



議程場次	講師
MySQL HeatWave Update	Ivan Tu-MySQL Solution Engineering Manager
MySQL Customer Reference	
Move and Improve your MySQL App in OCI	Rayes Huang-OCI Solutions Director, Cloud Native Appdev, JAPAC



# 甲骨文MySQL雲服務 MySQL Database Service 和 HeatWave

唯一用MySQL企業版且整合高性能查詢加速引擎-HeatWave的MySQL雲服務

只有在  
**Oracle Cloud Infrastructure**獨家提供

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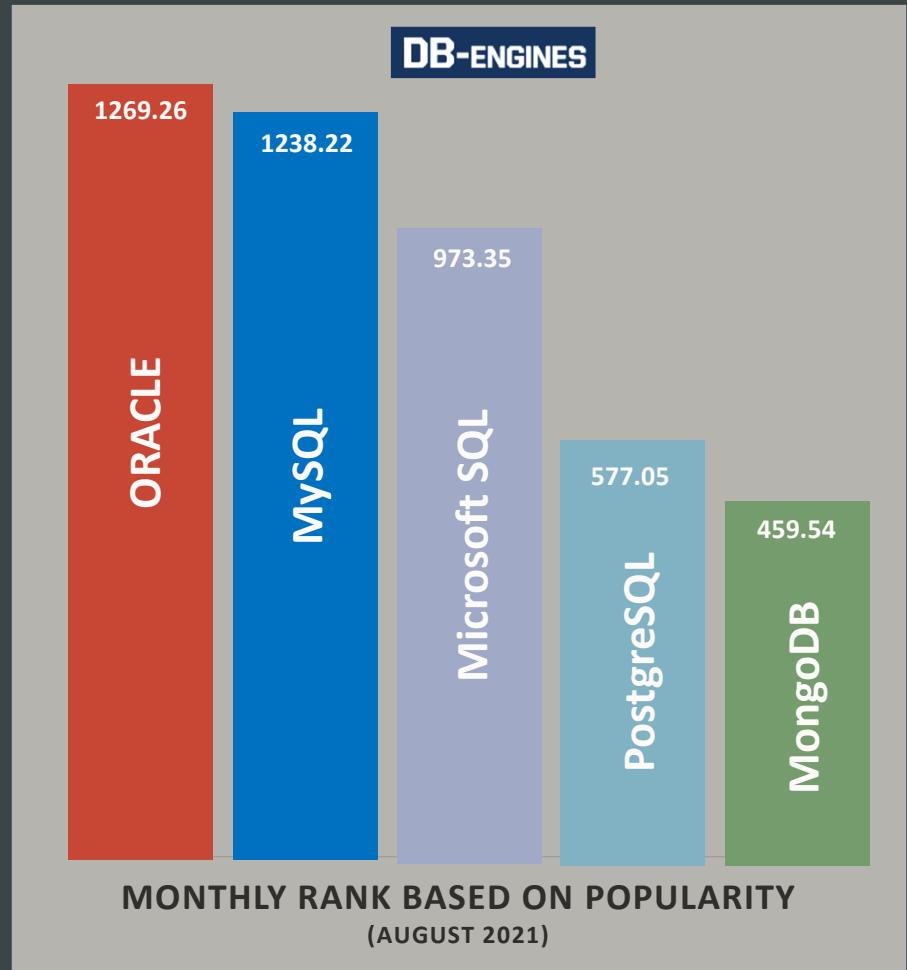
# MySQL是排名第一的開源資料庫

DB Engine的評價:

非常快,可靠,且有彈性的資料庫

定期發行更新版,帶出新功能和能力

支援多種最受歡迎的語言MySQL開發者的社群非常活躍



# 開發者喜歡MySQL

JetBrains 所做的調查

## 使用最廣的資料庫

過去12個月裡許多應用系統開發者仰仗MySQL其開發應用系統

用SQL為主時,MySQL是首選資料庫

因為以下原因而選擇



Performance



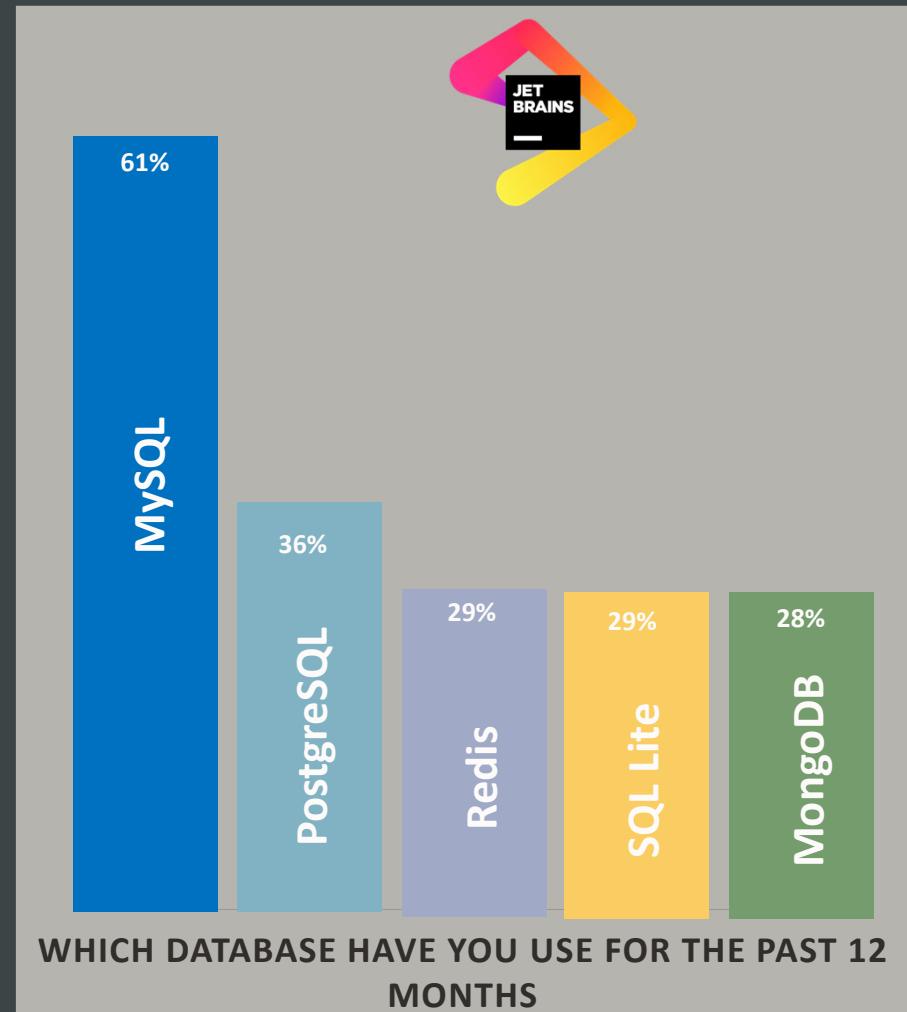
Scalability



Robustness



Cost



0

# MySQL企業版先進的安全功能

**Authentication** 

很容易的整合到安全架構中,包括PAM和Windows Active Directory

**Masking** 

內建解決方案,在顯示敏感的資料時隱藏和替換它們的值

**Encryption** 

在傳輸和存資料時,以即時的方式自動加密,具有加密,密鑰生成,數位簽證和其他密碼功能.

**Firewall** 

監看資料庫線程,自動產生允許執行之SQL的白名單,且攔阻沒被允許的資料庫取用.

**Audit** 

讓使用者能利用活動日誌,實施基於活動的日誌政策,管理稽核日誌檔案,且和Oracle Audit Vault或其他稽核工系統整合.

**Backup** 

提供資料庫"熱"備份,支援完全,增量,和部份備份,以及指時恢復,以降低資料丟失的風險.

**Monitor** 

超過四十個監看圖,和三百條最佳施行原則動態建議;主動告警資料庫的異常(或有可能異常的趨勢);查詢分析器替您找出需要優化的SQL,並分析其狀況和執行計劃

**TDE** 

保護表空間資料檔案甚至整個資料目錄,不會在不合法的地方被讀出

- 1 不需額外的硬體/VM
- 2 不需額外的軟體
- 3 不需額外的授權



## MySQL企業版協助客戶滿足安全法規



### Sarbanes-Oxley

Financial and Accounting Disclosure Information



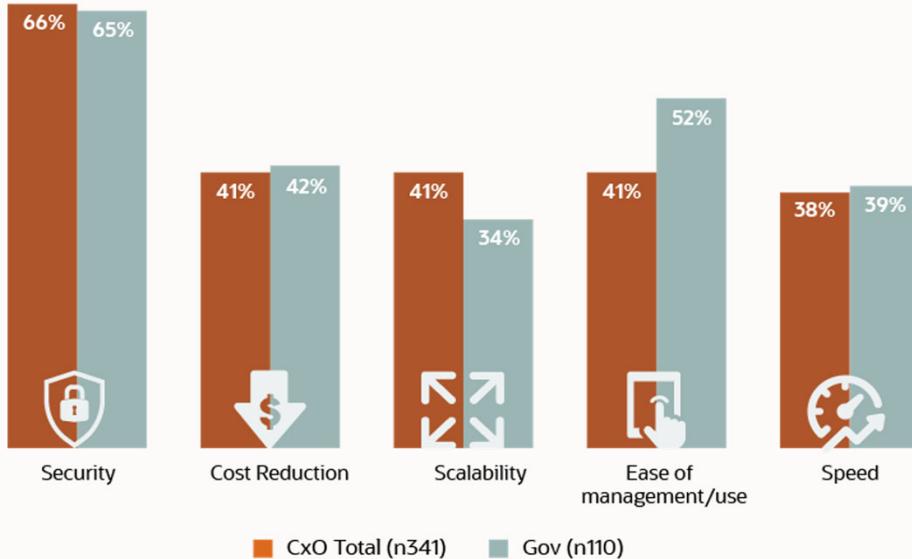
Data Protection Act 1998



# 資料庫持續往雲上遷移

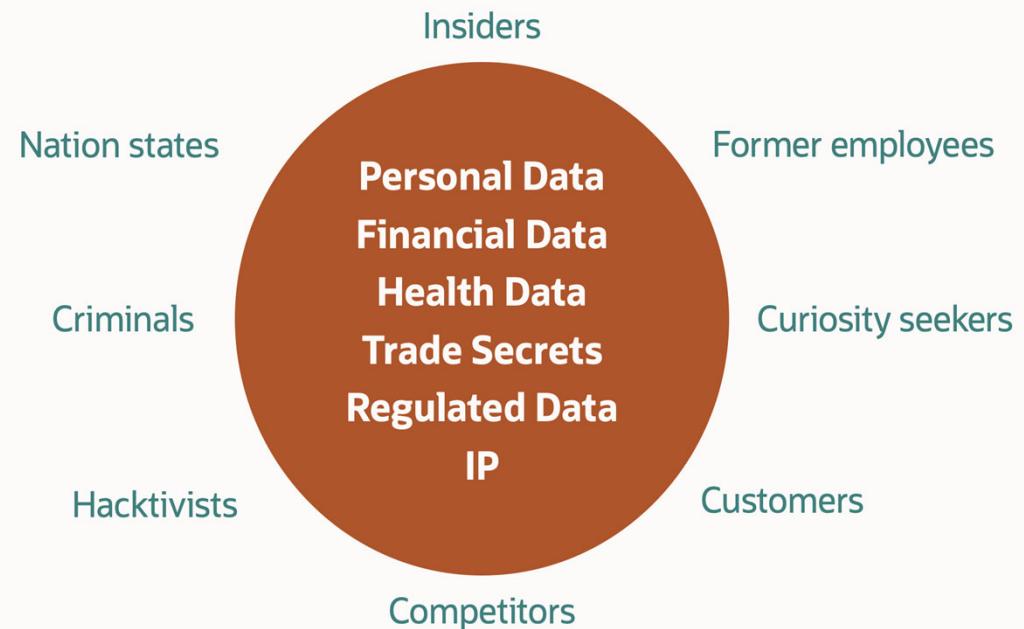


What are the biggest benefits of cloud computing for your organization today?



Source: [CxO survey](#)

Increasingly difficult to keep data secure on premise



# 客戶為何選擇MySQL Database Service

## 安全

使用 MySQL 企業版來滿足安全合規性

## 快速開通和自動化

為雲設計並在 OCI 中進行優化

## 外包

由 Oracle 提供的 MySQL 核心資料庫管理和基礎設施管理

## 更省錢

遠比其他第三方雲便宜



# 什麼是 MySQL Database Service (MDS) ?

Oracle所提供的MySQL雲服務,只在  
**Oracle Cloud Infrastructure**  
獨家提供



▶

## MySQL Database Service 是對第二代 Oracle Cloud Infrastructure 優化

有關第二代OCI: 保持第一代雲的優點, 同時持續改進

### First Generation Cloud

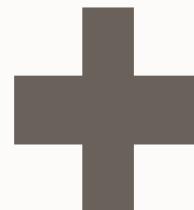
Elastic resources

Pay for what you use

High scale

Self-service

Easy to use



### Oracle Gen 2 Cloud

Security First

Superior Performance

Superior Economics

Enterprise Expertise

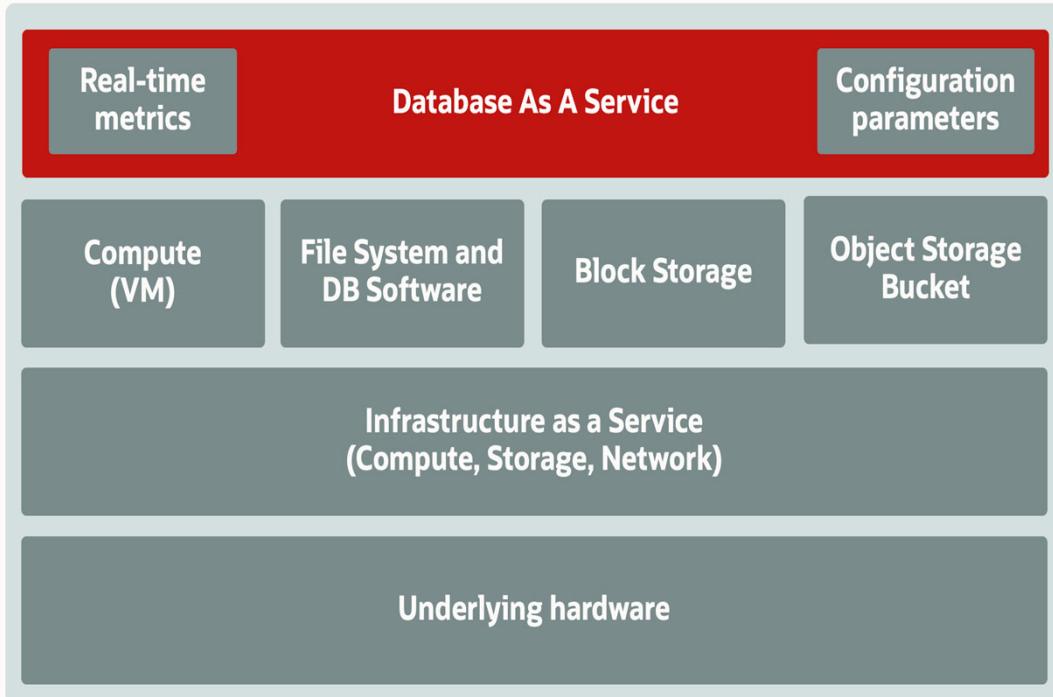
Open Ecosystem

# MySQL Database Service (MDS) 使用 MySQL企業版

- 1 降低資料洩漏的風險
- 2 滿足法令的要求
- 3 取得最新的更新版
- 4 和地端的MySQL 100% 相容
- 5 得到專家級MySQL 技術支援



# MySQL Database Service (MDS) 快速開通



- 1 不需要資料中心設施
- 2 不需要機房,硬體
- 3 不需要管理資料中心和太高深的 MySQL 專業知識
- 4 具可擴展性和擴展能力
- 5 減少時間和資源

MySQL Database Service (MDS) 的底層用 OCI 的資源, 自動管理運算, 存儲, 和按需求開通網路, 特別是不需人工介入.

# MySQL Database Service (MDS) 是自動化的

第二代人 OCI 提供敏捷性、可擴展性、部署速度和容易管理的能力

- 1 資料庫可擴展性
- 2 資料庫易於管理
- 3 部署速度



MySQL On Premise

MySQL Database Service

Automated (Green dot)

Manual (Red dot)

		MySQL On Premise	MySQL Database Service
Database	Scaling	●	●
	Backup	●	●
	Security Patch & Upgrade	●	●
	Provision & Configure	●	●
OS	OS Security Patch & Upgrade	●	●
	OS Installation	●	●
Server	Hardware Purchase & Maintenance	●	●
Storage	Storage Purchase & Maintenance	●	●
Data Center	Rack & Space	●	●
	Power, HVAC, Networking	●	●

# 以MySQL Database Service 外包 MySQL Database的運作

## 1 Oracle 負責

- 備份和恢復
- 具有自動故障轉移的高可用性
- 垂直和水平擴展
- 資料庫和作業系統修補
- 監控和日誌處理
- MySQL 企業版提供先進的安全性選項

## 2 客戶負責

- 邏輯模式建模
- 查詢設計和優化
- 定義資料使用和保留策略



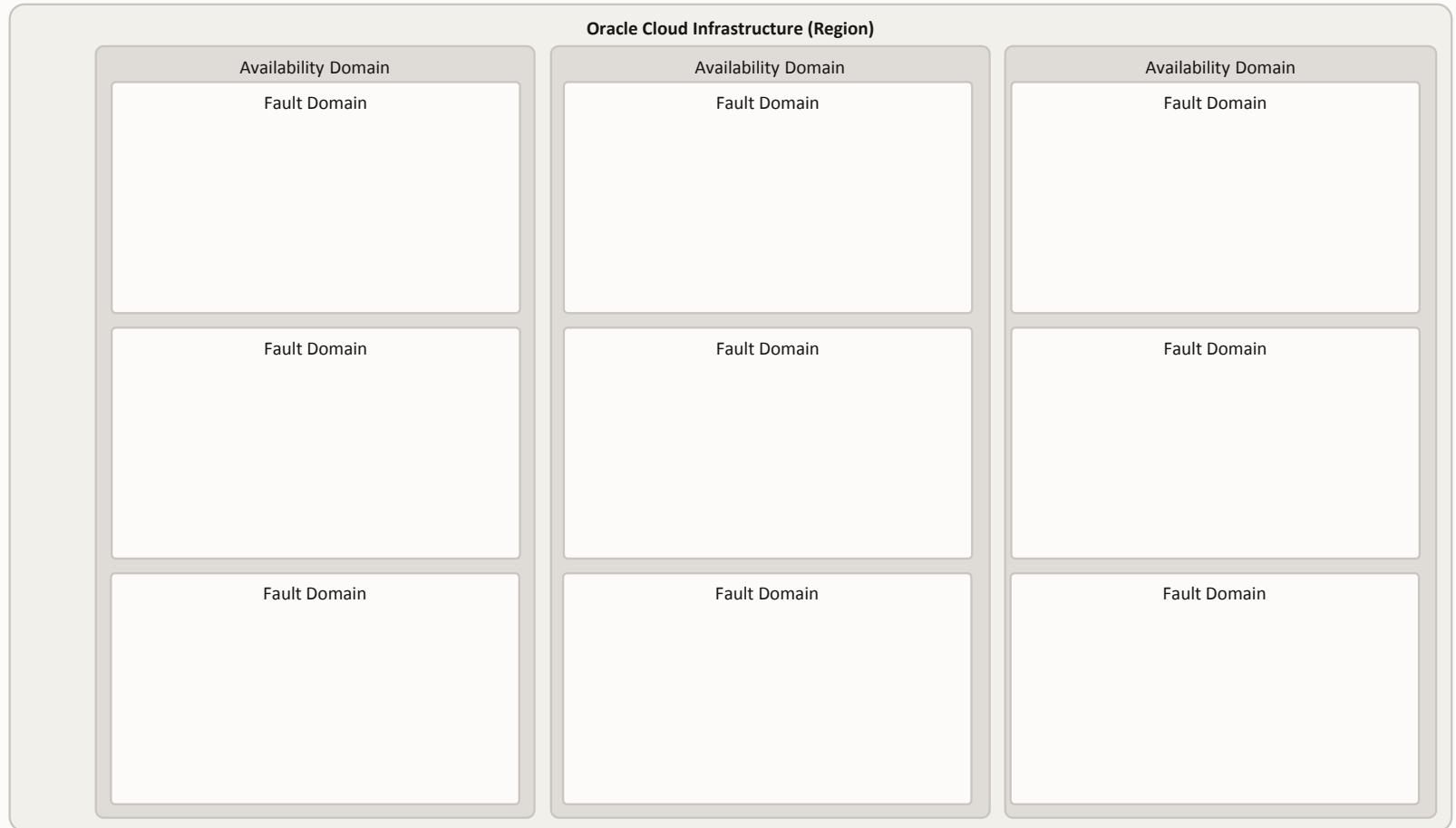
# 選擇您的地區

全球 23 個地區、31 個可用域



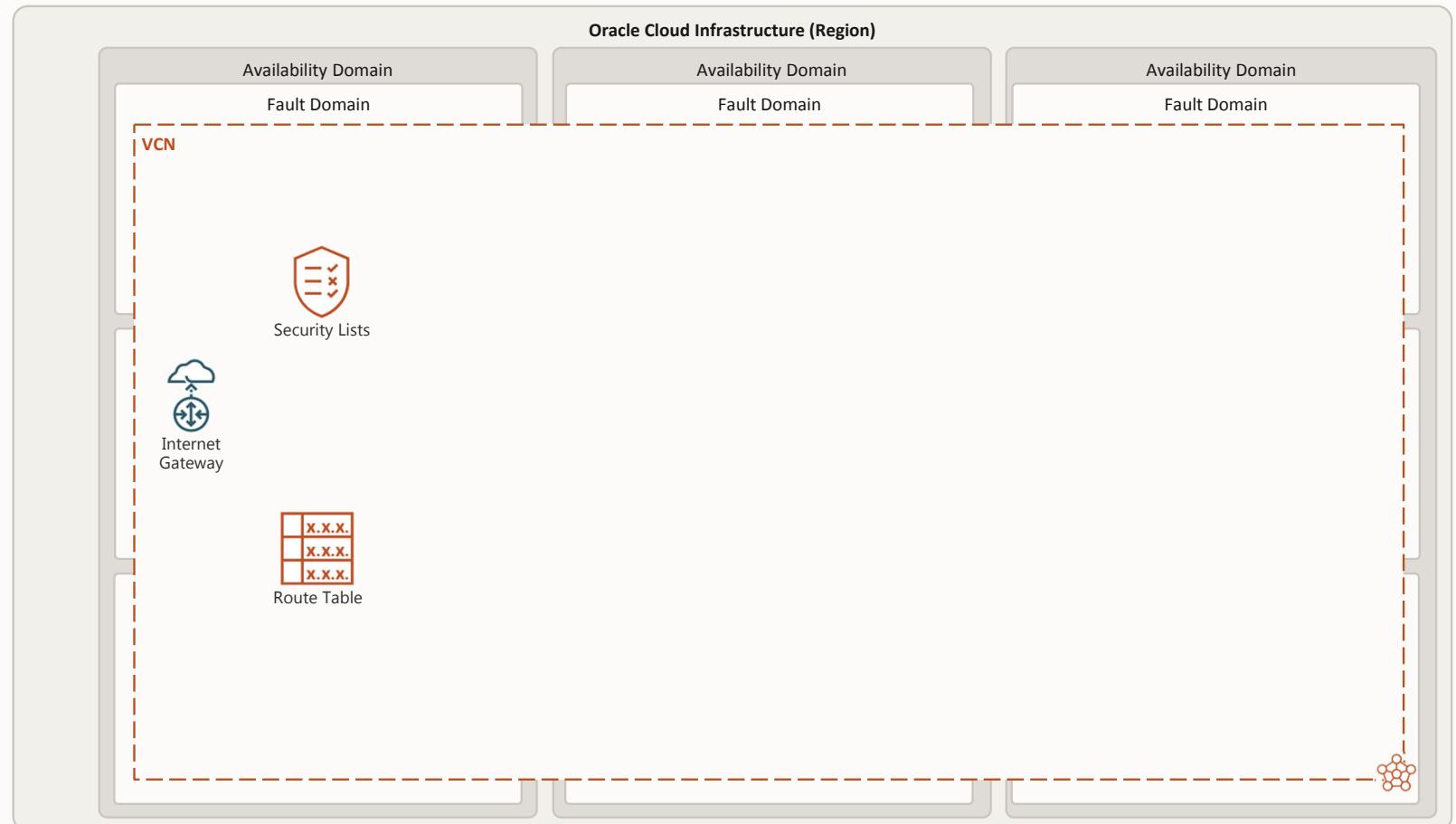
# 選擇您所在位置附近的地區

全球 23 個地區、31 個可用域



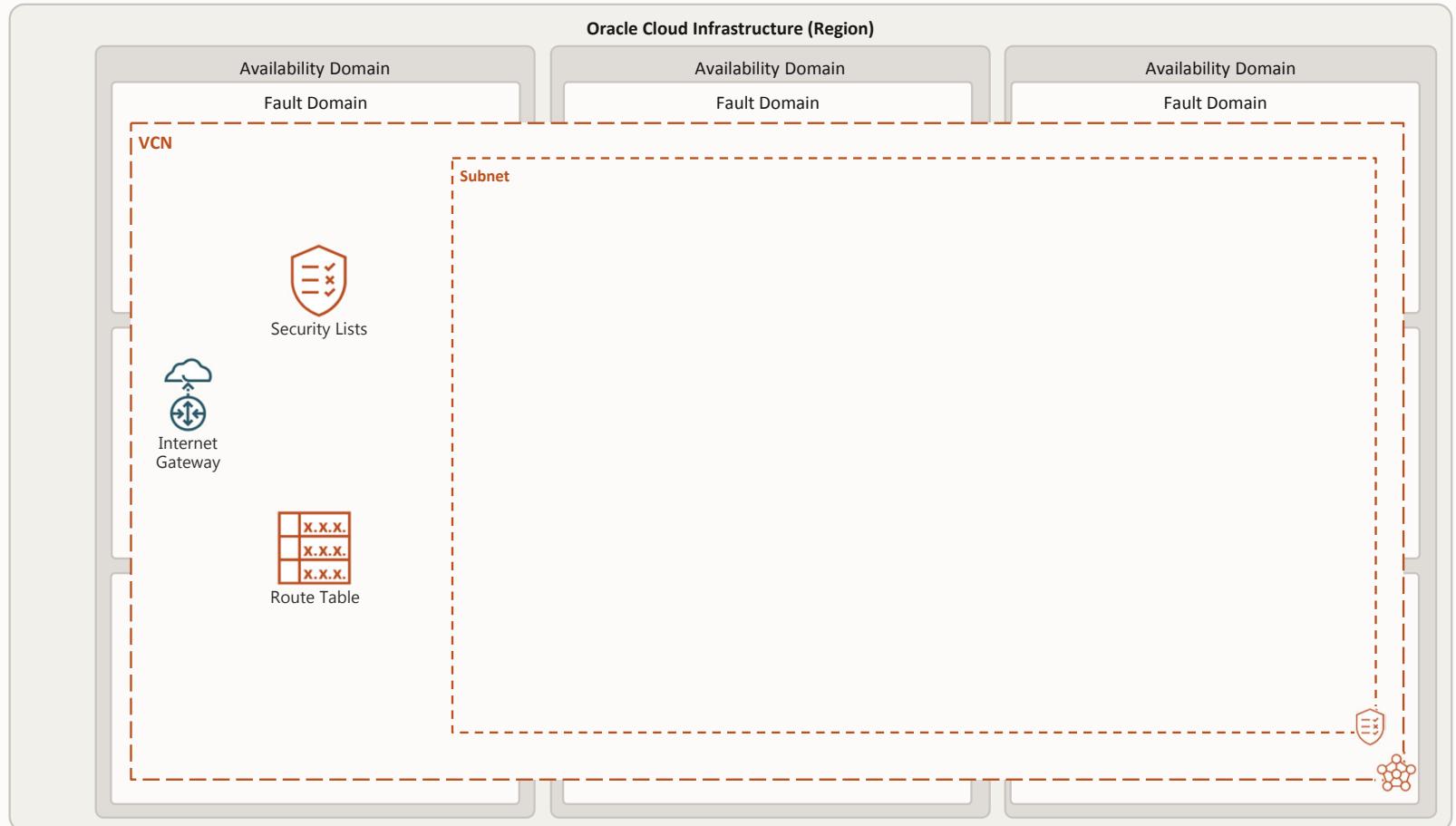
# 開通虛擬雲端網路(VCN)

可以在區域上配置 VCN

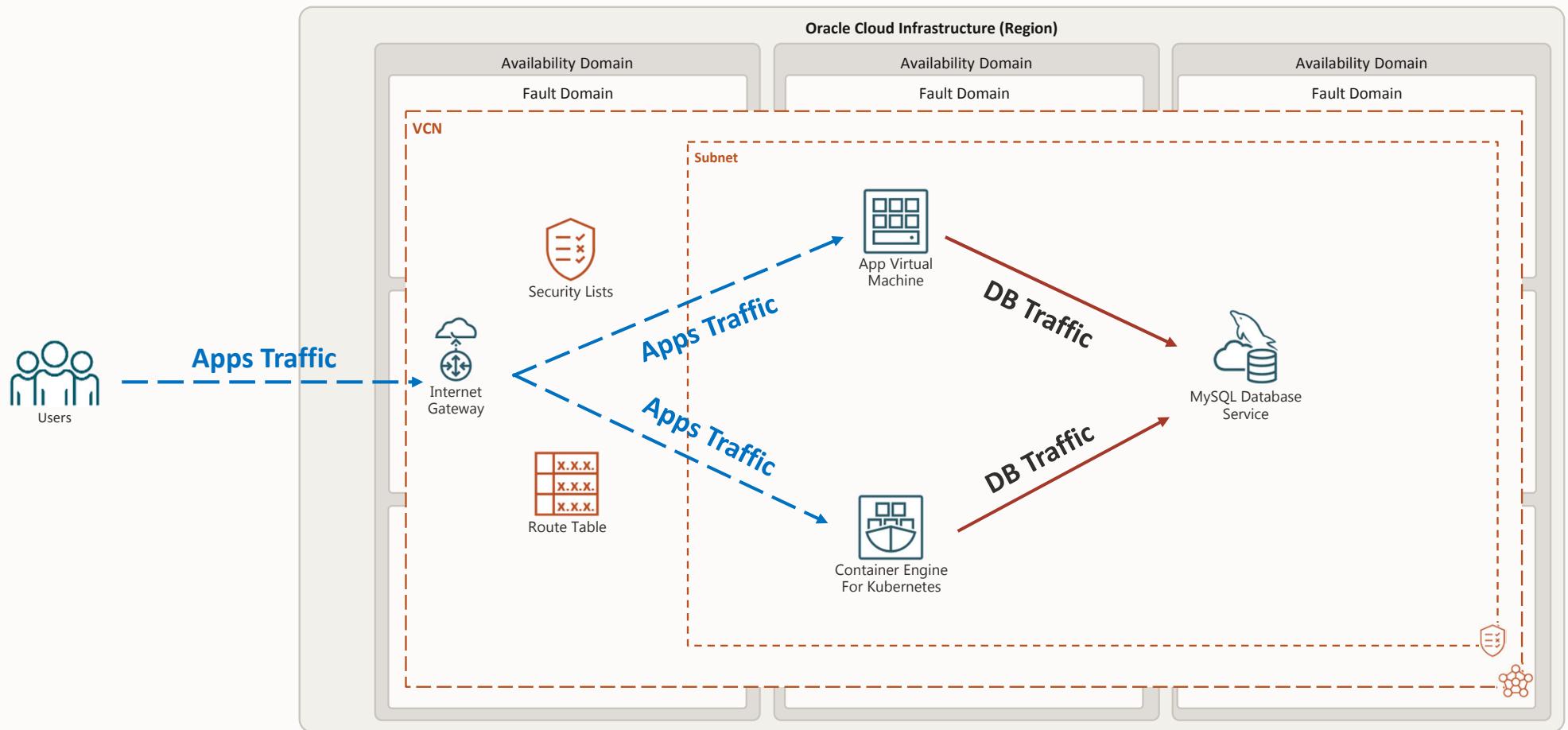


# 開通子網路

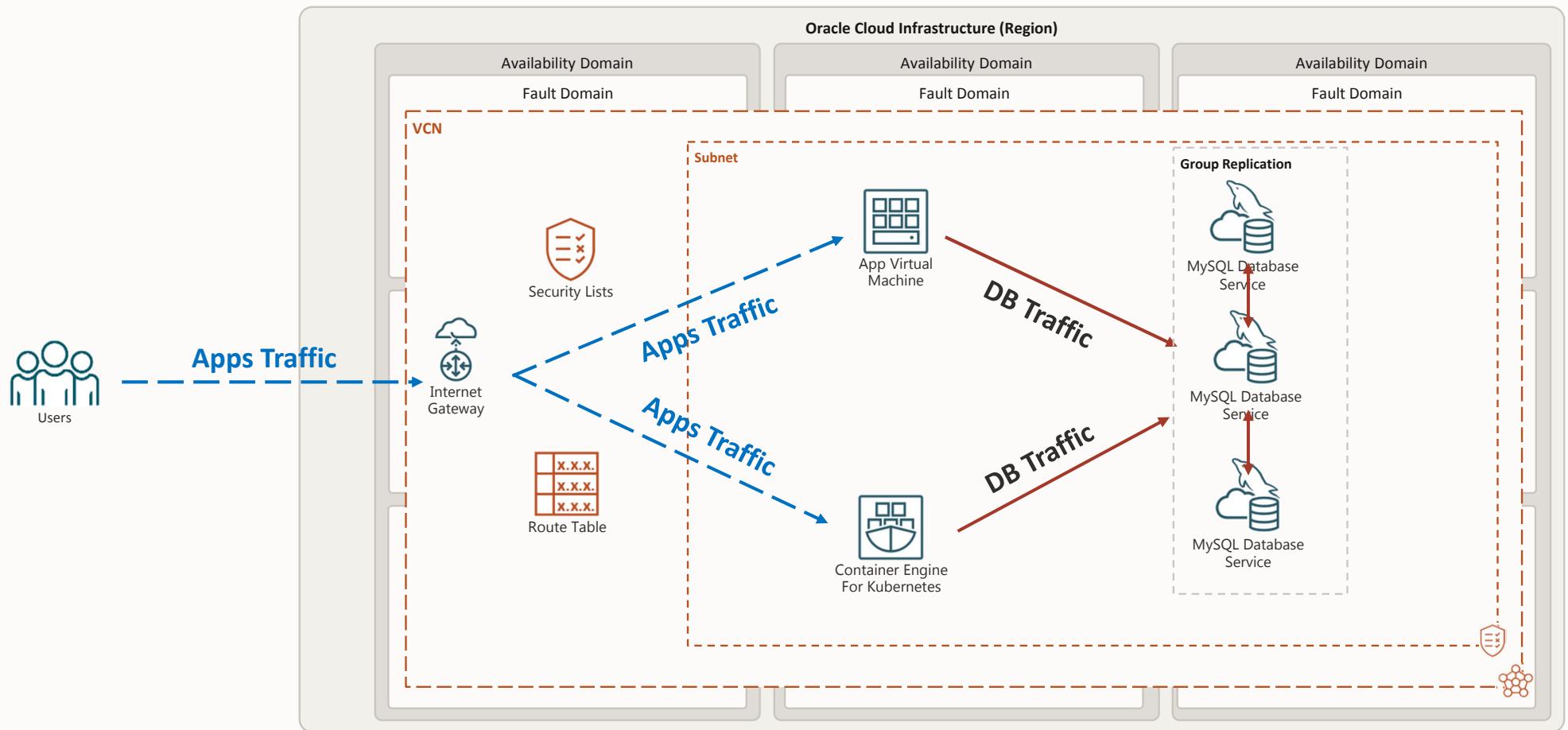
子網可以是 PUBLIC 或 PRIVATE 子網路



# 開通 MySQL Database Service – 單機

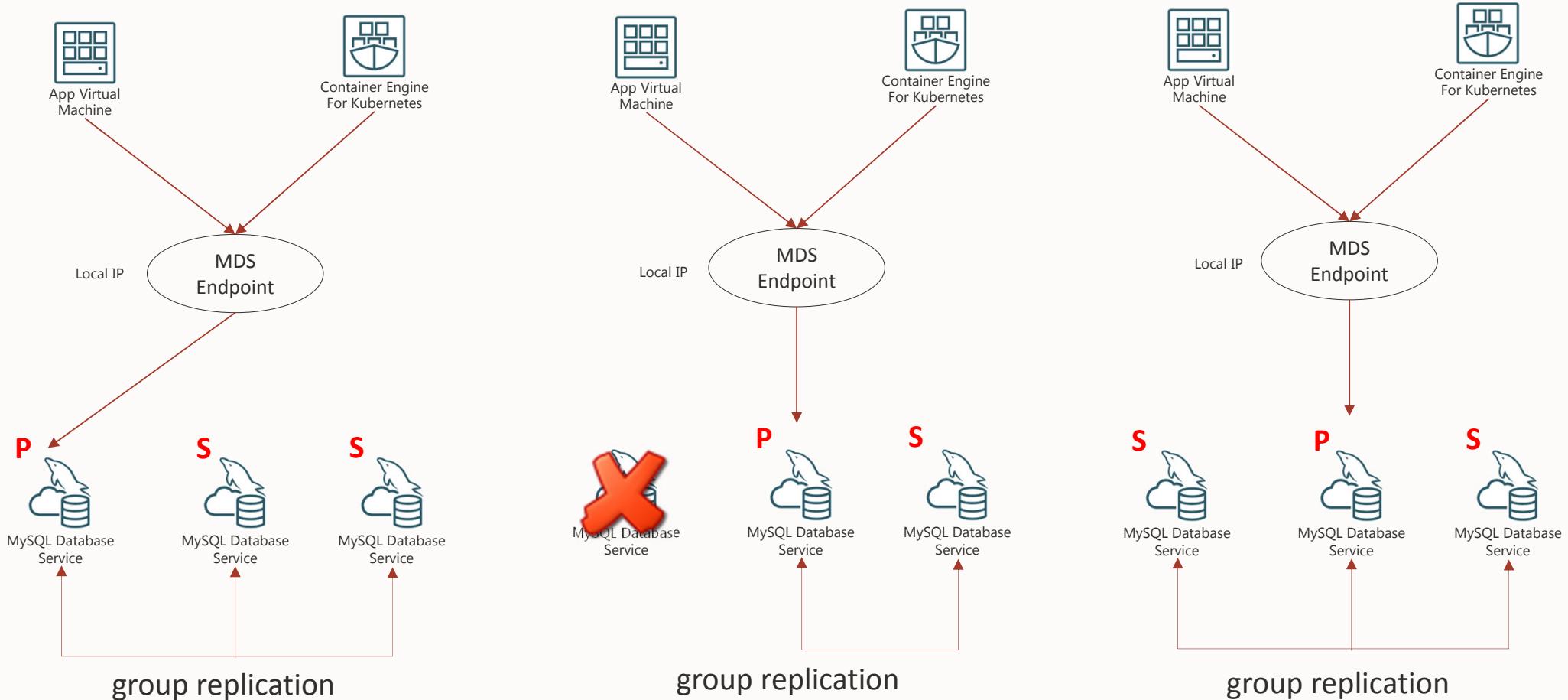


# MySQL Database 可以是高可用模式



# 以MySQL Group Replication 支援高可用

所有實例都是開的,故障移轉不需開機備用實例,不用崩潰回復,能rolling upgrade大幅增進SLA



相對其他MySQL雲服務成本可以降低

70%

MySQL Database Service: 1 Year TCO  
100 OCPUs, 1TB Storage

MySQL Database Service: Standard E3 AMD 16GB/Core, all regions have the same price.  
Amazon RDS: Intel R5 16GB/Core, [AWS US East](#).  
Azure: Memory Optimized Intel 20GB/Core, [MS Azure US-East](#).  
Google: High Memory N1 Standard Intel 13GB/Core, [GCP Northern Virginia](#).  
Configuration: 100 OCPUs, 1 TB Storage.

只需~30%的成本  
每年省 ~ 4億萬



inbound traffic is FREE and outbound traffic is FREE for the first 10 TB per month

0

## MySQL Database Service: 可供選擇的配置

A shape determines the options for resources such as core count, and memory size. For more information about shapes, see [System Configuration](#).

All Types Virtual MachineBare Metal

Available Shapes

Name	Supports HeatWave	CPU Core Count	Memory Size
<input type="checkbox"/> MySQL.VM.Standard.E3.1.8GB	No	1	8 GB
<input type="checkbox"/> MySQL.VM.Standard.E3.1.16GB	No	1	16 GB
<input type="checkbox"/> MySQL.VM.Standard.E3.2.32GB	No	2	32 GB
<input type="checkbox"/> MySQL.VM.Standard.E3.4.64GB	No	4	64 GB
<input type="checkbox"/> MySQL.VM.Standard.E3.8.128GB	No	8	128 GB
<input type="checkbox"/> MySQL.VM.Standard.E3.16.256GB	No	16	256 GB
<input type="checkbox"/> MySQL.VM.Standard.E3.24.384GB	No	24	384 GB
<input type="checkbox"/> MySQL.VM.Standard.E3.32.512GB	No	32	512 GB
<input type="checkbox"/> MySQL.VM.Standard.E3.48.768GB	No	48	768 GB
<input type="checkbox"/> MySQL.VM.Standard.E3.64.1024GB	No	64	1,010 GB
<input type="checkbox"/> MySQL.HeatWave.VM.Standard.E3	Yes	16	512 GB

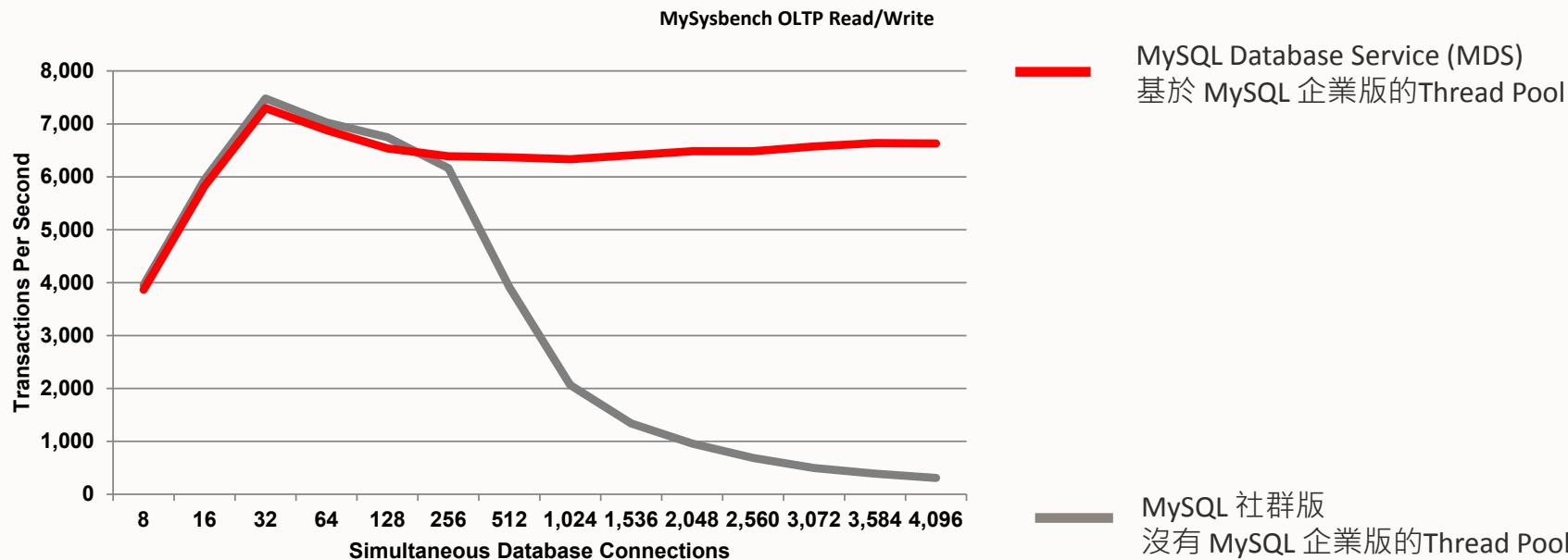
0 Selected Showing 11 Items



## 以MySQL Database Service (MDS)加強性能和容量

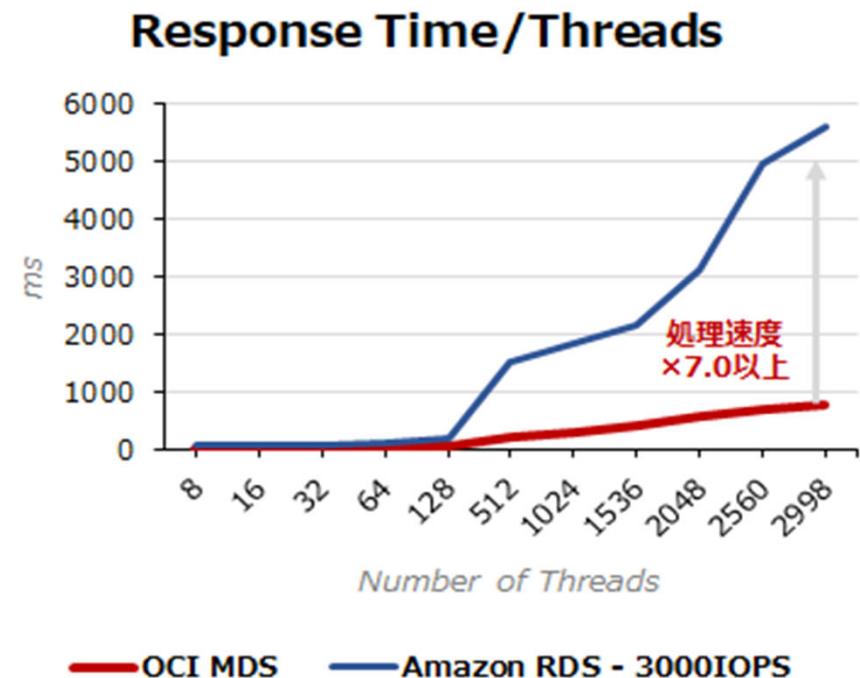
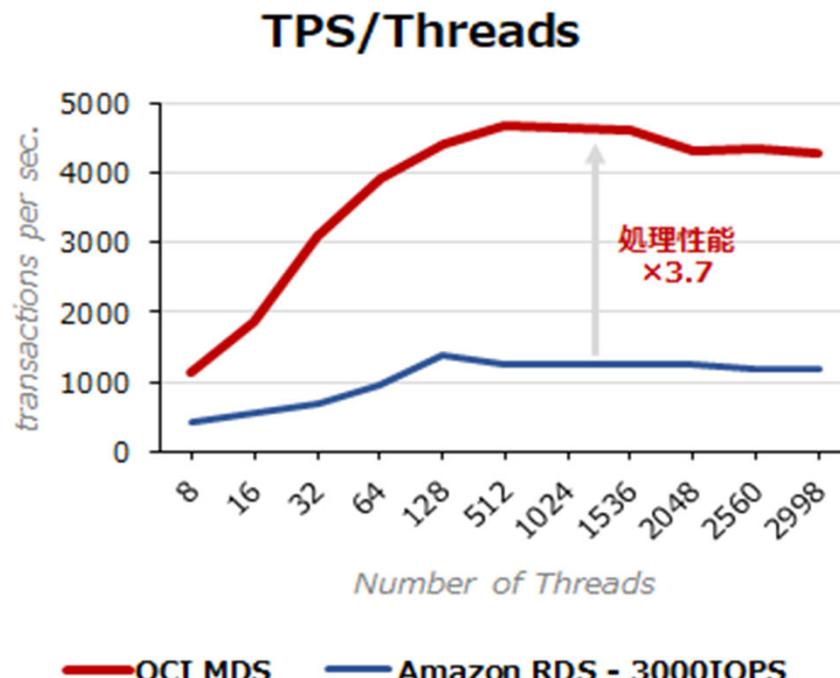
具有 MySQL 企業版的線程池的可使擴展性加大

20倍



# MDS和AWS RDS的性能的比對

- <https://blog.s-style.co.jp/2021/02/7329/>



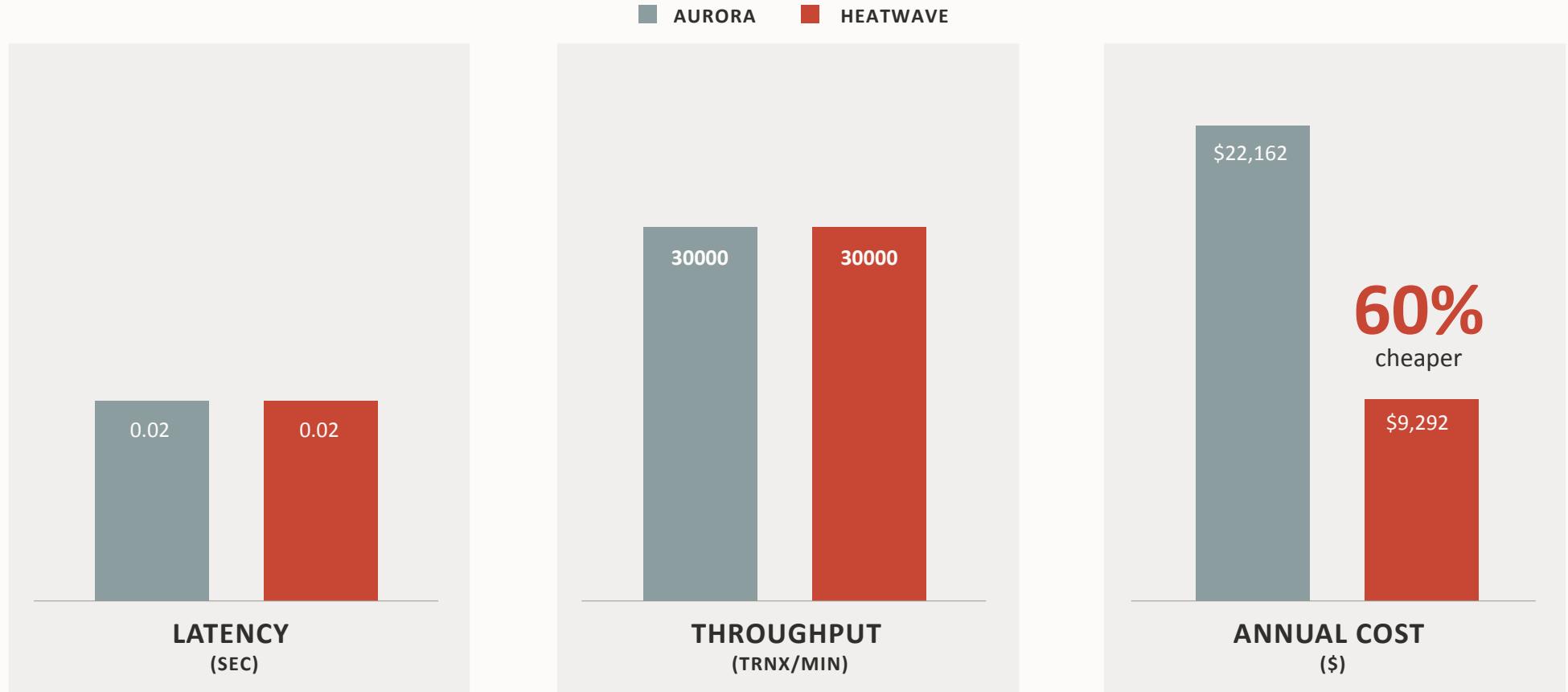
RDS	-Db.r6g.4xlarge ( 16个vCPU / 128GB ) -MySQL 8.0.21 ( 最新可选版本 ) -存储 : 预置SSD 200GB ( 3000IOPS ) / 300GB ( 15000IOPS ) (* 2 )
sysbench执行服务器 ( EC2 )	- T3a.xlarge ( 4个vCPU / 16GB RAM ) - 存储 : 200GB (* 1 ) - NW带宽 : 最大5 Gbps

MDS	-MySQL.VM.Standard.E3.8.128 ( 8个OCPU / 128GB ) -MySQL 8.0.22-存储空间 : 200GB
sysbench执行服务器 ( Compute Instance )	- VM.Standard.E3.Flex ( 4个OCPU / 16GB RAM ) - 存储 : 200GB (* 1 ) - NW带宽 : 4 Gbps



## 只看用於OLTP的性價比, 價格仍然是Aurora的一半

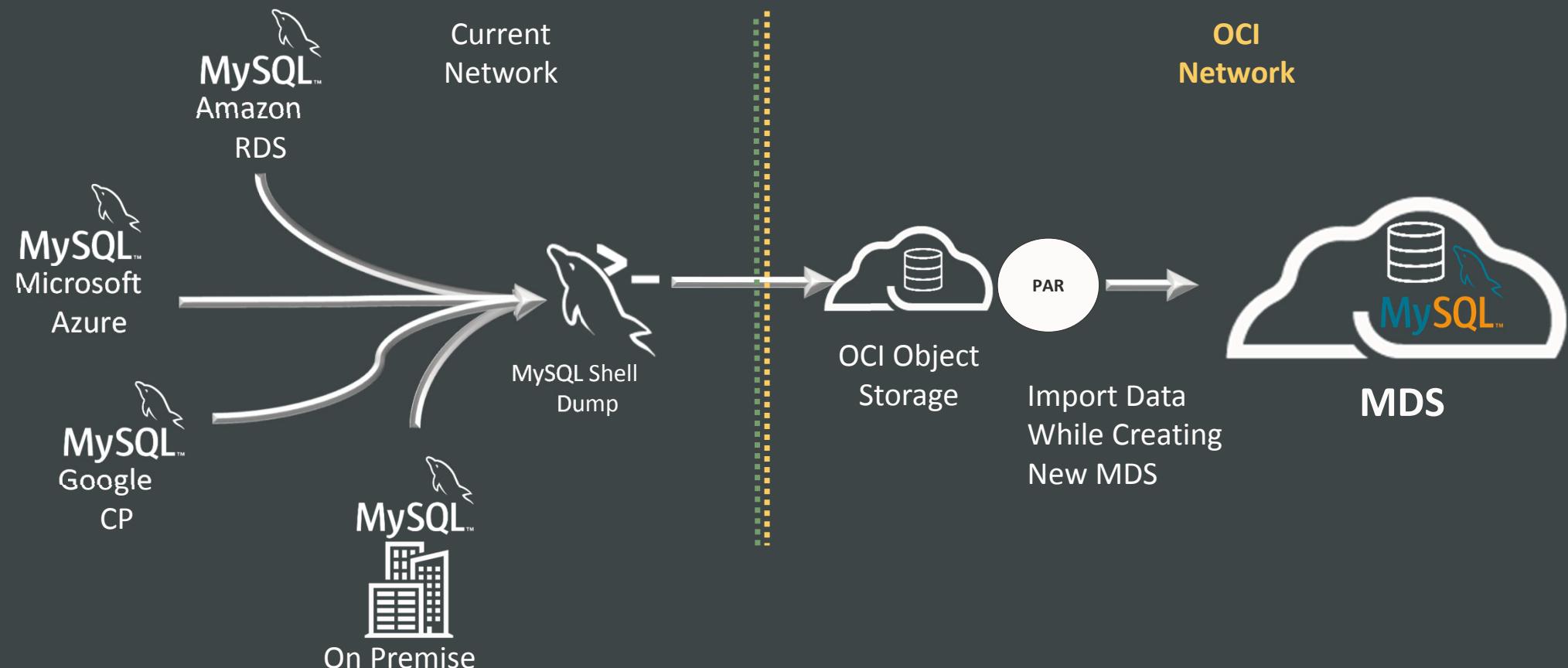
CH-benCHmark, 100G, TPCC, 128 concurrent sessions, 30K OLTP transactions/min



\*Benchmark queries are derived from CH benchmark, but results are not comparable to published CH benchmark results since they do not comply with CH specification.



# 將資料庫遷移到 MySQL 資料庫服務



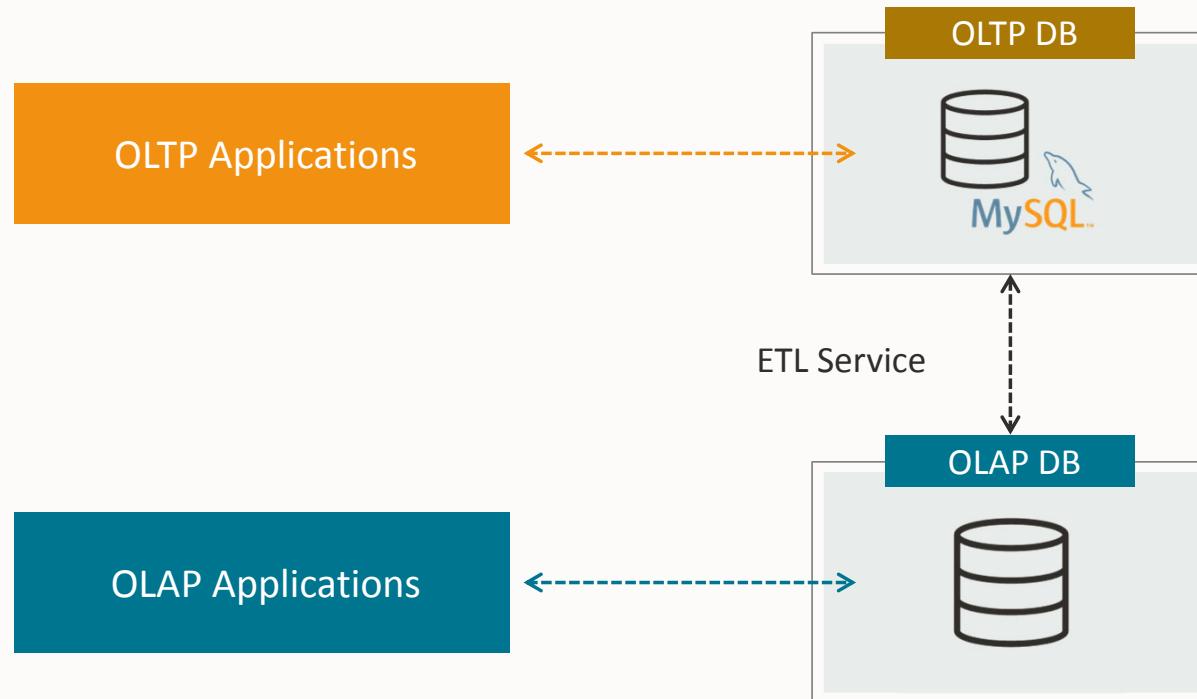
# 使用 MySQL Heatwave 使查詢性能加速400倍

如果您有以下問題,請留意以下的內容:

- 在做複雜查詢或大資料查詢有性能的問題嗎?
- 為了產生分析性報告必需搬移大量資料嗎?
- 無法及時提供分析性報告,以致無法因應市場的變化嗎?
- 受限於現有的技術,無法對更大量的資料做更複雜,更深度的分析嗎?
- 大資料分析的成本太高,不能普遍的應用



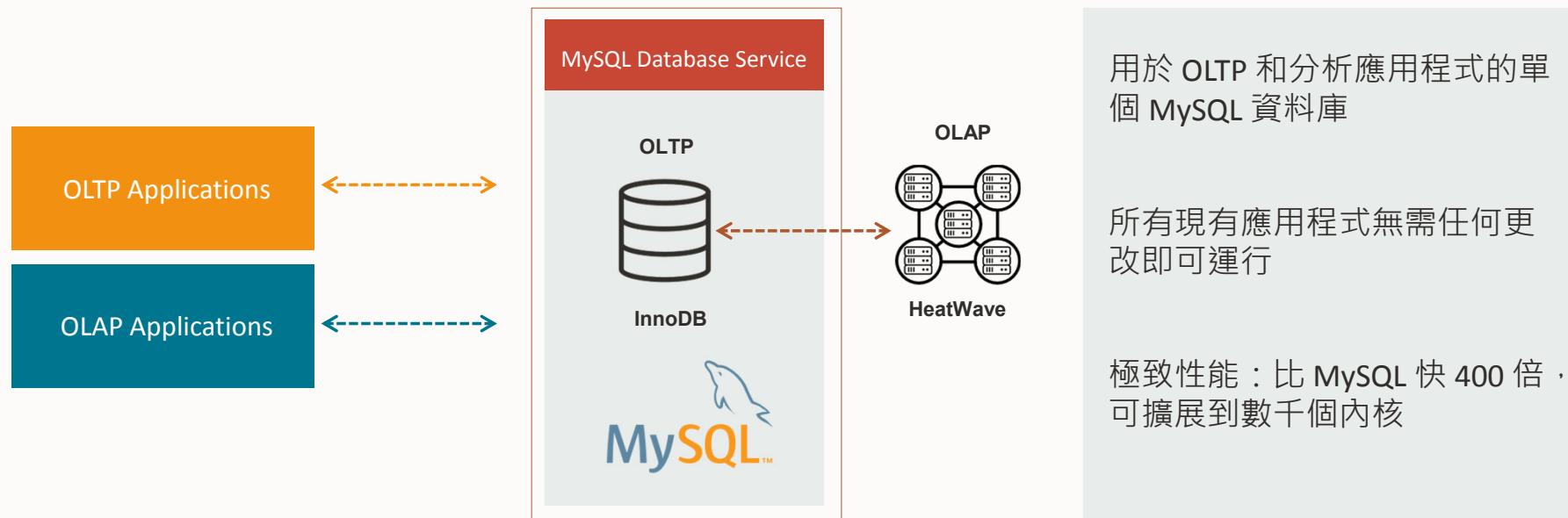
## 典型的部署： OLTP 和 OLAP 是獨立系統



你怎樣才能使它更容易實施和維護？  
如何讓它更容易使用？  
如何讓 OLTP DB 運行得更快？  
如何有實時的 OLAP 報告？  
如何降低複雜度？  
如何減少技術環境足跡和成本？

## 具HeatWave的MySQL Database Service

輕鬆對 MySQL 資料庫運行高性能分析，無需 ETL



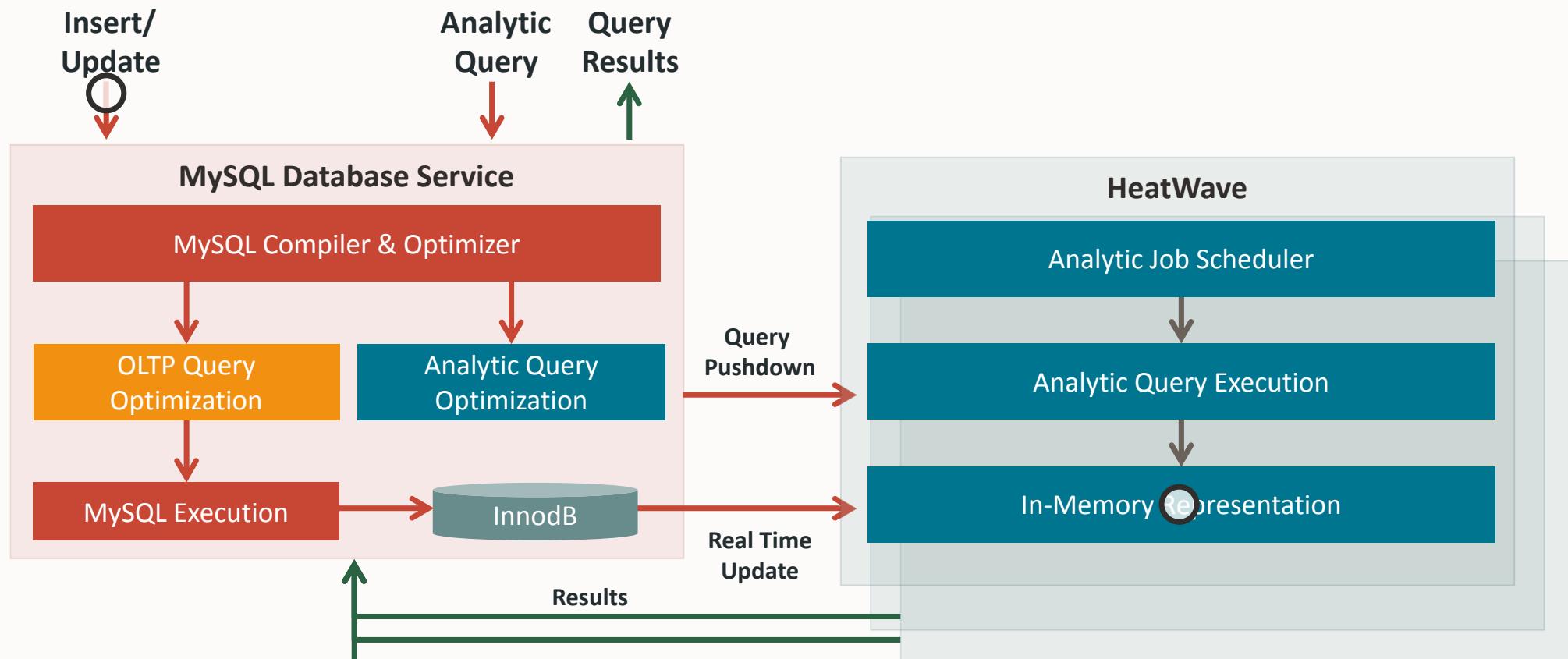
“By 2022, public cloud services will be essential for 90% of data and analytics innovation.”

Gartner



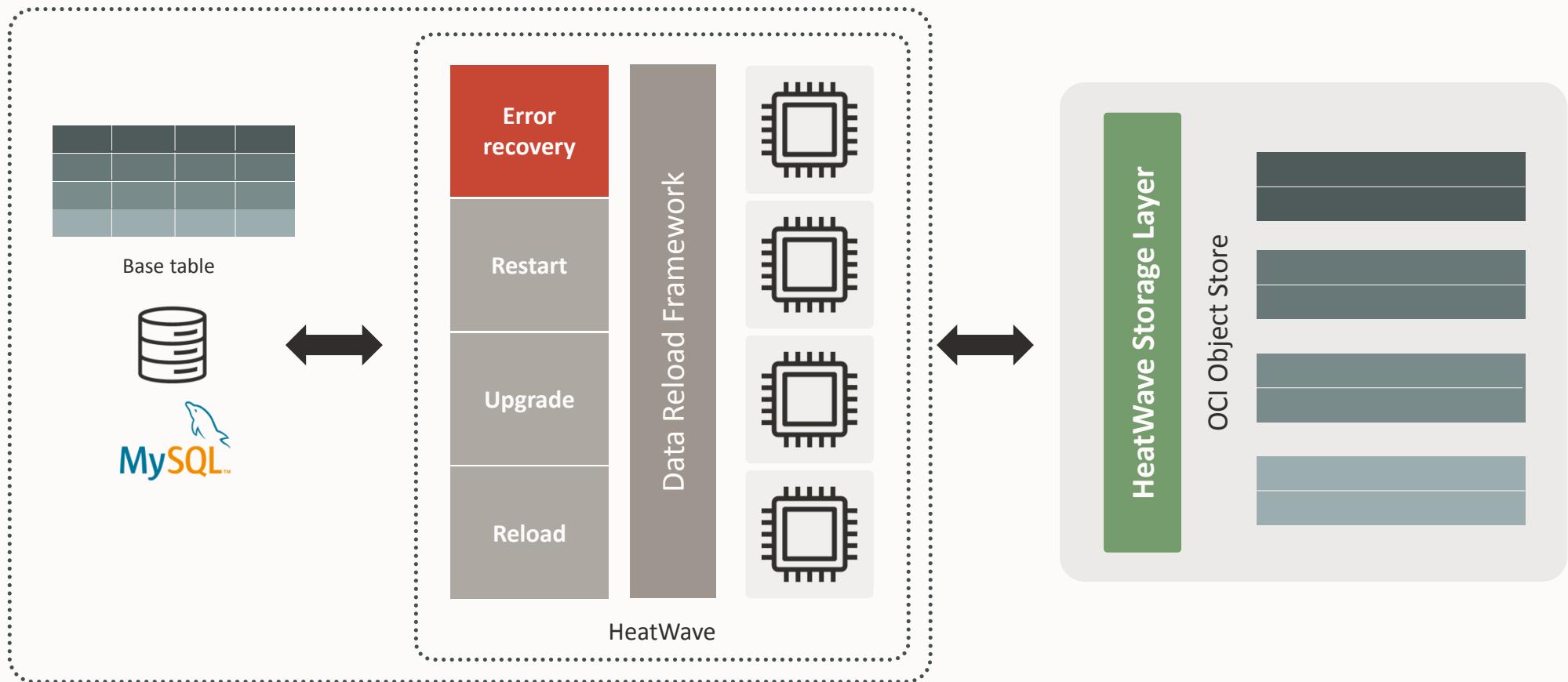
## 具HeatWave的MySQL Database Service

在 MySQL 中的資料變更可在一秒鐘內就能用於分析查詢



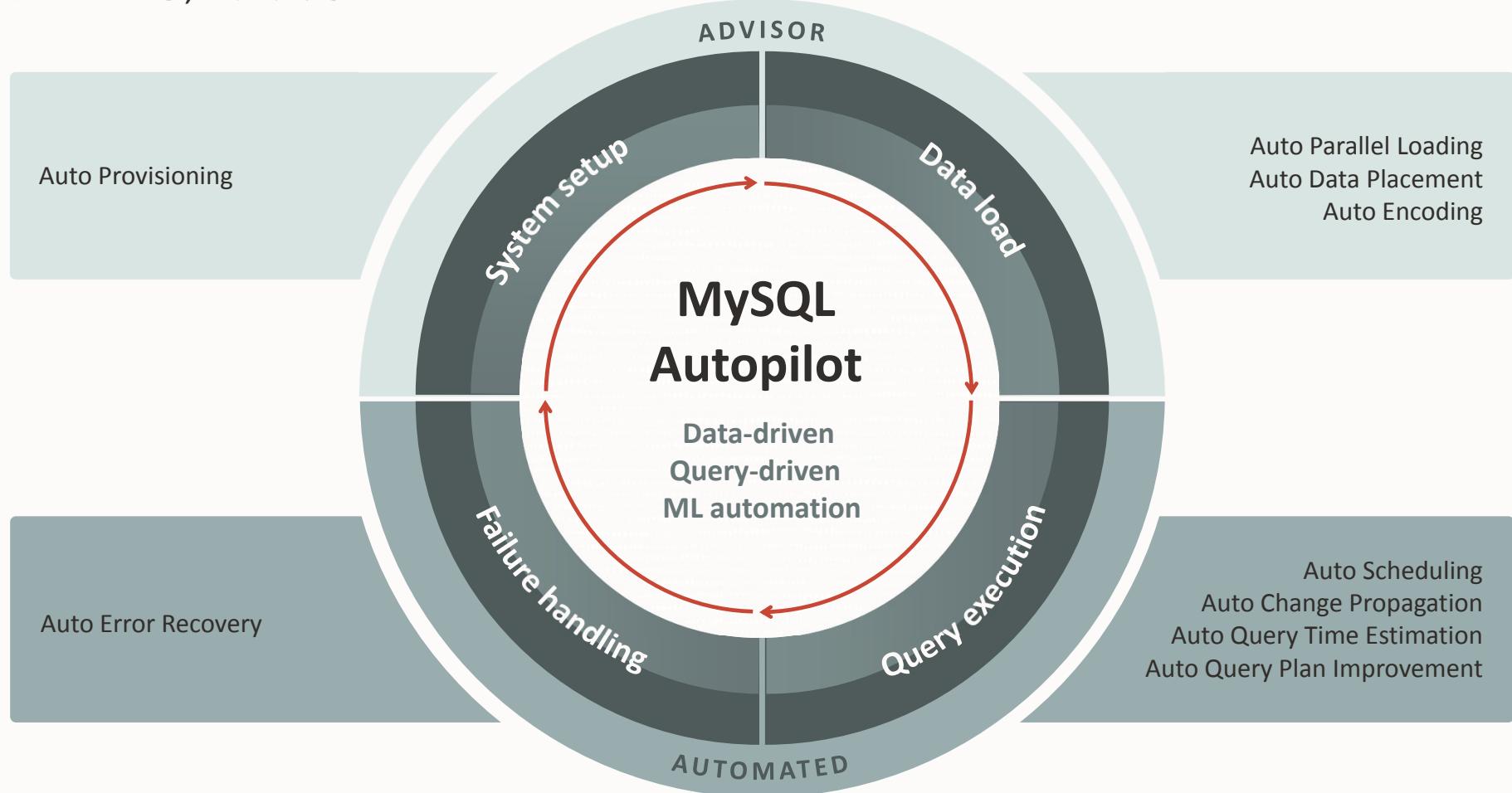
# MySQL HeatWave 的横向擴展力

重新加載任何數量的資料的時間是固定的



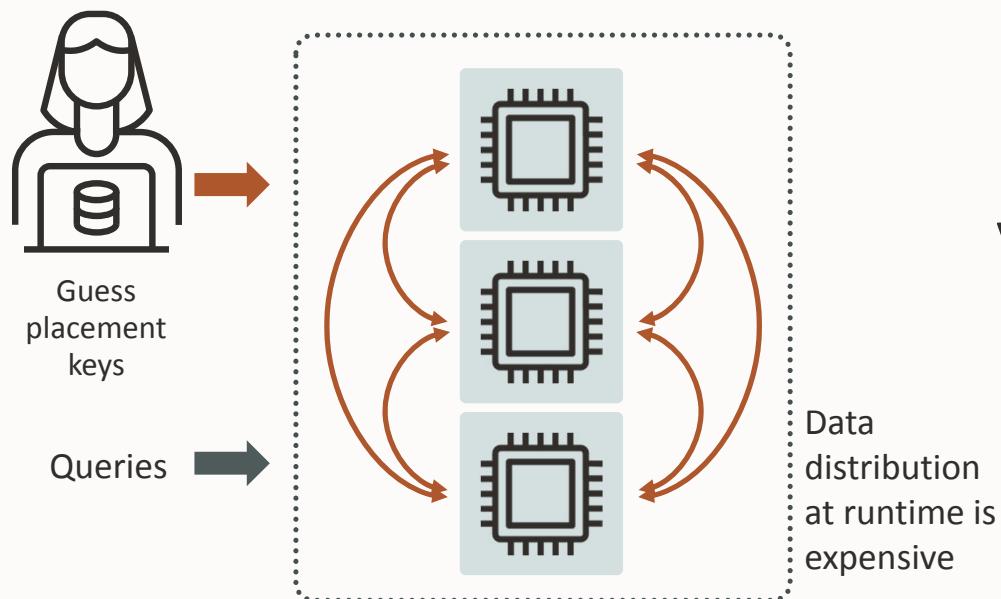
# MySQL HeatWave以machine-learning為基礎的自動化

## 持續改進 - 好,還要更好



# Auto Data Placement

用猜的決定資料如何分佈通常無法得到最佳效能



- 系統根據資料和查詢特性預測和選擇最佳的欄位做在記憶體中的分片
- 可預測在執行時能得到的改善

# Auto Data Placement 的結果

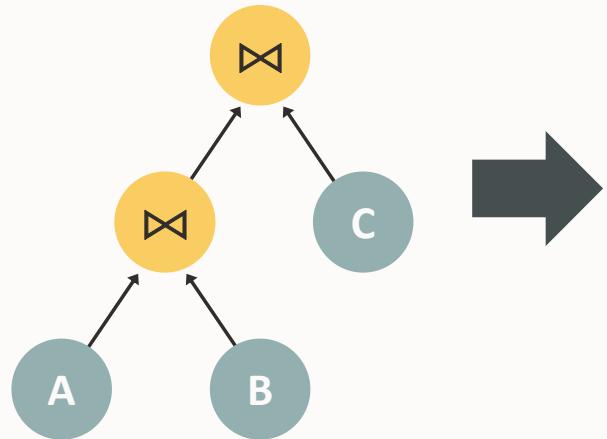
用 machine learning 持續學習性能改進模的模式 – 越用越快

Dataset	Time with primary key placement	Predicted improvement	Actual improvement
TPCH 1024	332 sec	26%	<b>37%</b>
TPCH 4096	373 sec	20%	<b>25%</b>

# Auto Query Plan 改進

基於以前的查詢,優化器學習並改進查詢計劃

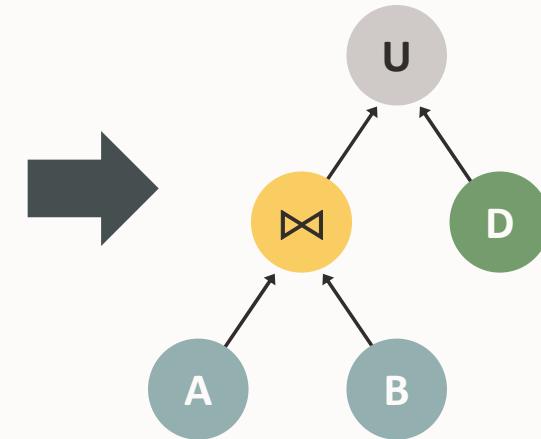
Query #1  
 $A \bowtie B \bowtie C$



Node	Statistics
A	70
B	150
$A \bowtie B$	1000
C	...
$A \bowtie B \bowtie C$	...

Runtime stats

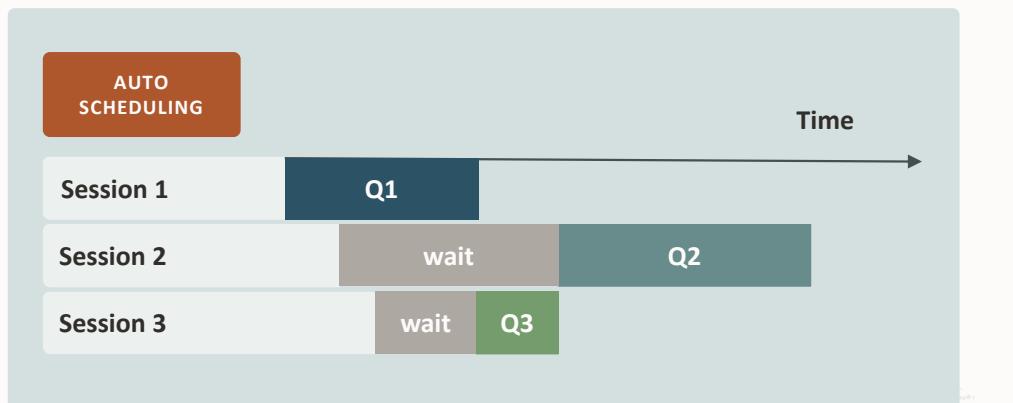
Query #2  
 $A \bowtie B \cup D$



以TPCH, TPCDS 24TB以場景, MySQL Autopilot 使性能增進 **40%**

# Auto Scheduling

預測執行時間,且提升短查詢的優先順序,而提升總體效能



Reduces wait time for mixed workloads  
(OLTP + OLAP)

## Performance results

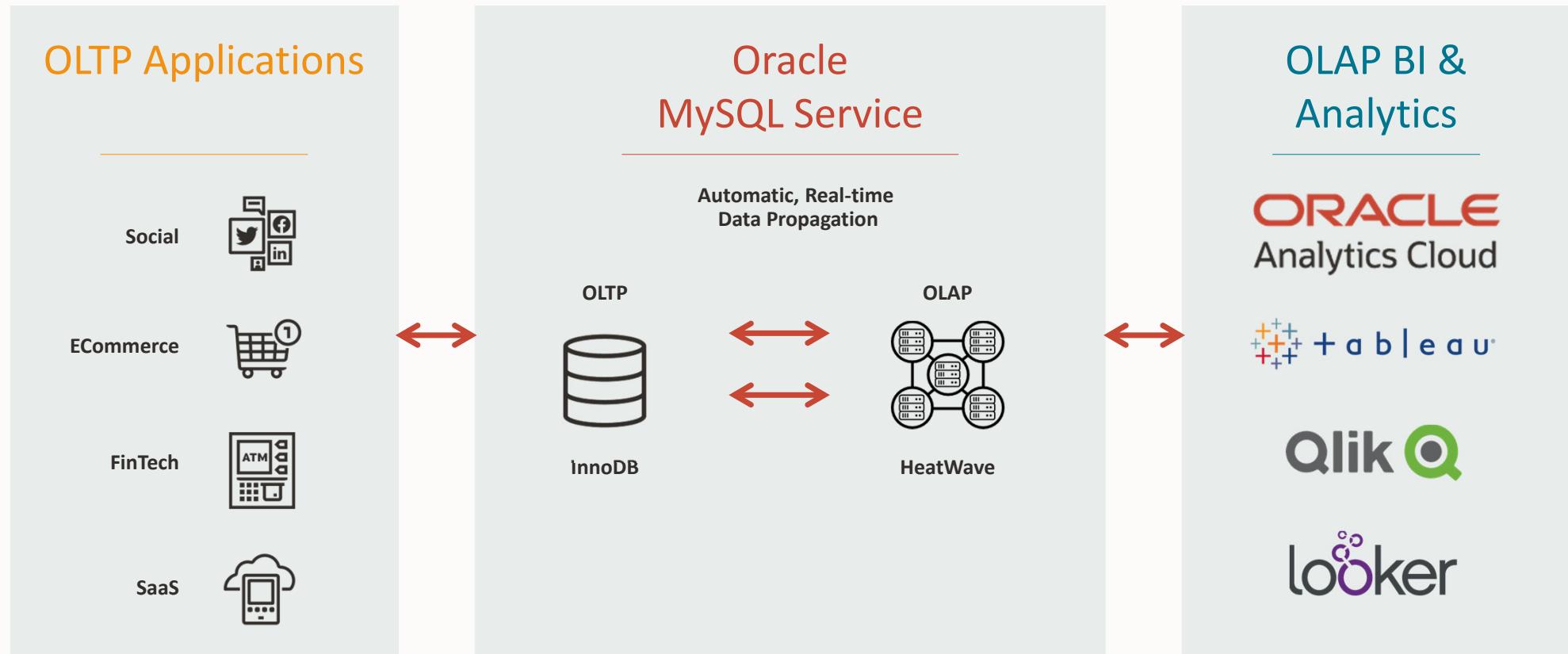
Short queries in workload			
Query	Baseline (sec)	Auto-Scheduling (sec)	Elapsed Time Reduction
12	26.03	7.43	
16	27.18	12.45	
10	18.93	12.62	
7	16.27	12.08	
19	18.24	13.81	
Geomean	<b>20.89</b>	<b>11.43</b>	<b>45.29%</b>

## Long queries in workload

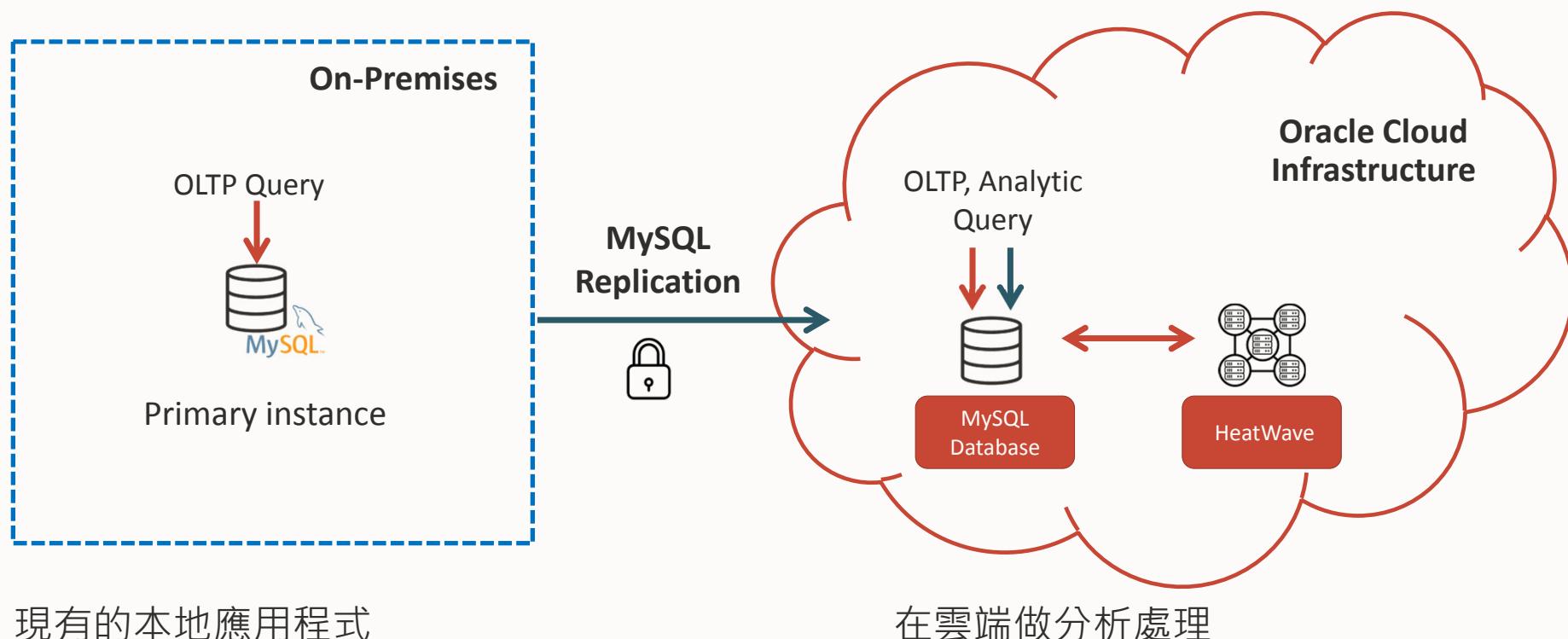
Long queries in workload			
Query	Baseline (sec)	Auto-Scheduling (sec)	Elapsed Time Increase
21	62.17	65.59	
18	44.37	59.41	
9	31.42	25.59	
17	38.06	42.07	
1	22.02	23.56	
Geomean	<b>37.34</b>	<b>39.72</b>	<b>6.36%</b>

以增加長查詢2.5秒總時間的代價,使短查詢總時間縮短8.5秒

所有與 MySQL 兼容的分析應用程式 無需任何更改即可運行

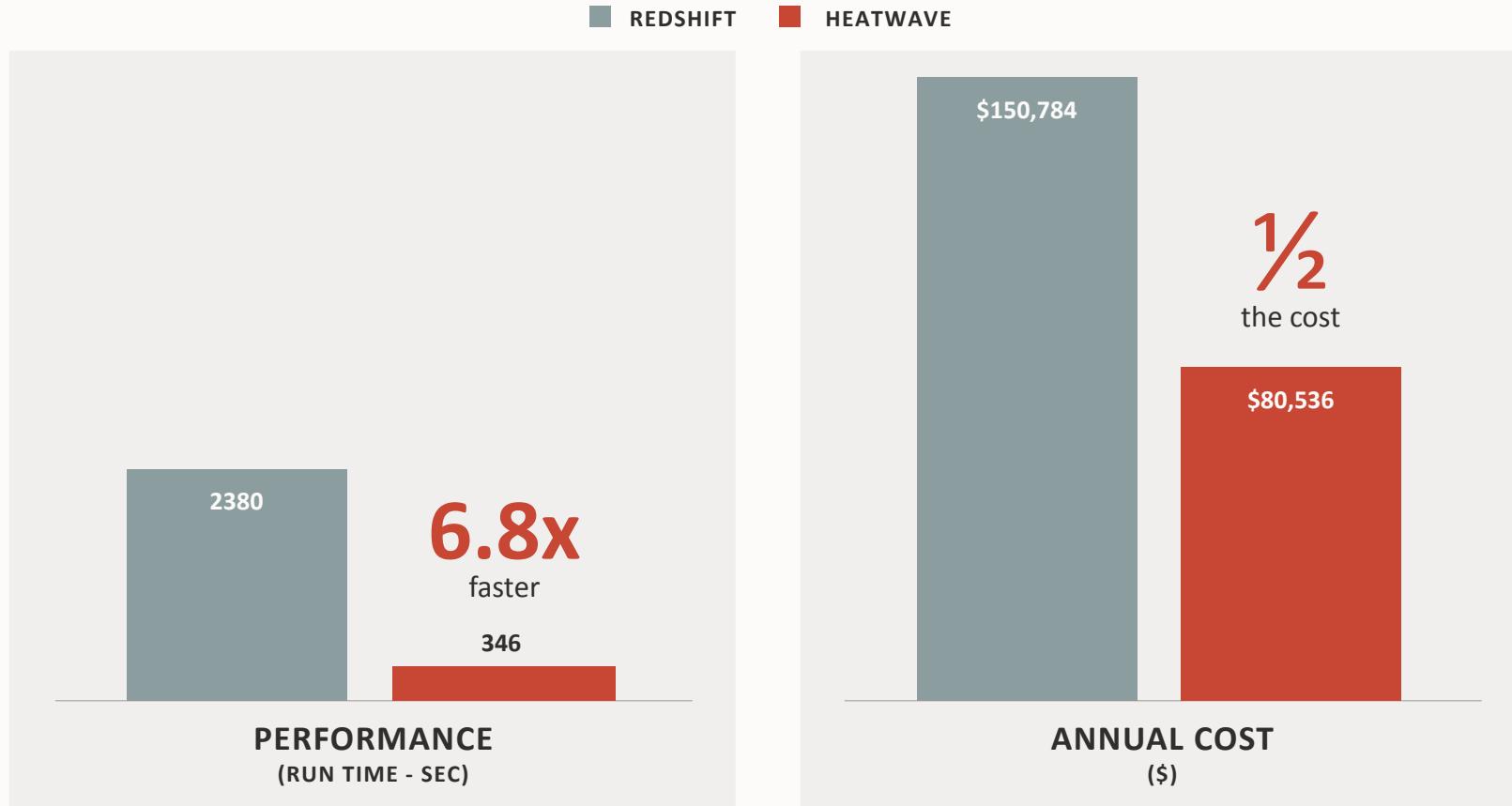


## 透過複製輕鬆對本地 MySQL 資料庫做分析



# 性價比是Redshift AQUA 的13倍

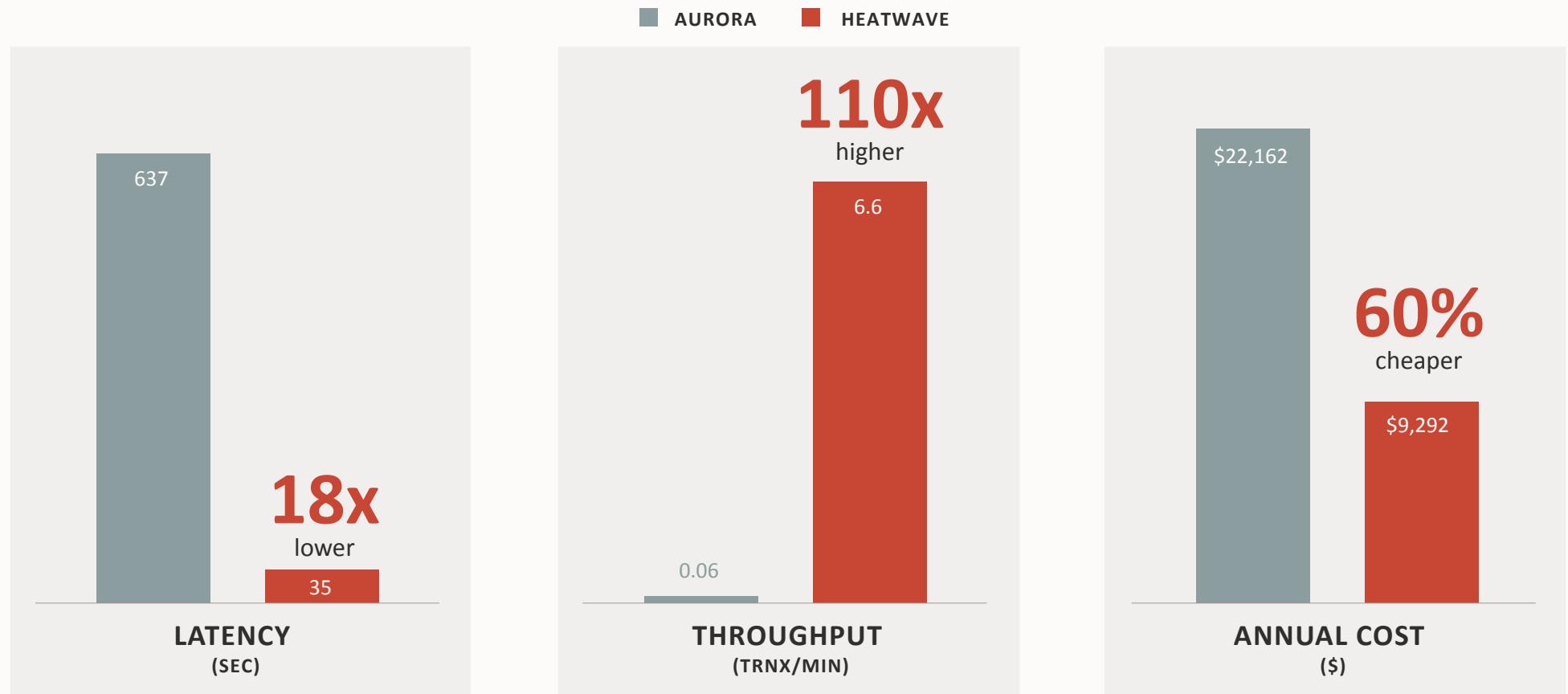
10TB TPCH



25 nodes of HeatWave, 8 Nodes of RA3.4xLarge, 1 year, paid upfront, price used for AWS  
Benchmark queries are derived from TPC-H benchmark, but results are not comparable to published TPC-H benchmark results since they do not comply with TPC-H specification.

相對於Aurora,回應速度快18倍,吞吐量高110倍,但價格只有一半

CH-benCHmark, 100G, 4 concurrent OLAP sessions



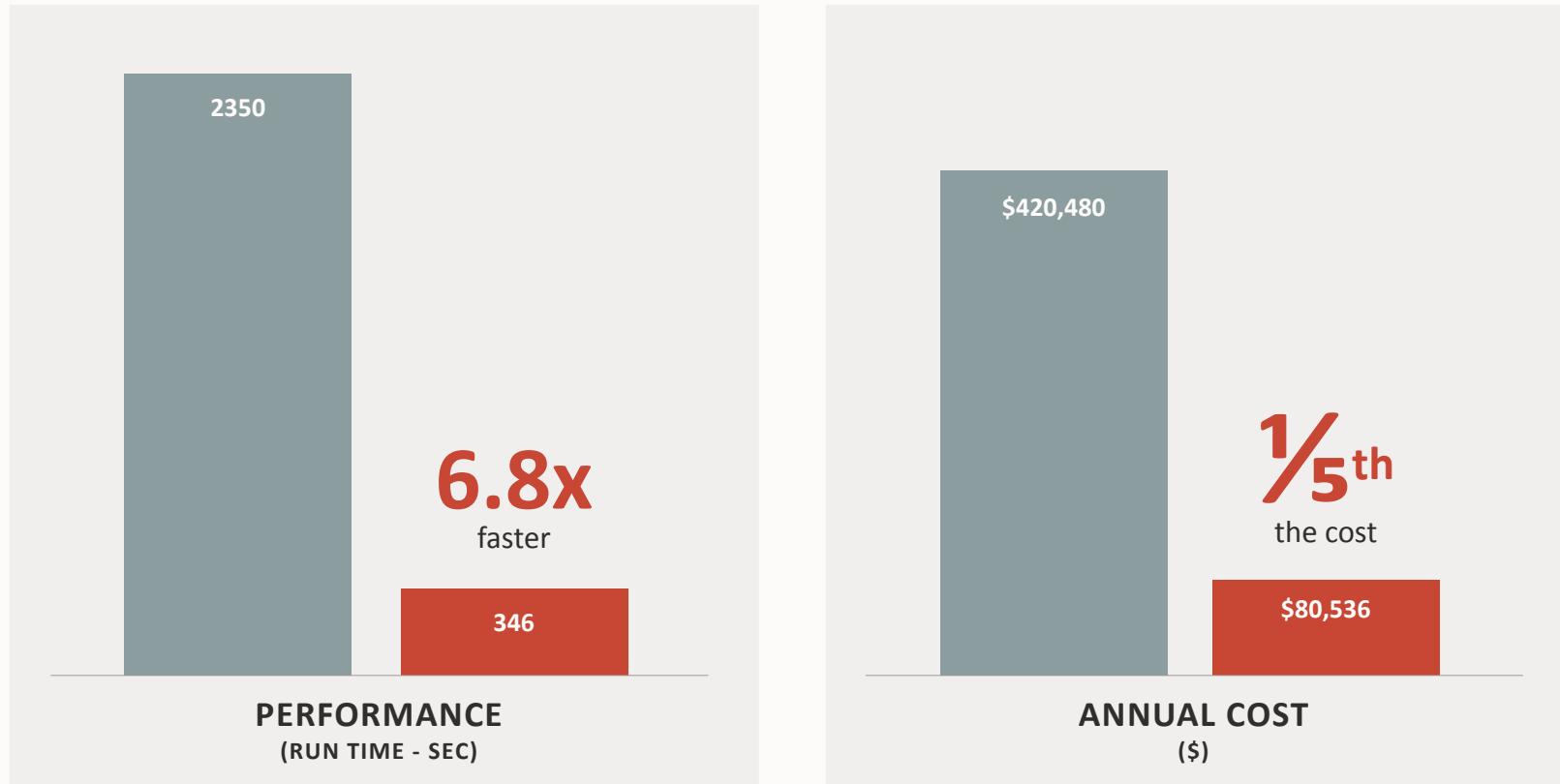
\*Benchmark queries are derived from CH benchmark, but results are not comparable to published CH benchmark results since they do not comply with CH specification.



# 性價比是Snowflake的35倍

10TB TPCH

■ SNOWFLAKE ■ HEATWAVE



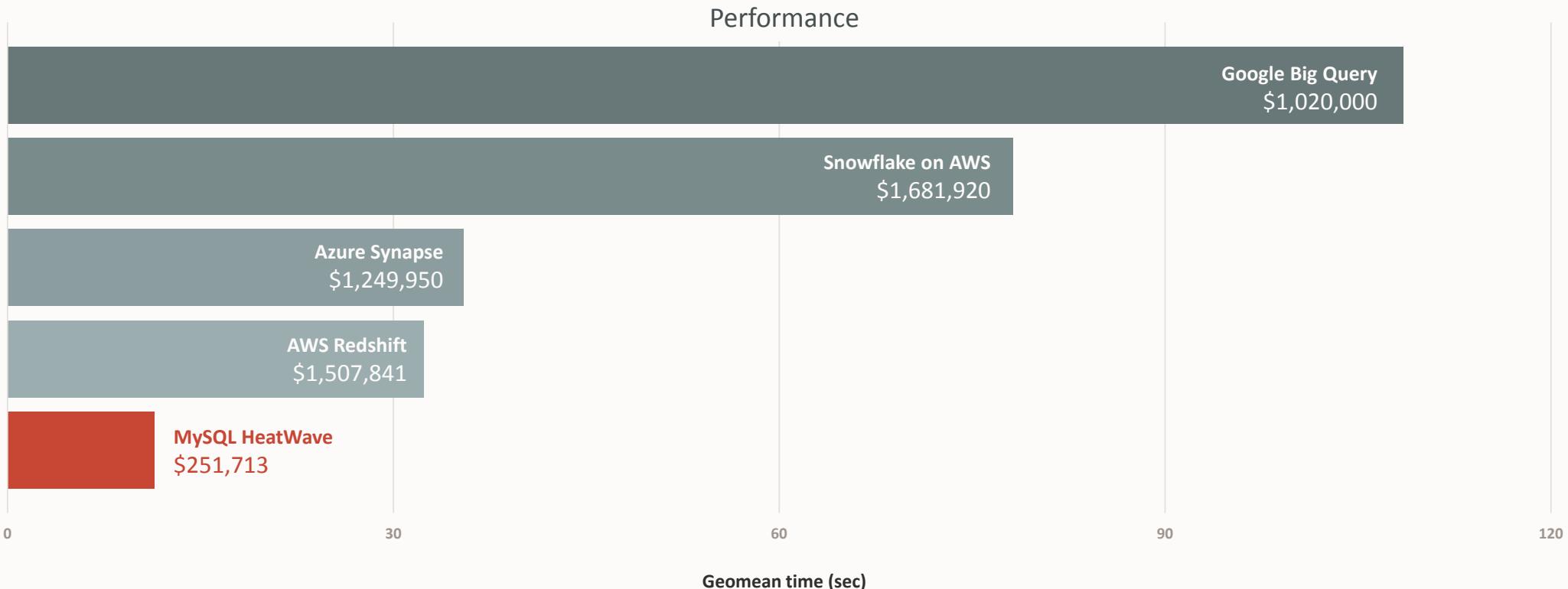
25 nodes of HeatWave, X-Large Cluster for Snowflake, 1 year list price used

\*Benchmark queries are derived from TPC-H benchmark, but results are not comparable to published TPC-H benchmark results since they do not comply with TPC-H specification.



# 所有主流大數據方案的性能和價格比

以30TB TPCH測試, HeatWave 比所有競爭者快3-10倍, 價格又只有別人的1/4 – 1/5



3rd party numbers derived from Gigaom report of Oct 2020

Using PAYG pricing for Snowflake. Other prices are based on **1 year** pricing

\*Benchmark queries are derived from TPC-H benchmark, but results are not comparable to published TPC-H benchmark results since they do not comply with TPC-H specification.



# 演示

1. 試試看HeatWave能帶來多大的性能提升?
  - `select count(*) from patient;`
  - `explain select count(*), continental from country c,patient pt, province p where p.countryid=c.id and pt.provinceid=p.id group by continental order by continental;`
  - `select count(*), continental from country c,patient pt, province p where p.countryid=c.id and pt.provinceid=p.id group by continental order by continental;`
  - `set @@use_secondary_engine=off;`
2. 由OAC儀表板看到是什麼狀況?
  - <https://chuncheon3-idazzjlcjqzj-yn.analytics.ocp.oraclecloud.com/ui/>
  - `alter table patient secondary_unload;`



## 成功案例分享

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由AWS Aurora遷移**6TB** 的資料到,複雜查詢的性能提升 **千倍**

整體性能提升**85%**

成本比用AWS Aurora還要低**60%**

性能隨叢集的CPU核數擴增而等比增加,  
可擴增到數千個核

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**Amit Palshikar**  
CTO, Red3i

# QBS 的MySQL Database Service經驗

在香港的一家IoT服務公司,為物流/食品/製造等行業提供設施追蹤和Location Based服務

## 業務需求:

- 減少用於監督服務的穩定性的人力
- 當服務下線時主動告警
- 增加雲存儲的容量

## MDS 改善客戶體驗並加快上市速度:

- 提供穩定的生產環境
- 不曾發生過服務中斷
- 為客戶提供安全的資料使用
- 開發人員有一致的體驗

10+

Apps Running on  
MDS

20%

more on Cost  
Saving



“ We ran the analytic workload of the Social Game Infrastructure group on MySQL with HeatWave **without requiring ETL or changing our application**. HeatWave is up to **500x** faster than our current on-premises MySQL 5.7 instance. ”

**Masashi Hamahira**

Senior Manager, Social Game Infrastructure Group  
SQUARE ENIX CO., LTD.



## Tetris.co 為何選擇 Oracle

評估過Google BigQuery 和 AWS Redshift後, Tetris.co 將資料庫由AWS Aurora 遷移到 [Oracle Cloud Infrastructure \(OCI\)](#) 的 [MySQL HeatWave](#) 因而大幅增進分析的性能,同時還降低成本. HeatWave 使Tetris.co 同仁能在同一個MySQL資料庫上做OLTP和, 不再需要搬移和整合資料到不同的分析性資料庫. 這不僅使複雜查詢時間由數分鐘加速到一秒以內,而成本也只有用Aurora和RedShift時的一半. 我們在一個月內完成移,這還包括訓練和測試.

**“MySQL HeatWave dramatically reduced our AWS Aurora and Redshift cost by more than 50%. We are no longer moving data around so now we have blazing fast, real-time insights with no effort. More importantly, scalability has made our expansion plan possible, allowing us to onboard more data and new clients without impact to costs. It's a dream come true.”**

**Pablo Lemos**  
Cofounder and CTO, Tetris.co





Process more data,  
**faster and lower cost**

### More automation

Secure ML-powered  
Easier experience

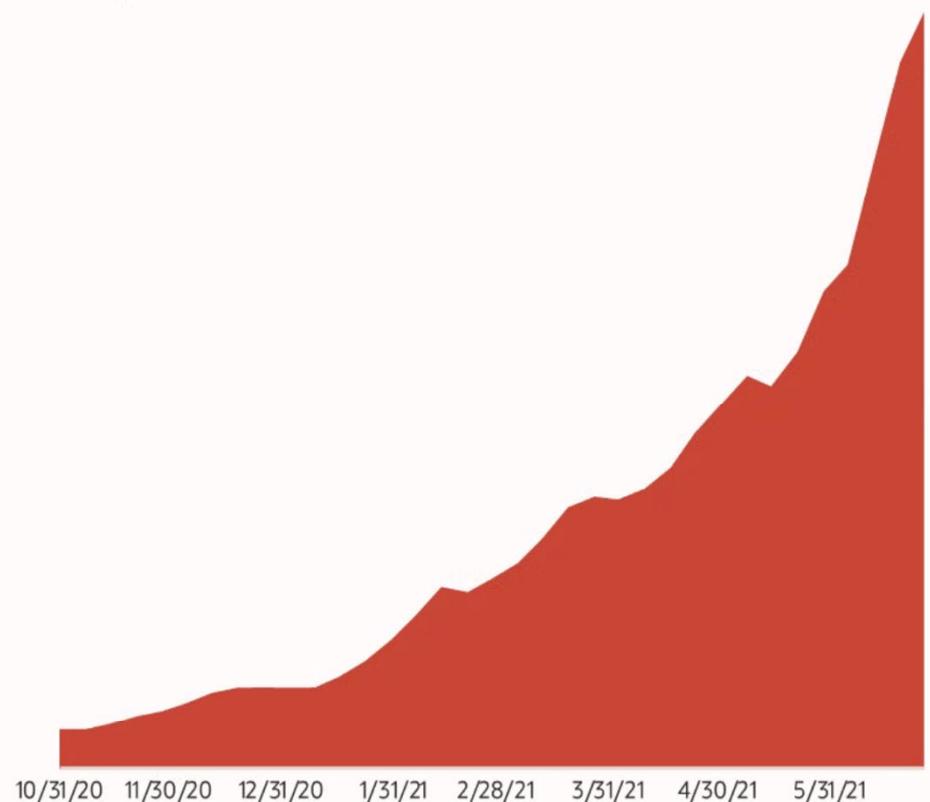
### More scale

Scalability improved 20%  
64 nodes supported

### More performance

Best price and performance for analytic  
and mixed workloads  
All TPCDS queries supported

**Customers are using  
MySQL HeatWave – a lot**



Oracle Login - Single Sign On X FAQ on Oracle's Cloud Free Tier X +

Back Forward Home Refresh https://www.oracle.com/cloud/free/faq.html 120% More

## How do I convert my Oracle Cloud Free Tier account to a paid account?

You can upgrade your cloud account to paid at any time. Simply go to Account Management in the Oracle Cloud Console and complete the upgrade steps.

## Why do I need to provide credit or debit card information when I sign up for Oracle Cloud Free Tier?

To enable us to provide free Oracle Cloud accounts to our valued customers, we need to ensure that account holders are real people. We use your email, phone number, and credit/debit card for account set-up and identity verification. For users in the United States, you may see temporary charges of \$1 on your account statement. Users in other countries will see a similar charge in their local currency. These are verification holds that will be removed automatically, typically within 3 to 5 days.

We will not use your credit/debit card information to automatically upgrade your Always Free or Free Trial to paid without first getting your explicit approval.

## What payment methods does Oracle accept?

## Is my credit usage rate discounted during Free Trial?

Yes, during the Free Trial period of 30 days, your usage rates are discounted. This will let you gain free, hands-on experience with the wide range of Oracle Cloud services.

### What are the discounted rates?

During the 30-day Free Trial period, you will just pay the Oracle IaaS rates for all platform services including Oracle Database Cloud, Java Cloud Service (WebLogic), and other services which are normally billed at higher rates.

\* Free Tier is available worldwide. See the [data regions page](#) for detailed service availability. US\$300 free credits [available in select countries](#) and valid for up to 30 days. Oracle Cloud credits are consumed at discounted rates during the 30-day promotional period. The capacity limits listed under each service are only estimates and reflect the maximum capacity you can get if you consume your entire credits on one service during the promotional period. The maximum capacity per service you get can be less if you consume multiple services. The list of services and capacity estimates are subject to change. Your credit balance is available to you in the Oracle Cloud Infrastructure Console.

\*\* 1 OCPU on x86 CPU Architecture (AMD and Intel) = 2 vCPUs; 1 OCPU on Arm CPU Architecture (Ampere) = 1 vCPU

 Start chat  Contact or call 

What happens when my Free Trial expires or my credits are used up?

When you've reached the end of your 30-day trial or used all your Free Trial credits (whichever comes first), you'll be notified and will have a grace period of 30 days, starting from the expiration date, to upgrade to paid. You will no longer be able to create new paid resources, but your account will remain active. Your resources will continue to exist for a few days, allowing you to upgrade your account and keep your resources before they're reclaimed by Oracle. If you do not upgrade to paid by the end of the grace period, your Free Trial service instances and data will be deleted. (Note that reclaimed resources can't be recovered—they are permanently deleted.)

Resources identified as Always Free will not be reclaimed. After your Free Trial expires, you'll continue to be able to use and manage your existing Always Free resources, and can create new Always Free resources according to tenancy limits.

However, Ampere A1 Compute instances are disabled when your trial ends and then deleted (terminated) after 30 days, unless you upgrade to a paid account. To continue using Arm-based compute instances as an Always Free user, you must delete your existing Ampere A1 Compute instances and create new Ampere A1 Compute instances.

If I upgrade, do I keep my Free Trial credit balance?

After I upgrade my account, can I downgrade?

How do I recover my data once the 30-day Free Trial comes to an end?

You are responsible for exporting and importing all of your data manually or using tools supported by the object storage.

## What is Oracle Cloud Promotion?

How do I convert my Oracle Cloud Free Tier account to a paid account?

You can upgrade your cloud account to paid at any time. Simply go to Account Management in the Oracle Cloud Console and complete the upgrade steps.

如果您有興趣 -  
我們提供免費專場  
**MDS 和 HeatWave**  
**體驗工作坊**

取得 US\$ 300 的額度和30  
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» <https://www.oracle.com/cloud/free/>

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甲骨文業務代表  
或00801-81-2732

# 如果您不確定現有系統是否能移轉過來 - **Oracle Cloud Lift Services**

使遷移更容易

善用Oracle的遷移經驗和專業

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[oracle.com/heatwave](http://oracle.com/heatwave)

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