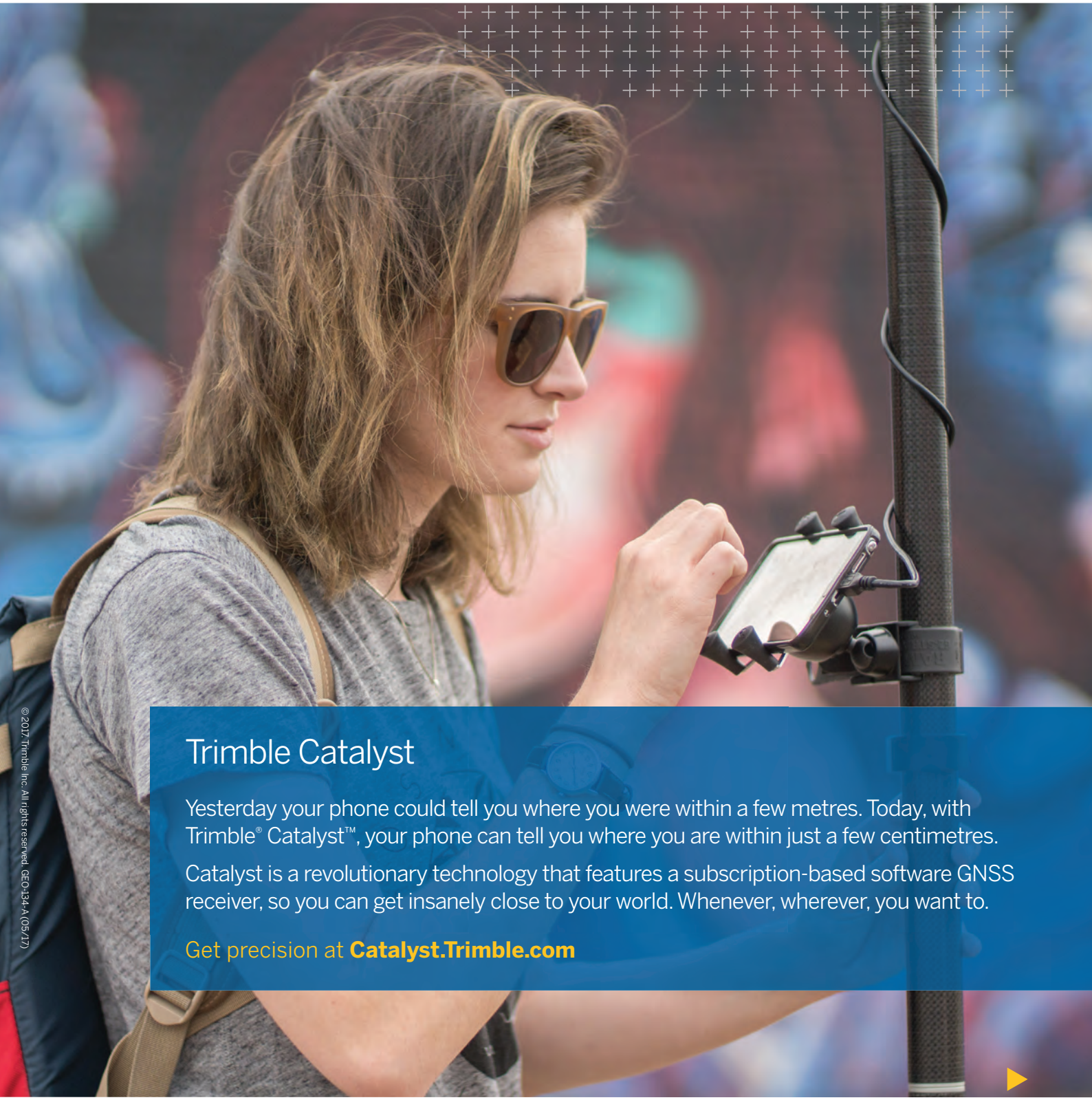
AUTODESK USER CONFERENCES 2017
8th November 2017, London, United Kingdom
http://www.cadline.co.uk/Events/AutodeskUserConference2017

BIG DATA SERIES 2017
20-21st November 2017, Riyadh, Saudi-Arabia
https://www.trescongloba l.com/bigdata/#home

DATA MANAGEMENT & GIS WORKSHOP: MODERNISING OUR APPROACH TO DATA MANAGEMENT
22nd November 2017, London, United Kingdom
http://www.oceanwise.eu/news/events/event-register/

GISR AFRICA
23-24th November 2017, Abuja, Nigeria
http://www.gisrafrica.org/

ADVERTISERS' INDEX



Trimble Catalyst

Yesterday your phone could tell you where you were within a few metres. Today, with Trimble® Catalyst™, your phone can tell you where you are within just a few centimetres.

Catalyst is a revolutionary technology that features a subscription-based software GNSS receiver, so you can get insanely close to your world. Whenever, wherever, you want to.

Get precision at **Catalyst.Trimble.com**

On demand, high precision GNSS for mobile devices

TRANSFORMING THE WAY THE WORLD WORKS

Trimble