**How to calculate vCPU to CPU**

As I mentioned, the ratio of CPU to vCPU is generally not 1: 1. In fact, how many vCPU a host can assign is determined by the manufacturer. It’s calculated by taking the number of processing threads that a chipset offers per core and multiplying the number of occupied sockets:

**(Threads x Cores) x Physical CPU = Number vCPU**

For example,

A 8 cores/ 16 threads CPU has (16 Threads x 8 Cores) x 1 CPU = 128 vCPUs

**How does a vCPU work**

The number of a VM’s vCPUs represents the maximum number of threads that the VM can run at any given moment.

When using a hypervisor to create VMs, you will be asked to specify the number of vCPUs for the VM. And the number of vCPUs assigned to a VM cannot exceed the number of logical cores in the host.

The Hypervisor allocates a portion of the physical CPU computing resources to the vCPU of a specific VM. Each vCPU is seen as s single physical CPU core by the VM’s operating system.

**2 Golden Formulas To Estimate Server CPU Core Needed**

**First,** we need to calculate how many requests the cloud server able to serve per seconds:

*Number of core / Average time for a request-response (in seconds)= Maximum number of request per seconds*

**Example:**

Screenshot for one of my projects with a load of 175ms per page request to estimate the Core and RAM needed. Source: Chrome Developer Console

*4 vCPU / 0.175s (Load: 175ms) = 22.8571 Round down to approximately 22 requests per second*

**Secondly,** we need to figure how many users able to surf your application simultaneously:

*Maximum number of request per seconds (From above formula) \* 60 \* User click action in seconds*

*= Maximum number of simulteneous user*

**Example:**

To get user click action per minute, please use Google Analytics to calculate the rough estimation using Average Session Duration / Page Per Session. The rule of thumb for an e-commerce website is 1 click per minute. So, let’s say an assumption of 2 clicks per minute.

*Maximum 22 requests per second \* 60 (1 minute) \* 2 click per minute = 2,640 simultaneous users*

**Example:**

With 4 fixed cores Compute Engine, the site can serve up to 2,640 simultaneous users. The site might serve up to 100,000 daily users due to click actions throughout the day.

So how much vCPU do we need for serving 10,000 simultaneous users for this particular application? Let’s reverse engineer the formula.

10,000 simultaneous users / 60 (1 minute) / 2 click per minute = Maximum 83.3333 request per second

83.3333 \* 0.175s (Load: 175ms) = 14.5833

~15 vCPU

Since the core is a multiple of 2, the nearest core number is

16 vCPU

[What is vCPU](https://www.ubackup.com/enterprise-backup/vcpu-to-cpu.html#:~:text=It%E2%80%99s%20calculated%20by%20taking%20the%20number%20of%20processing,8%20Cores%29%20x%201%20CPU%20%3D%20128%20vCPUs)

[Estimate Server CPU Core Needed](https://medium.com/geekculture/how-to-estimate-vcpu-core-memory-disk-size-for-a-cloud-server-31fa26c883f5)