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1. What is GNSS?

e-GNSS European Global Navigation Satellite System

the infrastructure that allows users with a compatible device to determine their position, velocity and time (PVT) by processing signals from satellites in space.

- **GNSS** signals are provided by a variety of satellite positioning systems, including global constellations and Satellite-Based Augmentation Systems (Regional).
- **GPS**: The first GNSS, fully operational since 1995, is managed by the US Department of Defence.
- **GLONASS**: The Russian GNSS, completed in 1995 and fully operational since 2011, is managed by the Russian Aerospace Defence Forces.
- **Galileo**: Europe's GNSS, currently under development as the only civil GNSS, is owned and managed by the European Union.
- **BeiDou (COMPASS)**: The Chinese GNSS, set to supersede the COMPASS regional system operating since 2000, is managed by the governmental China Satellite Navigation Office.
- **Satellite-Based Augmentation Systems (SBAS)**, such as EGNOS (Europe), WAAS (North America), GAGAN (India) and MSAS (Japan).

Based on the list above, we can define EGNSS - European GNSS as a Galileo and EGNOS.

GNSS is the key space based technology (next to earth observation and telecommunication). Nowadays it is one of the most promising and fast-growing market segment.

Global Navigation Satellite Systems are a significant enabling technology that has many applications, covering the mass market, professional and safety-critical, that generate economic and social benefits.

Several studies and research highlighted, that one of the main obstacles for the further development and sustainability of the European space industry is lack of scientists, engineers and technicians with specific skills and abilities.

Galileo, EGNOS (EGNSS) and the satellite navigation field at large, are as well affected by this lack of skills and competences.

Looking at the topic from an end-users perspective, space is only a part of a more complex knowledge system, needed to exploit the satellite navigation opportunities. Communications, applications development skills, creativity and business competences are as relevant and essential to leverage on the Galileo and EGNOS initiative to make Europe a credible player in this international context and satellite navigation a concrete asset for the European economy in terms of innovation, market development resulting in job creations.

With respect to the growing competition and resource optimization the sustainable success of industry is crucially linked to effective identification and transfer of knowledge, innovative technologies and solutions available, which is a main goal of the e-KnoT project.

2. What is e-KnoT Project?



e-KnoT e-GNSS Knowledge Triangle

The **e-KnoT project** aims to **strengthen the interaction between the areas of Education-Research-Industry in Europe** in order to consolidate a strong e-GNSS *knowledge triangle*, a solid network for the creation of a critical mass involving the relevant actors in the three areas.

2.1. Project description

The focus of the e-KnoT project is on the **innovation transfer to industry**, the support to the **creation of innovative downstream applications** and the consolidation of the links and of the initiatives beyond the project duration. The project approach is in line with the general policy of the H2020 programme, for the **capacity building and critical mass creation** in strategic areas, so to increase Europe competitiveness and attract investments from outside Europe. In GNSS this can only be realized by investing on a strong coordination among universities, research centers and industry to fill the gap with respect to other areas of the world.

E-KnoT relies on concrete results of previous projects in this field of Education in GNSS and on educational initiatives already in place in Europe, and it **implements concrete actions and events for companies, students and professionals**.

The e-Knot project is developed by a consortium of qualified institutions with a strong experience in GNSS education, research, cooperation with companies and industrial world.

2.2. Partners:



Politecnico di Torino



**Ecole Nationale de l'Aviation
Civil
DL Consultant**



**Universität der Bundeswehr
München**



**Universitat Politècnica de
Catalunya**



Astri Polska Sp. z o.o.



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3. e-KnoT opportunities:

3.1. FOR COMPANIES

The project offers to small and large companies **opportunities to create strong links** with research centers and to **work with students trained in GNSS**.

3.1.1. Support to PhDs

Joint PhDs between academia and industry, are potentially a tool to ease innovation creation taking into account both scientific challenges as well as industry needs.

PhDs are a pervasive link among the three areas, easing the knowledge transfer among the scientific and industrial world (in both directions), as well as a way to link scientific research to future innovative applications, that in perspective are the boost for the market and competitiveness of the companies involved. The process of supporting GNSS PhDs with a link to industry, aims at achieving a larger number of PhD theses funded by industry and thus making the process more sustainable.

Two co-funded PhDs will be created in this frame. 50% of the PhD funding is provided through the e-KnoT project and the rest of the funding is provided by one or several industrial partners. The 2 host institutions for the PhDs are **Ecole Nationale de l'Aviation Civil** (Toulouse, France) and **Bundeswehr University Munich** (Germany).

Application & selection criteria (in English only): <http://www.eknot.polito.it/support-to-phds.aspx>

3.1.2. Industry Vouchers

- **Build relationships with academic experts**
- **Get feedback and advice on an innovative idea**
- **Short-term and specialized support by high-level academic staff**

"Industry vouchers" is a new initiative aiming at consolidating links between Research and Industry by supporting innovative ideas in the area of GNSS, emerging from European companies, in particular SMEs, thanks to the support of strong academic partners teaming in a Horizon 2020 financed Project. The objective of this initiative is to **provide short-term, specialized expertise to European companies from high level academic staff**. Indeed industry has specific needs that could be related to the definition and understanding of a problem, the need for advice, the feedback on an innovative idea or the review of a new concept. Such specific needs can be blocking points while an appropriate expert could tackle it in a relatively reduced time. This is particularly true for small entities with reduced

resources. The idea of this action is thus to offer such expertise to companies in need that can be seen as **'advice', 'feedback' or 'guidance'**.

Companies willing to benefit from this innovative action will be selected through calls organized all along the Project. The call is open to European companies as defined under Horizon 2020, essentially headquartered in the EU or in a H2020 associated country.⁽¹⁾

(1) COUNTRIES ASSOCIATED TO H2020 - Iceland, Norway, Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Montenegro, Serbia, Turkey, Israel, Moldova, Switzerland, Faroe Islands

Application & selection criteria (in English only): <http://www.eknot.polito.it/industry-vouchers.aspx>

3.1.3. Internships

Candidate your company to host a student already trained in GNSS

The programme encourages students to perform summer internships on GNSS-related topics in companies operating in an EU country or in a country associated to H2020*.

Four students per year will receive a €2500 grant to encourage their mobility.

Companies interested to participate to the program by hosting an intern, are invited to submit a proposal.

For the companies this is an opportunity to:

- Find a suitable intern with GNSS education,
- Build relationships with GNSS-related education programmes and universities,
- Potentially identify and train a future employee,
- Be mentioned as a company participating to this programme on the e-KnoT website.

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Application criteria (in English only): <http://www.eknot.polito.it/internships.aspx>

3.1.4. Professional Training

The e-Knot professional training program is an ambitious program aimed at providing GNSS training to employees of industry, research centres and institutions. It is based on the provision of 12 3-day free-of charge tutorials over 3 years (2 in 2015, 5 in 2016 and 5 in 2017).

INSTRUCTORS

The instructors of the e-KnoT professional training program are GNSS experts from the Ecole Nationale de l'Aviation Civile (France), Politecnico di Torino (Italy), Universitat Politècnica de Catalunya (UPC) and Astri Polska.

PARTICIPANTS

The tutorials are open to any employee coming from a company, an international/national institution or a research centre.

Application criteria (in English only): <http://www.eknot.polito.it/professional-training.aspx>

3.1.5. Support to MNRA

The MNRA, the Specializing Master in Navigation and Related Applications (MNRA) offered by Politecnico di Torino and ISMB, is a great opportunity for training highly qualified personnel that can be an added value for the companies for a specific training in the GNSS market. The MNRA is now running for the 11th edition and has trained GNSS experts which are now appointed to relevant roles at European Space Agency, in national space agencies, and qualified research centers working for Galileo and other satellite navigation systems.

The E-KNOT project offers the possibility to co-fund the training of a post-graduate student who will get specialised training and work with the selected companies for 3 months.

Companies willing to benefit from this specific innovation action that allows the student to work within a company for a 3 months' Internship will be selected through this public call.

The e-KnoT project entirely covers the enrolment cost of the student, while a financial contribution of € 6000 has to be provided by the company as scholarship for the student.

The call is open to European companies as defined under Horizon 2020, essentially headquartered in the EU or in a H2020 associated country(*)

Application and selection criteria (in English only):

<http://www.eknot.polito.it/support-to-mnra.aspx>

3.2. FOR STUDENTS:

The e-Knot project offers several opportunities for students to work in the GNSS field during their study career, getting in touch with companies and the industry world of GNSS.

3.2.1. PhD Training

This initiative, aims at improving the PhD education level in GNSS and to reach a high common standard of PhD in GNSS in Europe by supporting the networking of young researchers-to-be who will be the GNSS scientific community of the future.

3.2.2. Internships

The programme encourages students to perform summer internships on GNSS-related topics in companies across Europe. **Four students per year will receive a €2500 grant** to encourage their mobility.

Benefits to the Students

- Find an internship in a GNSS-related company in the EU
- Use your GNSS knowledge on industry needs,
- Receive a €2500 mobility grant,
- Prove yourself to a potential future employer.

Application and selection criteria (in English only): <http://www.eknot.polito.it/phd-training.aspx>

3.2.3. Specializing in Master in Navigation and Related Applications

The II Level Specializing Master on Navigation and Related Applications (MNRA) is a joint initiative of **Politecnico di Torino** and **Istituto Superiore Mario Boella (ISMB)** with the collaboration of **Istituto Nazionale di Ricerca Metrologica (INRIM)** and the **United Nations Office for Outer Space Affairs (UN-OOSA)**. It is a 1-year programme taught in English aiming at offering an effective answer to the job market demands in terms of high-level technicians who have a thorough knowledge and a broad vision of the navigation/ localization world.

The MNRA provides an extensive background in navigation/localization systems as well as a detailed analysis on NAV/COM integration and environmental monitoring applications or a specific training on timing. The courses range from system aspects, receiver technologies (hardware design) and innovative applications based on the user position. Courses address a wide range of topics: GPS and Galileo systems, GNSS regulatory aspects, Receiver technologies, Localization in mobile systems and WLAN, Navigation and communication hybridization (GNSS + wireless networks), applications of GNSS in surveys and mapping, Added-value navigation-related services and applications, timing and time scales generation.

A three months' Internship in a company is mandatory for all the students (mid-June to mid-September) to be spent in a company or a research center.

The 11th edition of the Master started in September 2014. More than 150 people from 30 different countries were trained in the past ten editions of the MNRA.

Applications for the Master in NAVIGATION AND RELATED APPLICATIONS 2015/2016 are now open. For more information visit the [official page of MNRA](https://didattica.polito.it/master/navigation/2016/introduction)
<https://didattica.polito.it/master/navigation/2016/introduction>

3.2.4. Satellite navigation University Network

The Satellite Navigation University Network (SUN) started its work in 2010 and is now part of the **e-KNOT** project, funded by the GSA/EC within the Horizon 2020. It is for **faculty members and students** related to the field of GNSS as well as representatives from industry and politics.

Download the flyer of the SUN [here](http://ifem.bauw.unibw.de/snun/download.php?f=c5ede8e96b77ad2f3a7904a1e64a5fd8&target=0)
<http://ifem.bauw.unibw.de/snun/download.php?f=c5ede8e96b77ad2f3a7904a1e64a5fd8&target=0>

Get the information about the SUN at www.gnss-sun.eu

3.2.5. Workshop on downstream applications

The **University Challenge**, as part of the **European Satellite Navigation Competition (ESNC) 2015**, invites students and research associates from any field of study to show off their innovative business ideas. These ideas can propose new potential uses for satellite navigation in virtually any area – from logistics and healthcare all the way to mobile apps.

The winner of the competition gets a cash prize, Virtual incubation, technical and business consultancy support, and a free ticket to attend the Munich Satellite Summit 2016, and a strong promotion of the idea at international events.

This one day workshops are intended to introduce the ESNC University Challenge, provide competitors with information e.g. on SatNav application potential, and grant access to experts in global navigation satellite systems, business and intellectual property.

Selection criteria (in English only): <http://www.eknot.polito.it/support-to-mnra.aspx>

4. Work on success basis



- ⦿ Creation of the SUN (Satellite navigation University Network) (<http://www.gnss-sun.eu/>)
- ⦿ Creation of the MSc in GNSS managed by ENAC (<http://www.enac.fr/fr/menu/formations/formations-1er-et-2eme-cycles/master-gnss>)
- ⦿ Support to the Specializing Master in GNSS (<https://didattica.polito.it/master/navigation/2015/introduction>)
- ⦿ Professional Training Programme
- ⦿ Specialized Training for GNSS PhDs

4.1. ERIG



Education, Research and Innovation in GNSS (2006 - 2007)

Effective transfer of knowledge, technology and innovation to keep Europe competitive in GNSS.

Objectives:

- To assess the actions to be taken to develop education, research and innovation/technology transfer (ERI) in the field of GNSS in Europe.
- To better understand the specific dynamics between ERI and economic growth in the field of GNSS.

Results:

- **Recommendations for fostering education, research and innovation** providing useful input to EU and national policy-makers and practitioners looking to enhance the competitiveness of European GNSS.
- **A repository of data** collected for ERIG representing a substantial Europe-wide information resource which may be made available for further expansion/updating where data is not commercially sensitive was made available to the GSA.
- **Industry needs analysis** provide data on the current and future needs of industry with respect to ERIG priorities.
- Self-contained CD-ROM/web resource **Education Kit** which provides developers a technical module and an application-oriented course with exercises and feedback mechanisms.

4.2. GTRAIN



Supporting Education and Training in GNSS (2010-2013)

A European framework for higher education in GNSS field.

Objectives:

- The general objective of G-TRAIN was to strengthen the GNSS education in Europe, focusing on higher education. This was achieved by both coordinating and upgrading some already existing educational initiatives, and creating new opportunities for students and teachers to become networked.
- The project addressed:
 - o the creation of a collaborative Master of Science;
 - o the strengthening of a Specialising Master for long-term professional education;
 - o support to PhD training and networking.
- Creation of network of universities in Satellite Navigation (SUN).

Results:

- Project addressed GNSS education from a European-centric perspective.
- The growth of a new generation of European GNSS experts.
- A long-term and European-wide educational approach in the GNSS field based on the coordination of universities and on the exchange of students/researchers. Allowed to develop a functional model aimed at carrying on beyond the project's timeframe.
- Creation of a community of GNSS experts fundamental to the development of a good GNSS education environment.
- Creation of a generation of European experts who are open to cross-border and international co-operation.
- Creation of a strong framework for qualified GNSS education beneficial for the competitiveness of European companies and for the scientific level of Europe in GNSS at large.

4.3. GENIUS



GNSS Education Network for Industry and Universities (2012-

Strengthening GNSS research and education programmes and fostering co-operation between research and business

Objectives:

- To Strengthen GNSS Research and Education Programmes.
- To Foster Co-operation Between Research and Business.

GENIUS supports and nurtures a network of universities and research institutions that are active in the provision of GNSS education in the field of satellite navigation technologies, applications and services to connect with industry. The project lays the foundation for the development of pan-European collaborations and enables technology transfer between the university and research institutes and industry.

Results:

The results of GENIUS are achieved through technology transfer and knowledge exchange between the university & research institute sector and industry (especially SMEs). GENIUS promotes entrepreneurship through the University Challenge of the European Satellite Navigation Competition supporting the competition at 6 universities during 2012.

Specific provisions include: 10 professional GNSS courses, 4 PhDs with Industry, 2 PhD training events, 1 PhD Workshop, 16 internships with industry and 4 MSc scholarships.