



YEAR IN REVIEW





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Open Innovation Platform®

A NOTE FROM JODI CO-FOUNDER AND CEO GLOBAL SEMICONDUCTOR ALLIANCE

Many things have changed since I co-founded GSA in 1994. As an organization, we remain true to our mission of being a neutral platform where leaders meet to openly discuss the industry and innovation. Since then, we have expanded beyond just semiconductor companies and now include software, systems, solutions, and service companies. With this increased vision, we provide a platform for semiconductor players and the greater ecosystem to collaborate.

Overall, GSA has successfully serviced our members because of our unique platform based on global value creation, where we stress the positive interdependency of our partners. We know that value has been created through collaboration and open standards, equal access to markets and the protection of intellectual property. This global collaboration is one of the key ingredients to our industry's success.

To further this success, we created our Women's Leadership Initiative (WLI) to increase diversity and inclusion in the industry. Today, women represent about 20% of the total semiconductor industry workforce, and women in senior leadership is even smaller, less than 10% at and above the director level. We're aiming to change that through WLI, which was launched two years ago with the understanding that if we want our industry to progress at the same rate it has over the past 30 years we must appeal to the other half of the population and demonstrate to women that this is an industry where they can create, contribute, thrive, and lead.

The commitment and support of our Women's Leadership Initiative from GSA member companies and CEOs has been 100% - whether through signing the WLI CEO pledge, volunteering to assist with our efforts, and in many cases funding the initiative.

One of the most interesting projects we are working on through the WLI is the re-branding of the semiconductor industry, specifically for women but the messaging can ultimately be applied to anyone: if you join the semiconductor industry you are directly contributing to global social responsibility. Our industry plays a significant role in combating global climate change, global pandemics, and global poverty. We all have a role to play within our own community, but these big problems need global solutions.

While 2020 was an unprecedented year, GSA's global vision and diversification efforts helped our members continue to connect, thrive, and succeed. I hope you enjoyed last year's programming as we worked to achieve the highest quality and most relevant content in a virtual format. As a special thank you to our sponsors for their continued commitment and their role in our successful events, please enjoy this 2020 event overview to reflect on the programs, key takeaways, and lessons learned.

As we begin the New Year, I am hopeful that we will soon be able to meet again in person and I look forward to even greater achievements in the global semiconductor industry.

Wishing you a happy, healthy, and successful 2021,

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EVENT METRICS

GSA continues to maintain one of the highest level executive engagement platforms for this industry. Given the scope of 2020, we have seen impressive numbers actively involved in our events. *GSA is where leaders meet.*



Event:	Registration #'s:
Navigating the Disruptions of COVID-19	173
COVID-19 Business Implications & Recovery	138
In the Middle of the Storm	102
Impact of COVID-19 on the Semiconductor Ecosystem	155
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Not Home Alone: Staying Connected During COVID-19	108
How to Respond, Recover and Thrive with Digital Supply Networks	109
Emerging 5G Application Platform	175
AI - Moving Intelligence to the Edge	215
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Al in Action	272
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In 2020, we executed financing transactions on behalf of these semiconductor and GSA member companies:



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WEBINARS

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2020 COVID-19 WEBINAR SERIES NAVIGATING THE DISRUPTIONS OF COVID-19

On March 27, 2020, the GSA held its first webinar around the COVID-19 pandemic. GSA's goal is to provide up-to-date essential business information related to the expanded semiconductor ecosystem to our members.

In the midst of the COVID-19 crisis, GSA invited Roawen Chen from Qualcomm and Syed Alam from Accenture to discuss the impact and what companies are doing to navigate the evolving situation.

Roawen shared insights on the areas of focus during the crisis from the operations perspective and how to navigate the disruptions. Roawen and Syed also exchanged views on the recovery phase, with China already showing signs of a quick recovery, and the impact to the supply-demand balance for the semiconductor value-chain.

- Main areas of focus during crisis management should be on supply chain disruptions, workforce resources, tracking the crisis, monitoring the logistics network, and preparing an exit strategy for post crisis recover.
- The supply-demand balance has the potential to shift from not enough supply capacity to weak demand. Consumer spending will drive the recovery.
- China is already in recovery mode with increased demand and restarting of operations. Current signs point to a quick V-shape recovery.
- The semiconductor industry is in good shape as many companies had contingency plans in place. Diverse markets are keeping demand strong and it's business as usual for major Taiwan semi companies.

2020 COVID-19 WEBINAR SERIES COVID-19 BUSINESS IMPLICATIONS & RECOVERY

GSA's goal is to provide up-to-date essential business information related to the expanded semiconductor ecosystem to our members. In the midst of the COVID-19 crisis, GSA invited Lip-Bu Tan, CEO, Cadence and Chairman, Walden International to offer his insights on what companies should be doing to navigate these unprecedented conditions.

Lip-Bu discussed the 4 phases of the crisis, from the "Outbreak" to "Return to Growth", offering timelines and action items at each phase. Anticipating a short-term economic downturn, Lip-Bu provided his thoughts on what leaders should be doing to best manage their businesses through these times and how to be prepared after the recovery.

- Navigating the 4 Phases of the COVID-19
 - Crisis outbreak/containment phase
 - Recovery phase
 - Normalization phase
 - Return to Growth phase
- Focus for Business Leaders
 - Take care of your most valuable asset Talent
 - Secure cash
 - Plan for various scenarios
 - Over communicate
 - Quick decision making
- Recovery Strategy
 - Change after the crisis is inevitable
 - Be prepared to adopt to change
 - Invest now to be ready after recovery
- Semiconductor Industry Should Come Out in Good Shape
 - China in recovery phase with most operations back to normal
 - Short-term demand for semiconductors picking up
 - \circ Supply-chain disruption not becoming a major issue

2020 COVID-19 WEBINAR SERIES **IN THE MIDDLE OF THE STORM**

APRIL 2, 2020 REGISTERED ATTENDEES: 102

GSA's goal is to provide up-to-date essential business information related to the expanded semiconductor ecosystem to our members. For our third session of the COVID-19 webinar series, we invited **Ondrej Burkacky**, **Partner from McKinsey & Company** to offer McKinsey's analysis and projections on the COVID-19 impact to the semiconductor sector. Ondrej provided McKinsey's current overview and projections of the evolving COVID-19 situation and the implications on the global semiconductor industry. He deep-dived into the impact to the semiconductor supply chain and potential manufacturing risks. Ondrej concluded the webinar by offering recommendations for semiconductor business leaders to address the immediate challenges and prepare for the postcrisis opportunities.

- Global Economic Impact of COVID-19
 - This is still an evolving situation without a clear outcome
 - Indicators can be found by looking into the depth, length of the disruption, and shape of recovery
- Impact on Semiconductor Sector
 - Correlation of global GDP and semiconductor sales growth are in "unknown territory", meaning there are no data points from the past to accurately project what would happen
 - Analysis of end-market and semi-product category provides a view that growth forecasts will differ significantly by end-market verticals
 - Average of total semiconductor market growth projections for 2020 range from -4% to -11%, with a wide range of deviation between end-market verticals
- Supply Chain / Manufacturing Disruption
 - Disruption of semiconductor supply chain is not as bad as initially expected. Logistic transportation is becoming an issue as air freight is the main method for semiconductors. Delays in logistics are forcing changes to production planning.
 - Regionally, Southeast Asia seems to be most affected by government induced shutdowns forcing production stops, which are resulting in semiconductor back-end capacity issues. Companies in this region are projecting to take over 4 weeks to return to 100% capacity.
 - Border closures causing labor shortages in areas where workers live in one country and work in another.
 - 5 Horizons for Business Leaders to Consider
 - Resolve address immediate challenges
 - Resilience prepare for near-term financial, operational challenges
 - Return create business recovery plan
 - Reimagine prepare for market landscape changes
 - Reform prepare for regulatory/competitive environment changes

Learn How the Right ML Architecture Ensures AI Meets its Potential



arm

The GigaOm report explores the requirements for artificial intelligence to deliver on its promise of improving our lives through the devices around us.

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2020 COVID-19 WEBINAR SERIES IMPACT OF COVID-19 ON THE SEMICONDUCTOR ECOSYSTEM

GSA is providing up-to-date essential business information related to the expanded semiconductor ecosystem to our members through the COVID-19 webinar series. For this webinar, we invited Mark Edelstone from Morgan Staley to offer the latest analysis and projections on the COVID-19 impact to the global economy and semiconductor sector based on Morgan Stanley's extensive data analysis.

Mark presented the current state of global markets impacted by the evolving COVID-19 crisis. He offered an analysis on the implications to the global economy, technology sector, and a deep-dive into the impact to the semiconductor market and companies, comparing to past market crashes during the Tech Bubble in 2001 and the Financial Crisis in 2008. Mark provided recovery scenario projections and offered optimism that "Near-term Environment is Challenging but Ample Opportunities Ahead".

- State of Global Markets and Recovery Scenarios
 - Impact of COVID-19 to the global economy is unprecedented and changing dynamically. Projections are frequently being updated.
 - Morgan Staley sees the global economy currently in a recession and projects no global GDP growth in 2020.
 - Regionally, Asia is in recovery mode, Europe is stabilizing, but the US is still deteriorating. Supply will return quickly but demand will lag.
 - US economy to start recovering in Q3 2020 with the immediate government monetary and stimulus actions expected to boost the recovery.
- Impact on Technology Sector
 - Low consumer confidence and consumption will impact the technology sector.
 - Companies in the "new economy" markets have done well during the crisis. Companies tied to automotive and consumer markets to be hit the hardest.
- Impact on Semiconductor Sector
 - Semiconductor industry to hit bottom in Q3 2020, but the industry is positioned to perform better than most other industries. Semiconductor revenue is projected to decline by 10 to 20% and return to precrisis levels by the end of 2021.
 - Semiconductor stocks projected to return to pre-crisis leaves by mid-2021.
 - Datacenter/server, Gaming, Network Infrastructure markets will drive demand.
 - Most likely recovery scenario for the semiconductor industry is predicted to show a U-shape recovery.
 - M&A activities to resume towards the end of the crisis.

2020 COVID-19 WEBINAR SERIES **ROAD TO RECOVERY**

GSA is providing up-to-date essential business information related to the expanded semiconductor ecosystem to our members through the COVID-19 webinar series. We invited Handel Jones, Founder, Chairman & CEO of IBS (International Business Strategies) to offer his analysis and projections on the COVID-19 impact to the global economy and semiconductor sector.

Handel offered his view on the latest state of the semiconductor industry impacted by the COVID-19 crisis and expanded on the challenges and opportunities facing the industry as we head towards recovery. Based on his extensive knowledge of the semiconductor industry and China markets, he provided insight on the end-markets that will drive the recovery and in-depth analysis of the different scenarios in the US and China.

- Impact of COVID-19 will hit bottom in Q3/2020 for the electronics and semiconductor industries, but predicted to be a short-term phenomenon.
- Q4-2020 should see a recovery with positive growth in CY 2021. The semiconductor market is expected to reach \$1 Trillion in early 2030s compared to \$400B in 2019.
- The smartphone market consumes 40% of total semiconductors and is projected to be one of the key end-markets to drive the recovery, especially 5G smartphones will show high growth.
- New businesses and new ways of doing business will emerge. Many emerging technologies will show acceleration into markets such as wearable medical devices for consumers.
- Recovery in China has been strong on the supply side, but demand is lagging, especially in exports. This crisis can lead China to accelerate development of new technologies, and could change the center of gravity in technology investment.
- Companies that come out strong are companies that find ways to increase market share and strengthen their positions during this crisis.

NOT HOME ALONE: STAYING CONNECTED DURING COVID-19

APRIL 15, 2020 REGISTERED ATTENDEES: 108

During these current circumstances, the GSA lends its leadership and guidance as we all manage new working conditions. In this roundtable, we invited HR experts from leading semiconductor companies to provide insight and advice on successful methods for working in this unique new environment. The panelists offered their experience on how their companies are adapting to the new work conditions and advice on how they are managing the workforce. The panelists also shared the "lessons learned" and "silver linings" from this unplanned sudden change in the work environment.

MODERATOR:

• Jodi Shelton, CEO of GSA

PANELISTS:

- Sharawn Connors, Vice President, Diversity & Inclusion, Micron Technology
- Ruth Cotter, Senior Vice President, WW Marketing, HR and IR, AMD
- Vicki Mealer-Burke, Chief Diversity Officer and VP, Human Resources, Qualcomm
- Emily Reilly, Senior Vice President & Chief Human Resources Officer, GLOBALFOUNDRIES.

- Communication
 - Communication is key to keeping the workforce informed and motivated
 - There is no such thing as over-communicating
 - Communication keeps employees engaged
- Health and Safety
 - Health and safety of the workforce is top priority
 - Leadership should show empathy and address diverse needs
- Silver Lining
 - Acceleration of embracing technologies for remote work
 - Productivity has stayed at a high level with the majority of the workforce WFH Trust that workforce can stay motivated under flexible environment
 - Hiring can be done virtually

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KEY HIGHLIGHTS

- Global coverage in 30 cities
- \$12.5 billion in LTM revenue
- \$46.6 billion in total assets
- 3,900 employees, including 900 in Europe and 400 in Asia-Pacific
- Over 130 Technology Investment Bankers
- Dedicated Semiconductor & Electronics team providing global investment banking coverage and global research coverage

Gunjeet Baweja Global Head of Semiconductors and Electronics Investment Banking gbaweja@jefferies.com

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HOW TO RESPOND, RECOVER AND THRIVE WITH DIGITAL SUPPLY NETWORKS

APRIL 30, 2020 REGISTERED ATTENDEES: 109

GSA's goal is to provide our members up-to-date essential business information related to the expanded semiconductor ecosystem. GSA invited **Chris Richard and Joe Fitzgerald from Deloitte Consulting** to offer their views on how digital transformation of the supply chain can be leveraged to respond to disruptions.

As companies assessed the impact of the pandemic, this webinar highlighted the potential risks and vulnerability of the semiconductor supply chain across three areas: supply, demand, and logistics. This challenged the industry to consider a new way of thinking and transform its global supply chain model. Chris and Joe discussed how companies can leverage digital supply network capabilities to better respond in this environment.

- The global health crisis has disrupted three aspects of the semiconductor supply chain
 - $\circ~$ Supply disruption varies by labor content and government mandates
 - Demand disruption varies by market segment
 - Logistic disruption Road/Air Freight and Warehousing most effected
- Digital supply network capabilities provide resilience to reduce the impact of supply chain uncertainties and disruptions
 - Reduces judgement and guessing in upstream supply chain
 - Digital capabilities allow for faster response and more accurate forecast collaboration
 - Shift from a linear supply chain model to a more dynamic, automated, AI enabled network model
- Use this crisis as the forcing function to identify and start building the capabilities you need to operate effectively in the next normal

RESHAPING INDUSTRIES, TRANSFORMING SOCIETIES SERIES EMERGING 5G APPLICATION PLATFORM

GSA launched its second webinar series **Reshaping Industries**, **Transforming Societies** that focuses on the markets and technologies that will help drive the semiconductor industry to recovery.

Our speakers from Ericsson, Mallik Tatipamula and Yogesh Bhatt, discussed how 5G creates a platform combining communication and compute fabrics for AI, IoT and Control workloads enabling us to do more with less.

- To do more with less, focus needs to be on optimizing resources instead of throwing more capacity
 - Digitalization is top priority for enterprises
 - Digital transformation is being driven by both Business and Technology considerations
 - Connected products throughout their life cycle are the heart of digital transformation
- Optimization of resources leads to complexity of life cycle management of services and applications
 - Levels of virtualization make infrastructure more efficient
 - Resultant App/Service architectures now need more coordination to run, making it complex
 - The higher the number of disparate App pieces, the higher the number of events to be handled and secured
 - Operations now requires problem-specific tools which multiplies with levels of virtualization
- Answer lies in solving industry problems with simple and easy communication and compute platform
 - 5G boosts performance in 8 dimensions more value than just speed and latency
 - 5G platform provides a decentralized converged infrastructure with micro Datacenters
 - 5G provides the emerging application platform with Connectivity, Compute, and Control

RESHAPING INDUSTRIES, TRANSFORMING SOCIETIES SERIES **AI – MOVING INTELLIGENCE TO THE EDGE**

For the second part of the "**Reshaping Industries**, **Transforming Societies**" webinar series, GSA hosted the "AI – Moving Intelligence to the Edge" webinar to discuss the acceleration of moving Intelligence to the Edge based on the increasing demand for mission-critical and time-sensitive decisions to be made faster, more reliably and with greater security.

Our speakers Mike Henry from Mythic, Louis DiNardo from Brainchip and Chris Bergey from ARM, provided insights on different technologies and approaches to address this demand for AI at the Edge along with solutions to create an effective edge architecture.

- Large growth opportunity for AI Inference at the Edge with emerging markets/use cases
 - Automotive
 - Video analytics
 - Industrial/Aerospace
- Edge AI is about tough constraints, not single-network benchmarking
 - Cost
 - Power
 - Size
 - Low latency
- Data consumption is driving a new Internet architecture
 - $\circ~$ Latency is the largest influence in moving AI to the Edge
 - Large opportunity in AI being used in management functions
 - Next wave of virtualized AI edge technology stack cloud-native experience



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NEW INFRASTRUCTURE , NEW OPPORTUNITIES SERIES **5G EVOLUTION AND BEYOND**

JUNE 2, 2020 REGISTERED ATTENDEES: 294

The semiconductor industry continues to develop the on-going future technology trends and applications in 5G, Artificial Intelligence, Internet of Things, Cloud Computing, Big Data, Automotive fields to build up a win-win ecosystem.

5G technology, as a key element of new infrastructure, plays a vital role in making the industry more efficient and connected to explore unlimited possibility. Through the webinar, we hope to explore how the semiconductor industry embrace the accelerating 5G arrival.

KEY TAKEAWAYS:

- Future 5G Demand and Semiconductor Outlook
 - Where we are in the semiconductor cycle
 - Pie for 5G semiconductor chips will get bigger
 - US technology export control on Huawei design impact to global semiconductor market

GLOBALFOUNDRIES

- China semiconductor localization the need and the progress
- How will 5G Reshape our Digital Life
 - Broader future of 5G more scenarios, more verticals, more device forms
 - Challenges differences, fragmentation, gaps, barriers
 - 5G + AI + IoT = Paradigm Change
 - 5G Era not only welcomes explorations but accelerates consolidations
- Opportunities in Sub-6GHz 5G from RF front end perspective
 - More transmit
 - More receive
 - More switches
 - More filters
 - Advanced packaging
 - Higher integration
- Differentiated End-to-End Silicon Solutions for 5G Leadership & Beyond
 - SOI solution & RF solution
 - Technology challenges beyond 5G 100GHz to 1 Terahertz Band
 - The future of communication

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EMPOWERING INNOVATION

Semiconductors and the applications they empower are fundamental in addressing the current and future global challenges including the most crucial one we face today: COVID-19.

JUNE 11, 2020

REGISTERED ATTENDEES: 255

Young Sohn, President and Chief Strategy Officer of Samsung Electronics, and Chairman of HARMAN, shared his views on the impact of COVID-19 on the markets that semiconductors play a large role in and his thought leadership on the innovations and technologies that will lead the industry through the new decade.

- Impact of COVID-19 on the 4C's
 - Consumer
 - Cloud
 - Cybersecurity
 - China
- The Era of Convergence Innovation Drivers
 - Convergence leads to the next generation of applications
 - Biology + Technology
 - Smart Machines
 - Data + AI = DATA.I.
- Core Semiconductor Enablers Heterogeneous Integration
 - Node Scaling & Compute
 - Storage
 - Connectivity
 - Power Management
 - Advanced Packaging
 - Security Management
- Semiconductor Industry Call to Action
 - Think beyond technology and business
 - Technology x Purpose x Sustainability

RESHAPING INDUSTRIES, TRANSFORMING SOCIETIES SERIES **BEYOND 5G**

JUNE 16, 2020 REGISTERED ATTENDEES: 276

Roll out of 5G hardware and commercial services continue to accelerate in various parts of the world and promises to open new business opportunities in numerous vertical markets that could not become reality without 5G connectivity. The "Beyond 5G" webinar discussed the opportunities and challenges that 5G brings and touched upon what to expect beyond 5G. The panel discussion moderated by Ritu Favre from NI between Maryam Rofougaran from Movandi Corporation, Eric Hardouin from Orange Labs, and Volker Ziegler from Nokia Bell Labs offered valuable insights from their unique perspectives as a semiconductor chip supplier, 5G network infrastructure supplier, and wireless carrier on the emerging use cases and technology driving 5G.

MODERATOR:

- Ritu Favre / SVP & GM Semiconductor Business / NI PANELISTS:
 - Maryam Rofougaran / co-CEO, COO, co-Founder / Movandi Corporation
 - Eric Hardouin / VP, Ambient Connectivity Research Domain / Orange Labs
 - Volker Ziegler / 6G Leadership / Nokia Bell Labs & CTO

KEY TAKEAWAYS:

- Unique opportunities and benefits of 5G
 - Increased capacity
 - New use cases
 - New services for enterprises
 - Energy efficiency

• What mmWave offers

- Alternative to fiber Fixed wireless
- Increased local mobile capacity
- Industrial applications
- 5G Challenges
 - Cost effective, superior performance at mmWave frequencies
 - Extended coverage
 - Technology will continue to improve and innovate
- Beyond 5G 6G
 - 5G just introduced 6G is still in research
 - Need to approach 6G with a future vision for connectivity
 - Must involve all parties across the ecosystem for collaboration during development

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- 5,400+ employees
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- 10,000+ patents worldwide
- Research and development centers located in USA, Israel, India, Germany, China

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AT THE HELM - CEO PANEL DISCUSSION

JULY 8, 2020 REGISTERED ATTENDEES: 234

The semiconductor industry is entering an era of tremendous growth in multiple end-markets. GSA invited industry executives and entrepreneurs to discuss the opportunities and challenges that their companies face, as well as their advice on how to not just navigate, but capitalize during tumultuous times.

The panel discussion was moderated by Jennie Raubacher from Wells Fargo Securities with 3 executive panelists: Tamara Baksht / CEO of VisIC; Mouna El Khatib / CEO of AONDevices; and Jane Li / Board Member of Semtech, Knowles, CTS & ServicePower. The panelists offered their views on various growth markets and technologies. They also provided valuable insight on how they are navigating through the current environment as leaders and entrepreneurs.

Moderator:

• Jennie Raubacher / Head of Semiconductor & CleanTech / Wells Fargo Securities

Panelists:

- Sharawn Connors, Vice President, Diversity, Equality & Inclusion, Micron Technology
- Ruth Cotter, Senior Vice President, WW Marketing, HR and IR, AMD
- Vicki Mealer-Burke, Chief Diversity Officer and VP, Human Resources, Qualcomm
- Emily Reilly, Senior Vice President & Chief Human Resources Officer, GLOBALFOUNDRIES.

- Markets and Technologies that will drive growth of the industry
 - Edge Intelligence Low power, privacy requirements
 - Transportation Digitalization and Electrification of vehicles
 - Virtual experience Virtual workplace, on-line education
 - Healthcare, Life Science
- What new use cases/markets have opened up as a result of the current pandemic?
 - Fundamental growth markets have not changed, but growth in some markets are accelerating
 - Telemedicine
 - Contactless use cases Voice recognition, edge intelligence
- Advice for upcoming leaders
 - Partners/ecosystems are essential to the success of startups
 - Difficult to commercialize new technologies/products without an ecosystem platform join an ecosystem or create an ecosystem
 - $\circ~$ Understand the DNA of your organization strengths and focus
 - Plan for different scenarios

NEW INFRASTRUCTURE , NEW OPPORTUNITIES SERIES THE NEXT WAVE OF TECHNOLOGY INNOVATIONS

JULY 28, 2020 REGISTERED ATTENDEES: 306

Artificial Intelligence is set to drive the growth of the global semiconductor industry into the new decade. GSA invited some of the exciting emerging companies in the Asia-Pacific region that are working on various aspects of AI to discuss and share their views on the opportunities AI presents for the industry.

PROGRAM:

- The Semiconductor Outlook and Data Center Opportunity Beyond the Pandemic
 Speaker: Randy I Abrams / Head of Taiwan Research, Asian Semiconductors / Credit Suisse
- Edge AI is Key to Post-COVID World
 - Speaker: Albert Liu / Founder & CEO / Kneron
- Knowledge Graph The Stepping Stone of AI
 - Speaker: Zhixu (Leeon) Li / VP of NLP, iFLYTEK AI Research Institute / iFLYTEK
- Taking AI from the lab to production How to build, buy & learn
 - Speaker: Richard Biggs / APAC Market Development Lead / Element AI

- The Semiconductor Outlook and Data Center Opportunity Beyond the Pandemic
 - COVID-19 triggering a severe macro downturn, but semiconductor cycle behavior different than prior macro downturns
 - Data demand driving a self-perpetuating growth cycle for semiconductors with connected devices, 5G, cloud and internet services accelerated by AI driving the cycle
 - \circ $\,$ Localization is expanding opportunities for China ASICs and Storage $\,$
- Edge AI is Key to Post-COVID World
 - Security and Privacy concerns moving more intelligence to the Edge
 - New Edge AI platforms emerging to support new use cases and business models
- Knowledge Graph The Stepping Stone of AI
 - Knowledge Graph: The best partner of cognitive intelligence in AI applications
 - Where Knowledge Graph is most valuable
 - Domain knowledge is large and complicated
 - Massive personalized demand
 - High cost of expert decisions
 - Hard to identify hidden information
 - Machine decision-making is difficult to understandIndustry experts' experience is difficult to pass on
- Taking AI from the lab to production How to build, buy & learn
 - Enterprises are actively exploring AI, but fewer than 1 in 10 businesses have put AI in production
 - Few enterprises understand how to build, integrate & deploy AI at scale
 - Building higher proficiency in Research allows organizations to drive higher potential transformative value

RESHAPING INDUSTRIES, TRANSFORMING SOCIETIES SERIES **AI IN THE CLOUD**

Al in the cloud continues to reshape the business computing landscape to make organizations more efficient, productive, strategic, and insight-driven. As performance requirements become more demanding, new computing architectures are emerging to solve these new challenges. GSA invited Balachandran Rajendran from Dell Technologies, Steve Pawlowski from Micron Technology, and Dhiraj Mallick from Cerebras Systems to discuss the challenges of running Al in the datacenter and the latest compute architectures that are designed to address these challenges.

SPEAKERS:

- Balachandran Rajendran / CTO, EDA/Semiconductor Unstructured Data Solutions/ Dell Technologies
- Steve Pawlowski / Corporate Vice President, Advanced Computing Solutions and Emerging Memory Systems / Micron Technology
- Dhiraj Mallick / Vice President Engineering and Business Development / Cerebras Systems

- Al in Cloud
 - Cloud is an enabler and an operating model, not a destination.
 - Al is driven by Data, but existing solutions are not data centric needs data first approach
 - Semiconductors are fueling AI, but AI is barely fueling semiconductors
- AI Computing Architectures in the Cloud
 - Evolving computing usage models are driving greater computing demand
 - Driven by vast amounts of data and the economic value of that data
 - New memory/system architectures will have greater impact on system efficiency
 - New architectures will take time to evolve
 - Market driven use cases can speed adoption
 - Integrate compute into Memory and Storage to get greatest energy and perf efficiency
 - New devices MUST build from and evolve the dominant SW ecosystem
- Accelerating AI Compute with Wafer Scale
 - AI has massive potential, but is compute-limited today
 - Training takes too long
 - Existing processors can't keep up
 - A new compute solution is needed to accelerate deep learning
 - Al optimized compute Many cores optimized for sparse linear algebra
 - AI optimized memory Memory tightly coupled to compute
 - Al optimized communications High bandwidth communication

Intelligent Connectivity: Empower the Future



5G and AloT advancements are enabling today's intelligently connected world to communicate with astounding speed and coverage. UMC has developed a broad range of foundry technologies specifically engineered to drive this new generation of devices, including world-class HV, BCD and RFSOI processes for 5G, plus leading imaging and connectivity technology to power the AloT era. To learn more about how our specialty technology solutions are helping IC designers empower the future, please visit **www.umc.com**.



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AI IN ACTION

OCTOBER 29, 2020 REGISTERED ATTENDEES: 272

With the technology of Artificial Intelligence increasing and growing more complex, new forms of A.I. are emerging rapidly. AI is bringing prosperity and productivity to many and we see tremendous progress in the ways of how it is used in every part of the economy, from IoT edge devices, face recognition, digitalization of manufacturing, autonomous vehicles, and enterprise software. Speakers of this webinar discussed recent developments in A.I., use cases and applications empowered by AI that are changing businesses and human behavior.

SPEAKERS:

- Matthew Putman / CEO / Nanotronics
- $\circ~$ Radoslav Danilak / co-Founder and CEO / Tachyum
- Daniel Cooley / SVP & Chief Strategy Officer / Silicon Labs
- Philip Cooper / VP, Products, Tableau CRM/ Salesforce

KEY TAKEAWAYS:

- Al in Action
 - AI has enabled end users in various applications, industrial manufacturing is one of them.
 - Al is used in factories for self-correction to vulnerabilities due to human intuition
 - AI cuts down manufacturing costs
 - Al adds another layer of security for hard to detect abnormities
- New Approach to AI Processing
 - Current architectures in the datacenter and high-performance computing are CPU, GPU, and TPU over 50% of server time is wasted due to chip specialization

salesforce

- Universal processor approach can utilize server idle time
- AI applications are diverse and different types of AI to address different applications
- Performance growth is slowing that is resulting in more datacenters more power consumption
- Machine Learning in the IoT
 - Intelligence moving to the edge happening quickly
 - Machine learning enables increased functionality and improved business models
 - Use cases at the edge are all about inference, not training
 - True edge intelligence cannot scale without trust/security
- Al, a Pragmatic Approach
 - The new normal requires innovation nosiness roles are changing
 - Intelligent insights are more important than ever legacy approaches are not smart or adaptable
 - Key success principles
 - KPI-centricity
 - Immediacy
 - Decision-centricity
 - Iteration

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RIDING THE WAVES WLI APAC EXECUTIVE PANEL DISCUSSION

NOVEMBER 19, 2020 REGISTERED ATTENDEES: 272

The continuous collaboration between hi-tech industry executives is accelerating growth. This panel discussion explored the opportunities and challenges industry leaders face and how they execute long-term corporate vision and mission. The panelists also shared valuable and practical experience on how to develop effective internal and external communications in an international working environment among multiple cultural differences to achieve business success and embrace the future of technology and innovations. Moderator Helen Chou from Charisma International Consulting was joined by executive panelists, Eva Chen, CEO of Trend Micro; Chee Ching, President of Far EasTone Telecommunications; and Lora Ho, SVP, Europe & Asia Sales of TSMC. The panelists representing 3 different industries, software, telecommunications, and semiconductors, exchanged thought leadership in the areas of leadership, collaboration, and market opportunities and challenges.

MODERATOR:

• Helen Chou / President & CEO / Charisma International Consulting

PANELISTS:

- Eva Chen / CEO / Trend Micro
- Chee Ching / President / Far EasTone Telecommunications

 $\circ~$ Lora Ho / SVP, Europe & Asia Sales / Taiwan Semiconductor Manufacturing Co (TSMC)

KEY TAKEAWAYS:

- Visionary Leadership
 - Leaders need to think across domains in this connected world
 - Empathy and trust within the organization is essential
 - Communication is key in cultivating trust with your employees
 - Understand yourself and be yourself
- Collaboration
 - Customer-centric, service-oriented approach from design stage critical to successful business
 - Understanding and respecting cultural differences are required for international collaboration
 - Common goal is to make the world better for the next generation
- Opportunities and Challenges
 - Digital transformation is the next big opportunity and COVID-19 has accelerated the process
 - Digital transformation is not just about digitalization, but an opportunity to lead to change business models for future growth

MEDIATEK

• Digitalization brings new opportunities to businesses

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VIRTUAL CONFERENCES





U.S. EXECUTIVE FORUM SEPTEMBER 9, 2020

OVERVIEW:

The GSA hosted its annual **US Executive Forum** virtually for the first time this year. GSA's mission is to provide a unique platform based on global value creation, where we stress the positive interdependency of our global membership base. We know historically that value has been created through global collaboration and open standards, equal access to markets and the protection of intellectual property. This global collaboration is one of the secret ingredients to our industry's success.

The semiconductor industry also contributes directly to global social responsibility with the commitment to global diversity and inclusion that takes into account race, nationality, gender and sexual orientation. It also plays a significant role in combating global climate change, global pandemics and global poverty. GSA emphasizes the global aspect of these solutions.

For this year's US Executive Forum, GSA invited experts and leaders to discuss the global economic outlook, technologies and markets, US policy, and share thought leadership on the future of our industry.

SPEAKERS:

- Keynote Global Economic Landscape
 - Ira Kalish / Chief Global Economist / Deloitte
- Leading Technology Innovations Panel Discussion
 - Moderator: Deirdre Hanford / Chief Security Officer / Synopsys
 - Panelists:
 - Penny Li / VP, VLSI / Sambanova
 - Sundari Mitra / Corporate VP, General Manager, IP Engineering Group / Intel
 - Suzanne Plummer / Corporate VP, Design Engineering / AMD
 - Vanitha Kumar / VP, Modem SW Engineering / Qualcomm
- Keynote Policies Influencing the Industry
 - Michael Zezas / Managing Director, Head of U.S. Public Policy Research & Municipal Credit Strategy / Morgan Stanley
- Keynote
 - Siva Sivaram / President, Technoloy & Strategy / Western Digital

KEY TAKEAWAYS

1. Keynote – Global Economic Landscape

- Government policies and success rate of lockdowns and shutting down economies to suppress the virus have varied by region
- Monetary and fiscal policies have had short term positive impact, but long term uncertainties remian
- What to expect in the Post-COVID world
 - Workplace changes/virtual meetings less travel, less office space demand
 - On-line shopping/entertainment less stores and entertainment outlets
 - Diversification of supply chains more resiliency, redundancy of supply chains
 - Change in government policy Globalization, De-coupling
- $\circ \ \ \, \text{Long-term, the COVID pandemic will boost productivity growth, but will disrupt labor markets}$

2. Leading Technology Innovations Panel Discussion

- Challenges and Opportunities of markets/technologies that are driving the future of the industry
 - 5G very diverse use cases; wireless becoming critical
 - Computer vision / Artificial Intelligence Hi-resolution image processing; Facial recognition; AR/VR/XR
 - Healthcare Remote consultation; Remote medical monitoring; Telemedicine
 - Gaming COVID has accelerated popularity of gaming
 - Touchless applications digital assistants, voice recognition
- Diversity
 - Need to start by creating a healthy diverse pipeline
 - Diversity is important for innovation, requires diverse minds to solve problems
 - Not only Diversity but Inclusion is key
 - Support of top management and input from employee groups both essential to success
 - Focus is not just on gender but all underrepresented groups
- Challenges during COVID
 - Connecting with people actually became easier
 - Productivity increased but workforce overworked work/life balance
 - New hire mentoring

3. Policies Influencing the Industry

- Slowing of Globalization
 - Slowing of globalization is decreasing the costs to re-shore or near-shore manufacturing to the US
 - Geopolitics are accelerating slowing of globalization
- Trade Protection
 - Interest of global free trade in the US is low protectionism becoming more popular consensus
- China Relationships
 - Bi-partisan support for strong stance against China
 - US elections most likely will not change current policy
- Impact on the semiconductor industry
 - Non-tariff barriers, such as export restriction control list, is heavily impacting semiconductor industry
 - CHIPS Act has high possibility of passing before the end of the year may require multiple years to take effect

4. Keynote - Flash Forward: Data Storage in the times of COVID

- Growth of data is exploding 143ZB (per year) of data creation by 2024
- NAND continues to scale faster than Moore's law
- Single storage solution will no longer serve all segments
- Technology evolutions are supporting scaling to support growing amount of data
- The digital evolution is happening, but demographic dividends cannot be equally shared without more female participation



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We embrace ideas from different perspectives, encourage an inclusive culture, and promote ethnic, race, and gender equity throughout our organization. Our core value of integrity drives us to be better – for each other, our customers, our suppliers, our communities, and our planet.

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OCTOBER 6, 2020

ACCELERATING INDUSTRIAL AND SOCIETAL TRANSFORMATIONS

OVERVIEW:

VIRTUAL EVENT

At the 2020 GSA European Executive Forum hosted virtually this year, industry leaders and experts exchanged thought leadership on three key areas, "Industries in Transformation", the "Evolving Global Economy and Geopolitical Tensions", and "Automotive Electronics".

1. EXECUTIVE CHAT

- Dr. Reinhard Ploss, CEO of Infineon and Dr. Tien Wu, COO of ASE Group exchanged views on the key elements surrounding the industry, Protectionism, Remote Connectivity, and Europe's Role.
- KEY TAKEAWAYS
 - Protectionism could last for a long time and has negative effects that is distorting the overall industry.
 - Remote connectivity achieved an instant acceptance due to COVID-19 pandemic. The pandemic has pushed changes in ways to be more effective and there is more room to improve.
 - Europe should embrace digitalization and tie it to the green economy.

2. INDUSTRIES IN TRANSFORMATION

Sensorization: Enabling a Quantum Leap in the Digital World

• Benedetto Vigna, President of the Analog MEMS and Sensors group of STMicroelectronics shared his insight on the recent advancement of sensorization and how it would enable the digital world.

KEY TAKEAWAYS

- We are in a stage where sensors are enhancing artificial intelligence and taking it to the next level
- The next step in sensorization is how to implement sensors that will enable industrial digitalization, healthcare and other emerging use cases
- Sensors will enable a quantum leap in digitalization but we need to mindful that AI is for Humans, not the other way around

Industries in Transformation Panel Discussion

- In this session, industry experts discussed how new technologies, such as 5G, AI, the Cloud, and digitalization are transforming industries. The panel also discussed how the pandemic has impacted and accelerated this transformation.

 - MODERATOR:
 - Deirdre Hanford / Chief Security Officer / Synopsys
 - PANELISTS:
 - Prith Banerjee / Chief Technology Officer / Ansys
 - Stefan Jockusch / Vice President, Strategy / Siemens Digital Industries Software
 - Birte Lübbert / SVP, Head of Corporate Quality Management /
 - Robert Bosch GmbHDavid Pellerin / Head of Worldwide Business Development for Infotech/Semiconductor / Amazon Web Services

- Technologies reshaping industries
 - New digital technologies are making manufacturing more efficient but need to be safe, secure, and robust
 - Digital Twins are beyond simulation, and driven by all players of the ecosystem
- Acceleration of digitalization
 - The pandemic has accelerated digital transformation in industries and proved that digitalization is effective
 - Digital transformation is not just a technology shift but also a cultural shift

3. GLOBAL ECONOMY

Global Economy Landscape

• Catherine Mann, Global Chief Economist and Mark Garcia, Managing Director of Technology Investment Banking Group at Citi discussed the recent outlook of the global economy.

KEY TAKEAWAYS

- Economies around the world are recovering at different paces and this asymmetry is the cause of concerns for the global economy in 2021, especially in trade and business investment.
- The semiconductor industry will see growth as productivity enhancing technologies are more deployed
- Globalization increases the size of the pie as de-globalization makes the pie smaller. Visibility, flexibility, diversification are the three new dimensions of the supply chain that are part of a new globalization with more localization.

Impact of Recent Sino-US Relations on Semiconductor Ecosystem

• Peter Kuo, Partner and co-Founder of Canyon Bridge Capital Partners addressed the recent geopolitical tensions between the US and China and how it is impacting the semiconductor industry.

KEY TAKEAWAYS

- Semiconductors have been the tip of the spear for US tech restrictions and these restrictions are also impacting the semiconductor supply chain
- The tech war has escalated to a broader tech decoupling but China still retains a central position in the global supply
- US-China tensions are taking place in the backdrop of deteriorating relations between China and EU

4. AUTOMOTIVE

Mastering the Edge: Critical Factors to Enabling Edge Computing

• Lars Reger, CTO of NXP Semiconductors shared his views on why mastering edge computing with the right level of safety and security is critical to enabling next-generation technologies.

KEY TAKEAWAYS

- The world is shifting from on-demand to an "ahead of demand" world with devices around us that sense and anticipates what we need
- Smart edge devices all have sense, think, connect, and act capabilities, and at the system level, "trust = safety and security" is paramount
- Trend is moving from "Big Data to the Cloud" to "Relevant Data to the Cloud", requiring edge devices to be more efficient, robust, and secure.

Reliability in Automotive Electronics Panel Discussion

- In this panel discussion, we heard from various players from the automotive ecosystem on their challenges and solutions to address the reliability concerns of automotive electronics.
 - MODERATOR:
 - Luca DeAmbroggi / Sr. Principal / Wards Automotive
 - PANELISTS:
 - Shai Cohen / co-Founder and CEO / proteanTecs & co-Founder Mellanox
 - Dino Flore / VP Technology / Qualcomm

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- Tomomitsu Maoka / SVP, Deputy GM of Automotive Solution Business Unit / Renesas Electronics
- Lars Reger / CTO / NXP; Managing Director NXP Semiconductors Germany

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KEY TAKEAWAYS

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- Quality and reliability requirements of electronics for automotive applications have not significantly changed but functional safety and security have become critical
- New uses cases requiring vehicles to be in use 24/7, is changing how electronics are monitored in the car and improving maintenance efficiency

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SYNOPS

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- Vehicle connectivity is becoming more of a heterogeneous framework, both V2X and in-vehicle connectivity are critical
- With electrification of vehicles, power semiconductors are moving into more critical applications in the electric vehicle requiring better understanding of the device behavior under stress conditions

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ASIA PACIFIC EXECUTIVE FORUM NOVEMBER 17, 2020 VIRTUAL EVENT

OVERVIEW:

The GSA Asia Pacific Executive Forum 2020, invited experts and thought leaders to discuss how technological innovations are driving the growth of applications and markets such as AI, IoT, 5G, and Automotive, to enable a faster and smarter connected world. The program also provided valuable insights on the future technology landscape of the semiconductor industry.

KEY TAKEAWAYS:

1. Accelerating Hardware Innovations for the Cloud – Rani Borkar / Microsoft

- The new normal is forcing all to adapt and accelerate Digital Transformation
- Hardware innovation is essential to support the intelligent cloud and intelligent edge
- Computing is becoming ubiquitous and embedded everywhere
- Artificial Intelligence is driving computing efficiency
- $\circ~$ The growth of more computing at the edge is driving the evolution at the edge

2. Leading MCU Solutions for a Data-Centric World – Sailesh Chittipeddi / Renesas

- Move of intelligence to the end-point is accelerating
- Combination of AI and the IoT is opening up new vistas for organizations to sense and respond to events and opportunities around them
- Interfaces, AI engines, ecosystem, and security will be the key differentiators with respect to MCU architectures for meeting future needs
- Ecosystem partnerships are key for future success

3. Design-for-Security: Emerging Trends and Challenges – Deirdre Hanford / Synopsys

- Growing markets for semiconductor increases the needs for safety, security, reliability
- Semiconductor design criteria changing to Power, Area, Speed, Security (PASS)
- Threats can occur at multiple stages of the semiconductor supply chain
 - Design / Foundry / Assembly / Test Distribution

- Zero Trust Security Model concept can be applied on chip level Zero Trust in Silicon
- Design for Security Solutions Locking, Obfuscation, Encryption, Watermarking
- Silicon Lifecycle Management through intelligent analysis of ongoing silicon measurement

4. Exploring the World, Sensing Infinity – Michael Wu / OmniVision Group

- Sensors are around us anytime and anywhere
- CMOS Image Sensor Market & CIS Market Exceptional growth during the last 10 years
- Growth driven by smartphones, computing, automotive, medical and security
- Smartphones (mobile imaging), automotive, security, and medical applications offer multiple opportunities to use imaging sensors

5. Technologies for People in the New Normal – Luc Van den hove / imec

- $\circ~$ 2020 New Reality Digital Technology is playing a crucial role
- Combination of Power of Technology and Power of People key to conquering the pandemic
- Demand of cloud services will drive growth of related hardware markets, benefiting the semiconductor industry
- Exponential increase of data consumption requires smarter ways to compute, store, and connect to offset the increase in power consumption.
- Moore's Law will not stop will require disruptive transistor architecture innovations, such as Design-technology co-optimization, 3D integration of subsystems
- $\circ~$ Heterogeneous computing evolution of logic and memory circuitry





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Equity Capital Markets	Camtek Follow-On Offering Co-Manager November 2020	Control Contro	Convertible Senior Notes Co-Manager October 2020	Follow-On Offering Co-Manager June 2020	Follow-On Offering Sole Bookrunner June 2020
M&A / Advisory	MAXLINEAR Has Acquired intel Home Connectivity Division April 2020	Sale to NOKIA March 2020	SwiftStack Sale to NVIDIA. March 2020	ESSAI Sale to ADVANTEST January 2020	Sale to Entegris January 2020

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Helen Li

Head of China Investment Banking hli@needhamco.com

James King

Head of West Coast Investment Banking jking@needhamco.com

Pooyan Mehdizadeh

Co-Head of Mergers and Acquisitions pmehdizadeh@needhamco.com



SANARDS VIRTUAL CEREMONY

CONGRATULATIONS TO THE 2020 GSA AWARD WINNERS!

Individual Awards:

Rising Women of Influence Award

This award recognizes and profiles the next generation of women leaders in the semiconductor industry that are believed to be rising to top executive roles within their organizations. This year's award was presented to Jaya Jagadish, Corporate Vice President, Silicon Design Engineering at AMD.

Company Awards:

Most Respected Semiconductor Companies

GSA members identified the winners in this category by casting ballots for the industry's most respected companies, judged for their vision, technology and market leadership. Below are this year's recipients:

Most Respected Public Semiconductor Company Achieving Greater than \$5 Billion in Annual Sales

• NVIDIA

Most Respected Public Semiconductor Company Achieving \$1 Billion to \$5 Billion in Annual Sales

• Marvell

Most Respected Public Semiconductor Company Achieving \$500 Million to \$1 Billion in Annual Sales

• Inphi

Most Respected Emerging Public Semiconductor Company Achieving \$100 Million to \$500 Million in Annual Sales

• Lattice Semiconductor

Most Respected Private Company

• SiFive

Best Financially Managed Semiconductor Companies

These awards are derived from a broad evaluation of the financial health and performance of public semiconductor companies. Below are this year's recipients:

Best Financially Managed Semiconductor Company Achieving up to \$1 Billion in Annual Sales

• Power Integrations

Best Financially Managed Semiconductor Company Achieving Greater than \$1 Billion in Annual Sales

NVIDIA

Start-Up to Watch

GSA's Private Awards Committee, comprised of successful executives, entrepreneurs and venture capitalists, chose the winner by identifying a promising startup that has demonstrated the potential to positively change its market or the industry through innovation and market application.

Cerebras Systems

As a global organization, the GSA recognizes outstanding companies headquartered in the Europe/Middle East/Africa and Asia-Pacific regions having a global impact and demonstrating a strong vision, portfolio and market leadership. Two awards were presented in this category:

Outstanding Asia-Pacific Semiconductor Company

• MediaTek

Outstanding EMEA Semiconductor Company

• STMicroelectronics

Analyst Favorite Semiconductor Company

Two analyst pick awards were presented based on technology and financial performance as well as future projections:

- Vicor Corporation was chosen by Quinn Bolton, Managing Director at Needham & Company, LLC
- NVIDIA was chosen by Mark Lipacis, Managing Director at Jefferies, LLC



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2021 EVENTS CALENDAR

WLI EMEA WEBINAR

Virtual | March 9, 2021 | 5 p.m. CET

ENTREPRENUERSHIP CONFERENCE Virtual | March 21, 2021 | 5 p.m. CET

SILICON LEADERSHIP SUMMIT Mountain View, CA* | April 14, 2021 | Time TBD

EUROPEAN EXECUTIVE FORUM

Munich, Germany* | June 15, 2021 | Time TBD

GSA MEMORY+ CONFERENCE Virtual | Q2 | Date, Time, Location TBD

UNITED STATES EXECUTIVE FORUM

Rosewood, CA* | September 16, 2021 | Time TBD

WLI TECHNICAL CONFERENCE

Q3 | Date, Time, Location TBD

ASIA PACIFIC EXECUTIVE FORUM Q4 | Date, Time, Location TBD

AWARDS DINNER

Santa Clara, CA* | December 9, 2021 | Time TBD

+MANY OTHER EXCITING EVENTS TO BE ANNOUNCED

*In light of the continuing COVID-19 pandemic, GSA will continue hosting all North American and EMEA events virtually. Although we would like to begin meeting in person, we are following the advice of health experts and will take their cues on when it is safe to do so. Should any events be confirmed for in-person attendance, we will update you accordingly.