

**2023**

**A N N U A L R E P O R T**

# CONTENT

Interview with Michael Neisen	04
Interviews with the ASAP Group's Management	10
Facts   Figures   Data	24
<b>Highlights 2023</b>	<b>26</b>
HCLTech acquires the ASAP Group	28
Interview with Hari Sadarahalli	30
ASAP Group receives German Innovation Award	34
New Managing Director for the ASAP Group's Wolfsburg site	38
New COO for division Software	40
<b>Innovation Corner</b>	<b>42</b>
ALM-Tool Codebeamer	44
ASAP Group confirmed as a member of the PTC Partner Network	50
New methods for functional validation of exterior lighting	54
Complete-Vehicle Validation	62
Integrated functional development for e-mobility	68
Machine learning-based anomaly detection	72
Sustainability Consulting	76
ASAP and the future of testing	80
Test and Validation Centre - Facts   Figures   Data	82
<b>News</b>	<b>84</b>
ASAP Group celebrates Munich site expansion	86
ASAP expands in Ingolstadt	90
Award-winning	92
Certified	96
Imprint	98



Michael Neisen, CEO of the ASAP Group

# INTERVIEW

## 2023 FOR THE ASAP GROUP

### How would you summarise 2023 for the ASAP Group?

*„The year 2023 saw the most significant transformation in the history of our company.“*

In HCLTech, the ASAP Group now has a new shareholder with a 100% stake. Upon successful closing on 1 September 2023, the

ASAP Group was officially integrated into HCLTech. In the future, we will have a world leader in the field of technology and IT services by our side as our parent company. Another particularly noteworthy aspect of the 2023 business year is that we were able to continue on our planned growth path despite the difficult market situation, especially for system suppliers. Alongside very successful customer projects and the

outstanding position they put us in with our customers, we have also advanced our company's internal development over the last year. This included projects on topics such as company culture, employer value proposition, employer branding, digitalisation and project management. We also focused on fostering even closer connections between our specialist divisions. This included appointing additional division heads. We are also delighted about the numerous employer, business and innovation awards, including Top Employer, Leading Employer and Top Innovator, that we received again last year. In addition, at the end of Q3, we saw the first generational change in the company's management. After ten successful years as Managing Director of ASAP Engineering GmbH Wolfsburg, Thomas Martens stepped down from his role on 30 September 2023. At this point, I would like to thank Thomas once more for his tireless commitment and wish him the very best for the future. He is succeeded by Gernot Joswig, who I hope will enjoy just as much success as the new Managing Director of our Wolfsburg location.

### In your view, what were the ASAP Group's highlights in 2023?

To explain the biggest highlight of 2023, I need to take a brief trip back to 2022 – which is when we launched the M&A process for the sale of 35% of the shares in

the ASAP Group. At the start of Q2 last year, we narrowed down the list of potential buyers and held intensive negotiations. Ultimately, all shareholders decided to sell their shells, which led to us signing the agreement with HCLTech in June.

*„Closing the M&A transaction was a particular highlight, not just for the ASAP Group but for me personally. I joined ASAP as Managing Partner on 1 September 2009 and on the anniversary of that date, on 1 September 2023, we became a fully owned subsidiary of HCLTech.“*

There were also several highlights in our five divisions. For example, we further expanded our capacities, especially in our Electrics/Electronics and Software division, and further refined our focus on the topic of the software-defined vehicle. We also integrated additional division directors for these topics into our organisational structure and, at the end of the year, Marcus Hiller became an additional COO, responsible for the Software division and one of our key accounts, CARIAD. At this juncture, I would also like to underline the very positive economic development of our Vehicle Engineering activities.

*„We have also been able to expand our customer portfolio once again across all divisions. The closer specialist connections I mentioned earlier, and*



*the fact they facilitate mutual, cross-location support within the ASAP Group, also represent a key milestone in the last year.“*

I was also particularly pleased that we again implemented several insights in targeted projects and measures arising from workshops in our cultural initiative “Better Together”. This also included redesigning our new offices in Munich and Stuttgart in line with the novel ‘Made for New Work’ concept, creating a real sense of well-being.

**Since the successful closing of the M&A transaction, the ASAP Group has been part of HCLTech. To what degree do the two companies complement each other and what are the benefits of ASAP’s integration into HCLTech?**

*„The merger offers very clear benefits for both HCLTech and for the ASAP Group. For one thing, HCLTech benefits from our strong position in the automotive industry and our outstanding access to customers in Germany.“*

For another, by integrating the ASAP Group, HCLTech has expanded its resources with additional 1,700 highly qualified employees and an experienced management team. This means that HCLTech simultaneously expands its abilities with our expertise and gains a local presence in Germany. The benefits for the ASAP Group include access to a scalable, global pool of talented minds,

additional service offerings and an extensive partner network (specialising in cloud computing, semiconductors, ISVs, etc.). Furthermore, we can access the cross-sectoral experience of HCLTech, which extends far beyond the automotive industry, and operate as part of a financially strong corporate group as a fully owned subsidiary of HCLTech. The expertise of ASAP and HCLTech complement each other perfectly, so we can also significantly expand our service portfolio and implement even more extensive projects in the future. There are also benefits for our employees, who will have the opportunity to work on even larger projects in the future and draw on state-of-the-art technologies from HCLTech. It has also considerably broadened the horizons of career paths within the ASAP Group. Our affiliation with HCLTech, a global engineering and service provider, will also give our employees the opportunity to work at locations around the world and in other industries. At the same time, our new shareholder will not make any changes to our customary operations at ASAP, while the future stability of the corporate group is ensured.

*„In the end, of course, the merger of ASAP and HCLTech will also benefit our customers. Thanks to our new shareholder, our customers gain access to a scalable, global pool of expertise and resources along with the ability to implement projects even more cost-efficiently.“*



Another benefit for our customers is that we are now part of a technology-driven network of partners and, by expanding our competencies and capacities, can provide end-to-end services – including IT and engineering services.

**Will the ASAP Group and its existing divisions retain their independence in the future? Or should we now expect a strategic and structural realignment?**

*„The ASAP Group will remain fully autonomous as a subsidiary of*

*HCLTech – and its jobs, the ASAP brand and its internal structures will all be fully retained.“*

Although there will be no changes induced by HCLTech, we will continue our ongoing evolution to ensure that we can adapt to prevailing market requirements and operate successfully on the market. This is why, in the last year, we once again focused on increased networking between our divisions, as ASAP develops from a location-oriented company to an organisation focused on specific technological fields.





**How would you describe the initial months of the cooperation between HCLTech and the ASAP Group?**

*„The cooperation to date has been smooth and very positively received by our employees. We have communicated as equals, with both sides demonstrating the necessary understanding and appreciation for the other. It has also been very pleasing to see that our shared goals are already firmly anchored in the thoughts and actions of HCLTech and ASAP.“*

Joint visits to our main sites and a town hall meeting shortly after the closing have contributed to this, with members of HCLTech and ASAP management standing together to inform all employees about the background to the M&A transaction and our objectives and activities moving forward. There was also an intensive process of getting to know one another – on both personal and technical levels – which will continue in the coming year through a range of workshops and webinars intended to facilitate an exchange of expertise. In the initial months of our cooperation, we have also engaged in an array of successful strategic workshops on

marketing strategy, sales and technology transfers. In addition, we have drawn up marketing and sales materials on ASAP and HCLTech's combined service portfolio. We have already received extensive enquiries and issued joint project proposals.

**Are you able to give us an idea of what is to come over the next few years? What is the vision for the ASAP Group over the next five years?**

*„We have a clear vision for the ASAP Group – a new, shared objective in partnership with HCLTech: ASAP*

*will remain an autonomous corporate group, acting as HCLTech's automotive engineering headquarters in Germany.“*

In the years ahead, we will concentrate more heavily on the internationalisation of ASAP, including by integrating HCLTech's nearshore and offshore capacities into our projects. In conjunction with this, we also hope to expand our customer penetration, both domestically and, in the future, abroad. I'm certain that we can achieve these goals because, thanks to our clear focus on automotive industry megatrends, we are in an excellent position and will further enhance our service offering in the future. We will therefore continue to expand our services in relation to key trends in automotive technology, such as connectivity, e-mobility and autonomous driving, with a particular focus on the topic of the software-defined vehicle. Furthermore, we will foster even closer connections between ASAP's divisions in order to leverage synergies more effectively. Establishing joint service sectors with HCLTech will also be a focus in the years ahead.

*„In summary, looking to the years ahead, the ASAP Group will remain autonomous, our competencies and capacities will be supplemented by HCLTech, and ASAP will develop to become a leading international player in the automotive engineering sector.“*





# INTERVIEW

## THE ASAP GROUP'S MANAGEMENT REFLECTS AND LOOKS AHEAD

An interview with members of the ASAP Group's management team, covering the events and highlights of 2023 as well as the developments and issues that await us in the years ahead.





Robert Morgner

**Robert Morgner, CFO of the ASAP Group:**

The year 2023 was not an easy one for the automotive industry as a whole. Automated driving, software-defined vehicles and e-mobility are just a few of the technological challenges facing our customers at present. At the same time, the shortage of skilled

workers has become even more acute and the general economic conditions have not eased. It has been clear since the Shanghai Auto Show that Chinese manufacturers now have a good handle on some of these new technologies and therefore represent direct competition on the global market. On the supplier side, the technological transforma-

tion and SOP delays have thrown up massive economic challenges. Thanks to its focus on Electrics/Electronics, Software and E-Mobility, the ASAP Group is part of the automotive transformation and therefore finds itself in an excellent position to help its customers overcome these challenges. Despite the difficult conditions, we once again recorded considerably higher growth than the overall market in 2023. In total, we achieved growth of approx. 15% on the previous year.

Of course, the ASAP Group's 2023 business was shaped to a significant extent by its acquisition by HCLTech. We believe that HCL's shareholding in our company has considerably strengthened our market position. With HCLTech as our partner, we will be able to supply our products internationally and take advantage of global nearshoring and offshoring. This translates to enormous advantages for our customers: enhanced scalability and greater competitive power with ASAP's established quality. Our integration into HCLTech also presents exciting prospects for our employees, because it will enable us to offer specialist, project-specific and management career opportunities in an increasingly international context.

In 2023, we more than compensated for declining sales in certain customer segments with strong growth in other areas. Despite the considerable challenges of the economic landscape, we once again achieved excellent growth and also wel-

comed over 400 new employees to ASAP. By intensifying our focus on our five divisions, we were able to offer our customers more deeply integrated services while also responding flexibly to new requirements.

When it comes to employee satisfaction, we once again achieved ratings well above the industry average on relevant portals in 2023. Our employee survey painted a similar picture: despite the dynamic changes and challenges of the 2023 business year, we further improved our survey outcomes across all areas – and once again achieved further outstanding results. Although the pressure from our customers to cut costs and drive the transformation is likely to further exacerbate the economic conditions in 2024, we expect it to be another very positive year for the ASAP Group. We currently expect to grow even faster in 2024. We believe we will have good opportunities to further expand our customer base through our technologically attractive yet economically competitive service offering. Ultimately, with HCLTech by our side, we will continue to refine our technological expertise while also driving forward our use of nearshore and offshore resources. This will enable us to make significant progress as a company, both in terms of our services and through rapid scalability. At the same time, however, we will continue to grow our workforce, especially in our core areas of Electrics/Electronics, Software and E-Mobility.



**Robert Werner, Managing Director of ASAP Engineering GmbH Ingolstadt and ASAP Electronics GmbH:**

For ASAP Electronics GmbH in Munich, 2023 was a year of successes. We achieved our growth targets, thereby demonstrating our sustainable development and stability. Our results have vindicated our strategy and confirmed our company's continued positive momentum, even if we were unable to exceed our targets by the same amount as in 2022. This was due to the very challenging economic environment, especially in the second half of the year. The transformation underway at our OEM customers – moving away from combustion engines to electric, digital, networked vehicles – means that development budgets are subject to growing pressures.

Overall, however, the business year was very positive across all divisions. This applies in particular to our wire harness development activities, where we achieved excellent results. Our customers integrated us in all relevant wire harness-related projects at both our Munich and Ingolstadt sites. Our success in securing new projects has confirmed that integrating Sigl Bordnetz Design GmbH into the ASAP Group in 2022 was the right move. Our new employees have contributed and been integrated wonderfully, becoming part of the company's everyday reality. We have also recorded consistently high orders in the Electrics/Electronics division. The Automotive Test Suite was a highlight project in this

regard. In a large-scale project focusing on series production support and development in relation to central vehicle infrastructure, we further solidified our ties to the customer and deepened our expertise in hardware and control units.

One notable development was the move to our new offices at Weimarer Strasse 32 in Munich. The 'Made for New Work' concept – based on our Better Together cultural initiative – offers innovative solutions for the demands of a hybrid working world. Not only do our new premises provide more space, they also feature co-working spaces, quiet areas and spaces that foster informal meetings. These new working environments reflect our adaptability and our commitment to modern working methods. This relocation and the new office concept provided the perfect platform for our in-house exhibition, which took place in the autumn of 2023. It gave us the opportunity to show off our new offices – and our comprehensive service spectrum – to our customers and partners. The positive feedback and the new contacts we gained, especially from representatives of our main client in Munich, were clear indicators of the event's success.

The entire ASAP Group can expect 2024 to be an eventful year. Our new parent company, HCLTech, is sure to bring a number of exciting challenges. The internationality and extensive service spectrum of HCLTech complement ASAP wonderfully and provide the perfect foundation for even more expansive



Robert Werner

projects across all divisions. We will create strong synergies between the two companies and have the ability to draw on the various resources of a corporation operating on an international scale. This will require us to intensify our cooperation and grow even closer together. In recent weeks, we have already re-

ceived large-scale enquiries – including from HCLTech's Sales department – which we now have to convert into new projects. Our incorporation into HCLTech will present a host of new opportunities and I'm looking forward to shaping the future of ASAP together with our new partner.



Christian Schweiger

**Christian Schweiger, Managing Director of ASAP Electronics GmbH and ASAP Engineering GmbH Ingolstadt:**

Just like previous years, 2023 was a very successful business year overall for our ASAP site in Ingolstadt. Yet, this success was combined with considerable stresses

because, in addition to the challenging circumstances in the world economy as a whole, the automotive industry is facing its own particular challenges. Our industry – including OEM customers and system suppliers – is currently undergoing a transformation of unprecedented scale. With this in mind, expediting the diversification of our

customer pool, especially for our Test and Validation Centre, was a key focus in 2023. However, the defining event of the business year was undoubtedly the acquisition of ASAP by HCLTech. This will open up a host of new opportunities for us, especially regarding further diversification of our customer pool – through our newly gained internationality and our improved competitive standing through increased ease integrating BCC resources into our projects. Over the last few months, we have also made considerable advances in terms of cross-location cooperation within the ASAP Group. We have made real progress on this, especially in our Software division; this has allowed us to compensate for project postponements at other sites by deploying employees in projects at our Ingolstadt site.

Turning to the highlights of 2023, I'd firstly like to mention the A-SPIICE Level 2 audit of our Software Development activities, which we completed relatively swiftly – an excellent achievement. We also secured a number of new, long-term projects from an automotive software manufacturer and further consolidated our position with the customer. In connection with that, we have also expanded the lab spaces at our Ingolstadt site – which we need to validate advanced driver-assistance systems for autonomous driving – by a further 1,300 square metres. In addition to Software Development, we've also increased the variety of projects in our

Electrics/Electronics and Consulting & Service divisions. It was particularly pleasing to conclude strategically important framework agreements for our Test Systems division and three extensive framework agreements for our Communication Service, comprising two OEM customers and one automotive software manufacturer. Particular highlights at our Ingolstadt site included a series of employee events throughout the year, which focused on interdepartmental networking and fostering a sense of community. In addition to our ever-popular summer party and legendary Christmas party, we also held two after-work events for almost 600 attendees, both of which were well received and brought people together.

I expect that the year 2024 will be no less exciting than the last: we will still be forced to contend with a challenging market environment, as our customers remain subject to enormous cost pressures as the transformation continues. Suppliers are particularly hard hit. Having said that, I think the current situation also offers plenty of opportunities for ASAP because we are extremely well positioned in sought-after areas – the software-defined vehicle, autonomous driving, e-mobility, electrics and electronics. What's more, our new partner HCLTech will generate new potential for growth, both domestically and abroad. So, I expect 2024 to be yet another very positive business year for the ASAP Group.



**Gernot Joswig, Managing Director of ASAP Engineering GmbH Wolfsburg:**

I joined the ASAP Group as CTO in 2023. This valuable period of finding my feet and the opportunity to network within the company now helps me a great deal in my day-to-day work. Since July, I've been Managing Director of ASAP Engineering GmbH Wolfsburg. We almost achieved the targets we set for 2023. Our Wolfsburg site was heavily impacted by very challenging economic conditions – including the prolonged chip shortage, other after-effects of the pandemic, very fragile supply chains and delays to project start dates. However, thanks to our integration into HCLTech, we enjoyed a number of new opportunities towards the end of 2023. Our new partner will enable us to process end-to-end orders more easily in future and work across different trades. Given that projects are awarded with increasingly broad scope, this creates excellent conditions for the future of the entire ASAP Group. In my view, one particular highlight of the last year is ASAP's developments in connection with the application lifecycle management (ALM) tool Codebeamer. For example, we became a member of the PTC Partner Network in 2023, which has consolidated our extensive expertise in relation to Codebeamer and made us a Preferred Partner in the DACH region for all services related to the ALM tool's implementation. We're already contributing to Codebeamer projects for one of our key clients, working Group-wide. Our expertise and

capacities in this area mean we're in an ideal position to achieve further growth – not only in Wolfsburg but throughout the entire ASAP Group. We will also expand our Codebeamer-related services through our cooperation with HCLTech, so I see this as a vital growth area for ASAP. In addition, we celebrated a number of successes, especially in Q4 of 2023. Our increased visibility through our new partner HCLTech has already yielded results: we've received wide-ranging enquiries about long-term, extremely extensive end-to-end projects, including in relation to vehicle commissioning.

Over the next few months, we can expect the market environment to remain challenging and, given the global economic situation, extremely volatile. Nevertheless, I expect that our Wolfsburg site will enjoy a robust order backlog with extensive projects along with a host of new opportunities through our cooperation with HCLTech.

Our Battery Test Centre and Environmental Simulation division are already well on the way to filling their order book for all of 2024. In the Electrics/Electronics division we will focus on leveraging further synergies across the entire ASAP Group.

We laid important foundations for this in late 2023 by appointing two new division heads. We expect there will be more highlights in store in relation to Codebeamer and in our Software division, having secured our A-SPICE certification in a relatively short time. Furthermore, we commenced a major



Gernot Joswig

functional development project in 2023. The customer has been delighted with our work so far and has already outlined follow-up projects. I'm particularly looking forward to the open-house event we have planned for

our customers and partners. The idea for this came from the Sales Management team at one of our OEM customers, who were thrilled with our service portfolio and suggested showcasing it on a larger scale.





Martin Ott

**Martin Ott, Managing Director of ASAP Engineering GmbH Stuttgart, ASAP Engineering GmbH Lake Constance:**

Our sites in Baden-Württemberg achieved their targets for 2023 despite being forced to overcome growing challenges, with our customers still in the midst of a fundamental transformation.

In addition to new technologies and services, our customers must also develop product campaigns and either modernise or rebuild their production facilities. This involves considerable up-front investment. There is also instability in some key supply chains, demand-driven markets have been weaker than forecast and new competitors are imposing themselves on global markets. This

complicated and challenging overall picture means that our customers are considering more carefully than ever the areas in which they are willing – and able – to move forward with development projects. With this in mind, we have continued to see the trend towards large-scale projects over the last year, which promise to deliver both synergies and efficiency gains.

The ASAP Group, however, is in an excellent position to cope with this industry transformation and the rapid rise in cost pressures. Despite challenging conditions, we once again recorded a successful business year in 2023. We successfully offset postponements of projects for our key customers, some at very short notice, with new customers and projects. However, some of our employees have also been integrated into ongoing, cross-location projects, which has allowed us to minimise the economic impacts. Today, our specialist divisions operate very independently of individual sites in their projects, which I'm sure will give us a decisive competitive advantage. We will continue to cultivate this advantage in 2024 and consolidate the organisational structure of our specialist divisions.

This year, I'd like to highlight our component development activities at our Neckarsulm site. From concept development and design to component manufacturing with external partners to assembly and commissioning, we effectively offer end-to-end services for the model initiative of one of our OEM customers.

In terms of projects, 2023 was another very intensive year for our employees – and one customer has been so pleased with our work that they have signed a multi-year framework agreement with us. Also worthy of mention is the continued expansion of our activities in our Software and Electronics/ Electronics division at our Weissach site. We increased our order volumes from our OEM customers and also secured a new Tier 1 customer. I think there is even greater potential to grow in 2024, which is why we have repositioned ourselves for the year ahead. Besides additional management staff, we have also appointed two E/E division heads in the ASAP Group to lay the foundations for a truly comprehensive service offering, increased use of best-cost methods and, consequently, optimised resource management.

Finally, another highlight for me was moving into our new premises in Leonberg, which means we are closer to Stuttgart and in a more central location for our customers. Doubling the space available to us has not only laid the foundations for further growth, it has also created a new ASAP home base with a real feel-good atmosphere. Although the prevailing economic conditions remain challenging, I believe that our locations in Baden-Württemberg – and the ASAP Group as a whole – have huge potential to grow in the years ahead. Together with HCLTech, we will continue to develop our specialist areas and our capacities even faster than before. Our new shareholder will

make it easier for us to integrate nearshore and BCC capacities into our projects in the future and thereby offer comprehensive, global solutions. This will put us in an even better position to handle large-scale projects for our customers. Our five comprehensive, customer-oriented divisions, which are complemented wonderfully by the expertise and global service provision abilities of our new parent company, will further enhance our performance capabilities and make us even more competitive as a result.

**Volker Schier, Managing Director of ASAP Engineering GmbH Rhine-Main:**

At first, there seemed to be few good omens for the 2023 business year at ASAP's Rhine-Main site: many projects had come to a close towards in late 2022, which presented considerable challenges for us at the start of the year. It is all the more pleasing, then, that we not only achieved our growth targets for 2023 but even exceeded them. We surpassed our targets for the last year in every area, without exception. In 2023, we once again focused on continuing to drive forward Group-wide cooperation in the context of our ASAP 2025 strategic project, in particular expanding our capacities in our Electrics/Electronics and Software divisions. We have made significant progress on this issue. We've consolidated our newly established Software and Electrics/Electronics teams at our Rhine-Main site – which provide cross-support for the entire ASAP Group. Our plan of utilising the Rhine-Main labour

market to supplement our Software and Electrics/Electronics divisions has proven successful, so we'll continue to advance this in future. In this context, we have already established excellent links with universities in the Rhine-Main region.

At this point, I'd like to take this opportunity to highlight the fact that we secured a huge number of smaller-scale projects from suppliers across all manner of services. By successfully realising these projects, we transformed a business year that began with a gloomy outlook into a success for our location. I think that our Better Together cultural initiative has been another highlight. Over the last year, we've implemented a number of measures as part of this initiative, bringing the ASAP spirit to life for all the new employees at our site who spend a lot of time working remotely or providing support throughout the Group. For our Rhine-Main location, where a considerable proportion of employees work fully remotely, the cultural initiative represents an important building block in ensuring that employees feel connected and collaborate smoothly, wherever they are.

The market environment will continue to present us with challenges in 2024 – especially because many of our customers at ASAP Engineering GmbH Rhine-Main are suppliers subject to enormous cost pressures. With this in mind, I expect a subdued start to the new year; we must focus all our efforts on continuing to utilise our full capacity across all areas. Nevertheless,



Volker Schier

I expect 2024 to be a positive year overall, as the ASAP Group's integration into HCLTech will offer us plenty of new opportunities in the future. For example, with HCLTech as our shareholder, we have excellent opportunities to operate on a global scale. With this in mind, I would describe the prospects for our location in the Rhine-Main region – where

numerous global suppliers are based – as very positive. Together with HCLTech, we will be able to further expand our existing network. Through easier access to nearshore and offshore resources, we will also be able to scale up more rapidly and handle projects of even larger scope.

# 2023

## FACTS | FIGURES | DATA

people employed by the corporate group across 9 locations.

# 1,700



# 171 Mio. Euro

turnover recorded by the ASAP Group in 2023.

of the added value was generated by ASAP employees in mobile working.

# 28 %



# 26.5 %



average annual growth in the ASAP Group since 2010.

# 11



employer, business, innovation and SME awards were received by the ASAP Group in 2023.

# 7



time in succession, the ASAP Group has been named a leading innovator among medium-sized enterprises in Germany.

# 38



nationalities are represented within the ASAP Group's workforce.

# 19



the ASAP Group's position on the Automobilwoche ranking of the 25 development service providers with the highest global turnover.

# 30,408



hours of professional development activities completed by ASAP employees in 2023.

# 100 %

subsidiary of HCLTech.



# HIGHLIGHTS 2023



# HCLTech ACQUIRES THE ASAP GROUP

## MERGER ENABLES FURTHER EXPANSION OF THE RANGE OF SERVICES AND USE OF A GLOBAL PRESENCE

HCLTech, a leading global technology company, and ASAP Group, an automotive engineering services provider, have signed a definitive agreement under which HCLTech acquires 100 percent equity stake in ASAP Group. The transaction was approved by the competent authorities and was successfully closed on 31 August 2023. A global leader in technology and IT services, HCLTech has over 223,438 employees in 60 countries. With this acquisition, HCLTech is following

its strategy of strengthening its competencies in the field of engineering services for the automotive industry and expanding the company's presence in Germany and Europe. In the future, both companies will combine their know-how to offer customers an even wider range of services – especially in the areas of e-mobility, ADAS/AD and software-defined vehicle. The ASAP Group will continue to operate as an independent, wholly-owned subsidiary of HCLTech.

“Core engineering is at the heart of HCLTech’s DNA and truly differentiates our services portfolio. ASAP has developed some exciting capabilities in automotive engineering, and we share their vision for future of mobility. This agreement will enable us to scale these capabilities and innovations across our global network,” said Hari Sadarahalli, Corporate Vice President, Engineering and R&D Services, HCLTech. “This investment also reinforces our commitment to Germany, which is a focus market for us. We will continue to nurture local talent and innovation ecosystem to unlock their potential.”

“We are delighted to align our growth journey with HCLTech’s purpose of bringing together the best of technology and people to supercharge progress for all stakeholders,” said Michael Neisen, CEO at the ASAP Group. “We are confident that the combi-

nation of HCLTech and ASAP’s engineering and technology performance will bring best-in-class advantages to the automotive industry worldwide.”

### About HCLTech

HCLTech is a global technology company, home to more than 223,438 people across 60 countries, delivering industry-leading capabilities centered around digital, engineering, cloud and AI, powered by a broad portfolio of technology services and products. HCLTech works with clients across all major verticals, providing industry solutions for Financial Services, Manufacturing, Life Sciences and Healthcare, Technology and Services, Telecom and Media, Retail and CPG, and Public Services. Consolidated revenues as of 12 months ending June 2023 totaled \$12.8 billion.





Hari Sadarahalli, Corporate Vice President HCLTech

## INTERVIEW

### HARI SADARAHALLI, CORPORATE VICE PRESIDENT HCLTech

**How did the integration of the ASAP Group into HCLTech come about and why did you choose the ASAP Group for a strategic acquisition?**

Our decision to acquire ASAP is a strategic move aimed at boosting HCLTech's global leadership in engineering services. We want to further expand our advanced technology

capabilities and expertise in the fast-growing automotive engineering services segment in Europe and other key global markets. We were looking for a company that shares our vision of mobility and complements our growth strategies in the future-oriented automotive technologies covering advanced driver-assistance systems (ADAS), autonomous driving (AD),

electrification and connected mobility. The integration of ASAP strengthens our presence and consolidates our relationship with the leading manufacturers and players in the automotive industry. By combining our strengths, we can offer a more comprehensive and differentiated service portfolio. This development is an important step in our expansion in Europe and especially in Germany. We are convinced that this will enable us to meet our customers' requirements even better and significantly expand our market presence.

**What do you see as the particular strengths of the ASAP Group? What are the future advantages of combining the strengths of HCLTech and ASAP?**

The integration of HCLTech and ASAP presents a remarkable combination of strengths across crucial areas covering the entire spectrum of automotive engineering. ASAP has extensive expertise in ADAS/AD and electrification. Within the V-model of software and product development in the automotive industry, ASAP plays a decisive role in integration and validation. This position perfectly complements HCLTech's expertise in the left-hand side of the V-model. This synergistic collaboration allows ASAP to draw on HCLTech's extensive international resources and broad range of talents, strengthening and optimizing capabilities across the entire product development value chain.

**Why is it important for HCLTech to maintain the independence of the ASAP Group with its existing range of services?**

It is crucial to preserve ASAP's independence due to several key factors. ASAP has established a strong foothold in the German market, rooted in valuable relationships built with key automotive customers. Their local business approach, particularly their independent delivery centers for key customers, including leading global OEMs, is pivotal in navigating the nuances of German business culture. Moreover, ASAP has some of the best HR practices, characterized by industry-leading processes, systems, flexibility and agility. Before integrating them into the larger HCLTech, we intend to leverage and learn their unique processes and systems. We wish to understand the culture, customers and employees and uphold the value that ASAP has created over the years.

**What are the next joint steps after the successful closing? On which topics and projects will the focus be in the coming months?**

Following our successful integration, our immediate priority revolves around sustaining the growth momentum within the organization. Our subsequent steps involve leveraging the synergy between the two companies for mutual benefits. This would entail facilitating the exchange of capabilities – bringing ASAP capabilities to HCLTech



customers and vice versa, particularly emphasizing the critical HCLTech software capabilities to the ASAP customers. We intend to integrate our digital capabilities to ASAP and their customer base.

In conclusion, our strategic synergies will be concentrated on maintaining growth, optimizing efficiencies, establishing efficient teams, integrating capabilities, and emphasizing specific technological domains such as ADAS systems, autonomous driving and electromobility.

#### **HCLTech and the ASAP Group in five years – what is your vision for the two companies?**

HCLTech has a very expansive vision of growing its automotive business, especially in engineering services. Our aim is global expansion and ensuring an exponential growth trajectory. Through this integration, our goal is to significantly enhance our automotive capabilities, aiming to double our existing automotive capabilities within ASAP and HCLTech within a defined timeframe. Our high-level vision includes positioning HCLTech and ASAP as prominent players in the automotive engineering services market. For this, we envision a robust roadmap that focuses on bringing the people, leadership, processes, systems and infrastructure to establish a substantially large presence in automotive engineering services.

#### **Finally, a personal question: The people of the ASAP Group are united by their passion**



#### **for cars. What is your personal passion for the automobile?**

As an automotive engineering professional deeply involved in managing this space, my passion for cars and evolving technology has been a driving force throughout my career. From the start of my career, I have always aspired to establish a large automotive engineering company. I have always considered the German automotive companies as benchmarks in this sector and this integration provides an exciting opportunity to realize my dream, unlocking access to

the best of the automotive companies and technologies in Europe, especially Germany. For me, ASAP represents a channel to develop one of the finest automotive engineering companies. This endeavor aligns with HCLTech's vision and my personal passion for automotive. I could not have asked for anything better than this.

As a proud owner of German cars, I believe that today, a car is not just about styling, but is an embodiment of cutting-edge technologies. There is technology for safety, performance, comfort and entertainment –

all integrated into modern automotive design, catering to drivers, passengers and pedestrians.

I believe we are fortunate to be in this space and to be in the midst of the huge amount of transformation happening in the automotive world. It is a privilege to be associated with this transformative journey. It is crucial to contribute to making this sector green and sustainable. Driving the technology revolution more responsibly in this evolving landscape is also part of my ambition.



# ASAP GROUP RECEIVES GERMAN INNOVATION AWARD

## ACCOLADE RECOGNISES PROCESS AUTOMATION KIT (PAK) AUTOMATION SOLUTION

The ASAP Group was among the winners of the German Innovation Award 2023. The development partner to the automotive industry impressed the jury with its Process Automation Kit (PAK), an individually scalable automation solution. ASAP's outstanding innovative achievement was recognised in the "Excellence in Business to Business – Automotive

Technologies" category. The framework developed by ASAP facilitates individual, reusable automations and represents a useful addition to conventional DevOps practices. The automation solution demonstrably reduces the complexity, time and costs of development while improving developer acceptance and quality.



GERMAN  
INNO  
VATION  
AWARD '23  
SPECIAL





The German Innovation Award recognises products and solutions across different industries which set themselves apart from existing solutions through their user-centred design and added value. With this in mind, it is hardly surprising that the ASAP Group's Process Automation Kit (PAK) was recognised at the German Innovation Award ceremony on 23 May 2023. Crucially,

the PAK comes into play where comparable automation solutions reach their limits, shifting the focus in the DevOps pipeline onto the developer. This individually scalable automation solution's modular system concept makes it possible to define and automate development steps for specific developer roles and reuse these later for other processes. The PAK guides deve-

lopers through their work, reducing the burden on them and thus creating more time for creative, value-adding work and improving employee satisfaction. "Our automation solution comes into play where comparable solutions reach their limits – at the developer level," explained Sebastian Heinemann, Head of Software at the ASAP Group. "The PAK makes it possible to map complex PMT in organisations and their projects at the developer level, automate it wherever possible and focus on the people in the DevOps pipeline. The PAK is therefore a suitable solution for any DevOps-based organisation – and organisations looking to implement DevOps – as a useful addition to their automation pipeline. The German Innovation Award is confirmation that we have generated real added value for users with the PAK."

#### **PAK: Proven in practice**

In fact, the original solution for fully automated development has already been in use in functional and software development at an OEM for ten years. Based on these requirements and insights from productive use, ASAP fundamentally redesigned the PAK with state-of-the-art technologies from the DevOps landscape. Let's look at an example that shows the potential time savings through use of the PAK – and therefore the potential to cut development costs. Ten years ago, before any automation had been introduced, the entire field of function and software development at an OEM took

around six working days in total to achieve a new stage of integration. This meant the OEM could achieve around 50 stages of integration per year. Today, progress moves at around 1,000 stages of integration a year, with a developer only needing a maximum of 1.5 hours for each stage – as the rest is fully automated. Yet, despite this twenty-fold increase in integration stages per year, the number of developers – and therefore the development costs – have remained stable.

#### **Der German Innovation Award**

The German Design Council (Rat für Formgebung) presents the German Innovation Award to companies in recognition of their outstanding use of new, pioneering technologies, methods and services. Under the motto 'Shaping Futures', the award encourages applications from companies across all industries implementing change processes that generate value for society, the environment and the economy. The German Innovation Award honours new developments that demonstrably deliver improvements for users. The submissions were examined by an interdisciplinary jury with expertise in various fields. The German Design Council was established by the German Bundestag in 1953 and is sponsored by German industry. It is committed to helping German companies enhance their competitive position and presents awards internationally in recognition of outstanding design, brand and innovation achievements.



# NEW MANAGING DIRECTOR FOR THE ASAP GROUP'S WOLFSBURG SITE

## THOMAS MARTENS HANDS OVER TO GERNOT JOSWIG

Gernot Joswig, 49, joins the ASAP Group's management team as Managing Director of ASAP's Wolfsburg location with immediate effect. Joswig will initially oversee the site's management alongside Thomas Martens, 58, Managing Director of ASAP Engineering

GmbH Wolfsburg. At the end of the year, Martens will step down after over a decade of success as Managing Director of the ASAP Group's Wolfsburg site, to devote more time to his private life.

Under Thomas Martens, who has headed up ASAP Engineering GmbH Wolfsburg since January 2013, the site's workforce has grown from 20 to 350, making it one of the largest in the ASAP Group today. ASAP has continuously expanded its service offering under Martens' leadership, adapting its portfolio to current market requirements without ever losing sight of customer requirements. In the future, Gernot Joswig – who joined the ASAP Group as CTO on 16 January 2023 – will be responsible for driving forward these developments as Managing Director, initially working alongside Martens. Intensive preparations have been underway for the change in leadership. In his position as CTO, Gernot Joswig has had the opportunity to engage extensively with the technological and strategic direction of the ASAP Group over recent months, and especially that of ASAP Engineering GmbH Wolfsburg. Until Thomas Martens departs, Gernot Joswig will primarily take responsibility for operational aspects of Electrics/Electronics and Software Development. Thomas Martens will hand all other responsibilities over to Gernot Joswig in the coming months. "I look back with pride on the development of ASAP's Wolfsburg location and that of the entire ASAP Group in recent years; I consider myself fortunate to have been able to accompany and drive forward this development," says Thomas Martens. "I look forward to continuing to work with Gernot Joswig in the months ahead and wish him every success in his new position as Managing Director."

Gernot Joswig has over 30 years' experience working in IT, of which more than 20 years has been in the automotive industry. In his career to date, he has founded and managed two IT/engineering companies. Joswig co-founded ITConcepts Automotive GmbH and served most recently as its managing partner following the company's sale. "The development and growth of the ASAP Group since its foundation is impressive. I want to do my part in ensuring that ASAP's success story continues," says Joswig. "I've already been able to get to know many of my new colleagues at ASAP's locations and I very much look forward to working together and tackling this new challenge."







## NEW COO FOR DIVISION SOFTWARE

### MARCUS HILLER STRENGTHENS THE ASAP GROUP AS COO

On 1 November 2023, Marcus Hiller joined the ASAP Group as Chief Operating Officer (COO). In his new role, Hiller is responsible for a key account, CARIAD, as well as the

areas of software and IT services, reporting directly to Michael Neisen, CEO of the ASAP Group.

After studying automotive engineering and mechanical engineering with computer science at Ulm and Esslingen University of Applied Sciences, Marcus Hiller started his career at a company specialising in automation solutions, where he ultimately headed up a business unit. After ten years at that enterprise, he moved to a new position at a development service provider, where he played a significant role in the company's development for over two decades – initially as a team leader and later as managing director. He managed teams in the field of infotainment, expanded its electrics/electronics operations and drove forward employee growth at its Munich site. In addition, he demonstrated international leadership qualities by establishing and managing a subsidiary in Eastern Europe. Asked about his new challenge with the ASAP Group, Marcus Hiller said: "I'm looking forward to continuing the expansion of our Software division and strengthening the ASAP Group in relation to the software-defined vehicle. This is an exciting opportunity to establish IT services for the long term and thereby actively shape the future of the ASAP Group."

Michael Neisen, CEO of the ASAP Group, added: "In Marcus Hiller, we have brought on board a proven expert whose extensive experience and leadership skills will make a significant contribution to the development of our strategic objectives. His impressive career and his vision for the future of software and IT services are exactly what

we need to realise our ambitions for future-oriented technologies."

The arrival of Marcus Hiller as COO underlines the ASAP Group's unwavering efforts to continue expanding its competencies in key areas of the automotive industry and establish itself as a pioneer in the fields of software and IT services.





# INNOVATION CORNER





# ALM-TOOL CODEBEAMER

## CROSS-FUNCTIONAL TEAMS FOR DEVELOPMENT, INTEGRATION AND MIGRATION

The ASAP Group offers its customers integrated services in relation to the application lifecycle management (ALM) tool codebeamer, from the initial idea through to implementation and beyond. It undertakes the full range of tasks, from consultancy prior to the tool's implementation through to development,

integration and operationalisation. The use of cross-functional teams enables ASAP to handle the multidimensionality and complexity of this process. ASAP also relies on its PAK (Process Automation Kit) software and rapid prototyping approach to achieve maximum flexibility in implementation.

Manufacturers apply application lifecycle management (ALM) tools in an effort to counter the ever-increasing degree of complexity in the automotive industry and in response to the Automotive SPICE requirement for consistent traceability throughout a vehicle's lifecycle. These tools make it possible to create links between all stages in a development model. The ALM tool codebeamer, for example, is used for central requirements management, software development, hardware development and test management. Codebeamer makes it possible to interlink all stages of development – from drawing up the system specification through to the SOP for a vehicle model. In order to make the numerous advantages of this tool available to customers quickly and throughout companies, the ASAP Group offers a full spectrum of development and integration services for codebeamer. These range from data model and template development to process development in accordance with Automotive SPICE, extension, adapter and methods development, rapid prototyping, automation, project migration and third-level support.

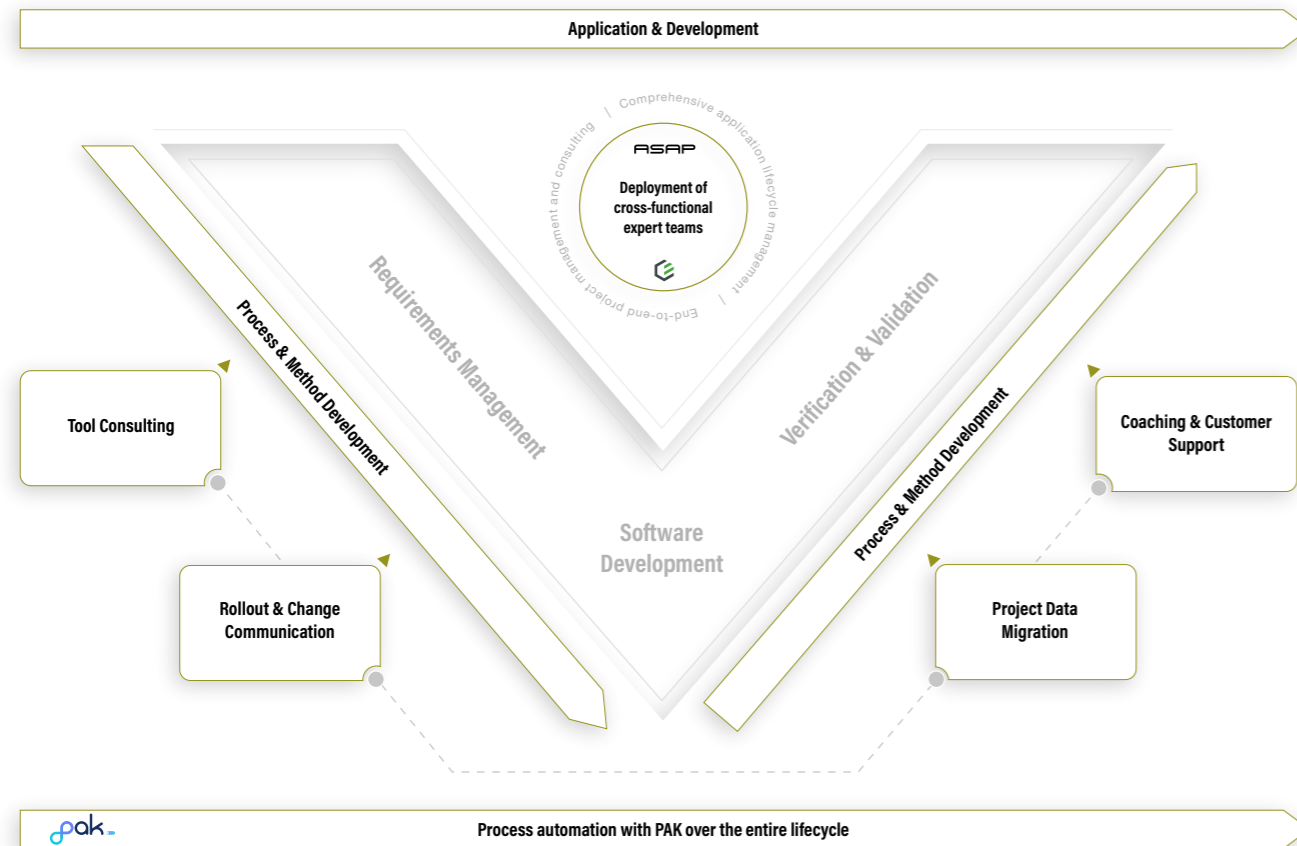
### Cross-functional teams

ASAP relies on cross-functional teams made up of experts in project and process management, Automotive SPICE, E/E test management, migration and software. The advantage of this approach becomes clear when developing the data model for codebeamer: this involves defining the data

model's basic structure, including all roles, sub-disciplines, domains and reporting requirements, which requires a highly developed understanding of development as a whole. In addition to data model development, ASAP also analyses the development processes and provides advice – such as whether and how these processes can be mapped in codebeamer, or whether adjustments may be needed to ensure A-SPICE compliance. In addition, ASAP has in-depth expertise in relation to the implementation of codebeamer and can refine the tool to meet customer-specific requirements by creating extensions. This means that even highly individual functions can be integrated, with newly developed features forwarded by ASAP to the tool manufacturer for long-term integration and maintenance. As a result, codebeamer can be customised to fulfil the requirements of individual sub-disciplines, making it suitable for use as a central development platform in companies.

### Integration of PAK for linking processes, data models and methods

ASAP also develops the adapters required to connect all development tools with codebeamer, which makes exchanging data with the tool as straightforward as possible for all specialist divisions. These adapters facilitate a direct exchange of data and thereby also create hard links between data. The challenge lies in creating the necessary interfaces, which may require the integration of business logic to ensure proper data trans-



formation between tools. ASAP therefore uses its Process Automation Kit (PAK) to implement this as quickly and flexibly as possible. The PAK is a framework for individual, reusable automations and a useful addition to conventional DevOps practices. This automation solution's modular system concept makes it possible to define and automate development steps for specific developer roles and reuse these later for other processes. Using the PAK, ASAP defines the methods in individual sub-disciplines and creates the interfaces between codebeamer and the required development tools. The PAK guides developers through

the workflow defined for them, which leaves more time for creative, value-adding work and improves employee satisfaction. The PAK automatically starts the tools required for the activity, informs the users of the activities they need to carry out, stores all the information and, finally, automatically transfers the required information to codebeamer and the repositories. ASAP and its automation solution therefore ensure that there is always a link between the abstract process, the data model in codebeamer and the method to be followed. Workflows can be quickly defined in the PAK, which facilitates use of the rapid



prototyping approach. It may be helpful to consider a brief use case: if a department's data model is already integrated in codebeamer but no decision has yet been taken regarding development tools and methods, it would not make sense to implement fixed interfaces at this point. In this case, the PAK offers a clear advantage, as different development tools can be connected with codebeamer quickly and relatively easily. This provides the flexibility needed to try out the tools at their disposal – and determine which are most suitable – before making a final decision. The fixed interface, which requires more extensive

programming, is then created following test operation. Then, in ongoing series operation, ASAP migrates all development artefacts into codebeamer, starting by preparing the source system to ensure it is compatible with the target system, codebeamer. In this step, ASAP designs, develops and implements automation solutions that remove the need for manual data migration. ASAP also produces training videos and documentation, holds training sessions and workshops, and provides change management to support the transition to codebeamer.



### Application & Development

- > Tool configuration & development
- > Extension & adapter development
- > Data model & template development
- > Tool automation
- > Auxiliary tool development
- > Reporting pipeline development

### Process & Method Development

- > Process development & operationalisation, incl. method consulting according to A-SPICE & ISO standards for:
  - > Requirements Engineering
  - > Software Development
  - > Test Management
  - > Error Management
  - > Support Processes
  - > Management Processes

### Rollout & Change Communication

- > Project set-up
  - > Initial project set-up
  - > Initial project configuration
  - > Project structure setup
  - > Project change configuration
- > Overall concept development & preparation of POCs & MVPs
- > Establishment & coordination of schedules

### Project data migration

- > Definition of a data migration process
- > Migration preparation and implementation
  - > Doors ↔ Codebeamer
  - > AVW ↔ Codebeamer
  - > Excel ↔ Codebeamer
  - > Polarion ↔ Codebeamer
  - > ALM-Migration ↔ Codebeamer
- > Automation Scripts for Migration

### Operational Application

- > Creation of requirements, test cases & reports
- > Management & status change of the created elements
- > Creation of traceability in the system
- > Derivation of data & reports

- > General User Support
- > User empowerment through training
  - > Introduction Tool Basics
  - > Introduction Project Administrators (Advanced)
    - > Project Configuration
    - > Project Deployment
    - > Project Administration

### Coaching & Customer Support

- > Introduction of customised toolchains (e.g. PowerBI by CARIAD)
- > Introduction to process-compliant work
- > Script development for the automation of administrative tasks



# ASAP GROUP CONFIRMED AS A MEMBER OF THE PTC PARTNER NETWORK

## FOCUS ON INTEGRATED CODEBEAMER SERVICES

The ASAP Group is part of the PTC Partner Network since 27 June 2023. The focus of the cooperation: the Application Lifecycle Management (ALM) tool codebeamer from PTC. With the admission to the partner network, PTC confirms ASAP's comprehensive know-how regarding codebeamer and makes ASAP a preferred partner in the DACH region for all services around the

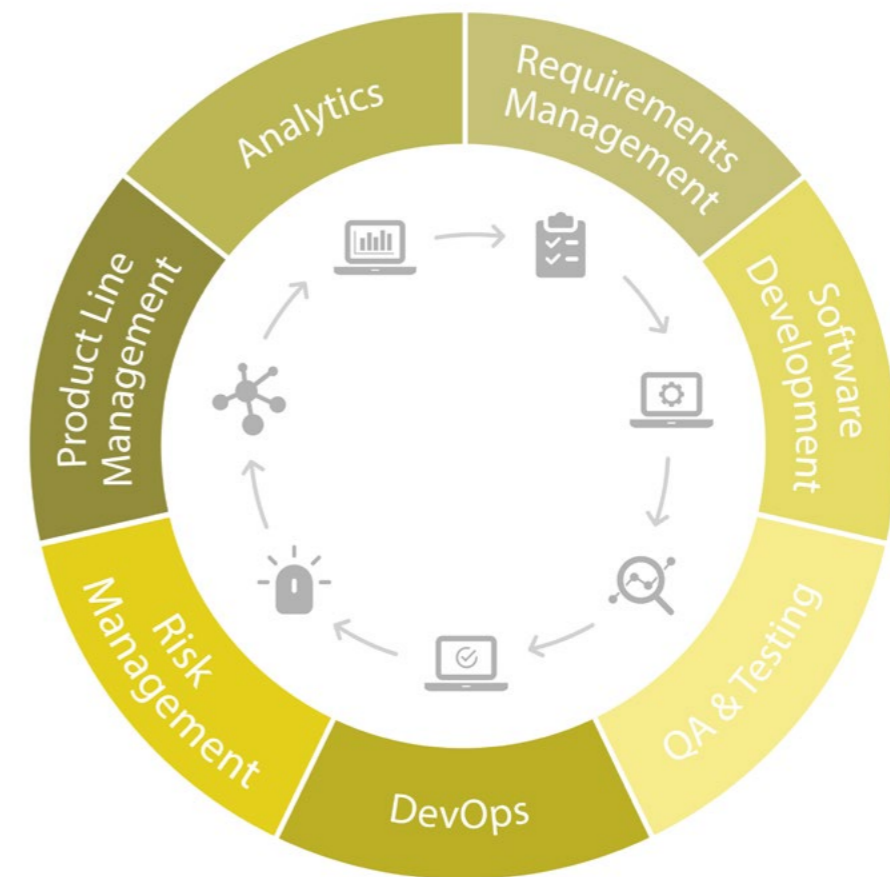
implementation of the ALM tool. The ASAP Group offers integrated services from the initial idea to implementation and beyond: it takes on all tasks from consulting even before the tool is introduced, through development and integration, to operationalisation. With ASAP joining the PTC partner network, customers will benefit from many advantages in the future.



After a thorough review, the ASAP Group was confirmed as a new member with a focus on codebeamer in the PTC partner network. ASAP is thus a Preferred Partner in the DACH region and, on the recommendation of PTC, takes over the implementation of codebeamer for customers as well as support throughout the entire product life cycle. ASAP's customers thus benefit from numerous advantages such as pre-releases, which enable ASAP to test new functions at an early stage and take them into account in the planning of customer projects. In addition, ASAP will further expand its training offer around codebeamer and, as a PTC partner, will be involved in the strategic further development of the codebeamer product at an early stage. „We are proud to be part of the PTC partner network and look forward to the cooperation,“ says Michael Neisen, CEO of the ASAP Group. „On the one hand, it makes our in-depth know-how around the ALM tool codebeamer even more visible. On the other hand, joining is of strategic importance for us, as we will expand our services around codebeamer even further in the future.“ Gernot Joswig, COO of the ASAP Group at the Wolfsburg location, adds: „At ASAP, we have already worked with the codebeamer product in numerous projects and have accordingly built up extensive know-how in both breadth and depth. Today, we employ more than 60 people around our services for the ALM tool. Joining the PTC partner network was therefore the next logical step for us to be able to expand our customer base for codebeamer services beyond the automotive industry.

### Consistent services for codebeamer

With its in-depth expertise in both the ALM tool codebeamer and A-SPICE conformity, ASAP convinced the decision-makers at PTC – because experts from both sides are necessary for optimal support of customer projects. ASAP offers integrated services for the development and integration of codebeamer: from data model and template development, process development according to Automotive SPICE, extension, adapter and methodology development as well as rapid prototyping to automation, project migration and 3rd level support. ASAP uses cross-functional teams with experts for project and process management, Automotive SPICE, E/E test management, migration and software. For many tasks, such as data model development for codebeamer, a distinct overall understanding of the development is required. In addition, ASAP also analyses the development processes and advises on them – for example, whether and in what form they can be mapped in codebeamer or whether an adaptation is necessary to ensure conformity with A-SPICE. Furthermore, ASAP has in-depth know-how about the implementation of codebeamer and can further develop the tool according to customer-specific requirements in the form of extensions. Even the most individual functions are integrated in this way and newly developed features are then transferred by ASAP to the tool manufacturer for long-term integration and maintenance. In order to make data exchange with codebeamer as simple as possible for all



departments, ASAP also develops the necessary adapters for connecting all development tools to the tool. These enable direct data exchange and thus also hard links between the data. ASAP also takes over the migration of all development artefacts into codebeamer during ongoing series production and first prepares the source systems for their compatibility with the target system codebeamer. So that the data does not have to be migrated manually, ASAP also takes over the conception, development and implementation of automation solutions in this step. Finally, ASAP also creates tutorial videos and documentation, organises training courses and workshops

and takes over change management as an accompanying measure to the conversion to codebeamer.

### About PTC

PTC helps global manufacturers achieve double-digit cost optimisation with software solutions to accelerate product and service innovation, improve operational efficiency and increase workforce productivity. Combined with an extensive partner network, PTC offers customers flexibility in deploying its technology to drive digital transformation – on-premises, in the cloud or via the pure SaaS platform.



# NEW METHODS FOR FUNCTIONAL VALIDATION OF EXTERIOR LIGHTING

## BRINGING LIGHT TO DARKNESS WITH SCENARIO-BASED AND KEYWORD-DRIVEN TESTING

A pedestrian crossing, projected across the road by a car as a signal for pedestrians to cross: this is just one future scenario that autonomous driving could turn into reality. Such developments are set to make the functions provided by a car's exterior lights even more important. However, this also means that the functions of exterior lights are becoming increasingly networked and more complex, which in turn makes valida-

ting such functions an even greater challenge. The ASAP Group, the development partner to the automotive industry, therefore relies on scenario-based and keyword-driven testing. When applied in combination, these methods make it possible to cover a wider range of test cases than conventional validation methods, thereby reducing both the time required and costs incurred in the development process.

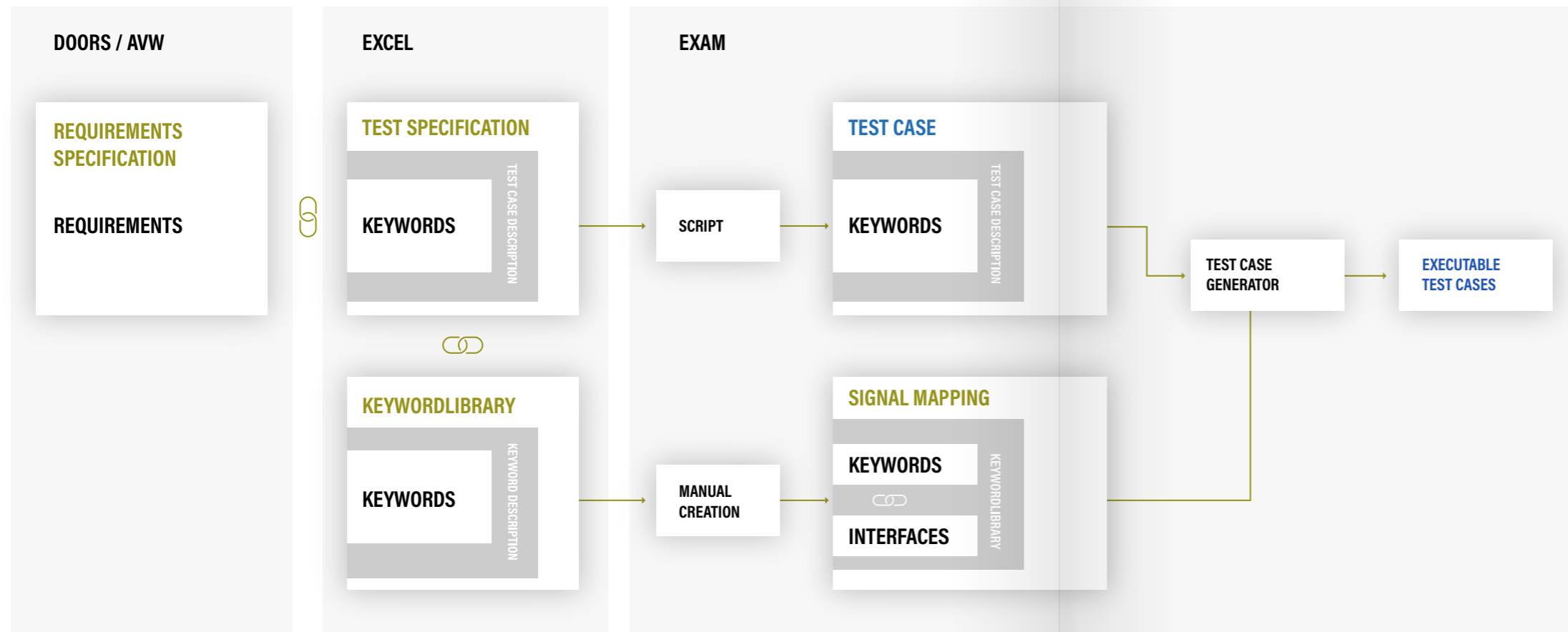
Many aspects of cars can be customised in line with customers' wishes – and the functions of exterior lighting are no exception. However, while customers might enjoy ability to add a personal touch to their cars, this presents considerable challenges for development and validation. This is because, as the range of customisable functions continues to grow, so too does the amount of software required to facilitate this. Consequently, exterior lighting functions are becoming increasingly networked and complex. Ultimately, automotive exterior lighting has long since evolved past being a design element that improves visibility for drivers. Instead, the significance of exterior lighting systems has grown enormously, especially in the context of autonomous driving. It must also provide clear external communication and optimise safety for the driver and other road users. The ASAP Group therefore carries out validation of

exterior lighting functions for its customers through scenario-based and keyword-driven testing.

### Evolution of exterior light functions

Dipped headlights, full beam headlights, rear lights and indicators – up until the end of the last century, standard exterior lighting for cars only provided around five or six functions. In modern cars, however, exterior lights provide roughly sixteen top-level functions along with a whole host of sub-functions. These include adaptive front light systems, proximity detection, highbeam assistants and communication lights – to name but a few. This array of new functions was initially made possible through the use of LED technology, which has since completely replaced the xenon technology used in the past. Today, development is moving towards the digitalisa-





■ AUTOMATICALLY GENERATED ■ GENERATED BY HAND

tion of LED lights, with digital matrix LED technology featuring micromirror systems set to become the new standard in the future. The primary advantage of this new technology is the ability to activate and deactivate LEDs individually, so that lighting can be used selectively. [2] This makes it possible, for example, to adjust high beam headlights very precisely to avoid blinding oncoming road users. [1] New functions – such as lane lights, which precisely illuminate the lane ahead and dynamically react to lane changes – improve safety on the road. [1] Furthermore, the rear lights can

be used as a display area for communication with following vehicles, warning them of potential dangers such as a traffic jam coming up ahead. Customisation options also allow drivers to configure individual light signatures, giving their car a lighting design tailored to each driver's wishes. There is considerable scope to make sensible use of exterior car lighting and develop numerous other functions in the future. This development will be further reinforced by autonomous driving levels 2 and 3, which will add further safety-related exterior lighting functions. A pedestrian

crossing projected across the road by the car to indicate that pedestrians should cross is just one potential scenario.

### Challenges for validation

New exterior light functions, and especially those relevant for autonomous driving levels 2 and 3, entail numerous challenges for validation. Different countries have a variety of mandatory regulations on exterior lighting. Another difficulty, however, is the fact that new functions are highly interconnected, because control units have

to refer to data from numerous sources. This includes navigation data for information on routing, rain sensors, light sensors, radar, cameras and acceleration data. The vehicle's lighting systems then need to adapt accordingly to all of this information. The numerous sources that influence exterior lighting generate input signals with extremely high information density, which makes the event chains examined in validation extremely complex. In addition to optical assessments (homogeneous light distribution, transitions when lights are activated/deactivated, etc.), ASAP also focuses on signal-based functional validation. It is not possible to provide an exhaustive specification for validation due to the infinite number of potential situations in which static and dynamic objects must be faultlessly identified, with multi-sensor data fusion creating a complete overall image for the light control unit. However, the variable parameters that could be used, for example, to accurately identify a vehicle ahead and trigger appropriate adjustments in exterior lighting functions, include: the size and speed of the vehicle, the angle between the two cars, light conditions, weather, road surface and other objects such as trees and road signs. Evaluating all of these parameters in all conceivable combinations is simply not possible. Conventional testing approaches alone are therefore not sufficient. Instead, it is important to create a virtual test environment for a test bench so that all variables



can be examined and validated as fully as possible.

#### **Validating dynamic processes through scenario-based testing**

The ASAP Group has therefore adapted scenario-based testing, originally used in relation to ADAS functions, for use in the validation of exterior light functions. By referring to the PEGASUS project, ASAP can conduct effective and efficient testing

while simultaneously taking heed of the risks involved. The PEGASUS research project, pursued by OEMs and numerous other partners from the worlds of business and science, aims to establish “generally accepted quality criteria, tools and methods as well as scenarios and situations for the release of highly automated driving functions” [3] and thus accelerate the realisation of autonomous driving. ASAP looked at the results of the PEGASUS research project while adapting scenario-

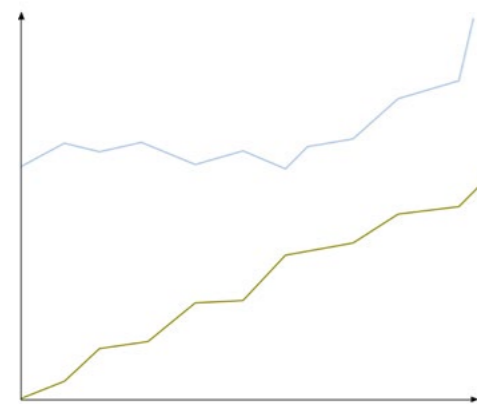
based testing for the validation of exterior lighting functions – and thereby reduced the complexity inherent in validation due to the near-infinite number of possible test cases. Unlike requirements-based testing, which ASAP uses in parallel for static, selective testing, scenario-based testing also makes it possible to test dynamic processes – such as speed changes and various road situations (e.g. approaching motorway slip roads or junctions) with a variable environment (other road users) and many different environmental conditions (rain, snow, fog, etc.). The ASAP specialists responsible for test design specify both the required scenarios and the test cases. When specifying scenarios, they start by defining all static and dynamic objects in a given scenario, such as a night-time drive with other vehicles travelling in the same and opposite directions. This description comprises detailed information of all environmental data, including the parameter spaces of the defined objects. This includes, for instance, all possible distances and speeds of a vehicle driving ahead. In sum, it describes in principle what should happen in a scenario. By contrast, when specifying test cases, the level of abstraction is far lower. Instead, test drives are set out with specific values for all objects involved in the test case so that, for example, an overtaking manoeuvre described as a scenario can be carried out correctly. Once the driving scenarios and test procedures have been defined, including the expected outcomes (test

cases), ASAP then moves on to validate the transmission of data from the control unit to the light source and the communication between the two. This form of validation, an innovation in the context of exterior light validation, offers numerous advantages. For example, it makes it possible to validate a far wider range of test cases than conventional methods and also reduces the work involved in making the necessary changes. Furthermore, this method facilitates time-efficient, cost-effective validation. This is because the restbus simulations used in conventional testing methods require manual specification of all signals and values. Due to the countless parameters and all their potential combinations, a manually configured restbus simulation of exterior light functions simply cannot be completed in a reasonable time frame.

#### **Keyword-driven testing for automated test case generation**

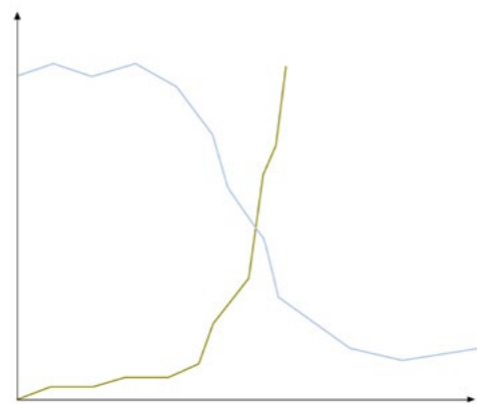
Although scenario-based testing makes it considerably easier to carry out testing, the vast number of different scenarios adds to the complexity of test automation. The solution is to use test automation to depict thousands of test cases in such a way that the tests themselves can be fully automated. For this to be possible, the descriptions of test cases and driving scenarios must be implemented automatically in the corresponding tools. In addition, test automation also serves to link the entire



**CLASSIC IMPLEMENTATION**

■ Implementation / maintenance effort  
■ Number of test cases

tool chain – with around eight different tools used in the validation of exterior light functions, along with the light control unit and the high-performance control unit – and ensure that all tools engage automatically and without interruption. This ensures, for example, that all relevant tools are automatically started when a test drive commences, including a tool for automated comparison of target and actual values in pulse width modulation (PWM) signals to activate the lights at the right time. In order to implement test cases more swiftly and reduce the complexity of test automation, ASAP combines scenario-based testing

**KEYWORD-DRIVEN TESTING**

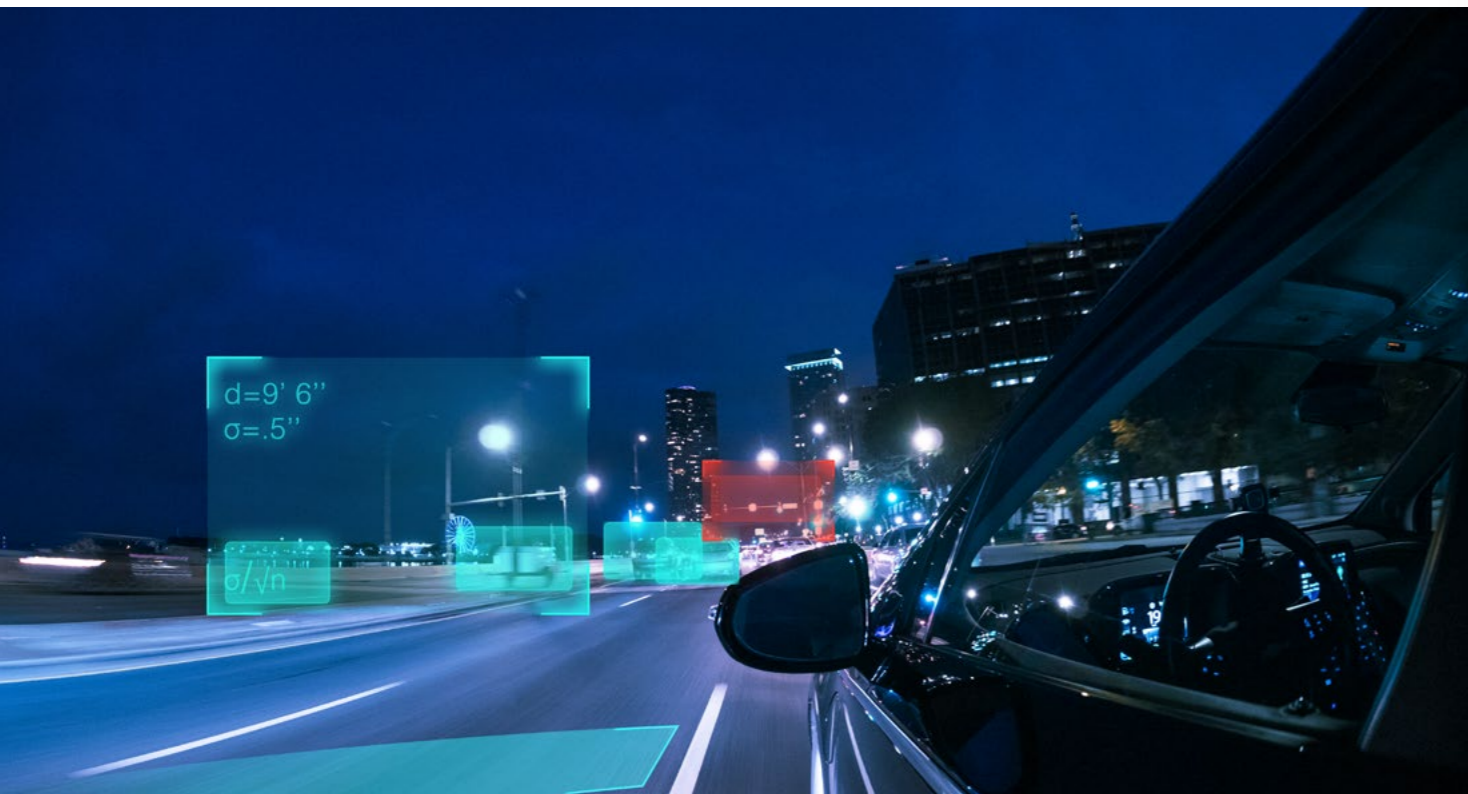
with keyword-driven testing for use in the validation of exterior light functions. In this form of test case description, which is certified in accordance with ISO 29119-5, individual test steps are stored in a database in both human-readable and machine-readable formats. This means that ASAP starts by writing a corresponding script for each defined test step – the so-called keywords – so that it can be carried out automatically. A test step is an instruction to control a specific function, such as activating an indicator. All finally defined keywords (test steps) are universally applicable and can be parametrised in the

database – so if, for example, the PWM signals to control a light source are supposed to change, this can be input in the database. This creates reusable test steps that only need to be parametrised with different input values. The process of inputting test steps to create a test case is also automated. The result? Partial automation of test automation, which delivers immense time savings due to the enormous volume of test cases required to validate exterior light functions. Another advantage of keyword-driven testing is that changes only need to be manually input once – to the relevant keyword in the central database – for this change to be automatically implemented in all test cases. Further significant benefits also arise from the fact that test steps are stored in human-readable and machine-

readable formats in the database. On the one hand, this means that real test drives can be reproduced using the documented data and repeated virtually any number of times until the desired validation outcome has been achieved or the scenario has been checked to ensure consistent quality. On the other hand, virtual test drives can also be verified with real test drives because the test cases are available not only as machine-readable script but also in a human-readable format for test drivers. So, with this new approach – a combination of scenario-based and keyword-driven testing – ASAP reduces the complexity and effort involved in test preparation and execution, ultimately ensuring time-saving, cost-effective and comprehensive validation of exterior light functions.

**References:**

- [1]: „Licht ist nicht nur Sicht, sondern auch Sicherheit“: <https://www.springerprofessional.de/fahrzeug-lichttechnik/fahrzeugsicherheit/-licht-ist-nicht-nur-sicht--sondern-auch-sicherheit-/17498176>
- [2]: Digitales Licht Von der Matrix zum Mikrospiegel: <https://www.springerprofessional.de/digitales-licht-von-der-matrix-zum-mikrospiegel/15415976>
- [3] Forschungsprojekt PEGASUS. Automatisiertes Fahren effektiv absichern: <https://www.pegasusprojekt.de/de/about-PEGASUS>



# COMPLETE-VEHICLE VALIDATION

## COMPLETE TURNKEY CONCEPTS FOR SEAMLESS E/E VALIDATION, FOCUSING ON ADAS/AD

In modern vehicles, numerous central high-performance computers and a host of further control units, actuators and sensors all need to communicate with each other seamlessly. The domain architecture for control units that relate to ADAS/AS systems – and therefore make safety-critical decisions regarding reactions in road traffic – are characterised by particularly high volumes of inter-component communication. As the complexity of these

systems continues to increase, so too do the challenges involved in their validation. The ASAP Group offers integrated functional validation services, facilitating the validation of entire vehicle electronics systems with a particular focus on ADAS/AD functions. This article outlines the requirements that testing systems must fulfil, and the methodology ASAP follows to achieve time and cost reductions while still providing comprehensive validation.

Autonomous driving is a vision for the future that offers numerous benefits, such as enabling vehicles to respond dynamically to complex situations and improving the safety of road transport. However, it is also associated with significantly higher demand on driver-assistance systems (DAS) and the associated software and sensors, which in turn increases the complexity of the vehicle as a whole. In the future, between 300 and 500 million lines of software code will be required to make autonomous cars a reality. [1] Even today, cars feature a network of high-performance computers (HPC) as well as over 100 control units, which can exchange up to 25 gigabytes of data between them within just one hour. [2,3] Communication within the vehicle is ensured by around 14 different bus systems and transmission standards. [4] All of these factors combine to present an enormous challenge for validation – especially for the validation of control devices associated with the domain architecture for driver assistance systems (DAS). This is because ADAS/AD systems present challenges that are partially control-technology based and partially algorithmic in nature, such as longitudinal control, sensor-data fusion, object classifications and the use of artificial intelligence. Control units in these domains need to be able to communicate with each other in high volumes as they are tasked with making safety-critical designs regarding the vehicle's responses in road traffic. Validating this type of software often requires scenario-based testing in complex co-simulation environments. In ad-

dition, it is not possible to specify all of the countless parameters in all possible scenarios, which further complicates validation.

### Focusing on DAS and the network of primary control units

The ASAP Group has therefore developed a test concept for the seamless validation of vehicle electronics, with particular focus on the network of high-performance computers (HPCs) and DAS functions. ASAP offers its customers a full range of services, from designing, commissioning and operating testing systems to requirements analysis, test specification and test automation through to reporting and final approval recommendations. In terms of the test infrastructure, ASAP Test Systems specialists started by borrowing the design for complete-vehicle HIL systems. These systems map all vehicle electronics and how they are networked, with the HPCs and an average of 60 further control units installed as real components in the test system. Correctly wiring communications links between all control units in the test system presents a particular challenge at this juncture. Only specific components that are still under development or have not yet been equipped with compatible software are simulated. So, unlike in component HILs, there is little need for restbus simulation as all control units are present. This reduces the test scope: complete-vehicle HIL system testing focuses on the integration of event chains – i.e. ensuring that all control units communicate faultlessly – because all





components from sensor input onwards are physically available in the test system. Using complete-vehicle HIL systems therefore offers fewer opportunities for manipulation, with the test moving away from the signal level towards driver control. It only simulates the input driving scenarios and surroundings and the driver's reactions. All internal signals and interfaces between the control units have to be issued independently by the control units in the test system. ASAP therefore integrates an additional steering table into the test benches so that its test engineers can make manipulations at the driver

level. This makes it possible to input the driver's reactions manually, thereby simulating the steering forces from the driver. This input is then fed into the test system via special interfaces.

#### **Complex driving functions require complex test systems**

Given the inherent complexity and the number of functions to be tested, complete-vehicle HIL systems are subject to tough requirements. On the one hand, flashing control devices in complete-vehicle HIL

systems represents a major challenge: test engineers must ensure that all components have the latest software version at all times. During these updates, it is important to bear in mind the interdependencies between different control units. On the other hand, developers need to ensure that the test system – and the sensors used in the virtual complete vehicle – receive information during virtual test drives, such as that another road user is braking a few meters ahead. Consequently, the biggest challenge for developing a complete-vehicle HIL system is the timing. If calculations and tests are to be accurate and meaningful, the models must provide a coherent overall picture for the vehicle's environmental sensors. For all sensor technology to combine simultaneously – and produce a coherent scenario – the test bench must provide all information with synchronized timing (i.e. deterministically). If, for example, a motorway pilot system is validated with a simulated test drive at 130 kph, with a slower-moving car merging into the lane ahead from the inside lane, all environmental data such as speed, distances and road layout must be fed into the control unit simultaneously and as a complete image in order to facilitate coherent data fusion. Only then, in conjunction with all other control units in the event chain, can the correct function in this example be identified, namely initiating braking. A further challenge is that, in the test system, the sensors must feed information on the recorded environment to the control units,

which means this has to be structured as a "closed-loop system". This term describes a situation in which the real, installed network of control units and computers interacts with the simulated environment. If, for example, the control units accelerate, the simulated environment must change accordingly and provide suitable feedback to the control units and sensors. Additionally, feedback on the environment must be transmitted directly from the sensors to the control unit, without any detours, so that the control unit can react immediately to the situation. So, to simulate the situation to the control units directly, the real sensors must be disconnected from the control units.

#### **Validating dynamic processes through scenario-based testing**

After constructing complete-vehicle HIL systems, experts in ASAP's Testing and Integration team ensure they are commissioned correctly. In parallel with setting up the test systems, they also conduct the requirements analyses and test case specification and automation required for the test infrastructure. ASAP does this using the scenario-based testing method. By referring to the PEGASUS project, ASAP can conduct effective and efficient testing while simultaneously taking heed of the risks involved. The PEGASUS research project, pursued by the OEMs and numerous partners from the worlds of business and science, aims to establish "generally accepted quality criteria, tools

and methods as well as scenarios and situations for the release of highly automated driving functions” [5] and thus accelerate the realisation of autonomous driving. ASAP looked at the results of the PEGASUS research results while adapting scenario-based testing for complete-vehicle HIL system validation – and thereby reduced the complexity inherent in validation due to the near-infinite number of possible test cases. In contrast to requirements-based testing, scenario-based testing can also be used to test dynamic processes – such as speed changes and various traffic situations with a variable environment and different ambient conditions. The ASAP specialists responsible for test design specify both the required scenarios and the test cases. In terms of scenario specification, the ASAP experts firstly define in detail all static and dynamic objects to be included in a scenario, including environmental data and parameter spaces. This includes, for instance, all possible distances and speeds of a vehicle driving ahead. By contrast, in the subsequent step of specifying test cases, the level of abstraction is far lower. Instead, test drives are set out with specific values for all objects involved in the test case so that (for example) the overtaking manoeuvre described as a scenario can be carried out correctly. Once the driving scenarios and test procedures have been defined, including the expected outcomes (test cases), ASAP then moves on to validating the E/E infrastructure for the complete-vehicle HIL systems.

#### **Automated test case generation with keyword-driven testing**

Although scenario-based testing makes it considerably easier to carry out testing, the vast number of different scenarios adds to the complexity of test automation. The solution is to use test automation to depict thousands of test cases in such a way that the test themselves can be fully automated. For this to be possible, the descriptions of test cases and driving scenarios must be automatically implemented in the corresponding tools. Test automation also has to bring the entire toolchain together and ensure that all tools engage with each other automatically and without interruption. In order to implement test cases more swiftly and reduce the complexity of test automation, ASAP combines scenario-based testing with keyword-driven testing for use in the validation of complete-vehicle HIL test systems. In this form of test case description, which is certified in accordance with ISO 29119-5, individual test steps are stored in a database in both human-readable and machine-readable formats. This means that ASAP starts by writing a corresponding script for each defined test step – the so-called keywords – so that it can be carried out automatically. A test step might be a command to perform a specific driver action. All finally defined keywords (test steps) are universally applicable and can be parametrized in the database. This creates reusable test steps that only need

to be parametrised with different input values. The process of inputting test steps to create a test case is also automated. The result? Partial automation of test automation, which delivers immense time savings due to the enormous volume of required test cases. In addition, in the event of changes, the corresponding keywords only has to be amended once in the central database – with any changes automatically integrated into all test cases. A further benefit is that test steps are stored in human-readable

and machine-readable formats in the database. This means, for example, that real test drives can be reproduced using the documented data and repeated virtually any number of times until the scenario has been checked to ensure consistent quality. So, with this combination of scenario-based and keyword-driven testing, ASAP reduces the complexity and effort involved in test preparation and execution, ultimately ensuring time-saving, cost-effective and comprehensive validation at its test centre.

#### **References:**

- [2] Autos brauchen neue Architekturen!: <https://www.se-trends.de/autos-brauchen-neue-architekturen/>
- [3] Roland Berger: Consolidation in vehicle electronic architectures
- [4] Wie Ethernet das Auto verändert: <https://www.elektroniknet.de/automotive/wie-ethernet-das-auto-veraendert.150788.html>
- [5] Forschungsprojekt PEGASUS. Automatisiertes Fahren effektiv absichern: <https://www.pegasusprojekt.de/de/about-PEGASUS>





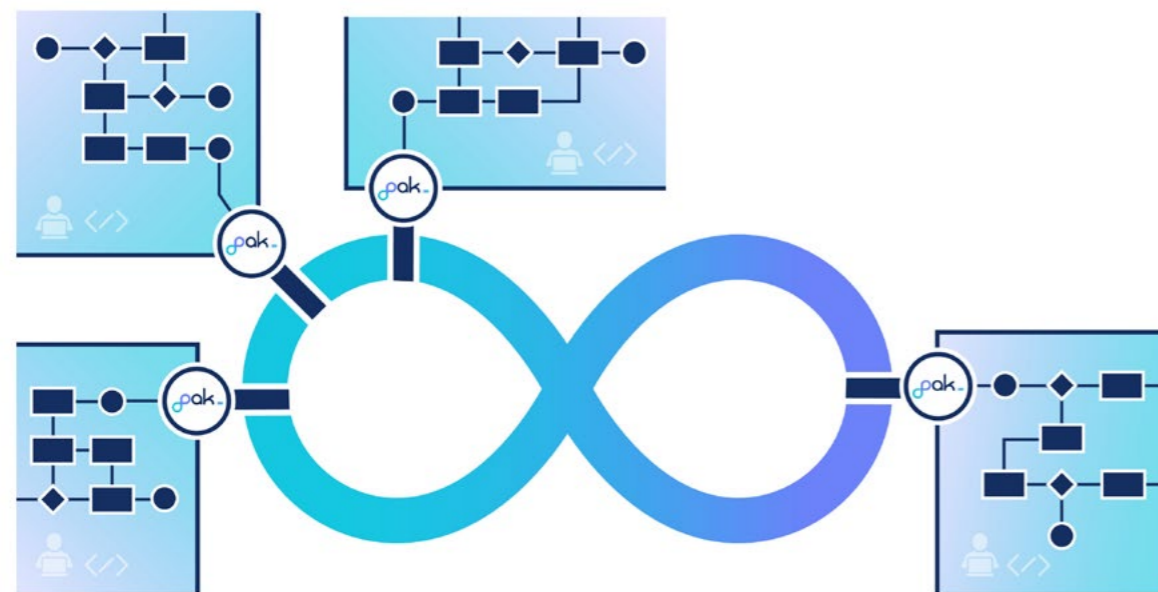
# INTEGRATED FUNCTIONAL DEVELOPMENT FOR E-MOBILITY IN THE CONTEXT OF A-SPICE

**BRIDGING THE GAP BETWEEN SERIES PRODUCTION AND PMT: HOW ASAP USES PAK TO AUTOMATE WORK STEPS AND TOOL CHAINS**

**The ASAP Group offers integrated functional development services for e-mobility. ASAP undertakes all aspects of functional development, ranging from requirements management and model development to control unit code development, integration in the vehicle and validation. A key focus of ASAP's Software Division is functional development for charging system components. ASAP relies on its PAK (Process Automation Kit) – a software solution developed in house – to maximise automation in the tool chain and ensure A-SPICE-compliant development. In May 2023, the ASAP Group received the German Innovation Award for the PAK and the innovative achievement it represents. The award recognises products and solutions across different industries which set themselves apart from existing solutions through their user-centred design and added value.**

Battery electric vehicles (BEVs) account for a growing proportion of the global car market. The rising prevalence of e-mobility is inherently leading to the development of more, increasingly complex functions. For example, EVs require thermal management systems to protect components, predictive efficiency assistants to provide actionable recommendations on the most efficient driving style, and functions related to HV charging. The ASAP Group offers its customers integrated functional development services in relation to e-mobility – from require-

ments management to developing models and control unit code to integrating solutions in the vehicle and validation. A key focus of ASAP's Software division is functional development for charging system components. On the one hand, this includes developing charging strategies that control the charging process. On the other hand, ASAP's development specialists are also responsible for battery monitoring functions. These prevent rapid battery ageing, including by curtailing the target charge level. In addition, ASAP is developing functions such as inductive and bidirectional charging, standardised error and termination management for the charging process and charging status notifications displayed to the driver via the HMI. For example, ASAP's developers are working to create suitable visualisations so that different visualisation patterns can be displayed on the charging socket and the HMI depending on the charging scenario – initialisation, charging complete, charging terminated, error notifications and so on. This includes making sure that the display brightness adjusts depending on the ambient light level. Another focus topic is data storage, which involves determining which information from previous charging cycles is defined as relevant and stored by the system. The stored data, which can include reasons for terminating charging and the charge level, can be evaluated at a later point in time for quality assurance purposes. The variety of parameter combinations resulting from



country-specific standards presents a particular challenge for functional definition and development, with different standards for HV charging in different regions. Consequently, different charging infrastructure and standards must be considered in EV development. One fundamental distinction is between AC and DC charging. When it comes to DC charging standards, the CCS2 connector is standard in the EU, while Japan relies on CHAdeMO and China follows the GB/T standard. The voltage in the charging point therefore has

to be adjusted to meet the relevant requirements during the charging process. This requires seamless communication between the EV and the charging point via the interface – without relying on any additional effort from the driver. Developers must ensure this happens for the different national variants and their charging standards and protocols. The additional functionality of bidirectional charging also represents a challenge to overcome during development. Bidirectional charging technology makes it possible to charge the EV but also for

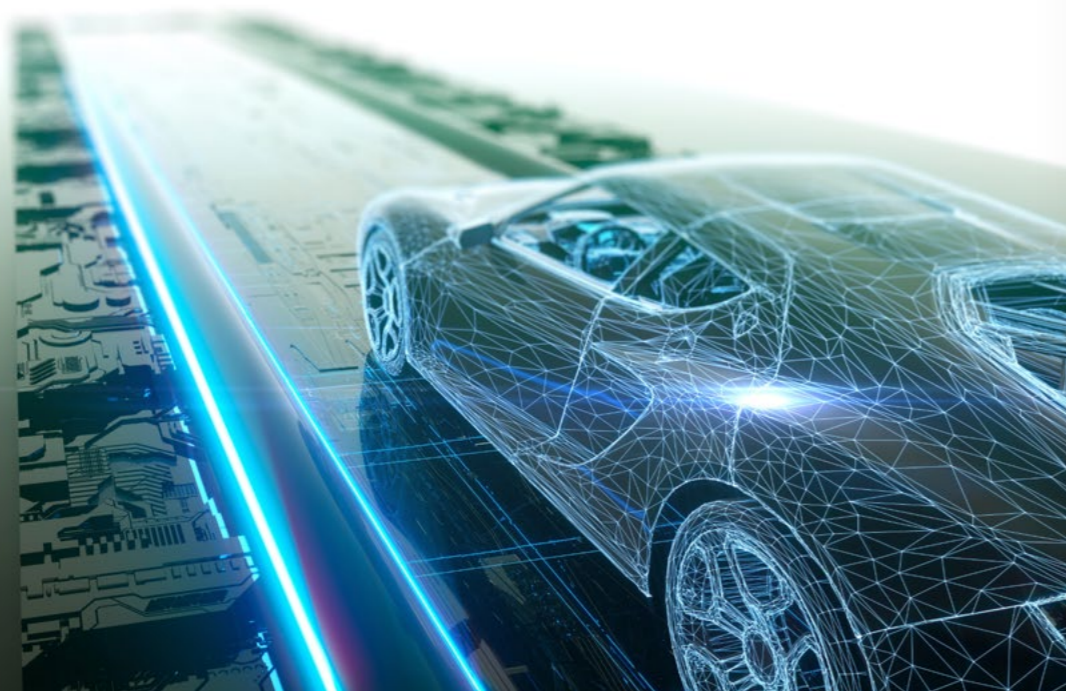
energy stored in the EV to be fed back into the public power grid or a domestic power supply. Once again, developers must ensure that the EV and charging points communicate seamlessly for this to function. ASAP's services in this context include requirements management and analysing country-specific standards for the communication process. Additional functionality in this context arises from optimised bidirectional charging and discharging strategies. The function must be developed so that charging and discharging avoids damaging the HV storage system in order to extend the battery's service life.

#### **A-SPIICE-compliant work with the PAK automation solution**

ASAP's functional development work always ensures compliance with the Automotive SPICE (A-SPIICE) standard. Established in 2005, this automotive standard makes it possible to assess processes and facilitates improvements. ASAP relies on its PAK (Process Automation Kit) software not only to ensure its development activities are

always A-SPIICE-compliant but also to maximise tool chain and work step automation. PAK is a framework for individual, scalable and reusable automations and represents a useful addition to conventional DevOps practices. The PAK's modular system concept enables users to define and automate development steps for specific developer roles and reuse them later for other processes. In addition, using the PAK makes it impossible to simply skip or forget individual steps in the development process, so users can always rely on adherence to specified quality standards and process conformity. Given that compliance with the Automotive SPICE standard is absolutely mandatory, this presents a crucial advantage for development processes. Ultimately, these factors facilitate more efficient collaboration and relieve the strain on employees while also ensuring a consistently high level of quality in development. So, by applying its PAK software, ASAP bridges the gap between series production of software and the automation of processes, methods and tools.





# MACHINE LEARNING-BASED ANOMALY DETECTION FOR SYSTEM AND VEHICLE VALIDATION

**DATA SCIENCE/AI RESEARCH PROJECT CONDUCTED BY THE ASAP GROUP**

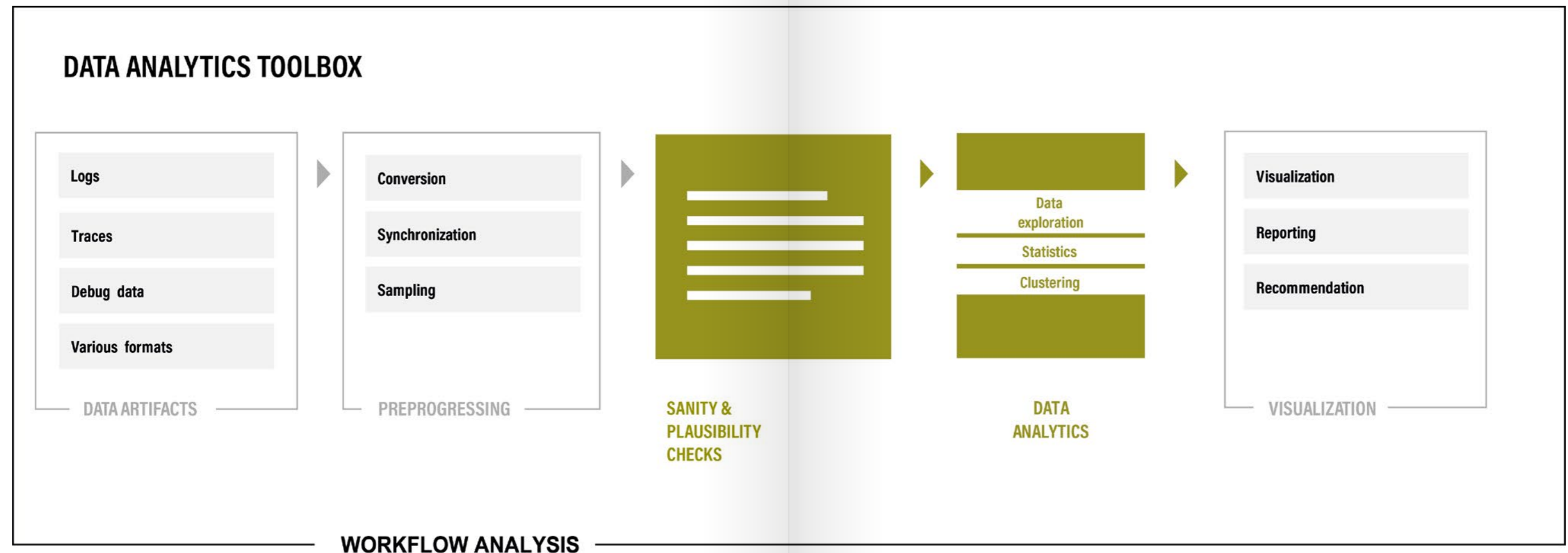
**The ASAP Group has received a special honour for a research and development project in the field of data science/AI: funding from the German Federal Ministry of Education and Research (BMBF). The BMBF determined that the project shows a very high degree of innovation and potential value and is therefore worthy of funding. By drawing on machine learning and statistical data analysis, ASAP hopes to automate the detection of anomalies in measurement data with the ultimate goal of developing an assistance system for test engineers. This aims to make large quantities of measurement data – recorded for purposes such as developing highly automated driver-assistance systems (DAS) – available for use as quickly as possible.**

The ASAP Group has once again lived up to its aspirations as an innovation leader and technology company, having been awarded state funding for research and innovation for another of its research projects. The Center of Excellence for Data Science/KI at ASAP's Munich site is focused on a key question: Against the backdrop of the rising time and cost pressures in the automotive industry, how can insights from large volumes of measurement data be used as quickly as possible? A highly automated DAS must complete millions of miles of test drives before final approval can be issued. This includes both real-world test drives in test vehicles and automated testing using

corresponding testing systems. Looking at this from a different perspective, the testing requirements also involve precisely recording and analysing vast quantities of data, with the results incorporated in the development process in order to continuously optimise functions.

## **Intelligent filter for measurement data**

The aim of the funded project is to develop a tool for use in the field of test automation. Automated identification of anomalous measurement data should assist test engineers in their work. The process of validating a DAS includes evaluating all measurement data from different sources (test systems, such as component and system HILs, as well as data from real-world test drives) to identify any anomalies. This, however, is where the ASAP Group's Data Science Tool comes in. It relies on statistical data analysis and machine learning to automatically examine these vast quantities of trace data and identify any anomalous data points that require inspection by the test engineers. This means that development teams no longer need to sift through trace data: instead, they can concentrate on the anomalies identified by the tool and, ultimately, devote more time to creative activities as development engineers. The tool is not designed for any one specific case or a single vehicle function. In the future, the tool will make it possible to examine all ECU traces from HIL and real-world vehicle



tests in the field of electronics development, conducting automated data analysis to identify anomalous data points.

#### How the tool box works

The toolbox relies on machine learning and statistical data analysis methods. Firstly, the data is loaded and examined for typical error sources such as formatting errors and potential duplicates. The signal values undergo statistical analysis to identify problems such as issues with signal speci-

fications. Data points that logically belong together are then compiled into sequences based on the prepared datasets. Removing non-relevant data from the evaluated dataset reduces the scale of the task, thereby facilitating more efficient calculations. Algorithms are used during this process to identify anomalous data points in the measurement data. This involves examining the reduced data from all angles in a high-dimensional space. Mathematical metrics work in the background to ensure the success of the machine learning techniques

by facilitating the automated calculation of intervals between all data points. This clusters the data points and ultimately facilitates their evaluation based on statistical anomalies, such as particularly large intervals to all other data points. The use of artificial intelligence (AI) therefore facilitates automated, rapid evaluation of all data and provides the test engineers with concrete recommendations of anomalous data points for review. The tool also generates a very simplified 3D display of the results to make them more easily comprehensible.

Continuous feedback from users constantly improves the underlying AI – and thus also supports the intelligent filtering of data points and, in turn, the recommendations for action. As a result, the tool developed by ASAP to automatically detect anomalies in measurement data not only makes it possible to apply data more quickly but also enables test engineers to give faster feedback to development teams in specialist divisions. The result is time and cost savings in the development process for vehicles and their functions.



# SUSTAINABILITY CONSULTING

## PRODUCT-SPECIFIC GREENHOUSE GAS FOOTPRINTS IN THE FORM OF LIFE CYCLE ASSESSMENT

The ASAP Group offers numerous services related to technology-neutral and sustainable mobility. For many years, it has supported its customers with development projects focusing on climate-neutral fuels and other sustainable mobility solutions. ASAP offers services including calculating greenhouse gas footprints for entire companies and individual products. For example, one current ASAP project focuses on conducting a life cycle assess-

ment for a bio-based fuel and examining its eligibility for certification as a “green fuel”. In addition to supporting customers with consultancy services in relation to sustainable mobility, ASAP also actively sponsors sustainable mobility. In 2022, ASAP initiated a drive to enhance the green credentials of the Donau Classic rally – and has again sponsored the carbon offsetting measures for this year’s edition of the popular event.

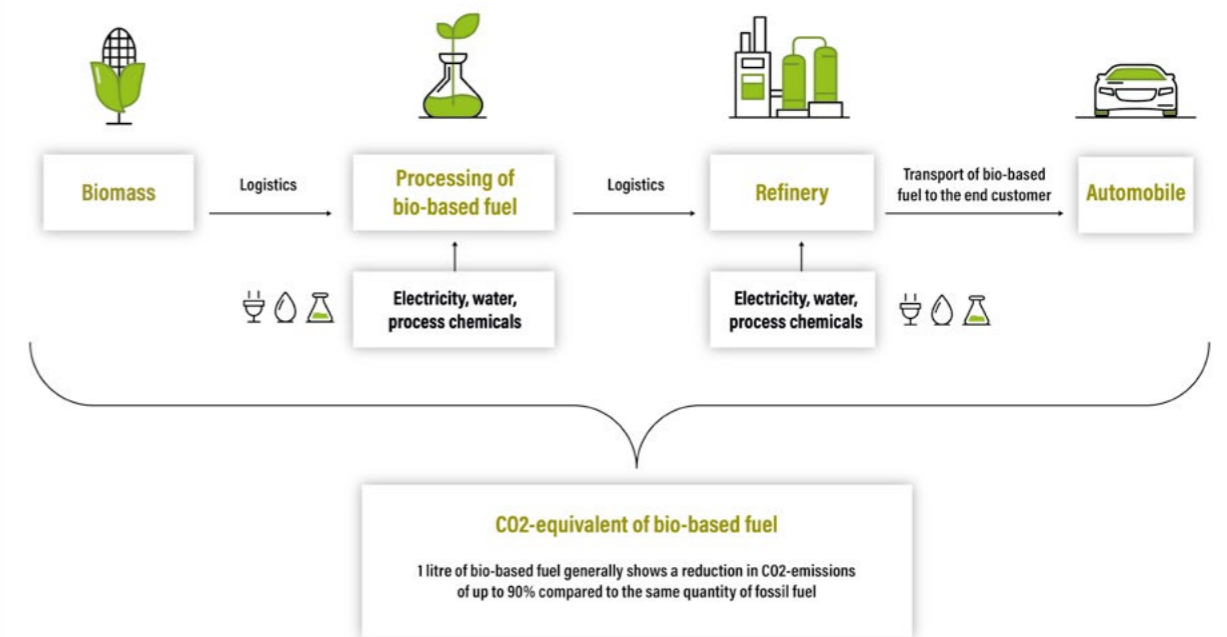


The ASAP Group and its Sustainability Consulting team supports customers with development and consultancy projects related to climate-neutral fuels and sustainable mobility solutions. In addition to advising companies on the sustainability of their mobility systems and certification management for renewable energy sources, the company also offers services such as study supervision and implementation, technical and economic consultancy on alternative energy sources and life cycle assessments. For example, one current ASAP project is focused on conducting a life cycle assessment for a bio-based fuel, examining the product's entire life cycle and production chain. This involves identifying all inputs such as energy, water and process materials, all machinery and equipment required in the production process, the logistics involved and all outputs in the form of the end product, by-products and waste. The experts in ASAP's Sustainability Consulting team ultimately collate all these factors in a single model to calculate the product's CO<sub>2</sub> equivalent. The assessment casts light on the details of every single process step. For example, it considers the biomass sources, power sources and quantity of energy used in the production process as well as how the fuel is transported. The amount of CO<sub>2</sub> absorbed by a plant is included as a negative value in the calculation – and therefore reduces the bio-based

fuel's CO<sub>2</sub>-equivalent accordingly. Ultimately, this assessment produces detailed, verifiable information on the level of greenhouse gas emissions arising throughout the tested product's entire life cycle. In terms of CO<sub>2</sub> emissions, one litre of advanced, bio-based fuel generally achieves a reduction of 70–90% compared to the same quantity of fossil fuel. ASAP also provides support in cases where customers require certification for the life cycle assessment, detailing the requirements, procedure and methodology used to determine the greenhouse gas footprint, and coordinating the entire process if needed. ASAP also offers its customers training on data collection and use in subsequent cases.

#### Carbon offsetting sponsored for the Donau Classic and Munich Classic rallies

In addition to supporting its customers with consultancy services in relation to sustainability mobility, ASAP also actively sponsors sustainable mobility initiatives. Last year, the ASAP Group sought to set a new, green direction for a vintage car rally – the Donau Classic – by organising and sponsoring carbon offsetting measures for the entire event. This year, ASAP has expanded its efforts by sponsoring carbon offsetting for two popular vintage car rallies: the Donau Classic (23–24 June 2023) and the Munich Classic (9 Septem-



ber 2023). As a result, the cars taking part in the rallies and all service vehicles used have effectively been made carbon-neutral for the entirety of the events. ASAP's efforts to enhance the events' green credentials started by calculating the carbon footprint of the two rallies. The corporate group then offset the calculated CO<sub>2</sub> emissions by

procuring combined certificates in cooperation with Nature Consulting. These combined certificates compensated for the CO<sub>2</sub> emissions of all vehicles involved in the two rallies by supporting forestation projects and international climate protection projects in line with the event's overall carbon emissions.



# ASAP AND THE FUTURE OF TESTING

## AN INTERVIEW WITH DOMINIK SEDLMAIR, HEAD OF DIVISION TESTING AND VALIDATION

**Dominik, in an increasingly digital world, people are asking whether traditional testing has a future in test centres.**

**What do you think?**

Dominik: Absolutely, real-world testing is and remains an irreplaceable part of our work. Although virtual validation can supplement real-life testing, it is by no means a replacement for it. Real-world tests provide us with indispensable data that we need to develop and refine our simulation models. In addition, there will always be new phenomena that we cannot yet replicate in virtual models. Sometimes, it's simply more efficient to carry out a real-world test than to create complex simulations.

**What are the current trends and changes in testing?**

Dominik: We are seeing major advances in simulation technology, particularly in the design of electric drive systems. Models are becoming increasingly sophisticated, which is already reflected in significantly improved

testing results. Hardware defects due to faulty design are becoming increasingly rare. However, digitalisation continues to advance, and our customers are increasingly demanding that testing solutions be incorporated into modelling and data analysis. Given all the data that modern vehicles generate, data analysis will become increasingly important in coming years. Nevertheless, physical testing remains highly relevant, as it provides the data essential for the virtual world.

**You said that virtual tests cannot simply replace real ones. Why not?**

Dominik: Virtual tests and digital twins are powerful tools, but they are based on known data and, sometimes, fail to capture or anticipate unknown phenomena. Physical testing offers us the opportunity to discover these kinds of unknown effects. Physical testing is also faster and more cost-efficient in many cases, especially if the necessary simulation models are very complex and have not been validated yet.

**What services do ASAP's testing labs offer?**

Dominik: Our testing labs offer a very wide range of services. We cover everything from component testing to comprehensive life cycle testing. We are particularly proud of our e-mobility expertise. We offer high-quality measurements and functional validation of components and systems, and also provide support with approval processes. We also test the product reliability and robustness of larger quantities of components in life cycle testing, which in turn places additional demands on testing logistics and organisation.

**What does the combination of virtual and real-world validation look like in practice?**

Dominik: Testing and simulation are kept separate in many companies. At ASAP, we are working hard to connect these two worlds. We leverage the strengths of both approaches to offer our customers the best possible solutions. It's not a question of either/or, but of combining both methods sensibly.

**In addition to the benefits, do your integrated services also produce synergies?**

Dominik: Yes, bringing the virtual and real worlds together generates immense synergies. Rather than following a rigid test plan, we aim to react flexibly to the respective product and the specific requirements. We can provide a framework that allows us



Dominik Sedlmair

to examine specific aspects and then decide to what extent we can trust the models and when real-world tests are necessary.

**What challenges do you see for testing in the future?**

Dominik: Further development will definitely be required. It's not just about virtualising more, it's about finding the best way to do it. The standards and specifications, the development processes and the validation of models must all be adapted. We must not simply take action for action's sake: we need a well thought-out digitalisation strategy. The quality and depth of the data we collect are becoming increasingly important for improving models and their calibration. There is still a lot to do here.



# TEST AND VALIDATION CENTRE

## FACTS | FIGURES | DATA

**1** Goal – together with the ASAP Group's Test Systems division, the Test and Validation Centres offer comprehensive, turnkey solutions in line with specific customer requirements. ASAP offers a complete package, from designing and fabricating customised test systems to performing all steps in the component testing process, including test reports.

**3** ASAP Group locations have a Test and Validation Centre: Ingolstadt, Sachsenheim and Wolfsburg.

**18** life cycle simulation systems for inverters/power electronics, all of which were designed, developed and fabricated by ASAP Test Systems and have delivered years of productive service in ASAP testing labs

**70** test benches available in total for integrated testing services – and, thanks to annual investments, this figure continues to rise.

**17025** ASAP's independent Test and Validation Centres in Ingolstadt, Sachsenheim and Wolfsburg hold certification of compliance with DIN EN ISO/IEC 17025:2018 from the German national accreditation body (DAkkS).

**5** key areas in ASAP's Testing & Validation division: component testing, life cycle testing, functional validation, measurement/application and homologation.

**100** percent: By offering integrated consultancy, project management and process management services from our Consulting & Service division, we guarantee that each step in the process flows seamlessly to the next. The result? Fully customisable automotive testing and validation services.

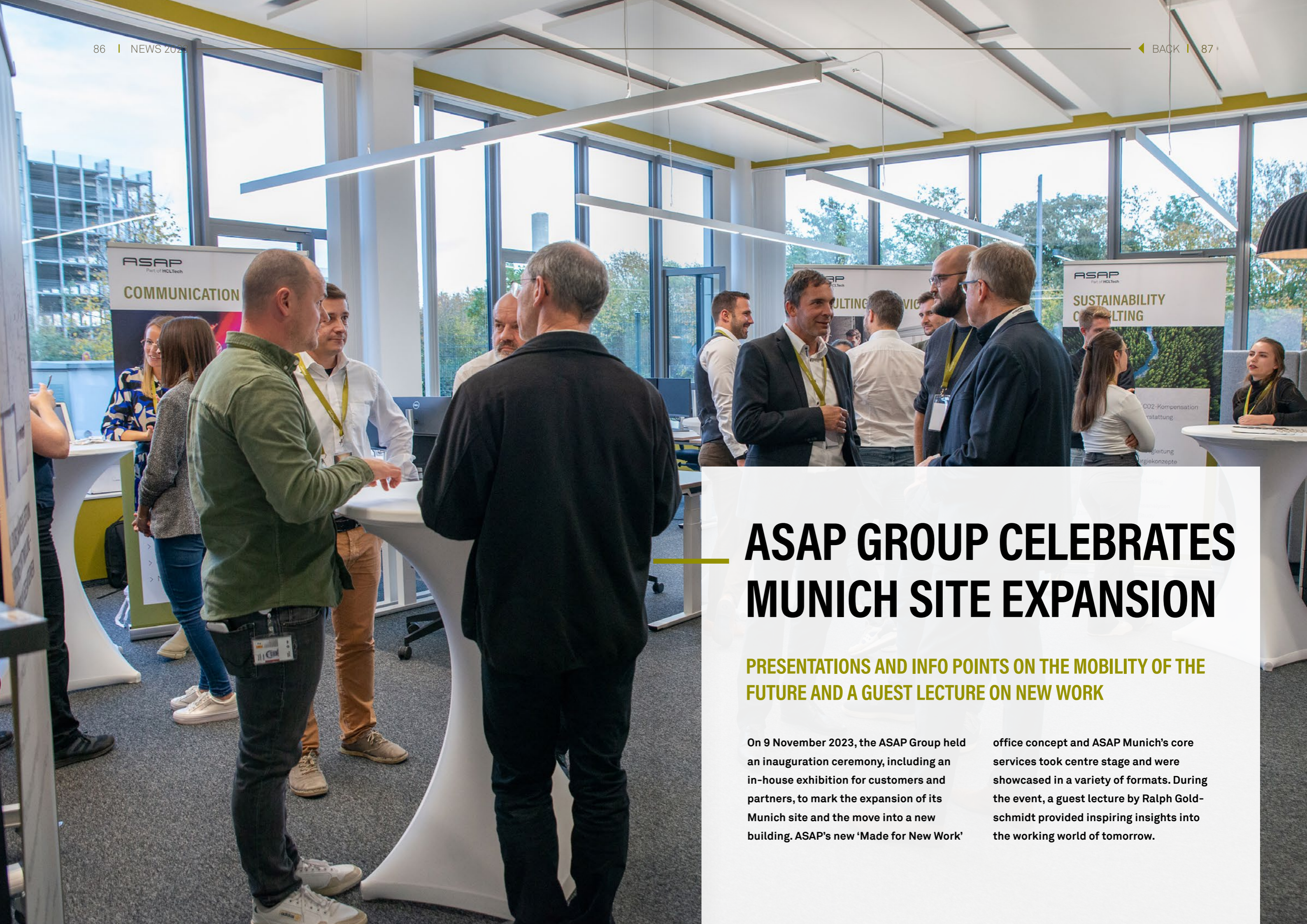
**600** test parts pass through our laboratories in our Test and Validation Centres every year: for tests ranging from high-temperature and thermal cycling tests to requirements-based software and functional tests to environmental, corrosion and strength tests on LV and HV components.

**6** terabytes of measurement data are recorded at our Test and Validation Centres each year. This data is then processed for our customers by ASAP data analysis specialists and made available in accredited test reports.



# NEWS 2023





# ASAP GROUP CELEBRATES MUNICH SITE EXPANSION

**PRESENTATIONS AND INFO POINTS ON THE MOBILITY OF THE FUTURE AND A GUEST LECTURE ON NEW WORK**

On 9 November 2023, the ASAP Group held an inauguration ceremony, including an in-house exhibition for customers and partners, to mark the expansion of its Munich site and the move into a new building. ASAP's new 'Made for New Work'

office concept and ASAP Munich's core services took centre stage and were showcased in a variety of formats. During the event, a guest lecture by Ralph Goldschmidt provided inspiring insights into the working world of tomorrow.





The ASAP Group, development partner to the automotive industry, hosted the inauguration ceremony for its new Munich premises at Weimarer Strasse 32 on 9 November 2023. Guests were firstly given a tour of the ASAP offices, which include a range of working environments designed according to the 'Made for New Work' concept. The presentations at the event kicked off with a guest lecture by Ralph Goldschmidt, in which he outlined the location's overall concept. Goldschmidt, an expert on the working world of tomorrow and future-proofing companies, gave new insights into the topic during his lecture entitled: 'New Work: Inspiring and quantifiable impetus for the working world of tomorrow'. Customers and partners then had the opportunity to learn about the site's main services in the company's Electrics/Electronics, Software, Consulting & Service, Testing & Validation and Vehicle Development divisions at an in-house exhibition featuring numerous info points. Multimedia presentations covered twelve key topics, including the Process Automation Kit (PAK), virtual

validation, XIL modelling, test systems and Codebeamer. The event also featured four keynote speeches by ASAP experts from various specialist areas. Some of the speakers presented ASAP's unique integrated approach to automotive wire harnesses, discussing the field of wire harness development as a whole. Others spoke about new approaches to test bench automation and the ALM tool Codebeamer. The event concluded with a keynote by a speaker from the ASAP Center of Excellence for Data Science and AI on the topic of 'Data-driven validation for vehicle development'. "I'm delighted that the event has been such a success and so well received," said Robert Werner, COO of ASAP's Munich location. "With the in-house exhibition, we were able to offer our experts an exclusive stage for them to present hot topics in the automotive sector and thus showcase our extensive service portfolio at the Munich location. However, the event was very much focused on personal dialogue with our long-standing customers and partners."



The image shows a modern, multi-story building with a light-colored facade. The ASAP logo is prominently displayed in large, dark blue letters on the upper left side of the building. The building features large windows and a section with vertical wooden slats. The overall scene is bright and clear, suggesting a sunny day.

# ASAP

## ASAP EXPANDS IN INGOLSTADT

### FOCUS ON THE ELECTRICS/ELECTRONICS DIVISION

**More space for automotive progress: The ASAP Group has once again significantly enhanced its capacities at the Ingolstadt site. After moving into another building on the ASAP Campus, the company now has around 1,300 square metres of additional laboratory space at its disposal. The new premises support the continuous expansion of the company's Electrics/Electronics division. Strong growth in this division over recent years and the prospect of continued growth have necessitated renewed expansion of the Ingolstadt location.**

ASAP remains fully focused on its course for growth: the Group recently moved into another building on the ASAP Campus in Ingolstadt. It has added around 1,300 square metres to provide more space for its Electrics/Electronics division. In particular, the new premises provides additional laboratory space to validate electrical functions. ASAP has significantly expanded its expertise and capacities in Electrics/Electronics in recent years and is responding directly to customer requirements by focussing on

this division. "Electronics and software development are the key growth drivers in our industry – the proportion of value added by these divisions has increased significantly in recent years and will continue to grow in the years ahead," says Christian Schweiger, COO of ASAP's location in Ingolstadt. "We are therefore making a direct contribution to the future and the strategic goals of the ASAP Group by creating the necessary infrastructure for our continued growth in our Electrical/Electronics division with another new building within a year. We have continued to make electronics and software development in terms of both content and capacity, and will continue to work hard to expand our capacities in the future. We see ourselves as a development partner and can offer our customers considerable added value thanks to our high level of service integration." The attractive new premises also provide employees with the best possible conditions for office-based work and create a place for everyone to network, exchange ideas and collaborate.



# AWARD-WINNING

## ASAP LEADS THE WAY

### LEADING INNOVATOR AMONG SMES

The ASAP Group has once again been named among the most innovative SMEs in Germany. This is the seventh year in succession that the development partner to the automotive industry has received the TOP 100 award. ASAP was once again able to demonstrate its innovative power, particularly impressing the jury in two categories: 'Innovation success' and 'Innovation-promoting top management'. TOP 100 uses a transparent, accountable and scientific methodology to identify the most innovative SMEs.



 **SEE MORE**

Video about the ASAP Group's TOP 100 award

### TOP EMPLOYER

The ASAP Group offers award-winning working conditions: In 2023, the development partner to the automotive industry was named among Germany's 'TOP Employers' for the eighth time in a row. ASAP once again made the TOP 10 in the 'Automotive and Suppliers' category, coming in 7th place, and ranked 148th out of 1,000 in the overall ranking. News magazine Focus collaborated with FactField, a research institute specialising in sound data collection and analysis, to select the award winners based on Germany-wide online surveys and employer evaluations.



### OUTSTANDING INNOVATIVE POWER

The ASAP Group has received the 'Outstanding Innovative Power' award. Rating and ranking agency ServiceValue, in cooperation with the free-to-air channel WELT TV, conducted a study to determine which companies stand out for their particular innovative strength. This involved surveying more than 216,000 managers from 2,379 German companies operating in 175 sectors.



### MINT MINDED COMPANY

The ASAP Group has been recognised as a 'MINT Minded Company' for the ninth year in a row for its commitment to promoting young STEM ['MINT' in German] talent. The initiative honours companies that are particularly committed to promoting young STEM talent and specialists.





## TOP COMPANY 2023

The Top Company 2023 seal recognises companies that have a particularly high rating on kununu. However, the kununu score is not the only factor in the Top Company designation. On average, companies that receive the seal have 93 more kununu reviews and comment on them 20 times more often than employers without it. This willingness to engage in dialogue is an important signal for talented professionals: according to a scientific study by Trendence, 60% of users consider companies' replies as relevant to the application process. In addition to the high comment rate, top companies also score consistently higher in other aspects of the kununu evaluation. A comparison shows that companies awarded the seal score particularly well in the area of 'Careers & professional development'. Top companies also do significantly better in terms of supervisor behaviour, with an average score of 4.2 stars. The third-most significant difference is in the 'Working atmosphere' category.

## A LEADING DIGITAL COMPANY

The ASAP Group has been named one of Germany's 'TOP Digital Companies'. A study by Statista GmbH identified companies that have played a leading role in the country's digital development and should therefore be regarded as the pioneers of digitalisation. The analysis included over 3,000 companies across 26 sectors with sites in Germany. The companies' internal digital processes and their overall digital presence were analysed for the assessment along with an independent online survey of 40,000 employees.

## CORPORATE RESPONSIBILITY

A commitment to corporate responsibility is reflected not only in our dealings with stakeholders but also in our compliance with ethical standards. For this reason, the ASAP Group was awarded the 'Outstanding Responsibility' rating in 2023. Rating and ranking agency ServiceValue, in cooperation with the news channel WELT TV, conducted a large-scale study to assess the sincerity and efficacy of corporate management's efforts to promote corporate responsibility. More than 171,000 managers at German companies were surveyed on the subject on corporate responsibility. The study examined 1,969 companies from 134 sectors.

## BEST EMPLOYER FOR CAREER OPPORTUNITIES

The ASAP Group received the award 'German Employer with the Best Career Opportunities' in 2023. ServiceValue, the Cologne-based rating and ranking agency, teamed up with monthly magazine €URO to conduct a survey of the population, examining this issue for the first time. The four-part study series surveyed around 493,000 citizens and assessed 3,866 companies.

## LEADING EMPLOYER

ASAP has once again received the 'Leading Employer' award, placing it among the top 1% of German employers for the fourth year in a row. The awards process studies over 100,000 companies and analysed eight million pieces of data, making the 'Leading Employers' award most comprehensive employer rating system of its kind in the world.

## ONE OF GERMANY'S BEST EMPLOYERS

Does the image match the reality? This is certainly the case at ASAP, which is why the corporate group has been awarded the 'Germany's Best Employer' quality seal for the third time running. Together with WELT, Cologne-based analysis institute ServiceValue GmbH conducted extensive nationwide surveys to determine how the public assesses the attractiveness of German companies. The ASAP Group was rated as a 'Very Attractive Employer'

## A VALUABLE EMPLOYER FOR THE COMMON GOOD

The ASAP Group has once again received the 'Valuable Employer for the Common Good' award in 2023, having been assessed as making a 'significant contribution to the common good'. In cooperation with ServiceValue, Wirtschaftswoche magazine conducted a study to determine how companies are perceived by people in the regions surrounding them. The decisive factor here was the respondents' assessment of the companies' relevance regarding the common good in their area.



# CERTIFIED

## A FOCUS ON QUALITY AND OUR CUSTOMERS

### CERTIFIED QUALITY

Quality and a strong focus on our customers are integral elements of the ASAP philosophy and decisive factors in ASAP's success. Bureau Veritas has certified the Group's quality management system in accordance with DIN EN ISO 9001:2015. In addition, as the operator of the Group's central IT and information security management systems within the ASAP Group, ASAP Holding GmbH has been certified by DEKRA in accordance with ISO/IEC 27001:2013. ASAP Holding GmbH also adheres to the information security catalogue issued by the German Automotive Industry Association (VDA ISA). It has also obtained TISAX (Trusted Information Security Assessment Exchange) certification from DEKRA. The TISAX assessment results are published on the ENX and can be viewed there.

### ACCREDITED TEST AND VALIDATION CENTRES

The ASAP Test and Validation Centers in Ingolstadt and Wolfsburg hold certification of compliance with DIN EN ISO/IEC 17025:2005 from the German national accreditation body (DAkkS). In addition, the Test and Validation Centres have passed audits according to automotive and industry standards, including LV 124, VW 80000 and 80101, DC 10611, 10612 and 10615; GS 95003-x and 95024-x; DIN EN 60 068 2-x and DIN ISO 16750.





## IMPRINT

### **Publisher**

ASAP Holding GmbH

Sachsstraße 1A | 85080 Gaimersheim

Tel. +49 8458 3389 0 | Fax. +49 8458 3389 199

holding@asap.de

### **Head of Marketing/Corporate Communications**

Ebru Kahraman

### **Editing and conception**

Annika Fuchs

### **Design and production**

Lukas Otting

### **Print**

Kontrastreich GmbH | 63500 Seligenstadt

### **Photos**

S. 3 iStockphoto\_699959836 \_terng99

S. 26 iStockphoto\_1390975452\_hanakaz

S. 33 HCLTech

S. 35-35 shutterstock\_1938998845\_SidorArt

S. 42-43 iStockphoto\_808559164\_FlashMovie

S. 44 iStockphoto\_1291478674\_NicoElNino

S. 50 iStockphoto\_1433041100\_NicoElNino

S. 54 GettyImages\_1440620306\_Emanuel M Schwermer

S. 62 GettyImages\_1200103194\_darekm101

S. 72 shutterstock\_618517217\_PATIWIT HONGSANG

S. 76 iStockphoto\_916333732\_Just\_Super

S. 80 shutterstock\_1826877758\_Ekaterina Kondratova

S. 84 iStockphoto\_873130186\_Bunphot

S. 99 unsplash\_will Francis

S. 100-101 GettyImages\_1129335362\_serts