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In the brave new world of post-pandemic change, it is evident the Covid crisis has sped up the pace of digital transformation by several notches.

While face masks may eventually end up ditched and forgotten (except for when helping us to date snapshots taken over the last couple of years), mandatory social distancing rules will leave lasting traces, with the irreversible disruption to some of the long-standing organizational paradigms at our workplaces and in our personal lives.

We embraced segregation as our sole hope of survival. It was enforced regardless of anyone's background, nationality, family ties, social status,



religion or personal beliefs. Governments across the world promoted social distancing as the most important priority to protect our communities. In this respect, the necessary consensus that the COP26 summit could not reach to collectively combat dangerous man-made climate change was achieved

in the case of the current pandemic without a single political meeting. Moreover, the global healthcare crisis demonstrated that mankind tends towards solidarity by necessity. The altruism expressed by adopting safe behavior protocols is now understood as a modern and vital form of egoism: in order to save ourselves it becomes essential to worry about others, whether we face the imminent possibility of contagion or the long-term threat of dangerous, man-made climate change.

In this context, the far-reaching potential of the digital society has finally come into full view: the digital dimension of the reality we live in is not less

important than the physical world that has always been our home.

In this light, one could venture to predict that the most popular new product in 2030 will probably be an interface device (whether goggles, a helmet or a complete suit) that enables us to access the metaverse. If we take this thought experiment even further, then we can foresee that one day our brain will become the User Interface without the mediation of our sensory system, thus closing the gap between thinking and doing.

Taking this scenario to the extreme, one can envision that one day mind reading will be possible, and even the reading of our thoughts by other people.

Without going that far, what we have learnt from the coronavirus crisis – which may have been the precursor of further pandemics – is that a more 'plural' self will need to express our preferences and drive our decisions. Egoistic altruism will be a pivotal quality of mankind as individuals will live in a world where even a slight mistake may cost us the very survival of our species.

Keeping this in mind, may we learn to be wise and caring already, developing the human skills we will hopefully be able to express in the years to come.

Enjoy!

Sophie B. de la Girarday



Would you like to put an outstanding thought leader, policy developer or pioneering decision maker under the spotlight for their contribution towards building a smarter and more environment-friendly society? Nominate your candidate for this year's SD Awards. See page 9 inside!



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A view of how the world looks today after the Covid pandemic in terms of connectivity in a new normal. Predictions for the future are discussed in the context of how the metaverse is potentially changing the digital dimension. Opinions and policies from big thinkers and world leaders on AI and its impact are also explored.



A study of the European Commission's aims to empower businesses and people in a human-centred, sustainable and more prosperous digital world. The EC's Digital Economy and Society Index (DESI) is referred here to track key developments in the digital economy and society and to explore concrete ways that ICTs help to reduce the environmental footprint in urban communities and the wider world.



This section looks at innovation around digital identity to the point where it is crystallizing into a highly important market. The report argues that players in this space must be able to arbitrate complications, such as fraud and multiple forms of digital IDs, so usage simple for business and ultimately, the end user. Furthermore, the reasons behind why ensuring improved digital identity use will be critical to success, are explored.



Track and trace technologies such as DI and intelligent labels are looked at in this report in terms of how they can enable a whole new level of supply chain visibility and efficiency in order to reduce waste and carbon to enhance sustainability for a truly circular economy. The goal here is to create more efficient production decisions and track any unavoidable waste so that it can be embedded back in the system.

2022 BUYER'S GUIDE

ICT technologies are constantly evolving and as the digital era sees widespread adoption in all sectors, auto ID still lies at the heart of the industry. Our publications regularly update government buyers, end-users in all vertical sectors, as well as integrators with essential tools to support their decisions. For two decades, the ID Community Publications offers the prime reference to access the best product portfolio in terms of stable and proven auto ID technologies, ideal compromise between functionality, economy and compliance, as well as smart choice for business continuity. As a global directory of the players of the auto ID industry and a knowledge bank of issues, new technologies and market trends, it is a unique platform in the world of advanced automatic identification. The full online Annual Buyer's Guide is the go-to online reference on auto ID technology solution and component suppliers, bringing together a comprehensive review of players in the fields of Cards, Biometrics, RFID and Digital Data.

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How the metaverse is changing the nature of reality

How is our digitally empowered, hyperconnected world changing today? How will it expand in its new dimension, and how are our individual identities developing in its real and digital domains?

Today's recent acceleration in digital transformation triggered by the Coronavirus crisis sees the world enter a new era. At a time when technology is ripe for the transition to the 'Internet of Senses', i.e. a full sensory immersion in the virtual space, a number of philosophical questions arise. In fact, with the advent of 5G and 6G mobile communication networks, and the emergence and convergence of disruptive technologies such as Artificial Intelligence, the Internet of Things, digital twins, Blockchains and distributed ledgers, cloud and edge computing, genomics and gene editing, quantum computing, and nanotechnology, a digital big bang will soon unleash the potential of the metaverse, disclosing virgin land where barriers between the real and virtual dimensions blur and may eventually disappear for good. In this sort of parallel universe, we will connect with all sorts of people and things, both real and digital. We will buy land, celebrate unions and purchase items in decentralized virtual economies powered by cryptocurrencies, obeying to specific rules and regulations of a reality created as a powerful and empowering alternative to the original, 'real' world and marketplace.

The question is, who will we be and what will we want, once we will start spending a major part of our time in the metaverse? How will we change if those moments start feeling like quality time offering us the most relevant experiences of our daily lives? How will we declare and manage our identities, and which of them will best help us assert our rights and privileges?

In this regard – in an Ericsson study – analysts expect that technology will enable people to sense the mood of their colleagues,



improve the taste of food and improve the experience even of the other senses by 2030. The survey around 'Internet of Senses' collected opinions of people on how sensory connectivity through artificial intelligence (AI), augmented and virtual reality (AR/VR), 5G and automation can change the work situation for white-collar employees.

Seventy-three per cent of senior managers believe that food in the company canteen can be digitally enhanced to taste like anything by 2030. Sixty-six per cent think that by 2030, technology will enable them to sense when a colleague is upset. That also means their employer will know when they themselves are upset, the report said.

Also, it is expected that there will be wearable devices that will use online weather

forecasts to make users feel the oncoming weather, such as the amount of wind or rain that a person will be exposed to. According to the study, the Internet of Senses will most likely be used for marketing and sales, with 59 per cent saying that spatial video and 50 per cent saying digital temperature will be used to have more immersive engagements with customers by 2030.

Metaverse

The digital revolution will see a huge acceleration once we step into the metaverse. In fact, ever since governments enforced safety measures worldwide during the Coronavirus pandemic to mitigate contagion rates, new behaviors such as remote working and learning have become commonplace. In the early

National AI strategies from the US to global adoption

In the US, when it comes to automation and AI, President Joe Biden and former President Donald Trump are not as far apart as they are on other issues. They both support rapid development of AI technologies, and they want the U.S. to be the global leader of AI development. They also agree that the current workforce needs to be reskilled to get there.

When in office, Trump said AI had become a defining issue of the time, affecting national security, economic development, human rights, and social media — for better and worse. His administration launched the American AI Initiative, directing federal agencies to focus on the technology. The US initiative, which followed on the heels of at least 18 other countries that have announced national AI strategies, had five key pillars — research and development, infrastructure, governance, workforce and training programs in computer science.

Since then and taking this a step further, Joe Biden's administration's White House Office of Science and Technology Policy (OSTP) and the National Science Foundation (NSF) announced the newly formed National Artificial Intelligence (AI) Research Resource Task Force which will write the road map for



expanding access to critical resources and educational tools that will spur AI innovation and economic prosperity nationwide. As directed by Congress in the National AI Initiative Act of 2020, the Task Force will serve as a Federal advisory committee to help create and implement a blueprint for the National AI Research Resource (NAIRR) — a shared research infrastructure providing AI researchers and students across all scientific disciplines with access to computational resources, high-quality data, educational tools, and user support. Furthermore, the Task Force provides recommendations for establishing and sustaining the NAIRR, including technical capabilities, governance, administration, and assessment, as well as requirements for security, privacy, civil rights, and civil liberties. A final report is due in November 2022.

days of the pandemic contagion led to the disruption of supply chains and shortages in semiconductors and automotive spare parts imported from the Far East. With telework, telelearning and telemedicine, a major and to some extent permanent societal transformation took place that fed directly into a new season of ICT-driven innovation.

Global village

Over the past two years, we learned to connect digitally with the entire spectrum of our relevant counterparts. Conversely, the world no longer comes across as small and easy to travel as when we spent decades pursuing the utopia of the global village, with constant innovation in technologies and policies allowing travellers to defy geographical distances and cross borders swiftly and securely. In the context of the coronavirus crisis, the full-fledged potential of the digital society has finally been understood by governments and citizens, organizations and employees, vendors and clients, doctors and patients alike.



6G will mean interacting with networks in a more immersive way as the digital world becomes a significant dimension

The advent of 5G and eventually 6G will project our identities in the future scenario built upon an 'Internet of Senses', connecting us with everything and everyone in a new and appealing way.

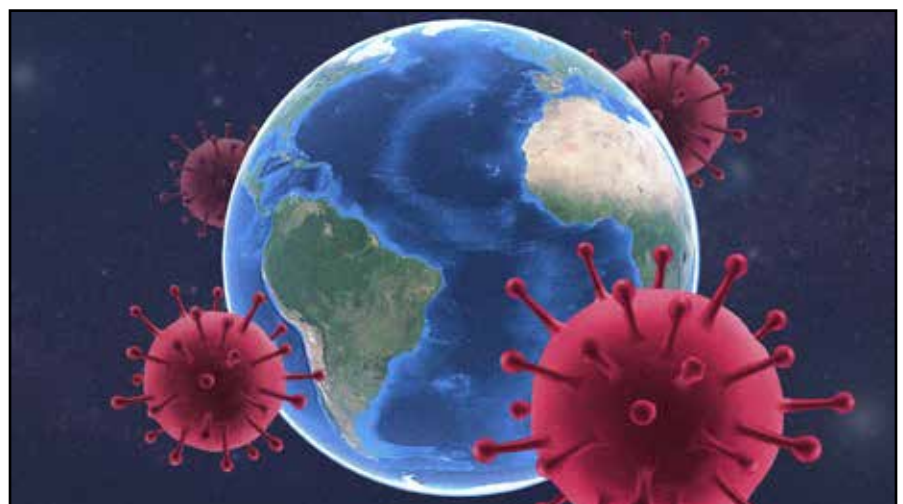
Magnus Frodigh, head of Ericsson's research division, predicts momentum for 6G is building. Frodigh says there are now dozens of researchers wholly dedicated to 6G research. He adds that test beds are likely to start emerging as early as 2024, with the first version of the standards — which will shape the way networks around the world operate — likely to be ready by 2028.

But what might the 6G world look like? Research is in its infancy but carriers and network providers are beginning to focus their thinking around certain themes that greater speed, increased data processing, and lower latency will enable. Ericsson's idea of the 'Internet of Senses', whereby people might be able to smell, feel and taste things within a digital world, means

Inclusive vision

The very perception of our identity is evolving, as consumeristic individualism gives way to a more comprehensive and inclusive vision encompassing the element of 'others' also in our self-centered calculations.

Was the coronavirus crisis a catalyst for change? The world is moving towards the future scenario built upon the 'Internet of Senses'



Debating on robots for safer deployment



A global debate on our future co-existence with intelligent machines has been triggered by renowned scientists, the founders of Internet giants and other prominent technocrats. Among them, Elon Musk, Time Magazine's Person of the Year for 2021, campaigns to stop the apocalypse of AI with a billion-dollar non-profit company, established to work for safer artificial intelligence. Back in 2017, at a meeting of the National Governors Association, he called AI 'the scariest problem', an invention that could pose an unappreciated fundamental existential risk

for human civilization. However, despite being attuned to the dangers of AI, he is a big player in the technology, in part through his car business, Tesla. The technology, Autopilot, is a suite of advanced driver-assistance system (ADAS) features offered by Tesla that amounts to Level 2 vehicle automation. Its features are lane centering, traffic-aware cruise control, automatic lane changes, semi-autonomous navigation on limited access freeways, self-parking, and the ability to summon the car from a garage or parking spot. Elon Musk has described Tesla as the world's biggest robotics company and he has announced plans to build a prototype robot sometime in 2022. The robot is intended to be friendly, and to eliminate 'dangerous, repetitive, and boring tasks'.

interacting with networks in a more immersive way.

Other thinkers say 6G is the key to the future, the 'enabler' of the world of tomorrow – augmented reality, metaverse, artificial intelligence, quantum computing – all connected to the evolution of objects.

Sci-fi predictions

In 'Shaping Things', for MIT Press, science fiction author, Bruce Sterling, states that while we have the good fortune to be alive, we should invent and apply ways of

life that expand the options rather than cause irreparable damage to our descendants' heritage. He believes the technologies in most critical need of reform are the most successful ones. These are the ones that have spread themselves throughout the techno-social fabric, into commerce, infrastructure, governance and culture. He thinks we need to understand technology with a depth of maturity that mankind has never shown before.

Sterling's futuristic and science fictional prediction involves the next step, which he calls tomorrow's tomorrow, and which sees the rise of the 'Biot'.. A Biot can be defined

as an entity which is both object and person. Today, every human being, everything that breathes, carries a load of industrial effluent. The industrial and natural worlds have interacted long enough and powerfully enough to become a kind of planetary froth. But some artificial substances are 'bioaccumulative'; our metabolisms preferentially sucks them out of the bio-sphere and tries to make structure out of them.

A Biot, continues Sterling, is somebody who knows about this and can deal with the consequences – to micromanage and design the processes that shape his anatomy. As he says, the ultimate consumer item is the consumer, and there is no metahistory we find more utterly compelling than our personal metahistory. The world has many forms of reward and gratification, but being alive and healthy underwrites all the rest of them.

Digital society

In this context and now that the pandemic has passed, the daunting potential of the digital society has finally been understood by everyone.

So, infrastructures and buildings, but also organizations and lifestyles will evolve in light of what is now a clear and shared vision, where the digital world is no longer seen as a lesser dimension but an integral part of the reality we live in.

Aligning policies in AI technology

A range of regulatory changes and new hires from the Biden administration signals a more proactive stance by the federal government towards artificial intelligence (AI) regulation, which brings the U.S. closer to that of the European Union (EU). These developments are promising, as is the inclusion of AI issues in the new EU-U.S. Trade and Technology Council (TTC). The expansion of AI governance raises concerns about potential challenges for international cooperation. That is, the increasing ubiquity of AI in online services and physical devices means that any new regulations will have important ramifications for global markets. Some pundits say the variety of different ways that AI can be trained and deployed also complicates this picture. For example, AI systems may be hosted in the

cloud and accessed remotely from anywhere with an internet connection. Retraining and transfer learning enable different teams to jointly develop an AI model with many datasets while working out of multiple countries. Edge and federated machine learning techniques enable physical products around the world to share data that affects the function of their AI models. EU President, Ursula von der Leyen champions the Commission's new rulebook for Europe's Digital Decade. First, there is the Digital Markets Act and the Digital Services Act. In those two acts, it lays out the basic principles for all digital companies in Europe. The intention is to create a level playing field for all businesses and clear rights for all users. Secondly, with the Artificial Intelligence Act, Ursula von der Leyen



says the Commission has created a 'guard-rail' for one of the most crucial technologies of our age. "We want companies and programmers to keep advancing and innovating and we are expanding our investment in AI," she says. "But as we do this, we must protect people and their rights with clear rules on the high-risk applications of AI. I believe AI must be a force for good, for greater human welfare. The AI Act can truly channel the power of artificial intelligence in the right direction."



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Assigned to the person who has produced the most concrete results in the field of smart, eco-friendly innovation

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Assigned to the person who is helping the Sustainable Development Community envision what will happen in the coming generations

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Recognising outstanding members of the global Sustainable Development Community who have distinguished themselves during the last 12 months by driving innovative projects in the areas of Eco-smart Innovation, Digital Economies and forward-thinking delivery models for Smart Lifestyle Communities.

Excellence in Eco-Smart Innovation



- Transportation (how electric cars, public transport, connectivity & emissions control innovate transport)
- Manufacturing (how developments in materials science, components & AI contribute to supply efficiencies)
- Building Automation (how sensing, smart city looping, inclusive urban living & eco-homes set the future)

Excellence in the Digital Economy



- Smart Systems (how digital transformation supports peace, progress & sustainable development in sharing economies)
- Finance Transparency (how transparency, control & high tech support the finance sector)
- Energy (how digital monitoring boosts production efficiencies renewables & waste management)

Excellence in Smart Lifestyle Communities



- Security and Safety (how communications systems, smart ICT & data storage enhance secure transactions and services)
- Global Migration (how digitization efforts for secure borders, travel & citizen-ID) support migrants)
- Public Services (how digital health, education, eco-infrastructures & systems create citizen-centricity)

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🏆 Excellence in Eco-Smart Innovation

Name, Company and Position _____

Motivation _____

🏆 Excellence in the Digital Economy

Name, Company and Position _____

Motivation _____

🏆 Excellence in Smart Lifestyle Communities

Name, Company and Position _____

Motivation _____

Submission Details

Name _____

Organization _____

Email _____

Signature _____

Job Title _____

Phone _____

Vodafone and Ericsson complete 5G network slicing trial

Major telecom players, Vodafone and Ericsson have completed a successful lab trial of 5G network slicing. Enabled by Standalone 5G, network slicing is a new service aimed at businesses and app developers that involves carving out a 'slice' of the network to in order to cater it to specific use cases. This can be based on geographical location, download and upload speeds, latency, capacity, and even specific cyber security needs. For

instance, the trial successfully conducted by Vodafone and Ericsson involved creating and configuring an on-demand 5G network slice for a retail store that would have the enough bandwidth to support virtual reality (VR). The slice, which took 30 minutes to complete, was able to deliver a guaranteed download speed of 260Mbps and latency of 12.4 milliseconds. 5G network slicing has the potential to enable a number of different 5G use case scenarios..

Emirate utility to launch continuous drone charging system

Dubai Electricity and Water Authority's research and development centre has announced the development of an unmanned aerial vehicle charging system using electromagnetic induction. The system uses a group of UAVs to charge the main one through electromagnetic induction. It can be used for government, military, commercial, and personal operations. This supports DEWA's efforts to increase its UAV operations. These include automatic regular checking of photovoltaic modules at the Mohammed bin Rashid Al Maktoum Solar Park, the largest single-site solar park in the world us-

ing the Independent Power Producer (IPP) model. DEWA uses UAVs to ensure solar photovoltaic panels are performing well. The new system enables longer working hours for UAVs, saves time and effort, increases productivity, and improves the accuracy of maintenance operations.



AI and sensors combine for traffic-monitoring solution

Velodyne Lidar has announced the University of California, Irvine's (UCI) HORIBA Institute for Mobility and Connectivity² (HIMaC²) has selected its Intelligent Infrastructure Solution (IIS) to create a public road network platform. Combining artificial intelligence (AI) and lidar sensors, Velodyne's IIS helps predict, diagnose, and address road safety challenges under all weather and lighting conditions. Per reports, HIMaC² will implement IIS at 25 intersections sur-

rounding UCI and the adjacent city of Irvine, as part of a study to improve traffic and energy efficiency, road safety, and air quality. Other contributors include Bluecity, Argonne National Laboratory (ANL), the UCI Institute of Transportation Studies, Toyota Motor of North America, Pony.ai, and Hyundai Mobis. Velodyne's IIS deployment is further assisted by a \$6 million grant HIMaC² received from the US Department of Energy's Vehicle Technologies Office (VTO). By implementing advanced infrastructure monitoring as a V2X (vehicle-to-everything) solution, HIMaC² will gather and synthesize critical data needed to optimize routes and improve traffic flow. HIMaC²'s study also focuses on ensuring safety for vulnerable commuters, regardless of weather and lighting conditions.



UK and Thailand fuel smart city collaboration

Launching the UK Thailand Tech Export Academy, partners say they are set encourage smart city collaboration between UK and Thai businesses. This move comes as part of the Tech Academy programme, which was launched last year by the trade department as part of a plan to support UK companies post COVID-19. Out of the 108 companies that applied, 30 were selected to join the nine-month programme in preparation for the final trade mission to Thailand. The virtual trade mission was part of other collaborative efforts in smart cities between the UK and Thailand, spearheaded by the initial launch of the UK-Thailand Smart City Handbook, in partnership with Thailand's Digital Economy and Promotion Agency (DEPA).

EU announces 100 cities for smart cities mission

The European Commission has announced the 100 EU cities that will participate in the EU Mission for 100 climate-neutral and smart cities by 2030, the so-called Cities Mission. The 100 cities come from all 27 Member States, with 12 additional cities coming from countries associated or with the potential of being associated to Horizon Europe, the EU's research and innovation programme (2021-2027). The Union's urban areas are home to 75% of EU citizens. Globally, urban areas consume over 65% of the world's energy, accounting for more than 70% of CO2 emissions. It is therefore important that cities act as experimentation and innovation ecosystems to help all others in their transition to become climate-neutral by 2050. Benefits for cities include tailor-made advice and assistance from a dedicated Mission Platform run by NetZeroCities, additional funding and financing opportunities and the possibility to join large innovation actions and pilot projects. The Mission also provides networking opportunities, exchange of best practices between cities and support to engage citizens in the mission.



Setting the digital compass for Europe

As the European Commission's aims to empower businesses and people in a human-centred, sustainable and more prosperous digital future take hold, there are many concrete ways that ICTs are already helping to reduce the environmental footprint



Digital society and technologies bring with them new ways to learn, entertain, work, explore, and fulfil ambitions. They also bring new freedoms and rights, and give EU citizens the opportunity to reach out beyond physical communities, geographical locations, and social positions.

The EC's 2021 Digital Economy and Society Index (DESI), which tracks the progress made in EU Member States in digital competitiveness in the areas of human capital, broadband connectivity, the integration of digital technologies by businesses and digital public services, provides some insight into key developments in the digital economy and society during the COVID-19 pandemic, so far.

All EU Member States have made progress in the area of digitalisation, but the overall picture across Member States is mixed, and despite some convergence, the gap between

the EU's frontrunners and those with the lowest DESI scores remains large. Despite these improvements, all Member States will need to make concerted efforts to meet the 2030 targets as set out in Europe's Digital Decade.

While Executive Vice-President for a Europe Fit for the Digital Age, Margrethe Vestager, sees the overall message of this year's index as positive, with EU countries having made some progress in getting more digital and more competitive, she believes more can be done. As a result the Commission is working with Member States to ensure that key investments are made via the Recovery and Resilience Facility to bring the best of digital opportunities to all citizens and businesses.

In addition, Commissioner for the Internal Market, Thierry Breton, says there is a need to get better collectively to ensure that European citizens and businesses, in particular SMEs,

can access and use cutting-edge technologies that will make their lives better, safer and greener.

Digital skills

With regard to digital skills, 56 percent of individuals in the EU have at least basic digital skills. The data shows a slight increase in ICT specialists in employment: in 2020, the EU had 8.4 million ICT specialists compared to 7.8 million a year earlier. Given that 55 percent of enterprises reported difficulties in recruiting ICT specialists in 2020, this lack of employees with advanced digital skills is also a contributing factor towards the slower digital transformation of businesses in many Member States. The data indicates a clear need to increase training offers and opportunities, in order to reach the targets in the Digital Decade for skills (80 percent of the population to have basic digital skills and 20 million ICT specialists). Significant improvements are expected in the coming years, partly because 17 percent of investments in digital in the Recovery and Resilience Plans that have so far been adopted by the Council are dedicated to digital skills (approximately €20 billion out of a total €117 billion).

Connectivity

The data on connectivity shows an improvement in 'very high-capacity networks' (VHCN), particularly that it is available in 59 percent of the households in the EU, up from 50 percent a year ago, but still far from universal coverage of Gigabit networks (the digital decade target for 2030). The rural VHCN coverage went up from 22 percent in 2019 to 28 percent in 2020. Moreover, 25 Member States have assigned some 5G spectrum, compared to 16 one year



The EC's DESI tracks the progress made in EU Member States in digital competitiveness

ago. 5G has been launched commercially in 13 Member States, mainly covering urban areas. The Commission has also published today studies on Mobile and Fixed Broadband Prices in Europe 2020, Broadband Coverage up to June 2020, and on national broadband plans. It is noteworthy that 11 percent of digital investments in the Recovery and Resilience Plans adopted by the Council (approximately €13 billion out of a total of €117 billion), are dedicated to connectivity.

Integration

With respect to the integration of digital technologies, there has been a large increase in usage of cloud technologies (from 16 percent of companies in 2018 to 26 percent in 2020). Large enterprises continue to lead the way in the usage of digital technologies: for example, they use electronic information sharing through enterprise resource planning (ERP) and cloud software much more frequently than SMEs (80 percent and 35 percent respectively for ERP and 48 percent vs. 25 percent respectively for cloud). Nevertheless, only a fraction of enterprises use advanced digital technologies (14 percent big data, 25 percent AI and 26 percent cloud). This data indicates that the current state of the adoption of digital technologies is far from the Digital Decade targets; the EU's ambition for 2030 is that 90 percent of SMEs have at least a basic level of digital intensity as opposed to the baseline of 60 percent in 2020, and that at least 75 percent of enterprises uses advanced digital technologies for 2030. At present, only a fraction of companies use Big Data even in several of the best performing countries, as opposed to the

target of 75 percent. Importantly, about 15 percent of digital investments in the Recovery and Resilience Plans adopted by the Council (close to €18 billion out of a total of €117 billion), are dedicated to digital capacities and digital research and development.

Public services

A major improvement in e-government services does not yet show in the data on digital public services. During the first year of the pandemic, several Member States created or enhanced digital platforms to provide more services online. 37 percent of investments in digital in the Recovery and Resilience Plans that have been adopted by the Council (approximately €43 billion out of a total of €117 billion), are dedicated to digital public services, so significant improvements are expected. The Commission has also made available the eGovernment Benchmark 2021, which surveys citizens in 36 European countries on their use of digital government services.

The 2030 Digital Compass: the European Way for the Digital Decade, which sets out Europe's ambition as regards digital and lays out a vision for the digital transformation and concrete targets for 2030 in the four cardinal points: skills, infrastructures, digital transformation of businesses and public services. The Path to the Digital Decade sets out a novel form of governance with Member States, through a mechanism of annual cooperation between EU institutions and the Member States to ensure they jointly achieve ambitions. 'The Path to Digital Decade' assigns the monitoring of the Digital Decade targets to the DESI and DESI

indicators are now structured around the four cardinal points of the Digital Compass.

Impact of ICT

Complementing the data in the DESI report is a study which surveyed the contribution of ICT to the environmental sustainability actions of EU enterprises, which reveals that 66 percent of surveyed companies said that they use ICT solutions as a way of reducing their environmental footprint.

In its survey on the relationship between uptake of ICTs and the environmental attitudes and actions of companies, the Commission gives an overview of actions businesses are taking to reduce their environmental impact. Findings saw that while business decisions were the most common reasons for businesses using ICTs, more than half of those surveyed stated a desire to reduce their environmental footprint as a reason for their use of particular ICTs. For example, 60 percent of those using collaborative stated an environmental sustainability as a motivation for their choice. Similarly, 55 percent of those using AI, and 58 percent of those using cloud computing cited environmental reasons.

The survey collected information about other ways companies have begun to reduce their environmental footprint: 77 percent of those have optimized processes to reduce their impact, while 64 percent have reduced their use of natural resources, and 59 percent have created guidelines to encourage environmentally conscious behaviours. Finally, businesses reported concrete ways that ICTs have already helped them to reduce their environmental footprint. Many use ICTs to facilitate teleworking and reduce travel. And, businesses reported ICTs helped them to use fewer materials, equipment and consumables, produce less waste and use less energy.

Overall, there are still many challenges associated with the digital transformation that need to be addressed during the digital decade. The EU must increase its strategic autonomy in tech and develop new rules and technologies to protect citizens from counterfeit products, cybertheft and disinformation. Most importantly, the EU needs to address the digital divide.

by the European Commission

Orchestrating effective digital identity

Across the world, the number of people with digital identity documents has been rising rapidly, and is expected to continue to do so. But how has the Covid pandemic forced changes in terms of digital services, onboarding and transformation?

The last few years have seen much innovation around digital identity, to the point where it is crystallizing as a highly important market. A digital identity is a technological link between a real entity, such as a person, and its digital equivalent entities. It includes a collection of electronically captured and stored identity attributes, including biographic and biometric data. People own many digital identities that consist of an email address and a password to access different online services. In this case, they are not verified and, therefore, not trusted. It is critical that user identity is verified and trusted when it comes to security sensitive services such as government, MNOs (Mobile Network Operators) and financial services

The number of people with digital identity documents has been rising rapidly, and is expected to continue to do so. Government use and issuing of digital identity has been of critical importance, and is a major driver of digital identity roll-outs. However, the digital identity market is also important in the banking & payments and mobile network operator spaces, reflecting the increasing widening of the market over time.

Ultimately, the best outcomes for users will be when government-issued digital identity becomes a contributor to a wider digital identity orchestration system, where onboarding in banking and mobile identity are added in to create an overall secure and accessible user experience.

Onboarding

Something that has become highly topical during the pandemic is onboarding – which is understandable, given the circumstances involved; however, this reflects a long-term acceleration of the digital uptake of the service. The COVID-19 pandemic has forced changes



in every corner of society. In Europe for example, measures taken to contain its spread during the peak of the virus have included lockdowns in Germany, France, Spain and the UK, which has been strengthened and relaxed at various points. The popularity of digital services has also been on the rise for several years, meaning that the pandemic has accelerated the existing direction of travel, rather than creating a brand-new market dynamic.

What is clear from these developments is that the pandemic has caused significant disruption to processes in a variety of areas, including banking & financial services, eCommerce, access to government services and others. This has had the effect of bringing the need for digital access to services into sharp focus. Given the lack of digital access to many services, digital onboarding, which was beneficial but not necessarily essential, has become critically important to the new way of operating.

The difficulty here is in facilitating these transactions. By enabling accounts, such as bank accounts or mobile phone contracts, to be opened online, stakeholders need a new

set of skills. Digital identity verification, being able to not only use digital credentials, but also to analyse their validity, is critical to this journey. During the pandemic, many businesses have adapted processes to support digital onboarding, but these have not taken full advantage of the capabilities in the digital identity space.

The so-called 'selfie onboarding' has been a popular way to do so, but it has required manual review of photos and videos by staff, where automated solutions have not yet been deployed. Scanning and sending documents has also been widely used, but this is a highly manual process.

Seamless future

The onboarding market will shift to a future which is much more seamless and much less reliant on manual input. By leveraging biometric capabilities and analytical systems, onboarding will move from its reactive position during the pandemic to a proactive one that makes the most of automation capabilities.

Orchestration is critically important to this future. Digital identity is made up of so many different elements, including the following:

- government-issued digital and mobile identities
- mobile identity from MNOs, including identifiers such as phone numbers
- biometric information, including face, voice, fingerprint and other elements
- transaction history at various merchants (credit checks)
- data from online presence (social media activity, etc)

Only by incorporating all these elements and more, businesses will build the optimal onboarding experience that reduces manual intervention, while increasing the quality of the user experience. Orchestrating these different areas requires a rich variety of capabilities and a strong identity network, making choosing the right digital identity technology vendor a highly important decision. It also requires a robust ability to handle data in a way that respects data protection regulations, as well as ensuring that only the authorised parties access information. We ultimately believe that authentication will move from selfie videos with government-issued identity documents, to authentication using biometrics and behavioural analytics, which will provide a better experience for both businesses and users, so technology vendors that support this will reap advantages in the market.

Digital Transformation

To date, digital transformation has been widely discussed as a topic across a variety of industries, but it has not been the simplest of processes. Digital transformation broadly involves making the heart of business models digital, but this has different ramifications in different verticals:

1. Digital Transformation in Banking: Perhaps most associated with banking, digital transformation has involved expanding services available via apps, while reducing branch footprints to increase efficiency. New digital features have included areas such as financial insights, chatbots or in-app onboarding.
2. Shift to eGovernment: Digital transformation in government has meant better delivery of public services with a clear shift to digital access to public services, such as for tax, social security and registering for elections. To accompany this move and protect



Digital transformation in retail means an omni-channel experience personalised to users

citizens from ID theft and online fraud, governments started to deploy digital identities, first taking the form of an eID card (in Estonia, Portugal, Belgium) and now moving to a civic mobile ID for more convenience (MitID in Denmark, Chave Móvel Digital in Portugal, Alicem in France, UAE Mobile Pass, etc)

3. Changes in Retail: In retail, digital transformation has meant offering an omni-channel experience that is personalised to users, as a reaction to the rise of eCommerce and the many struggles that traditional retailers have had.
4. Changes for MNOs: In this sector, regulations are adding pressure to ensure that strong identity verification is in place for users for all channels (in store and online). Digital identity services are also being boosted in this area due to the rise of digital telecom operators, who are very focused around a digital brand, and want to offer mobile-centric experiences to their users. MNOs have also faced challenges with work-from-home conditions, in ensuring that networks are resilient enough to cope with changes in usage.

In all these cases, the pandemic has accelerated these digital transformation journeys, but it did not create them. There has been a long-standing transition to digital services in many areas, driven by the increasing dominance of the app and improvements in service delivery. However, ultimately, digital identity is a key capability of digital transformation.

Why is this? At a basic level, a digital identity is a digital representation of a person in the online world, and understanding this digital representation is critical to better serving the user. Digital transformation means building a business model that is data driven, and using

digital identity is an important way to switch to this model. With a plethora of data sources currently available, building a digital representation which can be analysed to build a reliable picture of customer behaviours and can then inform business strategies, is more feasible than ever.

Armed with these accurate views, stakeholders can make their digital transformation journeys much more effective, by focusing on the areas which cause friction, and delivering the greatest value. We regard streamlined digital onboarding as a basic requirement for digital transformation, and its use for ongoing authentication and personalisation, backed by analytics capabilities, as the best way to reach digital transformation goals.

However, there are several challenges to overcome in achieving these goals. Data that can be used to build accurate digital identities is often siloed at businesses, with different departments using different systems that do not interact. The other challenge here is that processes are disconnected, with very little interaction between them. These challenges need resolving to get the best business outcomes. In banking, for example, updating core banking systems to use modular design is one way to build a system that can take advantage of digital identity. Stakeholders must review their digital transformation roadmaps and ensure that they have the capabilities necessary to take advantage of digital identity innovation.

Fraud and digital identity

The pandemic has had a dramatic effect on many areas, including the fraud area. The increase in 2020 is understandable, given that



Advancements in fraud require advancements in detection and prevention through DI

the pandemic has seen growth in digital services use, with many users new to the channel. It has also seen many merchants who had previously only worked in the offline space launch digital services for the first time, as well as governments starting to make essential public services available online, meaning that the area is exposed to fraud. It additionally saw many COVID-19-focused phishing attempts.

The other side of this increase in fraud is the high level of data breaches which continue to occur across the world. High-profile data breaches in 2020 include a middleware security failure at Estée Lauder exposing 440 million internal records, a breach at EasyJet resulting in 9 million customer records being exposed, and a breach at app Freepik impacting 8.3 million users. The healthcare sector was also badly hit, with breach reports up 35.6% in the second half of 2020 compared to the first half, according to a CI Security report. Every data breach adds more compromised credentials that can be used to create synthetic identities for fuelling account takeover fraud, which has become difficult for stakeholders across all online verticals to manage.

Advancements in fraud require advancements in fraud detection and prevention, and digital identity is a major step in this direction. Leveraging digital identity verification is a key requirement here to combat these advances in fraud. Only by using a well-orchestrated system of digital identity verification methods, with different methods utilised for appropriate scenarios, will stakeholders be able to combat

an increasing range of online payment, ID theft or social benefits fraud attempts.

eGovernment

Digital identity as a concept has become vitally important to government use cases, with several trends driving the greater use of digital identity for eGovernment purposes. These include the following trends.

Shift to eGovernment: regardless of the pandemic, there has been an overall shift to eGovernment over time, with digital processes becoming ingrained due to the benefits that this can bring to both users and the government themselves. The Estonian model is often lauded as an example, and today, governments around the world are expanding their eGovernment initiatives with the launch of a mobile ID for citizens. This requires a structured approach to identity, ensuring that access to services is seamless but also highly secure.

eDocument Reading via NFC: this is built into the vast majority of smartphones sold today, making this a key enabling technology for digital identity use. Android smartphones have always had open NFC access, and in late 2019, iOS 13 opened up NFC for purposes outside of making payments on iPhones. This has enabled the reading of NFC-electronic identity documents by smartphones, and is being used in areas such as visa applications. Combined with biometric face recognition, this is such a user-friendly way to identify citizens remotely

that governments that have already deployed contactless eDoc are using it to offer citizens a smooth remote onboarding to civic mobile identity. With so many NFC-equipped identity documents available, we anticipate that this will become widespread as a remote identification use case. With the use of wallet-style digital identities, governments are starting to add a mobile companion to the official ID documents they issue, taking the form of a wallet-style digital identity. digital ID wallets issued by public authorities can aggregate multiple digitalised and encrypted identities (mobile identity, driver license, digital travel credential, health credentials, proof of vaccination, etc) into a single app.

With the citizen having the ability to prove who they are online and authenticate themselves wherever they are, ease of access to eGovernment services is streamlined, and person-to-person identification in the physical world, with the possibility to run online checks versus government data sources, brings the trust needed to address new market needs and best support the sharing economy.

It is clear to see that government-issued digital identity has a significant role to play going forward, but will require countries to develop adaptable platforms that can be leveraged by third parties easily to gain the most. Digital identity is universal. It is just as critical to governments as it is to banks and to MNOs. The other element here is that when the overall adoption and technology use is better within the identity space and numerous players form effective identity networks, this has a network effect on how useful digital identity is, as the ecosystem grows and verification methods multiply. When trusted digital identity is shared, it must be recognised by all parties in the ecosystem to be truly effective. The system as a whole is better when more participants are submitting more data. The performance in anti-fraud then rises significantly as a result.

The difficulty is in orchestrating these different scenarios, verification methods and data sources. Vendors in the digital identity space must be able to arbitrate these complications, make implementations and usage simple for the business and ultimately, the end user, and ensuring it is improved, rather than degraded by digital identity use, will be critical to success.

by Thales and Juniper Research

Maturing AI to see new developmental growth

New analysis from global intellectual property firm Marks & Clerk, shows the AI market is entering a new phase as the recent technology rush starts to show signs of slowing. While the number of AI filings per year at the European Patent Office (EPO) continues to rise, the pace of growth has slowed, with a 24% rate of growth in 2019 (from 6,165 in 2018 to 7,624 filings), compared to 45% in 2017. Marks & Clerk said this suggests that the AI industry is beginning to mature. However, the company added the continued growth along with a wave of developments means that the market is far from an 'AI winter', due to

new countries are emerging as frontrunners when it comes to patent applications, with the Republic of Korea coming out top per capita. This analysis has also shown that patents have become an increasingly key part in defending business strategy, with the number of EPO oppositions filed against patents relating to AI technologies increasing in 2020 (25) and then again in 2021. There has also been a decrease in the opposition rate reported by all other technology areas, suggesting that AI patents in particular are increasingly becoming integral to businesses' commercial strategies.

AI-powered soft technology grasps e-commerce logistics

Soft Robotics has expanded commercial focus for its mGripAI AI-enabled picking solutions to target the consumer goods, e-commerce, and logistics industries. This solution of 3D vision, AI, and soft grasping gives industrial robots the dexterity and hand-eye coordination of human workers enabling use in unstructured applications such as order fulfilment, sortation, decanting, and kitting. Initially introduced to the food processing industry in 2021, mGripAI, with its proven ability to reliably pick, place, and sort delicate and variable products at

extremely high speeds (>90ppm) will now help warehouses and distribution centres decouple operations from the challenges of labour availability.



FAA approves airworthiness for Wingcopter delivery drone

German drone delivery company Wingcopter has announced that the Federal Aviation Administration (FAA) has issued the Special Class Airworthiness Criteria for its Wingcopter 198 US unmanned aircraft, marking a critical milestone in the certification process of the eVTOL delivery drone in the US. With the Airworthiness Criteria, the FAA



defines technological requirements under title 14 Code of Federal Regulations that must be met to have an aircraft type-certified for regular commercial operations in the US. Besides its design for commercial and humanitarian delivery missions, the Wingcopter 198 was engineered from the ground up to meet stringent safety standards. Wingcopter added in development it was able to leverage the operational experience of more than five years with the company's first delivery drone type in various geographical settings, from the Arctic to the Middle Eastern desert and from remote islands in the South Pacific to San Diego Bay in the US.

AI firm enables intelligent autonomy with perception technology

R&D and commercial teams at RGo are launching Perception Engine. The system is designed to give AMRs the ability to understand complex surroundings and operate autonomously. RGo has been partnering with global robotics firms to evolve its offering. The company says as most mobile robots are still blind and unable to navigate intelligently in dynamic and complex environments, they see first-hand how hard it is for machine and robot manufacturers to develop basic visual perception on their own. The firm says its technology changes this by leveraging advanced AI and vision technologies. It allows mobile machines to see and understand the world around them.

Japanese pilot showcases first fully automated warehouse

Konoike Transport has partnered with AI software firm Osaro for a new project at the Konoike Institute of Technology Innovation Centre (KITIC) to showcase automated warehouse operations. The project features autonomous mobile robots (AMRs) working together with picking robots optimised for warehouse and e-commerce applications that involve large SKU inventories. The pilot shows automation of logistics processes by linking inVia Robotics' AMR and Osaro's piece-picking robot to provide a smooth path from warehouse inventory to packing and shipping operations. The picking robot enables the robot to perform advanced pick-and-place operations by recognising transparent, deformed, reflective, and irregularly shaped items. According to the partnership, the displacement of traditionally manual tasks by smart robotics is expected to address the global issues of increasing logistics volume.



Shaping awareness of critical trends in global technologies

After two tumultuous years full of challenges, analysts are positioning some of the most telling trends expected for 2022 from smart technologies to robotics and IoT to smart cities. Are these progressive predictions ready to bring tools of recovery?

Continuing fallout from COVID-19 and global political tensions weigh heavily on the coming year's fortunes. Researchers looking at all aspects of the ICT and high-tech industries, have come up with 70 predictions of what will and will not happen. A cross-section of these trends for 2022 shows supply chain issues look set to continue, 5G will continue to struggle in the enterprise sector and will not be seen on the production line, UWB will start to bring precise location to the fore, and the Chinese vendor community will retain its dominance of the IoT module market.

In addition, ecosystem disaggregation trends like open Radio Access Network (RAN), public cloud, and 5G core networks point to a gradual evolution in product architecture from integrated designs toward modular stacks. An 'all-in-one' approach, championed by integrated vendors (e.g., Ericsson, Huawei, Nokia, and ZTE), is eventually complemented by 'best-of-breed' modular solutions provided by new suppliers like Altiosstar and Mavenir.

Another trend that is picking up pace is for Mobile Service Providers (MSPs) to embrace public clouds for growth opportunities outside of the consumer market. The most interesting scenario for this type of collaboration will be for Communication Service Providers (CSPs) to partner with public cloud providers to seek operational efficiencies for non-network workloads.

Smart technologies

Despite the extremely challenging industry backdrop of a global pandemic, geopolitical trade wars, and chipset shortages, the smartphone market has been remarkably



resilient. Although global smartphone shipments did drop in 2020, the growth of 5G during the year was stellar, and this is set to continue, although market uncertainties regarding component supply constraints and COVID-19 are likely to linger. While shipments are set to return to pre-pandemic levels, the vendor landscape is set to change drastically.

Likewise, demand for wearables and wireless headsets has grown significantly as a result of changes in lifestyle and consumer behavior instigated by the pandemic. Smartwatches and fitness trackers have evolved into effective and reliable health and activity monitoring devices that have experienced an increase in demand as consumers become more health conscious, embracing a need to track and monitor health vitals. This demand is expected to continue as technologists advance.

ePassport production is expected to rebound. A year-on-year (YoY) recovery of 26 percent for ePassport shipments is predicted to happen in 2022, after a sharp decline of -41% between 2019 and 2020. With most borders having been closed and almost no international travel opportunities, replacement rates for the credentials dropped significantly. With the passport market not expected to return to pre-COVID-19 levels until 2024, the chipset shortage will have a negligible effect on the shipment volumes for passports due to already low demand.

Digitized production

Enterprises are facing a tectonic change to their way of operation, as Industry 4.0 requires the full digitization of production processes and enterprise workflows. To



A year-on-year recovery for ePassport shipments is predicted to happen in 2022

support this, hyperscalers are emerging as a powerful vendor to provide necessary digitization platform capabilities. Their on-premises offerings, including Amazon Web Services (AWS) Outposts and Azure Private Edge Zones, guarantee data integrity and sovereignty to enterprises, while having the necessary platform architecture expertise to be able to provide this as affordably as possible.

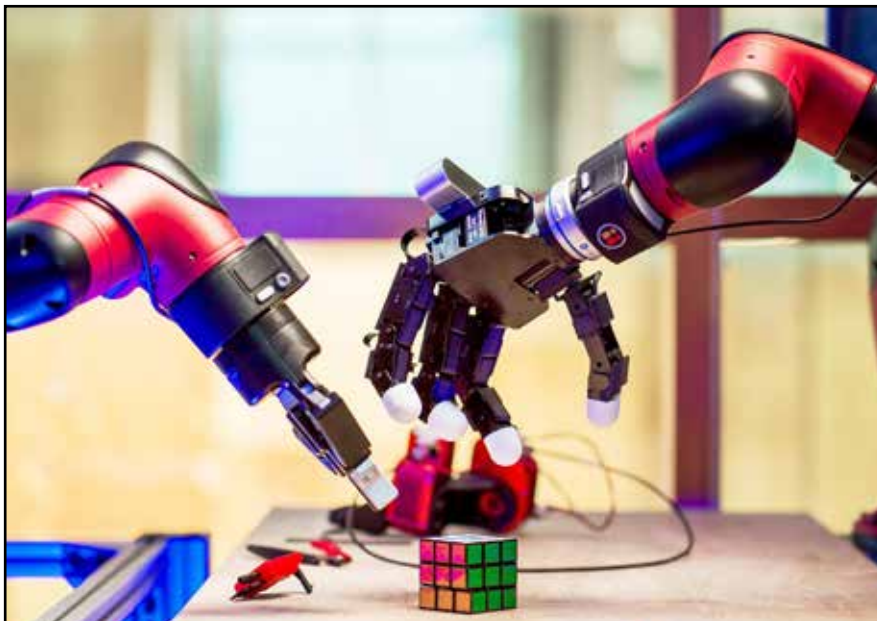
Also, enterprises have been leaning into AI to extract the maximum value from hardware, platforms, and services. Augmented Reality (AR)/Virtual Reality (VR)-specific usage has missed some of this momentum due to its more nascent state, but that is changing

rapidly. More than 20 million active users will leverage AI for augmented reality usage in 2022. AI for machine vision is in place but will grow in capability, increasing captured data and enabling greater analytics and insight potential for platforms. Prediction and automation are a significant value add for any organization, and the increased data flowing from and through AR/VR devices, combined with AI/ML, create a hotbed for worker-facing and backend systems.

Robotics

Processor vendors will increasingly offer Robot Operating System (ROS)-based

AI for machine vision will grow in capability enabling greater analytics



solutions for hardware acceleration across the entirety of robotics offerings. This should help tackle the problem of system integration and entice developers to adopt more off-the-shelf processors and hardware. In addition 5G is expected to play a critical role in enabling on-device ML for robots and drones, allowing them to feature highly-accurate object detection, autonomous navigation, facial recognition, and pose estimation. While IoT adoption from Utility Service Providers (USPs) will be driven by regional stimulus packages, markets will continue to be cautious with their capital spending on new technology solutions. USPs (energy and water) will remain one of the largest adopters of massive IoT solutions, as they continue to implement their grid digitalization programs that started more than a decade ago.

Smart cities

While progress in bringing connected sensors to a range of smart cities assets has been slow in the past decade, never reaching any significant scale, the future looks decidedly more promising. The installed base of LiDAR sensors in Smart Cities will start to gain traction in 2022 and reach over 2.5 million by the end of the decade.

Also, automation will address labor shortages and profitability issues. Continued labor shortages, the desire for contactless purchasing and delivery, and expansive e-commerce with declining delivery windows all lead to the need to supplement human labor across the supply chain through autonomy and robotics. In this regard, digital supply chain transformation efforts will ramp up. The recent global disruptions, have left many supply chains unprepared to react to significant disturbances that are occurring worldwide. There is now a sharp awareness that disruptions can happen at any time and that supply chains need digital solutions to make them agile and resilient.

The above trends are just some which are expected to transform and shape the industry as it arms itself with the key decision tools they need to act with speed, appropriateness, and efficiency.

by ABI Research

Pioneer in magnetic stripe technology – partner of choice for innovative encoding systems



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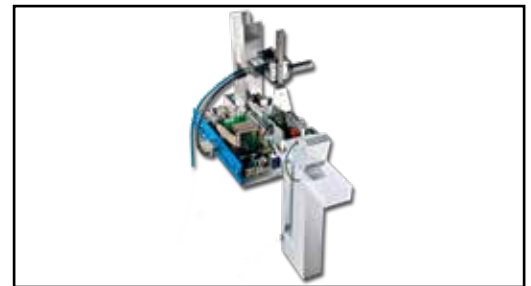
Since 1984, Rinas has been a leading innovator and driving influence behind sophisticated magnetic stripe technologies within the card manufacturing and system integration marketplaces. Rinas maintains a clear and highly-focused corporate engineering strategy that concentrates on developing and manufacturing high-precision OEM and stand-alone card encoding systems for magnetic, RFID and chip cards. Mechanical components are produced in-house using state-of-the-art CNC 5-axis technology.

Regardless whether standard or bespoke system solutions are required, Rinas develops all of them to the highest degree of precision – from the initial circuit diagram concept to the layout of the complete circuit board; from mechanical construction and customised software development to the assembly of complex modules and devices.

So, whether you need to encode, print, scan or sort industry standard or customised card and

ticket formats then Rinas is your one-stop-shop for:

- magnetic, RFID or smart card encoding solutions;
- encoding solutions with scan and print functionality;
- multi-RFID encoding systems for paper and plastic cards;
- card personalisation printing units;
- scanning solutions for 1D/2D codes and OCR text recognition



Providing secure and high added value components for card and document manufacturers



SPS has delivered several million epassport inlays and e covers based on its unique ebooster technology to Asian, African, and European countries. The Teslin based inlay uses an inductive coupling technology, where there is no physical connection between the antenna and the chip's module enhancing the durability of the passport. SPS' technology is designed to accept all chip and OS suppliers on the market, offering a highly reliable and cost effective solution to passport manufacturers. SPS offers unique security features which gives the final passport a unique added value. SPS also proposes a complete offer for Polycarbonate data pages from finished datapage to hinge inlay and electronic components.

The company is specialized in the design, manufacture and sale of contactless solutions based on inductive coupling technology and dedicated to ID cards, e-passport and dual interface banking cards. Headquartered in Rousset, France, with a subsidiary in Singapore, SPS employs 150 people. Part of IN

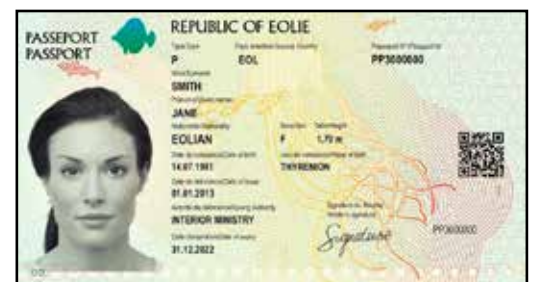
Groupe, one of the global leaders in secure identity solutions, the company specializes in contactless and dual-interface products, with a recognized micro packaging expertise. SPS has filed over 120 patents supporting its exclusive technologies.

As a world leader in dual interface banking and e-ID documents, the company brings value to its customers by pre-certifying the performance of cards using its technology and guaranteeing card functionality in the field.

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Atos Worldline www.atosworldline.be	MF -C -T(POS, HH) 1442 Chaussée de Haecht, 1130 Bruxelles, Belgium	Tel. 32/2/727/6111	Fax 32/2/727/6767
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LEGENDA

ROLE IN THE VALUE CHAIN
D = Distributor
MF = Manufacturer
SH = Software House
SI = System Integrator
VAR = Value Added Reseller

TECHNOLOGIES
B = Biometrics
BC = Barcode
C = Cards
DC = Data Collection
NFC = Near Field Comm.
RFID = Radio Frequency Identification Device
RTLS = Real Time Loc. System

PRODUCT CATEGORIES
A = Antenna
C = Cards
EP = Electronic Personalization
GP = Graphic Personalization
IC = Integrated Circuits
M = Media
MC = Machinery
MV = Machine Vision
P = Printers
R = Readers
S = Scanners
SW = Software
T = Terminals
TAG = Tags
VR = Voice Recognition

PRODUCT SPECIFICATIONS
BT = Batch
BC = Barcode
CL = Contactless
CM = Contact Memory
CMA = Card Materials
CP = Compact
DNA = DNA
EAS = Electronic Art. Surveillance
FF = Facial Feature
FP = Fingerprint
FX = Fixed
H = Holograms
HF = High Frequency
HG = Hand Geometry
HH = Handheld
I = Industrial

IF = Iris Feature
L = Labels
LF = Low Frequency
MG = Magnetic
MK = Marking
MW = Microwave
OCR = Optical Char. Recognition
OPT = Optical
POS = Point of Sale
RF = Radio Frequency
SL = Smart Labels
SM = Smart
TTR = Thermal Transfer Ribbon
UHF = Ultra High Frequency
VF = Verifier
VT = Vehicle Terminal

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BGI www.bginge.com	MF-C, RFID-C (CM, CP, MG) ZAC de la Goulgatiere, 4 rue Paul Langevin, 35220 Chateaubourg, France	Tel. 33/2/99008997	Fax 33/2/99008998
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Böwe Cardtec GmbH www.boewe-cardtec.com	MF -C -MC, SW Balhorne Feld 28 , 33106 Paderborn, Germany	Tel. 49/5251/180860	Fax 49/5251/1808699
Bundesdruckerei GmbH www.bundesdruckerei.de	MF, SI, D, SH -C, B -C (SM, CL, FP), P, R (HH, FX), T (FP, FP, FF, VF), SW, EP, GP Oranienstrasse 91, 10969 Berlin, Germany	Tel. 49/30/25980	Fax 49/30/25982205
CardLogix Corp. www.cardlogix.com	MF, SH -C -C (MG, CM, S, CL), P (I), T (POS), SW 16 Hughes, Suite 100, 92618 Irvine, CA, U.S.A.	Tel. 1/949/380/1312	Fax 1/949/380/1428
CodeCiphers www.codeciphers.com	MF, SH -B, C -C (CL) B, IC Rua Bogaert 107 Villa Verneha, 04298-020 Sao Paulo, Brazil	Tel. 55/11/2175/1106	Fax 55/11/2175/1171
Cogent Systems, 3M www.cogentsystems.com	MF -B, C, RFID, BC -C (MG, CM, SM, CL, OPT, FP), TAG (RF <HF>) R (HH, FX), S (FX POS, I) T (HH, FX, RF, I, BC, FP, IF, FF), SW, EP 639 N. Rosemead Blvd., 91107 Pasadena, CA, Usa	Tel. 1/626/325/9600	Fax 1/626/325/9700
Comercial Arqué www.arque.com	VAR -C, RFID, BC -C (MG, CL), TAG (RF<HF, UHF>), A, P (I, TTR) Carretera del Mig. No 54, L'Hospitalet de Llobregat, 8907 Barcelona, Spain	Tel. 34/932635100	Fax 34/933372690
Confidex Ltd. www.confidex.com	MF -RFID, NFC -TAG (RF<HF, UHF>, I), M (SL), C (CL) Haarlankatu 1B, 33230 Tampere, Finland	Tel. 358/10/4244 100	Fax 358/10/4244 110
Cryptomathic Ltd www.cryptomathic.com	SH, SI -C -SW 327 Cambridge Science Park, Milton Road, CB4 0WG Cambridge, UK	Tel. 44/1223/225350	Fax 44/1223/225351
De La Rue ID Systems (HID company) www.delarue.com	MF, SI -C -C (CM, CL, SM, FP), SW De La Rue House, Jays Close, RG22 4BS Basingstoke, UK	Tel. 44/1256/605000	Fax 44/1256/605004
Deister Electronic www.deister.com	MF -C, RFID -C (CL), TAG (RF<LF, HF, UHF>), R (HH, FX, RF, I), T (RF) Hermann-Bahlsen-Str. 11, 30890 Barsinghausen, Germany	Tel. 49/5105/516111	Fax 49/5105/516217
Dermalog Identification System GmbH www.dermalog.com	MF, SH, SI, VAR, D -B, C, RFID, BC -C (CM, SM, CL, OPT, FP), TAG (RF<HF>), A, R (HH, FX, RF, I), S (HH, FX, POS, I), T (HH, RF, BC, FP), SW Mittelweg 120, 20148 Hamburg, Germany	Tel. 49/40/4132270	Fax 49/40/41322789
Digital Identification Solutions AG www.digital-identification.com	MF, SH, SI -C, B -C (CM, CL, SM, MG, OPT, FP), M (TTR, H, I), P (CP, I, TTR), EP, GP, SW, MC Teckstrasse 52, 73734 Esslingen, Germany	Tel. 49/711/3416890	Fax 49/711/341689550

Diletta Maschinenteknik GmbH

www.diletta.com

MF -C, RFID -C (CL), P (I), GP, EP, MC

Industriestrasse 25-27, 64569 Nauheim, Germany

Tel. +49/6152/1804 - 0 Fax +49/6152/1804 - 22



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Elatec GmbH

www.elatec-rfid.com

MF -C, RFID -C (CM, SM, CL), M (L, SL, I), TAG (RF <LF, HF, UHF, MW>), R (HH, FX, RF, I), SW

Max-Planck-Str. 16, 82223 Eichenau, Germany

Tel. 49/8141/534980

Fax 49/8141/5349829

Elsag Datamat

www.elsagdatamat.com

MF, SH, SI -C, B, RFID, DC -C (CM, SM, CL), TAG (RF <HF, UHF>), P (I), R (HH, FX, RF, I), S (POS, I, OCR), T (FP, FF), SW, GP, EP

Via Puccini, 2, 16154 Genova, Italy

Tel. 39/010/6582215

Fax 39/010/6512329

Elyctis

www.elyctis.fr

MF, SH - C, RFID - R (RF, HH, FX, CL, OCR), SW

240 rue François Gernelle, 84120 Pertuis – France

Tel. +33 6 27 71 37 68

EMJ Data Systems Ltd

www.emj.ca

D-BC, DC, C, RFID, B -C (MG, CM, SM, FP), M (L, TTR, H), A, P (CP, I, TTR), R (HH, FX, I), S (HH, FX, POS, I), T (HH, FX, RF, I, BT, BC, FP, VT)

7067 Wellington Road. 124, RR6, N1H 6J3 Guelph, ON, Canada

Tel. 1/800/265/7212

Fax 1/877/801/6300

Entrust Datacard

www.entrustdatacard.com

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1187 Park Place, Shakopee, MN 55379, USA

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Fax 44/1489/555601

Evolis

www.evolis.com

MF -C, RFID -C (MG, CM, SM, CL), M (TTR, H), TAG (RF <LF, HF, UHF, MW>), P (CP, I, TTR, POS), T (POS), SW, EP, GP

14 avenue de la Fontaine, 49070 Beaucouze, France

Tel. 33/2/41367606

Fax 33/2/41367612

Exceet Group

www.exceet.ch

MF -C, RFID -C (CM, CL, SM), R (HH), TAG (RF <LF, HF, UHF, MW>)

Marktplatz 4, CH-9004 St. Gallen, Switzerland

Tel. 41/4179848/56

Fargo Electronics Inc

www.fargo.com

MF -C -P (CP, I, TTR), C (MG, CM, SM, CL)

6533, Flying Cloud Drive, 55344 Eden Prairie, MN, Usa

Tel. 1/952/9419470

Fax 1/952/9417836

Fastcards

www.fastcards.com.au

MF, SH -C, BC, RFID, B -C (MG, CM, SM, CL)

PO Box 3888, 4101 South Brisbane, Qld, Australia

Tel. 61/7/38444623

Fax 61/7/38464591

Feig Electronic GmbH

www.feig.de

MF -RFID, NFC -R (HH, FX, RF, I)

Lange Strasse 4, 35781 Weilburg, Germany

Tel. 49/6471/31090

Fax 49/6471/310999

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Fingerprint Cards AB www.fingerprints.com	MF -B -IC, T (FP), C (FP), SW P O Box 2412 (Kungssportsplatsen 2), 403 16 Gothenburg, Sweden	Tel. 46/31/607820	Fax 46/31/137385
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Fortress GB Limited www.fortressgb.com	SI -RFID, C -C (SM, CL, FP), TAG (RF<HF>), T (HH, FX, RF, HG, POS), SW South Block, Tavistock Square, Tavistock House, WC1H 9LG London, UK	Tel. 44/20/7874/7595	Fax 44/7874/7599
Gemalto (Thales company) www.gemalto.com/govt	MF -C -C (CM, SM, CL), EP, GP, T (HH, POS), R (FX, HH), SW 6, rue de la Verrerie, 92127 Meudon Cedex, France	Tel. 33/1/5501/50 00	
GET Group www.getgroup.com	SI - C - P (CL, CM, VF) 230 Third Avenue, Waltham, MA 02451 – USA	Tel. +1 781 890-6700	Fax +1 781 890-6320
Ghirlanda SpA www.ghirlanda.it	MF, SI -C -C (MG, SM), SW, GP, EP via Galileo Ferraris, 80/90, 20010 Marcallo con Casone, MI, Italy	Tel. 39/02/972331	Fax 39/02/9761657
Giesecke & Devrient GmbH www.gi-de.com	MF, SI -C, B, NFC, RFID -C (SM, CL, FP), M (H), IC, P (CP, I), R (FX), T (FX, BC, FP, FF), EP, GP Prinzregentenstrasse 159, 81677 Munich, Germany	Tel. 49/89/41190	Fax 49/89/41191535
HID Global www.hidglobal.com	MF -C, RFID -C (MG, CM, SM, CL, OPT), M (TTR, H, I), TAG (RF<LF, UNF HF), IC, P (CP, I, TTR, POS). R (HH, FX, RF, I), SW, EP 15370 Barranca Pkwy, 92618 Irvine, CA, Usa	Tel. 1/949/732/2000	Fax 1/949/732/2120
Hirsch Electronics Corp. www.hirschelectronics.com	MF -B, C, RFID -C (MG, CM, SM, CL, OPT, FP), TAG (RF<LF, HF, MW>), R (HH, FX, RF, I), T (HH, FX, RF, I, BC, FP, IF, VT, VF), SW, EP, GP 1900-B Carnegie Ave., 92705 Santa Ana, CA, Usa	Tel. 1/949/250/8888	Fax 1/949/250/7372
HJP Consulting www.hjp-consulting.com	SH, SI -C, RFID -SW Hauptstraße 35, 33178 Borcheln, Germany	Tel. 49/5251/417760	Fax 49/5251/4177666
Honeywell Access Systems www.honeywellaccess.com	MF, SH -RFID, B -C (MG, CM, SM, CL, FP), M (TTR, H), P (TTR), R (HH, RF), S (HH) 2700 Blankenbaker Pkwy, Suite 150, 40291 Louisville, KY, Usa	Tel. 1/800/6753364	Fax 1/502/2975770
IAI Industrial Systems www.iai.nl	MF - C - EP De Run 5406, 5504 DE Veldhoven – The Netherlands	Tel. 31/40/2542445	Fax 31/40/2545635
Identitas www.identitas.it	D -C, B -C (CM, SM, OPT), T (FP), GP, EP Via Tiburtina 912, 00156 Rome, Italy	Tel. 39/06/4072199	Fax 39/06/4086199
Identive Group www.identive-transponders.com	MF -RFID -TAG(RF<HF, UHF>), M (SL), D – RFID, NFC – IC, TAG (RF<LF, HF>) Mu_hlweg 2c, 82054 Sauerlach, Germany	Tel. 49/8104/6495100	Fax 49/8104/6495110
Idesco Oy www.idesco.fi	MF -RFID, C -C (SM, CL), TAG (RF<LF, HF>), R (RF), T (RF) Teknologiantie 9, 90570 Oulu, Finland	Tel. 358/20/74384175	Fax 358/20/7434176
IDTeck www.idteck.com	MF, D -C, B, RFID -C (CM, SM, CL), TAG (RF<LF, HF, UHF>), T (RF, FP, FF, VF), SW 5F, Ace Techno Tower B/D 684-1, Deungchon-Dong, Gangsuh-Gu, 157-030 Seoul, Korea	Tel. 82/2/26590055	Fax 82/2/6590086
iDTronic www.idtronic-group.com	MF -C, RFID -C (CL), M (SL), TAG (RF<LF, HF, UHF>), R (HH, FX, RF, I), T (RF) Donnersbergweg 1, 67059 Ludwigshafen am Rhein, Germany	Tel. 49/621/66900940	Fax 49/621/66900949

Imprimerie Nationale Groupe www.imprimerienationale.fr	MF, SI - C, B - C, EP, R, SW 104 avenue du Président Kennedy, 75016 Paris	Tel. 33 01 4058300	Fax 33 01 40583085
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Innova Card www.innova-card.com	MF -C -IC, SW ZI Athélia IV - Le Forum, Bât. A, Quartier Roumagoua, 13600 La Ciotat , France	Tel. 33/4/42981480	Fax 33/4/42083319
Intelcav www.intelcav.com	MF -C -C (MG, CM, SM, CL, OPT, FP, H) Rua Hungria 514, 50 andar Jardim Paulistano, SP 01455-000 São Paulo, Brazil	Tel. 55/11/2169/0750	Fax 55/11/2169/0769
Interflex Datensysteme GmbH & Co. KG www.interflex.de	MF, SI -B, C -T (RF, FP), SW P.O. Box 81 03 60, 70520 Stuttgart, Germany	Tel. 49/711/13220	Fax 49/711/1322/111
International Bar Code www.interbar.com	MF -C, BC -C (CL), R (RF), S (FX, I) 160 Oak Street, 06033 Glastonbury, CT, Usa	Tel. 1/860/6599660	Fax 1/860/6573860
International Biometric Group www.biometricgroup.com	SI -B, C -SW One Battery Park Plaza, 10004 New York, NY, Usa	Tel. 1/212/8099491	Fax 1/212/8096197

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International Security Tech. www.ist-china.com	MF -C, BC, B -C (MG, CM, SM, CL, OPT, FP) No. 99 Meicun Road, 518049 Shenzhen , Guangdong , P. R.China	Tel. 86/755/83124964	Fax 86/755/83315467
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Idemia www.idemia.com	MF, SI -C, B -C (CM, SM, CL, FP), R (RF), T (RF, FP, IF, FF), SW, EP, GP Boulevard Lénine, BP 428 76805, Saint-Etienne-du-Rouvray, France	Tel. 33/2/3564/5346	
Ixla srl www.ixla.it	MF -C -MC, SW, GP, EP Via Ponte Chiusella 28, 10090 Romano Canavese, Italy	Tel. 39/0125/719286	Fax 39/0125/718455
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Kronos Systems Ltd www.kronos.com/uk	MF -B, C -T (FP) Kronos House, Carey Road, RG40 2NP Wokingham, UK	Tel. 44/118/9789784	Fax 44/118/9782214
Kugler Womako www.kugler-womako.com	MF - C - MC, C (CMA) Schlosserstraße 15, 72622 Nürtingen, Germany	Tel. +49 7022 70020	Fax +49 7022 33444
Labau Technology Corporation www.labau.com.tw	MF -BC, C -R (HH, FX), P (CP, TTR), S (FX), T (POS) 3F-3, No 125, Ln 235, Bau Chiau Road, 231 Taipei, Taiwan	Tel. 886/2/89191371	Fax 886/2/89191771
Linxens www.linxens.com	MF - C, RFID, NFC - TAG (RF <LF,HF, UHF>), A, M(SL), C (CL) 6 Rue Marius Auphan, 92300 Levallois Perret – France	Tel. +33 1 41343450	Fax +331 47576492
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Magna Carta Chipcard Solutions www.magna-carta.com	MF -C -C (MG, CM, SM, CL), T, SW Naritaweg 126, 1043 CA Amsterdam, Holland	Tel. 31/20/582/20/50	Fax 31/20/582/20/51
Magtek www.magtek.com	MF -C -S (POS), T (POS) 20725 South Annalee Avenue, 90746 Carson, CA, Usa	Tel. 1/800/421/5208	

Masktech GmbH www.masktech.de sales@masktech.de	SH -C, B, RFID -IC, SW Nordostpark 45, 90411 Nuremberg, Germany Tel. 49/911/955149-0 Fax 49/911/955149-7
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Maurer Electronics GmbH www.maurer-electronics.de	MF -C -MC Hanauer Strasse 1, 80992 Munich, Germany Tel. 49/89/139268630 Fax 49/89/1392680
Melzer Maschinenbau GmbH www.melzergmbh.com sales@melzergmbh.com	MF -C, RFID -MC, C (MG, CM, SM, CL), M (L, SL), TAG (MK, RF<LF, HF, UHF, MW>) Ruhrstr 51-55, 58332 Schwelm, Germany Tel. 49/2336/9292/80 Fax 49/2336/9292/85
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Multicard AG www.multicard.com	MF -C -C (MG, CM, SM, CL), T (FP, FF, VF) Widenholzstrasse 1, 8304 Wallisellen, Switzerland Tel. 41/44/8779000 Fax 41/44/8310003
Nadra www.nadra.gov.pk	VAR, SI, SH -C, B, RFID, DC -SW, EP, GP State Bank of Pakistan Building, Shahrah-e-Jamhuriat, G-5/2, 44000 Islamabad, Pakistan Tel. 92/51/9205568 Fax 92/51/9202939

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Nagra ID www.nagraid.com	MF -C, RFID -C (MG, CM, SM, CL), M (L, TTR, H, I), TAG (RF<LF, HF, UHF>), EP, GP Crêt du Locle 10, 2301La Chaux-de-Fonds, Switzerland	Tel. 41/32/9240404	Fax 41/32/9240400
NEC Solutions (America) Inc www.necam.com/ids/law	SI -B -T (FP), SW 10850 Gold Center Drive, Suite 200, 95670 Rancho Cordova, CA, Usa	Tel. 1/800/777/2347	Fax 1/916/4637041
Nexus www.vps.de	SH, SI -C, B, NFC, RFID -SW, EP, GP Carl-Zeiss-Strasse 2, 76275 Ettlingen, Germany	Tel. 49/7243/54880	Fax 49/7243/548811
Oasys Technologies www.oasys.uk.com	MF, SI -C -C (MG, SM, CL), SW, EP 3, Stratton Business Park, Biggleswade, Beds. SG18 8UB, UK	Tel. 44/1767/600232	Fax 44/1767/601532
Omnia Technologies www.omniatags.com	MF -RFID, C -TAG (RF<LF, HF, UHF>) Plot No. 68, Sector - 5, IMT Manesar, 122050 Gurgaon, Haryana, India	Tel. 91/124/4366411	Fax 91/1244366410
Orell Füssli www.ofs.ch	MF -C -C (CL,CM), EP Dietzingerstrasse 3, CH 8036 Zurich, Switzerland	Tel. 41/44/466/7711	Fax 41/44/466/7901
Otto Künnecke GmbH www.kuennecke.com	MF, SI -C -C (MG, SM), GP, EP, MC Zeppelinstrasse 10, 37603 Holzminden, Niedersachsen, Germany	Tel. 49/5531/9300545	Fax 49/5531/9300903
PAV Card GmbH www.pavcard.de	MF -C, RFID -C (MG, CM, SM, CL), EP, GP, TAG (RF<HF>), M Hamburger Strasse 6, 22952 Luetjensee, Germany	Tel. 49/4154/7990	Fax 49/4154/799151
Prooftag www.prooftag.com	MF -C -C (OPT), M (L), TAG (MK) 350, Av d'Italie, 82000 Montauban, France	Tel. 33/5/63211050	Fax 33/5/63211058
ruhlamat GmbH www.ruhlamat.com	MF - C, RFID - A, C(CL), EP (MK), GP, MC Sonnenacker 2, 99819 Marksuhl, Germany	Tel. 49/369259290	Fax 49/36925929111
 <p>ruhlamat is an innovative engineering and machine building company with its headquarters located in Germany. Activities are focused on smart card and passport processing technology, e.g. passport production and personalization, card production and personalization, module preparation as well as Inlay/RFID solutions and special machinery. ruhlamat branches and representations throughout the world create an ideal basis for a professional and area-spanning service network.</p>			
Safe ID Solutions AG www.safe-id.de	MF, SI -C, RFID -C (CL), GP, EP, SW, MC Otto Brunner Str. 43, 82008 Unterhaching, Germany	Tel. 49/89/4521260	Fax 49/89/452126126
Schreiner LogiData www.schreiner-logidata.com	MF -C, RFID, BC -C (SM, CL), M(L, SL, I), TAG (RF<HF, UHF>) Bruckmannring 22, 85764 Oberschleissheim, Germany	Tel. 49/89/31584/4140	Fax 49/89/31584/4109
SCM Microsystems (Identiv) www.scmmicro.com	MF -RFID, NFC -R (HH, FX, RF), T (HH, FX, RF) Oskar-Messter-Straße 13, 85737 Ismaning, Germany	Tel. 49/89/9595/5000	Fax 49/89/9595/5555
SecureTech Consultancy www.securetech-consultancy.com	SH, SI, VAR - C (CL, CM, SM), EP, T (FF, OCR, TTR) 827, Street No. 85, I-8/4, Islamabad-44000, Pakistan	Tel. +92 51 111 111 782	Fax +92 51 4436480
Selex Elsag www.selexelsag.com	MF, SH, SI -C, B, RFID, DC -C (CM, SM, CL), TAG (RF<HF, UHF>), P (I), R (HH, FX, RF, I), S (POS, I, OCR), T (FP, FF), SW, GP, EP Via Puccini, 2, 16154 Genova, Italy	Tel. 39/010/65821	Fax 39/010/6512898

SICPA Security Solutions www.sicpa.com	MF, SH - C - P, SW, TAG (L, MK) Av de Florissant 41, 1008 Prilly – Switzerland Tel. +41 21 627 61 55 Fax +41 21 627 57 27
	<p>At the core of SICPA's security expertise are high-performance security inks that protect the majority of the world's banknotes, security documents and value documents from counterfeiting and fraud. SICPA's Government Security Solutions Division enables Governments to protect tax revenues and deliver associated policy objectives by providing unique and secure authentication and traceability solutions. SICPATRACE® combines material based security with state-of-the-art information technology which enables our partner Governments to secure revenue and protect consumers. SICPA is a pioneer in this field and has successfully implemented and operated nationwide track and trace solutions for Governments worldwide.</p>
Skidata AG www.skidata.com	MF, D, SI -C, RFID -C (SM, CL, OPT, MG), M (L, TTR), TAG (RF<LF, HF>), P (CP, TTR), R (HH, FX, RF), S (HH, FX, POS), SW, T (HH, FX, BC, POS, VT) Unterbergstrasse 40, 5083 Grödig - Salzburg, Austria Tel. 43/6246/8880 Fax 43/6246/8887
Smartware www.smartware.fr	MF -C, RFID -EP, GP, R (RF) 11, Avenue des Andes, Le Carthagène, Z.A. de Courtaboeuf, 91940 Les Ulis, France Tel. 33/1/6486/2525 Fax 33/1/6486/2526
SPS - Smart Packaging Solutions www.s-p-s.com	MF - C - A, C (CMA, CL, HF), IC, DATAPAGE 85 avenue de la Plaine, ZI de Rousset-Peynier, 13790 Rousset – France Tel. +33 4 42 53 88 30 Fax +33 4 42 53 84 48
Spartanics www.spartanics.com	MF -C, RFID -C (MG, CM, SM), M (L), P (I) 3605 Edison Place, 60008 Rolling Meadows, IL, Usa Tel. 1/847/3945700 Fax 1/847/3940409
STMicronics www.st.com	MF -C, RFID, B -C (CM, SM, CL, FP), M (SL), TAG (RF<HF, UHF>), IC 39, Chemin du Champ des Filles CP 21, 1228 Plan-Les-Ouates, Geneva 15, Switzerland Tel. 41/22/9292929 Fax 41/22/929/2900
STMicronics www.st.com	MF -C, RFID, B -C (CM, SM, CL, FP), M (SL), TAG (RF<HF, UHF>), IC 39, Chemin du Champ des Filles CP 21, 1228 Plan-Les-Ouates, Geneva 15, Switzerland Tel. 41/22/9292929 Fax 41/22/929/2900
Thales www.thalesgroup.com	MF, SI -B, NFC -IC, A, T(FX, FP, IF, FF), SW, EP 20-22 rue Grange Dame Rose, 78141 Velizy, France Tel. 33/1/73320000
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Vision-Box www.vision-box.com	MF -C, B -C, R (FX, FF, FP, VF), T Rua Casal do Canas n.2, Zona Industrial de Alfragide, 2790-204 Carnaxide, Portugal Tel. 351/21/154/3900 Fax 351/21/154/3901
Vlatacom d.o.o. www.vlatacom.com	MF, SI, SH -C, B, DC -R(HH, FX, RF<HF>), S(OCR), T (HH, BC, FP, FF, RF, VF), SW, EP, GP 5 Milutina Milankovica, 11070 Belgrade, Serbia Tel. 381/11/377/1100 Fax 381/11/377/1199

LEGENDA

ROLE IN THE VALUE CHAIN	
D	= Distributor
MF	= Manufacturer
SH	= Software House
SI	= System Integrator
VAR	= Value Added Reseller
TECHNOLOGIES	
B	= Biometrics
BC	= Barcode
C	= Cards
DC	= Data Collection
NFC	= Near Field Comm.
RFID	= Radio Frequency Identification Device
RTLS	= Real Time Loc. System

PRODUCT CATEGORIES	
A	= Antenna
C	= Cards
EP	= Electronic Personalization
GP	= Graphic Personalization
IC	= Integrated Circuits
M	= Media
MC	= Machinery
MV	= Machine Vision
P	= Printers
R	= Readers
S	= Scanners
SW	= Software
T	= Terminals
TAG	= Tags
VR	= Voice Recognition

PRODUCT SPECIFICATIONS	
BT	= Batch
BC	= Barcode
CL	= Contactless
CM	= Contact Memory
CMA	= Card Materials
CP	= Compact
DNA	= DNA
EAS	= Electronic Art. Surveillance
FF	= Facial Feature
FP	= Fingerprint
FX	= Fixed
H	= Holograms
HF	= High Frequency
HG	= Hand Geometry
HH	= Handheld
I	= Industrial

IF	= Iris Feature
L	= Labels
LF	= Low Frequency
MG	= Magnetic
MK	= Marking
MW	= Microwave
OCR	= Optical Char. Recognition
OPT	= Optical
POS	= Point of Sale
RF	= Radio Frequency
SL	= Smart Labels
SM	= Smart
TTR	= Thermal Transfer Ribbon
UHF	= Ultra High Frequency
VF	= Verifier
VT	= Vehicle Terminal

Looping traceability for the planet without wasting it

Technologies such as digital IDs and intelligent labels are predicted to enable a whole new level of supply chain visibility. So how can businesses create more efficient track and trace to reduce waste and carbon to enhance sustainability for a truly circular economy?

Across the globe, two billion tonnes of waste are generated each year, according to the World Bank. Consumers are confronted with waste on a daily basis, from expired foods in their refrigerators to unworn clothing in their closets and non-recyclable packaging in their rubbish bins. Brands, retailers and manufacturers are confronted with it too – across the supply chain, inventory loss and inefficiencies lead to wastage, while over-production and misestimations lead to disposal of unwanted stock.

Modern living has accelerated this exorbitant build-up of waste. Mass consumption, throw-away culture and the lure of convenience have resulted in a landscape where many do not consider the wasteful implications of their shopping habits. As retail continues to shift to online – a long-term trend accelerated by the Covid-19 pandemic – there will be even more waste. Already, containers and packaging make up 28 percent of the waste that ends up in American landfills according to the EPA and in December 2020, an estimated three billion packages were shipped for Christmas in the US – up 800 million from the year prior.

Globally, new trends are emerging that focus on building a circular economy, where nothing is wasted and everything is fed back into the system in an endless loop of recycling and reusing. Circularity requires businesses to find value in resources already in circulation and reframe how they perceive waste in the first place.

Building a zero waste future requires rethinking the economics of waste, and problem-solving from multiple angles in order to create end-to-end solutions that both lessen waste and prevent it from the outset. Innovation in



materials can make products and packaging more recyclable, and more likely to stay within the loop longer. Technological and digital ID innovations will provide unprecedented visibility over the supply chain, creating more efficient inventory management and allowing businesses to eliminate unnecessary waste. Increasingly, sustainable mindsets, debates over consumption and plastic waste, new waves of legislation and a realisation amongst brands and retailers that avoiding waste is good for business for a zero-waste future.

Sustainable mindsets

Consumers' demand for action on sustainability – commingled with a realisation amongst brands and retailers that waste reduction offers tangible value – is pushing new circular systems. Meanwhile, consumer awareness over sustainability has undergone a massive shift in the last decade as the reality of climate

change has made itself apparent. Regular extreme climate events such as flooding, wildfires, hurricanes and sweltering heat waves

have turned climate change into a lived experience for many. In a Pew Research Centre survey of 20 nations in Europe, Asia and North America, 70 percent of people reported experiencing climate change where they live. Since 2015, there has been an increase of at least six points in those believing climate change to be a very serious problem. In the US, for instance, the share raised from 45 percent to 53 percent while in Japan it leaped from 45 percent to 70 percent.

The coronavirus pandemic has also heightened the need for sustainable behaviours. The consultancy firm Kearney found that nearly half of consumers are more concerned about the environment due to the pandemic. Moreover, 78 percent believe companies should be helping them make decisions that improve envi-

ronmental outcomes. For businesses, catering to this demand is proving to have positive economic benefits. Enterprises who embrace a sustainable mindset are not only appeasing their customer base but finding tangible value in waste reduction.

Embedding eco-design

One key route to reducing waste is designing it out at the initial phases of concept development. The World Economic Forum (WEF)'s Net Zero Challenge report suggests that key to businesses tackling supply chain emissions is to redesign their products and value chains for sustainability. Indeed, some brands are already embedding principles of eco-design into their products from the beginning, to ensure that the environment is at the core of their proposition, rather than an afterthought. Eco-design is an all-encompassing belief system that ensures products are designed not only from the perspective of the materials used but from a holistic sustainability viewpoint. Avery Dennison has implemented eco-design guidelines that help brands design sustainable packaging, taking its entire product lifecycle and existing recycling infrastructures into account.

Returnable loops

For a long time, recycling has been equated with throwing a plastic bottle or a paper box into a certain bin. But now brands are expanding the idea of what can be recycled, creating return systems and novel products where recyclability is part of the appeal.

Digital ID technology is enabling these returnable loops, allowing brands and retailers to track their products, ensuring they stay within the circular system. Unilever, for example,

Advancements in films and adhesives are creating solutions to enable recycling



is also leveraging technology to monitor the success of its latest refill trial in Europe. Consumers can buy personal care products such as shampoo and shower gel in refillable aluminum bottles, which have QR codes printed on their label, to ensure full traceability during the entire lifecycle from first purchase to each repeated refill.

Enhanced recyclability

Recycling plastic packaging is often complicated by the different types of plastics, films and label adhesives used on the pack, however, innovations in materials and design are making it easier to do so.

One solution is mono-materials – creating packaging all from the same material, which ensures the package can be easily recycled at its end-of-life. Home cleaning brand Splosh offers customers refillable products that come in plastic green pouches which can be sent back to the brand for recycling. While plastic bottles used in laundry and home care brands are usually downcycled, Splosh can turn its pouches into new products thanks to its mono-material. This transforms the economics of recycling.'

Another obstacle to recycling can be the package label, which often contains permanent adhesives that contaminate the package and reduce recyclability. But advancements in films and adhesives are turning these obstacles into opportunities to enable recycling. Dutch dairy brand Floating Farm uses CleanFlaketm technology to enable the recycling of its PET container, the brand switched from a standard PE label to one using CleanFlaketm. The adhesive easily separates allowing the label to slip away during the recycling process, resulting in food-grade recycled PET.

PET is a plastic that can be recycled over and over and has a relatively high collection rate. In the US, PET collection has remained at a steady rate of 29 percent for the last decade, according to NAPCOR and in the EU it stands at 58.2 percent on average. Polypropylene (PP), another commonly used plastic for packaging, has a recycling rate of just 3 percent. But new methods of recycling coupled with infrastructure development promise to enhance material recyclability in the future, expanding which plastics can be recycled. Chemical recycling – which uses heat, pressure and solvents to break down used plastics instead of



A route to reducing waste is designing it out at early concept label development

mechanically crushing them – offers a route to creating recycled polypropylene (rPP) from post-consumer resin (PCR) that is of the same structural quality as virgin PP.

Carbon labelling

Many consumers do not know where to begin when it comes to making environmentally sound choices. In a survey by Futerra, 88 percent of American and British consumers stated they wanted brands to help them be more environmentally friendly in their daily lives. Carbon output is one metric brands are now using to help consumers understand the impact products have on the environment, with some adding carbon labels to their products to help consumers make more considerate choices. But measuring carbon can be a difficult task. To make carbon labelling more widespread requires greater oversight of the supply chain. Technologies such as atma.io connected product cloud – which assigns unique digital identities to products and stores them in an end-to-end platform – are allowing brands to understand their carbon footprint at an item level. Using digital ID technology, businesses can trace goods throughout their production cycle, and dynamically calculate carbon emissions as they move through the supply chain, offering greater insight into their carbon footprint beyond a static calculation.

As far as the future is concerned, technologies such as digital IDs and intelligent labels will enable a level of supply chain visibility manufacturing has never had before. Tracing raw materials and inventory allows businesses to create more efficient production decisions and track any unavoidable waste so that it can be embedded back in the system – fostering a truly circular economy.

by Avery Dennison Smartrac

Sewio offers RTLS service

Provider of ultra-wideband (UWB) real-time location system (RTLS) technologies, Sewio, has announced a new set of subscription services and software known as myRTLS Care. According to the company, the myRTLS Care services are intended to ensure proper installations and smooth operations while minimizing downtime. The package includes more than 15 features designed to let users monitor system health, the company explains, while real-time notifications, weekly reports and predictive alerts control mission-critical RTLS solutions. If an issue arises, device care and customer experi-

ence support are available to subscribers for expedited resolutions. The services and software offer control and analytics for customer systems, Sewio says, particularly with regard to its Alerts feature. During maintenance work, an anchor accidentally being hit could affect the accuracy of location data. If maintenance personnel are unaware of the mistake and fail to report it, unreliable data could remain unnoticed potentially until weeks after the incident. The Alerts function immediately notifies users that an anchor is sending inaccurate location data so the problem can be fixed.

Wiliot and Identiv wave in battery-assisted IoT Tags

Internet of Things (IoT) platform provider Wiliot has announced its battery-assisted IoT pixel tag, developed in partnership with smart tag manufacturer Identiv. This new tag follows the company's Battery-Free IoT Pixel, a stamp-sized computer that harvests and recycles energy from radio waves (see Evaluation Kit Targets Developers for Power-Harvesting IoT). The Battery-Assisted IoT

Pixel uses the same chip as that prior model and broadcasts the same standard Bluetooth beacon, but adds a tiny, printed battery and is smaller than a business card. The tag does not require bridges or other source of radio waves from which to harvest energy. All it needs is a device with a Bluetooth radio to read transmissions, such as a smartphone, a Bluetooth gateway or a Wi-Fi access point. BLE readers can be configured to read Battery-Assisted IoT Pixels, with no additional infrastructure required. The tag can track low-priced products such as clothing, food and medicines, the company explains, as well as medium- and higher-value assets such as temporary promotional signage, returnable transport items, IT assets and retail assets.



Securitas Direct launch Swiss IoT-based intruder prevention

Essence Group, a technology group that supplies wireless, cloud-based security solutions for homes, families and businesses, has partnered with Securitas Direct to pilot the company's MyShield intruder-prevention system in the Swiss market. Securitas Direct will test the MyShield solution for mass deployment. The Internet of Things-based device connects to cellular IoT networks, including both CAT-M and NB-IoT, the company reports. Integration with existing security systems will provide added secu-

rity to residential and commercial users in Switzerland. The fog-generating MyShield system incorporates a passive infrared motion detector, a high-definition video camera with recording capabilities, two-way voice communication, and a cloud-based services platform with reporting and analytical tools. The fog generator, serving as a first-responder system, fills a room with harmless yet disorienting fog within seconds, forcing intruders out of premises.



Motorsport drives RFID use in pits

Racing drivers and teams are using a solution from Surgere to track the performance and manage the equipment within their cars using RFID. The system, provided by Internet of Things (IoT)-based supply chain technology company Surgere's Motorsports division, enables them to track the usage and replacement of tires or other components during practice and races, for the purpose of regulation compliance and safety. Surgere is also lining up sponsorship contracts with driver Parker Thompson's JDX racing team, which is testing Surgere's RFID Pit technology, while another sponsorship comes from Rahal Letterman Lanigan Racing (RLL), which competes in the International Motor Sports Association (IMSA).



RFID enables vehicle access control

Acura Technologies has released an updated version of its EDGE-30R+ AutoID UHF RFID reader. The device has a modern design and allows for easy installation, the company reports, eliminating the need for coaxial cables. Users can employ two conventional network cables, one for power-over-Ethernet (PoE) and the other for communication. The reader performs automatic tag reading, sending data directly to a PC or a controller in real time, using the most common protocols on the market, including TCP/IP, Wiegand (26/34 bits), RS-232 and Abatrack. According to the company, configuration can be accomplished via an HTML page, directly from a browser and without requiring an application programming interface or a software developer's kit. In addition to easy installation, the EDGE-30R+ AutoID is IP67-certified, meaning it offers protection against water and dust, provided its RJ-45 plug is properly connected. This, they say, guarantees the integrity of the reader when it is placed outdoors, such as at gates or entrances to parking lots.

Applying technologies to an endless array of real-world customer needs

3M is fundamentally a science-based company. We produce thousands of imaginative products, and we're a leader in scores of markets - from health care and highway safety to office products and abrasives and adhesives. Our success begins with our ability to apply our technologies - often in combination - to an endless array of real-world customer needs. Of course, all of this is made possible by the people of 3M and their singular commitment to make life easier and better for people around the world. We leverage these competencies to create



innovative solutions for our customers and to also provide investors with attractive long-term returns.

Radio Frequency Identification (RFID) technology from 3M ensures that books and other materials move out of the library faster. Using a self-service system and RFID, customers can check out multiple items at once, resulting in less time spent waiting in line at the self-service station or the circulation desk. RFID technology when combined with automated material handling systems, can also speed accelerate the process for getting CD, DVDs, videotapes and books—including frequently-checked-out best-sellers - back on the shelves where customers can use them. This innovative technology from 3M ensures accurate shelving of various items, eliminates frustration of searching and increases customer convenience.



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Avery Dennison RFID

Creating products and solutions that solve business process challenges in diverse environments

Avery Dennison RFID designs and manufactures Radio Frequency Identification (RFID) inlays. RFID Inlays include the antenna and microchip that contain the data in an RFID system - a critical link between the tagged item and the hardware, software and databases in a data collection system. Every day Avery Dennison RFID technology helps more businesses across the world reduce costs, increase sales & productivity and even improve healthcare processes to keep patients safe.



In the real-world, RFID inlays are required to perform on myriad materials and in diverse environments, many of which challenge basic RF functionality. For instance, metals cause RF waves to detune, liquids absorb RF waves and manufacturing or retail settings can be full of wireless interference. Avery Dennison RFID inlay design experts and applications engineers leverage decades of experience to create products that overcome these real-world challenges.

Avery Dennison RFID tests its inlays in simulated "real-world" environments at their RFID Technical Support Centers in Atlanta, Georgia and Luxembourg in Europe. The technical centers are fully equipped to provide real-world RFID testing, as well as consultation and training to end users, systems integrators and other companies interested in evaluating RFID solutions to solve business process challenges.



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Impinj

Sensing environments to automatically adapt to new and changing conditions



Impinj is a leading world provider of UHF Gen 2 RFID solutions. Impinj draws on its technical expertise and industry partnerships to deliver a wide range of products and solutions comprising high-performance tag chips, readers, reader chips, software, antennas, and systems integration. Impinj products provide excellent performance, integration, and cost effectiveness to a global customer base, in applications across numerous vertical markets, including apparel, inventory management, asset tracking, authentication and serialization.

Among Impinj products is the Monza 4 family of RFID tag chips, which deliver privacy, performance, and memory benefits that address even the most challenging of RFID applications. The chips provide the best sensitivity combined with excellent interference rejection, support for omni-directional antennas (True3D antenna technology), innovative privacy features (QT technology), and expanded memory options.

The Impinj product line includes the Indy RFID read-

er chip family, based on technology acquired from Intel, and the Speedway Revolution RFID reader with Autopilot, which senses its environment, automatically configuring and adapting to new and changing conditions.

Impinj, founded in May 2000, is privately held and has raised over \$110 million in funding.



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Infineon

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This expertise is used to increase security in an increasingly connected world, e.g., mobile payments, system security and secure electronic sovereign documents. Infineon has developed innovative, hardware-based security solutions for over 25 years and is now a global market leader.

With a global presence, Infineon operates through its subsidiaries in the USA from Milpitas, California, in the Asia-Pacific region from Singapore, and in Japan from Tokyo.



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AEG Identifikationssysteme GmbH www.aegid.de	MF, SI -C, RFID -C (MG, CM, SM, CL, OPT), M (L, SL, TTR, I) TAG (RF<LF, HF, UHF>), IC, A, P (POS) R (HH, FX, RF, I), RF, EP, GP Hörvelsinger Weg 47, 89081 Ulm, Germany	Tel. 49/7/3114/00880	Fax 49/7/3114/0088/9000
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Allflex Europe (UK) Ltd www.allflex.co.uk	MF, SH, SI -RFID -TAG (RF<LF>), A, R (HH, FX, RF) Units 6, 7, and 8 Galalaw Business Park, TD9 8PZ Hawick, UK	Tel. 44/1450/364120	Fax 44/1450/364121
Alphasource www.alphasourceintl.com	MF -RFID - R (HH, FX, RF, MW), SW 4837-49 North Stenton Ave., Philadelphia, PA 19144-3024, USA	Tel. 1/215/844/64702	
ARH Inc. www.arhungary.hu	MF -B, RFID, DC, BC -BC, R (HH, FX, RF, I), S (HH, FX, POS, I, OCR), SW (S) 41. Alkotas St., HU-1123 Budapest, Hungary	Tel. 36/12019650	Fax 36/12019651
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Almex www.almex.de	MF -RFID, NFC, BC, DC -R (HH), S (HH, POS), T (HH, BC, POS, VT), SW Stockholmer Allee 5, 30539 Hannover, Germany	Tel. 49/511/6102/600	
Atlas RFID www.atlasrfidstore.com	MF -RFID - TAG (RF<HF, UHF>), R (HH, FX, RF, MW), SW 2014 Morris Avenue, Birmingham, AL 35203, USA	Tel 1/205/774/6237	
Avery Dennison RFID www.RFID.averydennison.com	MF -RFID -M (SM), TAG (RF<HF, UHF>) 4350 Avery Drive, 30542 Flowery Beach, GA, Usa	Tel. 1/866/903/7343	
Avonwood Development Ltd www.avonwood.co.uk	MF, SI, SH -RFID -TAG (RF<LF, HF, UHF, MW>), R (FX, RF, I), T (RF), SW, A Knoll Technology Centre, Stapehill Road, BH217ND Wimborne, Dorset, UK	Tel. 44/1202/868000	Fax 44/1202/868001
Awid Inc www.awid.com	MF -RFID -C (SM, CL), M (SL), TAG (EAS, RF<LF, HF, UHF, MW>), A, R (HH, FX, RF, I), T (HH, FX, RF, I) 18300 Sutter Blvd., 95037 Morgan Hill, CA, Usa	Tel. 1/408/825/1100	Fax 1/408/782/7402
Axiome Alpha SA www.datawin.de	MF -RFID, BC -S (OCR), T (HH, RF, BT, BC) Avenue Soguel 1a, 2035 Corcelles, Switzerland	Tel. 41/32/7310740	Fax 41/32/7310742
Balluff GmbH www.balluff.com	MF -RFID -C (CL), M (L, I), TAG (RF<LF, HF, UHF>), A, R (HH, FX, RF, I), S (OCR), SW Schurwaldstrasse 9, 73765 Neuhausen, Germany	Tel. 49/7158/173195	Fax 49/7158/69154
Baltech AG www.baltech.de	MF -RFID -C (CL), M (SL), TAG (RF<HF>), A, R (HH, FX, RF, I), T (HH, RF) Lilienthalstrasse 27, 85399 Hallbergmoos, Germany	Tel. 49/811/998810	Fax 49/811/9988111

Bancolini Symbol SpA www.bancolini.com	MF, SI -BC, DC, RFID, RTLS -M (L, SL, TTR), TAG (RF<LF, HF, UHF>), A, P (CP, I, TTR), R (HH, FX, I), S (HH, FX, I), T (HH, FX, RF, I, BT, BC, VT, VF), SW via Emilia, 292, 40068 San Lazzaro di Savena, BO, Italy	Tel. 39/051/6258589	Fax 39/051/6258576
B-Id GmbH & Co., KG www.b-id.eu	MF, D -C, RFID -C (SM, CL, OPT), TAG (RF<LF, HF>), A, R (HH) von-Seebach-str. 28, 34346 Hannoversch Münden, Germany	Tel. 49/5541/956670	Fax 49/5541/956671
Caen RFID www.caenRFID.it	MF -RFID -TAG (RF<UHF>), R (HH, FX, RF, I), T (HH, POS, VT), A Via Vetraia, 11, 55049 Viareggio, LU, Italy	Tel. 39/0584/388398	Fax 39/0584/388959
Checkpoint Systems Inc www.checkpointsystems.com	MF, SI, D -RFID, DC -M (SL), TAG (EAS, RF<HF, UHF>), A, R (HH, FX, RF), T (HH, RF, POS), SW 101 Wolf Drive, 08086 Thorofare, NJ, Usa	Tel. 1/800/2575540	Fax 1/856/3843199
Coilcraft Inc www.coilcraft.com	MF -RFID -TAG (RF<LF>) 1102 Silver Lake Road, 60013 Cary, IL, Usa	Tel. 1/847/6396400	Fax 1/847/6391469
Comercial Arqué www.arque.com	VAR -C, RFID, BC -C (MG, CL), TAG (RF<HF, UHF>), A, P (I, TTR) Carretera del Mig. No 54, L'Hospitalet de Llobregat, 8907 Barcelona, Spain	Tel. 34/932635100	Fax 34/933372690
Confidex Ltd. www.confidex.com	MF -RFID, NFC -TAG (RF<HF, UHF>, I), M (SL), C (CL) Lumpeenkatu 6, 33900 Tampere, Finland	Tel. 358/10/4244 100	Fax 358/10/4244 110
Databac Group www.databac.com	MF, SH, SI, VAR, D -C, RFID, B -C (MG, CM, SM, CL, OPT, FP), M (L, SL, TTR, H, I), TAG (RF<HF>), P (TTR), R (HH, FX, RF), S (HH, POS), T (HH, RF, BC, FP, IF, VF), VR, SW, EP, GP Number One, The Ashway Centre, Elm Crescent, KT26HH Kingston, Surrey, UK	Tel. 44/208/546/9826	Fax 44/208/547126
Datacon Technology GmbH www.datacon.at / www.besi.com	MF -RFID -MC Innstr. 16, 6241 Radfeld, Austria	Tel. 43/5337/6000	Fax 43/5337/600660
Datalogic www.datalogic.com	MF -RFID, DC, BC -R (HH, FX, RF, I), S (HH, FX, I, OCR), T (HH, FX, RF, I, BC, FP), SW Via Candini, 2, 40012 Lippo di Calderara di Reno, (BO), Italy	Tel. 39/051/3147011	Fax 39/051/3147205
Datamars www.datamars.com	MF -RFID -TAG (RF<LF, HF>), A, R (HH, RF) Via Industria 16, 6814 Lamone, Switzerland	Tel. 41/91/9357380	Fax 41/91/9450330
Datatronic Identsysteme www.datatronic.eu	MF -RFID -C (SM, CL), M (SL), TAG (RF<LF, HF, UHF>), A, P, R (HH, FX, RF, I), S (HH, FX, I), T (HH, FX, RF, I, BC, FP), SW Brunnergasse 2-8, AT-2380 Perchtoldsdorf, Austria	Tel. 43/1865/0206/33	Fax 43/1865/0206/11
Deister Electronic www.deister.com	MF -C, RFID -C (CL), TAG (RF<LF, HF, UHF>), R (HH, FX, RF, I), T (RF) Hermann-Bahlsen-Str. 11, 30890 Barsinghausen, Germany	Tel. 49/5105/516111	Fax 49/5105/516217
DetecTag Inc www.detectag.com	MF -RFID, RTLS -C (CL), M (SL), TAG (EAS, RF<LF, HF, UHF>), A, R (FX, RF, I), S (FX, POS, I), T (HH, FX, RF, I, POS) 10-117 Young Street, Alliston, ON, Canada	Tel. 1/905/939/9265	Fax 1/905/939/9266
Detego (RF-iT Solutions) www.detego.com	SH -RFID -SW Hans-Resel-Gasse 17a, 8020 Graz, Austria	Tel. 43/316/7111110	Fax 43/316/711111
Diletta Maschinenteknik GmbH www.diletta.com	MF -C, RFID -C (CL), P (I), GP, EP, MC Industriestrasse 25-27, 64569 Nauheim, Germany	Tel. 49/6152/18040	Fax 49/6152/180422
Dorset Identification b.v. www.dorset.nu	MF, SI, VAR, D -RFID -C (CL), TAG (RF<LF>), A, R (HH, FX, RF, I), S (HH, FX), T (RF) Weverij 26, 7122 MS Aalten, The Netherlands	Tel. 31/543/477119	Fax 31/543/475355

Dupont Microcircuit Materials www.dupont.com/mcm	MF -C, RFID -C (CL) Bath Science Park Dirac Crescent, Emersons Green, Bristol BS16 7FR, UK	Tel. 44/1438/734000	Fax 44/117/9313099
Ekahau www.ekahau.com	MF, SH -DC, RTLS -TAG (RF), SW 1925 Isaac Newton Square E., 20191 Reston, VA, Usa	Tel. 1/866/435/2428	Fax 1/703/860/2028
Elatec GmbH www.elatec-RFID.com	MF -C, RFID -C (CM, SM, CL), M (L, SL, I), TAG (RF<LF, HF, UHF, MW>), R (HH, FX, RF, I), SW Max-Planck-Str. 16, 82223 Eichenau, Germany	Tel. 49/8141/534980	Fax 49/8141/5349829
Elecsys Corporation www.lindsay.com	MF -RFID -TAG (RF<LF>), R (RF) 846 N Mart-Way Court, 66061 Olathe, KS, Usa	Tel. 1/913/647/0158	Fax 1/913/647/0123
Elektrobit Group Plc. www.elektrobit.com	MF -RFID -R (RF) Elektroniikkatie 13, 90490 Oulu, Finland	Tel. 358/40/3445/999	Fax 358/8/570/1301
Elyctis www.elyctis.fr	MF, SH - C, RFID - R (RF, HH, FX, CL, OCR), SW 240 rue François Gernelle, 84120 Pertuis – France	Tel. +33 6 27 71 37 68	
EM Microelectronic Marin SA www.emmicroelectronic.com	MF -RFID, NFC -IC (CL, CM, SM, EAS, RF<LF, HF, UHF, MW>) Rue des Sors 3, 2074 Marin, Switzerland	Tel. 41/32/7555111	Fax 41/32/7555403
 <p>EM Microelectronic is a semiconductor manufacturer specialized in the design and production of ultra-low power, low voltage integrated circuits for battery-operated and field-powered applications in consumer, automotive and industrial areas. Our product portfolio encompasses RFID, NFC, smart cards ICs, ultra-low power microcontrollers, LCD drivers, sensors, opto-electronic ICs, mixed-mode arrays and standard analog ICs. Our innovative RFID products cover all frequencies from LF to UHF, addressing all market segments.</p>			
Eter Biometric Technologies Srl www.eter.it	D, VAR, SI -B, RFID -C (MG, CM, SM, CL, OPT, FP), TAG (RF<LF, HF, UHF>), R (RF), T (RF, FP, HG, IF, FF, VT), VR, SW Via Cartesio 3/1, 42100 Bagno, RE, Italy	Tel. 39/0522/262/500	Fax 39/0522/624/688
Etilux SA www.etilux.com	SI, VAR, D -BC, DC, RFID, C -C (MG), M (L, SL, TTR), TAG (RF<HF>) P (CP, I, TTR), R (HH, FX, RF, I), S (HH, FX, I), T (HH, FX, RF, I, BT, BC), SW 45, rue de l'Espérance, 4000 Liege, Belgium	Tel. 32/4/2249999	Fax 32/4/2261106
Eurolink Systems www.eurolinksystems.com	MF, SI, VAR -RFID, DC -C (SM), M (SL), TAG (RF<LF, HF, UHF>), A, R (FX, HH, I), T (RF), SW, EP Via Piedicavallo, 51, 00166 Roma RM, Italy	Tel. 39/06/61914001	Fax 39/06/61914001
Euro Plus d.o.o. (Nice Label) www.nicelabel.com	SH -BC, RFID -SW Poslovna cona A 2, 4208 enur, Slovenia	Tel. 386/4/280/5000	Fax 386/4/233/1148

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OPT = Optical
POS = Point of Sale
RF = Radio Frequency
SL = Smart Labels
SM = Smart
TTR = Thermal Transfer Ribbon
UHF = Ultra High Frequency
VF = Verifier
VT = Vehicle Terminal

Exceet Group www.exceet.ch	MF -C, RFID -C (CM, CL, SM), R (HH), TAG (RF <LF, HF, UHF, MW>) Marktplatz 4, CH-9004 St. Gallen, Switzerland	Tel. 41/4179848/56	
Faubel www.faubel.de	MF -RFID -M (SL) Schwarzenberger Weg 45, 34212 Melsungen, Germany	Tel. 49/5661/7309/0	
Favite www.favite.com	MF -RFID -R (HH, FX, RF, I), TAG (RF <LF, HF, UHF>) 176, Taihe Road, 30267 Jhubei City, Hsinchu County, Taiwan	Tel. 886/3/6560300	Fax 886/3/5545982
Feig Electronic GmbH www.feig.de	MF -RFID, NFC -R (HH, FX, RF, I) Lange Strasse 4, 35781 Weilburg, Germany	Tel. 49/6471/31090	Fax 49/6471/310999
Finmeccanica leonardocompany.com	MF, SH, SI -C, B, RFID, DC -C (CM, SM, CL), TAG (RF <HF, UHF>), P (I), R (HH, FX, RF, I), S (POS, I, OCR), T (FP, FF), SW, GP, EP Piazza Monte Grappa n. 4, 00195 Rome, Italy	Tel. 39/06/324731	Fax 39/06/3208621
Giesecke & Devrient GmbH www.gi-de.com	MF, SI -C, B, NFC, RFID -C (SM, CL, FP), M (H), IC, P (CP, I), R (FX), T (FX, BC, FP, FF), EP, GP Prinzregentenstrasse 159, 81677 Munich, Germany	Tel. 49/89/41190	Fax 49/89/41191535
GlobeRanger Corporation www.globeranger.com	SH -RFID, RTLS -SW 1130 E. Arapaho Rd, Suite 600, 75081 Richardson, TX, Usa	Tel. 1/469/330/5526	Fax 1/972/744/9988
GSI Technologies, LLC www.gsitechnologies.com	MF -RFID -M (SL) 1213 Elko Drive, Sunnyvale, CA 94089, Usa	Tel. 1/408/331/8800	Fax 1/408/331/9795
HID Global www.hidglobal.com	MF -C, RFID -C (MG, CM, SM, CL, OPT), M (TTR, H, I), TAG (RF, LF, UNF HF), IC, P (CP, I, TTR, POS), R (HH, FX, RF, I), SW, EP 15370 Barranca Pkwy, 92618 Irvine, CA, Usa	Tel. 1/949/732/2000	Fax 1/949/732/2120
Honeywell Access Systems www.honeywellaccess.com	MF, SH -RFID, B -C (MG, CM, SM, CL, FP), M (TTR, H), P (TTR), R (HH, RF), S (HH) 2700 Blankenbaker Pkwy, Suite 150, 40291 Louisville, KY, Usa	Tel. 1/800/6753364	Fax 1/502/2975770
IBM United Kingdom Ltd. www-03.ibm.com/industries/government/	MF, SI, SH -B, RFID -T (FP, FF), SW New Square, TW14 8HB Bedfont Lakes, Feltham, UK	Tel. 44/7802/461174	
ID.SYS International www.idsys.de	D -BC, DC, C, RFID -C (MG, CM, SL, CL), M (L, SM, TTR, H, I), TAG (RF <LF, HF>), A, R (HH, FX, RF, I), S (HH, FX, POS, I, OCR), T (HH, FX, RF, I, BT, BC, POS, VT, VF), SW Kreuzstr. 1A, D-85459 Berglern/Niederlern, Germany	Tel. 49/8762/72640	Fax 49/8762/7264/50
Identec Solutions AG www.identecsolutions.com	MF, SI -RFID, RTLS -TAG (RF <HF, UHF, MW>), A, R (HH, FX, RF, I), T (HH, FX, RF, I, VT), SW Millennium Park 2, 6890 Lustenau, Austria	Tel. 43/5577/873870	Fax 43/5577/8738715
Identiv www.identiv.com	MF -RFID -TAG (RF <HF, UHF>), M (SL), D - RFID, NFC - IC, TAG (RF <LF, HF>) 2201 Walnut Ave., Suite 100, Fremont, CA 94538, USA	Tel. 1/888/809/8880	
Idesco Oy www.idesco.fi	MF -RFID, C -C (SM, CL), TAG (RF <LF, HF>), R (RF), T (RF) Teknologiantie 9, 90570 Oulu, Finland	Tel. 358/20/74384175	Fax 358/20/7434176
IDTeck www.idteck.com	MF, D -C, B, RFID -C (CM, SM, CL), TAG (RF <LF, HF, UHF>), T (RF, FP, FF, VF), SW 3F, Ace Techno Tower B/D 684-1, Deungchon-Dong, Gangsuh-Gu, 157-030 Seoul, Korea	Tel. 82/2/26590055	Fax 82/2/6590086
iDTronic www.idtronic-group.com	MF -C, RFID -C (CL), M (SL), TAG (RF <LF, HF, UHF>), R (HH, FX, RF, I), T (RF) Ludwig-Reichling-Straße 4, 67059 Ludwigshafen am Rhein, Germany	Tel. 49/621/66900940	Fax 49/621/66900949

IER www.ier.fr	MF, SI - RFID, DC - TAG (EAS, RF<HF, UHF>), A, M (L, SL), P (I, TTR), R (HH, FX), S (HH, POS), T (HH, FX, RF, BT, BC, VT), VR, SW 3, rue Salomon de Rothschild, 92156 Suresnes Cedex, France	Tel. 33/1/41386000	Fax 33/1/41386278
Industrial Innovation Group www.industrialinnovationgroup.com	MF, SH - C, B, NFC, RFID - C (MG, CM, SM, CL, FP), M (L, H), TAG (RF), P (I), SW, EP, GP, MC Building Z-2, Executive suite 85, SAIF Zone, Sharjah a/p, P.O. Box 9015, Sharjah, UAE	Tel. 971/6557/0725	Fax 971/6557/4810
Impinj, Inc. www.impinj.com	MF - RFID - IC, R (RF) 701 N. 34th Street, Suite 300, 98103 Seattle, WA, Usa	Tel. 1/206/517/8300	Fax 1/206/517/5262
Infineon Technologies AG www.infineon.com	MF - RFID, C - IC Am Campeon 1-12, 85579 Neubiberg, Germany	Tel. 49/800/951951951	Fax 49/89/2349553431
Inotec UK www.inotecbsl.com	MF - RFID, BC - M (SL), TAG, R Inotec House, Viking Close, HU10 6DZ Willerby, East Yorkshire, UK	Tel. 44/1482/654466	Fax 44/1482/655004
Intelligent Ltd www.intelligent.co.uk	SI - BC, RFID - M (SL), TAG (RF<HF, UHF>), R (HH, FX, RF), T (BC, RF) Landmark House, 5 Station Rd, Cheadle Hulme, Cheadle SK8 7JG, UK	Tel. 44/161/4981140	Fax 44/161/4368787
Jadak www.jadatech.com	MF - RFID, C - R (HH, FX, RF, I), SW, A Parkring 57-59, 85748 Garching, Germany	Tel. 49/8931/707/100	Fax 49/8931/707/222
Johnson Electric www.johnsonelectric.com	MF - C, RFID - C (SM, CL), M (L, SL), TAG (RF<HF, UHF>), A 6/F, 12 Science Park East Avenue, Hong Kong Science Park Shatin, NT, Hong Kong	Tel. 852/2663/6688	Fax 852/2897/2054
Kapsch TrafficCom AB www.kapsch.net	MF - RFID - TAG (RF<MW>), R (FX, RF), SW Box 1063, SE-551 10 Jönköping, Sweden	Tel. 46/36/2901500	Fax 46/36/2901501
KFI Trading www.kfi.it	VAR, D, SI - RFID, BC, DC - M (L, TTR, SL), TAG (RF<HF, UHF>), A, P (CP, I, TTR, POS), R (HH, FX, RF, I), S (HH, FX, I, OCR), T (RF, HH, FX, I, BT, BC), VR, SW Via delle Scienze, 21, 20082 Binasco (MI), Italy	Tel. 39/02/905731	Fax 39/02/90092245
Lab ID www.lab-id.com	MF - RFID - TAG (RF<HF>), R (RF), A, C (CL), M (L, SL), SW via Corticella 11/4, 40013 Castel Maggiore, Bologna, Italy	Tel. 39/051/705941	Fax 39/051/705948
Label Logic www.label-logic.com	MF - RFID - TAG (RF<HF>), P 516 Pine Creek Ct. Elkhart, IN 46516, USA	Tel. 1/574/266/6007	
Legic Identsystems AG www.legic.com	MF - RFID, NFC - IC (CL, RF <HF>), R (RF), T (RF), EP Binzackerstrasse 41, CH-8620 Wetzikon, Switzerland	Tel. 41/44/9336464	Fax 41/44/9336465

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UHF	= Ultra High Frequency
VF	= Verifier
VT	= Vehicle Terminal

Lindsay www.lindsay.com	MF -RFID -TAG (RF<LF>), R (RF) 18135 Burke Street, Suite 100, Omaha, NE 68022, USA Tel. 1/402/829/6800
Lowry Solutions www.lowrysolutions.com	D, SI -BC, RFID, B -M (L, TTR), TAG (RF<HF, UHF>), S (HH, FX, I, POS), P (CP, TTR, I), T (RF, BT, VF) 9420 Maltby Road, 48116 Brighton, MI, Usa Tel. 1/810/2297200 Fax 1/810/2295189
Lux-Ident s.r.o. www.lux-ident.com	MF -RFID -TAG (RF<LF, HF>) Tovární 368, 56301 Lan_kroun, Czech Republic Tel. 420/465/352/500 Fax 420/465/352/501
Lyngsoe Systems A/S www.lyngsoesystems.com	MF, SH, SI -BC, DC, C, RFID, RTLS -C (SM), M (L), TAG (RF<LF, HF, UHF>), IC, A, P, R (HH, FX, I), S (POS), T (BT, VT, VF), SW Lyngso Allé 3, 9600 Aars, Denmark Tel. 45/96980980 Fax 45/96980980
Manhattan Associates www.manh.com	SH -RFID -VR, SW e2, Eskdale Road, Winnersh Triangle, Wokingham, Berkshire, RG41 5TS, UK Tel. 44/1189/228000 Fax 44/1189/228099
Melzer maschinenbau GmbH www.melzergmbh.com	MF -C, RFID -MC, C (MG, CM, SM, CL), M (L, SL), TAG (MK, RF<LF, HF, UHF, MW>) Ruhstr 51-55, 58332 Schwelm, Germany Tel. 49/2336/9292/80 Fax 49/2336/9292/85
Microchip www.microchip.com	MF -RFID -IC (CL, RF<LF, HF, UHF, MW>) 2355 West Chandler Blvd., Chandler, Arizona, USA Tel. 1/480/792/7200
Microlise www.microlise.com	MF, SH -DC, RFID, RTLS -R (RF), T (VT, RF), SW, VR Farrington Way, Eastwood, NG16 3AG Nottingham, UK Tel. 44/1773/537000 Fax 44/1773/537373
Microsensys GmbH www.microsensys.de	MF -RFID -TAG (RF<HF, UHF>), R (RF) Office Park im GVZ, In der Hochstedter Ecke 2, 99098 Erfurt, Germany Tel. 49/361/598740 Fax 49/361/5987417
 <p>With 30 years' experience in the RFID market, microsensys connects the real world of things with the virtual world of data. As a world leader in the development and production of technically sophisticated RFID system components, microsensys primarily operates in niche markets worldwide. Its range of specialised RFID system solutions based on a wide standard product range in the HF and UHF frequency areas include innovative RFID transponders, RFID sensors and data loggers, as well as smart low-power RFID read/write devices and user-friendly software tools. Core competencies include sensor integration and miniaturisation, special packaging and tailor-made product designs.</p>	
Microsoft Corporation www.microsoft.com	SH -C, B, RFID, DC -SW One Microsoft Way, 98052-6399 Redmond, WA, Usa Tel. 1/800/642/7676 Fax 1/425/936/7329
Motorola Solutions www.motorolasolutions.com	MF -RFID, BC -A, R (HH, FX, RF, I), S (HH, FX, POS, I), T (HH, FX, RF, I, BT, BC, POS, VT), SW 1303 East Algonquin Road, 60196 Schaumburg, IL, Usa Tel. 1/847/5765000
Mojix www.mojix.com	MF -RFID -M (L, SL), TAG (EAS, MK, RF<HF, UHF>), A, R (HH, FX, RF, I), T (HH, FX, RF, I, POS), SW 4470 W Sunset Boulevard, Suite 107, Los Angeles, CA 90027 Tel. 1-877-886-6549
Mühlbauer Group www.muehlbauer.de	MF, SH, SI -RFID, C -C, M (SL), TAG (MK, RF), P (CP, I, TTR), T (FX, RF, I, BT, FP, IF, FF, VF), SW, EP, GP, MC, MV Josef-Muehlbauer-Platz 1, 93426 Roding, Germany Tel. 49/9461/9520 Fax 49/9461/9521101
Murata www.murata.com	MF -RFID -IC, TAG (RF<UHF>) 2200 Lake Park Drive, 30080-7604 Smyrna, GA, Usa Tel. 1/800/241/6574
Nagra ID www.nagraid.com	MF -C, RFID -C (MG, CM, SM, CL), M (L, TTR, H, I), TAG (RF<LF, HF, UHF>), EP, GP Crêt du Locle 10, 2301 La Chaux-de-Fonds, Switzerland Tel. 41/32/9240404 Fax 41/32/9240400

NCR Corporation www.ncr.com	MF, D -RFID, BC -M (L, SL, TTR), P (I, TTR), S (FX, POS) 864 Spring St NW, Atlanta, GA 30308, USA	Tel. 1/937/445-/936	Fax 1/937/445-/936
Nedap AVI www.nedapidentification.com	MF, SI -RFID -TAG (RF<LF, HF, UHF>), R (RF), T (RF) Parallelweg 2e, 7141 DC Groenlo, The Netherlands	Tel. 31/544/471111	Fax 31/544/464255
Newave Sensor Solutions www.newaverfid.com	MF, SI -RFID -RTLS, A, S (SL) 9011 Heritage Drive / PO Box 181 Plain City, Ohio 43064, USA	Tel. 1/ 888/677/7343	
Netcetera (Nexperts) topay.netcetera.com	SH -NFC, RFID -SW, T (HH, RF), TAG (RF:HF), R (HH, RF) Zypressenstrasse 71, 8040 Zürich, Switzerland	Tel. 41/44297/5555	Fax 43/7236/33514699
NiceLabel EMEA www.nicelabel.com	SH -BC -SW, M (L) Poslovna cona A 2, SI-4208 Šencur, Slovenia	Tel. 386/4/28050/00	Fax 386/4/23311/48
Nordic ID www.nordicid.com	MF -RFID, BC, DC -R (RF<UHF>, HH), T (HH, RF, BC, BT, POS) Salo IoT Campus, Joensuukatu 7, 24100 Salo, Finland	Tel. 358/2/7277700	Fax 358/2/7277720
NXP Semiconductors www.nxp.com/identification	MF -RFID, NFC -IC (RF<LF, HF, UHF, MW>, CM, SM, CL, R) Mikron-Weg 1, A-8101 Gratkorn, Austria	Tel. 43/3124/299/1600	Fax 43/31/24299270
Quake Global www.quakeglobal.com	SI -RFID -SW 4711 Viewridge Avenue, Suite 150 San Diego, CA 92123	Tel. 1/7858/277/7290	Fax 1/858/277/7259
Oltremare Srl www.oltremare.net	SH, SI, D -DC, RFID, BC, C, B -C (MG, CL), TAG (RF<LF, MW>), R (HH, FX, RF), S (HH), T (HH, FX, RF, BT, BC, HG), SW Via del Gelso 7, 33100 Udine, UD, Italy	Tel. 39/0432/508988	Fax 39/0432/204121
Omnia Technologies www.omniatags.com	MF -RFID, C -TAG (RF<LF, HF, UHF>) Plot No. 68, Sector - 5, IMT Manesar, 122050 Gurgaon, Haryana, India	Tel. 91/124/4366411	Fax 91/1244366410
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Omron Corporation www.omron.com	MF -RFID -M (L), TAG (RF), A, R (RF), T (RF) Shiokoji Horikawa, Shimogyo-Ku, 600-8530 Kyoto, Kyoto, Japan	Tel. 81/75/344/7173	Fax 81/77/344/7149
Oracle Corporation www.oracle.com	SH -B, RFID -SW 500 Oracle Parkway, 94065 Redwood Shores, CA, Usa	Tel. 1/650/506/7000	

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Panmobil Feig Electronic www.panmobil.com	MF -RFID, BC, DC -R (HH, RF, I) Hansestr. 91, 51149 Köln, Germany	Tel. 49/2203/10334777	Fax 49/2203/10334720
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Pepperl und Fuchs GmbH www.pepperl-fuchs.com	MF -RFID -R (RF, I), T(RF), SW Lilienthalstraße 200, 68307 Mannheim, Germany	Tel. 49/621/7760	Fax 49/621/7761000
Planet ID www.planet-id.com	MF - RFID -R (HH), SW, TAG Hauptstr. 5-9, D-45219 Essen – Germany	Tel. +49/2054/939650	Fax 2054/9396519
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Repacorp www.repacorp.com	D, SI -RFID - AG (RF<LF, HF, UHF>), SL, SW 31 Industry Park Court Tipp City, Ohio 45371, USA	Tel. 1/937/667/8496	
Reva Systems www.revasystems.com	MF -RFID -N/A 100 Apollo Drive, 01824 Chelmsford, MA, Usa	Tel. 1/9782440010	Fax 1/9782440055
RF Code www.rfcode.com	MF -RFID -TAG (RF), R (RF), SW 9229 Waterford Centre Blvd., Suite 500, 78758 Austin, TX, Usa	Tel. 1/512/439/2200	Fax 1/512/439/2199
RF Controls www.rf-controls.com	MF, SI -RFID, RTLS, A, IoT, SW 1400 South 3rd St., Suite 220, St. Louis, MO, 63104-4430, USA	Tel. 1/314/584/1500	
RF IDEas Inc www.RFIDEas.com	MF -RFID, NFC -C (MG, CM, SM, CL), TAG (RF<LF, HF>), R (RF) 4020 Winnetka Ave, 60008 Rolling Meadows, IL, Usa	Tel. 1/847/8701723	Fax 1/847/4831129

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RFID Inc www.RFIDinc.com 	MF -RFID, NFC, RTLS -C (CL), TAG (RF<LF, HF, UHF>), IC, A, R (HH, FX, RF, I), T (HH, FX, RF, I) 14100 E Jewell Avenue, Suite 12, 80012-5678 Aurora, CO, Usa Tel. 1/303/3661234 Fax 1/303/3661222 RFID, Inc. – Manufacturer and custom developer of RFID Tags & Readers since 1984 offering 868-915 MHz UHF (active) hardware.
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Savi Technology www.savi.com	MF, SH -RFID -TAG (RF), R (RF), SW 5285 Shawnee, Suite 210, Alexandria, VA 22312, USA Tel. 1/571/227/950 Fax 1/571/227/7902
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Selectamark Security Systems Plc www.selectamark.co.uk	MF, D -RFID, BC -TAG (MK, DNA, RF<LF, UHF>), R (HH, FX) 1 Locks Court, 429 Crofton Rd, BR6 8NL Locksbottom, Kent, UK Tel. 44/1689/860757 Fax 44/1689/860693
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Texas Instruments RFID Systems www.ti-RFID.com	MF -RFID, C -C (CL), M (SL), TAG (RF<LF, HF, UHF>), IC, A, R (HH, FX, RF), T (RF), SW 6550 Chase Oaks Blvd, 75023 Plano, TX, Usa Tel. 1/800/962/7343 Fax 1/214/567/7343
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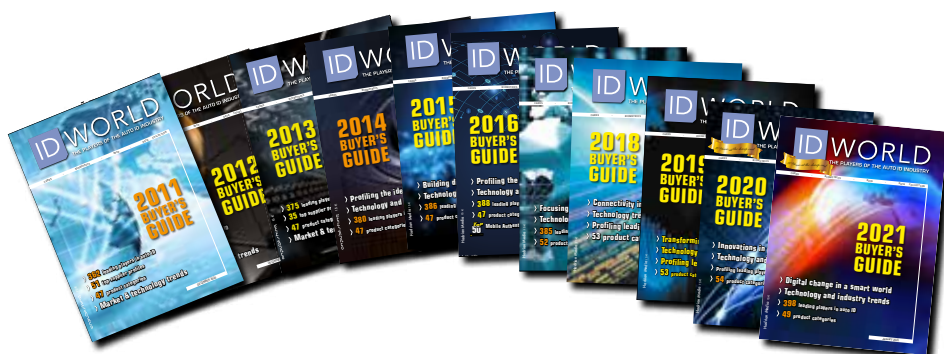


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