COgITOR
Pioneering liquid cybernetic computing

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Europe stands at the edge of a new computing era. The **COgITOR project**, funded under Horizon 2020 (Grant Agreement 964388), marks a decisive shift from silicon-based systems to **liquid cybernetic computing**: resilient, sustainable, and future-ready. Applications span from **healthcare diagnostics to food analytics and extreme environments**, with transformative potential to deliver both scientific breakthroughs and market-ready solutions.

COgITOR is more than research: it is **Europe's commitment to strategic autonomy and technological excellence**, designed to deliver competitive advantage in tomorrow's most demanding markets.

Take the Lead!
Join the COgITOR revolution.

COgITOR is more than innovation: it is Europe's commitment to strategic autonomy, sustainability, and technological excellence in action. Step in today to forge powerful partnerships, access competitive funding, and drive the creation of groundbreaking applications in liquid cybernetic computing.

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Strategic intelligence driving market impact

At the core of **COgITOR** is the **Strategic Innovation Services (SIS) team from PNO Innovation**. While project partners engineer advanced AI solutions, SIS ensures that these innovations are **anchored in real-world needs and adoption pathways**.

Our value creation model is built on four strategic pillars that translate innovation into measurable impact:

Opportunity

Identifying relevant opportunities through our **data-driven** tools to achieve comprehensive **technology and market intelligence**.

Influence

Mapping **stakeholder and competitor dynamics** to clarify positioning within evolving innovation ecosystems.

Activation

Accelerating implementation via strategic partnerships, benchmarking, and targeted **open innovation initiatives**.

Uptake

Enabling systemic adoption by supporting **business development, EU project participation, and navigating policy and funding pathways**.

How we add value

In COgITOR, our SIS Team has:

Led **Exploitation** of project results, maximising European-level visibility, coordinating market and stakeholder analysis, and ensuring strategic uptake of the **flagship solutions across food, health, and extreme environment sectors**. This included producing two formal WP6 deliverables[1]:

- D6.4 **Stakeholder Analysis**, enabled by PNO's proprietary **Wheesbee** data-driven analytics platform
- D6.7 **2030 Visionary and Technology Roadmap**

Showcased the project through Dissemination & Communication activities at major European events, including:

- **ECOMONDO 2025 (Rimini, Italy – 4–7 November 2025):** PNO Innovation Italy will join with its own stand at Europe's benchmark event for green and circular economy innovation, promoting COgITOR and engaging directly with industry decision-makers.

- **EFF2025:** COgITOR will be presented at the European Future Forum 2025, offering a unique opportunity to share insights, exchange experiences, and connect with stakeholders driving sustainable innovation.

- **ECOMONDO 2024 (Rimini, Italy – November 2024):** The project was showcased at the Green Technology EXPO, attracting numerous stakeholders eager to learn about its innovative cybernetic computing systems.

- **ECOMONDO 2023 (Rimini, Italy – November 2023):** Featured at the 26th edition of Europe's leading Green Technology EXPO, COgITOR generated strong interest from stakeholders in the fields of circular economy, industrial technologies, and sustainable processes.

Four flagship solutions shaping next-gen computing

COgITOR delivers four flagship solutions of the project:

1	**2**	**3**	**4**
Liquid State In-Memory Computing System (IIT)	New Computation Material	Soft Thermogalvanic Cell (EPFL)	Self-Healing Skin (IIT)
neuromorphic, resilient, eco-efficient computing.	multifunctional for advanced memory, sensing, and energy harvesting.	flexible, sustainable, and self-healing for energy harvesting.	transparent, scalable, and autonomously self-healing at room temperature.

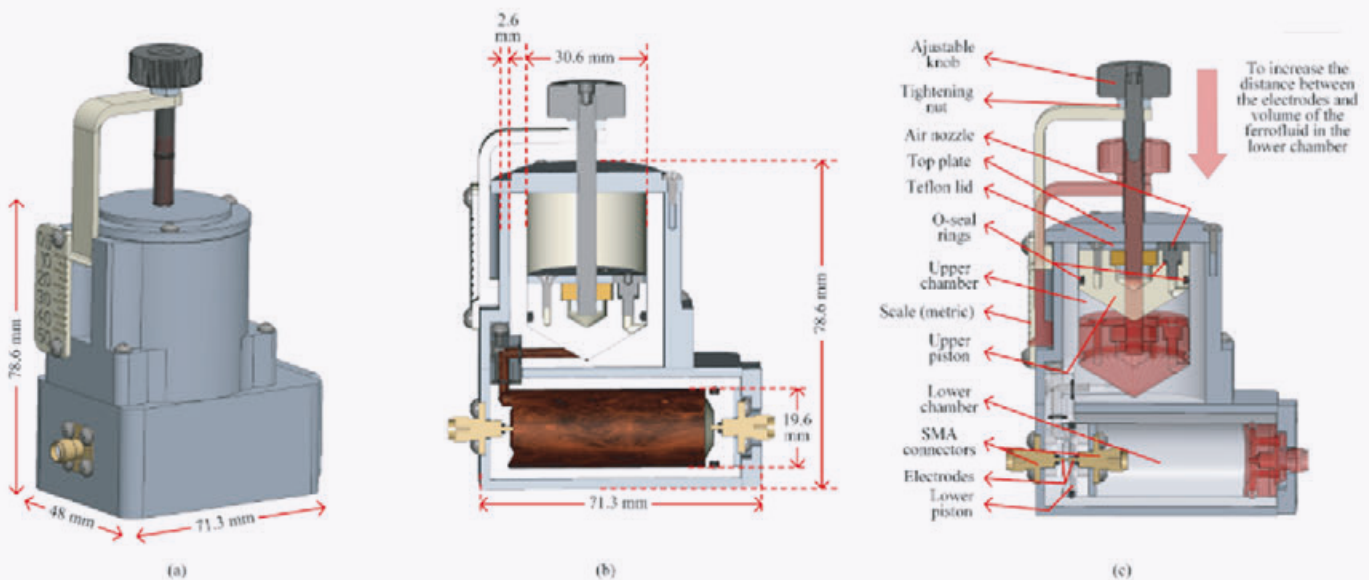Together, these four flagship innovations form the technological backbone of liquid cybernetic computing, ready to address high-growth markets in food analytics, healthcare diagnostics, and extreme computing.

(Flagship Solutions 2–4 remain critically important, each offering a compelling business proposition and considerable readiness for commercial utilisation. Our experts are available to provide comprehensive insights into these advanced solutions and discuss opportunities for strategic engagement.)

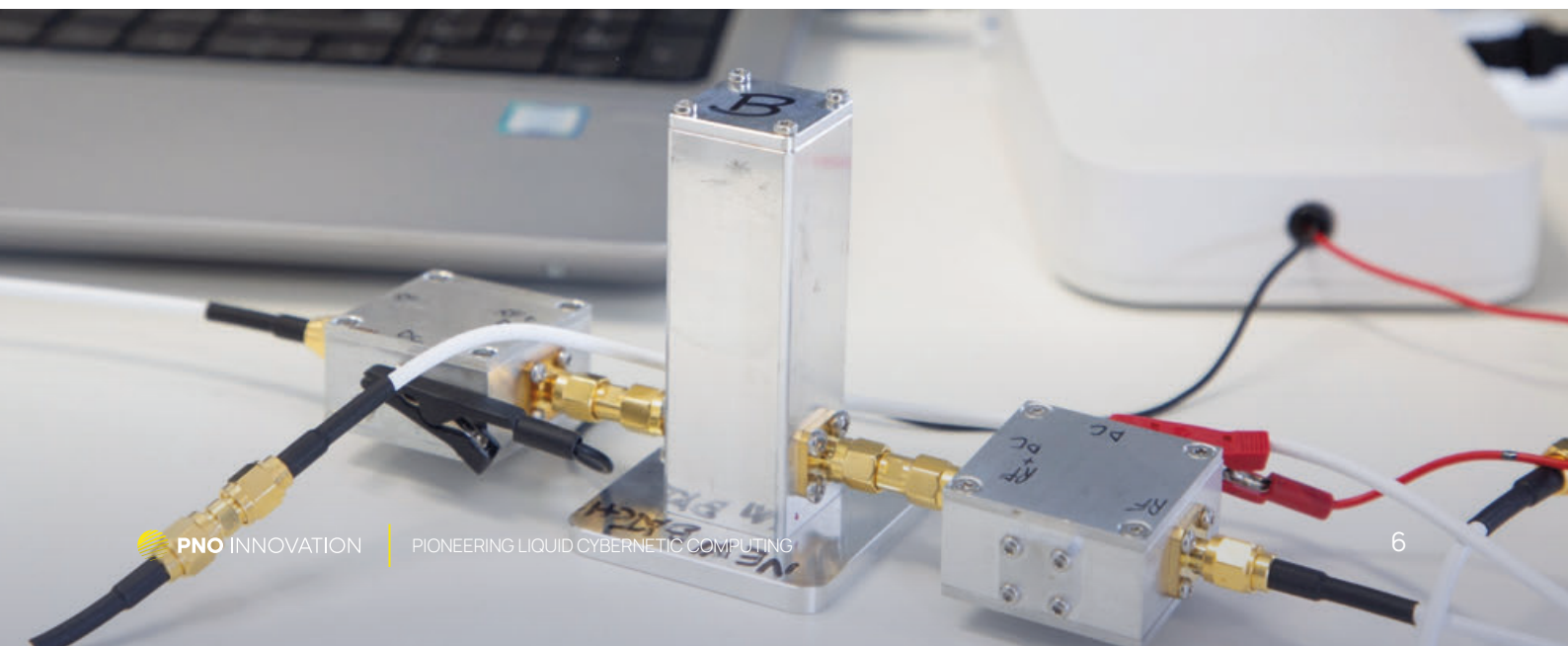# Liquid in-memory systems: a leap beyond silicon

COgITOR's Liquid State In-Memory Computing System represents a disruptive leap beyond traditional computing platforms. Leveraging colloidal liquids, this novel system by IIT integrates reservoir computing principles, mimicking neural networks' adaptive, fault-tolerant capabilities. Unlike conventional rigid silicon systems, this approach thrives in extreme conditions, from outer space to nuclear environments, making it uniquely positioned for future-proof resilience.

Liquid State In-Memory Computing System. Vial with variable volume. (a) 3D view of the vial, (b) Lateral view of the vial, © Lateral view of the vial where the positions of maximum and minimum distance between the electrodes are highlighted.

Liquid State In-Memory Computing System. Vial with fixed volume.

Market opportunities: from food to space

Alimentary liquids: pioneering food quality assurance

The global demand **for precise, real-time sensory analytics in food production** (especially within wine, olive oil, and dairy industries)[1] is rapidly expanding.[2] COgITOR's solution **provides unmatched sensitivity and accuracy** in detecting organoleptic qualities through advanced sensory technologies like electronic noses and tongues, spectroscopy, and AI-driven analysis.

Market entry strategy: start with European viticulture, scaling from **10 farms to 600 within five years** across Italy, France, Spain, and Greece. This positions COgITOR as a driver of **quality assurance, traceability, and premium market value** in Europe's most competitive food sectors.
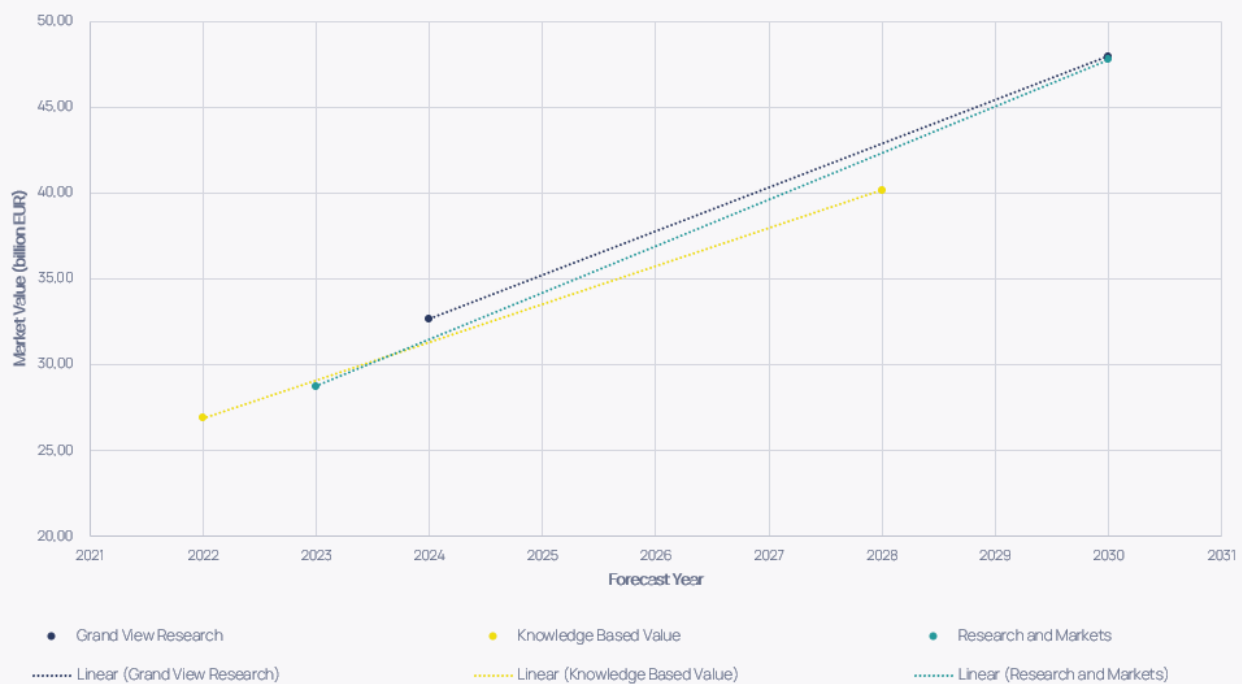

Alimentary Liquids from the Food Sensory Analytics Market Forecast.

Healthcare diagnostics: transforming biological fluids analysis

The biological diagnostics sector is projected to surpass **€47 billion by 2030**[4]. The innovative system delivers **rapid, reliable, and minimally invasive** testing of biological fluids[5], crucial for detecting diseases and monitoring therapeutic efficacy in cancer treatments[6].

Strategic advantage: validated through early collaboration with institutions like the **National Center for Oncologic Hadron Therapy (CNAO)**, COgITOR's solutions align with the shift toward **personalised medicine** and will accelerate adoption across clinical diagnostics.
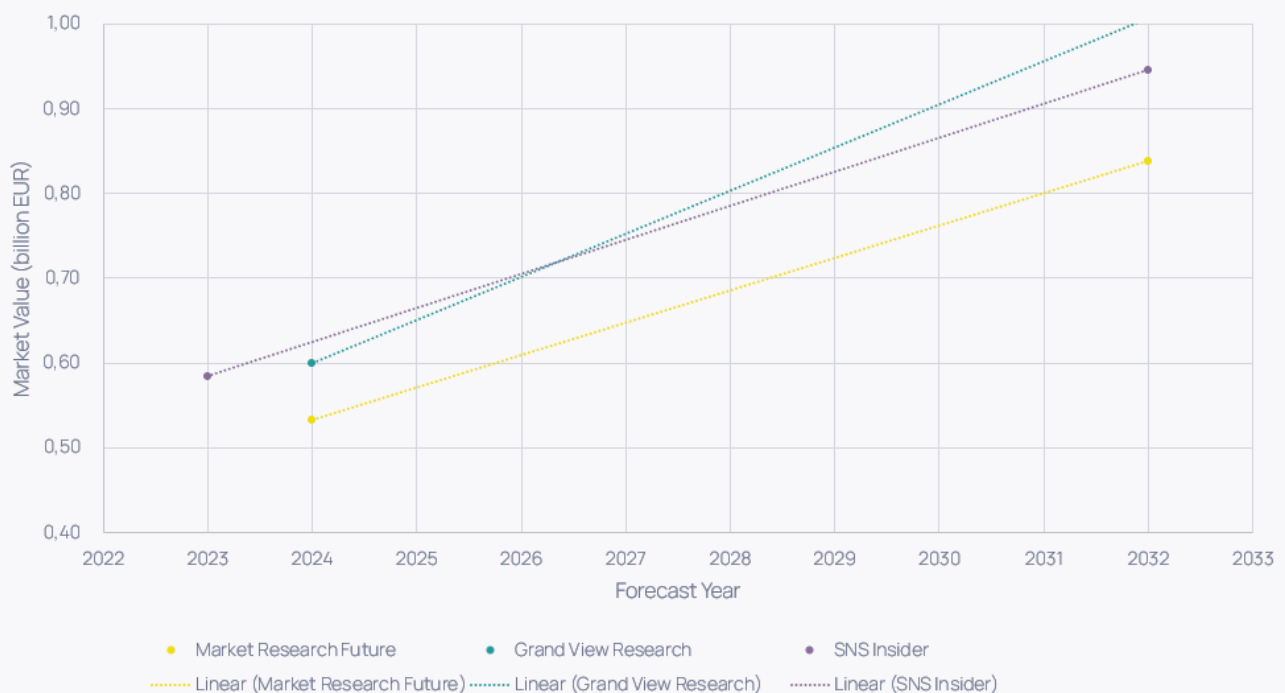

Biological Fluids Collection and Diagnostic Market Forecast

Extreme environment computing: next frontier for robust technology

As deep-space exploration, advanced physics, and defence programmes expand[7], the need for **ultra-resilient computing systems**[8] is rising fast, with CAGR projections up to **15% through 2030**[9], COgITOR's liquid cybernetic systems are engineered to endure radiation and extreme conditions where silicon fails.

Market opportunity: positioned for **aerospace, defence, and high-energy physics**[10], COgITOR's solutions offer **future-proof resilience** and the potential to become a preferred partner for agencies and corporations pursuing critical missions in extreme environments.

Extreme Environment Computing Market Forecast

Path to market: roadmap & investment outlook

By strategically extending its roadmap through 2035, **COgITOR** aims to align closely with market dynamics, technological advances, and regulatory shifts. This extended timeline provides the opportunity to rigorously validate technological solutions, ensure comprehensive regulatory compliance, and build strategic alliances with industry leaders, stakeholders, and policymakers.

The project forecasts cumulative market revenues to reach **€4.8 million** within five years post-project initiation, reflecting robust growth across diverse sectors:

Alimentary liquids analytics (€2.9M)
Leveraging innovative sensory analytics technology, the project anticipates substantial growth in European markets driven by stringent quality standards, growing consumer preferences for premium and traceable food products, and increased industry adoption of AI-driven analytics solutions. Targeted strategic engagements with key wine-producing regions are expected to significantly enhance market penetration.

Biological fluid diagnostics (€1.1M)
Rapid advancements in healthcare, the rising incidence of chronic diseases, and the demand for personalised medicine underpin growth projections in this sector. The project's minimally invasive, precise diagnostic solutions are well-positioned to capitalise on healthcare providers' need for fast, reliable, and patient-centric diagnostics. Collaborative initiatives with leading healthcare institutions and diagnostics laboratories will further accelerate market adoption.

Extreme computing environments (€0.8M)
With global investment intensifying in space exploration, defence, and high-energy physics research, the robust computing solutions tailored for extreme environments will witness significant market uptake. The technology's superior resilience to radiation and extreme environmental conditions positions the project strategically to become a preferred partner for agencies and corporations pursuing ambitious missions and critical infrastructural projects.

Strategic takeaways for decision-makers

Key Takeaways:

Revolutionary liquid-state computing innovation for extreme resilience and adaptability

Significant market opportunities in food analytics, healthcare diagnostics, and extreme environment applications

Strategic roadmap aligned with technological advancements and market dynamics

Robust revenue growth projections supported by targeted market strategies

Act now: seize the opportunity to lead

The COgITOR project represents more than innovation: it embodies Europe's commitment to **strategic autonomy, sustainability, and technological excellence.**

Your options for engagement:

Lead the market
Partner with PNO Innovation to unlock strategic alliances and funding pathways.

Accelerate exploitation
Work with us to scale COgITOR's flagship solutions into high-value markets.

Future-proof your strategy
Position your organisation at the forefront of Europe's computing revolution.
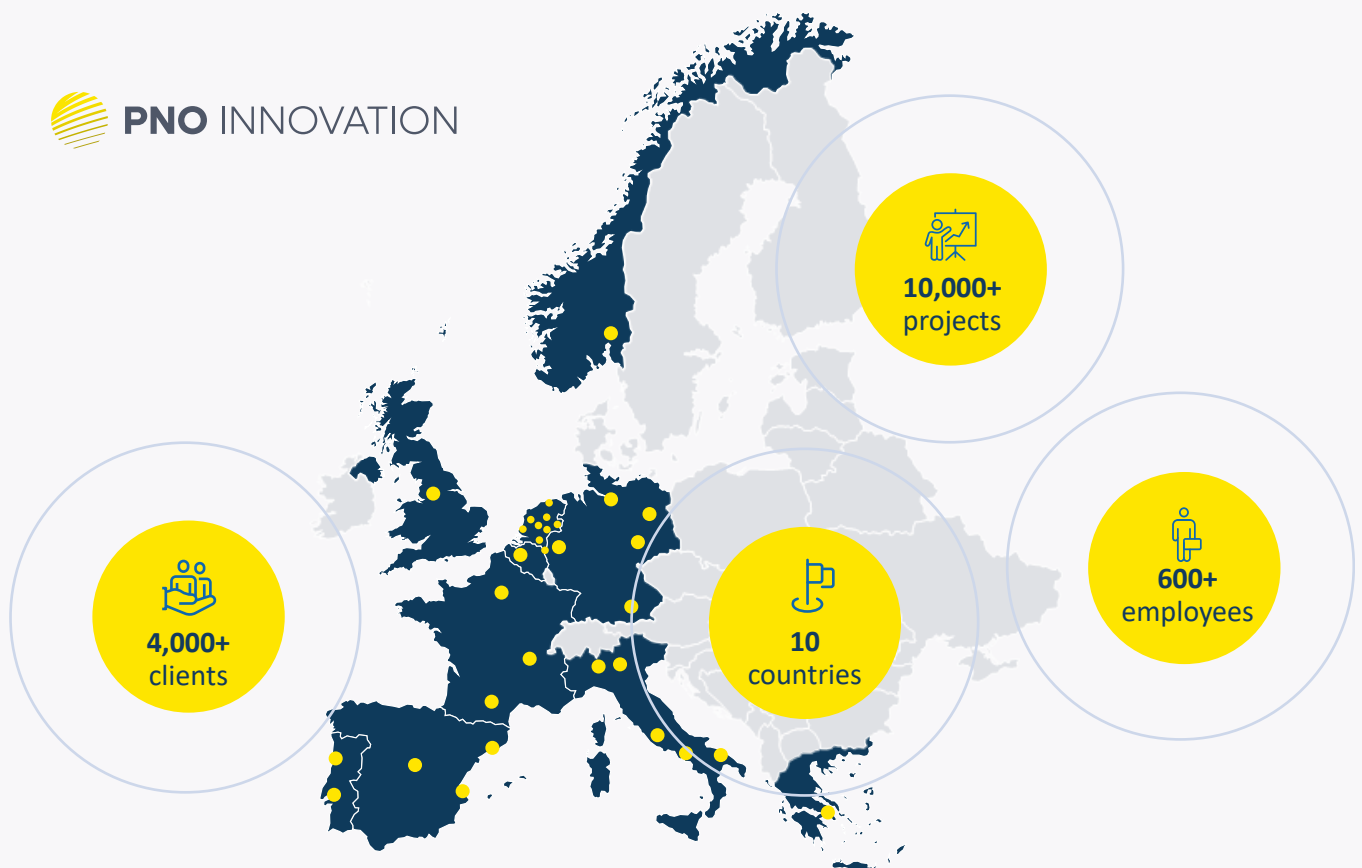
Why PNO Innovation

The success of COgITOR's dissemination and exploitation is powered by **data-driven analysis from the Strategic Innovation Services team** and the **deep expertise of PNO Innovation consultants**. By bridging **innovation intelligence with market strategy**, PNO

Innovation ensures EU-funded projects like COgITOR deliver sustainable impact. When you collaborate with us, you gain more than insights: you gain a partner who **knows the funding landscape, the stakeholders, and the market forces shaping Europe's technology future**.

Connect with the **Strategic Innovation Services Team** to explore tailored strategies and realise the potential of liquid cybernetic computing.

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PNO INNOVATION

10,000+
projects

4,000+
clients

10
countries

600+
employees

Footnote

[1] European Commission. (2025). COgITOR – A new COlloidal cybernetIc sysTem tOwaRds 2030 (Project ID: 964388) Results. Retrieved from CORDIS: https://cordis.europa.eu/project/id/964388/results

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[6] Knowledge Based Value. (2023). **Global Body Fluid Collection and Diagnostics Market Size, Share & Industry Trends Analysis Report by Product, by Technology, by Sample Type, by Application (Diagnostics & Monitoring, Therapeutic Decision Making and Prognostics & Screening), by Regional Outlook and Forecast, 2022 - 2028**. Retrieved from Knowledge Based Value: https://www.kbvresearch.com/body-fluid-collection-and-diagnostics-market/

[7] Market Research Future. (2025). **Rugged Servers Market Research Report Information by Component (Hardware, Software, Services), by Type (Dedicated, Standard), by Capacity (< 256 GB, 256 GB-512 GB, 512 GB-1 TB, >1 TB), by Application (Military & Defense, Industrial, IT & Telecommunication, Aerospace, Energy & Power and Others) and by Region (North America, Europe, Asia-Pacific, and Rest Of The World) - Industry Size, Share, and Forecast Till 2032**. Retrieved from Market Research Future: https://www.marketresearchfuture.com/reports/rugged-servers-market-10474

[8] SNS Insider. (2022). **Rugged Servers Market Size, Share & Segmentation by Offering (Hardware, Software, Services) by Type (Standard, Dedicated) By Memory Size (< 256 > 512 GB–1 TB, >1TB) by Application (Military and Aerospace, Industrial, Marine, IT and Telecommunication, Energy & Power, Others), by Regions And Global Forecast 2024-2032**. Retrieved from SNS Insider: https://www.snsinsider.com/reports/rugged-servers-market-2359

[9] Global Data. (2022). **Extreme Environment Computing Market Analysis and Forecast, 2022-2030**.

[10] Grand View Research. (2023). **Rugged Servers Market Size, Share & Trends Analysis Report by Offering (Hardware, Software, Services), by Type, by Memory Size, by Application, by Region, and Segment Forecasts, 2024 - 2030**. Retrieved from Grand View Research: https://www.grandviewresearch.com/industry-analysis/rugged-servers-market-report

Connect with our experts

Are you prepared to pioneer liquid-state computing and secure a leadership position in Europe's future technology markets?

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Connecting innovation and meaningful impact.

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