Database in the Cloud

Amazon Relational Database Service (Amazon RDS)

- Amazon RDS is a web service that makes it easy to set up, operate, and scale a relational database in the cloud. It provides cost-efficient and resizable capacity while managing time-consuming database administration tasks, freeing you up to focus on your applications and business.
- Amazon RDS gives you access to the capabilities of a familiar **MySQL, Oracle, Microsoft SQL Server,** or **PostgreSQL** database engine. This means that the code, applications, and tools you already use today with your existing databases can be used with Amazon RDS. Amazon RDS automatically patches the database software and backs up your database, storing the backups for a user-defined retention period and enabling point-in-time recovery. You benefit from the flexibility of being able to scale the compute resources or storage capacity associated with your Database Instance via a single API call.
- Amazon RDS DB Instances can be provisioned with either standard storage or Provisioned IOPS storage. Amazon RDS Provisioned IOPS is a storage option designed to deliver fast, predictable, and consistent I/O performance, and is optimized for I/O-intensive, transactional (OLTP) cloud-based database workloads.

DB Instance Classes

- **Micro DB Instance:** 630 MB memory, Up to 2 ECU (for short periodic bursts), 64-bit platform, Low I/O Capacity, Provisioned IOPS Optimized: No
- **Small DB Instance:** 1.7 GB memory, 1 ECU (1 virtual core with 1 ECU), 64-bit platform, Moderate I/O Capacity, Provisioned IOPS Optimized: No
- **Medium DB Instance:** 3.75 GB memory, 2 ECU (1 virtual core with 2 ECU), 64-bit platform, Moderate I/O Capacity, Provisioned IOPS Optimized: No
- **Large DB Instance:** 7.5 GB memory, 4 ECUs (2 virtual cores with 2 ECUs each), 64-bit platform, High I/O Capacity, Provisioned IOPS Optimized: 500Mbps
- **Extra Large DB Instance:** 15 GB of memory, 8 ECUs (4 virtual cores with 2 ECUs each), 64-bit platform, High I/O Capacity, Provisioned IOPS Optimized: 1000Mbps
- **High-Memory Extra Large DB Instance:** 17.1 GB memory, 6.5 ECU (2 virtual cores with 3.25 ECUs each), 64-bit platform, High I/O Capacity, Provisioned IOPS Optimized: No
- **High-Memory Double Extra Large DB Instance:** 34 GB of memory, 13 ECUs (4 virtual cores with 3.25 ECUs each), 64-bit platform, High I/O Capacity, Provisioned IOPS Optimized: 500Mbps
- **High-Memory Quadruple Extra Large DB Instance:** 68 GB of memory, 26 ECUs (8 virtual cores with 3.25 ECUs each), 64-bit platform, High I/O Capacity, Provisioned IOPS Optimized: 1000Mbps
- **High-Memory Cluster Eight Extra Large DB Instance:** 244 GB of memory, 88 ECUs, 64-bit platform, High I/O Capacity

Note: One ECU provides the equivalent CPU capacity of a 1.0-1.2 GHz 2007 Opteron or 2007 Xeon processor.

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Example: On-Demand Oracle DB Instances *(License Included)*

- Under the "License Included" service model, you do not need separately purchased Oracle licenses; the Oracle Database software has been licensed by AWS. "License Included" pricing is inclusive of software, underlying hardware resources, and Amazon RDS management capabilities.
- On-Demand DB Instances for the License Included model let you pay for compute capacity by the hour your DB Instance runs with no long-term commitments. This frees you from the costs and complexities of planning, purchasing, and maintaining hardware and transforms what are commonly large fixed costs into much smaller variable costs.
- **Currently supported model:**
  - The pricing applies to a standard Database Instance deployed in a single Availability Zone.

Region: US East (Northern Virginia)

	Price Per Hour
DB Instance Class (On-Demand)	
Micro DB Instance	$0.040
Small DB Instance	$0.140
Medium DB Instance	$0.280
Large DB Instance	$0.565
Extra Large DB Instance	$1.130
High-Memory DB Instance Class	
Extra Large DB Instance	$0.785
Double Extra Large DB Instance	$1.570
Quadruple Extra Large DB Instance	$3.140

Amazon DynamoDB

- DynamoDB is a fast, fully managed NoSQL database service that makes it simple and cost-effective to store and retrieve any amount of data, and serve any level of request traffic.
- All data items are stored on **Solid State Drives (SSDs)**, and are replicated across **3 Availability Zones** for high availability and durability.
- With DynamoDB, you can offload the administrative burden of operating and scaling a highly available distributed database cluster, while paying a low price for only what you use.

YouTube https://www.youtube.com/watch?v=oz-7wJJ9HZ0

Features and Benefits

- DynamoDB delivers seamless throughput and storage scaling via API and easy-to-use management console, so you can easily scale up or down to meet your needs.
- Many customers have, with the click of a button, created DynamoDB deployments in a matter of minutes that are able to serve trillions of database requests per year.
- DynamoDB tables do not have fixed schemas, and each item may have a different number of attributes.
  - Multiple data types add richness to the data model.
  - Secondary indexes add flexibility to the queries you can perform, without impacting performance.
- Performance, reliability and security are built-in, with SSD-storage and automatic 3-way replication.
- Amazon DynamoDB uses proven cryptographic methods to securely authenticate users and prevent unauthorized data access.

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Scalable

Amazon DynamoDB is designed for seamless throughput and storage scaling.

- **Automated Storage Scaling:** There is no limit to the amount of data you can store in a DynamoDB table, and the service automatically allocates more storage, as you store more data using the DynamoDB write APIs.
- **Provisioned Throughput:** When creating a table, simply specify how much request capacity you require.
  - DynamoDB allocates dedicated resources to your table to meet your performance requirements, and automatically partitions data over a sufficient number of servers to meet your request capacity.
  - If your throughput requirements change, simply update your table's request capacity using the **AWS Management Console** or the **Amazon DynamoDB APIs**.
  - You are still able to achieve your prior throughput levels while scaling is underway.
- **Fully Distributed, Shared Nothing Architecture:** Amazon DynamoDB scales horizontally and can seamlessly scale a single table over hundreds of servers.

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Amazon DynamoDB Pricing

- Pay only for what you use. There is no minimum fee.
- **AWS Free Usage Tier:** Users can get started with DynamoDB for free.
  - DynamoDB customers get 100 MB of free storage, as well as up to 5 writes/second and 10 reads/second of ongoing throughput capacity (enough to perform up to 432,000 writes and 864,000 reads for free every day).
- **Provisioned Your Table's Throughput Capacity:** Amazon DynamoDB lets you specify the request throughput you want your table to be able to achieve.
  - Behind the scenes, the service handles the provisioning of resources to achieve the requested throughput rate.
  - Rather than asking you to think about instances, hardware, memory, and other factors that could affect your throughput rate, Amazon simply asks you to provision the throughput level you want to achieve and AWS handles the rest.
  - When you create or update your Amazon DynamoDB table, you specify how much capacity you wish to reserve for reads and writes. Amazon DynamoDB will reserve the necessary machine resources to meet your throughput needs with consistent, low-latency performance.

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Pricing

- You pay a flat, hourly rate based on the capacity you reserve.
- **Write Throughput:** $0.0065 per hour for every 10 units of Write Capacity (enough capacity to do up to 36,000 writes per hour)*
- **Read Throughput:** $0.0065 per hour for every 50 units of Read Capacity (enough capacity to do up to 180,000 strongly consistent reads, or 360,000 eventually consistent reads, per hour)*
- For small items, one unit of capacity can handle one request per second (or two requests per second in the case of ***eventually consistent reads***). Larger items may require more units of capacity to handle the same request rate.

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Reserved Capacity

- Reserved Capacity pricing offers significant savings over the normal price of DynamoDB provisioned throughput capacity.
- When you buy Reserved Capacity, you pay a one-time upfront fee and commit to paying for a minimum usage level, at the hourly rates, for the duration of the Reserved Capacity term.
- Using Reserved Capacity pricing, you can save up to **53%** with a 1-year term and up to **76%** with a 3-year term.

	1-Year Term		3-Year Term	
Monthly Commitment	**Upfront**	**Hourly**	**Upfront**	**Hourly**
5,000 Write Capacity Units	$7,500	$0.643 per Hour	$9,000	$0.407 per Hour
5,000 Read Capacity Units	$1,500	$0.128 per Hour	$1,800	$0.0815 per Hour

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Data Transfer

- Data transfer “in” and “out” refers to transfer into and out of Amazon DynamoDB.
- There is no additional charge for data transferred between Amazon DynamoDB and other Amazon Web Services within the same Region (i.e. $0.00 per GB).
- Data transferred across Regions (e.g. between Amazon DynamoDB in the US East (Northern Virginia) Region and Amazon EC2 in the EU (Ireland) Region, will be charged at Internet Data Transfer rates on both sides of the transfer.

	Pricing
Data Transfer IN	
All data transfer in	$0.000 / GB
Data Transfer OUT	
First 1 GB / month	$0.000 / GB
Up to 10 TB / month	$0.120 / GB
Next 40 TB / month	$0.090 / GB
Next 100 TB / month	$0.070 / GB
Next 350 TB / month	$0.050 / GB
Next 524 TB / month	Contact Us
Next 4 PB / month	Contact Us
Greater than 5 PB / month	Contact Us

Amazon Redshift

- Amazon Redshift is a fast, fully managed, petabyte-scale data warehouse service that makes it simple and cost-effective to efficiently analyze all your data using your existing business intelligence tools.
- It is optimized for datasets ranging from a few hundred gigabytes to a petabyte or more and costs less than $1,000 per terabyte per year, a tenth the cost of most traditional data warehousing solutions.

https://www.youtube.com/watch?v=Jb_bN4tkkZ0 YouTube