Data Centers as Impermanent Infrastructures

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If you drove to 3500 F.X. Tessier, an address located in an industrial park in the Canadian town of Vaudreuil-Dorion, you would be confronted by a massive wall. The wall announces the home of one of Ericsson's three 'Global ICT Centers,' meant to boost local economic development by enabling '25,000 R&D engineers to collaborate beyond borders more easily and efficiently' and to 'brin[g] innovation faster to the market' (Ericsson, 2016). If you drove there today, however, none of these R&D engineers would be found on site: Ericsson shut down the facility less than a year after its inauguration, leaving the local community in dismay.

The Vaudreuil data center was supposed to be the last node in Ericsson's emerging 'cloud' network, comprised of three identical data centers with a shared purpose. They would reorganise the company's internal operations, research, and development, making them all cloud-based. The first two nodes in the network, located in the Swedish cities of Linköping and Rosersberg, were completed in 2015 and 2016 respectively. The Vaudreuil facility, the third and final node, opened at the end of 2016 and closed less than a year later in autumn 2017. Ericsson explained the shutdown of this data center as a response to sinking profits and less demand for cloud storage capacity than it originally expected (FinancialPost, 2017). The second node in the network of data centers – the data center in Rosersberg, Stockholm, Sweden – is not working at full capacity, either, and has barely any staff. In an interview with me, Ericsson's infrastructure manager stated[1] that it had turned out to be too difficult for Ericsson to make its R&D teams work remotely, and that they had overestimated the need for cloud storage. The massive wall that surrounds the now-empty data center in Vaudreuil acts today as an imposing reminder of the local community's frustrated hopes for economic development through 'taxes and prestige' (Jelowicki, 2017) – and, likewise, of the contingent relation between global capitalism and media infrastructures.

We are used to assuming that media infrastructures are made to last. While the material forms of television towers, radio masts, satellites, and fibre-optic cables may be fragile and vulnerable, they nevertheless endure in time as infrastructures (see for example Ericson and Riegert, 2010; Starosielski, 2015). In contrast, data centers are impermanent. As the Vaudreuil example suggests and as this essay will illustrate, they relocate as capital demands. By discussing some of the reasons why they move, we can gain a better understanding of their power to reshape global and local peripheries into temporary nodes for value extraction, as well as the ways in which data centers influence the topography of global internet connectivity.

Assumptions about the permanence and profitability of data center infrastructure inform current policy efforts to incentivize new data center projects with the promise of corporate tax reductions, cheap land and electricity cost packages, eased access to high-voltage electricity grids, and low-latency fibre connectivity. Policies like these have already converted the Nordic countries into central nodes in the global cloud infrastructure by hosting the data centers of Microsoft, Amazon, Apple, Google, Facebook, Yandex and global collocation providers like Equinix or Interxion. A potential relocation or descaling of any of these facilities might have a significant impact on local communities in many locations in the Nordic countries, where the search for fossil fuel alternatives has led governments to connect local energy distribution systems to the supply of heat from data centers (Velkova, 2016). Urban and rural areas further expand fibre-optic connectivity and larger electricity and heat management connections in order to be more marketable as 'data-center-ready' spaces that global corporations could tap into to immediately start extracting value[2]. By focusing on the impermanence of the data center, we can come to understand the full extent of their economic and social fragility.

In order to make a case of the impermanence of the data center as one of its defining characteristics, I begin by contrasting the discourses through which they are often represented in the media against their design and the wasteful materialities that underpin their operation. This comparison illuminates the exploitative neoliberal dynamics that are otherwise obscured by a narrow focus on data centers' monumentality, as well as the ways in which data centers' impermanence can reshape communication infrastructures. By bringing attention to these processes, I open up temporality and impermanence of data centers as a new theme for critical intervention that extends earlier discussions on the environmental impact of data centers (Cook and Van Horn, 2011; Cubitt et al., 2011; Hogan, 2015), and their politics of territoriality (Rossiter, 2017; Vonderau, 2018).

Media representations of new data center projects emphasize their monumentality and spectacularity in ways that obscure their impermanence. As ever more powerful and power-hungry data centers have been established in diverse locations around the world, reporters have repeatedly quantified their impact in terms of their physical size. For instance, a tech magazine described a new data center established in a former printing press in Toronto as a 'huge facility...however you look at it' (Jackson, 2018). An online outlet that covers data centers announced an underground data center located in a former mine in Norway as a 'massive', 'highly secure' facility that provides low latency connectivity to London (Capella, 2017). Amazon's project to construct multiple data centers in three locations in Sweden is described by the Swedish public service broadcaster in terms of a 'historical investment' and stresses the size of the plots of land – a total of about 300 000 square metres – as a central measure of the significance of the investment (SVT, 2017). In this respect, large[3] data centers resemble other forms of communication infrastructure, such as television towers, whose monumental designs not just represent but also actively communicate their claims upon permanence, of having arrived in order to stay (Mattern, 2017).

By presenting data centers as monumental structures in these ways, the media insists upon their size and stability as the primary epistemological categories defining data centers, using their size as shorthand for their cultural, economic, and political significance. Other strategies to reinforce their spectacularity include press releases produced by data center operators which contain images of imposing facades, shiny cables, or spectacular buildings, such as the brutalist Digital Beijing Data Center or the sci-fi aesthetics of the Swedish company Bahnhof's data centers. These images help to reinforce assumptions about the durability and eternality of cloud infrastructures (Jakobsson & Stiernstedt, 2012). Such infrastructural visibility is political, as Lisa Parks (2010) reminds us with the example of the Antenna Tree: as Parks argues, visibility often functions as a strategy of concealment meant to protect and naturalise what might otherwise appear as ugly or potentially disputed infrastructures. Holt and Vonderau (2015) extend this argument to data centers, suggesting that media representations tend to highlight their most spectacular components while 'most of the relations [they] engende[r] and the rationality embodied in [their] overall system sink deeply in obscurity' (Holt & Vonderau, 2015: 80). The data center's impermanence is one such element that tends to be obscured, and which comes into public view only when large projects such as that of Ericsson's data center in Vaudreuil close down.

Indeed, despite the ways that data centers have been represented in the media, in practice, their structures have more often proved to be impermanent than eternal. Historian of architecture Kazys Varnelis (2014) notes that the majority of US data centers are designed without much care for either durability or aesthetics. Often located in remote locales or suburbs, data centers 'merely appropriate the banal form of the big box,' a form derived from 'the warehouse and the supermarket, not a place of production as much as of throughout, aimed at maximizing flows,' an embodiment of the '21st-century culture' (Varnelis 2014). This ephemerality is not unique to US data centers. Finnish architect Juka Heiska, who has designed about 30 data centers of different scales in Finland over the past decade, sees warehouses and box-shaped designs as ideal for data centers due to their cheap structure and the flexibility that large, open spaces offer to accommodate their demands for physical server storage capacity. Heiska also describes the tension between data centers' impermanence and the effort to establish data centers as secure storage facilities. On the one hand, he points out, data centers are designed with security in mind: they lack windows by design and their interiors are often divided into security zones, with the most secure being in the very inner core of the building. On the other, designing a safe space for data and computation security is not the same thing as creating permanence. In an interview, Heiska told me the story of a data center in Finland which was built in a logistics center only to be demolished five years later: 'It was a building in an already existing building, and it was so easy to demolish it then, and move it to another place. It was very easy', he said.

The ease with which the data center can be demolished and reestablished somewhere else is also tied to its server hardware. A little-known fact is that the lifespan of data centers is intimately tied to the lifespan of the server racks inside them, which the hardware industries invested in producing artificial obsolescence have set to be between three and five years. When servers have to be replaced after five years of use, Heiska observes, 'if you have a five-year-old data center, it is very easy to take it away too, together with moving away the computers – because you need to fill it [the data center space with new computers] then again'. Indeed, companies that operate data centers tend to limit their lifespan to six years only. The infrastructure manager of a large telecom company explains this short term planning as a function of the cycles of planned obsolescence: 'Even if the facility is really expensive, most of the money is in the servers. And if they get replaced every three years, this means that they can actually move the whole site at a minimal migration cost to somewhere else, by building a new site and doing all installations there'. He also notes that data center companies are constantly reevaluating the economic profitability of particular locations in synchrony with server replacement cycles and new legislative frameworks that come into force. Should tax regulations, electricity prices, legislation or geopolitical dynamics shift, even a hyper-sized data center like Google's in Finland or Facebook's in Sweden could make a corresponding move to a place with more economically favourable conditions within three years.

The looming possibility that large data center companies could swiftly relocate to new and more profitable places poses major challenges for local governments and dedicated state agencies. Many governments have offered much higher benefits, infrastructural support, and tax reduction packages to data center companies than they have to many other industries in an effort to boost their local economies. So far, despite scant evidence demonstrating that providing a temporary shelter to data centers translates into clear economic benefits for host communities, governments are willing to gamble a great deal on the economic potential that data center investment represents. In a rare report commissioned by Google, a Danish economic consultancy insists that it is crucial for the Nordic countries and the global economy to keep supporting data center growth because of the potential high 'ripple effects' for local economies, which could lead to 10% GDP growth and thousands of jobs (Thelle et al., 2017). The report presents this growth potential as the result of the successful implementation of as-yet unrealized technologies, such as creative implementations of cloud solutions and pervasive automation across industries. At the same time, however, the report states that among the top largest barriers to widespread digitization in Finland is the '[u]nclear economic benefit of digital investments'. Indeed, if we consider that 'the new wave of automation' (Bauwens, 2016) enabled by data centers is about to render many jobs obsolete, the economic benefits of hosting data centers become increasingly unclear. If data centers can relocate within six years while facilitating automation, infrastructural mobility may open up a new dimension of economic precarity, in which the jobs that data centers facilitate are as short-lived as their life-span, as the case with the Vaudreuil data center demonstrates. Data centers, such as those by Facebook in Sweden and Google in Finland also exploit resources in often economically fragile communities, which already have a legacy of industrial devastation and internal colonial processes of raw material extraction to serve other territories and interests (Vonderau, 2018). As local communities and global peripheries imagine a new future of economic prosperity and a central role for themselves in the global data economy, data center companies exploit their aspirations by gaining tax exemptions, commodifying and selling their waste products like heat back to them (Velkova, 2016).

The threat of data center relocation puts pressure on governments to reshape the topography of global media infrastructures into one that would maximize data center's profit margins. For example, take Arctic Connect, a project initiated by Finland that will lay a new transoceanic fibre-optic cable to connect Northern Europe with Japan. The project emerged in order to further incentivize the construction of data centers in Finland, with the goal of cutting latencies[4] from Northern to Central Europe and Asia in half. However, because Nordic countries' low populations do not offer large markets for the IT companies whose data they are hosting, their governments are often hard pressed to develop further incentives to prevent these companies from relocating elsewhere, as a local company representative shared with me. Infrastructure projects to provide new fibre-optic connectivity to communities around the world and lower latency delays represent an important part of the larger effort to keep data centers 'in place' in northern Europe. In this way, we can read projects like Arctic Connect as a response to data centers' impermanence and the implicit threat of their relocation, rather than to an actual demand for more broadband and faster connection speeds.

For Finland, the Arctic Connect project is also a strategic investment meant to turn two cities in Lapland into global nodes for data traffic distribution. As Julia Seppälä, Managing Director of Rovaniemi Development Ltd., a state company that works to attract investors in the region explains, the project will radically alter the current landscape of data traffic: 'When completed, the trans-Arctic data cable connection will make the periphery the new core. Kirkenes, Norway would become the new Marseille – a landing area for data traffic – meaning that both Lapland and Kainuu would be the closest ways to access international markets' (Cinia, 2018). The idea of making the periphery a new core reflects local projects to transform 'rust-belts' in the Nordic countries where steel and paper industries have since long shut down operation, into central hubs for storing the cloud. In reality, these locations are to become temporary nodes in the shifting global maps of data-driven resource extraction. Far from transforming Lapland and Kainuu into the center of the global data market, a new undersea fibre-optic cable is far more likely to maintain these locally and globally peripheral locations as sites of exploitative value extraction meant to serve other regions and other markets. Instead of redirecting the flow of global data, the Arctic Connect cable will support the flow of data and computation to the major interconnection points, such as those in Helsinki and down to Central Europe or Asia.

As Parks and Starosielski remind us (2015), communication infrastructures are situated sociotechnical systems which support the distribution of audiovisual traffic that can reorganize territories and temporal relations. The launch of the Arctic Connect project shows how data centers exert a powerful influence on the topography of global internet connectivity, reorganizing global territories and connectivity speeds through the threat of constant relocation rather than through the durability and monumentality they are ascribed in public discourse. Furthermore, the deliberately brief lifespan of data centers allows companies to move their operations from location to location in order to maximize their access to local economic, energy, and connectivity resources. Such moves are made whenever profitability decreases, as the case with the Vaudreuil data center suggests, when newly restrictive legislation is implemented, or if new host locations emerge wherein local governments are willing to offer more to attract data centers' business. Insisting on the data center's material impermanence as one of its defining features makes possible a larger conversation about its parasitic capacity to reshape global communication infrastructure by extracting value from new sites until they are no longer the most effective locations to maximize profits. Impermanence represents both the means and the ends for an exploitative neoliberal politics of constant growth and expansion of capital from data flows. Not only does the data center's connection to the cycles of planned obsolescence further aggravate its environmental impact, but its tendency to make waste production and its management into a mechanism for economic renewal threatens to reproduce histories of industrial colonialism and exploitation. Tracking these dynamics opens up infrastructural temporality, and specifically data center's impermanence and mobility, as a new theme that requires more critical intervention and empirical attention as it extends existing discussions about the environmental impact and the politics of territorial reshaping by allowing to see data centers as driving forces behind obsolescence driven capital expansion that deepens precarity and redraws the maps of global internet connectivity.

Notes

1. Interview, Stockholm, July 2018.

2. See for example the Stockholm Data Parks initiative at https://stockholmdataparks.com/

3. The industry measures the size of a data center not in terms of the surface area that it occupies, but by its 'it-power', or the power it consumes from the grid in order to power servers. For instance, Google's data center in the Finnish port of Hamina is now considered to be 'hyper-size' because it needs 100MW electricity to power its servers. A large data center is one that needs about 5-40 MW to power its servers.

4. Latency is the time lag between sending and receiving information.

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