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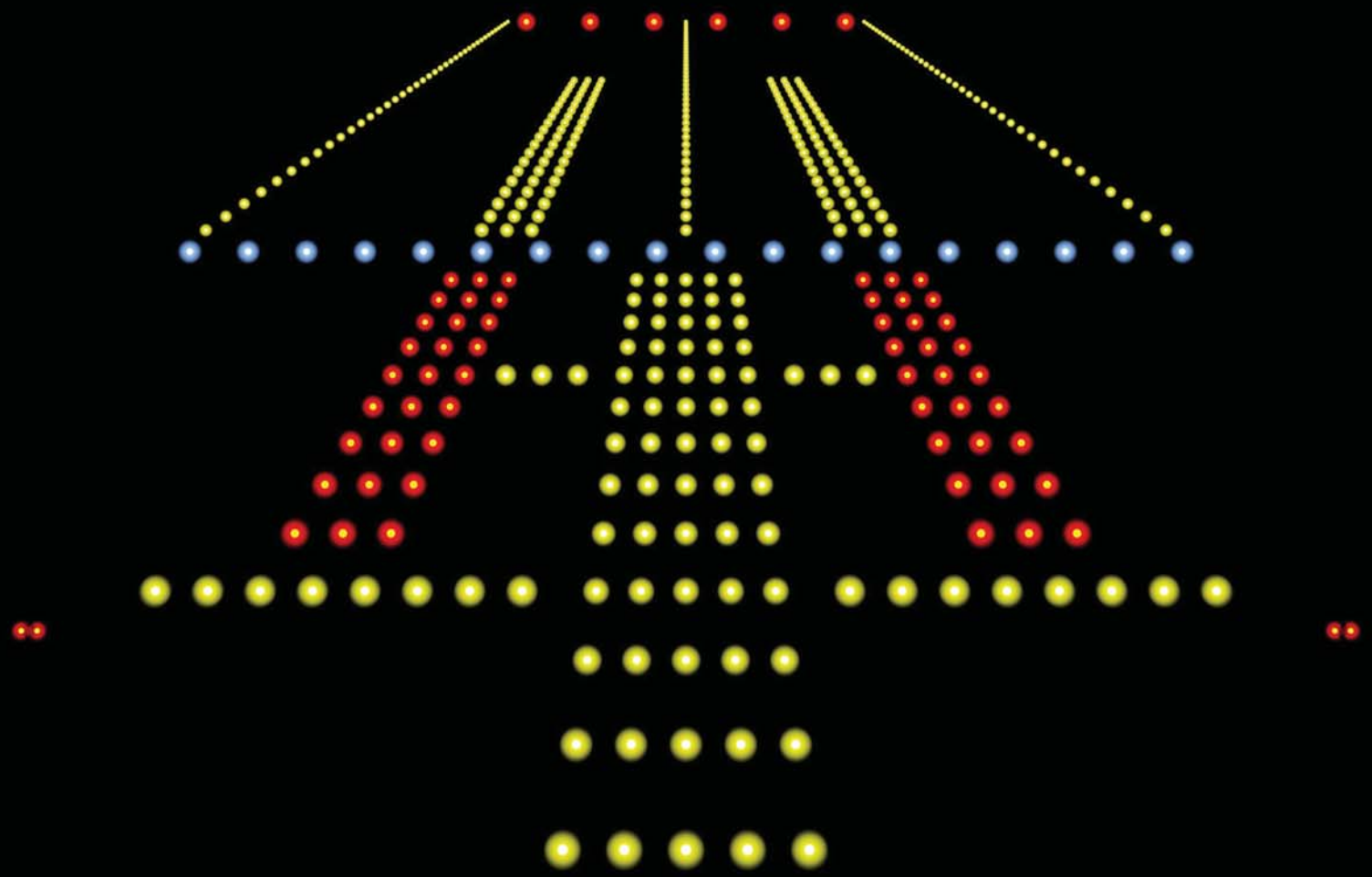
TOWARDS A SAFER SKY WITH EGNOS



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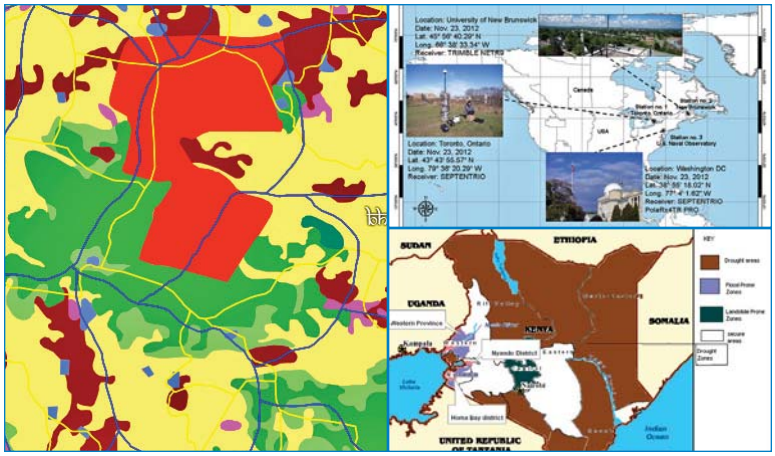
[1]There is no public GLONASS L3 CDMA ICD. Trimble cannot guarantee full compatibility.



In this issue

Coordinates Volume 9, Issue 12, December 2013

Articles

Columns

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Towards a safer sky with EGNOS

Europe's progress towards a full scale LPV implementation - Current status (first implementations), lessons learnt and challenges for the future

F Javier de Blas
Service & Business Development Manager, Service Provision Unit, ESSP SAS, Madrid, Spain

The European Geostationary Navigation Overlay Service (EGNOS) is Europe's first venture into satellite navigation, providing an augmentation signal to the Global Positioning System (GPS) Standard Positioning Service (SPS). It has been a long way for Europe, since the beginning of the EGNOS programme in the late 90's, culminated with the declaration of availability of the three EGNOS Services:

- The Open Service (OS), targeting mass market applications, declared available by the European Commission on the 30th of October 2009.
- The Safety of Life (SoL) Service, which main objective is to support civil aviation operations down to LPV (Localiser Performance with Vertical guidance) minima, declared available by the European Commission on the 2nd of March 2011.
- The EGNOS Data Access Service (EDAS) declared available by the European Commission on July 2012, is oriented to users in different domains of application such as Location Based Services (LBS), Assisted-GNSS (A-GNSS) concepts, a broad range of services in professional GNSS markets, and related R&D activities.

As most of the Satellite Based Augmentation System (SBAS) systems around the world, EGNOS was defined, designed and developed to be used primarily for aviation. Therefore the SoL Service is "the service" that EGNOS was originally meant to provide, justifying its very existence. Thus, the introduction of the EGNOS SoL Service in the EATMN (European Air Traffic Management Network) was, maybe, the most important milestone for the whole EGNOS project.

From the 2nd of March 2011 onwards all European Air Navigation Service Providers (ANSPs) were enabled to proceed with EGNOS based procedures publications, with the LPV procedure in Pau (France) being the first operational procedure on the 17th of March 2012.

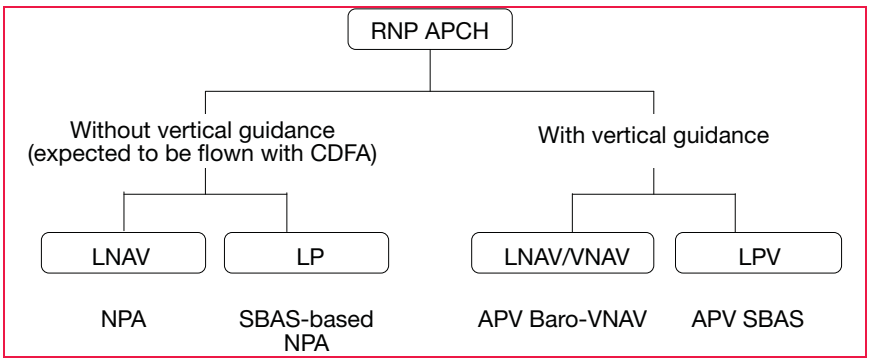

Figure 1: RNP APCH types described in the PBN Manual

European Framework for LPV Implementation

EGNOS benefits for aviation

During the International Civil Aviation Organisation (ICAO) 36th Assembly in September 2007, it was discussed about the growing importance of Performance Based Navigation in respect to aviation safety. The recommendations laid down to States in Resolution 36-23 on Performance Based Navigation (PBN) goals were of particular interest at that time. The Assembly urged States to complete PBN implementation plans by 2009 to achieve "Implementation of approach procedures with vertical guidance (APV) (Baro-VNAV (Vertical Navigation) and/or SBAS) for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014".

The ICAO 37th Assembly in October 2010 amended the above mentioned resolution by adding, concerning APV, "implementation of straight-in Lateral

Navigation (LNAV) only procedures, as an exception, for instrument runways at aerodromes where there is no local altimeter setting available and where there are no aircraft suitably equipped for APV operations"

EGNOS, as Europe's SBAS, guarantees the level of vertical performance required for PBN with the potential to lower pilot's decision height down to 250 feet (200 feet in the future) without the need for ground navigation aids like ILS. Baro-VNAV performance will not allow APV Baro minima lower than 250 ft. EGNOS provides real benefits to airspace users in terms of accessibility of airports, reducing delays, diversions and cancellations while maintaining today's high safety levels.

In addition, EGNOS is free of charge and will allow for savings in maintenance costs associated with ground-based conventional navigation aids used for approach. It increases safety by allowing Instrument Flight Rules (IFR) approaches at difficult locations or under meteorological conditions where previously such approaches were not possible due to safety concerns. In addition, EGNOS provides a convenient and inexpensive back up for runways already equipped with ILS ensuring IFR approach capability even when the ILS is not available.

An independent cost-benefit analysis commissioned by the European GNSS Agency (GSA) indicated that the benefits for Europe's aviation sector will add up to €2.4bn by 2030. Of this, about €1.2bn will be saved due to reduced flight delays, diversions and cancellations. Another €900m in benefits will be due to the reduction of Controlled Flight Into Terrain (CFIT) accidents. And €300m will be saved due to the phasing out of infrastructure navaids.

Another study by EUROCONTROL and Helios compared the use of Baro vertical navigation technology with a satellite-based augmentation system (SBAS) such as EGNOS for APV landings. APV Baro provides vertical navigation by measuring changes in air pressure with altitude. For airports that lack ILS on all runway ends, the benefits of using APV Baro for landings can range from €50,000 to €200,000 a year in savings (estimated benefit of reduced aircraft disruptions). Cost savings will depend on the airport traffic level, the number of ILS installed, the airport topography (and its impact on the minima that can be achieved) and local meteorological conditions. Using EGNOS in addition to APV Baro can provide an additional €20,000 a year in benefits, compared to using only Baro-VNAV.

> Today's GNSS penetration in the global aviation market is approximately 90%, mainly driven by the large sales volume in General Aviation

European pre-operational past experiences

A number of R&D projects cleared the way to the adoption of EGNOS in European aviation, addressing the needs of all involved stakeholders and evidencing the already mentioned benefits EGNOS brings to aviation.

We could highlight GIANT-2 project, which introduced EGNOS enabled operations to end users within identified niche markets, by using integrated avionics onboard and performing pre-operational flight demonstrations, before EGNOS certification.

In particular, a Cessna 172 airplane performed 9 LPV approaches and demonstrated EGNOS' potential in helping small and medium airports run more safely and efficiently.

Complementarily other GIANT-2 trial tests involved Search and Rescue (SAR) helicopters (Agusta Westland) in order to use the navigation technology for maritime search and rescue by the Italian Coast Guard. Emergency services rely on the speed and versatility of helicopters, because of their ability to reach locations without landing aids, but suffer from the impact of adverse weather conditions which can often stop them landing because instrument approaches are not available.

The purpose of these flight tests was to assess the vertical guidance offered, and to examine the impact on improved safety for helicopter approaches.

Pilots and air traffic controllers (ATCOs) provided very positive feedback being enthusiastic about the benefits this new navigation capability would bring to European civil aviation.

On rotorcraft's side, HEDGE project explored EGNOS exploitation for rotorcraft operations.

As of today, helicopters are underserved by the current European ATM system which was really designed for fixed wing aircraft. EGNOS allows the development of high performance operations, including approaches to places which cannot install traditional navigation aids such as hospitals and oil rigs, as validated in HEDGE.

LPV approaches and the PBN concept

PBN represents a fundamental shift from sensor-based to performance-based navigation. Significantly it is a move from a limited statement of required navigation accuracy to a more extensive statement of required performance of the area navigation system in terms of accuracy, integrity and continuity. PBN describes how this performance is to be achieved in terms of aircraft and crew requirements.

ICAO sees PBN as the vehicle to promote global interoperability world-wide. PBN provides a set of navigation specifications for different phases of flight which can be used as needed by regions and States, thereby avoiding the proliferation of different certification and operational approvals.

The ICAO PBN Manual (Doc 9613) replaced the Required Navigation

Performance (RNP) Manual in 2008, with the objective to further improve safety, provide an enabler for extra airspace capacity improve interoperability and consequently reduce costs for operators.

Approach has been historically sensor driven, but will become performance-driven with the introduction of the RNP APCH and RNP AR APCH navigation specifications, fully in line with the ICAO Assembly Resolution A37-11.

At the end of 2012 and the update to the PBN Manual, the RNP APCH navigation specification will officially include approach to all 4 minima: LNAV, LP (Localizer Performance), LNAV/VNAV and LPV minima (Volume II, Part C, Chapter 5 [1]). Approaches to LNAV and LP minima are Non Precision Approaches, whereas approaches to LNAV/VNAV and LPV are APV (Approach with Vertical guidance).

Despite they are true RNP applications (with monitoring and alerting functions) RNP APCH procedures are published on charts with the title Area Navigation (RNAV) (GNSS) RWY XX. Consequently and according to PANS-ATM [3] section 12.3, clearance by ATC to perform an RNP APCH procedure is given in terms of "clearance to RNAV approach RWY xx".

These approach charts can have one or several minima lines to accommodate the needs and capabilities of the different airspace users on the final approach segment towards the runway. Note that the design of the Initial approach segment and the missed approach can either be done according to RNP APCH criteria (common to all "types" of RNP APCH) or to other criteria like RNAV 1.

With the aim to reinforce Europe's commitment towards PBN Implementation, EUROCONTROL received a mandate from the European Commission (EC) to draft an Implementing Rule (IR) on PBN for Europe. The IR will define navigation requirements and identify the functionalities required in en-route and terminal air-space, including arrival and departure, and also approach. Eurocontrol delivered a Regulatory Approach Document (RAD) which was accepted by the EC in March 2013 and will produce a final report, by the end of 2013, aimed at being the basis of the PBN IR to be finally published by the EC in 2014.

EGNOS is free of charge and will allow for savings in maintenance costs associated with ground-based conventional navigation aids used for approach

Drafting the IR will account for the outcomes of an analysis of the areas of the regulatory provisions that could be covered (on the ANSP and/or on the airspace users) to ensure the desired interoperability. Finally, the overall goal of the implementing rule will be to ensure harmonised and coordinated implementation of ICAO Assembly Resolution AR 37/11 within the European (ATM) Network.

The LPV Implementation Process

The ANSP Perspective

There are two ANSPs involved in the implementation of EGNOS based operations in Europe (in particular LPVs):

- *ESSP, the EGNOS Service Provider*, in charge of the EGNOS SoL navigation service. All ESSP oversight activities have been taken over by European Aviation Safety Agency (EASA) since the end of 2012.
- The *Air Traffic Services (ATS) Service Provider* responsible for the LPV procedure publication and the corresponding ATS services, referred hereafter as "the ANSP". The competent supervisory authority for the ANSP will be its National Supervisory Authority (NSA role played by the corresponding State's Civil Aviation Authority in most cases) referred hereafter as "the NSA".

As key prerequisites for EGNOS based operations implementation:

- The NSA needs to agree to the use of GNSS in their airspace.
- The required EGNOS SoL Service availability at the aerodrome concerned must be confirmed in the EGNOS Safety of Life Service Definition Document [6], published by the EC with the support of ESSP. A signal availability and spectrum check should be performed as well but a real time GNSS signal monitoring is not required, as integrity is monitored on board the aircraft.

Both ANSPs' activities are ruled by the Single European Sky (SES) provisions where we can highlight the following required processes specifically linked to the LPV implementation process:

- *The certification of ESSP*, as EGNOS Service Provider (the ATS provider is supposed to be certified as well) as required by European Union (EU) Regulation No 1035/2011 [4].
- *The establishment of the so-called "EGNOS Working Agreement" (EWA)* between these two ANSPs containing:
  - ESSP SoL Performance commitment, in line with the EGNOS SoL Service Definition Document [6]
  - ESSP-ANSP coordination for contingency management.
  - ESSP-ANSP working arrangements including:
  - EGNOS NOTAM (Notice to airmen) Proposals provision (when required)
  - GNSS Data recording: in the context of post accident/incident investigations
  - Collaborative Decision Making (CDM): enabling the ANSP involvement in ESSP decision making process to minimize potential impact of ESSP planned activities in the corresponding EGNOS based operations.
- The *issuance of the EGNOS system*

Declaration of Verification (DoV) by ESSP, ensuring its compliance with EU Regulation No 552/2004 [5].
- The rest of *activities linked to the LPV procedure publication* following the same approval process defined for any other approach procedure publication in line with the procedure design criteria provided in ICAO PANS-OPS [7].

The operator perspective

From an operator perspective there are two possibilities in terms of GNSS (GPS/WAAS/EGNOS) avionics certified equipment, stand-alone or integrated, meeting the applicable European Technical Standard Orders (ETSOs):
- ETSO-C145: Airborne Navigation Sensors using the GPS augmented by WAAS.
- ETSO-C146: Stand-Alone Airborne Navigation Equipment using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS).

These regulations refer to RTCA DO-229 [8], which is the current requirement for GPS receivers having the WAAS/EGNOS capability, and is the certification basis for ETSO-C145 (DO-229A) and ETSO-C146 (DO-229B).

Once a certified EGNOS enabled avionics equipment is selected to be installed, the operator must obtain the following approvals:
- The *Airworthiness Approval* applying for the corresponding Type Certificate (TC), Restricted Type Certificate (RTC) or Supplemental Type Certificate (STC) to European Aviation Safety Agency (EASA).

To ease this process EASA has generated an Acceptable Means of Compliance (AMC) standards to support and facilitate the implementation of EGNOS based operations within the context of the European Air Traffic Management Network (EATMN). These AMCs ([9] and [10]) provide some acceptable means that can be used to obtain airworthiness approval also defining the operational criteria necessary to conduct safely such approach operations in designated European airspace.

Complementarily to [9], EASA published a Certification Memorandum (CM) clarifying the acceptability of the use of GPS/EGNOS geometric altitude as a source of altitude for approaches to LNAV/VNAV minima.

Applications for Airworthiness Approval can be made to EASA on the basis of a Certification Review Item (CRI). In fact, a number of certification projects have been already completed, under Type Certificate (TC) or a Supplemental Type Certificate (STC) projects together with the validation of Garmin's FAA All Model List (AML) STC for the GTN series.
- The *Operational Approval*: The avionics installation involves not only the technical aspects directly related to the airworthiness of the aircraft but also addresses those aspects related to the changes that such modification could induce in its operation.

Those changes must be fully assessed in order to ascertain that the aircraft modification does not pose additional hazards and therefore that the appropriate safety level is maintained.

To this purpose, an Aircraft Operational Qualification is intended to assess all the elements relating to the training and qualification of flight crews (both cockpit and cabin), all elements of compliance with operational rules including normal, abnormal and emergency procedures, and to update the required operational documentation (POH (Pilot Operating Handbook), AFM (Aircraft Flight Manual), MEL (Minimum Equipment List)). This process is managed by the National Supervisory Authority (NSA) of the aircraft's State of registry based on [9], [10] and [11].

Today's GNSS penetration in the global aviation market is approximately 90%, mainly driven by the large sales volume in General Aviation (GA), as described in the GNSS Market Report issue 2, published by GSA in 2012. Over the last few years the penetration of GNSS in commercial aviation has increased with sustained sales, and it is expected to increase from 70% to 90% by 2020.

The expected shipments of EGNOS enabled devices is expected to dominate the market through the regional, business and general aviation segments in the next decade. The penetration of SBAS enabled units in regional aviation is estimated as close to 9% and is expected to increase up to 39% by 2020. Sales already achieved within business and general aviation can now be operationally used to deliver benefits, and is expected to increase from some 26% in 2012 to 77% in 2020.

Business and general aviation are key niche markets for EGNOS based operations introduction at this early stage. Today, almost all new navigation equipment sold by general aviation manufacturers is SBAS capable and IFR pilots can decide to install a stand-alone SBAS enabled receiver for a relatively small price.

A survey performed by GSA confirmed that the vast majority of the European GA IFR community (85%) is interested in installing and using SBAS or have at least considered it before. Indeed, approximately 48% of participants indicated that their aircraft are already SBAS approved, although it does not necessarily imply that they have operational approval to fly LPV approach procedures.

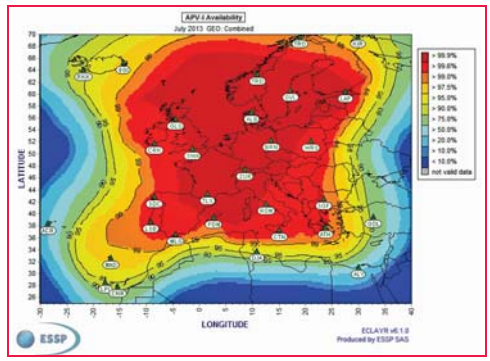

Figure 2: EGNOS APV-I availability with ESR v2.3.1 (February 2013)

Photo: Sindre Lundvold

NORWEGIAN EXTREME ARTIST, ESKIL RONNINGSBAKKEN, DURING A BALANCING ACT AT PULPIT ROCK, 1982 FEET ABOVE THE LYSEFJORD, NORWAY, 2006.

AMAZING SKILLS OF THE WORLD

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Availability of approach procedures and equipage/certification costs are the main barriers dissuading non-SBAS equipped GA users from upgrading.

In order to tackle these issues, GSA has launched a roadshow, in collaboration with EASA, in order to increase awareness on the safety benefits provided by EGNOS, providing practical guidance on how to certify an aircraft and facilitate getting EGNOS-specific landing procedures published and available for general aviation.

EGNOS SoL Service Roadmap

In close coordination with the European Commission (responsible for the EGNOS Programme Management) ESSP has recently published the EGNOS Services Roadmap documents (available at http://www.essp-sas.eu/printed_documents).

These documents provide a high-level overview of the three EGNOS services' current status and their expected evolution, linked to the consecutive EGNOS system releases (ESR) deployment and the information/interfaces improvements described therein, structured in 4 different categories: Service Area, Service Level, Service Robustness and User Interfaces.

Particularly the EGNOS SoL Service roadmap shows the following planned milestones up to 2015, materializing how the SoL service is expected to evolve in the short-midterm and specifically where and when LPV capability will be enabled in the different EU member States areas:

- *Service Area:* Two main service area extensions linked to the deployment of the following ESRs:
  - ESR v2.3.1: Deployed in February 2012 introducing a relevant coverage extension mainly to the south and east of Europe. *Figure 2: EGNOS APV-I availability with ESR v2.3.1*
  - ESR v 2.4.1: To be deployed in the beginning of 2015 targeting to provide APV-I availability to EU28 Member States.
- *Service Level:* The most relevant improvement included in this category is the introduction of LPV 200 capability in the beginning of 2015.
- *Service Robustness:* Several robustness improvements associated with the following ESRs deployment:
  - ESR v 2.3.2: To be deployed in October 2013
  - Inclusion of 2 new Ranging and Integrity Monitoring Stations (RIMS) stations
  - Improved Ionospheric monitoring
  - ESR v 2.4.1: To be deployed in early 2015
  - Inclusion of 2 new RIMS stations
  - SES ASTRA (SES-5) replacing PRN 120
  - SES ASTRA 5-B replacing PRN 124 (Artemis)
  - EGNOS Wide Area Network enhancement
- User Interfaces:
  - The EGNOS helpdesk (egnos-helpdesk@essp-sas.eu) extended its operating hours to H24 every day of the year being available to receive user requests via phone call and e-mail since July 2012.
  - The EGNOS User Support Website (http://egnos-user-support.essp-sas.eu) is being re-organised to provide specific contents for each EGNOS Service in a differentiated way before the end of 2013.
  - Interfaces within the EGNOS Working Agreement (EWA). Main improvements:
  - Improved Contingency Communication to ANSPs achieved in September 2012.
  - Progressive improvements to EGNOS NOTAM proposals generation.

European LPV Implementation Status

ESSP has concluded 12 different EGNOS Working Agreements, since the SoL Service was declared available in March 2011, with the following ANSPs: DSNA (France), Skyguide (Switzerland), Guernsey Airport (Bailiwick of Guernsey, Channel Islands), DFS (Germany), ENAV (Italy), Austrocontrol (Austria), NATS (UK), AENA (Spain), PANSA (Poland), ANS CR (Czech Rep), HIAL (UK) and EDAL (UK).

Figure 3: APV-I target service area 2015

On the ground of these EWAs the following EGNOS based approaches have been published in Europe up to now:

- *DSNA (France):* 50 LPV procedures in 39 airports.
- *Skyguide (Switzerland):* 4 LPV procedures in 4 airports.
- *Guernsey Airport (Bailiwick of Guernsey):* 2 LPVs in Alderney Airport.
- *DFS (Germany):* 73 APV Baro-VNAV procedures authorized to be flown with EGNOS vertical guidance in 32 different airports plus 14 LPVs in 9 of them.
- *ENAV (Italy):* 7 LPV procedures in 4 airports.
- *AENA (Spain):* 2 LPV procedures at 1 airport.

These pioneer EGNOS based operations implementations are paving the way for the coming ones that, in line with the different European ANSP's plans shared in different fora and the European funded implementation projects' objectives, will triple current figures in the short term generating a snowball effect that will be extended soon all across Europe.

ESSP makes this information available through its website (http://www.essp-sas.eu/) where an "EGNOS based procedures map" is displayed together with a detailed table listing these procedures already in place.

At a higher level, EUROCONTROL has developed an interactive map called the "PBN Approach Map Tool". The tool provides a means to illustrate the implementation status and plans for PBN Approaches, including RNP APCH (to all 4 minima: LNAV, LP, LNAV/VNAV and LPV) and RNP AR APCH.

Implementation status information is factual (approach procedures are available in national AIP (Aeronautical Information Publication)). Implementation plans are collected from individual countries. Whether these publication plans will materialise and when is dependent on a number of factors (e.g. difficulties to collect obstacle data for procedure design, unforeseen issues faced in the procedure design phase or delays in the approval for publication by the supervisory authority) and should not be considered as commitments by a country.

The tool shows information about individual types of approaches or of APV in general. This also shows the evolution over time of the percentage of runways ends where approaches are published.

This is freely available to any user of the EUROCONTROL extranet (Onesky Online) at the following link: https://extranet.eurocontrol.int/http://prisme-newgis.hq.corp.eurocontrol.int/pbn/.

Guidance Material, Supporting Cells and Existing Incentives

EGNOS based operations adoption is in its initial stage. Except for those States/ANSPs most active in GNSS, involved in EGNOS research & development projects for long, most European States/ANSPs/operators start now to assess the feasibility and cost/benefits of implementing EGNOS based operations to fulfill ICAO 37th Assembly Resolutions on what regards to APV implementation.

There is a huge effort being done by the European Commission for the dissemination and awareness of the aviation community on EGNOS with the lead of the GSA and the support of ESSP.

ESSP SoL Users' consultation 2012 revealed a clear need, as identified by the European ANSPs consulted, for support and guidance to boost EGNOS based operations implementation towards ICAO Assembly resolutions in coordination with existing funding programmes and implementation initiatives.

Table 1: EGNOS based operations already in place

Country	LPV		APV Baro	
	# Airports	# Procedures	# Airports	# Procedures
France	39	50	1	1
Switzerland	4	4	0	0
Guernsey	1	2	0	0
Germany	9	14	32	73
Italy	4	7	0	0
Spain	1	2	0	0
Total	58	79	33	74

Figures updated in November 2013

Complementarily, although there is a clear recognition of the current effort being done up to now, more effort on guidelines / awareness material generation and dissemination is requested. General and Business aviation operators flying to small-medium regional airports are clearly identified as best candidates obtaining higher benefits from LPV early adoption. Therefore, an improvement on the support/link with these aviation communities to provide guidelines/awareness material to trigger the necessary decisions (CBAs (Cost Benefit Analysis), technical guidelines, awareness material, etc.) is requested.

What is being done to answer this need?

- *Guidance Material:* EUROCONTROL, the European Organisation for the Safety of Air Navigation, led the development of "Guidance material for RNP APCH (Approach) implementation" which was published by ICAO as the ICAO EUR DOC 025. The guidance are to assist first in identifying the type of approach which is the most relevant to publish at the airport (EGNOS-based LPV is one option) and then guides through the implementation process. These guidelines are making reference to other reference material amongst which:
  - APV SBAS Concept of Operations
  - APV SBAS generic safety assessment
  - European GNSS NOTAM concept
- Supporting Cells:
  - ICAO PBN TF: Under the chair of the European and North Atlantic (EUR/NAT) Office, this Task Force is focused on monitoring the deployment of PBN applications (in all phases of flight, and including but not limited to EGNOS-based operations) in the ICAO EUR/NAT Region. This collects the national PBN implementation plans as requested by ICAO and assist together with the Go-Teams and EUROCONTROL individual countries in the move towards PBN.

There is a huge effort being done by the European Commission for the dissemination and awareness of the aviation community on EGNOS with the lead of the GSA and the support of ESSP.

  - EUROCONTROL RNAV Approach implementation Support Group (RAiSG): The objective of the group is to co-ordinate the activities necessary for the implementation of RNAV Approaches, including RNP and RNP AR (Authorisation Required) approaches. In coordination with the appropriate (international/global) organisations, the tasks of the RAiSG include in particular:
  - providing a forum for sharing lessons learned
  - contributing to improving the awareness on RNAV approaches
  - monitoring/tracking the deployment progress and plans;
  - and supporting/conducting all sorts of technical and experts' types of activities dealing with operational concepts, infrastructure and airport requirements, procedure design, support to certification, flight inspection, ATC procedure, AIS and NOTAMS, safety assessments, etc.
- European incentives towards EGNOS adoption in Aviation
  - ACCEPTA: A co-funding incentive scheme has been established through ACCEPTA project to support ANSPs and airports to design, develop, check, verify and publish EGNOS LPV approach procedures at selected European airports. In addition, the project also supports the installation of EGNOS enabled avionics, certification and operational approval to perform LPV approaches with a number of aircraft of the involved operators. In total, 71 runways at 39 airports and 44 aircraft from 11 operators and end-users are receiving co-funding.
  - SHERPA: This project is undertaking specific capacity building activities in Easter Europe countries to map the implementation of EGNOS into the States PBN strategy.
  - FILGAPP: Looking at operations evolutions, curved approaches enabled by EGNOS are being investigated and several flight trials will be performed in 2013.
  - HEDGE NEXT: It targets the operational implementation of EGNOS into the rotorcraft domain, by supporting the certification of helicopters and APV implementation in selected sites from Spain, Poland and Switzerland, involving national rotorcraft leader operators on emergency services. Moreover, HEDGE NEXT is creating low-level RNAV routes that intercept previous SOAP (SBAS Offshore Approach Procedure) procedure criteria implemented in the North Sea and moves forward on the development, test and validation of curved approaches for helicopters using GPS and SBAS as sensor (PinS and advanced PinS concepts)
  - SIRAJ supports the EGNOS service extension to the areas covered by ACAC and ASECNA by promoting and demonstrating the benefits of EGNOS for civil aviation in a real environment.

Other SBAS based operations implementation

APV Baro-VNAV

In addition to APV SBAS, the use of SBAS on RNAV(GNSS) approach procedures is also possible for performing APV Baro-VNAV procedures down to the published LNAV/VNAV minimum.

Anyhow, the State publishing the procedure has to confirm that they allow APV Baro procedures to be flown with either Baro-VNAV or SBAS equipment. In this case, EGNOS NOTAMs are provided accordingly to inform on a possible unavailability of the procedure down to LNAV/VNAV. In the US this is also permitted and the PANS OPS procedures design criteria allow this possibility.

Class 2, 3 or 4 approved SBAS aircraft avionics are a requirement for the use of vertical guidance with EGNOS on APV Baro-VNAV procedures.

As an example, there are 73 APV Baro-VNAV procedures authorized to be flown with EGNOS vertical guidance in Germany. Other countries, as France, also authorise the use of EGNOS for APV Baro-VNAV and more procedures will be available in the near future throughout Europe.

PinS

The Point in Space (PinS) concept consists in flying under Instrument Meteorological Conditions (IMC) to/from a Point-in-Space located in the vicinity of the landing/departure site. The segment joining the PinS and the landing/departure site is flown visually but does not require VFR minima. The main advantage is that PinS procedures allow IFR flights to/from non-IFR sites (aerodromes, heliports, helidecks).

PinS LPV approach procedures are progressively being introduced for helicopter operations providing clear benefits for Search and Rescue (SAR), SBAS Off Shore Approach Procedures (SOAP) and Helicopter Emergency Medical Services (HEMS).

Challenges for the future

There are currently a number of areas of research on future SBAS-based operations: surveillance, advanced approach procedures as well as instrument approaches at small airfields.

Surveillance

The high accuracy and integrity of SBAS-based positioning enable to enhance both surface and airborne (e.g. ADS-B) surveillance functions.

Advanced approach procedures

In the frame of the Single European Sky ATM Research Programme (SESAR) 5.6.3 project a new advanced instrument approach procedure based on SBAS is been researched. This advanced procedure is an extension of the 'ILS-look-alike' APV SBAS approach by making use of the RF functionality within the RNP APCH navigation specification. Radius to Fix (RF) legs are possible in the initial and intermediate segments as well as in the final phase of the missed approach. The vertical profile of the initial and intermediate segments is flown with the CDA technique (based on barometric vertical positioning) whereas the final approach segment is an APV SBAS down to LPV minima.

Instrument approaches at small airfields

The implementation of LPVs at non-instrument aerodromes is a clear challenge. The minimum runway infrastructure and the minimum level of ATS are key issues to work on.

In the UK, the Civil Aviation Authority (CAA) is developing a policy regarding instrument approach procedures to aerodromes without an instrument runway and/or approach control. A risk-based approach will be followed to regularise existing discrete Instrument Approach Procedure (IAPs) and when considering other aerodromes meeting specific criteria. Mitigation against inferior runway or ATS will be derived subject to an acceptable safety assessment. A consultation was performed over the summer of 2012 and the publication of the Policy and Guidance is expected in 2013.

In addition, the ACCEPTA project is also assessing the operational implementation of EGNOS-based instrument procedures down to LPV in small airfields in Europe that are typically restricted to operate under Visual Flight Rules (VFR).

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References

[1] ICAO, Performance-Based Navigation Manual, Volume II, Implementing RNAV and RNP (Doc 9613).
[2] ICAO Assembly Resolutions A37-11 and A36-23
[3] ICAO, Doc 4444, Procedures for Air Navigation Services, Rules of the Air and Air Traffic Services (PANS-ATM)
[4] Regulation (EU) No 1035/2011 laying down common requirements for the provision of air navigation services
[5] Regulation (EU) No 552/2004 on the interoperability of the European Air Traffic Management network (the interoperability Regulation)
[6] Safety of Life Service Definition Document (EGN-SDD SoL, v1.0)
[7] ICAO, Doc 8168, Procedures for Air Navigation Services – Aircraft Operations (PANS OPS)
[8] RTCA DO-229 Minimum Operational Performance Standards for Global Positioning System / Wide Area Augmentation System Airborne Equipment
[9] EASA AMC 20-27 Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV Baro-VNAV Operations
[10] EASA AMC 20-28 Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operation to LPV minima using SBAS
[11] Commission Regulation (EEC) No. 3922/91 Annex III (EU-OPS) and its subsequent amendments

NSDI in India: Status and the road ahead

During the XII Plan (2012-2017), NSDI is being upscaled to develop the National Geographical Information System (NGIS) by setting up of a National Data Registry, a National Geo-spatial Platform, and development of products/ application services for a select group of end users.

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Background

There is a growing emphasis on sustainable management of natural resources and preservation of environment due to the realization that these are vital to our socio- economic development. Citizens have to be provided with better quality of life, health care and education. Challenges like internal security, energy security, inclusive growth, climate change, disaster mitigation etc. are required to be effectively addressed. Towards these goals, there is a need to design, implement and monitor focused intervention measures while taking into account the multiple issues involved in each of the situations. At the heart of this strategy lie the appropriate compilation, sharing, and integration of diverse spatial data (i.e. data with reference to a location on the earth's surface) and statistical data that can permit incisive analysis and enablement of decision support systems. The 12th Five Year Plan (2012-2017) thus recognizes the importance of digital spatial data, satellite imageries, positioning systems, Geographic Information Systems (GIS) and various other computational and analytical means to provide decision support. Spatial data sets compiled and provided by various data providing agencies at the national level (See Box: NSDI Shareholders) form a major component of these diverse sets of data.

NSDI Shareholders (Indicative)

- Survey of India (SOI)
- National Remote Sensing Centre (NRSC)
- Geological Survey of India (GSI)
- Forest Survey of India (FSI)
- Census of India (CoI)
- India Meteorological Department (IMD)
- Central Water Commission (CWC)
- Central Ground Water Authority (CGWA)
- National Atlas & Thematic Mapping Organisation (NATMO)
- National Bureau of Soil Survey & Land Use Planning (NBSSLUP)
- Military Survey
- Naval Hydrographic Office (NHO)
- Central Pollution Control Board (CPCB)
- National Informatics Centre (NIC)
- Ministry of Statistics & Programme Implementation (MoSPI)

Despite elaborate in situ mechanism for compilation of spatial and statistical data sets in the agencies above, there are inherent problems inhibiting data sharing, integration and effective utilisation by the end user (See Box: NSDI Stakeholders/ End Users). Inaccessibility to up-to-date and GIS-processable data, inefficient data discovery mechanism, lack of standardisation, absence of seamlessness in data layers, non-availability of decision support tools, inadequate integration of GIS with the end user workflows, insufficient capacity amongst end users have been some of the major bottlenecks.

Context

Recognizing the above, the National Spatial Data Infrastructure (NSDI) Initiative has been set up jointly by the Department of Science & Technology and Department of Space. The Initiative aims at developing and maintaining standard digital collection of spatial data, common solutions for discovery, access and use of spatial data in response to needs of diverse user groups, and to increase awareness and understanding of the vision, concept and benefits of NSDI.

Since December 2009, the India Geo Portal has been increasingly making accessible the data holdings of various agencies through interoperable geographic information services like Catalogue Service on Web (CSW), Web Map Service (WMS), Web Feature Service (WFS), and Web Processing Service (WPS). In order to make the higher resolution data sets available with the State level Line Departments/ Agencies accessible to the end users, the State level Spatial Data Infrastructures are being set up during the XII Plan period. State Geo Portal prototypes are being developed

NSDI Stakeholders/End Users (Indicative)

Government/ Ministries
Rural Development, Urban Development, Environment & Forests Mines, Water Resources Agriculture, Health & Family Welfare Human Resources Development, Home, Communication, National and State Disaster Management Authorities

Academia
IITs/ NITs, Universities, Research Laboratories, Autonomous Institutions, colleges, schools

Industry/ Business
GIS Industry, Value-added product/ tool developers

Civil Society
NGOs, Self Help Groups

in States like Karnataka, Kerala, West Bengal, the North East, Haryana, Uttarakhand, and Jammu & Kashmir.

Geo-Information and Communication Technologies (Geo-ICT), on the other hand, have further evolved with advancements in Data and Service Registry, Geo-spatial Interoperability Specifications, Volunteered Geographic Information (Crowd-Sourcing), Cloud Computing, Social Media Applications, Open Source Technologies, Linked Data, Smart Phones etc. Potential of these emerging concepts and technologies are required to be assessed, explored and utilised.

Current Status

Taking note of the above, the National Spatial Data Infrastructure (NSDI) is being re-oriented and upscaled towards improving sharing, discovery and access to GIS-processable data sets acquired by various national agencies. Provision of GIS-processable data is expected to not only improve its direct entry and efficient processing in standard GIS software packages but also to help in the development of applications accessible by end users on Web and Mobile Devices. Provision of nationwide seamless and current data services in a standard interoperable form, making available state-of-art facilities for product/ application development services for decision support, and framing required policies are three important aspects of the newly emerging NSDI.

Supporting Policy Framework

In order to improve access and facilitate sharing of processable spatial data, several policy level changes have been brought about in the recent past. Revised National Map Policy (2005), Constitution of NSDI (2006) for spatial data governance, Revised Remote Sensing Policy (2011) and the National Data Sharing and Accessibility Policy (NDSAP, 2012) have been the major steps in this direction. NDSAP mandates various agencies and departments for making the data sets acquired by using public resources shareable in a processable form in the public domain. The agencies are required to publish an Exclusion list (Negative List) indicating the data sets that they would not share under the mandate considering issues like security. In support of this requirement, agencies are expected to provide access to their data sets – both spatial and non-spatial (attribute) – by setting up data nodes.

Open access to processable data through data.gov.in – implemented by National Informatics Centre – has been a major outcome of the NDSAP. A set of 4936 data sets including spatial data sets are now accessible through the Data Portal. More spatial data nodes are under development by various agencies for making their data accessible through the Data Portal.

NSDI Data Nodes and Data Re-engineering

Setting up of a web-accessible spatial data node in each Data Providing Agency is a pre-requisite to an operational NSDI. Data nodes have been established in agencies like SOI, GSI, and FSI and existing nodes (e.g. NRSC's BHUVAN) harmonised for improving access to spatial data and satellite images from the single window gateway of India Geo Portal set up in NSDI. Built on a simple system configuration aimed at compiling and sharing metadata sets, the Data Nodes are expected to provide access by end users to GIS-ready data sets and services in 24x7 mode. Preparation of GIS-ready vector data from the existing digital cartographic data, development and maintenance of geo-relational database, compilation and sharing of metadata, and provision of catalogue, feature and map services are core activities at each Data Node. A Standard Operating Procedure (SoP) is now available for re-engineering of Survey of India digital topographic data (Figure 1) to GIS-ready format.

Metadata

Metadata (i.e. data about data) helps discover and search digital spatial data over the web. Useful in assessing a data set's fitness for purpose in an application, metadata should be documented in a standard form, regularly updated, and made accessible to the users. A Metadata Tool based on NSDI Metadata Standard version 2.0 (founded on ISO 19115) has

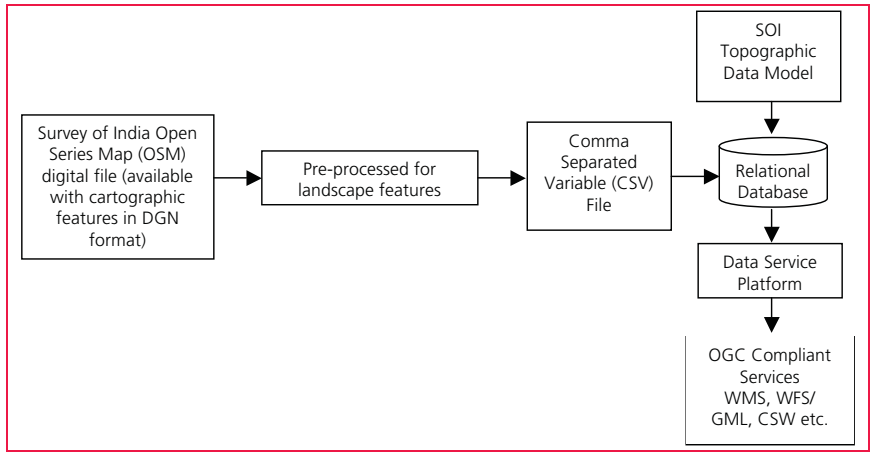

Figure 1: Topographic data re-engineering process at SOI Data Node for provision of GIS-ready data

been developed and shared with the Data Providing Agencies for documenting and uploading the metadata on the centralised NSDI Server. Metadata in the NSDI Server has been recently updated with the involvement of the data providers for improving utilisation (Figure 2). Some of the Agencies have begun to share detailed metadata sets from their individual data nodes (Figure 3) for the benefit of the end users. Summary metadata available on the Central Server through the single window India Geo Portal will be regularly and automatically updated from the detailed metadata of individual data nodes by the help of web-based crawlers.

NSDI Web Services

For application development and analysis, standard Geographical Information System (GIS) software packages require on-line access to up-to-date data or images through Web Services. NSDI Data Nodes are in the process of providing OGC/ ISO -compliant Web Map Services (WMS) and Web Feature Services (WFS) for provision of maps and feature data owned by the individual Data Providing Agencies. A variety of spatial data sets from SOI (Surveykshan Portal) (Figure 4), NRSC (Bhuvan Portal) (Figure 5), FSI, and GSI are available for access from respective vector data of corresponding servers by end user as PNG or JPEG files for display on browsers (e.g. Mozilla, IE etc.) or on GIS software packages for developing applications around the WMS. Similarly, GIS-ready vector data could be downloaded in OGC/ISO-compliant Geography Mark Up Language (GML) for analysis at the end of the user. Web-based Catalogue Services (CS-W) are being developed for on-line provision of metadata to end users/ clients.

State Spatial Data Infrastructures (SSDIs)

Line Departments and Agencies in the State Governments acquire spatial data for their own use. These include Survey Settlement & Land Records, Roads & Building, Planning Board, Public Health, Irrigation, Geology & Mines, Forest, Groundwater Board, Municipal Bodies, Remote Sensing Centre, Lake Development Authority, Biodiversity Board etc. Data holdings of these Departments and Agencies are mostly in analogue and proprietary forms inhibiting sharing and integration amongst themselves and also with those from national level data providers. Taking this problem into account, the State SDI Initiative has been launched. State level clearinghouses, databases, and Geo Portals are being set up in selected States (e.g. Karnataka, Kerala, West Bengal, the North East covering 8 States, Haryana, Uttarakhand, and J & K) to improve spatial data discovery, sharing and utilisation.

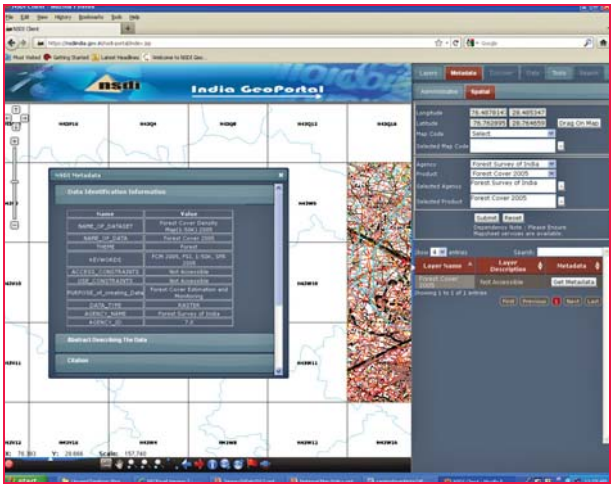

Figure 2: Sample metadata search and display of FSI data from India Geo Portal

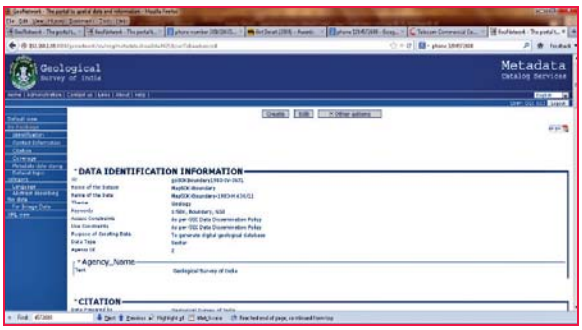

Figure 3: Metadata display on GSI Data Node set up under NSDI support

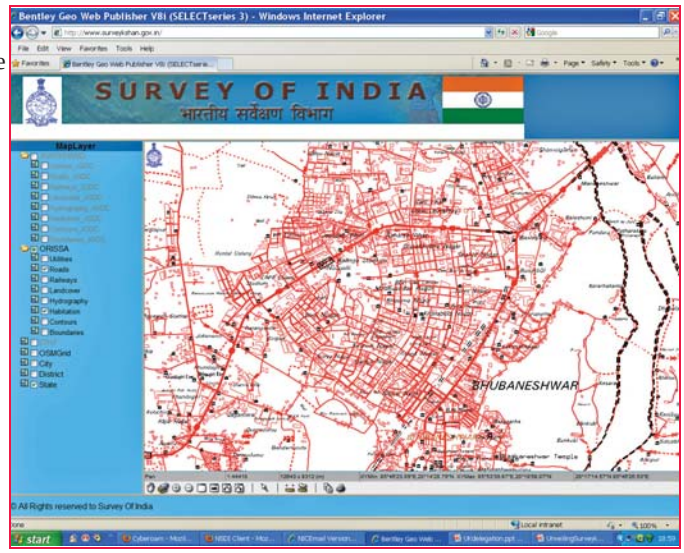

Figure 4: Topographic data layers for Roads & Settlement of Bhubaneswar (Odisha) as WMS from SOI's Surveykshan Portal

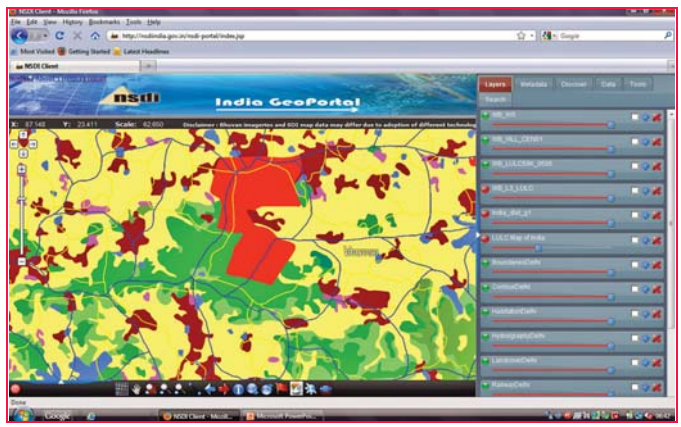

Figure 5: Thematic data for West Bengal accessible as WMS from Bhuvan Portal

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Government of National Capital Territory of Delhi has created a sound base for setting up of Delhi State SDI.

Advanced Lab on Geo-Information Science & Engineering (GISE)

An Advanced Laboratory on Geo-Information Science & Engineering (GISE) has been set up at the Department of Computer Science & Engineering (CSE) of Indian Institute of Technology Bombay to provide the required technical back up to the NSDI activities. In addition to its thrust on pursuing Research & Development in the frontier areas of GISE, the Laboratory conducts pilots and demonstrates proof-of-concept for adoption in operationalisation of NSDI. Training and Capacity Building of scientists and officials from the Data Providing Agencies are an important priority for the Laboratory.

GISE Initiative on Emerging Standards and Concepts

A framework for collaborative work in GISE involving academic and research institutions has been evolved with the active participation of the Advanced Lab at IIT Bombay. This is aimed at working on emerging standard specifications from OGC and advanced concepts in GISE: GeoSMS, Web Processing Services (WPS), IndoorGML, RESTful Geo-Web Services, Sensor Web Enablement, Location Based Services (LBS), Linked Data, Geo-Semantic Web, LIDAR Standards, Geo-Visualisation etc. A series of indicative studies launched in the past year may be seen in Table 1.

Outputs and insights gained in the above studies will be useful in further upscaling the NSDI and provision of product/ application services.

Training and outreach

Training / demonstration workshops for officials/ scientists/ potential users and Awareness Campaigns for Stakeholders in the Civil Society so as to develop the requisite human resource base form a vital component of the NSDI strategy. Capacity building of institutions/ organisations receives priority.

Research Thrusts for GISE Laboratory (indicative)

- Service-oriented Architecture
- Spatio-temporal Data Modelling
- Visualisation and Analytics
- Software Engineering for Geo-spatial Systems
- Geo-spatial Interoperability
- Geo-spatial Technology Platform

Activities completed since December 2009 (Indicative)

- Platform and repository established for hosting technologies, applications and prototypes
- Crop ontology for farmers developed for providing agro-advisory solutions
- Smart campus system using 3D Modelling for IIT Bombay
- Open source based Spatial Decision Support System for watershed-based water resources management
- Bus Transportation Network Analysis of Mumbai
- Android Upload Tool
- Evacuation Planning in Large Building Complexes
- Tree Census of Pune
- Spatial data support for Ganga River Basin Management Plan
- Enhancements in Agent Based Modelling and Simulation (MTP) & Spatial Hadoop
- A group of 7 post doctoral fellow engaged on GISE projects, 20 project engineers trained, 25 M.Tech projects (both IITB and external) completed

Table 1: Indicative list of projects launched in Geo-Information Science & Engineering on emerging standards and concepts

Sl No.	Project	Participating Institution	Area/ Focus
1	Development of a GeoSMS Framework to facilitate Location based Services	Indian Institute of Technology (IIT), Kharagpur	GeoSMS
2	Development of geospatial web application for site selection and structure suggestion for artificial recharge of groundwater	National Environmental Engineering Research Institute (NEERI), Nagpur	Web Processing Services (WPS), (Application: Hydrological Modelling)
3	Indoor Information Representation and Management System	Amrita Vishwa Vidhyapeetham, Coimbatore	IndoorGML
4	Service-Oriented Architecture for Spatial Data Integration and Spatial Reasoning	Dhirubhai Ambani Institute of Information & Communication Technologies (DAIICT), Gandhinagar and Ahmedabad University, Ahmedabad	RESTful Geo-Web Services
5	Real time Air Pollution Modelling and dissemination of location-based information using mobile devices	Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore and Bharatidasan University (BU), Thiruchirapally	Sensor Web Enablement (Application: Air Pollution Modelling)
6	Sandesh: A SemANtic Data mESH over Indian Open Data	International Institute of Information Technology (IIIT), Bangalore	Linked Data, Geo-Semantic Web
7	Development of LIDAR Data Standards	Indian Institute of Technology (IIT), Kanpir	LiDAR Standards
8	LAN-based Interactive Three Dimensional Visualisation of LiDAR Data	International Institute of Information Technology (IIIT), Bangalore	Geo-visualisation

Training workshops are conducted from time to time for the staff from the Data Providing Agencies on 'Data Modelling', 'Spatial Data Re-engineering', 'Geo-spatial Interoperability', 'Provision of Spatial Data Services' etc. in order to equip them with the requisite skill set for setting up and maintaining Spatial Data Nodes.

During Awareness Campaigns amongst the school children, utility of tools like GIS, Positioning Systems, extracts of topographic maps and satellite imageries is demonstrated through elementary survey exercises. A Resource Book – 'Geography in Everyday Life' – has been prepared in various regional languages (Telugu, Bengali, and Punjabi) and distributed amongst the school children as a part of the resource kits.

In a similar endeavour involving students from educational institutions like universities and colleges, elementary survey kits have been distributed for surveying the disaster affected areas in the Garhwal and Kumaon regions for assessing the damage under the Sub-programme 'Mapping the Neighbourhood in Uttarakand (MANU)'. The students are initially trained on the techniques of surveying and uploading the spatial data sets to centralised servers for analysis and integration by Geospatial Domain Experts.

In order to enhance the capability and expertise in handling advanced technologies, Geospatial Chairs have been set up in selected leading academic and R & D Institutions/ universities to appoint reputed academicians or researchers for imparting training and pursuing research.

Specific training programmes and summer and winter courses are organised and supported to promote geospatial technologies and increasing their outreach up to lowest level of the planning and decision-making hierarchy. A Capacity Building Resource Portal has been developed to provide materials, data sets, tools and kits useful in imparting training in Geospatial Technologies.

Management Structure

A two-tier management structure governs NSDI. The higher tier – National Spatial Data Committee (NSDC) – is the apex body and is chaired by the Minister of Science & Technology and Earth Sciences with Secretaries from various concerned Departments of the Government as members. Surveyor General of India and the Director, National Remote Sensing Centre (NRSC) act as the Member Secretaries. NSDC provides policy level guidance to the implementation of NSDI.

The NSDI Executive Committee (EC) at the lower tier implements the decisions/ recommendations of the NSDC. Both Surveyor General of India and the Director, NRSC act as co-chairmen in the Committee with Heads of Data Providing Agencies as members. Chief Executive Officer, NSDI is the Member Secretary. The EC defines and implements standards, constitute working level sub-committees, defines and formulates rules for data sharing and access, and facilitate capacity building activities.

Working Groups have been constituted under the chairmanship of nodal officers from various Data Providing Agencies to help work out details of the strategies and implement the decisions of the EC (see Table 2).

DST's NRDMS Programme Steering Committee, Expert Committees and nationwide network of leading academic institutions, R & D Laboratories, universities, State S & T Councils, Remote Sensing Centres, autonomous institutions, Non-Governmental Organisations participating in the NRDMS activities provide the required R & D support to the operational activities of NSDI and the State SDIs.

Table 2: NSDI Working Groups and associated Agencies

Working Group	Chair
Node Architecture & Guidelines	Central Ground Water Authority
Interoperability and Data Exchange	Forest Survey of India
Metadata Standard	Space Application centre
Data Content Standard	National Bureau of Soil Survey & Land Use Planning
Network and Access Control	National Informatics Centre
Cost Recovery/ Payment Gateways	National Remote Sensing Centre
Outreach and Communications	Central Water Commission
Policy, Legality, Security, and Projections/ Transformations	Survey of India
Data Delivery and Capacity Building	Geological Survey of India

NSDI has a modest budgetary support of Rs. 2.0 Crore per annum to support its activities.

Linkages

NSDI has established effective linkages with various national and international agencies and organisations. Bureau of Indian Standards (BIS) – the national agency for standardisation – has set up a dedicated BIS Sectional Committee – the Electronics & Information Technology Division 22 (LITD-22) – for establishing national standards in the field of Geospatial Information. The Sectional Committee is expected to act as the National Mirror Committee for International Standardisation Organisations (ISO) Technical Committee (TC) 211 concerned with the domain. India has upgraded its status from that of an Observer Member to a Participating Member in ISO TC 211.

DST has been a Primary Member in the Open Geospatial Consortium (OGC) – a not-for-profit international consortium of about 475 companies, government agencies, research organizations, and universities participating in a consensus process to develop publicly available geospatial standards. OGC Standards support interoperable solutions that "geo-enable" the Web, wireless and location-based services, and mainstream IT. NSDI by virtue of DST's membership has access to OGC's internal resources (draft specifications, artefacts, tools etc.) for promoting and customising international spatial data and process standards. The December 2013 OGC Technical Committee and Planning

Committee Meetings are taking place at IIT Bombay on 2-6 December 2013.

NSDI has been actively associated with the initiatives launched by the United Nations Global Geospatial Information Management (UNGGIM) and Global Spatial Data Infrastructure (GSDI) Association towards furtherance of its vision and goals.

The road ahead

NSDI Aspirations

In order to firm up a strategy for upgrading NSDI to a more robust and effective infrastructure, a wide-ranging consultation was recently carried out with the involvement of the Shareholders and the Stakeholders of NSDI. NSDI has so far been operating in the 'Data domain'. Aspirations of the stakeholders like end users in the Government, Industry, Academia, and the Civil Society call for availability of accessibility to solutions in the form of products and applications and not the data alone. It has thus been recommended that NSDI should migrate from the present 'Data Domain' of enabling infrastructure to 'Product Domain' of a performing infrastructure in the coming years.

Towards National Geographical Information System (NGIS)

With the availability of the Geo Portals, various stakeholders like the Governments, Academia, Industry, and the Civil Society Organisations are in a position to access geo-spatial data sets/ resources. For effective utilization of these spatial data sets in governance (for Geospatial Governance or 'g-Governance') and businesses, there is a need to adopt suitable Spatial Information Processing Models and reusable web-enabled software based application utilities and analytics from relevant domains of applications. Towards this goal, domain-specific algorithms for multidimensional data analysis or product design, forecast models, predictive analytics, scenario generation and simulation should be developed with the help of participation of the shareholders and stakeholders.

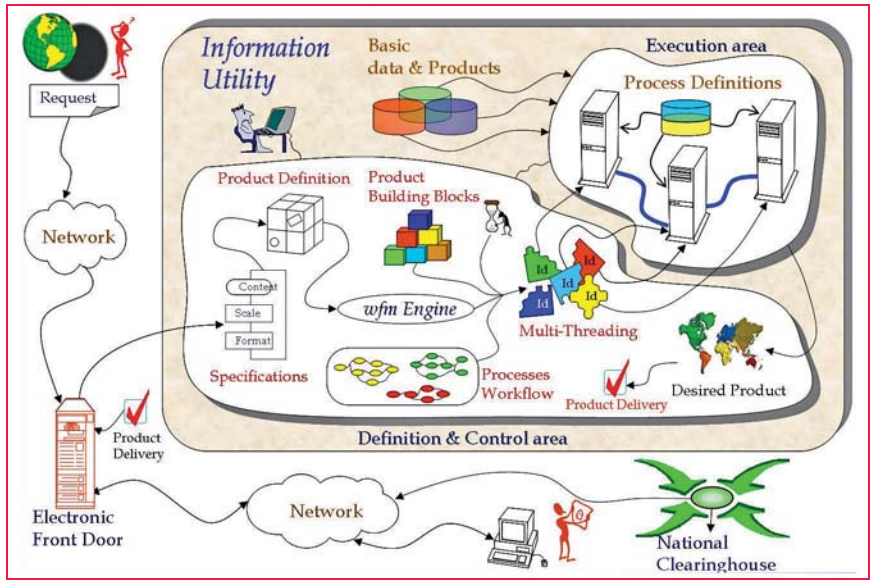

Figure 6: A high level proposed architecture for National GIS for product/ application development for decision support

A high level architecture showing the concept of the proposed NGIS may be seen in Figure 6. Based on the request of the end user to the Electronic Front Door, the Information Utility is expected to develop the required products or applications using the basic data/ products and the process definition specifications in the Execution Area. The resulting products/ applications will be delivered to the end user through the Electronic Front Door. Various Data/ Metadata Services like WMS, WFS, CSW etc. made accessible from NSDI will be used in the development of products/ applications.

This will require collaborative work between various agencies involving (i) setting up of the National Data Registry by networking the spatial data nodes from various NSDI Shareholders, (ii) National Spatial Data Technology Platform, and (iii) development of necessary products and applications for decision support (Geo-DSS) with the state-of-the-art utilities and systems.

During the XII Plan, efforts will be made towards operationalising the National GIS using the network of Spatial Data Nodes of Data Providing Agencies built under the NSDI Initiative and Upscaling the NSDI Clearinghouse to a National Data Registry.

Conclusion

Over the years, a robust network of shareholders has been installed and sustained for provision of various web-based services in an interoperable form over the web. Utility of Geo Portals, Standard Specifications, Spatial Data Re-engineering, Interoperapability etc. has been demonstrated with the involvement of the Advanced Laboratory on Geo-Information Science & Engineering at IIT Bombay and the network of R & D Institutions of Natural Resources Data Management System (NRDMS). These are being adopted and used by the NSDI Shareholders. Required capacities are being built in various organisations and agencies at the National and State levels to operationalise Spatial Data Nodes for provision of web-based Data Services. There is a greater degree of awareness about NSDI Web Services amongst the Stakeholders and End Users. However, the gap exists between end user's access to Data Services and their effective utilisation in decision support. NSDI is thus currently migrating itself from the present 'Data Space' to 'Product Space' to meet the aspirations of the NSDI Shareholders and the Stakeholders.

The paper was presented at NSDI 13, IIT Bombay during November 29-30, 2013

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Encouraging coordination among GNSS providers

8th ICG meeting, 10 – 14 November 2013, Dubai, United Arab Emirates

Joint Statement

The Eighth Meeting of the International Committee on Global Navigation Satellite Systems (ICG) was held in Dubai, United Arab Emirates (UAE) from 10 to 14 November 2013 to continue reviewing and discussing developments in global navigation satellite systems (GNSS) and to allow ICG members, associate members, and observers to address recent developments in their organizations and associations with regard to GNSS services and applications. Chairman of the UAE Telecommunications Regulatory Authority (TRA), H.E. Mohamed Ahmad AlQemzi and Chairman of the Emirates Institution for Advanced Science and Technology (EIAST), H.E. Hamad Obaid AlMansouri delivered an opening speech on behalf of host government. A representative of the United Nations Office for Outer Space Affairs also addressed the Meeting.

ICG addressed GNSS science and innovative technology applications and future commercial applications. Representatives from industry, academia and governments shared views on GNSS compatibility and interoperability.

EIAST hosted the Meeting on behalf of the Government of Dubai. Attendees included China, India, Italy, Japan, Malaysia, the Russian Federation, the United Arab Emirates, the United States of America, and the European Union, as well as the following intergovernmental and nongovernmental organizations: Civil Global Positioning System Service Interface Committee (CGSIC), European Space Agency (ESA), Federation Aeronautique Internationale (FAI), International Federation of Surveyors (FIG), International Association of Institutes of Navigation (IAIN), International Association of Geodesy (IAG) and IAG Reference Frame Sub-Commission for Europe (EUREF), International Bureau of Weights and Measures (BIPM), International Earth Rotation and Reference Systems Service (IERS), International GNSS Service (IGS) and Interagency Operations Advisory Group (IOAG). Representatives of the Office for Outer Space Affairs and the International Telecommunication Union (ITU) also participated. A representative of Canada was invited to attend as observer. The representatives of the Asia-Pacific Space Cooperation Organization (APSCO), the African Regional Centre for Space Science and Technology Education - in English Language (ARCSSTE-E), and Space Generation Advisory Council (SGAC) also participated. The representatives of the Arab Institute of Navigation (AIN) and the European Space Policy Institute (ESPI) also attended and were recognized by ICG as new observers.

ICG recalled that the United Nations General Assembly, in its resolution 67/113 of 18 December 2012, noted with appreciation the continuous progress made by ICG towards achieving compatibility and interoperability among global and regional space-based positioning, navigation and timing systems and in the promotion of the use of GNSS and their integration into national infrastructures, particularly in developing countries, and also noted with appreciation that ICG held its seventh meeting in Beijing from 5 to 9 November 2012.

The ICG considered the future scope of its work and organizational structure, and ways and means to enhance user input and the visibility of the ICG, and other proposals to increase the effective implementation of its recommendations. In this regard, the ICG adopted a Mission Statement, concluded that the ICG, as a platform for open discussions and information exchange is a great success, and adopted “The Summary of discussions concerning the Future of the International Committee on Global Navigation Satellite Systems”.

Mission Statement

The International Committee on Global Navigation Satellite Systems (ICG), established in 2005 under the umbrella of the United Nations, promotes voluntary cooperation on matters of mutual interest related to civil satellite-based positioning, navigation, timing, and value-added services. The ICG contributes to the sustainable development of the world. Among the core missions of the ICG are to encourage coordination among providers of global navigation satellite systems (GNSS), regional systems, and augmentations in order to ensure greater compatibility, interoperability, and transparency, and to promote the introduction and utilization of these services and their future enhancements, including in developing countries, through assistance, if necessary, with the integration into their infrastructures. The ICG also serves to assist GNSS users with their development plans and applications, by encouraging coordination and serving as a focal point for international information exchange.

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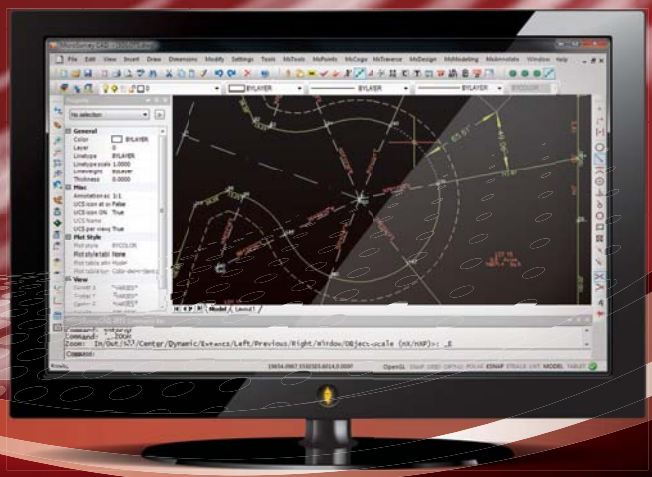

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ICG noted that the working groups focused on the following issues: compatibility and interoperability; enhancement of the performance of GNSS services; information dissemination and capacity-building; and reference frames, timing and applications.

The Working Group A on Compatibility and Interoperability (WGA) addressed all four areas of its current work plan during its inter-sessional meeting held in Vienna, Austria in June 2013 and during the ICG-8 meeting. The compatibility and International GNSS Monitoring and Assessment (IGMA) subgroups of WG-A provided reports at the intersessional meeting that formed the basis for recommendations on spectrum protection, open service performance, and the monitoring of open services. Recommendations were also presented to the Committee related to interoperability and interference detection and mitigation. In additional to the inter-sessional meeting, WGA organized and completed the second ICG Interference Detection and Mitigation Workshop and the first Interoperability Workshop, held in Honolulu, USA, April 2013, and reported the conclusions to the working group. The next IDM Workshop will take place in May 2014 immediately preceding the China Satellite Navigation Conference (CSNC-2014). Two regional interoperability workshops involving users and manufacturers from Russia and China, as well as members of the Interoperability Task Force, will be held in Moscow, Russian Federation in conjunction with Moscow Satellite Navigation Forum in April 2014 and in Nanjing, China in conjunction with the China Satellite Navigation Conference in May 2014, correspondingly. A meeting of the IGMA subgroup is planned for 22-26 June 2014 in Pasadena, USA in conjunction with the 20th anniversary IGS Workshop, and the 2014 inter-sessional meeting is tentatively scheduled for July at the ITU in Geneva, Switzerland.

The Working Group B on the enhancement of GNSS service performance (WGB) has made significant progress in establishing an interoperable GNSS Space Service Volume (SSV) during the Eighth Meeting of ICG through significant pre-work, presentations at the Meeting and additional robust contributions from the administrations of the Russian Federation and China. The Working Group further discussed the benefits of an interoperable GNSS SSV. All WGB participants believe that a fully interoperable GNSS SSV will result in significant benefits for future space users as it will allow for performance no single system can provide on its own. The Working Group will continue to work within the ICG towards an interoperable GNSS SSV.

A fully interoperable GNSS SSV will result in significant benefits for future space users as it will allow for performance no single system can provide on its own

The Working Group C on information dissemination and capacity-building (WGC) focused on the available capacity-building opportunities and the status of operations of the United Nations-affiliated regional centres for space science and technology education and centres of excellence, such as the Russian Education Centre led by the Russian Federal Space Agency (ROSCOSMOS) of the Russian Federation, the Beihang University of China, and Geospatial and Space Technology consortium for Innovative Social Services (GESTISS) of Japan. In that context, WGC noted that providing additional new GNSS education opportunities at different levels would be the best way to cover the different needs in the GNSS field in order to maximize the benefits of the use of GNSS to support sustainable development, particularly in developing nations. The Working Group recommended that new technical knowledge generated by ICG should be effectively communicated to the public and the GNSS-related scientific research community, and industry at large via the ICG information portal, and through the use of existing electronic infrastructure and brochures. The Working Group noted that EIAST will also provide capacity-building and contribute to information dissemination in the use of GNSS and its applications.

The Working Group D on Reference Frames, Timing and Applications (WGD) noted significant continued progress on the geodetic and timing references for the GNSS currently represented in the ICG. Specific progress was noted in (1) the refinement of the alignments of GNSS associated reference frames to the latest realization of the International Terrestrial Reference System in the form of ITRF2008, and (2) on timing references in relation to rapid Coordinated Universal Time (UTCr), BIPM publication and GNSS time offsets. WGD has contributed and will continue to significantly contribute to ICG IGMA initiative. The Working Group also made 5 recommendations: one in relation to the assessment of the level of reference frame alignments to the International Terrestrial Reference Frame (ITRF), and 4 on timing issues related to: the work of the proposed redefinition of UTC; official provision of a rapid UTC (UTCr) by BIPM; the BIPM publication [UTC – GNSS times] and [UTC – UTC (k) GNSS] and on the monitoring of offsets between GNSS times.

ICG accepted the invitation of the European Union to host its Ninth Meeting of ICG in Prague, Czech Republic from 10 to 14 November 2014. The Office for Outer Space Affairs, in its capacity as the Executive Secretariat of ICG and its Providers' Forum, will assist in the preparations for the meeting and for interim planning meetings and Working Groups activities to be held in 2014. ICG noted the expression of interest by the United States of America to host the Tenth Meeting of ICG in 2015.

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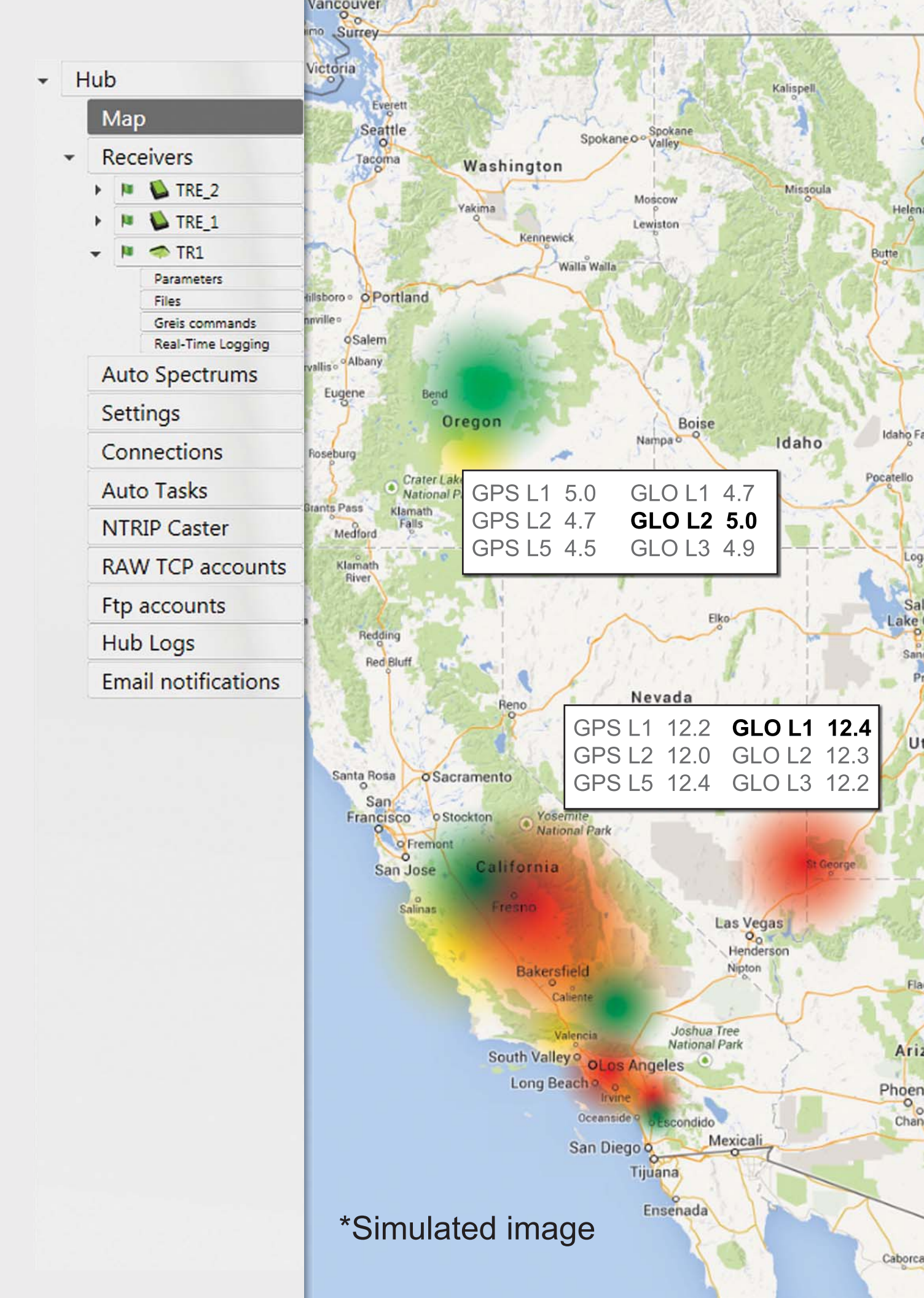
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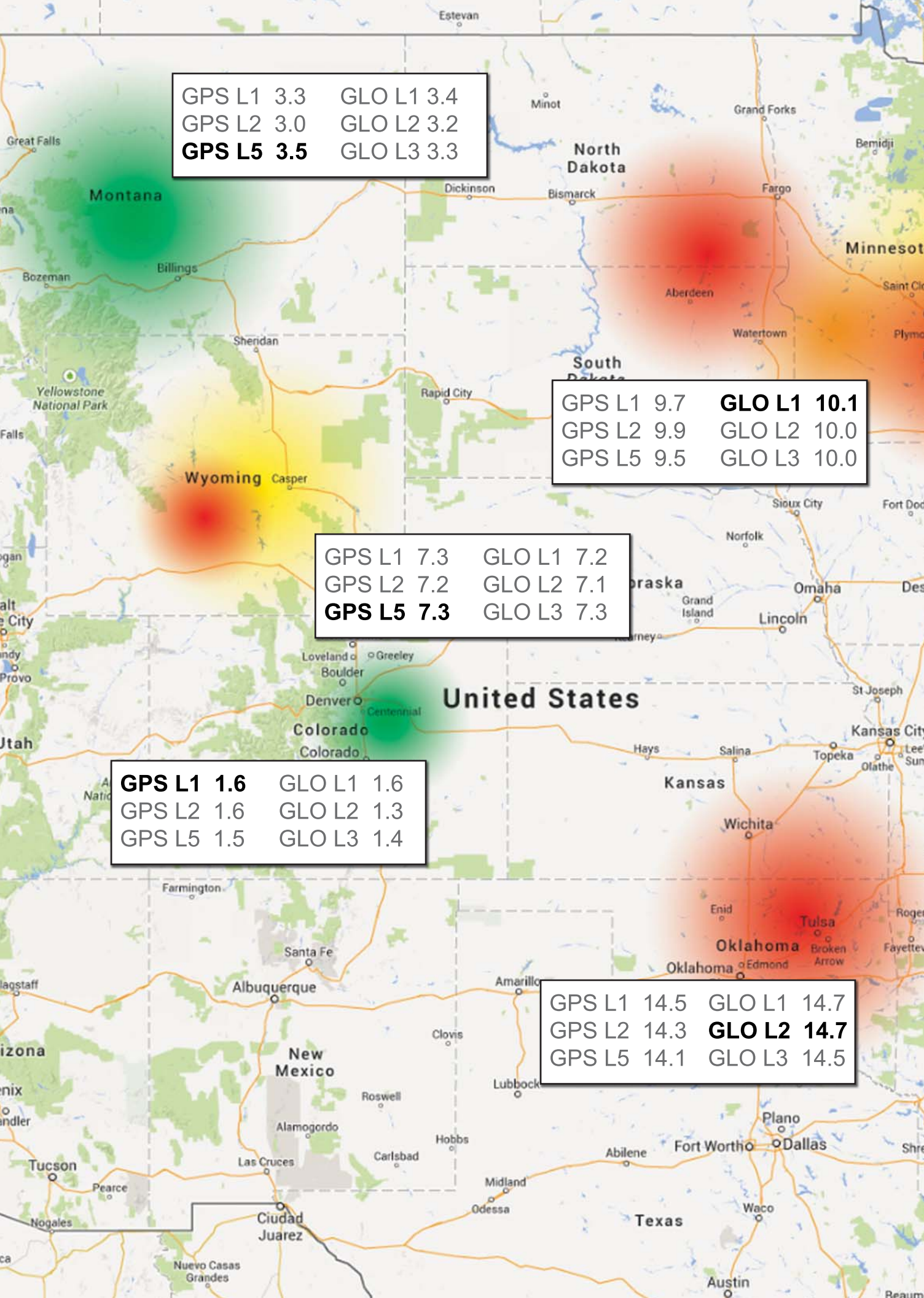
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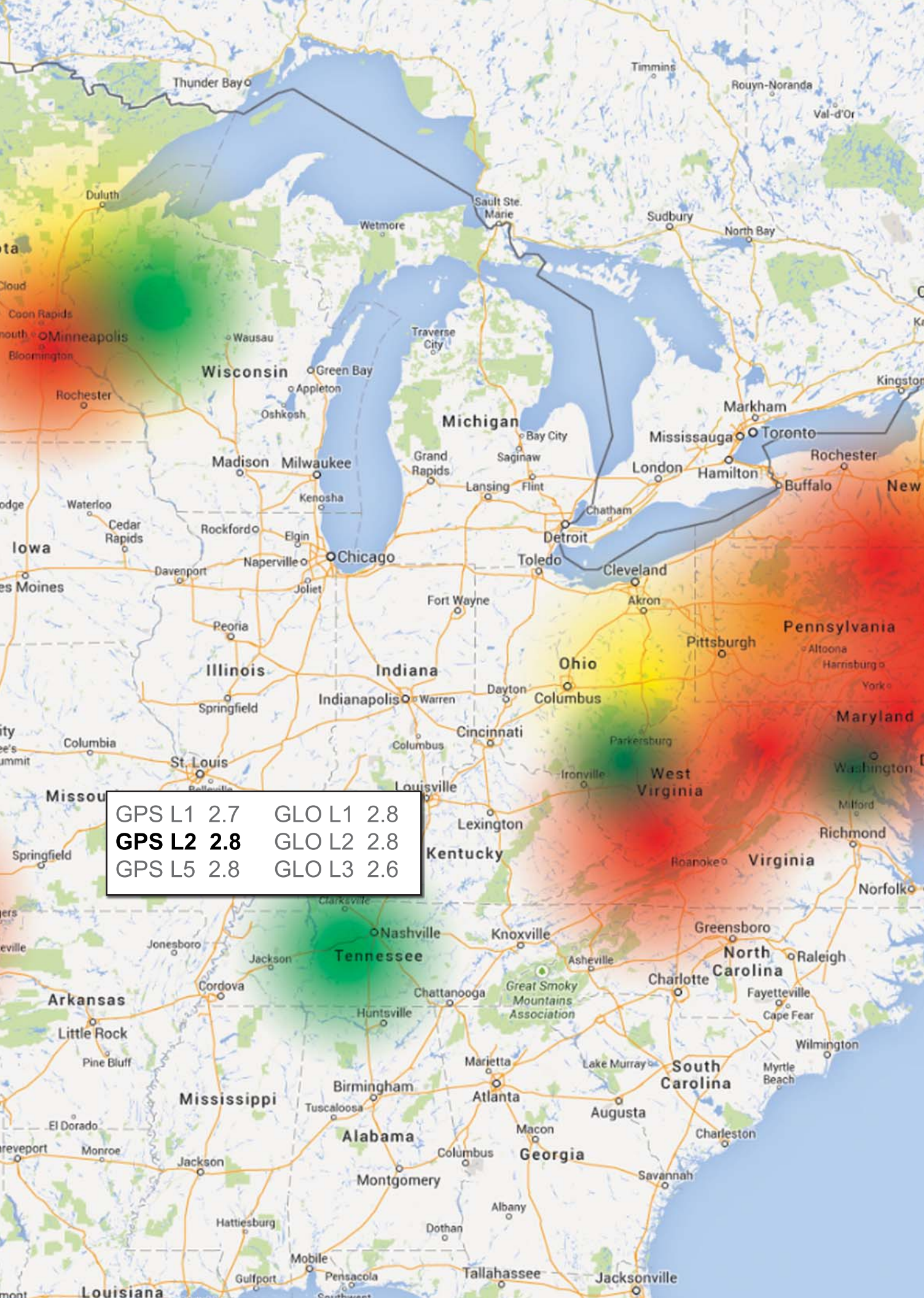
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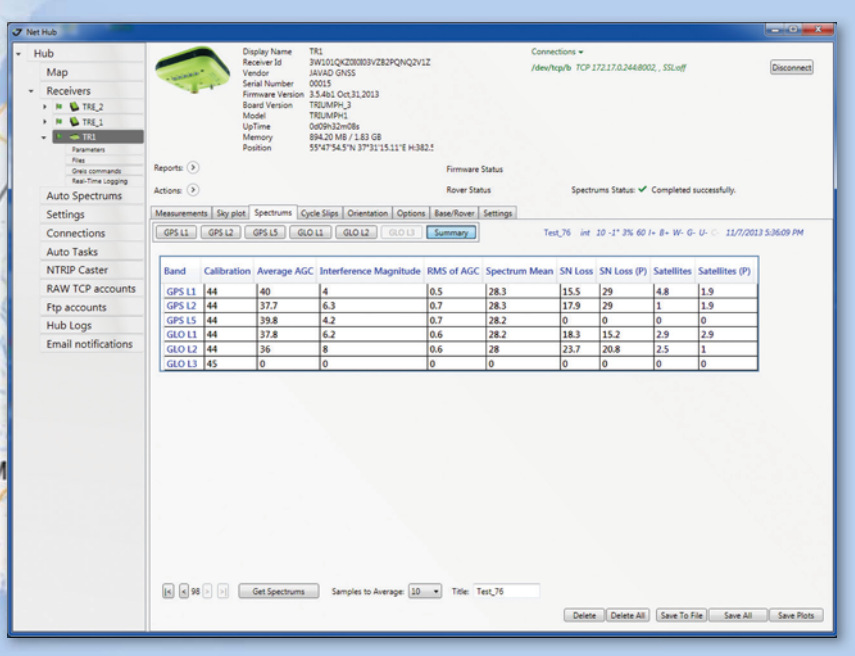
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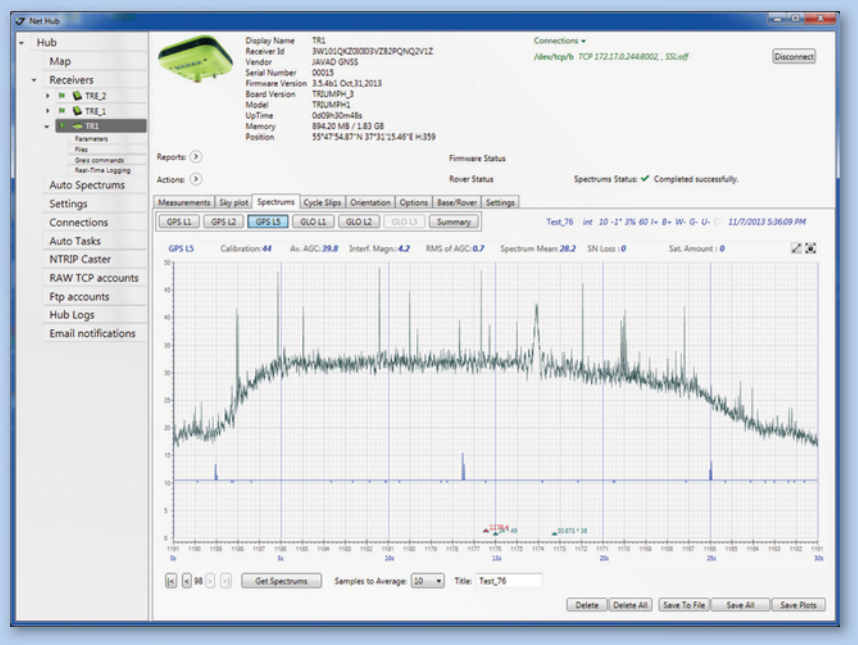
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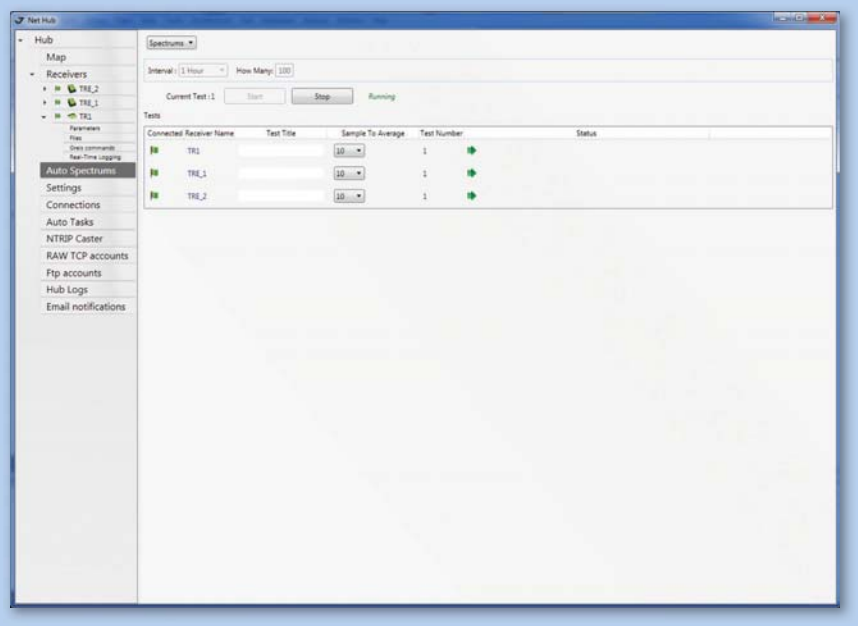
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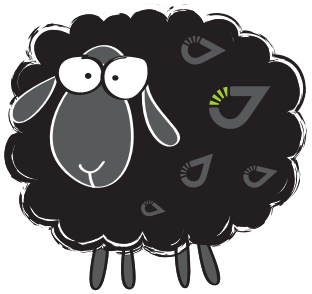
and **we monitor interferences in five different ways*** in each receiver **and receive reports with Net-Hub**.



This is true **GNSS patriotism.**

A one man coalition

to protect all GNSS bands!

Several patents pending

* 1) Spectrum Shape, 2) AGC values, 3) AGC variations, 4) Satellites C/No, 5) Satellites C/No variations

Single frequency GPS/Galileo precise point positioning

The results of the combined GPS/Galileo solution show a sub-decimeter level of accuracy and an improvement up to 30% of the convergence time

Akram Afifi
Department of Civil Engineering, Ryerson University
Toronto, Ontario, Canada

Ahmed El-Rabbany
Graduate Program Director, Professor, Geomatics Engineering, President Elect, Canadian Institute of Geomatics
Department of Civil Engineering, Ryerson University
Toronto, Ontario, Canada

GPS Precise Point Positioning (PPP) technique has attracted many users due to its lower cost and comparable precision to the differential technique. A drawback of a single GNSS system, however, is the availability of sufficient number of visible satellites in urban areas. With the launch of the new Galileo satellites, however, a PPP solution based on the combined GPS/Galileo measurements is feasible. Combining GPS and Galileo systems offers more visible satellites to users, which is expected to enhance the GDOP and the overall solution (Hofmann-Wellenhof et al., 2008).

In order to take full advantage of the new Galileo signals, it is essential that its stochastic characteristics are rigorously determined. In this research, sessions of Galileo measurements were used to study the stochastic characteristics of the new Galileo signal E1. As a by-product, the stochastic characteristics of the legacy GPS signal P1 are also determined which were used to verify the developed stochastic model of Galileo signals. Combined L1/E1 signals of GPS and Galileo, respectively, were used to verify the stochastic model.

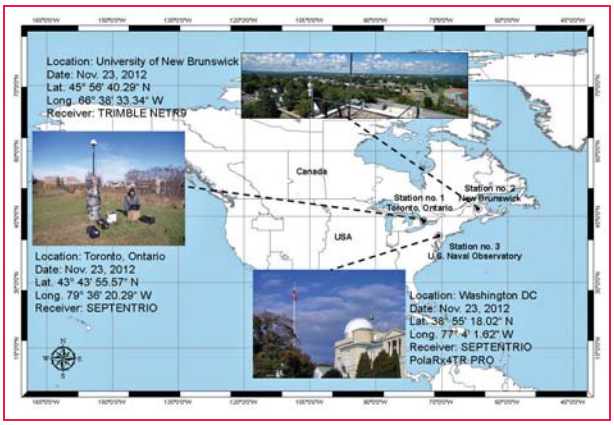


Figure 1: Analysis stations location

To verify the obtained results, the newly developed stochastic model is implemented to assess the effect of the stochastic characteristics on the combined GPS/Galileo PPP solution precision and convergence time. The results of the combined GPS/Galileo solution show a sub-decimeter level of accuracy and an improvement up to 30% of the convergence time.

GPS/Galileo measurement errors

GNSS observations are affected by random and systematic errors, which must be considered to obtain accurate positioning. The accuracy of precise point positioning depends on the ability to mitigate all kinds of errors. These errors can be categorized into three classes, satellite related errors, signal propagation related errors, and receiver/antenna configuration errors (El-Rabbany, 2006).

GNSS errors attributed to the satellites, include satellite clock errors, orbital errors, satellite hardware delay, satellite antenna phase centre variation, and satellite initial phase bias. Errors attributed to signal propagation, include the delays of the GNSS signal as it passes through the ionospheric and tropospheric layers. Errors attributed to receiver/antenna configuration include the receiver clock errors, multipath error, receiver noise, receiver hardware delay, receiver initial phase bias, and receiver antenna phase center variations.

In addition to the above errors, combining GPS and Galileo observation in a PPP model introduce additional errors such as GPS to Galileo time offset (GGTO) due to the fact that each system uses a different time frame. GPS system uses the GPS time system which is referenced to coordinated universal time (UTC) as maintained by the US Naval Observatory (USNO). On the other hand, Galileo satellite system has its time frame namely The Galileo system time (GST), which is a continuous atomic

time scale with a nominal constant offset with respect to the international atomic time (TAI) (Hofmann-Wellenhof et al., 2008). Moreover, The GPS and Galileo measurements are on different reference frame, which should be considered in the combining PPP solution.

System noise test

The receiver measurement noise results from the limitations of the receiver's electronics. Determining the noise level of the GNSS observations can be performed by testing the receivers. Two tests are normally used to determine the receiver noise level, namely the zero and short baselines tests. The zero baseline test uses one antenna followed by a signal splitter that feeds two or more GPS receivers. Several receiver problems can be investigated through zero baseline test, including inter-channel biases and cycle slips. The use of a common antenna cancels out systematic errors such as multipath and the preamplifier's noise. The short baseline test, on the other hand, uses two receivers a few meters apart on two consecutive days. In this case, the double difference residuals of one day would contain the system noise and the multipath effect. As the multipath effect repeats almost every day for a GPS system, differencing the double difference residuals of two consecutive days will cancel out the multipath effect and leave the system noise. However, multipath effect is not repeatable for the Galileo satellite system as the Galileo orbit parameters lead to a period of about 14 hours 4 min 45 sec and a ground track repeat cycle of about 10 days which is equivalent to 17 cycles (Hofmann-Wellenhof et al., 2008).

In this research, a short baseline test is used to determine stochastic characteristics of Galileo E1 signals. Usually, this test is performed using the same type of receivers. Unfortunately, two different receivers were available (Septentrio and Trimble) for the test, which can observe the Galileo measurements. This, however, were considered when processing the

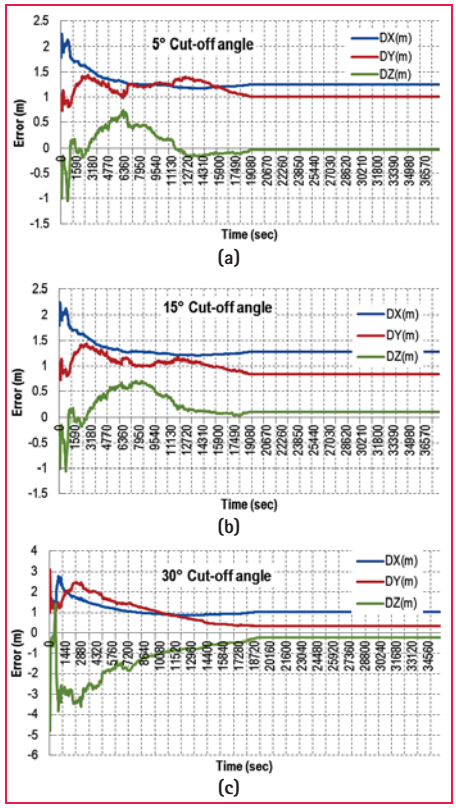


Figure 2: GPS PPP solutions using three elevation cut-off angles for Ontario station

data. Differencing the pseudorange and carrier phase equations of each receiver cancels out the geometric term, satellite and receiver clock error, and tropospheric delays. The remaining terms include the satellite and receivers' hardware delays, ionosphere error, the ambiguity parameter and the system noise.

The phase measurement noise has been neglected due to its small size compared to that of the pseudorange measurements (Elsobeiey and El-Rabbany, 2010). The receiver hardware delay is assumed to be stable over the observation period, almost four hours in this research, while the ambiguity parameter and initial phase bias are constants for a continuous session of measurements (Hofmann-Wellenhof et al., 2008). As such, they can be removed from the model by differencing with respect to the first value of the series.

Stochastic model development

The stochastic properties of the observations are reflected in the

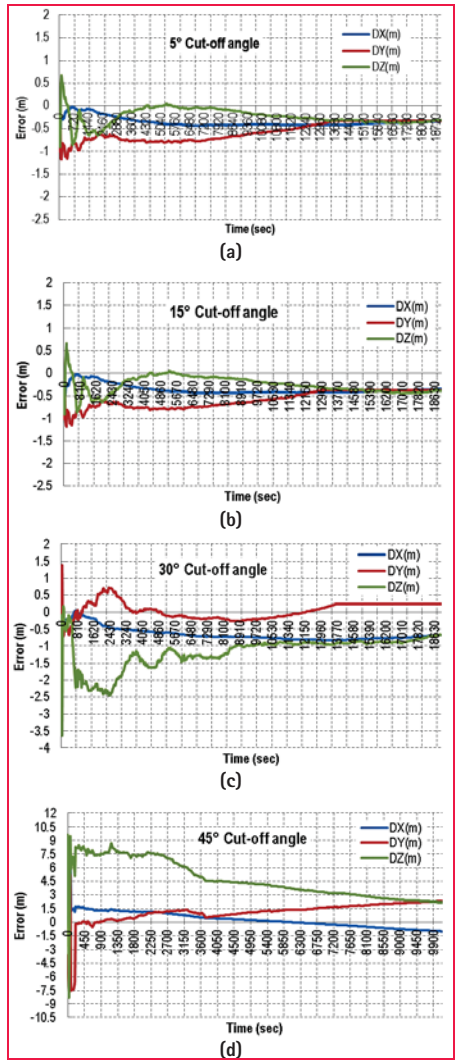


Figure 3: Combined PPP solution using four elevation cut-off angles for Ontario station

observations weight matrix which includes their absolute and relative accuracies with respect to each other. In the PPP modeling, most of the available observations stochastic models are empirical models such as the sine or cosine model, exponential and polynomial models. All of these stochastic models are function of the satellite elevation angles. These models may not be accurate enough for all receivers' models and the new GNSS frequencies.

The differenced measurements shown in Equation 9 are divided into nine bins depending on the satellite elevation angle, starting from 0° to 90° with increments of 10° (i.e., 0º to 10º, 10º to 20º, etc.). The least square best-fit model that relates the standard deviation and satellite elevation angle is used to present the stochastic model.

Results and discussion

A combined PPP of GPS L1 with Galileo E1 solution is presented in this research. The GPSPace PPP software from Natural Resources Canada (NRCan) was modified to handle data from both GPS and Galileo systems, which enables a combined GPS/Galileo PPP solution. The NOAA ionospheric correction model was used to correct for the ionospheric delay (Smith, 2004). In addition, the NOAA model is used along the Vienna mapping function to correct the tropospheric delay (Ibrahim and El-Rabbany, 2008). International GNSS service (IGS) precise orbital and clock corrections are used for GPS satellites (Kouba, j. 2009). On the other hand, COoperative Network for GIOVE Observations (CONGO) network precise satellite orbital and clock corrections are used for Galileo satellites (Montenbruck at al., 2009).

The PPP analysis is done on two stages. The first stage studies the effect of combining the the measurements of GPS and Galileo satellite systems on the PPP solution in the urban areas with different cut-off angles. The second stage, on the other hand, compares the PPP results obtained from the existing empirical stochastic model, namely the sine model, and the newly developed stochastic model.

Combined GPS/ Galileo PPP results

To simulate a dense urban environment, different scenarios were considered in this research using cut-off elevation angles of 5, 15, 30, and 45 degrees. GPS and Galileo measurements of three stations located in Ontario, New Brunswick and Washington D.C, respectively, were used in the analysis. Figure 1 shows the locations and the receiver information of the three stations.

Due to space limitation the results of the Ontario station is presented for both GPS system only and the combined GPS/Galileo PPP solution at different elevation angles.

Figure 2 shows the results of the GPS PPP solutions using three cut-off angles, namely 5°, 15°, and 30°. The GPS PPP solution at 45° cut-off angle is not possible because there are no enough visible GPS satellites at this location.

Figure 3 shows the results of the combined GPS/Galileo PPP solution at different cut-off angles, namely 5°, 15°, 30°and 45°. The Galileo satellite system can offer more satellites at 45° cut-off elevation angle for both the Ontario and Washington D.C. stations. With the additional Galileo satellites, it becomes possible to have a PPP solution at these two stations (Ontario and Washington D.C.) at 45° cut-off elevation angle. The results shown in Figure 3 show that a decimetre-level accuracy is possible with single-frequency GPS/Galileo PPP in the static mode, which is comparable to the GPS dual-frequency solution.

Figure 4 shows a summary of convergence times for single-frequency PPP solutions of both GPS and combined GPS/Galileo measurements at each of the three analysis stations. In addition, Figure 4 shows the convergence times at the same analysis stations for dual-frequency GPS

solution, which are used to assess the GPS/Galileo combined PPP solution.

It was found that the PPP solution convergence time was improved by 20% to 30% with single-frequency GPS/Galileo when compared with single-frequency GPS solution.

Verification of stochastic model

To verify the determined stochastic characteristics of the Galileo E1 signal, Natural Resources Canada (NRCan) GPSPace PPP software was modified to handle the determined stochastic models. In order to verify the stochastic model, the GPS and Galileo measurements of four well distributed analysis station in North America and Europe are used in the PPP solution, namely DLFT, and GOP from Europe in addition to UNB, and USN from North America. Only the results of the DLFT station is presented in this paper as other stations have the same results. Figure 5 shows the results of the combined single frequency Galileo/ GPS of E1 and L1 signals using the empirical general sine stochastic model.

Figure 6 shows the results of the combined single frequency Galileo/ GPS of E1 and L1 signals using the new stochastic model. The results show that the new stochastic model improves the positioning accuracy and the convergence time, as well.

Conclusions

Single-frequency PPP algorithms were developed in this research to combine the E1 Galileo and L1 GPS signals. A short baseline test was performed to determine the stochastic characteristic of the E1 Galileo signal. It has been shown that Galileo satellite system can offer more satellites at 45° cut-off elevation angle to the GPS system, which makes the PPP solution possible at this high cut-off angle. The results showed that a sub-decimetre positioning accuracy

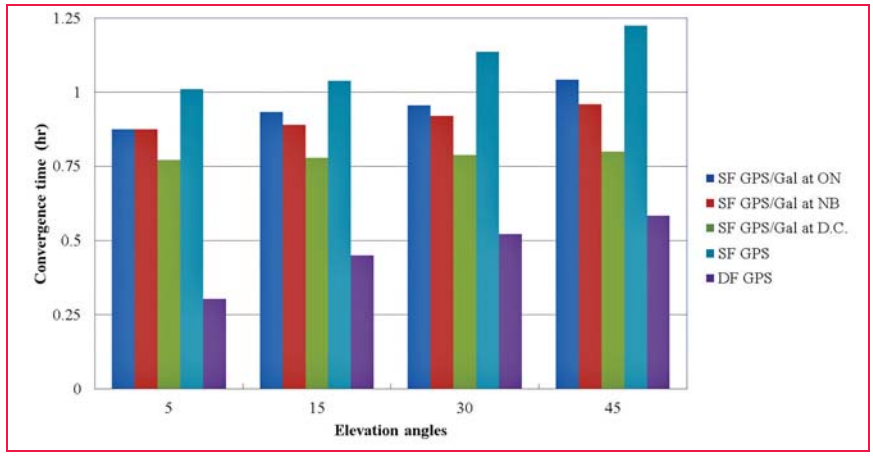


Figure 4 Analysis summary of the convergence time

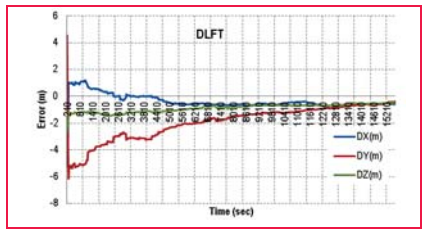


Figure 5 Combined Galileo(E1)/GPS(L1) PPP results using the empirical stochastic model

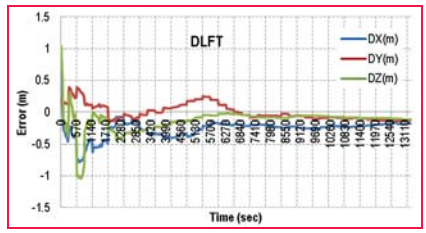


Figure 6 Combined Galileo(E1)/GPS(L1) PPP results using the new stochastic model

and up to 30% improvement in the convergence time can be obtained with single-frequency GPS/Galileo PPP.

Acknowledgments

This research was partially supported by the Natural Sciences and Engineering Research Council (NSERC) of Canada and by the Ontario Government.
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References

El-Rabbany, A. (2006). Introduction to GPS: The Global Positioning System. Artech House Publishing.

Elsobeiey, M. and A. El-Rabbany (2010). "On stochastic modeling of the modernized global positioning system (GPS) L2C signal." Journal of Measurement Science and Technology, Volume 21, Number 5, pp. 1-6.

Hofmann-Wellenhof, B., H. Lichtenegger, and E. Wasle (2008). "GNSS global navigation satellite systems; GPS, Glonass, Galileo & more". Springer Wien New York. 501pp.

Ibrahim, H. E., and A. El-Rabbany (2008). Regional stochastic models for NOAA-based residual tropospheric delays. The Journal of Navigation. 61. 209-219.

Kouba, J. (2009). A guide to using international GNSS service (IGS) products. Available at http://igscb.jpl.nasa.gov/igscb/resource/pubs/UsingIGSProductsVer21.pdf

Montenbruck, O., Hauschild, A., Hessels, U., Steigenberger, P., Hugentobler, U. (2009). CONGO first GPS/ Giove tracking network for science, research. GPS World, 20(9), 56-62.

Smith, D. A. (2004). Computing unambiguous TEC and ionospheric delays using only carrier phase data from NOAA's CORS network. Paper presented at the plans 2004. Position location and navigation symposium, 26-29 April 2004, Piscataway, NJ, USA.

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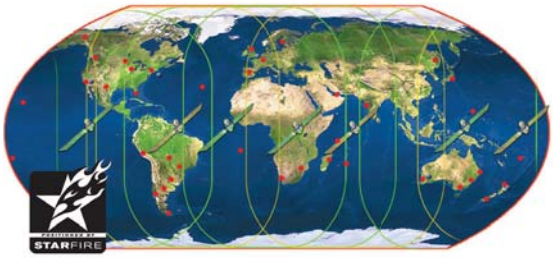

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Challenges and opportunities in Kenya

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The Republic of Kenya

In the last two decades, Kenya has faced a rising degree of vulnerability to the risk of disaster. Risk is the probability of a hazard turning into a disaster, with households or communities being affected in such a manner that their lives and livelihoods are seriously disrupted beyond their capacity to cope or withstand using their own resources, with the result that affected populations suffer serious widespread human, material, economic or environmental losses.

As challenges go, Kenya has had a fair share of disasters. Some have been natural like floods, famine, drought, hurricanes while others have been man-made, like the terrorist bombings that have become commonplace in our society, of late. Such as the Sinai tragedy where 100 people died; the Sachanguan Petrol Tanker tragedy in which over 300 died, more recently eight girls in Primary Boarding School died in a dormitory; that same week more than 50 perished when a neighbouring community in Tana River Delta invaded another, etc.

The bombings can be traced to the decision last year to invade Somalia with the aim of flushing out the Al Shabbab gangsters. This was as a result of frequent incursions into our country by the Al Shabbab militia, and their abducting and subsequent murdering of tourists and Kenyans alike. It was a direct threat to the tourism industry, which is critical to Kenya's economy. Hotel bookings got cancelled and foreign governments issued advisory notes to their citizens not to venture into Kenya. Some of the other man-made happenings also could have been prevented.

To my mind I see a dichotomy of two clear distinctions of disasters; the one in which we can anticipate, plan for and prevent; or if they happen, we are so prepared that they cause minimum disruption. The other class of disasters occur and we have to deal with them, in a reactive manner. Nevertheless we can prepare ourselves.

Kenya's disaster profile is dominated by droughts, fire, floods, terrorism, technological accidents, diseases and epidemics that disrupt people's livelihoods, destroy infrastructure, divert planned use of resources, interrupt economic activities and retard development. Despite the many important disaster management initiatives undertaken in Kenya over the past two decades, an adequate level of preparedness required to address its significant risk profile has not been achieved. Initiatives have been undertaken in an inconsistent, unharmonious, reactive and uncoordinated manner due to lack of a unified policy framework. In view of the experiences gained and lessons learnt during the management of various hazards and disasters, the Government of Kenya formulated a draft National Disaster Management Policy to emphasize proactive and preventive strategies in

In the absence of a clear policy framework, disaster management lacks a definite planning structure or approach. This is reflected both in the lack of legislation and in the setting of priorities in government expenditure allocations

addressing disaster situations. But this has not yet been finalized and yet it still needs revision to reflect the requirements of the Constitution of Kenya 2010 (CoK 2010).

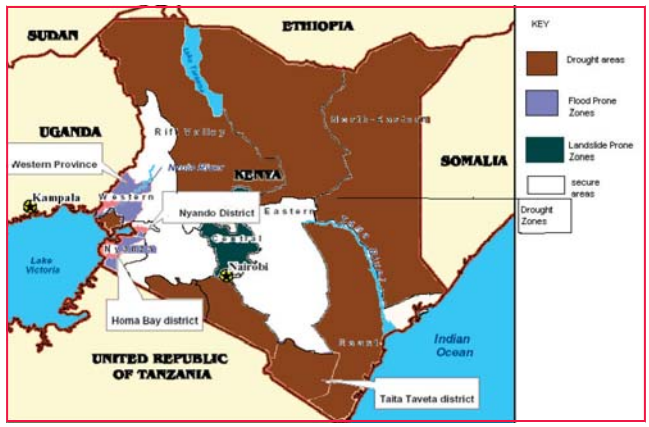
Policies and legislations on risk prevention and, in the unfortunate event of occurring, risk reduction and facilitation of relief activities can help to reduce the human sufferings and impact of disasters and health emergencies. They can also be critical to empowering communities and the society as a whole, to do the work they need to do to address the most urgent situations of vulnerability. Moreover, they can go further to guard against discrimination in the design and implementation of disaster management programmes.

Current disaster situation in Kenya

Although Kenya's economy could be classified as highly vulnerable to natural and man-made disaster risks, we do not have a comprehensive disaster management framework and strategies guided by appropriate policy and legislative provisions. We have been able to manage from one emergency to another without an effective disaster management system, albeit with a very high level of support from the international community, at great expense and diversion of resources from much needed social and economic development work. The frameworks and legislations to facilitate the coordination of disaster management activites from the central level to local level have not been institutionalized. Citing the new constitutional dispensation which is implementing devolved governance, the systems should seek to delegate authority to the least centralized level, such as the village, that has the capacity to respond to emergency or urgent needs.

Disaster trends in Kenya

Of late, there has been an alarming increase in such types of disasters such as fires, collapsing buildings, terrorist bombings and motor accidents. Search and rescue efforts in the urban areas also require specialized training. These are distinct in many ways and the intensity of damage is usually very high, warranting effective Disaster Management plans. Urban mapping of infrastructure of spatial resolution can be taken up for development of a Decision Support System (DSS) for management of urban risks as a unique area.



Kenya disaster Map

Climate change instigated disasters

More than 70% of natural disasters in Kenya are related to extreme climate events that are key causal factors for some emergencies that lead to disasters. Climate change is impacting water balance, agriculture, forestry, coastal ecology, bio-diversity and human and animal health. There are definite indications that climate change would increase the frequency and intensity of natural disasters like floods and droughts in the coming years. In order to meet these challenges in a sustained and effective manner, synergies in our approach and strategies for climate change adaptation and disaster risk reduction ought to be encouraged and promoted.

Past and recent major disasters and their costs

Quantifying exact damages is difficult - some disasters impact far beyond the occurrence and restoration phase. However, the estimates show some of the results of recent disasters (Table 1).

The effects of disasters

In Kenya, disasters have resulted in the following:

- Migration of people from rural areas to urban centres to enhance their survival chances. This movement is primarily as a result of agricultural employment losses, due to drought.
- Uncontrolled urbanization on vacant land that is unsuitable for safe housing. In addition, the informal settlements have been subjected to the rapid spread of fires and flash floods. (Mukuru Kwa Njenga and Mathare slums in Nairobi are typical examples.)
- Loss of life that occurred. Examples of these are Mukuru (300 lives lost in 2011 due to fire), Ramogi (17 lives lost in 2012) and Bundalangi floods (13 lives lost in 2010).

The examples quoted could have been avoided through better planning and control measures, early warning systems and community preparedness.

Environmental degradation and increased poverty - Several areas near rivers are occupied by informal settlements without any or with only minimal protection of the water body.

Disaster management policy in Kenya

In 1993, the Government created a Relief and Rehabilitation unit and an Emergency Drought Recovery Project to address the consequences of frequent droughts in the country. The Drought Recovery Project was phased out in 1996, and in its place the Arid Lands Resource Management Project I was put in place to carry out drought monitoring and management activities in 10 arid districts in Northern Kenya. The Project (ALRMP II) was

expanded in 2003 to cover 22 Arid and Semi-Arid districts. Another 6 districts have since been added to this project.

The Government of Kenya also established the National Disaster Operations Centre in early 1998 at the height of El-Nino induced floods. The Centre was tasked with monitoring the floods and coordinating logistics to assist the communities in the flood areas. The Centre has been retained to monitor disaster incidents on a 24-hour basis and to mobilize responses to the areas affected.

The thrust of the Policy is to institutionalize disaster management and mainstream disaster risk reduction in the country's development initiatives. This focus is in keeping with International and Regional initiatives as contained in the Yokohama Strategy and Plan of Action for a Safer World (1994), the Johannesburg Plan of Implementation issued at the World Summit on Sustainable Development (2002) and the targets set to achieve the Millennium Development

NO	Type of Disater	Vulnerable Population		Past Incidences	Effects
	Population affected		Socio-Economic impacts		
1.	Drought	North Eastern Province, Eastern Province, Part of Rift valley Province, Coast Province	1971- Widespread 1983/4 Widespread 1991/2 1995/6 1999-2000 2004-2006 2008-	150,000 200,000 1.5m 1.41m 4.4m 11m 900,000	6.7 Billion (Food) 33.8 Billion
2.	Fire	All Urban Areas	1982-Nairobi 1990-Lamu 2004-Nairobi 2005-Kyanguli	10,000 20 Death 67 Death	Lives and property lost worth Billions of shillings.
3.	Floods	Nyanza, Coast, North Eastern, Western Provinces	1982-Nyanza 1985-Nyanza 1997/8-wide spread 2002-2003 –Nyanza, Western and NEP	4,000 10,000 1.5 M 24000- Displaced	Lives and property lost worth Billions of shillings.
4.	Train Accident	Along Railway line	1992-Mtito Andei	31-Death 207 -Injured	Lives and property lost worth Billions of shillings.
5.	Terrorist Bomb	Urban Areas and Strategic Areas	1998-Nairobi	250 Death 5,000-Injured	Lives and property lost worth Billions of shillings.
6.	Ferry Accident	Indian Ocean and lake Victoria	1994-Mtongwe Mombasa	270 -Death	Lives and property lost worth Billions of shillings.
7.	Road Accident	All Major Highways	Wide spread	Wide spread	Lives and property lost worth Billions of shillings.
8.	HIV/AIDS	All	1984-2008-Widespread	2.2m dead so far and 700 die daily	Current Prevalence rate of 7.8%.
11.	Earthquake	Major Towns	July 2007 Earth tremors	Nairobi, Mombassa, Nakuru	Public scare.
12.	Locust Invasion	Wide spread	Late 2007	Mandera,Wajir and Moyale	Wide spread loss of pasture and crops.
13	Livestock diseases Outbreak	NEP, Rift-Valley, Eastern, Central and Nairobi provinces	2006 2008	RVF outbreak PPR	Millions of Shillings of property lost.
14.	Air Accidents	All	1992 - Nairobi 2003 - Busia 2006 - Marsabit 2007– Cameroon 2008 - Narok	52 dead 3 dead 9 dead 149 dead – Kenya Airways 4 dead	Lives and property lost worth Billions of shillings.
15.	Human Conflict	Rift Valley, N/Eastern, Urban areas and parts of Eastern	2007-08 – Post election violence, inter communal conflict and cattle rustling	1139 dead and over 200,000 displaced	Lives and property lost worth Billions of shillings.

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Goals, and finally the Hyogo Declaration and Hyogo Framework of Action 2005 — 2015; Building Resilience of Nations and Communities to Disasters as agreed upon during the World Conference on Disaster Reduction held in Kobe, Japan in January 2005.

Primary actors in disaster management

Many existing institutions deal with disaster management but their activities are uncoordinated, reactive and sectoral. In the Office of the President, there is the National Disaster Operations Centre, Arid Lands Resource Management Project, Relief and Rehabilitation unit, National Food Security Office and National Aids Control Council. There are also envisaged specialized organizations and departments which have roles in search, rescue, anti-terrorism, evacuation, planning and management, enforcement of crowd control, conflict resolution and fire fighting. Systems for disaster and risk management are still centralized and tall neck bureaucratic red tape, which have not yet been devolved to the counties, making meaningful and effective response impossible. If city and town dwellers have a chance for quick rescue, those in rural areas and informal settlements must rely on prayers and faith in destiny.

Institutional framework (WHO)

Tools to facilitate implementation:

- Risk mapping, hazard and vulnerability analysis and research
- Standard Operating Procedures
- Public Communications Plans
- Handbooks
- Emergency Personnel Rosters
- Training and Training of Trainers
- Drills and Exercises
- Supply Chain, stock procurement, distribution arrangements
- Partnership and mutual assistance agreements
- Village and grass-root based units, which are not in place.

Organizational chart of the national disaster management organization

- National Disaster Management Council – Fully equipped
- Central Operations Group (National Coordinator & Technical Team) - Fully equipped
- National Disaster Management Organization - Fully equipped
- National/Regional/District Technical Committees – Ill equipped
- Regional/Municipal/City Council Disaster Management Committees - Weak
- District Disaster Management Committees – Very weak
- Village Development Committees – Non-existent

> The lack of clear coordination at the national and departmental level has led to ineffective systems of management

Weaknesses and constraints in current disaster management

Weaknesses at the policy, planning and legislative level

To date, disasters are seen in the context of emergency responses and not part of the long-term planning and development government programmes. Therefore in times of disaster, the response is directed at the provision of emergency need; rescue and evacuation and also attending to the recovery phase.

In the absence of a clear policy framework, disaster management lacks a definite planning structure or approach. This is reflected both in the lack of legislation and in the setting of priorities in government expenditure allocations.

- The current draft policy and strategy does not take into account the need for adequate personnel at the national, county, location, sub-location and village levels.
- The past misconception of disasters as events over which people have no control led to a low priority being given to the civil protection function until such an event occurred.
- Although it is now understood that people can do much to prevent or mitigate disasters, the low prioritization still remains.
- Many authorities are reluctant to move away from the Civil Protection-mode, until new directives and legislation materialize.
- The absence of or limited available guidelines to public and private sectors at national and county levels, on what their roles are in disaster management needs to be addressed.
- Contingency plans are an important element involving both public and private sectors. In some cases there is an absence of such planning, and in other cases the plans are designed without reference to preventative and mitigation measures that are already underway.
- Criteria for state intervention are based on the magnitude of the event (and how vocal and elaborate media reporting is), instead of the needs of the communities affected.

Weaknesses at the level of preparedness and response

The criteria for declaring a disaster or a disaster area are not clearly defined. In the past, each case has been judged on its own merits rather than according to a clearly defined set of criteria. It is also clear from recent and past experiences that the population at large is ill-prepared to cope with disaster situations. For instance, public awareness campaigns have tended to be launched only after commencement of disaster measures. The most vulnerable sectors of our community like pastoralists and small-scale farmers are ill informed or do not have easy access to information, due to language and other barriers. There is therefore a need for greater public education, preparedness, awareness and participation.

Weaknesses at the institutional level

The lack of clear coordination at the national and departmental level

has led to ineffective systems of management. This is often reflected in the poor responsiveness to dealing with disasters, and mixed signals from sources of expert information.

Past experience has shown that there is a need for a permanent risk reduction focus and disaster (emergency) management or coordination capability at national, county and local levels. This is necessary to ensure that planning, data collection, mobilization of expertise and setting up of disaster management structures can be done rapidly rather than in a reactive manner. In particular, there is a need for national and county departments of public works, water, health and agriculture to develop integrated proposals for relief at a local level throughout the country whenever there is a major loss of livelihoods (e.g., through drought, floods, fires, terrorism).

The ability of government to deal with disasters is based on the idea that there is adequate institutional capacity. However, the biggest weakness in institutional capacity lies at the county and local levels.

Budgetary constraints often result in departments (both those who have a primary role and those who have a secondary or support role), having limited capacity to respond effectively with minimum resources.

Coordination and funding mechanisms

Coordination in disaster management involves bringing together the different elements of complex activities or organizations into a harmonious and efficient relationship and to negotiate with others in order to work together effectively for the benefit of those affected by the event. Currently, disaster management coordination is lacking resulting in gaps and duplications, inappropriate assistance, inefficient use of resources, bottlenecks and impediments, slow reaction to changing conditions, frustration of providers, officials, and survivors, poor information transfer to the public and other organizations resulting in a loss or lack of confidence.

Legislative framework: What legislation is in place?

One of the main shortcomings of current legislation is that it refers only to disaster response issues. It places great emphasis on dealing with the consequences of disasters (a reactive approach) and disregards the approach required for disaster management, which includes the proactive or risk reduction approach, through thorough preparation and insurance.

A legislative framework is a critical factor for any Government Intervention undertaking. This is certainly true for the disaster management approach. Legislation needs to create an enabling environment, in particular at local government levels, which are institutions at the forefront and on the ground of disaster management.

What current legislation provides for:

Natural Disaster relief Act, 1982 and the Local Government Act (LGA) Chapter 265, in the Laws of Kenya have provisions that give local authorities the mandate to provide disaster mitigation, although they do not mention disaster management in the main Act. Sections 154 (d), 160c, 160K, 179, 166 have provisions for disaster management. Other pieces of legislation include Environment Management Act of 1999, Kenya Red Cross society Act (Cap 256), the Water Act (Cap 372).

In terms of national disaster relief Act: If the disaster is at the local level, the prime responsibility for handling the problem rests with the specific local authority. When the severity of the event is greater than the local government can handle, it must inform the province and request appropriate kinds of assistance. The Minister of State for Special Programmes has the power to declare a 'state of disaster'. In terms of the Act, there is no provision for funding from national government.

In terms of local government Act: The Ministry of State for Special Programmes will advise the President who can declare an event to be a National Disaster. Financial assistance can be given from the disaster relief fund to victims of a disaster on an ex gratia basis for damages or losses.

The main problems with the legislation: The present legislative framework can be a source of confusion as it introduces many levels where decisions could be taken. It does not provide a clear-cut delineation of authority and process for the declaration of a 'state of disaster'. In other words, there are no clear criteria for when the state should intervene.

A further weakness is that in the event of a disaster, fund-raising and the provision of financial disaster relief to victims cannot be undertaken within the framework of 'National disaster Relief' legislation, but is addressed under a separate Act - the Agriculture Act, the Livestock Act, etc.

Paradigm shift in disaster management

The policy talks of people centred early warning system for preparedness and response, but what we see missing is the empowerment of the people in counties, districts, divisions, locations, sub-locations, villages, grassroots in order for them to prepare to respond suitably.

Laws and regulation

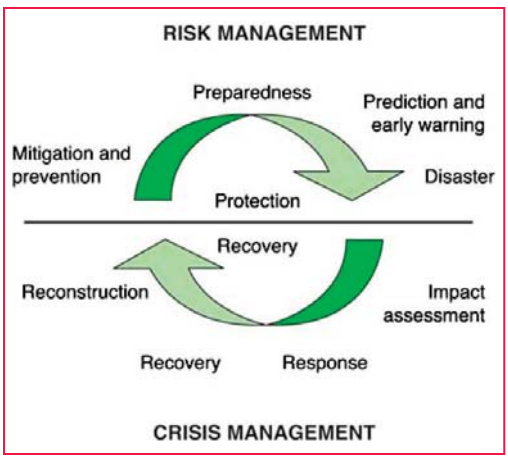
Presuming that the overall objective of disaster management is progressively to minimize the impact of disasters on populations, vulnerability to disasters can only be decreased if the factors that contribute to it are tackled. Although in the recent past a policy on disaster management has been developed, the main challenges for the Kenyan Government is to promote a culture of prevention, preparedness and resilience at all levels through knowledge, innovation and education, encouraging mitigation measures based on technology, traditional wisdom and environmental sustainability, mainstreaming disaster management into the developmental planning process.

- Ensuring efficient response and relief with a caring approach

towards the needs of the vulnerable sections of the society.
- Undertaking reconstruction as an opportunity to build disaster resilient structures and habitats for ensuring safer living.
- Promoting a productive and proactive partnership with the media and the private sector for disaster management.

The National Disaster Management Authority is mandated to deal with all types of disasters; natural or man-made. However, such other emergencies including those requiring close involvement of the security forces and/or intelligence agencies such as terrorism (counter-insurgency), law and order situations, serial bomb blasts, hijacking, air accidents, port and harbour emergencies, forest fires are on the increase and have not been clearly addressed in the current policy. When they occur, they are only handled by the extant mechanism, i.e., National Crisis Management Committee (NCMC) has to be set up to deal with the specific occurrence. This is both wasteful and expensive. Instead, there ought to be an anticipatory mechanism to facilitate preparation. Instead there ought to be more Integrated Disaster Risk Management (see model below) as opposed to Crisis Management which is the practice at the moment.

The disaster cycle or the disaster life cycle consists of the steps that emergency managers take in planning for and responding to disasters. Each step in the disaster cycle correlates to part of the ongoing cycle that is emergency management. This disaster cycle is used throughout the emergency management community, from the local to the national and international levels. India, USA, Canada and the UK have models for Crisis Management that emphasize protection, prevention and preparedness.



Risk reduction and response

Opportunities to be considered: Some financial practices such as disaster risk insurance, micro-finance and micro-insurance, warranty on newly constructed houses and structures and linking safe construction with home loans ought to be considered for adoption.

Expectations and conclusion

It is clear that in some cases where disasters are recurrent, the level of disaster planning and management ought to be more advanced. In areas where there is thought to be no risk, the level of preparedness or the taking of preventative measures may not be well established, enforced or revisited.

The management of disasters by government departments at various spheres of engagement is almost entirely reactive in nature. It is also clear that the full continuum necessary for disaster management, such as prevention, mitigation, preparedness, response and rehabilitation is not an integral component of current disaster management systems. Rather, each disaster is treated as a crisis, and preparations are conducted to deal only with emergency situations.

There is a clear distinction between disasters that occur spontaneously, and those that are a result of cumulative effects. Such distinctions require different kinds of planning and management of risk. How do we deal with issues such as Aids, violence, and road traffic accidents? These are not seen as disasters but as individual incidents. Some of the main areas of concern are:

- The lack of coordination and integration of plans, strategies and resources at the national, county and local level.
- Lack of capacity, and knowledge of how to deal with disaster management, in particular with implementing preventative and mitigation measures.
- There is no integration of disaster management into development planning.
- Disaster management also requires a shift of thinking away from the use of only physical and technological measures in dealing with disasters. It must also incorporate and creatively explore the use of sociological and other human science approaches to dealing with disasters as part of long-term strategies.

Way forward

It is recognized that, to mobilize the community in responding to disasters, there is a need to have institutionalized frameworks and laws to facilitate the coordination of disaster management activities from the central level to local level."

IT and communication: Communication and sharing of up-to-date information using state-of-the-art IT infrastructure remain at the heart of effective implementation of the disaster management strategy. Reliable, up-to-date and faster sharing of geo-spatial information acquired from the field or the affected areas is a pre-requisite for effective implementation of disaster management strategies, this is one of the challenges that Kenya faces.

- Significantly strengthened capacity to track, collate, monitor and disseminate information on phenomena and activities known to trigger disastrous events, supported by institutional emergency preparedness and response capacity by government and the private sector, communities and other non-governmental role-players.
- Increased commitment to prevention and mitigation actions that will reduce the probability and severity of disastrous events by incorporating these actions into policies, plans and projects of both government and the private sector.

Tourism services on Bhuvan

bhuvan

RISAT-1 Medium Resolution with VV polarisation

National Remote Sensing Centre, Hyderabad
www.nrsc.gov.in http://bhuvan.nrsc.gov.in sales@nrsc.gov.in

Intergeo 2013: Boosting innovation

Essen, 28.11.2013. More than ever before, INTERGEO 2013 in Essen focused on social megatrends such as the energy revolution, climate change, smart cities and demographics – all in close dialogue with politicians, geoexperts and geobusiness. From 8 to 10 October, over 16,000 visitors from 87 countries worldwide took the opportunity to gain an insight into innovations and trends through demonstrations of solutions and services, and learn more about hardware and software. More than 500 exhibitors from 30 countries represented innovation, know-how, application and consultancy services, while 140 speakers shared scientific presentations and evaluations. Intelligent business processes and diverse methods of data acquisition are the raw materials of geobusiness and, at INTERGEO, demonstrated the potential for developments in the future. It was clear that mobility is becoming an increasingly crucial topic in all sectors. The positive feedback from a survey carried out among exhibitors and visitors at INTERGEO underlined the importance of the three-day conference trade fair as an exceptional international platform.

The high proportion of international exhibitors and visitors once again showed that INTERGEO is a central marketplace and communication hub for producers, developers and users of international geobusiness. In the survey conducted by independent company Gelszus Messe-Marktforschung GmbH, 80 percent of exhibitors said they had achieved the objectives they had hoped for by participating in INTERGEO. In addition to actual sales and prospective business with new customers, the primary goals were to work on customer care and image, introduce new products and gauge visitors' reactions. Some 81 percent of the exhibiting companies praised the high standard of discussions. Almost 94 percent said they were keen to participate in INTERGEO again in 2014.

Almost 40 percent of visitors were happy to travel over 300 kilometres to attend the event, and 92 percent said they would consider visiting INTERGEO again. More than a quarter of the visitors came to the event with the intention of awarding contracts. In line with that, more than 40 percent of visitors were independent entrepreneurs, managing directors or department heads with a high level of decision-making powers. At the same time, the event in Essen also attracted a particularly large number of talented young people, with one in ten falling into this category. That's more than just a coincidence.

Promoting young talent with Jobshaker

Alongside the main topics, there was also an intense focus on Intelligent Urbanization (IU) and promoting young talent. In cooperation with Messe München International, the theme of IU was the centre of attention at the Trend and Media Forum (TMF) on the Wednesday of the fair. The new recruiting format Jobshaker encouraged school pupils, students and career starters to engage in informal discussions with employers about the many different job profiles that make up the geodata industry. Each Jobshaker in the TMF lasted half a day. There are plans to expand both formats in 2014.

Excellent attendance at national INSPIRE Conference

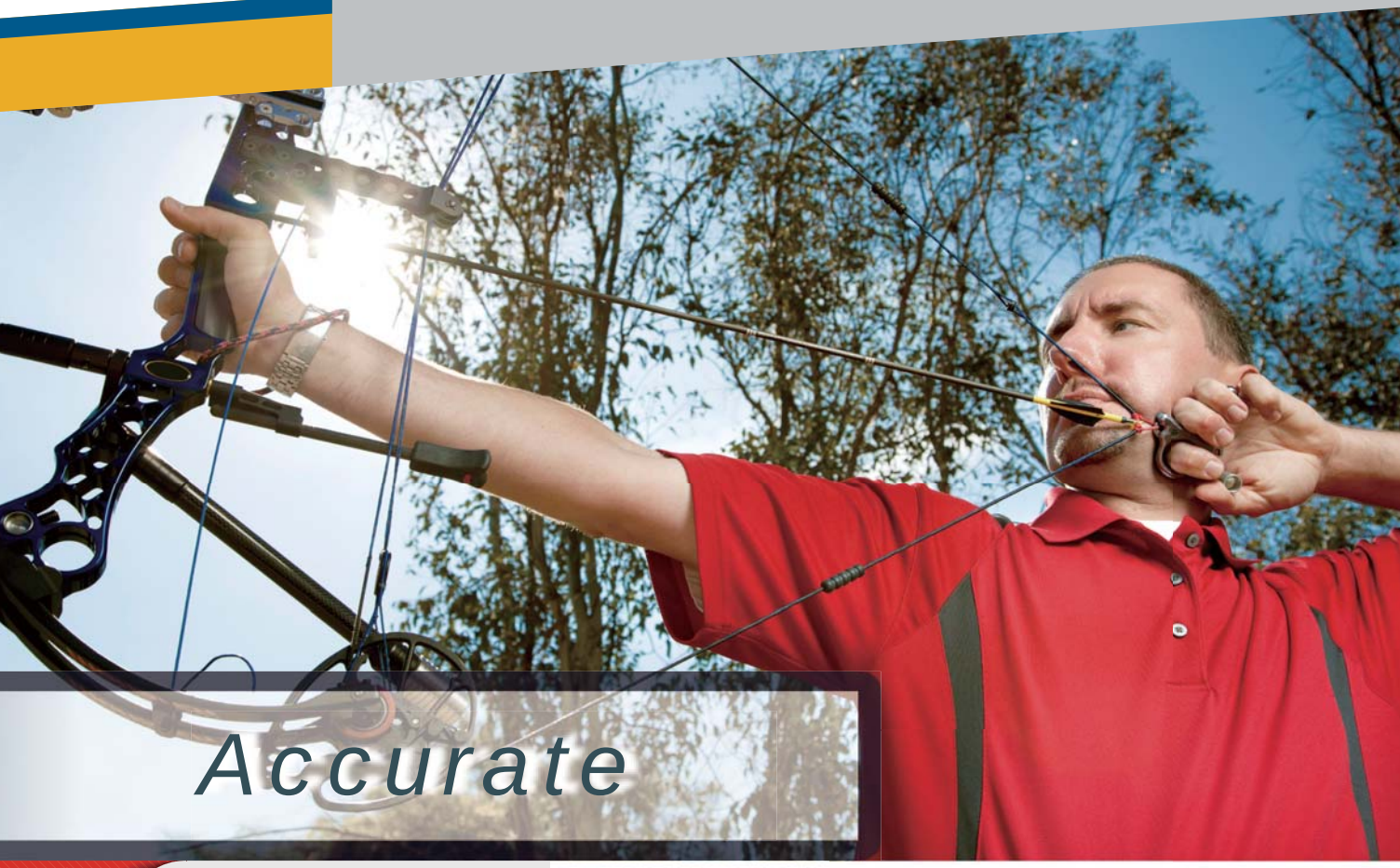
The high attendance at the second national INSPIRE Conference shows clearly that putting local authority issues front and centre was the right move. This highlights just how important reliable geoinformation is for creating appealing urban environments where people want to work and live. The metropolitan region of the Ruhr and its large population centres offered the ideal platform for this.

Surveying and GIS become one

"INTERGEO in Essen has boosted innovation throughout the value-added chain, from data right up to decision-making and expertise. Ultra-innovative geoinformation applications are at the very forefront," said DVW President Professor Karl-Friedrich Thöne. One new aspect is the merging of GIS and surveying. The technology makes it possible to combine ultra-accurate surveying work with mobile geoinformation systems. Presenting results in real time and having them available for information, processing and visualization generates real added value.

GIS-based answers to key issues

The winners of the GIS Best Practice Awards are representative of the added value generated by geobusiness. The awards were presented by the DVW the evening before INTERGEO. First place went to the project "SIMKAS 3D" led by the Technical University of Berlin's Centre for Technology and Society. This GIS-based solution impressed the judges with its response to the diverse challenges of coordinating infrastructure operators and authorities involved in ensuring public security in a crisis. Potsdam-based 3D Content Logistics GmbH came second with the project "smartMap Berlin - Berlin 3D city map on mobile devices". Focusing on the real estate sector, the project offers a new application for the existing Berlin 3D city map. Third place went to LiveMap GmbH from the Prenzlauer Berg district of Berlin for its interactive reporting system "Broadband Atlas Germany".



NEW

LT400HS GNSS Handheld – Accurate, Productive, and Versatile Surveying & Mapping Solution

- ***RELIABLE AND EFFECTIVE***
  The LT400HS Handheld GNSS is a rugged GPS+GLONASS data collector designed to achieve sub-meter to centimeter accuracy in adverse mapping conditions with or without the external antenna.

- ***COMPETITIVE SURVEY SOLUTION***
  Bundled with Carlson's SurvCE software, the LT400HS is the perfect cost-effective GNSS RTK Survey Solution for survey and construction professionals.

- ***POWERFUL GIS SOLUTIONS***
  Combined with DigiTerra Explorer7 Mobile GIS software, the LT400HS GNSS handheld offers feature-rich solution for accurate GIS field data collection and maintenance.

www.chcnav.com

Boosts for LBS by Singapore government

The Infocomm Development Authority of Singapore (IDA) has published an Open Positioning Framework (OPF) which is a set of standards and protocols which will help reduce the time and costs involved in developing and deploying Mobile Positioning and Analytics Services (MPAS) and enable more businesses in various sectors to reap the benefits of location-based services.

In the airport sector, for example, an operator can make use of MPAS capabilities in workforce management to locate roaming customer service officers and re-deploy them where they are most needed. In estate management, the location of maintenance officers can be detected automatically using MPAS, without requiring them to scan QR codes at every station, thus saving time and process.

Today, smart phones are typically equipped with a variety of sensors such as GPS, Wi-Fi, Bluetooth and accelerometers, making it possible to have more accurate and effective location positioning, both outdoors and indoors. With the deployment of MPAS still in its infancy and in the absence of well-established standards and protocols, IDA has taken the lead in developing the OPF to drive interoperability across the MPAS ecosystem and help businesses take advantage of developments in this space. *http://www.ida.gov.sg*

Sony Seeks 'SmartWig' Patent for Hairpieces With Sensors

Sony Corp., is seeking a U.S. patent for "SmartWig" hairpieces that could help navigate roads, check blood pressure or flip through slides in a presentation. The wig would communicate wirelessly with another device and include tactile feedback, Sony said in the filing with the U.S. Patent & Trademark Office. Depending on the model, the hairpiece may include a camera, laser pointer or GPS sensor, it said. The development of wearable technology such as eyeglasses, watches and earpieces is expanding as consumers seek new ways to integrate computers into everyday life.

NTT Docomo to provide GPS-based tracking services

NTT Docomo Inc. will start providing location tracking services for corporate customers in late January. It will provide a 30-gram device that can be easily attached to a person's belongings like shoes worn by elderly citizens and to satchels carried by schoolchildren. The location and time information of users of the device can be tracked with cellphones and other equipment that use GPS. *http://ajw.asahi.com*

TRAI prescribes tariff for service data-based mobile banking

Aiming to promote the use of mobile banking services across India, the telecom regulator TRAI has come out with guidelines and tariff on unstructured supplementary service data (USSD)-based mobile banking services.

USSD technology is used by telecom operators to send alerts to their users. It can be used for pre-paid call-back services, location-based content services and menu-based information. A large section of the population, especially in rural areas, do not have easy access to banks and this facility will help to tide over that shortcoming, he added.

The Mobile Banking (Quality of Service) (Amendment) Regulations, 2013, have come into immediate effect and the Telecommunication Tariff (56th Amendment) Order, 2013, will come into force on January 1, 2014, the Telecom Regulatory Authority of India (TRAI) said in a note yesterday. *www.thehindubusinessline.com*

Kinexon GmbH wins 10th European Satnav Competition

Kinexon GmbH at the ESA Business Incubation Centre Bavaria has developed a cloud-based solution for analysing and visualising training data on mobile devices. The solution kits athletes out with a small, portable location sensor and feeds the resulting data into the cloud by means of a stationary base antenna. This enables users to track and analyse performance parameters and tactical movements down to the centimetre - all in real time. In particular, however, it was the solution's user-friendliness during training and relatively low cost that won over the international jury of experts in the European Satellite Navigation Competition (ESNC). So far, the high price of such systems has limited their use to professional sport; Kinexon's system will now give amateur clubs the chance to benefit from adding online analysis to their training activities, as well.

Microsoft partners with TCS, Wipro

Microsoft India announced the launch of Microsoft CityNext in the country. It is an initiative to enable city residents and city leaders to use technology to build a foundation for sustainable growth. Globally the programme was launched in July this year.

Microsoft has also signed up technology services providers Tata Consultancy Services (TCS) and Wipro as partners to implement the CityNext solutions and services. Such solutions can help in areas including traffic management, healthcare services, payment of local taxes and tackling environmental issues. *http://articles.economictimes.indiatimes.com*

EIAST successfully launches Dubai Sat-2

The Emirates Institution for Advanced Science and Technology (EIAST) has successfully launched Dubai Sat-2. It marks another accomplishment for the UAE in aerospace and complements EIAST's achievements in the fields of space science and advanced technology. Dubai Sat-2 was launched from the Yasny Launch Base in Russia, using the Russian Dnepr rocket launcher in cooperation with the Russian International Space Company (Kozmotras). *http://gulftoday.ae/portal*

RADARSAT-2 DEM for the Malaysian Government

MDA's Information Systems Group (MDA) has signed a contract with Sky-Shine Corporation of Malaysia to deliver over 52,000 square kilometers of digital elevation products using space-based imagery from RADARSAT-2 acquired during 2013 and 2014. MDA will deliver the completed digital elevation products for an area in Peninsular Malaysia as part of a project for the Malaysia Remote Sensing Agency in early 2014. This contract builds on MDA's leadership in the production of large-scale Digital Elevation Models (DEMs). *www.mdacorporation.com*

Drones in the Port of Hamburg

The Aibot X6 was able to utilize its unique features when inspecting the famous Koehlbrandbridge in Hamburg, Germany. The bridge spans approximately 3600 m (2.3 miles). It is submitted to a complex examination procedure. The exact process of the inspection is regulated by DIN norm 1076 with the aim of documenting the current state to detect damages in time. The drone circles around the bridge and delivers high-resolution videos and images. *www.aibotix.com*

China launches remote-sensing satellite

China has sent a remote-sensing satellite into scheduled orbit, according to the Taiyuan Satellite Launch Center. The Yaogan XIX satellite was launched from the launch center in north China's Shanxi Province. The launch marked the 184th mission for the nation's Long March rocket family. *http://news.xinhuanet.com*

Astrium's SPOT 6 satellite qualifies for Copernicus programme

Astrium Services's SPOT 6 high-resolution satellite has been qualified by the European Space Agency (ESA) to take part in the Copernicus Earth observation programme. Copernicus – known as GMES (Global Monitoring for Environment and Security) when it was founded in 1998 by the European Union and ESA – aims to provide a series of data obtained by observation satellites and in-situ measurement instruments, in order to produce a comprehensive global view of the state of our planet. *www.astrium.eads.net*

Indra and ESA agreement

Indra has closed an agreement with the European Space Agency to host the main processing and archiving centre for the images of the Sentinel-2 mission at its facilities and take charge of its operation.

The company is the leader in the development of ground segments in Spain and has vast experience in Earth observation systems and applications. *www.4-traders.com*

Hitachi and Mitsubishi Corporation Cooperation

Hitachi, Ltd. and Mitsubishi Corporation have announced that MC agreed to sell, and Hitachi agreed to purchase, 51% of the issued shares of Japan Space Imaging Corporation (JSI), a subsidiary of MC, and that Hitachi and MC will jointly operate the satellite imagery business through JSI from November 15, 2013. *www.mitsubishicorp.com*

Iran to manufacture UAV for aerial photography

Chairman of Iran's Topography Organization Mahmoud Ilkhan said that the manufacturing process of an indigenously designed Unmanned Aerial Vehicle (UAV) for aerial photography purposes is underway.

"Now, with the help of Tehran University, a research project to build a drone for aerial photography to make technical maps is underway," said Ilkhan, adding, "The underway project's results will be finalized in the next few months." *http://english.farsnews.com*

At a Glance

- Esri introduces ArcGIS for Electric and Gas
- Topcon announces release of GLS-2000 laser scanner
- TomTom introduces MySports mobile app for TomTom GPS watches
- Bulgaria signs accession agreement with EUMETSAT
- Qualcomm Finalizes Sale of Omnitracs, Inc. to Vista Equity Partners
- Graebert India signs National Distribution agreement with Ingram Micro
- Smart™ 3D 2014 released by Intergraph
- PCI Geomatics, Feng Chia University and Lotus (H&R) Inc. Sign International Industry-Academia CoopAgreement
- FAA Releases Roadmap for UAS
- TV Documentary on JFK Assassination Highlights Use of Leica ScanStation P20 in Shooting Scene Reconstructions
- Interactive Esri Map Tracks The Exploits of Five Real Pirates of the Caribbean
- U.S. Forest Service Offers New Digital Maps for Mobile Devices
- Orbit GT Mobile Mapping Solutions Chosen by Istanbul Metropolitan Government
- Updated Elevation Data Inventory Available from NOAA, USGS, and FEMA
- Safe Software Expands into iPaaS Market with New Cloud Service

Chronos launches GPS interference & jamming detection and monitoring service

Chronos has announced a range of GPS interference and jamming detection and monitoring products and services for critical infrastructure, law enforcement and services dependent on GPS and (in the future) Galileo signals for mission critical operations. Capabilities include hand-held monitoring and detection as well as 24x7 remote sensor monitoring with centralised web based viewing of events and email alerts. *ww.chronos.co.uk*

GPS backup plans still incomplete

The federal agencies responsible for developing backup capabilities for GPS are not making sufficient progress in meeting a presidential directive issued nearly a decade ago, according to a new report by the Government Accountability Office, the nonpartisan investigative arm of Congress. A National Security Policy Directive (NSPD-39) tasked the Department of Transportation and the Department of Homeland Security in December 2004 to jointly develop backup capabilities in response to potential natural and manmade GPS disruptions. The directive instructed the DOT and DHS to create a plan for detecting and mitigating GPS interference. It also required them to coordinate efforts to "develop, acquire, operate, and maintain backup capabilities that can support critical civilian and commercial infrastructure during a GPS disruption," the GAO report said. *www.informationweek.com*

RTCM Issues an amendment of its standard for Differential GNSS

Special Committee 104 of the Radio Technical Commission for Maritime Services (RTCM) has just completed another amendment to RTCM 10403.2, the widely-used "Version 3" standard for Differential Global Navigation Satellite System Services (DGNSS). RTCM's standard supports very high accuracy navigation and positioning through a broadcast from a reference station to mobile receivers. This amendment introduces an ephemeris message and a set of the new Multiple Signal Messages (MSM) for the Japanese Quasi–Zenith Satellite System (QZSS). The new signals join the GPS and GLONASS messages, as well as the recently added Galileo and BeiDou System (BDS) messages. The amended standard is available from RTCM at its secure online publication store. *www.rtcm.org*

Glonass security against Electronic Warfare

Russian Ministry of Defense has launched a project aiming to secure Glonass against enemy disruptions of signals. The ministry has handed a 350 million ruble (US $11 million) contract to two local entities, the Russian Scientific-Research Institute of Physical-technical and Radiotechnical Measurements (VNIIFTRI) and NAVIS navigation systems. The two contractors are to increase the system's immunity to electronic warfare. *www.defensenews.com*

Global GNSS Market 2012-2016

TechNavio's analysts forecast the Global GNSS market to grow at a CAGR of 20.98 percent over the period 2012-2016. One of the key factors contributing to this market growth is the growing popularity of LBS. The Global GNSS market has also been witnessing the increased replacement of PNDs by smartphones. However, the reduced investments due to global recession could pose a challenge to the growth of this market. *www.researchandmarkets.com*

ZEB1 Mobile Mapper by Formby Surveys

Formby Surveys' ZEB1 mobile mapping system is a hand held rapid laser mapping system, undertaken in partnership with 3D Laser Mapping, UK. It has reported significant time savings achieved in the scanning of existing buildings, compared to more traditional technologies and techniques. Formby Surveys offer a precision measurement services portfolio providing a variety of professional sectors with land, property and specialist surveying services. *www.3dlasermapping.com*

GPS III prototype communicate with GPS satellite constellation

The Lockheed Martin prototype of the next-generation GPS satellite, the GPS III, recently proved it was backward-compatible with the existing GPS satellite constellation in orbit.

During the tests GPS III Nonflight Satellite Testbed (GNST), successfully communicated via cross-links with Air Force flight-like hardware simulators for the GPS IIR, GPS IIR-M, and GPS IIF satellites, which make up the bulk of the current GPS satellite constellation. Testing also demonstrated the ability of an Air Force receiver to track navigation signals transmitted by the GNST. 'These tests represent the first time when the GNST's flight-like hardware has communicated with flight-like hardware from the rest of the GPS constellation and with a navigation receiver,' explained Paul Miller, Lockheed Martin's director for GPS III Development. 'This provides early confidence in the GPS III's design to bring advanced capabilities to our nation, while also being backward-compatible.'

Glonass must for phones sold in Russia

Phones sold in Russia will have to use GLONASS or GLONASS + GPS as of 2014, according to a report from the Voice of Russia. Phones with only GPS will be illegal in Russia, and any mobile devices imported will have to support GLONASS. A new bill claims that in order to guarantee stable operation of a unified telecom network in Russia regardless of conditions, it's necessary that the satnav system used be the one controlled by the Russian Federation.

Funding for Galileo and EGNOS

The European Parliament has approved funding for Galileo and the European Geostationary Navigation Overlay Service (EGNOS)—until 2020. Between now and then, the European Union will spend $9.4 billion to complete the satellite navigation infrastructure and launch the provision of services. The European

Commission pointed out, however, that Galileo was expected to contribute around €90 billion to the EU economy over the first 20 years of operation, according to independent studies. *http://atwonline.com*

Police vehicles with GPS across Kerala, India

According to Kerala police officials, 600 GPS devices will be bought to be installed in police vehicles, mainly in vehicles with the police control room and Highway police.

An official in police headquarters said the GPS system will have a high resolution digital mapping facility, which would connect police vehicle with the police control room in each district. *http://newindianexpress.com*

"Multidimensional Spatial Data" for maintenance of speedways completed

Recently, PASCO Corporation, Japan, has completed its "Multidimensional Spatial Data" for the maintenance of speedway and preparation of unexpected disaster in cooperation with Aero Asahi Corp. PASCO and Aero Asahi have completed 99 per cent of the survey by 12 special surveying cars installed with mobile mapping system.

These special surveying cars run on national speedways to grasp detail data. PASCO has a special technology of spatial information using cars, aircrafts and satellites. It includes management of the facility set nearby road. This technology contributes to efficient management of social infrastructure. Aero Asahi has top technology of surveying and analysis for spatial information service. *www.business-standard.com*

Bangalore airport GAGAN ready

Bangalore airport is ready for the system, GPS Aided Geo Augmented Navigation or GAGAN, which is set to begin operations December-end. ISRO, which is implementing this satellite-based navigation, has said tests are currently underway by AAI to check information flow between Air Traffic Control (ATC) and the flights to ensure that the satellite signals coming to an aircraft are being received correctly. The airport too will receive signals from the satellite and so it will be a three-way communication - between satellite, airport and aircraft. *www.deccanherald.com*

SLA's GeoInnovation Fund

The Singapore Land Authority (SLA) has launched the GeoInnovation Fund to spur innovation through the use of Geospatial Information Science and Technology (GIST). SLA hopes to attract individuals who are keen to develop creative geospatial applications and services to tap the fund.

Those who have ideas on how GIST can be used to benefit the society and the economy may apply for up to S$50,000 worth of funding per project. *www.channelnewsasia.com*

Galileo update

Landmark Navigation for highly automated driving wins Copernicus Masters 2013

Highly automated vehicles require highly precise and redundant positioning and navigation systems in order to stay on track. With an innovative approach designed to meet this need through landmark-based navigation, Hartmut Runge from the Earth Observation Center (EOC) of the German Aerospace Center (DLR) has just been named the overall winner of this year's Copernicus Masters, as well as of the competition's BMW ConnectedDrive Challenge. DLR's navigation method incorporates street lights, crash barrier posts, bridge railings, and other roadside features that are easily visible for both vehicles and Earth Observation satellites. With modern radar satellites, a comprehensive inventory of such landmarks can be compiled with centimetre-level accuracy and applied to digital roadmaps. A vehicle's optical or radar based system can thus constantly determine its current position based on triangulation of these points. *www.space-solutions.eu*

Delays for Galileo

The prime contractor of Europe's 22 Galileo positioning, navigation and timing satellites said it is likely to retain its planned profit on the program despite delays that have caused European Commission officials to threaten penalties. Satellite builder OHB AG of Bremen, Germany, said it had completed development of the first satellites earlier than planned, and that this will compensate for the late start in testing and later-than-planned delivery to its customer – ESA.

ESA's Galileo Satellites...

The first of the two satellites is now midway through a five-week immersion in vacuum and temperature extremes that mimic the conditions it faces in space.

This 'thermal–vacuum' test takes place inside a 4.5 m-diameter stainless steel vacuum chamber called Phenix. An inner box called the 'thermal tent' has sides that are heated to simulate the Sun's radiation or cooled down by liquid nitrogen to create the chill of Sunless space. With the first four Galileos already in orbit, these new versions are the first two of a total 22 'Full Operational Capability' satellites being built by OHB in Germany with a payload from Surrey Satellite Technology Ltd in the UK.

The second satellite joined its predecessor in mid-August at ESA's European Space Research and Technology Centre in Noordwijk. This is the largest spacecraft testing site in Europe, with a full range of space simulation facilities under a single roof in cleanroom conditions. The newly arrived satellite first underwent a 'mass property test', measured to check its center of gravity and mass are aligned within design specifications.

The more precisely these are known, the more efficiently the satellite's orientation can be controlled with thruster firings in orbit, potentially elongating their working life by conserving propellant. *www.satnews.com*

BSF India decides to procure ground sensors for border

The Border Security Force has decided to acquire ground sensors to pick up movement along the LoC and the International Border. The gadget, based on experiences drawn from some foreign countries, is called the 'Un-attended Ground Sensor' (UGS) and once operationalised, it will be the first such security mechanism deployed on any frontier in the eastern or the western flank of India. *http://zeenews.india.com*

Kenya to register four million land parcels by 2017

The government through the ministry of land, housing and urban development has embarked on an ambitious plan to register four million land parcels in the country by the year 2017. However this uphill task will call for use of modern mapping technologies for efficient capturing of geospatial data for it to succeed. To enhance this ministry will acquire satellite imageries which will be used during the process of land adjudication.

Kenyan Geodetic Reference Frame (KENREF) is the basis for all mapping, cadastral surveying, land registration title system and physical planning as well as utility and construction of development infrastructure like roads, rails dams and power lines. *http://www.kbc.co.ke*

White House Unveils Big Data Projects, Round Two

The White House Office of Science and Technology Policy (OSTP) and Networking and Information Technology R&D program (NITRD) has introduced a slew of new big-data collaboration projects aimed at stimulating private-sector interest in federal data. The initiative is targeted at fields as varied as medical research, geointelligence, economics, and linguistics. The new projects are a continuation of the Obama Administration's Big Data Initiative, announced in March 2012, when the first round of big-data projects was presented. *http://www.informationweek.com*

FOIF PRODUCTS- It's professional

RTS360 WinCE total Station

- Windows CE 5.0 operating system
- Endless drives, sight target faster with two hands operation
- A trigger key, user do not lose sight of the target while measuring
- 3.5" colour TFT LCD (320 x 240 dots) touch screen, transflective sunlight readable display
- Automatic keyboard illumination with light sensor
- Long reflectorless measuring distance reaches to 500m(R500) or 1000m(R1000)
- 500m long range Bluetooth cable-free connection
- Smart battery managing system
- Professional onboard software: FOIF Fieldgenius or Carlson SurvCE

A30 GNSS Receiver

- Professional GNSS Satellite tracking(GPS,Glonass,Galileo,BDS...)
- Equipped with industry standard GNSS engine (Trimble, NovAtel...)
- OLED display with superior brightness & temperature range
- Proven Satel radio for base and rover communication
- 3.5G WWAN (HSDPA/WCDMA/EDGE...) module option
- FOIF PRS technology, compatible with other brands GNSS products
- Automatic tilt correction system within ±30 degree
- Automatic data collection during centering

GTA1310

Automated Gyroscope Station
Find azimuth anywhere and anytime with accuracy of 10s/GTA1310 or 15s/GTA1315

EL03

High Precision Digital Level with standard deviation of 1km double run: ±0.3mm

F55

GNSS Handhelder
H-accuracy:
<20 cm 95% confidence (L-Dif™)
<0.5 m 95% confidence (DGPS)

F52

GIS Handhelder
FOIF SuperGIS software
H-accuracy: 1-3m

FOIF Since 1958
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E-mail:janak.ji@yahoo.com Website: www.janaksurvey.com
Tel: 011-23515400,23515399 Fax: 011-23682185

Czech Office for Surveying, Mapping and Cadastre delivers rapid public access to terabytes of data

The Czech Office for Surveying, Mapping and Cadastre (COSMC), has implemented a web-based solution from Intergraph® for the distribution and publishing of national geospatial data. It includes high-performance image compression and delivery for handling big data on a large scale. COSMC's original system was recently upgraded to an integrated web-based portal, leveraging multiple Intergraph technologies *http://geospatial.intergraph.com*

British trade delegation to Libya taps Proteus for mapping expertise

Proteus, a provider of satellite-derived bathymetric mapping and seabed classification services, represented the mapping industry in a British trade delegation to Tripoli organized by the Libya-British Business Council (LBBC). Proteus presented potential solutions to coastal mapping challenges faced by Libya during meetings with the National Oil Corporation, Ports and Maritime Transport Authority, University of Tripoli, and Libyan Center for Remote Sensing. *www.lbbc.org.uk.*

GIS for Locating Funerary Facilities

The shortage of public facilities for funerary service and the traditional social custom in Taiwan inevitably cause the NIMBY (not in my backyard) confliction when locating funerary facilities such as funeral home, memorial pagoda, and cemeteries, which might bring sustainability issues for landscaping, air pollution by crematorium, and noise pollution of traffic. Hence, by utilizing GIS, Pingtung Senior High School planned to analyze and find out a better solution.

In this project, SuperGIS Desktop 3.1a, SuperGIS Network Analyst, and Address Locator enable the officials and the students to display, edit, manage, and query geospatial data, overlap the feature layers and satellite images of Pingtung county and city, as well as carry out buffer analysis for landscape planning. Besides, Google Earth was also used to explain the relevant topographic features, terrain, and land utilization types in the research area. *www.supergeotek.com*

1Spatial & LSI Partner Win contract extension

1Spatial have signed a contract extension with the U.S. Census Bureau. The contract extension will focus on the provision of software licenses and services in preparation for the 2020 Decennial Census and to widen the use of the technology within the organisation. Through a long term engagement with the U.S. Census Bureau, 1Spatial and LSI have prototyped and designed an automated conflation process to carry out geospatial data conflation. This delivers a phased roll-out for 1Spatial's Validate & Integrate software. *www.1spatial.com*

MRPC launches GIS system for mustard crop in India

A mustard research body has launched GIS for the commodity in the country to provide farmers all information about sowing and harvesting of the crop. "Mustard crop being the major oilseed crop of India has been first selected for this purpose among the cereal crops. This information system model will be replicated to other agricultural crops in future," Mustard Research and Promotion Consortium (MRPC), Delhi said in a statement. MRPC added the government has roped them as an agency which will handle the assembled data through GIS and ground for scientific interpretation. *http://articles.economictimes.indiatimes.com*

3-GIS Mobile with Android 2.1 released

3-GIS have released their mobile software called 3-GIS Mobile 2.1 with Android compatibility. It worked with Gas Technology Institute (GTI)-a leading research and development organization serving energy and environmental markets-and Operations Technology Development (OTD)-a partnership of natural gas distribution companies formed to develop, test, and implement new technologies-over the past 18 months to design and develop this application with specific gas industry functionality. *www.3-gis.com*

Mapping project to help Philippines reconstruct typhoon-hit areas

As part of the National Government's efforts to rebuild the localities hit by Super Typhoon Haiyan, the Mines and Geosciences Bureau of the Department of Environment and Natural Resources (DENR) is sending a team of licensed geologists to Tacloban in order to identify areas unsafe to build relocation sites.

According to MGB Director Leo Jasareno, the team will identify areas that are vulnerable to geological hazards and come up with recommendations to determine relocation sites for many displaced residents. *www.futuregov.asia*

Singapore, Esri sign agreement on 3D smart city technology

Singapore's Urban Redevelopment Authority (URA) and Esri have signed a two-year MoU that will see Singapore bring its urban planning and design processes to new Esri technology developers in the US will commit to investing in 3D GIS technology development in collaboration with the URA; and Esri Singapore specialists will provide the agency with local support, advice and expertise. This agreement will enable URA to embark on several new spatial projects, and establish a '3D Urban Simulation Prototype Lab' for 3D GIS testing and modelling. *www.futuregov.asia*

New Google Maps feature launched in Taiwan

Google Inc. released a new mapping service feature in Taiwan recently that can help users discover new nearby places to visit. It will allow users to quickly search for specific types of locations, in the categories of Eat, Drink, Shop, Play and Sleep. Taiwan is among a second group of countries, along with India, Australia, Hong Kong and South Korea, in which Google is launching the Explore. *http://focustaiwan.tw*

Introducing the new look of Hemisphere GPS

Hemisphere

GeoMapper Handheld Solutions

Introducing Hemisphere GNSS' all-new rugged handheld ***GeoMapper*** series, suitable for mapping and survey professionals.

Create a complete field solution with ***GeoMapper Mobile*** and ***GeoMapper Office*** software applications.

Enhance Your Position

www.HemisphereGNSS.com
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NovAtel CORRECT™ OEM Positioning Solution

NovAtel Inc has launched NovAtel CORRECT positioning technology. It optimally combines data from multiple GNSS satellite constellations with corrections from a variety of sources, to deliver the best position solution possible. It provides integrators with the opportunity to choose pricing and subscription options that best match their OEM business objectives. Delivery of correction data is available via satellite or Internet, depending on the requirements of the application.

Designed for NovAtel's OEM6® high precision receivers, the NovAtel CORRECT precise point positioning (PPP) solution delivers decimetre-level accuracy worldwide. L-band delivered PPP corrections from TERRASTAR are also supported without users having to add base-station infrastructure. *www.novatel.com/correct*

New FARO® SCENE 5.2 software

FARO Technologies, Inc has released new scan processing software solution, FARO® SCENE 5.2. It makes complex geomatic and surveying tasks easier, and makes scan results look better. Apart from better sharpness, the software also improves 3D views by reducing color differences due to inhomogeneous light conditions at different scanning positions. *www.faroasia.com/scene/in*

New Leica Cyclone 8.1

Leica Cyclone 8.1 includes a major licensing update for all standalone Leica Cyclone products and Leica CloudWorx plug-in products. With the licensing update, plus other accompanying Cyclone additions and enhancements, users will spend less time in the office and can work easier with rich, as-built point cloud data. Cyclone is an underlying software foundation for popular Leica CloudWorx plug-ins that enable 3rd party applications to work more efficiently with point clouds. *www.leica-geosystems.com/hds*

R&S SMBV100A now supports BeiDou

Rohde & Schwarz extends the functionality of the R&S SMBV100A vector signal generator by adding BeiDou/Compass capability to its integrated GNSS simulator. With the R&S SMBV-K107 option the GNSS simulator now covers the BeiDou standard as well as the GPS, Galileo and Glonass satellite navigation systems.

The new option allows users to generate realtime scenarios with up to 24 BeiDou satellites. R&S SMBV-K107 supports all possible BeiDou orbits and can therefore even simulate satellites that are not yet in orbit. It also supports hybrid scenarios with GPS, Galileo or Glonass satellites. A software update makes it easy to upgrade existing GNSS simulators for BeiDou. No hardware modifications are required. *www.rohde-schwarz.com*

GLI-METRO-G by GPS Source

GPS Source has released GLI-METRO-G. A smart GNSS controller designed with technology derived from high performance systems and military applications. Capable of handling any GPS L1/L2, GLONASS L1/L2 Signal application, it has many highly desired features, including the ability to select GPS+ GLONASS, GPS only or GLONASS only signal output power control. It also has built-in antenna monitoring and oscillation detection. With the GLI-METRO-G, the user has complete control over effective radiated power (ERP) levels for the entire GNSS range. It has the unique benefit of allowing selection for the power control between signals. *www.GPSSource.com.*

Exelis delivers critical GPS satellite simulation software

Exelis has successfully completed factory acceptance testing for the GPS III navigation payload simulator software. The software will simulate the behavior of GPS signals in space, which will be used for testing the U.S. Air Force's next generation GPS ground station known as the operational control system (OCX). The simulator

Trimble News

Applanix brings Trimble CenterPoint RTX Correction Service

Trimble® CenterPoint™ RTX™ correction service will be available across Applanixs entire airborne mapping portfolio. Using this correction service, Applanix will be able to deliver significant benefits to the aerial survey marketplace like high accuracy, speed and low cost, simplicity, more uptime and reliability, ease of use fast and reliable convergence.

New GeoExplorer Data Collection Solution by Trimble

Trimble has introduced the next generation of its Trimble GeoExplorer data collection solution. The new Geo 7X includes an integrated laser rangefinder module, extended GNSS capabilities and improved hardware performance. It can enhance productivity in difficult physical conditions and challenging GNSS environments. When faced with either obstructed satellites or inaccessible locations, GIS professionals now have the geospatial data collection tools they need--in a single package. With Flightwave technology, users can easily capture offset measurements from the Geo 7X's rangefinder module for direct integration with Trimble data collection software. It is compatible with existing and planned GNSS satellite systems.

Cloud-based software and mobile apps from Trimble

Trimble has introduced the latest version of its smart water and wastewater management software– Trimble® Connect™ version 1.5. The latest release of the cloud-based software includes a suite of applications that help water and wastewater utilities to deploy smart meters, repair leaks and reduce non-revenue water (NRW), locate and map critical infrastructure using Geographic Information System (GIS) technology, extend the life of aging assets, and improve worker safety and productivity. *www.trimble.com*

will be integrated into the Raytheon-developed GPS System Simulator (GSYS) within OCX. Exelis is on contract to provide critical software elements in the navigation processing subsystem to enable GPS constellation controllers to better understand the satellites' exact position. This helps ensure accurate navigation information is being securely broadcast to users. *www.exelisinc.com*

Smallest standalone GNSS module from u-blox

u-blox has unveiled smallest standalone GNSS positioning module in the market. The LGA module EVA-7M, measuring 7 x 7 x 1.1 mm integrates crystal and passives and need only an antenna for instant global positioning capability. The module supports existing GNSS, plus all SBAS augmentation systems. Based on u-blox' advanced GNSS technology u-blox 7, the module achieves -160 dBm sensitivity when tracking GPS satellites (-158 dBm with GLONASS satellites), fast acquisition time and the lowest power of any u-blox 7 module (16.5 mA at 3 V). *www.u-blox.com*

Juniper Archer 2 by Altus

Altus Positioning Systems has launched new Juniper Archer 2 field computer packaged with Altus' APS-3 GNSS RTK receiver. It is a powerful handheld computer with an IP68 certification and MIL-STD-810G compliance, and operates between -30 to +60 degrees C. It features a 1.0 GHz processor, 512 MB RAM and 8 GB flash storage. Like Juniper Systems' other rugged handhelds, the Archer 2 is made to take a beating.

Global Mapper SDK v15 by Blue Marble

Blue Marble Geographics has released Global Mapper Software Development Kit (SDK) version 15. It offers many new features and functions including a new mathematical raster calculator, LiDAR analysis tools, 3D PDF read/write support and much more. It provides a Windows DLL, which allows users to include much of the functionality of Global Mapper within their own software applications. The SDK includes both native 32-bit and 64-bit DLL's, so users can target any Windows operating system.

LiDAR USA announces CHC Packaging

CHC Navigation headquartered in Shanghai will provide preconfigured GNSS base stations optimized for ScanLook. Matching the appropriate CHC system with ScanLook, LiDAR USA is now able to offer preconfigured and optimized base station solutions to help obtain the highest accuracy. LiDAR USA is pleased to be able to offer the CHC GPS base station equipment along with ScanLook as a single purchase making it easier for the first-time buyer to enter the market fully equipped and ready to work at the maximum accuracy possible. *www.chcnav.com*

SimActive Releases Correlator3D™ Version 5.0

SimActive Inc., has released version 5.0 of Correlator3D™. It has numerous improvements, including the enhancement of Correlator3D™ aerial triangulation module (AT) with visualization and editing tools, as well as improved DTM and 64-bit support. It allows users to obtain an overall

quality assessment of their project in the blink of an eye. This is accomplished by displaying links between images after tie point collection and residuals with a color coding system following bundle adjustment. A native 64-bit support was also added and the DTM generation module was completely redesigned. The new DTM algorithms result in a higher level of accuracy while processing times has been brought down.

New Simplicity Sight Survey 2014 by Carlson Software

Marking the first new Simplicity release in five years, the all new Simplicity Sight Survey 2014 is now available from Carlson Software. It will draw directly in MicroStation and is an effective companion product for its users working in the AutoCAD and IntelliCAD environments. Familiar commands such as Field-to-Finish, Contouring, Edit-Process Raw Data, and Network Least Squares work within Simplicity as they do within Carlson Survey. A Windows-based coordinate geometry program, it provides simplified methods for solving commonly encountered coordinate geometry and construction surveying problems.

GeoTexture for Backscatter Data Processing Evaluation at AWI

Regarding co-registered, georeferenced backscatter data, the German Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research (AWI) has recently been evaluating the Kongsberg Geoacoustics GeoTexture software suite for backscatter data processing, mosaic creation and seabed classification. The software performance has been optimised for the analysis of GeoSwath Plus backscatter data, as it allows for beam pattern correction, vessel motion and sea-bottom topography, which substantially improve the quality of the mosaics and simplify image analysis and interpretation.
www.hydro-international.com

MARK YOUR CALENDAR

January 2014

DGI 2014
21 – 23 January, 2014
QEII Conference Centre, London, UK
http://www.wbresearch.com/dgieurope/home.aspx

ION International Technical Meeting
27 – 29 January
San Diego, California, USA
www.ion.org

February 2014

International LiDAR Mapping Forum
17 – 19 February 2014
Denver, Colorado, USA
www.lidarmap.org/international

March 2014

Munich Satellite Navigation Summit 2014
25 – 27 March
Munich, Germany
www.munich-satellite-navigation-summit.org

ASPRS 2014 Annual Conference
23 - 28 March
Louisville, Kentucky USA
www.asprs.org

April 2014

ENC-GNSS 2014
14 – 17 April
Rotterdam, The Netherlands
www.enc-gnss2014.com

Interexpo GEO-Siberia 2014
16 - 18 April
Novosibirsk, Russia
http://expo-geo.ru/event/27_Interexpo-GEO-Siberia-2013

IGRSM 2014
21 - 22 April
Kuala Lumpur, Malaysia
http://www.igrsm.com/igrsm2014/

2014 International Satellite Navigation Forum
23 – 24 April
Moscow, Russia
http://eng.glonass-forum.ru

ASPRS 2014 Annual Conference
23 – 28 March 2014
Louisville, Kentucky USA

9th National GIS Symposium in Saudi Arabia
28 - 30 April 2014
Dammam, Saudi Arabia
http://www.saudigis.org/default.aspx

May 2014

China Satellite Navigation Conference
May 2014
Nanjing, China
http://www.beidou.org/english/index.asp

IEEE/ION Position Location and Navigation Symposium
5 – 8 May 2014
Monterey, CA
www.ion.org

Esri Africa User Conference
6 – 8, May 2014
Cape Town, South Africa
www.esri.com/events/auc

Annual Baska GNSS Conference
7 – 9 May 2014
Baska, Krk Island, Croatia
renato.filjar@rin.org.uk

MundoGEO Connect 2014
7 – 9 May
Sao Paulo, Brazil
http://mundogeoconnect.com/2014/en/

GNSS: Principles, Augmentations and Evolutions of EGNOS
12-23 May 2014
Toulouse, France
sandrine.castiglioni@enac.fr

GEO Business
28 – 29 May 2014
London, UK
www.geobusinessshow.com

June 2014

Hexagon Conference 2014
2 – 5 June
Las Vegas USA
http://hxgnlive.com/

ION Joint Navigation Conference 2014
16 – 19 June
Orlando, United States
www.ion.org/jnc

5th International Conference on Cartography and GIS
15 – 21 June 2014
Riviera, Bulgari
http://iccgis2014.cartography-gis.com/Home.html

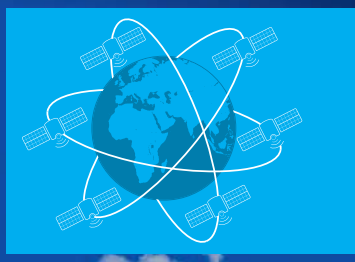
XXV FIG Congress
16 – 21 June
Kuala Lumpur, Malaysia
www.fig.net

July 2014

GI Forum 2014
1 – 4 July 2014
Salzburg, Austria
www.gi-forum.org

Esri International User Conference
14 – 18 July 2014
San Diego, USA
www.esri.com

Gain perspective in real-world GNSS simulation



The GNSS simulator in the R&S®SMBV100A vector signal generator
Expensive, inflexible simulation of GNSS scenarios is a thing of the past. Now you can easily and cost-effectively test your satellite receivers under realistic conditions.

- Comes with a variety of predefined environment models such as "rural area", "urban canyon", "bridge" and "highway"
- Allows flexible configuration of realistic user environments including atmospheric modeling, obscuration, multipath, antenna characteristics and vehicle attitude

The R&S®SMBV100A generates all relevant communications and broadcasting standards such as LTE, HSPA+, WLAN, HD Radio™ and FM stereo.

To find out more, go to
www.rohde-schwarz.com/ad/smbv-gnss

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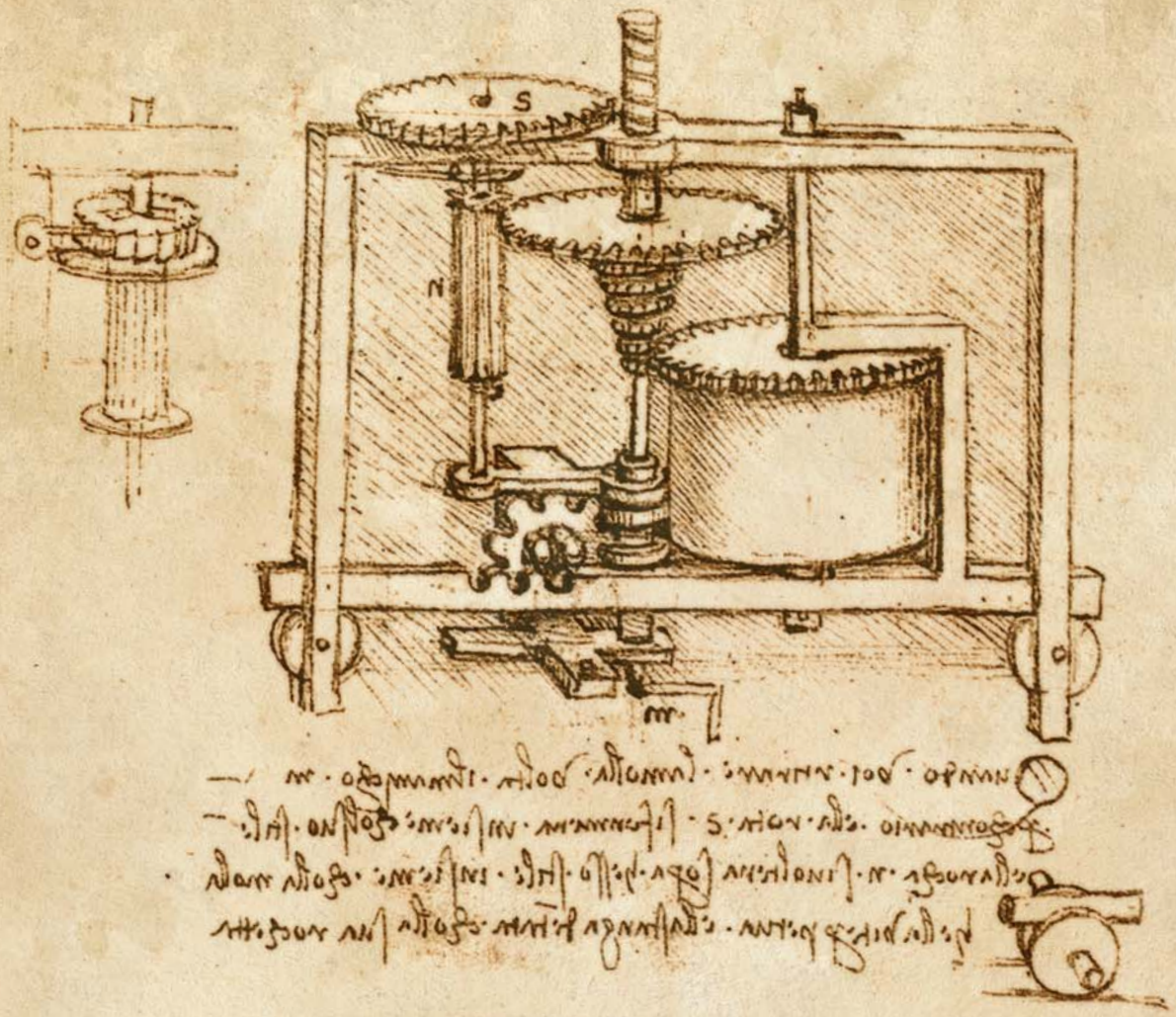

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Like great thinkers of the past, engineers are at the forefront of creating inventions that change our world. NovAtel's three new OEM6 high precision receivers – containing our most advanced positioning technology – will help you push the boundaries of possibility. The new OEM638 receiver card, ProPak6 enclosure and SMART6 integrated receiver/antenna provide the multi-constellation tracking, configurability and scalability for solutions you are working on today and for your inventions to come in the future. Visit **novatel.com/6** to learn more.

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