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Redefining Healthcare through genome quantum computing advances innovation and HPC role in APAC

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Kumar Mitra, Executive Director & General Manager, CAP & ANZ, Infrastructure Solutions Group, Lenovo The adoption of population genomics, newborn sequencing, and AI-augmented diagnostics is advancing across Asia Pacific and ASEAN, driven by the region's high burden of genetic and rare diseases where earlier intervention can significantly improve long-term outcomes. Future innovation in this space will prioritize scalability, efficiency, and accessibility to enable broader adoption of genomics while ensuring sustainability.

The rapid evolution of genome sequencing is redefining healthcare by enabling transformative progress in diagnostics, drug discovery, and precision medicine. Across the APAC region, healthcare leaders are intensifying efforts to leverage genomic data as a cornerstone of innovation, driven by the need to process and analyze vast datasets with unprecedented speed.

High-Performance Computing (HPC) and AI are pivotal in this shift, slashing genome analysis time from days to minutes and empowering researchers, clinicians, and pharmaceutical companies to advance precision medicine, cancer research, and drug development. These technologies are also instrumental in addressing healthcare access challenges in emerging APAC markets, making advanced tools more scalable and cost-effective.

With quantum-enabled platforms and HPC-AI synergies accelerating breakthroughs, the region is at the forefront of reshaping healthcare innovation. The ability to decode trillions of DNA base pairs efficiently supports population-scale genomics and national health programs, demonstrating how advanced technologies can bridge gaps in care delivery. As healthcare systems increasingly adopt these tools, the potential for real-time discoveries to save lives and improve global health equity continues to grow, underscoring the critical role of HPC and AI in driving the future of healthcare across APAC.

In an exclusive interaction, **Kumar Mitra, Executive Director & General Manager, CAP & ANZ, Infrastructure Solutions Group, Lenovo** shared furthur insights on *accelerating Genomics and Precision Medicine through Innovation in Asia and beyond.*

- **How is genome sequencing transforming diagnostics and precision medicine in the Asia Pacific region?**

Genome sequencing is enabling healthcare systems to move towards population-scale discovery and more proactive, data-driven care. It is shifting healthcare from reactive treatment to earlier detection, risk prediction, and more personalized interventions.

Across Asia Pacific and ASEAN, we are seeing growing adoption of population genomics, newborn sequencing, and AI-augmented diagnostics. This is important because the region carries a high burden of genetic and rare diseases, and earlier intervention can significantly improve long-term outcomes.

At the same time, advances in bioinformatics infrastructure are making genomics more scalable and accessible. For instance, leading institutions such as the University of Delhi, one of India's top research universities, are nowprocessing a 30× human genome in just 1.3 hours, achieving a 36× speed-up that allows both plant omics and human disease programs to scale dramatically. This reflects a shift in APAC's bioinformatics infrastructure, moving away from one-size-fits-all medicine toward more predictive, preventive, and personalized healthcare across the region.

- **What are the key challenges healthcare providers face in processing and analyzing large volumes of genomic data?**

The main challenges are data fragmentation, infrastructure constraints, skills gaps and governance complexity. Many healthcare organizations still operate in fragmented, inconsistent, and hard-to-govern data environments, which limits their ability to process genomic information efficiently and scale AI-driven analysis.

Most existing healthcare IT environments were not designed for high-volume genomics, multi-omics and GenAI workloads, creating bottlenecks in compute, storage and system integration.

In addition, providers must navigate privacy, security and cross-border compliance requirements while ensuring data remains accessible, auditable and protected across edge, core and cloud environments.

- **What trends in AI and HPC adoption are shaping the future of healthcare innovation in the APAC region?**

First, AI and machine learning are increasingly being embedded into genomics pipelines for variant calling, classification, and multi-omics integration. Hybrid infrastructure is becoming more important because it provides the right balance of performance, privacy, speed and scale, allowing sensitive data to remain on-premises while still supporting collaboration, model updates and broader analytics.

Second, high-performance computing is evolving towards more efficient, genomics-optimized platforms that can deliver strong performance at lower cost and support cutting-edge research. We are witnessing growing demand for consumption-based models, which make advanced compute more accessible to hospitals and research institutes.

Recent statistics indicate, AI adoption in APAC healthcare is accelerating rapidly, with organizations prioritizing investments that improve clinical outcomes and operational efficiency.

- **What role do advanced solutions like GOAST play in reducing the time required for genome analysis, and how does this impact clinical decision-making? In what ways can High-Performance Computing (HPC) and AI address the scalability issues of genomic analysis?**

Advanced solutions like Genomics Optimisation and Scalability Tool (GOAST) are significantly effective in optimizing compute architecture for genomics workloads – capable of reducing whole genome analysis time from around 40 hours to just about 23.5 minutes. Capable of processing 30x whole genomes at a throughput rate of up to 2.5 samples/hour and 50x whole exomes at 60 samples/hour, it allows labs to significantly increase productivity and throughput while reducing to time to insight. Faster analysis means clinicians can iterate more quickly, validate suspected disorders sooner and identify causal mutations earlier. This improves the speed at which genomic insights can inform diagnosis and supports more timely clinical decision-making.

Furthur, scalability in genomics is fundamentally a compute, storage, and data movement challenge - this is where HPC and AI play a complementary role. HPC enables parallel processing of large sequencing datasets, addressing bottlenecks across compute and I/O, while AI enhances pipeline efficiency through improved variant detection, prioritization, and interpretation. Building on this, we focuses on purpose-built, bioinformatics-optimized infrastructure with solutions like GOAST integrate tuned compute, high-throughput storage, and pre-validated pipelines to maximize utilization and throughput - helping organizations scale without a proportional increase in cost or complexity. This is further enabled by Lenovo's hybrid, edge-to-cloud approach, allowing organizations to balance performance, data sovereignty, and collaboration as genomic workloads continue to grow.

- **How do healthcare organizations measure the ROI of AI and HPC investments in genomics, and what metrics are most significant?**

ROI in genomics is increasingly measured across clinical outcomes, operational efficiency, and scalability. Clinically, organizations focus on improvements in diagnostic yield and the ability to support more precise and timely interventions. Operationally, key metrics include throughput, cost per sample, infrastructure utilization, and workflow efficiency.

Beyond this, there is a growing focus on long-term value - ensuring infrastructure can support increasing data volumes, multi-omics workloads, and evolving AI models without frequent redesign or reinvestment. From a Lenovo perspective, this is where optimized system design and consumption-based models like TruScale play a role - enabling organizations to align cost with usage while maintaining flexibility to scale innovation.

- **What are the broader implications of quantum-enabled platforms in accelerating therapy discovery, and how might they integrate with existing HPC and AI systems?**

Quantum computing introduces new possibilities in areas such as molecular simulation and complex biological modeling, particularly where classical systems face computational limits.

However, in the near term, the impact will come from hybrid models. HPC will continue to underpin large-scale data processing, AI will drive insights and prediction, and quantum will be applied selectively to highly complex optimization problems. An open, flexible infrastructure allows organizations to integrate emerging technologies like quantum computing with existing HPC and AI systems, enabling gradual adoption while preserving value from current investments. This approach supports scalability and innovation in fields such as genomics and healthcare without disrupting operational efficiency and we follow similar approach.

- **How can collaborations between technology providers and healthcare institutions drive more efficient use of genomic data?**

Efficient use of genomic data depends on how well it is integrated, processed, and translated into actionable insights - not just how much is generated. Collaborations enable co-design of architectures and pipelines tailored to real-world genomics workflows, reducing data fragmentation, improving interoperability, and streamlining data movement across sequencing, analysis, and clinical systems.

This means aligning infrastructure with bioinformatics tools to maximize throughput, minimize redundancy, and enable seamless data access across edge, core, and cloud. Lenovo's ecosystem and AI Innovators program further support standardized pipelines, faster validation, and secure data sharing - helping organizations move from siloed environments to scalable platforms where genomic data is continuously utilized for clinical and research impact.

- **What ethical or regulatory considerations should be prioritized when implementing AI and HPC in healthcare genomics?**

As genomic data scales, maintaining trust becomes critical. Organizations must prioritize strong data protection, governance, and compliance - particularly around data residency and cross-border data flows. This is increasingly important in APAC, where regulatory environments are evolving rapidly. We addresses this through a secure, end-to-end approach spanning device, data center, and cloud, supported by trusted supply chain practices.

At the same time, responsible AI deployment is essential - ensuring transparency, explainability, and addressing bias in datasets. Insights from Lenovo's CIO Playbook 2026 highlight that healthcare leaders see governance and data security as foundational to scaling AI, not just compliance requirements. Together, a robust governance framework and secure hybrid infrastructure are key to balancing innovation with trust.

On the other hand, the balance is shifting from a trade-off to a model where efficiency enables innovation as genomic technologies continue to advance. Advances in workload-optimized infrastructure are improving performance while reducing cost per analysis. Solutions like GOAST are designed to enhance throughput and utilization, helping control cost and complexity. At the same time, consumption-based models such as TruScale are lowering barriers to entry, allowing organizations to scale HPC and AI capabilities without significant upfront investment. Lenovo's CIO Playbook reinforces this shift - with healthcare leaders increasingly prioritizing investments that deliver both operational efficiency and measurable outcomes.

Going forward, innovation will be defined by scalability, efficiency, and accessibility - enabling broader adoption of genomics while maintaining sustainability.

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