The future of healthcare in the cloud

Meet the AWS customers who are driving innovation and transformation in healthcare with the cloud

aws | intel

Welcome

At Amazon Web Services (AWS), we support healthcare experts so they are better equipped to discover and collaborate to help save lives across the world. Organisations in the healthcare and life sciences industry use AWS for everything from basic storage to clinical information systems.

AWS and Intel share a passion for innovation. Together, they have developed a variety of resources and technologies for high performance computing, big data, artificial intelligence (AI), machine learning (ML), and the Internet of Things (IoT).

Read this eBook to uncover how some of our customers use the cloud to innovate and transform the way they work. Hear their stories in precision medicine and medical research, including innovative responses to the COVID-19 crisis. With AWS Regions across the world, we're helping to empower the public sector by enabling the sort of transformational thinking needed to solve critical healthcare problems.

Contents

Select a customer below to learn more

Precision Medicine

Medical Research

Look out for 'Learn more' articles throughout the eBook

Case studies

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Safe and accessible storage

"Using AWS, we are able to offer our customers a lower cost, high-performance genomic analysis platform, which can help them speed their time to answers."

Andy Nelson, *Associate Director, Informatics and Cloud Operations, Illumina*

Illumina

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Illumina is a global leader in genomics–an industry at the intersection of biology and technology. It offers DNA sequencing and array-based solutions for analysis of genetic variation and function, in fields ranging from cancer research to agriculture.

At the most fundamental level, the company enables its customers to read and understand genetic variations, with 90 percent of all DNA sequencing worldwide being performed on Illumina machines. It uses products like Amazon Redshift to support its BaseSpace Sequence Hub, which currently stores 10 petabytes of genomics data.

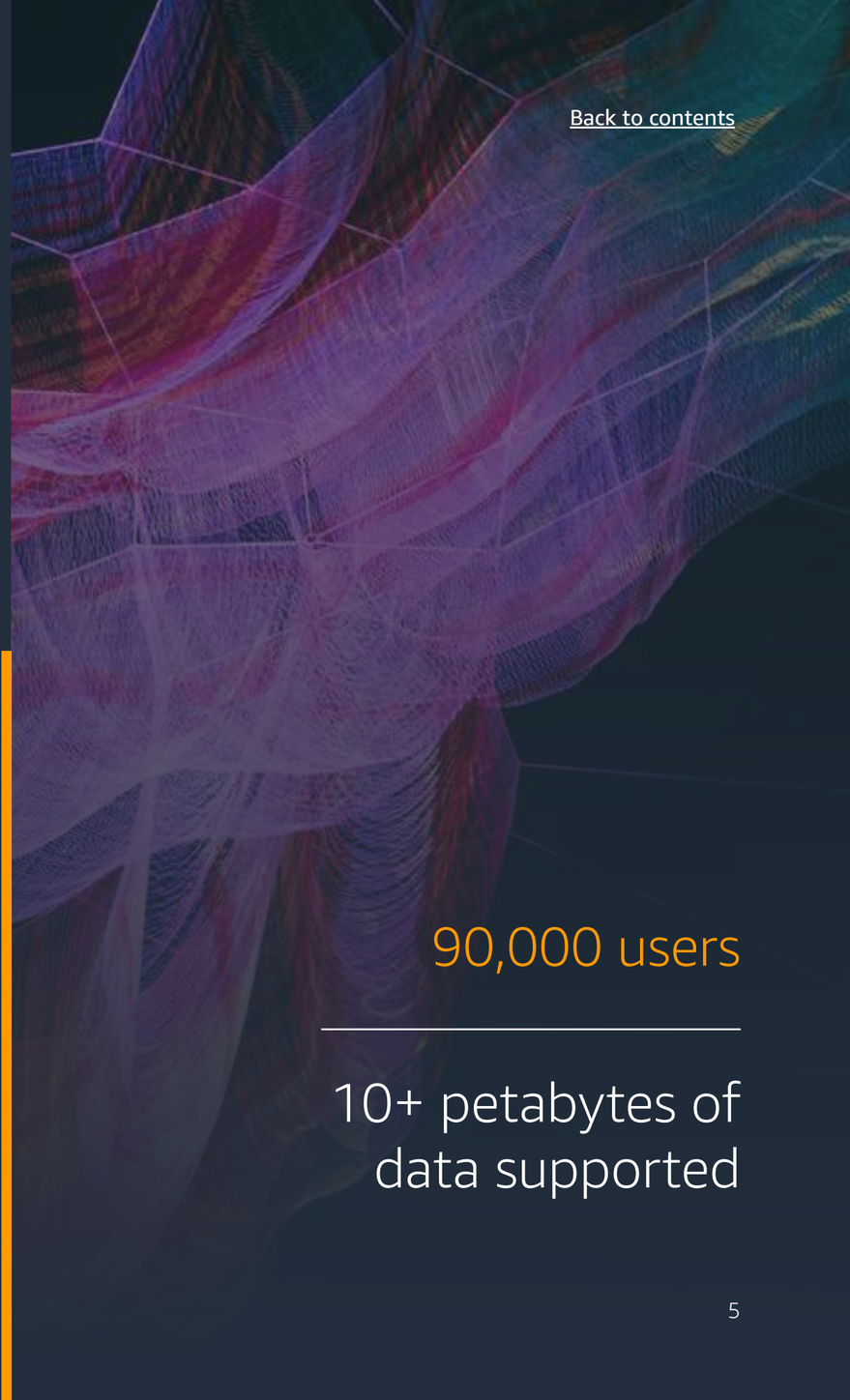
“Reliability is incredibly important to us because if the computational system breaks down, then there’s no sequencing going on,” said Alex Dickinson, senior vice president of strategic initiatives at Illumina.

The company also relies on unlimited scalability but in an unusual way since genomic data is incredibly sensitive. It also requires a comprehensive strategy on security, because of the sensitivity of the data and regulatory compliance.

“We strive to make our solutions increasingly simple, more accessible, and always reliable. As a result, discoveries that were unimaginable even a few years ago are now becoming routine and making their way into patient treatment.”

Learn more

Read the Illumina case study.



90,000 users

10+ petabytes of data supported

Harnessing the power of software to decode the genome

"Using Fabric Genomics' interpretation software on AWS, along with other software tools, we can interpret an entire genome's variant set within minutes, whereas other platforms might take hours."

Shareef Nahas PhD, *Senior Director of Clinical Laboratory Operations, Rady Children's Institute for Genomic Medicine*

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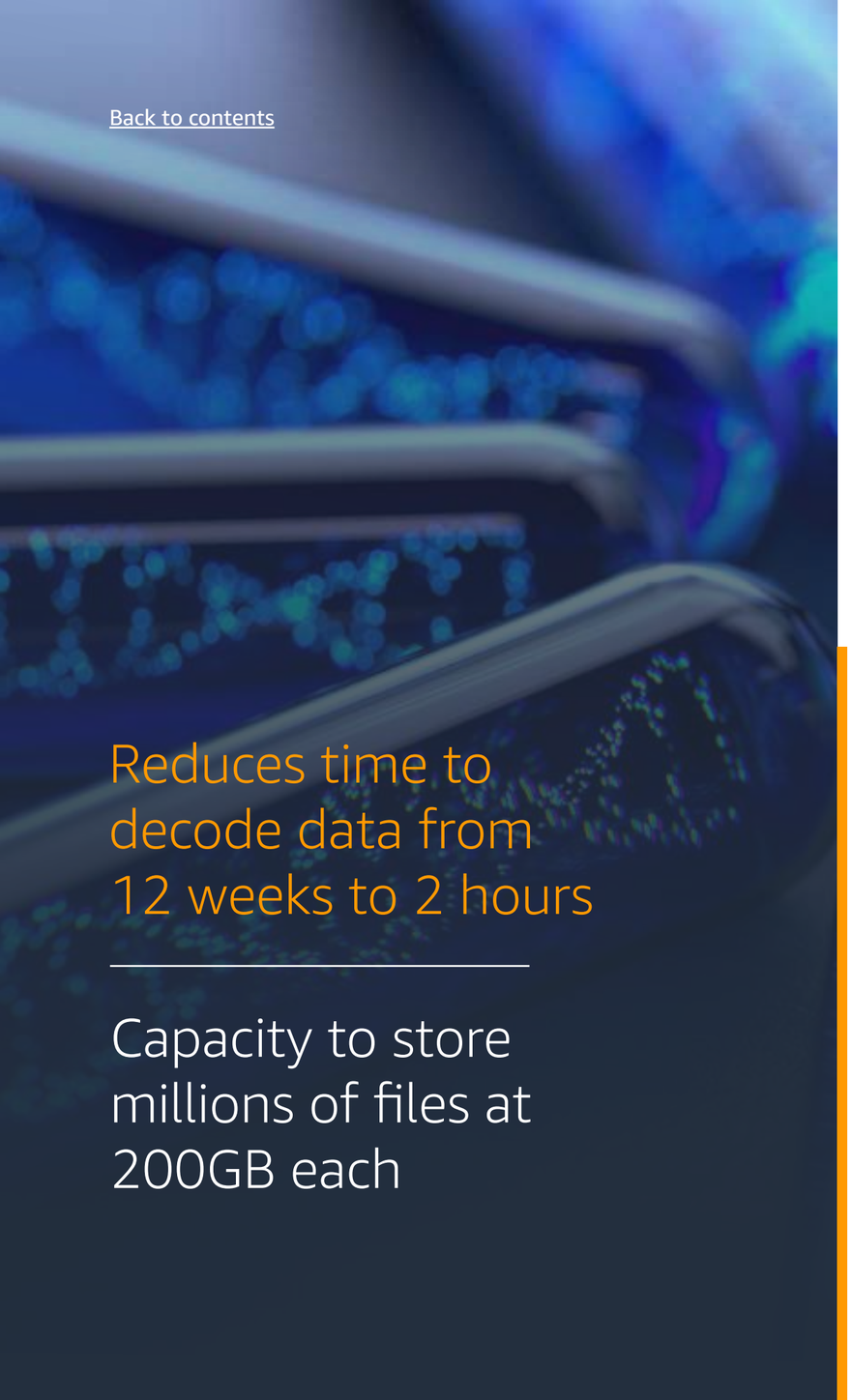

Reduces time to decode data from 12 weeks to 2 hours

Capacity to store millions of files at 200GB each

Fabric Genomics

Fabric Genomics is a software genomics company that helps customers accelerate access to genetic disease insights.

It runs its software on the AWS Cloud for enhanced performance, using the latest Intel® Xeon® processors, and for scalability. “We get the computational power and capacity we require to process and analyse large genomic datasets,” says CEO and co-founder, Dr. Martin Reese. “In a typical laboratory, it takes 12 weeks to interpret a genome. With our software, we have reduced that to two hours.”

To protect patient data, the organisation relies on AWS security and encryption technologies: “This is some of the most sensitive data in the world–it’s literally the code of who a person is. AWS gives us enhanced security to help us comply with strict patient health information data-protection requirements.”

Using the scalability of AWS, the company is able to respond to customers’ diverse data analysis needs. “If a customer wanted to process 10,000 genomes, we could process all those genomes simultaneously. We have an unlimited ability to expand compute capacity. Without the scalability of AWS, we wouldn’t be able to deliver 10,000 reports in two days.”

Learn more

Read the Fabric Geonomics case study.

Accelerating diagnoses and seeking a cure

"The first human genome cost three billion dollars [to sequence], and it took 13 years to be finished. In the last 10 years, the cost of sequencing for a single genome has dropped to $1,000 and is now possible within two days."

Dr. Torsten Haferlach, *Chief Executive Officer, Munich Leukemia Laboratory*

Munich Leukemia Laboratory

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Munich Leukemia Laboratory (MLL) is a diagnostics and research institution whose mission is to find a cure for leukemia and lymphoma. MLL uses the latest molecular and IT-supported methods to shape the future of hematological diagnostics and therapy. Using AWS, MLL reduced the turnaround time to process patient genome data from 20 hours to three hours. The faster turnaround time helps to accelerate research and improve the diagnosis of leukemia.

High-throughput Next Generation Sequencing (NGS) increased the organization's compute and storage needs, which exceeded the capacity of MLL's local infrastructure. MLL needed to deal with its growing need for scalable compute and storage while maintaining a high standard for data security.

So, MLL turned to AWS and deployed Illumina's BaseSpace solution in the AWS Region in Frankfurt.

MLL uses Amazon Elastic Compute Cloud (Amazon EC2) FPGA-based F1 instances to accelerate its genomics data processing. It uses Amazon Simple Storage Service (Amazon S3) for cost-effective storage of the data. Since 2018, more than 2.4 petabytes of data were created from MLL's analysis of more than 4,200 patient genomes. MLL is now looking to add parallelization, automation, and machine learning to expedite genomic analysis and improve diagnostic accuracy.

Learn more

View the Munich Leukemia Labratory video analysis.

Over 4,200 patients' genomes sequenced since 2018

Sequencing used to take 20 hours, it now takes 3

Using genomic technology to improve health outcomes

"Genomics is a kind of fingerprinting, very similar to how we might find the fingerprints of a culprit at the scene of the crime. If we can identify bad guys specifically, we can identify that outbreak."

Dr. Swaine Chen, *Senior Research Scientist, Genome Institute of Singapore*

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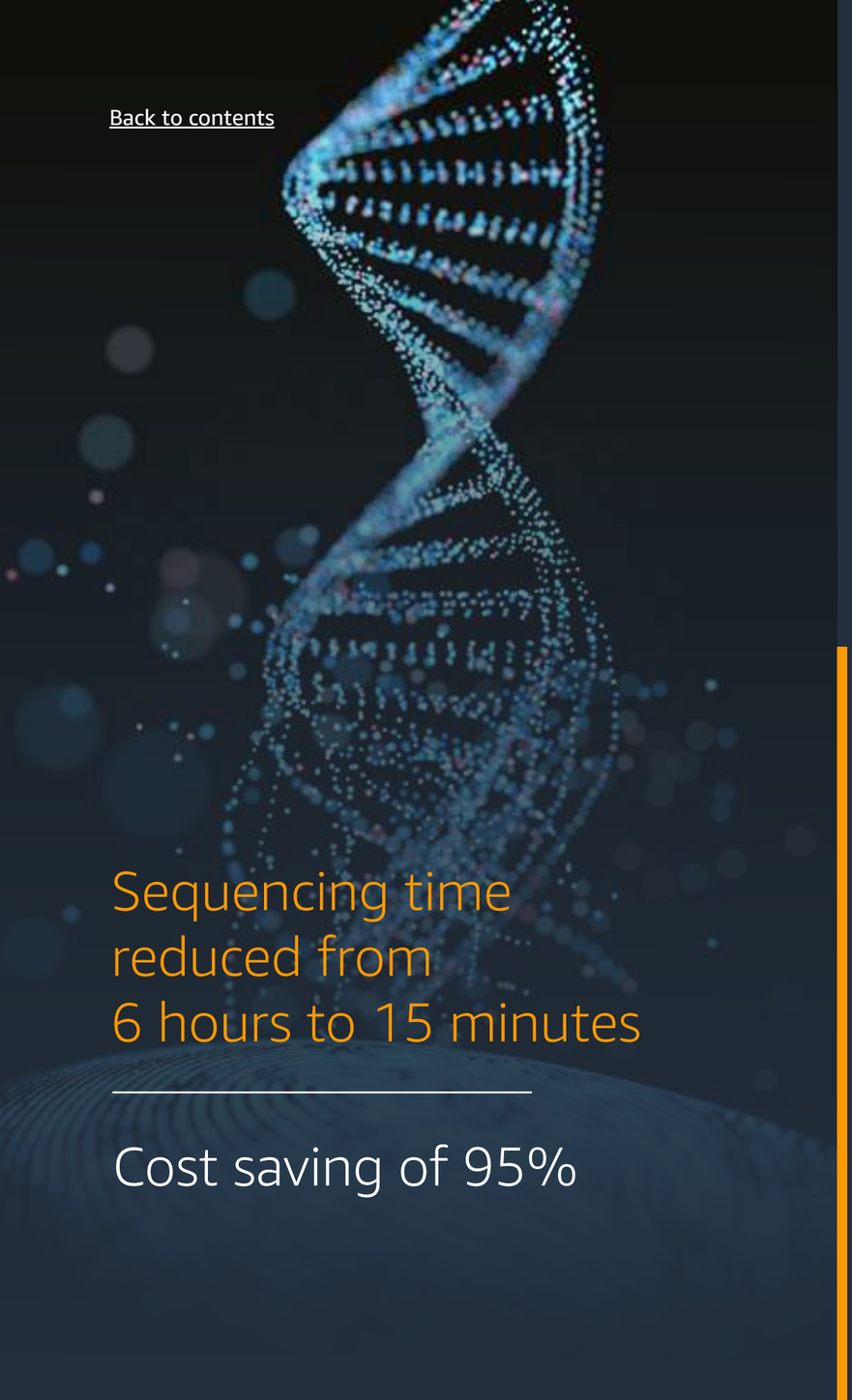

Sequencing time reduced from 6 hours to 15 minutes

Cost saving of 95%

Genome Institute of Singapore

The Genome Institute of Singapore(GIS) uses genomic technology for research to help improve human health.

Swaine Chen, senior research scientist at the Institute, uses AWS in his infectious disease lab and across the organization to store data, reduce human error, and enable speedier applications, both for individual health care and to address infectious outbreaks so that the nation can take preventive measures to save more lives.

One challenge GIS faced was that genomics requires a huge amount of computing power to process millions of data streams. The Genomics Institute is working with AWS to reduce time taken to analyse a single person's genome from six hours to 15 minutes and save 95% of the cost along the way.

The vision is to have genomic devices collecting data across the city, constantly uploading data to the cloud.

Learn more

Read the Genome Institute of Singapore case study.

Using software to understand brain-related challenges

"AWS has provided all of these technologies that look and integrate very well together, allowing us to deploy this in less than a year."

Runpeng Liu, *Software Developer, Brain Power*

Brain Power

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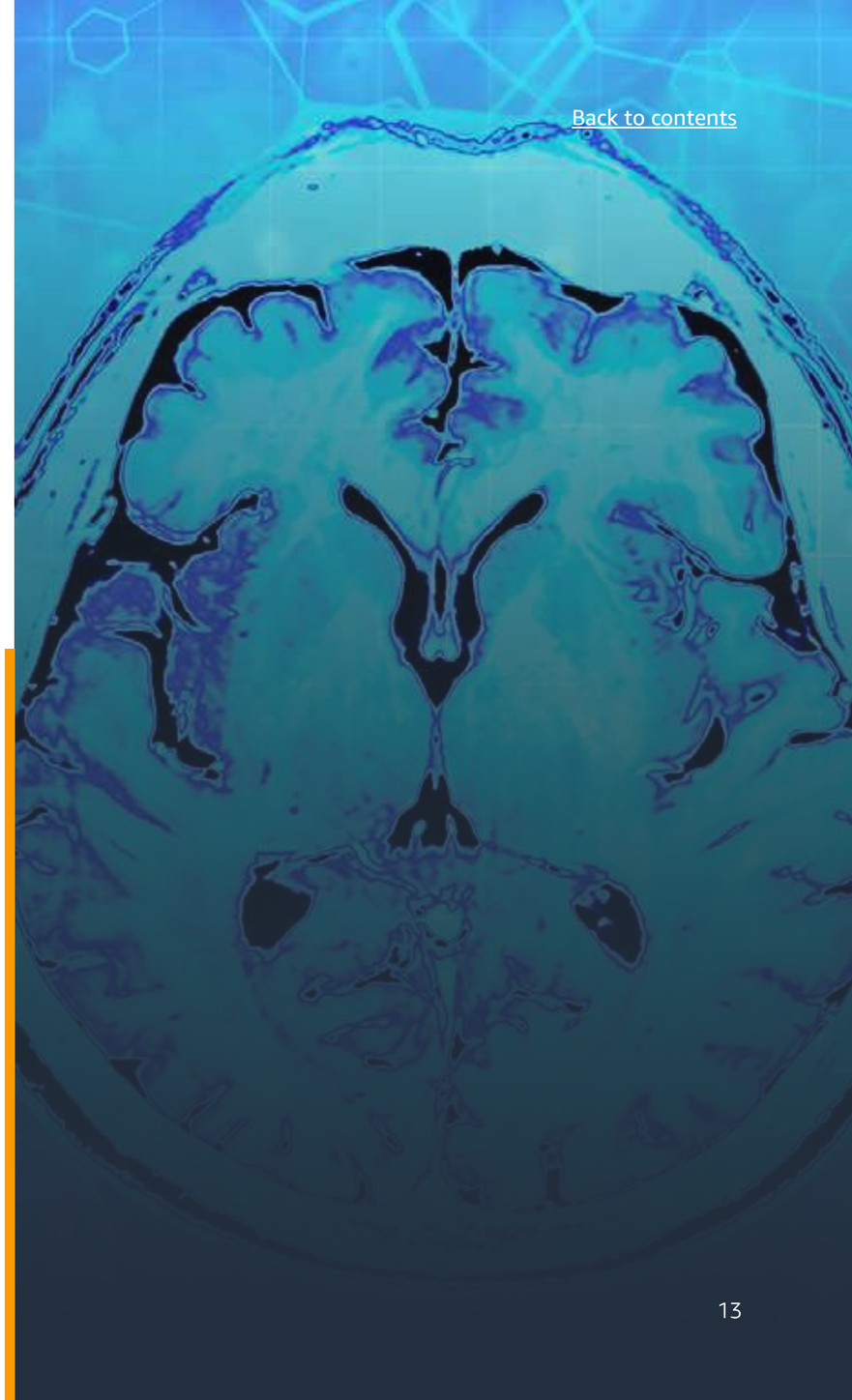
Brain Power develops wearable apps and analytic software to assess and coach people with brain-related challenges such as autism, ADHD, and traumatic brain injury.

The organization has built an artificial intelligence (AI) system to analyse body language in order to gauge attention, engagement, and enjoyment in near real-time. This system helps analyse clinical trial videos of children with autism and/or ADHD. The system uses Brain Power's method, called "fidgetology," to quantitatively summarize fidgeting and other body motions as a behavioural biomarker.

Using accessible technologies like webcams and mobile devices, the software can stream video to Amazon Kinesis Video Streams. It can later stream to Amazon Rekognition to detect facial positions. Raw data is ingested into Amazon Kinesis Data Streams and consumed by AWS Lambda functions to analyse and mathematically compute attention and body motion metrics. A visualization web app is provided to retrieve processed metrics to both visualize and alert on anomalies.

Learn more

View the Brain Power Brain Power Fidgetology® Video



Powerful potential of sequencing technology

"Using AWS Step Functions, Dante Labs developed a completely automated infrastructure for the production of Custom and Multilingual Reports, increasing production capacity by 500 percent, shortening release time of the report to the client from an average of 25 days to two business days and lowering costs per analysis compared to the previous solution, which was based on physical servers."

Andrea Riposati, *CEO, Dante Labs*

Dante Labs

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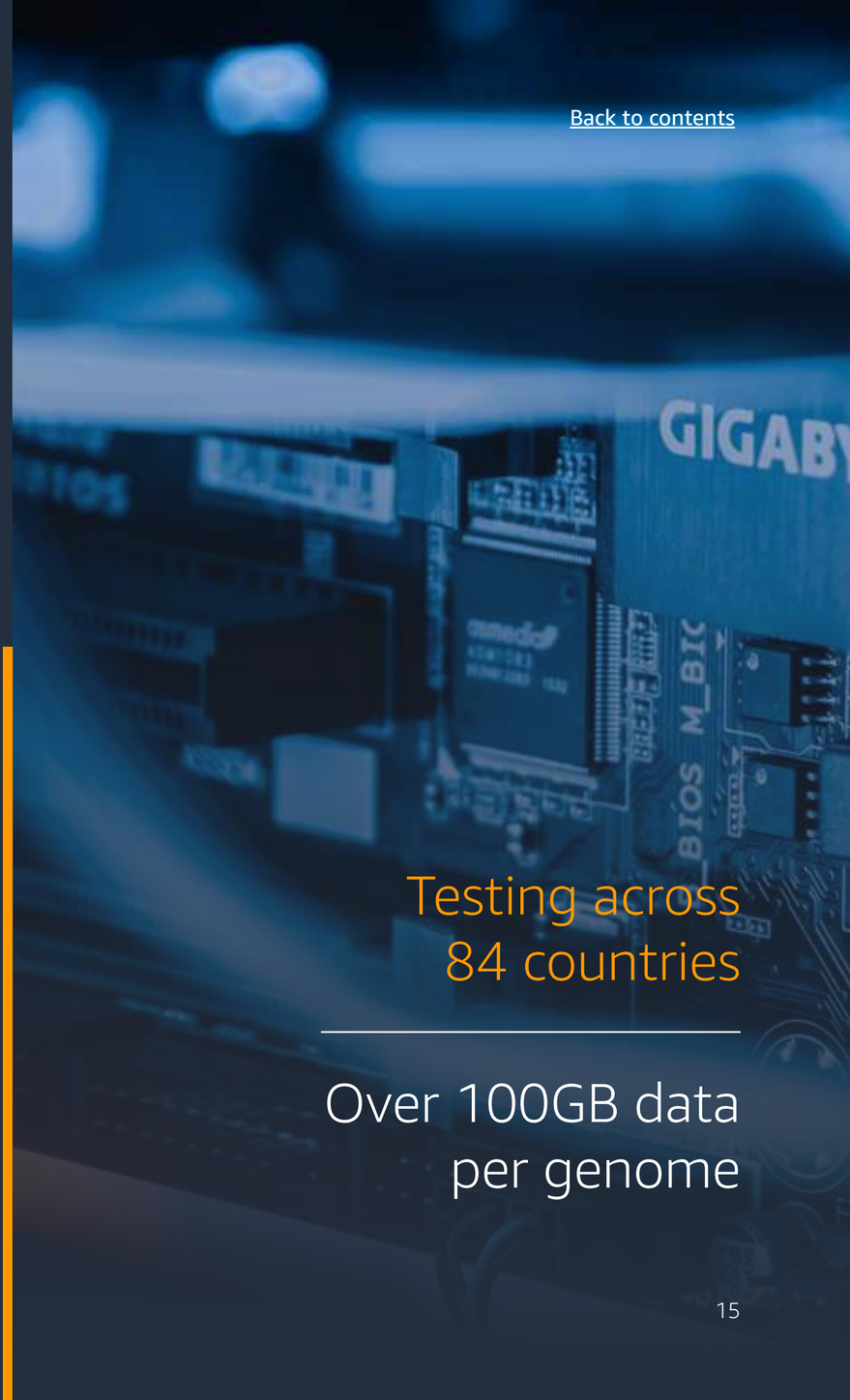
Dante Labs developed analyses that allow personalised prevention and treatment paths, based on the genetic characteristics of each individual subject. In response to COVID-19, they have used their sequencing technology to develop an antibody test.

Dante Labs identified AWS as a solution for three key reasons. For a start, an individual's genome has a data weight of circa 100 GB, which means that considerable computing power is needed to sequence it. It was also important that the data could be analysed from a centralised system while the company operated across 84 countries. The security and privacy of the data collected was of utmost importance, and a key deciding factor when choosing to work with AWS.

The AWS Lambda serverless system allows for the relative genetic data to be sent to a storage system and a document created and translated automatically, without the need to use an in-situ server at the very moment an individual orders a report.



Testing across 84 countries

Over 100GB data per genome

Personalised healthcare on a global scale

"The pace and effectiveness of our vision is limited only by our ability to create the intelligence that powers it."

Ryan Hamilton, *Senior Vice President Population Health, Cerner*

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10 petabytes of data

27,000 facilities in 35 countries

Cerner

Cerner is a leading supplier of health information technology (HIT) solutions. It's the world's largest publicly traded pure healthcare IT company, helping clients manage more than 27,000 facilities in 35 countries.

The organisation believes technology holds the key to create sustainable models for healthcare. Supported by AWS, it uses big data to gain actionable, real-time insights that help simplify healthcare delivery while reducing costs for payers, providers, and patients. Ultimately, its vision is to create a personalised plan of health for every person.

Cerner takes advantage of the AWS global reach and breadth of services. This not only allows for the use of technologies including machine learning and AI but also promotes collaboration, as the AWS Cloud community provides a diverse meeting place for innovators across industries to come together to help solve challenges.

"We have an enormous amount of data on about 150 million people," says Ryan Hamilton, senior vice president, Population Health for Cerner. "That represents approximately 10 petabytes, processing about 110,000 times a day. But the pace and effectiveness of our vision is limited only by our ability to create the intelligence that powers it. Using AWS, we're able to reduce the time it takes us and the cost to create a new intelligence model by more than 80 percent."

Learn more

View Cerner at the AWS San Francisco Summit

Detecting mutations worldwide

"Prescribing the correct medication to patients saves lives. Our software solutions help doctors make the right genetic diagnosis."

Dr. Imogen Wright, *Co-founder and Chief Technology Officer, Hyrax Biosciences*

Hyrax Biosciences

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Hyrax Biosciences uses AWS to automate genetic sequencing of SARS-CoV-2 genomes to help track transmission and to contribute valuable data to the global vaccine efforts.

Based in South Africa, Hyrax Biosciences is known for their contributions to HIV drug-resistance testing. They have now released a practical software tool to detect mutations in the genome of SARS-CoV-2, the coronavirus responsible for COVID-19.

The tool runs in the cloud on the company's genomics platform, Exatype, powered by AWS, which automates the analysis of an infinite amount of data in parallel, reducing the time spent interpreting data from days or weeks to hours, regardless of the volume of data being uploaded by the labs.

Exatype SARS-CoV-2 will be used worldwide in efforts to track the evolution of the virus as it spreads. Mutation detection and raw DNA sequencing data analytics are crucial to vaccine research, outbreak tracking, and drug development.

Learn more

View the Hyrax Biosciences AWS Partnership

Analysis time reduced from weeks to hours

Capacity to process an infinite volume of data

Expanding the potential of clinical trials

"Properly built application systems running on AWS… give the Clinical Research Network a level of reliability, resilience, security, performance, flexibility, and future-proofing not previously experienced by the organisation."

Nick Hirst, *Chief Information Officer, National Institute for Health Research*

National Institute for Health Research

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The UK's National Institute for Health Research (NIHR) plays a fundamental role in the development of new health services and treatments in the UK by supporting the management and coordination of clinical trials at the National Health Service (NHS).

The NIHR Clinical Research Network Coordinating Centre manages the Clinical Research Network (CRN) on behalf of the Department of Health. The CRN provides the infrastructure that allows the NHS to conduct clinical research funded by charities, and life sciences organisations.

It can be a challenge to coordinate over 4,500 trials per year involving over 650,000 people, further compounded by strict regulatory scrutiny and ethical guidelines. The ultimate goal of the CRN is to facilitate research and development in the UK, and to provide opportunities for patients to gain earlier access to new and better treatments through research participation.

Through the AWS Cloud, 23,000 users from the research community, regulators, and other authorised individuals can now track the status of trials through a single, centralised portal. Improvements to workflow and user interface have simplified data collection, and the solution's ability to integrate with external systems.

This technology not only enables real time collaboration, but dynamically scales to meet spikes in demand.

Learn more

Read the NIHR Global Data case study.

4,500+ trials annually

650,000+ participants

Crowdsourcing solutions to COVID-19

"It became clear that with AWS it would be possible to create a public challenge while at the same time guaranteeing sufficient data protection. Thanks to AWS, the COVID-19 Challenge became a much greater idea by allowing to crowdsource solutions from the smartest minds globally."

Simon Weidert, *MD, Chief Executive Officer,*
M3i GmbH, initiator of the www.covid19challenge.eu

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8 cooperating clinics

231 incoming data sets

M3i GmbH

The COVID-19 Challenge connects the best brains to support the medical industry with Artificial Intelligence (AI) solutions to aid medical professionals to tackle the virus globally. The project is a nonprofit collaboration between M3i and two Munich-based universities, Technische Universität and Ludwig-Maximilians-Universität of Munich.

Three years ago, Simon Weidert founded the M3i GmbH, an industry-in-clinic platform based in Munich that has specialised in connecting medical experts and clinical infrastructures with industry research and development of innovative medical technology.

The COVID-19 Challenge has become an international effort to fight the novel coronavirus by crowdsourcing solutions to improve treatment based on radiology and clinical metadata with the help of AI. This challenge is about connecting the experts across the field to support doctors with AI systems that will be no cost for public use.

Researchers and deep learning practitioners will have the opportunity to train models on big and well-annotated COVID-19 datasets, without compromising patient privacy. By using AWS, patient data can be provided in a safe space, where researchers can run their algorithms without the possibility to download the data itself. AWS also offers a scalable solution with its dynamic platforms and tools, such as Amazon SageMaker, to support the deep machine learning needed by this complex global project.

Learn more

About the COVID-19 Challenge

Cloud-supported solutions for large-scale problems across India

"The ambition for the future is to use the power of AI to solve societal problems linked to health."

Dr. P Anandan, *Chief Executive Officer, Wadhwani Institute for Artificial Intelligence*

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Wadhwani Institute for Artificial Intelligence

Based in Mumbai, India, the Wadhwani Institute for Artificial Intelligence is an independent, nonprofit research institute and global hub focused on developing AI solutions for social good.

Their main areas of research include health, agriculture, financial inclusion, infrastructure, and education. AWS helps the Wadhwani Institute for Artificial Intelligence scale and securely process their government sensitive data as they build multiple solutions for large-scale, societal problems.

One solution concerns infant mortality rates in rural areas of India, where access to even basic medical equipment is not possible. If care providers measure the baby's weight at birth, interventions can protect against mortality. The institute is developing a solution to allow health workers in these locations to do so using only photos and video taken with their cell phones. With AI, the solution creates a virtual 3D model of the infant in the cloud, and from that, the institute can calculate the weight and other crucial measurements.

Learn more

View how WIAI Builds Innovative Health Solutions Using AWS

Our global infrastructure

The AWS Global Cloud Infrastructure is the most secure, extensive, and reliable cloud computing environment anywhere, on and off the planet. AWS provides you the cloud infrastructure where and when you need it.

AWS and Intel share a passion for innovation. Together, they have developed a variety of resources and technologies for high performance computing, big data, artificial intelligence, machine learning, and the Internet of Things. Intel® Xeon® Scalable processor families are the foundation of new services being deployed by AWS. AWS instances based on Intel® processors are ready to serve unique and innovative new workloads that demand better data protection, faster processing of greater data volumes, and service flexibility without a hit to performance.

These processors feature Intel® Advanced Vector Extension 512 (Intel® AVX-512), which offers accelerated application performance 2x better than previous generation technologies. These processors also feature Intel® Trusted Execution Technology (Intel® TXT) which is Intel's technology for establishing more secure platforms.

Explore our world

See our global infrastructure

Start your cloud journey

Let’s build your success story next!

TELL US MORE

More public sector healthcare customer stories and insights.

LEARN MORE

Chat to us to further explore the use cases covered here.

LIVE CHAT