

Semiconductor
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Connect 2021

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Q&A



SSIA SUMMIT 2021

Building a Smart Nation with Innovation and Technology

THURSDAY, 30 SEPTEMBER 2021

GUEST-OF-HONOUR

DR JANIL PUTHUCHEARY

Senior Minister of State, Ministry of Communications and Information & Ministry of Health

KEYNOTE SPEAKER



Jacqueline Poh

Managing Director (Designate)
Singapore Economic
Development Board (EDB)

PANEL MODERATOR



Alpesh Patel

Partner
McKinsey & Co

SPEAKER



Jagadish CV

CEO
Advanced Micro Foundry

SPEAKER



Jen Tan

Senior VP, Head of
Integrated Solutions
Semcorp Industries

PANELLIST



Laurence Liew

Director, AI Innovation
AI Singapore

SPEAKER



Dennis Wong

VP, Enterprise 5G & Cloud
Singtel

SPEAKER



Chung Wei Hoe

Director, Head of IoT
Systems AP
Infineon

SPEAKER



Sascha Maennl

Senior Director, Factory
Automation Sales Asia-Pacific
Siemens

SPEAKER



Dr Wu Jie

Head of Technical Customer
Service, South East Asia
Henkel Singapore Pte Ltd

EVENT DETAILS



VIRTUAL EXHIBITION



FOREWORD BY Executive Director

We are three-quarters into 2021 by now, and wrapping up the month of September with our flagship **SSIA Summit event**. For industry partners who have been supporting our event for years, and had been looking forward to catching up over our Semiconductor Dinner intended for the same day, you will know that the latter has been rescheduled to align with national measures against Covid-19. I choose to see this as a chance to organise our gathering at a more opportune timing, and in a more conducive environment.

The Covid-19 pandemic and global supply chain disruptions have not only elevated the status of Singapore as a semiconductor hub, but also reinforced the importance of strengthening and digitalising our local ecosystem to be in tandem with Singapore's positioning as a **Smart Nation**. Our sector's ongoing and collaborative efforts must continue, which is why we see the importance to present this year's Summit with a theme and agenda focusing on business centricity with relevance to Smart Nation. Riding on this national strategy and its initiatives will help us build a robust business landscape towards a Covid-resilient nation and endemic business norm.

Back in July, we saw the electronics sector shipment, including the semiconductor industry, expanding 15% year-on-year. This trend was mainly driven by the high demand for consumer electronics, push for digitalisation and emerging technologies such as 5G. As we know, the **global chip shortage** has not ceased, and chip manufacturers continue to address these shortages by increasing both short and long term capacities. We should anticipate this surge in chip demand well into next year.

Another challenge we have been managing is **manpower crunch** due to the expansion of our sector. SSIA has been working closely with companies and partners to identify new talent sources to help ease this crunch. We will be launching a new jobs portal in the coming month. This one-stop platform aims to help job seekers get a headstart on starting a career in our industry, with access not only to available roles but also informative insights. Hiring companies can not only post their job vacancies, but also manage a comprehensive dashboard to better manage job applications and interviews.

Talking about recruiting talents, our team had an insightful time working on this edition of VOICE, gathering insights from inspiring individuals from the industry. You will read about the young and aspiring semiconductor talents from your companies, as well as the older and still committed volunteer Career Advisors. Heads-up, we are definitely going to feature more **voices and personalities from our sector** in the coming editions – remember, SSIA Voice is a magazine by the industry, for the industry. Don't be shy to contribute your share of voice when my team approaches you!

Lastly, I thank all of you partners and friends for your continued support and trust in SSIA, and hope we stay healthy and safe for our next catch-up!

Best regards
Wee Seng

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Semiconductor Business Connect 2021

– Emerging Stronger as an Industry

SSIA kicked off a three-day **Semiconductor Business Connect 2021** on 27 July, bringing together multi-national, SME, academic and government entities for thought leadership and insight sharing, as well as business matching and networking opportunities.

As one of the Association's signature events, this year's **Semiconductor Business Connect** – themed *Emerging Stronger – Innovate, Connect and Collaborate* – was scaled up to meet broader strategic objectives.



Graced by **Mr Alvin Tan, Minister of State, Trade and Industry and Community, Culture and Youth** officiating the event opening, the Guest of Honour spoke about challenges and opportunities in the semiconductor industry today, and how Singapore continued to attract investors because of our skilled talent, global connectivity, ease of doing business, and well-developed semiconductor research and manufacturing ecosystem. Reiterating the event theme, MOS Alvin Tan also highlighted the need to:

- **Innovate** – with semiconductor companies leading the digital transformation of manufacturing
- **Connect** – building up industry networks and tapping on the industry for growth; and
- **Collaborate** – leveraging on partnerships to push boundaries and uplift the semiconductor industry.

The line-up of speakers included a keynote by Dr Marvin Lee, Vice President, Semiconductor, from the Singapore Economic Development Board (EDB), followed by local and global industry leaders, on topics most relevant for today's business landscape.

Jennifer Teong, SSIA Treasurer and Manufacturing Vice President, Silicon Labs International did the opening address.



Dr Hai Wang, Corporate Vice President, General Manager, Product Supply Chain and External Manufacturing, Intel, presented insights on *Supply Chain Re-configuration for the New Normal*.



Tan Yew Kong, Vice President and General Manager, Fab Management, GlobalFoundries, shared his perspective on *Strengthening of Local Ecosystem – Challenges and Opportunities*.



Jamie Neo, Director, Ink Supplies Operations, HP Inc on *Transformation journey towards Industry 4.0*.



Alpesh Patel, Partner, McKinsey & Co, moderated the Panel Discussion on *Industry Opportunities and Addressing Industry Needs* – with Dr Hai Wang, Tan Yew Kong and Jamie Neo in the panel.



Day Two's speakers included (from top left, clockwise):

- James Bramante, Data Scientist, INFICON
- Tariq Shallwani, Solution Sales Lead, APAC, Manufacturing & Distribution Industry Vertical, Hewlett Packard Enterprise
- Ang Wee Seng, Executive Director, SSIA
- Dr Tan Puay Siew, Research Division Director, Manufacturing System Division (MSD), SIMTech, A*STAR



Semiconductor Business Connect 2021 came to a close on 29 July, with the Arizona Commerce Authority and their partners sharing valuable insights on how the US state, in just about over a year, became the epicentre of semiconductor talents and the place to be at now.



SSIA took the opportunity to share corporate and industry priorities. One of which is the **Singapore Semiconductor Intelligent Manufacturing Framework (SIMF)**, slated to be ready in Q4 2021. SIMF aims to eventually share benefits of an evolving Industry 4.0, how this has made improvements in fundamental manufacturing methods and factory physics, and significantly impacting key performance index. Industry know-how will form the architecture for intelligent manufacturing, and become the framework to help companies transform, be it those keen on enhancing productivity or others who need to devise customer solutions.

To create a more cohesive and interactive community, SSIA has also soft launched the **Semiconductor Business Network (SBN)**. This portal, available on web and mobile app, enables users to create their desired profile, self-manage preferred degree of connections, be part of a growing business directory, and stay updated with industry ongoing and insights. This encourages sustained business networking and connectivity, beyond parameters and restrictions of events.

Ang Wee Seng, Executive Director of SSIA said of the event, "Challenging ourselves to make more out of our events, and being in the best position to gel overseas and local semiconductor partners, we want our platforms to bring greater value to supporting, strengthening and growing the local ecosystem. Our local companies have the commitment and capacity to grow. MNCs recognise their reliance on local firms and want to help us grow. SSIA's role is then to avail avenues, connections and resources to speed up transformation of the local ecosystem."

The hybrid event hosted a total of 1300 attendees from 250 companies, including virtual and overseas participants.



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ams Digital Active Noise Cancellation (ANC) technology tunes out ambient noise through market leading ANC performance >40dB. The technology simultaneously tunes in speech and music with its natural and boosted transparency modes.

The ams Augmented Hearing device supports feedforward, feedback, and hybrid ANC topologies as well as featuring Automatic Leakage Compensation (ALC) algorithms which – for the first time in the audio industry – enable hybrid ANC functionality in loose- fit earbuds.

ams.com/active-noise-cancellation



China Chips and Semiconductor Seminar in Dongguan, Greater Bay Area, China – 18 May 2021

The Dongguan Bureau of Industry and Information Technology presented “Brave Heart – China Chips and Semiconductor Seminar” on 18 May 2021. The one day event, attended by over 600 delegates, brought together speakers from the Bureau and industry, both local and international, to share insights and opportunities. Among them were Mrs Li Lingdong, Senior Researcher at Dongguan Bureau of Industry and Information Technology, Mr Luo Daojun, Director of the Fifth Electronic Research Institute, Ministry of Industry and Information Technology, as well as SSIA’s Executive Director Ang Wee Seng.

SSIA’s sharing created more awareness of Singapore’s semiconductor landscape and trends, how the nation is playing a significant role in the global outlook for the sector, and inter-country opportunities.

Dongguan – A Global Electronic Manufacturing Hub

Dongguan is in the core area of the Greater Bay Area of China, covering all major cities in the Pearl River Delta including Guangzhou, Shenzhen, Hongkong and Macau.

Dongguan has risen over the years to become an electronic manufacturing hub, with operations by Chinese brands such as Huawei, ZTE, oppo, vivo, BYD, China Southern Power Grid, CSR, Dji Luxshare, among others. International names like Hitachi, Fujitsu, Delta, Kyocera, Flex and Philips have also set up base in the city.



The electronic manufacturing industry in Dongguan has a solid foundation and is well equipped to cover the entire supply chain. The city has the largest number of industrial enterprises above RMB20million revenue, including 2124 high-tech manufacturing enterprises above RMB20million revenue. As of end 2020, there were 10861 enterprises here – 550 more than Shenzhen, 3134 more than Foshan and 4987 more than Guangzhou.

The Southern Base of China’s Third Generation Semiconductor

In 2016, the Southern Base of China’s third generation semiconductor was launched in Dongguan, positioned as the second largest national industry base after Shunyi in Beijing. A number of R&D institutions were also launched in Songshan Lake, near Dongguan City.

The city government is expected to invest RMB201.6billion to continue developing its electronic manufacturing industry, of which semiconductor is a key component.



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Worldex-Singex Exhibitions

Plug & Work: EtherCAT Terminals for circuit boards

The EtherCAT I/O solution for series machine production



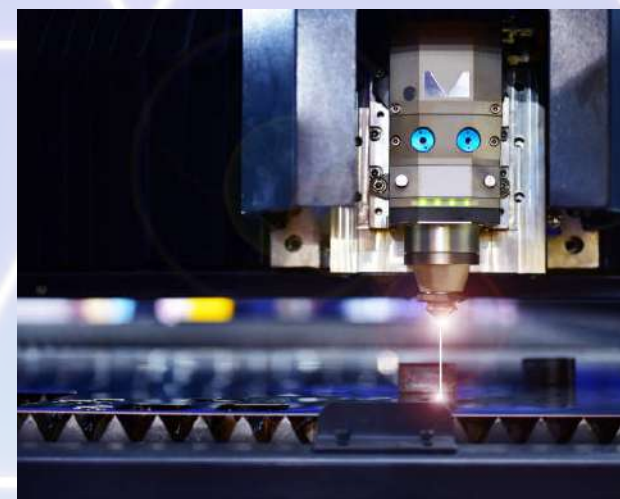
Designed for the needs of medium to high-volume series machine production, Beckhoff has created an innovative wiring solution that provides a new level of efficiency: the EJ Series EtherCAT plug-in modules. While electronically based on the tried and tested EtherCAT I/O system, the new mechanical design enables direct connection by plugging into application-specific circuit boards. This not only saves time, but also installation costs: Instead of elaborate and time-consuming manual wiring of single wires, prefabricated cable harnesses are simply plugged in, reducing unit costs and minimising wiring error risks through the use of coded components.

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Scan and learn
more about the
EJ plug-in modules
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Sawing machine was conceptualised and the **1st Gravita36** was launched successfully in 2017. Integrated with Disco world-class DFD dicing engine, **Gravita36** is ahead of its time with highest UPH attained and features many unique machine functions that are still unmatched today. Soon **Gravita36** was on its way to be qualified by a couple of renowned Semiconductor MNC companies. Today, **Gravita36** are found in twenty-two ODM and OSAT manufacturing sites in 8 countries and counting.

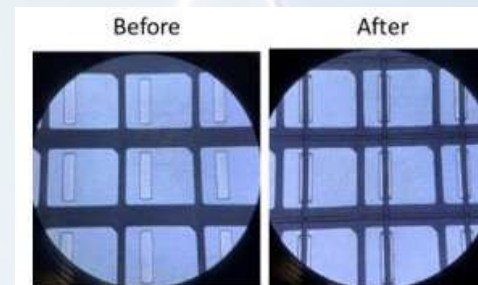


Figure: Laser pre-cut on copper leadframe

Combining **Gravita36** system, **Astra's** revolutionary and patented laser pre-cut system delivers a clean cut on copper-based leadframe packaging and at high speed, resulting in peerless final singulated unit quality and productivity. GSP is now ready to meet the ever-changing demand in advanced semiconductor packaging singulation requirements.

Other products that we carry complement our Core singulation products including Manual/Semi-Auto/Full Auto Wafer mounter, NGK Megcon CO2 bubbler, Denka Elegrip tapes (Dicing/Backgrind tape), LED/Mercury UV cure system, Water cooled chiller, Vacuum pump, Silicon Wafer (Prime/Test/Dummy), Tooling and Conversion Kits, wafer rings and wafer cassettes to name a few. Besides this, we welcome to co-work with our partner customers to develop new solution and equipment that bring value to their production line.

GSP's Sales & Service offices are in Singapore, China, Malaysia, Thailand, and the Philippines. We work closely with our worldwide network of partners and agents to provide one stop business and technical support.

Please contact James Yeong @ jamesyeong@gsp.com.sg for any inquiries.

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**Gravita 36 Fully Auto
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GSP



Genuine Solutions Pte Ltd (GSP) was established in Singapore on 9th June 2014 with the vision to develop top notch quality and performance Semiconductor equipment to meet new and existing Packaging requirements. Leveraging its founder core expertise and knowhow on package singulation, our flagship Gravita Jig

With undying passion and dedication, our team has been exploring a new methodology and process to improve package singulation since GSP inception. Through years of research and countless testing, we are now making our dream of laser cutting for packaging solution a reality. **Astra Laser Cutting system** was born with breakthrough technology co-developed with **Singapore Institute of Manufacturing Technology (SIMTech)**. We are proud to announce the launch of **Astra120** Laser pre-cut machine for Wetable Flank QFN by end of 2021, to be followed soon with **Astra270**.



With the Right Advice, You Can Put Your Possibilities to Work

SSIA is a key partner of Workforce Singapore's volunteer Career Advisors (vCA) initiative, which provides individuals (especially mature workers) with peer-level support and career guidance as they navigate professional pathways to advance their careers or transition to other jobs. In this second feature, we put the spotlight on three vCAs in the electronics and semiconductor sector.

MR CHUNG CHING THIAM
Director
Semiconductor Supplies &
Consultancy



What made you interested to join the WSG's volunteer Career Advisors initiative?

Having more than 35 years in the electronics industry, I recall some missed opportunities as well as good decisions made in my career, that can be shared with our younger comrades to learn from both my good and bad experiences.

Particularly in these challenging times, more young PMETs are likely facing disruption in their career, many of them shouldering significant financial commitments. I hope to share ideas on how to adjust and adapt themselves along their respective paths and lead them out of the adversity they are facing now.

As a vCA, what experience/guidance would you like to provide for your advisee(s)?

These are insights I find important:

- Maintaining positive energy during difficult times
- Re-evaluating their career paths from a helicopter view
- Optimising their personal VIP (Values, Interest and Personality) to seek new career opportunities
- Leveraging initiatives from SGUnited and WSG to work towards a career change or upskilling for a better career

Do you have a mentor/advisor in your career journey? Could you share more with us how your mentor/advisor has supported your career growth?

I had a few good supervisors who helped me pave my career and guided me towards success by being role models themselves. Skills I learnt from these mentors include juggling finer details with the bigger picture, balancing hard skills versus soft skills, managing different types of bosses, peers

and subordinates, and handling potential crises.

MS LEE MEE NEE
Project Manager
UTAC



What made you interested to join the WSG's volunteer Career Advisors initiative?

I have been working in the semiconductor industry for over 20 years, covering product test engineering, quality engineering, new test product introduction from initial prototype sample build to final product launch, and readiness for mass production. My current function requires direct interface with customers. I hope to give back to the industry by sharing insights and skillsets from extensive experience.

As a vCA, what experience/guidance would you like to provide for your advisee(s)?

I hope to instill interest in the younger generation to join the semiconductor industry. I want to share semiconductor industry trends, not just the technical aspect of work but also importance of the right soft skills.

Soft skills help us overcome challenging situations in the working world. In my current job as a Test NPI Manager, I frequently coach new hires, so that they are equipped with necessary product transfer knowledge, as well as knowhow to meet required project deliverables according to planned timeline, address different stakeholders' expectations, and resolve conflicts arising at the workplace.

Do you have a mentor/advisor in your career journey? Could you share more with us how your mentor/advisor has supported your career growth?

I count past and present reporting officers as my mentors, having gained a lot from them in many ways. They have been very open and generous in sharing their experiences and industry knowledge through my working years. They have also been instrumental in defining who I am today, inspiring me to persist in my journey within this industry. Quoting one of my former supervisors: "Everyone is a leader in his/her own way. Strive to become a better you."

MR TIMOTHY PHUA
Senior Manager,
Foundry Sourcing,
NXP



What made you interested to join the volunteer Career Advisors initiative?

I came across many electronics engineering students eventually not taking up roles in the electronics industry. This is possibly why we are experiencing widening skill gaps and talent crunch in Singapore, compounded by the COVID-19 pandemic. vCA is a good initiative where I can share the "ups-and-downs" with people who like to know more about this sector and hopefully, I can be a guide post for them prior to joining the industry.

As a vCA, what experience/guidance would you like to provide for your advisee(s)?

I am an example of someone who left, returned to the electronics industry and am still contributing

actively. I like to share my experience of my journey in the electronics ecosystem. Hopefully, my assignee can benefit from a better understanding and right mindset of this industry.

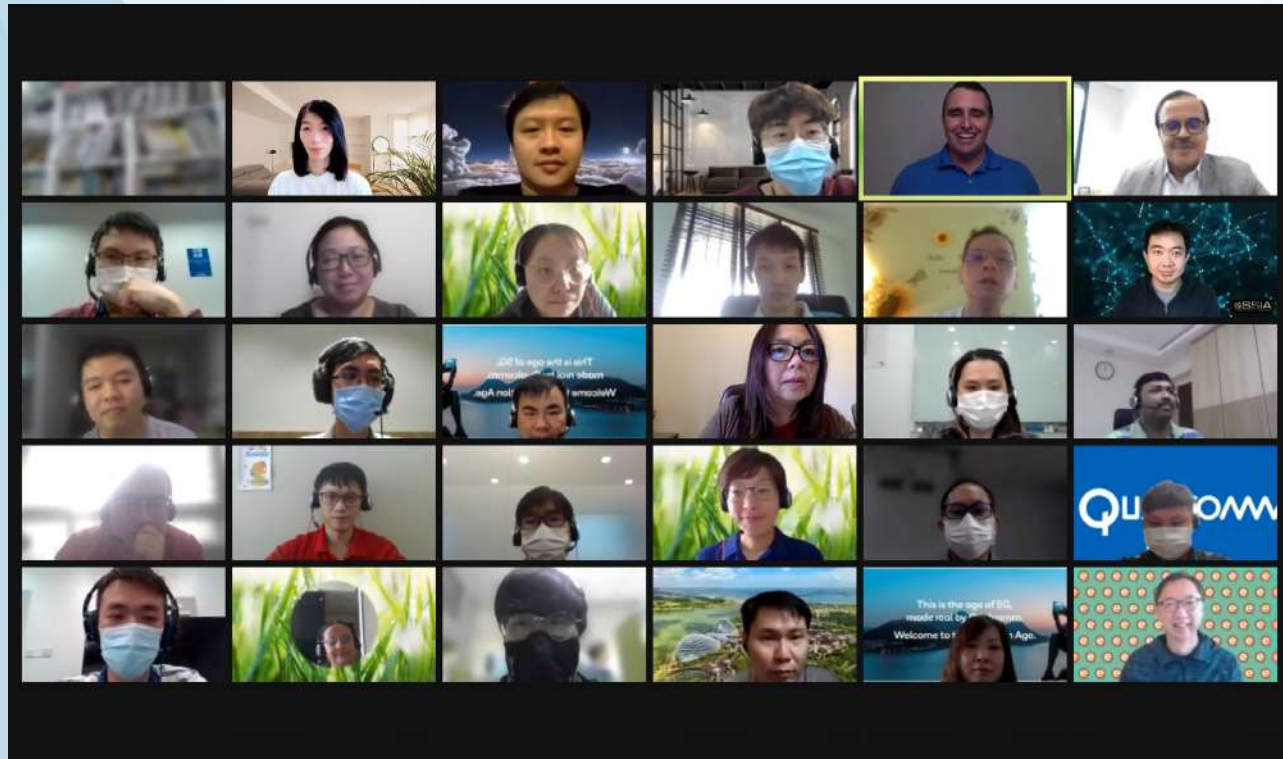
Do you have a mentor/advisor in your career journey? Could you share more with us how your mentor/advisor has supported your career growth?

There are many people whom I have crossed paths with, who were my mentor or advisor in one way or another. I am grateful for their willingness to share and believing in me. For example, one of them gave me an opportunity to take on a new role despite my not having prior knowledge or experience. When I probed why I was chosen, I was told "knowledge and experience can be accumulated as long as you have the right attitude". This has left a deep impression on me since, that a right attitude will indeed get you going even when you enter uncharted territories.



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SSIA Leadership in Engineering – 12–23 July 2021 Virtual Training Programme Review

“The growth and development of your people is the highest calling of leadership” – Harvey Firestone

For the semiconductor industry to realise its highest potential through this period of exhilarating growth and transformation, it is paramount for organisations to develop a strong pipeline of leaders.

Over two weeks in July, SSIA, in collaboration with EQ Strategist, facilitated a “Leadership in Engineering” programme for a group of exceptional engineers and engineering managers, identified as top talent by their organisations. The learning objective was to empower delegates with the

mindset and soft skills of leadership, learn from industry leaders and network with peers.

EQ Strategist’s team of facilitators comprised international coaches whose credentials included 16 years in leadership development and culture transformation in the industry. The three guest speakers were industry veterans, who shared their wealth of experience and insights.

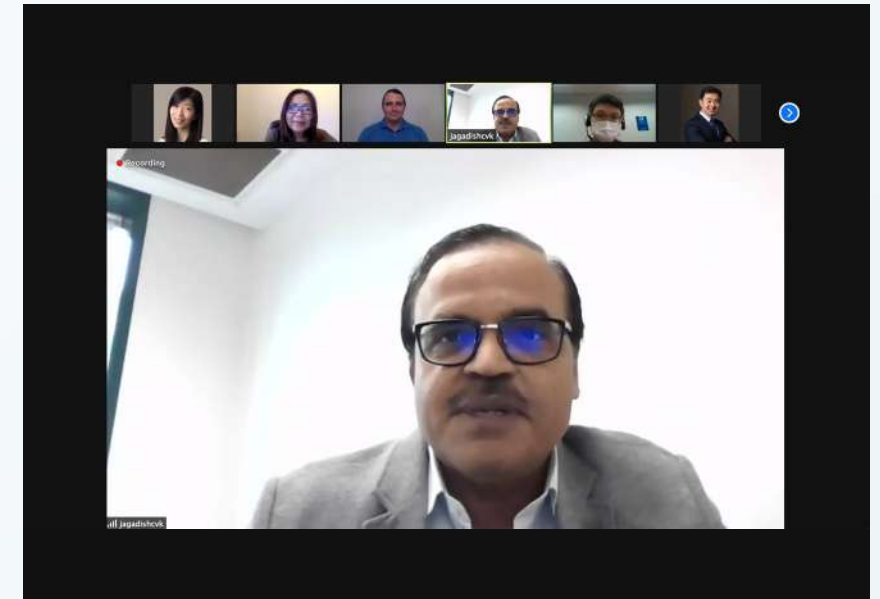
In week one themed “Leading from within”, SSIA Executive Director Ang Wee Seng noted in his Welcome Address that while the industry is going through “boom times”, it remains a significant challenge to attract new blood and retain top talent.

With employee engagement research showing that it takes two-and-a-half “satisfied” workers

to be as productive as one who is “inspired”, coaches Dominic Siow, Andrew Davey, Jack Rankin and Dale White empowered delegates with the mindset and strategies, to find and create their inspiration from within. From attendees’ feedback, this was a powerful paradigm shift for many, who had previously viewed leadership as a position, instead of a reflection of the conscious choices they made every day.

Mr Jagadish CV, former CEO of SSMC and newly minted CEO of Advanced Micro Foundry, shared his message for delegates “to be clear of their career vision, deepen their mastery of the basics, see every setback as an opportunity to grow and yet, always putting health and family first”. Delegates were deeply inspired, prompting one to share how he was torn between having to decide between going far in his career and being there for his young family, a sentiment that seemed to be shared by many of his contemporaries.

In week two’s shift to “Influencing without a title”, delegates were empowered to own the outcomes of every communication they made, to appreciate the barriers of effective communication and to make time to deepen the rapport they had with stakeholders as a foundation for influence. Mr CP How, Chief-of-Staff of GlobalFoundries inspired delegates with his personal journey of transformation, from someone who responded to change, to one competent and able to lead and sell change using Kotter 8 Steps to Leading Change. His encouragement to delegates to learn and use stories in their communication was further reinforced in the final module on “Story-telling skills”.



The programme was well received, achieving an overall rating of 4.8 (out of 5) – an exceptional outcome especially for one delivered virtually. Delegates felt the content was “empowering”, “enriching”, “enlightening”, “inspiring” and “extraordinary” – a good indication that it was time and energy well-invested.

All in all, a fulfilling and productive journey for all present, made

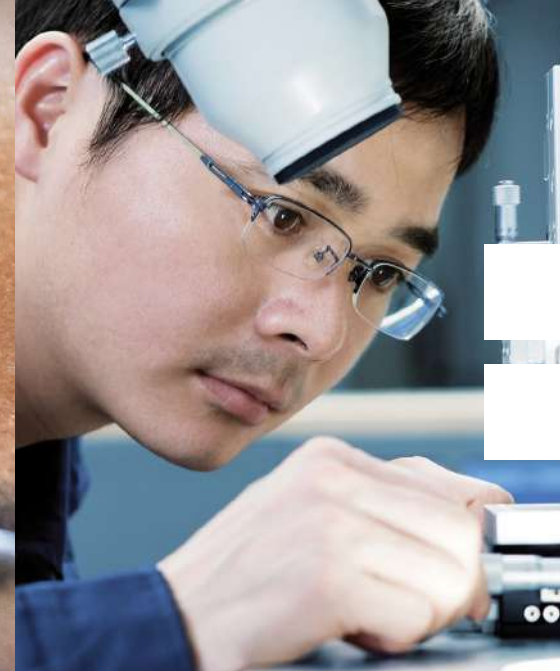
possible through the collaborative efforts of partners committed to an exceptional learning experience and who saw their work as a vocation, and not a job.

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Dominic Siow
CEO/Co-founder
EQ Strategist



**Delivering
a new era
of more**

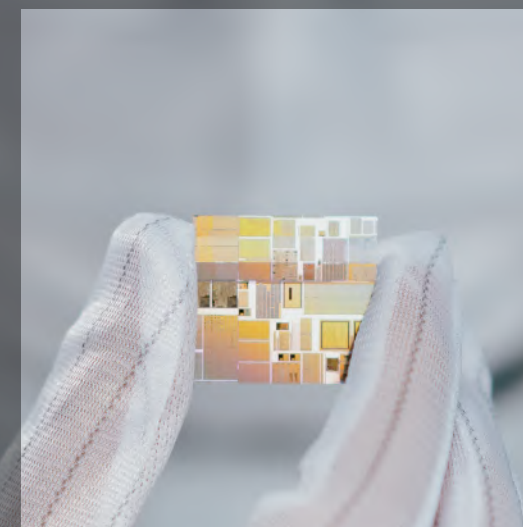


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The Future Is Ours to Create

Whether it's a driverless car, VR experience, or factory robotics, we help turn theory into possibility.

We help create the technological devices and ideas that transform our future and shape our current life.

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Efficient material-handling solutions are an important but oft-overlooked tool in modern semiconductor factories. Solutions to handle, track, transfer, store and trace components, and WIP during the production process reduce needless human errors and give management more tools to improve processes.

As **material-handling specialists**, Innogrity's turnkey solutions have improved labour efficiency, eliminated unnecessary errors and increased space utilization for top-tier semiconductor customers ranging from OEMs and OSATs.

From traditional AGVs, robotics and automated storage, to specialized packing, inspection and real-time traceability solutions, our engineering team enjoys tackling challenges given by the customer. We understand that each customer's situation is unique and aim to deliver solutions tailor-made for your site.



Innogrity's focus
Developing deep understanding of each customer's existing processes in order to utilise its great experience across both OEMs and OSATs in order to provide unique solutions unavailable off the shelf for customers.

Innogrity delivers solutions in	Main industries	Customer base
Semiconductor Equipment Material Handling Automation Water Treatment (BOO and BOT)	Semiconductor Healthcare	Singapore China Malaysia Taiwan

Establishment 1990	Operating offices Singapore Penang Suzhou Huzhou	Team strength 150 comprising Design Engineers, Software Engineers, technical support teams operating 24/7
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Getting to know SSIA Secretariat – Lynda Lim

20 years as a marketing communications practitioner and following a break, **Lynda Lim** is now onboard the SSIA Secretariat doing what she still loves – communications.

Tell us about your career journey. Is communications really such an endearing profession?

I often tell people that I am good for nothing else, but comms work. Chatty and outgoing with a love for writing since childhood, something related to comms was a natural choice of education and later career. Perhaps not the most appreciated work function at times, I simply can't see myself doing anything else. So yes, after 20 years of sheer workaholicism in the field and a short break later, I am still back in comms work, however in an industry absolutely new to me. This is quite likely what has kept me refreshed and curious in the same role all these years – exposing

myself to different industries to hone my adaptability, as well as to learn the best (and worst) of how various sectors navigate comms.

There seem to be mixed reviews and perceptions about the semiconductor industry – even though it has been in the spotlight more than ever, especially with the global pandemic. How has it been for you as a newbie in this sector so far?

To be honest, I came in with no bias, only with an open mind. I have never been one to fear the unknown, at least not without trying first. In fact, what I don't know piques my curiosity and interest. I appreciate the breadth and depth of the industry, promising much to learn and exactly what I need for an intended long stay. The passion, enthusiasm and willingness to share domain expertise that I experience from my team and industry partners so far have been infectious and

inspiring. The fact that many of them are veterans in this sector and still going strong – this must suggest the semiconductor industry has unlimited learning opportunities and potential as a purposeful career, right?

How is doing comms in SSIA different from your past jobs?

Aside from the domain being fresh and exciting to me, this is possibly the smallest entity I have served thus far – but our team more than makes up for it with each and every individual being versatile, adept in our assigned roles and working well together. It is not always “strength in numbers”, in SSIA's case, we can be “small and mighty”. I also deeply appreciate our working hard when it is time to, and enjoying work life balance off work. This is a godsend for me after 20 years as a workaholic, and finally deciding to pace myself for other priorities in life.

Sounds like SSIA takes care of employee wellbeing, and setting an example for staff retention?

It is definitely nice knowing at the end of a hard day's or week's work, I can take time out for myself and hobbies. Though an extrovert at

work, I came to realise I am an introvert at heart (perhaps with age too). Even before the pandemic, I was already staying home a lot, updating my personal travel blog (search “Lynda's Taiwan-logue” online), reading and just chilling out with my furkids (two cats now, after my senior mongrel crossed the rainbow bridge in early 2021). There is always work to be done, but many of us forget that we work better when we are well-rested and rejuvenated. So, remember to treat ourselves better!



Lynda's mongrel furkids at Pasir Ris Farmway, before one passed away and the other was brought home to enjoy its final years.



Currently on Lynda's English and Chinese reading list



Lynda with mom and elders on vacation



Exhibitions are a regular on Lynda's travels.

SSIA Welcomes New Members

Deston





Build a resilient business in the new normal with HP for Business

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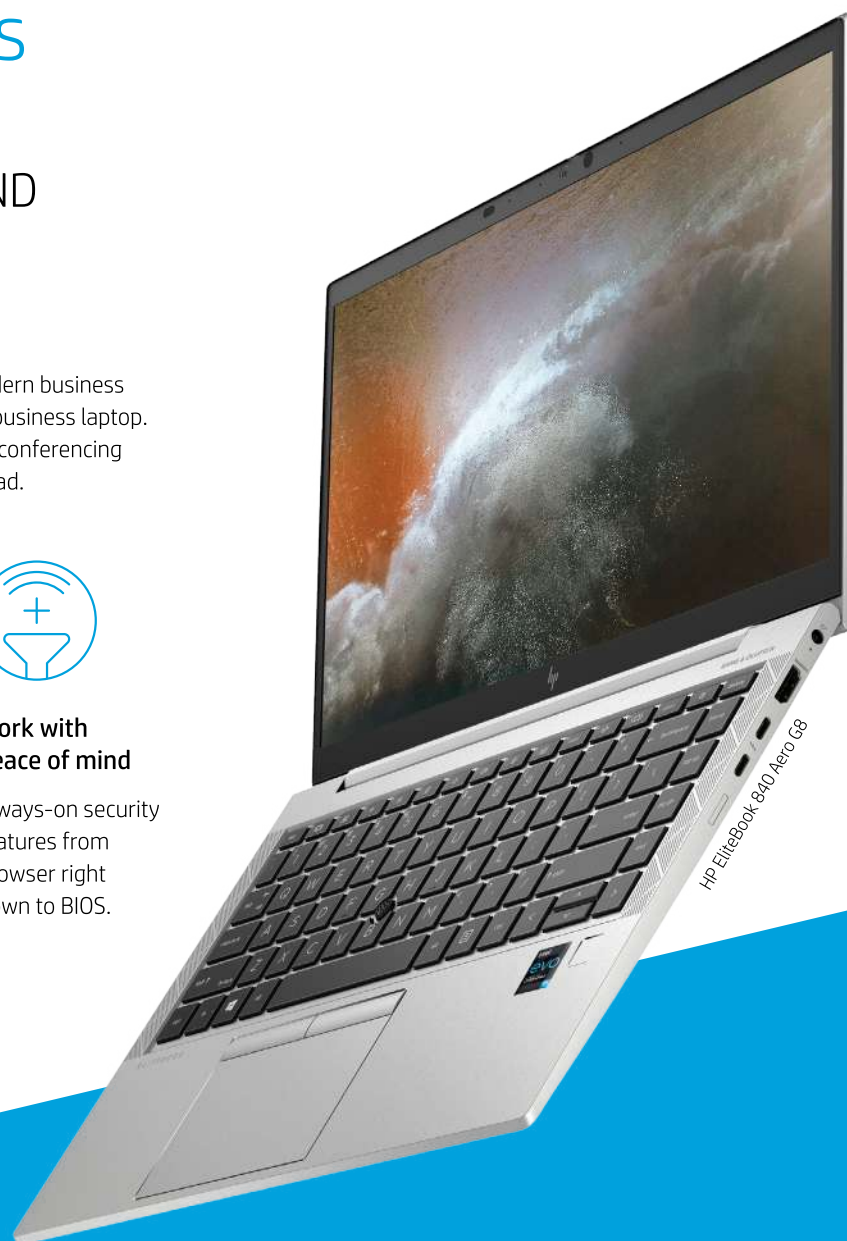
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¹ Based on HP review of 2016 published security features of competitive in-class printers. Only HP offers a combination of security features that can monitor to detect and automatically stop an attack then self-validate software integrity in a reboot. For a list of printers, visit <http://www.hp.com/go/PrintersThatProtect>. For more information: <http://www.hp.com/go/printersecurityclaims>

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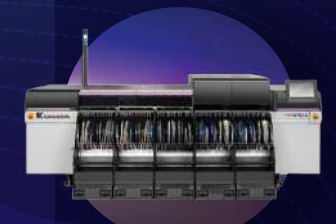
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Hybrid SiP

Pick & Place for SiP

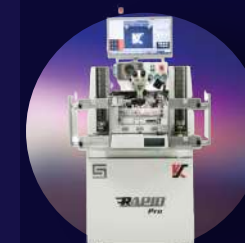
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VOICES OF SEMICONDUCTOR

Young Talents – the Building Blocks of our Smart Nation

Singapore's Smart Nation initiative is about harnessing technology to stay ahead as a global city, and to improve lives and livelihoods. In the nationwide effort, backed by government, corporations and citizens, the semiconductor industry plays a crucial role. We put the spotlight on the young talents in our sector, to hear what they feel about their role in enabling Smart Nation.



FOO JUNGHAU

MediaTek Singapore
AI Engineer

Being an AI engineer in the semiconductor industry is an interesting combination and I am glad I can do it in MediaTek Singapore. I am involved in developing the next state-of-the-art AI applications and to ensure these applications are efficient to run on consumer grade hardware. My work also involves software-hardware co-optimisation, from ensuring the current applications run smoothly on AI accelerators, to working on AI optimisation technologies. It is satisfying to know all my efforts will benefit the future generations of AI chips and bring us even closer to becoming a smart nation.



SAILOR ZHOU JINHUI

Kulicke & Soffa
Advanced Engineer, Electrical

Semiconductors are the brain and infrastructure for innovative technologies transforming the way we live and work. I am proud of my career as an engineer in Kulicke & Soffa (K&S), where I contribute to the design and enhancement of critical sub-systems in our machines. These machines produce billions of semiconductor chips round the clock, serving 5G technology, Internet of Things, Artificial Intelligence, communications, automotive, computing and consumer industries. These are aligned with K&S' goals to create solutions that enable performance improvements, efficiency and assembly excellence for the current and next-generation semiconductor devices, supporting Singapore's ambitious Smart Nation initiatives.



CHEN TIANKAI

Micron
Data Science Engineer

My transition from a manufacturing engineer in the oilfield service industry to a data science engineer in the semiconductor industry has been nothing less than rewarding. I have been exposed to different opportunities to implement cutting-edge smart manufacturing solutions in Micron. One example is the collaboration with our Global Data Science team on enabling the Natural Language Processing (NLP) on our site. It is an AI platform that analyses manual historical records, determines possible root causes in machine troubleshooting and recommends rectifying actions based on previous experience. This solution has significantly reduced our machine downtime, and in turn, led to improved machine utilisation. I am proud to be part of the Micron team driving the Industry 4.0 transformation, a key initiative in Singapore's Smart Nation roadmap.



CHAN PRISCILLA

Lam Research
Field Service Engineer

Being new (just one month old!) in the industry and company, I believe there will be a whole lot of hands-on installation of dielectric etch tools, learning about semiconductor industry and challenging myself to perform up to standards. The initial learning curve is steep. As the first female Field Service Engineer in Lam Research SEA, I did not feel that gender matters, as my coworkers and seniors are friendly and willing to guide me. Semiconductors are the essential building blocks for our digital revolution and the innovation of technologies. My role supports the advancement of semiconductor technologies by improving the efficiency and quality of wafer fabrication – helping to increase Singapore's capabilities and optimise benefits of being citizens in a Smart Nation.



SOHAM SAWANT

Marvell
Senior Design Verification Engineer

The semiconductor industry is a key sector of Singapore's economy. It plays a valuable role in building a smart nation using automotive chips, considering the rise of Internet of Vehicles (IoV). With modern vehicles incorporating many sensors and safety systems like Advanced Driver-assistance Systems (ADAS), immense ethernet support is required to communicate the high-bandwidth data. My role as a Design Verification Engineer is to design and implement tests to ensure this is achieved by our high-performance and high-speed Automotive Ethernet Switches. Taking pride as an engineer with a zeal to uplift society, it gives me immense contentment to work in Marvell where my team thrives on thoroughness and rigor to leverage the potential of Automotive Ethernet. Growing up, I have always aspired to contribute towards pioneering technology, and I encourage more curious young minds to join this booming industry.



KOW JIA XIN

Soitec Microelectronics Singapore Pte Ltd
Yield Section Manager

Delivery of essentials, data cloud storage, vaccination health apps, and more – these are through one or few taps on our smart devices, bringing us to wherever we want. Humankind is surrounded by semiconductors which are of enormous significance to us in this digital age. I hold this conviction and aspiration dearly in my heart, hence carving my career with an innovative company. I strongly believe that together, we constantly challenge the norms and revolutionise the industry with many advanced solutions, from bare wafers to sophisticated devices and solutions. Through relentless adventures, these have benefitted not only my career, but also my country Singapore, a smart nation I call home.



PAUL ANG LI XUAN

Xilinx Asia Pacific Pte Ltd,
Design Engineer

Explosive data growth has sparked strong demand for 5G technology, part of the critical infrastructure for Singapore's smart nation plans. Being a young aspiring engineer, I feel fortunate for my opportunities to play an important role alongside senior team members working on Xilinx's bleeding edge solutions. Such as our Zynq UltraScale + RFSoc, the industry's only single-chip adaptive radio platform for 5G. As a physical design engineer, I am responsible for implementing solutions for logic gates placement and metal layer connections to achieve optimum area utilisation and performance. These designs channel massive signal flows, enabling what was not possible just a few years ago.



KENNETH TAN

Applied Materials South East Asia Pte Ltd
Manufacturing Engineer

Applied Materials Southeast Asia is in the midst of a "Smart" makeover, introducing Industry 4.0 concepts into our manufacturing processes to enable a connected and streamlined factory. Executing this initiative in our high-mix low-volume environment is challenging but exciting and rewarding. As a young engineer, I have been involved in various aspects of this project – strategy planning, ecosystem engagement, and technical execution. Experiencing these different facets has shown me that with ideas, resilience and government support, Singapore has a rich environment for innovation. Semiconductor companies from all segments of the value chain can innovate new solutions to elevate their manufacturing capabilities.



SEK MUN FOONG

Innowave Tech
Project Engineer

I joined Innowave Tech intrigued by the vision of enabling smart solutions that revolutionise the factory floor, especially in the semiconductor industry. As a project engineer, I am involved in the initialisation and data collection for customised computer vision solutions. One of our success stories is the wafer crack reduction project featured in SSIA Voice Vol 12. My work in optimising imaging conditions allowed for the successful development of innovative algorithms by our in-house data science team. Some of our latest current projects include the autonomous smart detector and augmented reality SOP solutions. I am glad that my work can contribute to the successful implementation of a smart factory and from a wider perspective, a Smart Nation.



PHILLIP LIM

Infineon Technologies Asia Pacific Pte Ltd
Design Engineer

As a design engineer at Infineon, one of the best parts of my job is seeing my work transform into real life products. My chip designs today will bring us one step closer to smart and zero emissions cars and enable tomorrow's Smart Nation. It is quite an exciting time for me to be part of the semiconductor industry. I have the opportunity to both learn and work with AI, and be at the heart of the latest technological developments. Above all, through my work, I am doing my part to make life easier, safer and greener for everyone.

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1951 - 2021



Silicon Labs is a Leader of Secure, Intelligent Wireless Technology for the IoT

Silicon Labs, a leader in secure, intelligent wireless technology for a more connected world, has become a pure-play leader of intelligent, wireless connectivity for IoT. The company is focusing on IoT when the overall market and Silicon Labs' growth opportunities are accelerating, as industry anticipates a multi-year ramp up in connected devices.

Over the last two decades, Silicon Labs has evolved from a semiconductor start-up, committed to helping developers reduce the cost and complexity of their designs, into a global leader in solutions for IoT. The Austin, Texas based company has shipped more than 7 billion devices to date, holding more than 1,700 patents, and employing more than 1,600 people globally. There are offices and facilities in more than 15 locations worldwide, including its US global headquarters and the Silicon Labs International facility in Singapore.

Accelerating IoT Market Leadership

In July 2021, Silicon Labs completed a \$2.75 billion divestiture of its automotive and infrastructure business. This allows Silicon Labs to become hyper-focused on helping customers use its integrated hardware and software development platform and award-winning security technology to create connected devices for a wide range of applications.

Delivering Unmatched Wireless Technology

Silicon Labs possesses the industry's most comprehensive wireless portfolio based on an integrated hardware and software platform, supporting the widest range of protocols, including **Bluetooth**, **Proprietary**, **Thread**, **Zigbee** and **Z-Wave**, and major ecosystems such as Amazon, Google, Tuya and Xfinity. The company's connectivity solution is the only wireless IoT offering to achieve ARM's security PSA Level 3 certification. In April 2021, Silicon Labs added Wi-SUN® technology to its portfolio, opening up IoT market opportunities in smart city application development.



Driving the Future of IoT

Silicon Labs has developed the industry's most comprehensive IoT ecosystem, serving tens of thousands of customers, thousands of applications and hundreds of leading partners, including organizations defining the next wave of technology such as Project Connected Home over IP and Amazon Sidewalk.



Works With IoT Developer Conference is your one connection to all things IoT. The annual conference gathers the biggest names in the industry, including IoT decision-makers and device developers, to share and receive practical training and educational sessions. Attendees leave with actionable insights to build, deploy and interconnect the latest smart home, smart city and industrial IoT (IIoT) technologies to accelerate market launch. Works With 2021 is held virtually and free of charge. For more information and to register for replay this year, visit workswith.silabs.com.

The Defining Smart Home Developer Event



Locally Designed Innovative Products that Bring a Smile

Integrated Circuit (IC) Design product companies in Singapore are making waves with commercial and industrial SMART products, significantly impacting our everyday life. Let's take a closer look at some of the wonderful innovations that are designed and manufactured locally.

Most of us will be familiar with oximeters, as every family has been provided a set by the government. **Silicon Laboratories'** EFR32xG22 wireless SoC solutions are part of the Wireless Gecko Series 2 platform used to produce Shanghai Berry's **Bluetooth Fingertip Pulse Oximeter**. The oximeter empowers consumers to keep tabs on our own health. It not only provides instant and remote monitoring, but also safely stores patient data for sharing with physicians, caregivers and family members. Having the ability to continuously monitor and share



health data, without the need to visit hospitals, frees up valuable medical resources for others who need them more.

Another product made possible by the Wireless Gecko Series 2 platform is the electronic shelf label InforTab. Co-developed by Silicon Laboratories Austin and Singapore IC design teams in 2018 and productised in 2020, it is sold by South Korea-based RAINUS, set

to provide retailers with a way to update prices throughout the store in real-time, maximising operating efficiency and improving in-store experience for shoppers. Prices are updated automatically and in real-time through a concentric network system. Shoppers can see the right price and information at any time, using near-field communications (NFC) embedded inside InforTab, to use their mobile phones to access product details.

Drivers in Singapore will not be foreign to the IU (in-vehicle unit) in cars. Zynq is **Xilinx's** first ever family of hardware programmable SOC's (system on chip), with IC designers from Xilinx Singapore's Silicon Architecture and Verification Group contributing to its design. The team developed top-level RTL (register-transfer level) used for chip-level logic connectivity and verification, as well as functional models to enable comprehensive hardware/software co-simulation prior to silicon tape-out. This is something unique to FPGAs (or SOC's with hardware programmable logic). These models are required to accurately represent the functionality and connectivity of the programmable hardware resources to Xilinx's Vivado software suite that performs the programming, ensuring the best ROI for customers.

Eu Gene Goh, Senior Director, Design Engineering at Xilinx shared, "All of us at Xilinx Singapore felt so proud when it was announced that Singapore's Land Transport Authority had selected our automotive series Zynq-7000 programmable SOC for its Intelligent Transport Systems. This means that

MediaTek AIoT Bringing AI into Consumer & Enterprise IoT



we will eventually have a Xilinx Zynq device in practically every vehicle on Singapore roads when the roll-out of the next generation IU - now called the OBU (on-board unit) - begins in the second half of 2021."

Artificial intelligence combined with Internet of Things, termed AIoT, is progressively impacting everything around us - homes, enterprises, industries, automotive applications and even personal devices in daily life. Initially, AI applications were built on big data stored in centralised servers, requiring huge amounts of computational resources, from device to cloud server. However, recent progress in computing capabilities has enabled the fast growth of Edge AI, allowing more nuanced devices that offer a number of benefits such as faster response and increased user privacy and data protection. To handle

a broad spectrum of complex applications, Edge AI devices require heterogeneous computing - a capable inference engine that works in conjunction with several other processing units, not forgetting a capable team behind the chip to implement its hardware effectively.

Addressing these challenges, **MediaTek** launched its i350 AIoT chip, empowering ecosystem partners to develop innovative applications. The MediaTek i350 boasts both a dedicated AI processor (APU) and digital signal processor (DSP) in-chip, ideal for AIoT products that require vision and voice edge processing. The ultra-efficient chip is built on a 14nm process and offers integrated touch interfaces, wifi, bluetooth and advanced multimedia features. The MediaTek i350 is ideal for smart appliances, smart access, vending machines, kiosk, POS systems, industrial applications and medical environments.

These are just some of the industry partners who are creating wonderful products, to benefit and convenience end consumers. SSIA is proud to be part of the IC Design Committee, working with like-minded partners to make a difference to people's life.

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SSIA IC Design
Committee



Engineers from Xilinx's Silicon Architecture and Verification team - Yeow Ling Tjioe and Lian Heng Tan (3rd and 4th from the left) who contributed to the Zynq design.



Internet of Things... Explained

There's a lot of talk about the Internet of Things (IoT) and its impact on our day-to-day lives. From home security systems to smart watches, IoT is upgrading the technologies we rely on every day to architect a network of interconnected devices. But what is the IoT? And how has it become so pervasive across multiple industries?

Breaking Down IoT

The Internet of Things is the concept of connecting devices to the internet and other computing devices. This network of connected objects, equipped with sensors, can collect and, in some cases, act on the data they receive from their environments without requiring human interaction.

So what is exactly is a thing? A thing in the IoT can be any object that is assigned an internet protocol (IP) address and can transfer data over a network. For example, a car that provides a driver's loved ones with a notification in the event of a crash or a smart watch informing its wearer to walk a few more steps around the block to reach a fitness goal are "things."

IoT in Our Everyday Lives

The appetite for IoT devices is only growing. Tech analyst company IDC predicts there will be nearly 42 billion connected IoT devices by 2025, with

the industrial and automotive sectors experiencing the bulk of the growth. In other words, every second, another 127 devices are connected to the internet.

Most people are already using the IoT. For example, smart speaker devices are being used in 31% of homes in the United States and that number is projected to jump to 75% by 2025. From controlling home lighting to traveling in an airplane, IoT has been tangibly, albeit quietly, improving our daily lifestyles.

IoT does not just end there, either. Devices like motion sensors on a sidewalk or smart thermostats inside the home are among other noteworthy applications. The IoT market is growing at a frenetic pace. It is expected that, within the next two years, a staggering 70% of cars will be equipped with internet connectivity.

Global IoT Trends

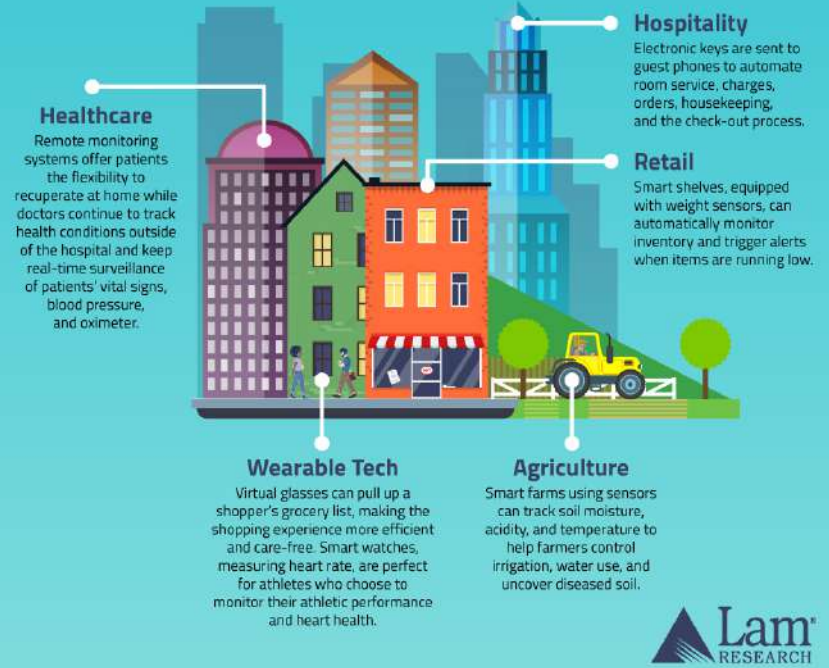
Cost-effective chip technology and improving wireless networks allow otherwise disconnected things to connect through sensors, thus adding what is known as digital intelligence to devices. During the COVID-19 pandemic, the need for IoT technology has never been greater, with schools, businesses, and governments operating in a remote capacity. Enabled by chip technology, each of the top-10

growing chip markets is expected to experience a substantial increase in sales. Let's take a look at some IoT use cases around the globe.

- In India, the agriculture sector is experiencing significant growth with IoT technology. Fasal's IoT device has been deployed across more than 10,000 acres of farmland and has saved more than three billion liters of water. The device is giving farmers unprecedented insights into how their farms operate to improve productivity. Specifically, the device leverages sensors and transmitters to help farmers observe moisture levels and identify mildew before its arrival to help them save water. Farmers in India have improved yield by 20% in a single year using this device.
- China is leveraging the IoT to improve practices across in consumer electronics, automation, industrial, transportation, and healthcare. In fact, the country spun up the "Made in China 2025" initiative in 2015 to place a premium on IoT development. As such, China is set to surpass the U.S. as the largest IoT market in the world within the next three years, and accounts for nearly 27% of global IoT spend. China is investing within the automotive industry to monitor traffic elements including traffic, navigation, and car speeds.



Industries that leverage the Internet of Things include:



- The United States is also boosting its automotive industry with IoT technology. Through IBM Watson, the US is integrating IoT into vehicles to not only connect them, but also assist with spatial awareness, adaptive cruise control, and blind-spot recognition. With connected vehicles utilizing sensors, these vehicles can provide driver insights and pertinent vehicle statistics to measure historical usage, share real-time analytics, and predict car trouble.
- In Europe, consumer goods and manufacturing are noticing the most improvement from IoT technology. The European IoT market size is growing rapidly and is responsible for 23% of the world's IoT spend. Beyond the consumer goods market, Europe is heavily investing in utilities to develop smart grids for more efficient electricity, water, and gas.

As cities and technologies continue to develop, the number of industries relying on IoT capabilities will continue to rise. Built on top of chip technology, industries like the automotive industry, healthcare, and farming have already seen substantial improvement and are poised to continue to evolve.

The IoT is enabling a smarter, safer, and more sustainable world. As more things are connected, more data is captured, creating the potential for continued transformation in our everyday lives.

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Micron: Charting a Smart Course Toward Singapore's Manufacturing 2030 Vision

In early 2021, the Singapore Government announced a 10-year plan to grow the country's manufacturing sector by 50%, the amount required for the industry to keep its 21% share of GDP.

Semiconductor manufacturing, one of the most complex manufacturing processes in existence, has the potential to lead the way in building continued manufacturing excellence in Singapore. For more than 50 years, Singapore's history in this industry, its robust supplier ecosystem and its optimal mix of talent and infrastructure have made it ideal for global players like Micron to expand and scale their operations.

With the long-standing partnership with the government, large manufacturing footprint, commitment to sustainability and focus on people, Micron is well placed to help Singapore's manufacturing ecosystem achieve the Manufacturing 2030 Vision.

Micron brings technology transitions and innovation to Singapore's vision

For more than two decades, Micron has continued to deepen its commitments and investments in Singapore, becoming one of Singapore's largest foreign investors and employers. Micron Singapore is home to the

industry's leading 176-layer NAND technology, providing scale to future technology transitions that will fuel new device experiences and infrastructure innovation across the data center and intelligent edge.

Best of all, Micron brings smart manufacturing to the ecosystem. Smart manufacturing enables Micron to make complex products with the highest quality and to accelerate time to market while increasing energy efficiency, reducing waste and maintaining an efficient end-to-end supply chain.

According to Koen De Backer, Micron's vice president of Smart Manufacturing and Artificial Intelligence, "We embrace AI to solve our manufacturing and business problems. We leverage the vast amount of data generated – 13 terabytes daily – to gain insights and create the innovation necessary to gain an edge through AI. For instance, we use AI to analyze millions of images a day and detect real-time process anomalies."

He lists the impact of these transformations: a 30% reduction in unplanned downtime, an 18% improvement in labor productivity, a 40% reduction in product downgrade, a 20% reduction in new-product ramp time and a 15% savings in energy.

This last impact is vital to the environmental sustainability that lies at the heart of Micron's manufacturing footprint. With an investment of US\$1 billion over the next five to seven years, Micron has established ambitious long-term environmental sustainability goals across four key categories: emissions, energy, water and waste. The Micron team is also looking into

data platforms and smart end-to-end energy management solutions to drive environment sustainability in Singapore operations. Micron Singapore has already been recognized by the World Economic Forum in its Global Lighthouse Network for its sustainability commitments.

Micron scales from front-end smart manufacturing to an end-to-end smart enterprise

We are also leveraging our six years of smart manufacturing initiatives to create cross-functional approaches that remove siloes and promote transparency and collaboration. Micron partners with key external stakeholders and suppliers to develop joint roadmaps and data-driven insights that enhance products and reduce product ramp times.

De Backer adds, "We identify the learnings from our smart manufacturing initiatives and proliferate the lessons, strategies

and investment throughout the enterprise to enhance efficiencies, productivity and quality. One example is the use of an AI-based auto-diagnostic solution by our procurement teams. It identifies saving opportunities and supply market dynamics by integrating insights from various category-specific costs and market intelligence tools to recommend a go-to-market and negotiation strategy."

People are the core of this transformation journey

Micron has embraced AI to not only benefit its position as a leading semiconductor memory maker, but also to inspire, enable and upskill our workforce. This approach allows team members with different abilities or in different age groups to perform efficiently, contribute equally and extend their careers. Examples include supporting team members with disabilities to work remotely and achieve their full potential with the assistance



Micron is the first technology company to sign up the President's Challenge Enabling Employment Pledge, a commitment to supporting employees with different abilities through means such as AI.

of smart applications leveraging augmented and mixed reality technology.

Micron also focuses on attracting top talent in Singapore and the region. "Micron has sponsored industry-relevant projects, engaged student researchers and hired them in internship programs," says De Backer. "We recently partnered with the National University of Singapore's Advanced Robotics Centre to develop autonomous transportation capability at our Singapore site. We will accelerate adoption of new technologies and upgrade the skill sets of our team members in response to any uncertainties that we may encounter in the future."



Micron Singapore is recognized as an Advanced 4th Industrial Revolution Lighthouse by the World Economic Forum's Global Lighthouse Network.

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<https://sg.micron.com/>

Driving IC Innovation

About Realtek Semiconductor

Realtek Semiconductor Corporation was established in the Hsinchu Science Park, Taiwan in 1987. And has branch offices in the United States, China, Japan, Korea and Singapore, which provide real-time communication and comprehensive support services to our customers. According to market research report conducted by IC insights, Realtek was ranked 11th among global fabless IC design companies in 2020. It is one of the world's top IC suppliers and the third largest Taiwanese IC design company.

Realtek offers a wide range of products in three main areas. Our products are used throughout daily life, and its flagship models offer outstanding performance:

Product Lines

- Communications Network ICs
- Computer Peripheral ICs
- Multimedia ICs

Applications

- Infrastructure
- Smart City
- Connected Home
- Connected Car
- Personal PC
- Wireless Device

Realtek Solutions

- Ethernet NIC, PHY
- Automotive Ethernet Solutions
- Switch Controllers, Gateway Controllers
- Broadband: ADSL2+, VDSL, xPON
- Digital Home Center: STB, OTT
- Wireless controller: Wi-Fi, BT, IoT
- Card Reader / Type-C / USB HUB Controllers
- HD/ SoundWire Audio Codecs
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- PC Cam & Webcam Controllers
- IP Cam Controllers
- LCD Monitor / TV Controllers
- Display Translators



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IoT / Wi-Fi MCU

Ameba IoT solutions lead to a variety of smart solutions to the home, medical, entertainment, engineering, and other scenarios.

Our chip design focuses on the small size, low power consumption, and low latency, with a built-in audio codec solution and a LCD touch display controller. We have the world's smallest Wi-Fi dual-band/Bluetooth integrated SoC to enable short-range Bluetooth network and cloud remote control via Wi-Fi, thereby realizing a perfect smart life.

AP Router

Our vision is to allow more consumers to enjoy the convenience of Wi-Fi 6 at a reasonable price. With the support of more devices on the market and the requirements of many new models for internet connection speed (working from home, live broadcasting, the premiere of cinema movies, e-sports, etc.).

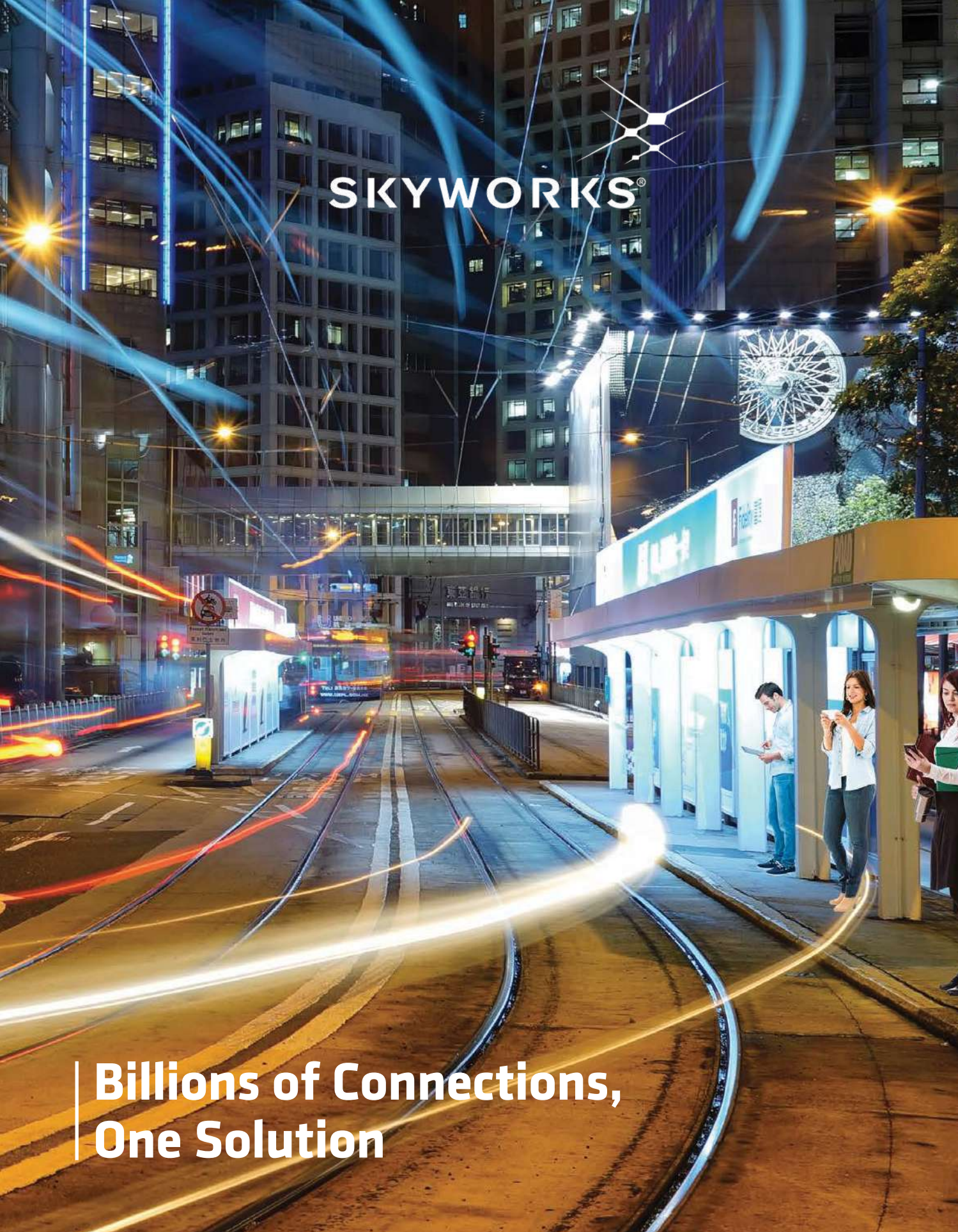
As the starting point of Wi-Fi 6, 802.11AX 1500 will be applied to this router by end 2021, following which the entire Wi-Fi 6 industry will take off and advance at full speed.

Video SoC

The Ameba Pro series is the only IP camera system on a chip (SoC) on the market that integrates CPU, NPU, Wi-Fi, Bluetooth, video, and audio functions. In response to the needs and trends of extensive camera applications, such as Edge AI, low power consumption, miniaturization, high resolution, fast startup, and long-distance transmission, we have planned a series of products.

We hope that the integration of technologies and applications will accelerate market development and upgrade user experience as an important driving force for the development of AI and interactive audio-visual communications in the future.





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One Solution**



Air Liquide
is ACTing for a
Sustainable Future!

Since 1902, inventing and shaping the future with state of the art technologies, operational competences and services close to customers or patients, has always been in Air Liquide's DNA. We have been working with our partners and customers in developing new solutions towards a more sustainable future.

Taking Actions for Sustainability through Performance Analytics Centre (PAC)



Our Singapore Performance Analytics Centre (PAC) makes use of predictive data analytics to better understand and manage our Carrier Gas plants. Equipment

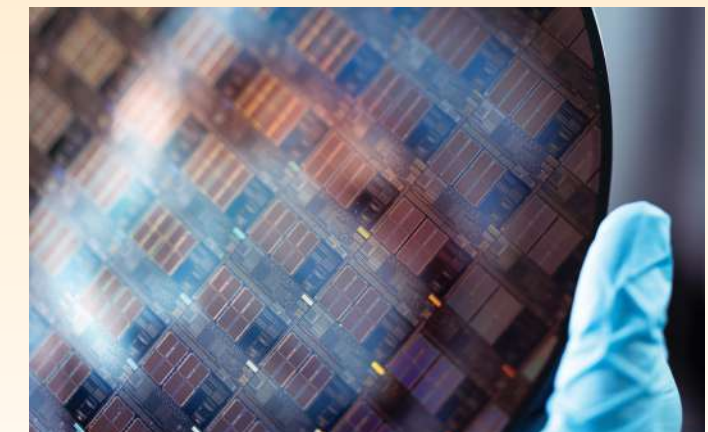
reliability is improved, plant uptime is increased and energy consumption is optimized; allowing us to respond more effectively in real time to customers' varying supply needs and reducing the dependency on external gas sources, indirectly lowering carbon emissions.

Reducing carbon footprint of our vehicles

Using data to calculate the consumption rate, the system is triggered to place an order once the tank level hits a certain level and optimizing delivery trips.



Fighting the global warming effects with enScribe™



enScribe™ is a new family of advanced etch materials designed for 3D production and able to etch the latest chip architectures very deeply, at a nanometric scale. It is also designed to reduce the Global Warming Potential (GWP) impact typically associated with most contemporary gases used in etch processes.

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Happy Golden Anniversary to the Microprocessor



It is a fact - we take microprocessors for granted. Most people who aren't deeply involved in technology may have no idea where a microprocessor shows up in their lives. It's not just in our computers; it's innumerable devices we use on a daily basis.

What Is a Microprocessor?

A microprocessor integrates three essential elements onto a single chip:

- A central processing unit, or CPU. This is the engine that does the actual computing work.
- Memory, which stores both the inputs to and the outputs from the computing operations.
- Input/output, or I/O, capabilities that make it possible both to provide the microprocessor with the data it needs to do its work (the inputs) and to read out the results of that work (the outputs).

The definition of a microprocessor can get a bit murky for those who want to parse things closely, but the critical element that distinguishes a microprocessor (which is largely built out of logic) from other logic chips is that microprocessors use software to define their functions.

So, when was the first single-chip processor born? If we focus on commercial availability, that nod goes to the Intel 4004, which was introduced in 1971 - 50 years ago.

Constant Evolution

The microprocessors we use today bear little resemblance to the first ones. As we've been able to place more transistors on a chip, the architecture of the microprocessor has become increasingly sophisticated. The "best" architecture at any time depends on what that microprocessor's job will be, but, in general, the microprocessor has evolved along four lines.

- The number of "bits". This specifies the size of the minimum chunk of data. In general, the bigger the chunk, the more work can be done in a given period of time. Starting from 4 bits, we've moved through 8, 16, 32, and 64 bits. Specialised processors may be bigger, but the standard size for today's general-purpose high-performance microprocessors is 64 bits.
- The length of the "pipeline". In order to make processors work with faster clocks, one major approach has been to divide the computing task into subtasks. The idea is that, the smaller the subtask, the faster that portion can be done, which means you can run the clock faster and deliver results faster.
- Specialised features for speed. For instance, when a computer program has a decision to make, you don't know what the result of that decision will be until you run the actual program. Sophisticated processors can now make good guesses as to what the likely result will be, so that it can

prepare for that decision early and keep things moving quickly.

- More than one CPU. This is referred to as "multicore" computing, and the idea is simple: if one CPU can finish a job in a certain amount of time, then more CPUs can do the job even faster. This is often true, although it's a tricky business. Not all jobs can be shared easily between CPUs. Nonetheless, major mainstream microprocessors today typically contain more than one CPU.

New Devices, New Tasks, New Priorities

Of course, speed isn't the only consideration anymore. Especially when it comes to battery-powered devices, power is equally important. Keeping them small is also critical if they're going to be used in space-constrained devices like smart watches. And combining them with more memory and specialised other circuits gives us microcontrollers, which are used in innumerable devices.

All in all, some version of the microprocessor exists in pretty much any electronic gadget we use these days. And it all started 50 years ago.

So, we wish the microprocessor a very Happy Golden Anniversary!

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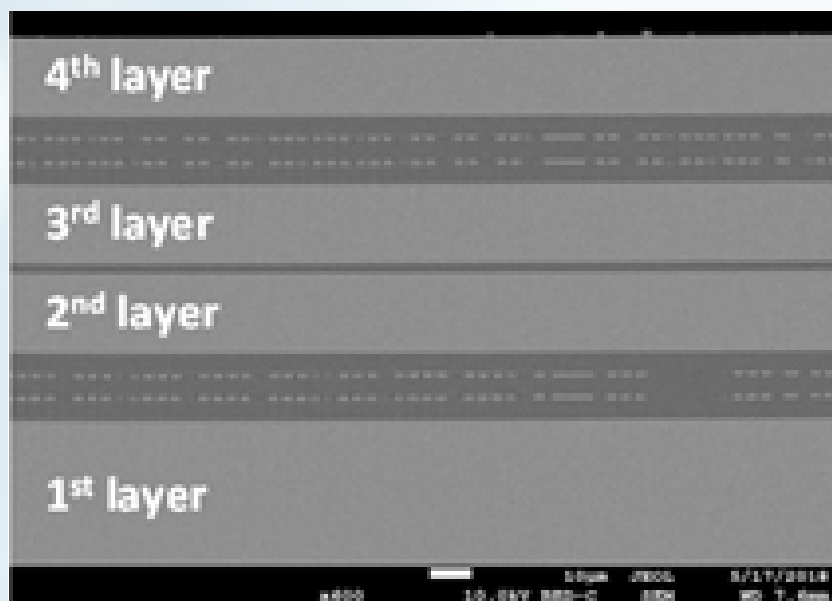


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3D Stacking Paves Way for Smaller, Power-packed Computing Chips

Scientists from the Institute of Microelectronics (IME) at the Agency for Science, Technology and Research (A*STAR) have developed breakthrough technology that can stack up to four layers of wafers, potentially decreasing the cost of production by 50 per cent.



4-layer multiple wafer stacking

Defying Limitations to Moore's Law

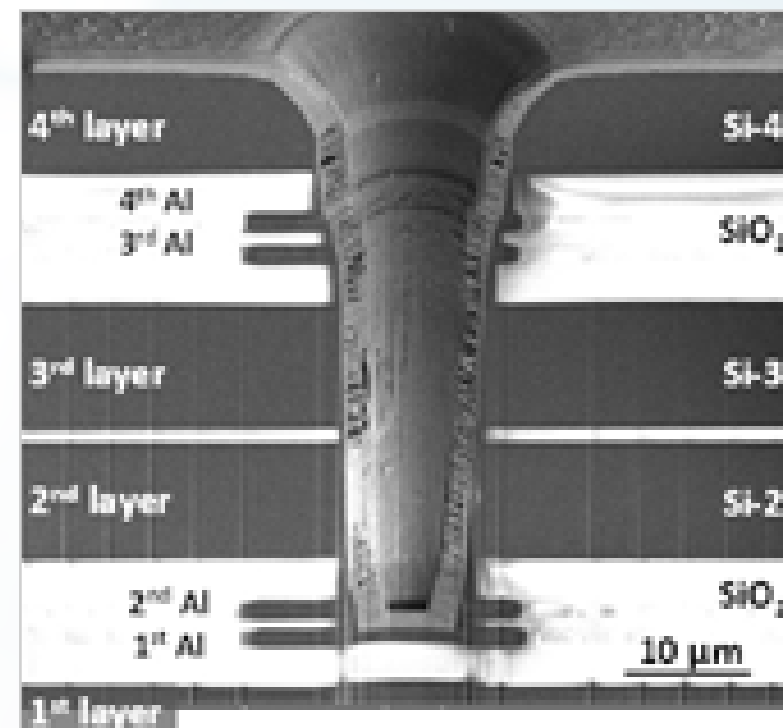
Computing performance is struggling to keep up with the relentless drive for higher-performing chips, as performance bottlenecks have emerged with scaling reaching the limit on all fronts. One way to extend Moore's Law is through heterogeneous integration, which can pave the way to future devices with increasing performance levels.

As chips become smaller and more powerful, the wires connecting the growing number of transistors get thinner and more densely packed. The resulting increased resistance and overheating can cause signal delays and limit the central processing units (CPU) clock speed. Other issues include frequency limitations in large-scale integrated circuit (LSI) operations, battery-related power limitations, and cooling problems.

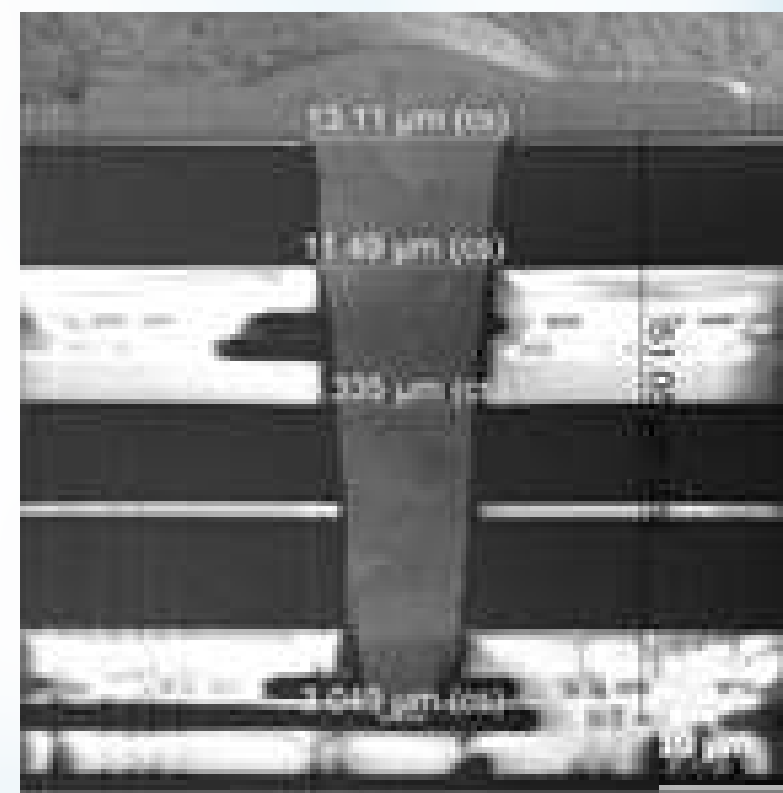
When improving performance in mobile computing and graphic processing systems, one consideration is to ensure that neither the operating frequency nor power consumption is increased. Another consideration is that improving the memory access bandwidth with power consumption efficiency, makes it necessary to have a wide input/output (I/O) memory bus instead of a high-frequency interface. Also, the memory capacity in such systems is becoming more significant as the system performance improves.

3D chip technology helps solve several issues challenging the making of chips with performance increases and processor size reductions. This approach layers one chip or integrated circuit (IC) on another through a process called wafer bonding. The use of the through-silicon vias (TSV) manufacturing approach vertically stacks multiple chip components on each other, creating faster, smaller and lower-power CPUs. TSVs can also enable more efficient heat dissipation and improve power efficiency. With this approach, multilayer wafer-to-wafer (W2W) stacking for more than two layers with fusion/hybrid bonding technology is critical.

"In the search for cost-effective solutions for 3D integration to implement 3D ICs across a wide range of markets, there is much room for cost reduction from current technology," said Dr Kawano Masaya, Senior Scientist and project lead at A*STAR's IME. "Adding a third dimension to an integrated circuit allows Moore's Law to continue as vertically stacking the layers packs more transistors into the same small footprint," he added.



Confirmed successful dry etching punching through 4-layer structure



Good Cu filling was confirmed

Innovative 3D Integration

IME has successfully developed a multi-wafer fusion bonding process and a one-step TSV process that can stack up to four layers of wafers. This resulted in the production cost reducing by 50 percent.

This significant reduction in cost, coupled with higher volume manufacturing, was made possible by combining Face-to-Face and Back-to-Back wafer bonding with one-step TSV after stacking.

Explained Masaya, the capability to have multilayer W2W stacking for more than two-layers with fusion/hybrid bonding technology is critical for next generation products. This includes a wide variety of applications such as mobile computing, high performance computing and graphic computing require cost-effective 3D integration technology.

"The 3D integration, TSV process and multi-wafer fusion bonding technology breakthroughs will allow device manufacturers to better integrate 3D products with high added value. This development will mean new business opportunities with its low cost 3D-DRAM [3D-dynamic random access memory] and manufacturing, for device manufacturers, equipment suppliers, and material suppliers," said Masaya.

For more information on IME, visit www.ime.a-star.edu.sg.

For more information on A*Star, visit www.a-star.edu.sg.

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Building Innovative and Enterprising Industry-Academic Partnerships

Entrepreneurs, academics and industry experts who convened at the Singapore University of Technology and Design's (SUTD) **FIRST Industry Workshop 2021**, collectively recognised that the pandemic had not only pushed the frontiers of entrepreneurship to its limits, but also propelled us to create new realities that were previously unthinkable and impossible.

The annual flagship event, which took place virtually on 28 July 2021, was aimed at fostering collaborative research through the development and deepening of industry-academia ties. More than 1000 registrants from 32 countries joined in to hear industry and academic experts share insights

into successful entrepreneurship and innovation arising from industry-university collaborations.

"The pandemic has reset the world's economy and this is the best time to start a new business. When academia and the industry work closely to fuse their complementary skills, knowledge and expertise, it will bring about a multiplier effect at a speed, scale and scope unlike anything that we have experienced before," said Professor Yeo Kiat Seng, Associate Provost for Research and International Relations at SUTD during the opening address at the workshop.

Alongside Assistant Professor Mohan Rajesh Elara from SUTD's Engineering Product Development pillar who shared his journey as both an academic researcher and entrepreneur, two other impactful keynote addresses were delivered by industry experts. **Mr Chaney Ho**, Co-founder & Executive Director of Board of Advantech Co., Ltd. and the Advisor for the Singapore Mentorship Committee (SMC), spoke about 'Building Supply Chain Management Resilience in the De-Globalisation Age' while **Dr David Ong**, Senior Partner, Naef Group Spiele AG and Chairman of the Singapore Mentorship Committee (SMC) shared his insights on 'Reimagining Unicorns of the Future'.



Attendees were also engaged in a thought-provoking forum panel discussion among industry experts on the topic 'University-Industry Collaboration: Entrepreneurship and Innovation'.

Ms Celestine Khoo (Senior Director, Venture, Innovation, and Entrepreneurship, SUTD), **Mr Eugene Wee** (Director, Enterprise Division, A*STAR), **Mr Nicholas Ma** (President of Huawei, Asia Pacific Enterprise Business Group), **Mr Jeremy Sim** (First Prototyper, Audacity & Creative Director, Mistletoe) and **Ms Hemalatha Annamalai** (Founder, Uni Connect and Investor & Mentor in Disruptive Startups) provided inspiring and diverse perspectives on possible collaboration frameworks and modalities relating to the topic, which included a discussion on cultivating a resilient talent pipeline that will power the future economy. The event wrapped up with showcases on our industry partners and SUTD's research capabilities.

The next FIRST Industry Workshop has been scheduled for 27 July 2022. For updates and recordings from the previous event, please log on to <https://www.sutd.edu.sg/FIRST>.



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SUTD
SINGAPORE UNIVERSITY OF
TECHNOLOGY AND DESIGN



SEMICONDUCTOR TRADEWINDS

July/August 2021



As we move towards the end of Q3, the semiconductor industry continues its turbo charged journey to new highs, that started last year with no immediate end in sight. The global chip shortage started with increased demand for computer, gaming and data centres driven by the work and study from home lifestyle, as a result of the pandemic. Since then, demand for all classes of semiconductors has continued to increasingly cause shortages in most areas, the most prominent of which is the automotive industry.

As a result of chip shortage, automotive plants of all the major automakers around the world are having temporary shutdowns. It is not just this industry that is struggling, as Apple and Sony, among many other companies, have had to delay or stagger launches of phones, tablets, gaming consoles and more. Separately, capacity in foundries and OSATs

is fully booked into next year. As a result, ASP for wafers and assembly test services has increased due to a lack of capacity, shortage of raw materials as well as increased raw material prices.

The latest market analyst predictions indicate that semiconductor sales will increase around 25% this year, to around US\$550 billion, as the ongoing economic recovery drives demand for 5G, IT infrastructure and other sectors. IC unit shipments should increase to around 390 billion units, the largest increase in shipments since 2010. In addition, the shortage of capacity is causing an increase in ASP, further boosting sales increase. Growth in the semiconductor industry is expected to continue into 2022 with a further 10% increase to over US\$600 billion in sales.

For the year to date, all major foundries are reporting record revenues and full capacity. Foundry market leader TSMC has reported revenue of US\$30.6 billion for the year-to-date till July, up 18% compared to the same period a year ago. In the back end OSATs, it is a similar story – market leader ASE's revenue for the year-to-date till July is up 14% to US\$6.3 billion for their ATM business. Both foundries and OSAT are reporting customers now doing long term deals to secure capacity and co-invest in capacity expansions.

In Q2, according to market research firm IC Insights, Samsung took over the number 1 spot from Intel as the world's largest semiconductor supplier, with sales growing 19% compared to Q1, due to surging demand for DRAM and flash memory, and a recovery in memory prices. Samsung is expected to



further increase its lead in Q3. IC Insights also predicts that 29 of the 33 semiconductor product categories will experience double digit growth this year.

This surge in chip demand is also good for the equipment, wafer substrate and leadframe suppliers. Foundries and OSATs are rapidly trying to increase capacity, both in the short term by adding capacity to existing lines, as well as announcing new factories. SEMI is predicting that global equipment sales will increase 34% in 2021 to US\$95 billion, before exceeding US\$100 billion in 2022. This trend should continue as new fabs around the world start to come online in 2023 and 2024. Another factor limiting capacity increases is the shortage of some raw materials, so the industry will need to ensure that raw material supplies are able to ramp up in tandem with capacity increases.

Around 29 fabs have been announced to be built to support this increase in demand, with 19 breaking ground this year and further 10 next year. GlobalFoundries broke ground on a new US\$4 billion 300mm fab in Singapore next to its current campus, and it will spend an additional US\$1 billion to expand capacity at its New York Malta facility before subsequently building a new 300mm fab there. TSMC is considering whether to build new fabs in either Japan or Germany,

in addition to its US 5nm Arizona fab currently under construction. Samsung is evaluating Texas, New York and Arizona for its new US\$17 billion fab; and Intel will spend US\$20 billion to build new fabs in Arizona.

The global demand for chips is driving up the demand for silicon wafers, with area shipments being 6,871 million sq inches in the first half of 2021 according to SEMI, up 13% compared to the first half 2020. Silicon suppliers are also planning new capacity to meet the increased demand and Siltronic has announced it will build a new US\$2.3 billion 300mm fab in Singapore, next to its existing plant.

All this bodes well for the semiconductor industry for the coming months and into 2022, and Singapore will benefit directly with an additional US\$6.5 billion investments announced in new wafer substrate and IC chip fabs.



ABOUT THE AUTHOR

Mark Dyson

Head of Global Subcon
Manufacturing of Osram
Optoelectronics

How did ASML support global ecosystem of semiconductor industry to fix the world’s short on chips?

Microchips. At almost every moment of every day, you’ll make use of technology that contains one of these small but mighty devices. Whether you are video chatting with a friend or waiting as a healthcare worker retrieves your COVID-19 vaccine from the fridge, there are chips at work all around you. Not to mention the cloud, data processing centers, the internet – all possible thanks to semiconductors.

The global pandemic, digital transformation and the increasing demand for new technology has drawn all eyes to the semiconductor industry and the technology companies that make the digital world go round.

Where does ASML fit in the semiconductor shortage?

ASML’s lithography systems use light to fabricate the circuitry patterns on silicon wafers, a critical step in the chip manufacturing process. The patterns link together as a single integrated circuit that can offer computing or memory function. Lithography systems can be found in the factories of every major chipmaking company in the world.



The unique way chips are produced has created a highly collaborative semiconductor industry.



The team working on the pilot to shorten production cycles with the first shipment through this program.

What is ASML doing about the chip shortage?

Addressing a global chip shortage in the middle of a pandemic is no easy feat, but those who work at ASML love a challenge. Shipping new systems, supporting fast installs and improving the availability and efficiency of installed systems, including through upgrades, are key ways we are helping our customers get on top of this shortage.

Responding to this shortage requires a holistic response across ASML’s entire product portfolio, which spans DUV, EUV, metrology and inspection systems, software and services.

When will the microchip shortage end?

It will not be easy to solve the shortage of chips that we are seeing today. Peter Wennink, our CEO, recently explained his outlook: “2020 – the COVID year – was really a year where customers were cautious. Looking back, too cautious. So that underspend you could call is now translating into demand for 2021. Of course that will take some time before we have our output ramped up.” In his view, catching up with the demand on output could take up until 2022.

"The underlying trend is the digital transformation," concludes Peter, "and that will be here for years to come."



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ENABLING THE ADVANCES OF TOMORROW

Versatile Material Ideal for Power Package Applications

Henkel launches LOCTITE® ABLESTIK® ABP 8068TD, a high thermal die attach paste developed for use in applications where no die back-side metallization (BSM) is required, although can be used if desired. The adaptability of the material gives semiconductor companies a high thermal conductivity die attach option for bare silicon (Si) die integration and is particularly well-suited for high power applications.

LOCTITE ABLESTIK ABP 8068TD extends the benefits of pressure-less sintering to a wider variety of power packages using different types of die and lead frame finishes. The material has bulk thermal conductivity of 50 W/m-K equivalent to soft solder and was evaluated across several standard testing regimens with bare Si die and Ag-metallized die of various dimensions, up to 5.0 mm x 5.0 mm; as well as on copper (Cu), Ag and pre-plated (PPF) lead frame finishes.

LOCTITE ABLESTIK ABP 8068TD has achieved MSL 3 on most tested die finish/lead frame combinations, and MSL 1 for several Ag-BSM and bare Si die/lead frame pairings.

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Simplify processes and reduce complexity with the seamless, bidirectional transfer of engineering and construction data. You can configure automation in the TIA selection tool and transfer these configurations for technical application in the TIA portal. This reduces effort and costs.

Shorten workflows and time to market

Digital twin. The digital twin of the product, production and processes lets individual process stages be seamlessly linked throughout the entire lifecycle. This makes it easier to reuse proven concepts, because adaptations and new requirements can already be taken into account and simulated ahead of time. Another benefit of the digital twin is shorter workflows, thanks to the ability to work in parallel to assembly and construction.

Virtual commissioning. Virtual commissioning means that mechanical engineering, production, product design and automation are all performed in parallel. In this way, you optimize your automation project in a virtual test environment. Tests and simulations based on virtual commissioning ensure a seamless transition to real commissioning. This means a shorter commissioning time for products, product design and mechanical engineering, which in turn results in a shorter time to market.

Rely on maximum flexibility

With the Digital Enterprise portfolio for the electronics industry, you have flexible machine concepts, faster product changeovers, and no problem modifying processes and motion functions – for example, when the design of an electronic device has to be changed just before the start of production. Additional benefits include the standardized integration and control of product lines based on standardized data interfaces and status models. Fast configuration and programming also enable new machine concepts in various industries and applications.

Get ready for the future

As a thought leader and developer, Siemens supplies digital systems well in advance so that companies are future-ready. Three trends are fundamentally transforming the electronics industry: artificial intelligence, edge computing, and augmented reality.

Artificial intelligence. Artificial intelligence has the potential to transform human-centered engineering models into automated systems, which is important for quality control and predictive maintenance. AI can also lead to productivity gains that surpass human efforts and facilitate continuous occupational training.

Edge computing. The Industrial Edge, or edge computing, can help supplement PLC functionalities with additional computing power and personalized service requirements – with no need for fundamental changes to the production architecture. Edge apps also offer you additional functionalities for your machines. Benefits include central updates of all devices through mass rollouts.

Augmented reality. Augmented reality will be the HMI of the future. For operators, this means extreme transparency and invaluable insights into controllers, machines and production processes.

For more information, contact us,
Mr. Zhongyang Wang zhongyang.wang@siemens.com
Marketing Team industrymarketing.sg@siemens.com

SIEMENS

Highly Parallel Wafer Level Reliability Systems with NI PXI SMUs

Reliability testing has long served as a method of ensuring that semiconductor devices maintain their desired performance over a given lifetime. As IC manufacturers introduce new and innovative processes with decreasing device geometries, they need to ensure the additional complexity from these changes does not affect the long-term reliability of their ICs. Additionally, major technology trends in autonomous driving, cloud-based data storage, and life sciences are forcing IC suppliers to provide higher assurances of product reliability to their customers who work on mission-critical applications.

These two trends are driving semiconductor manufacturers to vastly increase the amount of reliability data collected and analyzed, at the same time decreasing the cost of test. When faced with this problem, many reliability engineers struggle to solve it using traditional reliability solutions, therefore turning toward modular, flexible solutions that can scale to fit their needs.

Challenges of Traditional WLR Systems

The traditional WLR approaches of either buying purpose-built systems or building rack-and-stack systems from box instrumentation served their purpose for decades. However, these architectures do not scale to meet their evolving data and cost requirements.

Turnkey systems do not provide the flexibility to modify the test software or hardware as device requirements change.

Rack-and-stack systems are limited by the low-channel density of traditional box SMUs. As reliability stresses often require fixed stimulus times, the best way to increase data velocity, or the amount of data that can be gathered in the same (or less) time, is

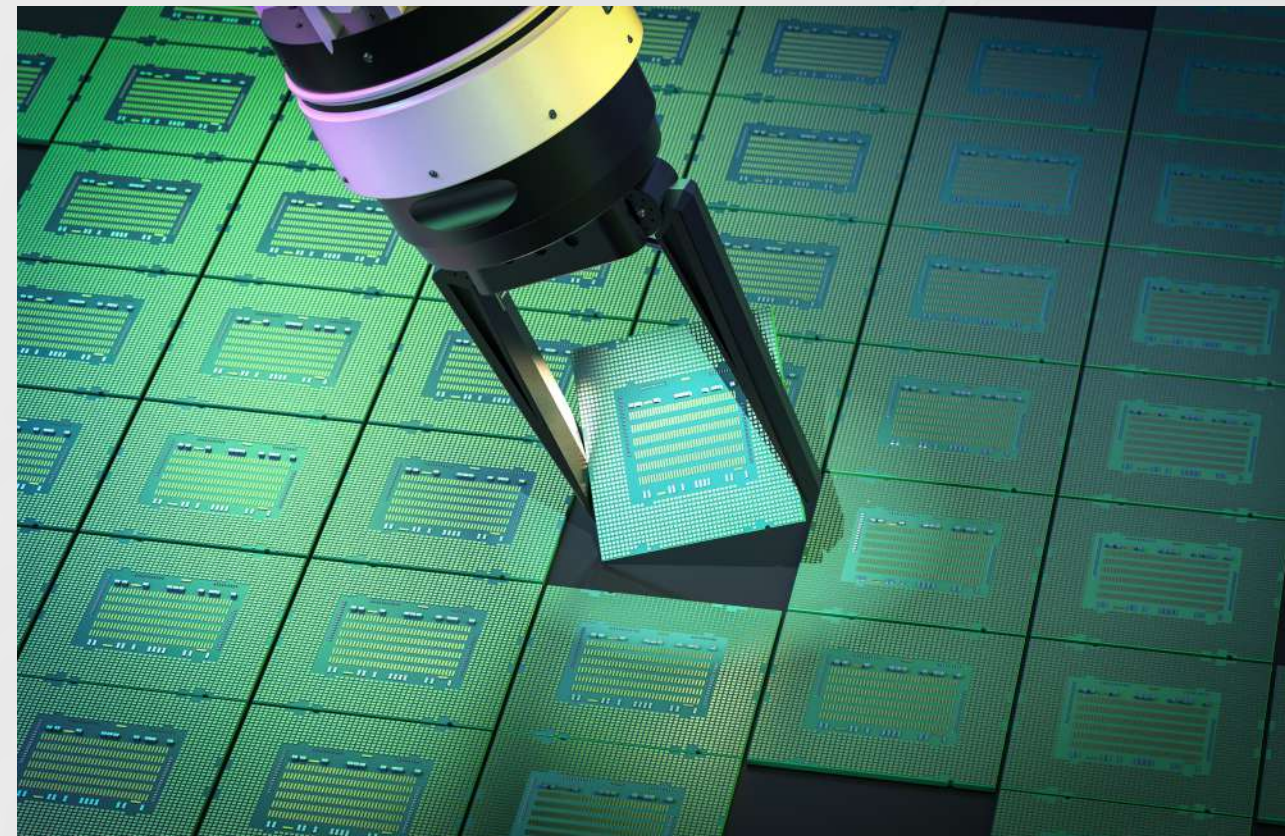


by increasing parallelism. The limited channel density of traditional box SMUs creates challenges for building high-channel-count systems with a small footprint and often forces engineers to use a switched topology to multiplex the SMU to multiple pins. However, switched topology quickly becomes a bottleneck because the pins are tested serially instead of in parallel, failing to achieve the desired goal of increased data velocity.

These challenges drove many companies to build parallel test systems using modular instrumentation.

A New Approach

Using a modular approach, you can dramatically reduce the footprint of WLR systems without sacrificing measurement quality. The open software architecture allows defining the functionality of your system, modifying tests, and adding hardware as your requirements change. This includes integrating the latest multicore processors,



maximizing system uptime through health and monitoring tools, and adding I/O.

High Density Source Measure Units

By using PXI SMUs as the foundation for WLR systems, you can add hundreds of SMU channels to your system while maintaining a reasonable footprint and cost per channel. NI SMUs are designed for building automated test systems where the modular architecture can be used to optimize the number of channels and device specifications of your overall system. With the high-channel density, you can avoid placing switches between the SMU and the wafer. Instead, you can connect each test pad directly to a high-precision device. This “SMU

per pin” architecture prevents the negative impact that switches have on signal integrity, test time, and test routine flexibility to help you implement advanced stress-measure algorithms.

NI WLR Test Solution

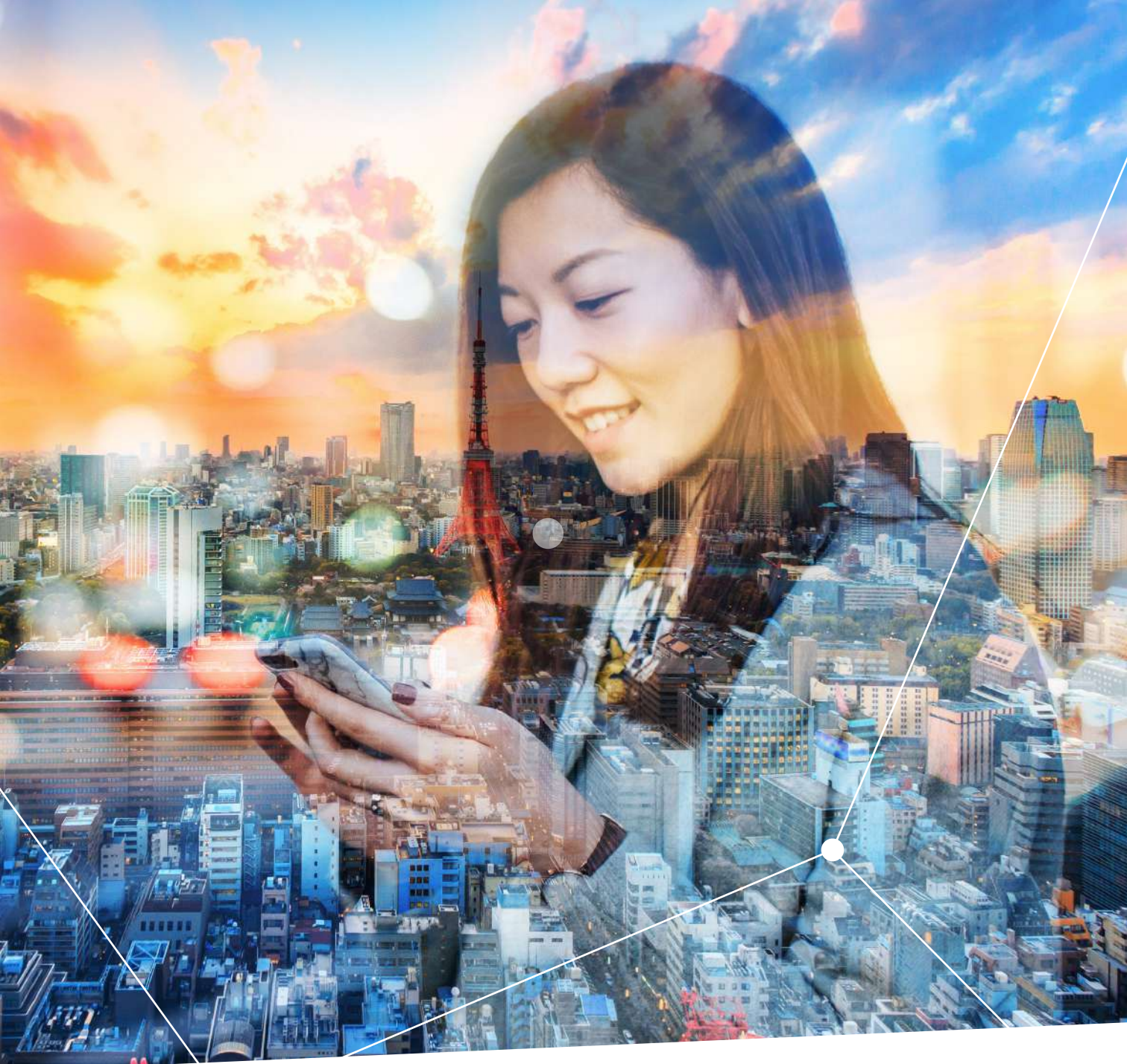
The ability of the Traditional reliability systems to provide and analyze massive amounts of reliability data is decreasing. To address these needs, many companies are turning to modular platforms, such as PXI, for highly parallel WLR systems with high uptime and the latest commercial processors. Using the software-defined architecture of these systems, companies can maintain control of their intellectual property and scale their systems as

requirements change. This satisfies their need for more reliability data at a lower cost and positions them well to address the ever-changing test requirements.



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Optimise your workforce and maximise productivity with workforce management

As COVID-19 rapidly changes the world around us, its impact on the semiconductor industry represents a double-edged sword. On one hand, the demand for products has skyrocketed and the industry is set for massive growth. On the other hand, product shortages, supply chain disruptions, and the importance of keeping employees safe and productive has never been greater. With this in mind, how can a workforce management system set organisations up for success?

✓ Improve productivity with automation

Running an efficient and productive operation is key to remaining competitive. Implementing a workforce management solution can help improve productivity by automating and streamlining time-consuming tasks, such as scheduling, leave requests, and approvals - allowing employees and managers to focus on output, rather than admin.

✓ Keep employees safe

Ensuring the health and safety of your entire workforce is critical for avoiding disruption in a manufacturing environment. Using a workforce management system to track employee contact, should a staff member test positive to COVID-19, can be the difference between containing an outbreak and needing to halt operations. A robust workforce management system can also help reduce the risk of an infected employee starting their shift through powerful attestation tools that confirm their health status and other indicators.

✓ Minimise compliance risk to protect your employees and organisation

In a heavily regulated environment, a workforce management solution can provide visibility into potential compliance risks. Real-time projections that predict possible violations before they even occur can help keep your organisation in regulatory compliance.

UKG is the world's leading workforce management solutions provider. With over 4,000 manufacturing customers worldwide, UKG can help your organisation to optimise its workforce and mitigate risk through their purpose-built solutions.

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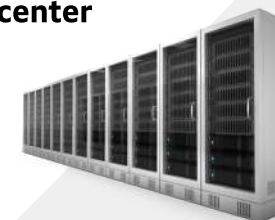


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- Headquartered in Santa Clara, California
- 10,000+ patents worldwide
- Research and development centers located in USA, Singapore, Israel, Germany, China

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Focus on a Growth Culture to foster talent

Applied Materials (Applied) in Southeast Asia is home to a diverse and global workforce – we hail from 18 countries and many of us helm regional and global roles. As a company, we invest in the professional development of all our team members at every stage of their careers, whether you are a semiconductor veteran, an experienced professional new to our industry or just joined us post-graduation.

We are proud that our efforts in people development and culture of inclusion are recognised as we were once again announced as one of Singapore's Top Employers in 2021. In addition, Applied was ranked #14 by the global Training Magazine for our development programs which are designed to enable our employees to grow strength to strength with us.

Hear from three of our employees – Elaine, Tuck Foong and Jeck Ann on how they grew their careers with Applied Materials.

“At Applied, we focus a lot on innovation, performance and teamwork, this means a fair, and conducive environment for all.



ELAINE SEAH,
Senior Manager,
Commodity Business Management

Being in the industry for over two decades, Elaine Seah continues to find joy in solving the unique industry challenges and delivering Supply Chain excellence to Applied and its customers. What keeps her going is the evolution of the function and role which enables her to continuously learn innovative approaches for materials assurance. Most importantly, she knows the team makes an impact on the company's growth and success.

“The requirements of our supply chain are very different due to the cyclical nature of the industry. However, with everyone at Applied committed to become the winning team, that really helps a lot when it comes to cross-team and even

cross-site collaborations. We're all focused on forging forward collectively as one team to make Applied the leading semiconductor firm across the globe.”

To Elaine, the industry and her workplace have undergone major transformations too.

When she first joined the industry, her male colleagues took up about 80% of the seats in meetings. Fast forward to today, the ratio has balanced out with more females having a say in the male-dominated industry.

To female peers who are looking to join the industry, Elaine's advice is to focus on career charting, personal growth and networking. “There are many trainings Applied has curated for us, but personally, I've enjoyed those focused on our soft skills. For instance, how to communicate and bring forth your ideas clearly and how to negotiate with stakeholders for a win-win solution – which I believe are crucial to my career development.”



KOH TUCK FOONG,
Senior Process Engineer,
Metal Packaging Products

From the reusable plasticware in our food takeaways to network servers that facilitate the exchange of data, material processing technology and innovations play a critical role in powering our society.

“There are a lot of opportunities for internal movement and growth at Applied – I started off as a hardware engineer, before moving on to my current role as a Senior Process Engineer. This transition helps me better understand the close relationship between hardware designs, processes and precision materials engineering, which I think

is really valuable as we continue to develop what's needed for our customers to eventually deliver products that enhance the quality of lives in our society.”

The team at Applied often comes together to collaborate and develop differentiated hardware capabilities to enable precision materials engineering. To Koh Tuck Foong, this had given him a broader perspective on what is needed to get the business running successfully – from R&D to developing the right capabilities for applications in the real world.

“Applied is enabling technologies that impact our everyday lives. This is how we're making possible a better future.

Joining the semiconductor industry was almost a natural choice for Tan Jeck Ann who had been passionate about IT and hardware since young. But joining Applied really widened his perspective when he witnessed how the company has enabled transformative changes in technologies that are fuelling the economy.

“One great example is a recent seasoning endpoint model project that I'm also personally proud of. As a mission-critical business, every second is valuable, and time saved here can result in production efficiency for our customers. By working closely with the process, hardware and algorithm development teams, we utilised onboard sensor data to tell when the process chambers are good to go, which helped solve a real-world problem that our customer was facing.”

Being in the industry for only five years, Jeck Ann thinks that there is still room for growth.

“Applied has provided us with many learning programs through the Applied Global University (AGU) including various back-to-campus courses. With the opportunity to team up with co-workers from different functional groups, this has been an eye-opening experience for me as we bring those theories that we learned in university to life.”



TAN JECK ANN,
Customer Engineer

“I've had the honour to work with many bright minds at Applied, and I'm excited to see how we can leverage data to solve high-value customer problems across different industries.

Growing together in the next 30 years - Join us!

Applied Materials celebrates 30 years in Singapore. As we look to the next 30 years, we will continue to grow and invest in our talents. Join us to make possible a better future!



For more information, please visit www.appliedmaterials.com

EXECUTIVE SPOTLIGHT

Mr Jonathan Chou, CFO, UTAC

UTAC welcomed their new SVP & CFO for Finance, Corporate IT & HR, Mr Jonathan Chou, in February this year. Bringing with him insights gained from 30 years of leadership in Fortune 500 and Asia-headquartered US-listed companies, Mr Chou held prior executive positions at Kulicke & Soffa, Honeywell International and Lucent Technologies/Bell Labs, among others. SSIA speaks with Mr Chou about his vision, plans and more.

It has been a few months since you took on this new challenge at UTAC. Tell us more about how you see your rich background bringing value to UTAC, and what are your vision and plans here?

UTAC has done very well in the last few years. Our revenue grew by about 22% in 2020. We are well positioned with our customers, our technology, package and test strategy and with the support of our relatively new investors, we are on track to another year of significant double-digit growth. Having spent many years in the semiconductor industry, as well as several other

sectors in Asia Pacific, I believe I can add value to take UTAC to the next level by leveraging decades of finance and operations experience, from banking, telecommunications equipment, and from industrial to semiconductor companies.

Throughout my career, I had the privilege to hold unique Global CFO roles to help achieve successful NYSE mainboard listing, bringing to fruition global headquarters relocation from the US to Singapore for a Nasdaq listed company, among other milestones. My close partnership with a former CEO saw us working in tandem to bring significant value to the company's competitive and financial positions, bringing about increased scalability and improved operating cost structure to the company's global platform. Similarly, I am working closely with my current CEO, the board and the key stakeholders as

we embark on becoming a billion dollar company this year.

I joined UTAC to further advance my CEO's vision, and support our long-term plans under UTAC's

new private equity ownership. I have a simple vision – to see UTAC move up the global OSAT ranking and be recognised as one of the best companies to work for. Based on my experience, I appreciate a robust planning process which would allow the leadership and executive team to assess and consider the use of technologies to increase competitiveness, and most importantly how best to serve and please our customers.

I am impressed with UTAC's implementation of Industrial 4.0, particularly the use of IoT devices, robotics, automation, artificial intelligence, and other emerging technologies. With labour costs rising in Asia and automation solutions poised to be more mainstream and affordable, I believe it is critical for companies to increase levels of automation in our workflows, thereby increasing efficiency and productivity for the company.

There is much effort to bridge local SMEs and suppliers with MNCs, considering the vast potential in collaboration and shared opportunities. How do you envision working even more closely with SMEs in Singapore?

Recognising the importance of strategic partners, I pride myself on identifying such stakeholders

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swiftly, who in my past, are not only investors, financial services firms and banks, but also often sole-sourced suppliers. It is good to team up with suppliers who can support long-term mutual success of our companies, and commit to short and long-term goals. These include working together on cost-down options and opportunities to increase price competitiveness. One of our initiatives is to leverage SSIA's Semiconductor Business Connect, which gives us opportunity to work with locals SMEs on our long-term goals.

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Customers would then be the ultimate beneficiary of these results from the reduction of Average Selling Price (ASP) while gross margins are protected. The benefits

from a well-run strategic planning process that looks out 3-5 years allowing the company's leadership team to steer away from pitfalls and hopefully into more profitable areas, should at the same time benefit partners and customers we work with here.

What is your perspective on opportunities for the local workforce, including new talent cultivation, re-training/upskilling and staff retention?

Singapore has a good talent pool, especially in the area of semiconductor backend. UTAC leverages this and continues to invest in our employees. The continued effort by both the government and private sector must continue as there is still work to be done, to create a business environment conducive for high tech jobs. UTAC management works closely with EDB and participates in several government agencies' initiatives. I also believe in necessary outreach to the graduate pool at universities, polytechnics and ITEs. UTAC partners with these

education bodies and participates in career fairs. We work closely with SkillsFuture SG (SSG) and Workforce Singapore (WSG), offering re-training, upskilling and work-study programs for our staff.

You seem like a busy man with many corporate priorities on your shoulders. Lastly, out of curiosity, do you still have time for hobbies?

Yes I do! In my free time, and before the current pandemic brought about restrictions, I enjoy travelling, golfing, hiking and scuba diving. My friends call me a “food dude” as I appreciate food of all kinds from different parts of the world. Am definitely looking forward to resuming these activities when leisure travel is permitted.

CONTRIBUTED BY



Wisdom of a Servant Leader

Servant leadership has been a leadership term that has been around since the 1970s when Robert K. Greenleaf first coined the phrase in his essay "The Servant as a Leader." It was and remained a simple, elegant but powerful concept that significantly impacts when you live the principles.

Recently I had the opportunity to interview Howard Behar. For those of you who may not know him, he was at Starbucks for 21 years, where he helped set the foundation for building the company from a mere 28 stores to a 15,000 store mega-brand spanning five continents. After being at the helm, he served on the Starbucks Board of Directors for 12 years.

Howard is the consummate Servant Leader. If you asked anyone who worked for him, he lived and to this day continues to spread the virtues of being one. So, when I asked him to describe what is a Servant leader, he shared these three insights.



Helping others get what they want

As a leader, he said that if you help people get what they want in life, they will help you get what you want. So as a leader, how much are you thinking about what your people really want, versus just what you want them to do for you? As we know, the more you build your people, the more successful you become.

Give before you receive

As Howard puts it, "it is putting other people first", and before you can achieve his first point, you have to give before you receive. It is about a way of leading "we are all put on this earth to serve others", and if you are not a believer of this, it will be tough to be a Servant Leader. It does not matter what your job is – a doctor, a fireman, an architect – you serve people, first.



Understand it is "WE," not "ME"

It is the easiest concept that we tend to forget in the thick of an issue or problem. If you have a "WE" mindset, your perspective is totally different from being only about you. I am sure we cannot help thinking about "ME" once in a while, but servant leaders have a predominantly "WE" perspective.



When I asked him if there is any Servant Leader who made an impression on him, without hesitation he said Jim Senegal. Jim is one of the co-founders of Costco.

In 2021, Costco is ranked #10 on Fortune 500 rankings of the largest US corporations. Howard related when Jim was asked by an analyst why he was paying his people so much, his reply was, "That's what we need to do to keep our people, and if you don't like that strategy, maybe you should buy some other companies' stock." Costco takes care of its people. Jim stood up for what he believed and truly displayed the virtues of a Servant leader.

So, here are some questions that you should think about if you want to be a true Servant Leader for your people:

- 1 Are you helping your people get what they want, or are you focused only on what you want?
- 2 Are you putting other people first and giving

before thinking about what you will receive?

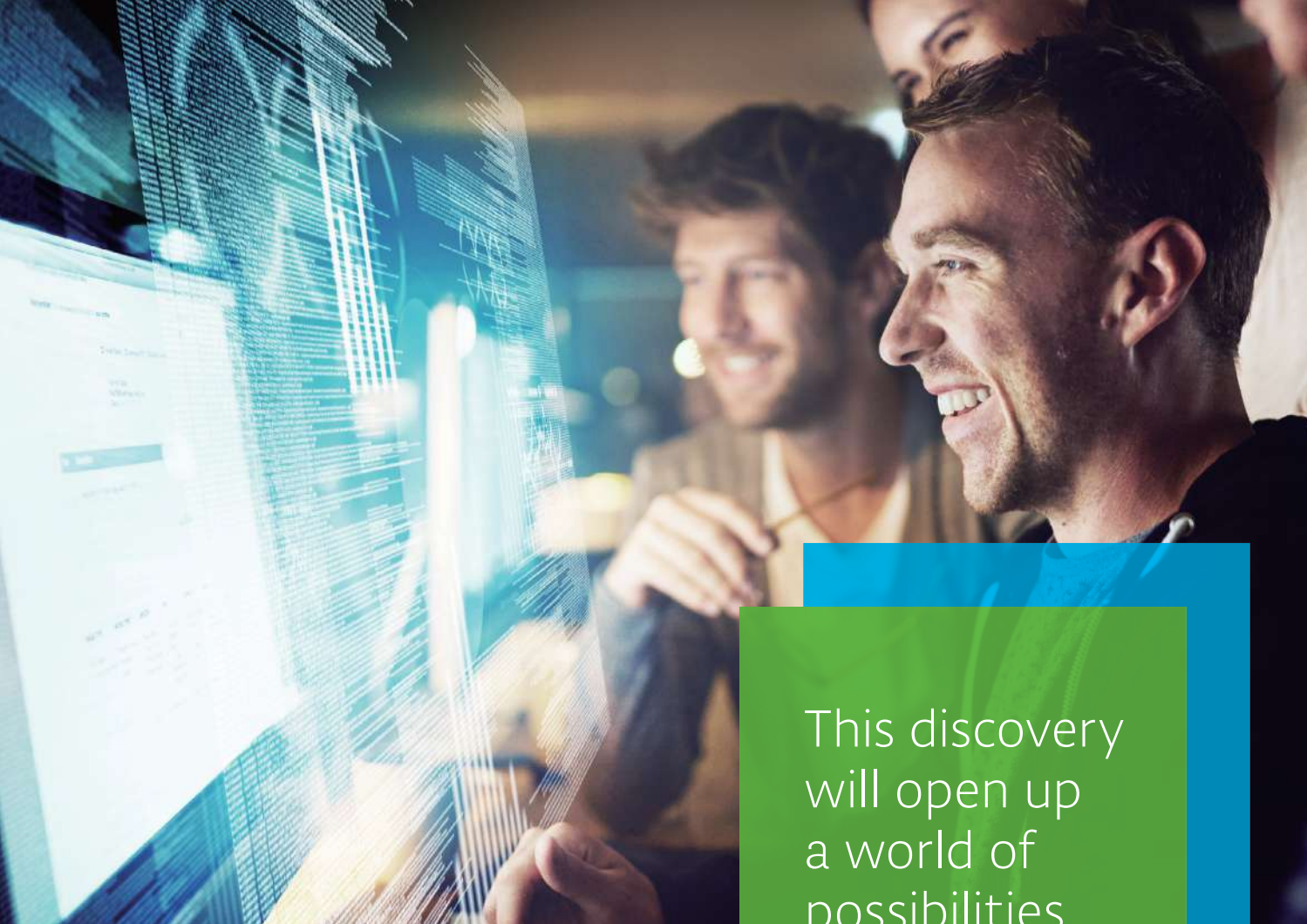
3 If I went to your colleagues and asked them if you had a more "WE" versus "ME" attitude – what would they say?

You were put on this earth to serve others – be a Servant Leader and serve.



ABOUT THE AUTHOR

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This discovery
will open up
a world of
possibilities.

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