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THE PRESENT AND FUTURE OF EARTH-OBSERVATION APPLICATIONS

INTERVIEW

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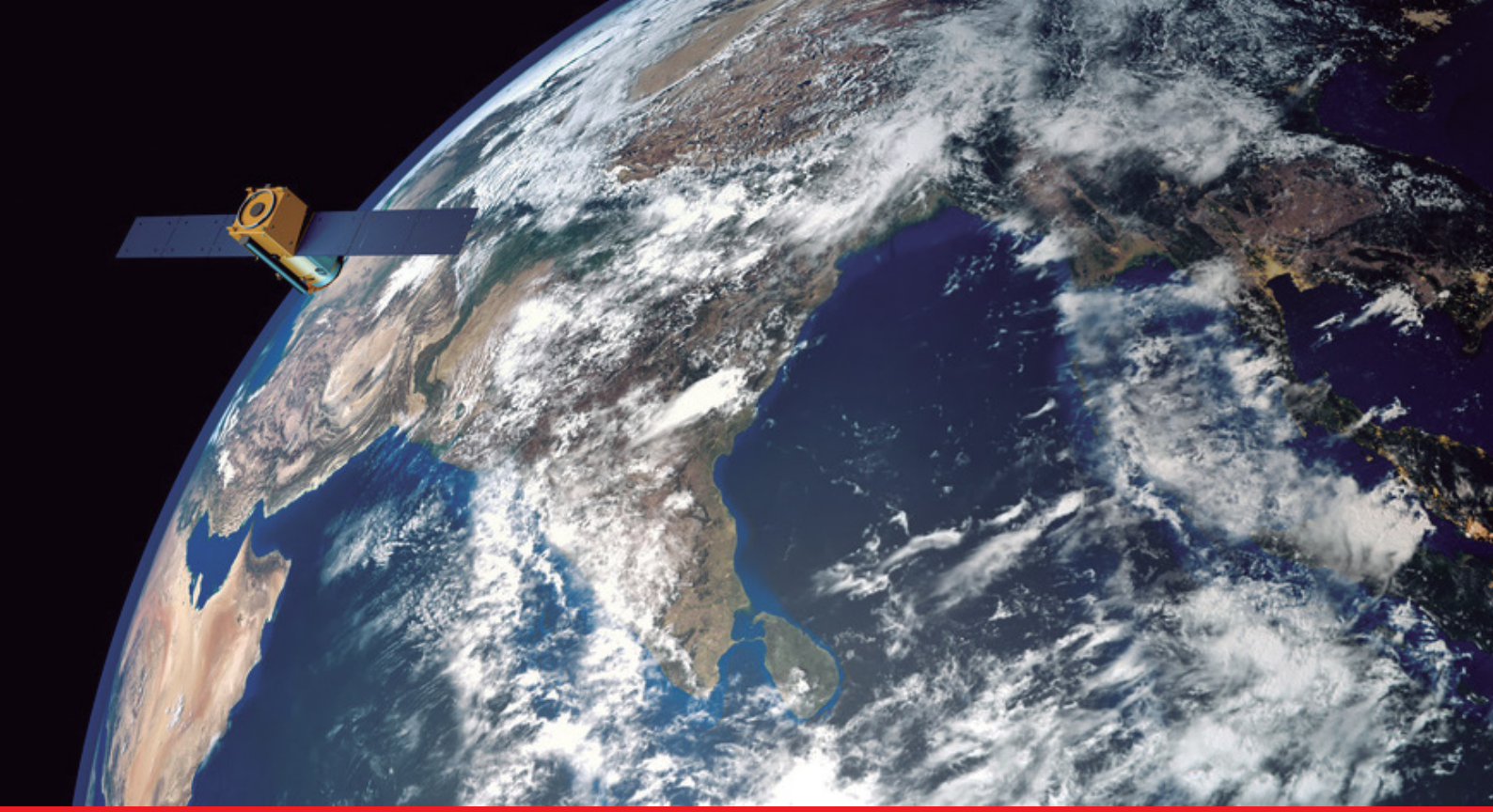

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GMV will be attending (stand number 28-31) the 15th International Conference on Space Operations (SpaceOps 2018), on May 28th to June 1st in Marseille in the Palais du Pharo.

For more than 25 years, the International Conference on Space Operations has been the technical forum for the space operations community that addresses state of the art operations principles, methods and tools.

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LETTER FROM THE PRESIDENT

The ozone hole has been showing up in earth-observation satellite images since 1974. However it took another eleven years before it was finally discovered in ground-based measurements taken from the Antarctic. Only then, on reanalysis of the satellite data, the ozone hole was identified in the satellite images, which have since served to confirm and monitor the evolution of this problem from 1974 to date. Until that time the surprisingly low ozone data in these images had been written off as measurement errors. This anecdote illustrates that the challenge of Earth Observation is twofold: to develop and deploy top-quality satellite instruments on one hand and to interpret their data thoroughly on the other.

The amount of top-quality data produced nowadays by satellites of Europe's Copernicus project alone adds up to 12 TB a day, with an unprecedented spatial resolution and freely available on internet. Until now specialist knowledge was normally required to interpret raw satellite data. Copernicus's aim, however, is to deliver processed data and useful information for every possible application. As a case in point Sentinel-5P, launched last October, provides atmospheric measurements of nitrogen and sulphur dioxides with a resolution 100 times better than previous instruments. This makes it possible to detect and monitor the emissions of individual power stations and oil refineries and to compare the air quality of different parts of the same city.

Copernicus is generating a treasure trove of data. GMV is helping to generate this data and is also already exploiting it in projects ranging from safety at sea to precision agriculture. But GMV has also built up a wealth of knowledge in Big Data and advanced data-processing techniques to help our clients mine it. As with the ozone hole, the data is already there. If we know how to use it, its value will be incalculable.

Cordial greetings,

Mónica Martínez

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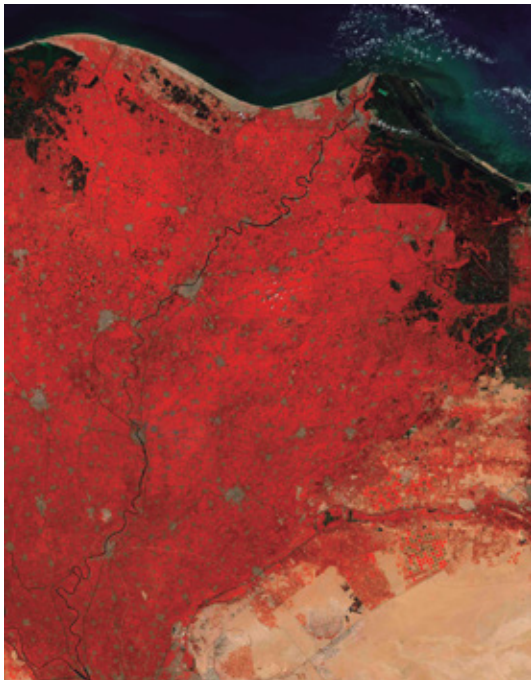

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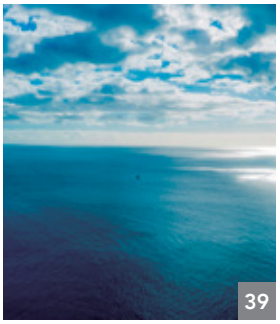
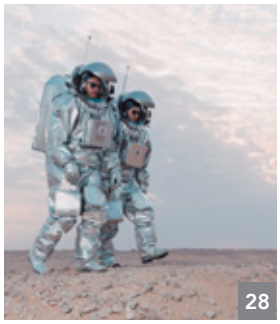
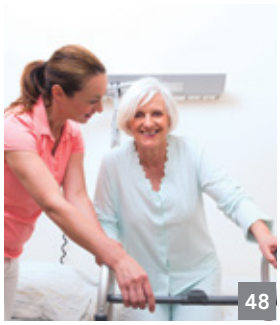
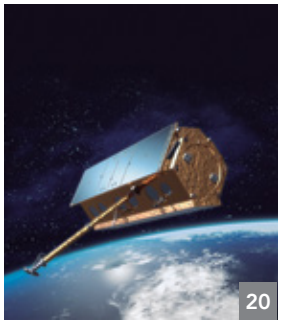








THE PRESENT AND FUTURE OF EARTH-OBSERVATION APPLICATIONS

EARTH OBSERVATION IS A KNOWLEDGE DOMAIN THAT AIMS TO DEFINE AND DEVELOP METHODS, TECHNIQUES AND TECHNOLOGIES FOR THE MONITORING OVER TIME OF THE EARTH'S PHYSICAL, MORPHOLOGICAL, CHEMICAL AND BIOLOGICAL PROCESSES AND FEATURES

In the broadest sense this is considered to take in the atmosphere, the magnetic and gravitational fields, the earth's surface and any item (whether natural or human) on this surface. In any case Earth Observation generates a wide range of applications in a huge variety of areas, which can be broken down, as proposed by Copernicus as follows:

- Atmosphere monitoring
- Marine monitoring
- Land monitoring
- Climate change
- Emergency management
- Security

Examples of services and applications might be: management of urban areas, sustainable development, disaster management, biodiversity protection, regional and local planning, precision agriculture, forestry and water resources, fishery and maritime-transit monitoring, checking of legislation, civil protection, healthcare, critical infrastructure and tourism.

Earth Observation is just one more arrow in the quiver of solutions for dealing with the abovementioned problems. Normally, however, it calls for the integration of various sensors, data and information to obtain the best result. The most obvious example is the sensitivity of surface observations to atmospheric conditions, above all clouds, which act as a severe limiting factor on optic sensors. An example of integrated solutions would be the joint consideration of satellite data, ground-sensor data, social media, cell phones or demography.

The development of EO-associated technology and knowledge has been underway since before WW2. Throughout this time the growth has been exponential. The maturity of theoretical and practical concepts has helped to boost efficiency across the board. Different paradigms have been cropping up in this field; the current one focuses on mass data collection at different levels of scale (global, national, regional, local) and time. Properly combined, the resulting time series allow us to observe and understand the impact of our actions in terms of change and knock-on effects.

The advantages of this enhanced knowledge of the environment and its evolution will be twofold: firstly greater support for government programs and a check of the benefits and effects of public investments; secondly, it will underpin strategic decision-making of private entrepreneurial initiatives in sectors as important as they are varied. Earth Observation has turned from pure scientific research into applied science. Witness all the private initiatives based on sustainable and innovating business models for turning earth-observation data and information to the best possible account.

Alongside the consolidation of traditional EO applications and services there is an increasingly strong urge to find and demonstrate groundbreaking and practical uses of all available information to support not only the political decisions of public organizations but also the business decisions of private management. These business models benefit from policies of free access to data or open data and from the availability of data of different resolutions at much more affordable costs.

Two unquestionable consequences derive from the combination of these policies: On the one hand, the guarantees provided in terms of transparency, good governance and efficiency of public policies, especially bearing in mind the availability of higher-quality, more up-to-date and more frequent data than in the past. On the other, on the strength of a consolidation of existing services and the proliferation of new services closer to users' needs, make this technology easier to use by organizations lacking the necessary technical knowledge for a direct use but which are receivers of added value, so that they can apply decision-making policies in a much more effective way. This brings services into a bigger trawl of users, making them more sustainable from a market and business point of view. The upshot is a virtuous circle of justifying outlays and driving a greater data demand to cater for policies based on evidence of results.

As a result, many firms and space agencies have deployed a great number of earth-observation satellites in recent years. This greatly boosts the supply of data of a very diverse nature, either due to the technology employed (optical, radar, atmospheric), the different spatial resolutions, the quicker revisit times or the scale of associated costs. This array of data means that we service

providers can now tap into vast and complex sets of raw satellite data at an affordable cost. Traditionally these were processed for one-off projects with a high cost in time and resources. Mass automatic processing is now catching on, however, with more efficient analysis methods, automated in remote servers (cloud platforms). All rounded out by classic manual or semi-automatic processing techniques, which still have their market niche in situations where needs of security, quality or even the human being's abstraction capacity have balked higher automation levels.

The exponential increase in available data has spawned three main technological challenges; namely, improvement of automated processing, improvement of analytical development and, finally, advances in how data is delivered to final users.

As regards improvement of automated processing, work is now underway on data management and access in combination with automated processing algorithms/methods. The new paradigm is to bring users and processing closer to the data, eschewing mass data download for local processing. The infrastructure has evolved towards cloud processing and platforms that facilitate and simplify processing. The clearest example to hand is the future Copernicus Data and Information Access Services (DIAS) platforms, promoted by the European Commission; these facilitate access to Copernicus services and data and enable cloud processing. By opening up access to data and information, together with the processing of resources, tools and other pertinent data, this initiative is now expected to favor user acceptance of earth-observation information and data, and stimulate innovation and the creation of new business models based on said data.

How many developers, data scientists and companies will be drawn in by these information-processing and accessing facilities and by potential service users?. And if we also factor in here that users themselves could participate in the service creation process, what then?. Obviously the result remains to be seen but an unprecedented range of opportunities is opened up.

As for improvements in analytical development, new analytical algorithm/methods are now being developed in an automated processing environment. If before we have spoken of infrastructure and the cloud, now we are talking about big data and deep learning/machine learning techniques or artificial intelligence. The question, in short, is how we might process a greater amount of data more quickly and how we can apply learning techniques to be able to automate the processing, without unduly forfeiting quality parameters.

Another crucial aspect here is commercial sustainability, which is the last barrier to earth-observation services. The classic project approach will continue to exist (images processed in local services with manual or semi-automatic procedures), but the trend is clearly towards a service-based model that needs to guarantee longer-lasting income streams.

At this point, where services based on long-term analysis and the delivery of market information seem to have undergone the greatest development, attention is turning to geospatial intelligence. It is not a question only of data processing but also of

Many firms and space agencies have deployed a great number of Earth-observation satellites in recent years. This greatly boosts the supply of data of a very diverse nature

drawing conclusions from them and providing clients with the value-added information in the most frequent and continuous fashion possible by means of subscription models.

Cutting down the revisit time over the observed zone increases data-compilation and service-provision frequency, an important factor for supervising applications that depend on change detection. This need is now being met by satellite constellations but there is now a need not only for the hardware- but also the software-solution for processing this data. The main examples of services of this type are now cropping up in sectors like precision agriculture or market/company intelligence services.

Finally, the last technological challenge centers on how the information is delivered to users; this is so because the information is no longer a definitive solution but might be continually tweaked and enhanced by user review and interaction or on the basis of the data they themselves might provide. We are talking here about the development of cell-phone Apps, applications for integration of positioning technologies and virtual reality, advanced geographic information systems, the use of social networking sites and collaborative platforms (crowd sourcing). All these technologies have to be based on a common denominator: data access according to open and recognized standards.

As for the most immediate future, operators and public bodies are now increasingly opting for scalable processing platforms and the development of value-added services (like DIAS) to encourage earth-observation data takeup by an ever broader audience. The important thing here is not the data but the information that might be drawn from it and here the imagination knows no limits. The platforms will make the proper tools available; users will express their needs in methods (scripts, add-on) to be integrated in bigger processing chains in a flexible way.

It is for this reason that future earth-observation satellites are shrinking in size, carry fewer instruments and are seeking to cut costs and be easily replicable. The upshot will be a bigger number of constellations in the next 5-10 years. These satellites will make it easier for smaller countries to take part in space activities. The main challenges are economic timing, the development of sensors small enough to be carried on these mini-satellites and dealing with space debris, which now poses a grave risk. Regardless of this approach, users will always need high-resolution precision sensors.

Finally, the future of earth-observation programs depends on various factors. Firstly, it will always be hard to strike the right balance between public-sector and private-sector needs. Familiarization with satellite data, favored by open-data policies, is likely to have spurred the use of data from private satellites that provide better resolution or revisit times. As always, the best solution depends on the problem to be observed: services providing solutions on a global, national or regional scale (and in some cases, local) will be able to continue feeding from this free data.

It is essential to rethink current and future needs and understand the technology trend in this domain. It is also crucial to understand which needs might be satisfied from data collected and who will benefit from derived services. This will enable us to decide which business model might be best suited: public, private or public/private collaborations. At the moment the demand for earth-observation data still depends overly on the public sector; it is true that this trend is changing but there is still a need to promote assimilation by private users, simplifying data access, adapting services and solutions and encouraging industrial access to raise awareness.

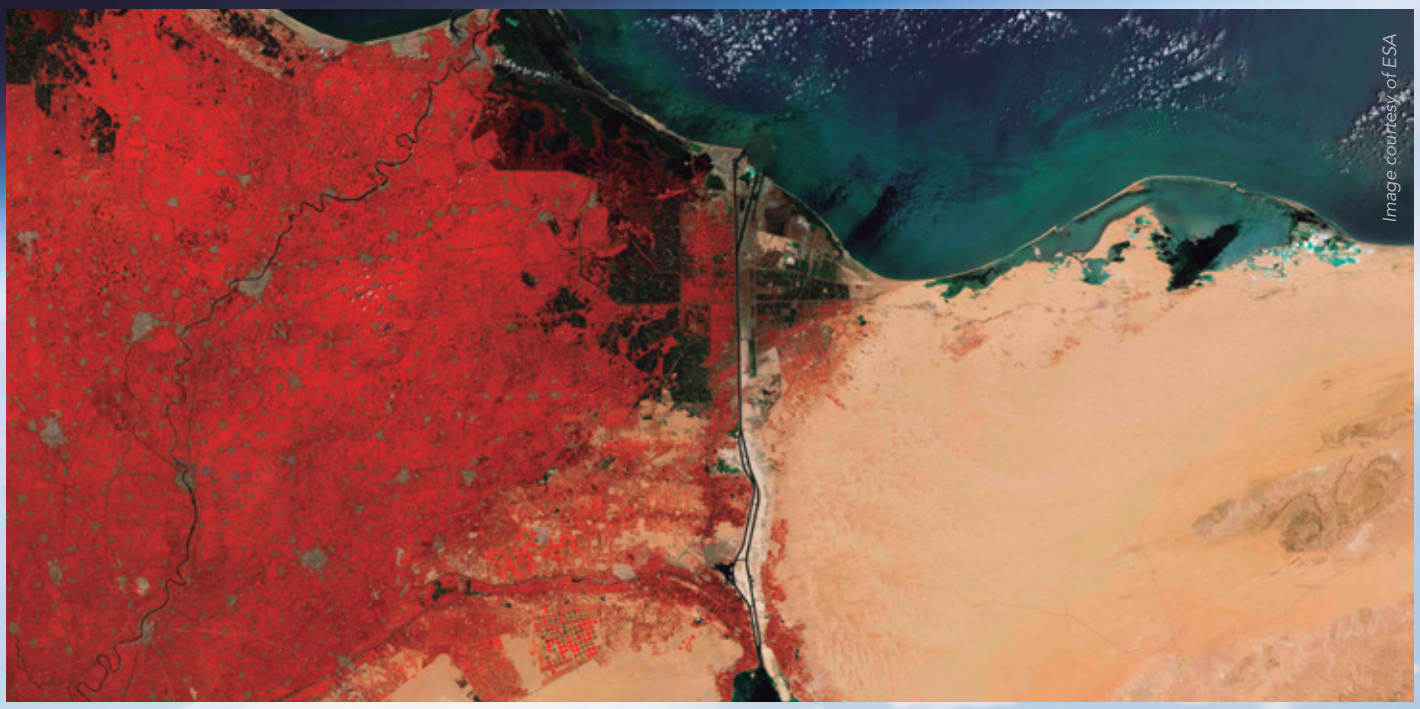


Image courtesy of ESA

EUROPEAN POSITION: COPERNICUS PROGRAM

A big part in this whole process is being played by the Copernicus program for setting up a European earth-observation system. Run and coordinated by the European Commission, it is one of Europe's grandest technology programs. It consists of a complex set of systems that cull data from several sources: earth-observation satellites, physical models and in situ sensors like ground stations, airborne sensors and maritime sensors. It processes all this data and gives users trustworthy and up-to-date information through a set of environment- and security-related services taking in the six main areas described at the start of this article.

As regards the particular satellites launched under this program, several of the Sentinel missions are based on a two-satellite constellation to cater for revision and coverage requirements, providing robust data sets for Copernicus services.

These missions use diverse technologies, such as radar and multispectral imager for land-, sea- and air-monitoring:

- Sentinel-1 is a polar-orbiting radar-imaging mission for land and ocean services. Its data are already operational and available.
- Sentinel-2 is a polar-orbiting, multispectral high-resolution imaging mission for land monitoring. Its data are already operational and available.
- Sentinel-3 is a multi-instrument mission to measure sea-surface topography, sea- and land-surface temperature, ocean color and land color with high-end accuracy and reliability. Its data are already operational and available.
- Sentinel-4 is an atmospheric-monitoring payload embarked upon a Meteosat Third Generation-Sounder.
- Sentinel-5 Precursor – also known as Sentinel-5P – will provide necessary observations of atmospheric chemistry for monitoring and forecasting air quality.
- Sentinel-5 will also provide atmospheric-composition monitoring data.
- Sentinel-6 carries a radar altimeter to measure global sea-surface height, primarily for operational oceanography and for climate studies.

Additionally, the European Commission is running studies to determine user needs, broken down by themes and timeframes, seeking to meet general and common interests in terms of needs, timetabling and budgets to be able to define future missions.

Under this program also come the national Copernicus Academy and Relays Networks to encourage user uptake. They act as national standard bearers, coordinating and promoting activities around the Copernicus program, bringing its plethora of benefits and opportunities to wider notice among local business and residents. The members of this new community, with the participation of over 75 organizations, are the representatives of Copernicus on the ground and will promote the benefits of the EU's earth-observation program.

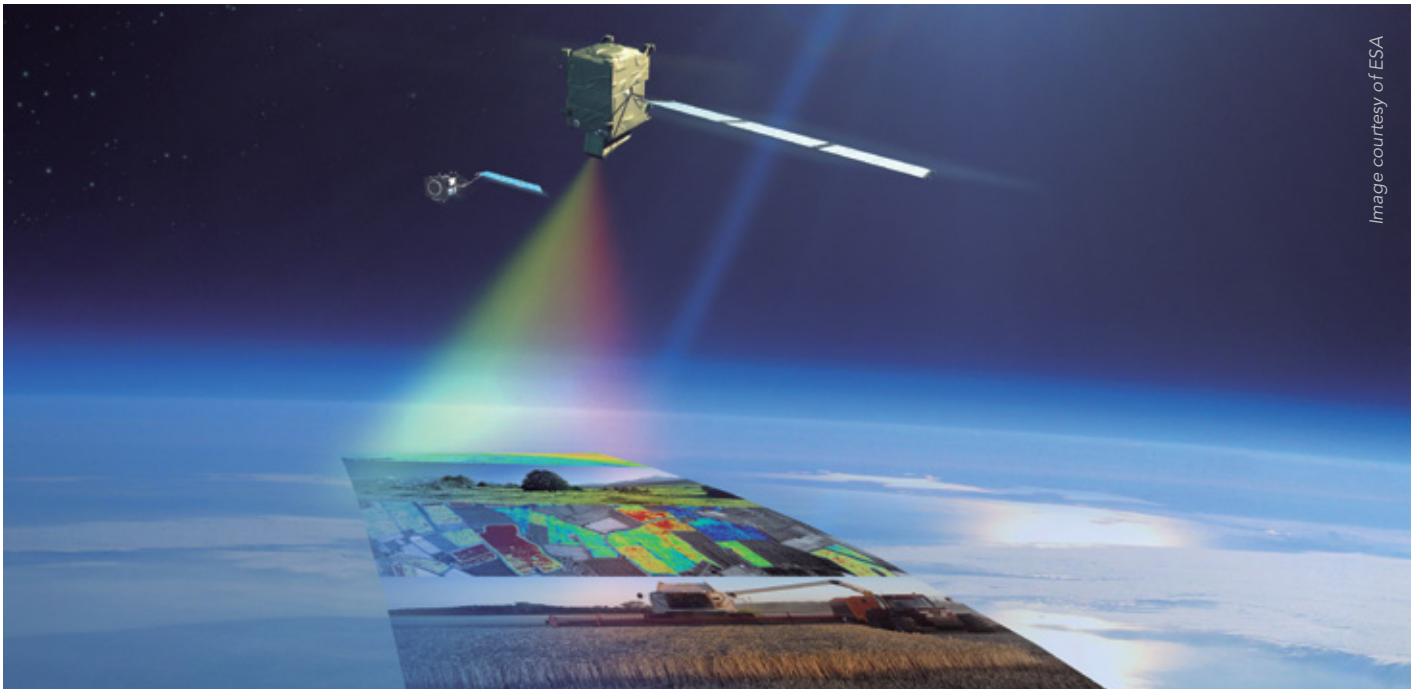


Image courtesy of ESA

GMV ACTIVITIES IN EARTH-OBSERVATION APPLICATIONS

GMV has by now become a key stakeholder and recognized benchmark in this field. GMV has now clocked up 34 years in the aerospace sector, and remote sensing has been one of its activities right from the start. Initially, the company developed ground processors for satellites' onboard instruments, soon building up a leadership position it has maintained to date. The scientific and technical knowledge acquired from the implementation of processor algorithms fueled a rapid transition to the development of remote sensing services, topped up with its experience in information-system technologies and geospatial solutions.

From then on GMV's catalogue of clients and expertise has never stopped growing, nowadays covering a wide range of services and applications, taking in the acquisition of multiple data sources (satellite data, terrain elevation models, land-coverage and -use maps), image analysis and processing, development of inhouse processing software and personalized space-monitoring and management systems.

Some of the most noteworthy recent activities:

1. GMV is one of the companies in the consortium that has won the contract for providing Copernicus security services, in support to EU external action. The European Union's Satellite Center (SATCEN) is coordinating this service, which helps the EU in its operations and interests outside the EU, providing decision-makers with geospatial information for remote, hard-to-access areas posing a high security risk. It also helps non-EU countries to head off global and transregional threats with a destabilizing effect in crisis or emergency situations.

2. GMV is coordinator of the European Commission's AfriCultuReS project, which sets out to design, implement and demonstrate an integrated agriculture monitoring and early-warning system to aid food-security decision-making. AfriCultuReS offers a wide range of climate, production, biophysical and economic information for several regions of Africa. AfriCultuReS applies geospatial sciences to sustainable agriculture development, natural-resource management, biodiversity conservation and poverty alleviation in Africa.

3. GMV is coordinator of the European Commission's MySustainableForest project. The remit of this project is to develop a pre-commercial service and platform for forestry stakeholders, compliant with open and standard interfaces, to integrate Earth Observation into the forest stakeholders' decision-making processes and daily operations.

4. Since 1998 GMV has been supporting the Spanish State Meteorology Agency (*Agencia Estatal de Meteorología*: AEMET) in the development and maintenance of its operations for the acquisition, transformation, mining, dissemination and filing of meteorological data. The main activities also include the development of complex data processing for generating high-level weather-forecasting products. GMV is also participating in all the following space meteorology missions: MSG (Meteosat Second Generation), MetOP (Meteorological Operational satellite programme) and MTG (Meteosat Third Generation), all of which will provide invaluable weather-forecasting and climate-modeling information.

5. GMV is coordinating the NEXTSPACE project for the European Commission. NEXTSPACE aims to pinpoint the necessary developments for Europe's long-term space infrastructure. This is based on compiling observation requirements of European user communities and passing them on in the form of recommendations to drive feasibility studies plus the necessary industrial-development contracts for the next generations of Sentinel satellites.

6. GMV has by now built up a commercial client list in areas as diverse as precision agriculture, gas-, oil-, mining-, environment- and maritime-surveillance-infrastructure and support for international humanitarian programs.

7. GMV is one of Spain's Copernicus Relays; as such it is the only private commercial organization in the initial group, set up with the clear purpose of boosting Copernicus data uptake.

«Copernicus brings benefits to European Union citizens and reinforcing Europe's position as a responsible global actor»

ANDREAS VEISPAK

HEAD OF SPACE DATA FOR SOCIETAL CHALLENGES AND GROWTH UNIT EUROPEAN COMMISSION

Andreas Veispak, an Estonian, started his career at PricewaterhouseCoopers working on and leading numerous projects across different sectors of the economy in fields related to economic development, strategic advisory, mergers & acquisitions, project finance, public-private-partnerships, due diligence and corporate recovery.

He joined the European Commission in 2005 where dealt with the automotive industry and was responsible for questions related to industrial competitiveness, energy and the environment. In 2010 he joined the team at Director General of DG GROW (internal market, industrial competitiveness, space – Copernicus and Galileo – entrepreneurship and SMEs). In the summer of 2015, he became the acting Head of Unit for Space Data for Societal Challenges and Growth at the European Commission with responsibility for space-related data, user uptake and new business models as well as international relations and outreach activities.

Andreas was educated at the University of Oxford, UK, where he studied Modern History.

In upcoming years the market of earth-observation based services is expected to grow at least 15%, with a surge of groundbreaking services in many different areas. Copernicus is Europe's biggest initiative in this area, ushering Europe straight into the golden age of Earth Observation. No one better than Andreas to give us an overview of the Earth Observation area, initiatives and activities, with a special stress on the Copernicus program, its current state, its impact and the road map for the coming years.

CAN YOU BRIEFLY DESCRIBE YOUR UNIT'S ROLE IN THE COPERNICUS PROGRAM?

The main role of our team is to develop and implement activities to promote the uptake and use of space-related data and services in order to maximize their societal and economic potential. Our main objectives include the following:

- Increase the accessibility of Copernicus data and information distribution so as to both reinforce traditional distribution channels as well as designing and implementing more forward-looking innovative concepts (e.g. new data access platforms).
- Gather user requirements to reinforce our existing services and develop future missions addressing new challenges such as CO_2 monitoring, GHG or polar.
- Manage the acquisition of third-party data to complement the Copernicus Sentinel satellites with very high resolution data for applications which need it.
- Design and implement a toolbox of measures to encourage the uptake of Copernicus data by downstream actors and end users.
- Manage the international relations and agreements of Copernicus.
- Foster and increase the visibility of Copernicus through branding and communication actions to raise awareness of the program and to enlarge the user community.

WHAT DO YOU SEE AS THE GREATEST BENEFITS TO BE AFFORDED BY COPERNICUS?

The key benefit of Copernicus stems from its free, full and open data policy, meaning the data is accessible and usable by everybody. Copernicus responds to the needs of its users and ultimately serves European citizens, both directly through its products and applications, and indirectly through its social, economic and environmental benefits. The Copernicus Services serve policy needs ranging from land and marine monitoring to air quality and climate change through to security and emergency services. Copernicus also contributes towards the development of new innovative applications and services, tailored to the needs of specific groups of users, which touch on a variety of economic and cultural or recreational activities, from urban planning, sailing and insurance to archaeology. Copernicus provides global and operational European services for early warning, emergency response, crisis management and humanitarian aid. Therefore Copernicus

«International cooperation can also serve as a market-opener for the promotion of European technology and services in areas related to Earth Observation»

brings benefits to EU citizens and reinforcing Europe's position as a responsible global actor.

HOW FAR DO YOU THINK COPERNICUS WILL CONTRIBUTE TOWARDS THE DEVELOPMENT OF THE EARTH OBSERVATION (EO) INDUSTRY?

Copernicus contributes to the excellence of European industry in space – a highly strategic sector with strong growth potential. But the entry costs into this sector have now decreased significantly, with free space data, lower storage costs and a larger pool of workers able to work with space data. We have developed an integrated Copernicus Ecosystem – all steps of the value chain. Earth Observation is just one of the activities where it is better to pool European citizens' resources, and act at Union level rather than as single Member States. The Copernicus free and open data policy provides opportunities for European industry to tailor Earth Observation products based on Copernicus data and information for non-European markets. International cooperation can also serve as a market-opener for the promotion of European technology and services in areas related to Earth Observation. International markets could represent significant opportunities for European companies in the EO domain in the future. These are all new markets and I think we are only at the start of beginning to understand the different uses of Earth Observation data.

WHAT DOES THE INITIATIVE KNOWN AS THE COPERNICUS DATA AND INFORMATION ACCESS SERVICES CONSIST OF?. WHAT IS ITS PURPOSE?

The Copernicus Programme generates over 12 TB of data per day that can be used on a full, free and open basis by everyone globally. DIAS (Data and Information Access Service) is a service which allows accessing Copernicus data and information without the need to download it. It makes the massive amount of Copernicus data and information available together on-line with processing capacities and tools. DIAS allows bringing the user to the data and provides the same level of services and resources throughout Europe to all users. As such DIAS becomes an enabler for Small Medium Enterprises, industry, research institutes, public services and the Copernicus community at large for developing innovative Earth Observation based solutions. The DIAS are currently in the development stage and first versions are expected to be available to users by June 2018.

COPERNICUS MISSIONS AND THE DIAS ARE PRESUTED BUILDING BLOCKS SUPPORTING THE POSITIONING OF EUROPE IN THE GLOBAL EO MARKET TO WHICH EXTEND?

Copernicus provides Europe with an autonomous capacity for Earth Observation, whilst simultaneously setting the stage for European participation in global initiatives both bilateral and multilateral . The full, free and open data policy of the Copernicus programme fosters the role of "soft power" of the EU in the international arena. Copernicus data and information will support the EU's position in international negotiations on climate, environment and biodiversity, thereby strengthening the European Union's role in space.

HOW DO YOU SEE THE ROLE OF THE COPERNICUS ACADEMY AND RELAYS NETWORKS IN THE DEVELOPMENT OF COPERNICUS?

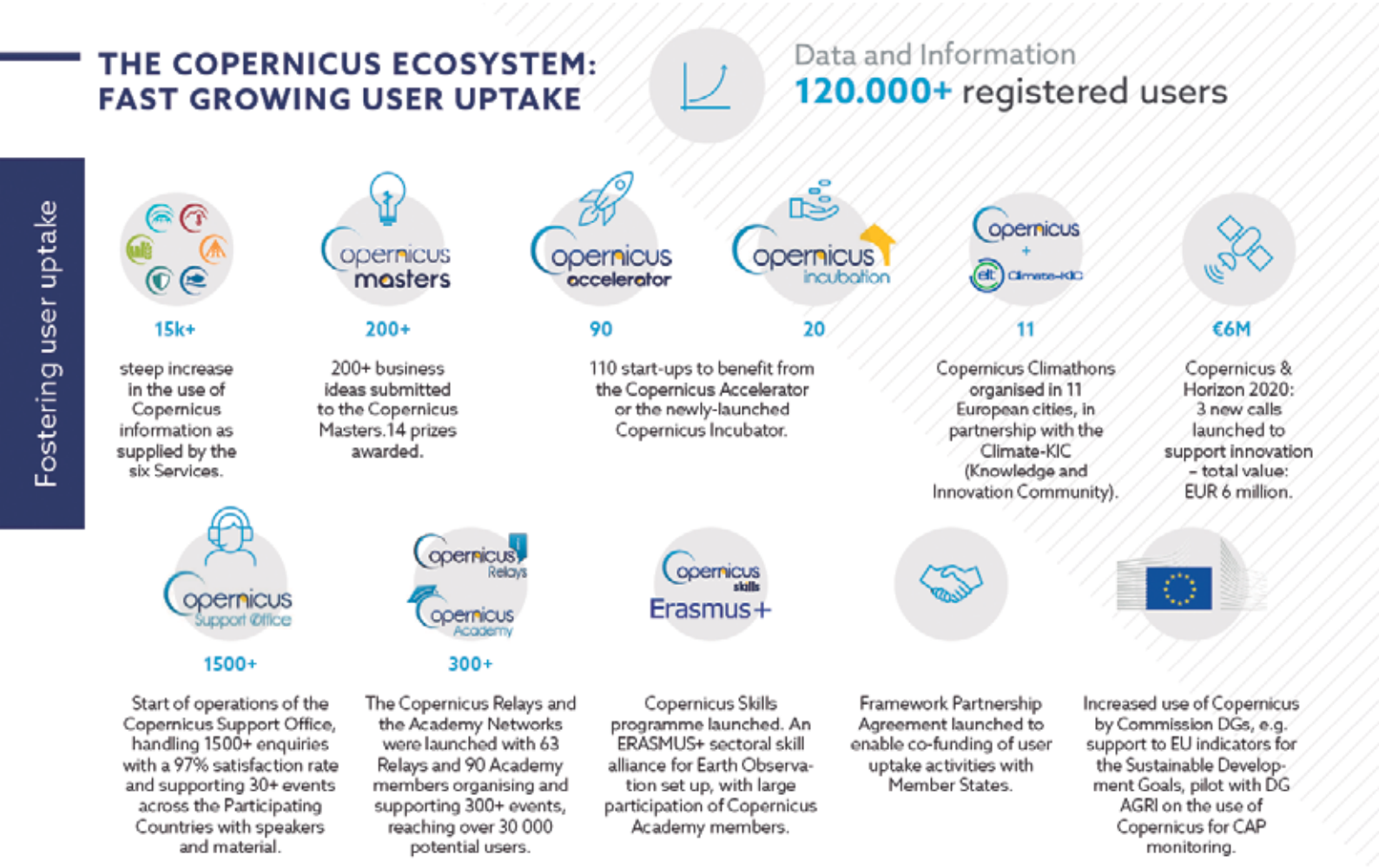
The Copernicus Relays and the Copernicus Academy have been launched to contribute to spreading awareness and knowledge about Copernicus across and outside the EU and to faciliate the use of Copernicus at local levels.

The Copernicus Relays play a key role by promoting Copernicus as a sustainable source of full, free, open and reliable information to meet the needs of National/regional/local public services, as well as a booster for the development of services with high commercial potential by local entrepreneurs. The Relays ultimately contributes to increase Copernicus awareness at the national, regional and local level, and in some cases, also at national level.

The Copernicus Academy Members supports the Commission in bridging the gap between skills and data use, and enable the uptake of Copernicus data in new sectors. Their aim is to foster the development of interdisciplinary masters and educational classes, skills boosting programmes for vocational training, industry-university traineeships and the creation of spin-offs.

Today there are over 200 network members from 38 countries, so potential users can find any information or support they are looking for in the language they work in. In the future, we hope the Copernicus networks will grow even further to cover all Copernicus-

«Copernicus has a key role in ensuring independent access for Europe to strategic geospatial information supporting many EU, national and regional policies»



participating corners of the Earth and to be of even more help to users around the globe.

WHAT NEW BUSINESS MODELS ARE OPENED UP BY THE HUGE FLOW OF COPERNICUS DATA?

With six Copernicus Sentinel satellites in orbit, the Contributing missions and in situ sensors, we're producing over 12 TB of Earth Observation (EO) data per day. What can you do with this data? Well, almost anything – from farming and monitoring bee activity, pollution or air reporting, to forest fire alerts and Earth Observation social networks – the applications we've seen so far are numerous and very different. With more Sentinels (e.g. Sentinel-3B to be launched in April) and the upcoming DIAS platforms it is the right time to get started or to scale up any EO business. Earth Observation and big data from the Copernicus programme offer unique insights into life on Earth, its environment and people. Let`s give an example of support we provide. In the beginning of 2018 the Copernicus Incubation Programme has been launched. The European Commission supports European entrepreneurs and start-ups working with Copernicus data to create innovative, commercially viable products and services. This initiative is part of the Copernicus Start-up Programmes which also include Masters, Accelerator, Hackathons.

WHAT HAS THE SPACE STRATEGY FOR EUROPE ADOPTED AT THE END OF 2016 MEANT FOR COPERNICUS?

In line with the recent Space Strategy for Europe, we have decided, to focus on 3 objectives:

- Increase awareness about opportunities offered Copernicus. We have considerably strengthened our outreach strategy with: information and training sessions, many internal and external events, actions on social networks.
- Facilitate access to data and services for entrepreneurs through DIAS. New platform will considerably improve access to Copernicus product and their combination with other data sources. We also created the Copernicus Support Office, so that all users have access to an effiecent helpdesk.
- Support towards user uptake through Copernicus Start-up Programmes which include Incubation, Masters, Acceleratorand Hackathons.

These 3 objectives require strong involvment of all stakeholders (local and regional). The European Commission must foster the emergence of this new Copernicus eco-system.

WHAT IS THE FUTURE OF COPERNICUS?

Copernicus has a key role in ensuring independent access for Europe to strategic geospatial information supporting many EU, national and regional policies. Public authorities in Europe as well as globally are increasingly integrating Copernicus information into their services and decision-making processes. It is very important to further develop an effective, well integrated and secure Copernicus infrastructure, including space and ground segments, and services, to secure their continuity and future evolution.

Our first priority is to ensure the continuity of the data and services offered by Copernicus to provide planning certainty and predictability to all our users. We are also looking to adapt Copernicus to new needs such as climate change or security. Copernicus has a crucial role to play in supporting Europe's commitment to tackling global challenges while seizing the unique opportunity of becoming a leader in the fast growing EO market. Climate change (including CO_2 emission and arctic environment) is one of the most challenging/demanding aspects of Copernicus` future evolution.

GMV participates in the PASSARO project for development of an airframe integrated technology demonstrator

PASSARO AIMS TO DEMONSTRATE THE APPLICABILITY OF A SET OF INNOVATIVE TECHNOLOGIES IN THE DESIGN, MANUFACTURING AND ON-GROUND TESTING STAGES BY USING REPRESENTATIVE CABIN AND WING AEROSTRUCTURE PROTOTYPES

Set up back in 2016, PASSARO is funded through the Clean Sky 2 Programme under topic JTI-CS2-2015-CPW02-AIR-02-06 "Airframe on-ground structural and functional tests of advanced structures"

GMV is part of the consortium set up to run the PASSARO project (caPAbilities for innovative Structural and functional teSting of AeROstructures), which aims to demonstrate the applicability of a set of innovative technologies in the design, manufacturing and on-ground testing stages by using representative cabin and wing aerostructure prototypes.

GMV's participation is based on three development areas, all related to technologies of preparation and execution of tests in an industrial environment.

- The first area is related with the study and development of a centralized information network within a factory environment (aircraft manufacturing plant) with the purpose of homogenizing information accessible to all operators within the plant.
- The second refers to development of testing software capable of preparing, executing and analyzing test results. The goal is to expand today's systems to a distributed, preferably web-based architecture that is capable of running on the test hardware. This new testing software should also maintain the ability to interact with systems currently operating in the factory environment selected for the validation campaign to run.
- Finally, selection and development of portable hardware equipment, taking into consideration the state of the art in tablets, communication devices, augmented reality, visual and vocal patterns recognition systems that have the ability to run the testing software developed in the previous area of development.

The combination of the three separate development areas into a single development path, is expected to increase the efficiency and capabilities in the domain of portable critical software testing, with the potential results not confined to aeronautics but applicable also to other industrial systems.

GMV, one of the companies involved in this project, was selected on the basis of the following capabilities: software development capable of presenting the information in augmented reality views; indoor positioning solutions fully complemented by GNSS, in order to provide a unique ubiquitous navigation in a heavily industrialized scenario; secure communications and technological solutions to optimize the productive processes of large corporations.

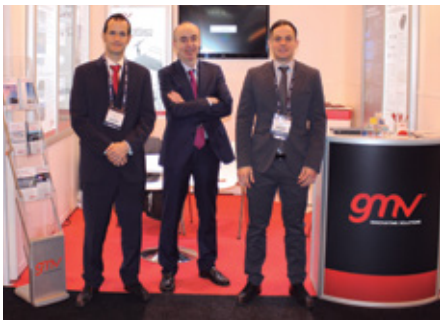
The Clean Sky 2 program, brokered by the European Commission and the aeronautics industry and falling under the EU's new Horizon 2020 research program, is Europe's biggest aeronautics research program. Its main remit is to develop game-changing technology to drive sustainable development and improve air-transport's environmental performance on the continent, resulting in quieter and more fuel-efficient planes and helping to meet environmental targets of the Single European Sky, guaranteeing at the same time the competitiveness of the European industry at world level.

The present and future of air traffic at the World ATM Congress

FROM 6 TO 8 MARCH MADRID HOSTED THE LATEST WORLD ATM CONGRESS (WAC 2018), AN EVENT ORGANIZED BY THE CIVIL AIR NAVIGATION SERVICES ORGANISATION (CANSO) AND THE AIR TRAFFIC CONTROL ASSOCIATION (ATCA)

Attracting over 255 exhibitors and a turnout of nearly 7500, WAC ran a complete lecture program to debate the current worldwide air-traffic panorama, the changes to confront, the challenges to rise to and the new uses of aviation.

In this editiont GMV showcased its ATM products at this sixth World ATM Congress. Pride of place here goes to the GNSS interference detector ***srx-10i***, now deployed in 11 Spanish airports; the ***emil*** system for ground inspection of ILS and VOR radio aid; and the web App ***magicIFP*** for on-ground and in-flight validation of LPV approach procedures.



The Spanish satellite PAZ is now in space

AT 06.17 HOURS LOCAL TIME (14.17 HOURS GMT) ON 22 FEBRUARY THE SATELLITE PAZ BLASTED OFF SUCCESSFULLY ATOP A SpaceX FALCON 9 LAUNCHER FROM THE VANDENBERG AIR FORCE BASE IN CALIFORNIA, USA

The satellite carries onboard a Synthetic Aperture Radar (SAR), which will pool all recorded data to build up maps of a great variety of environments of national and commercial interest. Although this technology was first taken up in the eighties of last century, PAZ is the first satellite capable of combining data compiled by the SAR and the AIS receiver, also carried onboard the satellite. AIS is short for Automatic Identification System, i.e., a commonly used ship tracking device.

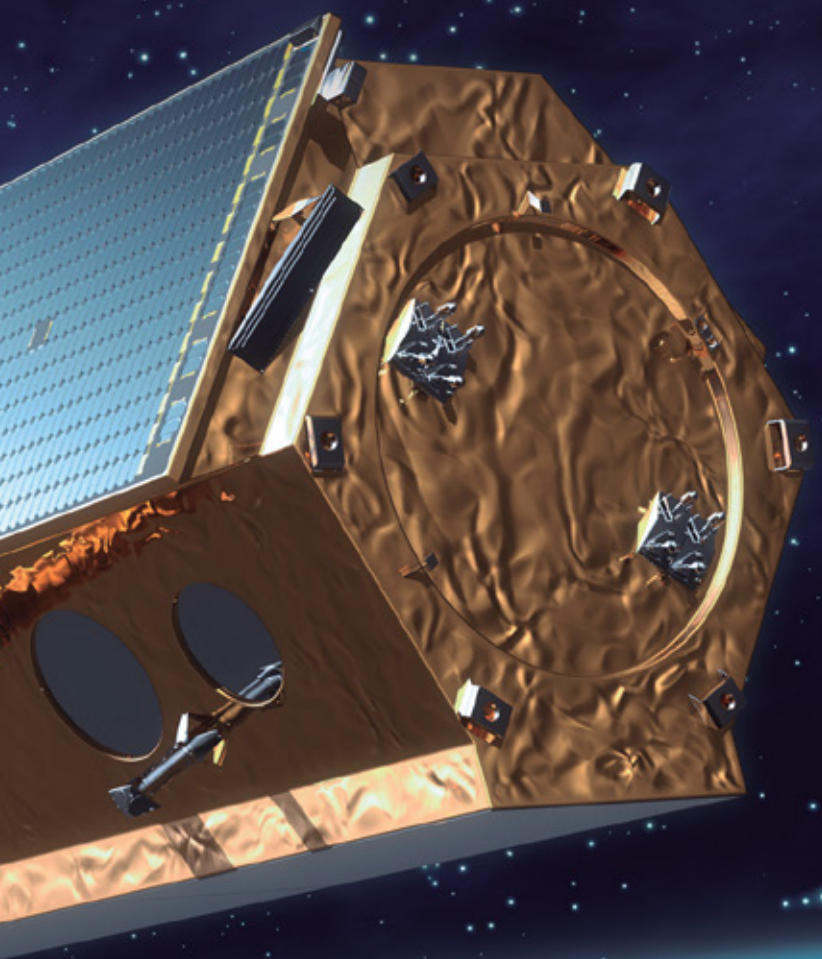
Eighteen European firms and 3 Spanish universities have been involved in the mission. GMV forms part of the industrial group that has worked on the mission's ground segment, holding responsibility for setting up the control center, the precise tracking system and the planning system. GMV is also responsible for providing the radar-image-distribution and user-management system, both for civil and defense users.

This hexagonal polyhedron, weighing nearly a ton and a half, will orbit our planet about 15 times a day, covering a wide swathe of 300,000 km^2 every 24 hours, in a sun-synchronous orbit at a height of about 500 km.

The satellite will carry an Extreme Precipitation and Radio Occultation (*Radio Ocultación y Precipitación Extrema*: ROHP) experiment of the Space Science Institute (*Instituto de Ciencia del Espacio*) of the Higher Council of Scientific Research (*Consejo Superior de Investigaciones Científicas*), which will study atmospheric phenomena by analyzing GPS signal occultation upon crossing the

PAZ, part of Spain's National Satellite Earth-Observation Program (*Programa Nacional de Observación de la Tierra por Satélite*: PNOTS), is equipped with high resolution radar imaging technology, capable of working in any weather or light conditions

atmosphere. This productive mission will also contribute towards the Copernicus space program, Europe's biggest security and environmental monitoring program. Specifically, PAZ falls within Mission Group 1 (SAR, VHR1 and MR1), the first of the five mission groups designed to improve this service of the ESA program.



THE ORIGINS OF THE PROGRAM

Spain's National Satellite Earth-Observation Program (*Programa Nacional de Observación de la Tierra por Satélite*: PNOTS) is an agreement signed between Spain's MoD and the Ministry of Industry, Tourism and Commerce (*Ministerio de Industria, Turismo y Comercio*). Under CDTI funding the company HISDESAT is responsible for the space segment and INTA for the ground segment.

This program has spawned two satellites, PAZ and Ingenio. PAZ arose as a response to the Spanish Airforce's demand for radar technology of these characteristics, while aiming at the same time to meet civil needs. Ingenio, based on optical technology, meets civil and governmental needs and is expected to be operational by 2020.

2007 was the year when the program's starting pistol was fired. Only ten years later, with the launch of the first satellite, the project is a reality. This new step will boost Spain's satellite-based earth-observation autonomy.

Image courtesy of ESA

GMV studies the application of Big Data and Earth Observation to migratory movements

THE FEASIBILITY PHASE OF THE BIGMIG (BIG DATA FOR MIGRATION) PROJECT HAS RECENTLY BEEN BROUGHT TO COMPLETION, A PROJECT AWARDED TO GMV BY THE EUROPEAN SPACE AGENCY (ESA) UNDER THE UMBRELLA INTEGRATED APPLICATIONS PROGRAMME (IAP)

The main remit of BIGMIG was to study how Big Data – including space data – can help us to understand better, respond to and in general handle the complex human migration phenomena.

Personnel from different GMV business areas and subsidiaries were called upon to take part in the project in order to cater for its wide-ranging characteristics, straying beyond the strictly space domain. This enabled the project to be tackled from several different viewpoints and areas of expertise. The resulting synergies have helped to define a series of high added-value services that GMV will be able to pass on to the users involved in the project.

In particular, the project drew up a portfolio of remote-sensing-based services designed to suit migration-related NGOs and international organizations. These services leverage earth-observation data, large-scale data processing and machine learning to provide users with crucial information for their operations. These services plug the current gap that hinders the use of earth-observation techniques and data for humanitarian purposes. The use of both technologies together will provide enhanced situation awareness, speed up response times and improve resource management.

Thanks to this project, moreover, GMV has sealed sales agreements with selected NGOs working on migration-mitigation and -management tasks. It will now continue working along these lines to expand its market share of value-added services for this user community.

The new generation of precise point positioning features in the latest IGNSS Congress

From 7 to 9 February Sydney in Australia hosted the latest IGNSS symposium, the premier event in the sector of satellite-positioning GNSS applications and innovations.

One of the sessions dealt with Australia and New Zealand's new-generation satellite-based precise point positioning system, a project in which GMV is responsible for the development, deployment and installation of the processing platform in charge of generating the system's precise corrections and integrity parameters.

In this session Lockheed Martin set out the project's overall goals, the characteristics of the services and the benefits afforded by the diverse positioning technology used. The presentation included a demo of a user terminal, developed by GMV specifically to support the scheduled demonstration and testing plan.

Apart from this demonstration, two additional GMV papers stressed the technical aspects and results achieved in system services, including the satellite-based augmentation system (SBAS) and precise point positioning (PPP).

GMV takes part in a new study within ESA's SSA program

GMV FORMS PART OF A CONSORTIUM LED BY OHB SYSTEM AG. THE STUDY TO BE CARRIED OUT BY THIS CONSORTIUM AIMS TO DEFINE, ANALYZE AND DESIGN A MISSION FOR MONITORING THE SUN'S ACTIVITY

The activity, falling within the European Space Agency's Space Situational Awareness (SSA) program, sets out to send a spacecraft to orbit the Lagrange L5 point (chosen due to its stability and visibility properties). After reaching its orbit, the spacecraft's mission is to obtain and compile information about the interplanetary medium, plus sun data, to be sent back to earth where it will be further used for improvements in various sectors of the technological community, such as navigation, terrestrial communications, electronics, healthcare and many more.

Image courtesy of ESA

Within this research project GMV will be responsible for developing the guidance, navigation and control (GNC) system as well as analyzing the feasibility of the proposed design in accordance with the overall system design of the spacecraft. Specifically, GMV will be inputting the GNC requirements and a selection of the spacecraft's GNC sensors, actuators and algorithms.

By midway through the year, when the project's Preliminary Concept Review (PCR) is due, GMV will have to ascertain the diverse pros and cons of the satellite's attitude and orbital control system (AOCS/GNC), as well as conducting a feasibility analysis in order to establish a preliminary baseline for the GNC system.

Hispasat 30W-6 successfully launched

ON 6 MARCH THE SPANISH COMMUNICATIONS-SATELLITE OPERATOR HISPASAT SUCCESSFULLY LAUNCHED ITS TWELFTH SATELLITE, HISPASAT 30W-6, ATOP A SpaceX FALCON 9 ROCKET FROM CAPE CANAVERAL AIR FORCE STATION

Once slotted into its orbital position and after passing a test phase, Hispasat 30W-6 will supply a wide range of telecommunications services for Europe, the Americas and North Africa.

Hispasat 30W-6, built from Space Systems Loral's LS-1300 platform, is the fourth satellite of Hispasat's fleet. GMV is responsible for developing the operational satellite-monitoring and –control and flight-dynamics systems, using its renowned inhouse products ***hifly®*** and ***focusGEO***, already used in the rest of Hispasat's fleet.

Hispasat 30W-6 will replace Hispasat1D (Hispasat 30W-4), becoming the seventh member of the up-and-running satellite fleet. With a useful life of over 15 years this 6-ton satellite will provide telecommunications services to improve capacities in Hispasat's current operating areas.

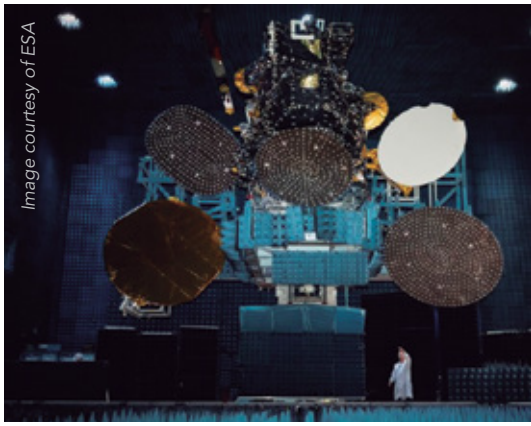


Image courtesy of ESA

GMV will bring its database technology expertise to the European TYPHON project

February saw the TYPHON kick-off meeting. In this three-year project, carried out under the European Commission's Horizon 2020 (H2020) research and innovation program, GMV is playing a key role.

The project's aim is to provide a methodology and technical solution for designing, developing, querying and evolving scalable database architectures for large volumes of hybrid data (relational, graph-based, document-based, natural language etc).

The TYPHON consortium pools various research partners with a long track record in research into software models, programming languages, text mining and data migration and providing robust, open-source software solutions. It also takes in industrial partners active in the automotive, Earth Observation, banking and freeway-operation domains. Finally, the consortium is made up by an industrial advisory board of world-class experts in the fields of databases, business intelligence and analytics and large-scale data management.

GMV is playing a key role in the project as a proven expert in database technology for space applications, where it is used – to give only some examples – in earth-observation data catalogs and for storing and accessing reference satellite data in mission control applications.

Specifically, within this project, GMV will define a set of use cases in which to apply the hybrid database technology developed during the project, then weighing up the improvement and advantages achieved as against traditional technology. The result will be beneficial both for GMV – as a potential user of such technology – and for the development community, since its outcome will be validated against real-world use cases and in an operational context.

GMV is playing a key role in the project as a proven expert in database technology for space applications

GMV attends SATELLITE 2018

Pedro Morenés, Ambassador of Spain to the United States of America, Jaime de Rábago, President of TEDAE and Miguel Ángel Molina, Executive Director of Programs and Business Development of GMV's Aerospace sector

From 12 to 15 March the Walter Edward Washington Convention Center in Washington D.C. hosted the world's most important satellite-technology event, SATELLITE 2018.

The new edition of the event brought together representatives from the top telecommunications-satellite companies. This crucial sector nowadays underpins such markets as the communication media, transport, telecommunications, finances and even the consumer goods industry, in an increasingly connected and interrelated scenario.

GMV boasts a wealth of experience in ground-segment developments; it is currently the world's number one supplier of control systems for telecommunications space missions.

GMV, with the support of the Spanish External Trade Institute (*Instituto Español de Comercio Exterior*), exhibited its products and services, showcasing especially its ground-segment control systems such as ***hifly®*** (satellite control), ***focussuite*** (orbit control), ***closeap/focusoc*** (collision risk management and associated services), ***flexplan*** (satellite resources planning system), ***magnet*** (monitoring-station control), ***smartrings*** (configuration management and payload optimization) and ***smarthz*** (frequency-management system); plus network-security and vulnerability-analysis services.

GMV leads a project for application of EGNOS to maritime safety

SEASOLAS, LED BY GMV WITH THE PARTICIPATION OF KONSGBERG, GLA, ESSP AND VVA, UNDER THE TECHNICAL SUPERVISION OF THE EUROPEAN GNSS AGENCY (GSA), IS PART OF THE HORIZON 2020 PROGRAM

In late December, GMV conducted a field campaign in the framework of SEASOLAS, a project to weigh up the potential of the safety service of the new phase of EGNOS (EGNOS v3) for application to the maritime sector. The project is dealing not only with technological questions but also other important aspects such as the market, cost-benefit, strategic matters, service provision, standardization, etc.

GMV has recently run a data campaign onboard a cargo ship of the company OPDR (since 2018 MacAndrews) on the Seville-Tenerife-Las Palmas-Seville route, with the aim of analyzing the main idiosyncrasies of the maritime environment.

This campaign, made possible by the collaboration and management of the Harbor Authority of Seville (*Puerto de Sevilla*), involved the installation of five multi-frequency GNSS receivers at different places on the cargo ship. These receivers recorded data during various operational phases, such as entry into the Seville lock, port operations and ocean navigation.

The information obtained from this process was then used to ascertain the probability of navigation safety being jeopardized during the various events. And, despite the inclement weather during the route, the campaign was reckoned to be a success, largely thanks to the collaboration of the crew of OPDR Canarias.

The results of this data processing enabled us to define with greater certainty the specific maritime safety problems faced and propose a set of technical solutions to head off these problems and guarantee navigation safety.

The remit of SEASOLAS is to weigh up the potential of the safety service of the new phase of EGNOS (EGNOS v3) for application to the maritime sector

GMV develops a new GNSS receiver for high-precision applications with integrity

GMV has developed a light, portable and compact user terminal geared towards high-precision positioning applications (3-5 cm) and integrity. The terminal is capable of processing not only corrections provided by GMV's Precise Point Positioning (PPP) service but also corrections sent by first- and second-generation Satellite Based Augmentation Systems (SBASs) (Dual-Frequency Multi-Constellation: DFMC). It also incorporates integrity assurance algorithms developed and patented by GMV such as the Kalman Integrity Protection Level algorithm (KIPL).

The terminal is completely compatible with the SBAS DFMC (Dual-Frequency Multi-Constellation), currently deployed in Australia and New Zealand. GMV has participated in the development, deployment and installation of this system by providing the processing platform that generates the precise corrections and integrity parameters sent by the system.

GMV's aim in developing this terminal is to plug the commercial gap for second-generation SBAS-DFMC-compatible user terminals, in particular satisfying the existing demand in Australia and New Zealand for terminals of this type.

GMV has recently handed over the first batch of terminals designed to test the DFMC system available in the region in various sectors, such as precision agriculture, construction and sea-, air-, rail- and road-transport.

The user terminal has a built in user-friendly interface for monitoring equipment performance and function and configuring its connectivity. The terminal can be set up to send position and integrity messages easily in standard NMEA format to external Apps.

GMV presents AfriCultuReS Project at ESRIN

ON 5 AND 6 MARCH, INVITED BY THE EUROPEAN SPACE AGENCY, GMV WENT TO ESA-ESRIN'S SITE IN FRASCATI, ITALY, TO PRESENT THE AFRICULTURES PROJECT (ENHANCING FOOD SECURITY IN AFRICAN AGRICULTURAL SYSTEMS WITH THE SUPPORT OF REMOTE SENSING) AT THE SECOND "EO FOR FOOD SECURITY AND SUSTAINABLE AGRICULTURE" CONGRESS

Funded by the Horizon 2020 (H2020) program and coordinated by GMV, AfriCultuReS aims to design, implement and demonstrate an integrated agricultural monitoring and early warning system that will support decision-making in the field of food security in Africa. To do so it will apply geospatial science to sustainable agricultural development, natural resource management, biodiversity conservation, and poverty alleviation in Africa.

The project brings together seventeen prestigious African and European organizations that are benchmarks in various fields of specialization: climatology, meteorology, crop yield monitoring and modelling, information technologies, social sciences and Earth Observation.

Project presentation fell to Juan Suarez, Project Head in the Service Division of the Earth Observation Exploitation Platforms. During these opening remarks he set out the framework of activities for the upcoming years of this project, which is set to play a key role in the ongoing Europe-Africa dialogue and is considered by the European Union as one of the keystones of its strategy for intensifying cooperation and development of European Union-African Union policy. In the context of Earth Observation this cooperation crystallizes in the GMES and Africa program, tied in with the European Union's Copernicus program. AfriCultuReS will also contribute towards initiatives under GEO (Group on Earth Observation), an intergovernmental organization working to improve the availability, access and use of Earth Observation for the benefit of society. In particular the project will contribute to the European and African GEO initiatives, EuroGEOSS and AfriGEOSS, as well as the global crop monitoring program GEOGLAM.

Gmv plays a key role in the removal of Europe's largest derelict satellite Envisat

GMV TAKES PART IN THE MOST RECENT PHASE OF THE E.DEORBIT PROGRAMME OF THE EUROPEAN SPACE AGENCY'S SPACE RESEARCH AND TECHNOLOGY CENTRE (ESTEC). THE REMIT OF THE E.DEORBIT PROGRAM IS THE POST-LIFE DISPOSAL OF ESA'S ENVISAT SATELLITE, USING ACTIVE SPACE DEBRIS REMOVAL TECHNOLOGY

Weighing in at 8 tons at the moment of its launch and now decommissioned and following the already crowded Sun-synchronous orbit, Envisat was ESA's last EO satellite and the first on the active space-debris removal list due to the high probability of its collision with other objects.

The ongoing phase, in which GMV is playing a key role in an Airbus-led team, focuses on implementation of the findings from the intermediate System Requirements Review (SRR) for adaptation of a GEO servicing vehicle (Spacetug concept) to the e.Deorbit mission.

Specifically, a team made up by members from GMV's Portugal and Poland subsidiaries is responsible for adapting the guidance, navigation and control (GNC) system for the orbital-rendezvous, inspection and stack-orbit phases, comprising a bespoke guidance system, a camera-based relative navigation filter and an H-infinity robust controller. The study includes the carrying out of high-fidelity, worst-case-scenario simulations to study GNC performance in unfavorable conditions. A study will also be made of the performance of the complete camera-based navigation chain and a high-fidelity image generator will be developed, plus a vision-based navigation model to be included in the simulator.

GMV is responsible for adapting the guidance, navigation and control (GNC) system for the orbital-rendezvous, inspection and stack-orbit phases

GMV takes part in the Mars simulation mission AMADEE-18

In the frame of the high visibility Mars analog mission AMADEE-18, in February a field crew of 15 members from 8 nations conducted experiments preparing for future human Mars missions.

AMADEE-18 is led by the Austrian Space Forum (OeWF) in partnership with international research organizations.

During the one-month mission, a team of six analog astronauts from the Austrian Space Forum (OeWF) descended on the stark landscape of Oman's Dhofar desert to live in isolation and conduct a series of experiments in the fields of engineering, planetary surface operations, astrobiology, geophysics/geology, life sciences and others.

One of this analog astrounaut was João Lousada, member of GMV's subsidiary, GMV INSYEN, Analog Astronaut and Deputy Field Commander at OeWF.

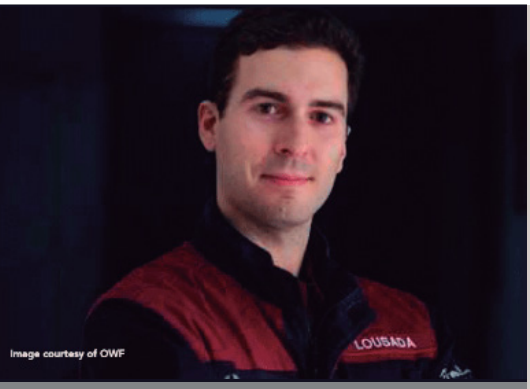


Image courtesy of OWF

Born in Portugal in 1989 João Lousada studied Aerospace Engineering in Lisbon, doing his master thesis at the University of Victoria, Canada, on satellite attitude determination and control. Presently he works in the GMV's subsidiary, GMV INSYEN, as Flight Operations Engineering for Columbus, controlling the subsystems of the European module of the ISS, at the Columbus Control Center in Munich, Germany. He is also a certified parachutist and rescue SCUBA diver.

What skills does an analog astronaut need? What was your selection procedure like for becoming one of OeWF's analog astronauts?
Together with over 100 other candidates, I applied to the call of analog astronauts issued by the OeWF back in 2015. The selection process was quite a demanding one, focusing on assessing all the skills needed to successfully perform as analog astronaut: we were evaluated in physical fitness, technical knowledge, psychology, coordination, situational awareness, team work, public speaking and many others skills. In total, we went through 3 increasingly difficult selection rounds and over 600 individual tests. By the end I was lucky enough to be one of the selected analog astronauts for the class of 2015, together with 4 exceptional "class-mates".

What were the factors behind the choice of Dhofar in Oman as the scenario for the AMADEE18 mission?
The Dhofar desert, in Oman, presents a very unique simulation environment for a Mars analog mission. There are several geological features that are similar to those of the red planet such as evidence of past fluvial structures, similar mineralogy and equal grain size distribution. Additionally, we were interested in testing our systems in the fine dust environment and understand which problems we would encounter and which design options work better. Our objective is that things go wrong: we want to find the problems and challenges that a mission to Mars entails and solve them before we send the first humans to Mars.

Are simulation missions of this type habitual? Why?
There are several organizations around the world that perform varied analog missions and each mission has a different focus. There are missions that focus on the psychology, others that focus on the nutrition. The OeWF analog missions focus mainly on the Extra-vehicular Activities (EVAs) and the operational workflows and constraints around them. EVAs will be crucial for a human mission to Mars and we want to understand how to efficiently and safely perform them.

What are your responsibilities in the Amadee18 mission as deputy field commander?
As deputy field commander, I am

Image courtesy of OWF

the second in command for the mission and often take the role of field commander where I lead all the operations on "Mars". This means that I am responsible for coordinating and guiding the crew, making time critical decisions and assuring the successful execution of the mission. But above all, I am directly responsible for the safety of my crew in this harsh environment.

What is the election procedure for the experiments to be conducted in the mission?

For every mission of the OeWF a public open call for experiments is issued approximately one year in advance. After receiving several applications from research organizations and universities, a selection panel is formed to select the final list of experiments to take place in the mission and the results are announced. The preparation of these selected experiments is then followed closely and several review cycles are performed to assure a good maturity and readiness of the experiment before the mission start. For AMADEE-18 we had a very good set of experiments ranging from a highly technical, fully automated and autonomous greenhouse module proposed by the Italian Space Agency, to an ingenious geophone system that detects subsurface traces of water proposed by a team of high school children, from Oman.

Although it's only just been completed, are there any significant findings yet? Will these results be open to the whole world?

We have just completed the mission and now the processing and analysis of the data and geological samples can start. We received very good feedback from our investigators as we were sending the different data, so we know that we have provided valuable data and we are very much looking forward to the results that will come out and the final findings will be made available to the general public. Unfortunately it is still early to have any consolidated findings, but at the AMADEE-18 Science Workshop, at the end of May, we will start seeing the first results from our researchers.

As in all OeWF missions, the entire data and findings of AMADEE-18 will be made available in the OeWF multi mission science data archive and open to the public.

Any other analog mission on the cards? If it were up to you, which other analog mission would you like to take part in?

With AMADEE-18 complete, there is still some work to be done for analyzing and publishing the outcomes. However, the attention now also starts turning to next mission, where we hope to continue and improve the work performed this year.

From a personal point of view, I would be thrilled to have the opportunity of performing an analog mission in Antarctica or the Artic. I believe these sites offer a very unique simulation location for analog Mars research with several interesting and similar environmental parameters that can teach so us much about a human mission to Mars and help us lay the first footprints on the red planet.

Earth-observation technology for sustainable forestry

THE END OF 2017 SAW THE OFFICIAL KICK-OFF OF MYSUSTAINABLEFOREST, A PROJECT FUNDED UNDER THE EUROPEAN UNION'S FRAMEWORK RESEARCH AND INNOVATION PROGRAM, HORIZON 2020, WHICH AIMS AT PHASING INCREASED USE OF EARTH OBSERVATION TECHNOLOGY AND TOOLS INTO THE FORESTRY SECTOR TO ENSURE A MORE SUSTAINABLE USE OF OUR WOODLAND

Kick off meeting del proyecto - November 2017 - Tres Cantos (Madrid)

Europe is about 40% woodland. For two decades now initiatives, agreements and policies have been underway to ensure a balanced development of these crucial woodland ecosystems.

The MySustainableForest initiative is being carried out by a GMV-led consortium including the Portuguese Navigator Company (*Instituto de Investigaçao da Floresta e Papel*: RAIZ), the Hrvatski Sumarski Institut (Croatian Forest Research Institute: CFRI), the University Forest Enterprise (UFE) of the University of Mendel of the Czech Republic (*Mendelova Univerzita V Brne*), the Forestry Association of Navarre (*Asociación forestal de Navarra*: FORESNA), the Lietuvos Misko Savininku Asociacija (Forest Owners' Association of Lithuania: FOAL), the French National Forestry Ownership Center (Centre National de la Propriete Forestiere: CNPF), the Spanish companies Madera Plus Calidad Forestal SL (MADERA+) and Föra plus the European Forest Institute.

Evaluating biomass, mapping timber quality, developing a climate-change strategy and pinpointing vulnerabilities are, among others, the applications to be developed during the course of this long-term, 36-month research project.

Forests are the lungs of our planet. But their key environmental role is not their only boon; their economic and social knock-on effects are coming into their own too. Direct and indirect benefits are in fact equally important. Conserving our forests and, above all, ensuring a sustainable use of them is therefore a pressing need at worldwide level.

3rd ATLANTOS General Assembly

IN LATE 2017 THE CANARIES OCEAN PLATFORM (*PLATAFORMA OCEÁNICA DE CANARIAS*: PLOCAN) HOSTED IN LAS PALMAS OF GRAN CANARIA THE PLENARY SESSIONS OF THE 3RD GENERAL ASSEMBLY MEETING OF THE EUROPEAN ATLANTOS PROJECT (OPTIMISING AND ENHANCING THE INTEGRATED ATLANTIC OCEAN OBSERVING SYSTEMS)

AtlantOS makes an important contribution to the World Ocean Observing System, working towards enhancing existing coordination in observation activities and information management, as well as helping to fill the gaps in global earth-observation systems by making more data available.

The assembly brought together 62 partners representing companies and institutions linked to the Atlantic Ocean maritime and marine sector, coming from 18 countries of Europe, Africa and America. GMV, represented by Amaya Atencia, responsible for PDPA business development - GMV's Aerospace sector, was invited to the event to give a chat as an expert firm in satellite-based earth observation, presenting current Copernicus products and data that are valid for marine/maritime applications. As leader of the NEXTSPACE project, GMV also presented the results of user-requirement definition in this same field of application. NEXTSPACE is a European Commission framework contract to prime the future Copernicus generation.

GMV, ground-segment leader of the new generation of the Galileo program

LATE JANUARY SAW THE KICKOFF MEETING OF A NEW PROJECT AWARDED BY THE EUROPEAN SPACE AGENCY TO A GMV-LED CONSORTIUM TO DEFINE GALILEO'S SECOND-GENERATION GROUND SEGMENT

The European Commission has defined the evolution of the Galileo mission on the basis of three strategic objectives: independence, robustness and competitiveness, also establishing three mission evolution scenarios with an incremental demand in terms of objectives.

The three system evolution scenarios were analyzed in a first phase finishing in March 2017.

Now in a new program evolution phase, GMV, one of the main players in Europe's satellite-navigation strategy implementation, continues to play an outstanding role in the program.

The project, including over 10 international subcontractors, has the main aim of consolidating mission definition and carrying out a set of analyses identified at the end of the former phase. The project also comprises the critical review of the ground-segment requirements of the next Galileo generation plus the preliminary design of this segment.

This Horizon 2020 project for satellite-navigation innovation and research is particularly important in that it allows GMV to take on responsibility for specification and design of one of Galileo's most important segments.

In the first generation of Galileo GMV is responsible for several items in the Ground Mission Segment (GMS) and the Ground Control Segment (GCS). This new contract award makes GMV leader of the Ground Segment (including both activities, GMS and GCS) of the Galileo second generation.

Image courtesy of ESA

The RLSP of Galileo's Search and Rescue Service crosses the equator

SINCE THE END OF 2016 GMV HAS BEEN CARRYING OUT THE RETURN LINK SERVICE PROVIDER (RLSP) OF THE SEARCH AND RESCUE SERVICE (SAR) OF THE EUROPEAN GALILEO SATELLITE NAVIGATION SYSTEM

RLSP, under the control of the European Commission, with the technical assistance of the French Space Agency (CNES) as future operator of Galileo's Search and Rescue Service, is the infrastructure responsible for generating Galileo's return messages and its coordination with the system, which interacts with the Cospas-Sarsat network, on one hand, and with the Galileo ground segment, on the other.

The GMV-primed consortium, also including the French firms PROSICA and AMOSSYS, has already designed and developed the RLSP. The project is now in validation and installation phase in the SAR/Galileo Service Centre, before moving on to the phase of supporting system-integration and -acceptance tests.

At the end of January the CNES team came to GMV's Tres Cantos head office to carry out the Factory Acceptance Test (FAT), which was declared to be a success after four busy days of requirement-validation and demonstration tests. After RLSP had come through this test with flying colors, CNES authorized the transfer of part of the equipment to its Toulouse site for conducting the Site Acceptance Test (SAT). During February and March part of GMV's team has been posted to Toulouse to monitor these tests in situ, with the additional support of GMV's RLSP team in Toulouse.

GMV takes part in the Copernicus User Forum

LATE 2017 SAW THE 6TH MEETING OF THE COPERNICUS USER FORUM. COPERNICUS IS THE EUROPEAN UNION'S EARTH-OBSERVATION AND -MONITORING PROGRAM

The User Forum is a workgroup set up to help the Copernicus Committee to determine user requirements, check service compliance and public-sector user liaison and coordination. In Spain the User Forum is coordinated by the Ministry of Agriculture, Food and the Environment (*Ministerio de Agricultura, Alimentación y Medio Ambiente*: MAPAMA) and the National Geography Institute (*Instituto Geográfico Nacional*: IGN), while the Copernicus Committee is made up by the Ministry of Industry, Energy and Tourism (*Ministerio de Industria, Energía y Turismo*) and the Industrial and Technology Development Center (*Centro para el Desarrollo Tecnológico e Industrial*: CDTI).

The objective of this meeting, held yearly since 2011, is to pinpoint Copernicus users' needs and give information on its utility, presenting the possible business opportunities it may give rise to.

GMV, as member of the Copernicus Relays Network in Spain and leader of the framework contract for defining user requirements of the future generation of Copernicus satellites, was invited to the forum to talk about its experience and knowledge of the program.

The Copernicus Relays Network was set up by the European Commission to promote the use of Copernicus data, both those provided by its services and Sentinel satellite images. The Copernicus Relays act as single local windows; they are the voice but also the eyes and ears of the Commission at local and regional level to guarantee program users' needs are fed into the program and to maximize use at local and operational level. They also broadcast the Commission's incentives for the development of groundbreaking applications and new business models.

Since 2016, GMV has been the only Spanish company designated by the European Commission as member of the Copernicus Relays Network. In 2017 GMV has taken part in various national seminars and forums to carry out this awareness-raising work.

Julia Yagüe Ballester, head of GMV's Copernicus Services, gave a chat on future user requirements.

First PRS solution in Portugal

GMV INVITED TO PROVIDE A DEMONSTRATION OF GALILEO'S GOVERNMENTAL SERVICE, PRS (PUBLIC REGULATED SERVICE), WHICH SHOULD BE FULLY OPERATIONAL BY 2020

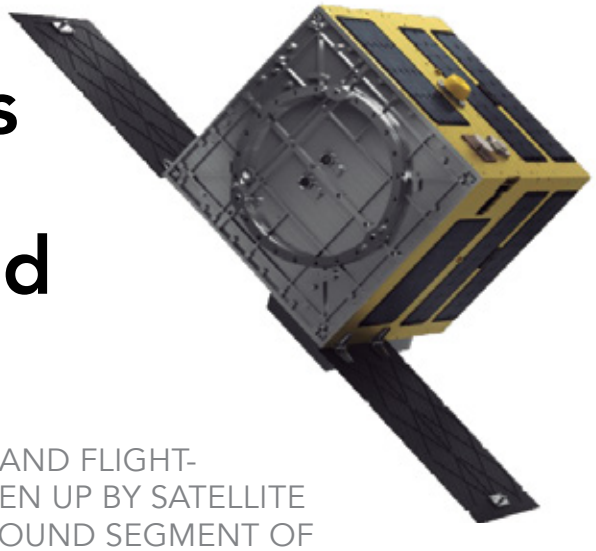
As part of the 58th Anniversary of the National Security Cabinet of Portugal (GNS), GMV was invited to provide a demonstration of Galileo's governmental service, PRS (Public Regulated Service), which should be fully operational by 2020.

At a ceremony attended by the Minister of the Presidency and Administrative Modernization, Maria Manuel Leitão Marques, GMV successfully showcased this service, which aims at providing a more robust GNSS solution as compared to the Open Service, i.e. more reliable and resistant to interference.

The PRS service, controlled through encryption key management systems, is restricted by GNS to authorized users, such as civil protection, security forces, armed forces, judicial entities and customs authorities, among others.

The main tasks of the PRS National Pole, due to be fully operational by 2020, will be verification of national PRS use rules, risk assessment, the reporting of security incidents and the distribution of encryption keys to national users.

Catapult takes up GMV's flight-dynamics and mission-planning systems for the ELSA-d mission



flexplan AND ***focussuite***, GMV'S MISSION PLANNING AND FLIGHT-DYNAMICS SYSTEMS, RESPECTIVELY, HAVE BEEN TAKEN UP BY SATELLITE APPLICATIONS CATAPULT TO FORM PART OF THE GROUND SEGMENT OF THE END-OF-LIFE SERVICE BY AstroScale (ELSA-D)

ELSA-d is a service-demonstration mission for end-of-life services. The mission comprises two satellites, an active, controlled vehicle called "Chaser", which rendezvous, docks or captures, and another vehicle or simulated space debris called the "Target".

The Chaser is equipped with optical sensing instruments and a redundant capture mechanism, while the Target is mounted on a docking plate to make it easier to identify, approach and capture.

The mission's aim is to demonstrate the Chaser's capacity to approach and capture end-of-life satellites. Once the object has been captured, the Chaser will shift it into a safe parking orbit or launch it into the atmosphere to burn it up. This will avoid the buildup of space debris from end-of-life space missions.

This concept is of the utmost importance for two reasons:

- There is a growing concern about the buildup of space debris among most space agencies, which have launched various initiatives for cataloging and monitoring it (take the example of ESA's SSA program), with a planned budget increase in coming years.
- In line with the above, the announced launches of mega satellite constellations for the upcoming years mean that they will need to be removed upon reaching the end of their useful lives.

If the demonstration mission is successful, AstroScale will offer commercial and institutional operators these capture services for their missions, reusing the ground segment developed for the demo mission. This will consolidate the presence of both ***flexplan*** and ***focussuite*** within AstroScale's future space-debris capture missions.

GMV invited to a workshop organized by MAPAMA and the European centre for weather forecasts ECMWF

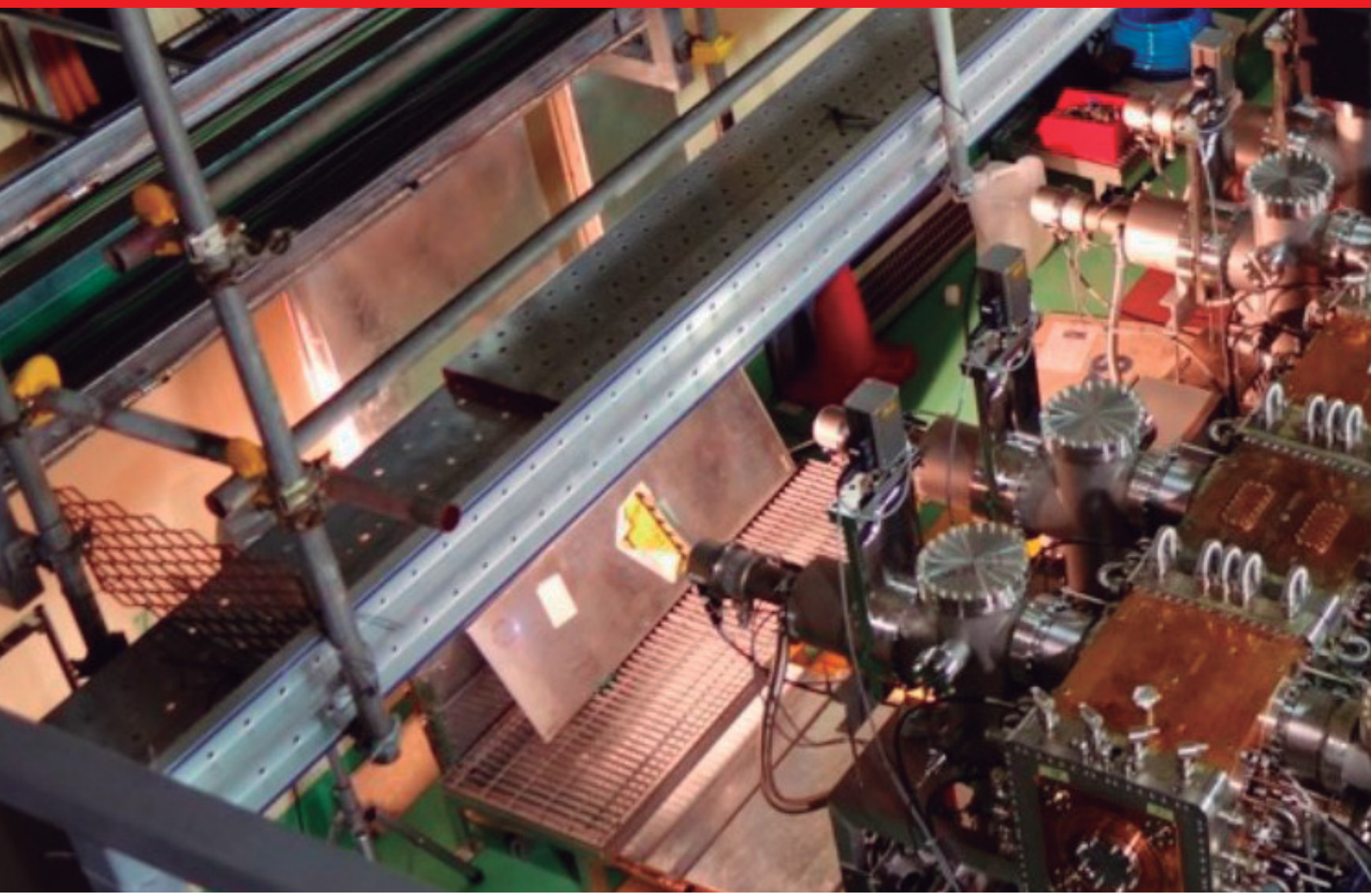
The European Centre for Medium-Range Weather Forecasts (ECMWF) is an independent intergovernmental organization supported by 34 states. ECMWF is both a research institute and a 24/7 operational service.

ECMWF runs two Copernicus services by delegation of the European Commission: the Copernicus Atmosphere Monitoring Service (CAMS) and the Copernicus Climate Change Service (C3S).

In late 2017, in conjunction with the Ministry of Agriculture, Food and the Environment (*Ministerio de Agricultura, Alimentación y Medio Ambiente*: MAPAMA), ECMWF organized the workshop "Copernicus for Green Growth and Smart City development" as part of the activities to bring Copernicus services and products to wider notice. The workshop was coordinated by the National Copernicus User Forum.

The workshop set out to encourage use of Copernicus atmosphere-monitoring products by the environmental community and Spanish urban-sustainability managers.

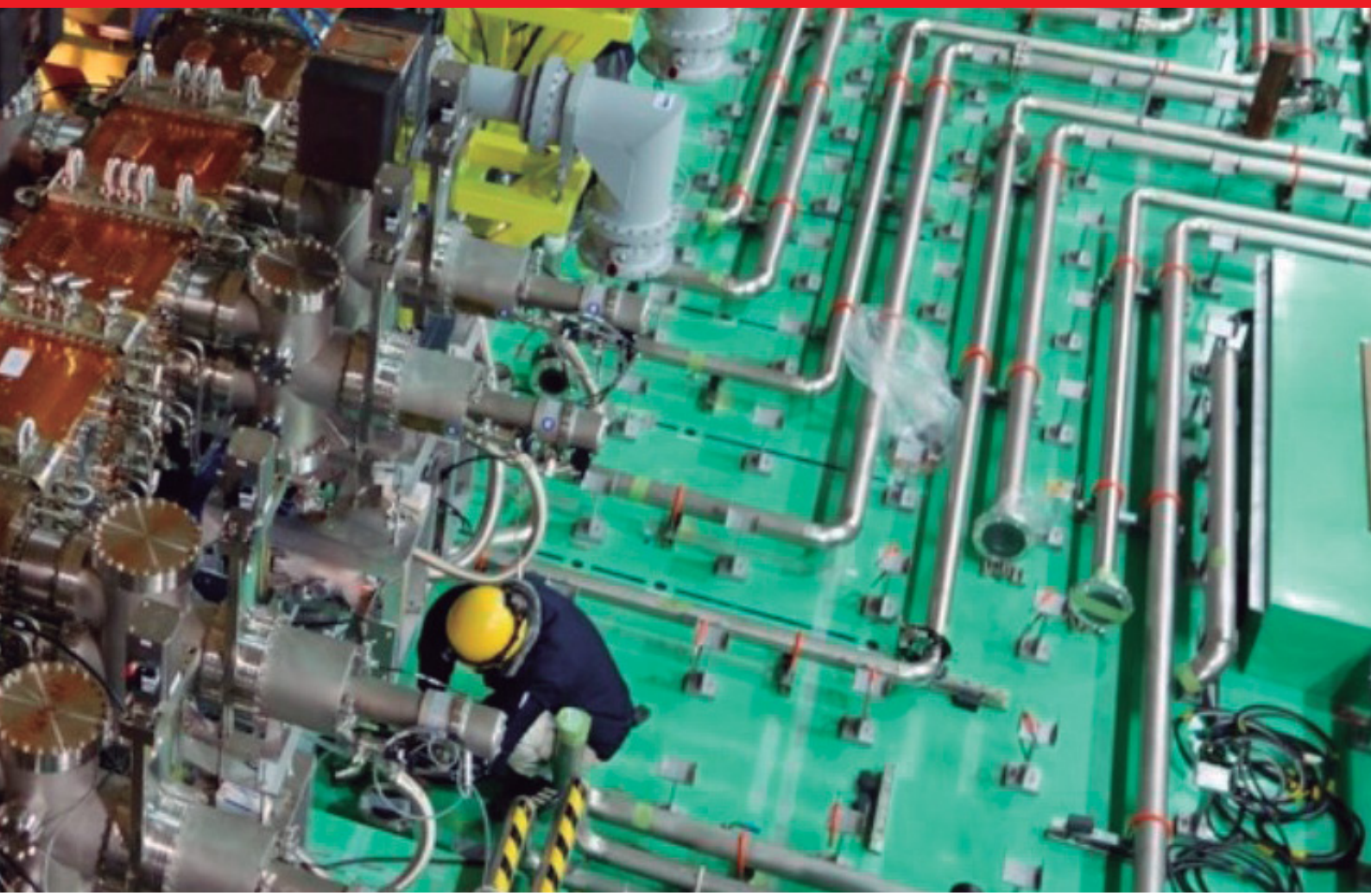
In the section dealing with the benefits of Copernicus for industrial users, Julia Yagüe, head of GMV's Copernicus Services, presented Urban GreenUp, an H2020 project that aims to develop a European strategy for re-naturing cities through Nature-Based Solutions.



GMV successfully completes its contribution to the new LIPAc phase

To reproduce the radiation conditions inside a fusion reactor, it is necessary to build a specific neutron source based on the nuclear reaction produced between deuterium and lithium nuclei. The conceptual design of an irradiation facility has been brewing since the nineties under the name International Fusion Materials Irradiation Facility (IFMIF).

The "Broader Approach" (BA) agreement, signed in 2007 between Europe and Japan, created a collaboration framework between hundreds of nuclear-fusion experts, focusing on the technological challenges beyond ITER, under the coordination of the Japanese National Institutes for Quantum and Radiological Science and Technology (QST) and the European Fusion for Energy (F4E) agency.



IFMIF is reckoned to be crucial in designing the post-ITER future on the basis of the information obtained on material behavior under the expected neutron radiation. As part of the agreement, therefore, a project called IFMIF Engineering Validation and Engineering Design Activities (IFMIF/EVEDA) is being carried out, with the aim of proving the technical feasibility of IFMIF. In particular, one of the subprojects includes the validation activities for the accelerator system, which involves the construction in the Rokkasho Reprocessing Plant (Japan) of a prototype accelerator similar to those of the IFMIF (LIPAc: Linear IFMIF Prototype Accelerator), with different phases.

Through a local Japanese partner, GMV has now been working successfully for QST for the last two years, in the Central Control System (CCS) of the LIPAc of IFMIF/EVEDA, specifically on the design, development, implementation and testing of subsystems updated and added on for the imminent B phase. The developments are carried out on the industrial control system EPICS and include not only the real-time control and instrumentation side but also the data archivity. This project involves the collaboration of the *Universidad Politécnica de Madrid* through the Research Group in Instrumentation and Applied Acoustics and the Particle Accelerator Laboratory IZPILab of the University of the Basque Country (*Universidad del País Vasco /Euskal Herriko Unibertsitatea*: UPV/EHU).

In the words of Juan Carlos Llorente, GMV's Head of Business Development in this field of Big Science Facilities, "*Thanks to the excellent results to date and given the impeccably professional approach and experience of all parties involved, we confidently expect client satisfaction to bring new opportunities in the following phases and in similar, simultaneous or subsequent developments, including DONES (DEMO-Oriented Neutron Source), consisting basically in a simplification of IFMIF*".

Through a local Japanese partner, GMV has now been working successfully for QST for the last two years, in the Central Control System (CCS) of the LIPAc's Prototype Accelerator of IFMIF/EVEDA

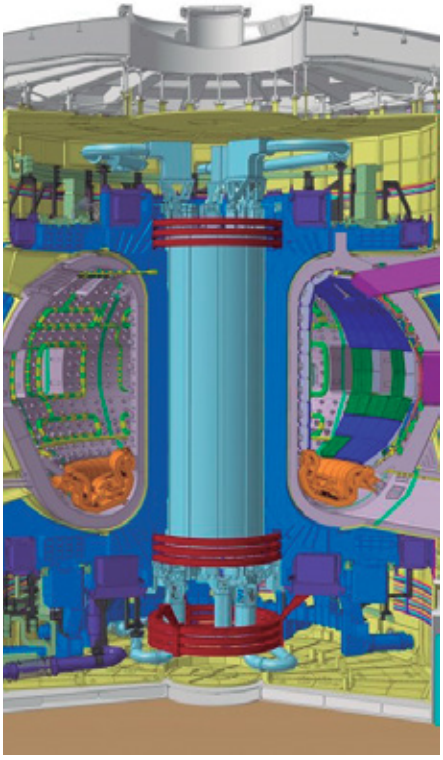
New Contract with ITER Organization

GMV has won a new framework service contract from ITER Organization (IO), the object of which is to provide the development, maintenance and support services for microTCA™ device controllers in the context of their use in the CODAC Core System (Control, Data Access and Communication)

CODAC, based on open-source software like EPICS, CSS, etc, is ITER's brain and nervous system.

MicroTCA™ or µTCA™ (Micro Telecommunications Computing Architecture), for its part, is an open standard of the PICMG consortium (Peripheral Component Interconnect Industrial Computer Manufacturers Group) for compact, high-performance modular systems. This is an advanced computational telecommunications architecture specifically designed for the most demanding applications that need to cope with a high communication bandwidth, a great processing capacity and high availability. This is the case of some applications in Big Science Facilities such as control of low-level radiofrequency in the European X-ray free-electron laser facility (XFEL), data acquisition in the ITER magnetic diagnostic system or in the future European Spallation Source (ESS).

This new project will draw on GMV's wealth of experience and expertise in real-time critical software engineering, by means of client services or projects, as well as its knowledge built up in previous NDS-related projects (Nominal Device Support, the infrastructure for the development of said device controllers) and CODAC.



GMV signs its first contract with ESS

THE EUROPEAN SPALLATION SOURCE (ESS), ONE OF THE BIGGEST SCIENCE FACILITIES UNDER CONSTRUCTION IN EUROPE TODAY, HAS AWARDED GMV A FRAMEWORK CONTRACT FOR PROVISION OF INTEGRATION SERVICES FOR INTEGRATED CONTROL SYSTEMS (ICS)

ESS is being designed to generate a neutron source for scientific uses, complementing the sources currently in operation, becoming the world's most powerful neutron source. ESS will also facilitate a wide range of new research activities as well as new discoveries in material engineering, life sciences, pharmacology, environmental technology, cultural heritage and fundamental physics. The neutrons will enable us to see and understand basic atomic forces and structures, in the guise of a gigantic microscope for studying various materials, ranging from plastics and drugs to engines, proteins, molecules and nanotechnology.

Organized as a European Research Infrastructure Consortium (ERIC) with over 15 European member countries, this facility represents the collective effort of hundreds of scientists and engineers. Construction work began back in September 2014 in Lund in southern Sweden, and the first neutrons are expected to be generated by the end of this decade. The Data Management & Software Center (DMSC) is near Copenhagen.

The 4-year framework contract awarded GMV includes several batches of integration-engineering services: control systems based on EPICS, embedded systems, industrial control systems, infrastructure and security of control systems, project management and training.

For GMV this contract represents a new chance to input value, drawing on its wealth of experience built up since its creation in control and instrumentation solutions, control centers, data processing and Cybersecurity, as demonstrated in other sectors like Big Science. It is also an opportunity to contribute with the greatest enthusiasm and zeal to the analysis and solving of the technological challenges posed by a unique facility like ESS.

GMV collaborates with Effective Space in the development and validation of small spacecraft

GMV HAS INITIATED A COLLABORATION AGREEMENT WITH EFFECTIVE SPACE SOLUTION LIMITED, A UK-BASED PRIVATE COMPANY THAT PLANS TO DEPLOY AND OPERATE A FLEET OF SMALL SPACE DRONE™ SPACECRAFT FOR LOGISTIC SPACE MISSIONS

In the first phase of this collaboration, each spacecraft will offer life-extension in-orbit services for near-end-of-life communication satellites in GEO (Geostationary Earth Orbit). The two first SPACE DRONE™ spacecraft, due for launch by 2020, have been designed and developed under a customer contract.

GMV is in charge of supporting the development of the service mission with several activities related to the execution of hardware- in-the-loop test campaigns in GMV's ***platform-art***© facility.

These activities include verification of the Rendezvous and Docking (RvD) system, testing of the sensor engineering models, checking of the onboard computers that run the GNC (guidance, navigation, and control) software, and the docking arms system.

Under this collaboration agreement GMV's ***platform-art***© facility is using industrial robots coupled with real time numerical simulation in order to reproduce the relative dynamics of the host satellite and the SPACE DRONE™ spacecraft, while it approaches the host satellite and docks with it. It therefore allows hardware-in-the-loop tests by stimulating the sensors as if they were in space.

The first test campaign was performed in late 2017 with the participation of the Effective Space engineering team. This first phase has focused on testing of the docking arms system prototype through state-of-the-art emulation of zero-gravity dynamic conditions.

Within the collaboration agreement between Effective Space and GMV another three ***platform-art***© test campaigns have been scheduled, to be performed throughout this year and the following year. At the moment GMV is busy developing one of the critical components of the SPACE DRONE™ RvD system, i.e., the image processing algorithm that will be used for detecting the customer's GEO host satellite and computing its position and attitude during the rendezvous maneuver.

GMV's *platform-art*© facility is using industrial robots coupled with real time numerical simulation in order to reproduce the relative dynamics of the host satellite and the SPACE DRONE™

Industrial autonomous vehicle research

State-of-the-art industrial autonomous vehicles, used in companies to completely automate internal logistics and transport, always call for a partial or complete adaptation of warehouse structure. This would include robot-compatible artificial marks on floor and walls to keep the required level of autonomy and decision-making capacity as low as possible.

The cost of deploying and maintaining this accessory infrastructure in the industrial environment could become very high, and any change in the scenario requires significant changes and modifications. Robot autonomy can hence be foiled by any unforeseen situations, without any decision-making capacity to allow the vehicle to continue with its tasks unaided.

Enter SISIFOT (Transport system and outdoor autonomous logistics for warehouses), a research project being carried out by GMV in collaboration with Automated Devices and Geko Navsat for the Ministry of Economy, Industry and Competitiveness.

SISIFOT is a planned research project into technologies, algorithms and techniques to acquire new knowledge in robust navigation of autonomous transport and logistics robotics systems to work indoors or outdoors in factories and warehouses.

GMV holds responsibility for management of the project, development of planning and navigation algorithms, integration of subsystems and system validation.

Under the SISIFOT project research is underway into various concurrent areas of Industry 4.0 to create advanced algorithms and the necessary technology for giving robots greater autonomy so that they no longer need a structured environment and are capable of dealing with any unexpected situations that might crop up, as well as any changes in warehouse layout.

In late March, under the aegis of this project, GMV's central office hosted the final project validation. During three days all the positioning and navigation algorithms plus the planning and maneuvering algorithms were put through their paces, proving the platform's autonomy capacity.

GMV working towards technological readiness of space robots

GOTCHA (GOAC TRL Increase Convenience Enhancements Hardening And Application Extension), a European Space Agency (ESA) project awarded to GMV with the collaboration of Universidad Carlos III, kicked off in late 2017.

GOTCHA aims to achieve an autonomous framework for space robots, increasing their Technology Readiness Level (TRL) to be used in future space systems.

Under this project, due to end by mid-2018, an autonomous system was set up in a planetary rover prototype, ESA's RAT platform, for which GMV has developed the software platform under the LUCID (Lunar scenario Concept validation and Demonstration) project.

GOTCHA adds several autonomy-boosting elements to the robot's existing software: a robotic controller, path-planner and trajectory control, plus an onboard mission planner that controls the actions of the rover platform in order to achieve high-level goals (e.g., gather science on a given area).

GMV's head office has recently successfully hosted several tests, using GMV's lunar rover prototype, LUCID, giving the go-ahead for field tests to be held in the upcoming months.

GMV forms part of OCEAN2020, Europe's biggest maritime-surveillance technology development program

OCEAN2020 REPRESENTS ONE OF THE MAINSTAYS OF THE PADR, WHICH SETS OUT TO PROVE THE FEASIBILITY OF A SPECIFIC DEFENSE RESEARCH PROGRAM IN THE NEXT EU MULTIANNUAL FINANCIAL FRAMEWORK OF 2021-2027 (EUROPEAN DEFENCE RESEARCH PROGRAMME: EDRP)

In coordination with the Spanish MoD, the Directorate General of Armament and Material (*Dirección General de Armamento y Material*: DGAM) and the Spanish Navy, GMV forms part of the European OCEAN2020 consortium, to which the European Commission has awarded the biggest project of the first round of activities of the Preparatory Action on Defense Research program (PADR). Primed by the Italian multinational Leonardo, the consortium of 42 partners from 15 European countries signed the contract with the European Defense Agency (EDA) in March.

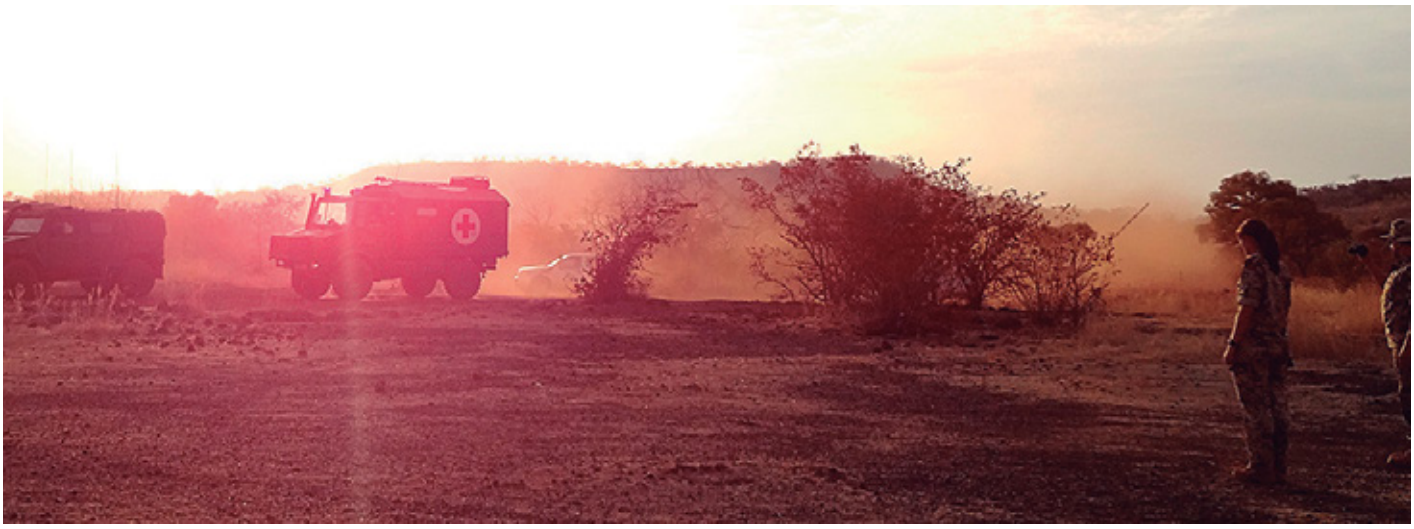
OCEAN2020's partners include the ministries of defense of Italy, Greece, Spain, Portugal and Lithuania, with additional support from the MoDs of Sweden, France, the United Kingdom, Estonia and the Netherlands. GMV has a twofold participation in the project, with its subsidiaries of Spain and Portugal both taking part. OCEAN2020's industrial partners includes the Spanish firms INDRA and Seadrone plus the most important companies of the European defense sector such as SAAB, Safran, PGZ, Ficantieri and MBDA. Other participants include research centers such as NATO's Centre for Maritime Research and Experimentation (CMRE), Fraunhofer IOSB and Qinetiq.

GMV's particular contribution focuses on C2 (Command and Control) and JISR (Joint Intelligence, Surveillance and Reconnaissance), in keeping with the company's international track record in these areas. As part of Spain's participation in NATO's MAJIIC (Multisensor Aerospace /Ground Joint ISR -Intelligence, Surveillance and Reconnaissance- Interoperability Coalition) project, GMV is responsible for the SAPIIEM system (made up by several systems such as ATENEA, COLLECTOR, CSD SIERRA, SIERRA tools and C2NEC), which pools information from several sources in different formats, providing intelligence analysts with the necessary wherewithal for exchanging ISR information and workflows, ensuring interaction in all JISR phases. GMV's participation in OCEAN2020 also includes the design and development of a Brussels-based European Centre of Maritime Operations, to be set up under the project.

Under the project two demonstrations will be conducted in a real scenario of maritime surveillance and interdiction missions. Coordinated by the Italian Navy, the first exercise will be held in 2019 with key participation by the Spanish Navy. GMV will be rolling out its intelligence and command-and-control solutions. The second exercise, coordinated by the Swedish Navy, will be held in 2020 in the Baltic Sea.

GMV's participation in OCEAN2020 also includes the design and development of a Brussels-based European Centre of Maritime Operations, to be set up under the project

GMV participates in EDA's Innovation for Field Medicine workshop



In late January the European Defence Agency (EDA) put on the workshop "Innovation for Field Medicine" with the aim of supporting future Multinational Medical Modular Unit (M3U) developments, fostering a platform for multinational collaboration and establishing a dialogue with industry.

The Workshop was structured in three sessions: Advancements in pre-Hospital care Field Hospitals for present and future CSDP Operations and Medical training and Simulation.

The Workshop served, on the one hand, for gathering information for the EDA study being carried out by GMV called "Command, Control & Communication applied to Multinational Medical Support", giving GMV the chance to swap ideas on the study with some of Europe's leading experts.

GMV also gave a workshop paper to present its healthcare ICT solutions and analyze the obstacles and opportunities for European cooperation in the military medicine area.

GMV's participation in this event cements its position as a benchmark firm in command and control solutions for multinational environments at European level

BRISAN shows GMV and the EDA its skills and capabilities

On 28 February the Spanish army's Healthcare Brigade (*Brigada de Sanidad*: BRISAN) was visited by personnel of the Directorate General of Armament and Material (*Dirección General de Armamento y Material*: DGAM) accompanied by a working team made up by GMV personnel and military healthcare personnel from Germany, the Czech Republic, Slovakia, Italy, Cyprus, Belgium and Switzerland, members of the Project Team Medical of the European Defence Agency (EDA).

This visit was part of the umbrella study "Command Control & Communication Applied to Multinational Medical Support", which GMV is carrying out for the European Defence Agency.

After a presentation of the Brigade's organization and capabilities the delegation then visited the healthcare-instruction simulation classroom and then the combat healthcare instruction runway to witness an exhibition of the simulation resources deployed there.

Lastly, the visitors were shown the capabilities, skills and makeup of the ROLE 2 Function of the Forward Surgical Team (FST).

MARISA, artificial intelligence and Big Data applied to maritime surveillance

UNDER THE MARISA PROJECT (MARITIME INTEGRATED SURVEILLANCE AWARENESS) GMV IS DEVELOPING ALGORITHMS FOR DETECTING SHIPS CARRYING OUT ILLEGAL ACTIVITIES

On 16 and 17 January GMV's Tres Cantos head office hosted the 2nd User Community & Innovation Management Meeting, a MARISA stocktaking meeting.

One of the most important of these up-and-running projects is the Maritime Integrated Surveillance Awareness (MARISA) initiative, nearly 82% funded by the European Commission under the umbrella Horizon 2020 program.

The overriding aim of MARISA, which kicked off in May 2017, is the integration of Big Data with multi-sensor data-fusion; this groundbreaking technique involves the mining of data from different sources to glean useful, top-quality information, applied in this case with maritime security in mind. This will be made possible by a set of interoperable tools that give easier access to data generated by various technological resources that are currently in operation.

II User Community & Innovation Management Meeting - GMV, Tres Cantos (Madrid)

The project consortium, led by the Italian multinational Leonardo S.p.A., includes 21 companies from 9 different EU member states. GMV is one of these partner companies, playing a standout role in the project. It is responsible for system design, the development of several data-fusion and anomaly-detecting algorithms, as well as the Spanish and Portuguese trials to be held in collaboration with the Spanish Guardia Civil and the Portuguese Marinha.

It brought together over 50 attendees including consortium partners, end users and representatives from the industry, research centers and agencies to weigh up the project to date and define operational trials and scenarios. The meeting also helped to share knowledge, swap notes and profile project-user requirements.

GMV participates in the "Industry Day on Border Surveillance and Integrated Border Management" organized by the European Commission

On 6 and 7 February GMV participated in the Industry Day on Border Surveillance and Integrated Border Management, put on by the European Commission with the industry in Brussels

The main remit of this Border Surveillance and Integrated Border Management Day was to present to the industry the first results of the evaluation made of EUROSUR and its services and communications network, in which GMV has played a key role.

The EUROSUR network nodes are currently deployed in the National Coordination Centers (NCCs) of all EU countries of the Schengen area, thus allowing for the exchange of information on EU border incidents in relation to such aspects as irregular immigration, drug- and goods-trafficking and the falsification of documents. GMV has a framework contract with FRONTEX, the European Border and Coastguard Agency, for maintenance and development of the EUROSUR network.

The results of the Commission's evaluation shows the success of EUROSUR's operational concept, with over 140,000 incidents notified on the network since it was set up.

As well as the papers dealing with EUROSUR, others were presented looking at the European Commission's most important border-surveillance-related R&D initiatives, projects in which GMV is playing a standout role.

Spain's Guardia Civil, for its part, presented the CLOSEYE project in which GMV, together with Airbus Defence and Space, led the solution deployed in the Alboran Sea. Furthermore, the Operations Manager of SATCEN and the DG GROW of the European Union presented, respectively, the services provided by SATCEN and COPERNICUS in support of EUROSUR; both programs in which GMV is actively participating as one of Europe's leading players in remote detection services.

GMV showcases its security and defense solutions to NATO

PUT ON BY THE SPANISH ASSOCIATION OF DEFENSE, AERONAUTICS AND SPACE TECHNOLOGIES (*ASOCIACIÓN ESPAÑOLA DE TECNOLOGÍAS DE DEFENSA, AERONÁUTICA Y ESPACIO: TEDAE*) FROM 26 TO 28 FEBRUARY, THE PLENARY MEETING OF THE NATO INDUSTRIAL ADVISORY GROUP (NIAG), HELD IN THE TOLEDO INFANTRY ACADEMY (*ACADEMÍA DE INFANTERÍA DE TOLEDO*), BROUGHT TOGETHER DELEGATIONS FROM 26 ALLIED COUNTRIES AND OVER TWENTY SPANISH FIRMS

NIAG, set up in 1968, is a high-level consultative and advisory body of senior industrialists from NATO member countries and is industry's main liaison body with the Atlantic Alliance.

As part of this meeting, in the industry-centered day of 28 February, GMV was able to show NIAG foreign delegations its capabilities, technologies and state-of-the-art products. GMV displayed its experience in JISR (Joint, Intelligence, Surveillance and Reconnaissance) command and control systems, focusing on its participation in NATO's MAJIIC project, where GMV is collaborating not only with diverse NATO organizations but also MoDs of alliance members from both sides of the Atlantic. Its range of products includes its inhouse Mobile ISTAR Operating system (called SEISMO after its Spanish initials: *Sistema de Explotación ISTAR Móvil*), CSD (Coalition Shared Database), Atenea (IRM&CM Tool) and COLLECTOR (ISR sensor simulator), which pools information from many different sources to provide intelligence analysts with the necessary tools for exchanging ISR information and performing workflows that enable interaction throughout all JISR phases.

Also, within the B2B encounters between the companies, the NIAG delegations and accompanying companies from their respective countries, GMV was able to sound out other cooperation arrangements and find out at first hand about future needs pertaining to industrial, technical, economic, managerial and other R&D aspects as well as the defense-related productions of the delegations of member countries.

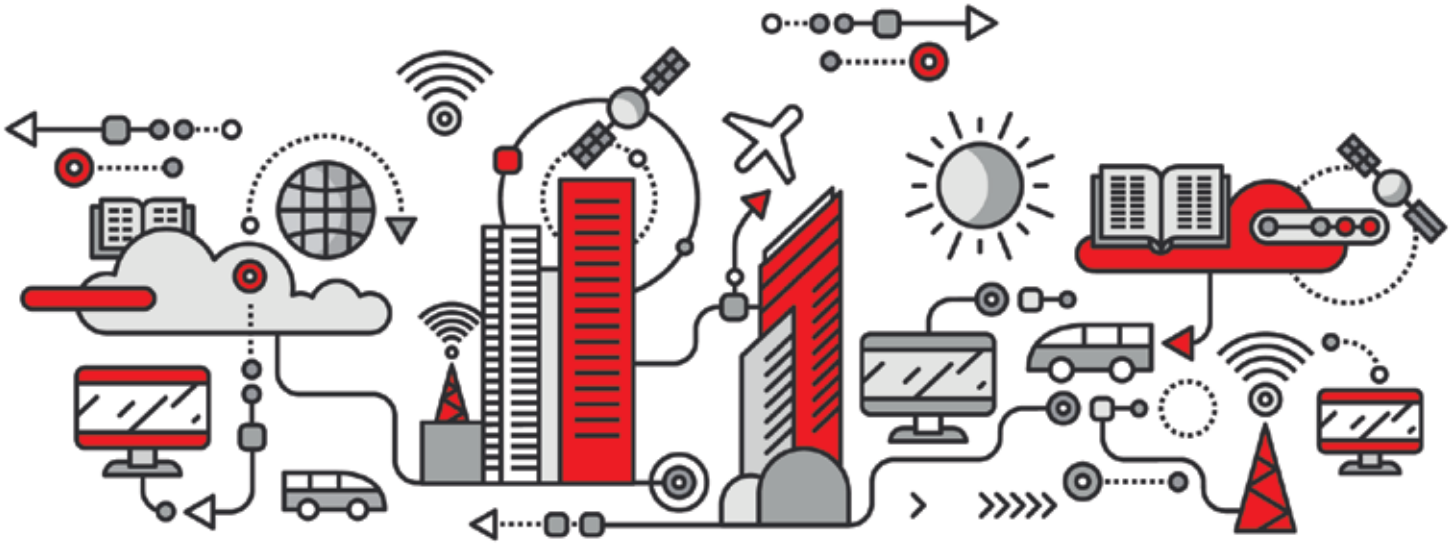
Some of the leading figures attending the conference were the Director General of Armaments and Material of the Spanish MoD, Lieutenant General Juan Manuel García Montaño; the Director of the Infantry Academy, Colonel Francisco Javier Marcos, and the NIAG President, John Jansen.

GMV participates in Infoday H2020 "Secure Society Challenges"

On 20 February, as part of the International Security Tradefair, SICUR´18, the Industrial Technology Development Center (*Centro para el Desarrollo Tecnológico Industrial*: CDTI), in collaboration with the Spanish Association of Defense, Aeronautics and Space Technologies (*Asociación Española de Tecnologías de Defensa, Aeronáutica y Espacio*: TEDAE), put on Infoday H2020 "Secure Society Challenges".

The aim was to set up an information-exchange and meeting forum for defense and security organizations.

As a key player in areas such as border surveillance, emergencies and Cybersecurity, GMV gave one of the papers on the role of industrial associations in the H2020 program and also took the chance to check out the new developments and establish possible technological collaborations.



Cybersecurity Challenges in Smart Cities

ICTS HAVE BECOME INDISPENSABLE IN OUR LIVES. DAILY TECHNOLOGICAL DEPENDENCE IS PATENT, IN TRANSPORT, HEALTHCARE, ENERGY, IN WORK AND DEALINGS WITH GOVERNMENT AUTHORITIES

Cities have been obliged to bring themselves into line with these swingeing changes, turning themselves into Smart Cities in all aspects. Nonetheless, this greater citizen connectivity with the city, through its services, its infrastructure, makes both parties more vulnerable.

One of the main concerns revolves around the sensors being deployed around cities, most of which are not configured securely; neither are they tested properly. These devices have now fallen within the sights of cybercriminals, since they are easily tampered with, causing failures in data taking, system shutdowns, traffic light management, upsets in power and water supply/etc. There is now a need for a proper selection of technology with the requisite security controls and measures, with the same attention paid to this technology's functionality and security characteristics.

Another of the security aspects to be considered in any Smart City is its attack surface. This is currently growing in line with all the following factors: the increasing complexity of any smart city's infrastructure, the deployment of more complex systems, the existing interdependencies between components and services, connectivity with citizens and the constant dataflow in this whole city-modeling platform. Thus, any device connected up to a smart city's platform is open to attack and could then spark off an even larger-scale attack, not only in our city platform but in all the services it is managing (lighting, water supply, transport, etc.).

The last point to be dealt with is the data. Data traveling from sensor to sensor, exchanged between the various actors, Apps and access channels.

Any Smart City project will have to be modeled as a platform on which Cybersecurity experts have to be involved from the very start, from the initial design, identifying weak points, the proper data encryption measures, establishing the compliance level of the identified Cybersecurity measures and thus cutting down the risk level of the city's essential service provision infrastructure.

Monitoring platforms can give some control over what is happening in our cities, pinpointing and analyzing any Cybersecurity incidents. Just as the major firms nowadays run a computer security incident response team (CSIRT/CERT), any smart city will have to make attack-risk reduction arrangements, be capable of responding to any incident and guaranteeing the highest possible quality of life of its citizens.

How BBVA is managing its corporate security at moments of transformation

IT HAS ALWAYS BEEN SAID THAT ANY CHAIN IS ONLY AS STRONG AS ITS WEAKEST LINK. LIKEWISE, ANY SECURITY SYSTEM IS ONLY AS STRONG AS ITS LEAST SECURE POINT. FOR THIS VERY REASON SECURITY STRATEGY SHOULD ALWAYS TAKE IN THE WHOLE PICTURE, ENSURING THAT EACH AND EVERY ONE OF THE ORGANIZATION'S ELEMENTS IS DULY PROTECTED

For the financial group BBVA one of the most critical aspects is its corporate security. Which security manager wouldn't like to know in real time all the incidents occurring in any of the company's worldwide offices, how they are interrelated and what action should be taken to prevent recurrence in the future? This is a stiff challenge for a banking firm running 8271 banks worldwide, employing 131,856 people and serving 72 million clients in over 30 countries. Since 2012 BBVA has managed to pull off this challenge thanks to taking up the GMV-developed ***Faro Corporativo*** platform, capable of ensuring the best possible management of all the organization's physical security arrangements. To date, BBVA has rolled out the solution in 11 countries and it is now being used by more than 1000 people.

We have been speaking with Inés Díaz Ochagavia, BBVA's Global Physical Security, who has helped to create and set up the platform. No one better, then, to tell us how ***Faro Corporativo*** has improved the banking company's corporate security management.
Inés tells us that one of Faro's most important inputs is the knowledge of what type of event is occurring and where, in real time. The tool is so highly automated that it cuts down the time needed to run security: real time information reports needed by any user are available instantly; emails are whisked off to user groups that need to be informed of the instant; it also provides predefined screens and visual risk maps…

GMV developed *Faro Corporativo* platform, capable of ensuring the best possible management of all the organization's physical security arrangements

Faro also improves the collation of all security-incident information that might call for an official casefile. It takes charge of all evidence custody (site images that might clear up the perpetrator of a theft); the maintenance and management of the organization's complete security activity documentation: protection plans, operational procedures, applicable legislation, checklists, Cybersecurity policies... keeping a single and global repository, cutting out overlaps and incongruences.

She wound up by stressing the benefit obtained from operations and maintenance of the security facilities, keeping a detailed control of incidents, of system renewals, budget control..., as well as evaluating the performance of external suppliers, especially the outsourced surveillance service. This service eats up a large chunk of the private security budget and a check needs to be kept that the service actually received matches the contracted service.

Inés Díaz, Global Physical Security BBVA Group

Our processes are more fleet-footed and uniform; we have managed to automate daily work, making it more flexible to suit the real needs of each user and obtaining bespoke reports. ***Faro Corporativo*** *has allowed us to improve decision making and control of the security function thanks to the global vision it affords us*

State-of-the-Art Cloud Security Study

With the coordination of Mariano J. Benito, CISO of GMV's Secure e-Solutions sector and coordinator of the Operational Technical Committee of the Spanish chapter of Cloud Security Alliance, the fifth edition of the "Study of the Art of security in the Cloud" was published. This study has been conducted with the collaboration of about 30 experts from Spain, Peru, Argentina, Chile, Bolivia, Brazil and Argentina, belonging to ISMS Forum, Cloud Security Alliance and ISACA.

The aim of this study is to explore the state of the art of cloud computing takeup from the users' perspective and the role played by security in this takeup.

The results show that users see the Cloud as increasingly trustworthy with more reliable security conditions. The upcoming entry into force of the General Data Protection Regulation on 25 May 2018 is one of the most attention-grabbing features at the moment, especially in the public sector and in the services and financial sector. Although Cloud service clients' satisfaction levels have risen, the service is still below their expectations, with a particularly striking need to improve legal compliance in the future.

The report also points to a shortcoming in Cloud users' security awareness, both at management and worker level. One of the positive features is that users migrating into Cloud services note an improvement in their incident detection capacity, both in number and criticality, thereby being able to cut down management resources.

Portugal will have a Cybersecurity and Cyber-defense training center

Portugal will have a "national center of excellence" for training and practice in "Cybersecurity and Cyber-defense" within the framework of a NATO-led project in the country. GMV is part of the 40 organizations and companies that formalized with the Ministry of Defense the start of this project.

The first pole of the so-called "Cyber Academy and Innovation Hub" will be installed at the Military Academy in Amadora, Portugal. Its operation should extend to other academic institutions that are part of the project.

At the signing ceremony of the protocol between the Ministry of Defense and organizations, universities and companies, National Defense Minister Azeredo Lopes pointed to knowledge in Cyber-defense and Cybersecurity as a "broad strategic priority" for the Government. José Neves, Director of GMV Portugal's Security and Defense sector, represented GMV during the signing ceremony.

The new center, coupled with the transfer to Portugal of NATO's information and communication systems academy, will allow Portugal to affirm itself "*as a center of national excellence*" in the areas of Cybersecurity and Cyber-defense, said the Minister Azeredo Lopes.

The cyberthreats trend and sector response

Pedro Lopes Vieira, Business Development Manager of GMV's Secure eSolutions sector in Portugal

How are cyber-threats evolving and how is the industry responding?. How has the WannaCry fallout affected organizations' awareness of the overriding importance of this area of IT? Pedro Lopes Vieira, Business Development Manager of GMV's Secure eSolutions sector in Portugal, joined other market players to answer these and other questions and discuss the current context of Cybersecurity at a roundtable organized by the specialized media IT Channel.

According to Pedro Lopes Vieira, "*the headline-grabbing nature of the 2017 attacks brought security and data management into the foreground, raising awareness of the problem*". He goes on: "in 2018 other attacks will happen." The new General Regulation on Data Protection, binding as from May 25, was also one of the subjects discussed, and for Pedro Lopes Vieira there is an "*induced motivation*" since it will force cultural changes in the way of looking at information.

Artificial Intelligence (AI) was another central feature, considered as a double-edged sword, since the availability of AI and machine learning tools looks likely to make hackers' lives easier and their attacks more agile and automatic. However, the malicious use of AI is not only limited to the automation of attacks; "*Another important factor here is diversification; hackers can now turn to user behavioral analytics to imitate human behavior, even giving rise to the buzzword term of AI weaponization. The botnet of things, the diversification of the ability to produce attacks using remote computing will be a trend*" concluded Pedro Lopes Vieira.

In 2018 Cybersecurity continues to be one of the companies' biggest concerns as threats are becoming increasingly complex and sophisticated.

GMV collaborates in implementation of the NIS Directive

GMV has provided twenty-three options for improvement in the transposition of the European NIS Directive into Spanish legislation, in such fields as penalizing mechanisms, the approach to security improvement of penalizing organizations, the CISO's law-abidance role within organizations, the auditing right of organizations subject to the law, communications between organizations and government authorities, the security incident information retention period or the incident reporting method and arrangements.

Security and reliability and security of network communications and information systems are essential for the common activities in our Information Society. Several examples (WannaCry, Petya, DyN, for example) have shown significant impacts on security incidents and how they can affect different Member States and the Union as a whole, influencing economic and social activities. They can also generate considerable financial losses, altering the routines of citizens and the services that are used on a daily basis, undermining user confidence and causing major damages to the economy of the Union.

For that reason the European Union has been promoting a series of actions to guarantee higher security in information systems and networks, such as the "European Union Cybersecurity Strategy" and the "NIS Directive" (European Parliament and of the Council concerning measures for a high common level of security of network and information systems across the Union), Directive (UE) 2016/1148). They continue and extend other nearby and ongoing actions as, for instance, GDPR.

As it is a European Directive, its adoption in the legislative body of the Member States requires a process of transposition in each one of them. Therefore, Spain initiated this process and submitted the text prepared by the legislator to a process of public consultation by Industry and citizens, prior to its processing and approval by Parliament. GMV has offered its knowledge and experience to the Spanish government, participating in the public enquiry for bringing the Directive into line with Spanish legislation, both individually and in collaboration with other organizations and associations of which it is a member or with which it collaborates.

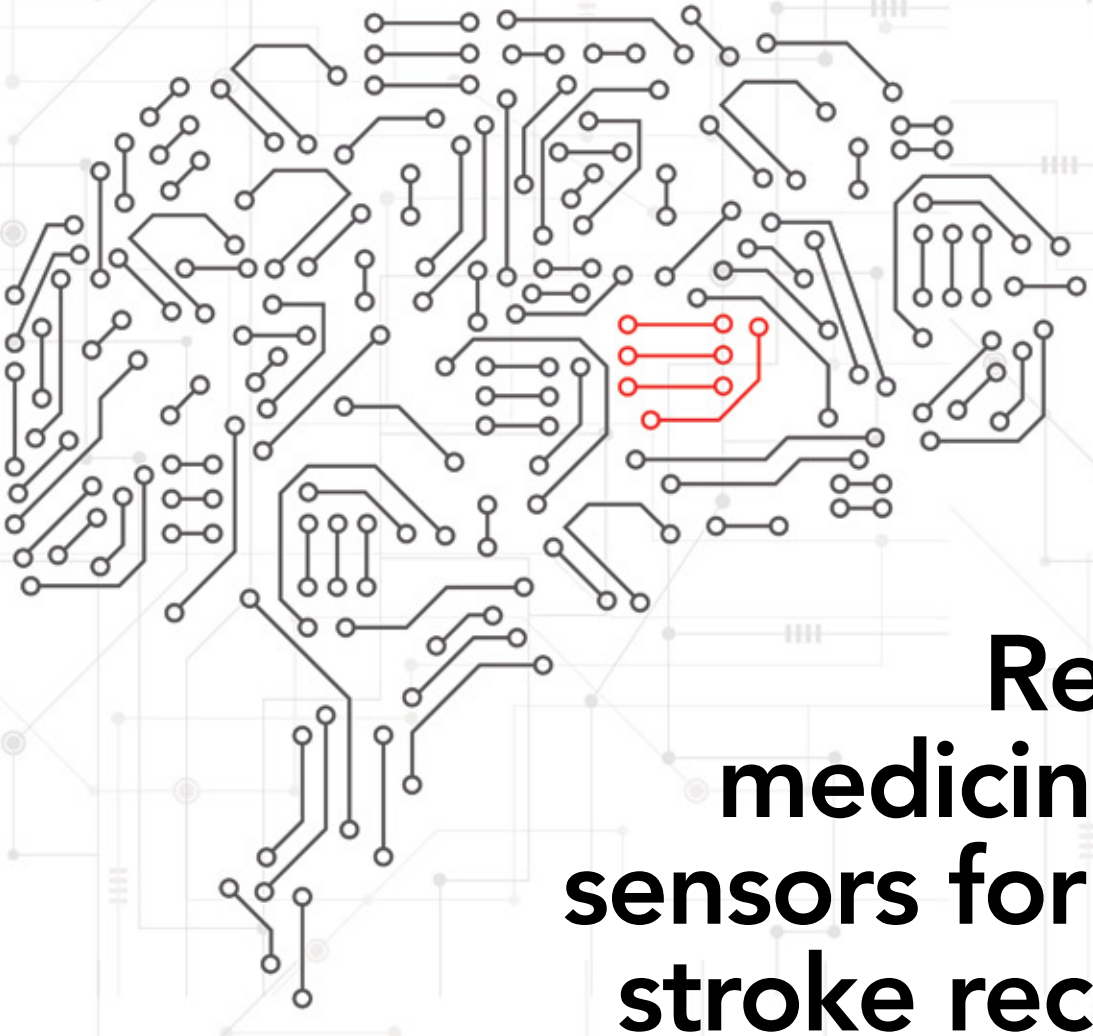
The best ATM-vulnerability-combatting solutions brought together in Las Vegas

THE USA HOSTED A MEETING OF THE WORLD'S MAIN ATM (AUTOMATED TELLER MACHINE) STAKEHOLDERS, DISPLAYING THE LATEST TECHNOLOGY TRENDS AND SECURITY BREAKTHROUGHS

For yet another year ATMIA (ATM Industry Association) put on one of the sector's most eagerly awaited events "US Conference", under the banner headline this year of "Innovate and Succeed: the Next Decade for ATMs".

GMV, together with SPL Group, its US partner, showcased checker ATM Security as the world's most advanced solution to head off ATM cyberattacks. This inhouse GMV product has been protecting ATMs from cyberattacks for over 11 years; it is now safeguarding over 130,000 ATMs in more than 30 countries, cementing its market leadership. "*Attacks are becoming increasingly sophisticated and the banking industry's security methods are often falling short. We therefore stand in need of solutions specifically designed for ATMs, such as* ***checker ATM Security****, with which banks can protect themselves from cyberattacks*", in the words of Javier Fernández, presales engineer of ***checker ATM Security*** in the USA.

During the event experts warned that physical and logical ATM attacks are on the rise, and that financial service providers in the US need to pay heed to what is happening in Europe as a sign of what is waiting for them. For this very reason US providers need to place more stress on safety and give it top priority, even overriding client service and convenience. A clear indication of this situation is the U.S. Secret Service alert about the jackpotting attacks now hitting cash machines in the states.



Remote medicine and sensors for post-stroke recovery

THE SWITHOME PROJECT, IN WHICH GMV'S INHOUSE ***antari Home Care*** PLATFORM IS PARTICIPATING, KICKED OFF IN 2018

The number of people suffering a stroke increases year after year. According to London's King´s College report "The Burden of Stroke in Europe" between 2015 and 2035, overall there will be a 34% increase in total number of stroke events in the European Union.

SwitHome came into being in 2018 with the aim of improving post-stroke walking rehabilitation in the home under the supervision of a specialist. Thanks to ***antari***, stroke sufferers can perform this rehabilitation at home under the supervision of a specialist. The rehabilitation of these patients calls for resources that are often insufficient or even completely missing. On many occasions it is the family members themselves who have to fend off long-term incapacity unaided. To help them in this task and also allow physical rehabilitation units to cater for more patients, this home-rehabilitation project has been promoted.

SwitHome's smart insoles record such walking data as patients' stride distance, gait, etc, and also map the pressure at different points. Taken together with GMV's inhouse remote healthcare platform ***antari Home Care***, this then enables therapists to monitor patients' progress and adjust the rehabilitation plan to suit. The readings are digitally recorded in high resolution and are easily retrievable at any moment. This allows the specialist to assess treatment efficacy, both past and present, and thus build up priceless knowledge allowing him or her to adjust the rehabilitation plan accordingly. The only equipment needed to be able to benefit from the patient-therapist web platform, ***antari***, is an internet-connected computer. And all this without patients having to leave their homes.

The advantages of rehabilitation supervised and guided in the patient's home are numerous. First and foremost it boosts patients' treatment loyalty and keenness to involve themselves in their own recovery, two of the fundamental factors determining the effectiveness of any therapy. For patients the advantage is obvious; they can monitor their own rehabilitation at home under medical supervision but without having to travel elsewhere.

The average cost of each rehabilitation session, for a post-stroke patient to recover motor functions, comes out at over €50. With SwitHome each remote session will cost a total of €15. Other benefits of the project besides this cost reduction are personalized care without the patient needing to go to a rehabilitation center and the capacity of catering for more people with the same resources. The project, one of the most ambitious publicly funded healthcare initiatives, is being promoted by EIT Health Spain and led by Portugal's Instituto Pedro Nunes.

antari Home Care, enables therapists to monitor patients' progress and adjust the rehabilitation plan to suit

The Big Data clinical and epidemiological platform, HEXIN, hailed by WITSA

The World Information Technology and Services Alliance (WITSA) has granted its Innovative e-Health Solutions Award to HEXIN, the Big Data platform for mining clinical and epidemiological data of the Galician Health Service (*Servicio Gallego de Salud*: SERGAS).

Developed with GMV technology, HEXIN is the first system of its kind taken up by a Spanish regional authority, furnishing over 300 healthcare professionals with information made up by predefined reports with clinically useful stats, adding up to a total of 800 corporate documents all available to the general public. HEXIN was nominated for the WITSA Awards by the Spanish Association of electronic, information-technology, telecommunications and digital-contents firms (*Asociación de Empresas de Electrónica, Tecnologías de la Información, Telecomunicaciones y Contenidos Digitales*: AMETIC), a member of this consortium of international associations representing over ninety percent of the world ICT market.

The Iberian Telemedicine and Telehealth Society recognizes GMV's commitment to healthcare

IN THE 2ND TELEMEDICINE AND TELEHEALTH FORUM THE IBERIAN TELEMEDICINE AND TELEHEALTH SOCIETY (*SOCIEDAD IBÉRICA DE TELEMEDICINA*: SITT) HAILED THE WORK OF THOSE WHO HAVE MADE A SPECIAL CONTRIBUTION TO MODERNIZING HEALTHCARE SERVICES IN IBERO-AMERICA

In the event, which brought together prestigious specialists from the whole of Ibero-America, Carlos Royo, Director of Healthcare Strategy at GMV's Secure e-Solutions sector, was appointed Partner Honoris Causa by the SITT Governing Board for the work he has been carrying out for years, facilitating communication and collaboration between engineers and doctors with the same aim in view: the population's health.

The GMV directive also presented some use cases of the remote medicine platform ***antari***, in fields like telepediactrics and teleophthalmology as well as its deployments in international projects to provide healthcare for troops posted on overseas missions or to diagnose the state of people who have just suffered a road accident.

antari Home Care: improving the prognosis and treatment of neck and low back pain

A scientific study conducted in 188 countries and published in the British medical journal, The Lancet, concluded that low back pain is the major cause of incapacity worldwide and the ailment that most hinders everyday living

The study listed the main cause of incapacity worldwide, a list headed by low-back pain and also featuring neck pain. Among them features GMV as industrial leader and technological partner in the European project Personalised Prognostic Models to Improve Well-being and Return to Work After Neck and Low Back Pain (back UP), coordinated by the Valencia Biomechanics Institute.

Under study is the design of a prognostic model to back up application of more efficient and effective treatment based on digital representation of clinical information and assessments with in silico techniques (simulations, modeling, experiments or analyses carried out with simulation algorithms and computational prediction). Applying machine learning, the aim is to obtain evidence on the basis of clinical information of a sundry nature drawn from different sources.

The idea is to help neck- and low-back-pain sufferers to recover and get back to work. Crucial amongst all this information is the patient-clinician interaction in the former's home, using GMV's inhouse remote medicine platform ***antari Home Care***. Prognoses about probability, treatment-dependent recovery time; recurrence risk; simulation of the affected musculoskeletal function during and after recovery, as well as associated costs of recovery treatment and sick leave are some of the data that will be obtained from the research carried out under this Horizon 2020 research and innovation project.

GMV participates in Inforsalud 2018

In the 21st National Healthcare IT Congress "Inforsalud", put on by the Spanish Healthcare and IT Association (*Sociedad Española de Informática y Salud*: SEIS) under the banner "Digital Health: a collaborative project", GMV shared its experience in Big Data, security and compliance. Rubén Villoria, Business Solutions for Health Privacy and Evidence in GMV's Secure e-Solutions sector, gave a detailed account of the project "MOPEAD: Big Data in the early detection of Alzheimer's Disease", where the company is inputting its healthcare Big Data experience and expertise. Furthermore, GMV's Head of the Security and Compliance Consultancy Section, Sonia Morales shared her expertise about how to successfully tackle the General Data Protection Regulation, in relation to the protection of individuals, the processing of personal data and its free circulation.

GMV completes its Syncromatics takeover

THE AGREEMENT FORMS PART OF THE INVESTMENT INITIATED BY GMV IN 2015, A NORTH-AMERICAN MARKET INVESTMENT STRATEGY THAT IS NOW ONE OF GMV'S CHIEF GROWTH LEVERS IN THE SECTOR

GMV has now completed its takeover of Syncromatics, a technology company specializing in Software as a Service (SaaS) or Software in the Cloud solutions for the public intelligent transportation systems (ITS) market.

As of now Syncromatics is providing its intelligent transportation solutions to over 130 operators and public-transport authorities in 26 different states of the USA. Some of its flagship and most recent clients are the City of Los Angeles Department of Transportation (LADOT), Los Angeles Metropolitan Transportation Authority (LA METRO), MV Transportation, Ventura County in California, Victor Valley Transit Association in California, and the city of Maui in Hawaii, among others.

GMV, for its part, is national ITS leader for urban public transport and railways; its systems have by now been set up in over 34,000 vehicles from more than 30 countries. Moreover, GMV's fare-collection or ticketing systems have been implemented in over 275 national projects, with standout clients like Transports Metropolitans de Barcelona (TMB), ALSA, AVANZA, Vectalia, RENFE, ALSTOM and Talgo. On an international level GMV's ITSs have been taken up in over 11 countries, pride of place going to Australia, Chile, Morocco,

SYNCROMATICS INTELLIGENT TRANSPORTATION SOLUTIONS

TRACKING & LIVE DISPATCH

REPORTING & ANALYTICS

REAL-TIME PASSENGER INFORMATION

WIFI

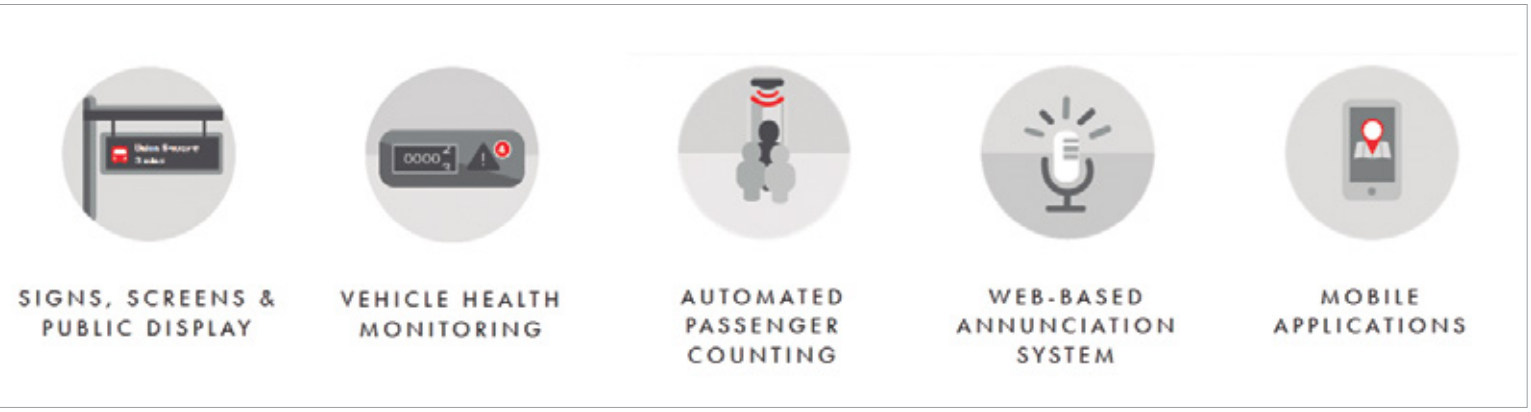
Malaysia, Mexico, Poland, Sweden and Uruguay. The company is now putting the finishing touches to the successful modernization of Cyprus's public-transport systems, a project involving nearly 400 ticket-vending machines in Santiago de Chile's metro. Likewise it is currently completing implementation of a fleet-management system for Sydney's new light rail network.

Syncromatics's technology range, complementing GMV's, is adapted to the North American market; right from the start the alliance of both companies has enabled them to tap into significant synergies of a commercial, technological and operational nature. This has boosted Syncromatics' growth and created added value for GMV. As fruit of these synergies Syncromatics is now on the point of integrating into its USA solutions the new family of equipment for advanced fleet-management systems and the built-in ticketing systems, in which GMV has been investing heavily for a year and a half and are now about to hit the market.

Since the first takeover phase was formalized in 2015, Syncromatics has tripled in size, even performing new acquisitions itself, such as its 2016 takeover of the demand response technology company Mobilitat Works Inc.

After this agreement GMV's North American ITS company comes to be known as GMV SYNCROMATICS, knitted seamlessly into GMV Group's set of companies.

By completing the 100% takeover of the Los Angeles-based technology company, GMV boosts its expansion capacity within the USA and cements its position in the worldwide ITS market



GMV signs new contracts in Poland

GMV HAS BEEN OPERATING IN POLAND SINCE 2008. GMV'S INTELLIGENT TRANSPORT SYSTEMS HAVE BEEN IMPLEMENTED IN MANY POLISH CITIES SUCH AS SZCZECIN, TRICITY, WARSAW, BYDGOSZCZ AND TORUŃ

In Poland the Gdańsk Urban Transport Company (*Zarząd Transportu Miejskiego w Gdańsku*: ZTM) is one of GMV's longest-standing clients. The collaboration between both of them led to the setting up of an advanced fleet-management system, Passenger-Information and Traffic-Light-Priority System for public transport vehicles in the fleet of nearly 500 buses and trams. In December 2017 GMV and ZTM Gdańsk signed further contracts, the object of which is to provide the maintenance service for the driver's interface type C11 with the installation connecting it to the onboard unit, as well as the disassembly and re-assembly of the set of onboard equipment in public transport vehicles.

In 2011 GMV started cooperating with *Zarząd Dróg Miejskich i Komunikacji Publicznej w Bydgoszczy* (ZDMiKP). It was the time when the Fleet Management System, Passenger Information System and Passenger Settlement Module were introduced. The first of such projects in Poland, it has brought many benefits, both for the authority and passengers. In December 2017 ZDMiKP and GMV signed another contract for the provision of a post-warranty service, the ongoing maintenance and the technical support of the ITS System for the fleet of 280 vehicles. The scope of the contract includes a package of development hours intended for modifications and improvements in the system. The Purchaser intends to use this package for developing the Passenger Information Module for mobile devices as well as for introducing applications for Android and iOS systems.

In 2013 GMV won the contract in Szczecin, which included the design, construction, installation and configuration of an integrated computer system, together with the delivery of brand-new equipment and the warranty service. In addition, 35 station TVMs and 317 onboard TVMs were also launched. At the end of the last year the Municipal Commune of Szczecin and GMV signed a contract for the disassembly and assembly of the onboard equipment constituting the abovementioned systems.

GMV showcases its public-transport technological breakthroughs in Germany

The sixth biennial IT-TRANS, held in Karlsruhe (Baden-Württemberg, Germany) from 6 to 8 March, attracted a turnout of nearly 300 organizations.

Electric vehicles in urban transport, mobility as a service (MaaS), the autonomous vehicle, Account Based Ticketing (ABC) or fare payment by EMV bank card were some of the latest developments presented at the 2018 edition.

GMV, a habitual exhibitor at this event, displayed this year its public-transport ticketing, fleet-management and scheduling solutions. It also showcased its latest breakthroughs, such as efficient management of electric-vehicle operation or the new compact onboard unit ***EP100***.

Two of GMV's most keenly received stand exhibits were, firstly, its range of ticket vending machines (TVMs), which allow passengers to buy tickets or recharge their farecards autonomously, paying either in cash or by bankcard, contactless or otherwise; and, secondly, its inhouse ***GMV Planner*** *powered by DPK Systems*, which ensures the best possible design of scheduling, services and shifts in any public-transport network.

GMV was also invited to take part in the expert panel on "Lucrative optimization of scheduling". Within this panel GMV gave the paper "How to offer top-quality public transport with scarce resources", setting out the virtues of ***GMV Planner*** *powered by DPK Systems*.

Grupo AVANZA turns to GMV for giving ITS status to its new interurban transport lines

EL GRUPO AVANZA HAS ONCE AGAIN TURNED TO GMV FOR SUPPLYING FLEET-CONTROL SYSTEMS FOR ITS RECENTLY AWARDED LONG-DISTANCE CONCESSIONS OF THE HUESCA-BARCELONA AND SEGOVIA–MADRID LINES, OPERATED BY THE COMPANIES ALOSA AND LLORENTE BUS, RESPECTIVELY

Until now it had been collaborating actively in the areas of urban and interurban transport. This new project brings long-haul transport into GMV's Grupo AVANZA portfolio.

The system supplied by GMV comprises an advanced fleet-management system, a passenger-information system and a closed circuit TV system (CCTV). The fleet-management system continues along the lines of the systems previously supplied to Grupo AVANZA, swelling the number of the group's fleets now running with this system. This is now topped up with the new version of the CCTV system not yet deployed in Grupo AVANZA. The passenger-information system, for its part, fulfils the basic functions of showing passengers helpful information plus multimedia information associated with points of interest. It also has the additional function of showing safety videos on driver demand and improves the previous passenger-information systems supplied to Grupo AVANZA, by adding on the video plus image capacity, thus modernizing the whole system. The fleet-management system will also be integrated with the multimedia panels fitted in the headrests of the bus seats to keep passengers better informed and entertained.

Although the Huesca-Barcelona line will come on stream in April, the project itself is due to finish in June, after the long-distance Segovia-Madrid line has come into operation; thus bringing the project to an end and cementing GMV's position as Grupo AVANZA's main supplier.

Las Palmas turns to GMV for upgrading of its urban transport fleet

GUAGUAS MUNICIPALES, THE LOCAL BUS-SERVICE FIRM OF LAS PALMAS DE GRAN CANARIA, HAS ONCE AGAIN TURNED TO GMV FOR RENEWAL OF ITS ADVANCED FLEET-MANAGEMENT SYSTEM AND PASSENGER-INFORMATION PANELS

GMV set up the fleet-management system of Guaguas Municipales back in 1998, made up by all the following: a fleet-management server, operator posts, onboard tracking equipment in 220 buses and 12 passenger-information panels with communication based on Private Mobile Radio (PMR), with radio repeaters in the control center.

With the passing of time Guaguas Municipales's fleet has grown to 239 buses and 36 passenger information panels. Of these, 109 buses and 21 information panels are still run by radio communication and these are now the object of this current upgrading.

GMV has come up with a two-tier renewal. The onboard equipment will be upgraded to a state-of-the-art communication system that will enhance the service and phase in new functions, such as onboard video surveillance. As for the information panels, currently fitted in bus shelters, these will be replaced by panels with anti-vandal housing, LED display and operator post. The technology is based on GPRS 3.5G communications and voice announcements of bus-stops and outside announcement of the destination line for the visually handicapped.

Alongside the renewal scheme GMV will continue to carry out the current maintenance without any break or interruption in system operation.

Image courtesy of TMB

GMV renews the onboard video-surveillance system of TMB

TRANSPORTS METROPOLITANS DE BARCELONA (TMB) HAS ONCE AGAIN TURNED TO GMV FOR RENEWAL OF THE ONBOARD VIDEO-SURVEILLANCE SYSTEM OF BARCELONA'S METRO TRAINS

TMB currently runs a metro fleet made up by various train series, each of them fitted with different video-surveillance systems, all of which use analog technology and suffer from various degrees of obsolescence. This has triggered an upgrading project to implement a uniform video-surveillance system on a total of 149 trains from 8 different series and running on the lines L1, L2, L3, L4, L5 and L11 of Barcelona Metro.

The project comprises the supply of 300 video recorders, 300 communication nodes, 600 antennas, 760 video coders, 740 Ethernet switches and 540 IP cameras. This new system will also be integrated with existing CCTV systems on 8 train series, maintaining a total of 2038 analog cameras.

The core of the system under this project is the GMV-designed digital recording equipment to capture images in Full HD resolution, with the capacity of replay and simultaneous exporting. The recorder guarantees ONVIF compatibility, thus catering for recording searches, parametrized deletion, exporting, protection and automatic management of obsolete recordings, in a standardized way.

Each metro train will also carry onboard two recorders working in redundant mode, providing a high-availability recording system. Each train will also be fitted with an onboard ring-redundancy multiservice Ethernet, which will not only provide support for the new video-surveillance system but also furnish other systems with connectivity as need be in the future.

The implemented network will also have two communication nodes in redundant architecture, concentrating the onboard information not only of the new video-surveillance system but also the other systems. Through a wireless link this will then be passed on to TMB's operations centers.

The train-to-ground link will use Wi-Fi and 4G/LTE technology, choosing the most appropriate channel at each moment to suit the train's location, thus guaranteeing unbroken, quick and robust communication.

One of the functions to be implemented on this new wireless communication channel is real-time video broadcasting to ground, so videos from all trains along the line can be viewed from any of TMB's control centers.

The system is topped up with state-of-the-art digital cameras with infrared vision for nil-illumination recording in the cab and in tunnels. The system will also have an onboard display terminal in both driver cabs for real time supervision of any of the unit's passenger zones.

For the moment the new system with GMV technology will run alongside the existing video-surveillance systems to guarantee a seamless transition to the new system without impairing the current service.

Castilla y León turns anew to GMV for renewal of its demand-response transport system

IN FEBRUARY THE REGIONAL AUTHORITY OF CASTILLA Y LEÓN (*JUNTA DE CASTILLA Y LEÓN*) RENEWED GMV'S CONTRACT FOR OPERATION AND MAINTENANCE OF CASTILLA Y LEÓN'S DEMAND-RESPONSE TRANSPORT SYSTEM, FOR AN INITIAL FIFTEEN-MONTH TERM EXTENDABLE FOR ANOTHER FIFTEEN MONTHS AFTERWARDS

GMV's 15 years of experience with demand-response transport systems make it Spain's most experienced ITS firm and vouch for its depth of knowledge in the design, commissioning and maintenance of systems of this type in the rural world.

The demand-response system offers an efficient transport system for rural zones with a scattered, low-density population, such as Castilla y León.

By calling a free number any potential passenger (though the service is largely used by the elderly) can travel to wherever they may need to go at that moment, such as their health center or bank.

The booking center in GMV's site in the technology park called *Parque Tecnológico de Boecillo*, in Valladolid, receives these calls and books the transport to suit; these bookings reach the operators by three main vectors: by SMS, in the Web Portal *www.transladem.com* or through a physical device such as the bus's onboard message console.

The demand-response system greatly enhances the quality of life of people living in rural areas and also means a huge energy saving

The booking center runs a fleet of 327 buses and caters for one million inhabitants, 5392 sites, 105 operating areas and 1675 service routes. It also deals with a yearly average of about 250,000 journeys.

The system greatly enhances the quality of life of people living in rural areas without any other means of transport than the local bus service.

The demand-response system also means a huge energy saving; vehicles go only to those places where a booking has made instead of covering all the kilometers of a fixed route.

In short, systems of this type make country dwellers' daily lives much easier while also making transport both economically and environmentally more efficient.

Tram of CAF's Urbos 3 series

GMV begins to work with CAF as ITS supplier for its Urbos trams

GMV HAS REACHED AN AGREEMENT WITH CAF, A BENCHMARK RAILWAY MULTINATIONAL TO SUPPLY PASSENGER-INFORMATION, PA/INTERCOM AND VIDEO-SURVEILLANCE SYSTEMS FOR THE TRAM NETWORK OF THE ITALIAN CITY OF COSENZA

The project comprises the engineering, design and manufacture of the system, to be mounted by CAF during the manufacture of this series of Urbos trams, corresponding to the last generation of urban train developed by the Basque manufacturer.

The passenger-information system supplied by GMV will keep all passengers constantly informed throughout the run with service messages and notices: final destination, next stop, door-opening side, among others. This information will be displayed on LED panels and broadcast on the PA system, also supplied by GMV, throughout the whole tram.

GMV will also supply the emergency intercom system, allowing two-way communication between driver and passengers. Passengers will also be able make an emergency call in the event of any incident throughout the run.

Lastly, the video-surveillance or CCTV system will record the images filmed by cameras fitted throughout the tram, also allowing for real-time viewing.

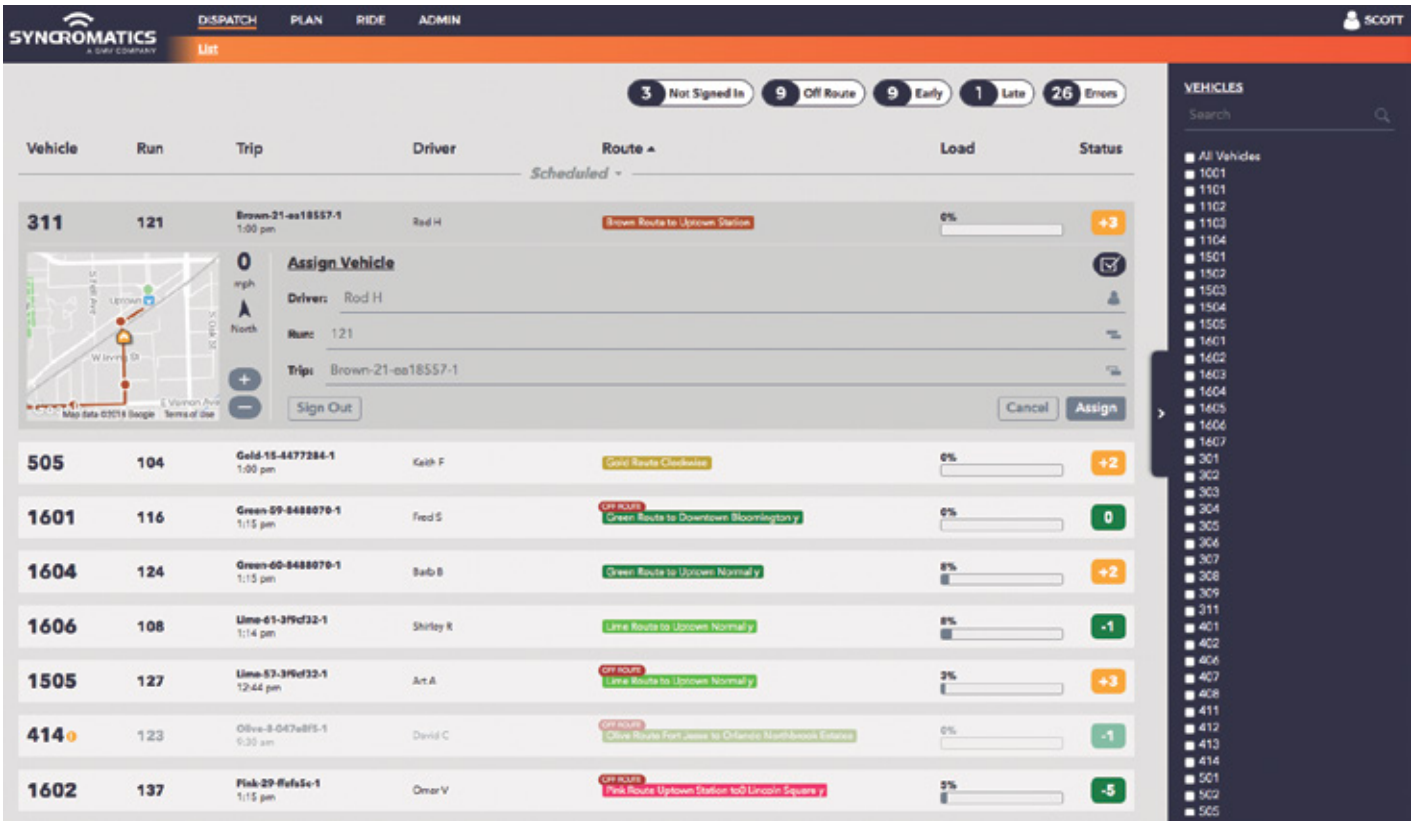
As well as all these functions, GMV's system will compile performance information on all interconnected elements, sending this information both to the driver and control center.

GMV is supplying all these systems combined in one single integrated system, which can be managed in a unified manner from the management display of the driver's desk. For this purpose GMV will embed over the latter a control view incorporating all necessary operation accesses.

The passenger-information system supplied by GMV will keep all passengers constantly informed throughout the run with service messages and notices

New information-management tools

GMV SYNCROMATICS, MAKES NEW INFORMATION-MANAGEMENT TOOLS AVAILABLE TO TRANSPORT PLANNERS



It isn't easy to keep a bus network running on time. It's up to dispatchers to make sense of everything that a particular vehicle is doing at any given time.

Where is bus X?. Where should it be?. How many people are on board?. Does that driver need a break?. Why did that stop get skipped?. How long will it be until the next bus arrives?.

Better dispatching means better transit trips. The name of the game is improving transit for riders by helping dispatchers do all the things they do. More accurate information, better communication, and a simpler all-around interface

These are questions dispatchers could have to answer in real time for every vehicle on the road. It's enough to make you dizzy just thinking about it.

In the past, orchestrating perfect transit trips has meant checking a huge array of tools that provide bits and pieces of all this information. Dispatchers are experts at synthesizing those bits and pieces into a coherent whole, but if there were a way to condense trip-, vehicle-, driver- and passenger-information into one consolidated dispatch tool, imagine how much time and effort it would save! With this in mind, GMV SYNCROMATICS, has recently launched the new Dispatch List page, which does exactly this.

The Dispatch List acts as a centralized source of information for every vehicle, providing real-time answers to dispatchers' questions. Each vehicle has its own row showing all the details about its current trip, including up-to-the minute passenger load and on-time performance data.

By clicking on the row, dispatchers can get an expanded view showing the vehicle's exact location, speed and heading. Action cards allow them to manage vehicles on the road and help maintain the accuracy of the arrival data that goes out to riders.

Dispatchers can filter vehicles based on name, route, driver, and more to quickly find exactly what they're looking for.

And status pills at the top of the page group vehicles based on actionable characteristics. For example, a dispatcher could check on every bus that is active but has no driver signed in, or see all buses currently running behind schedule.

New functions added to Montevideo's electronic fare collection system

In 2008 GMV provided the ticketing solution for Montevideo's urban bus network. This system, called STM - *Sistema de Transporte Metropolitano*, is led by Intendencia de Montevideo and integrates all public transport in a common system; this makes it more efficient, rational and safe.

The system was implemented in order to improve the mobility of Montevideo's citizens, with the concomitant social, economic, productive and cultural benefits. A well-connected city and a public transport adapted to citizens real needs represent an important step in the construction of a more integrated and fairer society.

STM comprises 4 Public Transport Operators, 1528 buses, 144 routes and 4835 stops, and it carries 300 million passengers per year. It has been a very successful system during these years.

During the following months STM will be extended with the integration of the metropolitan area (Montevideo, Canelones and San José), and this ticketing solution will grow to take in 225 routes, 8881 stops and approximately 370 million passengers per year.

By adding the metropolitan area to STM, the following objectives will be achieved:

- An integrated transport system, in terms of both time and geography.
- Allow passengers to benefit from this integration, and reduce their travel times.
- Better passenger information, with detailed information on routes, frequencies and schedules, given by different resources: bus-stop panels, cell phones, internet, etc.).
- Definition of new types of travelling arrangements.
- Obtaining real, detailed, system-wide information on punctuality and frequency.
- Use of technology to improve system security and the protection of passengers and transport operators.
- Simplification of the ticket validation procedure between different transport operators.

GMV presents its latest transport breakthroughs in Railwaytech Indonesia

On 22-24 March GMV took part in Railwaytech Indonesia 2018, a transport technology trade fair held yearly in Jakarta as part of INAPA 2018.

Indonesia, given the size of its population and economy, is one of GMV's target markets in the Asia-Pacific area. Also, local authorities are currently moving towards an ambitious transport modernization program.

GMV, for its part, displayed its whole array of solutions for the transport market, such as its advanced fleet-management, electronic ticketing solutions and passenger-information systems for both, urban public and railway transportation.

The exhibition was a great opportunity for GMV to further raise its profile in the ASEAN rail and bus industry, meet the management of different train- and bus-operating companies, as well as public transport authorities, from all over Indonesia and other Asian countries, and show potential customers how GMV can improve their transport systems.

The event was a big success, with more than 1,000 exhibiting companies from over 25 different countries presenting their innovative products and services. Additionally, it was attended by approximately 35,000 visitors.

The I_HeERO project is brought to completion

ON MARCH 2018 THE EU-FINANCED I_HEERO PROJECT CAME TO AN END. ITS GOAL WAS TO PREPARE THE NECESSARY INFRASTRUCTURE AND LEGAL REQUIREMENTS FOR THE EUROPE-WIDE LAUNCH OF ECALL AND TO KICK OFF THE WORK ON THE NEXT STEPS OF ECALL

HeERO 112
Harmonised eCall European Deployment

GMV's position as a key player in the area of telematic services for vehicles, both in onboard equipment and enabling platforms

The I_HeERO project was born in 2015 to define and coordinate implementation of the second generation of eCall, a pan-European system for detection of vehicle accidents and automatic generation of 112 emergency calls.

I_HeERO has successfully prepared the necessary PSAP (Public-Safety Answering Point) infrastructure for making a pan-European eCall. It has also driven member-state investment in PSAP infrastructure and service interoperability while also paving the way for eCall rollout for heavy goods vehicles, hazardous freight, long-distance buses and two-wheeled motor vehicles.

The project, which brought together a total of 61 partners from 12 Member States, has involved GMV participation from the word go. This participation has translated into system implementation both in Spain and Portugal.

GMV also participated in the validation and certification processes, in which it was responsible for the definition of the validation process and the execution of the field trials along with its partners.

Additionally, GMV participated in two pilot demonstrators, one focused on the implementation of eCall for heavy goods transport, in particular dangerous goods; and another related with data integration, where GMV participated in the specification process of the data interfaces between 112 centres and external entities, such as police or road concessionaires.

As from 31 March the eCall system has been obligatory for all new cars and vans; this new technology will enable emergency services to react more quickly to traffic accidents and save hundreds of lives a year.

The connected and autonomous vehicle: a social paradigm shift and an engineering opportunity

GMV TOOK PART IN THE EVENT ORGANIZED BY THINK HUB OF THE SPANISH CIVIL ENGINEERS FOUNDATION (*FUNDACIÓN DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS*) TO DEAL WITH THE LIKELY IMPACT OF THE CONNECTED AND AUTONOMOUS VEHICLE, THE CHALLENGES POSED AND THE GREAT ENGINEERING OPPORTUNITY IT OFFERS

The conference, held in February, ran through the likely mobility implications of the autonomous vehicle, regional policies and the public at large in socioeconomic terms, as well as the technological changes that will be necessary in vehicles and roadside infrastructure to make such vehicles a realistic prospect in the near future.

In two panel discussions top-level speakers debated the likely effect of the autonomous vehicle from two main standpoints. Firstly, in terms of mobility, regional policies, the economy and the development of society and, secondly, investigating how the introduction of connected and autonomous vehicles will affect roads and the vehicles themselves. The debate also dealt with the necessary communication systems driving the various types of Apps that will enable the rollout of vehicles of this type. All this will result in an improvement of road safety, traffic efficiency and a more ecofriendly mobility while also enhancing user experience.

Sara Gutiérrez, manager of the automotive business unit of GMV, took part in the second panel discussion, alongside organizations like ITS España, OHL Concesiones, ANFAC, BOSCH and Kapsch, to address technical aspects of the connected and autonomous vehicle from different points of view.

This project cements GMV's position as a key player in the area of telematic services for vehicles, both in onboard equipment and enabling platforms, and reaffirms its support for the development of road-safety-boosting Apps.

The evolution of eCall will now depend on future projects building on the outcomes of the pilots performed in I_HeERO. Some of the envisaged future extensions will consider motorcycles, heavy goods transport, buses and coaches, and satellite eCall.

ESCAPE, the self-driving paradigm, chalks up its first major milestone

The European GNSS Agency (GSA) has recently announced that ESCAPE (European Safety Critical Applications Positioning Engine), Europe's self-driving response, has completed the preliminary design of its ESCAPE GNSS Engine (EGE).

EGE is an innovative positioning engine that leverages the Galileo signal to provide a critical positioning component in autonomous vehicles. The positioning capability of the EGE is based on a complex algorithm produced by the GNSS sensor, including several positioning levels to achieve maximum possible accuracy.

ESCAPE pools some of Europe's top research and industrial institutions. Primed by the Spanish company FICOSA, the project is backed by the collaboration of partners from the whole of Europe, all of them key stakeholders in the domain of safety-critical applications for road transportation: GMV from Spain, RENAULT and IFSTTAR from France, STMicroelectronics and Italy's Istituto Superiore Mario Boella.

GMV boasts an important technical role in the ESCAPE project. As well as responsibility for technical management of the project, within the development of the EGE positioning engine (ESCAPE GNSS Engine), GMV is also furnishing the algorithms that will process the readings of the vehicle sensors, the cameras and GNSS receiver to provide the positioning service together with the integrity required by the connected autonomous vehicle. It will also be providing the intermediate data-fusion layer software, in charge of binding all the communication components together into a synchronized system.

ESCAPE will set up a new paradigm within road-vehicle automation technology, following the vision of companies that have joined the project.

GMV participation in INSIA's MIVAC Master

GMV PARTICIPATES IN THE FIRST ENGINEERING MASTER DEGREE IN THE AUTONOMOUS AND CONNECTED VEHICLE (*MÁSTER EN INGENIERÍA DEL VEHÍCULO AUTÓNOMO Y CONECTADO*: MIVAC) OF THE AUTOMOBILE UNIVERSITY RESEARCH INSTITUTE (*INSTITUTO UNIVERSITARIO DE INVESTIGACIÓN DEL AUTOMÓVIL*: INSIA) OF THE *UNIVERSIDAD POLITÉCNICA DE MADRID*, LECTURING ON COOPERATIVE SYSTEMS

On 15 February Carlos Barredo and Sara Gutiérrez, from GMV's automotive business unit, took part in a session to introduce this subject to engineering students, including a wide-ranging review of the connected vehicle, telematics and cooperative systems.

The session was divided into a theoretical part, addressing the different types of services, architectures and technologies that enable safety-related applications like eCall, usage-based insurance (UBI), new mobility arrangements like carsharing and others, plus various types of C-ITS services such as notification of on-road events, indication of speed limit onboard the vehicle and others, in which inter-vehicle collaboration and communication between vehicles and roadside infrastructure play a key role. This communication and collaboration raise road safety levels, boost traffic efficiency and cut down mobility's environmental impact.

During the practical part GMV helped students to familiarize themselves with the various tools, simulators and technologies used in this field.

The MIVAC master forms part of the necessary initiatives for training up specialists in the autonomous and connected vehicle, currently enjoying a worldwide boom.

"Ideas" is the go-to patent-management App

THE AUTONOMOUS UNIVERSITY OF BARCELONA (UNIVERSITAT AUTÒNOMA DE BARCELONA: UAB) WAS LOOKING FOR A SOFTWARE SOLUTION TO STREAMLINE THE MANAGEMENT OF ITS PATENTS. IT TURNED TO GMV AND TOGETHER THEY DEVELOPED "IDEAS"

Intellectual property (IP) rights are like any other property right: they allow the creator or holder of a patent, brand or copyright to enjoy the benefits deriving from his or her work and the investment made in its creation. These rights are enshrined in Article 27 of the Universal Declaration of Human Rights.

The Autonomous University of Barcelona (*Universitat Autònoma de Barcelona*: UAB) was looking for a software solution to streamline the management of its patents, affording swift, secure and simple protection to the intellectual property generated by its researchers. It turned to GMV and together they developed "Ideas".

"Ideas" manages all types of intellectual property (Patent, Technological Bid, Copyright, Agreement, Trademark, TBC, Project, Knowhow, Design, Utility Model, etc.), automating renewals and deadlines and offering detailed information on the state, dates and deadlines, legal documentation and information and

the IP's complete genealogy tree. Additionally, "Ideas" affords the basic functions of a CRM for client- and opportunity-management and of an ERP for financial project control. Last but not least the platform also facilitates data display and export by means of a simple reporting and dashboard system. In sum, "Ideas" offers a complete feet-finding service for both researchers and IP managers right from the initial birth of the idea through to its final consolidation as a technological and commercial bid.

Several universities and organizations are now protecting their researchers' intellectual property with "Ideas", such as the *Universitat Rovira i Virgili* (URV), the *Universitat d'Alacant* (UA), the *Instituto Nacional de Técnica Aeroespacial* (INTA), the *Institut Català d'Investigació Química* (ICIQ), the *Institut Català de Nanociència i Nanotecnologia* (ICN2) and the *Universitat Autònoma* de Barcelona (UAB) itself. It is also currently being taken up by the *Universitat Politècnica de Catalunya* (UPC), the *Universitat de Girona* (UdG), the *Universitat Oberta de Catalunya* (UOC) and the *Universitat Politècnica de València* (UPV).

WHY SHOULD INTELLECTUAL PROPERTY BE PROMOTED AND PROTECTED?

According to the World Intellectual Property Organization (WIPO) there are several compelling reasons: First, the progress and well-being of humanity rest on its capacity to create and invent new works in the areas of technology and culture. Second, the legal protection of new creations encourages the commitment of additional resources for further innovation. Third, the promotion and protection of intellectual property spurs economic growth, creates new jobs and industries, and enhances the quality and enjoyment of life.

Lourdes Jané,
Director of the CTTi of Fundació URV

> *From the very first moment "Ideas" chimed in with our needs as the URV's Marketing Unit. It makes it much easier for us to manage the vast amount of information and documentation in our casefiles, ensure a more efficient control and monitoring and extract indicators. "Ideas" accompanies us all the way, during the processing of research results and enterprising projects right from their original detection through protection, marketing or creation of the spinoff*

To find out more about "Ideas" and see a demo of the solution:
http://www.ideas.barcelona.

USER EXPERIENCE DESIGN

CUSTOMIZATION

INTEGRATION

OPEN PATENT SERVICE (OPS)

Blockchain: Welcome to the new era of the internet of value and trust

In February, Ángel Gavín, GMV's specialist in disruptive technologies, gave a lecture in a Blockchain conference held in Zaragoza University; Blockchain is the technology that looks bound to be a future game-changer. GMV's expert explained how it might change our society, as well as mentioning the main Blockchain-based applications, today and tomorrow, in sectors like banking, insurance, healthcare, energy, transport and industry.

Internet is a powerful communication- and information-transformation tool, but up to now it has not catered for value exchanges: money, house ownership, electric power... Not without a go-between, a third party both parties trust. Business models like YouTube, Amazon, Airbnb, Facebook, Spotify, etc. base their success on serving as a central point of contact between various actors, building up customer trust. At the same time, however they are hoist by their own petard.

What would happen if persons, firms or even machines could intercommunicate, setting up networks where trust is guaranteed and distributed, not centralized on one of the actors in the relation? What would happen if we were also able to carry out transactions anonymously without revealing our identity? Welcome to Blockchain, a world that still begs many questions even while it opens up new expectations and opportunities. A technology that could change absolutely everything. In short, a new digital era: that of the Internet of value and trustworthiness.

VIRTUAL CURRENCY

In 2008 an author (or authors) hiding behind the pseudonym of Satoshi Nakamoto created Bitcoin, the first electronic currency meeting all the abovementioned requisites: decentralized, anonymous, secure and inviolable. The Bitcoin-enabling technology is called Blockchain. But Blockchain also transcends Bitcoin.

The irruption of the so-called intelligent contracts and, based on them, the decentralized autonomous organizations (like the DAO) are bound to revolutionize practically all sectors, as well as our way of understanding organizations, democratic participation

and employment. The freedom from any central relation-supervising authority sets up a level playing field between individuals or between any individual and administrative structures. There will also be more powerful tools for defining relations with other organizations, offering many advantages but also imposing more responsibilities, which have to be managed more freely and mindfully.

HITEC hails Luis Fernando Álvarez-Gascón's business track record

The General Manager of GMV's Secure e-Solutions sector has been recognized by the Hispanic IT Executive Council (HITEC) as one of the most influential ICT professionals in Latin America and Ibero-America.

This organization of ICT professionals, originally North American and now a premier global executive leadership organization of senior business and IT executives, has thus acknowledged the career record of Álvarez-Gascón in the international panorama and his associative contribution.

A continual drive for innovation and adaptation of disruptive technologies in a constantly changing environment has been one of the hallmark features and keys to the success of the organization he leads. In particular, in recent years he has carried out actions that have won GMV a benchmark technological position in sectors like cybersecurity, healthcare, banking and telecommunications.

How to maximize the success of Big Data projects

Big Data is here to stay; it is now radically changing the world of consumers, citizens and organizations. Most sectors are now busy setting up Big Data strategies but some pacesetters have already experienced the benefits of using technologies of this type.

In this context, and with the aim of instructing professionals in this new paradigm, the ProCom Conference, put on by the Aragon Investigation, Development and Innovation Association (*Investigación, Desarrollo e Innovación en Aragón*: IDIA), has set out the possible applications of data science to maximize the likelihood of project success.

Pablo González, GMV Data Scientist, was invited to give a paper, in which he stressed the advantages of cross referencing the organization's data sources, on the assumption they are made accessible to all employees. The key lies in connecting points, patterns and doing so in such a way as to make the client feel that what you are offering is on hand at this moment, in real time and for that particular client. He also mentioned the importance of building up solutions, rather than infrastructure, that are scalable. "*One technology may be useful for collation purposes, another for filing and the other for high-speed data analysis*" he argued. Another of the lessons learned in his projects was the data-storage opportunities offered by the cloud or the use of open source technologies that are free of charge and really useful for achieving the best result.

GMV runs an expert Data Scientist team, carrying out Big Data projects in very diverse sectors, such as artificial-intelligence-based prevention of banking fraud, detection of cyberthreats and anomalies in datacenters, monitoring and analysis of internet publicity campaigns, management of clinical and epidemiological data, evidence-based clinical rehabilitation, optimizing of industrial processes, precision agriculture based on Earth Observation, knowledge management, preventive management of IT infrastructure, classification of documents and cognitive solutions with IBM Watson.

GMV and enerTIC join forces to boost energy efficiency and sustainability

In recent years technology has grown at a breakneck rate, completely transforming industry.

Mindful of the sector's needs and drawing on its proven innovation and challenge-solving capability, GMV brings its hi-tech expertise to bear on all business processes to help organizations bring them into line with digital progress. It is clear that game-changing technologies give productive sectors a chance to improve their logistic processes and boost their energy efficiency. "*We at GMV believe that the ICT trends of the coming years will be developed along three main lines worldwide: application of artificial intelligence in forecasting and operation models for efficient energy use; the use of new Cybersecurity models in citizen-related information systems; and the application of disruptive technologies like Blockchain to optimize the use of resources and allow new relations among all stakeholders of the value chain*", argues Miguel Hormigo, leader of GMV's Industry 4.0 initiatives.

With the aim of levering technology to make Spain's industry more energy-efficient, GMV has joined up with enerTIC, the platform of technology and innovation firms, to improve energy efficiency; at present the platform is made up by 50 major associate firms. Among these technologies pride of place goes to the so-called enabling technologies: Big Data and machine learning, artificial intelligence, cyber-physical systems, simulation and virtual reality, robotics and autonomous systems, additive manufacturing, Cybersecurity, cloud computing (and computing in general), Internet of Things and other impactful, disruptive technologies that are now cropping up or will do so in the future (including, notably, Blockchain or even virtual assistants like chatbots).

GMV drives the Digital Transformation of Andalusia's companies

THE ANDALUSIAN MINISTRY OF EMPLOYMENT, ENTERPRISE AND COMMERCE, THE ANDALUSIAN TECHNOLOGY CORPORATION (CTA) AND GMV HAVE COME TOGETHER TO DRIVE THE DIGITAL TRANSFORMATION OF ANDALUSIA'S COMPANIES. TO THIS END A CONFERENCE HAS BEEN ORGANIZED CALLED "INDUSTRY 4.0 ENABLING TECHNOLOGIES"

The conference, held on February and inaugurated by the Secretary General for Innovation, Industry and Energy, Francisco Javier Baco, and the President of CTA, Adelaida de la Calle, forms part of the Andalusia 2020 ICT Sector Promotion Strategy.

The aim of the conference is to drive collaboration between the technology sector and Andalusia's top researchers and encourage the implementation of solutions based on Industry 4.0-enabling technologies in Andalusia. The digitization of industry (also called the smart factory, Industry 4.0 or the fourth industrial revolution) means the application of new technologies to this sector to make it more efficient, sustainable and competitive.

GMV's Industry 4.0 manager, Miguel Hormigo, presented Productio (PROductivity InDUstrial EnhanCement through enabling TechnolOgies), a project of the National Business Research Consortia (*Consorcios de Investigación Empresarial Nacional*: CIEN) under the aegis of the Industrial Technology Development Center (*Centro para el Desarrollo Tecnológico Industrial*: CDTI). This project is being run by a national multisector and multidisciplinary R&D consortium involving seven Spanish provinces and five regional authorities, including Andalusia. Its remit, as Miguel Hormigo explained, is to look into diverse technologies, techniques, tools, methodologies and knowledge designed to boost the operational capability of industrial processes within the context of connected industry.

The conference was brought to a close by Verónica Pascual, President of the Industry 4.0 Committee of the Spanish Association of electronic, information-technology, telecommunications and digital-contents firms (*Asociación de Empresas de Electrónica, Tecnologías de la Información, Telecomunicaciones y Contenidos Digitales*: AMETIC) and by Fabián Varas, technical director of CTA, who underlined the competitive leap forwards that the takeup of this technology might represent for Andalusia's industry and the great opportunity presented by the collaboration with university research groups to harness the ongoing advances.

Productio (PROductivity InDUstrial EnhanCement through enabling TechnolOgies) is a CIEN product of the CDTI that aims to look into diverse technologies, techniques, tools, methodologies and knowledge designed to boost the operational capability of industrial processes within the context of connected industry

SCIENCE IS GENDERLESS

The breakneck development of new technologies has widened the breach between the working world and academia. IT, industrial- and computing-engineering, robotics and fintech now top the list of most heavily demanded degrees by employers. Nonetheless, the search for STEM skills (Science, Technology, Engineering y Mathematics) has become a daunting task.

Among students, scientific-technical degrees have little pulling power, perhaps due to their expensiveness in comparison with other degrees. But if we zoom in on these figures we find that the percentage of women opting for these degrees is even lower. One of the greatest barriers is the social and cultural bias; other factors causing women to shy away are stereotypes and the false belief that such subjects are better suited to men's skillsets.

However, there is absolutely no empirical evidence for this. Look no further than GMV itself: nowadays there are many women colleagues working daily in GMV's offices around the world. In this copy of GMV News, and to commemorate the International Day of Women and Girls in Science (11 February), we have therefore decided to highlight the history of three women, among many other examples, who opted for degrees and careers in science, technology, engineering or mathematics.

TERESA FERREIRA

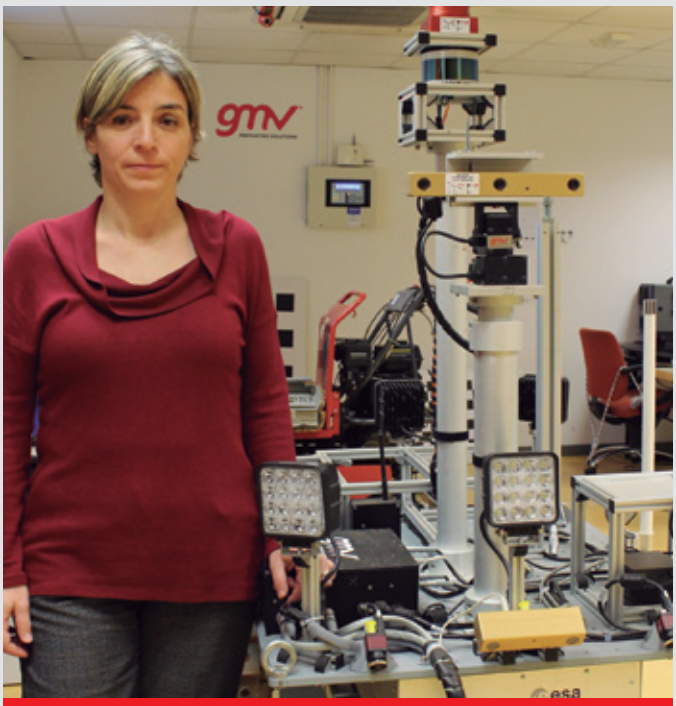
A love of mathematics and physics are the two main reasons that drove Teresa to study Electrotechnical and Computation Engineering in Lisbon.

She joined GMV in 2004 as a project engineer in the GNSS (Global Navigation Satellite System) team, working mainly on applications and receiver technology projects for the European Space Agency and the European Commission. Galileo was one of the very first programs she worked on, followed since by about 25 projects on which she contributed to developing GMV solutions in the satellite-navigation system applications domain.

She is now director of Space in Portugal, working on business development and strategy definition and interacting with the various national space stakeholders.

Her two children and partner are close to the heart of this indefatigable Portuguese woman, who, despite having her sights set firmly on space, likes in her free time to submerge herself in the ocean and practice her favorite hobby of scuba diving.

Nowadays GMV has many female colleagues working in STEM disciplines in its offices around the world



MARIELLA GRAZIANO

Mariella Graziano was born in a small village in the South of Italy. She started her carrier at University of Rome La Sapienza, Faculty of Aerospace Engineering. It has been most likely the desire of pursuing the understanding of how thinks really work to make her deciding to be an engineer. Or maybe she was inspired by the Top Gun movie. She is not yet sure about the real reasons, but this is not really important.

In 1991 she was selected has one over 25 students to design a space missions under the mentoring of the European Space Agency and important European aerospace companies.

Mariella started her professional career working for a small Italian and technology related company. In 1996 she moved to The Netherlands working for the European Space Agency in the area of system engineering. Later on, in 199, she moved to Spain working for GMV in the area of mission and space system analysis. Within GMV Mariella assumed different technical and managerial responsibility. In 2007 she has been appointed as Executive Director of a new Business Unit, Space Segment and Robotics.

She is member and chairman of many international association. Among those, Women In Aerospace Europe, IAC Exploration Committee, Planetary Defence Committee, etc.

She is mother of two fantastic boys, wife of a great man, daughter of great parents. She loves the moon and the mountains, she like all arts, mostly music, painting and sculpture.

MARÍA LUZ HERNÁNDEZ

María was born in Salamanca, going on to study physics in the same city. Her inquisitiveness about how things work and make sense in her surrounding world is what prompted her to study this science, which, after all, looks into the laws of nature.

Her zeal and drive not only won her a research grant but also meant she came out top of her degree course. A positive and never-say-die attitude is the hallmark of this go-getting Salamanca girl.

She landed in GMV in 2001, specifically in the Flight Dynamics and Operations unit. After a year working on the flight-dynamics system of the MetOp satellite she packed her bags to move to France's National Centre for Space Studies (*Centre national d'études spatiales*: CNES) in Toulouse. Straddling the this southern French city and the Spanish capital ever since, María Luz has worked on various programs, pride of place going to the ATV (European Space Agency's Automated Transfer Vehicle) missions.

Since joining GMV she has had the chance to participate in and run different hi-tech flight-dynamics projects as well as forming part of the operational team for the reentry of ATV4 and 5.

She is now living in Toulouse, working in GMV's French subsidiary. She successfully blends her working and family life and always finds time for a stroll through the streets of La Ville Rose or enjoying a good whodunit, especially if it comes from the pen of the French crime-fiction novelist Fred Vargas.

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