News

No. 89

gmv INNOVATING SOLUTIONS

At the cutting-edge of intelligent regional transportation systems

INTERVIEW

Diego Domínguez Amaral

Head of Technological Systems for Bus Operations, Transports Metropolitans de Barcelona (TMB)

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Letter from the president

In a business landscape increasingly dominated by corporate giants, GMV stands out as a family-owned enterprise that maintains its autonomy while achieving consistent growth year after year. Consolidating businesses into large conglomerates can offer advantages in terms of visibility, economies of scale and operational efficiency. On the other hand, independent companies are vital for a dynamic and resilient economy. Independent companies are often the ones to inject a breath of fresh air into the marketplace by providing original ideas and novel views, challenging the status quo and offering innovative alternatives. In addition, independent businesses play a pivotal role in economic diversification, reducing market concentration and the risk of monopolies or oligopolies that can limit competition. Maintaining a diverse business landscape, with players of different sizes and approaches, fosters healthy competition that drives product and service improvements, benefiting consumers and the economy as a whole.

Throughout its history, GMV has proven itself as a bastion of innovation and specialization, standing out for its ability to develop new solutions and expanding its business portfolio, building trusting long-term relationships with our clients. Our growth has been mostly organic, gradual but solid, reinforced by carefully selected strategic acquisitions. This track record has enabled us to take on leading roles in major programs such as EDIDP, LEO-PNT, and GOVSATCOM, coordinating consortia in which we cooperate closely with the best European companies, each contributing their expertise to the project at hand. Highly competitive independent companies such as GMV bear witness to the importance of business diversity for sustainable growth and innovation in our society.

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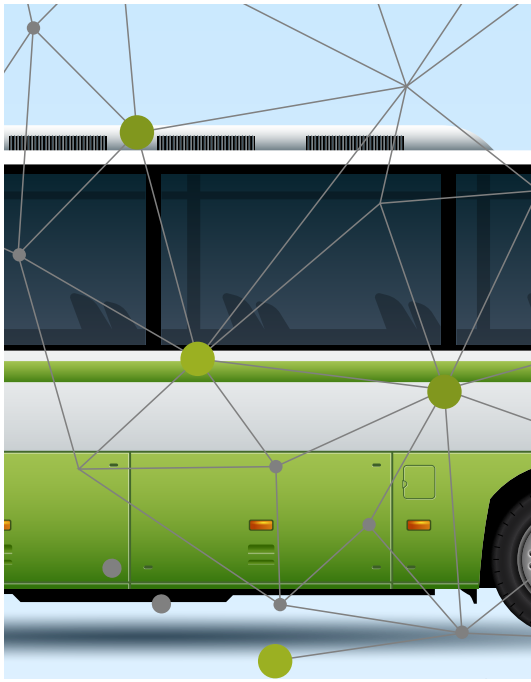
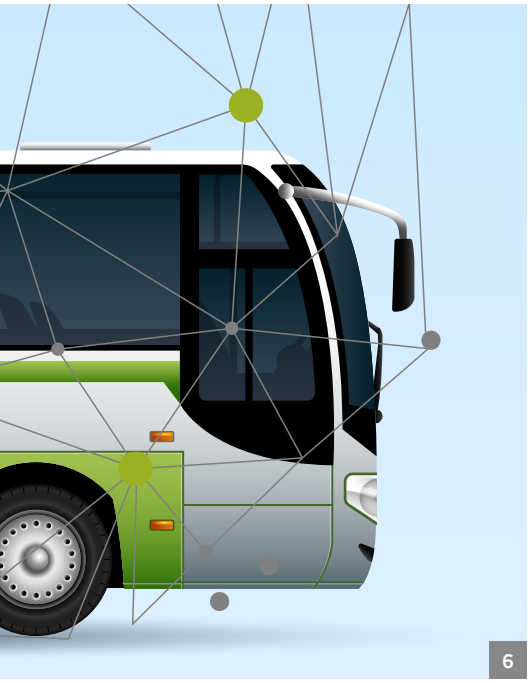
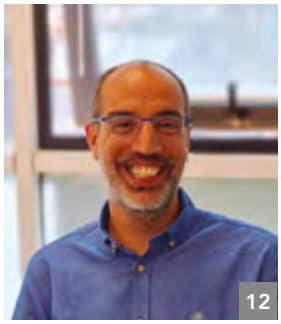
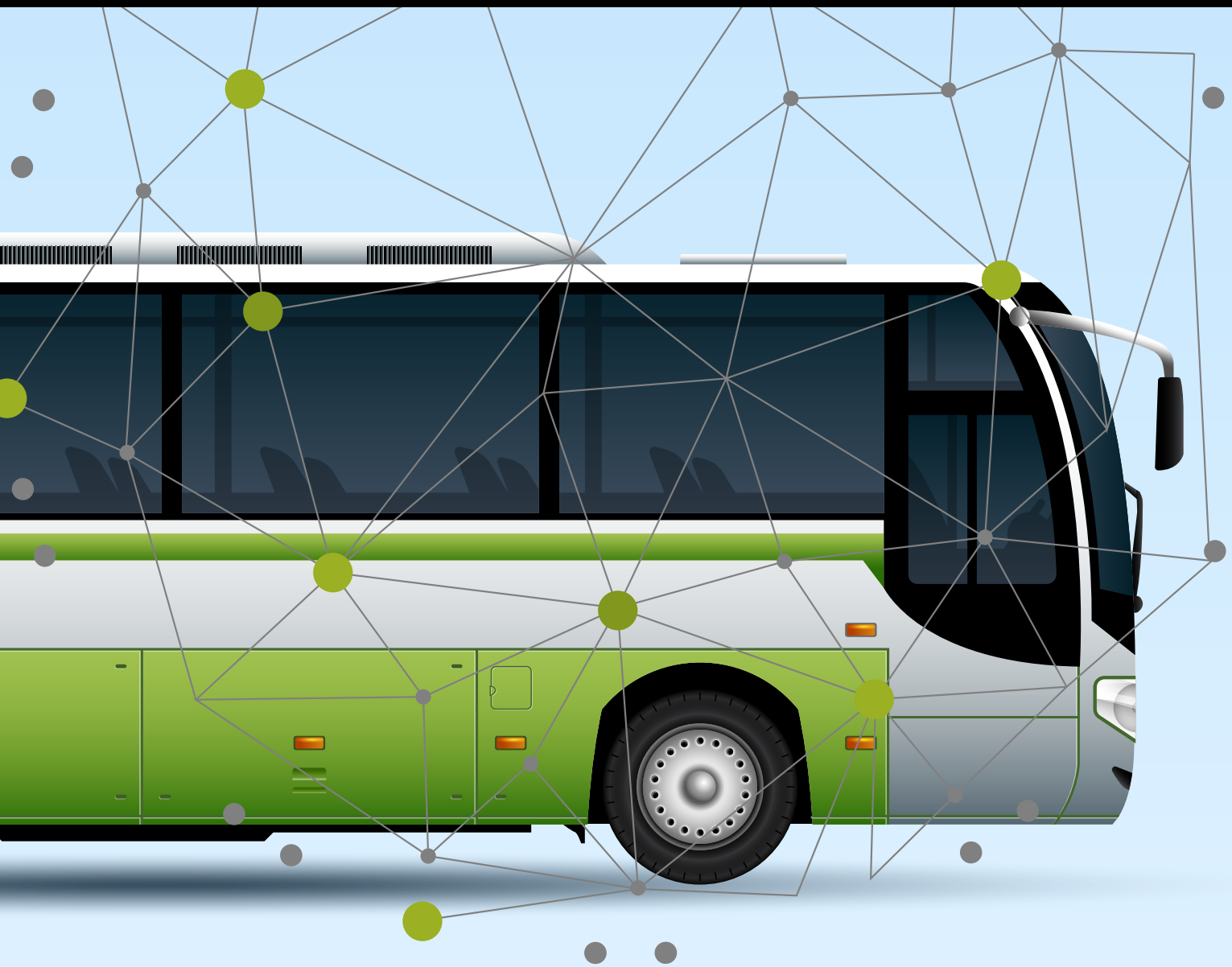
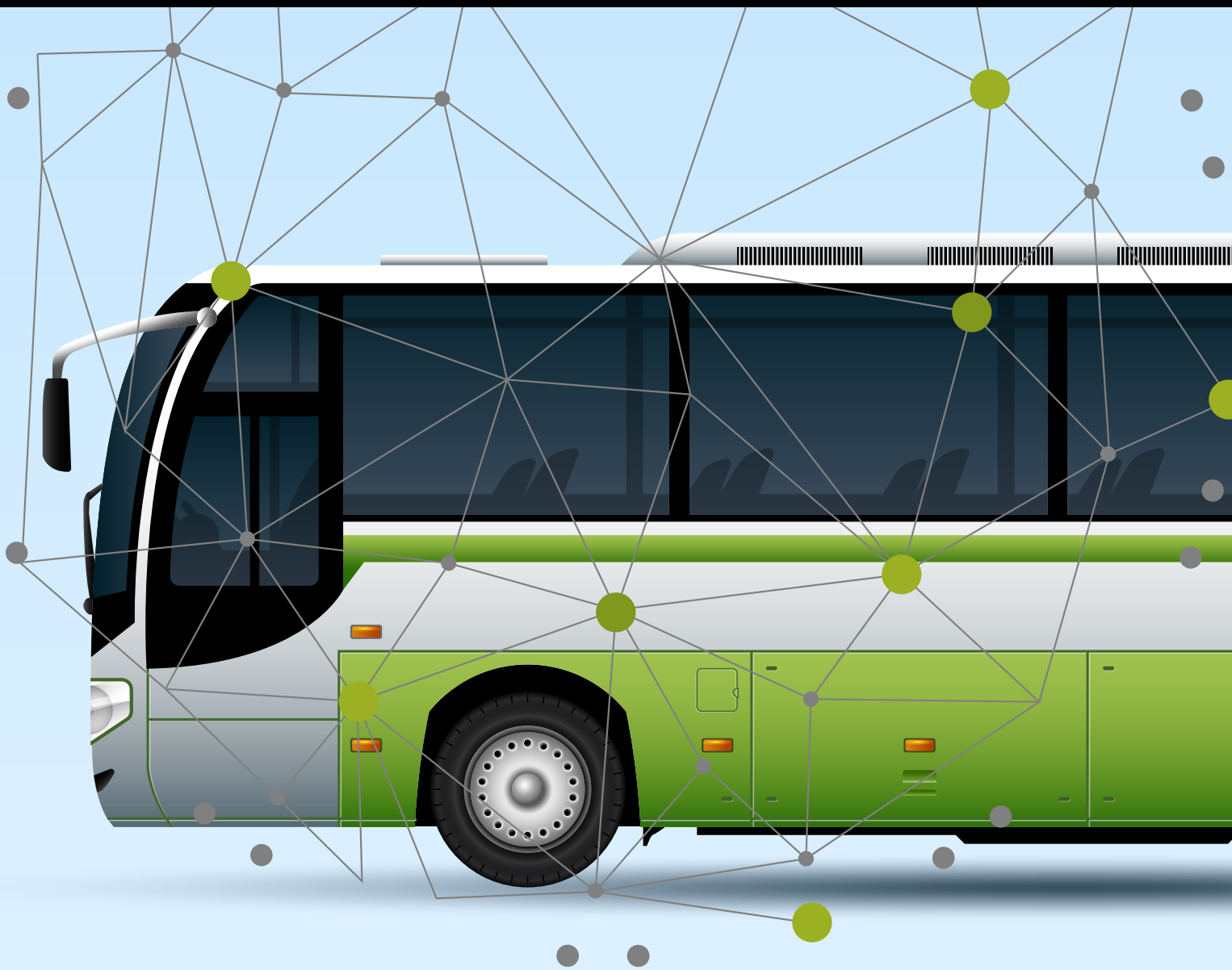








At the cutting-edge of intelligent regional transportation systems



The population in rural areas of the European Union (EU) is generally older than in urban areas. Over the next 10 years, this population is also expected to begin to diminish. Added to the lack of connectivity, underdeveloped infrastructure, lack of job opportunities, and limited access to services, this has made rural areas less appealing places to live and work.

Nonetheless, rural areas play an active role in the European Union's ecological and digital transition. Achieving the EU's ambitious digital targets for 2030 may offer more opportunities for the sustainable development of these areas beyond agriculture, livestock, and forestry, as it creates new prospects for growing the manufacturing industry and especially the service industry, and because it helps improve geographic division of services and industries.

Within this context, the European Commission presented the European Union Rural Action Plan in June 2021 to drive comprehensive, cohesive, sustainable rural development. This plan defines various scopes of activity, supported by emblematic initiatives aimed at helping rural areas to become stronger (training rural communities, improving their access to services, and facilitating innovation); more connected, both in terms of transportation and in terms of access to digital services; and more prosperous, diversifying their economic activities.

The demographic issue as well as territorial and social unity are challenges facing all of Europe requiring clear decision-making focused on the spaces most affected by territorial inequality: small towns and rural areas.

Experience has shown that the territorial concentration model has not had a driving effect on surrounding areas. The main consequence of this is a lack of social equity that has sometimes materialized in a difference in opportunities based on where people live. This scenario is the basis for the need to recover polycentric territorial development plans to drive small and medium-sized cities as well as rural areas.

Toward sustainable mobility

Regional interurban transit is characterized by having many routes with low traffic, low occupancy, and little financial cover. In fact, many of the regular transit lines providing regional services have negative operating profits. Most of them are money-losing ventures that offer a variety of routes connecting towns with small populations with major cities. Since they are public services, their main goal is to guarantee citizens' mobility.

In this context, transportation infrastructure is an essential component in developing territories, fostering social and territorial unity, boosting productivity, and improving competitiveness and the economy's export capacity. Thus, these infrastructures must be reliable, sustainable, resilient, and high-quality.

The path toward sustainable mobility requires a framework for public and private collaboration facilitating and accelerating the implementation of efficient solutions, among other aspects. Nonetheless, not only public agencies need to assume this duty, private companies can also do their part and accelerate fulfillment of this need, which is really a mandate from the people.

The messages from Europe on reducing emissions are bolstered by the European Recovery Program driven by the European Commission in response to the COVID-19 pandemic. The program's aim is once again to drive transformative projects to advance toward a more digital and sustainable Europe. The purpose of the European funds is to promote economic, social, and territorial unity within the European Union based on

the digital transformation, ecological transition, and growth. Transforming mobility is decisive for a country's economy and for its citizens. This huge commitment from the European Union presents a challenge for the necessary cooperation and collaboration between public institutions and the private sector that will accelerate the transformation toward sustainable mobility.

Sustainable mobility goals

In order to boost the resilience of transportation infrastructure in response to new demands and challenges, a range of sustainable mobility goals have been defined including digitization and sustainability in transportation.

In view of the needs of the model of regular regional public transportation, a set of requirements has been defined including driving transladem, incorporating school transportation with joint service formulas to create a more efficient and sustainable system, and managing mobility flows based on areas of influence.

In this context, the technology and architecture implemented to address these challenges should not only ensure proper functioning and modernization of the systems currently in use, but also its maintenance, adaptability, and future scalability. This must all be taken into consideration with interoperability with third parties, use of international standards, application of open, public norms, user-centricity, and an open and modular architecture.

GMV has shown that it has a powerful, innovative solution to fulfill these needs. It is a solution that is also comparable to other areas beyond regions, such as metropolitan transit authorities and regional transit consortiums, as well as equivalent government agencies internationally. The systems implemented by GMV stand out for several reasons. First, they stand out for their capacity to have standardized and centralized information about all the services available, as well as their capacity to provide a real-time flow of information to service users, which reduces wait times at stops, among other benefits. These systems also allow for more exhaustive and friendlier real-time control of ticketing, streamlining tasks for administrative personnel and facilitating planning, design, and operation of transportation services with immediate diagnostics.

Intelligent transportation systems (ITS) central systems, which make up the highest level of the architecture defined by customers, include the supply of a control center able to integrate data from multiple operators. This control center is comprised of a back-end with all the major modules and the necessary business logic in the system to implement the functionalities as well as a front-end for users, allowing each user to uniquely access information based on their permissions and hierarchical level.

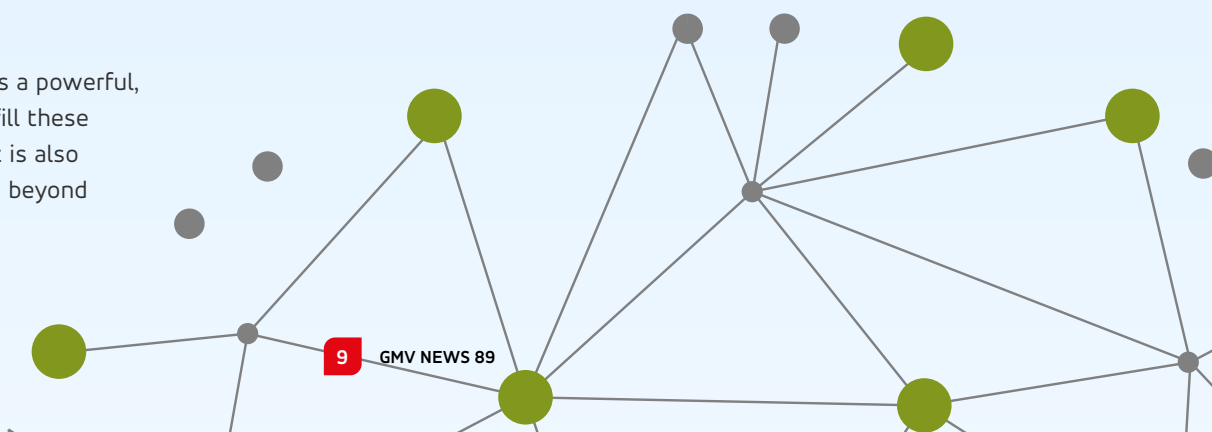
The platform also includes a common business intelligence module to analyze and leverage the mobility and metrics data accessible to the operations personnel of the various players using control panels and reports generated flexibly within the system through a web tool that can be accessed based on the permissions and roles defined for the (internal or external) personnel.

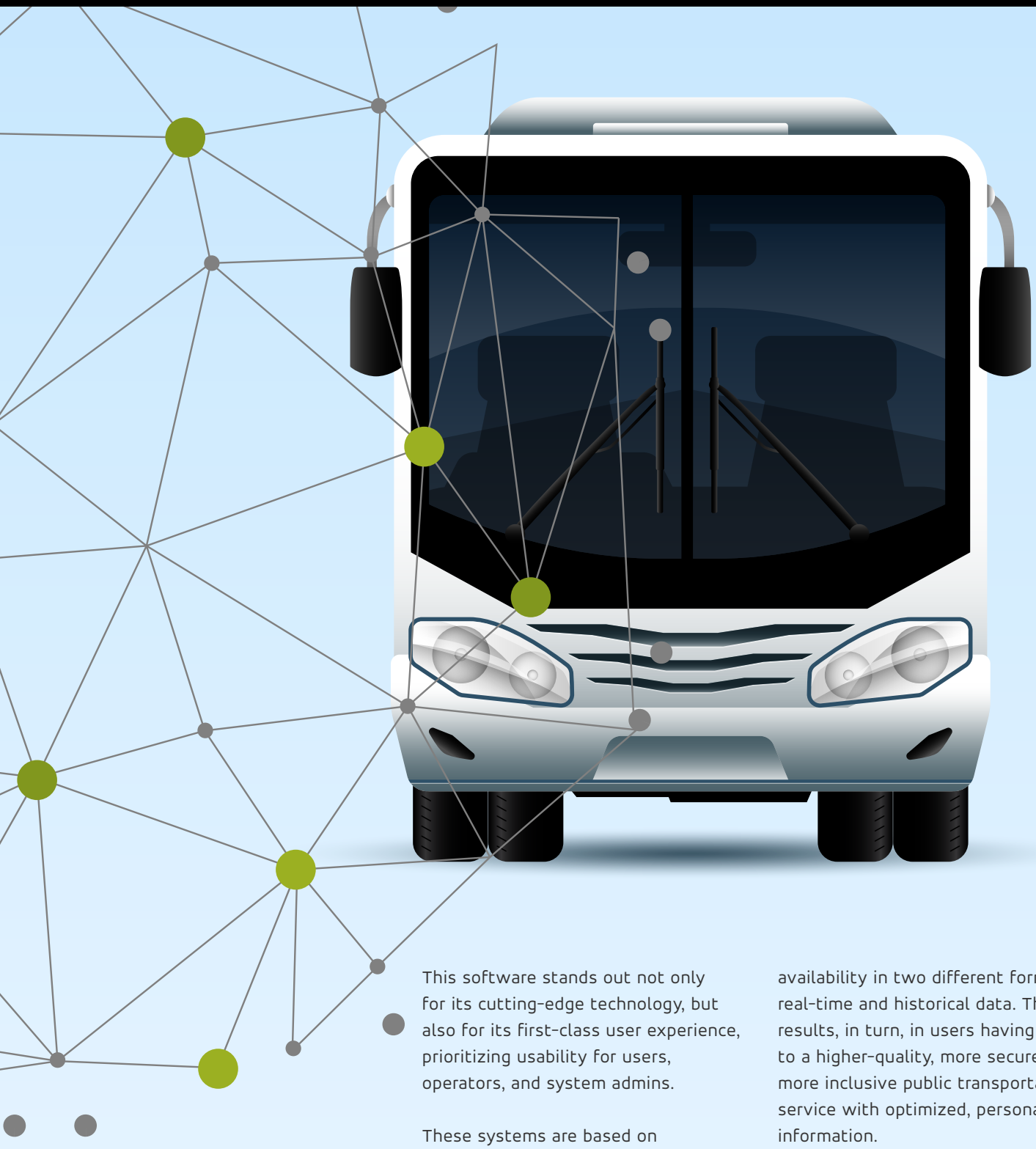
Specifically, the control center contains functionalities related to the computer-aided dispatch/automatic vehicle location system (CAD/AVL), providing an architecture based on the latest technology and software quality standards with applications that can be implemented and modified separately and comprehensively without missing information, duplicate data, or redundant processes. It also includes validation and sale functions in line with the need to digitize all the usual means of payment accepted around the world, allowing travelers to access transit using transit cards, QR codes, and bank payments.

The control center also provides travelers with information, sending it via standard open protocols to feed other systems using similar standards like GTFS and the CEN NeTEX standard, real-time GTFS-RT data, CEN SIRI standard data, as well as efficient and open non-standard information interfaces. Finally, the control center allows integration with other systems via standards both within the ITS architecture defined by the customer (such as integration with level 3 ITS administration architecture, as shown in the following figure) and with external systems.

ITS Suite

After more than 25 years providing ITS solutions on all continents, GMV has implemented and will continue to





implement the best ITS technology available on the market. This technology is the product of the evolution of solutions rolled out over the last five years providing excellent service given their experience and maturity.

GMV's solution is based on ITS Suite, a next-generation, state-of-the-art, expandable, scalable, open system following a microservices architecture.

This software stands out not only for its cutting-edge technology, but also for its first-class user experience, prioritizing usability for users, operators, and system admins.

These systems are based on the principles of scalability and interoperability. They are also based on international norms and standards allowing efficient operational integration both between different levels of the implemented ITS model and with other external systems.

They offer a wide range of advantages, as they optimize the processes involved and allow for digitization of administrative systems and public transportation data availability in two different forms: real-time and historical data. This results, in turn, in users having access to a higher-quality, more secure, and more inclusive public transportation service with optimized, personalized information.

Finally, these systems will allow for cooperation and information exchange with other public agencies with transportation competencies, which will foster the potential for digitization to become more developed, allowing for interconnectivity between modes of transportation, infrastructures, and the territory as a whole, thereby optimizing the transportation system at a national level.

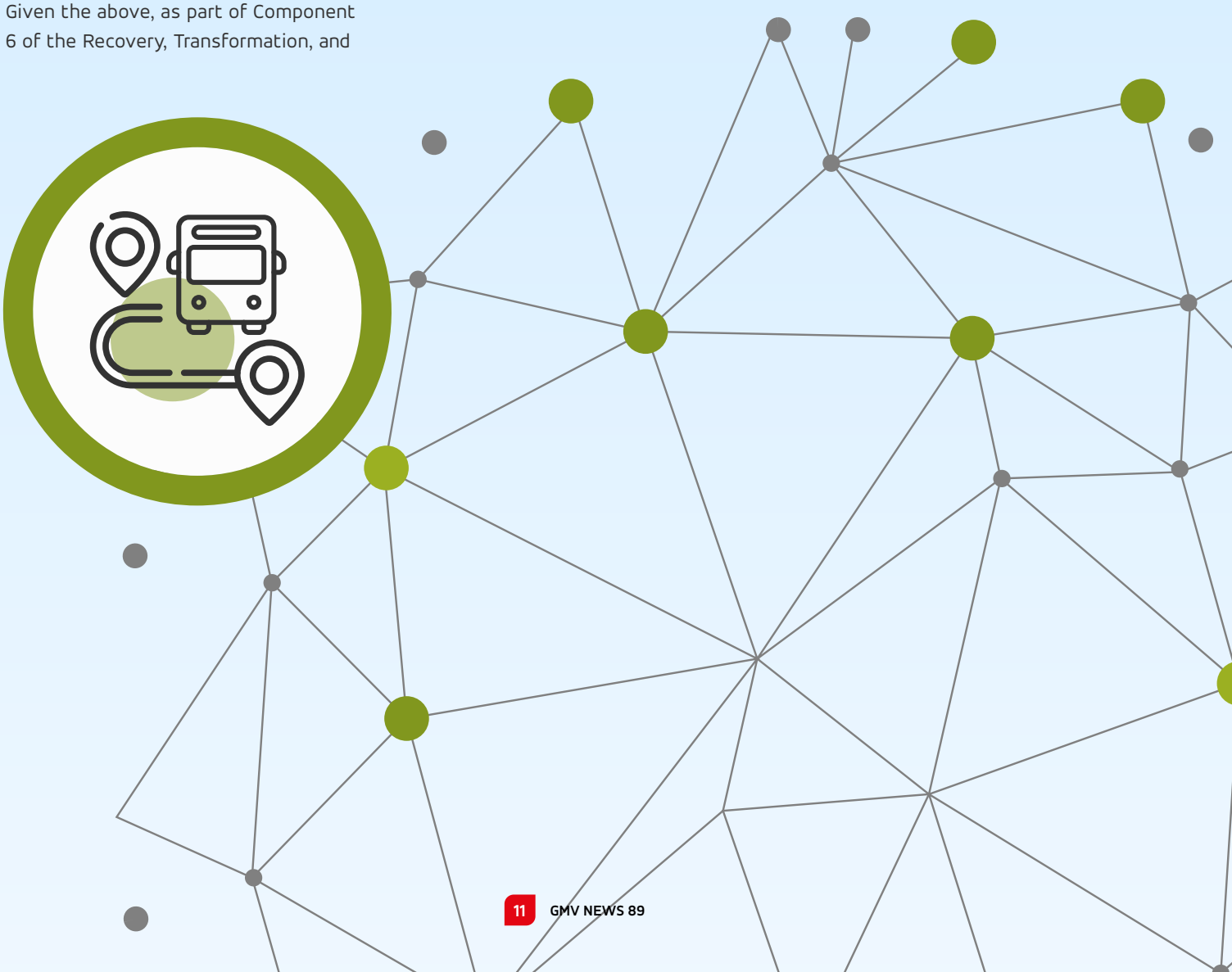
GMV leadership in regional ITS systems in Spain

In the particular case of a rural context like the Spanish one, with small, scattered population centers occupying 84.1% of the surface area and an aging population – people 65 and over make up 23.8% of the population in rural areas vs. 18.4% in urban areas, according to the Ministry of Agriculture, Fisheries, and Food 2019 annual indicator report – the lack of high-quality services is particularly detrimental to young people and seniors who are less autonomous. To take on these challenges and ensure mobility is sustainable, policies and actions must guarantee universal accessibility to basic services, promoting efficient public transportation alternatives adapted to the population's needs.

Given the above, as part of Component 6 of the Recovery, Transformation, and Resilience Plan (within the national plans drafted by the 27 Member States of the European Union to join the European recovery plan NextGenerationEU), a variety of measures and investments have been included to modernize, digitize, and enhance security and sustainability for key interurban and intermodal transportation infrastructures throughout Spain.

Within this context, various autonomous communities put out invitations to tender in 2023 to supply and implement a central ITS management system that will allow all interurban public transportation information to be integrated into the various licenses in the corresponding license maps and to manage all the services to be generated based on this information for the administrators, operators, and citizens, so as to improve the technological systems associated with regional public transportation.

GMV has shown that it has a strong and innovative solution to respond to the needs of regional public agencies. Within this context, the company has been supplying the transport management system in Galicia since 2015, integrating the information of 127 licenses and more than 3,500 vehicles belonging to the various transportation operators on the roads of Galicia with their CADs, and in 2022 it updated the Barcelona ATM's multi-fleet computer-aided dispatch/automatic vehicle location system (a pioneering system initially implemented in 2001). Continuing this leadership position, GMV was awarded the development and rollout of the digitization platforms for Castille León, Castille-La Mancha, the region of Murcia, and Aragón. The solution implemented by GMV is a cutting-edge system that is expandable, scalable, interoperable, and open, making it replicable both on a national and international scale.



Diego Domínguez Amaral

Head of Technological Systems for Bus Operations at Transports Metropolitans de Barcelona (TMB)

Diego Domínguez (Barcelona, 1983), Head of Technological Systems for Bus Operations at TMB, is an engineer computer scientist from the Faculty of Computer Science of Barcelona (2006).

Previously, he was a founding partner of a forum and web advertising company, where he acquired the basis of web technologies and of the Internet that he was later able to develop in the field of ITS.

At TMB, he has developed numerous projects over the years in the field of Ticket Management, Ticketing, Customer Information,, Security, Communications, Remote control of Infrastructures and Vehicle Telemetry, among others, always related to Intelligent Transportation Systems and public services.

He is also a partner of the startups SeniorDomo and Drimer, service companies which are entirely digital and that have helped him incorporate more innovative visions and ways of working at TMB.

Your career has been closely tied to TMB, where you have held various positions up to your appointment as Head of technological systems for Bus operations. What is your role in this position?

My role, or rather the role of the entire team of TMB employees, as well as our suppliers and strategic partners, is to come up with the technological solutions necessary to guarantee the delivery and excellence of TMB's services throughout their life cycle (definition, design, implementation, and maintenance).

In terms of public transportation and ITS systems, what milestones would you say best illustrate the progress the sector has made in recent years? How is TMB keeping pace and adapting to these advances?

Personally, I think the biggest change in ITS systems in recent years has been the shift from monolithic, siloed architectures to open and integrated architectures. This shift is clearly reflected in the ITxPT standardized architecture proposal, which aims to move from a mindset of closed, vertical systems to one of open systems that facilitate data sharing and seamless integration. As a result, data exchange interfaces (APIs) have been developed and systems are now designed to work with real-time data streams.

TMB has applied this mindset shift to projects over the past few years, using these new architectures when upgrading its ITS systems. Like any company that's been around for a while, TMB has a legacy that we haven't been able to update yet, but it's on our roadmap.

Sustainability plays a vital role in transportation. What is TMB's strategy in this regard? Do you think the sector is meeting users' sustainability demands?

When it comes to sustainability, as set out in the TMB 2025 Strategic Plan and based on the Sustainable Development Goals (SDGs), one of TMB's strategic lines is the decarbonization of its bus fleet, moving toward clean energy or zero emissions, with the goal that by 2025, 25% of the fleet will be zero emissions thanks to 233 electric buses and 46 hydrogen buses. It's a very complex transition because it involves not only purchasing electric or hydrogen vehicles, but also making numerous changes to infrastructure, operations, and maintenance.

Refueling is a good example. In the past, a garage with 300 to 400 internal combustion engine vehicles would have four or five gas pumps, and each vehicle would take about five minutes to refuel. Now each vehicle must have a high-powered charger in its parking space. This means installing 300 to 400 chargers and charging each vehicle for about four to five hours. What's more, providing all the power needed for so many chargers requires installing, managing, and monitoring a significant electrical infrastructure.

In terms of operations, the way the vehicles are driven is also different, so drivers need training to provide excellent service and maximize the potential of electric and hydrogen vehicles. It's also crucial to consider the current range of electric vehicles for some of the longer services.

In terms of maintenance, although electric and hydrogen vehicles should require less upkeep, there may be a higher initial burden as experience is gained with new traction technologies in buses and new components (batteries, ultracapacitors, etc.). Then there are the typical uncertainties surrounding the durability or lifespan of the batteries in these vehicles. In order for this transformation to be successful, new systems such as smart charging stations and bus telemetry had to be implemented to manage all of these new chargers and onboard bus elements.

Although TMB and other urban transportation operators are making great efforts to implement clean technologies in their fleets, the pace may not be fast enough in the current climate crisis. However, nearly all operators are converting their fleets to zero-emission vehicles – a trend that is rapidly gaining momentum.

The metro system, which has been 100% electric for many years and where all energy is currently from certified renewable sources, is also implementing energy-saving measures to reduce consumption by 6% by 2025.

Innovation is also one of TMB's strategic pillars. What are the latest measures you have taken in this regard?

The TMB 2025 Strategic Plan outlines a technological overhaul of transportation to meet users' demands for greater accessibility (simple, streamlined ticketing solutions), reduced uncertainty (improved real-time information), and increased comfort (occupancy monitoring, onboard safety measures, temperature regulation, safe driving practices, etc.).

Over the past few years, TMB has launched strategic initiatives to improve the user experience. These include the introduction of EMV card payment on buses, the integration of T-Mobilitat throughout the metro and bus network, the deployment of onboard video surveillance on trains and buses, and the implementation of

"One of TMB's strategic lines is the descarbonization of its bus fleet"

a new real-time passenger information system for trains, buses, platforms, and bus stops. This is in addition to new bus services, such as Bus on Demand, and emerging transportation modes, such as the shared bicycle system introduced by the Àrea Metropolitana de Barcelona (AMBici).

> "The digital transformation of public transport is essential to face the rest of the modes of transport an new alternatives, such as electric scooters or VTCs"

Other operators in the sector are also making significant improvements and innovations in their transportation networks. Renfe, for example, is implementing its Maas (Doco) model, while FGC now provides its information in GTFS Real Time, allowing third-party applications to display real-time updates on train status and location. There's also the Smou app, operated by Barcelona Serveis Municipals, which has integrated payment services for blue zone parking, residential parking, Bicing and motosharing services in Barcelona and surrounding municipalities in the Barcelona metropolitan area.

What are the key benefits of the new SIU-CCTV system launched in conjunction with GMV? What opportunities does this new technology offer?

The new onboard passenger information and video surveillance systems on buses were developed and implemented using state-of-the-art technologies and working methods. As a result, these projects have been highly successful, receiving overwhelmingly positive feedback from both internal stakeholders and customers alike.

Harnessing Kubernetes container technology has enabled us to use a single infrastructure and common architecture for both systems, optimizing resources and simplifying costs and management. This technology also allows us to use many standard market components for architectural purposes, which speeds up system development and implementation.

Additionally, the microservices architecture enables piecemeal solution development, while ensuring communication and integration across all system components through open APIs. This facilitates integration with other TMB systems and processes.

Cloud services, including text-to-speech, have been used to enhance and automate TMB's existing speech capabilities, providing a standardized service accessible across the entire network.

What's more, these services are powered by AI that learns and improves its performance through ongoing use and training. These machine learning models have been integrated into the project to facilitate intelligent video analysis, enabling the extraction of advanced insights from video surveillance data, including real-time calculations of bus occupancy.

The development of both customer applications and progressive web applications (PWA) has greatly facilitated deployment on the PCs of internal TMB users. These do not require installation and provide a rich, friendly user interface with performance comparable to a heavy application.

All of these technologies, combined with a new way of working through the Agile methodology, allowed us to build a minimum viable product (MVP) with which to begin deploying the solution on buses, while developing the remaining features and dynamically adapting our efforts to address the most pressing needs as they arose.

As we have already mentioned, technology applied to mobility plays a particularly important role. Where do you think public transportation is heading?

Public transportation is being modernized to boost its competitiveness and appeal compared to other modes and emerging alternatives such as electric scooters and vehicles for hire. To achieve this, it's essential to digitally transform public transportation and make it a competitive option on digital channels.

Real-time data stream architectures will play an increasingly vital role in relaying both internal and external information in real time. It will also become increasingly necessary to dynamically match supply to demand, so it will be critical to "sensorize" demand as much as possible to make predictions and stay ahead of the curve. Meanwhile, some routes may need to transition to on-demand or flexible transportation services to remain viable alternatives.

Developments in communications, with the effective implementation of 5G+ (5G SA) and improvements in positioning systems (multi-constellation, multi-band, dead reckoning) will improve the capabilities, availability, and reliability of all ITS systems. This, in turn, will lead to improved public transportation in the future.

GMV hosts the second technical review of the FCAS program

This March, as a member of the SATNUS consortium, made up of GMV, Sener Aeroespacial, and Tecnobit-Grupo Oesía, together with MBDA and Airbus Defence and Space, GMV hosted the "Technical Review 2" of the technological pillar of Remote Carriers and Manned-Unmanned Teaming, part of the NGWS/FCAS program.

The event, held at GMV's Madrid site, focused on reviewing the achievements to date within the pillar and analyzing the next challenges to address. As José Prieto, GMV's director of business development and institutional defense relations, put it, "the SATNUS-led MUT and MCSD aerial demonstration will change the rules of the game" in relation to these challenges.

The NGWS/FCAS program envisages the development of a "system of systems" integrating both manned and unmanned aerial platforms. Led by Germany, France, and Spain, it's one of the largest European defense projects. Spain has been a program partner since 2019. In Spain, the NGWS/FCAS is considered an important program for the sovereignty of the Spanish state, as well as a project that will contribute to technological development, the construction of a safer Europe, and the creation of an industrial fabric and a large number of highly qualified jobs.

UNEX analyzes the future of drones

The third edition of the UNVEX Live webinars took place in January. The gathering, "Drones: a comprehensive vision," addressed the possibilities of New Space for the defense sector, the outlook for the unmanned sectors industry, and drones as a threat.

The seminar was attended by representatives of ENAIRE, the Spanish air navigation agency, and the Spanish Ministry of the Interior.

GMV was represented by José Prieto, director of business development and institutional relations in the defense area, who focused on of the outlook for the drone market in the defense sector.

He remarked that there have been great expectations in relation to the drone market ever since it emerged, although regulatory challenges have been underestimated. He furthermore noted that while there are more than 100 drone startups in Spain, the business model in this industry is still in its infancy and has great potential for development.

The outlook for the next few years, he continued, is promising for the sector, largely thanks to progress in the regulatory framework and disruptive technologies, such as artificial intelligence and 5G.

GMV to upgrade SEEKER UAS aircraft to enhance Armed Forces capabilities

This evolution will reinforce the capabilities of the Armed Forces, ensuring their tactical superiority

The SEEKER unmanned aerial system (UAS), developed by Aurea Avionics and supplied by GMV, is one of the most effective unmanned aircraft in its category on the market. The SEEKER UAS is a rapidly deployable autonomous system that provides intelligence, surveillance, and reconnaissance capabilities. It has an endurance of 90 minutes, a range of 15 km, and a weight of 3.5 kg.

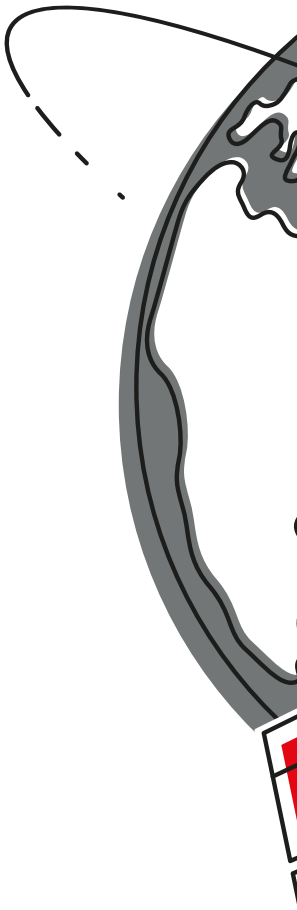
SEEKER is the backbone of a situational awareness system that delivers real-time intelligence. It is designed for military applications requiring rapid deployment and high mobility to perform low-altitude intelligence, surveillance, and reconnaissance missions.

Continuing its activities under the Spanish Ministry of Defense's RAPAZ program, GMV has been selected to upgrade this Class I remotely piloted aircraft system (RPAS).

In 2021 and 2022, the SEEKER systems underwent several operational testing campaigns by the Marine Corps Brigade-Tercio de Armada (BRIMAR-TEAR) and the Paratroopers Brigade "Almogávares" VI (BRIPAC) of the Spanish Army. The aim of these campaigns was to identify potential improvements to the system that would enhance the intelligence, surveillance, and reconnaissance capabilities of these units. Further improvements will be made to the current project throughout 2024. These include increasing payload resolution, enhancing operations in maritime environments, and developing a new ground station.

Under the terms of the contract signed between GMV and the Directorate General of Weapons and Material (DGAM) of the Spanish Ministry of Defense, GMV will implement the upgrades identified for the SEEKER system, carry out two flight campaigns to test the new capabilities, and conduct a s eries of training courses for Air Force and Navy personnel to facilitate the aircraft's future use.

These measures will represent a qualitative leap for the Spanish Armed Forces, strengthening their intelligence, surveillance, and reconnaissance capabilities, which are essential to ensure the tactical superiority and improved operability of their troops.



LEO PNT: The new frontier of satellite navigation

GMV leads a project to develop the key technology necessary to provide navigation services with low-orbit satellites, including launching five small satellites for in-orbit demonstrations

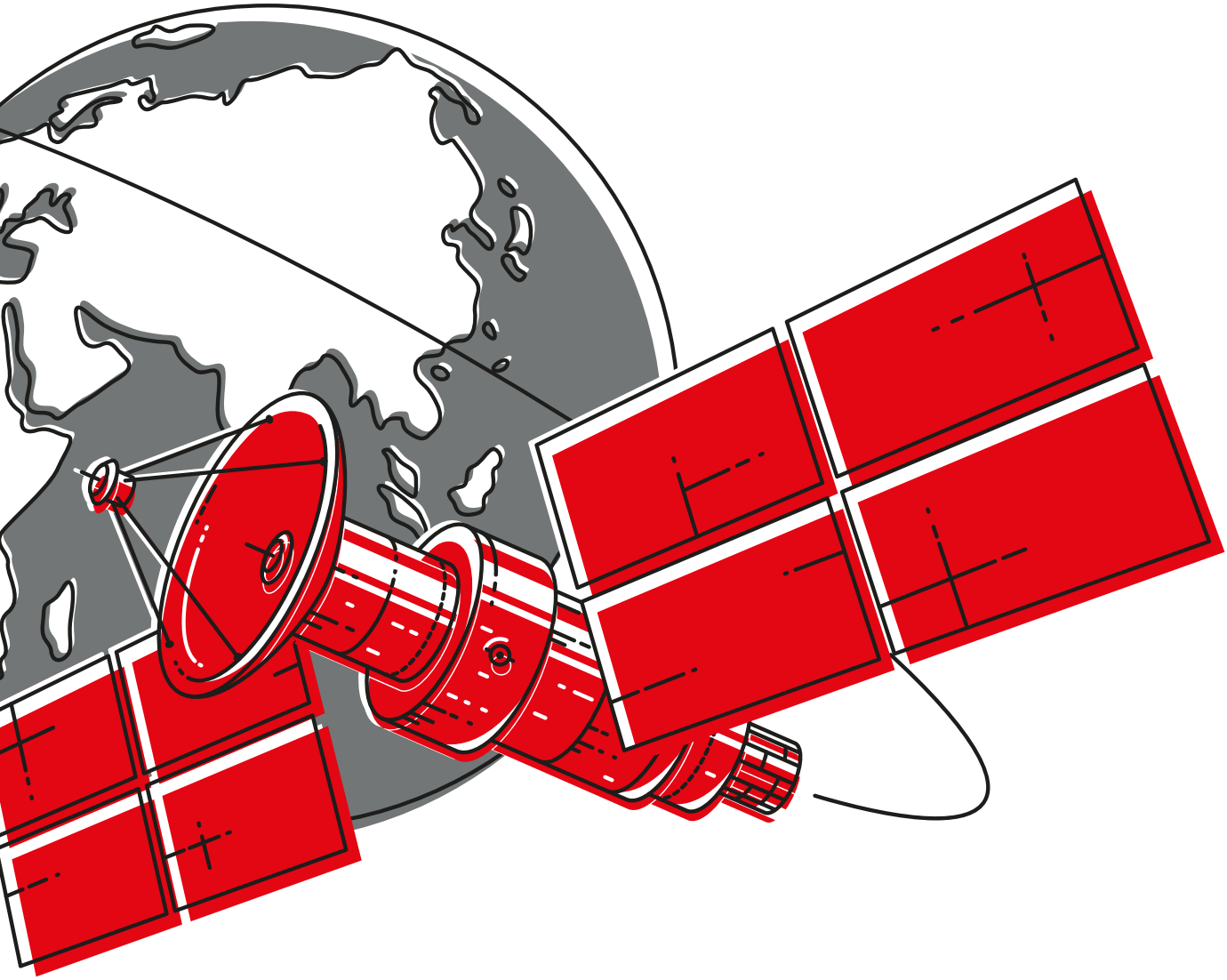
These days, satellite navigation systems play a fundamental role both for people and for the economy. Their applications have progressed considerably and they have been overwhelmingly accepted by users. Traditionally, satellite navigation systems (global navigation satellite systems, GNSS) have used medium Earth orbit (MEO) satellites, but in the future they may have satellites in other orbital configurations. Low Earth orbits (LEO) in particular may provide significant benefits in terms of enhanced robustness, precision, and efficiency of positioning, navigation, and timing (PNT) services.

Within this context, the European Space Agency (ESA) launched a new program in late 2022 called LEO PNT to explore the advantages of LEO satellites providing advanced PNT services. The first step, which is fundamental in developing this strategy, considers the development of key technologies and in-orbit demonstrations (IOD) of the new LEO PNT concept.

After being awarded one in a public tender process, GMV signed a contract with the ESA on April 19, 2024 to carry out a complete LEO PNT in-orbit demonstration mission. The contract includes the development, rollout, operation, and exploitation of a complete demonstration system including the design, development, and launch of five small satellites with navigation payloads capable of generating signals in a variety of bands, supplying ground station as a service (GSaaS) for the ground segment, developing a user-level test receiver, operating the system, and creating an experimentation and demonstration campaign for the new LEO-PNT services for end users.

The project also includes tasks aimed at assessing user interest in new LEO-PNT services. So, the consortium has included representatives from key sectors like road, rail, maritime, and inland waterway transportation, high latitude users, positioning inside buildings, fishing, precise time synchronization, IoT, critical infrastructures, location-based services, and 5G and 6G industries.

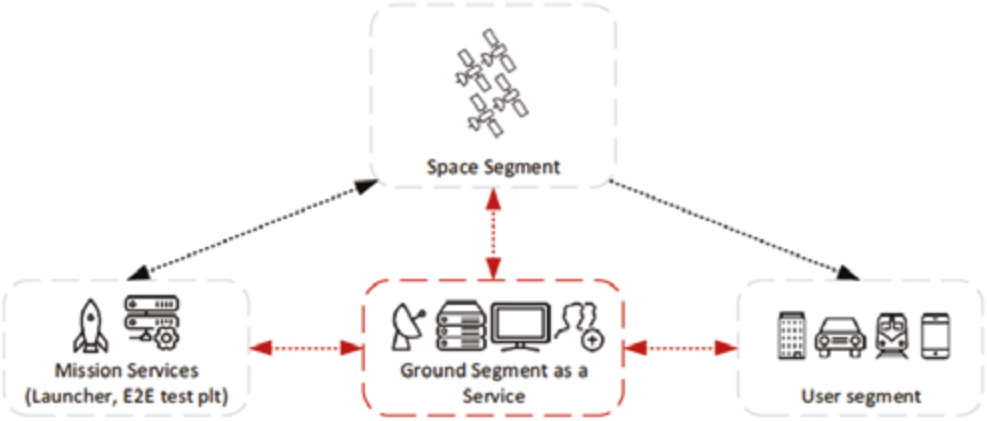
In addition to GMV subsidiaries in Spain, the United Kingdom, Romania, Portugal



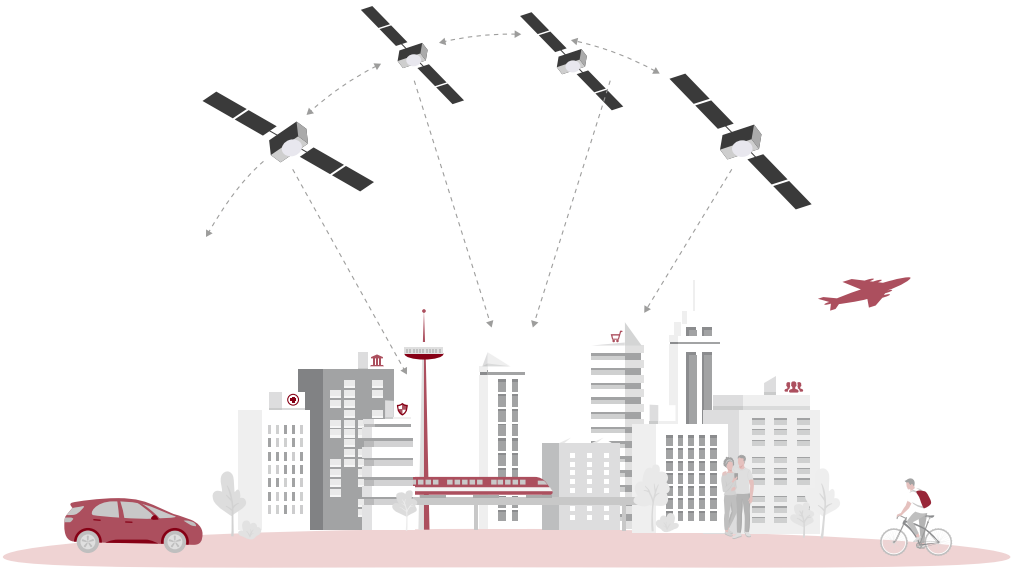
and Alen Space, the manufacturer of platforms for microsatellites and payload components – part of the GMV Group since mid-2023, the consortium includes key partners like OHB Systems AG, the manufacturer of 34 Galileo satellites; Beyond Gravity, an esteemed expert in navigation payload development; and Indra, bringing solid experience in GNSS applications across diverse markets.

Following this mission's ambitious calendar, which includes the design, manufacture, and launch of the first 12U Cubesat microsatellite will be completed in only 20 months, requires incorporating novel New Space and Agile methods throughout the lifecycle. While this first satellite is being developed, GMV will consider an initial user testing terminal to support validation and experimentation and will update the GMV's GSaaS solution to supervise and control the first satellite.

With the LEO PNT in-orbit demonstrator, GMV is ushering in a new era that will open the door to a new generation of navigation systems. The opportunity to lead a complete space mission from start to finish consolidates the company's position as a leading player in the European aerospace industry.



The ESA TGVF-X project closure



Over the last five years, the TGVF-X (Time and Geodetic Validation Facility eXtension) system developed and operated by GMV for the European Space Agency (ESA) has provided routine services from its Galileo Processing Center (GPC) at the European Space Research and Technology Centre (ESTEC) in the Netherlands. The GPC operations team comprised of GMV personnel working at ESA facilities has been responsible for operating the system throughout the contract.

Having its own global network of Galileo Experimental Sensor Stations (GESS) responsible for collecting GNSS measurements in real time from a variety of points around the globe has been decisive in the system's success. The GESS network has allowed TGVF-X to be used to supervise Galileo constellation satellites as well as test and validate new processing algorithms with real data. The system's great flexibility has allowed new functionalities to be incorporated into the system in very short periods of time.

To illustrate just a few uses of this technology, the ESA used TGVF-X during testing to assess improvements to Galileo's I/NAV message to verify proper transmission of new message content and assess its features, facilitating the incorporation of these improvements on operational satellites.

As part of the continuous monitoring tasks for the current Galileo constellation, the TGVF-X system was able to quickly alert the ESA of potential problems with the satellites. This characteristic has been crucial on many occasions, as it has allowed the ESA to anticipate potential problems even before they were detected by the Galileo system.

Although the TGVF-X contract has ended, its functions have been incorporated into the new Galileo second generation system test bed (G2STB), development and operation of which is also being led by GMV.

GMV participates in the Munich Satellite Navigation Summit

GMV participated in the Munich Satellite Navigation Summit, one of the most noteworthy events in the field of satellite navigation. The event took place from March 20-22, 2024 in the city of Munich, Germany, and brought together experts, industry leaders, researchers, and academics from all over the world.

This year's event with the slogan "GNSS meets friends in new orbits – potentials and synergies!" discussed issues like the first and second generation of the European Navigation System for the Galileo Satellite, modernization of the global position system (GPS) of the United States, as well as the state of the BeiDou system in China and other regional navigation systems.

This year's event had a panel dedicated to LEO satellites, in which topics of discussion included the potential use of these kinds of satellites to improve GNSS signal integrity on the Earth's surface. The event also explored the challenges and opportunities of the new space economy emerging in commercial satellite navigation settings.

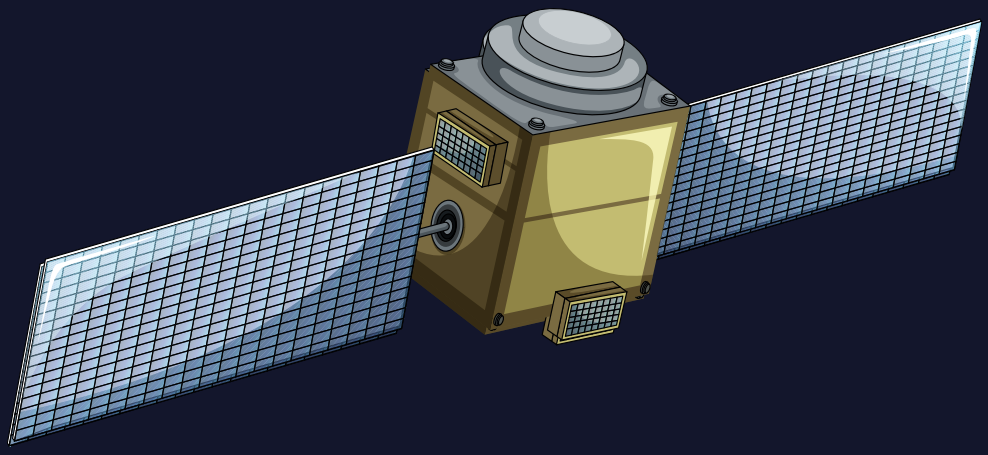
The conference featured a variety of presentations and sessions offered by industry experts, with GMV standing out as one of the world leaders in GNSS satellite navigation systems.

Víctor Pozo, director of GMV's Satellite Navigation Systems Ground Segment Control, participated in the panel at the "Operations of MEO-GNSS and PNT services from LEO constellations" session. Simón Cancela, head of GMV's Advanced Navigation Services division, was part of the "Galileo New Services and Differentiators" panel.

GMV successfully completes first version of test bed for Galileo second generation

GMV has developed a modern GNSS infrastructure utilizing cloud-native technologies

In February 2023, acting on behalf of the European Union Agency for the Space Programme (EUSPA) and the European Union represented by the European Commission (COM), the European Space Agency (ESA) awarded GMV the contract to develop the Galileo second generation system test bed (G2STB). Less than one year later, in December 2023, the G2STB consortium had the first version of the system accepted.



The G2STB offers the ESA unique verification and validation capabilities for Galileo to support its role as technical head of Galileo system development, thus allowing a wide variety of supervision, problem-solving, prototype development and experimentation campaign activities related to the Galileo system to be performed. The first version of the G2STB not only guarantees fluid transition from the Galileo first generation (G1G) to the second (G2G), taking advantage of the legacy tools from the predecessor system, but it also offers a highly flexible platform for developing prototypes, carrying out experimentation campaigns, and consolidating new Galileo services slated for G2G.

The G2STB V1 integrates G1G geodesy and precise time synchronization (TGVF-X) functionalities inherited from the predecessor system, developed and operated by GMV, as well as from the Galileo system evaluation system (GALSEE).

GMV developed a modern IT infrastructure for G2STB based on the use of cloud native technologies that offer the flexibility, scalability, and redundancy required by the ESA. This technological advancement is a logical step in this kind of infrastructure, as it allows for both existing applications for a platform as a service (PaaS) solution, as well as hosting G2 prototypes focused on microservices leveraging the multilayer architecture. The G2STB is the first Galileo installation to apply this technological advancement to a real case, allowing it to meet demanding standards of service.

This innovative platform could be developed in such a short period of time thanks to the introduction of a Scaled Agile Framework (SAFe), which adds an agile development approach geared toward continuous evolution. GMV was able to roll out an Agile Release Train or ART (a team of teams) focused on the G2STB with participation from all consortium members. Fluid integration of all teams, including the ESA as the business owner and subcontractors as suppliers of G2 software prototypes, lays the groundwork for the development of future G2STB versions. Additionally, the fact that all subcontractors can actively participate on the development minimizes implementation and evaluation time for new G2 services.

Acceptance of this first version has set the first G2STB operations in motion to be carried out by ESTEC. This paves the way for improvements to be made to G2 prototypes for the second version of G2STB, which is expected to be ready in early 2025. G2STB V1 will also allow for new improvements to be tested on Galileo services like HAS phase 2 and time synchronization service monitoring.

GMV completes first version of Galileo Second Generation ground segment control design

In early February, GMV completed its design of the first version of the ground segment for Galileo Second Generation (G2G). This milestone solidifies the design that GMV initially proposed during the tendering phase, and it includes the final interfaces with the various segments, final definition of the encryption algorithms, and the final architecture for this first version of the ground segment. It also represents an essential milestone for establishing the basis of development for this segment's various components, and for consolidating the design of the platform where those components will be implemented.

Development of ground segment control was done following the SAFe methodology and supplemented by specific milestones at the system level, where the contributions and designs for the various segments of the Galileo program are being synchronized and evaluated.

Once the initial design has been established, minor design adjustments will be carried out during the development phase, at the same time as intermediate deliveries to gradually validate functionality until the first rollout at the end of the year. These intermediate deliveries will facilitate the integration and validation process for the various segments of Galileo second generation.

It is currently expected that the final version of this first ground segment delivery will be rolled out into the operational chain at some point in 2025, thereby having it ready for the first launch of Galileo second generation satellites.

GMV and TAS-I sign contract for activities related to the Galileo system

GMV has signed a new €4 million contract with Thales Alenia Space Italy (TAS-I) including performing system activities for Galileo Second Generation (G2G). The tasks that GMV will carry out include systems engineering activities, a variety of developments associated with mission analysis studies, and tech support for integration and validation activities prior to the launch of the new Galileo second generation satellites. The contract also includes provision of two network data interface units (NDIUs), which will facilitate S-band interface validation for the new satellites.

These system level activities complement those already contracted by the ESA to carry out system compatibility test campaigns (SCTC) as part of the development and rolling out of the Galileo second generation ground segment. Said tests will be carried out for the two different second generation satellite programs currently being developed and built in Rome, Friedrichshafen, and Toulouse. The first launch with Ariane 6 is scheduled for the first quarter of 2026. Until then at least four compatibility testing campaigns must be performed with the satellites from each family prior to the final configuration and launch preparation.

With this contract, GMV is increasing its responsibility at the system level, as part of the definition, integration, and validation of the ground segment with the Galileo space segment.

Key role for GMV in new version of EGNOS system

In December 2023, the new version of the European Geostationary Navigation Overlay System (EGNOS) was successfully deployed. It incorporates various algorithmic improvements made in the new version of the EGNOS Central Processing Facility Processing Set (CPFPS) subsystem developed by GMV. The new version provides substantial improvements in system availability.

The EGNOS system first went into operation in 2009. It is a satellite-based augmentation system (SBAS) designed to provide differential correction for GPS users in Europe, thus increasing precision and ensuring the integrity of the positioning signals transmitted to users. The EGNOS safety of life service, primarily used in the aviation industry to assist with precision approaches to European airports, has considerably improved safety in the airline industry since its initial introduction in 2011.

GMV has played a fundamental role in the EGNOS program since it was first being developed, with active participating in the design and definition phases for the system's first generation, along with ongoing evolution of the system through its development and maintenance of the CPFPS. This subsystem, often considered the "heart" of EGNOS, is responsible for calculating corrections and the various integrity message parameters sent to users.

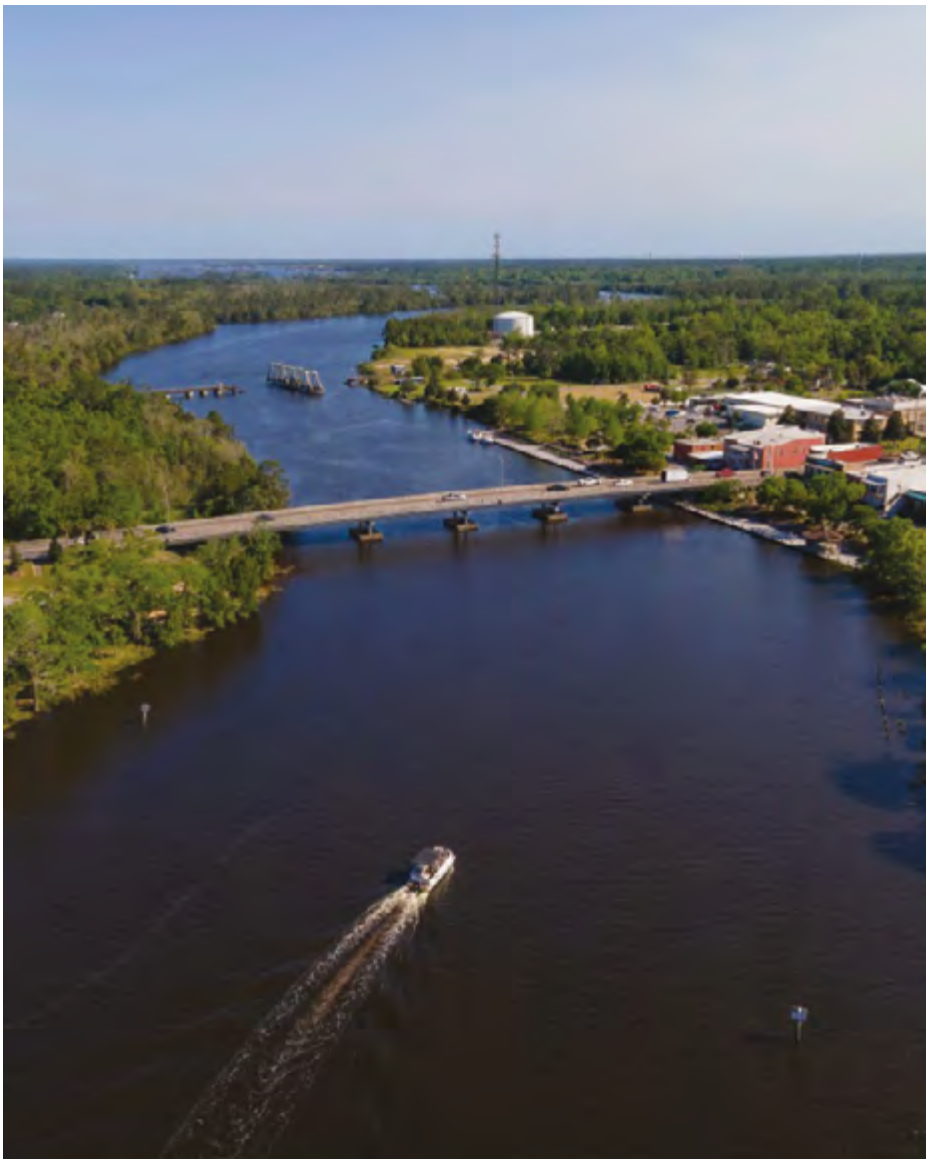
The commissioning of the new version allows GMV to continue contributing to the continuous improvement of EGNOS, a European Union-funded program in which the company has been involved for more than 25 years as the design, development, validation and maintenance lead for a variety of subsystems and tools such as CPFPS, EDAS, EURONOTAM, ASQF, and ATPAIV.

This article reflects the views and opinions of its author, not necessarily those of the European Union, European Space Agency (ESA), or European Union Agency for the Space Programme (EUSPA), which are not responsible for any uses made of the information contained in the article.

AVIS project: optimization in the navigation for autonomous vessels

The European Commission's AVIS project, which is being led by the multinational technology company GMV, officially got underway on January. The goal is to improve navigation for autonomous vessels along Europe's inland waterways by using European Union space systems such as the European Global Navigation Satellite System (E-GNSS) and Copernicus. In addition to improving navigation in inland waterways, the project is expected to help create new applications for autonomous vessels, as well as contribute to the European Union's goal of transforming transportation systems to make them more sustainable and less polluting.

Further goals of the AVIS project include defining requirements for autonomous vessels and for operating such vessels in Europe inland waterways; developing a prototype for onboard equipment; providing proof of concept for the AVIS solution through several pilot tests on European inland waterways to prove its feasibility and added value; creating new regulations establishing the minimum requirements to guarantee safe navigation as a contribution to the European Committee for Drawing Up Standards in the Field of Inland Navigation (CESNI), an EU body that includes other relevant standardization institutions; and finally, participating in outreach work to share the results of the project. The project will take place over the course of 37 months.



The consortium in charge of carrying out the project is led by multinational technology company GMV, with extensive experience in E-GNSS and Copernicus and a proven track record in developing secure solutions. In addition to managing the consortium, GMV will lead most of the work in standardization and the definition of technical solutions. The consortium includes a wide range of organizations, including Germany's Federal Waterways and Shipping Administration (WSV), the Hungarian National Association of Radio Distress-Signalling and Infocommunications (RSOE), HA Consulting Ltd. (HAC), Tresco, Bergmann Marine (BM), Ernst & Young (EY), and GMV's subsidiary in Romania.

The AVIS project is also expected to contribute to the goals of the European Union's NAIADES project, which seeks to provide multidimensional intelligence for the water sector through artificial intelligence technologies in order to achieve high-quality water management services. The goal of the EU's space programs is to maximize the socioeconomic benefits of its space systems for its citizens. In doing so, the EU seeks to transform society, transportation, and industry with the goal of making progress in its medium- and long-term goal of zero CO2 emissions, given that the transportation sector is one of the main contributors to these emissions.

GMV has been awarded the contract to develop the SKA telescopes' Timescales, the largest radio telescope in the world

GMV has been awarded a contract to develop the Timescales for the SKA Observatory's (SKAO's) two ground-breaking telescopes. The SKAO is an intergovernmental organisation with its Global Headquarters in the UK, at the historic site of Jodrell Bank Observatory near Manchester. The SKAO's mission is to build and operate cutting-edge radio telescopes to transform our understanding of the Universe, and to deliver benefits to society through global collaboration and innovation.

The SKA telescopes will cover two different frequency ranges. SKA-Mid, an array of 197 traditional dish antennas, is being built in South Africa's Karoo region, while SKA-Low, an array of 131,072 smaller tree-like antennas, is being built in Western Australia, on Wajarri Yamaji Country. For each telescope, the individual dishes and antennas work together as a huge array, with signals being digitally combined. The arrays will both be spread across large distances, with the most distant antennas being separated by 150km in South Africa, and 74km in Australia.

Using cutting-edge technology, including some of the fastest supercomputers in the world, they will make it possible to study the Universe in exquisite detail, revealing the environments around black holes, tracking the journeys of gravitational waves, and enabling a host of other ambitious science investigations.

Due to the sheer volume of data that will have to be transported, processed, stored, and distributed to end users around the globe, the SKA project is considered by many the ultimate Big Data challenge. An average of 8 terabits per second of data will be transferred over hundreds of kilometres from the telescopes. This is around 65,000 times faster than the estimated average home broadband speed in 2023.

Because signals from space reach each antenna at a slightly different time, the signals must first be aligned. This is achieved thanks to highly precise atomic clocks that timestamp the arrival of each signal. Each SKA telescope (SKA-Mid and SKA-Low) operates a central clock system called the Timescale. Each Timescale is composed of three ultra-stable clocks called hydrogen masers, plus ancillary hardware and software. The signals produced by the masers are continuously compared with one another to identify inaccuracies and are also compared and aligned via satellite with UTC time kept by the International Bureau of Weights and Measures (BIPM).

To support SKAO's mission, under this contract GMV will design, manufacture, install and commission an operational Timescale for time distribution at the two SKA telescope sites. The project will run from February 2024 until October 2027. GMV will deploy the operational SKA-Mid timescale in South Africa in February 2026 and the SKA-Low timescale in Australia in June 2026. The deployment is followed by a period of monitoring and support.

Policy framework for PNT system resilience

On 18th October 2023, the UK Government published its policy framework for Position, Navigation, and Timing resilience. In it, the government recognises the vital importance of PNT to public services, and the need to enhance the resilience of the nation to PNT threats in order to protect Critical National Infrastructure, economic security, and to develop in high growth sectors such as space.

The framework sets out the key points in the UK Government's plan to reduce the risks to the nation that result from the universal reliance on PNT, and in particular satellite navigation. Central to the framework is a list of 10 key policy areas that will inform the implementation actions over the coming years. Some will be quick to enact, others will take longer, and some are more about long term ambition. Nevertheless, these 10 points show a significant new level of political ambition and engagement that is welcome across the sector.

The framework held together by the establishment of a National PNT Office; a central function within government to co-ordinate PNT requirements and actions across all government departments. This crucial first step, implemented with the announcement, will give all stakeholders in the UK a focal point for engagement on PNT. That includes not just users (across government and critical infrastructure), but also politicians, industry, academia, and investors.

The framework also addresses:

- PNT sources and technology, for instance making a statement of intent towards a UK Space Based Augmentation System to (SBAS) to replace the lost access to EGNOS for safety critical services;
- Crisis planning, to ensure that the UK is resilient when threats occur;
- Skills, and developing a pool of talent able to execute and exploit the plan;
- Growth, recognising that this is a global market, and investment requires future return.

While the PNT Policy Framework is a great step forward, for now it remains a statement of intent, with no specific actions or budget to back it up. But GMV is in a unique position to seize this opportunity, to help the government achieve its ambition, and to deliver world leading technology and services.

Towards a more competitive european space industry

From 24 to 25 January in Brussels, Belgium, GMV attended the sixteenth edition of the European Space Conference, an opportunity for political leaders and space industry stakeholders to come together to discuss the future of the sector in Europe.

The year 2023 was undoubtedly a turning point for the European space sector, with the European Union continuing to work to strengthen its capabilities and foster the growth of a robust space ecosystem, thus securing its place in the space industry in an ever-changing global context. GMV sponsored the event, which included the participation of Enrique Fraga, general manager of EST space systems at GMV. Fraga spoke at the session on "Defining the European approach to Secure and Autonomous Connectivity from Space," highlighting the importance of the IRIS2 program for the European space ecosystem and the crucial role of European midcaps, not only as a result of their significant participation in the space sector, but also as an essential element in terms of meeting the required deadlines, costs, and innovation levels. He also emphasized that Europe has the opportunity to reinforce its own strengths rather than imitate the SpaceX model, advocating for a more efficient and competitive supply chain that is better prepared to take on leadership roles in the future.

Jorge Potti, GMV's strategy director, participated in the round-table discussion on "Space Economic Security: A strategic approach for non-dependency and autonomy," where he focused on the competitiveness and sustainability of the European space industry, geo-return, and future technologies to bet on (secure communications, space domain awareness, quantum communications, and PNT).

Mariella Graziano, director of business strategy and development for EST space system science, exploration, and transportation at GMV, participated in the round-table discussion on "The Future of European Space Exploration: Geopolitical and socioeconomic perspectives of European Human Space Flight and Robotic Exploration".

GMV to supply data services system for the MBZ-SAT satellite

GMV will bring its expertise in automated image planning and processing to significantly enhance MBRSC's services

The Mohammed Bin Rashid Space Centre (MBRSC) has awarded GMV a contract to develop the data services system for the UAE's MBZ-SAT Earth observation satellite. Through this partnership, GMV will develop the satellite's data reception, mission planning, processing, and user services system. This will be the fourth Earth observation satellite to be developed and launched by MBRSC.

MBZ-SAT is the most advanced commercial satellite in the region for high-resolution satellite imagery. Set to be launched in 2024, the satellite will feature an automated system for continuous image acquisition, processing, and cataloging. This guarantees that it will provide the highest standards of quality for satellite images specifically designed for global commercial use.

Through the project, MBRSC is set to greatly improve its capabilities for image production, addressing the growing demand for its services. This enhancement is supported by GMV, which will contribute its expertise in automated image planning and processing ensuring the quality and performance requirements demanded by MBRSC.

MBRSC will benefit from a suite of technical solutions and components that GMV has successfully implemented in past space missions. These GMV products include ***Flexplan*** (mission planning), ***Visualfocus*** (orbital calculation and 2D/3D visualization) and ***Prodigi*** (data processing and user services). Additionally, GMV will develop high resolution image processors.

The introduction of these technologies to the MBZ-SAT mission represents a significant leap forward in imaging capabilities, with the potential to more than double the resolution of images compared to previous systems. This marks a milestone for MBRSC, ensuring it remains at the forefront of space exploration and satellite imagery, ready to meet the demands of current and future missions with reliability and advanced technological support.

GMV will coordinate MESEO project to enhance end-to-end Earth Observation capabilities

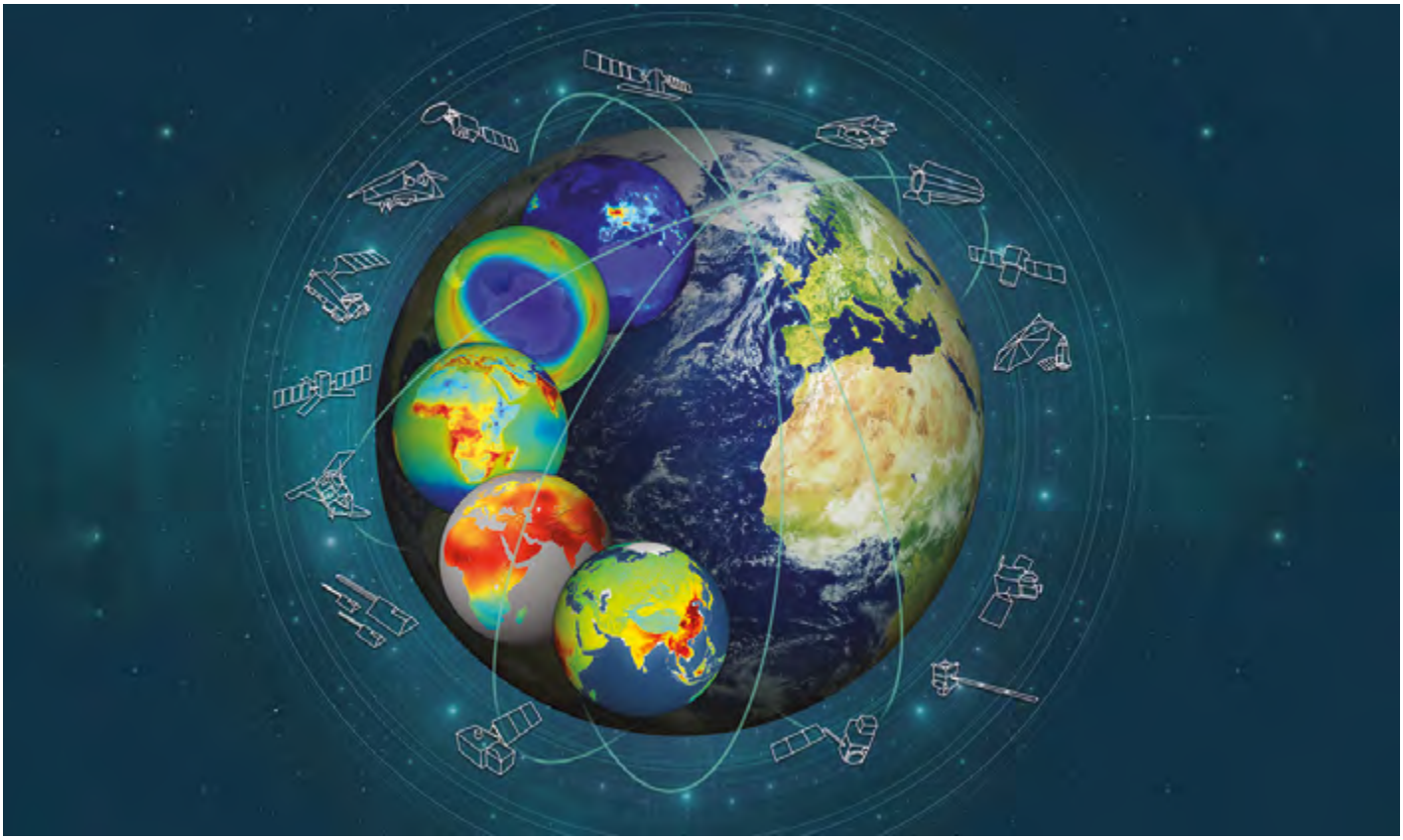
GMV has secured a contract under the Horizon Europe program by the European Commission. The project, named MESEO (Multi-Mission Efficient and Secure High Capacity End-to-End Earth Observation), is a multinational endeavor that boasts top-tier partners. As the coordinator, GMV will play a pivotal role in ensuring the project's success. The other esteemed partners include Airbus, Ubotica, Resolvo, Satl, Sistema, UNIFE, Creotech and Sovity.

MESEO aims to enhance efficient and secure high-capacity end-to-end Earth observation (EO) capabilities, and with this strong consortium, it's poised for success in advancing cutting-edge technology and scientific research.

MESEO aims to design, prototype and demonstrate an open, flexible and scalable multi-mission EO End-to-End system for massive processing. It will overcome potential performance bottlenecks either on board or on ground while ensuring Space data sovereignty. The main goal of the proposed approach is to improve quality of service and timeline reactivity by improving the end-to-end EO processing chain at different levels and through edge computing, while reducing communication bandwidth and incorporating new technology optimized in power consumption and processing capabilities.

MESEO is a crucial project for exploiting data from Earth observation satellite missions. It is user-centric, providing valuable information across multiple missions and payloads. The project will result in a system where functions are deployed collaboratively as services, both in the ground segment and in space. This system will have harmonized and secure interfaces, ensuring data sovereignty and secure communications, what is paramount in the European context.

The expectations for the outcome of this project are highly promising. We anticipate that it will establish a new paradigm in generating information based on Earth observation satellite technologies. This will be achieved through a secure and sovereign collaboration among various partners. Furthermore, it will elevate GMV to a higher level in the state-of-the-art data exploitation landscape, with significant commercial prospects."



Contract with the World Bank to Enhance flood and drought management in South Sudan

GMV, as lead of the Global Development Assistance (GDA) Climate Resilience consortium and use case lead, has been supporting the World Bank (WB) and South Sudan's Ministry of Water Resources and Irrigation (MWRI) in enhancing climate-resilient water resources management and strengthening flood resilience in specific river basins. Through the use of Earth Observation technologies, this support resulted in the provision of flood management data products.

In line with the coordinated strategy deployed between ESA and the World Bank following the Space for IDA cooperation framework principles, the WB has mobilised additional resources from the Global Facility for Disaster Reduction and Recovery (GFDRR) to complement the support provided by ESA through the GDA programme. This resulted in the publication of a WB public tender which was awarded to GMV for the implementation of a project entitled "Strengthening knowledge and information for flood and drought management South Sudan regional climate resilience program". This project aims at further enhancing South Sudan's water information management system (WIMS) through the incorporation of Earth observation (EO) data combined with model outputs and in-situ data.

GMV leads this new project in South Sudan formed by a consortium consisting of Vizzuality, Polytechnic University of Valencia, and Ass. Prof. Khidir Abdalla Kwal Deng from the University of Juba, who will serve as an independent local consultant. This project holds significant promises as it seeks to achieve two key objectives: the development of first-generation flood and drought hazard and exposure maps for South Sudan, and the creation of a Water Information Management System pilot tool and roadmap to enhance data and information availability for water management. To ensure effective implementation, the consortium will provide hands-on training and capacity building, actively engaging government experts in data collection and processing activities.

GMV supports crisis management, in the result of the floods in Germany

Last holiday season, the remote sensing division of GMV in Portugal was in full force, working 24/7 to support crisis management, because of the massive floods that occurred in Germany, caused by heavy rain that led to rivers and streams to rising. This type of work is developed in the framework of the Copernicus Emergency Management Service, in its Rapid Mapping component, where GMV participates since 2017 and renewed its contract for 2023-2028.

In this service, GMV uses satellite imagery and other geospatial data to provide around the clock (24/7) mapping services and other geo-information, within hours or days from the user request, supporting emergency management activities immediately following a disaster, or other humanitarian crises, anywhere in the world.

The service is part of the European Civil Protection Mechanism, and its outcomes are used by various actors active in the field of crisis management, namely the national civil protection of the EU Member States, EU agencies and services, and international humanitarian aid organizations. The service portfolio includes different types of products: to ascertain the situation before the event (reference product), to roughly identify and assess the most affected locations (first estimate product), assess the geographical extent of the event (delineation product) or to evaluate the intensity and scope of the damage resulting from the event (grading product).

Data security within the space traffic management based on privacy enhancement techniques

GMV has been recently awarded with a new ARTES A&T contract which looks into the privacy of the shared data in-between the satellite operators as well as satellite operators and SSA/CA providers. For this purpose, GMV proposes to use the previously developed tools in the frame of the Collision Risk and Automated Mitigation (CREAM) cornerstone of the ESA's Space Safety Programme by adding a new level security and trust to the data shared between the satellite operators.

One of the goals of the ESA's CREAM activities aim at automating the assessment and mitigation of the risk associated to a conjunction event while reducing the workforce in analysis. All these initiatives are based on the necessity of sharing data to better predict the potential collisions and to agree on a strategy of manoeuvres to avoid them. Privacy is a critical subject to consider when sharing sensitive information. To prevent the misuse or theft of sensitive data, some new techniques have been developed to enable data analyses without compromising privacy.

These techniques use state-of-the-art algorithms to perform computation directly on encrypted or derived data, ensuring end-to-end protection. However, privacy-preserving computation techniques are not without challenges: they require more computational resources, specialised hardware, or advanced programming skills, or a combination of these factors. Therefore, a trade-off between costs and benefit of the application of these techniques need to be found.

The objective of this activity is to develop and test prototypes to be included within collision assessment and coordination platform tools, ***AutoCA*** and ***AutoSTM***, to guarantee privacy of the used data and satisfy the data private requirements from satellite operators. Using privacy preserving would encourage satellite operators to share their sensitive data in order to increase the overall space safety, by improving the prediction models and the coordination of the collision avoidance mitigation actions.

GNC and avionic applied to reusable hypersonic craft

In March, GMV went to the workshop on reusable hypersonic craft organized by the European Space Agency (ESA) at the European Astronaut Center (EAC) in Cologne, Germany. The meeting was attended by representatives from the aviation industry and specialized research centers to establish research synergies to develop these hypersonic craft and their applications in aviation.

GMV shared its know-how about advanced avionics technology, hardware, and software, highlighting the guidance, navigation, and control (GNC) subsystem and the challenges posed by implementing it in this field. GMV's capacity to develop and assess avionics equipment applicable to these craft, such as GPS receptors and power units, was brought to light.

Francesco Pace, from GMV's Robotics and EST Space Flight Segment Unit, presented the company's vision and experience in hypersonic vehicles developed over the last few years on institutional projects, especially for ESA and commercial aviation.

Mariella Graziano, director of business strategy and development for EST space system science, exploration, and transportation at GMV, expressed about the strategic importance of hypersonic technology for the future of space exploration.

The goal of the event is to help identify critical technologies and aspects of transport and reentry of spacecraft in the context of ESA human exploration programs. GMV has had a notable trajectory in the field of guidance, navigation and control systems, and avionics, proven in missions like IXV, Space Rider, Hera, and PROBA3 and launcher projects like VEGA, MIURA-1, and THEMIS.

Unravelling the secrets of explosions and collisions in Space

Space debris is a growing problem that threatens the safety and sustainability of space activities. Break-up events can occur due to collisions with other satellites or debris, as well as due to internal explosions within a satellite (high pressure propellant tanks, electric batteries, etc.). Satellite break-ups create clouds of fragments, increasing collision risk for other spacecrafts and potentially causing a domino effect of cascading collisions that could make space unusable, known as Kessler Syndrome. To prevent this phenomenon, it is important to understand the dynamics and consequences of these events, and to develop methods to reconstruct and characterise them based on real data from historical break-up events.

GMV, together with the Politecnico di Milano (Italy) leading the project, the Istituto di Fisica Applicata "Nello Carrara", Consiglio Nazionale delle Ricerche (abbreviated IFAC-CNR, Italy) and SpaceDyS (Italy) has been recently awarded with a new ESA's activity named On-Orbit Break-up Forensics to provide innovative methodologies for the analysis and characterisation of space fragmentation events.

The activity will leverage the state-of-the-art debris modelling and observation capabilities to improve the estimates of the spatial and temporal distribution of debris fragments after a break-up in orbit. It will also focus on new metrics and methods to characterise the dynamics of a cloud of debris, and aim to optimise the tasking of sensors for dedicated observation campaigns. Rapidly observing fragments after a satellite break-up in orbit is critical as they rapidly disperse and become more challenging to accurately track. As a result, the activity will develop a new tool for reverse engineer a fragmentation starting from observed fragments.

This activity will contribute to the development of a digital twin of the space debris environment after a fragmentation, which will support forensics in space and the risk assessment for space missions in their design phases.

The activity is financed through ESA's Technology Development Element (TDE) and aligned to contribute to the technology objectives from ESA's Space Safety Programme, focusing on the improvement of the technologies for effective risk evaluation, by establishing a theoretical formulation for the estimation the space debris density within days after a break-up event in orbit.

PoC-1 now underway to improve in-space transportation vehicle capabilities

Last year saw the launch of Preliminary Design Of In-Space Transportation Proof Of Concept-1 (PoC-1): In-Orbit Rendezvous And Docking - Phase B1 Studies. This project is funded by the European Space Agency (ESA) and is being carried out by a consortium led by The Exploration Company and including GMV.

The aim of PoC-1 is to define and mature in-space transportation vehicle (ISTV) capabilities to enable the creation of a space transportation and logistics ecosystem. PoC-1 will focus specifically on demonstrating the capabilities required to achieve in-orbit rendezvous and docking between two orbital systems. The objectives of Phase B1 are to generate requirements and produce a preliminary system design. Subsequent phases will culminate in an in-orbit demonstration to validate the developed technologies.

GMV is a subcontractor in PoC-1 and its activities are focused on two areas: the development of a relative visual navigation system, which will allow the guidance, navigation, and control system to perform an approach with the necessary precision for automatic rendezvous and docking between cooperative vehicles, and the development of an interface for docking and interconnection between the two vehicles, and ensure refueling.

GMV will further develop and adapt the ASSIST docking and refueling interface developed in previous activities for use in PoC-1. The project will last five months and will be completed in May 2024.

GMV, Indra and Hisdesat awarded key contract for future EU satellite communications programme

The European Union Agency for the Space Programme (EUSPA) has awarded GMV, Indra and Hisdesat a contract for the preliminary design of the GOVSATCOM Hub (Stage 1).

GOVSATCOM is one of the five components of the EU Space Programme, together with Copernicus, Galileo, EGNOS, and Space Situational Awareness, and will be responsible for delivering secure and cost-effective satellite communication services to EU authorized users. It will provide military and civilian users with communication services in various scenarios, including crisis management, border and maritime surveillance, critical infrastructure management, and security-related services in polar regions.

The GOVSATCOM Hub is a central part of GOVSATCOM as it will link users with connectivity needs to providers of communication resources. It will be responsible for ensuring optimal service delivery by combining and aggregating available satellite and ground infrastructure to match user demands. The GOVSATCOM Hub will have to plan for both medium-term, predefined communication needs as well as dynamic, urgent requests related to unpredictable scenarios, all under strict security requirements. In addition to other European communication resources, the GOVSATCOM Hub will manage the services offered by the future EU multi-orbit constellation communication system IRIS2.

The awarded project is Stage 1 of a multi-stage procurement approach by EUSPA. This stage focuses on the preliminary design of the Hub system, including the security monitoring system for the entire GOVSATCOM infrastructure. The project in Stage 2 will involve the development and deployment of the final Hub as well as the production and delivery in 2024 of a security-accredited early version of the Hub capable of managing the GOVSATCOM Initial Services, which will also be demonstrated as part of the Stage 1 project awarded.

As project leader, GMV will oversee a team of ten partners, including Indra and Hisdesat as core team members. This project is an important step in competing for the GOVSATCOM Hub Stage 2 contract for the implementation and deployment of the final system.

This contract is executed within the framework of a program financed by the European Union.

GMV participates in New Space Portugal's first General Assembly

The prime objective of New Space Portugal, part of the NextGenerationEU agenda, is to develop, manufacture, and operate satellite constellations and Earth observation services while bringing about a leap in the levels of specialization and value chain position of the Portuguese space industry, by creating processes, products, and services through a New Space Praxis.

The General Assembly took place on 17 January at the Matosinhos premises of project co-promoter CEiiA (Center of Engineering and Product Development), and brought together 70 professionals with the goal of assessing the results of the hard work carried out over the past year and analyzing and charting the future of the Portuguese space sector and its projection in the European and global context.

GMV's Portuguese team is currently working on the initiative's "Very High Resolution" and "Digital Planet" work packages. In the former the Mission Data Systems and Products Division will develop systems for processing data generated by very high-resolution sensors and other elements of the ground segment of satellite systems. The latter is a contribution to a horizontal endeavor of definition and setup of solutions that leverage on the constellations - the Remote Sensing and Geospatial Analytics team in GMV will coordinate with stakeholders to build a framework for territorial management services and emergencies and climate resilience.

CARIOQA mission begins, key to testing quantum technology in space applications

The partners of the CARIOQA project—CNES (Centre National d'Études Spatiales), DLR (German Aerospace Center), Airbus Defence & Space, GMV, FORTH/PRAXI, and the European Commission—officially initiated the first phase of the mission in January. This project's name stands for Cold Atom Rubidium Interferometer in Orbit for Quantum Accelerometry.

To deploy Europe's space operational capacity in the future, first, the atomic accelerometers qualified for space must be tested, a colossal challenge given the performance requirements for space applications. The CARIOQA mission aims to fly and test the first atomic accelerometer in orbit by 2030. The project will elevate the technological readiness level for this type of instruments and demonstrate their performance in flight.

This milestone marks the mission's starting shot, key for demonstrating and qualifying quantum technology in space applications. In the case of CARIOQA, the instrument will be able to measure accelerations using cold atoms and deeply study disturbances in the Earth's gravitational field, being able to, for instance, monitor the water cycle or seismic hazards. Future geodesy space missions will benefit from this technology to enhance scientific knowledge of hydrology, oceanography, and glaciology, providing a deeper understanding of the water cycle and the interior structure of the Earth. Ultimately, such applications will help manage natural resources more sustainably, as well as mitigate natural disasters with a better understanding of climate change. CARIOQA will also contribute to research fields in fundamental physics, notably via its capacity to test the weak equivalence principle.

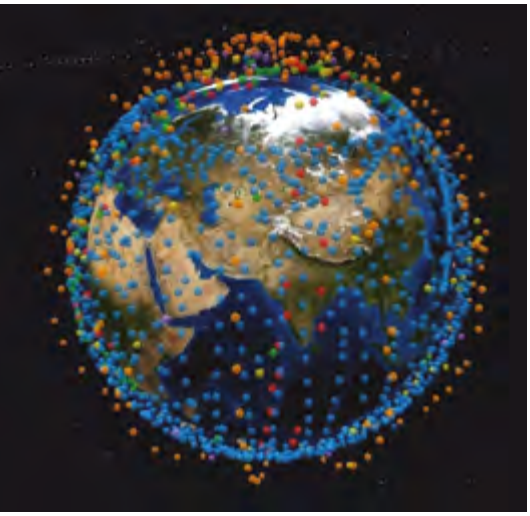
GMV is playing a crucial role in this project as Mission Analysis leader. The company will analyze and define the orbit where the instrument will operate and characterize the different phases of the mission in terms of propulsion needs, radiation and illumination conditions, and interaction with ground stations throughout the satellite's operating lifetime. GMV's contribution is, therefore, key to the activities of the other partners, and essential to the success of the CARIOQA mission.

Developed with a strong European Commission contribution with the Horizon Europe program, CARIOQA is sowing the seeds of a future European industry at the head of applications with quantum sensors in space.

GMV awarded LEOSG Project

In the last years there has been a growing interest in Low Earth Orbit (LEO) constellations to provide telecommunication and navigation PNT services, both from commercial and governmental entities. As an example, ESA's LEO PNT constellation proposes an augmented-PNT service compared to the classical MEO (Medium Earth Orbit) or GEO (Geostationary Orbit) satellites in current GNSS systems.

In the frame of ESA's Navigation Innovation and Support Program (NAVISP Element 2) GMV has been awarded with the activity LEOSG: LEO PNT Signal Generator. GMV proposes the development of an Engineering Model (EM) including all the critical components of a generic Navigation Payload Signal Generator demonstrator for a future LEO-PNT system.



Traditional solutions are based in Software Defined Radio SDR technologies. In this activity, a new technology called Radio Frequency System on Chip (RFSoC) will be used, allowing the implementation of RF solutions in architectures which incorporates powerful microprocessor (to implement versatile and reprogrammable Software Defined Radio), programmable logic (to implement accelerators for the most computational intensive operations) and Analog RF components (ADCs and DACs) in the same silicon. The highly integrated system RFSoC offers a competitive advantage in the level of integration of the different payload components (processing and transceivers), allowing to reduce the complexity of the hardware developments, size, weight and power consumption (SWaP) for complex RF payloads, keeping the capabilities of the traditional solutions and making it more versatile and upgradeable.

The final product, belonging to the Satellite Navigation Space Segment, will be a generic Navigation Payload Signal Generator demonstrator for a future LEO-PNT system, providing a flexible signal generation capability based on Software Defined Radio SDR technologies and processing acceleration implemented in programmable logic. The payload will transmit Navigation signals in 2 frequency bands: L-band and S-band.

With this solution, GMV proposes to adopt a new space approach with cheap and fast access to space. The payload will be quite versatile and therefore could address different services, missions for LEO platform with the possibility to adapt the signal design for the targeted customers.

Looking ahead to the next satellite era at SmallSat Symposium

GMV was once again present at SmallSat Symposium, one of the world's leading events in the field of small satellites, which held its ninth edition from 6 to 8 February in Silicon Valley, Mountain View, California. With the theme "Key Connections and Insights For The Next Evolution in SmallSats," the conference brought together experts from public, private, and governmental organizations to analyze and predict the changes that will transform the SmallSats market in 2024, guaranteeing its continued success.

The conference provided a platform for open communication and gaining critical insight, key elements for the future of SmallSats, which now make up approximately 95% of all satellites launched.

The program covered a wide range of subjects, including the market, regulatory aspects, investment in SmallSats, and emerging technologies such as the Internet of Things, in-space services, megaconstellations, machine learning, and cloud computing.

As a global leader in the satellite ground control market, GMV took advantage of this opportunity to participate in the conference with its own stand, where it showcased the company's product lines for satellite control (***Hifly***), flight dynamics (***FocusSuite®***), mission planning (***Flexplan***), ground station monitoring and control (***Magnet***), payload management (***Smart Payload***), collision avoidance services (***Focusoc***), and data processing services (***Prodigi***).

CREAM-IOD: Laying the groundwork for a more secure future in space operations

The European Space Agency (ESA) has kicked-off the Phase A of one of its most ambitious projects: the in-orbit demonstration of CREAM (Collision Risk Estimation and Automated Mitigation). CREAM cornerstone consists of a set of activities within the Space Safety programme, which address the technology needs and the opportunities for automated operations and coordination while operating spacecraft in a congested environment. Enabling the new mega-constellations to operate in this environment without creating further risks and, eventually, debris is vital for the future of space.

The In-Orbit Demonstration mission aims at inspiring a new generation of satellites that will provide technologies supporting safe operations in the space debris environment, with full capabilities for autonomous collision avoidance.

Thanks to its long-standing heritage and experience on developing collision avoidance technologies for both ESA and private customers alike, the consortium led by GMV has been awarded the development of CREAM-IOD Phase A project. It is a unique opportunity for the company since the whole consortium is made of GMV´s headquarters, involving teams in four different countries (Romania, Poland, Portugal and Spain), and enabling the platform design and development thanks to Alén Space.

In the first phase of the project, GMV will work on consolidating the requirements and defining the mission concepts and final baseline selection in agreement with the trade-offs presented to ESA. Based on this, the consortium will analyse and design the on-board system in charge of the autonomous collision avoidance, as well as both the overall space and ground segments.

With CREAM-IOD, GMV will boost ESA initiative to the next level, setting the path for a safer future of space operations.

GMV takes part in the 4th Space-Comm Expo

The UK's Farnborough International Exhibition Centre hosted in March the fourth annual Space-Comm Expo, one of the most important trade fairs for promoting commercial opportunities and defense in the space sector.

GMV took an active part in the exhibition, presenting its space initiatives and activities. The stand of GMV highlighted its contributions and opportunities in the UK market, tackling areas such as PNT, robotics, earth observation, ground control systems, lunar exploration and Space Domain Awareness.

Over the two days GMV's team made connections with key players from the UK's main space companies, as well as with various startups, suppliers and leading government agencies, including the UK Space Agency, MOD and DSIT. There was also the opportunity to interact with emerging talent from the country's universities.

GMV's participation in the Space-Comm Expo is an opportunity and recognition for the brand, which is gaining ground in the UK's space sector. GMV is thus reinforcing its commitment to investment and growth, supporting the UK's national space strategy.

GMV part of MANUS project to develop prototype robotic arm for Argonaut lunar mission

Breadboarding of a Robotic Manipulator for Lunar Missions (MANUS) was launched in February 2024. This project is funded by the European Space Agency (ESA) and is being carried out by a consortium of companies including the polish company PIAP Space (leader), GMV, Leonardo I, and Astronika (PL).

The aim of this project is to develop a breadboard prototype of a robotic arm that will be part of the ESA's Argonaut lunar mission. Argonaut is a versatile lunar lander designed to support a wide range of missions, from delivering payloads and infrastructure for lunar bases to autonomous scientific exploration and rover deployment. One of the main mission objectives will be the safe unloading of payloads from the lander onto the lunar surface using a dedicated robotic arm.

GMV is responsible for the design and development of the control hardware and software subsystem that will ensure precise positioning of the robotic arm and safe handling of the payloads on the lunar surface.

A step forward in improving the sustainability of commercial launches

Current launch campaigns involve several months of mission preparation for payload, resulting in a significant recurrent cost for each mission. However, modern onboard computer technology, sensor technology, and model-based methodologies enable a series of improvements in the design and performance of the guidance, navigation, and control (GNC) systems.

The GMV Portuguese team has been working on improving the launch preparation process through automation and increased autonomy. The goal is to significantly improve launch vehicle preparation times while increasing operational availability and safety through the use of advanced GNC algorithms and design tools and techniques that reduce the work involved in reconfiguration and commissioning. GMV recently showed the European Space Agency (ESA) the use of groundbreaking guidance and control (G&C) laws for reusable launch vehicles that exploit the redundancy present in engine groups and increase the technical readiness level of automatic reconfiguration capabilities in the event of failure.

GMV currently has a G&C architecture with integrated fault tolerance capabilities and modern optimization algorithms and control design for onboard trajectory calculation. This is supported by efficient mission data management, process digitalization and automation, and enables increased resilience to in-flight uncertainty (for example, due to wind), online adaptability to reduce algorithm re-tuning, more effective simulation campaigns, and a multi-mission framework.

Furthermore, for sustainable and recurring commercial launches, fault-tolerant control is of the utmost importance, as most mission failures are due to loss of propulsion or thrust vector control (TVC) errors, the consequences of which can be catastrophic.

The challenges of the space sector under debate at SSSIF

The space sector has gathered, once again, in the city of Malaga, which hosted the V edition of the Small Satellites & Services International Forum (SSSIF), from 20 to 22 February 2024. This meeting brought together industry experts to analyze and discuss the main challenges facing the small-satellite market and the space sector in Europe and the United States. GMV took part in the event as platinum sponsor, with the participation of several of its executives.

This year's edition, under the slogan "Lunar & Cislunar Missions & Business", focused on the analysis of exploration missions carried out on or near the lunar surface. Today, the exploration or mission industry encompasses a variety of activities, including missions to the Moon, Mars, deep space, as well as astronomy or astrophysics, and low-orbit manned spaceflight. In recent years, private exploration initiatives have also emerged, such as, for example, private space stations or missions to exploit the resources of the moon.

During the opening ceremony Enrique Fraga, GMV's Space Systems EST General Manager, spoke on the current situation of the sector and the great opportunities for the future, highlighting, among others, secure communications and satellite navigation.

This fifth edition of SSSIF also saw the participation of other GMV representatives in various round tables. Mariella Graziano, GMV´s Space Systems EST Strategy and Business Development of Science, Exploration and Transportation Director, took part in the expert panel "Exploration with small satellites". Miguel Ángel Molina, Deputy General Manager of GMV's Space Systems EST, was part of the panel on "Communication & Navigation Applications using SmallSatellites" and Guillermo Lamelas, CEO of Alén Space, was present at the round table "Investment, Business & Space Economy". Alberto Águeda, Director of Space Traffic Surveillance and Traffic Management of GMV's Space Systems EST, took part in the "Space Debris Mitigation & Orbit Services" roundtable.

The company also set up a stand in the exhibition area next to the two conference areas. GMV's presence at SSSIF 2024 reflects not only its experience in the satellite industry but also its commitment to innovation and research in this field, evidencing its dedication to technological development in areas such as space and telecommunications.

GMV continues building its legacy in human space flight

At the end of 2023, GMV was awarded a contract by DLR for the continuation of its services in support of Columbus Operations. The Columbus module, a crucial part of the International Space Station (ISS) project led by the European Space Agency (ESA), is operated primarily from ESA's Columbus Control Center (Col-CC) located at the German Aerospace Center (DLR) in Oberpfaffenhofen, near Munich, Germany. GMV Team has been supporting Columbus operations from the very beginning of the mission contributing in the Flight Operations, Ground Operations, training and Ground Segment sustaining engineering and maintenance.

Recently, GMV supported the Axiom-3 mission in varied important roles. Michael Demel was the lead Columbus Flight Director for the mission, supported by two other flight directors Claudia Kobald and João Lousada. Together with the GMV colleagues in the flight control and ground control teams they have played a crucial role in the success of the Axiom-3 mission, by carrying out the mission preparation and execution.

This mission was an important milestone, as it represents the first time an ESA astronaut took part in a private spaceflight mission. It also represents the first steps towards the commercialization of Human Spaceflight in Low Earth Orbit (LEO).

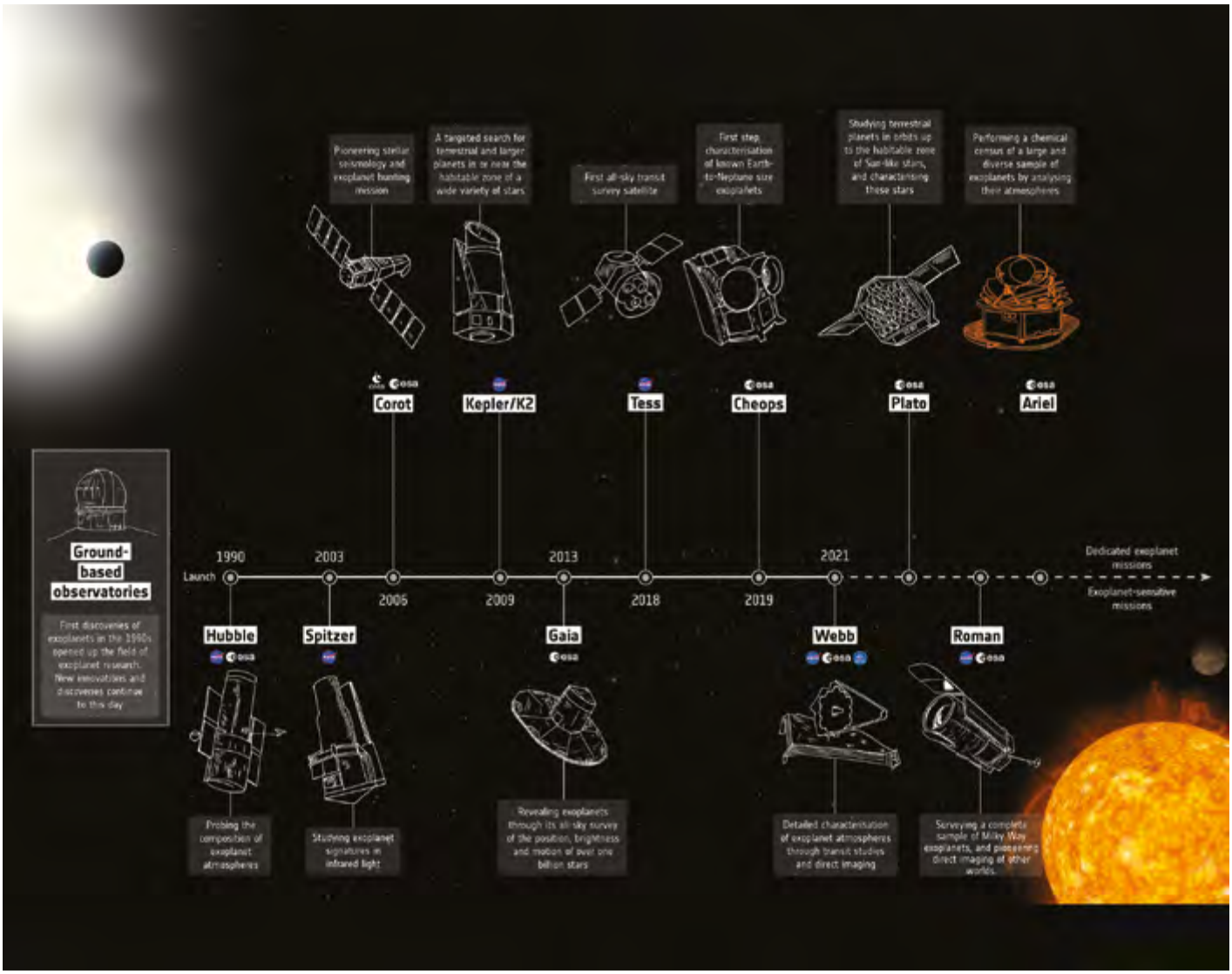
The teams at COL-CC were supported by multiple centres around the world, where again GMV colleagues played an important part. At the ESA Houston Office, at the Johnson Space Centre, Laura Zanardini was a key interface towards the NASA and Axiom counterparts, during the mission. While at EAC, the GMV team contributed to the training of ESA astronaut Marcus Wandt as well as the ground personnel, thus assuring they were fully ready for the mission.

Key role of GMV in the ARIEL mission

ARIEL (Atmospheric Remote-sensing Infrared Exoplanet Large-survey) is the fourth medium-class mission in the ESA Cosmic Vision Plan, following Solar Orbiter, Euclid, and Plato. This is the first mission devoted to measuring the chemical composition and thermal structures of hundreds of transiting exoplanets, taking planetary science beyond the confines of the solar system. The mission consists of a first phase lasting six months to transit to halo orbit at the L2 position, followed by cool-down and commissioning, and then an operational phase that will last three and a half years, with the mission lifetime estimated at two years. The start of the mission is scheduled for 2029. GMV will provide the central control system that will enable users to prepare and carry out tests and analyze the results.

The central control system (CCS) is at the heart of ARIEL's test environment, where most onboard software and equipment testing is carried out. It allows for the implementation of real-time automated testing through the use of specific automated procedures for testing, which provide automated control of the associated electrical ground support equipment (EGSE), as well as full monitoring and control of onboard systems and offline activities. The latter include ATP generation, synoptic generation, and offline analysis of test results and events (logbook).

This isn't the GMV team in Portugal's first time participating in such an important mission. It already worked on GAIA, the satellite known for creating an accurate three-dimensional map of over a billion stars in our galaxy, the Milky Way, mapping their movements, luminosity, temperature, and composition. Now, for ARIEL, GMV's Portugal team will also be responsible for providing the materials, labor, facilities, supplies, tools, equipment, documentation, and support services needs for designing, manufacturing, assembly, testing, and delivering the final products and services to the client.



GMV to be responsible for providing flight dynamics services on ESA's interplanetary missions

The European Space Agency (ESA) has awarded GMV the Flight Dynamics service for Trajectory Analysis and Spacecraft Dynamics Control of all ESA interplanetary missions. For a period of 2 years GMV will deliver the service at the ESA European Space Operations Centre (ESOC) in Darmstadt, Germany, where GMV cumulates decades-long experience delivering state of the art flight dynamics and mission analysis support.

ESA interplanetary missions currently flying include Jupiter moons-bound JUICE, Mercury-bound BEPI COLOMBO, missions on Mars like MARS EXPRESS and EXOMARS TRACE GAS ORBITER, deep-space observation missions in Sun-Earth Lagrangian points like GAIA and EUCLID and Sun observation missions in heliocentric (circumsolar) high inclination orbits like SOLAR ORBITER. Missions that will be launched during the service period will include asteroid Didymos-bound HERA.

The interplanetary missions that the European Space Agency (ESA) currently has in flight include Juice, which has the moons of Jupiter as its destination; BepiColombo, with destination Mercury; various Mars missions such as Mars Express and ExoMars Trace Gas Orbiter; deep space observation missions at Sun-Earth Lagrange points, such as Gaia and Euclid; and Sun observation missions in high-inclination heliocentric (circumsolar) orbits, such as Solar Orbiter. There are also some new missions that will begin during the service period, such as Hera, with the asteroid Didymos as its destination.

The service also involves trajectory analysis responsibility for the missions in flight, in preparation, and under study, including interplanetary missions such as Juice, missions to small bodies such as Hera and Comet-Interceptor, and missions to Mars such as MSR ERO.

The service will be tackling operationally challenging activities from early on in the project, like the Juice Lunar-Earth Gravity Assist (a first-of-its-kind flyby) happening in August 2024, the Hera LEOP in October 2024 or three BepiColombo Mercury swing-bys between September 2024 and January 2025.

Since its foundation GMV has been working in flight dynamics systems and operations. Today 40 years later, GMV is proud to commercialize a comprehensive range of state of the art flight dynamics software products and services for Earth orbits and to provide state of the art flight dynamics services for ESA interplanetary missions.

Spatial challenges and cutting-edge solutions at HiPEAC and DASIP

From January 17-19, 2024, the city of Munich, Germany, witnessed the HiPEAC conference, one of Europe's leading forums for experts in computer architecture, programming models, compilers and operating systems for general purpose, embedded and cyber-physical systems, as well as adding the field of neuromorphic computing. As part of HiPEAC, the 17th edition of the workshop on Design and Architectures for Signal and Image Processing (DASIP 2024) was held. This event provided an outstanding forum for sharing the latest trends, innovations and developments in the leading field of signal, image and video processing, as well as for machine learning in embedded custom architectures and systems, Edge and cloud computing.

David González Arjona, head of GMV's Space Equipment Section, was the key speaker at this year's conference, opening with the lecture "Orbiting the Edge and Stars: Bridging the Gap Between Space Avionics and Edge Computing, Challenges, and Space Missions Needs". During his talk González Arjona explored the challenges and opportunities of high-performance processing in space missions, where both algorithmic and reliability-oriented architectural designs and technology specific to the space environment play a crucial role.

CNR entrusts GMV with the development of the avionics system of the Aviolancio program

GMV has recently been awarded a contract by the Italian National Research Council (Consiglio Nazionale delle Ricerche, CNR) to provide the avionics subsystem for the Aviolancio program. The Aviolancio program aims to develop an air-launched micro-launcher to improve access to space for small platforms. As a first step, a suborbital vehicle will be integrated to validate most of the technologies and operations.

Functional tests to validate the propulsion system in flight were already carried out by the CNR and the Italian Air Force (AMI) in 2022, when a sounding rocket with hybrid propulsion was successfully launched from Poligono Interforze (Test Range) of Salto di Quirra (PISQ), Sardinia, Italy, coordinated by the Consiglio Nazionale delle Ricerche (CNR) and the Italian Airforce (AMI). The hybrid propulsion system was developed by Technology for Propulsion and Innovation (T4i) in collaboration with the University of Padua.

A captive test flight was also performed using an instrumented launcher mock-up and an F-104 Starfighter carrier from the Kennedy Space Center. This test was of great interest to obtain relevant in-flight data and to define preliminary procedures.

GMV was selected by CNR at the end of an exhaustive tender process that started in October 2022, with the contract finally signed in July 2023. CNR appreciated GMV's experience in GNC, OBSW and avionics for launchers, matured in various relevant European programs such as VEGA, IXV, Space Rider, as well as the new commercial end-to-end development.

CNR is the largest public research institution in Italy. Founded in 1923, its mission is to carry out research in its own institutes, to promote the internationalization of the national research system, to provide technologies and solutions for emerging public and private needs, to advise the government and other public bodies, and to contribute to the qualification of human resources. CNR has over 8,000 employees, more than half of whom are researchers and technologists. Its total budget for 2022 was €1.4 billion.

Alén Space celebrates its fifth anniversary

January 24, 2019 is a memorable date for Alén Space. It's the day when the company's official constitution was signed. Five years have gone by and that startup has turned into an industrial company that has been integrated into the GMV Group and established itself as a benchmark firm in Europe's small satellite market.

This fifth anniversary is a true milestone for Alén Space, but we've got to travel much further back in time to find the roots of the project. Its first steps date back to the creation 16 years ago of the Strategic Aerospace Association at the University of Vigo, which launched the first Spanish nanosatellite in history and subsequently gave rise to what is now Alén Space.

Five years later, now is the perfect time to proudly look back and look toward the future with the conviction that the best is yet to come. The company's inclusion in GMV Group in 2023 spurred a push for Alén Space's growth plans. It now has a team of more than 50 professionals and is taking on major short-term projects with companies and organizations from around the world.

When he looks back, Guillermo Lamelas, CEO of Alén Space, is sure that this trajectory is the product of the tireless work of many people: "It's an honor to have such an enthusiastic, motivated, and talented team."

As part of GMV, Alén Space's challenge is to become a global leader in the small satellite industry, according to Guillermo Lamelas. "We are on a path where we can aspire to anything. We have exciting projects ahead and are working in an industry with lots of opportunities for growth. I'm sure that we have the capacity to situate ourselves in a privileged position in a market in which more than 18,000 small satellites are projected to be launched into space in the next decade," Alén Space's top executive said.

The European Defence Fund projects awarded to GMV get off the ground

GMV has secured six out of the 41 EU-wide joint defense R&D projects supported by the European Commission

The first months of 2024 saw the launch of the winning projects from the second call for proposals of the European Defence Fund (EDF), which aims to improve the competitiveness of the European Union's (EU) defense industry and contribute to the EU's strategic autonomy.

In this second EDF call for proposals, GMV was awarded six of the 41 joint EU-wide defense R&D projects supported by the European Commission. The six projects awarded, four of which are already underway, focus on developing capabilities in anti-missile early warning systems, avionics, command and control, unmanned systems, navigation, and the use of artificial intelligence in various fields.

The CONVOY project (ClOud iNtelligent explosiVe detectiOn sYstem), led by GMV, kicked off on 22 January. Its goal is to explore the potential of artificial intelligence to detect, recognize, and avoid or neutralize hidden threats such as improvised explosive devices and landmines. GMV is leading this four-year project together with nine fund recipients from five EU countries.

Meanwhile, the FASETT (Future Air System for European Tactical Transportation) project held its virtual kickoff meeting on 25 January. The goal of this eighteen-month project is to analyze EU Member States' transport aircraft replacement needs in the 2030-2040 timeframe to identify opportunities for the development of a new European air transport platform. GMV is in charge of analyzing new technologies for onboard mission systems.

The STORE (Shared daTabase for Optronics image Recognition and Evaluation) project, which seeks to

optimize integrated image-recognition systems based on artificial intelligence and develop a European defense image database, kicked off in December 2023 with an online meeting followed by an in-person meeting on 6 and 7 February in Paris. In this 36-month project, GMV is in charge of the work package defining and documenting the data model and the interfaces needed to ensure the proper development and deployment of information-sharing tools among the partners in a federated environment.

Finally, there's the 36-month SWAT-SHOAL (SWArmand Teaming operation of manned & unmanned underwater vehicle SHOAL) project, whose goal is to develop a system-of-systems concept, based on swarm technologies, in order to integrate manned and unmanned naval assets and achieve higher performance and efficiency in a wide range of underwater missions. The kickoff meeting for this project was held on 9 and 10 January in Brussels. GMV is in charge of the work package that will propose solutions for assessing the technical potential of the swarms, their management options and the implementation of a common mission module for all unmanned underwater vehicles (UUVs) to support user decision making.

The EC2 project, which will provide the EU with a multidomain command and control solution, and the ODINSEYE2 project, which will provide Europe with an early warning system for missiles in space, will soon get underway as well.

GMV has once again cemented its place as a key player in international collaborative defense projects, with a total of twenty-seven European Defense Funds projects, making the company one of the top Spanish participants in this program.

The eCOLORSS project comes to an end

More than two years after its start the e-COLORSS (European COmmon LOng Range indirect fire Support System) project, part of the EDIDP2020 call for proposals and led by GMV, has come to an end.

The Defense Industrial Development Program (EDIDP) is designed to improve the competitiveness of the European Union's defense industry, contributing to its strategic autonomy.

One of the projects in this call for proposals is eCOLORSS, a long-range indirect fire support system, led by GMV and made up of 20 entities from 12 countries.

The e-COLORSS project represents a significant advance for European long-range artillery by means of the design of a 155mm gun and a European rocket launcher. The vehicle will be based on a hybrid truck-mounted platform, guaranteeing fast refueling of ammunition and loads and an interoperable system that is robust and safe.

As project coordinator GMV has been responsible for monitoring and ensuring correct execution of the project, reporting on progress to both the EC's program office and that of the Spanish Ministry of Defense. GMV has also led the activities of feasibility study and preliminary design of the rocket launcher weapon system and has actively collaborated in the study of the command-and-control solution, as well as in the tasks of defining the operational concept and requirements engineering and drawing up a roadmap laying the groundwork for the future development of Europe's future indirect fire support systems.

As part of the activities leading up to project closure, the 4th end-user conference was held on GMV's site in February to present the designed solution.

This was followed by the last general assembly of the project, attended by the whole consortium, the representative of the European Commission and representatives of two of the member states taking part in the project.

The defense and security general manager at GMV receives the Antonio Remón y Zarco del Valle Chair Honorary Award

Manuel Pérez Cortés, defense and security general manager at GMV, has received the Antonio Remón y Zarco del Valle Chair Honorary Award "for his extensive and brilliant academic work at the Polytechnic University of Madrid (UPM), as well as for his continued promotion of collaboration among academia, industry, and the public sector in the field of defense and security."

Manuel Pérez Cortés has been an aeronautical engineer since 1982 and received his PhD in aeronautical engineering in 1985 from the UPM. He completed his training with an Executive Development Program at the IESE business school. He has been a full professor at the UPM's Technical College of Aeronautical Engineers since 1987. He is also the director of the Spanish School of Flight Testing and Airworthiness at UPM (E4A). His career has been tied simultaneously to the UPM, where he has taught since he earned his degree, and GMV, where he has worked since the company's founding in 1984.

Within GMV, Manuel Pérez Cortés has worked in different fields, with a special focus on the development of applications for the aerospace and defense and security sectors, both in satellite navigation systems and in training, research, and engineering simulators for different types of vehicles; in command and control systems and, in general, information system integration. He has held a number of positions at GMV, where he is currently the defense and security general manager.

The award ceremony took place at the School of Aeronautical and Space Engineering School of Aeronautical and Space Engineering (ETSIAE) during the 20th UPM-FAS Conference, devoted to unmanned aerial systems, their capabilities and applications, and the increasingly important role of systems that make it possible to neutralize the threat they pose.

GMV to integrate Coast Artillery Regiment (RACTA) 4 systems into the *Talos* system

Developed starting in 2010 for the Spanish Defense Ministry's Directorate General of Weapons and Material, ***Talos*** is the fire-support command and control system designed by GMV for the management of coordinated combat operations and functions (fire support, target selection, intelligence, logistics, communications).

Talos makes it possible to plan, request, allocate, and control available fire resources, both their own and those of allies, promptly and efficiently.

It also allows for the comprehensive management of the fire support cycle, as well as its integration with the fire support systems of the allied nations in the ASCA group, of which Spain became a full member following its certification during Exercise Dynamic Front in 2021 (the United States, France, Germany, Denmark, Italy, Netherlands, Norway, Turkey, the United Kingdom, and Spain are the current members of the ASCA group). One of the challenges in the integration of ***Talos Arco*** that GMV will tackle with this new contract will be ensuring that the tracking of moving targets, such as ships, is carried out through automatic 155/52 howitzer tube movement to beat the target.

The ***Talos*** system is currently in version 6, which strengthens the concept of "Networked Fires," allowing for the integration of any sensor, radar, optronic sensors, and RPAS, among others, as well as a single presentation of the fire support situation for decision making.

GMV revamps the ship control system for amphibious assault operations

In recent years, amphibious operations have played a key role in the NATO environment, as they fulfill the mission of projecting force from the sea inland, with the first operational movement being disembarkation from a mother ship to the coast, in what is known as ship-to-shore movement (SSM).

The GMV-developed ship control system (SCE) has been serving the Spanish Navy for over ten years now. It is installed on the amphibious assault ships Galicia, Castilla, and the LHD Juan Carlos I, as well as on 14 LCM 1-E type vessels of the Playa de Cádiz naval group and on two Navy Force AAV amphibious vehicles. The SCE has successfully participated in several international operations in Brazil, Haiti, and Italy, as well as in national maneuvers.

This system covers the actual and important needs of the fleet, such as knowledge of the position of the boats, the evolution of troop and material landings, and incident control, both in day and night operations, with the aim of significantly reducing the uncertainty inherent in ship-to-shore movement, increasing the safety and effectiveness of operations.

In 2024, GMV will renovate the installation of the system on LCM vessels, supplying and installing commercial and in-house maritime equipment.

GMV awarded NATO-CSD maintenance contract

In 2019, NATO's NCI Agency awarded GMV the contract to develop the specifications, design, implementation, testing, and rollout of the ISR (Intelligence, Surveillance, and Reconnaissance) data sharing and dissemination capacity, called the NATO-CSD system, pursuant to STANAG 4559 interoperability standards. The project was successfully completed in December 2023 after fulfilling the various software development phases and culminating in the operational rollout of this capacity in the NATO command structure and various allied countries.

The NATO-CSD system is currently operational, contributing to intelligence and ISR data dissemination on the coalition's various missions, integrating the capacity for AGS (Air Ground Surveillance), BICES (Battlefield Information Collection and Exploitation Systems), and various air, space, and maritime platform products.

The company recently signed the maintenance contract for the NATO-CSD system until December 2025, with the possibility of extension to 2028, covering L3 support for the corrective maintenance of the software based on operational use of the system as well as evolutionary maintenance of the system based on the new operational and experimental needs emerging in the field of intelligence and ISR product dissemination and new interoperability mechanisms.

GMV is part of the Fundación Círculo's delegation in its audience with HM the King of Spain

On the occasion of the 40th anniversary of the Fundación Círculo de Tecnologías para la Defensa y la Seguridad Defense and Security Technologies Circle Foundation, His Majesty Felipe VI received a delegation from the organization, of which GMV is a longstanding member, on 23 January in the Zarzuela Palace.

The delegation was led by the Spanish secretary of state for defense, María Amparo Valcarce, as honorary president of the Fundación Círculo; the chairman, Félix Pérez; the general manager, Silvia Gamo; and several of the organization's patrons. The rest of the delegation was made up of the vice-presidents of the Board of Directors, the chief inspector of police, representatives of the longstanding corporate members, and other Fundación members.

After greeting the members of the delegation, including GMV's defense and security manager, Manuel Pérez Cortés, Felipe VI spoke with his guests about the latest initiatives and projects of the Fundación, which promotes collaboration among individuals, institutions, and companies with interests in the defense and security sector.

The Fundación Círculo de Tecnologías para la Defensa y Seguridad dates back to the 1st Military Electronics Conference, organized in March 1983 by the Colegio Oficial de Ingenieros de Armamento weapons engineers association, the Spanish division of the Institute of Electronics Engineers (IEEE), and the Fundación Universidad Empresa.

GMV hosts CESEDEN's armed forces intelligence course

On 4 March, GMV received a visit from the 17th Advanced Armed Forces Intelligence Class (CSIFAS) of the Spanish Ministry of Defense's Center for Defense Studies (CESEDEN).

The course lasts one academic year and is for armed forces officers, providing them with the understanding of intelligence, counterintelligence, security, and operational planning of joint operations they need to carry out intelligence-related tasks in specific, joint, and/or combined units, centers, or organizations. The theoretical part of the course is complemented by hands-on work, including visits to organizations, companies, centers, and units of interest.

GMV, as a leading company in the international defense and security sector, is a fixture of CESEDEN courses' scheduled meetings with industry companies.

During their visit to GMV, the attendees learned about GMV's work in the development of ISR (Intelligence, Surveillance and Reconnaissance) management systems, specifically the SAPIIEM product family currently supporting the Spanish Ministry of Defense, the European Union, and NATO. They were also able to learn about the company's work with C4ISR systems and tactical RPAS, as well as its participation in programs such as EUROMALE, SIRTAP, and the future FCAS air combat system. At the end of the visit, the students were also given an overview of GMV's participation in space tracking and surveillance programs (SSA/SST) and how these programs apply to space traffic and debris management.

These visits to cutting-edge defense, intelligence, and security companies give the students a chance to broaden their knowledge as part of their training to meet the new needs arising from the creation and strengthening of new intelligence agencies integrated into domestic barracks or forces, as well as domestic intelligence agencies deployed outside the country.

GMV, at the meeting of the President of the government with the spanish defense industry

On March 18, the president of Spain, Pedro Sánchez, and the minister of Defense, Margarita Robles, met with Spain's major defense sector companies at Moncloa.

The general manager of GMV, Jesús B. Serrano, and other senior managers from the industry to discuss, among other topics, the recent European Defense Industry Strategy (EDIS), developed by the European Commission in coordination with the European Defense Agency, a strategy in which the government wishes to make the sector a key player.

The president thanked the defense industry executives for their commitment in a tough geopolitical context, in which Spain is working to prepare for potential security threats and boost its strategic autonomy.

The meeting also dealt with issues like the importance of increasing investments in production capacity and R&D, creating jobs, and increasing participation and leadership in major European defense programs.

The president also showed his appreciation for the Spanish security and defense industry, the fourth-largest European exporter and the eighth-largest in the world. This industry is comprised of more than 400 companies spread throughout the country, employing more than 36,000 people directly and producing high-tech innovations.

In this context, GMV is a key player in various areas like aviation, defense and security, and space, and is a point of reference for its capabilities in command and control systems, intelligence, surveillance, and reconnaissance systems, navigation systems, critical avionics systems, infantry and cyber defense systems.

GMV advises on integrated maritime services for EMSA's SafeSeaNet ecosystem

In the realm of maritime activities, GMV in Portugal, in partnership with the Italian company Geosolutions and NOS Comunicações, has secured a framework contract, with the European Maritime Safety Agency (EMSA), involving Integrated Maritime Services (referred to as IMS), particularly in their user interface components.

SafeSeaNet is a vessel traffic monitoring and information system, and it has been set up as a network for maritime data exchange, linking together maritime authorities from across Europe. It enables European Union Member States, Norway, and Iceland, to provide and receive information on ships, ship movements, and hazardous cargoes.

Nowadays, over 20.000 ships are tracked in MSs area of responsibility every day. Per month, are recorded 100 million AIS positions and 160.000 messages are received. This relevant data and other information are used by European authorities to obtain a more reliable and precise picture of a wide range of activities in the maritime domain, fostering a common visibility among EU maritime interests. With this mission, IMS Services provide a broad set of functionalities addressing maritime safety, protection of the marine environment, port and maritime security, efficiency of maritime traffic and transportation, as well as various maritime information services and regional, national, and local cooperation for the exchange of additional information.

Detailing the scope of Integrated Maritime Services further, we can include the provision of ship position reports, vessel monitoring and fishing data, Earth Observation services, such as oil spill detection, METOCEAN information, remote sensing aircraft data, and ship traffic density maps.

In addition to the specialized IMS consultancy, the GMV Portuguese team will also be responsible for the SEG application (SSN Ecosystem GUI), which enables the provision of various maritime information services, including its mobile component.

CONVOY project: artificial intelligence to neutralize hidden threats

GMV kicked off in February the CONVOY (ClOud iNtelligent explosiVe detectiOn sYstem) project, an initiative selected for funding by the European Union with an estimated budget of €4,986,989.50. CONVOY is one of the projects selected by the European Defence Fund (EDF) as part of the EDF 2022 call for proposals within the first Technological Challenge launched by the European Commission in the field of detection of improvised explosive devices.

Given the current defense context in Europe, ground forces need solutions to face technically advanced threats, such as improvised explosive devices (IEDs) and landmines, which are some of the main causes of casualties among defence forces. Neutralizing these hidden threats is key to protecting soldiers and improving their operational efficiency.

The main goal of the CONVOY project is to explore the potential of artificial intelligence to detect, recognize, and avoid/neutralize hidden threats. Cloud infrastructure will be the foundation for sensor learning, allowing for continuous and efficient adaptation to the evolving threat posed by explosive device attacks.

Tasks that often fall to military forces, such as route clearance, are challenging, and existing technology does not offer a solution with the detection confidence needed to ensure that soldiers are protected under typical mission conditions. Given the importance of the fight against IEDs and landmines in the current geopolitical context, the CONVOY project is expected to have a major impact.

Opinion

Challenges for 5G security

The rapid deployment of the 5G network has marked a milestone in connectivity by offering a range of upgrades, including higher bandwidth, lower latency, and unprecedented device density. However, this technological revolution is not without its challenges, particularly in the area of security.

One of the most notable innovations is service-based architecture, which uses containers to implement network functions. This provides flexibility, but also requires a new approach to key security issues such as software updates and password management. For example, the issue of hopping between containers or from container to host system needs to be carefully addressed.

Another aspect to consider is the adoption of the HTTP/2 protocol for inter-service communication in 5G. Although it improves bandwidth utilization, it also introduces new attack vectors that can only be managed through careful selection of web servers.

Virtualizing network functions with software-defined networking (SDN) technology offers efficiency and

"The rapid deployment of 5G networks presents both challenges and opportunities"

flexibility, but security depends heavily on its implementation. Proper SDN deployment can significantly improve security by isolating network segments in response to suspicious traffic patterns.

The segmentation of the physical network into virtual networks, known as network slicing, is a unique feature of 5G. While it offers significant benefits, it is critical to ensure complete logical isolation between these networks to prevent unauthorized access and maintain quality of service.

The introduction of multi-access edge computing enables third-party applications at the edge of the network, but presents security challenges. Establishing bastioning procedures for third parties that connect to the network and verifying their compliance becomes imperative in this context.

The use of wireless connections between antennas and the network core also expands the wireless attack surface, while speeding up deployment. This requires special attention to ensure the security of these communications.

Isidro Labrador
Section Chief, Cybersecurity Consulting and Services
GMV Secure e-Solutions

Proper implementation of these measures, combined with innovative approaches to managing security procedures, can pave the way for mass adoption of 5G without significantly increasing the risk to mobile network users and operators. Security in the 5G era is a challenge, but it is also an opportunity to lay down standards that will ensure the robustness of our future networks.

Stepping up cybersecurity in the colombian electricity sector

Óscar Gaspar, GMV's Country Manager in Colombia, took part in a panel discussion on digitalization and cybersecurity in the Colombian electricity sector, demonstrating GMV's commitment to cybersecurity as part of its new involvement in the digital transformation of the country's energy infrastructure.

To achieve this transformation, digital technologies are being applied to all processes to improve the efficiency, sustainability, and reliability of the system. During the discussion, Gaspar shared valuable insights on the crucial role of cybersecurity in this process, highlighting the need for effective cyber resilience.

The event, hosted by the World Energy Council Colombia (WEC) and Huawei, addressed key aspects related to digital transformation, including significant opportunities to improve operational efficiency, integration with renewable energy sources, demand-side management, resilience to extreme weather events, and environmental sustainability. It also touched on inherent challenges such as investment, cybersecurity, regulation, and staff training. Panelists also emphasized the importance of collaboration between all key stakeholders, including users, businesses, and government. This collaboration is seen as essential to ensure a successful transition to a more efficient, sustainable, and resilient energy system in Colombia.

Challenges in ensuring the privacy of shared data

In January, AMETIC presented the report *Espacio de Datos Compartidos: Retos de Seguridad* [Shared Data Space: Security Challenges], which analyzes the keys and challenges in protecting privacy and trust in shared data spaces.

The presentation was led by Antonio Cimorra, Director of Digital Agenda and Sectoral Studies at AMETIC, and Alberto Berreteaga, IDS Competence Center Coordinator at TECNALIA and member of the AMETIC Cybersecurity Commission, which prepared the report. Javier Zubieta, Director of Marketing and Communication at GMV's Secure e-Solutions and fellow member of the AMETIC Cybersecurity Commission, was also involved in presenting the report.

Berreteaga stressed the importance of overcoming the security challenges of shared data spaces in order to take full advantage of the emerging opportunities for secure and trusted information sharing. The fact is that to ensure trust, privacy, and the success of these spaces, cybersecurity becomes essential in determining how, when, and under what conditions data can be used.

The federation of data spaces is seen as a strategic step towards expanding the possibilities for data use, as it provides a measurable, transparent, automatable, and cost-effective framework for trust. The report highlights the case of GAIA-X, a model developed by the Gaia-X international non-profit association that proposes a decentralized open market ecosystem (DOME) to ensure trust in information exchange, as well as the importance of a trust anchor framework and a decentralized identity and access management framework to operate in a trusted manner without relying on central authorities.

GMV-CERT joins the prestigious T-CSIRT Trusted Introducer network

GMV-CERT has been accepted as a member of the distinguished T CSIRT Trusted Introducer network, the most influential community of CSIRTs in Europe.

Trusted Introducer's primary mission is to build and strengthen a network of trust among computer security incident response teams (CSIRTs), in order to facilitate the secure and efficient exchange of critical incident response information. This recognition confirms GMV-CERT's commitment to the highest security standards and its willingness to actively participate in protecting cybersecurity on an international level. As a member of Trusted Introducer, GMV-CERT will be able to share experience, knowledge, and best practice with other cybersecurity experts in Europe. This will strengthen GMV's ability to effectively anticipate and respond to emerging cyberthreats, thereby contributing to global cybersecurity.

Óscar Riaño, Head of GMV-CERT, highlighted the importance of joining this network: "This achievement reflects GMV's continuous efforts to remain at the forefront of cybersecurity and strengthens our position as a leader committed to protecting our customers' digital assets and trust. We're excited about the collaboration ahead and look forward to actively contributing to the robustness and resilience of the Trusted Introducer network."

TF-CSIRT Trusted Introducer

GMV contributes technology to Carematrix project to improve holistic care of patients with multimorbidity

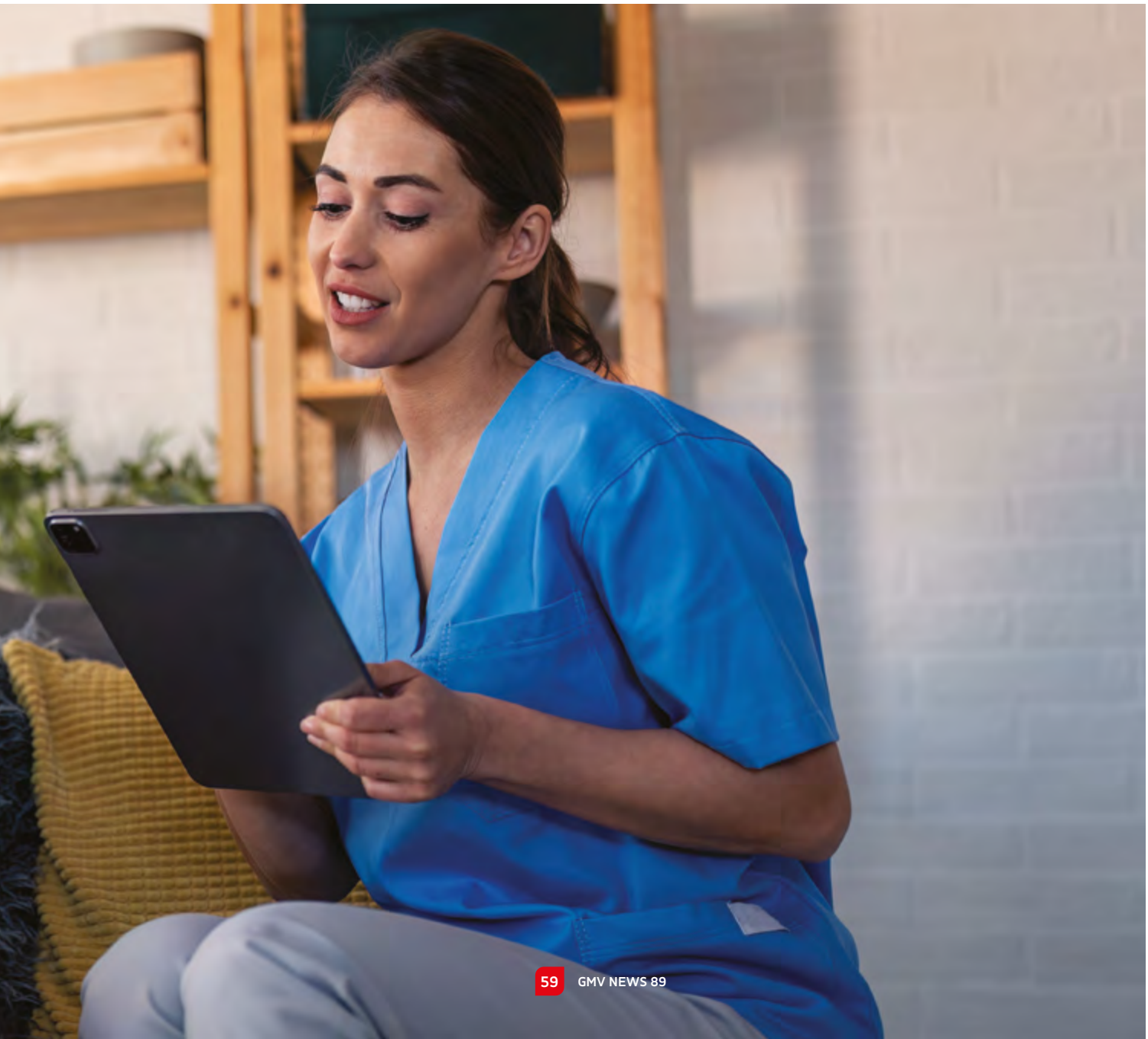
Carematrix strives to enhance the care and treatment provided to patients diagnosed with multiple chronic diseases. In the long run, the project anticipates a 20% reduction in the time patients spend at healthcare facilities

Technological development and health research, together with a greater culture of healthy habits, have led to an increase in life expectancy and healthy life expectancy in the European Union. According to Eurostat data, the average life expectancy in Europe in 2021 was 80.1 years and the average healthy life expectancy in 2020 was 64.5 years for women and 63.5 years for men.

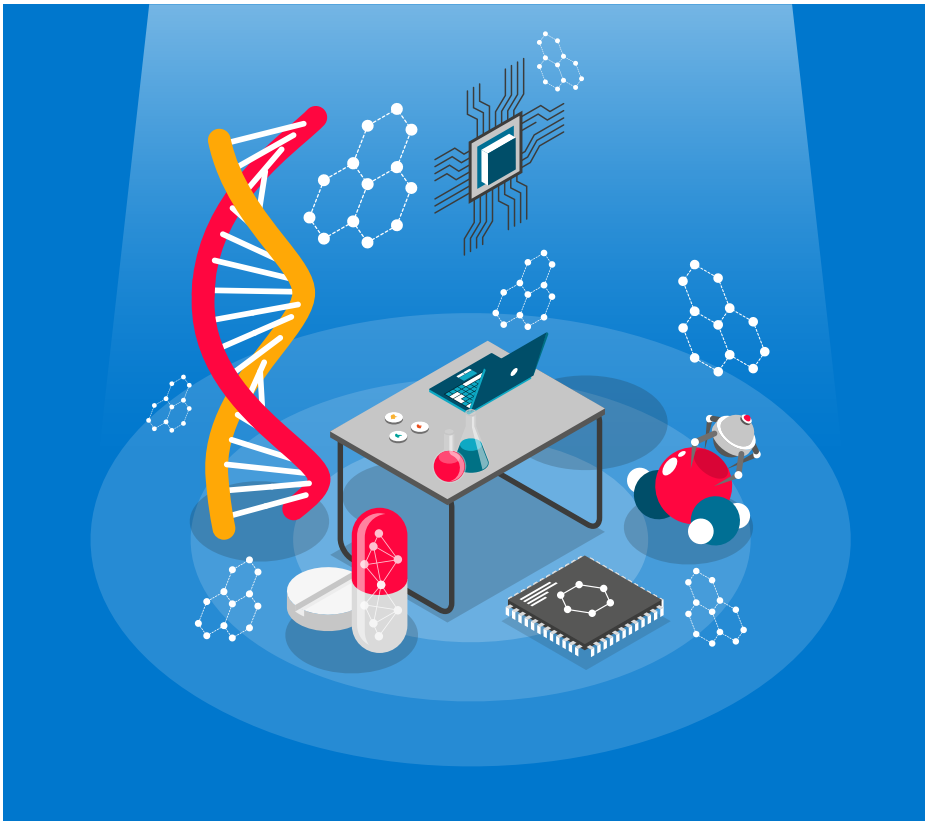
The gap between life expectancy and healthy life expectancy, coupled with the fact that older people often suffer from more than one condition, poses a challenge to the sustainability of health systems because of the increased demands on health and social care and the need for coordinated care for this type of multimorbidity. To address these challenges, the European Union has launched initiatives focusing on the use of technology in the management of chronic multimorbid patients and the promotion of healthy habits to prevent or delay the onset of chronic diseases. One of these is the Carematrix project, in which GMV is developing the PMMCare+ e-health online platform.

The aim of the Carematrix project is to improve the care, treatment, and management of patients with two or more chronic conditions through innovative integrated care solutions. The approach to these patients must be multidisciplinary and based on a holistic model that involves them in their healthcare, including in the design of their individualized treatment plans. PMMCare+ makes this possible by improving communication, coordination, and collaboration between the professionals involved in the care of these patients, thus facilitating interoperability and the advanced management of certain diseases.

In the long term, the project is expected to reduce time spent visiting healthcare facilities by 20%, improve care-related aspects by 75%, reduce incidents related to patient data management between different specialties by 50%, and reduce clinical errors by 30%.



Genetic information and digital tools to boost drug efficacy through personalized prescriptions



GMV has partnered with the Extremadura Health Service to develop a personalized prescription support tool, bringing its expertise in the development of advanced algorithms. Called PoPS (Personalized Oriented Drug Prescription System), this digital prescription support tool allows specialists to decide on the best combination of drugs for their patients, taking into account their genetic information.

To make this system a reality, the Extremadura Health Service genetically analyzed more than 5,000 patients spanning various medical disciplines, including primary care, rheumatology, pediatrics, oncology, mental health, and rare diseases. This comprehensive study involved 200 professionals and 61 centers organized into 17 patient cohorts. In the study carried out in Extremadura, "28% [of patients] reported having experienced adverse reactions to the medicines they were taking, reactions that in many cases were due to genetic variations," said Dr. Adrián Llerena, full professor of Pharmacology at the University of Extremadura's Faculty of Medicine and a specialist in clinical pharmacology.

The platform developed using GMV's technology is a truly groundbreaking achievement, as there has never been a decision support system of such high scientific sophistication. The PoPS prescription support system will be linked to the Extremadura Health Service's information systems, including the JARA digital clinical history platform, and will be available for doctors to consult.

AI in health research: secure federated networks

At the 21st Health Data Security and Protection Forum, organized by the Spanish Health Informatics Society (SEIS) and held in February, GMV presented ***uTile***, its groundbreaking solution for conducting federated research without compromising data security. As data scientist Juan Miguel Auñón explained in his presentation "Security in health data sharing," it is crucial to protect patient privacy in the age of artificial intelligence (AI). In the specific case of healthcare, "it's vitally important because, although AI can be of great help in clinical and pharmacological research to promote major advances, we mustn't forget that the data belong to the patients and their privacy cannot be compromised." As a way to ensure that this does not happen, Auñón pointed out that "technology offers us solutions to overcome this challenge. Specifically, with privacy-enhancing technologies, we don't have to choose between privacy and the creation of AI tools."

With this in mind, GMV has spent the last five years developing ***uTile***, a solution capable of building distributed AI models through federated training, while guaranteeing patient privacy.

Opinion

Harnessing the vast amount of data generated by healthcare systems will benefit patient health

Healthcare systems generate an enormous amount of data, which is being collected and analyzed to improve healthcare and research thanks to federated networks and artificial intelligence. Federated networks are used to allow multiple parties to share data and knowledge without compromising privacy or security, as their approach is one of decentralized collaboration. All parties have full control over their own data and only aggregated results or AI models are shared between them.

Meanwhile, artificial intelligence is also being used in many ways in healthcare, including medical diagnosis, data management, treatment optimization, and research. This is because AI algorithms make it possible to analyze large amounts of clinical and medical data to identify patterns, predict outcomes, and personalize treatments more efficiently. AI can also help automate and optimize many administrative processes.

In Spain alone, in addition to the 17 regional health systems and the National Institute of Healthcare Management (Ingesa), there are 35 accredited health research institutes, seven health outcomes-oriented collaborative research networks (RICORS), and 13 research support platforms, according to the Ministry of Health. There is also the Networking Biomedical Research Center (CIBER), which has eleven thematic areas present in almost all of the country's autonomous regions. All of this is in addition to the health systems of the 27 countries that make up the European Union (EU).

This complex and thriving health ecosystem presents an ambitious challenge, driven by the need for shared access to the data held by each constituent part, which is no easy task. This is why health data networks are being set up to link different sources of information and share health data, regardless of distance or borders.

To speed up biomedical research and provide better tools for clinicians, GMV advocates the creation of secure federated networks linking large data spaces. One of the main benefits of this is an improvement in the quality of the mathematical models used in machine learning, as they depend on the amount and heterogeneity of accessible data, aspects that are amplified by the aggregation of so many sources of information.

Here, GMV has developed the ***uTile*** tool to improve machine learning algorithms and analytical models. This development

Inmaculada Pérez
Digital Health Director, GMV Secure e-Solutions

uses advanced cryptographic methods that keep data encrypted at all times, even during the most complex calculations, without compromising organizational requirements or strict compliance with current regulations.

A great example of a federated network for clinical and health research is the Tartaglia project, which at its core is using federated learning network technology to break down data silos in healthcare organizations, enabling much more robust AI models to be created without exposing data or having to move them off-site.

With a federated network, it will be possible to train new models with pathologies that have not previously been studied to generate evidence, such as rare diseases.

GMV enters the Greek intelligent transportation systems market with CAF

GMV will be improving the passenger experience on Line 1 of the Athens Metro

CAF (*Construcciones y Auxiliar de Ferrocarriles*) has chosen GMV to supply the onboard intelligent transportation systems (ITSs) for the 14 trains currently running on Line 1 of the Greek capital's metro system. Managed by STASY S.A., the rail operator responsible for passenger transportation in the city of Athens, these ITS upgrades for the metro trains will include installation of passenger information systems, public address and intercom systems, and video-surveillance systems. This project is a continuation of the collaboration between the two companies, which also worked together when CAF awarded GMV the contract for the onboard systems on Lisbon's tramway in March 2022.

Line 1 of the Athens Metro is the oldest in the city. Commonly known as the green line, it connects Piraeus to the town of Kifissia, north of the capital. The trains began running between 1983 and 1985 and, after their renovation by CAF to operate efficiently for another 25 years, GMV will now improve the user travel experience. GMV will be supplying those various systems to CAF with the aim of enhancing the current passenger experience.

Information will be displayed for the passengers on front and side LED panels, as well as on 29.4" LCD screens distributed throughout the train, all connected to the system's central controller.

The fully digital public address system will feature an intercom system with 20 IP intercom devices per train, installed near the doors, which will allow immediate communication with the passengers in any emergency situation.

Finally, the video-surveillance system includes a cutting-edge digital recorder, which will be provided with the interior and rearview digital cameras enabling video-surveillance of the unit. All of this equipment will be connected to the train's onboard network.

All these systems will be integrated with the train monitoring and control system to receive the necessary control information and report their statuses and alarms.

In addition to the onboard equipment and software, as part of this supply contract, the applications corresponding to the control center will also be provided. They enable the management of both content for the passenger information system and images from the video-surveillance system of each train, among other features.

GMV updates Salamanca's urban transportation ITS systems

Salamanca de Transportes, S.A., a Grupo Ruiz company, once again shows its trust in GMV, and is renewing its contract for providing urban transportation services in the city of Salamanca. The operator has awarded GMV a contract to evolve the systems already installed by GMV in its fleet of 70 vehicles.

The work will consist of the installation of new onboard Computer-Aided Dispatch (CAD) and User Information System (UIS) equipment. These systems make it possible to send the vehicle's position to the control center, display regulation information for drivers, and manage the information to be posted on TFT platforms and onboard loudspeakers.

As part of the project, GMV will also update the CAD and UIS platforms for monitoring and management of the fleet, communication between the operator and drivers, calculation of stop times, and passenger information management. The project includes the provision of additional ticket tapping machines to the whole fleet and the installation of real-time passenger counting sensors.

As part of the UIS system, GMV will provide onboard TFT screens, ticketing desk and loudspeaker equipment for the new fleet joining the service, as well as 107 new information panels at stops, in addition to the 85 already in place.

The implementation of these innovative systems will make it possible to pay with EMV bank cards. It will also be based on the management of transportation passes through an Account-Based Ticketing (ABT) system, in which the balance of a card will be linked to user accounts created on the system, meaning that fare changes can be implemented faster.

Meanwhile, the QR-Based Ticketing (QBT) system will make it possible to purchase and use transportation cards through an app developed by the Grupo Ruiz, using a QR code on the user's smartphone screen.

The new CAD control center includes the posting of service data through standard protocols such as SIRI, GTFS, and GTFS-RT. This makes it possible to share information about the service and timetables through the app developed by Grupo Ruiz, as well as integration with the Plataforma TORMES+ platform as part of municipal government's strategy for the complete digitalization of the city.

Adopting these advanced systems is a major step forward in terms of modernization and flexibility in paying for and managing transportation passes. These solutions are not only more convenient for users, but also provide a greater ability to adapt to the ever-changing needs of the transportation system, emerging as a key breakthrough for efficiency and accessibility in public transportation.

GMV showcases in London its intelligent mobility and ticketing solutions

GMV recently participated in Transport Ticketing Global, one of the world's largest public transportation events for mobility and smart ticketing professionals.

The event took place in London on March 5th and 6th, and it brought together a wide range of industry leaders, decision-makers, and specialists representing transportation operators, regulatory bodies, technology suppliers, and industrial associations from around the world.

In addition to the extensive program of presentations, round tables, and discussion panels, the event also featured an exhibition area where participants could showcase their latest activities and new developments in the field. GMV had a booth in this area to demonstrate its latest innovations in the areas of account-based ticketing and EMV in transit payments.

GMV provides video surveillance system for FGC trains in Lleida

Stadler Rail has awarded GMV the contract to equip the Catalan government's new Ferrocarrils de la Generalitat de Catalunya (FGC) trains in Lleida with the CCTV video surveillance system. The trains will run on the new RL-3 and RL-4 commuter train lines. The contract is in line with the provision of the same system for Spanish railway company Renfe's High Capacity project, currently in the development phase.

The project includes providing onboard video surveillance equipment for four trains. Taking advantage of the architecture and equipment of the project underway, the same technology will be used and an NVR digital recorder and a protected memory will be integrated into each car, along with several different types of cameras (inside, 360º, front-facing, and rearview). The control station back-office tools that allow for the comprehensive management of the system will also be provided.

The system will make it possible to view the camera images in real time, both in the cab and in the control center, to monitor any alerts on the train. In this way, the conductor can watch the front-facing cameras to reverse the train, the rearview cameras to control access to the train at the stations, and select the inside cameras they need to see. They will also receive notifications if there are any incidents on the train, with direct access to the cameras that show these incidents.

The system also allows for redundant recording of images, both in the recording device itself, with a mirrored disk configuration, and in the system's "black box." This makes it possible to download the recorded images and analyze them from the control center.

The video surveillance system will be integrated with the train's monitoring system, which will receive information, statuses, and alerts. Meanwhile, the CCTV system will be integrated with the train's passenger counting system, allowing for in-cab viewing and recording.

GMV and Stadler Rail team up again to bring cutting-edge video surveillance technology to Portugal

■ Stadler Rail has awarded GMV the contract for equipping public operator Comboios Portugal's (CP) new trains with a video surveillance (CCTV) system, continuing the business partnership between the two companies.

The project includes providing onboard video surveillance equipment for twenty-two trains, with the goal of upgrading part of CP's fleet of regional trains.

Following the strategic line of action used in the parallel project with the Government of Catalonia (for the operator FGC), the same technology and architecture from the project with Spanish railway company Renfe will be used. This approach involves implementing identical equipment, which will translate into a significant reduction of maintenance costs for Stadler Rail. In this case, NVR digital recorders and various kinds of cameras, including inside and front-facing cameras, will be incorporated.

Furthermore, to facilitate system management and monitoring, the back-office tools needed for the control center will be provided.

This complete integration will allow for effective oversight and proactive system management, ensuring optimal performance and operational continuity for Stadler Rail.

The implementation of the CCTV system gives the conductor real-time access to the images from the cameras installed in the train, and makes it possible to instantly receive notifications related to incidents and alerts that may arise during the trip.

Meanwhile, the control center will be in charge of comprehensive system management, with camera images, downloads of recordings, and detailed image analysis making it possible to monitor the trains in real time.

GMV strengthens its ITS business development team

■ GMV has appointed Antonio Blanco Cedrón as its new Head of Business Development for Spain, Portugal, and Morocco in the company's Intelligent Transportation Systems (ITS) division.

Mr. Blanco Cedrón has more than 20 years of experience in business development, and in implementation and maintenance of technology projects in the field of transportation, especially in relation to payment and passenger information systems. His appointment will make an important contribution to strengthening GMV's intelligent transportation system division, which is currently carrying out a series of significant projects worldwide for the company. His appointment also comes at a time of strong growth and consolidation for GMV's ITS division, which has emerged as a leading supplier of intelligent transportation systems for public transportation in the bus and rail markets.

Furthermore, Javier Gómez, the head of GMV's railway division for intelligent transportation systems, gave a presentation on the video-surveillance system developed by GMV for Metro de Sevilla. This system has enhanced security by enabling onboard monitoring of passenger areas and the area immediately around the train exterior.

GMV to supply on-board equipment for Boston's Green Line trains

Spanish company Construcciones y Auxiliar de Ferrocarriles (CAF) has awarded GMV a new contract to provide intelligent transportation systems (ITS) for the new trains running on the Green Line in the US city of Boston. The work will involve updating a significant part of the light rail fleet operated by the Massachusetts Bay Transportation Authority (MBTA).

The contract awarded includes supplying onboard equipment for 102 trains, each with 7 cars. The ITS system to be provided is an onboard Computer-Aided Dispatch (CAD) system, which will make it possible to manage the services performed by the fleet, as well as other relevant information such as station stop times.

This onboard CAD system consists of an electronic unit that will connect to the train's ethernet backbone and collect information from the different systems it connects to. It will also be integrated with different systems to provide information on the trip, as well as to report statuses and incidents.

Within the scope of implementation of this system, GMV will incorporate its Human-Machine Interface (HMI) directly into the train cab's monitor through a specific online viewer to be displayed at onboard terminals. This integration will allow conductors to efficiently manage information on the services to carry out. Through the interface, they can define service information locally or based on the data received from a ground CAD system.

In addition to offering a practical user interface, the system will provide further information through other displays for the conductors to use. This approach ensures not only efficient onboard service management, but also a more complete driving experience, as the flexibility to define and adjust information at a local level or based on the ground CAD system offers conductors control adapted to their specific operational needs.

GMV showcases its light rail solutions at the European Light Rail Congress

On March 13th and 14th, GMV participated in the European Light Rail Congress, a two-day event held in the Spanish city of Seville. It provided an opportunity for representatives and professionals from throughout Europe to discuss the role of technology in creating more sustainable forms of urban passenger transportation.

Featuring presentations and displays by some of the industry's most innovative suppliers and service providers, this event also included a technical tour, an exhibition area, and more than eight hours of networking sessions.

This was an important event for GMV, as a leading company in the design, development, and installation of intelligent transportation systems for railroad and light rail applications. The company had its own stand to showcase its most recent ticketing system developments, along with the new features available for its SAE R® product. This is a suite of applications that has already become a market leader in the area of computer-aided dispatch / automatic vehicle location (CAD/AVL) systems for rail operations.

Furthermore, Javier Gómez, the head of GMV's railway division for intelligent transportation systems, gave a presentation on the video-surveillance system developed by GMV for Metro de Sevilla. This system has enhanced security by enabling onboard monitoring of passenger areas and the area immediately around the train exterior.

GMV Gsharp® solution already on the road

To millennials (and even earlier generations who grew up watching David Hasselhoff behind the wheel of the K.I.T.T. in the famous TV show), self-driving cars have always sounded like science fiction. Nonetheless, over the last few years, we've witnessed the auto industry's unstoppable progress toward building a totally autonomous car. GMV can be proud of its contribution to bringing this reality a little closer.

GMV GSharp® is a high-precision and safe positioning global navigation satellite system (GNSS) service able to provide support to critical software applications. This solution uses a correction service (CS) to generate precise, low latency GNSS products (satellite orbits and clocks, ionosphere corrections, and other satellite measurement biases) and the positioning engine (PE), the software client integrated into the vehicle's electronic control unit (ECU).

The PE processes GNSS data, the information collected by inertial sensors and the precise corrections transmitted by the CS over the internet, to calculate the precise and safe position of the vehicle, with integrity levels can reduce the risk of error not limited to minus 10-6/h.

This achievement has required close collaboration with more than 60 engineers responsible for designing processing algorithms, implementing software, validating the solution and integrating it in vehicles, and operating the service 24 hours per day, seven days a week. All of this has been done to see this GMV product on the roads of Europe and the United States.

For quite some time now, there have been a variety of car models on the market allowing the most courageous of drivers to enjoy level 2 autonomous driving. This mode allows for hands-free driving for quite long periods at highway speed. However, the driver still needs to keep their eyes on the road, as they must be ready to retake control at any time. Over the last few months, we have also witnessed the implementation of level 3 assisted driving on German roads. This allows users to look away from the road in situations like traffic jams.

This GMV solution has contributed to these functionalities coming to life. This has all been thanks to algorithms developed by GMV for precise GNSS correction estimation and cutting-edge positioning, as well as high reliability thanks to exhaustive testing and validation processes. It's been an intense journey, but we're ready to keep growing and improving.

GMV and Openvia Mobility sign a collaboration agreement to develop NeoRoads

The agreement aims to provide innovative, cost-effective and reliable solutions that address the current needs of operators around the world

GMV and Openvia Mobility, Globalvia's technology and innovation platform, have signed a collaboration agreement as part of Globalvia's NeoRoads initiative, which focuses on the development of connected, safe, and sustainable highways.

The main goal of the partnership is to jointly explore and develop solutions to meet use cases for connected highways, leveraging the V2X communications technology stack at both ends of the segment – on-road and in-vehicle – and focusing in particular on 5G-V2X cellular-based connectivity technology.

The NeoRoads initiative seeks to provide highway operators with a complete package of services and technologies that enable them to digitalize their infrastructure, thus improving their O&M processes and adapting this infrastructure to new kinds of traffic and the ever-changing needs of end users. The main benefits of NeoRoads are as follows:

- Optimization and streamlining of highway operations, improving the use of resources as well as decision-making and response times and increasing road safety conditions for all stakeholders: normal traffic, highway workers, vulnerable individuals, etc.

- Adaptation to new kinds of electric and connected vehicle traffic and offering services tailored to end users' needs. This will allow for greater enrichment of the entire mobility and infrastructure ecosystem, with technology enhancing environmental, social, and economic sustainability and also providing stakeholders with greater resilience in increasingly uncertain times and contexts.

- Making infrastructure maintenance work more efficient and sustainable by preventing failures and addressing deficiencies before they occur.

As such, GMV will play a key role in this Openvia project when it comes to using C-V2X communications and other ITS elements as some of the enabling technologies to develop use cases, such as those having to do with road safety: roadworks ahead, cooperative maneuvers between vehicles and infrastructure, and many others that seek to revitalize and update the added value that traditional operators can offer to their highway users in the new era. V2X communications infrastructure and the services provided will also be key for providing vehicles with the highest levels of autonomous driving capabilities.

The agreement was signed on 12 January by Fernando Vallejo Lázaro, Managing Director of Openvia Mobility, and Miguel Ángel Martínez Olagüe, General Manager of GMV's Intelligent Transportation Systems.

Innovation for inspection operations with *uPathWay*

In the complex area of inspection operations, GMV's ***uPathWay*** solution is now emerging as a beacon of innovation, by transforming the way in which supervision and monitoring tasks are carried out. This is a solution that allows autonomous operation of vehicles, offering a comprehensive response to the need for repetitive and routine tasks in this specialized area.

Rather than focusing on generalized automation, ***uPathWay*** presents a specialized approach to optimizing processes, such as inspection operations taking place in critical industrial and infrastructure environments. The autonomy it provides can guarantee continuous and precise coverage of areas that require regular assessment, eliminating the need for on site performance of these tasks by workers.

In addition to this focus on autonomy, the solution also ensures the accuracy of every movement, so that decision-making can be enhanced by compiling detailed data. This type of precision is essential when inspecting industrial equipment, monitoring critical infrastructure elements, and performing exhaustive evaluations in dynamic environments.

uPathWay is also notable for its ability to be adapted to a wide range of situations, including everything from manufacturing plants to outdoor installations. Vehicles are able to maneuver with agility, avoiding obstacles and traveling along optimized routes that ensure full, efficient coverage.

Another truly innovative aspect of ***uPathWay*** is found in its unique ability to engage in synergistic collaborations with personnel, through the use of a control platform. This focus on collaboration allows the autonomous vehicles to perform routine and repetitive tasks, freeing up workers to focus on work that requires more advanced skills and abilities. This solution is another example of GMV's overall vision of a future where technology and human resources work in harmony, to achieve unprecedented levels of productivity, sustainability, and excellence.

GMV launches the Luis Valle R&D&I program

This program, aligned with INCIBE's cybersecurity objectives, marks a significant step towards strengthening GMV's position as a pioneer in advanced cybersecurity solutions

GMV has achieved a significant milestone with approval of its Luís Valle Research, Development, and Innovation (RDI) Program by Spain's National Cybersecurity Institute (INCIBE), as part of that institute's Strategic Initiative on Innovative Public Procurement (IECPI in Spanish). GMV's program is aligned with INCIBE's cybersecurity objectives, and it represents a significant step forward for strengthening the company's leadership position as a supplier of advanced cybersecurity solutions.

The first key component of the Luís Valle Program is focused on developing a digital self-sovereign identity solution. The aim of this project is to overcome the limitations of the blockchain technologies that have frequently been used for self-sovereign identity systems. Instead of relying upon centralized authorities for issuing identities, GMV is basing its solution on identity-based encryption (IBE). This is an alternative approach that offers flexibility without compromising scalability, and without increasing energy consumption. IBE systems are an innovative approach that eliminates the need for certificates and blockchain technologies. GMV's reliance upon these systems is supported by the company's extensive experience with the use of encryption for mobile authentication, as evidenced by the two patents it holds in this area.

The second project within the Luís Valle Program will be addressing cybersecurity needs in the space industry, through implementation of a Security Operations Center (SOC). This SOC is being developed as an essential tool for managing and mitigating the risks associated with security incidents on satellites. Given the critical role that satellites now play in fields such as communications, Earth observation, and national security, a single incident can have significant socioeconomic consequences. This project is in line with the European Union's Directive (EU) 2022/2555, which is legislation that emphasizes the importance of strengthening cybersecurity in critical areas such as the space industry.

Security in the space industry presents a series of unique challenges, including how to manage the cybersecurity issues that can arise with global connectivity, and this is why GMV is focusing its efforts on the need for evolution beyond the traditional physical safeguards. The company already has a strong strategic position for taking on these challenges, and it recognizes that unlimited access to the software and systems used for space operations presents significant risks that must be managed in a proactive way.

Both of these projects included in the Luís Valle Program are strengthening GMV's commitment to cybersecurity innovation and continual improvement. By obtaining the INCIBE's approval as part of its IECPI initiative, GMV is not only consolidating its leadership position in the field of cybersecurity, it is also demonstrating its unwavering commitment to improving quality of life by developing advanced, secure technological solutions. Once these two innovative projects are put into operation, they will be providing tangible benefits to society, while also helping create a more secure and resilient digital environment.

Bank of Spain awards IT services contract to GMV

Modernization is one of the Bank of Spain's strategic objectives for this year, which it plans to achieve by using technology to become more flexible, efficient, and innovative. It therefore issued a call for tenders in order to select a series of technology companies that could cover its digital needs, while also emphasizing the importance of full reliability.

Based on the results of this competition, GMV has been invited to participate in a framework agreement for provision of IT services. That framework agreement was divided into three lots, with GMV awarded the two-year package focused on evolution, support, and maintenance services for the bank's business initiatives and solutions.

Although GMV's activities will primarily be focused on software development projects, the agreement will also include projects in the big data and artificial intelligence functional area. These are fields in which GMV has already emerged as a leader in relation to aspects such as language technologies, artificial vision, equitable and explainable algorithms, advanced analytics, and data platforms.

Spain's role in quantum technologies

GMV was recently invited to participate in a seminar sponsored by the Spanish Royal Academy of Engineering and the Engineering Institute of Spain, to discuss the increasingly important topic of quantum technologies and their cross-cutting impact on a range of industries. At this event, representatives from the public and private sectors had an opportunity to discuss the role that Spain is now playing in relation to developing quantum technologies. These participants included Luis Fernando Álvarez Gascón, General Manager of GMV's Secure e-Solutions division, who summarized some of the company's main projects in this field.

He also explained the work that GMV is doing in relation to constructing the first quantum computer using entirely European technology, which is contributing to the goal of strengthening Europe's position in this area. He also put a special emphasis on the CUCO project, which is being carried out by a consortium led by GMV, in which quantum computing is being applied to optimization of Earth observation satellite operations. Another project he discussed is one of the CDTI's missions related to AI in agriculture, which is also being led by GMV. In this case, digital technologies such as AI, robotics, and quantum technologies are being used to forecast agricultural yields. In relation to the communications field, Mr. Álvarez Gascón also discussed the company's participation in CARAMUEL, which is Spain's first geostationary satellite mission for quantum key distribution (QKD), and he emphasized the high expectations this mission is now generating.

Finally, he stressed the need for Spain to launch a strategy on quantum technologies that can integrate science, technology, and industry, and he pointed out the importance of a two fold focus, to address the needs of civil society while simultaneously strengthening national security.

Opinion

Autonomous mobile robotics as a driver of technological transformation

The field of robotics has experienced exponential growth in recent decades, and application of its technological advances has become a fundamental tool in areas such as industry, healthcare, and education. This ongoing progress is promising to redefine the ways in which we all live and work.

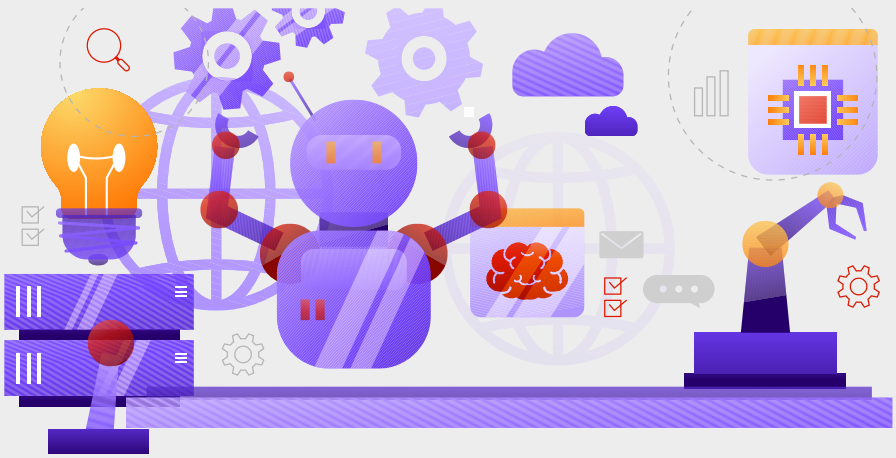
Self-driving cars have already been confronting economic and regulatory challenges for over a decade, which have often seemed to hinder their short-term feasibility. However, technologies like artificial intelligence have also been evolving at a pace that has exceeded all expectations, transforming the initial concept and opening up new possibilities.

One very notable trend that has arisen in relation to the future of robotics is the development of autonomous mobile robots (AMRs). Robots of this type have been evolving significantly over the last 10 years, and they will continue to evolve as new technologies are incorporated. It is now estimated that the global AMR market will double by 2028, with an annual growth rate of 15%, as the use of AMRs continues to expand beyond the areas of logistics and transportation.
In fact, AMRs are expected to take on an important role in a variety of other areas, such as urban infrastructure, energy, and agriculture. Their applications will include everything from public services in cities to specialized industrial tasks, such as autonomous inspection of energy facilities and automation of agricultural work.

These autonomous robots are also notable for their role as technological hubs that are integrating new knowledge from disciplines such as artificial intelligence, 5G communications, IoT, cloud computing, electronics, and mechatronics. The "cloud robotics" business model is rapidly becoming a reality, as the advantages of cloud computing are allowing tasks to be performed more efficiently, eliminating the need for specific hardware on the robots themselves.

There are also three other key technological aspects of AMRs that are worth emphasizing. First, although they are autonomous systems, they are also collaborative, with the ability to cooperate with each other and with other systems. Second, they can be provided with highly effective navigation systems that incorporate both local and external subsystems, to improve precision and the ability to operate in complex environments. And third, they can benefit from a cybersecurity-by-design approach, with security measures integrated throughout their entire life cycle.

Miguel Hormigo
Manager of Industry for GMV's Secure e Solutions division



Autonomous mobile robots not only represent a new path of technological evolution, they are also driving a form of transformation that is redefining the ways in which various types of technologies are able to interact. As these technologies continue to advance in the future, with an emphasis on collaboration, efficiency, and cybersecurity, AMRs will be revolutionizing the way in which automation and robotics are applied in our society.

GMV joins the Spanish Observatory on Big Data, Artificial Intelligence, and Data Analytics

GMV has become a member of the Spanish Observatory on Big Data, Artificial Intelligence, and Data Analytics (the Observatorio BIDA in Spanish). This is an entity focused on innovation, development, and implementation of advanced digital technologies, such as artificial intelligence and big data systems. As explained by Gema Pérez, Head of Business Development for the Financial Services Industry in GMV's Secure e Solutions division, "the main objective of GMV's membership in the Observatorio BIDA is to set up a platform for sharing experiences, with regard to the use of big data techniques for artificial intelligence (AI) and other contemporary approaches to data analysis".

The Observatorio BIDA is also sponsoring initiatives that are pursuing other important objectives, such as understanding the relationship between society and AI, examining the levels of transparency and ethics being applied, and the social, legal, and ethical pros and cons of applying artificial intelligence and big data in the public and private sectors, and in society as a whole.

As an entity developed by the Spanish Accounting and Business Administration Association (AECA in Spanish) in 2018, the Observatorio BIDA has been using a variety of initiatives and activities to encourage collaborative connections among its members. The entity is made up of 27 companies and organizations from the areas of finance and banking, telecommunications and networks, energy, insurance, IT solutions and infrastructure, and auditing and consulting, along with Spanish public-sector institutions and agencies, creating an ideal forum for public-private collaboration.

HPE names GMV best service provider of the year

Hewlett Packard Enterprise (HPE) has named GMV as winner of its Service Provider of the Year 2023 award. The HPE Constellation Awards recognize the company's channel partners that have shown outstanding results and achievements during the previous year. Other factors considered include levels of customer commitment and value development, and a focus on growth and innovation.

At a gala event held at Madrid's Club de Tiro as part of HPE's traditional Christmas lunch event, these awards were presented by HPE Spain's President and General Manager, Alfredo Yepezof, and Channel Manager for Spain, Gonzalo de Celis. In attendance to receive the award on behalf of GMV were Juan Antonio Abánades, Manager of Cybersecurity Technologies for GMV's Secure e-Solutions division, and Nathalie Dahan García, GMV's Head of Strategic Partnerships.

This award reflects the close collaboration that has existed between HPE and GMV for more than a decade, which has only grown stronger over time. During that period, GMV has made use of all types of HPE technologies in some of its most iconic projects, such as its design of the ground control segment for the Meteosat Third Generation, developed by the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT); the flight dynamics system and control and monitoring system for the Hellas Sat 3 program, and development of the Galileo Reference Centre (GRC).

Planting seeds for the future of agriculture: digitalization, training, and employment

As a way of assisting with digital transformation processes for SMEs, independent contractors, entrepreneurs, and operators in the sharing economy, Spain's National Employment Training Foundation (FUNDAE in Spanish) is organizing a series of thematic events as part of the "SME University" project, in collaboration with Spanish regional institutions.

With the aim of raising public awareness about activities on best practices for training and digitalization, in the various communities and productive industries in the Spanish region of Andalusia, the region's Directorate-General of Vocational Training for Employment organized a conference in February on digitalization and training in Andalusia's agricultural sector.

Miguel Hormigo, Manager of Industry for GMV's Secure e-Solutions division, participated in the discussion panel entitled "A Digital and Sustainable Future for Farming in Andalusia". He explained the technologies and solutions being used for digitalization in the agri-food industry, along with the advances being made as part of the AgrarIA project.

AgrarIA has been developed to help accelerate digital transformation in the agri-food industry, by integrating biotechnology, agriculture 4.0, the Internet of things (IoT), big data, robotics, and artificial intelligence (AI). The project's goal is to identify new agricultural production methods that can be used to drive sustainable transformation of that industry, by making its processes faster, more efficient, and more productive.

The AgrarIA project is funded by Spain's Ministry of Economic Affairs and Digital Transformation, through the R&D Missions in Artificial Intelligence Program of the State Secretariat for Digitalization and Artificial Intelligence (SEDIA) (file no. MIA.2021. M01.0004), using funds from the country's Recovery, Resilience, and Transformation Plan.

The impact of generative AI at universities

The Autonomous University of Madrid (UAM) held a workshop in December that addressed the growing influence of AI in society, and specifically its potential impacts on teaching and research. José Carlos Baquero, Manager of Artificial Intelligence and Big Data for GMV's Secure e Solutions division, participated in a round table discussion, during which he emphasized the need for a balance in education between automation and human participation. He also stressed the importance of establishing ethical guidelines to ensure responsible use of AI in the academic environment.

This workshop's participants discussed the potential for generative AI to enhance the personalization of learning, but they also emphasized the need to maintain human connections and mentoring relationships in higher education. The ethical implications of AI for university research were also explored, with the discussions addressing its potential to accelerate the scientific process, but also the importance of ethical and regulatory considerations. The event was rounded out by an open debate that reflected the diversity of opinions and concerns regarding the challenges and opportunities presented by generative AI in the university setting. In the end, the participants agreed that there is a need for a balanced and ethical approach to integrating AI into education.

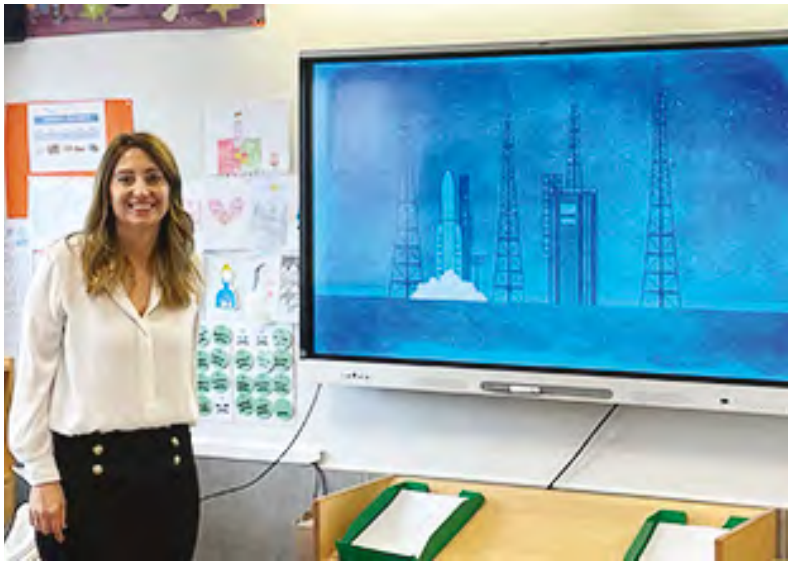
GMV celebrates the International Day of Women and Girls in Science

The International Day of Women and Girls in Science is a special date on our calendar each year, and so on February 11th, we make our own contribution to promoting access for women and girls to education and training in STEM fields (Science, Technology, Engineering, and Math).

The best way to awaken an interest in STEM is by example, so once again this year, women from GMV have made visits to elementary and high schools to demonstrate that talent is independent of gender, and that we can all make a contribution to scientific and technological development. Throughout the month of February, a total of 14 schools in Spain, Portugal, Romania, Poland, and the UK welcomed visits by these GMV professionals, to hear their testimonials and learn about the experiences they had during their own STEM education.

On February 16, Mariella Graziano, Manager of Sales Strategy and Development for GMV's Space Systems EST sector, participated in an event organized by Enrico Fermi Scientific High School, entitled "Women and Girls in Science". Ana Romero, Patricia Ayora, Patricia Ferré, Mónica Rollán, Sandra Garrido, Begoña Rojo, Fátima Reis, Stefania-Denisa Bocu, Aurora Izquierdo, Melani Álvarez, Almudena González, Andra Sararu, Cristina Cezón, Sangeetha Ilamparithi, María Romero, Ines Silva, Beatriz Reis, Barbara Matos, Agnieszka Rojek and Anna Katarzyna Myśliwiec also shared their experiences.

In a reality where change is possible, GMV does not want to just be a spectator. This is why throughout the year, the company actively participates in a variety of initiatives to promote advancement towards a more diverse and inclusive future.



GMV wins lifetime business achievement award

ESIC recognizes the path of GMV in its 40 years of history, a solid company that leaves its mark creating high technology in Europe, America and Asia

GMV received the ASTER Lifetime Business Achievement Award at a ceremony held in Madrid on 29 February.

Organized every year since 1982 by ESIC, Spain's leading business, marketing, and digital economy school, the ASTER Awards recognize the merits of individuals and organizations that have excelled in their professional pursuits and have advanced the integration of academic training and business work. Winners include outstanding professionals, companies, and institutions, making these awards some of the most prestigious in the Spanish business world.

The ASTER Lifetime Business Achievement Award recognizes the achievements of private and public companies that have done remarkable work throughout their history. With this award, the ESIC celebrates the path that GMV has taken over its 40-year history: from a small project born of the entrepreneurial initiative of Dr Juan José Martínez García, professor of Flight Mechanics at the School of Aeronautical Engineering (ETSIA), to a robust company that today employs more than 3,300 people, operates in Europe, America and Asia, and is making its mark in a wide range of high-tech sectors.

According to Pedro Schoch, GMV's Corporate Development, Marketing and Communication Director, who accepted the award from ESIC Vice-President María Teresa Freire: "It is an honor to receive this lifetime achievement award for our business performance. This prestigious award is a clear recognition of GMV's commitment to talent, excellence, and technological leadership in the areas in which we operate. It also coincides with the company's 40th anniversary, which we will be celebrating throughout 2024, with pride in our history and our sights set on the future.

GMV has been recognized for its work on developing female talent

On February 7th, the ASTI Foundation presented GMV with its Best Company award, as part of the 3rd edition of the foundation's annual STEM Talent Girl Awards. This event is designed to recognize outstanding female talent in STEM fields, as well as the work that companies and institutions have dedicated to supporting and encouraging that talent.

This recognition highlights the work that GMV has performed in relation to developing and implementing a cross-cutting strategy that is aimed at furthering the professional development of women in STEM fields. These award events take place in collaboration with the regional government of Castile and León, through the STEM Talent Girl program developed by its Ministry of Families and Equal Opportunities. This is an initiative designed to encourage changes in the education system to achieve a better balance between male and female students in STEM courses.

Through its female employees, GMV has been part of this program since its first initiative was launched in 2016. This collaboration has taken place in the form of mentoring sessions, workshops, and outreach talks and master classes, during which the women of GMV draw upon their own experiences and knowledge. This is a way of encouraging the girls participating in the program to pursue careers in science and technology, while also providing support for their academic progress.

GMV is also involved in other equal opportunity initiatives that have the aim of encouraging female students' talent by providing role models, and by empowering these students to pursue careers as engineers, physicists, architects, biotechnologists, data analysts, or any other kind of STEM professional they want to become.

SUGUS CTF victory for GMV team

For the second year in a row, the team representing GMV finished first in the cybersecurity Capture the Flag (CTF) competition, organized by the University of Valladolid's cybersecurity association SUGUS on February 23.

This third edition of the event had 24 teams participating and included 19 challenges in different cybersecurity areas, like steganography cryptography, and open-source intelligence (OSINT), among others.

The GMV team, comprised of Juan Nicolás Álvarez-Ossorio, Boris Pietro Treccani, and Alberto N. Gentil Otero, completed the challenges proposed over the 4-hour competition, gaining a clear advantage over the other teams.

Through these kinds of initiatives, GMV encourages developing cybersecurity skills and research in this field.

GMV encourages young talent with its Global Talent Internship Program

As part of its ongoing efforts to promote the development of young talent and keep up with the increasing demands of the IT industry, GMV has successfully implemented its Global Talent Internship Program. This is an initiative that gives students enrolled in engineering degree programs and technical vocational training an opportunity to participate in innovative projects, under the guidance of experienced professionals.

In February, as part of this program, GMV invited 81 students from engineering bachelor's degree programs to become interns at its various facilities in Spain. To welcome this year's exceptional number of new arrivals, the company once again organized some special workshops to help orient those talented students on their first day at the company.
As in previous editions, there was a substantial amount of interest in the program, reflecting the growing demand for qualified technical professionals in the IT industry. The technological revolution and digital transformation are generating an increasing need for experts in a wide range of technologies, and GMV has actively responded to this need through its commitment to education.

As part of that commitment, GMV maintains close collaborations with vocational training centers and universities. Not only does the company encourage students to select technical training and education programs at an early age, it also actively participates in their educational process. The overall aim is to give talented young people an opportunity to advance their professional career at GMV, while making their own contribution to the company's ongoing growth.

Language training: a key to global competitiveness and growth

GMV has been prioritizing the linguistic training of its employees for more than 30 years

In today's world of globalization and cultural diversity, the ability to communicate effectively in multiple languages has become an invaluable asset. With operations in 12 countries and projects across the globe, GMV sees this ability as key to its competitiveness and development. The company has become a veritable melting pot, with over 3,300 employees representing upwards of 60 nationalities and language cultures. Because of this, it considers language training to be a strategic pillar of its business.

For over three decades, GMV has included language learning as a core component of its development program, demonstrating its long-term commitment to the professional and personal advancement of its workforce. This approach not only promotes integration and smooth communication between teams in different countries, but also prepares employees to embrace the challenges and opportunities of their international environment.

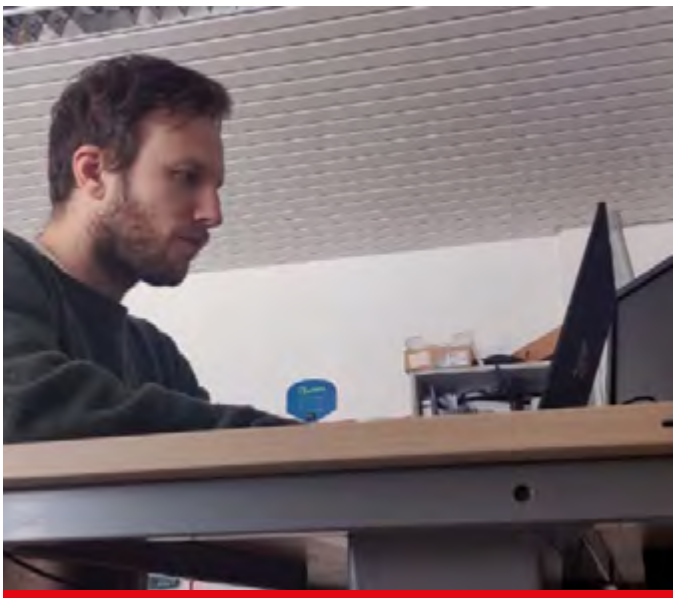
One initiative for newly expatriated employees stands out in this regard: financial support for initial language courses in the destination country to ensure the employee's smooth transition and effective integration.

Through this initiative, it is easy to see that GMV understands the importance of adapting, connecting with local cultures, strengthening international operations, and fostering an inclusive environment.

After the initial adjustment, GMV encourages the ongoing development of business-relevant language skills. From its earliest days, the company established a program to cover the cost of learning specific languages, with the aim of improving communication with customers and suppliers, as well as facilitating the integration and personal and professional development of its employees. With a fixed annual budget, this program is open to all GMV group employees, demonstrating the company's commitment to developing its talent.

Investing in the improvement of employees' language skills means greater competitiveness in the international market, while at the same time fostering a work environment that is enriching, diverse and cohesive.

Miquel Llobera and Matthias Urban tell us about the added value that language learning has brought them, not only professionally, but also in terms of personal development and cohesion among colleagues.



Miquel Llobera. Aerospace engineering

I have a lot of experience with GMV's language learning program, having benefited from it since I joined the company five years ago.

When I started at GMV in the Madrid office, my top priority was to improve my English. Once I found a decent-looking academy close to my home, it was easy to arrange for GMV to pay for it. After several months at the academy, with the pandemic and online classes in there as well, I reached the expected level and can now say that I am fluent in English. While studying English, I also decided to sign up for a French course with some colleagues. It was less intensive and was just to brush up on the basic French I had learned at school. Again, everything was straightforward and the company paid for it. The cost of learning two languages at the same time did not exhaust the full amount available to me, and I was grateful for that.

And so came 2021, the year I started working as an expat in Germany. Moving to Germany opened up a whole new language scenario for me. In the first year everything was new. Because I had to settle into my job and because COVID was still ongoing, I took a more relaxed approach to learning German. All I did was sign up for a few hours of online corporate training and pay the fee, also covered by GMV, to a well-known lifelong language learning platform.

Eventually, once I had settled in, I was able to combine online classes with face-to-face classes at reputable language schools in Berlin, and I also signed up for private refresher classes through an online platform. Overall it worked out well and I didn't go too far over the amount provided by the company, so I'm extremely happy and grateful for this GMV program.

Matthias Urban. Technical Leader

Working in an international team, the need for communication skills is obvious. I am a System and Software Engineer in GMV Germany (EOSS) and part of a team with members from literally all over the world. Most of our projects are run with partner companies spread all over Europe – from Finland to Portugal, from Great Britain to Greece. Naturally, the common ground for all is the English language. So, why would anyone want to learn additional languages apart from the "world-standard" English – as I am doing by learning French? By committing to a foreign language, you do not only learn how to write and speak but you also enlarge your intercultural competencies. Understanding the differences and commonalities in cultures broadens the cultural sensitivity and allows to reflect own attitudes and habits in an international environment. Moreover, although commonly agreed on English for communication, an additional Language may serve as ice breaker by establishing a channel on a personal level.

Why did I decide to learn French in particular? As France is one of the big countries contributing to ESA and the European space projects there are many links to the language on a professional level. Unfortunately, back in school I didn't take the chance to learn French. When I was joining the company 3 years ago, the Language Subsidies Program was one of the benefits offered to me. With the support of the company financing the language courses I took the chance to finally fill this gap.

Of course, a foreign language is a sensitive plant which must be cared about to stay alive. While learning French as my third foreign language, my skills on the second – Spanish – do suffer.

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