

The IGS Strategic Plan and Future

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Abstract

An overview is given of the IGS Strategic Plan 2002-2007 [1], which together with the IGS Terms of Reference, provides the necessary strategic and organisational framework for the multitude of activities carried out by the various components of the International GPS Service. The paper also summarises the status of its implementation as reflected in the work of some key elements, and the outlook for the coming years.

1. Introduction

After four years of operation as an official service of the International Association of Geodesy, the IGS Governing Board held a two day retreat from 12 to 14 December 1997 to review the state of the service. A number of issues were highlighted and discussed in depth. The recommendations and action items arising from the discussions were summarised by Ivan Mueller in a paper published in the Proceedings of the IGS 1998 Analysis Centre Workshop, which was held shortly afterwards in Darmstadt in February 1998 [2].

Some two years later, the Board began preparations for a second systematic review of the service and its future priorities. At the Governing Board Business Meeting in May 2000, a Strategic Planning Committee consisting of Ch. Reigber (Chair), G. Beutler (Former Chair), J. Manning, R. Neilan, J. Ray, R. Serafin, A. Moore, N. Beck, B. Melbourne and I. Mueller was set up. H. Bazoian later joined this group as consultant and facilitator. The Committee met in Frankfurt in September 2000 to evaluate the results of a questionnaire which had been sent to GB members and to many active contributors to the service, and to prepare for a retreat of the Board in Napa Valley, California following the Board's meeting at the AGU Fall Meeting in San Francisco. The retreat took place on 12-13 December 2000.

By the time of the next Board meeting in Nice, April 2001, a draft Plan was available.

Long-term goals and objectives and three strategic axes were derived from a mission statement, which was finally formulated as follows [1]:

“The International GPS Service is committed to providing the highest quality data and products as the standard for global navigation satellite systems (GNSS) in support of Earth science research, multi-disciplinary applications and education. These activities aim to advance the understanding of the Earth system components and their interactions, as well as to facilitate other applications benefiting society.”

2. Long and Medium Term Goals

A number of high level, long-term goals and objectives were derived from the mission statement. These are:

- To provide the highest quality, reliable GNSS data and products, openly and readily available to all user communities.
- To promote universal acceptance of IGS products and conventions as the world standard.
- To continually innovate by attracting leading-edge expertise and pursuing challenging projects and ideas.
- To seek and implement new growth opportunities while responding to changing user needs.
- To sustain and nurture the IGS culture of collegiality, openness, inclusiveness and cooperation.
- To maintain a voluntary organisation with effective leadership, governance and management

3. Three Key Strategies

In order to achieve the agreed objectives, three key strategies were identified:

Strategy 1: Ensure delivery of “world standard” GPS (and other GNSS) data and products, providing the standards and specifications globally.

Strategy 2: Pursue new opportunities for growth to improve the services and serve a broader range of users.

Strategy 3: Continuously improve the effectiveness of the IGS organisation.

3.1 Strategy 1

Ensure delivery of “world standard” GPS (and other GNSS) data and products, providing the standards and specifications globally.

IGS products quickly reached the level of a world standard, during and subsequent to the initial campaign of 1992, and the quality of its products has been improving ever since: in particular, the core IGS products orbit, clock corrections (satellite and ground) and ground positions (ITRF coordinates) should be mentioned. Formats developed, or further developed, by IGS, including RINEX for GNSS data, SP3 (in various flavours) for orbits, SINEX for exchange of solution data (containing sufficient standardised information about the solution to enable easy and meaningful combination with other solutions, even based on different measurement techniques) are important examples, which established themselves as global standards during the early and mid 1990’s. Later developments are IONEX (for exchange of ionosphere maps) and Antenna Phase Centre Value (PVC) Tables.

An essential element of this strategy relates to user outreach and education, and understanding of user needs and identification of new user groups, supported by an open data policy.

Expanding the participation in the core elements of the IGS system (stations, data centres, analysis centres, projects); attracting fresh talent through new, challenging projects consistent with the overall aims of the IGS; and diversifying the Governing Board by including members of other communities are all ways of contributing to implement this strategy. Publicising the work of the IGS, both within and outside of the agencies directly involved is another essential aspect. This can consist of participation in conferences and workshops, as well as through publications of Annual Reports and Workshop Proceedings, in addition to direct contacts.

3.2 Strategy 2

Pursue new opportunities for growth to improve the services and serve a broader range of users.

Two areas were highlighted here as necessary for the growth of the IGS:

- Develop and pursue plans in support of LEO satellite missions. In addition to providing standards and formats for mission-independent information, two directions were foreseen, viz. creation of new IGS LEO Precise Orbit Determination (POD) Products, and evaluation of the impact of LEO data on IGS global products.
- Develop and pursue plans related to real-time (RT) and near-real-time (NRT) applications, with the aim of providing standards and formats for RT operations, forming liaisons with existing regional communities and broadcasting IGS products for RT users.

Both of these are key fields of research and development in GNSS, and are natural areas of activity for the IGS. Several of the agencies active in the IGS (NASA, GFZ, ESA, CNES) are engaged in missions involving use of high-precision GNSS receivers on board of LEO spacecraft. Several such spacecraft are already in orbit (CHAMP, the two GRACE spacecraft, Jason-1, ICESat) and several others will be launched in the next few years (MetOp-1, GOCE, Jason-2, COSMIC, NPOESS).

3.3 Strategy 3

The third major area of the Strategic Plan concerns the continuous improvement of the effectiveness of the IGS organisation.

First of all, it is essential both to re-enforce the continuity of support provided by those organisations which have been involved since the early days of the IGS, by seeking an appropriate recommitment from those organisations. New alliances with organisations which may be motivated to contribute to IGS activities are also being explored.

4. Where are we now?

It is useful to survey briefly the current status of several core elements of the IGS and of Working Groups (WG) or Pilot Projects which are particularly central to furthering aims of the Strategic Plan. More information on all of these can be obtained from the Proceedings of this Symposium/Workshop.

4.1 Analysis Centres (AC) and AC Coordination

A major asset is the continuity of the AC participation. All of the original AC's are still actively participating on a daily basis to the work of the service. (The same applies to the Global Data Centres and to the Central Bureau.) Several new contributors have joined the service more recently, including two which were officially admitted at the Governing Board meeting in December 2003. In view of the continuously increasing load on the AC's, this is a welcome development. A well-coordinated handover of AC Coordination took place over the first half of last year: the tradition of strong and highly competent AC Coordination is continuing, as is the concept of passing this responsibility from one AC to another in a 4 year cycle.

4.2 Data Centres

Three Global Data Centres (two in USA, one in Europe) guarantee availability of data products to AC's and end users, with appropriate redundancy between them. A proposal from Korea to establish a fourth one is expected to be realised in 2004, and additional possibilities for new centres are being investigated.

4.3 Timing Products

Timing is central to the operation and exploitation of GNSS. The successful Time Transfer WG activity established jointly by IGS and BIPM has been superseded by a Timing Products WG, chaired by a Timing Products Coordinator. IGS timescales (rapid and final) are being generated daily and weekly, providing better stability with respect to UTC/TAI than is possible using only the satellites themselves, taking advantage of the existence of very stable hydrogen masers in the IGS ground segment.

4.4 GNSS/Galileo WG, IGLOS

IGS has already played a major role as an important reference in the development of the Galileo Mission System, in particular through the Galileo System Test Bed GSTB V1. An active GNSS WG is focussing attention on aspects such as requirements for proper calibration of satellite and ground antennas; radiation pressure models; integration of new signal measurements (both GPS and Galileo) into the IGS processes; and early participation in signal and receiver validation. Appropriate interactions with GNSS system operators and developers at programme office and technical levels are essential to further these objectives.

The International GLONASS Pilot Service IGLOS, which developed out of the International GLONASS Experiment IGEX in 1998, has provided a very successful demonstration of the capability of the IGS to successfully integrate another GNSS into its operations.

4.5 *LEO WG*

The Low Earth Orbiter (LEO) Working Group was restructured in 2001. With the availability of data from several orbiting LEO's since that time, processing campaigns have been carried out with the participation of a considerable number of Associate Analysis Centres. These have helped a lot to clarify some of the issues involved in processing data from orbiting receivers. Some progress has also been made with the other central aim of the WG, which relates to the utility of using LEO data within the generation of the core IGS products.

4.6 *Real Time WG*

The IGS Workshop held in Ottawa in February 2002 took as its unifying theme "Towards Real Time" [3]. The development of real time data flows from a sub-set of IGS stations has been proceeding since then, and currently 4-5 networks are contributing data on an experimental basis. With the availability of increasing communication capacities, real time data and derived products will play a much more important role in the future, complementing the reference role of the IGS in providing the highest accuracy products a posteriori.

4.7 *Reference Frame WG*

During the years of its existence, the IGS has played an ever-increasing role in the maintenance of the International Terrestrial Reference Frame (ITRF). Using the weekly contributions of the Analysis Centres, the IGS Reference Frame Coordinator, supported by a WG, has responsibility for the IGS reference frame, which underlies the IGS products and is a very close realisation of the ITRF and a major contributor to each ITRF update. Like the timing coordination, this is a core function in the IGS structure.

4.8 *IGS Global Network*

The IGS network is the foundation on which IGS products, in particular for reference frame purposes, are built. A major concern of the IGS during the year 2003, and a continuing concern, has been the maintenance and improvement of the network. (The same concern was expressed in the 1997 retreat, see [2].) A standards document for stations of the network [4] was developed by the Network Coordinator with the support and contributions of a specially appointed group. The resulting document was approved by the Governing Board at its 23rd Meeting in San Francisco in December 2003. The Network Coordinator will maintain this document and report back regularly to the GB on progress. A better understanding by station and network operators of the requirements on IGS stations and better and faster feedback from the Network Coordinator, AC's and ACC to them are key elements to improving the quality of the global network.

4.9 *IGS as an IAG Service, GGOS*

The new structure adopted by the IAG in July 2003 impacts the IGS, as it does the other IAG services [5]. New relations with the IGS Commissions, in particular with Commission 1 (Reference Frames) and Commission 4 (Positioning) are being developed by the IGS to facilitate this, as documented in a paper adopted by the IGS GB at its 24th Meeting as a working basis [6]. The IGS, working closely with its sister services including IERS, ILRS, IVS and IDS, is prepared to play an appropriate (major) role in the first project of the new IAG, viz. the Global Geodetic Observing System (GGOS) [7].

4.10 Central Bureau (CB)

The IGS is fortunate to have been served by a single highly competent CB since its beginnings. Unfortunately the considerably more demanding task which the CB is now asked to handle (including for example outreach to users and potential users, and participation in relevant international fora) have not been matched by increased funding of its activities, on the contrary, the CB has been struggling to continue with less resources than were available to it some years ago. This has been recognised as a central problem of the IGS for several years and has reached the point where some significant core requirements are becoming more and more difficult to satisfy. The Board, in close collaboration with the CB, is actively looking at possible solutions.

5. Outlook

The Strategic Plan 2002-2007 of the IGS, developed by the Governing Board and approved in December 2001, remains a valid basis for the work of the service, and many of its objectives are being successfully implemented. Several agencies which have been making major contributions to the IGS over the past decade are facing the challenge of finding new sources of funding, and in the future new ways of operating and of supporting the major undertaking represented by the combined efforts of the 200 agencies involved will be needed. Despite this, the very extensive use of IGS products in a wide range of applications and the continuous improvements reflected in these products, demonstrate very clearly that the IGS is thriving and can look forward with confidence to the next decade. The Strategic Plan is likely to need periodic revision, and it seems appropriate to envisage a further review of it during the next year, extending its validity beyond 2007. All active participants in the IGS are strongly encouraged to familiarise themselves with the current version of the plan and to contribute to the process of ensuring its continuing validity.

References

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