GRID & SILICON

Technology explainer

Liquid Cooling: How AI Chips Stay Cool

Why would a computer need plumbing?

In the news

AI computers need pipes as well as wires. NVIDIA announced a plan to have partners fit cooling pipes and other parts into units before shipping them. Those units still need a prepared site. Liquid cooling carries heat away from the chips so they can keep working.

Why do computers need cooling?

AI means computer programs that learn patterns from lots of examples. Software means instructions that computers follow. The computers use electricity while doing their work. Nearly all of a chip's electricity becomes heat.

A **data center** is a building where many computers run. Its cooling system must carry heat away from working equipment. Without enough cooling, equipment can get too hot to work safely. Cooling is part of computing, not an optional extra.

This lesson follows heat through one kind of liquid-cooling system. The diagram shows the main path, not every pipe. Read each arrow as a step in moving heat. The heat has to go somewhere beyond the computer.

What touches the chip?

A **chip** is a small part that does computing work. A **cold plate** is a metal part that collects heat from a chip. Liquid passes through small channels inside the plate. A channel is a narrow path through which liquid flows.

Heat moves from the chip into the plate and liquid. The liquid gets warmer as it takes up that heat. It then moves away through pipes toward other cooling equipment.

How does the liquid keep moving?

A **pump** is a machine that pushes liquid through pipes. The pump keeps liquid moving around a connected path. That path is called a **loop** because the liquid returns. The arrows in our diagram follow heat through part of that system.

Warmer liquid leaves the cold plate carrying heat from the chip. It travels to a **heat exchanger**, which passes heat between separate fluids. A fluid is a liquid or a gas that flows. The fluids can exchange heat without mixing together.

After giving up heat, cooler liquid returns toward the cold plate. It can collect heat again while the computers keep working. This is repeated movement, not one cup of water used once.

Where does the heat go next?

The heat exchanger passes heat onward to the building's cooling system. From there, equipment must release the heat outside or send it for useful heating. The exact route depends on the building and its design.

Think of carrying a full bag from one room to another. The first room is clearer, but the bag still exists. Moving heat away from a chip is only the first job. The rest of the system still needs to handle it.

In the diagram, Outside marks the final destination of this heat path. It does not show every possible outdoor cooling method. Some systems use water that evaporates, meaning it becomes water vapor. Others release heat through equipment using outdoor air.

Why does AI need this system?

Many powerful computing chips can produce heat in a small space. Collecting heat close to those chips can help carry it away. Liquid cooling is one way to do that. It does not make the chips stop using electricity.

Pumps and other cooling equipment also need power to work. Pipes and connections need care to prevent leaks. A design may still use air cooling for other computer parts. Not every part must use the same cooling method.

If liquid stops moving, heat removal at the chip can be reduced. Cooling only works when the connected parts do their jobs. The main idea is a path: collect, carry, transfer, then release heat. Each step supports the computers doing AI work.

A laptop fan and a liquid loop both carry heat away from computing parts. A warm spoon in cooler water also passes heat into its surroundings.

A cold plate collects heat from a chip.

A pump moves liquid through pipes.

A heat exchanger transfers heat between separate fluids.

Key ideas

- A cold plate collects heat from a chip.
- A pump moves liquid through pipes.
- A heat exchanger transfers heat between separate fluids.
- Liquid cooling moves heat; the heat must still leave the system.

Why this matters to you: Cooling affects the energy used by the services you use.

Lesson online · Source article: NVIDIA DSX POD shifts AI factory assembly off-site