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11.14.19

TSMC North America  
San Jose

Silicon Catalyst  
Portfolio Company  
Fall 2019 Update



[www.siliconcatalyst.com](http://www.siliconcatalyst.com)

# Si SILICON CATALYST Portfolio Companies

## CURRENT

Nov 14, 2019

Welcome to Silicon Catalyst's Fall 2019 Portfolio Company Update. We truly appreciate your participation

We would like to thank our event sponsors



TSMC, Mathworks, Certus Semiconductor, and Silicon Catalyst Angels.

Some highlights since the Spring Portfolio Company Update in May 2019:

- We held our 10th screening event in September and now welcome Beam Semiconductor, Digital Light, Dover Microsystems, SigmaSense, and Trameto as our newest Silicon Catalyst Portfolio Companies - bringing our total to 26 companies that have been admitted to our incubator.
- We welcome Cirrus Logic as our newest Strategic Partner.
- Lattice Semiconductor is our newest In-Kind Partner.
- David French joined the board of directors in October 2019.
- Silicon Catalyst Angels, chartered to foster and nurture innovation in our Portfolio Companies, was launched in July 2019, and made its first investment in September.
- Our Joint Venture with Silicon Power Technologies in Chengdu China was launched in January and has already admitted 8 portfolio companies.
- Our network of Advisors continues to grow, now in excess of 150 members.

Thank you for your continued support of our efforts to build a world-class ecosystem for startup companies focused on accelerating solutions in silicon.

Pete Rodriguez

CEO



# Silicon Catalyst Angels

EXPERIENCE ... THE DIFFERENCE



Silicon Catalyst Angels Board Members:  
Raul Camposano, Amos Ben Meir and Michael Joehren

Silicon Catalyst Angels was spawned from Silicon Catalyst, the world's only incubator focused exclusively on accelerating solutions in silicon. Silicon Catalyst, named UBM/Canon's Startup Company of the Year, is now in its fifth year of operations and has engaged with over 250 startups.

What makes Silicon Catalyst Angels unique is not only our visibility into an exclusive deal flow pipeline, but our membership is comprised of seasoned semiconductor veterans who bring with them a wealth of knowledge along with their ability to invest. Driven by passion and a desire to 'give back', our members understand the hardware space thanks to a lifetime of engagement in the industry. When you couple our members enthusiasm, knowledge, and broad network of connections with companies that have been vetted and admitted to Silicon Catalyst, you have a formula that is to date, non existent within the investment community.

# Startups start here.

it's about what's next.®



it starts with startups.



## APPLICATIONS NOW BEING ACCEPTED

**Our global outreach is underway to find early-stage semiconductor startups to join our incubator**

Silicon Catalyst is the world's only incubator focused exclusively on semiconductor solution startups.

We address the challenges faced by startups while guiding them from concept to product.

In the past 30 months, Silicon Catalyst has reviewed over 250 startups from the U.S., Europe, and Asia.

The 18 startups admitted since 2015 to the incubator are developing innovative solutions in a variety of areas including **energy harvesting, wearables, silicon photonics, memory technology, IoT, high performance computing, artificial intelligence, machine learning, wireless communications, and biomedical devices.**

The Silicon Catalyst incubator utilizes our coalition of in-kind and strategic partners to dramatically reduce the cost and complexity of developing semiconductor solutions. With our world-class network of mentors to advise startups, we are addressing their many challenges in moving from idea to realization and business success. We have provided our Portfolio Companies with a path to funding, free access to tools, testing and shuttle runs, along with advice on proper corporate governance and strategic execution.



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www.siliconcatalyst.com



# Fall 2019 Portfolio Company Update Agenda

11:30 am - 12:15 pm	Lunch	
12:15 - 12:45 pm	Silicon Catalyst Kickoff	Pete Rodriguez, CEO Tarun Verma, Managing Partner
12:45 - 1:00 pm	AEPONYX	Philippe Babin, CEO
1:00 - 1:15 pm	Mentium Technologies	Mirko Prezioso, CEO
1:15 - 1:30 pm	Quadric.io	Veerbhan Kheterpal, CEO
1:30 - 1:55 pm	Break Coffee/Cookies	
1:55 - 2:05 pm	Silicon Catalyst Angels	Michael Joehren
2:05 - 2:15	Silicon Power Technology (China JV)	Dave French
2:15 - 2:30 pm	ProbiusDx	Emmanuel Quevy, CEO
2:30 - 2:45 pm	Espre Technologies	John Terry, CEO
2:45 - 3:00 pm	SigmaSense	Rick Seger, CEO
3:00 - 3:15 pm	Dover Microsystems	Jothy Rosenberg, CEO
3:15- 3:40 pm	Break	
3:40 - 4:00 pm	New Strategic Partner Introduction	
4:00 - 4:15 pm	Owl AI	Chuck Gershman, CEO
4:15 - 4:30 pm	Eridan Communications	Doug Kirkpatrick, CEO
4:30 - 4:45 pm	Beam Semiconductor	Stacy Joseph, CEO
4:45 - 5:00 pm	Closing Pete Rodriguez, CEO	
5:30 - 6:30 pm	Reception Kellog Auditorium Silicon Valley Bank, Santa Clara	
6:30 - 8:00 pm	Semi Industry Forum Semiconductor Startups 2020	

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### Overview

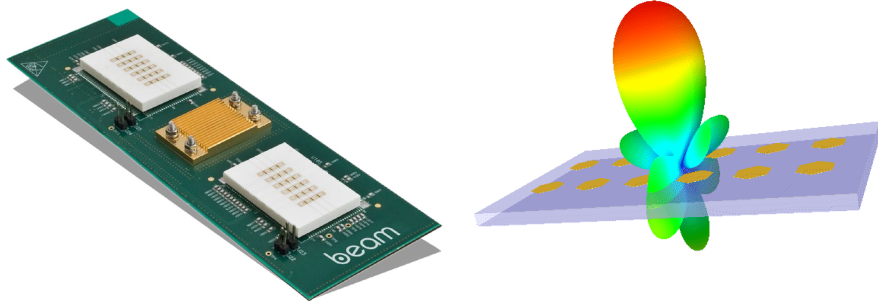
Beam has developed innovative RF silicon and unique antenna technology to address demanding 5G wireless infrastructure applications such as cellular backhaul, fiber extension and broadband / fixed wireless access last mile.

### Problem

Demand for mobile bandwidth has undergone exponential growth under the pressure of smartphone video streaming (live / on demand) and gaming. IoT, V2V / V2X and innovative mobile apps are driving the push towards the next generation network ... 5G. Optical fiber is the technology of choice for gigabit network rollouts. However, fiber is costly, time consuming to install and impractical in many locations.

### Solution

Beam's goal is to augment, extend and replace fiber with a compact broadband wireless transport solution based on patented 60 GHz and 28 GHz transceiver technology coupled with patented phased-array MicroHorn antenna technology. Beam has accomplished the integration of complex 3D internal structures in its MicroHorn antenna, forming a buried waveguide architecture that 'squeezes' the energy through it (much like a trumpet / horn) which provides power and gain. A point-to-point gigabit wireless link is formed with unique analog beam-steering RF electronics that allows the phased array antenna to automatically shape and steer the beam to eliminate manual positioning and achieve 10+ Gb/s throughput rates.



### Market Size/TAM

- Global mobile wireless transport market @ \$64B by 2025 with 13.52% CAGR
- Wireless transport silicon + antenna @ \$2.8B in 2022

### Business Model

Depending on the application, Beam products include the full 5G mmW module (silicon + antenna), the standalone antenna or the RF silicon. Beam has focused on direct engagements with wireless OEMs and Service Providers. Revenue initially comes from NRE for engineering development services, followed by product sales.

### Competition

Unlike consumer solutions such as WiFi and WiGig, Beam's proprietary 60 GHz platform is optimized for outdoor infrastructure applications and delivers superior data throughput, range, immunity to environmental variance, and reliability, resulting in robust link performance. Compared to existing microwave wireless solutions, Beam provides a dramatically smaller form factor, and its automatic beam steering sharply reduces cost.

### Defensibility

Beam holds 8 US and international patents surrounding key aspects of its intellectual property involving analog beam steering, manufacturing of the MicroHorn antenna along with use of Beam's phased-array antenna technology for future RADAR (proximity / imaging) applications.

### Milestone

- Won contract with Israel Ministry of Defense / MAFAT in June 2018
- Demonstrated gigabit link with beam steering at Mobile World Congress 2019
- Demonstrated 28 GHz Proof-of Concept to top Japan OEM's Softbank, Hitachi and Nagase (automotive V2V/V2X)

**Silicon Catalyst Start Date:** October, 2019

### Team

- Stacy Joseph, CEO (Silicon Optix, Quicklogic, Texas Instruments, IBM)
- Rafi Popovich, CTO (ELTA, General Microwave)
- Avigdor Berlin, COO (Israel Aerospace Industries, ELTA)

### Board of Directors

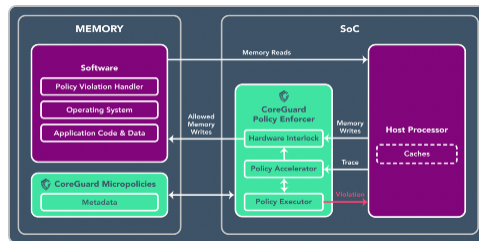
- Sri Purisai (Microsemi, California)
- Danny Spritus (Gilat / Raysat, Israel)
- Don McDougall (GLH, Canada)
- Stacy Joseph (CEO, Canada)

### Problem

Cybercrime damage costs are slated to hit \$6 trillion annually by 2021. Historically, customers haven't known what to do, so they added layers of defensive software, which only increased the attack surface because all complex software has bugs. In addition, highly publicized attacks, like the Chrysler Jeep Hack which affected 1.4 million vehicles and cost Fiat over \$2.1 billion, are causing customers to demand better cybersecurity in order to protect their brands and reduce their liability.

### Solution

Dover's CoreGuard® technology is the only cybersecurity solution for embedded systems that can prevent the exploitation of software vulnerabilities and immunize processors against entire classes of network-based attacks. CoreGuard embeds security at the lowest possible level - in the silicon - because silicon cannot be subverted over the network.



It integrates with all RISC architectures to monitor every instruction executed by the host processor to ensure that it complies with a defined set of security, safety, and privacy rules, called micropolicies. If an instruction violates a micropolicy, CoreGuard stops it from executing before any damage can be done.

### Target Market

Dover's primary market is device manufacturers in verticals who design and build their own SoCs, including Industrial IoT, Communications, Automotive, Medical Devices, and more. Our secondary market is large semiconductor companies. We leverage channel partners to engage with other industries, like Aerospace and Defense. The opportunity is large, with our Serviceable Addressable Market exceeding \$2 billion annual revenue.

### Business Model

Dover is an IP licensing company. Our CoreGuard solution consists of two licensable components: hardware and software. The hardware is licensed silicon IP and the software is licensed micropolicies. We license the full package (hardware and software) to customers making ASICs. For customers who already use a chip with CoreGuard, we license software and services specific to their applications.

### Competition

CoreGuard is a unique and disruptive cybersecurity solution for embedded systems—there are no other solutions like it in the market today. However, we encounter two different competitors for budget: Arm's TrustZone and encryption solutions from several different vendors.

TrustZone has been considered the industry standard, however, many recent attacks have highlighted its numerous vulnerabilities. Since all software has bugs, even applications within a "trusted" compartment can be compromised. As a result, many are becoming dissatisfied with TrustZone and are looking for a better cybersecurity solution.

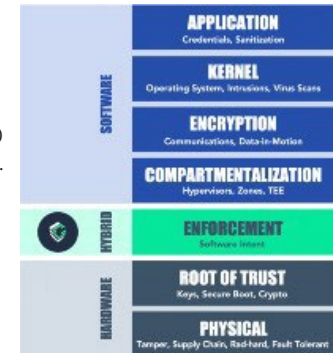
Encryption is an important layer of the cybersecurity stack; however, it too is vulnerable to software bugs. CoreGuard is a complementary solution to encryption. CoreGuard strengthens encryption by protecting against attacks that go after the origination point and via an overwrite of a return address, can bypass the call to encryption, rendering it useless.

### Competitive Advantage

There is a gap in the cybersecurity stack called "Enforcement." Everything above this level (including compartments, encryption, kernel, and the application) is vulnerable to attack because they are based in software and all complex software contains up to 50 bugs per thousand lines of code, including cybersecurity software.

CoreGuard is the first and only to fill the Enforcement layer of the cybersecurity stack, protecting embedded systems against 94% of known software vulnerabilities, including 100% of buffer overflows, code injection, and data exfiltration attacks, as well as safety violations.

Our CoreGuard technology has a robust pedigree: it is based on over nine years of development and \$28 million of non-dilutive investment, first as a part of the US DoD DARPA CRASH program, then at Draper, before spinning out as Dover as a commercial entity in 2017. We have over 35 patent applications and we are the first to market, with a long head start.



### Funding

Funding to date: cash \$8.75 million; total including debt conversion \$12 million. Investors include, Draper Labs, Qualcomm Global Trading, Hyperplane II L.P., Hub Angel Investor Group LLC, One Way Ventures, and Duke Angel Network.



**Silicon Catalyst Start Date: October, 2019**

### Team

- Jothy Rosenberg PhD, CEO
- Marco Ciaffi, VP Engineering
- Gary Christelis, Chief Legal Officer
- Steve Milburn, CTO
- Greg Sullivan Phd, Chief Scientist
- Susan Stewart, Director Finance
- Bob Labich, Director Sales
- Leslie Barthel, Director Marketing

### Executive Summary

EcoCircuits BV has developed unique patented Power Management chip technology that enables a significant increase of the battery lifetime of wireless IoT devices (up to a factor 10!). EcoCircuits seeks \$2.0 M to finalize the development of the Battery Booster chip, get it into production and conquer the market. The Battery Booster is recognized by customers and prospects as the ultimate solution for energy supply in their IoT products. Customers have forecasted the need for 7 Million devices in 2021. For the period 2022-2023 a turnover of > \$50M is expected.

### Problem

Requirements for battery operated IoT devices tend towards smaller size batteries and longer lifetime without battery replacement. The high peak power -required to transmit the data over long range- cannot be delivered directly by the battery. Today's solutions are bulky and extremely power inefficient.

### Solution

The EcoCircuits Battery Booster chip offers a solution to improve the trade-off between operating life time and power burst requirements for wireless transmission, resulting in higher reliability, longer life time and/or smaller battery size. The energy loss is up to 5x less compared to traditional solutions. The Battery Booster chip enables lower overall cost and a breakthrough in miniaturization. The patented technology comprises smart learning algorithms to optimize the energy efficiency.

### Market Opportunity

The target market for the battery booster chip is the Internet of Things (IoT). The weak spot of Wireless IoT devices is the battery lifetime and the Battery Booster solves that problem. Several 100M's of wireless, battery operated devices per year are currently sold in this market while growing exponentially. Enterprise and industrial applications (smart cities, metering, agriculture, logistics, oil & gas, construction) followed by building and consumer (smart homes, buildings and wearables) offer the highest potential battery cost savings enabled by the Battery Booster chip. Low power wireless technologies (Low Power WiFi, LoRa, Sigfox) and low power cellular protocols (4G and 5G compatible LTE-M1, NB-IoT) have most traction with significant growth in the Far East.

### Business Model

EcoCircuits is a fabless semiconductor company. EcoCircuits develops low-power smart power management chips and sells these in the market. The Battery Booster chip is the first in a range of products. Wafer production, assembly and test are outsourced to dedicated, qualified companies.

### Competition

Competition comes from traditional discrete solutions which are much less efficient and reliable. These solutions require more board space, higher bill of material cost, and always force using larger (more expensive) batteries. Customers have confirmed that the Battery Booster is the only fully integrated solution.

### Progress to Date

- A PCB based proof of concept was built. Experiments proved that 1 small Coin cell battery can power more than 600.000 long range data transmissions.
- Patents granted in USA and EU.
- Hired senior design engineer.
- Working with SiCat in-kind partner Synopsys to finalize design-flow for tape-out.
- The chip design is 85% ready.
- Samples expected in Q1 2020.
- Received subordinated loan from Dutch bank in August 2019 (\$175k)
- Funding until now: \$975k (founders, loans)
- NDA's closed with >12 prospects/customers
- Still operating in stealth mode

### Silicon Catalyst Start Date: May, 2019

### Team

- **Peter Kamp**, CEO  
Over 25 years of experience at Philips, Sierra Semiconductor, National Semiconductor, various Start-ups
- **Bert de Koning**, CTO  
Over 25 years R&D experience at NXP/ST Ericsson
- **Guido Bekkers**, VP of Sales and Marketing  
Over 20 years of sales, business development, product marketing experience at Philips, NXP, Agere Systems, Semecs
- **Jan Grotenbreg**, VP of Business Development  
Over 25 years of marketing, business development experience at Philips, NXP and various Start-ups



Eridan Communications, Inc.

*The world's most efficient radios for 5G and beyond*

### Problem

5G is the next-generation wireless standard that increases bandwidth, supports more connections, and reduces latency, delivering the fast, ubiquitous connectivity to enable new applications from driverless cars to virtual reality. Yet by 2025, just 15% of all wireless connections are expected to migrate to 5G, because 5G base stations are too expensive and too power-hungry to deploy outside of dense urban areas.

5G base stations are currently 4x more expensive than LTE equipment, 3x as many are required for the same coverage, and they consume 3x as much power each. In an industry where revenue per user has been falling to flat for the past decade, the business case for 5G needs a technology breakthrough.

### Solution

The Eridan MIRACLE transceiver sends and receives cellular signals using 5-10x less power per GB transmitted, enables 2-3x cost savings for equipment, and provides 50-100x more data capacity in existing spectrum, rewriting the cost equation for 5G deployments.

By using gallium nitride in a switch configuration (not a linear amplifier), the MIRACLE transceiver can generate a more precise signal, use less power, and operate across all cellular frequencies (so it's tunable in software).

### Market Opportunity

At scale, an Eridan MIRACLE transceiver can be in every wireless device on the planet. Including cellular base stations, mobile phones, connected cars, and connected devices, that's 3.7 billion units of addressable volume per year, and growing rapidly.

### Competition

The MIRACLE transceiver module will directly challenge Qualcomm's cellular modem dominance (which means lots of allies in our go-to-market efforts).

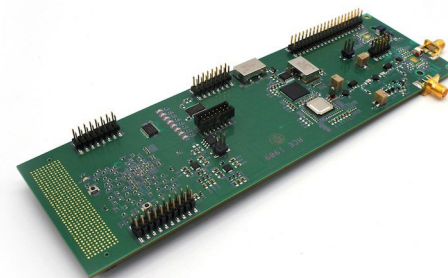
### Business Model

Eridan is a fabless semiconductor company selling modules, subsystems and eventually Systems on Chip to equipment manufacturers, with additional revenue from design services and maintenance contracts for digital over the air upgrades.



Eridan Communications, Inc.

The Eridan transceiver module will replace the power amplifier and digital-to-rf transceiver components of existing RF systems.



### The Eridan MIRACLE Transceiver Module

#### Progress to Date

Eridan is concentrating initially on two markets: defense and telecom equipment providers.

In the defense market, Eridan has received contracts from the DOD worth over \$3.5M if exercised in full, with more in the pipeline. The defense market is relatively low-volume and price-insensitive, ideal for early production efforts.

In the telecom equipment market, Eridan has engaged with 3 of the 4 largest equipment manufacturers, and 2 of the 4 major United States wireless operators. Eridan has also seen substantial traction with small cell manufacturers around our value proposition of power efficiency.

Eridan opened preorders for developer kits at the end of September, and has received deposits for modules expected to ship in December. Initial production runs are expected to follow in 4-5 quarters.

#### Silicon Catalyst Start Date: March, 2018

#### Team

Founded by 3 PhDs and serial entrepreneurs, company has grown to a team of 15 located in Mountain View and Croatia. CEO Doug Kirkpatrick is a former VC and Chief Scientist, DARPA.



# Espre Technologies

Chipsets, Modules, & Sensor Solutions for BoT & IIoT

## The Product

Espre Technologies offers chipset, modules and sensor products complementary to military BoT (Battlefield of Things) and commercial IIoT (Industrial Internet of Things) applications.

- NVL-MIMO 1.0 (FPGA Chipset) multiple antennas capacity, 5G equivalent, global, terrestrial & aerospace communications applications.
- NVL-AP WiFi (FPGA Chipset) asset/vehicle mount, base station, LTE module, TCP/IP, UWB, regional communications coverage.
- NVL-AP 200 (FPGA Chipset) small form factor, light weight, wearable, asset/vehicle mount, close quarters communications.
- NVL-Sensor 100 (Protocol Integrated Sensor Module) small form factor sensor applications from wearables to Plug & Play industrial protocols, fully linked platform.



## The Problem(s)

*Security is crucial.* Whether protecting troops, assets and military communications, or sensitive industrial transactions across the management platform, the loss of data integrity leads to losses on the battlefield and in the marketplace.

*Capacity & Connectivity needs are increasing exponentially.* As 5G becomes ubiquitous, hundreds of millions of sensors and billions of devices will compete for diminishing bandwidth.

*Interference is everywhere.* Competing sensors, devices and nodes all trying to transmit in real-time as well as increasingly mobile networks and topographical inconsistencies will degrade data efficacy and transaction delays.

## The Solution

*Security.* Communication and data transactions are converted into patented, non-repeating, and random chaotic waveforms over encryption. Embedded Artificial Intelligence (AI) automatically identifies and digitally compartmentalizes threat attempts.

*Capacity & Connectivity.* The chaotic waveform(s) are tunneled beneath the noise floor of any wireless protocol (Wi-Fi, UWB, LTE, SATCOM, etc.) increasing network device connectivity and data capacity by 10x.

*Interference.* AI driven optimized spatial diversity and spectrum allocations coupled with 10X+ simultaneous transactions v. 1X existing network communications minimizes multi-node and topographical interference

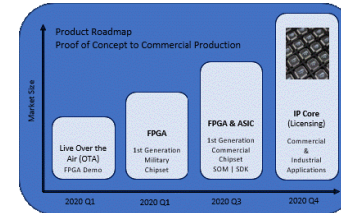
## The Market

Over the next 5 years, the military/defense BoT communications market is expected to exceed \$30B annually. The commercial IIoT market, excluding consumer-based routers and platform devices, will exceed \$330B in 2020. Growing at a CAGR of 20%, the IIoT market will exceed \$685B by 2025.

# Espre Technologies

## The Business Model

Espre will continue design and optimization efforts towards its initial suite of products under current military contracts. Final FPGA and ASIC chipsets will be transitioned into the commercial market(s).



Years 1-5, the company will contract with foundries to manufacture and deliver FPGA and ASIC chipsets and sensors directly to OEM consumers. By year 6, the company anticipates a transition to an ARM model where chipsets and sensors are designed in-house and licensed to OEM chip manufacturers to sell into their respective marketplace(s).

## The Competition

There are several competing low bitrate, low-power, ad hoc network technologies including Zigbee, LoRa, and Zwave. The offerings are built on legacy technology and have been updated to target IoT applications. Predominantly suited to indoor coverage, they have well-known scalability problems and significant limitations on device/sensor connectivity. Outdoor centralized coverage suppliers, like SigFox, Ingenu, and NB-LTE, employ a cellular deployment approach requiring significant CapEx for physical tower and base station assets with a focus on wide-area coverage. While suited for asset tracking and fleet management, indoor coverage has diminished performance and suffers from topographical and device connectivity impediments.

## Progress

Espre Technologies platforms and protocols are protected by 15 domestic and international patents. Currently under two defense/military contracts, the company is optimizing its FPGA chipset and sensor designs with completion by 4th quarter 2019. The US Army is interested in the Espre communications technology to protect data transmission within its iVAS (Integrated Visual Augmentation System) platform with a demo scheduled for March 2020 (\$10-\$12M revenue over the next 3 years).

**Silicon Catalyst start date: October, 2018**

## Team

- Founder - Dr. John Terry, PhD.
- 4 FT Engineers - DSP, Communications, AI/Machine Learning
- 6 Subcontractors – Firmware Support, Antenna Design, and App Dev.

## Investment

Espre Technologies is seeking \$1.3M to complete the US Army iVAS demo and accelerate development of the alpha ASIC product(s) for military/defense customers and IIoT systems integrators.

# Mentium Technologies

*Accelerate Anything*

## Problem

AI inference acceleration at the Edge is a massive market opportunity



The number of Edge applications are going to explode as Edge computing enables even new applications to emerge. IoT devices are going to be everywhere and a great deal of these devices will have AI-based computation. Smart and efficient devices are going to be the winners, and they cannot exist without efficient AI accelerators.

## Solution

Next step in memory evolution: Analog Computing Memory (ACM).



ACM delivers unbeatable speed (40x speed compared to Intel Myriad X or Google edgeTPU) with 10x efficiency improvement.

Our technology uses memory semantics and Non-Volatile Memory devices to store the Neural Networks parameters and perform computation at the same time, resulting in:

- Millions of scalar processors
- A fraction of the memory transfers required
- General purpose solution able to implement current and next generation Neural Networks

We envision a future where banks of ACM memory will work side-by-side with digital processor to accelerate AI algorithms in all kind of platforms.

# Mentium Technologies

## Market Opportunity

"The global artificial intelligence chip market is projected to reach \$91,185 million by 2025, growing at a CAGR of 45.4% from 2018 to 2025." (Allied Market Research)

## Business Model

Selling IC product to system integrators, starting from hi-end Edge computing platforms.

## Competition

Main competitors are two very good startup working on a similar technology:

**Mythic-AI**, developing a full SoC.

- Targeted at server and near-edge applications
- Different implementation

**Syantiant**. Came out with two products for trigger-words recognition on always-on microphones. These first products are fully-digital, as far as we know. They are working toward a mixed-signal SoC solution.

- Working toward SoC
- Directed at Speech applications

## Progress to Date

- Added semi-industry stars Mark Ross and Pete Rodriguez to the team.
- Engaged with strategic partners.
- Second test chip taped-out.
- New IPs filed across the whole chip design.
- Finalized exclusive license deal with UC system.

**Silicon Catalyst start date:** October, 2018

## Team

- **Mirko Prezioso, PhD**, CEO, co-founder
- **Farnood Merrikh Bayat, PhD**, CTO, co-founder
- **Mark Ross**, VPoE, former Cypress CTO, System Architecture
- **Jay Sulima**, CMOS Designer, electronic engineering
- **Pete Rodriguez**, advisor and Board Observer, Silicon Catalyst CEO
- **John LeMoncheck**, advisor, former CEO of Cambrios
- **John Bowers, PhD**, advisor, full-professor at UCSB
- **Dmitri Strukov, PhD**, advisor, co-founder, full-professor at UCSB
- **Konstantin Likharev, PhD**, advisor, co-founder

## Ask

Looking for seed round and pilot projects



# Owl Autonomous Imaging

*The smartest choice for the road ahead*

## Company Overview

Owl Autonomous Imaging is a solutions company providing a Thermal Ranging™ platform that uses proprietary sensors and software to deliver safe autonomous operation to the Autonomous Vehicle, ADAS, and Robotic Mobility markets.

## Solution

Our patented *Always On Thermal Ranging™* 3D camera provides precision ranging with 100x the resolution of LiDAR, operates day & night, in all weather, definitively classifies; pedestrians, cyclists, animals and vehicles (either moving or stationary) all the while calculating position, direction and speed (3D- true velocity) to unlock safe autonomous operation.

## Pain Points

Safe operation of Autonomous and ADAS vehicles (level 2 to 5) is a market imperative. To unleash this imperative sensor technology must deliver the ability to:

- (1) See night or day; through RAIN, FOG, SLEET, SNOW & EXHAUST
- (2) Classify living objects (pedestrians, cyclists) from inanimate objects
- (3) Track high speed objects while reporting range & velocity from all sides
- (4) Discern objects in shadows & intense light at both near and far distances (HD quality)

No camera exists that addresses these pain points, until now.

## Technology

The foundation of our technology is an adaptation of a thermal ranging solution we developed under a challenge grant from the US Air Force to track ballistic missiles in flight traveling at over 1,000 mph. Owl's new low cost automotive camera fuses Thermal Imaging with Range (X,Y,Z). The heart of our camera is our proprietary digital focal plane array coupled with light field optics.

## How We're Unique

Our solution combines Thermal Imaging with High Accuracy Ranging – no competitor provides this capability in a single camera. Up until now the ability to see and measure 3D (X,Y,Z) required the fusion of multiple cameras (generally vision and LiDAR). No longer.

## Barriers to Entry

No other company has demonstrated a single camera with X,Y,Z for commercial application at commercial price points and we do this using thermal imaging (passive). Owl holds foundational patents (22 awarded/pending) for fusion, 3D velocity, focal plane array, optics, spoofing, all specific to the automotive solution.



# Owl Autonomous Imaging

## Business Model – (B2B)

Owl designs, develops and has manufactured low cost, high performance, 3D high definition thermal precision ranging cameras for safe operation of ADAS, Autonomous Vehicles and mobile robots. Sales cycle is up to 2 yrs. from 1st prototype to production win/sale. Prototypes are revenue producing in 100 to 1K pc quantities @ very high margin, 1st MVP ship Oct '19. Automotive sample A available Q2 '20.

## Traction

- Proven and shipped MWIR & LWIR camera to US Air Force 2017
- Secured Early Access Customers (incl. major auto OEMs) - resulting in over \$1 M in 2019 revenue
- MVP camera shipped to Automotive OEM Oct. '19, Automotive A Sample 2Q'20
- Pipeline of Auto A Sample requests from numerous Auto OEMs, Tier 1s & AI suppliers

## The Opportunity

- \$22B SAM by 2026
- \$1M Backlog/Billable Revenue FY2019, additional multi-million dollar identified near term revenue pipeline
- 65% of Spend Secured for Auto A Sample (In-Kind, Convertibles, Net. Rev.)

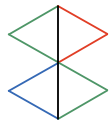
## Team

- **Chuck Gershman**, CEO & co-Founder, 30+ yrs, Exec Mgmt, multiple exits (Intel, PM-Sierra), Microsemi, Bay Micro, LSI, TI
- **Gene Petilli**, CTO & co-Founder, 30+ yrs, co-inventor of the digital CMOS camera, Kodak, Intrinsix
- **Atul Kishore**, 30+ yrs, Automotive VP, Nissan, Ford, Toyota
- **Skip Cusack**, 25 yrs, Sensor Fusion, MIT Lincoln Laboratory, Intel Advisors
- **Pete Rodriguez**, CEO Silicon Catalyst, VP & GM NXP, CEO Exar
- **Dinesh Maheshwari**, CTO, Memory Division, Cypress Semiconductor Director at JEDEC and UPA Technologist - 7 companies 4 Advisory Boards

## Seeking Initial Seed Financing Round:

Closure this fall: \$3.5M/\$4M seed round (inclusive of convertible notes) for automotive camera (field prototype)

## Raising additional \$2M to \$2.5M



# Power Down Semiconductor, LLC.

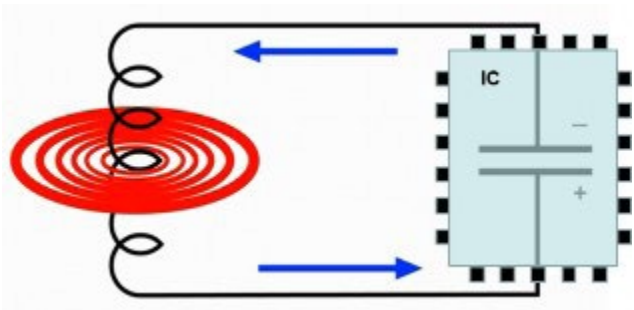
Energy-Efficient Solutions for Portable Applications

## Problem

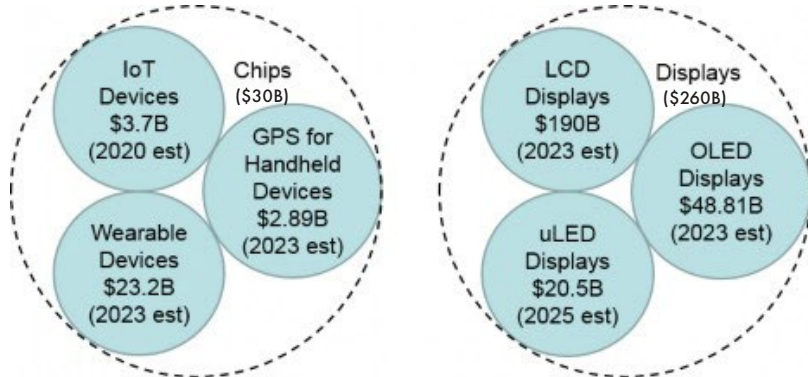
Today there is an ever-increasing demand for portable devices with extended battery life as well as greater performance. However, the supply is being limited by the efficiency of the processors and displays that comprise two of the largest energy consumers within those portable devices.

## Solution

In response to the power-efficiency dilemma facing manufacturers of portable consumer electronics, Low Power Processing (LPP™) was developed. The technology uses a “pseudo-adiabatic” technique to recycle charge and prevent CV2f losses in memory blocks, clock buffers, GPIO, and displays.

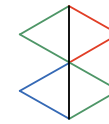


## Market Opportunity



## Business Model

Direct Sales + IP Licensing: PDSemi designs and develops ICs for the IoT market. Chips are sold through local distributors in China. For IP model, companies license LPP technology and PDSemi receives a licensing fee for each chip or display sold. OEM will pay “10% of the benefit” as the licensing fee.



# Power Down Semiconductor, LLC.

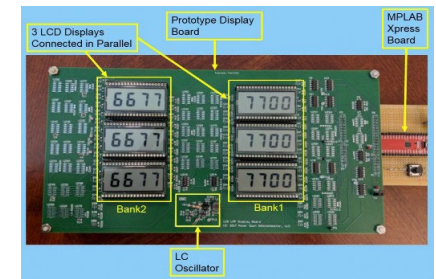
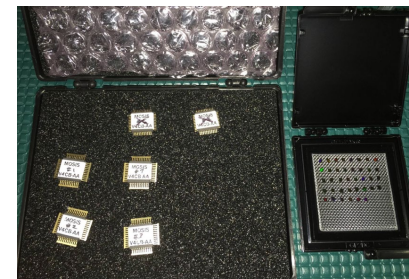
## Competition

CLEARink Displays, Inc. – developer of low-power reflective displays that are an alternative to OLED, LCD, and E-paper with limited frame rate and color depth.

Ink, Inc. – developer of ultra-low power displays for E-readers with static images. Full-motion video is currently not possible.

## Progress to Date

Two LPP prototypes built and tested. The SRAM chip shows a 25X reduction in power. The LCD display board shows ~30% reduction in power consumption over the traditional non-LPP prototype board.



## Team

- **DH** - Founder & CEO, Technical lead and/or manager on various high-reliability IC's for spacecraft & medical applications, A/D's, D/A's, References, Linear Oscillators, Sensor I/F IC's, Fiber Optic CDR's, PLLs for clock and timing applications.
- **FL** - President of China Division, Cof-ounder of several technology companies in the US and China. Industry expert in OLED display development. Currently, professor at Suzhou Institute of Nano-Tech and Nano-Bionics. He is listed as inventor or co-inventor on over 100 US patents.
- **PK** - VP Sales and Business Development, Various sales and business development positions including VP of North American sales for a Fortune 500 semiconductor company.
- **GK** - VP of Engineering, Various technical leadership positions in high-speed semiconductor design – regarded as an expert in his field with several patents and publications.
- **LL** - Sr. Analog Designer, Wireless RF design, LNA's, Mixers, VCO's. High-speed wireline equalizers, TIA's, and display drivers.
- **BY** - VP of Manufacturing, Fabless IC manufacturing consulting, wafer fabrication, packaging, and test planning.

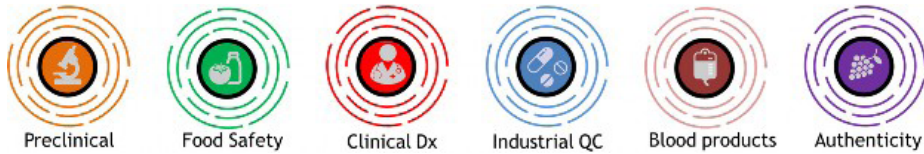
## Ask

PDSemi has raised ~\$400K through self-funding & 1 seed round. We are currently developing an ultra-low power 16-bit MCU for energy harvesting IoT applications. We are seeking \$6.5M for the follow-on 32-bit ultra-low power MCU.

Contact David Huffman, dhuffman@powerdownsemi.com • +1 (408) 612-5257 • www.powerdownsemi.com

### All electronic platform for fingerprinting of biological specimens

*Any target, any background, fast*



ProbiusDx brings a new approach to the bioanalytical market by digitally fingerprinting complex samples, wherein the electronic sample signature contains information about the intrinsic vibrational and electronic sub structure of constituent molecules. In preclinical research, our all electronic platform makes broad spectrum longitudinal studies on small animals possible. Unlike traditional assays, our instrument enables the multiplexed detection and quantitation of proteins and small molecules in quasi-real time at point of sampling, with only 10uL of specimen and without sample preparation. Our customers see this as a promising way to significantly accelerate their disease pathway and therapy discoveries. The differentiation of our approach, combining nanotechnology, advanced electronics and machine learning, is also evident in other testing applications, such as food safety, authenticity, and clinical diagnostics.

### Molecular test platform as a service (PaaS)



#### Key Technology Advantages:

- Ability to test multiple targets in one sample (multiplexed)
- Phenotypic classification of sample in native matrix
- Small sample volume (10uL) compatible with multiple time points in small animal models
- Easy, simple workflow with no sample preparation needed (minimum training)
- Rapid, 10min from sample to information at point of sampling
- Test any types of sample with same hardware and same workflow
- Fast turnaround time for new assay development (hours to days to build reference and train)
  - Application specific needs are customized on demand by software, including a posteriori interrogation of archived digital sample signatures.

#### Current partnerships:



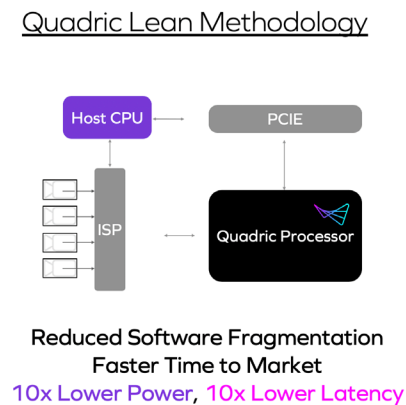
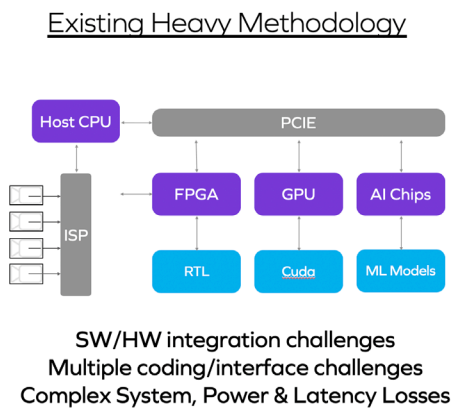
## Supercomputing At The Edge

### Problem

The proliferation of cameras and sensors into autonomous devices, calls for solutions that improve computational power while consuming less energy. Today's edge computing solutions built with heterogenous hardware & software, where discrete components such as DSP, FPGA, GPU, AI accelerators and CPUs are too complex to scale.

### Solution

Quadric's built a unified processor architecture where developers have the power to write and unify all parallelizable algorithms onto a latency-optimized processor. Unified Compute gives the developer power to accelerate works onto a single cohesive software approach, without the need for complex hardware integration, varied software languages, and frameworks.

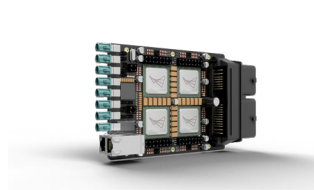


The Quadric Processor replaces FPGA, GPU, and AI Accelerator hardware components. All software workloads previously running on those hardware components now run on a single latency, performance and power optimized processor architecture.

### Business Model

Quadric sells single board supercomputers that are plug and play with after-market sensors. The software toolchain is available for free. In the Automotive segment, quadric sells processors and licenses software to Tier1 automotive companies to enable Level 2 through Level 4 & ADAS applications.

### Progress to Date



**Seed** - Quadric raised \$2.25M to seed the company in March, 2017. These funds were deployed to develop a new architecture for an end-to-end supercomputer for Edge applications. This includes a custom sensor fusion frontend and FPGA based kits that emulate the quadric processor. These have been used for carrying out customer pilots.

**Series A** - Quadric raised a total of \$12.5M Series A round in Dec, 2018. Quadric took a software first approach and developed an LLVM based toolchain for running Custom C++ high performance kernels as well as an inference graph execution compiler. Following the successful validation of the software stack with emulated hardware, Quadric is on track to tape-out the first version of the Quadric processor in Q1-2020.

### Silicon Catalyst Start Date: 2019

### Team

- **Veerbhan Kheterpal**, CEO & Co-founder, Founded three technology companies w/ two acquisition exits. Full stack expertise from Software to Silicon across Datacenters to consumer facing products. Ph.D. & M.S in ECE from Carnegie Mellon University.
- **Nigel Drego**, CTO & Co-founder, Prior to Quadric, Chief Architect & Co-founder at 21, Inc. where he designed and built-out three generations of mining ASICs. Full stack expertise from Software to Silicon. R&D at PDF Solutions & Intel. Ph.D. EE from MIT.
- **Daniel Firu**, CPO & Co-founder, Prior to Quadric, Daniel co-founded 21. Daniel handled microarchitecture & physical implementation and manufacturing of 21's first chips. He led business development efforts for licensing 21's Bitcoin-related IP. M.S, ECE from University of Florida.
- **Tim Smith**, Tim is a respected semiconductor industry figure who has managed, negotiated and delivered numerous high value multi-year, multinational, collaborative business engagements consistently increasing sales and profit. He has led Sales & Business Development at several companies eg. Rambus, IntinsicID, CoWare, Sonics, Tiscend, Memec.

### Ask

We have expanded the applicability of our platform to several new domains. Currently, we are taking in new customers in the area of real-time analytics in IOT, manufacturing & healthcare use cases. Customers can tremendously reduce bandwidth and cloud resource utilization by deploying on Quadric's edge computing stack.

# Seamless Microsystems

## Problem

Expensive and power-hungry next-gen. systems

## Solution

Seamless' patented time-domain designs

### Automotive



LiDAR makers, Tier-1  
RADAR engagements

### Medical Imaging



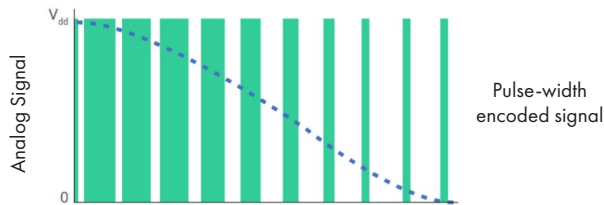
Delivered product

### Communications

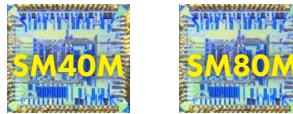
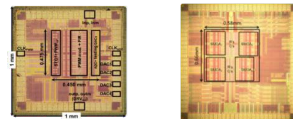


Discussions with  
base-station providers

## Switched-Mode Signal Processing

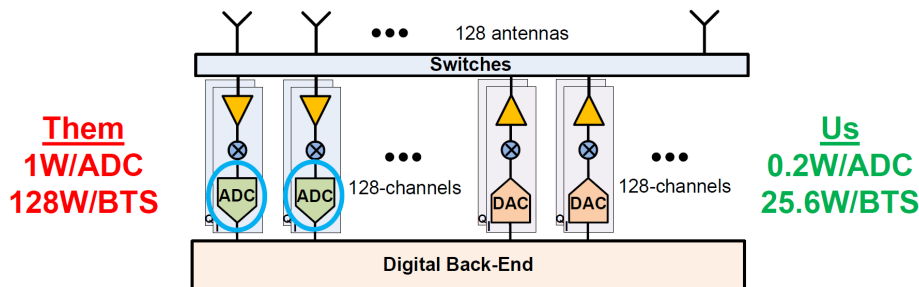


Analog design using switches



Si-proven technology

## The Seamless effect in 5G base-stations (BTS)



**5X lower power ADCs for 5G BTS**

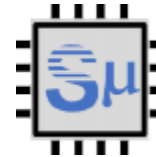
# Seamless Microsystems

Revenue Model: Discrete chipsets, MCM/Chiplets and IP

## IC



## MCM/Chiplets



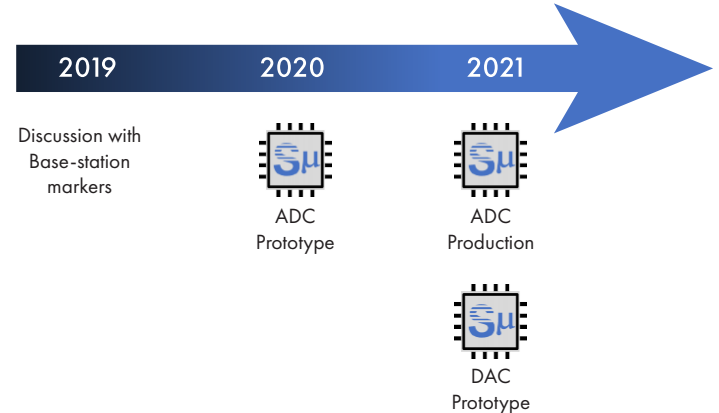
## IP



## Competition



## Go To Market Strategy for 5G



## Team



Jayanth Kuppambatti  
CEO



Augustine Kuo  
VP of Engineering



R. Scott Hills  
VP Sales



Keith Lobo  
Business Advisor



## SigmaSense

### Overview

SigmaSense®, the global leader in touch sensing performance, is changing the world of traditional analog sensing with a new advanced digital approach. By providing concurrent modality, applying efficient digital filtering, and greatly improving noise immunity, SigmaSense is delivering over 100X improvement in performance. Products ranging from small wearables to greater than 100 inch displays can now provide a superior human interface sensing experience that also reduces system costs and lowers design risk. Headquartered in Austin, TX, SigmaSense provides semiconductor and board level products with development tools, advanced software drivers and support.

### Markets

SigmaSense is providing smart touch screen controller technology to the \$150+ billion display industry, representing opportunities of more than \$5 billion today. The company is also developing a next generation of delta-sigma analog-to-digital converters (ADC), representing a \$2+ billion opportunity across a range of IoT markets.

### Customer Problems

Customers expect all screens to be capable of good predictable touch regardless of size. Display manufacturers are pursuing higher value by the integration of touch sensing into the display itself. Currently, large and/or flexible displays face a wide array of issues in supporting capacitive touch due to the varying high resistance and capacitive loads, RC timing constraints, and environmental noise. Current technologies are simply not up to the task and cannot provide the capacitive imaging or response times now demanded for interactive displays.

### Problem Solved

SigmaSense is pioneering the massive shift to low power multi-frequency concurrent modality for analog sensing systems. With its unique and patent-protected IP, SigmaSense is delivering a variety of sensing solutions to provide 100X improvements in touch performance while enabling over 50% system cost savings. The result is unparalleled performance combined with reduced design cycles and nearly instant tuning/calibration efforts.

### Proprietary Core Invention

Concurrency at the edge between analog and digital enables a new generation of sensing with far better SNR at lower power, and with instantaneous results. SigmaDrive™ provides ultra-low voltage multi-frequency sensing with concurrent drive, sense and comms on a single pin. SigmaDrive technology concurrently drives AND senses, transmits AND receives, instantaneously detecting and adapting to any change of impedance in a sensing system.



## SigmaSense

### Capacitive Imaging

Capacitive-Imaging utilizes the SigmaDrive™ Architecture to deliver an image of the entire display surface with energy efficiency and without the typical lag associated with PCAP based touch controllers. Traditional coordinate-based reporting cannot provide the rich data stream necessary to deliver the user experiences demanded by the market.

### Competition

SigmaSense creates an entirely new class of touch controller performance. Current touch controllers must increase voltage and insert long delays in sampling to meet customer SNR requirements. Using customers' existing systems for benchmarking, SigmaSense delivers performance that is 100-1000X better.

### IP Protection

SigmaSense has substantial investments in its patent filings. The core IP around SigmaDrive™, displays, and Pen support are issued, combined with 172 inventions protected through placeholders. The patent filings extend to a range of applications beyond traditional touch screens, including power regulation, electric motors, data communications, medical, automotive and IoT applications.

### Investment

To date, the Company has raised more than \$12 million from customers and early angels. The Company is currently planning to raise an institutional round of \$15M+ led by existing investors, customers and partners.

**Silicon Catalyst Start Date:** October, 2019

### Team

- Rick Seger, CEO
- Shawn Gray, COO
- Troy Gray, VP, R&D
- Steve Sedaker, CMO
- Gerald Morrison, CTO
- Dan Van Ostrand, VP Engineering
- Gary Baum, VP Emerging Technology
- Rudy Prince, CFO



Enabling tomorrow's wireless links

## Problem

Problems of Today's Wireless Technologies:

- The battery life of wireless devices is insufficient for many applications, leading to overly frequent recharge cycles, limited connectivity, and bulky batteries or costly maintenance. Ultimately, this is due to the inefficient wireless transceivers that are available on the market.
- Current wireless solutions significantly restrict the amount of data that applications using energy harvesting technologies can transmit.
- The long latency of wireless technologies makes their use inadequate in applications requiring real-time communications.

## Solution

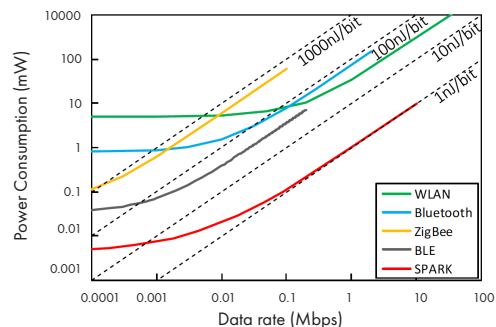
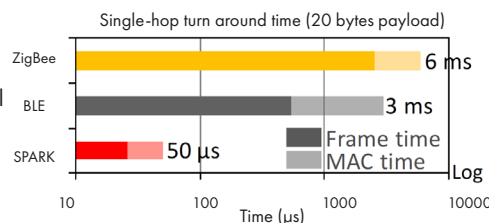
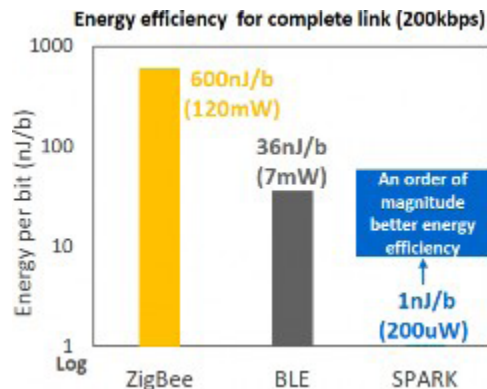
The SPARK Radio: Ultra Low Power Wireless Communication for the IoT that can enable battery-less sensor nodes, or significantly extended battery-life for high data rates wireless applications.

The SPARK radio is a patented short-range (up to 100m) ultra-wideband wireless communication technology that provides an order of magnitude better energy efficiency and latency than competing technologies. It also enhances link reliability while offering a scalable data rate at up to 10 Mbps.

## Market Opportunity

The low-Power wireless transceiver market is a \$8B industry growing at a 14% CAGR. Typical solution providers require between 100k and 10M units per year. Markets addressed:

- Automotive
- Biomedical and healthcare
- Gaming
- Health and fitness
- High-quality audio
- Industrial and automation, M2M
- Internet-of-Things
- Structural health monitoring
- Smartphones and tablets
- Smart agriculture
- Smart homes
- Streaming audio / video
- Wearables



## Business Model

SPARK Microsystems will sell an integrated circuit to product manufacturers and system integrators. SPARK may license its IP to select partners.

## Competition

The SPARK radio achieves more than 35X better energy efficiency and 60X shorter latency than today's low energy technologies such as BLE. It also supports instantaneous communications that are much more reliable and secure than other low energy technologies, while allowing for much faster communications. Its main unique features are:

- Ultra-low power consumption & scalable data rate
- <1 mW at 1 Mbps
- 1 nJ/bit energy efficiency at up to 10 Mbps
- 1.8 to 3.6 V supply, 700 nA sleep current
- Ultra-short latency, 50 µs to transmit 1000 bits
- Ultra-low power Time of Flight (ToF) indoor positioning to within +/- 30 cm accuracy

## Progress to Date

- Q4 2017 through Q4 2018: evaluation kits based on alpha, beta and pre-release silicon
- Q3 2019: Development kit based on final release chip available for sampling

### Upcoming

- Q4 2019: Close of seed-extension funding round
- Q4 2019: Battery-less IoT Evaluation kit
- Q1 2020: Engineering samples and pre-production volumes
- Q2 2020: Qualification, certification and production ramp g

## Silicon Catalyst start date: November 2016

## Team

- **Fares Mubarak**, CEO, more than 30 years of semiconductor experience spanning ANSYS, Actel, Samsung and AMD.
- **Dr. Frederic Nabki**, co-founder & CTO has 16 years of experience in the design of integrated circuits and MEMS and in the technical management of R&D. He has experience in creating and commercializing IP, setting the direction of the technological roadmap for start-up companies and coordinating product development efforts.
- **Dr. Dominic Deslandes**, co-founder & CSO has 18 years of experience in the design of RF systems. He managed several research and development projects in the field of antenna design, RF system integration and interconnections. He collaborated with several companies to develop innovative solutions for microwave sub-systems.
- **George Taylor**, VP Sales has more than 25 years of semiconductor sales experience

## Ask

SPARK Microsystems is seeking strategic partnerships to adapt the technology to specific application spaces and facilitate its entry in market segments such as gaming peripherals and consumer electronics, home and building automation, industrial, medical and automotive. We are also seeking investors for a series-A round targeted for 2nd half 2020.

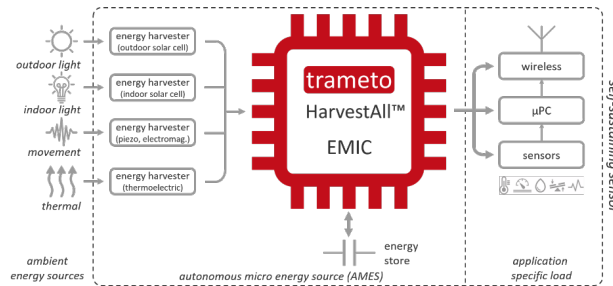
Enabling Battery-Free IoT

**Problem**

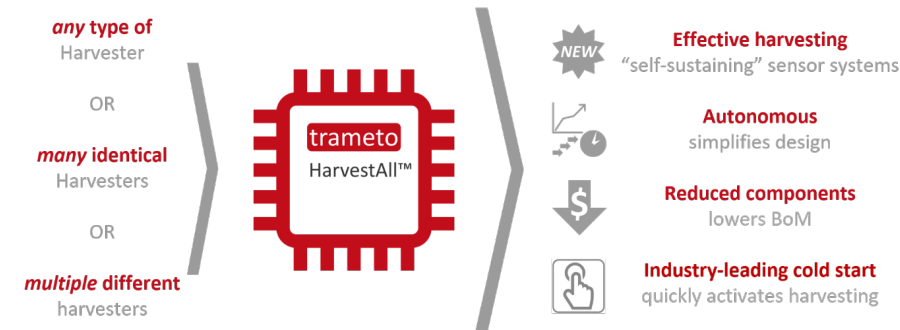
It is forecast that there will be 62 billion connected devices by 2024. If we postulate that only half of these will be primary battery powered, and that of these batteries' half will need to be replaced every year, this equates to 60M battery replacements needed every working day, which is infeasible.

**Solution**

Micro energy harvesting, and in particular the use of autonomous micro energy sources (AMES) – is seen as being an ideal solution to creating self-sustaining sensor systems. Along with energy harvesters and energy storage, the key component in an AMES solution is an



Energy Management Integrated Circuit (EMIC). Trameto's patent protected HarvestAll solution will uniquely deliver any-many-multi AMES capability; enabling harvesting from any type of harvester, many instances of the same energy harvester and multiple types of different energy harvester. HarvestAll will enable self-sustaining applications to be powered by all types of ambient energy now, drive the development of next generations AMES, and allow creation of novel AMES applications not previously possible.



**Market Opportunity**

In a recently published report, Energy Harvesting: Reaping the Abundant Market, Semico Research forecast that EMIC device sales in AMES applications will rise to \$2.4B in 2024, with unit sales of EMICs expected to rise to >1.2B units by 2024 at CAGR of 80%.

**Business Model**

Trameto is a fabless semiconductor company, selling our devices to system integrators within the industrial IoT. Our route to market will be via a blend of direct sales, distribution and manufactures' representation.

**Competition**

We have identified other suppliers of EMICs including Texas Instruments and Analog Devices. All devices identified are defined, and limited, by their single input harvester capability. Clumsy and costly work-arounds are used for multiple inputs.

**Progress to Date**

<p><b>2017</b></p> <ul style="list-style-type: none"> <li>Innovate-UK grant (132632)</li> <li>Seed funding round closed</li> </ul>	<ul style="list-style-type: none"> <li>Innovate UK grant (104036)</li> <li>Europe market introduction</li> <li>UK &amp; USA Patents granted</li> </ul>
<p><b>2018</b></p> <ul style="list-style-type: none"> <li>Innovate UK grant (104004)</li> <li>Japanese market introduction</li> <li>Euro Commission SME-1 grant</li> </ul>	<p><b>2019</b></p> <ul style="list-style-type: none"> <li>Euro Commission SME-2 grant</li> <li>Smart Cymru grant</li> <li>Join Silicon Catalyst</li> </ul>

We have received a number of letters of support from companies within the following sectors; aviation, machine condition monitoring, asset tracking and smart buildings. We have also agreed a strategic partnership (MOU) with a system integrator to further support commercialization through customer evaluation of HarvestAll devices. To date, Trameto has a discrete proof of concept HarvestAll platform.

**Silicon Catalyst Start Date: October, 2019**

**Team**

- Huw Davies**, CEO & founder has held executive and founder positions in the semiconductor industry from start-ups (Audium) to multinational corp. (Conexant Systems)
- Laurence Strong**, CPO & founder
- Chris Travis**, CTO previously CTO of Redux, acquired by Google in 2017

**Ask**

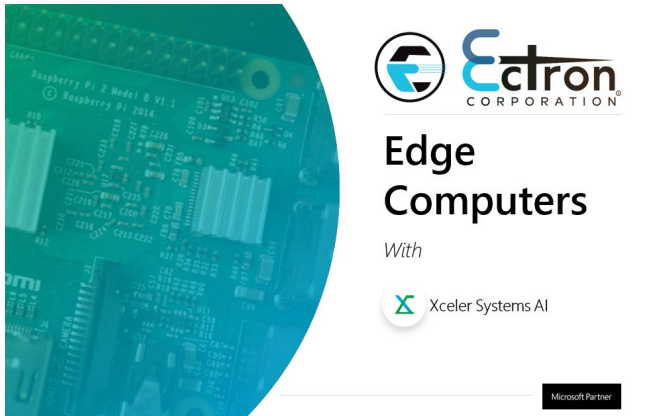
Trameto will require additional funding during H2 2020, Series A of circa \$5M, to scale the business to achieve our high-volume targets. During 2020 trameto will deliver first engineering samples and secure first design wins. In addition, the funds will ensure HarvestAll attains mass-production status and the team grow from 10 in 2020 to 80 in 2024.



# Xceler Systems

Enabling the Intelligent Edge for Industrial IoT

Xceler Systems, a Silicon Catalyst portfolio company founded in 2016 is focused on delivering solutions to enable the next generation "Intelligent Edge." Xceler is working with its partner Ectron Corporation, on embedding its processor into Ectron systems. These range from the first aggregation point in the sensor network to the edge server.



The first vertical the company is concentrating delivering solutions for is the Industrial IoT space. The challenges in this vertical are generally characterized by the following:

- Customers already have infrastructure that works and the solution has to be a fit rather than a forklift upgrade
- It is not always feasible to move the data to the cloud/data center in a remote location as pipes are not available or for security reasons wireless connections are not used
- Almost all Edge deployments of aggregation points use 16-bit or 32-bit microcontrollers and these are simply not capable of running any algorithms in real time to perform basic machine learning functions
- Power is a factor as one will not replace 16 bit or 32 bit micro with a 150 watt device

The Xceler systems and sub-systems built around its novel "Graph Processing," architecture address both supervised and unsupervised learning algorithms and inferencing.

Xceler Systems works with Ectron Corporation for IIoT Solutions

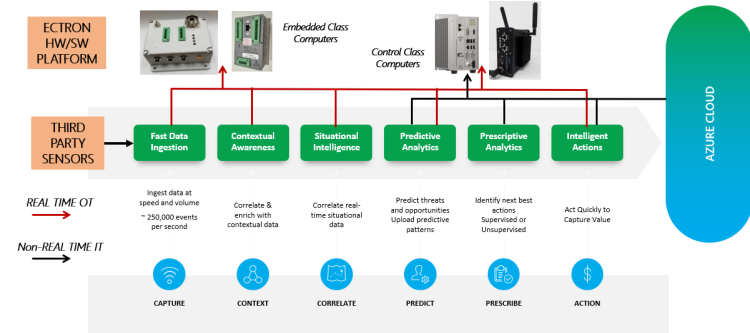


# Xceler Systems

## GTM Strategy

The total addressable market (TAM) for the IIoT market that Xceler is targeting is \$130 billion. Specifically, the embedded computer, edge gateways and edge server market TAM is approximately \$35 billion (VDC research). We are working with Ectron and its partner Microsoft to address this market.

- **PHASE I:** Xceler is rolling out its initial solutions in FPGAs which are ARM based SOCs. Xceler Graph processor is a co-processor to the ARM processor. We are working with our partner in building the co-processor cards.
- **PHASE II:** One or more SoC using ARM and RISC V processors for addressing both 32-bit and 64-bit markets. We are working with Silicon Catalyst and partners to determine the exact nature of the solution and the availability of first silicon.



## Market

• **FOCUS**  
 Controls and Monitors for Industrial Machinery, Gas Turbines, Wind Turbines and Steam Turbines branching out to Signal Conditioners and Factory Automation to implement industry 4.0, energy and operational efficiency across multiple industries.

Ectron Solutions with Xceler Embedded Machine learning solve this problem and provide real time analytics for multiple applications with or without cloud access. All Ectron products containing Xceler co-processors are Azure IoT certified.

• **VALUE PROPOSITION**  
 Downtime in the industrial market costs ~ \$100K per instance. The ability to monitor and predict avoids costly downtime. Predictive Maintenance, Operational and Energy Efficiency can save an average of \$60,000 per year for a small to medium sized manufacturers (There are over 250,000 SMM in the US).

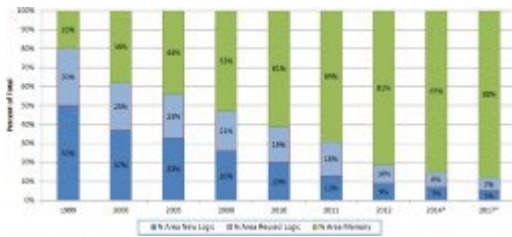
**Brief Profile**

Zeno Semiconductor, Inc. is a technology licensing company developing innovative scaling solutions in memory and logic technology. Zeno has been granted 50+ US and international patents.

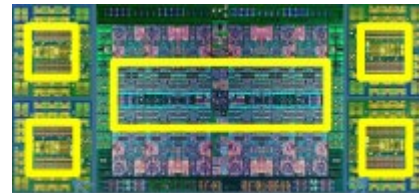
- Incorporated in 2010
- Si Catalyst start date: Oct 2016
- Funding: Angel, NSF SBIR grant, Corporate
- Stage: Silicon validation from major foundries across different technology nodes (14/16nm FinFET, 28nm, 40nm, 55nm)

**Memory Technology: 1-transistor / 2-transistor Bi-SRAM  
World's Smallest SRAM Cell**

Memory area on System-on-chip (SoC) occupies a significant percentage of total chip area, making embedded memory area and power efficiency a critical component in future IC designs. According to Semico Research Corp., embedded memory occupies >50% of total SoC area.

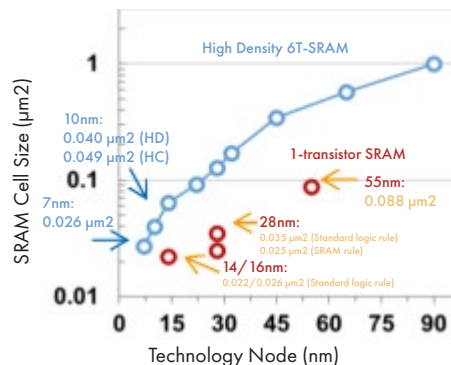


Source: Semico Research Corp.



Embedded SRAM

Conventional SRAM cell employs 6 transistors. Zeno Bi-SRAM is a novel static memory cell (no refresh operation) that offers 3-5x smaller cell size compared to conventional SRAM cell and is compatible with CMOS process.



Zeno Bi-SRAM cell at 28nm is smaller than 7nm High-Density (HD) SRAM

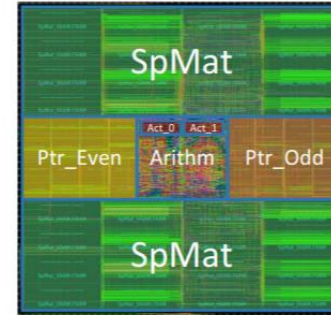
For more technical details, please see: Han, Jin-Woo, et al. "A novel Bi-stable 1-transistor SRAM for high density embedded applications", IEDM 2015.

Widjaja, Y. et al. "A Bi-stable 1-/2-Transistor SRAM in 14nm FinFET Technology for High Density / High Performance Embedded Applications", IEDM 2018



**Case Study: AI applications**

Memory takes up a significant fraction of AI chip area and power consumption. The following example illustrates that memory occupies >90% area and 59% overall power consumption.



THE IMPLEMENTATION RESULTS OF ONE PE IN EIE AND THE BREAKDOWN BY COMPONENT TYPE (LINE 3-7), BY MODULE (LINE 8-13). THE CRITICAL PATH OF EIE IS 1.15 NS

	Power (mW)	(%)	Area (µm²)	(%)
Total	9,157		638,024	
memory	5,416	(59.15%)	594,786	(93.22%)
clock network	1,874	(20.46%)	866	(0.14%)
register	1,026	(11.20%)	9,465	(1.48%)
combinational	0,841	(9.18%)	8,946	(1.40%)
filler cell			23,961	(3.76%)
Act_queue	0,112	(1.23%)	758	(0.12%)
PtrRead	1,807	(19.73%)	121,849	(19.10%)
SpMatRead	4,955	(54.11%)	469,412	(73.57%)
ArithmUnit	1,162	(12.68%)	3,110	(0.49%)
ActRW	1,122	(12.25%)	18,934	(2.97%)
filler cell			23,961	(3.76%)

Source: Han et. al., ISCA 2016

Using Bi-SRAM will result in significant area and power savings:

- Area 38-47% of 6T-SRAM macro
- Write Power 80% of 6T-SRAM
- Read Power 20-25% of 6T-SRAM

**Team**

- Yuniarto Widjaja, PhD, CEO & Founder, PhD in Chemical Engineering with minor in Electrical Engineering from Stanford University in 2002
- Zvi Or-Bach, Executive Chairman, Serial entrepreneur with over 25 years of experience. Founder of Chip Express, eASIC, and Monolithic3D
- Stefan Lai, Former Intel VP, Co-inventor of ETOX Flash memory
- Dinesh Maheshwari, CTO of Memory Div., Cypress, Member of Board of Directors of JEDEC, senior technical positions at startups (acquired by Mentor Graphics and Cadence), invited papers in ISSCC and CICC
- Prof. Yoshio Nishi, Stanford EE, MSE, IEEE Fellow, 1995 IEEE Jack Morton Award, 2002 Robert Noyce Medal
- Paul Lui, President and GM of SST China, CEO of Linvex Technology (acquired by SST) and President (USA) of Macronix
- Serguei Okhonin, Founder of Innovative Silicon, ActLight
- Pieter Vorenkamp SVP of Operations, Broadcom, SVP and GM of IP Group, Cadence

# Si Portfolio Companies

## ALUMNI



High Performance Integrated Optical Motion Sensor for the Self-Driving Cars Market  
www.onesiliconchippotonics.com



EdgeOps Prescriptive Maintenance and Analytics Software  
www.adapdix.com



Hyper-Efficient Architecture for Supercomputers of Today, and the Computers of Tomorrow  
www.rexcomputing.com



Electrical Characterization of Semiconductors at Atomic-Level Resolution  
www.alpinc.net



World's First Single-Wire Connectivity IC and Unique Magnet-Module Platform & Product Provider  
www.gmkay.com



Gigabits Wireless Connectivity for Better and Timely Service Everywhere for Everyone  
www.cloptech.com



Photonics with the Cost Structure of Microelectronics  
www.aeponyx.com



Bringing the Speed and Efficiency of Light to Computer Systems  
www.ayarlabs.com

# Si Strategic Ecosystem Partners



# Si In-Kind Ecosystem Partners





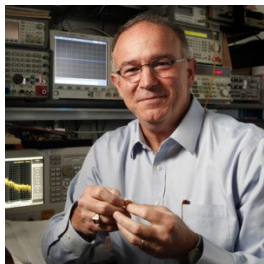
## Semiconductor Startups 2020: Back to the Future



**Dr. Yvonne Lutsch**  
**Investment Principal at Robert Bosch**  
**Venture Capital**

Yvonne is an Investment Principal at Robert Bosch Venture Capital's (RBVC) affiliate office located in Sunnyvale, responsible for sourcing, evaluating and executing investments for RBVC in the USA and Canada in fields like AI, IoT, mobility, next gen. computing, or sensors. Prior to this position Yvonne

was Director of Technology Scouting and Business Development for Bosch Automotive Electronics in North America. Her team's focus was to identify startups, disruptive technologies, or business models with the potential to create significant value to the division. Prior to that, Yvonne held different leadership positions in quality management, operations and engineering in Automotive and Consumer Electronics within Bosch Germany. Yvonne received a diploma in Experimental Physics from University of Siegen, Germany, and holds a PhD in Applied Physics from University of Tuebingen, Germany.



**Dr. Douglas Kirkpatrick**  
**CEO of Eridan Communications**

Douglas Kirkpatrick is a VC and former Chief Scientist at DARPA, where he led projects ranging from rapid DNA synthesis to real-time holographic displays. Prior to DARPA, Dr. Kirkpatrick was the VP of R&D for Fusion Lighting, a Maryland-based high-efficiency lighting startup, and prior to that a staff scientist and VP at SAIC.

Dr. Kirkpatrick received his BS degree (Physics & Mathematics) from the College of William and Mary (1980) and his Ph.D. from MIT in 1988 (Physics). He is a Fellow of the American Physical Society and has authored more than 30 journal articles and 60 US and international patents.

## Semiconductor Startups 2020: Back to the Future



**Dan Niles**  
**Founding Partner at AlphaOne Capital Partners**

Dan is a founding partner at AlphaOne Capital Partners, has teamed up with the Global Semiconductor Alliance to provide a series of webinar sessions that allows global CEOs, CFOs and other executives to monitor the industry's position in the cycle. Dan's quarterly reports covers: Monthly Semiconductor Industry Sales, Total Semiconductor Revenue vs. Total Capital

Expenditure % Growth, Predictions for the following quarter and overall year.

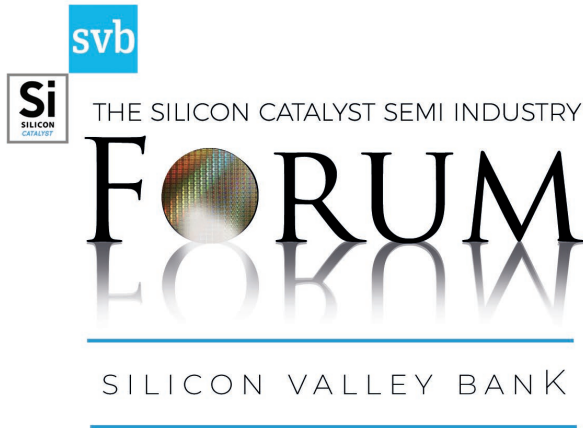
Formerly, Dan was the CEO of Neuberger Berman Technology Management which focused on long and short equity investments in the technology sector. In April of 2006, the Satori Technology Fund, which Dan manages, was awarded the "Best Newcomer" award at the 2006 MARHedge US Performance Awards in New York City. Dan joined Lehman Brothers in May 2000 and was ranked by Institutional Investor Magazine's "All-America Equity Research Team" survey from 1999-2003 in the semiconductor category and from 2000-2003 in the PC hardware/IT hardware categories. Dan previously worked at Robertson Stephens and was an engineer with Digital Equipment Corporation. He received an MS in electrical engineering from Stanford University.



**Pete Rodriguez, Moderator**  
**CEO of Silicon Catalyst, LLC**

Pete Rodriguez has 35 years of experience in the Semiconductor industry. Pete was VP & GM of Interface and Power at NXP Semiconductors. Prior to NXP Pete was CEO of Exar Corporation, CEO of Xpedion Design Systems, Chief Marketing Officer at Virage Logic, Major Account Manager at LSI Logic and Program Manager at Aerojet Electronic

Systems. He spent twelve years as an entrepreneur with three different startups and has raised over \$30 Million in venture capital. He retired from the US Naval Reserves with the rank of Commander. Pete has served on public, private, advisory and non-profit boards of directors. He is a graduate in strategy and policy of the Naval War College. Pete has an MBA from Pepperdine University, an MSEE from Cal Poly Pomona, and a BS in Chemical Engineering from the California Institute of Technology.



## Semiconductor Startups 2020: Back to the Future

November 14, 2019 at Silicon Valley Bank, Santa Clara, California

The climate for semiconductor startups has changed dramatically over the course of the past few years. Technical innovation in the areas of AI/ML, 5G and computing on the edge continue to garner the interest of the investment community, but the sources of capital have changed dramatically since the “gold rush” days of the past, as the venture community has focused on building unicorns, which for the most part is not a characteristic of the semiconductor industry.

What’s in store for 2020 and the coming decade? Where is the innovation going to come from? Can government-funded initiatives deliver results in a timely manner? How does the continuing geo-political turmoil impact the near-term and long-term results? What is the impact of corporate venture funding?

The semiconductor industry continues to have a significant impact on the world we live in - creating new industries, wealth, careers and jobs, access to communication and almost limitless connected information. Whether for the past or for the future, semiconductors will be at the center of the action - as we like to say, “It’s about what’s next™ “. Along with participation from the Forum attendees, the panelists will discuss key topics and challenges to find, support and grow innovative semiconductor solutions.

Moderator: **Pete Rodriguez**, CEO Silicon Catalyst

Panelists:

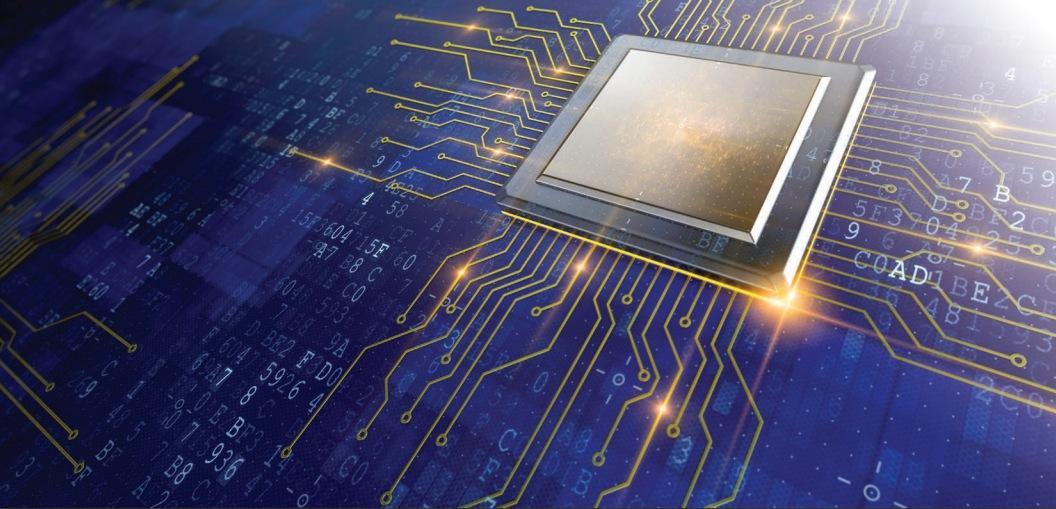
<b>Yvonne Lutsch</b>	Investment Principal, Robert Bosch Venture Capital
<b>Douglas Kirkpatrick</b>	Founder and CEO, Eridan Communications
<b>Dan Niles</b>	Founding Partner at AlphaOne Capital Partners

Agenda            5:30pm - 6:30pm Networking on the patio with food & beverages  
                         6:30pm - 8:00pm Forum

The Silicon Catalyst Semiconductor Industry Forum series was launched in 2018 with the charter to create a platform for broad-topic dialog among all stakeholders involved in the semiconductor industry value chain.

The Forum topics focus on technical and financial aspects of the industry, but more importantly the industry’s societal, geo-political and ecological impact on the world.





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THE SILICON CATALYST SEMI INDUSTRY

# FORUM

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SILICON VALLEY BANK

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SEMICONDUCTOR STARTUPS 2020:  
BACK TO THE FUTURE

11.14.19  
Silicon Valley Bank  
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