# Index.html – Section 1

## Introduction to water cooling

Every computer from smartphones to supercomputers generates heat, and that heat needs to be managed and removed. Most systems use air cooling, passing air over the components or a heat sink and expelling it out of the machine to carry the heat away. This works perfectly well for many systems and is easy to install and maintain but has drawbacks especially for high performance systems. Air is a relatively poor medium for carrying heat and you are limited in how much surface area you can use for heat sinks when cooling directly with air. In general, this means the only way to increase your cooling capacity with air cooling is too increase air flow by increasing fan speed (and noise).

Water cooling replaces air with water as the direct cooling medium. Instead of a heat sink attached to the component cooled by airflow, a water block is used, water flowing through the block carries the heat away so it can be removed more efficiently.

### Why water cool?

Water has over four times the heat capacity of air, making it a much better cooling medium. Further, water is far denser than air, meaning it has over 3000 times the heat capacity of air per-volume. I.e. a litre of water can carry away over 3000 times the heat of a litre of air. This means water is much better and faster at removing heat from components. This improved cooling capacity can be leveraged for increased performance.

You still need to cool the water coolant, which is generally done with air, but because this air cooling is decoupled from the components a much greater surface area can be used for cooling. For instance, CPU air coolers can usually only mount one or two fans, while a single water-cooling radiator can mount anywhere from 2 to 8 fans, and you can have multiple radiators for each component. This means you can direct much more cooling capacity at each component.

So, the major advantage of water cooling is that it cools components much better and far more quietly. Improved cooling has the further effect on reducing thermal stress on components, meaning they will last longer.

### Shortened Intro:

Every computer generates heat and that heat needs to be removed. The simplest method is to use air cooling which works perfectly well for many systems. Water cooling, however, uses water to cool computer components.

### Why water cool?

Water has over four times the heat capacity of air. Further, because water is denser than air, it has over 3000 times the heat capacity of air per-volume. I.e. to cool something as much as you can with a litre of water, you would need 3000 litres of air. So, air cooling requires a lot of fans moving a lot of air and the faster the fan spins, the louder it gets.

If you want a computer with maximum performance, that looks good and doesn’t sound like an aircraft taking off, there’s no alternative to water cooling. This comes at a price though. Water cooling is much more expensive, and because you periodically have to drain the loop, clean and refill it, it requires more maintenance.

Water cooling:

Pros:

Computer runs cooler

Components last longer

More headroom for overclocking = higher performance

Quieter

Looks better

Cons:

More expensive

Harder to install

More maintenance

Air-cooling:

Pros:

Cheaper

Easier to install

Less maintenance

Cons:

Computer runs hotter

Components might not last as long

Less headroom for overclocking = lower performance

Much louder

Not as aesthetically pleasing

# Index.html – Section 2

## About me

I have been building and maintaining computers for nearly thirty years, both in my spare time and professionally. Professionally I have experiencing working on everything from printers and laptops to servers and networking equipment on major government and private contracts.

# Showcase.html

## Project Chameleon

### Quick Look

Project Status: Complete.

Purpose: 4k/VR Gaming. Media creation.

Colour Theme: Black and white with silver highlights.

### Description

Project Chameleon is designed to be a top-end system for gaming and media creation. The brief was for a true powerhouse that can handle bleeding edge AAA gaming at 4k and VR, while also being suitable for high-end media creation. The system can handle video editing of large 4k projects, 3D/CAD scenes and rendering. In fact, virtually any workload you care to throw at it.

Further, it needed to perform these workloads as quietly as possible, working on audio projects can be difficult with fans screaming in the background. The final system is whisper quite at low load levels, averaging just 20db, less than rustling leaves (30db) or typing on a keyboard (~39db). At extremely heavy loads its maximum noise level reaches 40db, about the background noise level of an average home and far below the 60db of a normal conversation.

Aesthetics were a concern as it would be a showpiece system. A relatively neutral colour pallet of black, white, and silver were chosen so, when coupled with addressable LEDs, the entire colour theme of the machine can be changed with a click of a button. Hence the name: Project Chameleon.

### Shortened Description

Designed to be powerful and silent, Project Chameleon can handle everything from 4k gaming to video editing and 3D rendering. What is more it can deliver all this power while being whisper quiet!

A Neutral colour pallet combines with LED lighting to allow the machine to change its look at a press of a button, a true chameleon!

### Tech Specs

CPU: Intel i9 9900k Overclocked to 5ghz all core.

RAM: 32gb g.skill TridentZ RGB 3600mhz

Graphics: Nvidia Geforce 2080ti RTX

Cooling: 1x 360mm + 1x 240mm radiators for a total dissipation of 835W.

## Project Gecko

### Quick Look

Project Status: Building.

Purpose: HD/VR gaming, media centre.

Colour Theme: Black and Metallic.

### Description

Project Gecko is designed to be a HD/VR gaming and media centre PC. The brief for this system was for one with a good balance of performance to cost, capable of running modern games HD and VR games in a living room environment. Designed to blend into a living room environment, it needs to both merge into the background and take centre stage when needed.

It is intended to handle reasonably graphically intensive workloads, while remaining low noise like most living room electronics. A mini-itx platform allows the system to have a small footprint while retaining its power.

Aesthetically it is meant to invoke the look and feel of normal audio-visual equipment while also offering something extra. To save money it uses some older, but still capable components and parts originally intended for project Chameleon. Project Gecko is named so because it’s small, powerful and nimble.

### Shortened Description

Designed to be small and sleek yet powerful, Project Gecko can handle HD/VR gaming while not looking out of place in a living room. Water-cooling and a low watt CPU help keep temperatures and noise, to a minimum.

The metallic and black colour scheme help Gecko blend in with living room audio-visual equipment, while the small form factor helps it stay out of the way.

### Tech Specs

CPU: Intel i5 9400f

RAM: 16gb

Graphics: Nvidia Geforce 1080ti GTX

Cooling: 1x slim 240mm + 1x slim 120mm radiators for a total dissipation of 424W.