THE NOISE BETWEEN

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The CPU (Central Processing Unit) is the heart of every computing device. Its architecture comprises billions of electronic switches called “transistors,” and together these form the material basis for running code. In theory, 1s and 0s swap instantaneously as computation happens, changing according to the rules of binary logic. But in practice, the transistors take (just a little) time to switch between the corresponding “on” and “off” states.

The CPU must account for this duration, which it does with a clock running at a few billion ticks per second. Between the ticks, while all the switches are transitioning, the circuit is electrically unstable. As a result, the digital logic is also ambivalent during this time. But by the time the clock strikes, the bits have all fallen into place and the computation can proceed.

There’s something else important about the liminal experience of a transistor in the time between the ticks. For this short while, the transistor resists the electricity flowing through it, and the resulting friction produces heat. The more a transistor switches between on and off, the more heat it generates. Cumulatively, this can be dangerous for the circuit. If the silicon gets any hotter than about 300°F, the logic quite literally falls apart, and so the CPU must be kept cool with some combination of heat sinks, vents, and fans. While your laptop is one thing – and sometimes it runs pretty hot – in a contemporary data center there might be 80,000 computers on call to process your photos, likes, and messages. That’s a whole lot of transitioning transistors, a whole lot of heat, and therefore a whole lot of fans. So many fans that it’s not the circuits themselves that are responsible for the majority of the power used by a data center, but the air conditioning.

As a result, if we were to stand among the rows of servers in one of these vast buildings, we’d hear the deafening noise of a strange wind. Maybe we were expecting the silence of cold digital logic. But instead, the data center is acoustically resonating with the ambiguity that can't be computed. Can you hear it from here?