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Introducing to Oracle for Research

Oracle for Research

Rich Pitts

Senior Research Advocate for the European Region

Overview

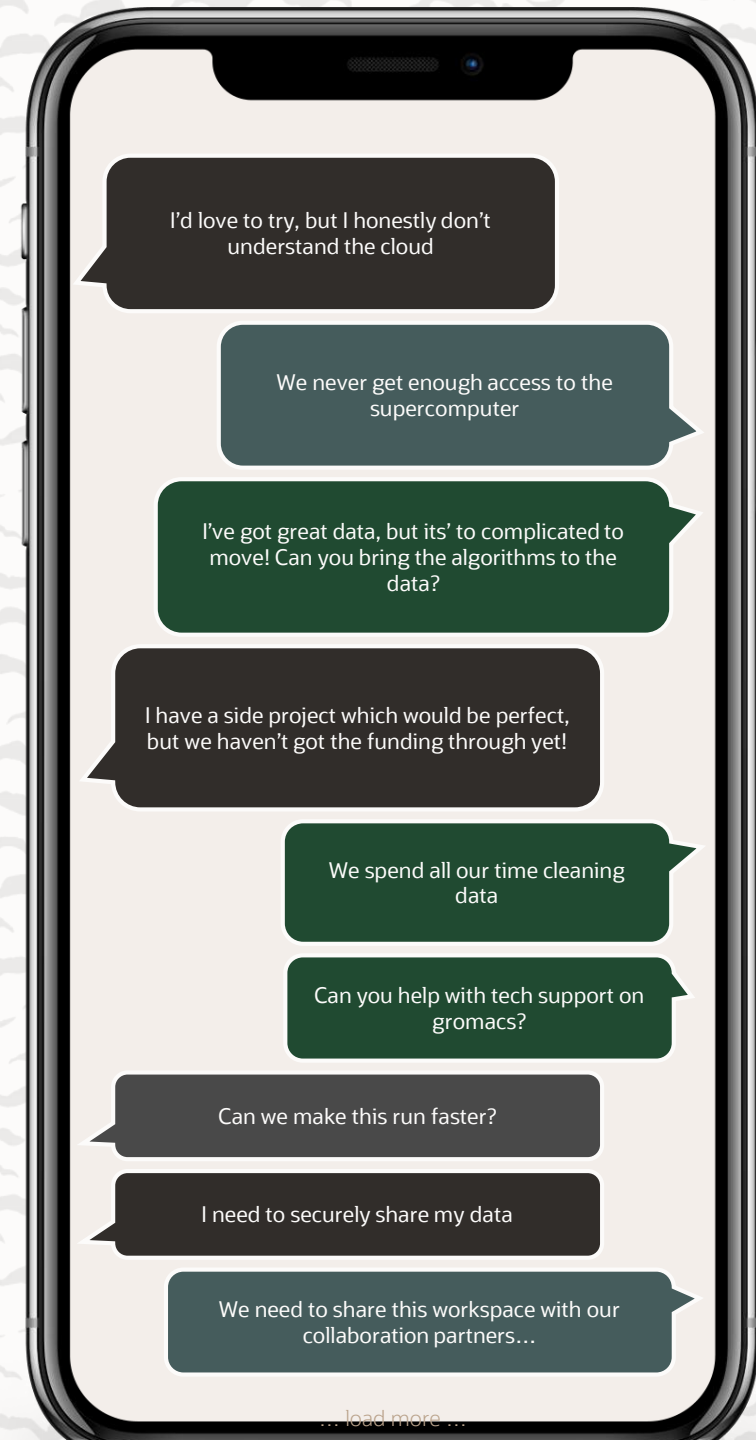
Oracle's Commitment to Discovery

Oracle for Research helps bring about positive change in the world by advancing research through cloud computing.

We provide scientists, researchers, and university innovators with open, nurturing communities; free access to high-value, robust Oracle Cloud technologies; and startup and industry collaborations to find solutions to complex problems.

Is there a problem to solve..?

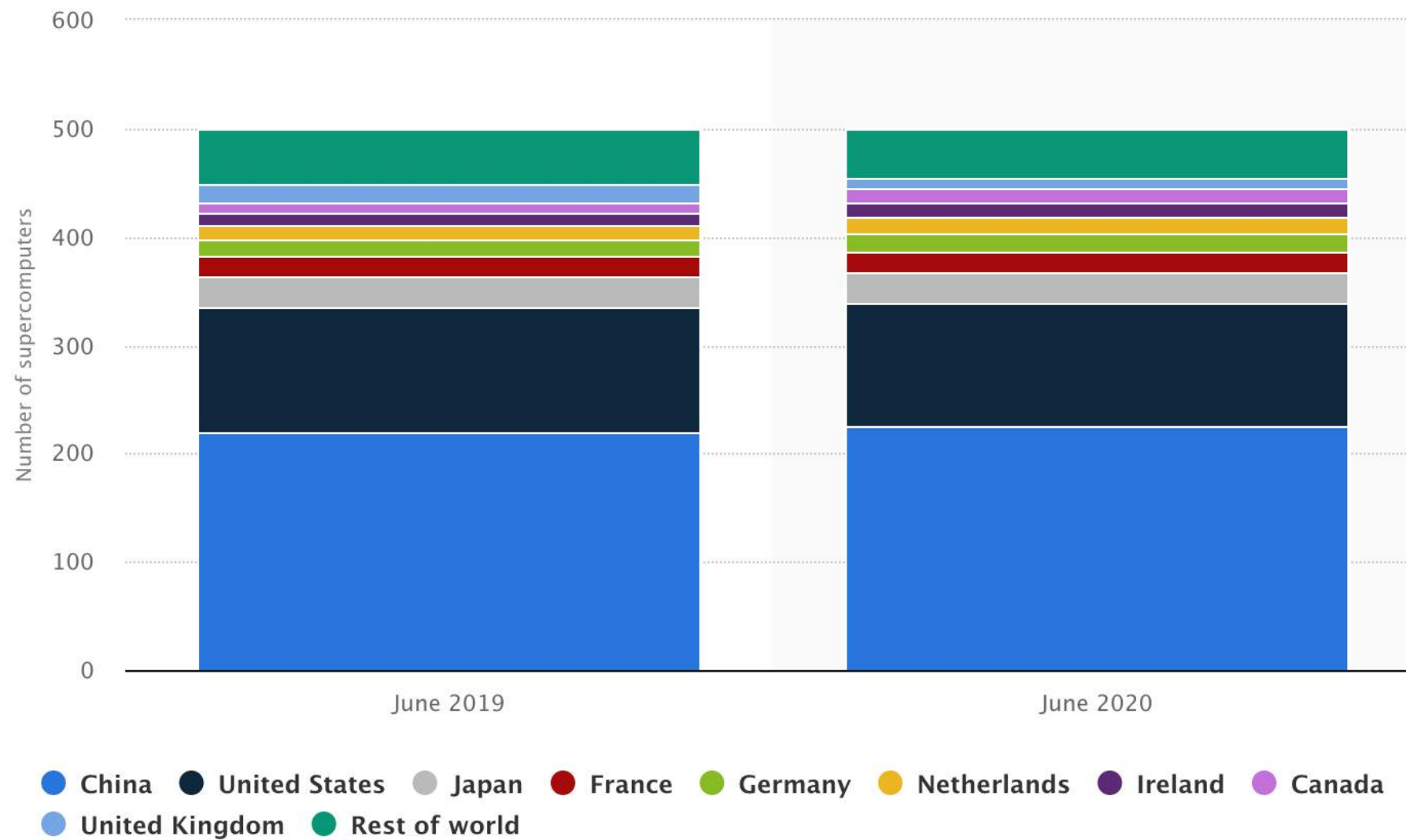
1. I have a great Project but no funding
 - OfR has a grant program to support you
2. I want to focus on the science not the IT?
 - We can provide support and automation
3. I can't get enough time on our supercomputer
 - On OCI you can spin up your own array



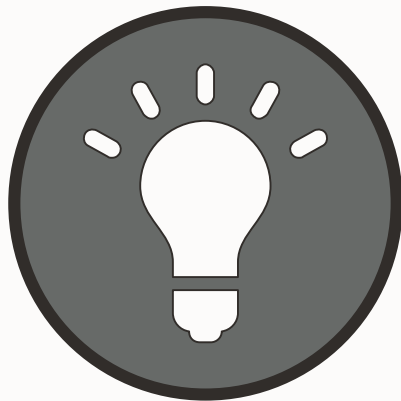
The Opportunity: Digital Research



Commodity Super Computing



Benefits of Oracle for Research



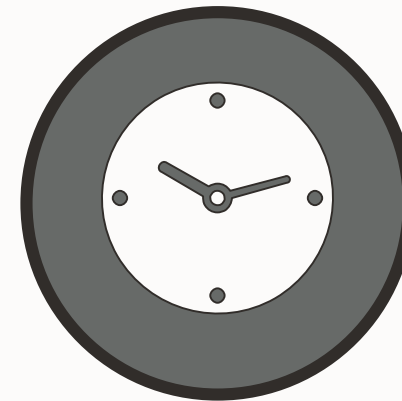
Focus on Outcomes

Focus on your research with simple platforms and tooling.



Open Standards

BYO-Stack! Run and build on the tools you love on the world's fastest cloud.



Time to Results

Run what you need when you need and eliminate queues in your workflow.

The Opportunity: Digital Research



**Commodity Super
Computing**



**Automation of Tools
and Platforms**

ORACLE - EMEA Team for Research

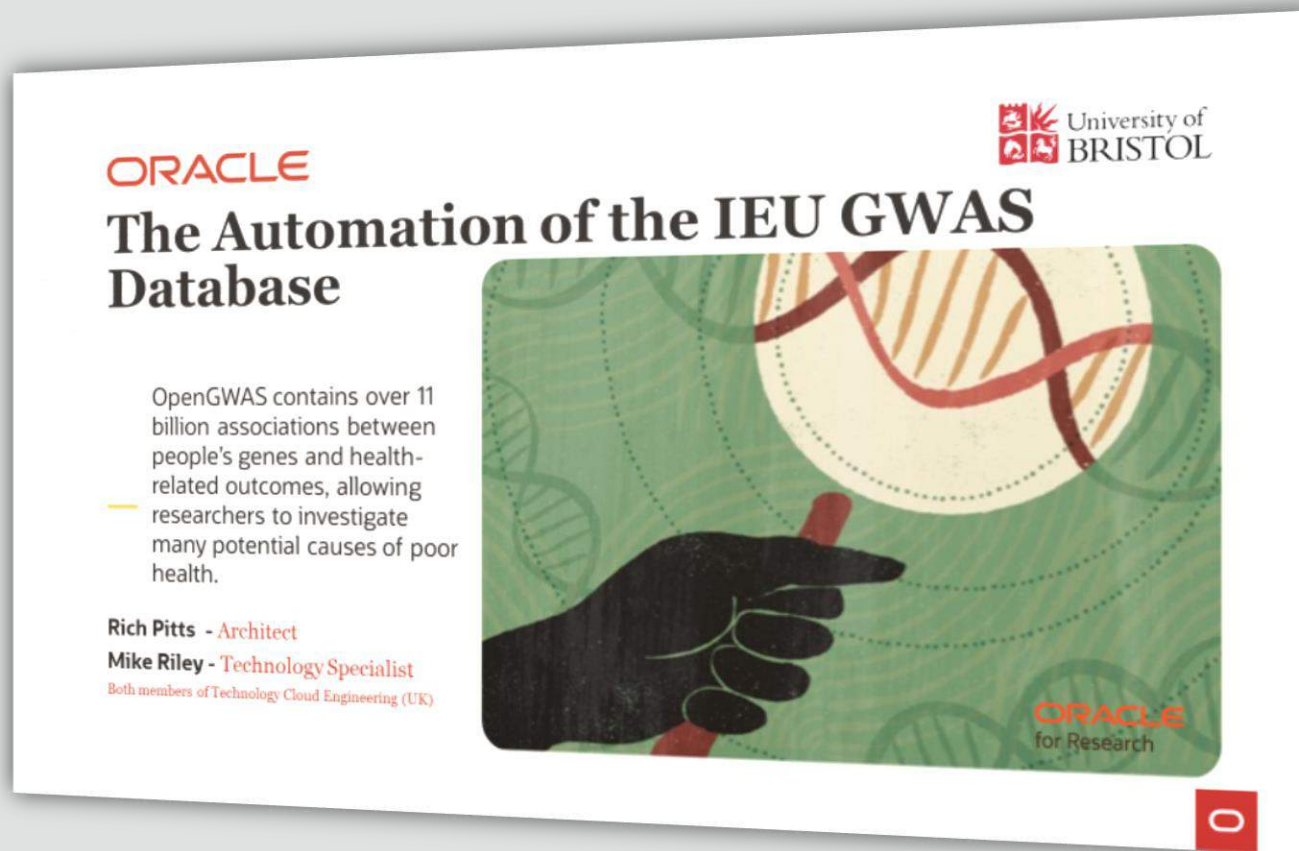
Team Backgrounds

Rich Pitts

Research Advocate
NERC / IUCN funded &
Environmental Research



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ORACLE University of BRISTOL

The Automation of the IEU GWAS Database

OpenGWAS contains over 11 billion associations between people's genes and health-related outcomes, allowing researchers to investigate many potential causes of poor health.

Rich Pitts - Architect
Mike Riley - Technology Specialist
Both members of Technology Cloud Engineering (UK)

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Mike Riley

Cloud Solution Architect
Business Information
Systems – Database
Specialist



michael.riley@oracle.com

125 Billion Records

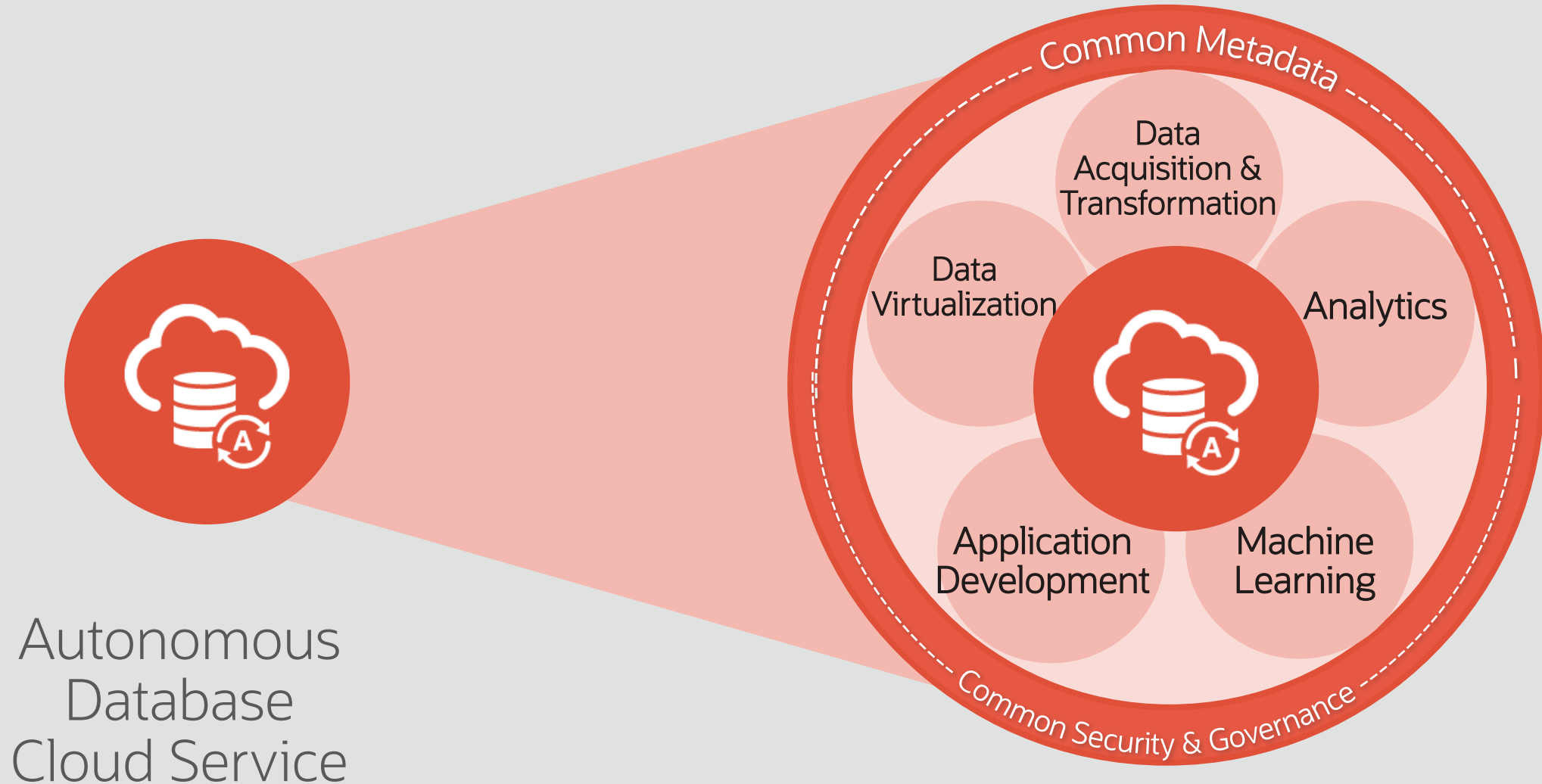
MRC-IEU The GWAS webpage....

<https://gwas.mrcieu.ac.uk/>

Oracle to provide an **autonomous** ATP DB
at the heart of
Open GWAS

The screenshot shows the MRC-IEU Open GWAS project website. At the top left is the logo for the 'ieu open gwas project'. At the top right is a navigation menu with links: 'home', 'datasets', 'phewas', 'about', and 'api'. The main heading is 'GWAS summary data.' Below this is a search bar containing the text 'e.g. Body mass index, rs1000940' and a search icon. Below the search bar are three text boxes: a red-bordered box stating 'A database of 112,706,801,597 genetic associations from 31,773 GWAS summary datasets, for querying or download.', a blue-bordered box stating 'See the API page for fast programmatic options to query the data, including R, python and HPC environments.', and a text box stating 'Use the gwasglue R package to apply the data to Mendelian randomization, fine mapping, colocalisation, etc.'. Above the website, an 'elastic' logo is connected by a blue line to the search bar and by a red line to the red-bordered box. A large red arrow points from the 'elastic' logo to an 'Oracle' logo (a red circle with a cloud and a database cylinder). A red line also connects the Oracle logo to the blue-bordered box. At the bottom of the website screenshot is a footer with logos for the University of Bristol, MRC Integrative Epidemiology Unit, Wellcome, The Royal Society, Cancer Research UK, GSK, Biogen, and Oracle Cloud Infrastructure. Below the logos is the text 'data contributions or requests • contact • © 2020 University of Bristol • v2.5.1 - 2020-06-03'.

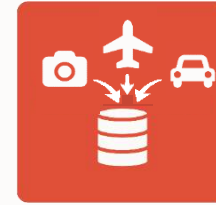
Autonomous Database | Evolves into a Data Platform



Tightly integrated data platform

“Autonomous Data Platform Creates Data Driven Outcomes”

***Technologies
Natively
Integrated into Database...***



IoT



Spatial



Documents



Social Graph
Analysis



Real-Time
Analytics



Machine
Learning



Blockchain

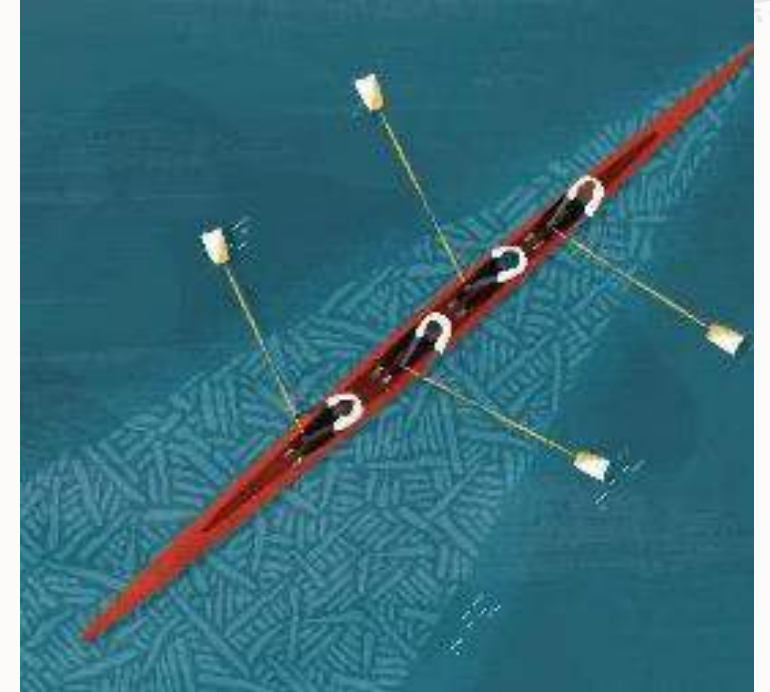
The Opportunity: Digital Research



**Commodity Super
Computing**

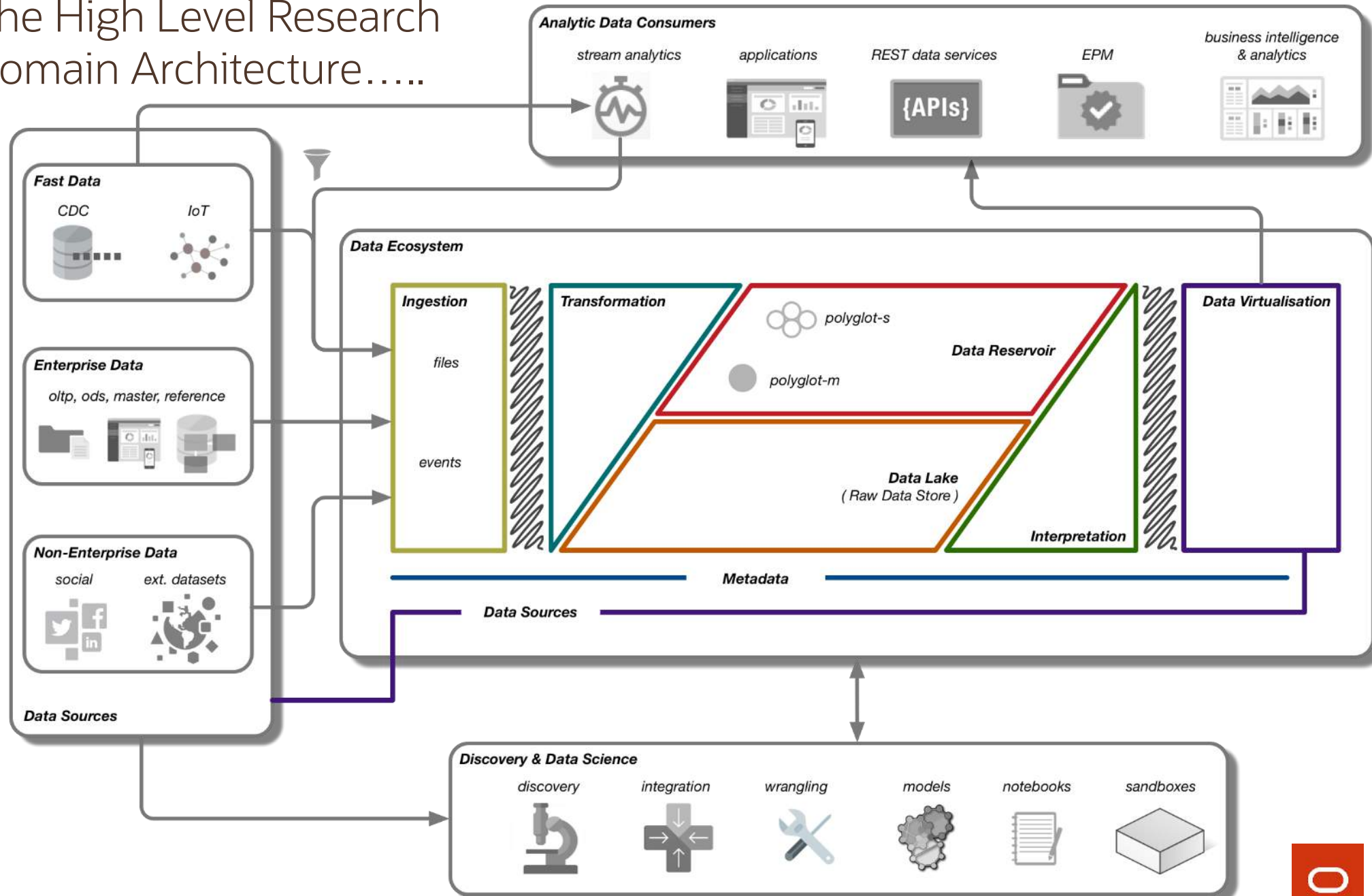


**Automation of Tools
and Platforms**



**Open
Collaboration**

The High Level Research Domain Architecture.....

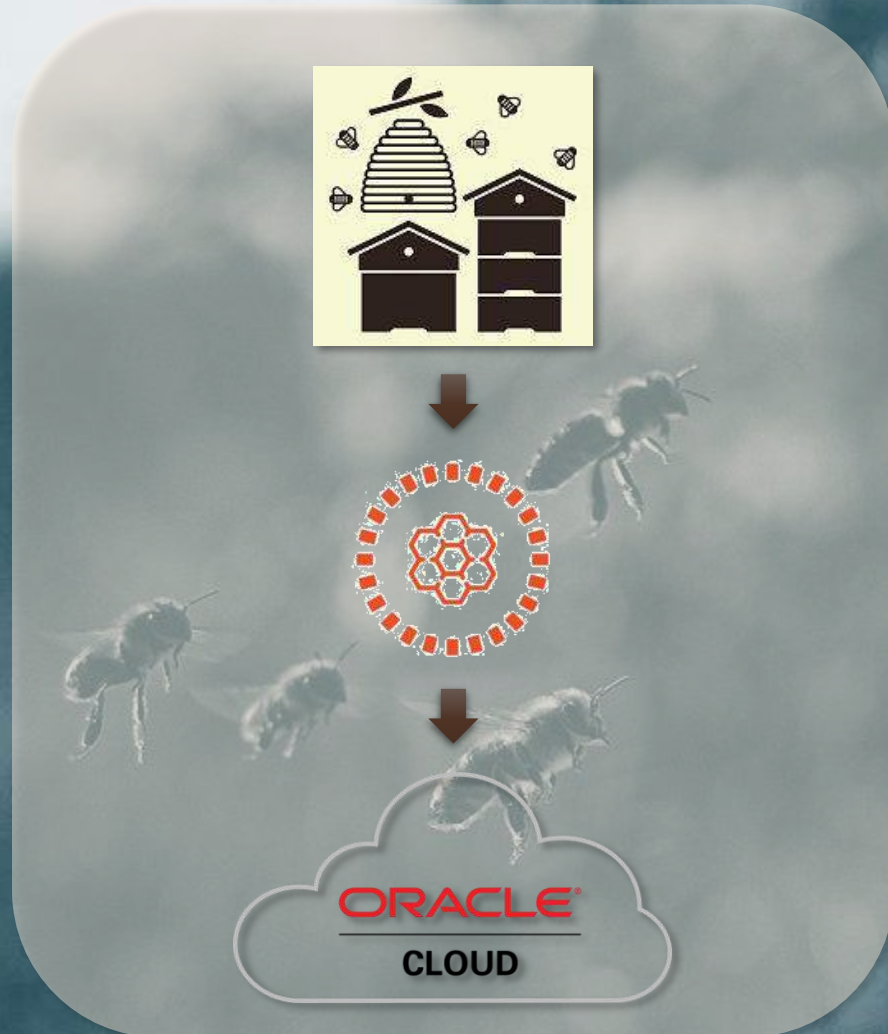


With Oracle for Research Technical Specialists we will work with you to Develop a high level Architecture into a practical solution.

The World Bee Project



How does the World Hive Network function?

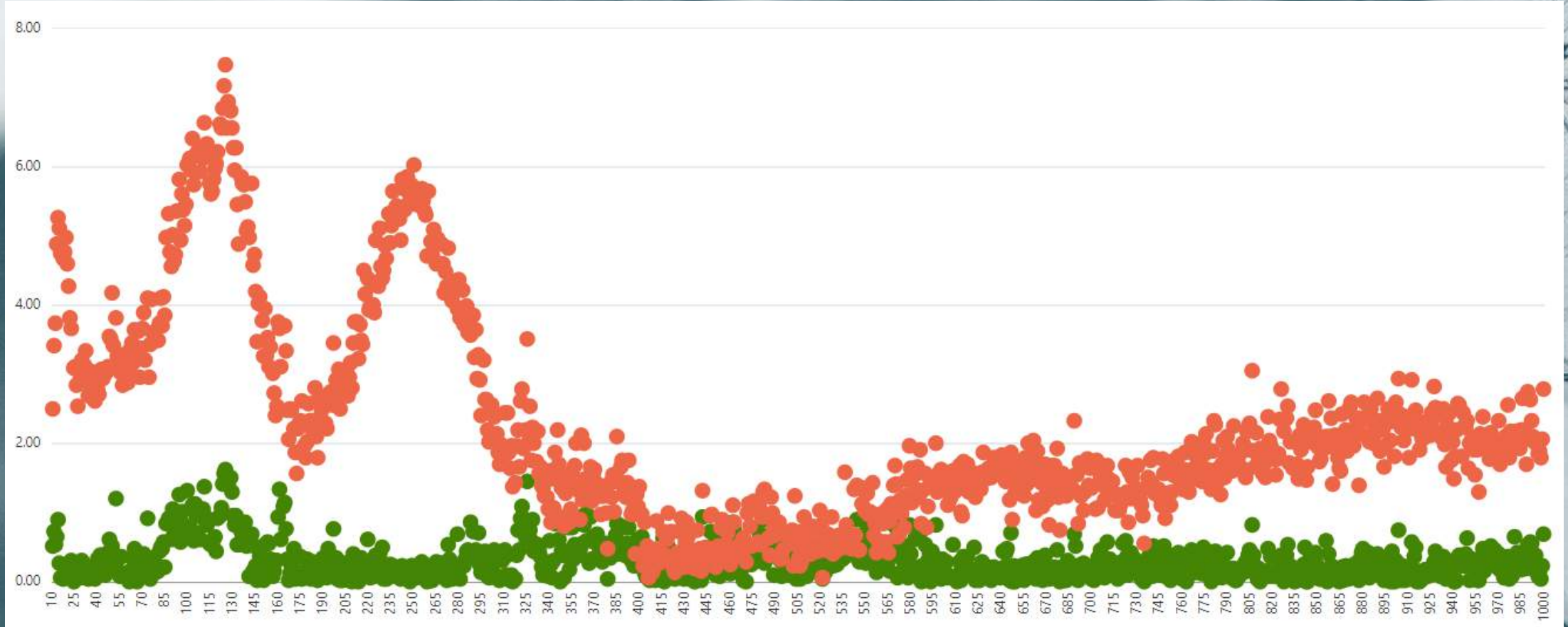


Sensor arrays in **the World Hive Network** hives remotely monitor and capture acoustics, brood temperature, humidity, hive weight, bee traffic and weather to generate insights into the status of hive health and surrounding environments

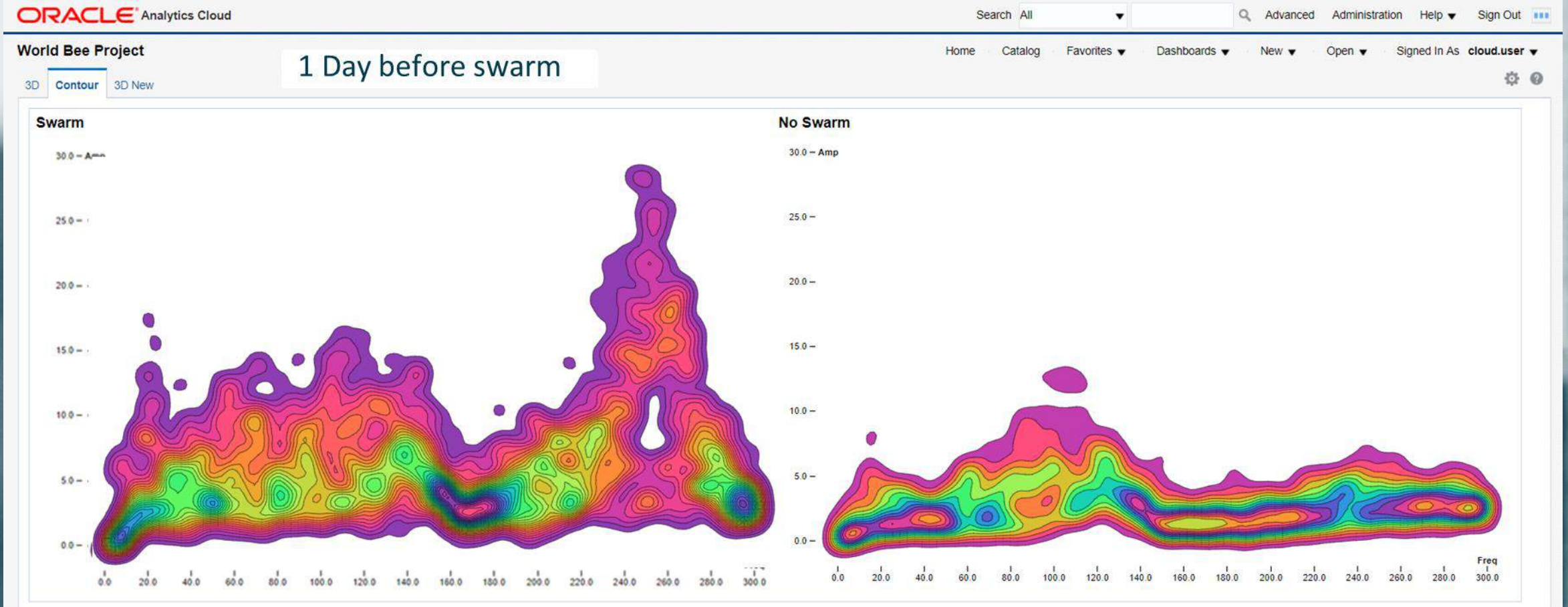
When the data is sent to Oracle Cloud, its held in an autonomous DB
AND THEN

AI and Machine Learning generate *further* insights into patterns, trends and correlations.

Detecting a Swarm ?



Detecting a Swarm ?



Building Open Communities



Open Data



Open Tooling



**Networks of
expertise**



COVID-19: An Unexpected Breakthrough

Discovery of a Druggable Pocket

“Oracle Cloud computing let us work at the pace required to achieve tangible results in this crisis.”

—Imre Berger, Professor Biochemistry and Chemistry, University of Bristol

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Oracle HPC Cloud Accelerated COVID-19 Research

Faster Time to Results Means More Opportunities for Discovery



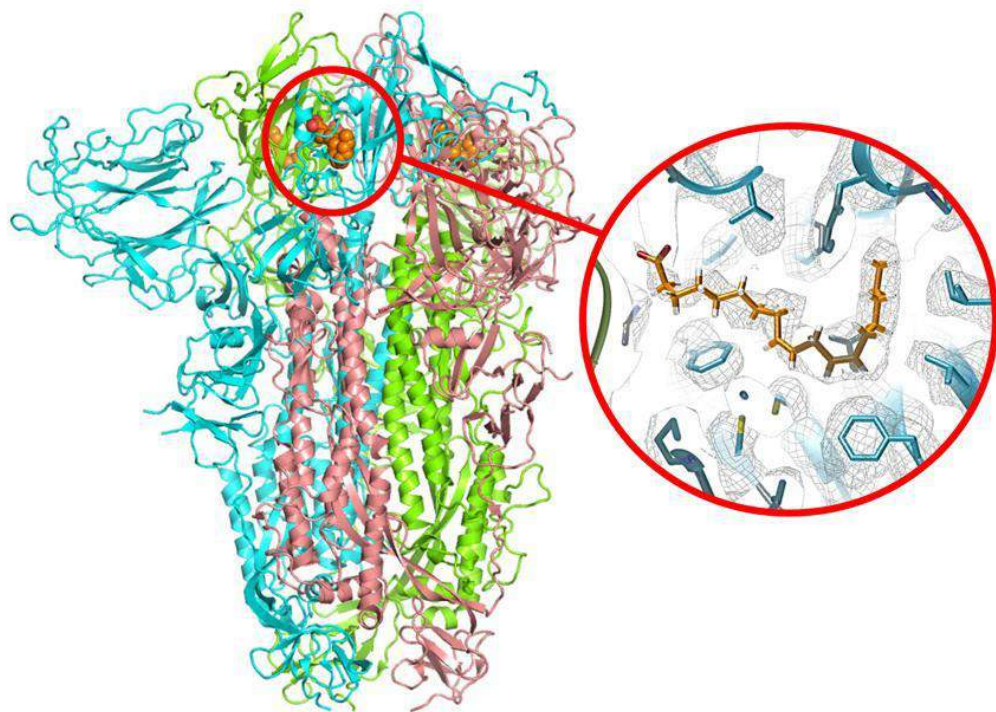
As hospitals filled with severely ill patients and the world went on lockdown to try to slow the spread of the novel coronavirus in early 2020, it was self-evident that treatments and vaccines were urgently needed. Researchers around the globe, including an international team led by Professor Christiane Schaffitzel of the University of Bristol's School of Biochemistry and Professor Imre Berger of the Max Planck-Bristol Centre for Minimal Biology, shifted their focus to SARS-CoV-2. It seemed that COVID-19, the disease caused by SARS-CoV-2, was triggered by its spike protein, and Professors Schaffitzel and Berger aimed to generate that spike to conduct serological tests.

When they used cryo-electron microscopy to perform a quality control check of their generated spike, they found something unexpected: the spike had a pocket that appeared to bind to an essential fatty acid – linoleic acid – potentially connecting the virus to its clinical symptoms of severe respiratory distress and organ inflammation. Even more exciting was the realization that if the pocket could be closed, the virus could be rendered harmless. The team had discovered a potentially druggable pocket and opened the door to the possibility of stopping COVID-19.



Oracle HPC Cloud Accelerated COVID-19 Research

Faster Time to Results Means More Opportunities for Discovery



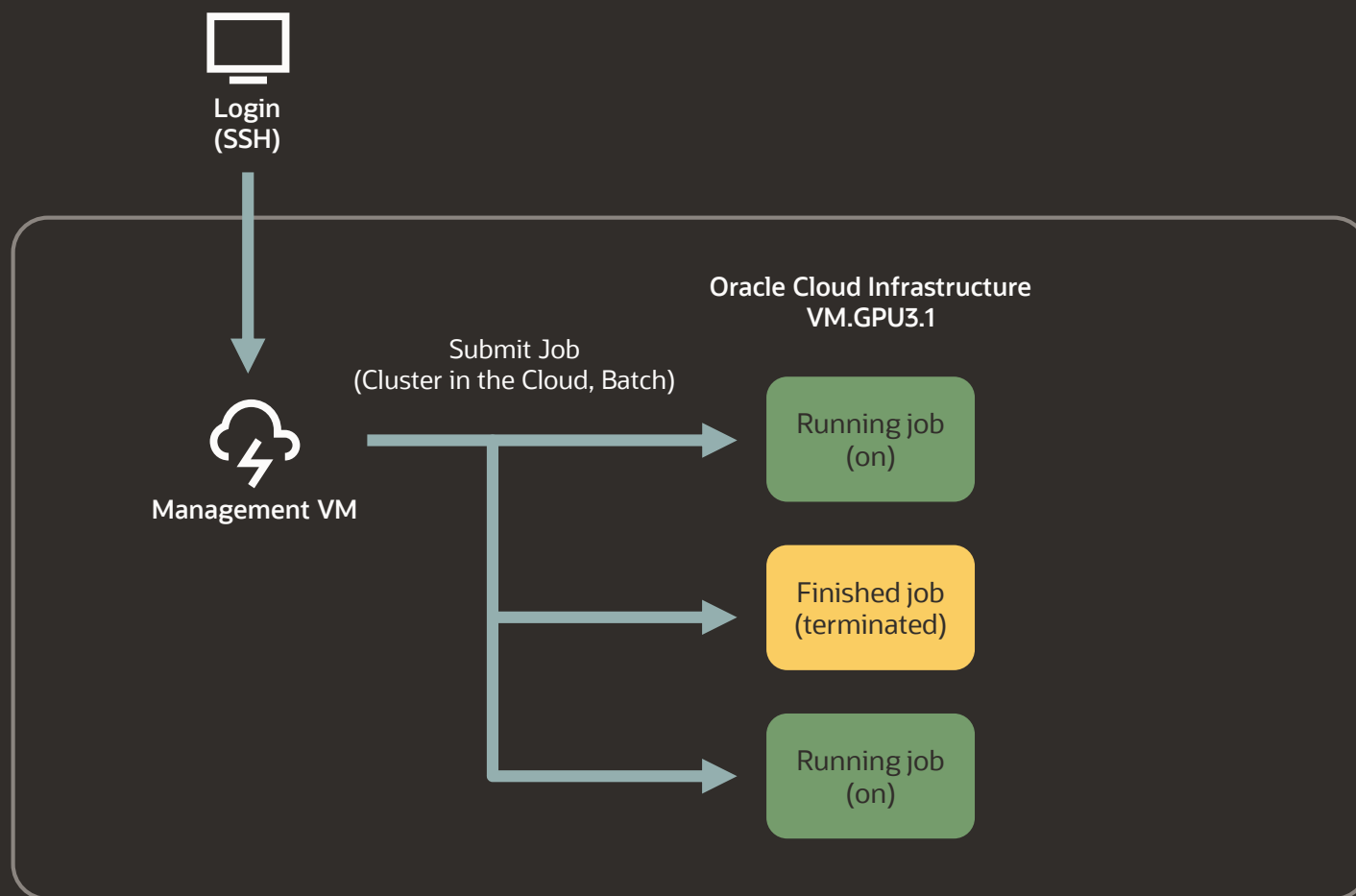
The SARS-CoV-2 spike protein captures linoleic acid, a key molecule in the body that regulates inflammation and immune response.
COURTESY OF THE UNIVERSITY OF BRISTOL

- The team led by researchers at the University of Bristol discovered that the SARS-CoV-2 spike protein binds with linoleic acid, an essential fatty acid that the human body cannot produce.
- Linoleic acid is important for regulating inflammation and immune response, and in patients with severe COVID-19 disease, linoleic acid is depleted. The discovery by the research team potentially helps explain why this is so, connecting linoleic acid, the SARS-CoV-2 virus and COVID-19.
- Even more importantly, the Bristol-led team found the “unique binding pocket” where the spike protein captures the linoleic acid, and discovered that when the SARS-CoV-2 spike protein binds with linoleic acid, it gets locked in a state that prevents it from binding to human ACE2 cell receptors – rendering it non-infectious.
- If this pocket on the spike protein can be drugged to its locked state, potentially using antiviral drugs, COVID-19 treatments will be improved and lives will be saved.
- Computational modeling of SARS-CoV-2 was critical to these discoveries. On-premise super computers needed the power of enterprise computing to process the very large data sets from the University of Bristol’s powerful cryo-electron microscope.
- The researchers leveraged Oracle’s high-performance Cloud infrastructure to develop a novel computational approach to create a 3D, high-resolution digital model that allowed them to visualize and study the spike protein molecule composition.

Oracle HPC Cloud Accelerated COVID-19 Research

Faster Time to Results Means More Opportunities for Discovery

Oracle Cloud Architecture in Cluster in the Cloud



OCI Performance Characteristics

- Best suited to heterogeneous high-throughput tasks
- Pipelines needing different node type(s) for different parts
- Can be much more specific than the average on-premise cluster
- Always have access to the latest hardware
- Nodes are only switched on and paid for while jobs are running
- Nodes are switched off automatically when idle
- Great for teaching clusters

Timing

- Full system test ~ 20 minutes on Oracle
 - Create cluster from scratch
 - Submit job
 - Run job
 - Tear down whole cluster
- Job submit → job start: < 2-3 minutes

Grant Program



Free Credits

Dedicated \$ value of cloud credits to use on what you want, when you want it.



Cloud Expertise

Technical Support and functional supports to make your workloads faster than ever.



Marketing

Collaborative marketing and signal boosting of research and white papers.

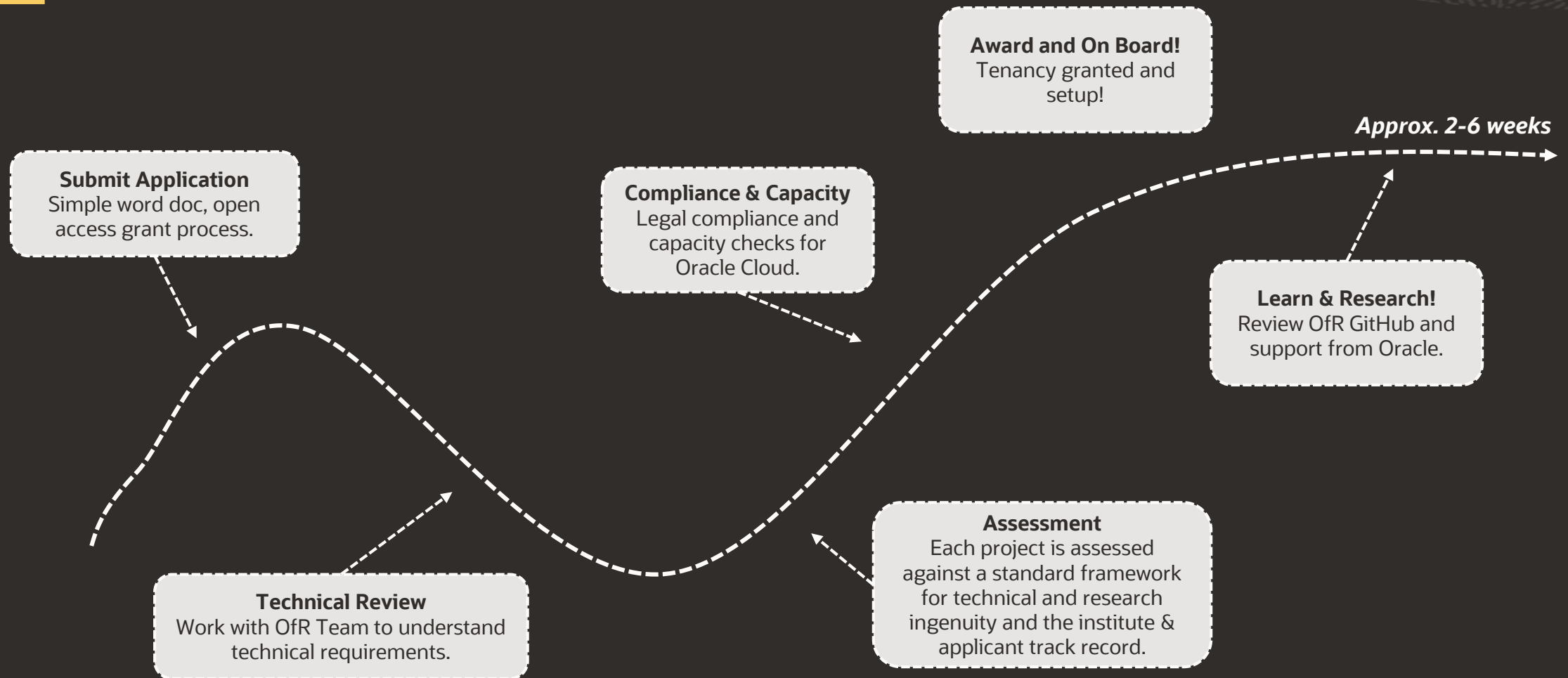


Your IP

You remain in control and retain all IP.

Application Process

<https://www.oracle.com/oracle-for-research/apply.html>



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DM on Twitter [@RichPitts](https://twitter.com/RichPitts)

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<https://github.com/OracleForResearch>

**Includes dedicated access to Oracle HPC/GPU resources*



Thank you

Our mission is to help people
see data in new ways, discover insights,
unlock endless possibilities.

Application for Oracle For Research Grants

<https://www.oracle.com/oracle-for-research/apply.html>

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The Oracle logo is displayed in a bold, red, sans-serif typeface. The letters are closely spaced and have a modern, slightly geometric feel. The logo is centered horizontally on a white background. Above the logo, there is a decorative horizontal band with a pattern of orange, yellow, and dark blue wavy lines.

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