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Where Servers Meet Saunas: A Visit to Google's Finland Data Center

Google operates nine giant data centers across the US and Europe. And it's building four more in Asia and South America. But only one has a sauna. Yes, that would be the one in Hamina, Finland.



Google's Finnish data center sits on the edge of the Baltic Sea. IMAGE: GOOGLE

GOOGLE OPERATES NINE giant data centers across the U.S. and Europe. And it's building four more in Asia and South America. But only one has a sauna.

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The sauna highlights the unique nature of this computing facility. But it's also a window onto Google's sweeping efforts to rethink the way data centers are built and operated. No other Google data center has a sauna, but each is unique in its own way -- and vastly different from the computing facilities driving the rest of the online world.

In an effort to save power and cost -- and maybe even the planet -- Google is always looking for new ways of improving the technologies that underpin its online services, and the good news is that many of the ideas driving its data centers are now trickling down to the rest of the computing industry.

I heard the sauna story firsthand from Joe Kava, who's in charge of building and maintaining the physical aspects of Google's data centers. We're discussing this while riding east from Helsinki toward Hamina, on the Gulf of Finland, as part of my deep dive into Google's remarkable infrastructure. Also on the ride is Vitaly Gudanets, who heads the digital side of the facilities. Our journey takes place in late April, so there's still plenty of snow on the ground.

Kava acknowledges that most of Google's giant facilities are built from the ground up. But in 2009, when Google was looking for a place to site its second big data center in Europe (the first is in St. Ghislain, Belgium), it chose to repurpose a pulp mill.

"Generally, we were looking in northern Europe," says Kava. "It wasn't like we were looking for a paper mill, or even a pre-existing shell." But then the company came across the Summa pulp mill operated by a company called Stora Enso. Summa was designed in the early 1950s by Alvar Aalto, a Finnish architect so revered his name is on a stamp. But what originally attracted Google was the size of the place. It had not one but two buildings spacious enough for server floors.

In other aspects, the recently abandoned mill had all the requirements Google looks for when siting a data center. The power grid in Finland was highly reliable, and it included renewables in the mix. The building had its own power substation, something Google would normally have to build. The local government was cooperative. And though Kava isn't comfortable with saying it outright, he recognizes the brutal poetry in Google's establishing one of its data palaces in the ruins of an iconic outpost of the dying world of print.

There were geographic anomalies in building a data center in wintry Finland. At one point, the team working on the fiber connection to Helsinki encountered a polar bear. And before the protective fencing was totally secured, a rogue moose sneaked in the grounds. (The moose is now celebrated in the data center's T-shirt logo.)

As with many of its data centers, Google had to ramp down expectations of a local economic miracle -- the pulp mill employed about 650 people and Google's workforce is less than 100. And as with most of Google data centers, the company's secrecy fomented loony speculation about what those geeks were up to. In this case a rumor sprung up that Google had planted mines in the sea to keep away fishermen. (In Lenoir, North Carolina, some locals once fretted about a story that Google was conducting operations inside a mountain to control the weather.)

But the signature feature of the Hamina center arose from its coastal setting on the Gulf of Finland. This allows Google to claim, on a very clear day: "I can see Russia from my data center!" The border is only 40 miles away. But there's a more practical benefit to being on the Gulf. At first, Google thought it would construct cooling towers like the ones at Lenoir and other sites. But it learned that the towers aren't a great match for Finland, because of the deep freeze of winter. "Then we found out that the paper mill had built a sea water tunnel," says Kava.

It turns out the Stora Enso plant had its own version of sustainable power. It had a co-generation operation to extract some electricity from the waste matter of the logs it transformed to pulp. The process involved stripping the bark from the logs, chipping it, and burning it in huge turbines that generated power. The tunnel was built to move sea water to

the turbines to cool them down.

To see if the tunnel was still functional, Kava arranged for a remote-controlled robot to survey the granite-shaft that run under the entire facility. The robot reported that the hole was in good shape. Google modeled all sorts of other factors: the fact that the Gulf froze in winter, the possibility that vegetation would affect the tunnel, the tidal effects — and decided to go through with the unprecedented process of cooling a huge data center with sea water.

The Google sauna. IMAGE: GOOGLE

Inside the Ice Palace

By the time Kava is finished describing the arrangement, we have arrived in Hamina. I previously visited Google's Lenoir site, and the view upon arriving can't be more different. Lenoir, like many of Google's custom data sites, was modern and functional, cloaked in the anonymity befitting a flagship of a digital enterprise. But Hamina is solid, a bit stately and a little foreboding. The two main, connected buildings look like giant Rust Belt factories with some rogue Ikea DNA. Even the grime looks sturdy. Visible in the distance are four

windmills, which do not provide power to the data center, but contribute to the overall grid.

After passing through several gates and security checks, and checking out Google offices with the usual primary colored decorations, we enter Hall One, part of the original Aalto construction. Hall Two -- which was built several years later than the first structure -- had gone into operation in September 2011. Its huge server floor is split between two levels, but Google is only now clearing out the Hall One area for a second server floor. The process is extra complicated because the Bureau of Antiquities is concerned that Google might mess with the historic exterior.

The space is a vast industrial ruin, big and high enough to entertain a reasonable amusement park. It has its own misty microclimate, the dust sometimes stirred by dive-bombing birds. Basically, it's the kind of place where the early Batman might wind up fighting an all-star squad of marquee villains.

Kava points out the giant concrete foundation pads where the pulping equipment once stood. Their removal requires dynamiting the bases and driving tractors into the building to clear the debris. The walk from this building to the rest of the facility is sufficiently long that we wind up riding some of the bicycles that are strewn on the floor for that purpose. One worker later tells me that before the bicycles, taking a bathroom break might require a 15-minute sojourn.

The highlight of the Hamina tour is tracking the journey of the seawater, the swirling blood of this data center. The 450-meter tunnel runs underneath Hall One, from the rocky shore of the gulf, to a seawater pump house, where the intake is filtered to block out any material in the water. The pumps, 30 feet high, send the water into a clattering facility -- think *Titanic* engine room -- which also hosts a second set of pipes containing the fresh water that circulates in and out of the server room. The pipes are color-coded: Blue represents cool water, and orange is hot. Both sea water pipes and those carrying hot water from The Floor go into giant heat exchangers whereupon the chilly seawater heats up and the sizzling data center water cools down. (Another connection to the sea is a thick fiber cable that Google submerged to connect the Hamina center to the rest of Europe.)

Google designs its own heat exchangers. There are ten of those monsters, each of which has hundreds of ultra-thin titanium plates that separate the seawater from the freshwater, transferring the heat from the freshwater side to the seawater side as the water trickles to the bottom. Warm seawater is sent back to the gulf, where Google further cools it down, typically to around 25 degrees Centigrade. “Our permit doesn’t call for that, but we decided that we weren’t going to have any negative impact on the local ecology,” says Kava.

Kava almost bursts with pride as he shows this off. This engineering, he claims, is as amazing as what’s happening on the server floor, with its clusters of computers performing the searches, Gmail and YouTube uploads that Google is famous for.

What’s ironic about Google's Finland center is that all of its contemporary wizardry is cheek-to-cheek with the discards of the Industrial Age. The prime example is the control room of the original mill -- still intact, accessible by a negotiating a maze of back doors, damp hallways, and rickety metal steps. Looking like a command bunker from the early Russian space program, the collection of retro-future consoles and control panels seems locked in time, almost as if the shirt-sleeved engineers running it had momentarily paused their ALGOL programs and dashed out for a sauna.

Oh, yes. That sauna. When the original paper mill was constructed, Stora Enso, like many Finnish corporations, also built a high-end sauna in a separate building. As was the custom in such operations, Kava explains, only executives were gained entry to its sweaty confines. Think of it as the Nordic equivalent of an exclusive country club.

When Google bought the site, the sauna remained, and in keeping with its egalitarian ethic, the company opened this once-exclusive perk to all employees. Local Googlers accustomed to the true Finnish regimen are welcome to dash out of the hot steam room for a dunk into the same chilly seawater that cools Hamina’s servers.



Steven Levy covers the gamut of tech subjects for WIRED, in print and online, and has been contributing to the magazine since its inception. His newest column, **Plaintext**, will soon only be available to subscribers; [sign up here](#). He has been writing about technology for more than 30 years, writing... [Read more](#)

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