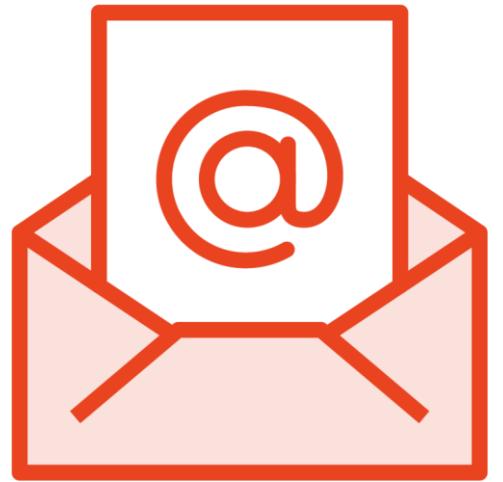
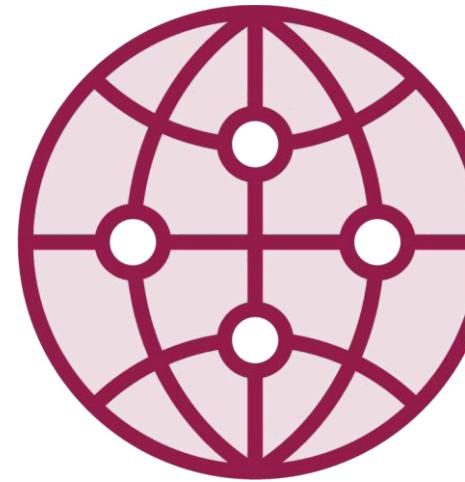


Reality Check – Business Requirements Lead to Technical Specs

Business Needs: Buy New Servers



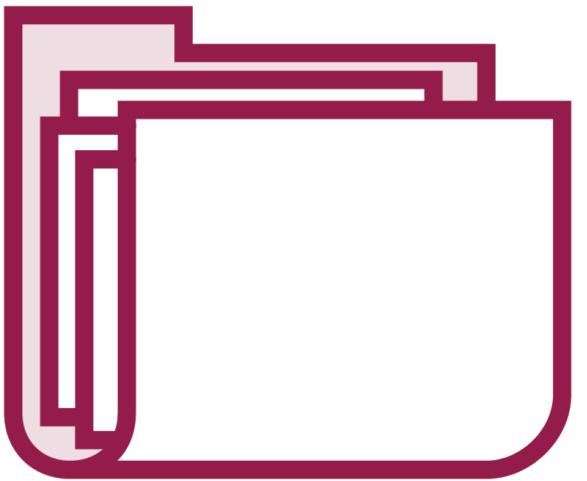
Email



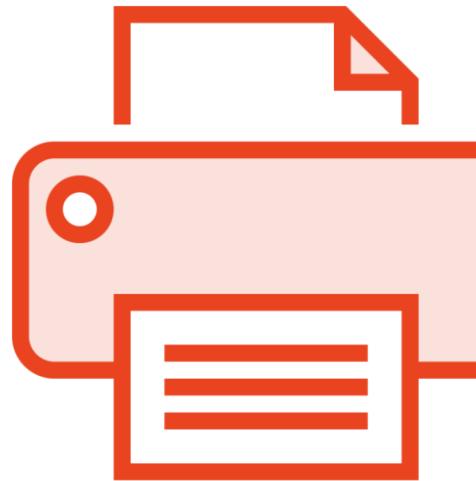
Web



SQL



File

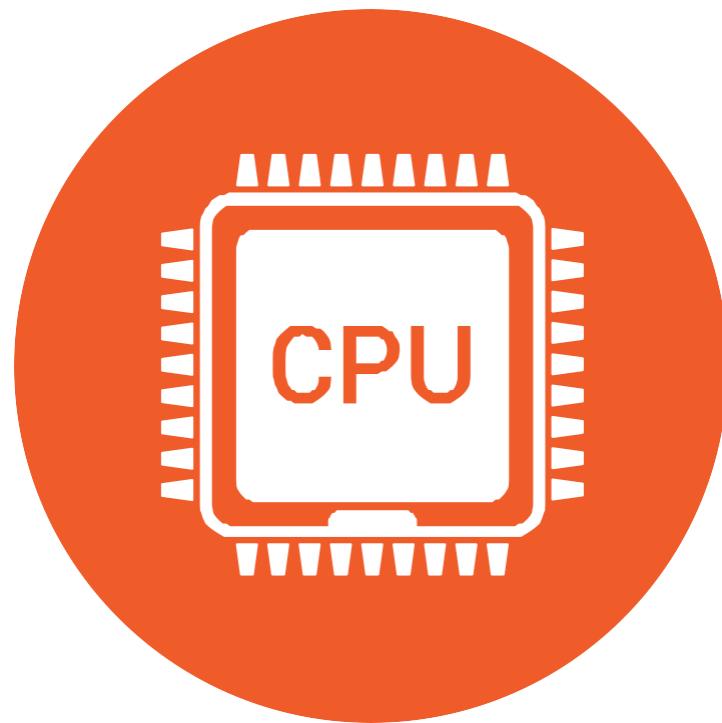


Printing

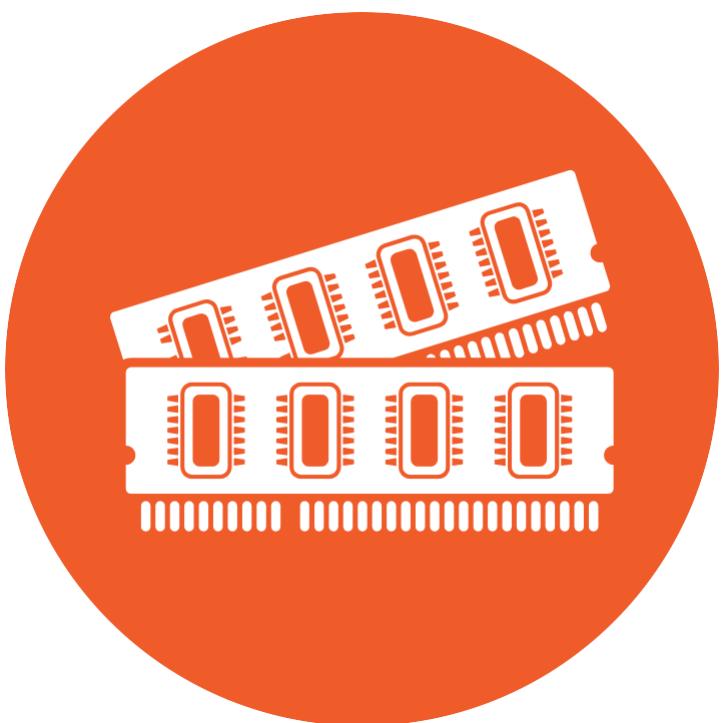


Authentication

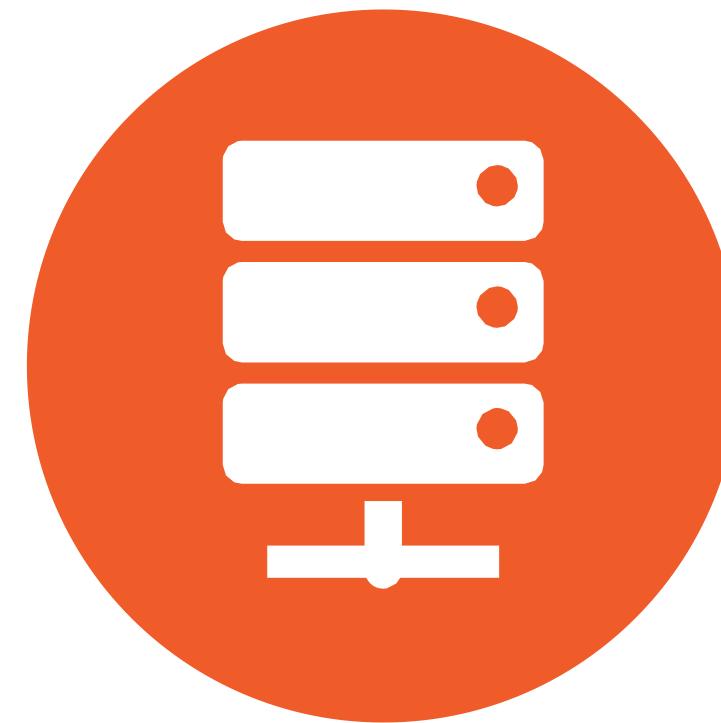
Resource Food Groups



CPU



Memory



Network



Storage

Where Do We Start?



Hardware requirements
Minimum specs
Recommended specs



Reliability and performance
How much downtime is acceptable?
How slow is “too slow”?

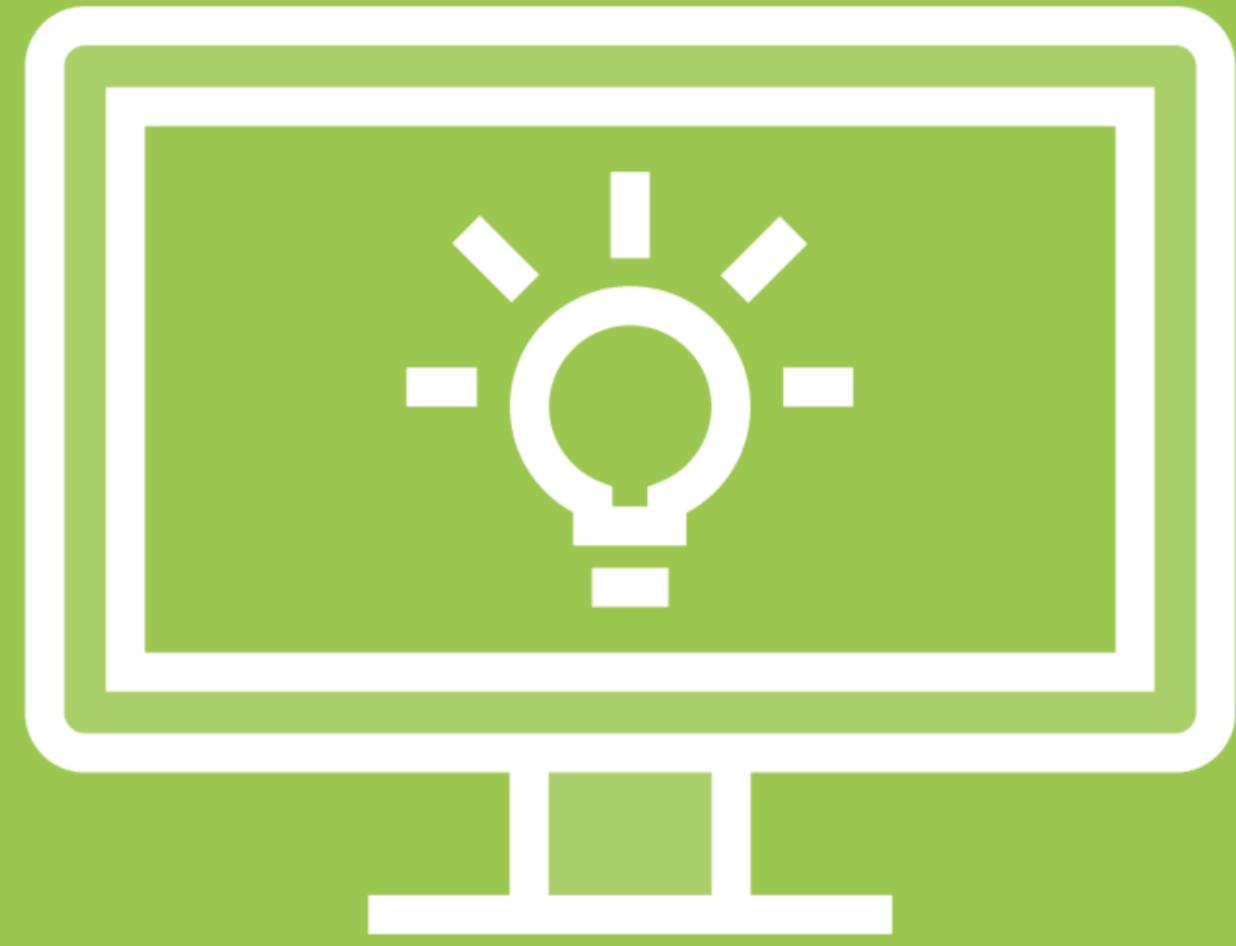
What Else Do We Need to Know?



Do they expect vendor support?

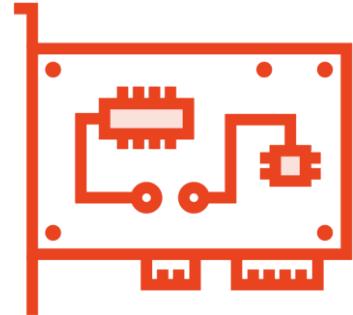


Does the software have a
Hardware Compatibility List
(HCL)?

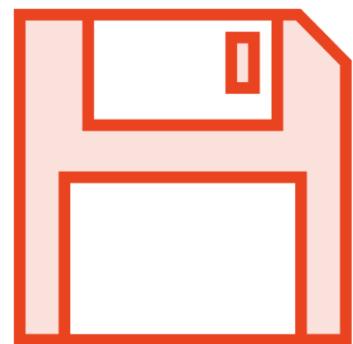


Tech Point Hardware Compatibility List (HCL)

What Is a Hardware Compatibility List (HCL)



The list of specific hardware devices the software vendor has tested and approved



May include specific firmware levels of hardware as well



Vendors typically maintain an HCL for each software version they support

VMware Compatibility Guide

Search Compatibility Guide: (e.g. compatibility or esx or 3.0) All Listings Search

What are you looking for: CPU Series Compatibility Guides Help Current Results: 57

Product Release Version: CPU Series: Enhanced vMotion Capability Modes: Fault Tolerant Compatible Sets:

All	All	All	All
ESXi 7.0 U2	AMD EPYC 7001 Series	AMD Opteron™ Generation 1	AMD Bulldozer Generation
ESXi 7.0 U1	AMD EPYC 7002/7Fx2/7Hx2 Series	AMD Opteron™ Generation 2	AMD Opteron™ Generation 3
ESXi 7.0	AMD EPYC 7003 Series	AMD Opteron™ Generation 3 without 3DN	AMD Piledriver Generation
ESXi 6.7 U3	AMD Opteron 13xx Series	AMD Opteron™ Generation 4	Intel® Haswell Generation
ESXi 6.7 U2	AMD Opteron 23xx Series	AMD Piledriver Generation	Intel® Ivy-Bridge Generation
ESXi 6.7 U1	AMD Opteron 24xx Series	AMD Steamroller Generation	Intel® Nehalem Generation
ESXi 6.7	AMD Opteron 3200 Series	AMD Zen™ Generation	Intel® Pennryn Generation
ESXi 6.5 U3	AMD Opteron 3300 Series	AMD Zen2™ Generation	Intel® Sandy-Bridge Generation
	AMD Opteron 41xx Series	AMD Broadwell Generation	Intel® Westmere Generation
	AMD Opteron 4200 Series	Intel® Cascadelake Generation	Only With Itself
	AMD Opteron 4300 Series	Intel® Haswell Generation	
	AMD Opteron 61xx Series	Intel® Ivy-Bridge Generation	
	AMD Opteron 6200 Series		

Update and View Results CPU/EVC Matrix Reset

Bookmark | Print | Export to CSV Display: 10

Search Results: Your search for "CPU Series" returned 57 results. Back to Top Turn Off Auto Scroll

CPU Series	Cores/Threads	CPUID Info	CPUIDs	Supported Releases							
AMD EPYC 7001 Series	32c/64t	17.01	0x00800F10	ESXi	<input checked="" type="checkbox"/>	7.0 U2	7.0 U1	7.0	6.7 U3	6.7 U2	
AMD EPYC 7002/7Fx2/7Hx2 Series	64c/128t	17.31	0x00830F10	ESXi	<input checked="" type="checkbox"/>	7.0 U2	7.0 U1	7.0	6.7 U3	6.5 U3	
AMD Opteron 3200 Series	4c/8t	15.01	0x00600F10	ESXi	<input checked="" type="checkbox"/>	7.0 U2	7.0 U1	7.0	6.7 U3	6.7 U2	
AMD Opteron 3300 Series	6c/12t	15.02	0x00600F20	ESXi	<input checked="" type="checkbox"/>	7.0 U2	7.0 U1	7.0	6.7 U3	6.7 U2	
AMD Opteron 4200 Series	4c/8t	15.01	0x00600F10	ESXi	<input checked="" type="checkbox"/>	7.0 U2	7.0 U1	7.0	6.7 U3	6.7 U2	
AMD Opteron 4300 Series	6c/12t	15.02	0x00600F20	ESXi	<input checked="" type="checkbox"/>	7.0 U2	7.0 U1	7.0	6.7 U3	6.7 U2	
AMD Opteron 6200 Series	8c/16t	15.01	0x00600F10	ESXi	<input checked="" type="checkbox"/>	7.0 U2	7.0 U1	7.0	6.7 U3	6.7 U2	
AMD Opteron 6300 Series	8c/16t	15.02	0x00600F20	ESXi	<input checked="" type="checkbox"/>	7.0 U2	7.0 U1	7.0	6.7 U3	6.7 U2	
Intel Atom C2700 Series	8c/8t	6.4D 6.37	0x00030670 0x000406D0	ESXi	<input checked="" type="checkbox"/>	7.0 U2	7.0 U1	7.0	6.7 U3	6.7 U2	
Intel Atom C3000 Series	16c/16t	6.5F	0x000506F0	ESXi	<input checked="" type="checkbox"/>	7.0 U2	7.0 U1	7.0	6.7 U2	6.7 U1	

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How Does This Differ from Hardware Requirements?



Hardware Compatibility List
“The Menu”

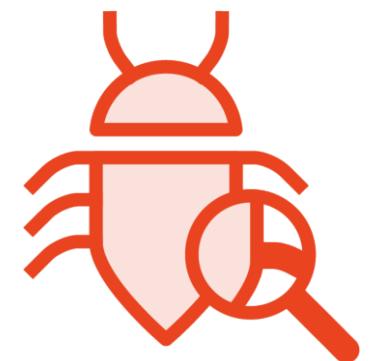


Hardware Requirements
“A Shopping List”

What Is the Purpose of an HCL?



You can feel confident that your hardware has been tested and confirmed to be stable with the vendor's application



The vendor can rule out hardware compatibility issues, making support easier



Some software vendors will not provide support if you do not follow the HCL

Example: HCL for VMware ESXi v.7.0

VMware Compatibility Guide

Search Compatibility Guide: ? (e.g. compatibility or esx or 3.0) All Listings Search

What are you looking for: CPU Series

Product Release Version: All
ESXi 7.0 U2
ESXi 7.0 U1
ESXi 7.0
ESXi 6.7 U3
ESXi 6.7 U2
ESXi 6.7 U1
ESXi 6.7
ESXi 6.5 U3

CPU Capabilities: Supports SMP-FT
Capable of Legacy FT
ALL CPUs

CPU Series: All
AMD EPYC 7001 Series
AMD EPYC 7002/7Fx2/7Hx2 Series
AMD EPYC 7003 Series
AMD Opteron 13xx Series
AMD Opteron 23xx Series
AMD Opteron 24xx Series
AMD Opteron 3200 Series
AMD Opteron 3300 Series
AMD Opteron 41xx Series
AMD Opteron 4200 Series
AMD Opteron 4300 Series
AMD Opteron 61xx Series
AMD Opteron 6200 Series

Enhanced vMotion Capability Modes: All
AMD Opteron™ Generation 1
AMD Opteron™ Generation 2
AMD Opteron™ Generation 3
AMD Opteron™ Generation 3 without 3DN
AMD Opteron™ Generation 4
AMD Piledriver Generation
AMD Steamroller Generation
AMD Zen™ Generation
AMD Zen™ Generation
Intel® Broadwell Generation
Intel® Cascadelake Generation
Intel® Haswell Generation
Intel® Ivy-Bridge Generation

Fault Tolerant Compatible Sets: All
AMD Bulldozer Generation
AMD Opteron™ Generation 3
AMD Piledriver Generation
Intel® Haswell Generation
Intel® Ivy-Bridge Generation
Intel® Nehalem Generation
Intel® Penryn Generation
Intel® Sandy-Bridge Generation
Intel® Westmere Generation
Only With Itself

Update and View Results CPU/EVC Matrix Reset

Bookmark | Print | Export to CSV

Search Results: Your search for "CPU Series" returned 57 results. [Back to Top](#) [Turn Off Auto Scroll](#) Display: 10

CPU Series	Cores/Threads	CPUID Info	CPUIDs	Supported Releases
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AMD Opteron 3200 Series	4c/8t	15.01	0x00600F10	ESXi 7.0 U2 7.0 U1 7.0 6.7 U3 6.7 U2
AMD Opteron 3300 Series	6c/12t	15.02	0x00600F20	ESXi 7.0 U2 7.0 U1 7.0 6.7 U3 6.7 U2
AMD Opteron 4200 Series	4c/8t	15.01	0x00600F10	ESXi 7.0 U2 7.0 U1 7.0 6.7 U3 6.7 U2
AMD Opteron 4300 Series	6c/12t	15.02	0x00600F20	ESXi 7.0 U2 7.0 U1 7.0 6.7 U3 6.7 U2
AMD Opteron 6200 Series	8c/16t	15.01	0x00600F10	ESXi 7.0 U2 7.0 U1 7.0 6.7 U3 6.7 U2
AMD Opteron 6300 Series	8c/16t	15.02	0x00600F20	ESXi 7.0 U2 7.0 U1 7.0 6.7 U3 6.7 U2
Intel Atom C2700 Series	8c/8t	6.4D 6.37	0x00030670 0x000406D0	ESXi 7.0 U2 7.0 U1 7.0 6.7 U3 6.7 U2
Intel Atom C3000 Series	16c/16t	6.5F	0x000506F0	ESXi 7.0 U2 7.0 U1 7.0 6.7 U2 6.7 U1

Previous 1 2 3 4 5 6 Next

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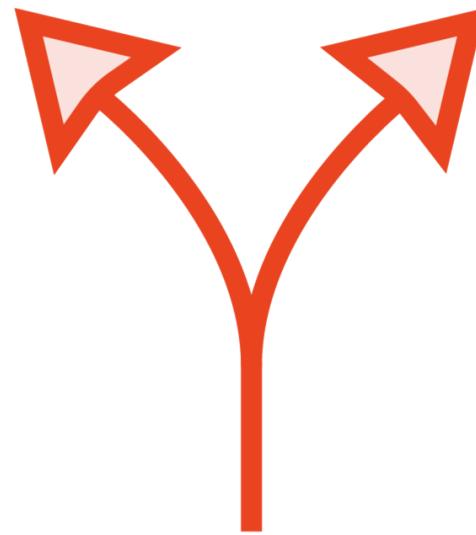
Do I Have to Follow the HCL?

There are consequences of either choice



Follow the HCL

The components listed on
the HCL may be more
expensive than the off the
shelf variety.



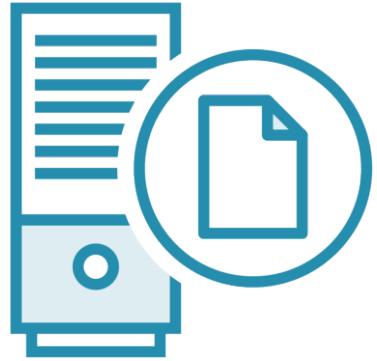
**Choose your own
Adventure**
No Support from the
vendor



Hindsight



Reviewing Globomantics' Needs



The server will be used to host their new line of business software and will serve as file storage for the five office employees



They do need support from their software vendor



The vendor requires customers to follow their Hardware Compatibility List (HCL) to be eligible for support



They need support from their software vendor

The vendor won't support them unless they follow the HCL



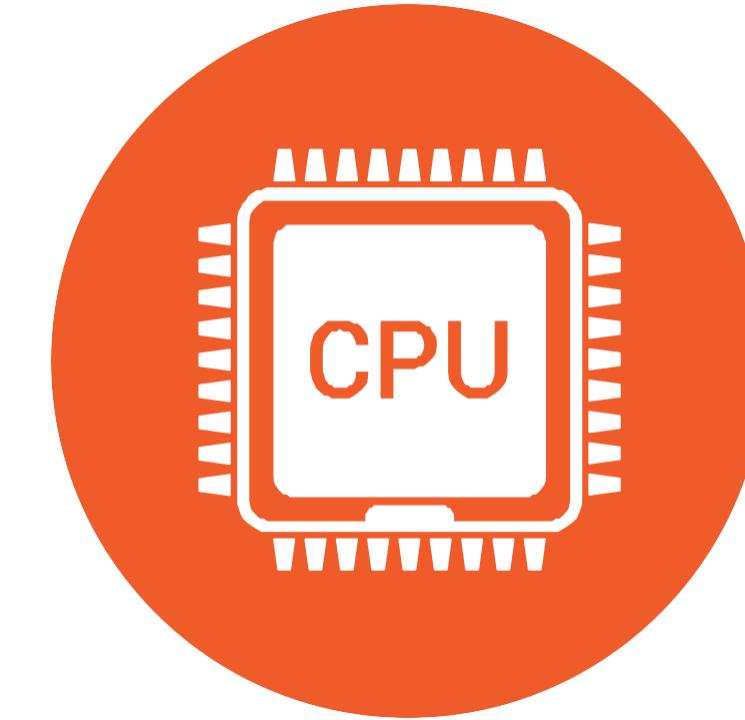
They will verify each of their server components is listed on the vendor's HCL

CPUs



Storyline

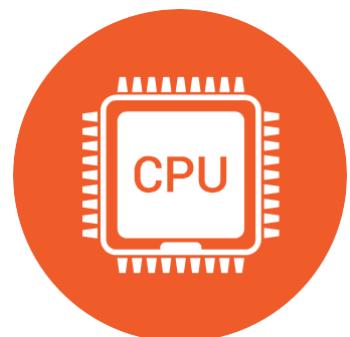
What Do You Need to Know?



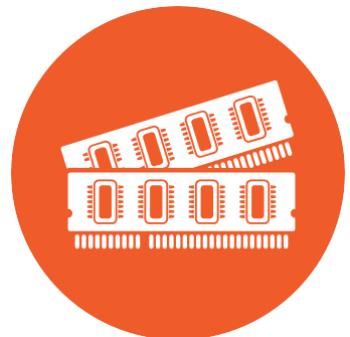
Globomantics is researching their CPU choices for the new server.

Let's learn more about the options and then see if the recommended hardware is suitable for Globomantics

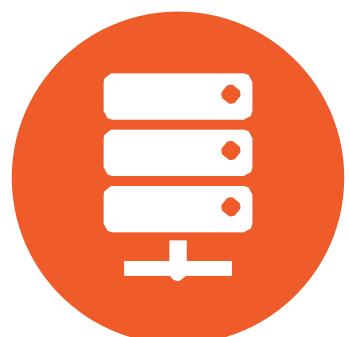
Minimum Hardware



1 CPU Sockets with 6 cores



64 GB of RAM



1 Gbps Networking



512 GB Storage

Recommended Hardware

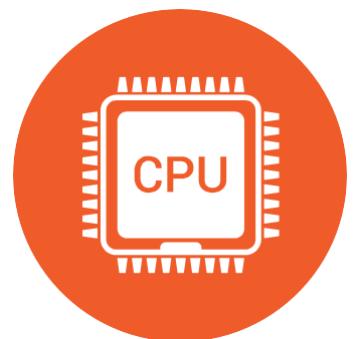
2 CPU Sockets with 12 cores each

256 GB of RAM

10 Gbps Networking

3 TB Storage

Minimum Hardware



1 CPU Sockets with 6 cores



64 GB of RAM



1GB Networking



512 GB Storage

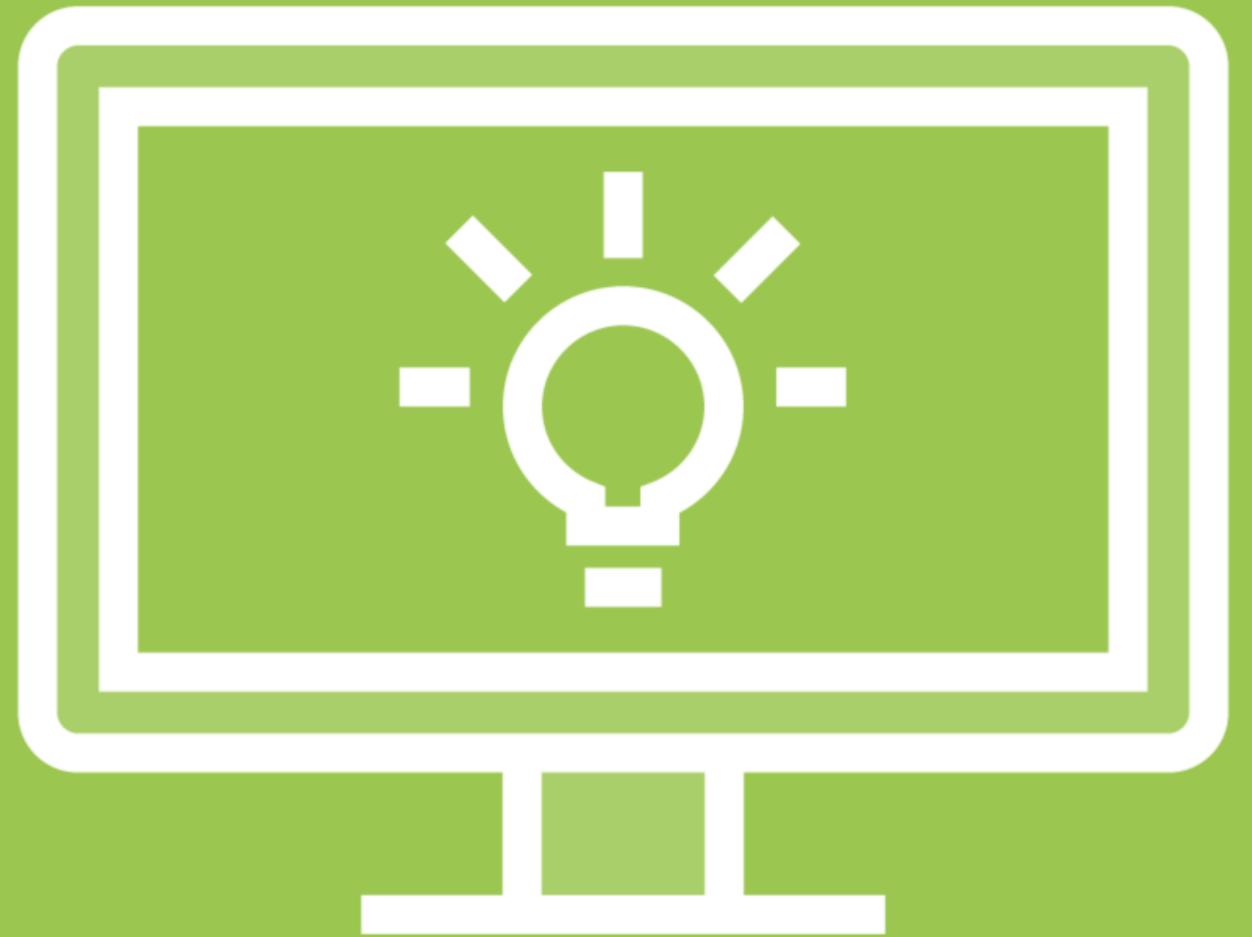
Recommended Hardware

2 CPU Sockets with 12 cores each

256 GB of RAM

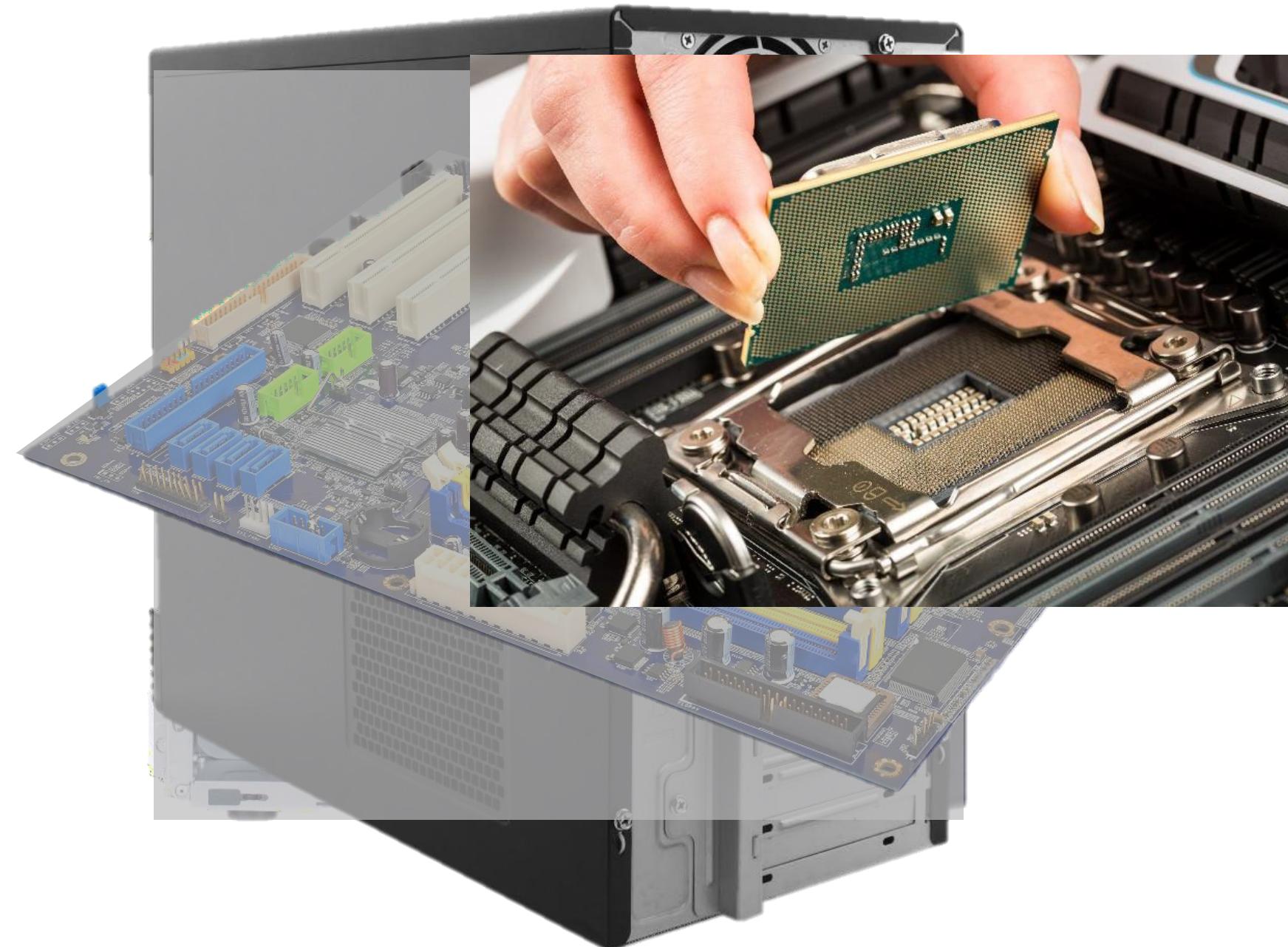
10 GB Networking

3 TB Storage



Tech Point
CPU Cores and
Sockets

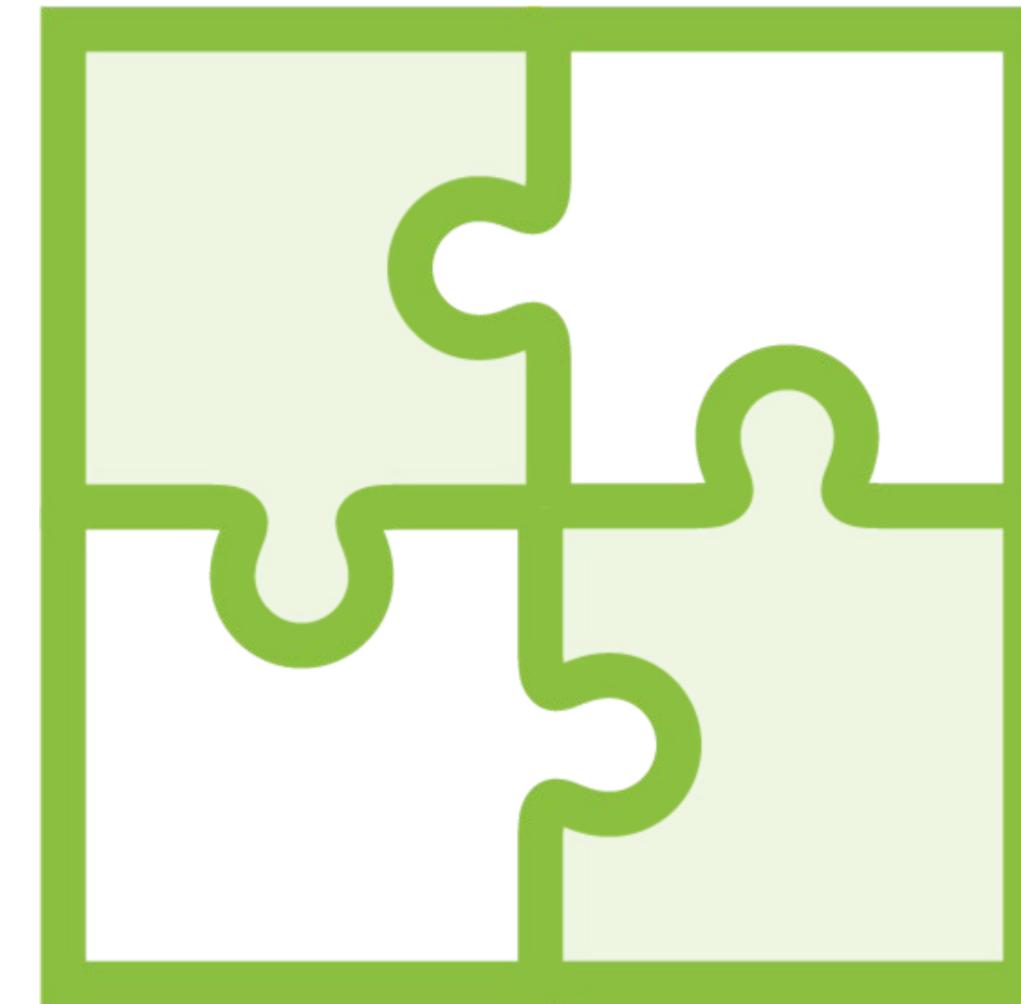
Visual Anchor



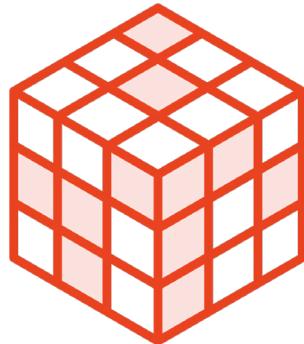
First, the Type of CPU



CISC
Complex Instruction Set
Computing



RISC
Reduced Instruction Set
Computing



Complex Instruction Set Computing (CISC)

Created and sold by Intel and AMD

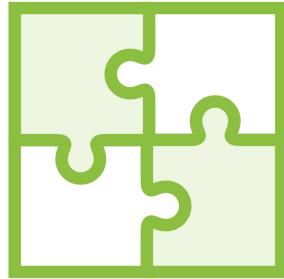


Original Intel standard - 32 bit
Not used in servers since the
early 2000s



Standard created by AMD and later
adopted by Intel
64 bit architecture

Backwards compatible with x86 CPUs



Reduced Instruction Set Computing (RISC)

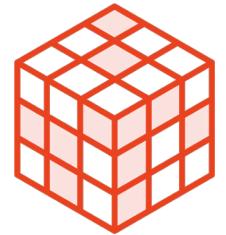
ARM (Acorn RISC Machine)

Acorn Computers makes the design and licenses them to manufacturers

Not widely used in servers, except low power ones

- Some companies deploy many low power servers for hyper-scale projects, HPC, etc.
- Being tried with Cloud, web servers, etc.

CPU Instructions Are Collections of Transistors



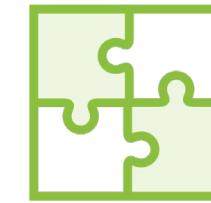
Complex Instruction Set Computing (CISC)

More transistors = **more** power consumption = **more** heat = **more** cooling required

Most PCs and servers contain CISC processors due to the wide operating system support

New versions typically scale up the capabilities of the CPU instruction set

Reduced Instruction Set Computing (RISC)

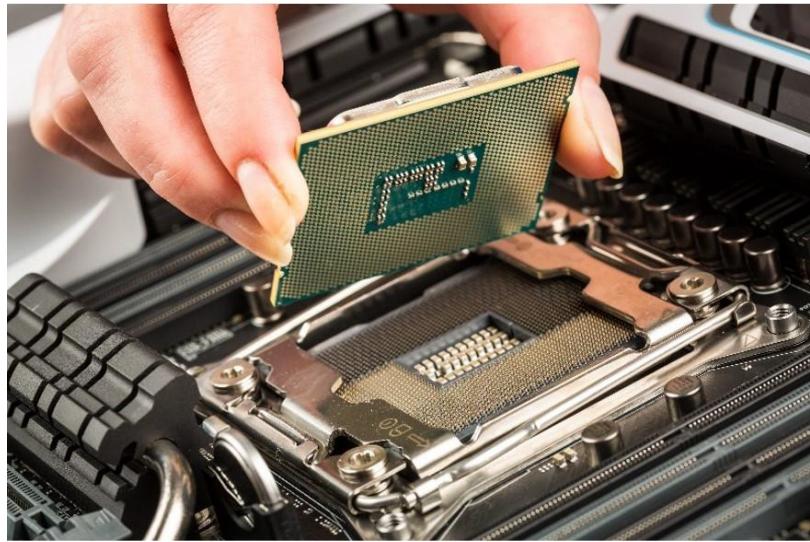


Fewer transistors = **less** power consumption = **less** heat = **less** cooling required

Great for mobile devices, ultra books, TVs, other embedded solutions, and low-power servers, such as web servers

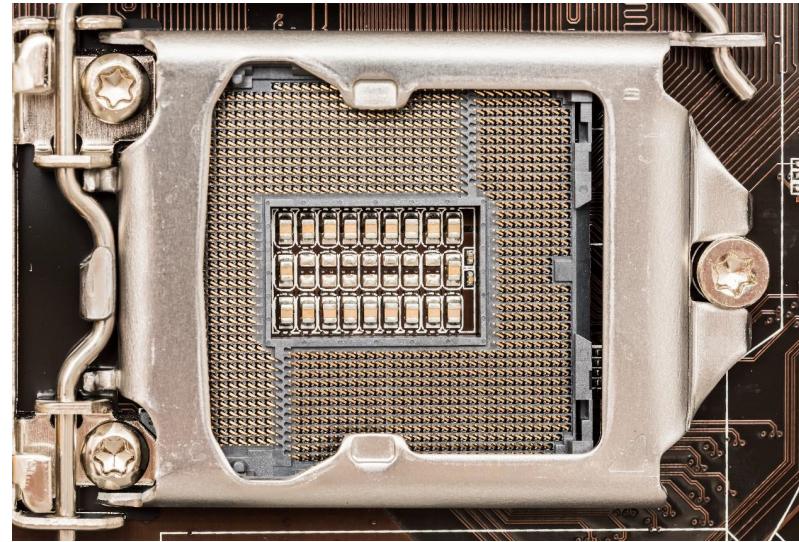
New versions typically scale out to include more processors / cores

CPU Processors, Sockets, and Cores



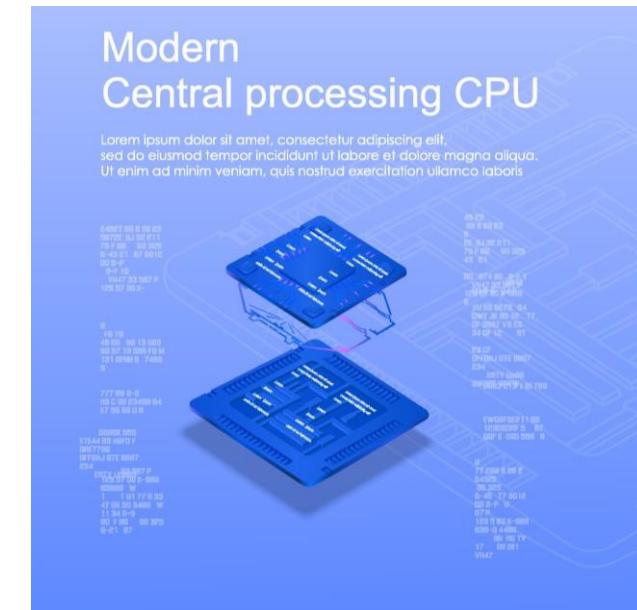
CPU Processor

A generic term, but usually refers to the physical chip that is inserted into a CPU
Socket



CPU Socket

Contains pins or plugs that electrically connect the CPU Processor to the motherboard



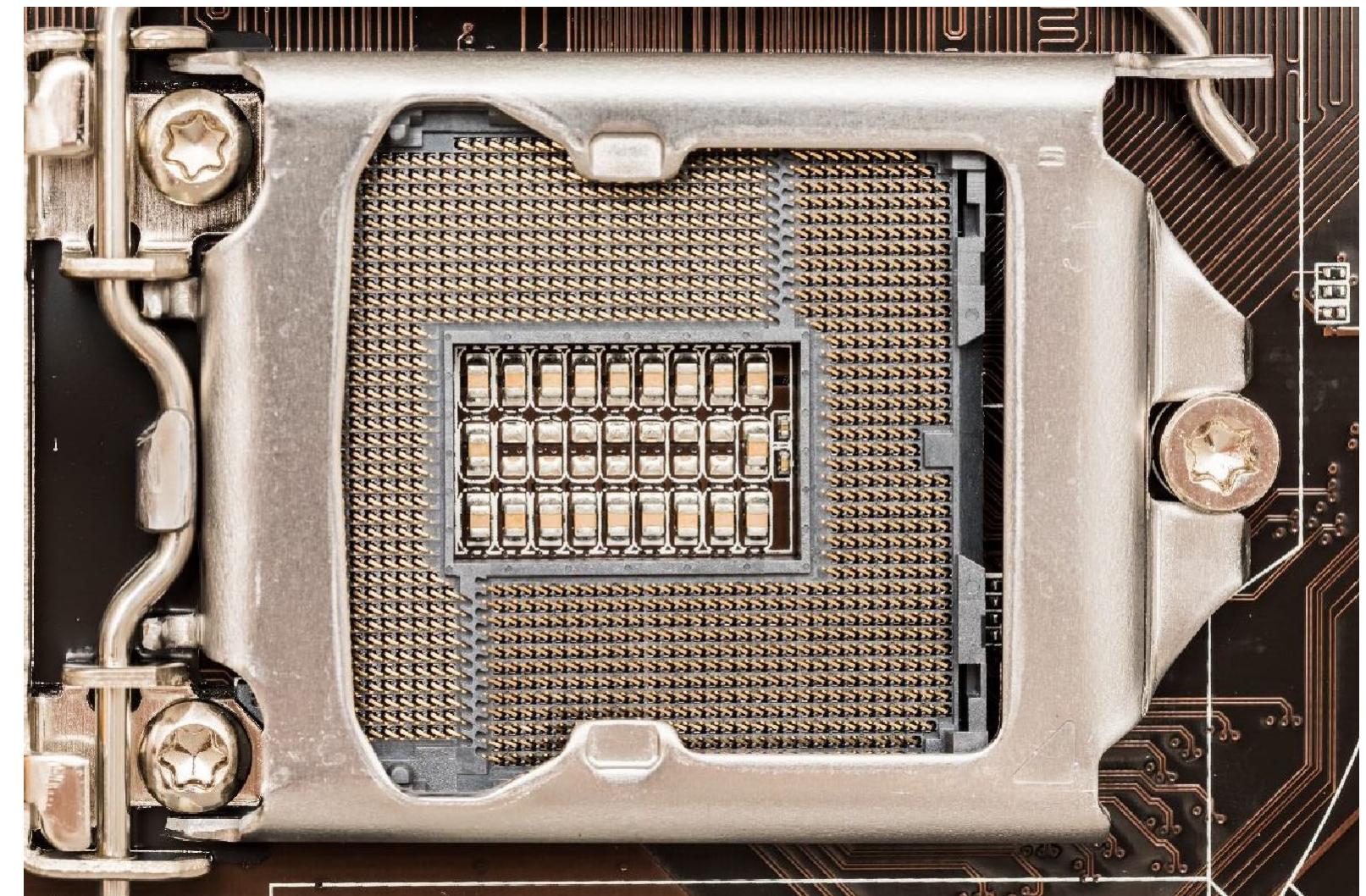
CPU Core

**One or more CPU Cores
are contained within a
CPU Processor**

Socket Types

Specific CPUs require a specific socket type

- Not upgradable
- Built into the motherboard
- Not backwards or forward compatible

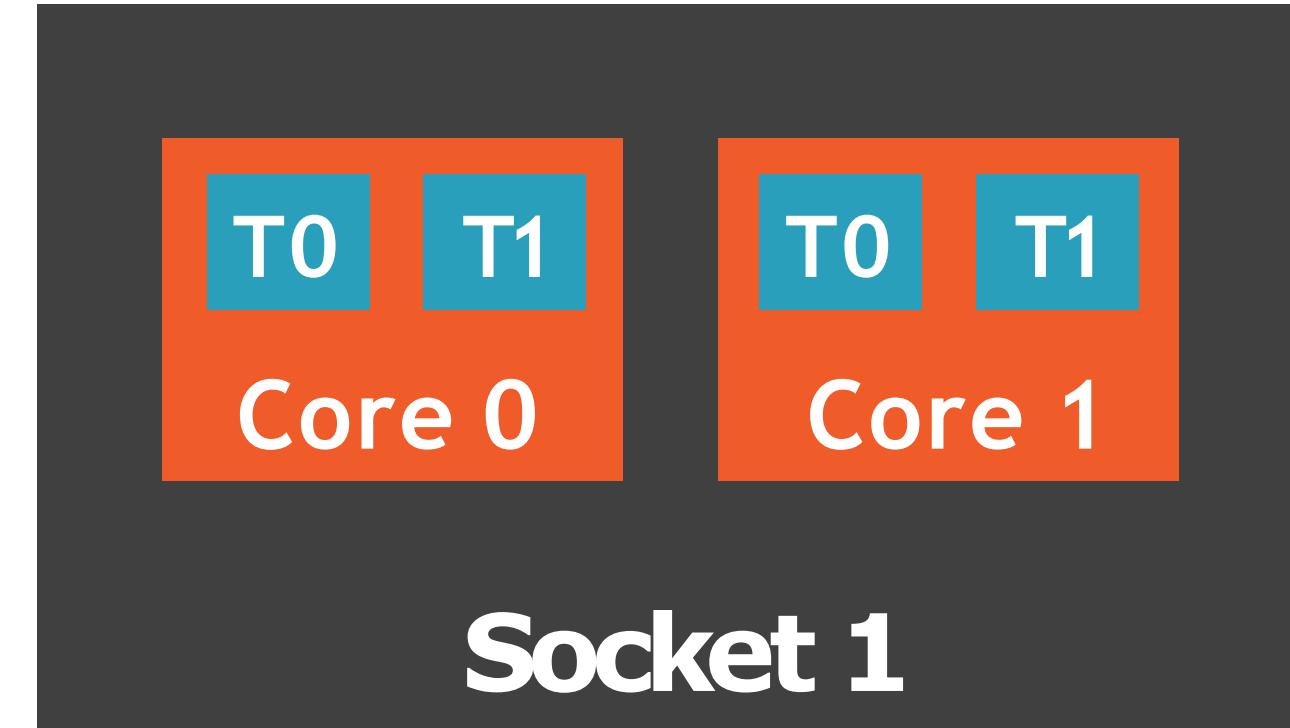


Multiprocessor vs. Multicore vs. Multithreaded

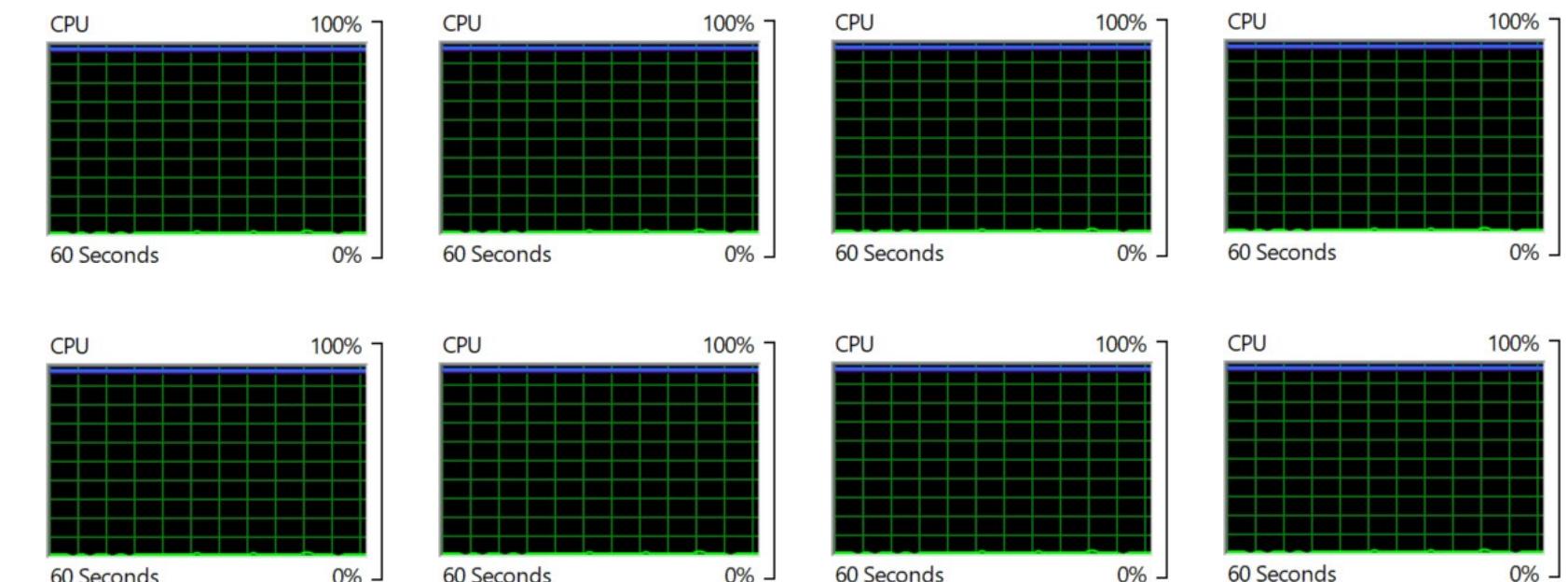
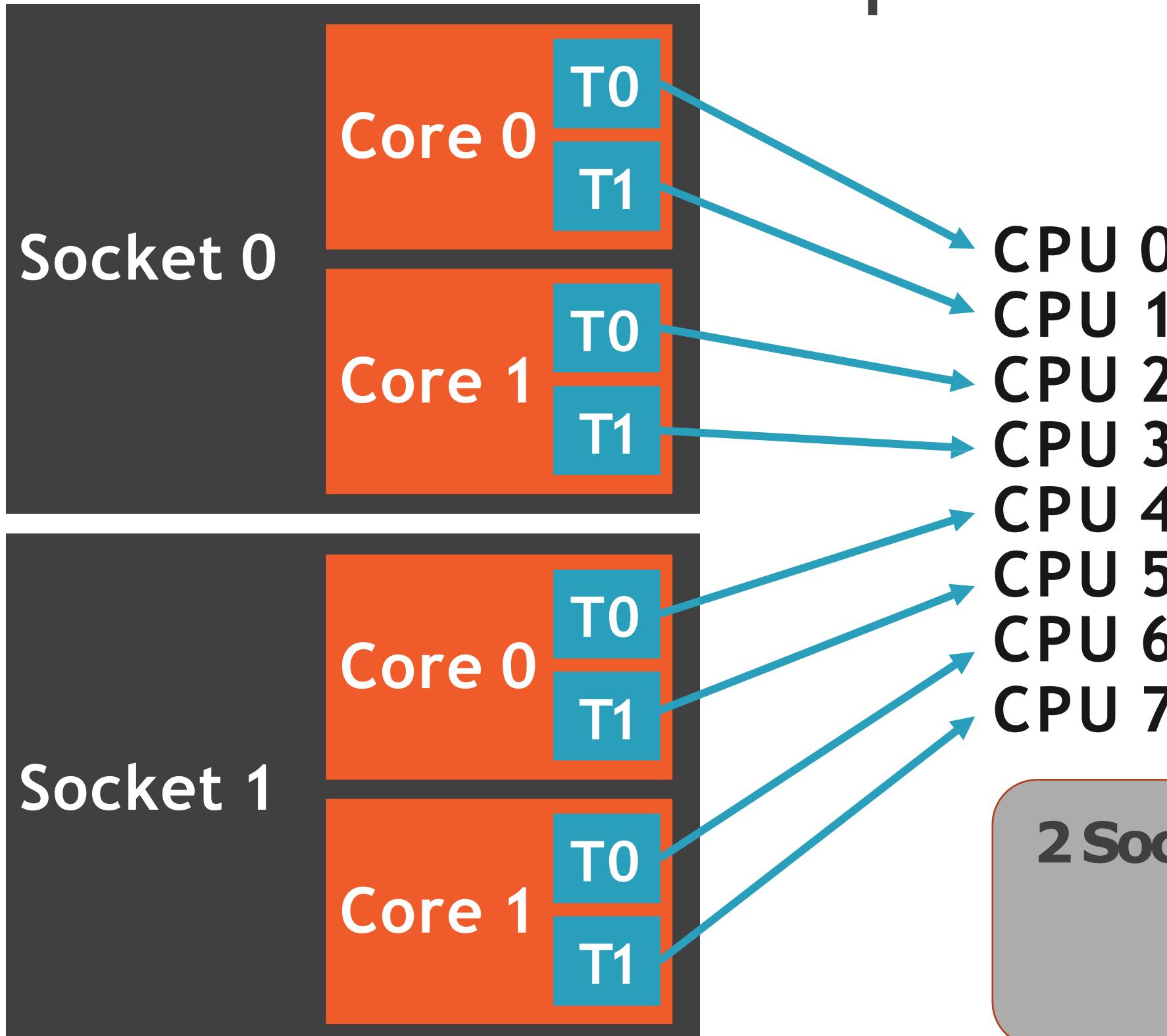
Multiprocessor indicates multiple CPU Sockets are used.

Multicore indicates multiple CPU cores exist within a processor

Each core can also have two thread execution queues, allowing simultaneous multithreading



Threads Appear as CPUs in the Operating System



2 Sockets x 2 cores/socket x 2 threads/core
8 Logical CPUs

CPU Speeds

Base Clock

Speed of one system cycle on the motherboard

Multiplier

The number of processor cycles that may execute during each system cycle

Core Speed

Listed speed of the processor

$$\text{Base Clock} \times \text{Multiplier} = \text{Core Speed}$$

Example: If the **base clock** is **100 MHz** and the **multiplier** is **37**, the **core speed** is **3.7 GHz**

Speed vs. Parallel Processing

Do you require extreme speed for a single process or are you planning to run a highly parallel workload?

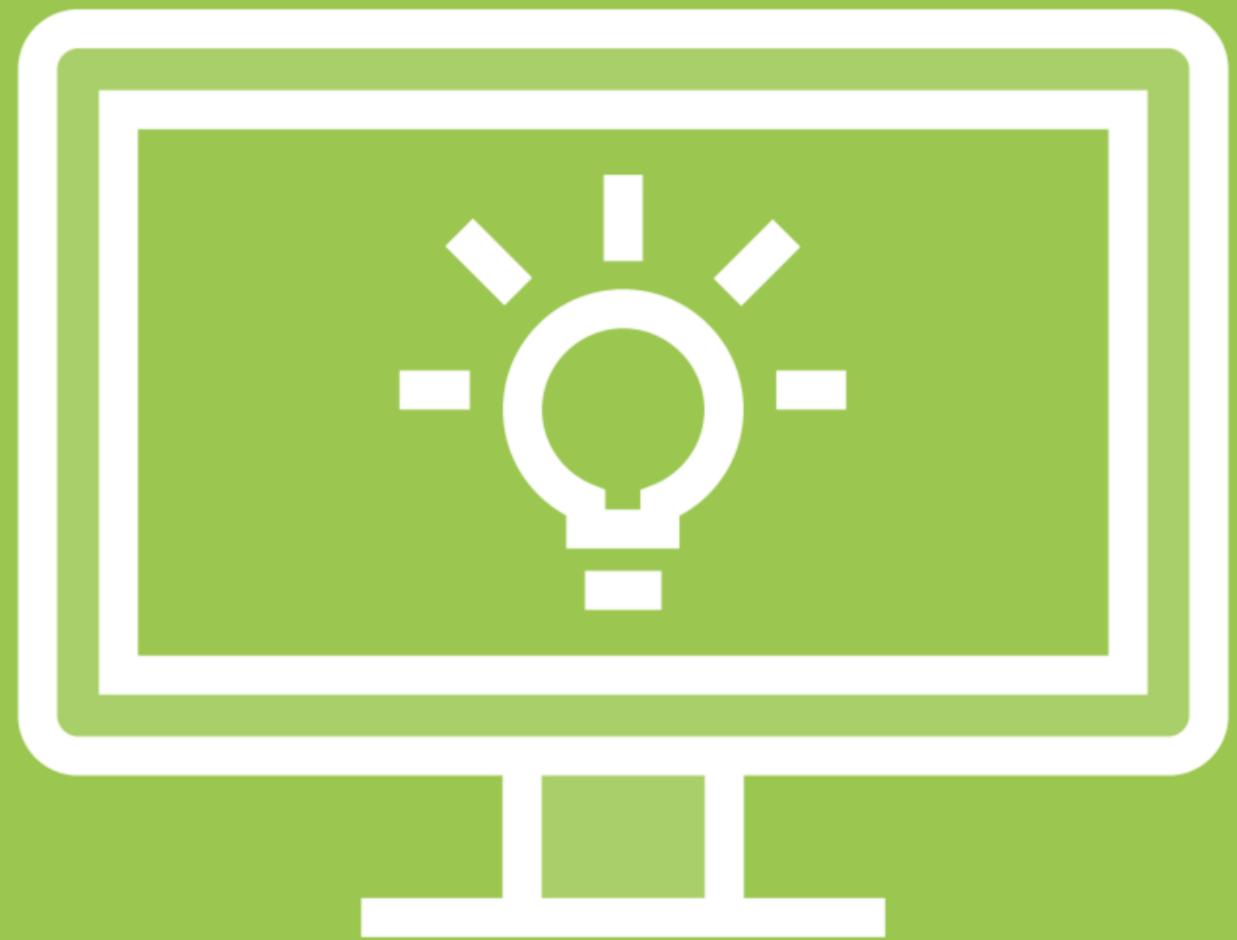


**Single-thread
Performance**
Choose a system with
fewer cores, where each
core has a high clock
speed



**Highly Parallel
Processing**
Choose a system with
more cores, but each core
will have a lower clock
speed

It's all about the heat!

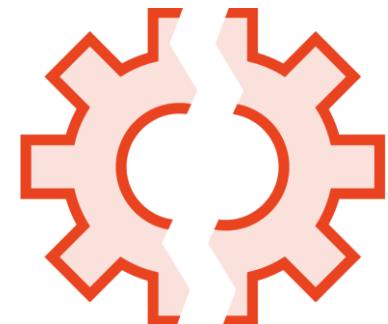


Tech Point
Heat
Dissipation

CPU Thermal Design Power (TDP)



CPU cores turn electricity into heat;
The faster the clock speed of each core, the more heat the CPU produces



CPUs stop working and may become permanently damaged if they overheat

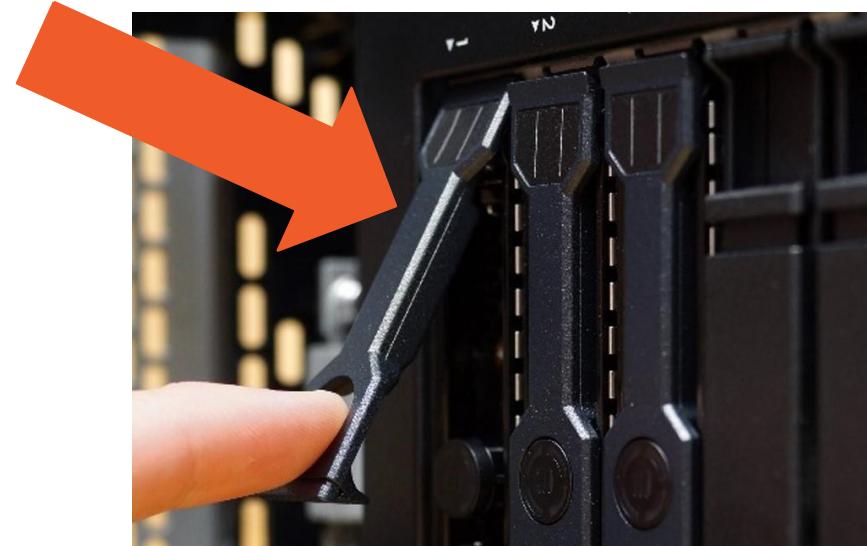


To prevent overheating, the power supplied to a CPU socket is limited;
This constrains the heat output; but also caps the base clock speed of each core.

Keeping the Entire System Cool

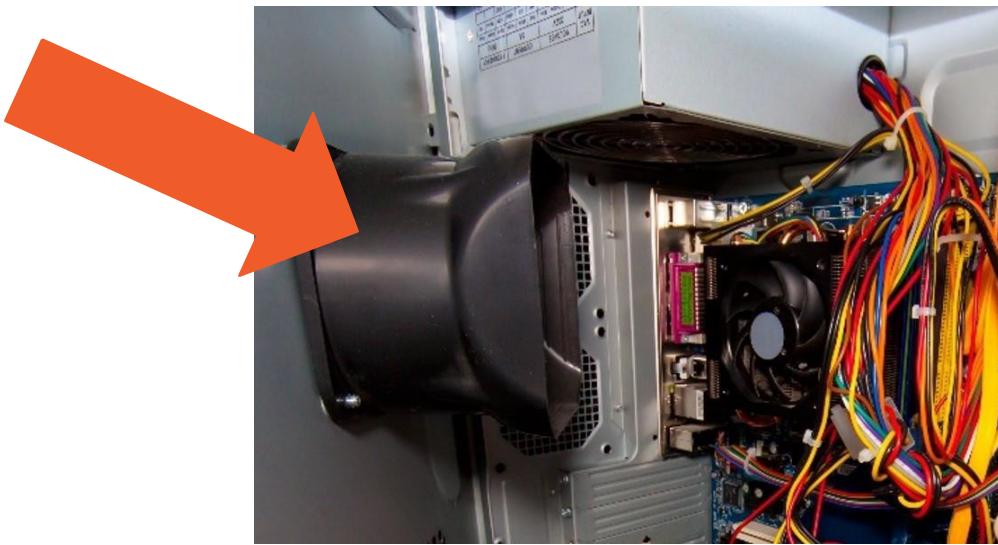
The CPU is only half of your battle with heat.

The RAM and other components also generate heat and must be kept cool.



Baffles

External covers that help channel the intake of cool air



Shrouds

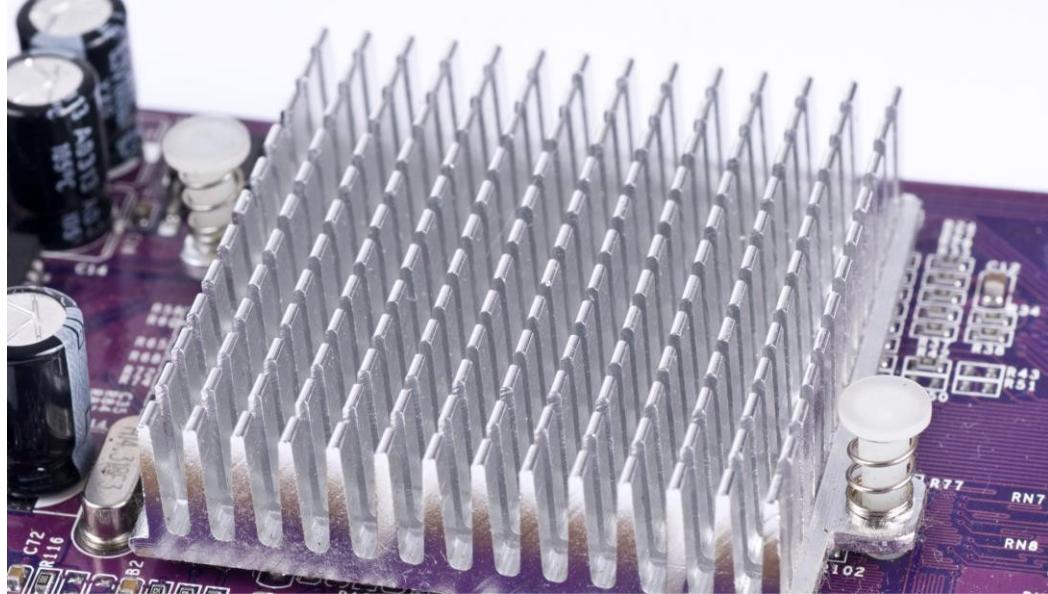
Internal plastic covers that direct the airflow across critical parts



Fans

Pulls cool air from the front of the server and exhausts it to the rear

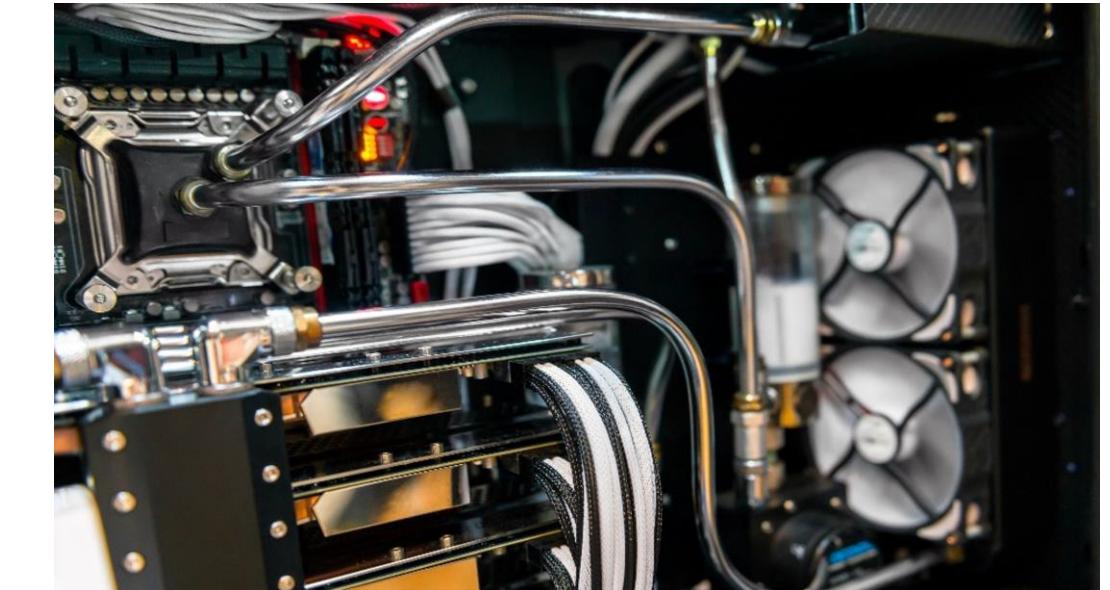
Beat the Heat



**Passive Heat
Dissipation**

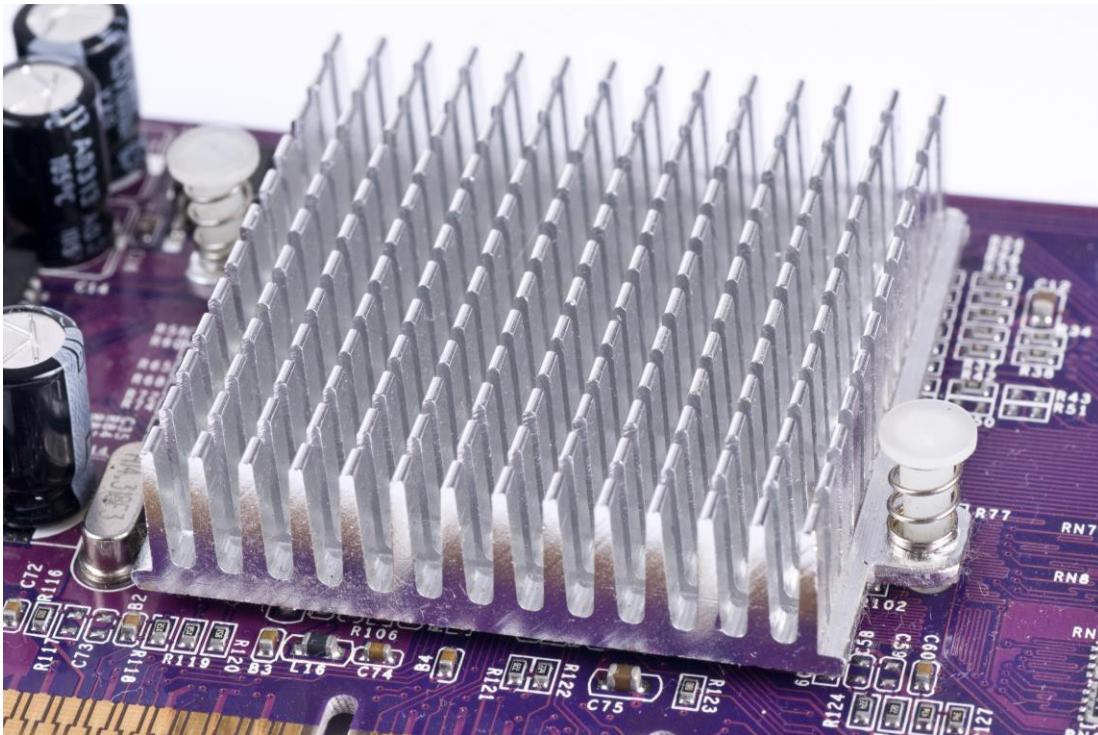


**Active Heat
Dissipation via forced
air-cooled heat sinks**



**Active Heat
Dissipation via liquid
cooling blocks,
pumps, and radiators**

Passive Heat Dissipation



Many components use passive heat sinks

- The metal block conducts heat away from the chip
 - Air flows across the fins, removing the heat.
 - Usually requires thermal compound to improve heat dissipation
 - Requires external fans to circulate air to remove the heat

Active Thermal Dissipation

Sensitive components like the CPU use active heat sinks

- Active heat sink cooling is similar to passive
- Addition of a fan that blows over/through the heat sink
- They are the primary method of cooling modern processors and graphics cards in servers

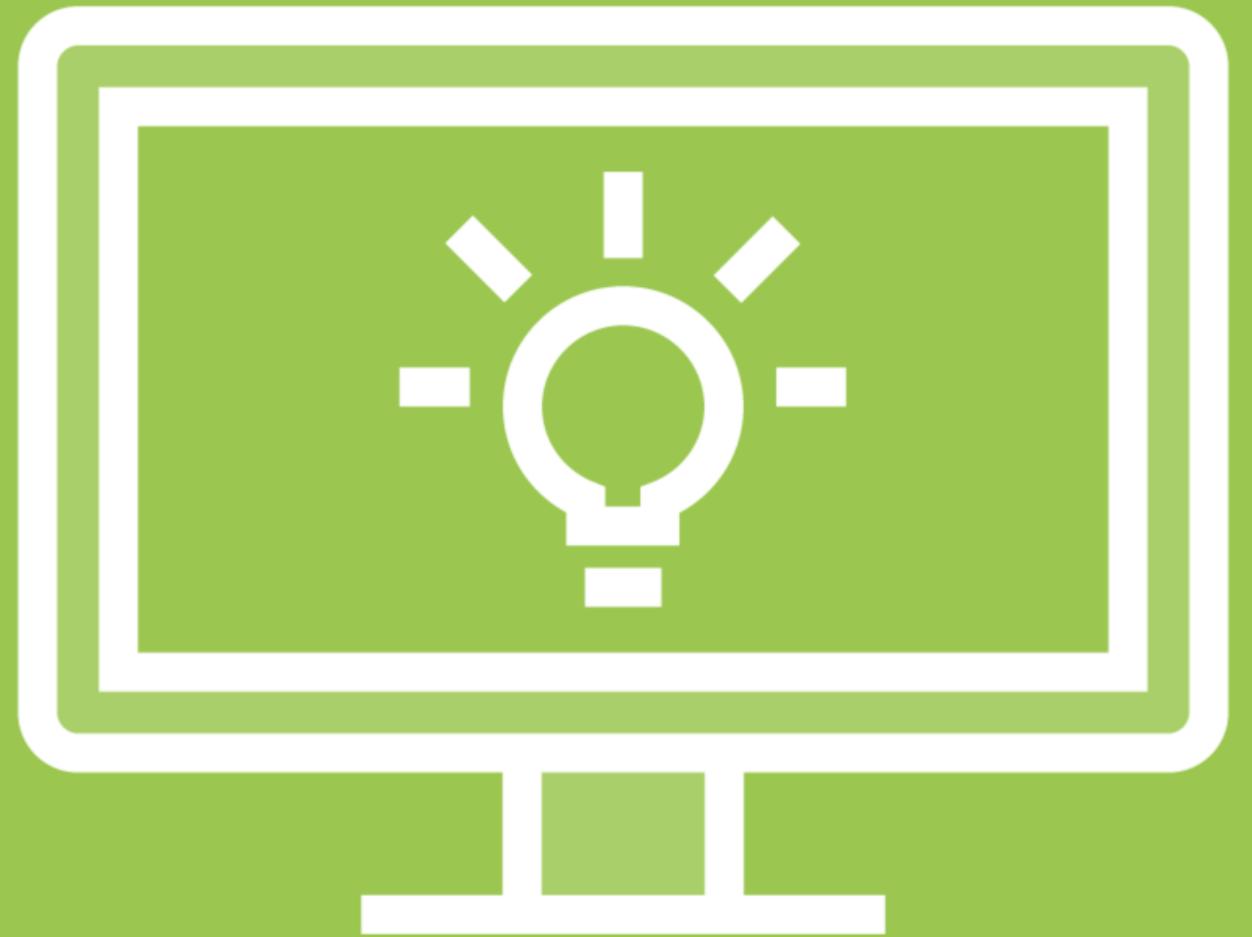


Liquid Cooling

A special liquid cooling block is attached to the CPU

Tubes carry cool liquid (water or refrigerant) from a reservoir to the CPU then to radiators and back to the reservoir

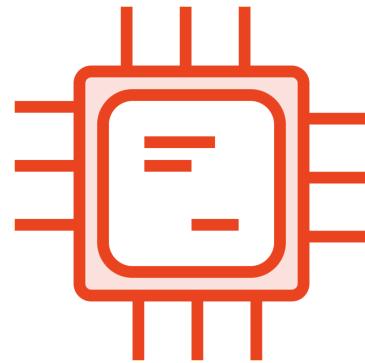
A pump (usually in the coolant reservoir) continually circulates the liquid to remove the heat



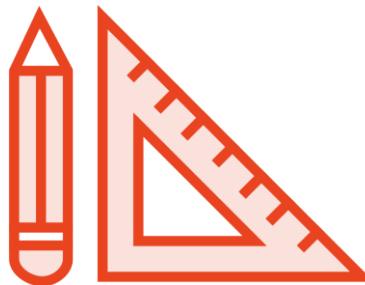
Tech Point
CPU Cache

Wait, there's memory *inside* of
the CPU?!

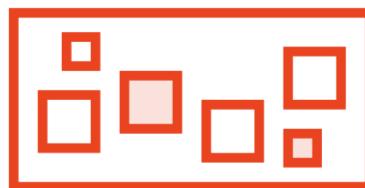
CPU Cache



CPUs have small amounts of memory in the chip

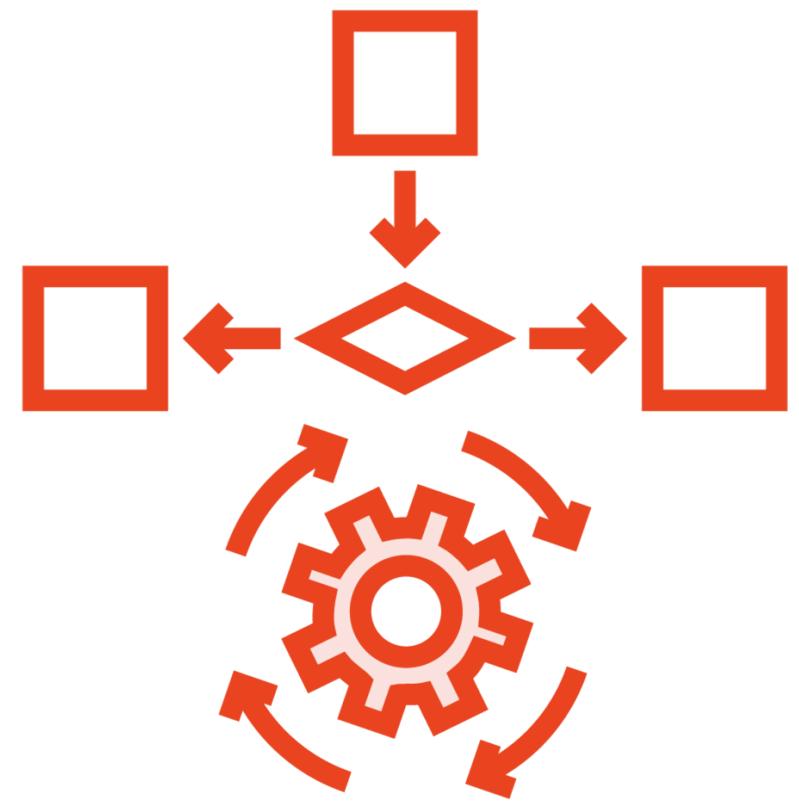


A cache is a working area, like your desk. You can store things in it that you use very often.



Just like your desk, the cache is limited in size

Types of Cache



Instructions



Data

Why Are There Multiple Levels of CPU Cache? (L1, L2, L3)

Larger cache sizes increase the chances of a cache hit, but increase latency

L1 is usually per core and the smallest

The last level (usually 3, possibly 4) is usually shared across all cores in a socket

Cache Hierarchy

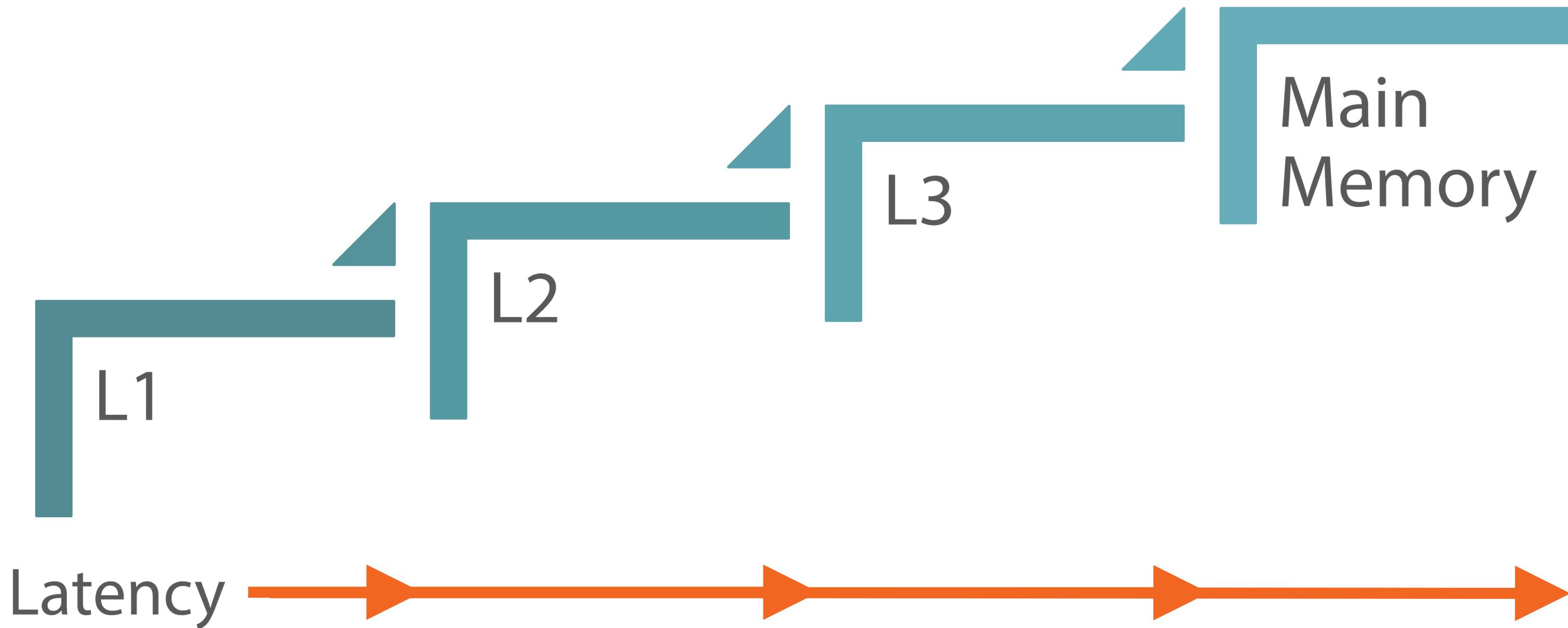
CPU Cache

L3

L2

L1

Cache Search Process

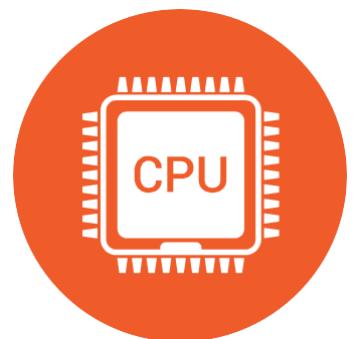




Hindsight



Minimum Hardware



1 CPU Sockets with 6 cores



64 GB of RAM



1 Gbps Networking



512 GB Storage

Recommended Hardware

2 CPU Sockets with 12 cores each

256 GB of RAM

10 Gbps Networking

3 TB Storage

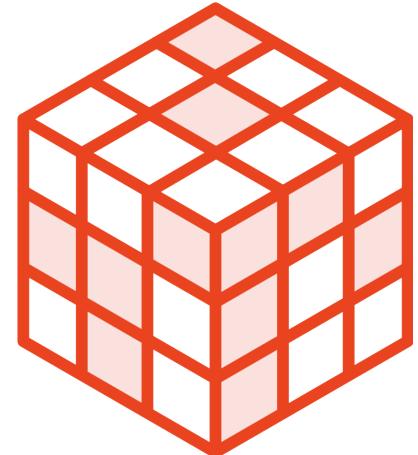


Decision Points

CISC or RISC Processor?

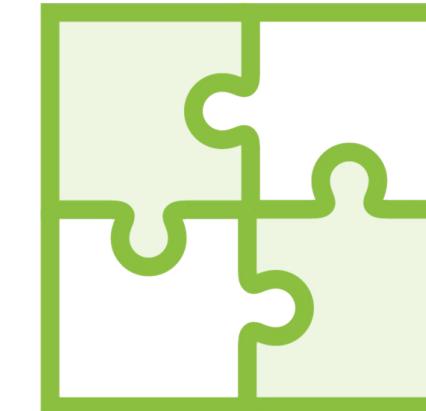
Complex Instruction Set Computing (CISC)

Most PCs and servers contain CISC processors due to the wide operating system support



Reduced Instruction Set Computing (RISC)

Great for mobile devices, ultra books, TVs, other embedded solutions, and even low-power web servers



Higher Clock Speed or More Cores?

The software vendor claims their application is optimized for parallel processing.

Increasing the number of CPU cores may yield better performance.



Single-thread Performance

Choose a system with fewer cores, where each core has a high clock speed

Highly Parallel Processing

Choose a system with more cores, but each core will have a lower clock speed