

A White Paper

**AWS, Azure, and Google  
Virtual Machine Price Matrix**

***HEROIX***

# AWS, Azure, and Google Virtual Machine Price Matrix

Before delving too deeply into a comparison of Cloud based Virtual Machine pricing, we'll want to start by grounding the matrixes below with a few preconditions:

- We're going to price out the virtual machines based fundamentally on CPU and Memory configurations. Storage pricing is important however, it is a distinctly separate part of the equation.
- As the hardware evolves (i.e. CPU, Memory, and Network), so does the physical makeup of the virtual machine sizes. The conclusions below are based on matching as closely as possible the VM configurations as of the time of this writing.
- The comparisons are based on four classes of VMs:
  - **Burstable:** provide a baseline level of CPU performance with the ability to burst to 100% of CPU for a period of time (i.e. smaller web server, small databases, and development / test environments).
  - **General Purpose:** provide a balance of CPU and memory for use by many applications
  - **Compute Optimized:** ideal for compute heavy workloads (i.e. batch processing or machine learning), these instances provide more vCPU relative to memory
  - **Memory Optimized:** ideal for memory intensive workloads (i.e. Business Intelligence, in-memory databases, real-time processing of unstructured big data), these instances provide more memory relative to vCPU
- For each class we provide a comparison at both a base (x) level and a twice base (2x) level, understanding full well that there are quite a few more virtual machine instance types. The goal here is to make sure we are working with enough data to draw accurate and valid conclusions.
- Reserved Instance pricing is calculated based on a 1 Year RI commitment.
- On-Demand Instance Pricing is calculated on an hourly basis.

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# AWS, Google, and Azure Reserved Instance Pricing

| Provider                 | Instance Type | vCPU | Mem (GIB) | 1 Year Linux | 1 Year Windows | Premium for Windows | Linux Price Delta | Wintel Price Delta |
|--------------------------|---------------|------|-----------|--------------|----------------|---------------------|-------------------|--------------------|
| <b>Burstable</b>         |               |      |           |              |                |                     |                   |                    |
| AWS                      | t2.micro      | 0.1  | 0.5       | \$63.12      | \$103.32       | \$40.20             | 35.57%            | 9.81%              |
| GCP                      | f1-micro      | 0.2  | 0.6       | \$46.56      | \$175.20       | \$128.64            | Low Price         | 86.20%             |
| Msoft                    | B1S           | 0.1  | 1         | \$59.05      | \$94.09        | \$35.04             | 26.83%            | Low Price          |
| <b>General Purpose</b>   |               |      |           |              |                |                     |                   |                    |
| AWS                      | t2.small      | 0.2  | 2         | \$126.12     | \$206.76       | \$80.64             | 6.87%             | 35.03%             |
| GCP                      | g1-small      | 0.5  | 1.7       | \$157.56     | \$175.20       | \$17.64             | 33.52%            | 14.42%             |
| Msoft                    | B1MS          | 0.2  | 2         | \$118.01     | \$153.12       | \$35.11             | Low Price         | Low Price          |
| <b>General Purpose</b>   |               |      |           |              |                |                     |                   |                    |
| AWS                      | m5.large      | 2    | 8         | \$534.36     | \$1,340.28     | \$805.92            | 5.37%             | 4.43%              |
| GCP                      | n1-standard-2 | 2    | 7.5       | \$582.60     | \$1,283.40     | \$700.80            | 14.88%            | Low Price          |
| Msoft                    | D2 v3         | 2    | 8         | \$507.12     | \$1,313.04     | \$805.92            | Low Price         | 2.31%              |
| <b>General Purpose</b>   |               |      |           |              |                |                     |                   |                    |
| AWS                      | m5.xlarge     | 4    | 16        | \$1,077.48   | \$2,689.32     | \$1,611.84          | 6.36%             | 4.78%              |
| GCP                      | n1-standard-4 | 4    | 15        | \$1,165.08   | \$2,566.68     | \$1,401.60          | 15.01%            | Low Price          |
| Msoft                    | D4 v3         | 4    | 16        | \$1,013.04   | \$2,624.88     | \$1,611.84          | Low Price         | 2.27%              |
| <b>Compute Optimized</b> |               |      |           |              |                |                     |                   |                    |
| AWS                      | c5.large      | 2    | 4         | \$473.04     | \$1,278.96     | \$805.92            | 8.80%             | 12.63%             |
| GCP                      | n1-highcpu-2  | 2    | 1.8       | \$434.76     | \$1,135.56     | \$700.80            | Low Price         | Low Price          |
| Msoft                    | F2 V2         | 2    | 4         | \$438.00     | \$1,243.92     | \$805.92            | 0.75%             | 9.54%              |
| <b>Compute Optimized</b> |               |      |           |              |                |                     |                   |                    |
| AWS                      | c5.xlarge     | 4    | 8         | \$946.08     | \$2,557.92     | \$1,611.84          | 8.80%             | 12.63%             |
| GCP                      | n1-high-cpu-4 | 4    | 3.6       | \$869.52     | \$2,271.12     | \$1,401.60          | Low Price         | Low Price          |
| Msoft                    | F4 v2         | 4    | 8         | \$876.00     | \$2,487.84     | \$1,611.84          | 0.75%             | 9.54%              |
| <b>Memory Optimized</b>  |               |      |           |              |                |                     |                   |                    |
| AWS                      | r4.large      | 2    | 15.25     | \$735.84     | \$1,541.76     | \$805.92            | 7.41%             | 8.06%              |
| GCP                      | n1-high-mem-2 | 2    | 13        | \$726.00     | \$1,426.80     | \$700.80            | 5.97%             | Low Price          |
| Msoft                    | E2 v3         | 2    | 16        | \$685.08     | \$1,491.00     | \$805.92            | Low Price         | 4.50%              |
| <b>Memory Optimized</b>  |               |      |           |              |                |                     |                   |                    |
| AWS                      | r4.xlarge     | 4    | 30.5      | \$1,471.68   | \$3,083.52     | \$1,611.84          | 7.42%             | 8.06%              |
| GCP                      | n1-high-mem-4 | 4    | 26        | \$1,452.00   | \$2,853.60     | \$1,401.60          | 5.98%             | Low Price          |
| Msoft                    | E4 v3         | 4    | 32        | \$1,370.04   | \$2,981.88     | \$1,611.84          | Low Price         | 4.50%              |

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## Assessment of Reserved Instance Pricing

- **Green** indicates the lowest pricing for given instance type and Operating System, while **Red** shows the most expensive. We have (4) classes, within each class we have (2) categories, and within each category we have pricing for (2) operating systems Linux and Windows.

4 categories \* 2 classes \* 2 Operating Systems = 16 price points

9 out of 16 price points Google holds a price advantage

7 out of 16 price points Microsoft holds a price advantage

- **Premium for Windows** – Note that for most all categories the premium for the Windows licenses is identical between AWS and Azure. Google is charging ~\$52 less per vCPU per year for the Windows license. We can see that there is correlation between the licensing for Windows and Googles pricing for Reserved Instances.

Remember, also your Windows licensing will vary with Microsoft if you're taking advantage of the [Azure Hybrid Use Benefit](#)

- **Price Differential** – When assessing the costs of the more significant General Purpose, Compute Optimized, and Memory Optimized virtual machine classes we can see that the price differential can be significant, ranging from 4% to 15%. Much, will depend on the size of the cloud deployment and the kind of relationship your organization cultivates with your cloud provider.

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# AWS, Google, and Azure On-Demand Instance Pricing

| Provider                 | Instance Type | vCPU | Mem (GiB) | Hourly Linux | Hourly Windows | Windows Premium | Linux Price Delta | Wintel Price Delta |
|--------------------------|---------------|------|-----------|--------------|----------------|-----------------|-------------------|--------------------|
| <b>Burstable</b>         |               |      |           |              |                |                 |                   |                    |
| AWS                      | t2.micro      | 0.1  | 1         | \$0.0116     | \$0.0162       | \$0.0046        | 52.63%            | 5.88%              |
| GCP                      | f1-micro      | 0.2  | 0.6       | \$0.0076     | \$0.0276       | \$0.0200        | low price         | 80.39%             |
| Msoft                    | B1S           | 0.1  | 1         | \$0.0110     | \$0.0153       | \$0.0043        | 44.74%            | low price          |
| <b>Burstable</b>         |               |      |           |              |                |                 |                   |                    |
| AWS                      | t2.small      | 0.2  | 2         | \$0.0230     | \$0.0320       | \$0.0090        | 9.52%             | 10.34%             |
| GCP                      | g1-small      | 0.5  | 1.7       | \$0.0257     | \$0.0457       | \$0.0200        | 22.38%            | 57.59%             |
| Msoft                    | B1MS          | 0.2  | 2         | \$0.0210     | \$0.0290       | \$0.0080        | low price         | low price          |
| <b>General Purpose</b>   |               |      |           |              |                |                 |                   |                    |
| AWS                      | m5.large      | 2    | 8         | \$0.0960     | \$0.1880       | \$0.0920        | 1.05%             | 7.43%              |
| GCP                      | n1-standard-2 | 2    | 7.5       | \$0.0950     | \$0.1750       | \$0.0800        | low price         | low price          |
| Msoft                    | D2 v3         | 2    | 8         | \$0.0960     | \$0.1880       | \$0.0920        | 1.05%             | 7.43%              |
| <b>General Purpose</b>   |               |      |           |              |                |                 |                   |                    |
| AWS                      | m5.xlarge     | 4    | 16        | \$0.1920     | \$0.3760       | \$0.1840        | 1.05%             | 7.43%              |
| GCP                      | n1-standard-4 | 4    | 15        | \$0.1900     | \$0.3500       | \$0.1600        | low price         | low price          |
| Msoft                    | D4 v3         | 4    | 16        | \$0.1920     | \$0.3760       | \$0.1840        | 1.05%             | 7.43%              |
| <b>Compute Optimized</b> |               |      |           |              |                |                 |                   |                    |
| AWS                      | c5.large      | 2    | 4         | \$0.0850     | \$0.1770       | \$0.0920        | 19.89%            | 17.30%             |
| GCP                      | n1-highcpu-2  | 2    | 1.8       | \$0.0709     | \$0.1509       | \$0.0800        | low price         | low price          |
| Msoft                    | F2 V2         | 2    | 4         | \$0.0850     | \$0.1630       | \$0.0780        | 19.89%            | 8.02%              |
| <b>Compute Optimized</b> |               |      |           |              |                |                 |                   |                    |
| AWS                      | c5.xlarge     | 4    | 8         | \$0.1700     | \$0.3540       | \$0.1840        | 19.89%            | 17.30%             |
| GCP                      | n1-high-cpu-4 | 4    | 3.6       | \$0.1418     | \$0.3018       | \$0.1600        | low price         | low price          |
| Msoft                    | F4 v2         | 4    | 8         | \$0.1690     | \$0.3260       | \$0.1570        | 19.18%            | 8.02%              |
| <b>Memory Optimized</b>  |               |      |           |              |                |                 |                   |                    |
| AWS                      | r4.large      | 2    | 15.25     | \$0.1330     | \$0.2250       | \$0.0920        | 12.33%            | 13.41%             |
| GCP                      | n1-high-mem-2 | 2    | 13        | \$0.1184     | \$0.1984       | \$0.0800        | low price         | low price          |
| Msoft                    | E2 v3         | 2    | 16        | \$0.1330     | \$0.2250       | \$0.0920        | 12.33%            | 13.41%             |
| <b>Memory Optimized</b>  |               |      |           |              |                |                 |                   |                    |
| AWS                      | r4.xlarge     | 4    | 30.5      | \$0.2660     | \$0.4500       | \$0.1840        | 12.33%            | 13.41%             |
| GCP                      | n1-high-mem-4 | 4    | 26        | \$0.2368     | \$0.3968       | \$0.1600        | low price         | low price          |
| Msoft                    | E4 v3         | 4    | 32        | \$0.2660     | \$0.4500       | \$0.1840        | 12.33%            | 13.41%             |

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## Assessment of On-Demand Instance Pricing

- **Green** indicates the lowest pricing for given instance type and Operating System, while **Red** shows the most expensive. We've (4) classes, within each class we have (2) categories, and within each category we have pricing for (2) operating systems Linux and Windows

4 categories \* 2 classes \* 2 Operating Systems = 16 price points

13 out of 16 price points Google holds a price advantage

3 out of 16 price points Microsoft holds a price advantage

- **Premium for Windows** – Similar to Reserved Instance pricing Google holds an advantage.
- **Price Differential** – It is important to remember that Google will automatically start discounting based on its Sustained Use Discount once the virtual machine instance has been running for 25% of the month.
- **Identical Pricing** - In all but the Burstable category AWS and Azure have identical pricing.

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## Conclusion

If we look at the numbers “clinically” we can see that pricing varies more significantly with Reserved Instances than with On-Demand instance. Much will depend on your use case and the kind of relationship you build with your cloud provider. You really can't make a bad decision here, AWS, Azure, and Microsoft come to the table with very capable technology.

We can make some generalizations:

1. **Reserved Instance Pricing:** Although Google has the most aggressive published discount pricing, there are wildcards that will most certainly affect the pricing:
  - a. Does your organization already have a close working relationship and Enterprise Agreement with Microsoft? Microsoft can be compelling with its tightly integrated hybrid cloud technology and aggressive Windows licensing with Azure Hybrid Use Benefit.

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- b. Do you need to pay month by month or all up-front? This may well be an important part of the equation, as AWS offers multiple purchasing options that not only affect the final price but provide companies the flexibility to pay all up-front, partial up-front, or monthly installments.
  - c. Be smart about the quantity and type of RIs you are buying. Whatever you do not over-provision. Ultimately, it is about determining an appropriate commitment level, maximizing your discount, and not committing to resources you'll never use.
  - d. The pricing differences can be neutralized if your organization is willing to go multi-cloud and then use it as an anvil to negotiate more favorable pricing.
2. **On-Demand Pricing:** If you're looking to take baby-steps and want to start with On-Demand instances and don't want to have to talk to anyone or negotiate any deals Google is the way to go. You simply can't beat the Sustained Use Discount.

Microsoft's Azure and Amazon's EC2 are pretty much identical in price. There are slight differences in the hardware (i.e. Azure includes a local SSD for temporary files), much will depend on whether you've an Enterprise Agreement in place with Microsoft or whether you've negotiated special terms with Amazon.

3. Remember your mileage will vary depending on the unique attributes of your applications, your supporting cloud infrastructure, and when you decide to jump into the market. To perform your own analysis, [download](#) this excel worksheet, you can then edit to your situation.

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## About Heroix

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