FROST & SULLIVAN

2024 TECHNOLOGY INNOVATION LEADER

IN THE NORTH AMERICAN INTEGRATED VOLTAGE REGULATOR INDUSTRY

MOVELLUS

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. Movellus excels in many of the criteria in the semiconductor power optimization space.

Movellus: Advancing High-Performance Silicon

Traditional voltage regulation solutions fall short as power efficiency and performance improvements become increasingly important differentiators in the fiercely competitive integrated circuits (IC) space. Currently, large processor companies leverage their industry expertise, market experience, and skills to create customized voltage monitoring and frequency regulation solutions in-house, redesigning their circuits for every new processor. Meanwhile, other players lacking the power management expertise to develop their own products (such as silicon vendors) are compelled to combine solutions from multiple suppliers. This issue results in non-optimal systems that do not support any post-silicon changes.

> *"Movellus' key differentiation lies in its unique approach of converting traditionally analog functions into the digital domain and adding a layer of system-level knowledge to solve complicated customer problems. Movellus' digital-first approach empowers it to develop feature-rich and 'synthesizable' intellectual property (IP) cores."*
>
> ***- Himanshu Kashinath Mhatre***
> ***Industry Analyst, TechVision***

In this context, hardware designers and manufacturers seek innovative solutions to identify and mitigate transient supply droop to meet the growing demand for higher performance and lower power systems. Recognizing this market gap, Movellus launched the industry's first integrated turnkey solution for droop response and dynamic voltage and frequency scaling (DVFS).

Founded in 2014 and headquartered in Sunnyvale, California, Movellus advances high-performance silicon by developing patented chip-level architectural innovations. The company's solutions significantly improve system performance and enable the next generation of complex ICs. Movellus' key differentiation lies in its unique approach of converting traditional analog functions into the digital domain and adding a layer of system-level knowledge to solve complicated customer problems. Movellus' digital-first approach empowers it to develop feature-rich and 'synthesizable' intellectual property (IP) cores.

As a result, Movellus' Aeonic™ digital IP platform provides designers with configurable, process-portable IP with a high degree of testability for a wide range of advanced system-on-chip (SoC) applications. The platform solves system-level power and performance optimization challenges, enabling extensive observability and configurability. Customers integrate this critical technology across various process nodes (from 40 nanometers [nm] to 3nm) and multiple applications, ranging from ultra-low power edge artificial intelligence (AI) devices to performance-centric cloud data center compute and networking offerings.

Launched in June 2023, Movellus' Aeonic Integrated Droop Response System™ is the first solution to simultaneously address the challenges of voltage droop and enable fine-grained DVFS capability.[1] The company combines droop detection and compensation into an integrated system, reducing effort while maximizing benefits. The system's observability gives design engineers greater visibility into SoC performance and silicon health, enabling them to make informed decisions and implement optimal silicon life-cycle-management strategies. By extracting maximum improvements from typically overlooked voltage and frequency guardbands, Movellus significantly decreases complex ICs' power consumption and increases operational reliability.

Some key features of the integrated droop response system include[2]:

- Extremely fast time to adapt (detect + respond) for droop with fine-grained clock speed selection and response time for DVFS control
- Industry-first observable droop response system for silicon health and analytics management
- Multi-threshold droop detection
- Support for remote and local droop detection
- APB and JTAG interfaces for silicon health and analytics management during bring-up, production test, and in-field operation

Impressively, Movellus' Aeonic Generate™ AWM2 systems, offered as convenient off-the-shelf synthesizable IP, enable industry-leading total adaptation time with performance comparable to complete custom solutions. The solution can deliver over 10% power savings, making it ideal for complex, power-sensitive SoCs.[3]

[1] https://www.movellus.com/press-release/movellus-announces-industry-first-integrated-droop-response-system-for-socs/, accessed November 2023.
[2] Ibid.
[3] Ibid.

As evidenced by its breakthrough integrated droop response system, Movellus believes in driving its technology roadmap to address customer problems without existing solutions. The company propels these efforts by fostering a culture promoting innovation and creativity. To this end, Movellus strongly emphasizes 'Team' spirit, a democratic approach, and ongoing cross-functional collaboration through several formal and informal avenues, including innovation forums, 'lunch and learn' sessions, product planning meetings, and biweekly roadmap meetings. The company incentivizes employees across all teams, including technical, marketing, and sales, to identify unmet customer needs and support new idea generation. Movellus funnels these insights into its Michigan- and Toronto-based research and development (R&D) centers to develop and launch several new products, including the Aeonic Insight™ Droop Detector released in November 2023.[4]

Technology Helps Business Growth

Movellus solves system level challenges for large SoCs with aggressive power targets, maintaining a steadily growing client base with customers such as Esperanto Technologies, Syntiant, Achronix, and Everactive. The company designs its solution to improve power consumption and optimize performance across applications in high-power processors (graphics processing units, AI accelerators, and high-performance computing processors), battery-powered devices, and harsh environments requiring mission-critical reliability. Moreover, Movellus' technology is foundry-agnostic, improving its overall applicability.

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- Sama Suwal
Best Practices Research Analyst

The company drives exceptional experiences for these customers by aligning operations across the organization through initiatives such as regular cross-functional pipeline reviews. These efforts ensure the entire team has visibility into company operations, empowering it to plan deployments accordingly. Moreover, Movellus' sales teams, field application engineers, technical experts, and customer success teams collaborate to stay updated with evolving market trends and emerging customer needs. The company also continually refines its go-to-market strategies to support customer acquisition. Finally, Movellus engages with its potential customer base by participating in trade shows and industry events.

Movellus' differentiated technology, robust product roadmap, and customer-centric approach continue to support its growth. In September 2022, the company disclosed the successful completion of a Series B funding round, raising $23 million. This round attracted participation from new investors, namely MESH and SK Hynix, and existing investors, including Accelerate Blue Fund, Candou Ventures, Hui Capital, Intel Capital, In-Q-Tel, Michigan Capital Network, and Stata Ventures. Movellus intends to leverage these funds

[4] https://www.movellus.com/press-release/movellus-introduces-aeonic-insight-product-line-for-on-die-telemetry/, accessed November 2023.

to expand its ongoing R&D efforts and extend its marketing and sales functions to support its growth plans.[5]

Moving forward, Movellus strives to continue its growth trajectory to achieve three to four times year-on-year growth over the next three years. The company's well-thought-out product roadmap with several planned new releases and the industry's growing inclination towards outsourcing IP core needs support its growth aspirations. Frost & Sullivan believes Movellus is well-positioned to enable the integrated voltage regulator space into its next growth phase, capturing market share and sustaining its leadership in the coming years.

Conclusion

Technology is a critical success factor for the semiconductor power optimization market. Yet, with many options available, market stakeholders need to leverage the most appropriate and best technology-based solutions to optimize their market impact.

Movellus advances high-performance silicon by developing patented chip-level architectural innovations that significantly improve system performance, enabling the next generation of complex integrated circuits (IC). The company's unique approach empowers it to develop feature-rich and 'synthesizable' intellectual property cores by converting traditionally analog functions into the digital domain.

Specifically, Movellus offers Aeonic Integrated Droop Response System™, the industry's first integrated turnkey solution for droop and dynamic voltage and frequency scaling response. It combines droop detection and compensation into an integrated system, reducing effort while maximizing benefit. By extracting maximum improvements from typically overlooked voltage and frequency guardbands, Movellus' integrated droop response system significantly decreases complex ICs' power consumption and increases operational reliability.

Movellus stands out from competitors based on its commitment to innovation and creativity while achieving commercial success. The company designs its solution to improve the overall power consumption and optimize performance across applications in high-power processors, battery-powered devices, and harsh environments that require mission-critical reliability. Moreover, Movellus' technology is foundry-agnostic, improving its overall applicability.

With its strong overall performance, Movellus earns Frost & Sullivan's 2024 North America Technology Innovation Leadership Award in the semiconductor power optimization market.

[5] https://www.movellus.com/press-release/movellus-secures-23m-in-series-b-funding-to-accelerate-growth/, accessed November 2023.

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

About Frost & Sullivan

Frost & Sullivan is the Growth Pipeline Company™. We power our clients to a future shaped by growth. Our Growth Pipeline as a Service™ provides the CEO and the CEO's growth team with a continuous and rigorous platform of growth opportunities, ensuring long-term success. To achieve positive outcomes, our team leverages over 60 years of experience, coaching organizations of all types and sizes across 6 continents with our proven best practices. To power your Growth Pipeline future, visit Frost & Sullivan at http://www.frost.com.

The Growth Pipeline Engine™

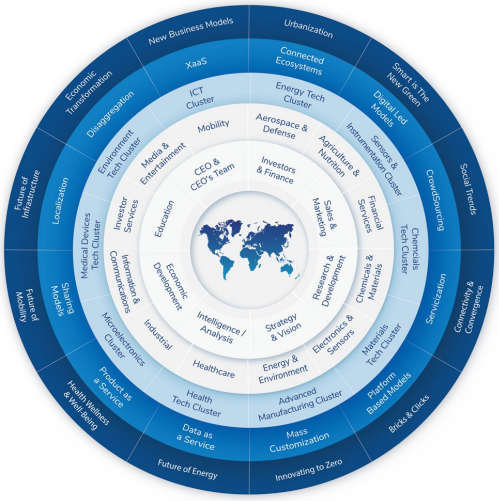
Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™.
Learn more.

Key Impacts:

- **Growth Pipeline:** *Continuous Flow of Growth Opportunities*
- **Growth Strategies:** *Proven Best Practices*
- **Innovation Culture:** *Optimized Customer Experience*
- **ROI & Margin:** *Implementation Excellence*
- **Transformational Growth:** *Industry Leadership*

The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.



- Mega Trend (MT)
- Business Model (BM)
- Technology (TE)
- Industries (IN)
- Customer (CU)
- Geographies (GE)