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| Date | Author | Description | Reason | Version |
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| 04/07/2017 | Vinicius | Initialization of report | Explanation of system speciation's | 1.0 |
| 23-07 | Vini | Update\new section " What we think will be necessary" | Improved previous information and added a more realistic estimation to the hardware specification. Appendix C added. | 1.1 |
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 Hardware specifications

There is no simple or exact way to predict performance and scalability of a system. Each application and environment is different. Programming languages, programs, APIs , functionalities all requires their fair share of resources and use different amount of memory, processing power, internet bandwidth and others as it also behaves differently.

The most accurate way to determine the correct specifications to a server or servers is to measure performance which will require the application itself or a prototype application to create a testing environment. Tests can be performed using virtual servers, load testing applications like "[JMeter](http://jmeter.apache.org/)" and application performance management tools, for instance [AppDynamics](https://www.appdynamics.com/) or [DynaTrace](http://www.dynatrace.com/en/index.html), to measure performance and identify bottlenecks. Only then, we can estimate what hardware specifications will suffice, without building an overzealous and unnecessary system.

For now, we have estimated what we believe would be required for the application to run and satisfy the requirements. However, this are only assumptions.

Attention: prices are subject to change based on the parts' brand, type, quantity. There are several ways to achieve the same or similar specifications.

See **Appendix C** for definitions.

**See below recommendation provided to us :**

Database Server

HDD - 2 TB or more SSD enterprise grade in RAID set-up.

Processor - Intel Xenon processor that support Error Correct Code (ECC).

128 Gb (minimum) with ECC.

Reverse Proxy Server

HDD - 1 TB or more SSD enterprise grade in RAID set-up.

Two or more processors - Intel Xenon processor that support Error Correct Code (ECC).

128 Gb (minimum) with ECC.

Application Server

HDD - 1 TB or more SSD enterprise grade in RAID set-up.

Two or more processors - Intel Xenon processor that support Error Correct Code (ECC).

128 Gb (minimum) with ECC.

*Note: these estimations above were provided by "Akshay Raj Gollahalli".*

**What we have got a quote for (See appendix A for full description):**

Database Server

2x Intel Xeon E5-2620 v4 2.1GHz Processor, 8Core/16Thread ( Supports ECC)

8x 16GB (128GB)of Memory RAM ( ECC Registered)

Hardware RAID controller with 2GB flash backed write cache

2x 150GB SSD (RAID1 – OS/Boot only – 150GB Raw usable)

6x 960GB SSD (RAID10 – Database – 2.8TB Raw usable)

Write workload max: 3.6TB per day

Reverse Proxy Server

2x Intel Xeon E5-2620 v4 2.1GHz Processor, 8Core/16Thread ( Supports ECC)

8x 16GB (128GB)of Memory RAM ( ECC Registered)

Hardware RAID controller with 2GB flash backed write cache

2x 150GB SSD (RAID1 – OS/Boot only – 150GB Raw usable)

6x 480GB SSD (RAID10 – Hot Data – 1.4TB Raw usable)

Write workload max: 1.8TB per day

Application Server

2x Intel Xeon E5-2620 v4 2.1GHz Processor, 8Core/16Thread ( Supports ECC)

8x 16GB (128GB)of Memory RAM ( ECC Registered)

Hardware RAID controller with 2GB flash backed write cache

2x 150GB SSD (RAID1 – OS/Boot only – 150GB Raw usable)

6x 480GB SSD (RAID10 – Hot Data – 1.4TB Raw usable)

Write workload max: 1.8TB per day

We believe that the specifications of the servers quoted for are more than sufficient to satisfy the requirements, whilst also providing scalability in the future. However, due to the frequency of the MATHEX competitions, we recommend to purchase only hardware that will be used.

*Why are the specifications so high?* The same requirements listed at "Hardware requirements" section and the recommendation provided above were used to inquiry for a quote. Our retail contact assumed that this is an enterprise-scale application, inferring that the servers will be running continuously with a constant 500 users or more. Therefore, the amount of storage memory is significantly high, it uses 2 processors and the memory matches the recommendations.

**What we think will be necessary:**

When assessing the current requirements, clearly there is not a significant amount of data that requires storage. For this reason, the database queries will be fast and simple. Also, the application should not perform complicated tasks that require heavy usage of the CPU. The challenge at hand is the hundreds of users using the application concurrently. Due to the powerful hardware available in the market, we believe that one server (Solution 3, see Hardware Requirements) should suffice. **See specifications below (See Appendix B for full description):**

Application Server \ Database Server

1x Intel Xeon E5-2620 v4 2.1GHz Processor, 8Core/16Thread (Supports ECC)

4x 16GB (64GB)of Memory RAM ( ECC Registered)

1x 150GB SSD (OS/Boot only – No RAID solution provided)

2x 960GB SSD (RAID1 – 960GB Raw usable)

(excluded) ~~Hardware RAID controller with 2GB flash backed write cache~~

(Exchanged) ~~Supermicro 1028R-WC1RT Barebone~~

In this estimation we have replaced the barebone as only 1x Cpu is needed, note there are 4x extra slots in case more memory is needed. Also, excluded CacheVault Supercapacitor as its extra protection is not necessary at this point.

Using this estimation, extra servers could be purchased to comply with the other solutions highlighted previously at "Hardware requirements". If this is the case, the specification above can be manipulated to reduce costs and better adjust to needs.

**Additional costs:**

Some other equipment may be necessary such as:

- Racks or cabinets to hold the servers

- UPS (Uninterruptible Power Supply)