Using servers for home heating

July 5 2016, by Anne-Muriel Brouet

Credit: Ecole Polytechnique Federale de Lausanne

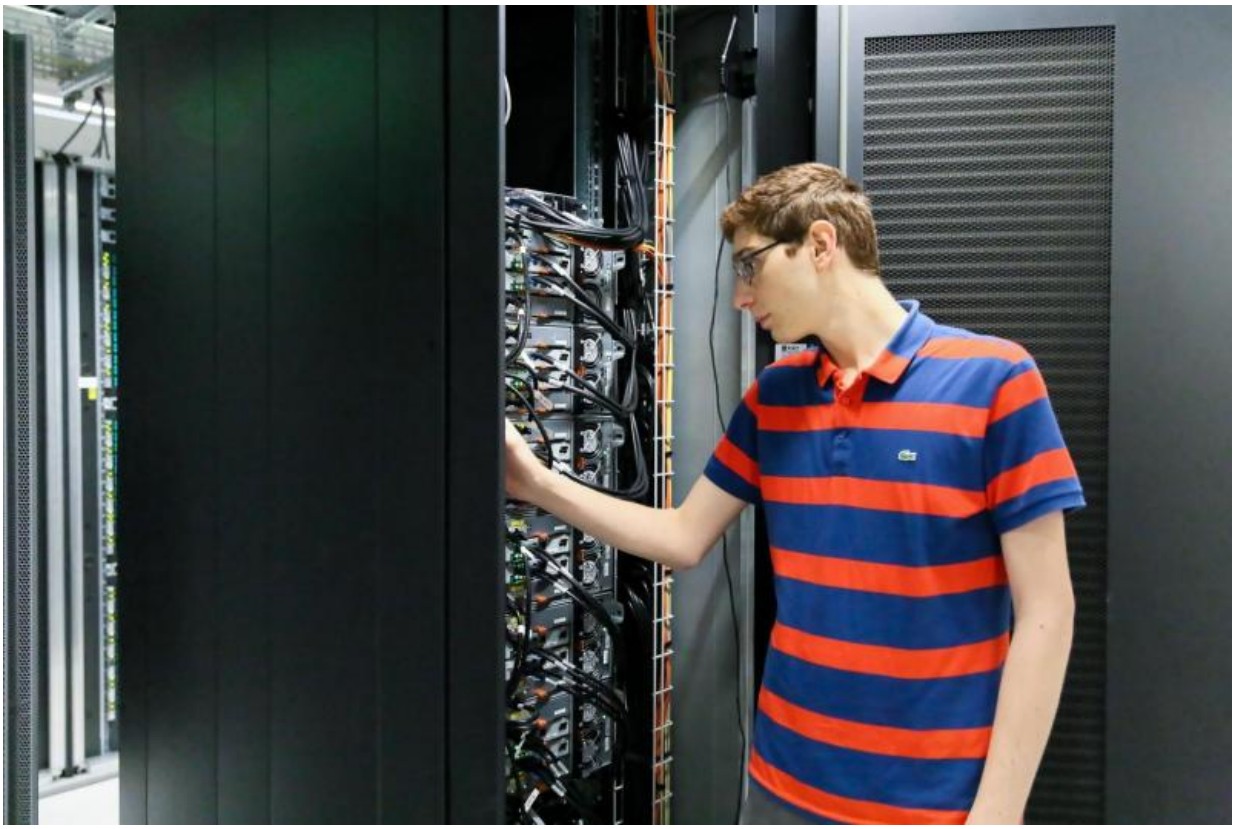
For his Bachelor's degree in electrical engineering, Karim Ziadé assessed the feasibility of putting data centers into residential buildings for heating purposes.

The newest development in the area of smarthome products may be the

server-heater. As they churn through terabytes of data, these machines can give off enough heat to maintain a comfortable temperature in your living room. Around 40% of the electricity used at data centers goes towards cooling the servers. Could this heat be put to good use? Karim Ziadé chose this topic for his Bachelor's project, venturing into essentially unexplored scientific territory. In terms of energy savings, Switzerland could stop importing energy in winter under one of the scenarios analyzed. In economic terms, on the other hand, this approach will require further analysis.

Let's look at some numbers. Data centers in Switzerland consume 1.1 TWh, or 2% of the country's electricity consumption. At the same time, the energy required for home heating and hot water heaters amounts to some 5.7 TWh, 80% of which is covered by imported energy in the winter. The logical solution is to put these data centers into residential areas around the country in order to make good use of their heat – and reduce our foreign energy dependency.

Of course, the energy requirement for heating purposes is five times greater than the heat generated by data centers. But with electricity consumption at data centers doubling every five years, the tipping point should be reached in a dozen years. That led Ziadé to come up with two scenarios: the present and the future, when electricity consumption at data centers will exceed the amount used for heating purposes.



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There are a number of constraints to be reckoned with. For reasons of data security, companies will not agree to move their servers off-site; for reasons of bandwidth, the servers will have to be located in regions equipped with optical fiber, which only five cities in Switzerland have at this point; and for practical purposes, the data centers run throughout the year yet their heat is not needed in the summer. But Ziadé focused his Bachelor's project at the Energy Center on macroeconomic considerations. Ziadé makes clear from the start: "This is just a simplified preliminary estimate meant to determine whether or not this could be feasible in Switzerland."

Heating only half the year

The rough calculations show that Switzerland could already reduce its electricity imports in the winter by over 10% today. And in the future scenario, we could achieve 100% energy independence. This solution is thus feasible, at least in terms of energy capture. But the economic analysis is less convincing. Ziadé estimates that servers used as heaters will cost companies three times more than those used in their data centers. And they will have to be replaced every three years, which means high installation costs.

Under the current-day scenario, the server-heater would have to be on for nearly 4,000 hours per year to be worthwhile. Yet heating is only needed for around 2,000 hours per year (out of a total of 8,700 hours in a year). The calculations are also subject to a major variable: the price of electricity. But we know that prices will rise, and that we will have to reduce our electricity use. In addition, the operating cost of data centers tends to increase relative to the acquisition price.

Ziadé concluded that the feasibility of server-heaters will require more complex calculations that take more parameters into account.

Provided by Ecole Polytechnique Federale de Lausanne

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