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# Technology company delivers cutting-edge medical insights with SQL Server 2019 Big Data Clusters

Customer

Systems Imagination

Products and Services

Azure Kubernetes Service

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SQL Server 2019

SQL Server 2019 Big Data Clusters

Industry

Partner Professional Services

Organization Size

Small (1 - 49 employees)

Country

United States

October 25, 2019

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Systems Imagination uses big data to discover new tiers of medical insights unobtainable through conventional means. In order to gain the distributed computing power it needed, the company adopted Microsoft SQL Server 2019 Big Data Clusters. Now it delivers results based on petabytes of data to its customers within hours, while simultaneously keeping operating costs low.



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—Chris Yoo: CEO

Systems Imagination

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Systems Imagination came into existence five years ago as a technology startup. The young company had an ambitious goal: gather massive amounts of biomedical data, much of it readily available to the public, and transform it into insights for researchers. Crafting a solution capable of delivering on that promise would, of course, require some ... imagination. The company created a specialized database called a hypergraph, which uses a hierarchical approach as it processes information—much the same way the human brain does.

A typical graph comprises data points and linear progressions depicting how these data points relate to each other. In the hypergraph created by Systems Imagination, each data point can have multiple data relationships, meaning a visual representation of it would look a lot more like a neural network than a series of lines meandering across a two-dimensional piece of paper. Research suggests that subnets of these complex relational networks support the human ability to reason. Therefore, by giving the hypergraph a similar structure for processing biomedical data, Systems Imagination aimed to develop a solution capable of discovering new relationships between genes through a layered understanding of similar, known genetic relationships.

To say these calculations are complex would be a gross understatement. A single ask from one of the company’s customers could involve data from clinical trials, genome sequences, the full history of a given disease and how it interacts with patients, and all of the scientific literature ever produced on the subject. “We needed a battle-tested, hyper-scalable computing

solution that we could easily adapt for use with our technology,” says Chris Yoo, CEO of Systems Imagination. “That’s exactly what we got with Microsoft SQL Server 2019 Big Data Clusters.” Using Big Data Clusters, Systems Imagination can access unstructured big data within the same cluster, enabling the hypergraph to rapidly traverse and query all of the available data in a single pass.

## Unlocking hidden understanding

As a startup, Systems Imagination considered a wide array of business models and solutions, including the other major players in the public cloud space. “We tried a number of the options before us,” says Yoo. “There were open-source solutions, modern data management tools, and even a business model that put our products in the hands of researchers themselves. But when we examined how they handled the three Vs of big data—variety, velocity, and volume—nothing came close to Big Data Clusters.”

To provide an example of the data requirements Systems Imagination needs for its work, let’s examine something called The Cancer Genome Atlas (TCGA). This public resource contains more than 11,000 cancer genomes. It is a petabyte-scale resource, and it just might hold the key to understanding how cancer changes DNA in order to develop and spread. A number of database solutions could potentially sift through this amount of data and distill it down to what matters for a patient’s individual case. It is an altogether more difficult task to take the sum of TCGA data and integrate it with dozens of other equally massive data sources to quickly identify currently undiscovered relationships between types of cancer, their treatment options, and an individual patient’s DNA.

“To find the unknown unknowns of cancer, you need a database structure capable of keeping track of all the relationships between data points while also dealing with the scale of your data sources,” says Yoo. “Big Data Clusters had the tried and tested functionality of the latest SQL Server, the ability to train neural networks with AI, and easy interoperability with the full capabilities of other Microsoft

data management technologies, like Power BI. That's the kind of solution we need to solve our customers' problems."

## Assuring access while strengthening security

Since adopting Big Data Clusters, Systems Imagination has used the scalability and security capabilities of the cloud to great effect, both for the business itself and for its customers. In Big Data Clusters, the company can easily configure its deployment and scale services to accommodate various workload requirements, a capability it has used to deliver complete analyses to existing customers more quickly. New customers looking for proof-of-concept experiments requiring less data can expect to get their answers even faster.

And with so many pharmaceutical customers, Systems Imagination places high priority on protecting their intellectual property. The company takes great care to demonstrate that any access it has to proprietary data is kept highly secure, audited, and understood. "That's the value of Microsoft Azure," says Yoo. "Delivering answers to our customers would take us much longer and cost us much more if we ran our own server infrastructure. And because the vast majority of our customers understand the security models employed by Azure Kubernetes Service, they know their data is in good hands."

## Answering big questions with big data

Systems Imagination uses Big Data Clusters to create workloads that push the boundaries of how massive data and computational analysis interact. In just 25 hours, the company recently ran a test of all 22,000 genes that reside in human cells in order to discover what gene pairs, if turned off as part of a hypothetical future cancer treatment, might result in cell death—a status known in the field of medical research as synthetic lethality. It ran 440 million unique gene pairs through a hypergraph of all the known

relationships each gene has to biological functions, their molecular processes, the pathways involved in these processes, and whether either gene in the pair had ever been implicated in cancer research. Not only did the research only take a single day, but the total cost of the experiment remained under \$3,000.

“The ability to approach synthetic lethality computationally is cutting-edge stuff,” says Yoo. “That we can quickly and affordably deliver this kind of data, which would take a human researcher a lifetime to complete, is very powerful.” Researchers looking to understand the results of an experiment they ordered through Systems Imagination also benefit from the solution. Because all the data relevant to their query resides in the same platform, they can readily see how that data links together, even if it might have originated from a dozen different sites and databases. “Microsoft technology helps small teams to do large-scale work and to do so very efficiently,” continues Yoo. “Had we deployed our own servers, our costs would have been more than 10 times what they are now, if not higher, and answers that take us hours would have taken months. Instead, we have matched our small, dedicated team of experts with the kind of technology that empowers us to compete with much bigger businesses.”

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