News

N° 76

INNOVATING SOLUTIONS

GMV NSL, a brand new company born in the times of Brexit and COVID

INTERVIEW
Mark Dumville
General Manager GMV NSL

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INNOVATING SOLUTIONS

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Over the years GMV has had the chance to work with space agencies, satellite operators and satellite manufacturers all round the world, furnishing them with systems, products and support services. It has by now become one of the world´s top suppliers within the sector. Our space applications and systems are now meeting the needs of a continually growing community of users in different activity sectors.

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Letter from the president

As this unforgettable year draws to its close, I look back trying to remember all that was good and that I can be grateful for. And I realize there is in fact quite a lot.

We have had to adapt very quickly to circumstances we had never faced before in a situation of pressing worries on both a personal and a professional level. But team GMV came up trumps, making sure all our projects went ahead. Our clients and suppliers have also bent over backwards to continue their business with us. Together we have drawn on all available resources and tried out many new ones to ensure ongoing progress. Between us all we've learnt to solve problems of all types remotely; where this proved impossible we've learned how to proceed with all due circumspection in order to safeguard our own safety while also looking out for the safety of everyone we work with. Thanks to the proactive attitude of our biggest clients, the pandemic has had relatively little impact on some of GMV's business areas. All in all, GMV's diversified business has been able to act as a shock absorber, mitigating the effect for one and all. Indeed, we have even managed to chalk up a slight increase in both sales and staff.

This year has brought out the overriding importance of human relations in all aspects of our lives. It has also shown us new ways to meet with each other, to collaborate and to keep up close contacts despite the imposed social distancing, which hopefully can soon become history. To everyone who has accompanied us in spite of the physical distance, our heartfelt thanks!

Mónica Martínez

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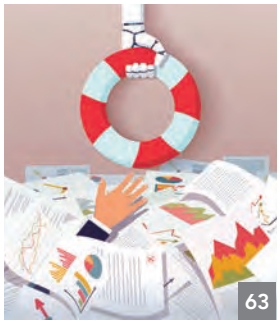


GMV NSL, a brand new company born in the times of Brexit and COVID

NSL is being merged with GMV's UK arm and is now operating as GMV NSL Ltd with offices in Nottingham, where NSL was based, and in Harwell, where GMV Innovating Solutions Ltd was based

ABOUT NSL

Nottingham Scientific Limited, or NSL as it became known was a UK based small to medium sized entity (SME) specialising in Global Navigation Satellite System (GNSS) technologies, in particular in solutions where there is a requirement to demonstrate the robust, reliable and assured use of GNSS and other positioning technology. This includes developing robust and reliable algorithms, software, devices and applications using GNSS technologies (GPS, Galileo, GLONASS, Beidou, EGNOS and other SBAS, ground-based augmentation systems etc).

NSL's core business was centred around the development of applications and the provision of services for safety critical transport operations (aviation, maritime and rail), mission critical applications (security, justice, law enforcement) and high value economic applications (e.g. road pricing). NSL was also a supplier into GNSS system-level programmes through the provision of algorithms and software related to different services. NSL clients included government departments, international organisations, infrastructure operators, service providers and system integrators.

TECHNOLOGY RANGE

Positioning, navigation and integrity related consultancy services

Multi-frequency and multi-constellation GNSS receiver solutions for professional markets

GNSS performance monitoring

Mission-critical software for Space, User and Ground Segments

System and application development for prototyping and concept validation

GNSS interference monitoring

Intellectual property for applications related to advanced positioning techniques

Positioning and communications systems and applications for transport (rail, road, aviation and maritime)

Map-matching, advanced routing and journey analysis services

GNSS receiver and positioning algorithms for enforcement and assurance regimes

At the time of acquisition, NSL comprised of approximately 50 staff with an annual turnover of approximately £4m

ORIGINS

NSL was created in October 1998 by Professor Vidal Ashkenazi following his retirement from the University of Nottingham and the specialist satellite navigation Department that he founded known as the Institute of Engineering Surveying and Space Geodesy, or IESSG. Based within an annex at the Department, Professor Ashkenazi with Dr. Mark Dumville, immediately began to implement a business plan of winning contracts for the University to complete. Primarily, but not exclusively, in satellite navigation the team quickly established a winning formula and achieved a high bid to win rate which ultimately led to NSL's first issue with resourcing as the Departments that were allocated the work didn't have the resources available to fulfil the contracts. A rethink followed and in 2002, key changes were made. Mark Dumville became a shareholder and General Manager, new appointments were made so that NSL would win work for themselves. With the increase in personnel and with new contracts to fulfil, NSL moved out of the university to commercial premises.

NSL work at that early stage was primarily concept definition and algorithm analysis for regulator's and other government related organisations and spanned the transport domains of rail, maritime, aviation and road. Work with GMV had begun, an early example being the Galileo Joint Undertaking's (the predecessor to the GSA, or GNSS Supervisory Authority) ADvantis project that was led by GMV.

DEVELOPMENT AND UPGRADE

As the company grew, it expanded its activities from the core business of scientific and engineering consultancy, to include greater involvement in the design and development of large engineering and technology programmes, primarily Galileo, and in developing GNSS applications and supporting their implementation by aiding the definition of standards. System level contracts as a third-tier supplier followed which allowed NSL to complement its personnel with mathematicians, software engineers, and test engineers. NSL was a sub-contractor to GMV, providing support to the development of the E-OSPF (Experimental Orbit Synchronisation and Processing Facility) for the European Space Agency, ESA. Algorithms relating to pre-processing and error detection were coded, documented, and tested to ESA software development standards, and successfully integrated into the E-OSPF kernel at GMV. Other examples include being part of the ESA Galileo System Test Bed Version 1 (GSTB v1) responsible for investigating optimised user positioning and integrity algorithms and supporting the consolidation of the Galileo Ground Mission Segment in phase C0.

NSL's capabilities were increasing to include software receiver technologies and several contracts allowed the company to specialise in two further areas; the Galileo Public Regulated Service (PRS) and the detection of interferences to GNSS. A number of UK based contracts allowed NSL to develop, patent, and demonstrate server-based PRS services. This included "Transmission of PRN codes" (snippets) plus "Sample and Processing" low-end server-PRS approaches. This award-winning work allowed NSL develop associated software receivers, hardware terminals and end user demonstration applications.

A couple of GSA contracts combined with both internal and external investment help NSL develop the DETECTOR system for GNSS interference monitoring and characterization. With patented techniques, this commercially available system comes in two variants: the GSS100D providing GPS/GALILEO L1/E1 monitoring capability, and the GNSS200D providing a multi-GNSS, multi-frequency monitoring capability. NSL are currently developing a further versions for governmental applications. DETECTOR captures raw RF, pre-processes and, if seen as an interferent, sends the RF to a service database for classification. To date, over one million interferences have been captured by DETECTOR systems located throughout the world, creating a unique and extensive database of GNSS RF interference signatures.

BREXIT, A WATERSHED MOMENT

Britain changed on 23 June 2016, the day of the Brexit referendum. NSL has always considered itself to be European; it promotes and specialises in European technologies, many of NSL's contracts come out of the EC, GSA as well as EU governments and industries and, above all, the NSL workforce comprises many different nationalities from the UK, the European Union and from further afield. Somewhat unexpected, the decision to leave the EU affected NSL creating an emotional and worrying time both professionally and personally. Business-wise, NSL had to immediately stop all Galileo PRS related activities and destroy all associated secure and confidential information and systems. Almost one third of NSL business was affected. The company maintained its workforce and sought other opportunities within UK industry gaining contracts with organisations that are developing their own GNSS capabilities.

With the exclusion of the British space industry from the EU's Galileo GNSS programme, the UK government began a programme to investigate the potential of a sovereign GNSS system that would be somewhat similar to GPS and Galileo. A technical and industry feasibility study followed, and NSL as the UK's specialist satellite navigation company were well placed to provide expertise and partner other leading space companies within the successful tenders. ESA's Navigation Innovation and Support Programme (NAVISP) began in 2017 with the UK being a major subscriber. Again, NSL were well positioned with many of the work programmes falling within our areas of interest and the company currently working on multiple Element 1, Element 2 and Element 3 projects.

NAVISP and the UK programme helped NSL to double in size since mid 2016. Success has been very much down to our people, having an excellent and engaged workforce allowing the company to push boundaries and establish and maintain very high standards.

A NEW CHAPTER IN THE NSL STORY

On 31 July 2020 GMV Innovating Solutions Limited, the English aerospace company belonging to the Spanish technology multinational GMV, signed a merger agreement with Nottingham Scientific Limited (NSL). GMV thus becomes the sole shareholder of NSL under the company name GMV NSL, now knitted seamlessly into GMV's group of companies.

Membership of the GMV powerhouse will enable GMV NSL to rise to even greater challenges and to tap into the opportunities offered by the UK markets, specifically the space market. As well as satellite navigation, this also includes applications, earth observation, telecommunications and new technologies with the overarching aim of winning pole position in Britain's space sector.

The outstanding qualities of both teams and the similarities between GMV and NSL on company values, technological excellence and client satisfaction were all key factors in this merger agreement, helping to ensure a perfect fit. Here begins a new chapter in the NSL story, with greater range, capacity and capability enabling solutions for a bigger, worldwide clientele.

OUR SINCEREST RECOGNITION

The success of NSL is further achievement of Professor Vidal Ashkenazi, OBE, our former CEO who retired from NSL at the time of the acquisition by GMV Innovating Solutions. Being a very well known personality within the GNSS community, some readers will be familiar with Vidal, however NSL would like to share Vidal's biography, thanking him for opportunities that he has given to everyone at NSL, both past and present.

Vidal has been involved with the geodetic aspects of positioning by using satellites from the earliest days. In 1976 he was invited by the US National Geodetic Survey (NGS) to assist with the development of geodetic coordinate systems, the framework that is still used today by satellite navigation (satnav) and mapping systems. Professor Ashkenazi was an academic at the University of Nottingham from 1965 to 1998, and the founding Director of the Institute of Engineering Surveying and Space Geodesy, one of the leading space geodesy research institutes in the world. He supervised around 50 doctoral (PhD) students, many of whom now occupy senior positions in universities and industry around the world. These included the US, where he spent 6 months in 1976 as Senior Visiting Research Scientist, at the invitation of the US National Academy of Science, Canada, Australia, India and Brazil. Professor Ashkenazi has the degrees of Doctor of Philosophy and Doctor of Science from the University of Oxford. In 1996, Vidal received a medal from the UK's Royal Society for his "significant contribution to the exploitation of GPS in a wide range of scientific and commercial applications".

Following his academic career, Professor Ashkenazi founded Nottingham Scientific Limited (NSL), to commercialise the innovation and expertise developed at Nottingham and other UK universities. As a recognised figure on the international scene of conferences and congresses, Vidal was regularly invited to deliver keynote presentations or to organise and chair Round Table Panel Discussions. In 2008, he was awarded the Harold Spencer Jones Gold Medal, the highest award of the Royal Institute of Navigation (the RIN) for "an outstanding contribution to navigation". Furthermore, Vidal was awarded an OBE in the 2017 New Year's Honours List for Services to Science. An OBE (or Officer of the Most Excellent Order of the British Empire) is the Queen's honour given to an individual for a major role in any activity such as business, charity or the public sector.

Mark Dumville

General Manager GMV NSL

Hello to colleagues at GMV and hello to all friends of GMV. I am delighted to be given this opportunity to inform you of the most recent chapter in the ongoing story of GMV. I am writing to you as the new CEO of GMV NSL, which is based in the UK. It is a great honor for me to have that position after spending 25 years within the space business and watching the development of GMV from my office in Nottingham.

For those wishing to know a little more about me: I am a civil engineer by degree but I have never built anything in my life. In the summer, the construction sites were dusty. In the winter the sites were cold and wet. Remember this is also the UK.

I did not want to be a civil engineer but I loved engineering. I just had to find the right type of engineering. After considering various job offers, I was still undecided and I accepted an offer to study for a PhD. The first offer was related to a new capability called "Global Positioning System (GPS)". I did not believe GPS would catch on outside of the military. Why would you ever need to know your position to 100-150 metres? Remember, this was back in 1990. Instead, I accepted an offer in Satellite Earth Observation. The PhD involved orbit determination, georeferencing imagery as well as artificial neural networks. I think I was already being prepared for life at GMV! On completion of the PhD, I moved on to being software manager and then accepted a business development role at the University of Nottingham, working for Professor Vidal Ashkenazi. Vidal (if I may) made the bold move of promoting the University's research abilities in industry and the institutions. This was not the way universities operated in 1990's. The venture was so successful that he secured the finances to build a dedicated Institute, whose main focus was on GPS and its applications. Following that success, when in 1998 Vidal asked me to join him in developing a new enterprise called Nottingham Scientific Limited, I did not need to think too much. Even after 22 years, I still remember the fact that I said YES to Vidal before I spoke to my wife.

I know that Vidal will be reading this. He has read every GMV newsletter. I would like to thank Vidal and to reassure him that NSL is in good hands with GMV as a parent. As part of the merger, Vidal retired at the age of 87. An exemplar to everyone for how to keep fit, eat well and remain challenged. Your colleagues and friends at GMV NSL sends their greetings to Vidal.

Which are NSL's stand-out values as a key company in the field in satellite navigation and critical applications in the United Kingdom's space sector?

To be honest GMV and NSL are very similar, apart from the size. We share the same heritage which has influenced our values, culture and ethos. Both companies were spin-outs from University departments, founded by world respected Professors. As such, both companies understand the value of investing in R&D as well as the business benefits from innovation. In fact, I appreciate the opportunity to mention to customers, partners and suppliers that the GMV company strapline is "Innovating Solutions". That is bold but true and captures the company ethos. Innovation has also always been at the heart of NSL. At NSL we always looked to keep ahead of the innovation curve and to quickly commercialise our innovations ahead of the competition.

What does teaming up with a partner like GMV mean for NSL?

During the merger discussions there was one word that was constantly being mentioned. That word was MUSCLE. I think that word captures the true value of the teaming with GMV will bring to NSL. MUSCLE can mean many things and for sure in terms of NSL, GMV brings MUSCLE. GMV has endured a rigorous training regime over the years. GMV has had to survive many competitions. GMV is a well toned and disciplined machine. You can use MUSCLE to fight and you can use MUSCLE to offer support and protection. By teaming with GMV, NSL will benefit from that MUSCLE. As an SME, NSL was limited by its size in terms of staff size and financial capacity. The GMV muscle provides the ability for NSL to enter into new domains, explore new markets and open-up doors that were previously locked. With GMV muscle, NSL will be encouraged to venture beyond its traditional horizons to see the greater potential for developing innovative solutions across a broader range of markets.

Which would you reckon to be the main synergies to be gained from the GMV NSL merger agreement?

Given the heritage and the long-lasting relations between the two businesses, there are an obvious

set of synergies to be gained from the merger. The most obvious is the increased scale and presence. The combined force of GMV and NSL in the UK will generate the largest engineering team in the country specialising in Position, Navigation and Timing technologies and applications. The merger is happening at a time when the UK government are committed, at the highest levels, to ensuring resilience and assurance is embedded into the provision of PNT within the country's critical infrastructures, operations and services. This is a fantastic opportunity for the merged business, with the skilled teams, the IP and technologies that exist across the company. In addition to the UK, other nations and regions will follow the leadership of the UK and start to understand their own dependencies on PNT and look for solutions to protect their infrastructures and services. We are confident a new market will emerge in this area which will complement the current dominant position of GMV within the GNSS marketplace.

In addition to scale, I believe there is a multiplier effect from the GMV and NSL teaming. I think this is summarized best by a comment posted on social media from a good customer in response to news of the merger. The comment stated that the combination of GMV plus NSL is a perfect example where the result of the deal is greater than the sum of the parts. Naturally, you always expect a positive outcome from a deal but I think this statement is true at many levels. It exists at the business level where NSL is agile and can develop solutions to rapidly address new market needs, whereas GMV has an enviable track record in delivering highly innovative and complex systems. If we combine both capabilities, we can generate more and maintain the best of both. At another level, there is the combination of staff capabilities. Whereas NSL was purely focused on GNSS and position, navigation and timing, through the merger with GMV we see amazing opportunities of harnessing the multidisciplinary skills of the combined team. Additionally, we are also seeing synergies at the corporate and management levels which are a hidden bonus for NSL. This was not expected and is most welcome. As an SME, we had to do everything ourselves, whether you were technical, managerial, administrative. The jobs needed to be done; IT needed fixing, mail needed collecting, parcels needed to be delivered same day, travels needed planning, payments needed chasing, job descriptions needed preparing and interviews needed to be coordinated among diaries. They are all critical activities for any business, but at NSL we were too small for dedicated resource to support these activities. The team had to find extra capacity to do deliver these activities. In doing so, this would distract the team from their day jobs. It is already apparent that GMV understands these challenges and we are already seeing the power and structure of the organization to centrally manage all of those critical business operations that are common across the group. Thereby the right people are now tasked with doing their job. I can imagine the delight and the smiles on the faces of the NSL engineering team when they realise the true value of having corporate support functions.

The combined force of GMV and NSL in the UK will generate the largest engineering team in the country specialising in Position, Navigation and Timing technologies and applications

How is NSL's personnel addressing the new stage that kicks off with the creation of GMV NSL?

I think change is difficult for many people. It takes time to understand and to adjust. In 2020, we have all had a rough and a tough year. Some people have had it really bad, which is very sad. It is awkward for me to discuss the personnel and their responses to the creation of GMV NSL without first praising the NSL team for the great work they have done during 2020. As with any merger, management are engaged in confidential discussions yet the business must continue to operate. The customers still require their services to be delivered, the business still needs to generate invoices, there is a need to recruit and we need to secure more business. In 2020, on top of the usual, there were the additional pressures. The NSL team have been great and I would like to say a big thank you to the team for their support during the year. I would also like to publicly inform colleagues at GMV that you have been joined by a great team of people in Nottingham.

In terms of the reactions and responses to the news, again events of 2020 have made it challenging to have the informal chats and discussions with individuals about their feelings and thoughts. I have tried where I can and the feedback is always very positive. The main messages that I am detecting is that staff are excited and delighted that a company like GMV has shown this level of interest in NSL and are already investing in NSL. It is pleasing to know that there is mutual recognition at all levels between NSL and GMV. I also sense that people feel more secure. When you are an SME there is always the possibility that a bad decision or change in circumstance may generate unexpected consequences that could jeopardise significant parts or the entire business. Through the merger this risk has diminished for the staff. The staff can already sense that the GMV management chain has a solid governance process that will ensure all risks are measured and monitored and, if anything should occur, then checks are in place to detect and prevent from further escalation. Strong governance provides a lot of reassurances to the staff. On a very personal level, I can also see that

the staff are interested to know more of the training and career progression aspects. Once again, as an SME you are always looking to find new ways to support staff progression and career development. Sometimes the size of the business does not enable you to deliver on your wishes. A bigger organization offers opportunities for the staff that simply where not possible when we were NSL.

What about the clients? How do they see this merger agreement?

There are two answers to this question depending on who you speak to. Mergers mean administration; change of names, banking, contracts, agreements, document templates, logos, acronyms. I think some of our customers are not so happy. Joking aside, the reaction from the close customers has been a huge surprise for me. Having operated as an SME for so long, I felt we had developed strong relations with our customers and I could not see how the relations could ever be improved. However since the news, we have received lots of interest for what we can now do in addition to our previous offerings. It is too early to tell, but it seems that the muscle of GMV has increased our credibility with our customers. I think this is similar to what I mention about the staff. With the backing and support of GMV, the customers feel safe and secure in exploring a wider range of business opportunities with a bigger business that can do more. There is also the fact that as NSL we were limited to GNSS and PNT, with the merger we have a wider product portfolio we can discuss.

Which would you regard as the main short-, medium- and long-term challenges to be faced by GMV NSL?

Business is about challenge and I like to find solutions to challenges. The integration of the two businesses is my current challenge. The merger transaction was entirely carried out remotely during the firsthalf of 2020. I think it is an enormous credit to both sides (and their respective teams of advisors) that we found a way to negotiate the deal under such demanding conditions. We are now in the process of integrating the GMV UK business with NSL and we are still unable to meet up in person. This is very frustrating for everyone involved. However, yet again we are coping and will continue to deliver an integrated business before the end of 2020.

The interation of the teams is my immediate challenge. It feels very strange that the two UK teams have not been able to meet and find out more about the respective businesses and the staff. A celebration of the new business would have been nice but understandable not posible for the time being. Nevertheless, the

business must continue and we find ways to proceed with the integration despite the conditions. It is to be expected that NSL and GMV have different processes and systems, as such there has been a lot of attention given to harmonisation and to integration. I should like to add that "staff" have always been important to both companies and integration issues associated with "staff" have been prioritised.

The next challenge will be what happens with Brexit on 1 January 2021. We are prepared for a range of scenarios, however the uncertainty is still there. As I answer this question, the negotiations are ongoing and situation is unclear, which is not helpful for any business. One thing for sure is that it will be different to what was before and to what we expect. We are prepared and we are ready to adapt to the new rules and the new ways of doing business. NSL has always been close to Europe and now as GMV NSL we are part of a European group which will keep us close to Europe.

As I look into the longer term, the real challenges I see is the ability to maximise the opportunities that will be available to the business. We are all very aware of the governmental as well as the commercial interest in Space. In the UK we are experiencing the dividends of the government's foresight and investment in the space sector. Space in booming and UK space industry is delivering on its promises of growth. Despite the problems in 2020, the Space sector continues to develop. We need to select the right opportunities. Space will continue to be a key industrial sector for the UK, providing the highly skilled jobs of the future, generating opportunities for further growth through sales, investment and export. When you combine Space, with Autonomy and robotics, together with artificial intelligence and cyber security you capture most of the advanced technologies that every nation seeks to develop. At that point I stop and think to myself if only I worked for a company that specialises in these technologies. I then I start to look forward to what comes next for GMV NSL in 2021.

As GMV NSL we are part of a European group which will keep us close to Europe

GMV participates in FCAS's Concept Study

The main remit of this study is the conceptual analysis of the possible FCAS capabilities and architectures ahead of the design, industrialization and full operational capacity, expected for 2040

GMV's has signed a contract with INDRA (FCAS national program coordinating firm) as one of the participants in the Joint Concept Study (JCS) of the European defense program NGWS/FCAS (New Generation Weapon System/Future Combat Air System). GMV thereby joins in the project that had already been initiated by France and Germany in early 2019.

The main remit of JCS is to conduct a conceptual analysis of the possible FCAS architectures and capabilities as essential spadework for the design, industrialization and full operational capability, scheduled for 2040. This analysis is based on a common high-level operational requirements document. The study's objectives include analysis of R&D in new technology and its integration in joint demonstrators.

The FCAS program aims to develop a system of systems connecting interoperable manned and unmanned air platforms. Driven by Germany and France, it is one of Europe's biggest defense projects. Spain has been participating as national partner since 2019. Spain's participation in FCAS, through NGWS and other programs, is considered to be a sovereignty-enhancing state project that contributes towards the construction of Europe, ongoing technological development and the knitting together of an industrial fabric, while also generating a large number of highly skilled jobs.

This study represents for GMV the prelude to full integration in the program (as part of the SATNUS consortium) in the Remote Carrier Technology Pillar. This pillar focuses on development of new technologies and the weighing up of new concepts, based on a set of unmanned vehicles.

GMV will complement this particular FCAS participation with direct participation in other technology pillars, inputting technological developments in areas where it has already won itself worldwide renown, such as avionics, navigation and artificial intelligence, among others.

GMV's expertise has been built up during a long, four-pronged track record in international industrial cooperation projects: firstly, direct contracts with NATO and European agencies; secondly, the sale of JISR products; thirdly, active participation in R&D programs and, last but not least, GMV's ongoing willingness and readiness to collaborate with other defense companies and the main research centers.

The present and future of the aeronautics, space and defense-sectors up for debate in the latest AED Days

With a record-breaking number of participants, the 7th AED Days was a unique opportunity to get together (virtually) and debate the present and future challenges of the Aeronautics, Space and Defense sectors. Involving the main Portuguese and international players of this industry, AED Days' conferences, workshops, B2B meetings, exhibition forums and networking enable participants to seek collaborations and business partnerships.

The event, organized by AED Cluster Portugal, took place between 6 and 8 November and registered more than 760 participants, 300 companies and 20 countries.

GMV was represented by Teresa Ferreira, Director of GMV´s Space sector in Portugal, who moderated the debate on "Microlaunchers, a new way to access space: taking advantage of the Portuguese context" and by José Neves, Director or GMV´s Homeland Security & Defence sector in Portugal. As President of AED he was also responsible for hosting the event and for moderating a wildfires session.

Portugal Air Summit 2020

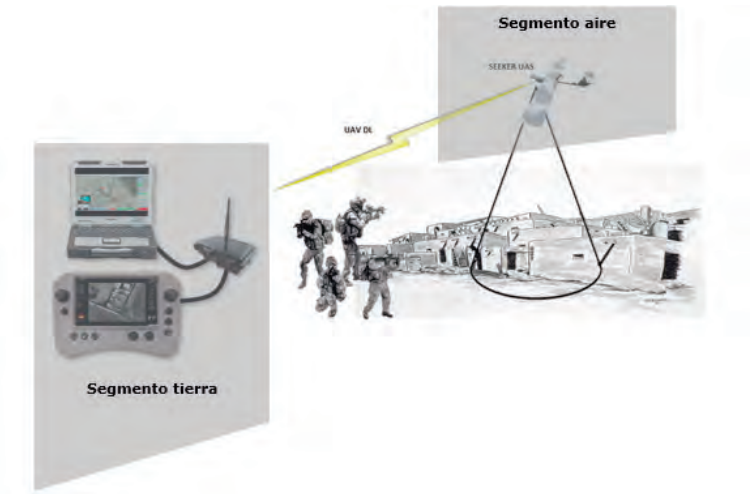
Ponte de Sor Municipal Airfield received the 2020 edition of the Portugal Air Summit, an annual event that sets out to debate and analyze Aviation and Aeronautics potential and future growth. The pandemic forced certain logistic changes on this year's summit, but this didn't blunt the interest or restrict the participation by leading organizations and figures from several industries.

The fourth Portugal Air Summit took place between 21 and 23 October with the central theme "Flying Digital". Totally in line with the new normal in Portugal, this year's event had a strong digital component, through web-based conferences, workshops and meetings.

Teresa Ferreira, Director of GMV´s Space sector in Portugal, formed part of the Navigation panel on the 3rd day of the Summit, debating the roadmap and future opportunities at national level. The panel included both national industry and the recently nominated executive director of the European GNSS Agency, Rodrigo da Costa.

GMV supplies the Ministry of Defense with two RPAS SEEKER systems

On 30 October GMV delivered to the Spanish MoD two UAS SEEKER systems, under the contract awarded to GMV about a year ago for the supply of two mini RPAS CLASS I systems.

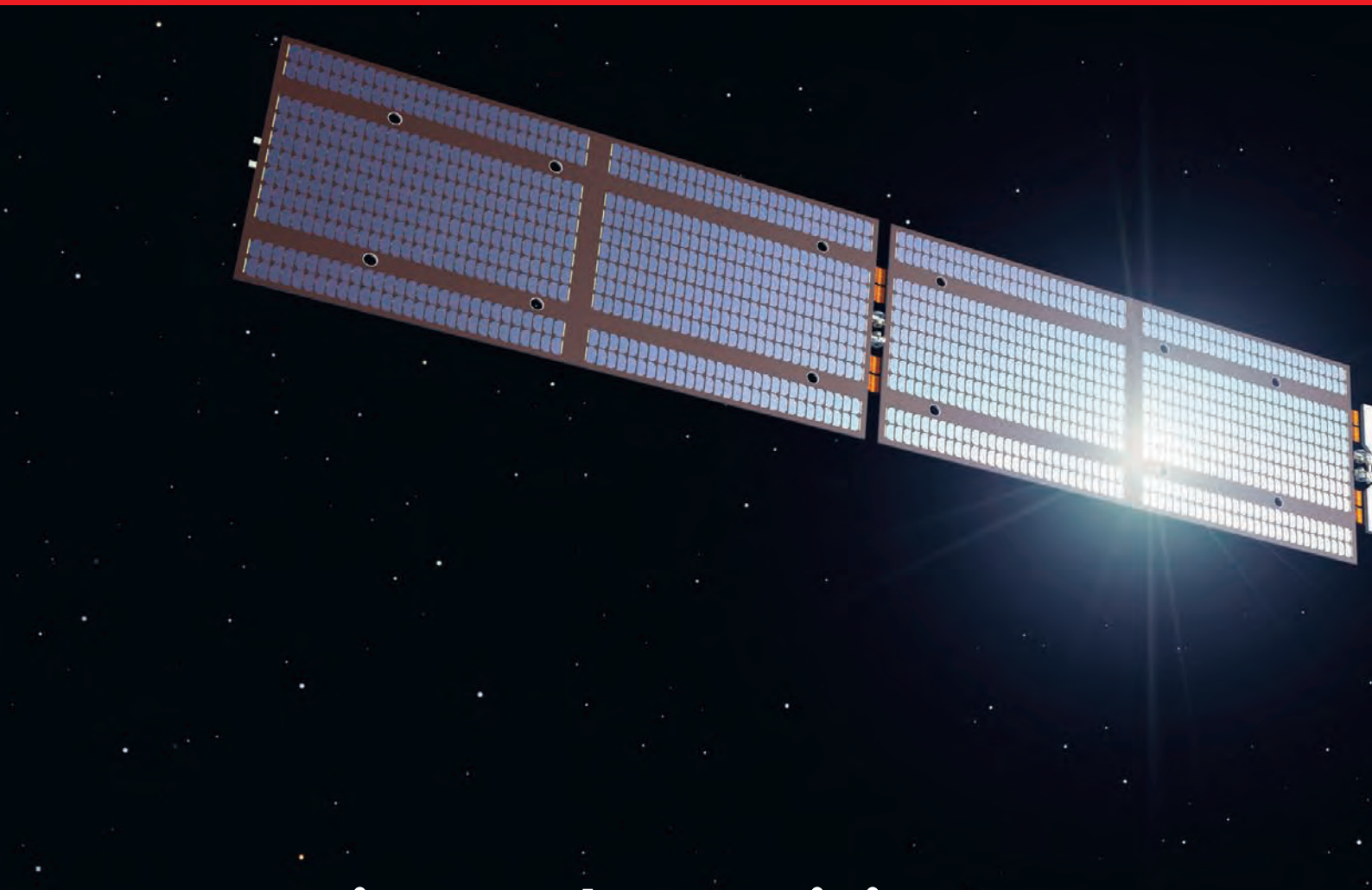


The two supplied systems will be integrated into various Spanish-army and -navy intelligence units. Under this arrangement the personnel of those units have been given theoretical and practical training for deployment and operation of the SEEKER system, doing so during training courses held from September to October in CMT Los Alijares (Toledo).

The SEEKER unmanned aerial system (UAS), developed by Aurea Avionics and supplied by GMV, constitutes the core of a situational awareness system providing real-time intelligence. It is designed for rapid-deployment and high-mobility military applications carrying out low-level intelligence, surveillance and reconnaissance tasks within a 15-km range.

The system components can be broken down into two major groups: the air segment and the ground segment. The air segment comprises the Unmanned Aerial Vehicle (UAV), with 90-minute autonomy and a range of 15 km. This aircraft is fit for daytime and nighttime operations and capable of completely autonomous flying. Each SEEKER system comprises two aerial platforms. The ground segment comprises a ground control station (GCS), a ground data terminal (GDT) and a remote handheld control (RHC). These systems between them monitor the UAV's operation and process its real-time video data.

GMV boasts a wealth of expertise and experience in Unmanned Aerial Systems (UAS), built up on the strength of many previous projects such as ATLANTE, where it developed the aircraft's flight control computer; EGNSS4RPAS, where it weighed up EGNOS performance for RPAS operations; and DOMUS, where it developed emergency-management and -monitoring service demonstrators for drone traffic control under the U-Space system. GMV is also a member of the SATNUS consortium, co-leading at national level the NGWS/FCAS Remote Carriers Pillar.



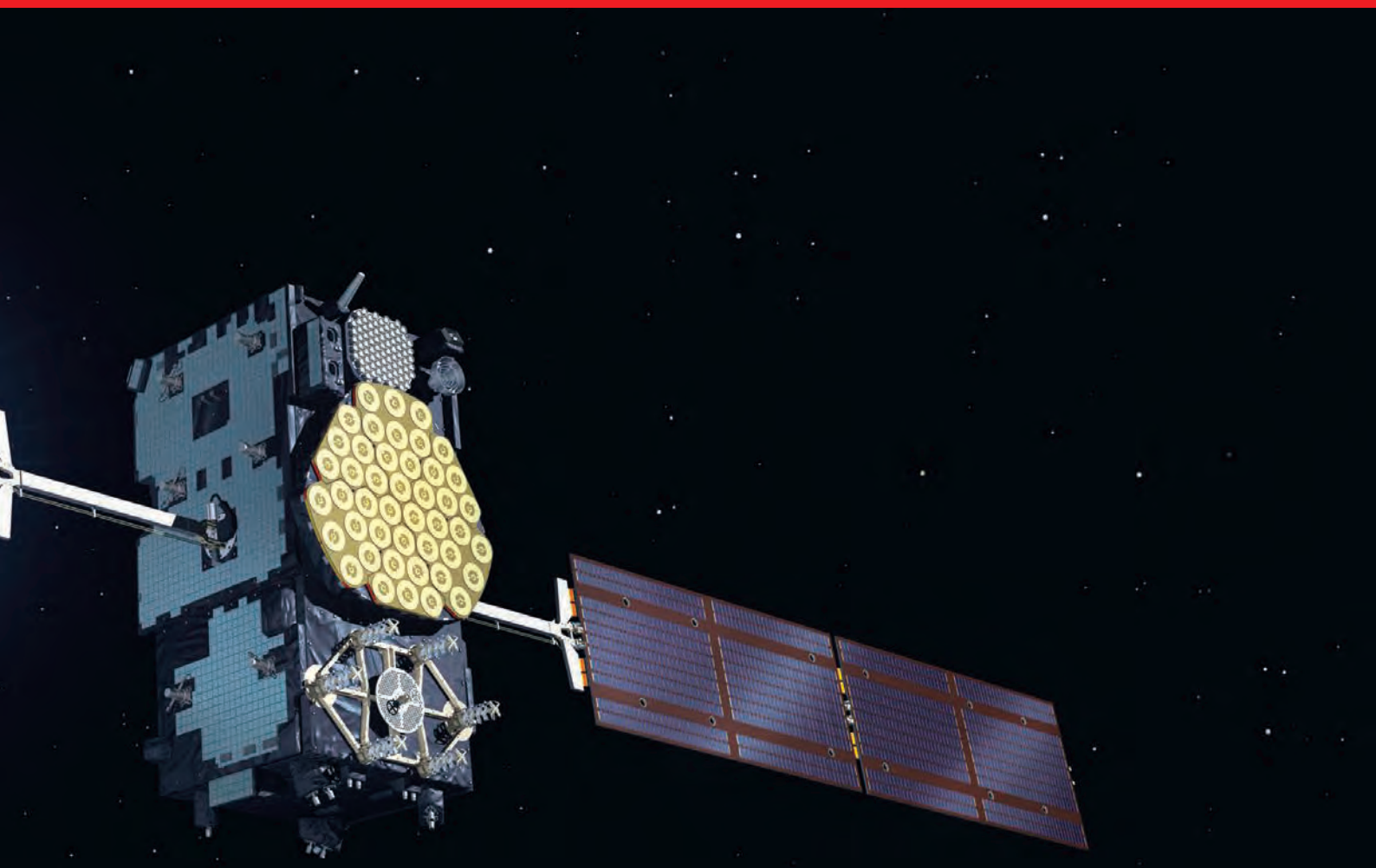
GMV wins pole position in development and implementation of the Galileo Second Generation ground segment

GMV has been chosen by the European Space Agency as one of the three main contractors of the Galileo Second Generation ground segment phase

GMV is playing a key role in the Galileo Second Generation (shortened to G2G) ground segment; Galileo is Europe's global, civil, satellite-based navigation and positioning system. Galileo First Generation (shortened to G1G), running since December 2016, consists of space infrastructure (26 satellites to date) and ground infrastructure.

G2G's main objectives are to phase in new services, improve existing services and boost system robustness and security while also cutting both operating- and maintenance-costs, all with the prime purpose of cementing Galileo's position as one the future's top GNSSs.

G2G is divided into several phases. In the first, led by ESA, mission requirements were defined at system level. This was followed by a preparation phase, leading on in turn to the implementation phase. As well



as priming several mission-requirement projects, GMV, since 2018, has been heading one of the consortia working on G2G's complete ground segment during the preparation phase.

Within the preparation phase, shortly before the start of the COVID lockdown, ESA announced the successful end of the B1 phase before launching a bid invitation for the new B2 phase as the prelude to G2G implementation.

Although publication of the bid invitation for this phase was eventually put back until mid-June, GMV never broke off its G2G activities. In recent months GMV has brought new recruitments and partners into the project team while also working on new ideas and kicking off some of the project activities. Team members have attended various skills-training courses, some of them gaining certification under SAFe® 5 Agilist.

During these months GMV has also been trimming its sails to the new pandemic circumstances, bringing in teleworking, virtual meetings and new toolboxes.

All this spadework has now come good. ESA recently has once more turned to GMV as one of the three main contractors of phase B2 of the G2G ground segment. This new award sets up the company in pole position for development and implementation of the G2G ground segment.

The world´s first SBAS-enabled smartphone service

Dynamic test writing the project name POSSUM in real-time

GMV NSL, RMIT University and FrontierSI are pleased to announce the demonstration of the first smartphone positioning service using data from SBAS DFMC (satellite-based augmentation system dual-frequency multi-constellation).

In a collaborative project with Frontier SI and the Royal Melbourne Institute of Technology (RMIT), a world first positioning service using SBAS DFMC data was developed and successfully demonstrated in real-time. Known as POSSUM, the service was developed within the Australia and -New Zealand SBAS Test-bed, and utilised both raw GNSS data from the Android Raw GNSS API as well as precise correctional services of DFMC SBAS. The services that were demonstrated could be received by potentially millions of users in both countries, anywhere in which they are connected to mobile service networks.

The project sought to showcase Aus-NZ SBAS within the consumer application market. With the availability of precise positioning on smartphones, it is anticipated that industry will find new and varied applications to take advantage of increased location service performance. These include applications in the fields of travel, leisure/sports, gaming, engineering, and agriculture.

The service was demonstrated in both Sydney and Melbourne.

Satellite navigation solutions in positioning applications for autonomous cars

On 29 October Irma Rodriguez, GMV's Division Head GNSS Algorithms, Products and Services- Aerospace, took part in the webinar "The Era of Autonomy is here: Going beyond the Vehicle Phenomenon" organized by the magazine GPS World.

Autonomy is by no means just a buzz word. It is becoming an increasingly important part of the automobile industry; it is also a key factor in robotics and industrial applications. Industry in general is increasingly taking up autonomous applications for critical infrastructure where positioning reliability is essential. Satellite navigation is playing a growing role in these integrated positioning systems and it is a vital factor in ensuring user integrity.

This webinar brought together a panel of various robotics and positioning experts to address the challenges, problems and solutions, and take stock of common requirements in industry, ranging from autonomous robots to totally autonomous heavy machinery.

Irma's presentation focused on the role of satellite navigation solutions in autonomous car positioning applications and how to address this challenge on a technical level.

Successful Sentinel-6A blastoff

Prime among GMV's activities for the satellite feature development and integration of the control center housed in ESA's space operations center (ESOC) plus development of the control center set up for EUMETSAT, the European operational satellite agency for monitoring weather, climate and the environment from space

Bang on time, at 17.17 hours GMT (18.17 hours CET) on 21 November, the European Copernicus program's satellite Sentinel-6A Michael Freilich was successfully launched from the Vandenberg Air Force Base (VAFB) in California atop a SpaceX Falcon 9 rocket.

Copernicus is an ambitious, European program for endowing earth observation with technological autonomy and capability. Previously known as Global Monitoring for Environment and Security, this program comprises six Sentinel satellite families that are already in operational deployment phase: Sentinel-1, designed to ensure the continuity of the radar data from European Remote Sensing (ERS) satellites and Envisat; Sentinel-2 and -3, dedicated to earth and ocean monitoring; Sentinel-4 and -5, for atmosphere-based meteorology and climatology missions; and Sentinel 6 or Jason-CS, which will make high precision observations of ocean surface topography. In the pipeline, moreover, are another six missions that have been cleared for the development process (CO2M, LSTM, CRISTAL, CIMR, ROSE-L and CHIME).

Rising sea levels are one of the greatest climate-change threats. Precise, decades-long monitoring of sea-level changes is therefore a vital strand of today's climatology to enable decision-makers to act accordingly and, in the last analysis, to protect people living in vulnerable, low-level areas.

The Sentinel-6 mission comprises two identical satellites, Sentinel-6A Michael Freilich and Sentinel-6B, launched five years apart and due to provide readings up to 2030 at least.

GMV's most important activities under the Sentinel-6A Michael Freilich mission include development and setting up of the control center located in ESA's European Space Operations Centre (ESOC), which keeps track of mission development during the launch and early orbit phase (LEOP). GMV also made a big contribution to development of the orbital control systems, as well as providing satellite-launch support.

GMV has also been responsible for development of the control center set up in the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) for mission control during the routine phase, to which must be added development and deployment of the orbital control system and the mission planning system, which will also take charge during the commissioning phase of ensuring that the mission meets specifications.

Last but not least, as part of the overall service GMV provides for all Sentinel satellites, GMV will also regularly and continually provide the Precise Orbit Determination (POD) service under an ESA framework contract. This service is necessary for processing and using the mission's onboard instrument data.

GMV successfully migrates the Flight Dynamics System of Al Yah 1 and Al Yah 2 satellites

GMV has successfully migrated the Flight Dynamics System (FDS) of Yahsat's satellites - Al Yah 1 and Al Yah 2 - to a new, state-of-the-art platform based on ***Focussuite***. The migration was done as per a contract signed in 2019 to boost the Yahsat satellites' coverage and capability.

Focussuite, GMV's in-house FDS, is a totally operative system tried and tested on GEO satellites. It has been customized to support Yahsat's Al Yah 1 and Al Yah 2 satellites, which were built by Airbus on its PPS variant, Eurostar 3000 platform and launched in 2011 and 2012 respectively.

GMV has rolled out the FDS in Yahsat's main and secondary control centres, in addition to training its satellite operators. The system is based on what was previously deployed by GMV for the Al Yah 3 satellite, manufactured by Northrop Grumman on its GEOStar-3 platform and launched in 2018.

Al Yah Satellite Communications Company (Yahsat) is a leading fixed and mobile satellite services operator offering integrated satellite communications solutions to over 150 countries across Europe, the Middle East, Africa, South America, Asia and Australasia through its fleet of 5 satellites (Al Yah 1, Al Yah 2, Al Yah 3, Thuraya 2 and Thuraya 3). In 2020, Yahsat commenced construction of Thuraya 4-NGS, the next generation telecommunications system for Thuraya, which is due to be in service by 2024. The new satellite will deliver higher capabilities and flexibility while increasing capacity and coverage across Europe, Africa, Central Asia and the Middle East, enabling next generation mobility solutions for all customer segments, including defense, government and enterprise.

Yahsat is one of GMV's marquee clients and currently uses GMV-developed FDS to control its Al Yah satellites.

GMV showcases its space portfolio at the Satellite Innovation Symposium

The Satellite Innovation Symposium 2020 was held online this year from 6 to 8 October due to the COVID-19 pandemic.

The symposium's remit is to talk about the latest breakthroughs and trends while providing new, groundbreaking SatCom insights and approaches. During the symposium's various sessions this year the executives and other professionals of the satellite-communication sector concluded that, despite the pandemic, more progress has been made than was hoped for back in the spring.

GMV showcased its range of satcom capabilities and products, featuring ***Hifly®***, its inhouse real-time satellite monitoring and control system, and ***Focussuite***, its inhouse flight-dynamics set. The participating GMV professionals also presented ***Smart Payload***, a satellite payload management system, ***Flexplan***, the satellite-resource planning system, as well as the ***Magic*** navigation-support family of products.

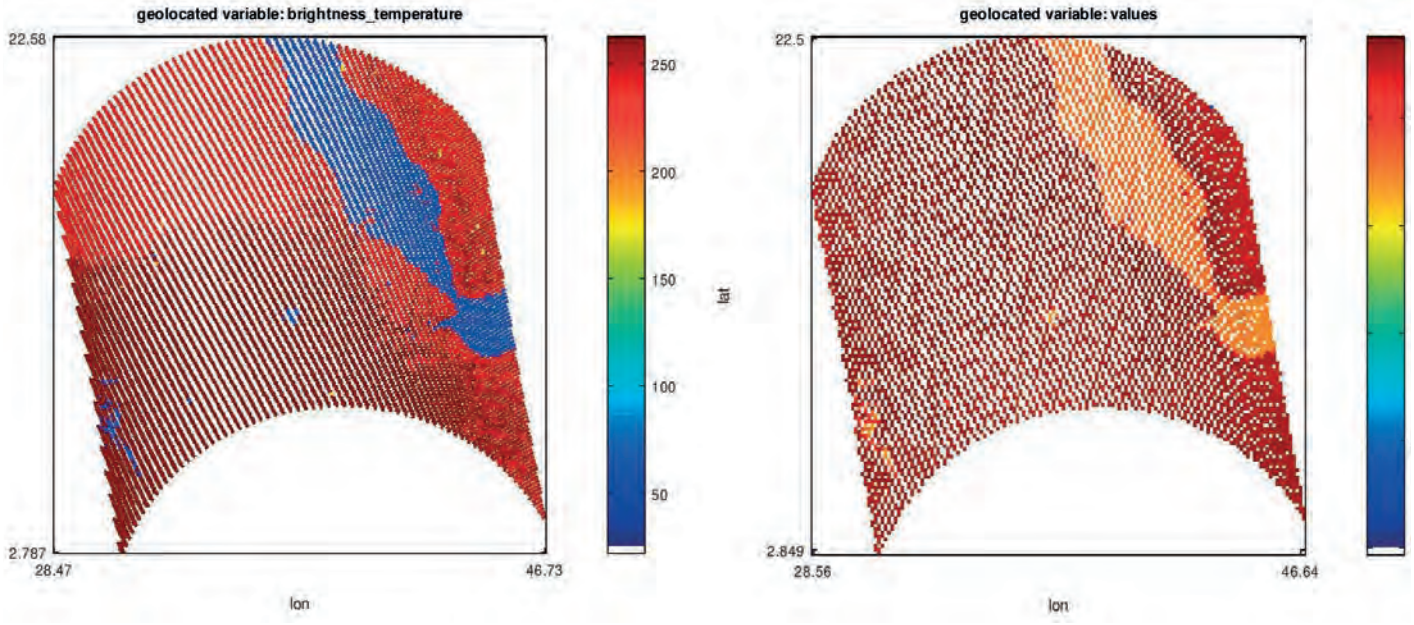
Taking stock of the BIBLOS project

GMV's activities have recently kicked off under the new phase of BIBLOS (BuIlding BLocks for earth Observations), a European Space Agency (ESA) project that follows on from the two forerunners, EOMODEL (BIBLOS-1) and BIBLOS-2, brought to a successful completion in May 2016 and November 2020, respectively.

Within this project a set of generic bricks, a software library called the Building Blocks (BB), is being developed and made available on the project website to a wide community of the Earth Observation family.

These Building Blocks make it possible to compile an End-to-End (E2E) simulation chain for a wide range of Earth Observation instruments, including optical and microwave instruments working as an active or passive system. The scope of each activity is defined in collaboration with ESA, and its implementation is supported by scientific teams from universities and research units from Poland (Military University of Technology, Institute of Meteorology and Water Management) and Spain (*Universitat Politècnica de Catalunya*: UPC). A common feature of the projects is the Reference Architecture, developed in ARCHEO-E2E and defining a series of six high-level modules and the interfaces that are common to all type of missions and instruments. Although the reference architecture is generic, it is flexible and can be adapted to suit the various mission particularities.

The main BIBLOS-3 objectives are development of Instrument and Level-1 Processing Modules for Active Microwave Instruments and the first version of Modules for Active Optical Instruments. Additional objectives are to achieve 6 levels of technological readiness (i.e. TRL 6) and integration of the external library inside the BIBLOS software.



The figure shows a comparison of reference and reconstructed brightness temperatures simulated by Building Blocks of the Passive Microwave Instrument

GMV participates in the lastest AMOS

The 21st Advanced Maui Optical and Space Surveillance (AMOS) Conference was held from 15 to 18 September.

Due to the current pandemic the Maui Economic Development Board, in charge of organizing the event, decided to hold the world's premier Space Situational Awareness (SSA) conference in all-virtual mode.

Representatives from government bodies, the industry and academia attended this four-day virtual conference, dealing with such matters as Space Domain Awareness (SDA), astrodynamics, machine learning, optical technologies and related policies.

GMV presented a paper called "Satellite maneuver detection with optical survey observations", explaining GMV's space-maneuver estimation and detection capabilities during the monitoring and cataloguing of space debris.

The program was rounded out with workshops and courses for interested members of the public, plus a specific syllabus for students pursuing a space career.

GMV brings Copernicus to wider notice as ambassador of "Copernicus Relays"

As part of the Space Strategy for Europe, the European Commission has established a network of Copernicus ambassadors: the Copernicus Relays. The ambassadors act as local champions, coordinating and promoting activities around the Copernicus program and bringing home its benefits and opportunities to local residents and businesses.

GMV was chosen by the EC as Copernicus Relay ambassador in 2016. Since then it has taken part in numerous events to encourage wider use and application of Copernicus services.

Developers and entrepreneurs came together during October in the online events Databeers Málaga and Copernicus Hackathon Málaga. In the former GMV presented sustainable forestry products developed with Sentinel images; in the latter it sat as jury member to award prizes to new applications designed to tackle the urban challenges deriving from climate change.

In November Antonio Tabasco, head of GMV's Remote Sensing & Geospatial Analytics Division, took part in the final event of the Copernicus Academy and Copernicus Relays networks, brought together in the projects CopHub.AC and CoRdiNet: "A hitchhiker's guide to digitalization in Europe – the detour through space". Over twenty European authorities (DG DEFIS, Regions Committee), regional authorities, universities and industries looked at the future of digitalization in Europe via the space sector and the earth observation program.

Last but not least, GMV was also present at Leicester University's seminar on access to satellite data for emergency and risk management, showcasing the solutions implemented under contract for Copernicus security and emergency management services. The seminar brought together several leading figures in this field: Attilio Gambardella from the Directorate General, Defence Industry and Space and responsible for the Copernicus Emergency Management Service; Jesús San-Miguel, coordinator of the European Forest Fire Information Service (EFFIS) of the European Commission's Joint Research Centre; David Hodgson from the International Charter Space and Major Disasters and David Moorel from the UK's National Centre for Earth Observation (NCEO).

GMV participates in the CDTI workshop on the use of Copernicus services and Sentinel data

Copernicus, Europe's earth observation system, offers complete, open and free access to key information for understanding how our planet works, responding to climate-change challenges and spurring the creation of applications, opportunities, markets and jobs.

On 6 October Spain's Industrial Technology Development Center (*Centro para el Desarrollo Tecnológico Industrial*: CDTI) hosted a workshop within the activities of the project Framework Partnership Agreement on Copernicus User Uptake (FPCUP), where CDTI is coordinating activities in Spain.

The goal of the workshop was to learn from the experience of users of Copernicus's climate- and atmosphere-services to boost takeup of the program's data and products. Top experts in service provision and user experience were on hand to fulfil this remit.

GMV was invited to take part in the section "The User's Experience on Copernicus from companies", where it presented an example of the company's activities in the Copernicus Climate Change Service (C3S). GMV explained how it made use of Copernicus services and Sentinel data in the identification of climate risks as drawn up by regional and world development banks in their investment projects. GMV carries out these activities under the ESA initiative, Earth Observation for Sustainable Development.

GMV working towards a better management of natural Atlantic resources and regulation of the maritime space

Under the European Space Agency (ESA)'s Atlantic Regional Initiative, GMV is participating in a project that aims to develop and demonstrate solutions based on earth observation data for coastal surveillance, oceanic renewable energy and marine litter

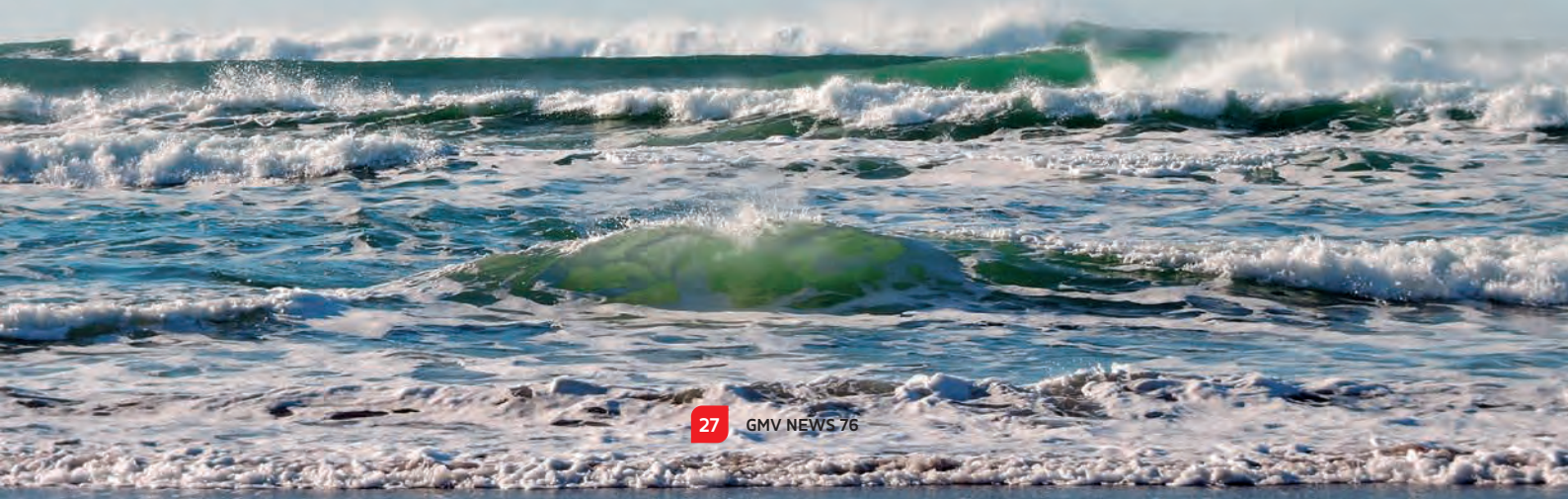
ESA Member States collectively represent by far the largest exclusive economic zone in the world. The 'Blue Economy' at the European level already accounts for roughly 5.4 million jobs with a gross added value of almost €500 billion a year, and still has room for further growth and diversification.

Furthermore, as the Maritime Spatial Planning (MSPD) and Marine Strategy Framework (MSFD) Directives are implemented across Europe, EU member states and aligning nations need innovative tools and approaches to monitor progress towards the goals of these two directives.

For this purpose GMV presented the Blue Economy project, standing as a demonstration of this potential for Atlantic coastal states. This 2-year project is being implemented through the European Space Agency's Atlantic Regional Initiative and aims at developing and demonstrating EO data driven solutions, to deliver actionable information to key coastal stakeholders. The developed applications will focus on coastal monitoring, ocean renewable energies and marine litter.

In addition, a range of Atlantic-focused recommendations will be developed from engaged stakeholder inputs, and community development activities. These perspectives will inform and enhance the roadmap being developed by the European Space Agency for the Atlantic Region, and found a seed Community of Practice of maritime-EO technology innovators for the Atlantic, focusing on developing EO solutions to address the Marine Strategy Framework, and fulfil the objectives of the Marine Spatial Planning Directives.

GMV's lead team, well aware of all these challenges, boasts a range of complementary skills within marine science, EO data analytics, processing paradigms, legal frameworks, and community development. The project team also possesses advanced knowledge in relation to the blue economy, innovations clusters and the Maritime Spatial Planning Directive and associated governance arrangements. The team can also draw on the expertise of relevant partners and stakeholders that helped to define the specific use cases.



GMV takes part in the MySustainableForest training webinar

On September 22, coinciding with EU GreenWeek 2020, the partners of the H2020 MySustainableForest (MSF) project held a webinar to inform forestry sector end-users of the application of forestry services based on remote sensing.

MSF's service portfolio includes products related to forest site characterization; wood characterization; forest condition; volume, biomass and CO2 stocks; ecosystem vulnerability and forestry accounting. These services, based on satellite, statistical, sonic and LiDAR data, have been developed and vetted by the consortium during the last three years; they aim to improve sustainable forestry throughout the whole of Europe.

GMV organized the webinar together with the European Forest Institute (EFI). María Julia Yagüe, Remote Sensing & Geospatial Analystics expert in GMV´s Aerospace sector and MSF Project Manager, gave the welcoming address followed by a presentation on satellite, statistical, sonic and LiDAR data.

During the workshop GMV also presented MSF's woodland diversity product, the MySustainableForest platform as well as the commercial solutions developed under the project.

GMV sponsors the Third Space Engineering Congress

GMV sponsored the Third Space Engineering Congress, put on in online format in late October by the Space Committee of Spain's Engineering Institute (*Instituto de la Ingeniería de España*: IIE) and the Space Group of the Association of Aeronautics Engineers of Spain (*Colegio Oficial de Ingenieros Aeronáuticos de España*: COIAE).

With King Felipe VI as honorary president, the opening addresses were given by Pedro Duque, Spain's Minister of Science and Innovation; José Trigueros, IIE President; Álvaro Giménez, director general of the General Foundation of Spain's Higher Scientific Research Council (CSIC in Spanish initials); and Isabel Vera, President of IIE's Space Committee.

Under the banner theme "Space, the Final Frontier", the 3-day lecture program revolved around communication and navigation technology; earth-observation missions; space-exploration missions; mission-analysis developments; space debris; rocket- and satellite-electronics; and New Space issues like low-cost missions and new propulsion systems, among others.

The congress kicked off with a discussion panel on sustainable development goals (SDGs) and the impact of COVID-19 on the space sector, run by Jorge Potti, General Manager of GMV's space sector and Vice President of the Space Committee of the Spanish Association of Space, Aeronautics and Defense Technology Companies (*Asociación Española de Empresas Tecnológicas de Defensa, Aeronáutica y Espacio*: TEDAE); Emilio Vez, from the Industrial Technology Development Center (*Centro para el Desarrollo Tecnológico Industrial*: CDTI); Ángel Moratilla, from the National Aerospace Technology Institute (*Instituto Nacional de Técnica Aeroespacial*: INTA); Javier Ventura-Traveset, from the European Space Agency (ESA) and José Luis Rodríguez, from Spain's main air-navigation services provider, ENAIRE.

GMV also gave four papers in various congress sessions; the first shared the company's insights and expertise in EO data-mining platforms; the second talked about its space-traffic management work; the third about its company's space-debris removal work; and the fourth about its developments in precise and safe positioning technology for autonomous driving.

AI and Earth observation based services for cultural heritage monitoring

The conservation of natural and historical monuments has a strategic importance for maintaining the local and national cultural identity, encouraging the sustainable exploitation of cultural properties and creating new social opportunities. Cultural heritage objectives are often exposed to degradation caused by the impact of various natural and human factors.

UNESCO has identified 14 major risk factors affecting World Heritage properties, namely urbanization, pollution, use of biological resources, resource extraction, local conditions affecting building materials, social / cultural uses of heritage, climate change and severe weather events, sudden ecological or geological factors, management factors, transport infrastructure and utilities, invasive or hyper-abundant vegetation species and human factors such as deliberate destruction and terrorism.

An accurate monitoring of the objective state of conservation provides essential and timely information for the implementation of preventive measures before they become irreversible. With the exception of the social /cultural uses of heritage and management factors, remote sensing technologies can ensure accurate monitoring of all other risk factors identified by UNESCO.

In this context, The Executive Agency for Higher Education, Research, Development and Innovation Funding from Romania has awarded GMV, the project AIRFARE whose aim is the development of a prototype of services on the target market, which analyses sites with high natural or cultural relevance and offers solutions to mitigate and prevent future degradation or deterioration by assessing past and current site conditions and forecasting future trends, focusing mainly on urbanization, vegetation changes and geological factors in the context of climate change and anthropogenic intervention.

The AIRFARE project will conduct the study in Romania to identify the requirements and performance of a service in providing remote sensing-based solutions to support the effective resilience of natural and cultural heritage sites against the major risk factors described.

In the study, GMV will take into account the scalability of the service for different types of heritage sites in terms of destination (cultural or natural), size and location (national or international sites). To this end, specific analysis tools will be used to build up a catalog of services dedicated to monitoring heritage sites, by integrating several advanced techniques, such as artificial intelligence / machine learning (AI / ML), with techniques for detecting changes based on Earth Observation Data (EO) from multiple sensors.

SECESA 2020

The European Space Agency (Technical and Quality Management Directorate and Concurrent Design Facility), promoted the 9th International Systems & Concurrent Engineering for Space Applications Conference as a digital event on 30 September - 2 October.

The attendance of participants from around the globe – despite the different time zones! - was notable, with almost 150 specialists and industry leaders, representing space and non-space entities dealing with Systems and Concurrent Engineering. Twenty two countries were represented with a split of delegates of 34% industry, 42% agencies and 23% universities.

The conference technical program included 7 sessions where GMV was present with the participation of the Portuguese Avionics Expert Daniel Silveira who presented "INFANTE: Technology demonstration of small missions using time space partitioning to manage multiple payloads" in the session on "Systems & Concurrent Engineering Applications - Part 1: Cubesats, Nanosatellites and SmallSats".

Model Based Space Systems and Software Engineering, MSBE2020

During 28 and 29 September the European Space Agency organized a two-day workshop on Model Based Space Systems and Software Engineering at in the European Space Research and Technology Centre (ESTEC) in Noordwijk, The Netherlands.

Tiago Jorge and Laura Gouveia from GMV in Portugal attended the workshop, which provided a forum to exchange practical experiences, lessons learned and new ideas on the best way forward for applications of model-based techniques in the area of Space System and Software Architecting and Engineering.

This workshop was attended by both practitioners from space agencies and the European space industry (primes and their suppliers), and researchers in applied model-based techniques.

The symposium included guest speakers /keynote sessions, participant presentations and interactive discussion sessions.

Remote sensing application in the analysis and understanding of migration trends

Last October, the World Association for Public Opinion Research (WAPOR) held its 73rd annual conference. This association is dedicated to researching the highest professional standards, ethics and techniques for polling around the world not just in advanced democracies, but also in emerging democracies.

In this scenario GMV made a presentation for the panel "Big Data and New Methodologies. Public Perception and Attitudes towards Migration". The title of the presentation was "Remote sensing application in the analysis and understanding of migration trends".

Traditional sources of information for migration data are characterized by big gaps in quantity and quality, despite increasing efforts from national governments and the international community to address these. It is in this context where the importance of improving data collection on migration using Satellite imagery as data source is becoming a primary element of information.

GMV has a long history of supporting humanitarian aid through satellite monitoring, not only for refugee camps, but also by analyzing migration routes and environmental crises all over the world. GMV has also been collaborating with major European government agencies and NGOs in providing our services for the detailed study of satellite images generating mapping and analysis to support decision making in these complicated situations.

Seeking to improve the understanding of these humanitarian crises, GMV are participating in Hummingbird project where a multidisciplinary consortium combines a wide range of scientific disciplines, diversified experience, knowledge and networks aiming at improving understandings of changing nature of migration flows and the drivers of migration, by analyzing patterns, motivations and new geographies, forecasting emerging and future trends.

The GNC of the CubeSat Juventas enters implementation phase

Onboard the mission HERA, a CubeSat that takes its name from the daughter of the goddess Hera and goddess of youth, Juventas, will be released in the vicinity of Didymos, which makes up a binary asteroid system with the smaller orbiting Dimorphos. Juventas, after greenlighting of the Hera mission in Seville's 2019 Council at Ministerial level, has now entered its implementation phase.

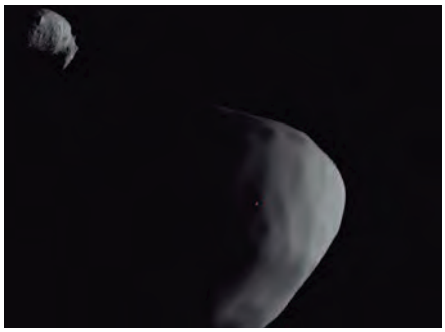


Image courtesy of ESA

Juventas will be in charge of key scientific operations to determine the composition of Dimorphos. It will map the asteroid's surface and study the impact crater left by NASA's DART probe. Its host of instruments will also study the main asteroid of this binary system, Didymos. Juventas will use its Inter-Satellite Link (ISL) to try out relative navigation between three satellites for the first time in outer space, favoring greater precision of the operation and ensuring a bigger scientific return.

Juventas will also be turning to good account the particular environment around the asteroids, where the solar radiation pressure can match the gravitational pull of the main asteroid, given its tiny mass. Nonetheless, navigation in such an adverse and unknown environment means that Juventas has to carry out its operations autonomously with hardly any input from ground control back on Earth. This task will be achieved by means of a groundbreaking guidance, navigation and control (GNC) system designed and implemented by GMV.

The CubeSat is being designed by a large international consortium led by GomSpace from Luxemburg. GMV in Romania is in charge of designing the guidance, navigation and control (GNC) system and mission design, while the Royal Observatory of Belgium is leading the science side of it. GMV has been set the goal of finishing GNC implementation, validation and verification onboard Juventas in time for the CubeSat to be launched onboard Hera by the end of 2024.

New online International Astronautical Congress (IAC)

The 71st annual International Astronautical Congress (IAC), held this year from 12 to 14 October, chose an online format for the first time. IAC is a yearly congress organized by International Astronautical Federation (IAF) and its partners.

GMV is a member of IAC, founded in 1951 to serve as an international cooperation platform for sharing knowledge and expertise within the space sector. Over the years this worldwide network of sector experts has carried out sterling awareness-raising work.

As in previous years too, the IAC was divided up into various plenary sessions, networking forums plus a wide-ranging program of papers and a virtual space given over to exhibitions and the mentoring program for students and young space professionals.

GMV took part in several paper presentations this year, sharing its insights and expertise in the various thematic areas like space debris, orbit determination or technology for space transport systems.

Mariella Graziano, moreover, Robotics and Flight Segment manager of GMV´s Espace sector is a member of the Planetary Defense and Exploration Committee, and chaired the session presenting the annual advances in solar system exploration.

But for the coronavirus pandemic, the 2020 host was due to be Dubai. In the event, however, it was decided to hold this year's congress online and without any registration fee, encouraging a much bigger turnout than in previous years.

1st Space & Industrial Economy 5.0 Seville Virtual Summit

■ GMV sponsored the first Space & Industrial Economy 5.0 Virtual Summit, held online on 16 and 17 December.

Under the title "Space as preserver of the planet" the summit addressed the development of innovation, technology and the new industry in Spain and Andalusia, with a special focus on the aerospace industry, doing so through a series of speeches, lectures, practical case histories and discussion panels.

As well as sponsoring the event, GMV also featured as a key participant. Jesús B. Serrano, GMV's CEO, took part in the discussion panel "Space as a source of R&D and its reflection in new industry. Innovation to improve people's lives"; Jorge Potti, GMV's Space Manager, took part in the discussion panel "Artificial Intelligence, 5G, IoT: Space and New Industry. The C21st internet revolution"; while Miguel Ángel Martínez, GMV´s Intelligent Transportation Systems Manager, was part of the discussion panel "Sustainable Development in the 5.0 Society. Sustainability in Transport and Journeys".

The free-registration summit dealt with issues like satellites, drones and robots, the rollout of 5G technology, artificial intelligence, the Internet of Things, digital twinning, the new means of payment and health-centered applications, without forgetting cybersecurity, the vehicles of the future and everything else to do with the new sustainable mobility and smart cities.

Space goes to school

Once again, GMV participated in the initiative "Espaço vai à Escola" promoted by ESERO Portugal, a collaboration between ESA and Ciência Viva, the Portuguese center for science.

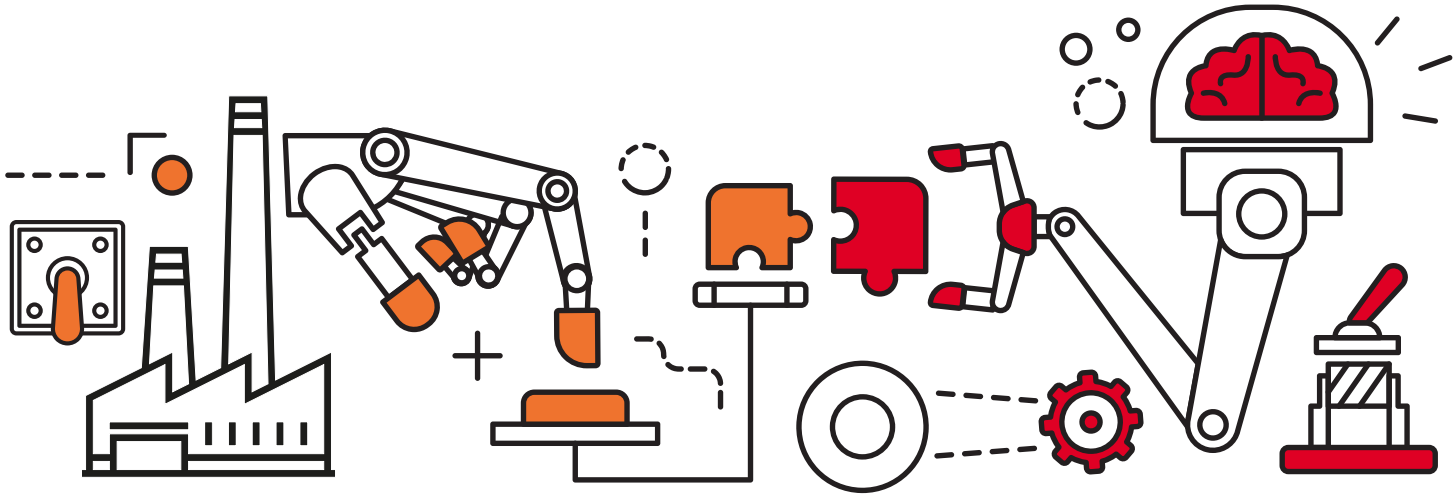
This initiative occurs yearly during the World Space Week and it calls for scientists and engineers that work in the space domain to go to schools and present their work.

This year's session were fully digital due to the pandemic but they still held the enthusiasm of the young generations.

GMV participated once more in this initiative through Rui Barradas, André Lemos and Tiago Araújo, engineers from GMV in Portugal who shared their passion for Space and their experience. The topics included Space Probes as well as HERA and HERACLES mission where GMV is playing an important role. The feedback was very positive and we are looking forward to next year's event hopefully in person!

Robotics as a lever for improving working methods and environments in the energy sector

GMV and Repsol Technology Lab put on a webinar illustrating the technical and cultural changes needed in the energy sector on the basis of two success stories



Robotization is one of the main strands of Repsol's digital transformation strategy, in its continual quest for greater efficiency, safety and functionality throughout its processes. Its research center, Repsol Technology Lab, develops groundbreaking technology to be implemented on an industrial scale in Repsol's various business lines. Its prime role is to test the technology and demonstrate its potential ("Thinking big, pilot small, scaling fast").

This R&D center, housing the de Robotics & IoT Hub, works along three main lines within the field of robotics: Process automation & Logistics, Demanding Environments and Confined Environments. Repsol Technology Lab taps into the technological skills of GMV, a cutting-edge, Industry-4.0 innovation firm, for the design, development and rollout of robotized cells in industrial processes automation projects, with the overall aim of improving working environments and methods.

On 29 September, to talk about examples that represent a technological and cultural change in the energy company, Repsol Technology Lab and GMV put on a webinar showing the needs, technological development and benefits accruing from two specific success stories: one robotic arm installed in a coking plant for opening and closing its reactors, and a logistic robot of autonomous transport carrying out the daily distribution of samples and equipment.

Two of the people most heavily involved in these projects took part in the Webinar; Alfonso García, Experimentation 5.0 Robotics Hub of Repsol Technology Lab, and Ángel C. Lázaro, Industry Business Partner of GMV's Secure e-Solutions sector, who both stressed the crucial importance of involving people in the sector transformation, giving them the necessary skills to take on tasks of greater business benefit. The webinar was moderated by Emilia Martínez Serrano, Senior Manager of Advanced Mathematics and Process Optimization in Repsol Technology Lab.

Both projects represent the first step in defining new processes and demonstrating the feasibility of innovating technology before bringing it up to industrial scale, driving what Repsol has dubbed "Experimentation 5.0".

Successful demonstration of the Spanish Dismounted-Soldier System (SISCAP)

The demonstration, held in El Goloso Military Base, involved several test cases representing between them three operational scenarios of the dismounted soldier system deployed around the maneuver field: reconnaissance platoon, surveillance platoon and the setting up of a checkpoint

The operational demo of the Spanish MoD's Dismounted-Soldier System (*Sistema Combatiente a Pie*: SISCAP), developed by GMV and Indra, was held from 5 to 9 October.

Driven by the Directorate General of Armaments and Material (DGAM), SISCAP's remit is to develop and integrate technology that suitably equips soldiers for an efficient combat operation. This national program, kicking off in 2017, is broken down into 7 subsystems: Armaments and Munitions (*Armamento y Munición*); Fire Efficiency (*Eficacia de Fuego*: EFU); Communications and Information Subsystem (*Subsistema de Información y Comunicación*: SIC); Upkeep (*Sostenimiento*); Survival (*Supervivencia*); Power Source (*Fuente de Alimentación:* FAL); and Training (*Preparación*).

SISCAP, drawing from the lessons learned in the forerunner Future Soldier 2006-2010 (*Combatiente del Futuro*: COMFUT) program, involves the development of 3 prototypes (HW and SW). SISCAP in particular centers on the research, design, development and vetting of the functions of the EFU subsystem to boost its capabilities of detection, reconnaissance and acquisition, together with the basic SIC components for the soldier's connectivity, such as the system's screenless computer, device control components, helmet-mounted display, platoon leader's graphic terminal, soldier's control unit push-button panel and built-in sensors (personal camera and wireless laser telemeter).

GMV, in a joint venture with Indra, is responsible for integration of the abovementioned subsystems and developing the electronics and software of the soldier's main computer, the Central Power Distribution and Processing Unit (*Unidad central del Proceso y distribución de Energía*: UCPE). The UCPE, based on previous inhouse GMV R&D, is responsible for command and control capabilities, connectivity with the devices carried by the soldier and power management, one of the most critical factors in the whole soldier system.

The operative demos involved several test cases representing three operational scenarios of the dismounted soldier system deployed around the maneuver field: reconnaissance platoon, surveillance platoon and a checkpoint. Day- and night-time firing sessions were also held to test the firing components' direct and indirect marksmanship.

Under the supervision of Colonel Moisés Serrano Martínez, head of the DGAM program, together with the rest of SISCAP's Program Office, the exercises were held on El Goloso military base with the personnel of the VIII Bandera de la Legión and the Regimiento Asturias. Also taking part in the exercise was Lieutenant General García de las Hijas, head of the Army Logistic Support Command (*Mando de Apoyo Logístico del Ejército*: MALE); brigade general Pérez, MALE's deputy arms systems manager; brigade general Colomer, head of the Guadarrama brigade, plus personnel of the Chief of Staff and Logistics Support Command of the Ministry of Defense.

The ISNAV navigation system of the VCR 8x8 vehicle now ready for operational assessment

The Spanish army is now developing a new armored combat vehicle to replace the current BMR and VEC vehicles. The VCR 8x8 "Dragon" vehicle is now being prepared for final tests using five demonstrators with different configurations.

Under this program GMV has developed a vehicle navigator (ISNAV) based on a hybrid architecture of inertial navigation and satellite navigation, integrating an inertial navigation unit and a GNSS receiver, and with the capacity for phasing in the future signal receiver of Galileo's Public Regulated Service (PRS), being jointly developed by GMV.

In 2019 delivery of the navigation systems to the program was completed. In 2020 so far the systems have been fully installed in the demonstrator vehicles. This work was completed in October with the navigation-system calibration tests, which confirmed the correct installation of the navigation systems and calibration of the inertial navigation units, supplied by the French firm iXblue, to check for any alignment errors and determine the odometer scaling factor. The vehicle tests carried out on the site of GDELS showed excellent positioning-, speed- and orientation-performance.

Running tests in nominal and degraded modes were also carried out, without inertial sensor or without GNSS, on the track and in the field. Precision was found to be fine without appreciable degradation due to the type of terrain. After fine-tuning of the installation and calibration parameters the nominal positioning precision was then measured and position degradation in purely inertial mode, outperforming required results both on the track and cross country.

Completion of this test campaign means GMV's demonstrator work is now over and the systems are now ready for handover to the armed forces for operational vetting.

GMV takes part in the definition of the future European SoC for the defense sector

GMV is playing a standout role in EXCEED, a project awarded in the second round of the European Commission's Preparatory Action on Defence Research (PADR) with the aim of developing a high-performance, trustable (re)configurable system-on-a-chip (SoC) for critical defense applications

November 4 and 5 saw kickoff of EXCEED, an ambitious project awarded in the second round of calls of the European Commission's Preparatory Action on Defense Research (PADR).

Coordinated by the semiconductor manufacturer STMicroelectronics, the 12-million-euro project, involving a total of 19 partners from 7 European countries, aims at creating a European supply chain of a reconfigurable, flexible and trustable programmable system-on-a-chip (SoC) family, targeting a number of ruggedized and secure defense applications.

This SoC must be able to meet the requirements of critical defense applications such as the dismounted soldier systems, radiofrequency and signal processing, navigation and positioning, data links for UAVs, military networks and cryptography, among others. The consortium therefore includes expert firms in many different fields, ranging from semiconductor manufacturers to chip designers for Europe's leading defense companies, including GMV.

The starting gun for this project is the prior design of a Field Programmable Gate Array (FPGA) by one of the consortium participants, NanoXplore. This will now be tweaked to meet the specifications agreed by defense application developers and other consortium members.

GMV has a crucial role to play in this project; it will be inputting its expertise in three of the project's main pillars. In terms of security, GMV is leading definition of the necessary security functions for the SoC to be developed. Secondly, on the strength of GMV's previous experience with NanoXplore's FPGA, the company will be participating in definition of the development tools for this new SoC. Lastly, GMV will be one of the firms in charge of developing one of the SoC's pilot schemes to put it through its paces, tapping into the advantages of this SoC to develop an application for dismounted soldier systems.

NATO-CSD successfully passes its integration and safety tests

From 5 to 16 October the System Integration Tests (SITs) and Security Tests of the NATO-CSD system were held; this system is currently being developed by GMV for NATO.

The integration tests are designed to show that the product reference line meets NATO's functional hardware-integration specifications; integration with other data repositories like the BICES node CSD, AGS CSD (SMARF); other national CSDs and NATO's Bridging Solution; as well as interfaces with other components such as the X-Domain's functional ISR product and service solution with INTEL-FS, ICMT, HUMINT, ICC. System-installation, -configuration and -employment were all duly found to comply with technical manuals.

The aim of the security tests is to show that the CSD services meet security specifications, clearing it for use in NATO's classified networks (up to secret level).

Test kickoff was duly approved on 2 October after a successful Test Readiness Review (TRR) with confirmation also of the correct performance of in-factory tests in July of this year.

Integration and security tests are conducted by means of NATO's reference system known as the Collaborative Development and Testing Environment (CDTE). Due to the travel restrictions of the COVID-19 lockdown, the tests were performed remotely from GMV by means of a Virtual Private Network (VPN) set up specially for this purpose. Remote client observers from diverse locations stood witness to correct test performance.

The tests ended on 19 October with the Status Test Review (STR), confirming system availability for passing on to the next test event: the System Acceptance Tests (SAT).

GMV holds a seminar on the dismounted soldier systems it is currently working on

In early November GMV hosted a webinar on "Dismounted Soldier Systems". Iñigo Barredo, GMV project engineer, fleshed out the concept, explaining that it consists of a system breaking down into a series of subsystems, seeking to boost the soldier's capabilities and enhance the situational awareness of the soldiers themselves and their commanders.

The seminar also gave a technical explanation of the Spanish MoD's Dismounted Soldier System (*Sistema de Combatiente a Pie*: SISCAP), developed by GMV and Indra.

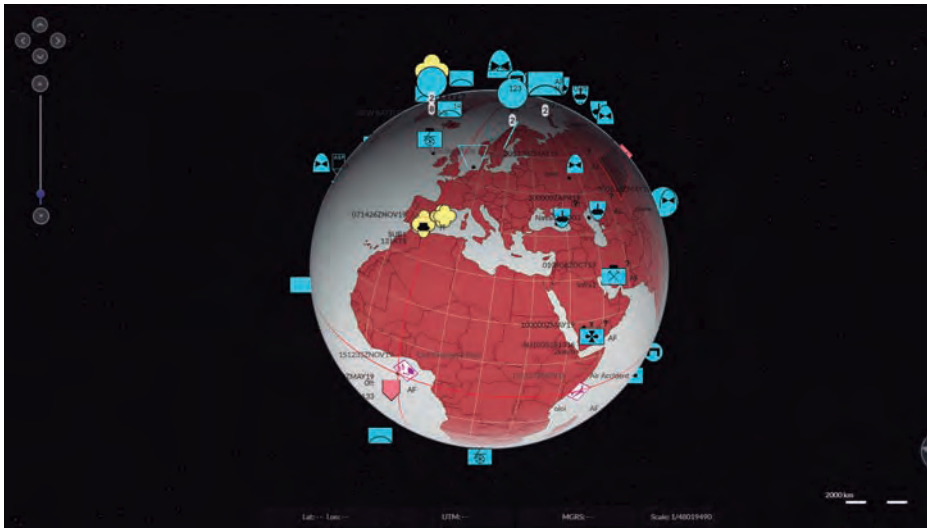
SISCAP, drawing from the lessons learned in the forerunner Future Soldier (*Combatiente del Futuro*: COMFUT) program, aims to develop and integrate technology to ensure efficient combat capabilities. It is broken down into 7 subsystems: Armaments and Munitions (*Armamento y Munición*); Fire Efficiency (*Eficacia de Fuego*: EFU); Communications and Information Subsystem (*Subsistema de Información y Comunicación*: SIC); Upkeep (*Sostenimiento*); Survival (*Supervivencia*); Power Source (*Fuente de Alimentación*: FAL); and Training (*Preparación*).

The seminar also gave a comprehensive account of the Generic Open Soldier System Reference Architecture (GOSSRA) project, in which GMV is participating within a consortium primed by the German firm Rheinmetall Electronics.

As for the future lines of dismounted soldier systems, Iñigo talked about the international interest they are arousing. Witness initiatives like LCG-DSS or GOSSRA, involving the participation of major firms and international organizations.

New activities in the European Union's command and control system

GMV has recently completed deployment of the required upgrades to the EU's command, control and information system (EUCCIS), carried out during the first four years of the framework contract signed back in June 2016.



This work has included modernization of the system for deployment in the new secure infrastructure for handling the classified information of the European External Action Service (EEAS), calling for updating of all existing software and the COTS being used up to now, plus virtualization of the whole system.

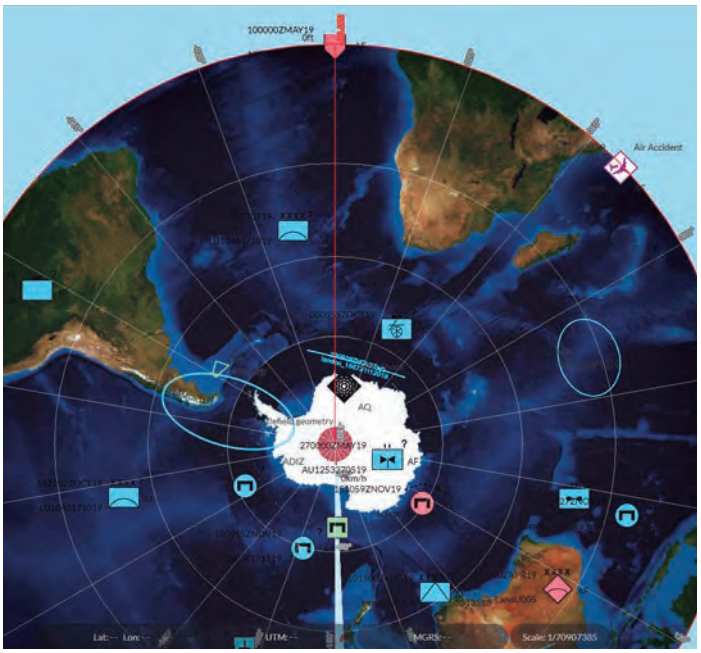
Work also included the setting up of a portal, including a contents management system, a chat service permitting the exchange of classified information and a component designed to carry out collaborative planning between system users cleared for access.

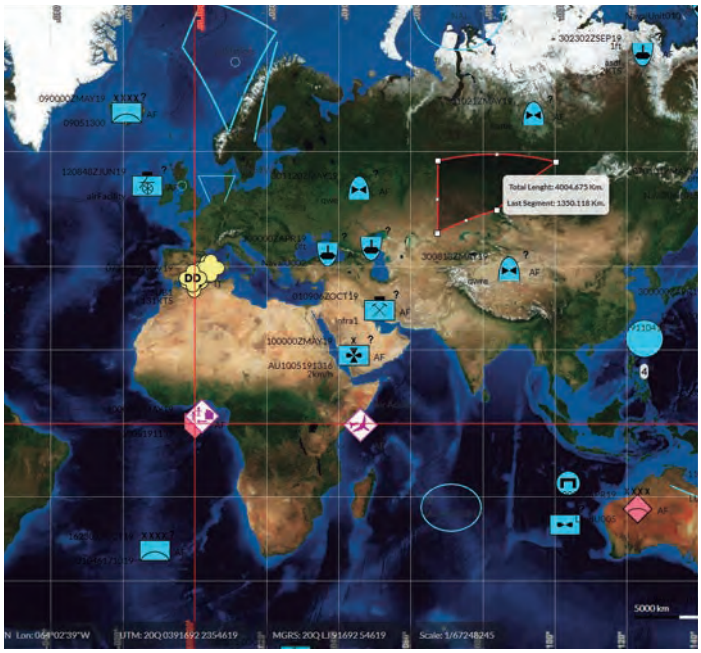
Especially noteworthy is the creation of the new tactical visor for obtaining a Shared Operational Picture, based on the exchange of information received in the latest standards. This system boosts situational awareness and the decision-making capacity of mission commanders.

Next step is the signing of a new contract to run from December 2020 to December 2021 for the carrying out of activities designed to guarantee service level, maintenance, training, consultancy plus the system's participation in different exercises.

EEAS is now redefining and reinforcing its structures and capabilities to give the EU a quicker, more efficient and responsive performance as provider of security services outside its borders. These operations cover the whole gamut of crisis prevention, management and response, ranging from humanitarian aid, civil protection, support for the stabilization and restructuring of conflict zones to evacuation of European citizens.

GMV's experience in communications and information systems (CIS) for command and control now enable it to take on the complete range of these activities, rubber stamping its longstanding reputation as tried-and-tested EEAS supplier.





GMV hosts the first Andromeda workshop

On September 28 and 29, acting as ANDROMEDA project partner, GMV organized and moderated the first ANDROMEDA workshop.

Andromeda, a Horizon-2020 project involving 19 partners from 9 different countries, aims to speed up detection and control of new incidents (human trafficking, arms or drugs smuggling, for example), to improve decision-making and reach joint decisions in handling cross-border situations. It is working with a distributed set of interconnected systems and services according to the principles of the Common Information Sharing Environment (CISE).

The webinar sessions were held online due to the current COVID-19 epidemic. The purpose of this online event was to discuss maritime- and land-border security and the need to encourage collaborative environments that favor the exchange of information between different countries and agencies. The technical sessions dealt with issues such as ANDROMEDA's promising results so far, the current status of CISE, the extension of its data model for use in land C2 systems and in Decision Support systems.

Besides the technical sessions, the workshop also featured several maritime- and land-security experts from various countries, who talked about their current problems in this area and their way of fighting against the threats they face on a daily basis.

The seminar closed with a session looking at the main European security projects, analyzing their common denominators. The seminar invited special guests from European agencies like EMSA, FRONTEX and JRC, who put forward their ideas in the various workshop sessions.

David Merino, maritime surveillance head of GMV´s Homeland Security & Defense sector, moderated various sessions of the two days and also drew the final conclusions of the workshop. Fernando Labarga, technical head of the ANDROMEDA project, gave a paper under the title of "The ANDROMEDA high-level architecture and system components", focusing on the challenges involved in the design of a CISE system of systems for surveillance of both land- and maritime-borders. He also described how the NATO Architecture Framework (NAF) methodology can help to tackle these challenges.

II Foro 2E + Fuerza 35

On 4, 5 and 6 November the Toledo Infantry Academy hosted the 3rd Army-Company and Research Forum (F2E+I), organized by the Army Museum Foundation (*Fundación Museo del Ejército*) and sponsored by GMV.

This year's event was held in a hybrid online/onsite format, combining master lectures with technical committees at various capability levels.

This forum is designed to foment an open and direct dialogue between the army, university and industry, outside the commercial and contractual environment, to encourage the exchanging of opinion about how to tackle future challenges up to the year 2035.

The forum's first day presented information on the current situation and expectations of the Force 35 concept (the Spanish army's military planning solution up to 2035) while the second day turned its attention to the specific capabilities of interest here, with a roadmap towards achieving them.

Presented at the forum will be GMV's Defense and Security Manager, Manuel Pérez Cortés, as well as GMV's C4IS-Defense and Security Manager, Francisco Jesús Aguilera, who gave a paper on TALOS system in the across-the-board committee "Firepower, precision and discrimination".

GMV features in the integration of the MARSUR network with CISE

In late 2019 the Spanish Navy's Logistics Support Office (*Jefatura de Apoyo Logístico*) awarded GMV a contract for enlarging the adaptor between the Common Information Sharing Environment (CISE) node and the systems of the Spanish navy's Maritime Surveillance Operations Center (*Centro de Operaciones de Vigilancia Marítima*: COVAM), of the Fishery Monitoring Center (*Centro de Seguimiento Pesquero*: CSP) and the Operational Coordination Center (*Centro de Coordinación Operativa*: CECOP).

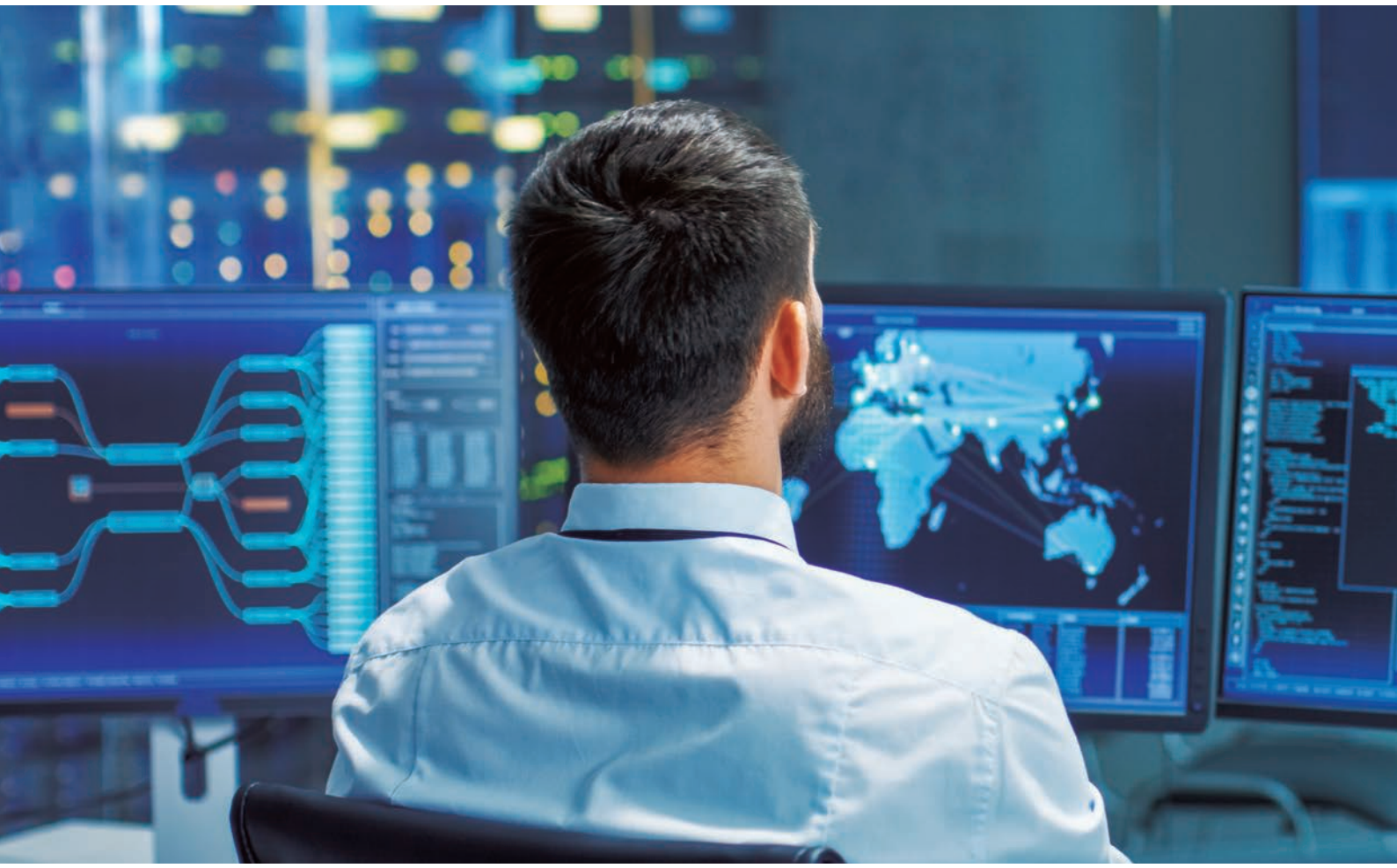
This project is an extension of the R&D services tendered under the EUCISE2020 program for creation of the EUCISE nodes for exchanging information between authorities of the various sectors.

EUCISE2020, which came to an end in the first half of 2019, was a European-Commission-brokered initiative to define specifications, develop and test a prototype CISE node and finance the national interface of a maritime safety/security and surveillance information sharing system in Europe.

In the framework of EUCISE2020 GMV installed a CISE node in navy sites in Cartagena for interconnecting with the information systems of various Spanish organizations such as the Deputy Directorate of Customs Surveillance (*Dirección Adjunta de Vigilancia Aduanera*: DAVA), CSP and COVAM.

During 2019 GMV developed and deployed the SMACS adaptor (Spanish Maritime Affairs Cross Sectorial IT Interoperability Improvement), thus providing for interconnection between not only the three Spanish organizations but also between them and the rest of the CISE participants, favoring maritime information sharing and collaboration at national and international level.

In late 2020, under this new project, GMV rolled out in the Navy's Cartagena base the new version of the adaptor and successfully tested it. This represents one more stride towards total connectivity, providing for two-way information interchange with the maritime surveillance network MARSUR (involving military organizations from 20 countries) and connection with MAJIIC JISR standards, areas in which GMV boasts a wealth of experience thanks to the family of CSD products developed for the Spanish MoD.



GMV-CERT recognized as a member of FIRST

GMV's Computer Emergency Response Team (CERT) has recently been recognized as a new member of FIRST (Forum of Incident Response and Security Teams), an international community pooling worldwide CERTS to share information and good response practices, guaranteeing a secure internet for one and all

GMV structures its managed security services range around GMV-CERT (Computer Emergency Response Team), the remit of which is to provide a 24x7, 360º managed information security service to take on today's huge cybersecurity challenges.

It has recently been recognized as a new member of FIRST (Forum of Incident Response and Security Teams), an international community pooling worldwide CERTS to share information and good response practices, guaranteeing a secure internet for one and all.

GMV's CERT is made up by a group of experts responsible for carrying out preventive and reactive responses to any information-system security incidents, offering a series of worldwide services.

The standard set of services comprises the following activities: the operation of security infrastructure like firewalls, WAF, IDS/IPS, UEBA, EDR, etc., support and maintenance of security infrastructure and third-party relations, monitoring of service and security-infrastructure availability, monitoring of security to pinpoint any malicious activity and security incident response.

The company's CERT also develops its own inhouse detection technology while working too as a top-level technological partner. One of the

CERT's essential remits is the development/integration of security technology to meet one of the main problems currently faced by CERTs, the lack of visibility and context in the analysis of any anomalies detected within any organization.

This range of advanced services includes vulnerability management, where GMV has developed its own inhouse technology, ***Gestvul***, capable of managing the complete vulnerability lifecycle. Specific security auditing services, pentesting, red teaming, etc, also come into the picture, to identify the security weaknesses of any organization's digital assets.

It also provides threat-identifying and -anticipation services as a model of preventive defense, doing so through the Cyber Threat Intelligence (CTI) group, with the aim of finding out which information to publish through the various outlets (social media, deep web, blogs, search engines, etc) or identify any malicious activities that might pose a threat to infrastructure or harm the corporate image. This service helps to head off fraud, information leaks, hacking and demonstrations or attacks against the organization or its key personnel.

It also includes digital forensic services, which aim to identify the causes and impact of any cyber-incidents and put forward preventive measures to ward them off in the future. Services of this type may well call for forensic investigation expertise, compiling evidence for a possible court case, keeping up the custody chain as required by law.

GMV-CERT also offers the most highly specialized services such as forensic readiness, advanced counterintelligence based on deception technology, Threat Hunting missions, and Purple Team coordination measures.

Simple cybersecurity to protect critical assets

Cybersecurity has by now become a buzzword not only for company executives but also the public at large. An event organized by the Management Progress Association (*Asociación para el Progreso de la Dirección*: APD) and GMV in Colombia under the banner theme "Simple cybersecurity to protect critical assets" set out to explain concepts that might seem simple to technology and cybersecurity experts but less so to the man in the street. The number of attacks is increasing day by day and users stand right in the firing line.

Sharing information of this type helps to raise the cybersecurity awareness of companies and persons in these times of digital transformation. Javier Zubieta, Marketing and Communications Manager of GMV's Secure e-Solutions sector, gave a paper under the title "Cybersecurity in understandable language" and Carlos Castañeda, Cybersecurity Presales of GMV's Secure e-Solutions sector, presented the company's security-protection range.

Grupo Santillana, security in the new digital education

Education is always a lynchpin of any society. It is also one of pillars shoring up a sustainable future and nurturing the personal and societal growth that is so essential to guarantee the fundamental values we all believe in. Witness Grupo Santillana, which boasts a five-decade track record of working for education from many different angles. Its range of educational materials and services has been forged over the years by collaborative working with all the teaching-learning stakeholders (pupils, teachers, parents).

One of Santillana's trademark features is its innovation capacity. It has proven to be capable of continually bringing its products and services into line with a global, ever-changing and interconnected scenario.

In the current context the new educational paradigms are crucial. Technological tools and digital content are key components of any hybrid teaching model, an area where Santillana has vast experience in developing, upgrading and setting up these services in many different countries.

Characterization of Santillana's overall range in the 22 countries it trades in poses a huge challenge from the information security point of view. The new hybrid educational arrangements need above all to be presented as secure and trustworthy.

Santillana has always regarded security as an ongoing, across-the-board process within the company. It also understands that security has an additional facet of expert consultancy, coordination and support for all users or developers of the various corporate services and products.

Within its overall security strategy Santillana has always deemed it essential to work with a leading managed-security company. For this purpose it has turned to GMV, which is providing these services through its specialist Commuter Emergency Response Team GMV CERT.

GMV takes on responsibility for orchestrating the various implemented security solutions, providing additional benefits with specific services such as running security technology, security-compliance audits and global vulnerability management through its ***Gestvul*** system, equipment hardening, advanced security monitoring, threat intelligence and security incident management.

These services are provided in all the countries Santillana trades in, designing an intake architecture and a hybrid, flexible and adapted correlation of security events as a service to meet Santillana's present and future needs.

AENOR issues Spain's first ISO 27701 Privacy Information Management

GMV, always a trailblazer in the adoption of standards, improves its management system with this certification, which ensures compliance with privacy and data-protection legislation

Spain's certification and standardization association, AENOR, has handed over to GMV's Secure e-Solutions sector the first certification under the Privacy Information Management ISO 27701 standard, a privacy management extension taking its cue from the Information Security Management standard ISO/IEC 27001 and the Information Security Controls Standard ISO/IEC 27002.

Based on the principle of proactive responsibility, this standard helps holders to ensure they comply with privacy and data protection legislation, namely the GDPR and Spain's, Data Protection and Guarantee of Digital Rights Law (*Ley Orgánica de Protección de Datos y Garantía de los Derechos Digitales*: LOPDGDD).

For GMV this represents an improvement of its management system, with all the concomitant benefits; it also guarantees it a keen competitive edge insofar as privacy is now considered as a whole together with confidentiality, integrity and availability. Mariano J. Benito, CISO/ security manager of GMV's Secure e-Solutions sector, sees GMV's achievement of the certification, the first in Spain, as "further confirmation of the firm's ongoing strategy of adopting international standards, seeking not only continual improvement but also innovation in fields like privacy and data protection, which have yet to be fully integrated into all organizations' processes".

In the words of Boris Delgado, AENOR's ICT manager, "Society is increasingly urging organizations to give cast iron proof of their due diligence in data management. Leading organizations like GMV, have laid down the path to follow for all go-ahead companies".

Right from its start back in 1984, GMV has always shown its determination to rubber stamp all its processes under the most demanding standards. This latest certification once more makes GMV a standard-adoption trailblazer, just as it was back in 2004 under the security certification standard ISO 27001 (the doyen of all the standards currently enforceable in Spain).

GMV has set up the ISO 27701-compliant privacy management system entirely under its own steam, drawing on all its experience, methodologies and expertise in management, cybersecurity and data protection systems.

Cybersecurity to forestall healthcare and reputational risks in the meat sector

Business activity in the meat sector is fraught with risks, of a food-based, financial or labor nature, among others. These risks may pose serious problems for companies. A risk-minimizing strategy is therefore essential to keep them under control and guarantee the ongoing feasibility of the activity in question. With this in mind, Spain's national meat-industry association (*Asociación Nacional de Industrias de la Carne de España*: ANICE) has organized a webinar attended by expert cybersecurity companies to look at information protection and the knock-on advantages of such measures for meat firms as well as the reasons why cybersecurity has become essential to fend off any security breach, manage risks and fight off attacks.

In his speech Javier Hidalgo, Industry Business Partner of GMV's Secure e-Solutions sector, gave an overview of cybersecurity in the productive industries, focusing on how this gives meat-industry firms a crucial competitive edge over the rest. He stressed that cybersecurity should be construed as an investment designed to protect productive processes, while also turning companies' assets to the best possible account. This should start, he argued, with a risk assessment identifying the external attacks the firm in question is likely to be hit by, then applying mitigation techniques to minimize their impact and get systems up and running again as soon as possible afterwards.

Hidalgo pointed out that any cybersecurity incident in the food industry might produce a loss of prestige or, in the worst-case-scenario, a health problem. To head off these risks he put forward a reference cybersecurity framework, valid not only for corporate systems but also whole industrial environments, while also pinpointing the main cyber-threat input vectors calling for special attention.

He wound up by highlighting the importance of defining an in-company cybersecurity strategy, recommending that a specialist risk-analysis firm should be brought in to underpin this strategy.

Eighth Cloud Security Study

The Spanish Chapter of the Cloud Security Alliance (CSA) has brought together Spain's top cloud computing stakeholders in its yearly conference to promote the use of good practices in order to guarantee cloud computing privacy and security; one of its main areas of interest is cloud compliance.

During the 10th Cloud Security Alliance Spain Encounter, Mariano J. Benito, CISO of GMV's Secure e-Solutions sector and Coordinator of the Operational Technical Committee of the Spanish Chapter of the Cloud Security Alliance, presented the conclusions of the 8th State-of-the-Art Cloud Security Study, an initiative of ISMS Forum and CSA Spain, doing so as one of the collaborating authors in the study.

The study, as well as addressing the classic cloud-security aspects, also looked at how COVID-19 has influenced the takeup of cloud services. One of the study conclusions stressed by Mariano Benito was the fact that half of surveyed firms were able to respond to COVID-19 with previously set-up IT services (local or cloud hosted),while the other half have had to tag on services of video calls, VPN and virtual desktops plus additional cybersecurity services.

GMV achieves EDHEN certification of the mapping of health data to the OMOP Common Data Model (CDM)

Granted by the European Health Data and Evidence Network (EHDEN), a European-Union Horizon 2020 initiative driven by the Innovative Medicines Initiative (IMI), this certification vouches for GMV's fitness to take part in all European projects for which it is an eligibility *sine qua non*

GMV has been certified by the European Health Data and Evidence Network (EHDEN www.ehden.eu) after proof of its theoretical and practical capacity for standardizing health data to the OMOP Common Data Model (CDM). This model allows for the systematic analysis of disparate observational databases as well as the handling of the necessary technical infrastructure and tools for doing so.

EHDEN, an EU initiative, was born with the aim of developing a federated network of real-world health research, standardized to a common data model that more smartly manages and shares research methodologies to the benefit of all European citizens' welfare. One of EHDEN's KPIs is geared towards an assessment of the growth of this market. The EHDEN community is made up by industry, universities, regulators, governments, European NGOs, etc.

The advent of the Electronic Medical Record (EMR) has opened up a universe of opportunities for reusing data and extracting clinical evidence from it. In this endeavor, however, it is essential for this data to be used and harmonized under a "common language". If everyone is speaking the same language, then the much-vaunted "interoperability" will actually be achieved.

This is where OMOP comes in. The OMOP Common Data Model allows for the systematic analysis of disparate observational databases. The concept lying behind this approach is to transform data contained within those databases into a common format (data model) as well as a common representation (terminologies, vocabularies, coding schemes), and then perform systematic analyses using a library of standard analytic routines that have been based on the common format. This then allows companies like GMV to extract priceless information that helps in the development of new drugs, therapies and treatments.

There is a direct relationship between the amount of harmonized data shared under the same standard and the development of drugs and therapies to deal with diseases that have hitherto had no efficient treatment whatsoever.

Inmaculada Pérez Garro, digital-health manager of GMV's Secure e-Solutions sector argues that EHDEN's certification of GMV vouches for the company's ongoing work in flagship projects like HARMONY, under which the company has set up the big data platform for achieving the biggest possible data trawl of European patients with blood diseases. Health-data processing standards are essential for making sure that today's huge volume of data can be properly mined and analyzed to the benefit of researchers and the patients themselves.

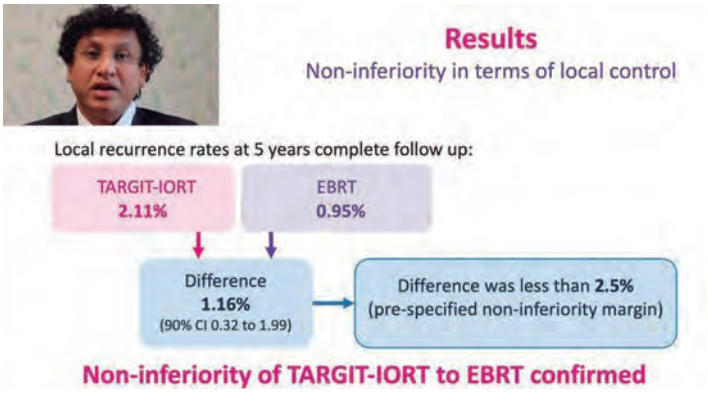
This certification clears GMV for participation in European projects calling for this certification as an eligibility *sine qua non*.

Radiance™ helps to bring in a new breast-cancer treatment standard

Twelve years of monitoring have now shown that for most early breast-cancer patients the administration of a single targeted dose of intraoperative radiation therapy (IORT) after the lumpectomy with Carl Zeiss Meditec International's INTRABEAM®, incorporating GMV's ***Radiance***™ planner, is an effective alternative to external beam radiotherapy, with comparable long term efficacy for cancer control and lower non-breast cancer mortality.

This was the conclusion drawn from the 2298-patient trial carried out by the TARGIT group, published on 19 August 2020 in the British Medical Journal (www.bmj.com/content/370/bmj.m2836), using the INTRABEAM® system with built-in ***Radiance***™ as the intraoperative radiotherapy administration method. The trial has shown that it is not only an efficient treatment but also in many ways better than other early breast cancer treatment methods. These results suggest that it should now be considered for selected cases as the new standard for early breast cancer treatment.

Intraoperative radiotherapy (IORT) is a high precision method of administering during the surgery itself a single, targeted high-radiotherapy dose to the tumor bed/microscopic residue or, in the case of unresectable tumors, to the macroscopic tumor. This single dose is targeted directly at the bed to be irradiated without affecting the surrounding healthy tissue.



One of the biggest advantages of single-dose IORT in the operating theater is saving patients daily journeys to the hospital during three to five weeks post-surgery. This has a knock-on effect on physical and mental health and quality of life. Patients are exposed to fewer hospital visits and also fewer sessions of external radiotherapy in certain cases, such as early breast cancer with favorable prognosis, while also minimizing secondary effects on healthy tissue.

GMV's inhouse ***Radiance***™ software guarantees the precision of this single IORT dose, helping to personalize treatment and making the work of radiation oncologists and physicists safer.

Antari, GMV's inhouse telemedicine platform at Hispasat Satellite Innovation Days

Adrián Rodrigo, GMV's Smart Health Product Manager, showcased GMV's inhouse telemedicine platform ***Antari***® at the eighth Hispasat Satellite Innovation Days. In particular he talked about its use in the Peruvian Amazon, where the challenging lie-of-the-land called for the use of broadband mobile connectivity and satellite connections.

The event looked at the satellite's role in the gigabit society of 2025. Rodrigo gave his take on the matter together with experts like Xavier Lobao, Head of Future Projects Division of the European Space Agency (ESA); Aarti Holla, Secretary General of the EMEA Satellite Operators' Association and Daniela Petrovic, Transformation Manager of O2 (Telefónica UK) and Delivery Director of the Darwin project.

Rodrigo argued that satellite connections were a highly promising way of providing healthcare services in rural areas. "They are extremely useful for the people living there. Prime examples like our ***Antari***® platform allow health service providers to attend their patients remotely, bringing them into online contact with the right specialist in each case and favoring monitoring and follow-up in their own homes". ***Antari***® helps to "democratize access to specialist healthcare and boost the quality of life in rural areas". GMV's ongoing pledge to develop inhouse digital healthcare systems like ***Antari***® tallies with the UN's Sustainable Development Goal 3, Health and Well-being.

The innovating healthcare provision service NAPO, brokered by the Spanish NGO Fundación EHAS and the PUCP Rural Telecommunications Group and using broadband internet satellite connections, has provided three thousand inhabitants of six far-flung communities of the NAPO River area of the Peruvian Amazon with a broadband mobile service and telemedicine services in thirteen rural health centers.

The health system targeted by cybercriminals during COVID-19: GMV's Intelligence Team on the lookout

Healthcare providers, big pharma, insurance companies and health centers remain firmly in the sights of hackers

During the COVID-19 pandemic, GMV's cyberthreats intelligence team is on the constant lookout for any malicious activity against any agents of Spain's health system: hospitals, public authorities, suppliers and healthcare personnel.

Juan Ramón Gutierrez, head of the Cyberthreats Intelligence Section of GMV's Secure e-Solutiones sector, has talked about some of the main conclusions drawn from this ongoing surveillance. Between 60% and 70% of threats use social engineering as their entry vector, taking advantage of human weakness and curiosity, need of information and fear of COVID-19 or an altruistic urge to help or find out more. He also points out that the main objective is the theft of patient or healthcare-personnel data, with phishing accounting for over 56% of the attacks, planted into emails, SMSs WhatsApp messages or the like.

Health-service providers, pharmaceutical and insurance companies and health centers are the hackers' main targets, and the latest ransomware attacks have shown that their main aim is data theft from patients' medical records or from healthcare personnel, information about the development of new drugs, clinical trials or industrial property, etc. GMV's specialists also confirm the existence, albeit at a lower level, of ransomware-type blackmail, such as the attacks on the insurers Mapfre or Adeslas or Torrejón de Ardoz Hospital.

In light of all the above, GMV's Cyberthreat Intelligence Team has drawn up a document to flag up the risks and put forward a series of recommendations explaining how the abovementioned targets of the cybercriminals can best protect themselves against these threats.

GMV hailed by Fundación Pfizer

GMV has come up with an idea for cutting down the rare-disease diagnosis time by up to 30%; this new system has made it to the final of Pfizer Foundation's fourth "e-DEA Health 2020 Challenge".

2020 challenge was maximum optimization of the rare-disease diagnosis process, cutting down the time and giving as much information as possible. The competition's jury shortlisted GMV as one of the three finalists.

In the words of Javier Téllez, Health Innovation manager of GMV´s Secure e-solutions sector, the solution submitted to e-Dea Health 2020 applies Artificial Intelligence techniques like natural language processing (NLP) to extract symptoms and other evidence from medical records and unstructured data. This technology, he goes on, not only allows us to cut the diagnosis time by 30% but also pinpoints within health organization's medical records those persons suffering from undiagnosed or misdiagnosed rare diseases.

Fundación Pfizer's mission is to drive science, technology and innovation and help bring it closer to society, thereby coming up with a response to system needs, to the benefit of the population's health and welfare. This commitment takes the practical form of initiatives like e-Dea Health, now being held for the 4th time.

Sergio Rodríguez, the foundation's president puts it this way: initiatives like e-Dea Health Salud engender projects that help to meet the needs of patients and the health system as a whole. Furthermore, he adds this fourth challenge is dealing with a crucial theme: the diagnosis of rare diseases. It is estimated that between 6 and 8% of the world's population is currently suffering from one rare disease or another and the average diagnosis time stands at five years.

COVID-19 as an accelerator of the digital transformation

Mariano J. Benito, CISO of GMV's Secure e-Solutions sector, took part together with con Javier Peris, executive vice-president at itSMF, and Francisco Gónzalez Calero, International Lead Advisor at Govertis, in the discussion panel organized by the Healthcare Development and Integration Institute (*Instituto para el Desarrollo e Integración de la Sanidad: Fundación* IDIS), which came up with strategies for successfully addressing the digital transformation in the health sector.

Benito argued for the need of taking a preventive, risk-based posture in order to be sure of carrying out the digital transformation successfully, citing as an example the better response to the COVID-19 pandemic by organizations that had previously set up robust, tried and tested contingency plans to keep up normal business.

In vulnerable situations like the current COVID-19 pandemic, Benito went on, organizations have to be ready to respond to the flak of cyberattacks on teleworkers, jeopardizing the information they handle and their very activity itself.

Any cybersecurity incident in the health sector might hit the victim's reputation, but it might also have a direct impact on such aspects as privacy and personal data protection, concerning sensitive information that has to be kept with all guarantees of secrecy and confidentiality. Any downtime in this sector might be especially critical. A worst-case scenario, as brought out in the debate, might be cancellation of an operation, however urgent, if the patient's medical record has gone missing due to a cyberattack.

The debate also showed how the sheer speed of today's digital transformation has made the technological ecosystem more vulnerable than ever. Big risks and security problems might crop up, unless there are trustworthy systems in place to head off cyberattacks, computer intrusions, data-capture or -encryption or other perils. These without any doubt pose a serious threat to correct and reliable operations, hitting all sorts of results hard, whether healthcare, financial, organizational and reputational, among others.

The CISO of GMV's Secure e-Solutions sector reminded his audience of the need to keep all processes under constant watch, carrying out pentesting and managing vulnerabilities properly to make sure no attack goes unnoticed, also keeping up double contingency circuits, especially in situations such as the current COVID-19 pandemic.

GMV to modernize Cyprus's public transport system

One of the most important features of this upgrade is the fare offsetting system, whereby the public authority automatically evaluates the performance of Cyprus's new transport concessionaires

Cyprus's Ministry of Transport, Communications and Public Works has once more placed its trust in GMV for modernization and continuous improvement of its transport system.

In 2016 GMV was awarded the contract for modernizing Cyprus's public transport. The successful performance of this contract was duly followed by a seven-year maintenance contract.

The original project was a turnkey fleet-management, passenger-information and ticketing system involving the supply, installation and commissioning of all technological equipment and the necessary software for Cyprus's public-transport bus fleet.

Cyprus's Ministry of Transport, Communications and Public Works has now decided to upgrade the system to meet the needs arising from the changeover of transport concessionaire firms, among other factors.

One of the most important features of this upgrade is the fare offsetting system, whereby the public authority automatically evaluates the performance of Cyprus's new transport concessionaires to ascertain the sum owing them at the end of each period. This system, now in design and analysis phase, is critical for all parties.

Other functions include Google integration of the vehicle's real-time position, permitting instant calculation correction when the public transport is to be used for traveling from one location to another, including the trip cost. Other essential features are, firstly, integration with new operators' planning systems; secondly, development of multi-language passenger information in Greek, English or Russian; and, thirdly, enhancement of user-information systems on the ministry's website or mobile iOs and Android apps.

GMV is responsible for the design and management of the technology transition plan between old and new transport operators. This includes the logical transition between the data models of both systems, transition of hardware elements between the vehicles of the old and new operators and the transition at the level of control centers and farecard points of sale and recharge. It is also in charge of system maintenance to keep up basic functions at all times so that end users hardly notice the switch.

GMV awarded the contract for maintenance of RENFE's communication platform

The Spanish national railway operator RENFE has awarded GMV the 3-year software maintenance contract for the communications platform of its commuter and medium-haul fleets, confirming GMV as one of its go-to technology suppliers.

The commuter and medium-haul fleet communications system, originally designed and rolled out by GMV, was awarded to the company back in 2008 before another two similar contract awards extended it to RENFE's freight, high-speed and long-haul fleets.

This system is based on GMV's inhouse railway fleet-management system ***SAE-R®***. The communications platform consists of a fleet-management system with bespoke features grafted on to bring it duly into line with RENFE's fleet-wide management and motorization needs. The main feature of this system is its interconnection with a host of existing onboard systems to extract useful information for the company. Among others, the communications platform establishes a connection with the onboard diagnosis systems, the power metering system, the juridical recording unit (JRU), the passenger information system (PIS) and video-information (VI) monitors, the PA and intercom system, the video-surveillance system (CCTV) and ridership counting system.

Real-time and historical information can be extracted from all the above, the real-time information differing to suit the nature of each system. For instance, the diagnosis system taps into technical alarms and the operational state of vehicle systems while the power metering system extracts instant consumption readings and the CCTV extracts live camera images.

The communications platform also extracts historical information from these systems, such as breakdowns and diagnoses, power consumption and recorded video images, etc. As well as extracting information, it can also interact with some other systems, such as the passenger information system. From the communications platform it is possible to publish, both in real time and on a programmed basis, image-, text-, video- and audio-images on the LED signage systems and video-information monitors and broadcast them on the train PA.

This system has now been completely rolled out and its software is by now out of warranty, so the time has come to maintain it.

The signed contract brings in corrective software maintenance, rounding it out with technical assistance and complete preventive maintenance on server environments and operator posts. Evolutive maintenance is also included, which will keep systems up to speed with the breathtaking rate of changes in the sector.

Inauguration of the Balearic Island's new fare system

GMV's technological equipment supplied under this contract blends contactless bankcard fare payment with smart cards, incorporating all advantages of a cloud-hosted account-based ticketing system (ABT)

On 5 October the Mallorca Transport Consortium inaugurated its new fare system in the Intermodal Station of Palma de Mallorca. The ceremony was attended by the Regional Minister for Mobility and Housing, Marc Pons, accompanied by the Director General of Land Transport and Mobility, Jaume Mateu, and the manager of the Mallorca Transport Consortium (*Consorcio de Transportes de Mallorca:* CTM), Maarten Van Bemmelen and the manager of Mallorca's railway system (*Serveis Ferroviaris de Mallorca:* SFM), Mateu Capellà. Also present were representatives of GMV, as the supply company of the technological equipment of the new fare system and its banking partner, Banco Santander.

This inauguration constitutes the first step in GMV's rollout of the new integrated and multimodal fare system in the Balearic Island's public transport network. GMV's technological equipment supplied under this contract blends contactless bankcard fare payment with smart cards (contactless cards habitually used in public transport) with EMV enablement in collaboration with Redsýs and Banco Santander, incorporating all advantages of a cloud-hosted account-based ticketing system (ABT).

After this inauguration the new fare system technology is now up and running in the 238 station-access turnstiles and the 63 station ticket-vending machines.

In the 411 interurban buses of all the Balearic Islands and in the 223 buses of Palma's urban service GMV is fitting a total of 611 desks and 1652 dual EMV/Smartcard validators, plus 1247 video-surveillance cameras and 543 onboard information panels.

For the management of bankcard payment GMV has supplied an end-to-end payment solution that adapts EMV technology to the new comprehensive fare system. Thanks to an agreement reached with Redsýs, as supplier of the payment platform, and Banco Santander, as service procurer, GMV has made it possible to blend in a single system the traditional smartcard-based payment system (farecards) with the new EMV contactless bankcard payment system.

The incorporation of the EMV payment standard allows any would-be passenger with a physical or cellphone-virtual bankcard to access the public transport system directly without any need for previous registration or ticket purchase and in the certainty that a post-payment system will guarantee him or her the most favorable fare in accordance with the actual use made of the public-transport system. The new system will also harden security in card-terminal transactions, since the EMV card validates transactions on the basis of the information stored in its chip.

Alstom turns to GMV for supplying the onboard Wi-Fi system for the new trains of TMB

GMV will take care of the engineering, design and configuration of this system, which is designed to provide a Wi-Fi service for TMB personnel working onboard the trains. Alstom will incorporate this system into the manufacturing process of the 42 new trains of the 7000 and 8000 series, which correspond to the enlargement of Barcelona's Metro fleet, replacing the series 3000 and 4000 trains due to be removed from service because of asbestos-containing components.

The architecture of this Internet On-Board (IOB) system is deployed on an autonomous Ethernet backbone segregated from the train's onboard network, with a ring configuration to endow the system with redundancy and incorporating an Ethernet switch for each car of the train. Each train has three wireless access points and two antennae associated with each one of these access points, allowing them to work in 2, 4 or 5 GHz bands. This will be a scalable system with new access points being phased in as need be in the future.

The implemented network will also have a communications gateway to concentrate the onboard information and allow for the exchanging of information with the central servers and remote system monitoring. It will be capable of automatically checking for the existence of software or firmware versions stored in the central repository, facilitating the communication of command and control from TMB's monitoring system. It will also have the capability of sending a record of logs and alarms.

The train-to-ground link will use Wi-Fi and 4G/LTE technology through a specific roof-mounted multiband antennae connected to the communication nodes. The role of this link is to choose the most appropriate channel at each moment to suit the train's location and the coverage available via each one of these technologies, thus guaranteeing unbroken, quick and robust communication.

GMV is developing cooperation with Solaris, an international manufacturer of eco-friendly buses for public transport

At the beginning of November, the Municipal Transport Company (MPK) in Nowy Sącz expanded its fleet of city buses by six brand new vehicles with ecological CNG drive, manufactured by Solaris. A set of equipment for fleet management and dynamic passenger information was provided by GMV. Currently, more than 85 public transport buses in the colors of the Nowy Sącz MPK equipped with the GMV on-board systems are being controlled by GMV's system.

The vehicle equipment delivered by GMV includes the ***REC30*** auto computer, which controls the onboard systems, provides wireless GPRS/ Wifi communication with the control center and makes it possible to determine a current position of the bus thanks to the GPS module. In each vehicle there are three energy-efficient LED destination panels, which inform passengers about the number and destination of the line thanks to the data transmitted directly from the SAE dispatching system.

Inside the vehicles, passengers have at their disposal monitors, which display real-time information about subsequent stops of the line or planned arrival time. Visual internal passenger information is additionally supported by automatic voice announcements. Each bus has four dual validators with a 5.7" touch screen, which cater for both traditional paper tickets and electronic tickets encoded on contactless cards.

GMV is also in the process of performing further orders for Solaris for onboard devices for 8 diesel buses and 6 electric buses ordered by the Municipal Transport Institution (MZK) in Toruń.

Each of the vehicles will be equipped with an industrial M20 LTE auto computer integrated with the 10" driver's console. The onboard computer will communicate with the fleet management and passenger information system recently implemented in the city by GMV.

Grupo Ruiz awards GMV the contract for its new Cascais ITS

GMV will be setting up a turnkey project on the 96-bus fleet, comprising an all-in fleet-management system, passenger-information system and onboard surveillance system plus the eCall system

Grupo Ruiz has turned to GMV for the ITS rollout of its new public-transport concession of Cascais (Portugal). Over the next 6 months GMV will be setting up a turnkey, all-in fleet-management, passenger-information and onboard video-surveillance system plus eCall for Grupo Ruiz's 96-bus fleet.

GMV's fleet-management system will fit these 96 buses with the company's inhouse ***REC30*** equipment, which pools the functions of localization and onboard communications, using an 8" TFT console as driver interface. Grupo Ruiz's control center will in turn be fitted with GMV's fleet-management server plus an advanced operator post for management of the whole system. Five additional operator posts will be set up for the municipal district of Cascais, in line with the specifications of the concession that has been awarded to Grupo Ruiz.

The onboard passenger-information system displays its information on a 21" TFT screen and will be connected up to the onboard LED panel and also the bus's outside LED panel. GMV will also be supplying standardized information to the bus-stop information panels not otherwise included in this contract.

The video-surveillance system will fit 4 IP cameras on Grupo Ruiz's 79 full-sized buses plus 3 IP cameras on each of its 17 minibuses. The ***REC30*** will also act as onboard video recorder in connection with the video-surveillance software of the control center.

Fleet-management peripherals include associated functions like ridership counting with sensors on the buses' entry and exit doors keeping a track of occupancy at all times.

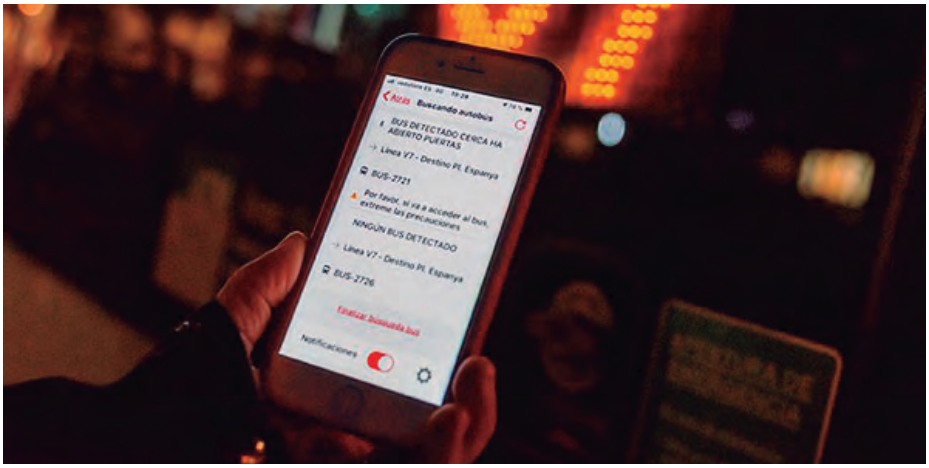
The project also includes the fitting of an emergency eCall system on Cascais' bus fleet.

This eCall system will be fully up and running by April 2021, making the buses capable of setting up a connection with the 112 emergency call attention center if any potential accident is detected or at driver request, enabling the emergency services to react immediately.

The system includes the onboard ***EP100*** equipment, which taps into the inertial system and the vehicle's CAN bus to detect the potential accident and set up the voice- and data-connection with the emergency center. Through the data connection, the onboard system sends primordial information such as location, accident time and vehicle identification number, while the voice channel allows the driver and vehicle occupants to communicate with the 112 agent.

The driver also has a button for setting up, if need be, instant connection with the emergency center without any intervening accident.

GMV presents together with TMB the bus-detection system for the visually impaired



In mid-September Barcelona hosted the official presentation of the Beacons project, in which GMV and TMB have been working together for two years to develop a system to meet the prescribed specifications. The aim of this project is to enable the visually impaired to identify simply the bus they are waiting for from the bus-stop, using an accessible App with voice assistance installed in their cellphone.

GMV has designed a beacon based on BLE Bluetooth technology, paying especially close attention to all relevant design-level aspects needed by an industrial-character beacon (vibration resistance, large temperature range, high IP degree, uninterrupted power supply, transmission power, etc.). This beacon has been fitted in each of TMB's 1100 vehicles, capturing vehicle data such as the state of the doors, speed, location, etc, provided by means of integration with the onboard systems previously developed by GMV during its 10 years of collaboration with TMB. It also publishes iOS- and Android-compatible wireless frames with a very high frequency, showing how close the bus is to the stop and the various states (stopped, moving, open or closed doors, etc.).

Any visually-impaired persons with the TMB App installed on their handheld can choose the desired for bus-line and destination. The app will then keep them informed with voice announcements of the bus-stop ETA of the first bus from this line and with this destination. It will also tell them when the bus is approaching the stop and give further instructions to help them get on safely.

Another important improvement is that drivers themselves are also forewarned that a person with special needs is waiting at the stop.

This GMV-developed technological advance is chalking up impressive results. It will help to enhance the quality of life and autonomy of a group that, until now, could rely only on a radio-frequency remote control to find out bus arrival times at stops fitted out for this purpose.

Arriva Galicia upgrades the control center of its fleet-management and ticketing systems

The company Arriva Galicia, after once more winning several of the transport concessions in the Spanish region of Galicia, shows renewed trust in GMV, with which it has been working since 2005. This time it has asked GMV to upgrade the control centers of its current fleet-management and fare-collection systems.

Their business relationship kicked off in 2005 with the purchase of the fare-collection system, comprising 207 ***ETC500*** ticket-vending machines, then renewed in 2015 with the incorporation of the fleet management system.

Up to now the control center of the systems set up in 2015 had been shared with another 15 companies of the region and centralized in the Galicia Mobility Operation Center (*Centro Operativo de la Movilidad de Galicia*: COMGA); GMV won the contract for supply and development of applications, services, running and maintenance.

In 2019 the Regional Authority (Xunta) of Galicia laid it down as a tender specification that the transport operators to which concessions are awarded must run their own local control center, connecting up to COMGA for sending data, making it possible for COMGA to pool the fleet management information of all road passenger transport operators.

In 2020 GMV has once more been awarded the contract for development and maintenance of said service. The new control center contracted from GMV by Arriva Galicia will therefore connect up directly to the new COMGA control center also supplied by GMV.

GMV will bring Arriva Galicia's new fleet-management and ticketing control center on stream in early 2021 after migrating specific existing operator functions and data to COMGA's current platform.

Supply of the control center will be rounded out with the contracting of the maintenance service, to run for the ten-year span of Arriva's new concessions.

GMV renews the maintenance contract of TMB buses' onboard information systems for another 3-year term

Barcelona's Metropolitan Transport (Transports Metropolitans de Barcelona: TMB) has renewed with GMV the maintenance contract of the onboard information systems, made up by 1458 energy management units, 1364 passenger information units and 1422 CPU30s.

To guarantee proper working of the system in time, GMV has proposed a set of simultaneously contracted maintenance services based on corrective and evolutive maintenance, technology migrations and remote technical assistance.

Corrective maintenance is based on equipment repair, carried out mainly by GMV technicians with the support of TMB's technicians in a GMV-authorized repair garage. This corrective maintenance includes engineering and certification tasks to deal with any obsolescence that might crop up.

Evolutive maintenance is based on a pool of 350 hours a year, taking in tasks of engineering, documentation and firmware developments for corrections and improvements.

To graft today's technology onto the oldest equipment of the system, the contract lays down a number of hardware migrations on the energy-management and passenger-information systems. GMV's project management and assistance includes the responsibility for a maintenance project to coordinate, prioritize tasks, draw up and analyze reports. A team of support technicians will clear up any hardware questions that might crop up and graft the new onboard components onto the system.

To consolidate the data on breakdowns, repairs, movements of rolling stock and equipment, TMB's SAP management systems and GMV's maintenance website are communicated through a web service that guarantees correct management and coordination of the corporate databases of both firms.

The three-year contract has a two-year tag-on option.

GMV shares its experience on cooperative intelligent transportation systems

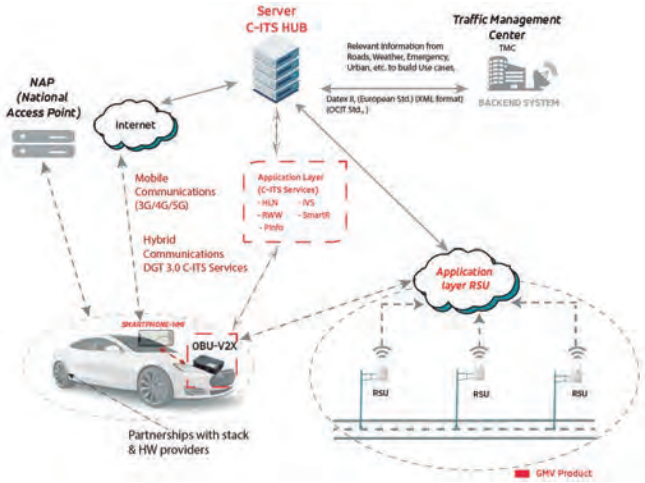
In November GMV took part in the cooperative intelligent transportation systems (C-ITS) workshop organized by ITS Spain, looking at issues such as communication technologies and security in cooperative systems and the diverse components making up a C-ITS architecture.

During the morning session GMVs longstanding expertise in onboard systems came to the fore with a presentation on the C-ITS role of On-Board-Units (OBUs) and their technology.

This presentation ran through the most important OBU features in overall C-ITS architecture, dealing with important aspects like OBU standards, implemented software and hardware architectures, plus the messages and protocols applied to devices of this type.

At application level the session specified OBU services and use cases, as well as user interaction with a smartphone acting as driver HMI. Alternatives to 802.11p were also mentioned for V2X communications.

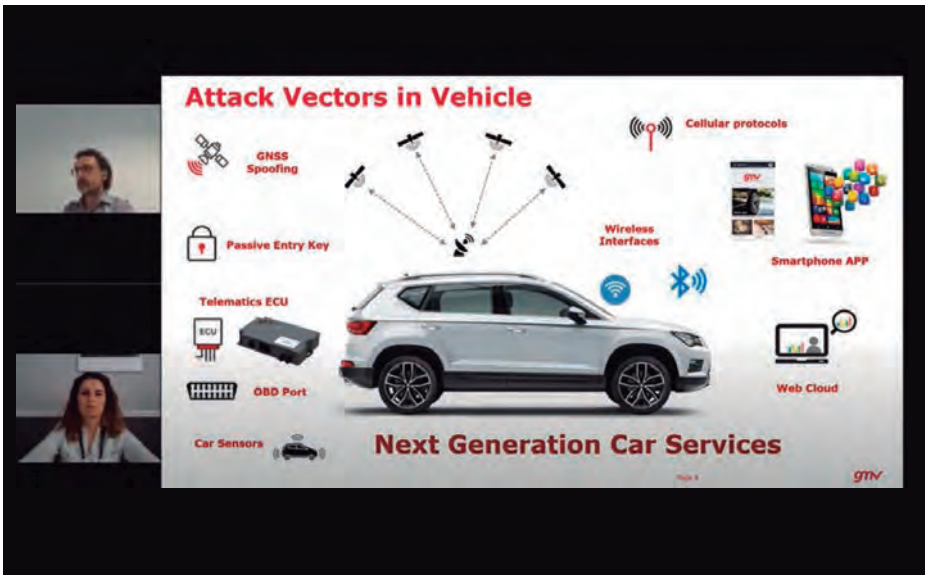
In the afternoon GMV then featured prominently in the colloquium on cooperative user services to be rolled out in the short- to medium-term, the future development of cooperative services and other burning issues.



GMV speaks about the vulnerabilities of connected and autonomous vehicles

In late September GMV held a webinar under the title “Understanding Vulnerabilities in Connected Vehicles”. This webinar was given by Belén Andrino, GMV’s Manager of Automotive Business Development, and Marco Donadio, GMV’s Cybersecurity Project Manager & Business Development Manager.

Today’s state-of-the-art vehicles work with several different connectivity technologies such as cellular networks, Bluetooth communications, Wi-Fi and mobile apps for opening, closing and starting up the car. If we also factor autonomous driving into the equation, it turns out that cars are highly vulnerable to cyberattacks.



In this context Belén and Marco first of all talked about the importance of vehicle cybersecurity, before detailing the key vehicle attack vectors.

Their speech ran through practical examples of the various types of vehicle vulnerabilities, discovered by tests conducted by GMV’s automotive business unit in the Car Hacking Lab.

Belén and Marco also explained how these vulnerabilities might be mitigated, starting with secure software development and also taking in risk analysis techniques and pentesting, where GMV has been leader for over 15 years.

GMV’s team is ready to support adaptation to the new cyber regulation UNECE WP.29, passed last June, and also the standard ISO-21434.

SATELISE® to integrate the digital DGT 3.0 platform in the Terrasa- Manresa toll road

A new testing phase now kicks off, integrating all the information gleaned from Spain's Traffic Authority (DGT) to ensure a more comfortable journey and secure a safer and more sustainable mobility

SATELISE®, the trailblazing initiative of Cintra and GMV for cellphone-based pay-per-use of toll roads, will integrate in test phase the information from the DGT 3.0. platform of the Spanish Traffic Authority (*Dirección General de Tráfico:* DGT).

The new technologies are capable of exchanging vast amounts of real-time data while also providing security mechanisms and service personalizing options. The digital platform DGT 3.0 is designed to cater for connection of many different agents for receiving and passing on information, thereby helping to head off traffic accidents and warning other road users of any obstacle or incident along their planned route.

The SATELISE® application, already in use in Catalunya in Autema (the toll road running from Terrasa to Manresa), was originally designed with the idea of using smartphone-based satellite-positioning technology for pay-per use tolling without having to set up gantries or any additional infrastructure.

After several years of operation and various technological upgrades, a new testing phase is about to start, integrating information from DGT's platform to ensure a comfortable journey, all in favor of safer, more sustainable mobility. During these tests information will be gleaned to weigh up the performance of the services rolled out by the platform (response times, dependability, etc.).

By simply updating the App, users will not only by able to pay the toll using satellite-positioning technology, as hitherto, but also receive on their handheld DGT information on the traffic situation, roadworks and other information about their current position, without need to install any additional Apps or sign up for any service.

The testing phase is due to kick off in late 2020, with toll-road users then being fed with updates during 2021, once the platform performance has been assessed and the system itself and information sources have been confirmed as suitable for distribution to the public.

GMV presents its connected- and autonomous-vehicle services, solutions and products

■ In late November personnel from GMV's automotive business unit took part in the latest Automotive Electronic Congress (Automobil-Elektronik Kongress), eventually held online because of the pandemic instead of this year's originally chosen venue of Ludwigsburg (Germany).

GMV ran a virtual stand to showcase its range of connected- and autonomous-driving solutions, while also staging automotive videos, seminars and live demos.

Team GMV presented its highly precise and secure GNSS-based positioning solutions and vehicle cybersecurity products and services (ISO 21434 and WP 29 support, complete cybersecurity audits, including pentesting, etc.), vehicle-connectivity technology including V2X-based cooperative services, mobility services (carsharing, pay-per-use, eTolling services, etc.) and smartphone apps, among others.

GMV's automotive unit now boasts over 15 years' experience in cutting-edge technological solutions with over four million vehicles running on GMV telematic software around the world.

GMV takes part in the online event "Connected vehicle: new opportunities and challenges"

■ On 8 October the Professional Association of Telecommunication Engineers (*Colegio Oficial de Ingenieros de Telecomunicación:* COIT) hosted a webinar under the title "Connected vehicle: new opportunities and challenges".

The purpose of this webinar was to give a multi-viewpoint take on the connected and autonomous car as one of the biggest challenges to be tackled by the telecommunications world in the mid-term.

Sara Gutiérrez Lanza, manager of GMV's Automotive Business Unit, took part in the webinar, explaining how GMV is working to endow vehicles, whether public or private, with connectivity. She also pointed out that the sector is progressing towards cooperative transport services with the aim of improving road safety, cutting down the environmental impact and improving cities' air quality.

Other participants besides GMV in this webinar included leading figures from COIT, Spain's Traffic Authority (*Dirección General de Tráfico*: DGT), the Spanish Road Association (*Asociación Española de la Carretera*), Cintra and Deep Mirror.

GMV is now busily working on advanced systems for the autonomous connected vehicle and automotive cybersecurity, based on its own R&D and inhouse products.

GMV rolls out a worldwide GNSS network

GMV, as a leading provider of precise positioning services, has designed and is now deploying a worldwide network of GNSS stations. This network will give GMV absolute control over the whole process; in particular it will help to provide an integrity layer over the precise positioning service.

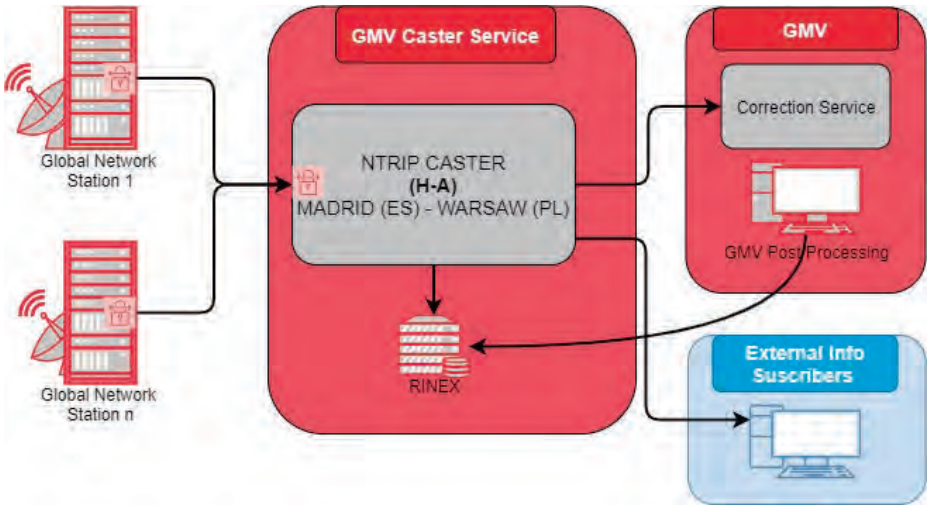
These new services will be crucial for the new generation of autonomous vehicles and can be set up in different clients, such as the carmaker BMW. It will also guarantee and improve the service level for current clients and break into the new emerging markets.

The tasks take in the whole network creation process from scratch, starting with the capturing of requirements and then moving on through design, manufacture, integration and worldwide deployment of the different components and necessary communication infrastructure to set up the network and make the data available in the datacenters.

Each station has two GNSS receivers capable of processing signals from the various GNSS constellations (GPS, Galileo, GLONASS and BeiDou), plus a third standby receiver. Each station also includes a communications device for establishing the connection through secure channels with the control center housed in GMV's Madrid and Warsaw offices, where station data is received and made available to the various service subscribers.

The data of this network of stations, once rolled out, can then be harnessed for various projects and purposes, making GMV one of the few firms with the capability of setting up running its own worldwide GNSS network.

The network is due to be fully up and running by Q1 of 2021.



GMV sponsors AMETIC's Telecommunications and Digital Economy Encounter

AMETIC, Spain's digital-industry employers' association, has held its 34th Telecommunications and Digital Economy Encounter under the banner theme "Digitization and Sustainability for Reconstruction; NOW or NEVER". This year's encounter has chalked up an all-time high turnout with over 112 national and international speakers, 24 panel discussions, 35 institutional representatives and over 9000 connections.

During the Encounter's first day Luis Fernando Álvarez-Gascón, as AMETIC's Vice President, moderated the debating panel "Policies for the country's sustainable, innovating, digital and industrial recovery. Strategic projects and missions: Macroproyectos Tractores" (major lodestar projects driving innovation and R&D), where he called for a higher R&D outlay by Spain to keep up with European competitors. "Innovation is crucial for economic growth, company competitiveness and meeting society's stiffest challenges".

The following days then dealt with various burning issues of the sector and their effect on the reconstruction. In the cybersecurity panel the marketing manager of GMV's Secure e-Solutions sector, Javier Zubieta, argued that "this unprecedented event has not hit everyone equally. Companies that have opted for cybersecurity-intensive business-continuity schemes have fared much better. Based on his own experience, Zubieta advocated investment in vulnerability diagnosis to maintain a snapshot of the state of technological infrastructure from the cybersecurity point of view as the base for subsequent reconstruction. Budget cutbacks are now likely in 2021 but Zubieta warned against the temptation of cutting cybersecurity outlay, since cybercriminals are not going to slacken their own efforts.

Another of the issues dealt with was healthcare digital technology in times of coronavirus, under the slogan "The Spanish citizen, owner of his/her health and donator of knowledge", moderated by María Neira, Director of the Public Health, Environment and Social Determinants department of the World Health Organization, and with the participation of Carlos Royo healthcare strategy manager of GMV's Secure e-Solutions sector and president of AMETIC's health committee.

Carlos Royo presented AMETIC's Healthcare Macroproyecto Tractor, with three clear objectives: to boost industrial development, innovation and sustainability in order to place Spain at the worldwide cutting edge of the healthcare technology sector. Royo stressed the moment for all pulling together is "Now or Never". Spain has the ability and hence the duty to do so, otherwise we would commit a grave irresponsibility.

The encounter wound up with a discussion panel on "Innovation and business growth during the recovery", moderated by Luis Fernando Álvarez-Gascón, in which he argued for the need of bringing innovation onto the national agenda.

GMV becomes the official distributor and integrator of Atomian's cognitive computing technology

Thanks to this alliance, lawyers' offices, real estate appraisers or BPOs will be able to benefit from a big saving in document-processing time and costs over manual processing and a great precision in the extraction of data insights and key document concepts

GMV has signed a contract with Atomian under which it becomes a new distributor and integrator of its cognitive computing technology, an artificial intelligence (AI) technique for more natural data mining.

Atomian develops knowledge-processing and -accessing technology and applications, looking at a scenario where computers and persons work together, sharing contents and speaking the same language, i.e., the technology adapts to the human language (natural language) rather than the other way round as hitherto.

Firms working with a huge volume of documents feel a growing and as yet uncatered-for knowledge-management and -access need. Enter Atomian. It extracts key concepts from any type of document in an automated way, replacing manual processes (costly and inefficient). This technology, once the information has been structured, also makes it possible to couch enquiries in natural language, obtaining instant results by simply writing the questions in the search engine and automatically generating a dashboard.

Thanks to the alliance between Atomian and GMV, clients such from diverse sectors such as lawyers' offices, real estate appraisers or BPOs will be able to benefit from an 85% saving in document-processing time, a 40% cost-saving over manual processing and a 95% precision in the extraction of data insights and key document concepts, guaranteeing the trustworthiness of the data insights.

Workers and teams will thus be provided with real, updated and top-quality information in seconds in order to analyze, draw valuable conclusions and take decisions to the firm's benefit.

Atomian's technology offers several competitive advantages. Most notably, the natural language can be processed in several languages (Spanish, English and Catalan); the semantics and concepts can be understood, whereas other systems merely identify words or labels; lastly, it is 100% proprietary technology, thereby guaranteeing total dependence from third parties.

In the words of Isabel Tovar, service director of GMV's Secure e-Solutions sector: GMV's range has three main thrusts: digital transformation, cybersecurity and innovation. This makes a perfect fit with Atomian's solutions, which apply technology as a driving force for change, opting for innovation as a means of democratizing knowledge and helping to ensure decisions are made on the basis of real information in a simple and natural way.

Beatriz Cabrera, Atomian's CEO puts it this way: We at Atomian want knowledge to flow freely and naturally between all people, enabling them to make decisions based on real and bang-up-to-date information, to the benefit of all the firms involved. A cutting-edge partner like GMV, which offers its clients hi-tech solutions, enables us to broaden our range of products, solutions and services and make sure they are constantly evolving to keep up with companies' essential digitalization needs.

What if we could improve our algorithms without compromising data privacy?

The AI & Big Data Congress clearly brought out how artificial intelligence's prediction capability can give companies an edge over the rest. An early takeup of this technology could therefore boost economic activity and generate jobs, while also help to bring companies more into line with today's environment.

The bugbear here, the burning issue in discussions of the ethical and legal ramifications of AI takeup, is the knock-on effect on data privacy. The General Data Protection Regulation (GDPR) sets out to safeguard EU citizens' privacy and give them greater control over their personal data.

Many have questioned whether it is possible to use AI while protecting the fundamental rights watched over by the GDPR and other protection measures applied by governments and organizations to keep this information private, decentralized and secure.

Enter ***uTile***. During the AI & Big Data Congress session dealing with the fairness of AI algorithms, José Carlos Baquero, Artificial Intelligence and Big Data Manager of GMV's Secure e-Solutions sector, explained how GMV's inhouse development ***uTile*** enables us to improve our algorithms without undermining data privacy.

Thanks to ***uTile***, organizations can now share and even securely monetize their data insights, on the strength of advanced encrypted computation procedures, complying with the privacy of distributed data sources and facilitating secure information exchange. We will, for example, be able to harness sensitive data in order to improve analytical models and machine-learning algorithms.

Security in the Hospitality Sector

The Technological Hospitality-Trade Institute (Instituto Tecnológico Hotelero: ITH) has held the ITH Virtual Innovation Summit, an annual event held this year in online format. The summit's purpose is to bring to wider notice the latest innovation and technology news in the hospitality sector.

Reyes Maroto, Minister of Industry, Trade and Tourism, gave the opening address, stressing the government's ambitious and far-reaching digitalization program and announcing investments worth €355 million to drive the Smart Tourism Destination model.

Security is one of the key points in digitalizing the hospitality sector. This aspect was addressed in the discussion panel "Security in the new processes: the invisible threat" with the participation of Joan Antoni Malonda, Tourism Business Developer of GMV's Secure e-Solutions sector, together with leading figures from the tourism sector. The panel debated the sector's best strategy for getting hotels up and running again and recovering client flows within a trustworthy atmosphere.

As for digitalization of the hospitality sector, Malonda stressed how robotic process automation (RPA) is one of the most efficient ways of digitalizing processes, saving time and costs and also cutting down human error while improving client experience, for example in booking, passenger name registration or data validation. As a caveat, he also pointed out that caution is called for in the integration of these new vulnerability-prone processes. Design-up security-risk prevention, i.e., SecDevOps, is therefore vital in order to guarantee a proper level of security.

To wind up Joan Antoni Malonda explained that innovation is hardwired into GMV, which plows back 10% of its turnover into projects to meet client needs. In particular, GMV is always prepared to invest its resources in pilot schemes to meet the hospitality sector's digital-transformation challenges.

Learning Life, GMV's new idea for continuous learning and training

Learning Life, serving as a knowledge-sharing channel, aims to offer a wide range of constantly-growing training contents based on needs pinpointed beforehand

Right from the word go, the career development of its personnel has been one of the main planks of GMV's whole business project. Working with top professionals gives the company a crucial competitive edge, so its personnel policy is geared towards not only attracting the crème de la crème but also nurturing their career development afterwards. This makes perfect sense because the company's business lines call for specialist and bang-up-to-date knowledge of the most cutting-edge technologies.

To develop the professional skills of its employees GMV runs an integrated training model to pinpoint its employees' knowledge and skills, keep them on their toes and ensure rapid project development. As the latest offshoot of this overarching philosophy, GMV has recently launched Learning. The aim of Learning is to offer a wide range of training content plus a catalogue of different types of training goals in constant growth, to meet detected needs, reach set objectives and share this knowledge among its employees, all based on this learning and self-growth culture.

Learning gives GMV personnel the starring role. Any member of staff can now access a catalogue of skills- and technology-training, check online learning contents and activities, manage defined needs in his or her own career-development plan and ask for any gaps in this plan to be filled. All this, moreover, can be done whenever he or she wants to, through the mobile App "Learn".

The training catalogue, containing both inhouse and outsourced courses, draws from a previous identification of specific training and knowledge needs in each specific area. Once this need has been defined and the provider found to satisfy it, the course is uploaded onto the platform so that personnel of all areas can apply for it, making it possible for all personnel to enhance their knowledge and skillsets and broaden their knowledge map.

Without a shadow of a doubt one of the key figures in this whole training process and the ongoing transfer of knowhow within GMV is the internal trainer. GMV currently boasts a stable of 50 inhouse trainers to teach on courses of strategic importance for the company; this figure is set to grow in the future.

Either on their own initiative or by seconding of their colleagues or bosses, internal trainers are appointed to take on this role on the strength of their communication and social skills. The idea is for them to pass on their knowledge and help to hone skills in specific areas, themes or technologies.

Over the years learning within GMV has evolved under the influence of diverse factors. Jesús Mariano Pascual and Diego José Fuentes Gil, GMV trainers drawing on their own personal experience, give a general explanation of how GMV's training courses are run and give one or two other tips.

Jesús Mariano Pascual Díaz

Innovation Department Manager

Looking back on how my interest in training first arose, what springs to mind is my first years in GMV and my concern for making sure the knowledge I was building up day by day was shared with the rest of my colleagues.

Fortunately, over the years, we have brought in a whole raft of technological devices to facilitate this task. But the one underlying strand that has never changed is the need for onsite training.

The mass takeup of teleworking to deal with the current pandemic has undoubtedly forced us to tweak this training scheme. The reaction across the board has been exemplary, minimizing the pandemic's impact to the lowest possible expression. A word that was almost taboo only a year ago, e-learning, has by now become a well-nigh miraculous instrument, demonstrating a huge but challenge-strewn potential. These challenges have tested the mettle of our systems but also honed our ability to come up with imaginative solutions. I have no doubt that this ability will be further tested and proved into the future.

Maybe this future will give birth to new educational paradigms, bringing in different learning models (driven by new tools), but right now we need people who are committed to the ongoing training work. After all, training is without doubt an essential activity for any organization like ours that is always on the lookout for even bigger challenges.

And it turns out, paradoxically, that teaching is one of the best ways of learning too.

Diego José Fuentes Gil

Software Engineer

I joined the community of trainers because I wanted there to be a new course in GMV's catalogue dealing with my own interest, agile methodologies, and helping other GMV software developers to understand it.

Once my first chance of giving a course came, I realized I really enjoyed the task of passing on knowledge and felt very comfortable in the role.

As a trainer it strikes me as crucial to involve all participants in the matter being dealt with for the whole time the course lasts. I usually ask many questions about the issues being dealt with and try to whip up a lively debate. I also put forward my own doubts, a practice that helps to clear up many questions and suggest new ones to be solved.

Under the current pandemic online tools have come into their own. A sad side effect of this might be less active involvement by participants, who might, under cover of the distance, be tempted to partly switch off and follow the course in name only while doing something else.

It is very important to prepare activities that encourage active, distance-spanning participation, using all types of online tools such as questionnaires or surveys, shared whiteboards, dashboards, etc. This a great way to get participants involved in the course contents on a continuous basis and prevent them from losing interest in the matters being dealt with.

If any colleague is thinking of becoming a trainer, my tip would be to do so with the greatest zeal and enthusiasm, and try to pass this on to course-goers.

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