



proteanTecs Recognized as the

2021

Technology Innovation Leader

Global Electronics Health

Monitoring Industry

Excellence in Best Practices

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. proteanTecs excels in many of the criteria in the electronics health monitoring space.

AWARD CRITERIA	
<i>Technology Leverage</i>	<i>Business Impact</i>
Commitment to Innovation	Financial Performance
Commitment to Creativity	Customer Acquisition
Stage Gate Efficiency	Operational Efficiency
Commercialization Success	Growth Potential
Application Diversity	Human Capital

The Importance of Electronics Health Monitoring in Today's Electronically Driven Lifestyle

Electronics have become an existential enabler for key industries, from data center to automotive manufacturers, where 24/7 continuity with zero in-mission failures is pivotal. Therefore, it is necessary to guarantee these systems' reliability, bringing a key question to the fore: How can service providers, such as data center hyperscalers and car OEMs, track the health of fleet electronic devices working under extreme conditions while ensuring business survival until the devices complete their lifetime?

At present, many industries face the critical challenge of maintaining electronic system reliability and performance on a device that demands 24/7 uptime availability. Preventive maintenance, a commonly used industrial approach based on pre-scheduled cycles to ensure the uptime and continuity of critical infrastructures such as data centers, has its limitations. In an ideal world, maintenance would take place at an individually scheduled time, per device, based on continuous and predictive monitoring. In reality, maintenance strategies are based on statistical measure, sometimes resulting in system failures and unexpected downtime, while other times resulting in unnecessary maintenance checks leading to excess costs. Since business models are transitioning from products to services, even a brief service interruption translates into millions of dollars in lost revenue, for service providers and their customers.

In addition, today's mission-critical markets rely on sophisticated and complex semiconductor technologies to realize mega functionality. These include advanced process technology nodes, 3D

packaging, and multi-die chiplets that need to process complex applications, such as artificial intelligence (AI) and high-performance computing (HPC), at scale and without sacrificing quality. As a result, the inherent equation of trade-offs between power, performance, quality, reliability, and cost has put manufacturers and service providers in a pinch as they struggle to meet the ever-increasing requirements while remaining competitive.

A new way of gaining visibility into advanced electronics is needed for companies to scale while ensuring profitability, reliability, and safety.

Indigenous Solution for Electronics Health Monitoring Driven by Deep Data Analytics

Founded in 2017 by a team of industry veterans that previously co-founded Mellanox (acquired by Nvidia), proteanTecs is an Israeli start-up that has developed deep data monitoring solutions for advanced electronics, from production to lifetime operation. The company's analytics platform, Proteus™, offers system health and performance visibility based on Universal Chip Telemetry™ (UCT) throughout the entire lifecycle. By weaving data science together with on-chip visibility, proteanTecs' solutions deliver an unprecedented clarity at each step of the chip and system's lifecycle.

As experienced industry insiders, proteanTecs' founders witnessed first-hand the rising challenge of achieving a balance between quality and reliability without affecting cost and performance, especially as technologies advanced. With a vision to scale advanced systems while meeting increasing market requirements, the company gathered a multidisciplinary team of experts from circuit design, data science, big data analysis, and cloud software to create a truly disruptive approach based on deep data analytics. By employing machine learning (ML) algorithms to novel data collected from UCT agents,

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- Sushrutha Sadashiva, Industrial Analyst

original equipment manufacturers (OEMs) and service providers, as well as electronics manufacturers can monitor the inner workings of advanced electronics like never before.

proteanTecs' flagship product is an enterprise analytics platform, Proteus™, which applies machine learning (ML) algorithms to deep data from

Universal Chip Telemetry (UCT). UCT is the in-situ collection of measurements from widespread on-chip agents (monitoring IP) and their automatic transmission to cloud and edge software for advanced analytics. The UCT agents, strategically placed throughout the SoC during design, extract performance, quality and reliability data related to various chip and system characteristics, apart from sensing defects owing to workload or environmental stress.

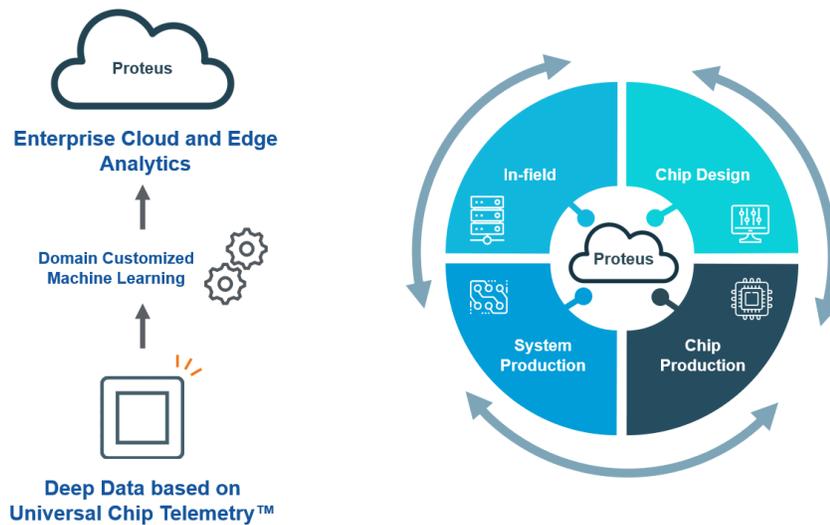
UCT agents are classified into: design profiling and material classification agents (determine the 'DNA' of each chip, providing fine-grain visibility of the full distribution at every stage); performance and performance degradation agents (provide visibility of the timing margins in production and lifetime operation - for every strategic location in the chip); operational agents (provide deep visibility of system/software/environmental issues as seen from the chip and diagnostics as to the root cause); and interconnect monitoring agents (provide visibility of die-to-die connectivity in heterogeneous advanced packaging technologies).

The UCT agent readouts are uploaded to the Proteus platform, which performs data analysis using ML, creating actionable insights and alerts of the chipset health as well as the system it is embedded in. During product bring-up and volume testing, chip and system vendors can optimize power-performance per application, improve performance robustness, optimize and track reliability margins, and significantly shorten time to market. Once deployed in the field, service providers can be alerted on faults before failures, reduce maintenance costs and RMAs, optimize system performance, and extend product lifetime.

Proteus enables automated feedback deployment by integrating with existing user platforms to close the loop with learned actionable insights.

Proteus creates a common data language throughout the value chain. This means the data type communicated between on-chip agents and the analytics platform is the same across the system lifecycle, resulting in streamlined data correlation of health and performance. It also allows customers to pinpoint the stage in which the system has faced the problem, unlike existing solutions that offer partial technologies for specific needs in the electronics value chain.

Common data language throughout the supply chain

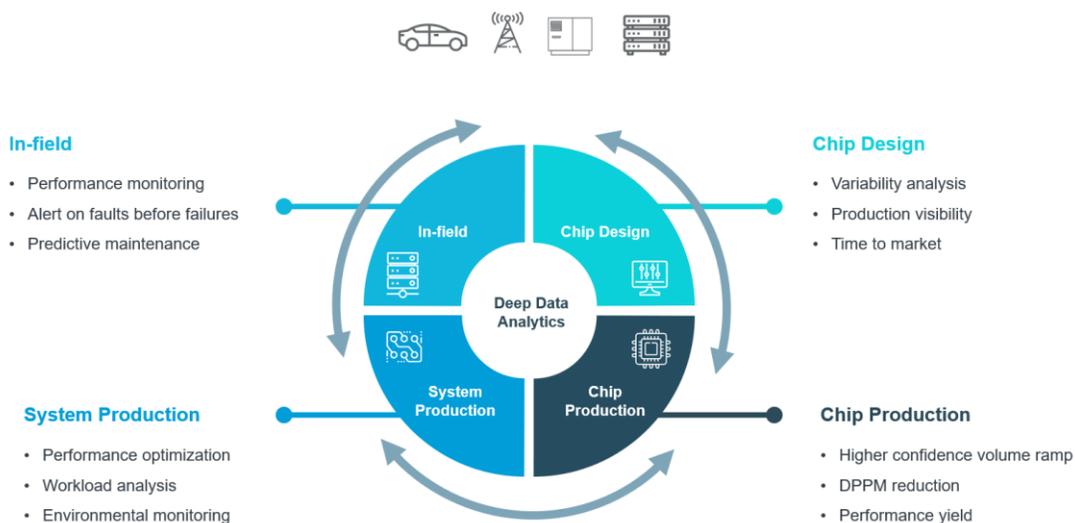


The deep data analytics solution from proteanTecs ensures chip and system visibility from design through production and in-field deployment. Electronics manufacturers and service providers can make data-driven decisions and optimize system performance, power, quality, reliability, and time-to-market, based on the insights derived from the fusion of agent data with ML.

This is especially needed in application markets that are mission-critical, uptime-critical and safety-critical – which have zero tolerance for unplanned downtime or errors, and require extremely high performance, low power and increasing functionality. These include the data center, automotive and communications markets, all transitioning to costly and reputation-driven as-a-service business models.

Frost & Sullivan recognizes that proteanTecs meets customers’ needs by offering a high coverage, high-resolution picture of electronics’ design and manufacturing sensitivities, as well as their operational behavior in mission mode. Its partners value the top performance and business impact of its electronics health monitoring solution.

Full lifecycle health monitoring of advanced electronics



Cutting-edge, User-friendly Electronics Health Monitoring Solution for Mission-critical Applications

proteanTecs has chosen three sectors (data centers, automotive, and Industry 4.0) as primary application markets as they are service-oriented and mission critical. Cloud adoption and the rise in high-performance computing applications drive data centers; electrification, autonomous driving, and advanced driver-assistance systems (ADAS) drive the automotive industry; and automation drives Industry 4.0. In the future, the company plans to expand its offerings to sectors such as mobile, communications and artificial intelligence of things (AIoT)/industrial internet of things (IIoT).

Increasing vehicle electrification, ADAS adoption, and autonomous driving have made the automotive industry a major semiconductor end user. Frost & Sullivan estimates that auto electronics will account for over 50% of a car’s manufacturing cost by 2030. As a result, automotive OEMs and fleet owners are moving toward predictive maintenance instead of the expensive preventive maintenance approach,

which falters significantly in predicting vehicle faults. proteanTecs' UCT is an ideal predictive maintenance solution for mobility systems. It offers actionable insights into the health and performance of various electronic components and electronic control units (ECUs) deployed in vehicles. Moreover, by providing a deep dive analysis of the root cause of problems in the ECUs, fleet owners can reduce operational costs and optimize scheduled vehicle maintenance, increasing productivity.

Technological innovations coupled with domain expertise have allowed proteanTecs to provide meaningful new data to its customers and shed light on phenomena they cannot see today. One of its key benefits for customers is the ease of solution integration with manufacturers' chip designs. The agents can be integrated during the design process without affecting the chip's overall functionality. Before embedding the agents, proteanTecs' custom suite of automated integration tools integrates with the customer's vendor-agnostic electronic design automation (EDA) tools to thoroughly analyze the customer's design. It determines the optimal mix, number, and location of each agent type. As a result, the agents do not hamper the working of the chips when deployed, a major gain for customers.

With advancements in ML, actionable insights on electronics will continue to evolve, enhancing the Proteus platform's predictive analytics offering. The platform comes pre-configured with meaningful dashboards and analytics tailored for typical use cases

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and is also open for algorithm development and user customization for custom-made advanced analytics. The UCT agents operate seamlessly in testing, functional, and mission mode, enabling customers to use them during manufacturing and in the field.

Frost & Sullivan commends proteanTecs' multidisciplinary and full lifecycle approach to ensure the reliability, safety and performance of electronics

used in mission-critical applications such as data centers, networking, and automotive. The domain-infused operation and ability to zero in on the stage at which the problem occurred have been significant drivers for the adoption of the company's technology across a varied clientele.

First-mover Advantage with a Strong Global Presence

Various semiconductor manufacturers, hyperscalers, OEMs, start-ups, application-specific integrated circuits (ASIC) houses, system vendors, and Fortune 100 corporations adopt proteanTecs' UCT-based Proteus platform. The technology is proven in advanced process technology nodes such as 28 nanometer (nm), 16nm, 7nm, and 5nm, at high volumes. The company's solution caters to mission-critical markets where uptime, reliability, and safety are vital. These markets are also highly dependent on advanced electronics that require mega-functionality and complex technologies.

proteanTecs is gradually establishing its presence worldwide with offices in California, Tel-Aviv, New Jersey, Germany, India, and Taiwan. It successfully raised \$150 million in investment since its founding in 2017, recently announcing a \$50 million extension to its Growth Equity funding round led by Koch Disruptive Technologies (KDT), and joined by market leaders MediaTek, Advantest, and Porsche SE. Other investors include Intel Capital, ITI Venture Capital Partners, Viola Ventures, Celesta Capital, Valor

Equity Partners, Atreides Management, Mitsubishi UFJ Capital, and Redline Capital Management S.A. The company will channel the funding toward enhancing the existing solution and increasing adoption and global footprint.

proteanTecs has been associated with various international electronics foundations such as the Facebook-founded Open Compute Project (OCP) that focuses on developing innovative solutions catering to data center infrastructure; TSMC IP Alliance Program, a major segment in TSMC's Open Innovation Platform® (OIP), that aims to provide the semiconductor industry's largest catalog of silicon-verified, production-proven and foundry-specific intellectual property (IP); and the Global Semiconductor Alliance (GSA).

As a new category, the UCT-based Proteus solution for electronics health monitoring offers a significant edge for proteanTecs. The company provides a turnkey monitoring solution across the system lifecycle. Until now, customers only had access to partial solutions in the form of local single-function sensors (home grown or 3rd party) and separate software that applies analytics to pre-existing data. In 2020, proteanTecs progressed from market education to market validation as more customers widely adopted its technology and commercial traction accelerated.

The semiconductor industry is experiencing a consolidation trend of mergers and acquisitions (M&As) and strategic collaborations, leading to combined solutions under the same roof. While competitors are working on possible solutions for electronics health monitoring, proteanTecs has successfully developed and deployed solutions that were strategically built from the ground up, and will continue to lead the industry. It is also notable that no other solution in the market offers a turnkey product similar to proteanTecs. Frost & Sullivan believes proteanTecs will continue to innovate, drive successful execution, and maintain market leadership in coming years compared to its peers.

Conclusion

Semiconductor chips have become a critical entity in today's electronic applications, with mission-critical systems housing multiple key integrated circuits (ICs). Chipset malfunction can lead to and indicate severe hardware failures, resulting in service disruption. Electronics health monitoring is essential to ensure these systems' functional continuity and reliability. proteanTecs offers a unique value proposition in the form of on-chip agents capable of extracting parametric data in various lifecycle stages. The UCT-enabled Proteus deep data analytics platform provides actionable insights and alerts to users along the value chain based on common, correlated, and predictive data. This allows users to take immediate action to maximize profit, ensure uptime, and improve power, performance, and reliability.

For its unrivaled expertise, high-performance and high resolution of the UCT-based Proteus platform, and customer-centric approach, proteanTecs is recognized with Frost & Sullivan's 2021 Technology Innovation Leadership award in the global electronics health monitoring industry.

What You Need to Know about the Technology Innovation Leadership Recognition

Frost & Sullivan's Technology Innovation Leadership Award recognizes the company that has introduced the best underlying technology for achieving remarkable product and customer success while driving future business value.

Best Practices Award Analysis

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization Success: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

