

Digitalizing the State Data Centres and the Power of Exchange

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Abstract

Big-Tech's data centres have recently emerged as important socio-political figures in the ongoing digitalization of the Danish state. Locating vast swathes of data in a country renowned for its renewable energy supply begs the question as to the nature of the relationship between the two. Our ethnographic interest resides in analysing how Denmark is rapidly becoming an attractive European location for US data centres, and in exploring the transformative processes through which the state is being reconfigured as digital. In doing so, we emphasise the role of infrastructures in digital state-making and draw upon a particular reading of anthropological exchange theory to conceptualize how the state is being reconstituted through exchange practices with data centre actors. We argue that as Big-Tech territorialises state land and resources, the state in turn reterritorializes the promising digital futures that come with Big-Tech, making visible its new digital frontier.

Keywords: Digitalization, Big-Tech's data centres, exchange, infrastructure, energy, the state

1 Introduction

While on fieldwork at a large data centre conference hosted by the ministry of foreign affairs in March 2018, the room was abuzz with talk of Denmark's ranking at the top of European and worldwide digital performance indexes.¹ State representatives from the foreign ministry, the digitalization authority, and the energy authority mingled with a range of data centre actors - cabling, wiring, concrete, security, lighting, electrical, and cooling companies – discussing the virtues of Denmark as a new 'digital frontier;' a state that excels at digital experimentation.² In particular, discussions tended towards the recent arrival of some of the world's largest technology

companies (Apple, Facebook, and Google) to Denmark. With agreements in place for these tech companies to construct two hyper-scale datacentres each, this small northerly nation was held up as the location of choice for US tech's European data. Beyond the immediate opportunities presented by the building phase of these data centres, the conference participants furtively discussed the range of future possibilities being opened up by the arrival of 'all this data.' The coming of these tech behemoths to Danish shores was, for those assembled, only further evidence of Denmark's emergence as a digitalised state par excellence.

As European states become increasingly preoccupied with digitalisation as a mode of governing relations with their citizens, the digital continues to be a contentious site for the practice of welfare politics. The hype and speculation that surrounds data, both as an object of economic hope and as a mode of solving complex social, environmental, and political problems has emboldened states to 'innovate' and 'disrupt' traditional modes of governance (Halpern 2018). In Denmark, such thinking is given life through various public sector digitalisation strategies at both municipal and state levels (Ministry of Economic and Business Affairs 2018, Agency for Digitalisation 2016). While this paper will not specifically examine public sector digitalization, it will use the arrival of hyper-scale data centres to Denmark as an occasion to engage with the digitalisation of the state. Given such a focus on data centres, the article will veer away from more common discussions within digitalisation debates, discussions that, for the most part, address questions of equality of access to digital services as well as the inclusions and exclusions produced by digitalisation (Schou and Hjejholt 2018). Instead, it will turn its attention to what can be described as the politics of locating data and the effects such a politics is having on the configuration of the state in an increasingly digitalized era.⁵

It is not uncommon to suggest that Western societies are producing and consuming data at an unprecedented rate (Kitchen 2014, Crawford and Boyd 2012). Geoff Bowker has coined the term

‘dataverse’ (2013) as a way to grapple with the overarching nature of this situation; a nomenclature suggesting that we are now thoroughly embedded in worlds constituted through, and of, data. From quantified-self movements, to the rise of data analytics, to newly emergent forms of economics (e.g. bitcoin and platform capitalism), to sensing-based environments (e.g. the internet of things), data continues to proliferate, and, in the process, transform people, organizations, and societies (Nadim 2016).

But if data is increasingly becoming a constituent part of our universe, what then are the social, political, and material aspects of this environment? Where is this data to be found that so fundamentally transforms society today? Colloquially, one might say that it is located ‘in the cloud’. However, as Tung-Hui Hu (2015) has recently demonstrated, there is a huge gap between the embodiment of the cloud in massive, energy consuming data centres and our understanding of it as ephemeral and cloud-like. Hu insists that to understand the world of data, we need to stop thinking about it as virtual and acknowledge that the idiom of the cloud also does social and political work. He suggests that we become interested in the historicity of data to understand its infrastructural ‘layering.’⁶

2 Infrastructuring and Exchange

In this paper, we situate ourselves within the conceptual ambit of Bowker and the historical specificity of Hu, by considering where, and how, the dataverse is located. Our particular ethnographic interest resides in analysing why Denmark is rapidly becoming an attractive location for US hyper-scale data centres and the transformative role this is playing in the ongoing digitalisation of the state. To do this we engage with and synthesise several strands of literature.

Most of the literature on data centres has developed through questions that address the materiality of the internet (Parks & Starosielski 2015; Starosielski 2015). One approach demonstrated in this literature has been to critically engage with the geography of the cloud through the identification and problematization of the data centres where the cloud is thought to materialize. The relationship between digital data and physical place becomes the primary axis of analysis in thinking through the economy of data storage and its organization across regions and nations. The move to make visible all that is obscured by the cloud metaphor is addressed by emphasizing the infrastructural connections between globalized geographies and localized impacts (Johnson 2016; Johnson & Hogan 2017). In such an approach the materialities and politics of data location emerge through questions of land purchase, energy use, cooling solutions, and tax rates (Hogan 2015a, 2015b; Holt & Vonderau 2015; Vonderau 2017; Vonderau 2018). Within this literature then, infrastructure is a productive analytic to think with as it helps to bring forth a more materialist politics of the internet, one that territorializes the cloud in particular localized configurations. While we support using infrastructure as a way to render politics in more materialist terms, a close reading of our ethnographic material suggests that there is also something more at stake in the politics of data location in Denmark. However, this *more* is difficult to pinpoint in explicitly material terms. It is one effect of the relationship between data centre corporations and institutions of the state as they build data centres across Denmark. As we will go on to show, the construction of these data centres requires complex forms of material, political, economic, and bureaucratic work. However, such ventures primarily consist in infrastructuring vast quantities of data with huge supplies of energy. What makes Denmark so attractive to data centre corporations is what the government refers to as its ‘energy dividend’ (Data Economy 2018); an ‘apparent’ abundance of renewable energy that the country has built up through significant state investment over the last thirty years. What makes these corporations so attractive to Denmark, on the other hand, is not just the lure of investment

capital, but the huge quantities of data they bring with them. Infrastructuring data centres, then, involves, one could say, an exchange of sorts; an exchange of energy for data. But what we want to argue is that this exchange does not just take a material form, it also facilitates an exchange of perspective through which the capacities of the state and these tech corporations are transposed onto one another. These *more-than-material* effects push us to consider infrastructure alongside anthropological exchange thinking.

Infrastructure has become a fertile analytic for anthropology and cognate disciplines. In particular, work at the productive intersection of anthropology and Science and Technology Studies (STS) has pushed ideas emanating from infrastructure studies in more explicitly performative directions. In such scholarship, the term infrastructure (singular) has been transformed to infrastructures (plural) to denote the ways in which various infrastructure layers overlap and intertwine in the circulation of people, objects, ideas, and so forth. At the same time, adoption of the form ‘infrastructuring’ has become a way to signal the ongoing processual work it takes to try and stabilise such circulations, while also indexing a conceptual leap that sees such processes as politically and ontologically generative (Harvey 2017; Harvey et al 2017, Jensen & Morita 2017; Rheinberger 1994).

In a much-cited article, Brian Larkin characterizes infrastructures as ‘matter that enable the movement of other matter’ or ‘objects that create the grounds on which other objects operate’ (2013:2-3). Larkin’s article is an interesting synthesis of much of the history of infrastructure studies, whose critical point of purchase has been to suggest that infrastructures are what distribute, circulate, or move people, objects, ideas, and relations, and that they do so in rather stable and durable ways (Carse 2012; Edwards, Bowker, Jackson & Williams 2009; Harvey & Knox 2012; Harvey et al (2017) Jensen & Winthereik 2013; Maguire & Winthereik 2017; Morita & Jensen 2015). In another formulation, Larkin pinpoints this kernel idea in similar language, characterizing

infrastructures as; ‘material forms that allow for the possibility of exchange over space. They are the physical networks through which goods, ideas, waste, power, people, and finance are trafficked’ (2013: 1). At the same time Larkin also points us towards the poetics of infrastructures, their various aesthetic and sensorial effects that can be just as, if not more, powerful than their material instantiations. Cymene Howe and Hannah Appel (2015) suggest something not dissimilar, noting that infrastructures are ‘invested with a host of meanings about modernity, progress, and development; they are saturated in desire, fantasy and affect.’ Like Larkin, these authors, help us to think about the more-than-material lives of infrastructures; bringing aesthetics and affect – our dreams, hopes and fantasies – within the frame of what they circulate. In what follows, we would like to make an intervention into the data centre literature by productively synthesising *more-than-material* infrastructure thinking with exchange theory in an effort to provide a conception of what we want to call the digital state.

The theorizing of exchange practices has been one of anthropology’s central concerns for many years now. One of ethnography’s early initiators, Bronislaw Malinowski (1984), contemplated why Trobriand Islanders risked their lives weathering treacherous seas in small boats to exchange a wide range of objects with one another, including some that did not appear to be at all valuable. What he pointed towards was that these exchanges were about more than the actual objects of exchange, they were also very much concerned with issues of honour, prestige, and power through which exchange partners built reciprocal obligations and relationships with one another. Marcel Mauss (2002) famously characterized such exchange practices as a ‘total social phenomenon.’ Mauss also suggested that one of the reasons why exchange partners live up to their obligation to reciprocate is because the spirit of the giver, its ‘hau,’ becomes part of the object under exchange. As a spiritual force, this ‘hau’ is constantly seeking to return back to its origin, and as such sets in motion the processes of obligation that characterize most forms of exchange (ibid).

Marilyn Strathern (1992) went one step further pushing the argument in a more ontologically inclined direction by suggesting that objects do not carry a 'hau' as such, but are, in fact, an actual part of the giver. This is based on a complex line of reasoning suggesting that Melanesians, whose ideas, practices, and institutional arrangements Strathern studied, consider both objects and subjects as partibles; as being made up of the social histories of the entities that comprise them (Strathern 1992: 180). Thinking partibles allows Strathern to suggest that a part of the person is embedded within the exchange object, and as such, their stories, as well as the history of the social relations that they are made from, travel along with it. New exchange partners, then, obtain a vantage point, or a perspective, from which to see a part of the life history of the other through the exchange process.⁷ In exchanging these objects persons *become* part of the story of the other, not only reciprocally embedding them within the socio-political activity that exchange relations circumscribe, but also offering them a perspective on the social histories, and futures, of the other. It is important to note that such a perspective, or seeing, is not phenomenal but ontological. What this implies, for Strathern, is that each partner is reconstituted through the reciprocity of such exchange transactions. Said differently, exchange has a double form, both a material exchange of objects accompanied by an exchange of perspectives; a reconstitution of these entities in relation to one another.⁸ What this foray into exchange thinking does is to highlight the double nature of exchange, as well as the inseparability of objects, entities, and their stories. Our proposal is that infrastructuring data centres, in this instance, is not only about the exchange of data and energy, it also facilitates an exchange of perspective through which a part of each entity is transposed onto the other. This *more-than-material* aspect of exchange, as transposition, highlights how data centre corporations and institutions of the state are also exchanging *capacities*, becoming reconstituted in the process.

After discussing our ethnographic encounters with data centres in the next section, we will go on to provide a short history of their development in Denmark. In the remaining sections, we will ethnographically flesh out our exchange argument as we discuss the centrality of both data and energy to the infrastructuring of data centres. In closing the article, we provide a way of conceptualising the emergence of the Danish state in a more digitalised form.

3 Ethnographic Encounters with Data Centres

‘Being there,’ the longstanding trope that governs the boundaries of what can be considered legitimate ethnographic research, has oftentimes been translated as signifying a form of co-location; being in spatial and temporal proximity to others in order to meaningfully participate in their life worlds. Developing an ethnographic sensitivity towards the issues and concerns that these others are occupied with is paramount to the production of granularized ethnographic knowledge. A form of immersement, as Strathern puts it, simultaneously totalising and partial (1999:1). Other scholars have argued for an approach that emphasises co-presence over co-location, particularly when it comes to more digitalised settings (Beaulieu 2010). But data centres have a heightened sense of doubleness as objects of ethnographic attention. They are both utterly located; landscape megaprojects that devour energy and other resources. Yet at the same time they are also entirely distributed; participants within planetary wide computational infrastructures that accumulate, assemble, analyse, and circulate data. While this is not the totalising-partial paradox that Strathern was referring to, it nonetheless gives a sense of the ethnographic challenges that arise in carving out data centres as ethnographic objects. Such challenges require a sensitivity to the *more-than-material* politics of data’s local instantiations and to the globally dispersed infrastructures and organisational forms and practices that afford them. Let us give an ethnographic sense of this.

People are conspicuous by their absence. ‘That’s mostly it, beyond cleaners,’ my guide says as we wave goodbye to a couple of security guards. The clinical monochromatic aesthetic of

this data centre imbues an eerie sense of the displacements that come with automation. My focus quickly turns to the material and sensory forms that occupy this place, forms that deeply implicate the global infrastructures that keep data centres up and running. Embedded in each form is a series of relationships, organizations, histories, and temporalities.

Blinking. A luminous atmospherics of flashing lights in manifold colours, signalling the reception of photons refracting through fiber optic cables in billions per second beats.

Humming. An acoustics of alternating current buzzing through the endless racks of server stacks piled tightly, one against another, one over another. *Whooshing.* A soundscape of air cooling within ventilators, pulsating through corridors, relieving the infernal heat of sensitive silicon servers. *Silencing.* All the while invisible, noiseless AI; analysing, calculating, and controlling; unnoticed, in the background. Ones and zeros, light and optics, current and heat, air flow and cooling, machine intelligence. And us, devices in hand, somewhere; searching, posting, sharing, commenting.

Data centres are complex interventions into physical, social, political, and digital landscapes. Their factory-like appearance belies the complexity of their doubleness as both situated and distributed phenomena. They are low rise enclosures that occupy vast quadrants of land. “A farm of sorts, but not for cows,” a taxi driver jokingly said to the first author as he drove towards Apple’s construction site just outside Viborg one day in the summer of 2017. “Just servers, servers, and more servers. Imagine that.” And imagine we must. The vignette from above is not from Apple or Facebook’s data centres, but from a smaller data centre on the outskirts of Copenhagen. Not dissimilar to many large tech companies, Apple and Facebook are entities that curate their engagements with the public in very specific ways; secrecy is the norm, concealment the operative mode of engagement. This is what makes tech company data centers even more opaque research objects than their doubleness affords. Few local actors have ever actually spoken to the representatives of these corporations, and even employees from the local municipalities where these data centres are located find it extremely difficult to gain access to their construction sites.⁹ As researchers, we are still learning how to confront the varying forms of silence that envelop this project, both in terms of the resounding absence of response from Apple and Facebook as well as in our oddly choreographed discussions with field interlocutors who are bound by non-disclosure agreements (NDAs). Silence, concealment, and secrecy have become constituent components in

how this research has been ethnographically bound and in the types of stories we are able to tell about data centres. Lacking the specificity of access that can produce the nuanced insights of richly textured ethnography, this story cannot be, as we would have wished, an ethnography *in* data centres. What it can be, however, is an ethnography *of* data centres that sits within the broader story of Denmark's path to digitalisation. The improvised workarounds we have come up with - interviews (albeit restricted) with local government officials, state agencies, and data experts, visits to other Danish data centers, attendance at data centre and digitalisation conferences, as well as network meetings of the newly formed Danish Data Centre Association – direct us in telling the story of how exchange relations with data centres are part of reconstituting the state in a digitalised era. It is this story that has become the locus of our attention.

However, in making our argument that the state is emerging in a more digitalized form we run the risk of reifying the state as a singular entity that can enter into exchange relations. While a certain degree of stabilization is unavoidable to make any argument about the state as such, we want to emphasize that we do not conceive of the state in singular terms. In fact, we want to contribute to a form of state scholarship which views the state, at heart, as a set of relational effects (Thelan et al 2018, Stepputat and Nuijten 2018). Importantly, our analysis does not take its point of departure from within the state's own categories - as a unique entity existing above and beyond society - but sees it as something that is constituted through everyday practices and interactions. (Stepputat and Nuijten 2018). The state is, in this way of thinking, an ever-changing socio-political formation that stabilizes in particular ways through particular infrastructural arrangements. The concept of the digital state that we will put forth has emerged through encounters at specific sites with data centre actors, although our analysis has been limited by the degree of secrecy that characterizes these exchanges. Furthermore, our analysis points out that what constitutes the state as an entity that can enter into exchange relations in the first place is the practices of a particular

constellation of actors - institutions of the state (foreign ministry), local governments (Odense and Viborg municipalities) regulatory and policy actors (energy agency and the digitalization agency), local data centre actors - some of whom cannot be conceived as state entities in any traditional sense of the term, but which, nonetheless, perform what could be thought of as state work. Take the Danish Data Centre industry group as an example. As an industry actor, its main ambition is to capitalize upon the arrival of technology corporations to Denmark by generating knowledge, expertise, and business opportunities for Danish led firms. But this group consistently performs the state as a particular type of digital entity in the talks and presentations they give at local and international industry events. That is, the state emerges through this group, amongst others, as an entity and territory that is attractive to large technology corporations. Said differently, the state is partially constituted through these practices and discourses as a particular form of digital actor that has the capacity to enter into exchange relations with Big-Tech. In this context the boundaries between state and non-state actors become somewhat fluid and blurred. It is in this spirit that we argue for the emergence of a form of state that could be characterized as digital.

4 The Emergence of Data Centres in Denmark

The history of data centres is short and under studied. In 1998 Google opened their first hyper-scale data centre in the US, known as ‘the cage’ (Pasquinelli 2018). The design and construction of this data centre was part of Google’s answer to the complex problem of how to effectively search the internet. Google’s solution – crawling the web, while indexing and ranking results – necessitated vast server space that could accommodate these new computational processes. ‘The cage’ became the first materialised instantiation of the hyper-scale data centre concept, engendering a global IT move towards data centralization. The emergence of Denmark as an attractive location for hyper-scale data centres is part of this shift towards more centralized data topologies, but it is also

intricately embedded in country's drive towards digitalisation. The state's commitment to a public digitalisation strategy in the late 80s initiated a range of public-private partnerships that built Denmark's extensive data cable network. According to our interviews with government and industry actors, these data cables, today fiber optic, became the infrastructural backbone for Denmark's digital transition. A round of deregulation in the 90's led to the privatisation of some of these partnerships, out of which emerged several companies that constructed Denmark's first medium sized co-location data centres. Sometimes known as data hotels, co-location data centres provide the infrastructural arrangements – primarily electricity, cooling, and security – that allow enterprises to locate their servers off site at discreet and securitised facilities. So, while Denmark's nascent data centre industry is tightly coupled with global data flows, it is also clear that the short history of these data centres is interwoven with the country's path towards digitalisation.

The move from co-location to hyper-scale data centres is also part of a particular reading of the role and legacy of former tech industries based in Denmark. While co-location data centres were just getting off the ground, Copenhagen was already an established hub for the telecommunications industry. In particular, the presence of Nokia and France Telecom boosted the country's reputation as a 'tech hub' for advanced technological and digital experimentation. With just the right size and population distribution, Denmark was articulated as a great match for large tech industries looking to test certain market hypotheses, which, if successful, could then be rolled out on an international scale. While the collapse of the mobile telecoms industry in Denmark is too detailed to repeat here, the story of the industry's initial incubation has become a model for how to think about future tech development. The range of benefits that came with these corporations - an influx of technical expertise, as well as increased investment and jobs – has stimulated state agencies and actors to build a similar, albeit more digitally inclined, 'hub' strategy. In particular, Invest in Denmark (IID) - the state agency responsible for attracting foreign investment capital to Denmark – has been

working hard to reproduce the legacy of the mobile telecoms industry in Copenhagen on a national scale. With an office within the ministry of foreign affairs in Silicon Valley, California, IID has been working aggressively to lure the titans of tech to Denmark since 2012 (Foreign Ministry 2017).¹⁰

5 Data Proximity and Promissory Futures

At a large data centre conference attended by the first author in 2017, a senior official from IID articulated a particular vision of Denmark's digital future. This future relies upon the acquisition of data. By converging the country's already existing energy infrastructures with vast amounts of data, Denmark has, he said, 'the potential to become Europe's leading digital hub.' The main priority, he argued, is to transform the country into a data haven – a strategy that consists in attracting as much data as possible to Denmark, but with a particular eye on the data of large US tech companies. In another presentation, the CEO of Global Connect, Denmark's largest fibre optic cable company, put it like this;

It's all about getting hold of Big-Tech's data¹¹, of letting our public and private companies get as close to it as possible. That gives us a clear latency advantage. Then for all those companies that have any interest in Apple, Google, or Facebook - whether they scrape their data or develop 3rd party apps that need to quickly access it - being close to their data is good enough. It brings them here to do business, and then a lot more infrastructure comes on top of that, and that's great for all of us here. If we get a hold of their data, others will come.

Getting hold of Big-Tech's data is not an issue of owning their data or getting the right to access and analyse it, it is a question of proximity. In today's digital political economy, being physically proximate to data comes with a latency advantage (reduced transmission times) that ancillary data companies are keen to exploit.¹² As the CEO of Global Connect put it, by bringing Big-Tech's data to Denmark, other tech and data-driven companies are likely to follow.¹³ The centralized topography of Big-Tech's data offers, therefore, a temporary advantage for those that are proximately located to it. Being able to leverage proximity in terms of speed, the argument runs, will entice a range of digital players to locate in Denmark, further enhancing the country's digital infrastructure and embedding it as a core 'hub' within Europe's digital architecture.¹⁴ Rendering Denmark's digital future in this way, IID create an argument that links the digital hub strategy with increased investment, jobs, growth, and welfare provision, an argument endorsed by the government in its recent 'Digital Growth' strategy document (Ministry of Economic and Business Affairs 2018). Importantly, while these strategies are about enhancing the digital capacities of the state, they are also about more than this, as the digital becomes a central figure in the future of welfare provision. Locating Big-Tech's data centres within the territorial borders of the Danish state is, therefore, not only an effort to secure future welfare provision, it also attempts to enable those very futures through an extension of the state's digital frontier. Let us now turn our attention to this.

Apple's \$1.9 billion-dollar data centre investments in both Viborg and Aabenraa are by far the biggest foreign capital investment in Denmark's history. Construction on the first data centre began in Viborg in 2017 and will continue over 10 years with the first of 4 data halls to be completed by early 2019. Each hall, industry experts estimate, will contain approximately 500,000 servers. The one million square meter tract of land upon which the Viborg data centre will host iTunes, iCloud, iMessage, Siri, and the app store for European activities. Similarly, Facebook are

developing sites in Odense and Esbjerg, while Google have just announced the development of data centres in Fredericia and Aabenraa.

As capital cities continue to exert a gravitational pull on the majority of peripheral resources, regional municipalities and small cities face existential crises as house prices sink, young residents leave, and welfare services begin to diminish. This is not a uniquely Danish concern, as states around Europe struggle to deliver a vision of welfare provision beyond their capital cities. In many ways Big-Tech promise what the Danish welfare state is finding increasingly difficult to guarantee; the provision of jobs and infrastructure to more peripheral parts of the country. The future imaginary that accompanies these data centres is of a promissory kind; as Big-Tech and its discourse makers - a phalanx of media outlets and selected experts – frame their arrival to Denmark in terms of the impact on the surrounding region, with a particular focus on local jobs. IID's representative in Odense put it this way: *“the reason why data centres are interesting is that they create jobs in the construction phase as well as the operational one. This makes for a good business case for society overall”*. Later in the interview he expands upon the importance of labour, but not just quantitatively. The promise is not just of jobs, but of the right type of jobs for a non-skilled labour force in these parts of the country.

This data centre has a broad spectrum of different jobs and so our Mayor, who is a social democrat, is not only focused on attracting high tech companies that only employ people with a higher education. We must also include other groups, and this is precisely something a data centre can deliver.

In the public, media estimates of job creation remain somewhat wild. Politiken, one of Denmark's major newspapers, ran a story in mid 2017 quoting the mayor of Viborg in what many see as a

moment of hyperbole; ‘Apple’s data centre will bring 10,000 jobs to the area,’ exclaimed the mayor. When pushed by other media outlets for clarification in the coming weeks, the mayor did not relent; “it’s the Apple effect,” he said.¹⁵ More sober assessments put job creation in the range of 300 to 1,000. While the counting of jobs continues to be a particular performative impulse of such megaprojects (Flyvbjerg et al 2003), one of its effects is the production of particular regimes of hope and expectation. As some of the world’s biggest corporations, Apple, Facebook and Google trade on their reputations of being ahead of the curve, existing at the fuzzy intersection of technology, imagination and the future. Apple, in particular, are widely perceived in the less critically inclined tech-literature as techno-wizards, producing the needs and desires of people before they even realise they have them. As future makers, Apple imprint Denmark within its promissory digital landscape of possibility and expectation.

The cities of Viborg and Odense have taken up residence in these promissory digital futures in similar, yet distinctive ways. Odense is one of Denmark’s oldest port towns and a thriving shipbuilding industry has served as the backbone of its development over many years. The decline of shipbuilding, and industry-based jobs in general, has left a vacuum that the small city is eager to fill. Discussions with municipal staff leave one in little doubt of their perception of being ‘infrastructurally’ left behind. But the history of automation that shipbuilding bequeaths, in particular the engineering and design components, has the potential to be transformed into a nascent robotics and drone industry. In this regard, Facebook’s data centre facilitates not just jobs, but infrastructural hope for the future, as a history of automation is transformed into an emerging technologies industry *for all*. The range of infrastructural opportunities and effects that come with Facebook’s data centre have fomented hopes for regional development on a significant scale. At a Meet the Buyer¹⁶ conference in Odense’s town hall, the talk among the business and technology

community was all about how to capitalise on Facebook's presence to push the digital hub strategy, but with a particular regional focus on the automation industries (robotics, data, and drones).

Viborg has a long history as a place of power in Denmark; a former Viking stronghold, and the place where Kings were anointed by noblemen during the middle ages.¹⁷ Today, animation is the focus. The town boasts an internationally renowned animation school that attracts students from all over the world, and an animation cluster with over twenty-five businesses, ranging from graphics, apps, and media, but which is particularly known for its animated short films and storytelling. These cluster companies are involved in a range of processes (storyboarding, concept development, graphic design) for small films used in entertainment, education, culture, and municipal service announcements. One of the companies, Nørlum, was nominated for an Oscar in 2015 and has subsequently been working with Disney for an upcoming film. *Animatio*, latin for animation - a way of giving life or spirit to something – has even been taken up by the municipality as a working concept and a strategic initiative.¹⁸

Municipal officers talk of Apple's imprimatur, '*if Apple has chosen us, then we must be the best place in the world, otherwise why would they be here?*' The Apple effect, as the mayor put it, is just that, a conjuring ability (Tsing 2005) to make the future in certain places, a vague type of 'magic' as Tim Cook, Apple's CEO, has put it.¹⁹ Big-Tech's Silicon Valley history is part of this conjuring. But the rhetoric of Big-Tech is not something people in these places recoil from, or express cynicism at. Animation is, in part, magic, a way of imagining and conjuring up worlds of the not-yet, through which impossible futures can emerge. But it is, at the same time, a serious business; a business of giving life to some, as of yet unknown, future. So, in many ways Viborg is a town that is already breathing new life into digital futures yet to come. People here have little difficulty seeing this as a place where such futures are being formed, even using the expressions

‘Viborg Valley’ and ‘Silicon Viborg’ when articulating the promissory sense that Apple’s arrival has engendered.

This is what puts places like Viborg and Odense back within the cartographic imagination of globalisation and reconfigures them as significant nodes of value within globalised data infrastructures. While they formerly suffered exactly because of their geography, i.e., they had been displaced by intensive capital flows towards the cities, the presence of Big-Tech promises to emplace them within more valuable digital futures. Being in proximity to Big-Tech, therefore, not only allows them to get hold of vast quantities of data (the first part of the material exchange) it also facilitates another *more-than-material* exchange, as the capacity of Big-Tech to provide hope for the future is transposed onto these regional and state actors.

6 Energy Exchange and Legitimacy

Back at the datacentre conference attended by the first author, IID’s special advisor for data centres listed the various reasons why Denmark is so attractive to Big-Tech; an almost 100% secure electricity supply²⁰ and connectivity to the Nordic electricity market, a growing abundance of green energy, competitive energy prices,²¹ a cool climate, the availability of large-scale sites, and an extensive fiber optic cable network routing data traffic internationally. Some of these ‘advantages’ are not unique to Denmark. In Northern Sweden, for example, a Facebook data centre has been welcomed by local government as a way to revitalise a stagnant steel economy (Vonderau 2017; Vonderau 2018). Renewable energy, along with the infrastructuring of cold air as ‘resource,’ also plays an important role in their story. Iceland too, shares many of these characteristics, although a fear of low latency and an unruly volcanic landscape prone to sporadic eruptions appears to be a risk too far for Big-Tech (Høvsgaard 2013).

While all the reasons we have outlined above are important, Denmark's particular attraction for Big-Tech is its energy. In making a home for hyper-scale data centres, the availability of vast quantities of secure, cheap, and green energy is part of what the government refer to as its 'energy dividend' (Data Economy 2018). Seen through electricity hungry eyes, the energy landscapes of Denmark look very attractive to Big-Tech. In the media, Denmark's history as being at the forefront of energy technology and policy development is valorised as a central reason for Big-Tech's presence, as a mixed bag of local and national outlets, as well as tech and energy enthusiasts, portray Denmark's energy infrastructure as a unique value proposition. Even at the pinnacle of government, the connections between data and energy are made apparent. Here is Prime Minister Lars Løkke Rasmussen during his opening speech to parliament in 2017;

It bodes well for the future, when Denmark can attract such important companies like Apple and Facebook to locate their data centres in Odense and Viborg. Our energy security is high and we have lots of green energy, so we have the right balance between big green ambitions and the desire to make money from it. In fact, on good days, almost all of our electricity comes from wind.²²

Representatives from IID, as well as those from Viborg and Odense, talk of Denmark's history of renewable energy, particularly its wind energy development, as a prominent topic of conversation with Big-Tech during negotiations. The connections between data and energy have even filtered into local understandings of why Big-Tech have come to town; "why? green energy of course," one man said to the first author at the library in Viborg during an impromptu conversation, echoing a sentiment he heard many times during fieldwork. Unsurprisingly, energy also takes pride of place in

both Apple and Facebook's promotional material, with banners proclaiming the development of 100% green data centres.

Figure 1

(Insert Figure 1 here). The image is part of a presentation given by Invest in Denmark's special advisor for data centers. See <http://datacenterindustrien.dk/wp-content/uploads/Invest-in-Denmark-Kim-Schultz.pdf>, accessed 21 January 2018.

Figure 2

(Insert Figure 2 here). The image is part of a presentation given by Invest in Denmark's special advisor for data centers. See <http://datacenterindustrien.dk/wp-content/uploads/Invest-in-Denmark-Kim-Schultz.pdf>, accessed 21 January 2018.

But such renewable optimism is not shared on all fronts. The Danish Energy Authority has estimated that the planned data centres will add an extra 22% to the energy grid by 2040 (Energistyrelsen 2018) - the equivalent of electrifying over 3 million new homes - and many now question where such large quantities of new green energy will come from. This has become a matter of some concern as Denmark finalises both its energy and climate agreements for the period 2020-2030. This critique has only grown in strength as Big-Tech refuse to publicly disclose the source of their energy. When we discussed this critique with the various actors in the field, we were met with silence, and this silence has become something that both we, and our field interlocutors, are learning to navigate in, and around. As we noted earlier, Big-Tech cover the vast majority of the details of their engagement with data centre actors in NDAs, and this includes the source of their energy. More of our fieldwork stories tell of the time when local governments around Denmark were alerted to the fact that a 'large foreign energy consumer' was looking to negotiate with Danish municipalities to initiate an 'unspecified' construction project. While IID facilitated the introductions to these municipalities, they also laid out the framework conditions through which a deal could proceed; and this necessitated conducting negotiations on the terms prescribed by Big-

Tech. Only a very small cohort of municipal employees were allowed participate in the process and keeping the details secret, which was considered paramount, entailed withholding information not just from co-workers and family, but also from elected officials on the city council. Those few that were involved talk of their first set of meetings with men introduced to them on a first name basis only. These men used gmail accounts and had a range of international accents, making it difficult to pinpoint where they were from. In relaying these stories to us, our field interlocutors very skilfully performed the tensions that they have been living with for the last couple of years. As city officials, they are used to particular norms of accountability and transparency, but as Big-Tech negotiators they have to manoeuvre within a morass of technicalities prescribed by NDAs. In essence, Big-Tech very tightly controlled the entire negotiation process, even to the extent of withholding knowledge of the deal from members of Viborg city council until the very day of its announcement - infringing what are considered standard democratic norms at city hall. The actual energy composition of the data centres is part of a closely co-ordinated veil of secrecy that Big-Tech impose on state and other actors. So, while Big-Tech perform themselves as 100% green, their actual energy composition remains entirely unclear.

This story of the relation between green energy and Big-Tech has a history. In 2011, Greenpeace released a game changing report, *How Dirty is Your Data* (2011). In it, Big-Tech, and in particular Apple, were excoriated for powering the vast majority of their data centres through fossil fuels. Being put on environmental notice, these companies began the process of reconstituting themselves as more socially palatable, environmentally friendly entities. The, by now, more standardised yearly report, *Clicking Clean: Who is Winning the Race to Build a Green Internet* (Greenpeace 2018) has become an industry staple of within the world of green data metrics. Apple, in particular, have made it part of their mission to become a 100% renewable company - at least where data centres are concerned.²³ So, with an ethical push from Greenpeace, the greening of data

infrastructures has become a central concern of Big-Tech. Locating in Denmark, therefore, not only allows Big-Tech to get hold of vast quantities of cheap and secure energy (the second part of the material exchange) it also facilitates another *more-than-material* exchange, as they mobilise the entire history of the Danish renewable energy adventure in an effort to legitimise their data flows as sustainable and climate friendly. Said differently, the capacity of the state to provide a legitimate renewable energy history is transposed onto Big-Tech. While their desire for legitimacy is part of a clearly co-ordinated market strategy, it also appears to be an effort to appease the broader public's anxiety over their role and responsibility as gatekeepers of our digital worlds in the wake of recent data scandals. Becoming a legitimate part of the Danish energy sector is one component in a multi-pronged strategy that Big-Tech seem to be engaged in.²⁴

7 Digitalizing the State

As digital practices and technologies continue to proliferate globally, multinational technology corporations continue to seek out new locations to materialise their digital ambitions. This paper has been partly directed towards analysing the conditions under which Denmark is rapidly becoming a key northerly location for the territorialisation of Big-Tech's vast computational infrastructures. As we discussed at the outset, while data centre literature focuses on deploying infrastructure as an analytic that renders internet politics in a more materialist vein, our ethnographic material opens up for the suggestion that there is also something more at stake in the politics of data location in Denmark. This more, we have argued, is an effect of the relationship between data centre corporations and institutions of the state as they build data centres across Denmark. Combining infrastructure analytics with anthropological exchange thinking, we have argued that the Danish state is in the process of exchanging both materials (energy for data) and capacities (legitimacy for promissory futures) with Big-Tech as data centres are infrastructured across the country, but

particularly at sites that are in need of some form of welfare renewal (investment, jobs, welfare services). As such, we argue that the state is being reconstituted in a more digitalized form. It is to the nature of this digitalized form with which we close the article.

While Denmark is continuously valorised as a country at the cutting edge of digitalization, it is now, in some sense, reaching beyond its own borders and into the very heart of the digital's promissory realm to sustain itself as a thriving welfare state. In this we see a double development. The first is that Denmark is undergoing a form of digital territorialisation, as the political geography of the internet encroaches upon small states willing to give up vast quantities of land and resources, particularly those with a history of investment in renewable energy. While criticism of this process is slowly emerging, such territorialisation has been actively sought and encouraged by a host of institutional actors as they seek to transform Denmark into a leading digital hub, positioning the country as a central node within Europe's digital architecture. It is at this juncture that we want to suggest a second development. As Denmark becomes increasingly territorialized through the expansion of global digital infrastructures, it has also begun a process of reterritorialization through the expansion of its own digital frontier.

Digitalizing the state is not just a process of enhancing the state's digital capacities, but is, more importantly, a process of restructuring the state around and through the digital. Part of this process includes how the future of welfare provision has become tied to, not just digital technologies, but to an expansion of the state's digital frontier. Hastrup and Lien (forthcoming) argue that Nordic countries are characterised by what could be called a form of 'welfare frontierism;' a way of thinking and practising territory and frontier making through a redistributive political lens. This form of frontierism suggests that while Nordic states - not unlike most of their international brethren - acquire and appropriate large tracts of land and resources, they do so with the intent of redistributing these resources for the welfare of their citizens. This is in

contradistinction to the more mercantilist colonial or settler frontierism one finds in places such as America, Australia, or other British colonial endeavours. Digitalising the Danish state, we suggest, is very much tied to the future of welfare provision at a time when Europe's political settlement is under strain from all sides. As the state exchanges both materials and capacities with Big-Tech, we are afforded a glimpse of the mechanisms through which its digital frontier is being extended. Such an extension, however, does not work through the state's appropriation or acquisition of territory, but through an inverse logic that facilitates Big-Tech's territorialisation of state land and resources. The logic of state digital frontierism is not, then, one of accretion of land and resources, but of their diminution. Territorializing Denmark for digital means, inversely extends the state's digital frontier as it moves beyond its own borders to occupy the promissory futures of Big-Tech. Said differently, as Big-Tech infrastructures the landscapes and resources of the Danish state, making visible the territory of the digital, the state in turn reterritorializes the promising digital futures that come with Big-Tech, making visible its new digital frontier.

As data and energy are exchanged and capacities transposed, this re-territorialized digital state has become entangled with Big-Tech in ways that will be difficult to disentangle. While future welfare provision is central to the embeddedness of this relationship, the question of what it might mean for the socio-political formation of the Danish state to stabilise in this particular digital configuration remains an open one.

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¹ See for example the *Digital Economy and Society Index* (DESI), where Denmark has been consistently ranked as the highest performing country in Europe. In addition, the EU's own website lauds Denmark as a European and world leader in digital progress, see <https://ec.europa.eu/digital-single-market/en/scoreboard/denmark>.

² This event was a three-day conference/tour that travelled around the country visiting the construction sites of Facebook and Apple's data centres. It was organized by the Danish Ministry of Foreign Affairs (via Invest in Denmark) in cooperation with the Danish Data Centre Industry.

⁵ We think of digitalization as the processes and practices through which digital assemblages transform societies, while datafication is the capacity of these digital assemblages to track, trace and produce quantifications of our digital interactions.

⁶ See Morita, 2016 for a discussion of layered infrastructures in environmental planning.

⁷ Eduardo Viveiros de Castro's Amerindian anthropology has further developed this point and brought forth the notion of 'equivocation' which assumes "the same representations and other objects, a single meaning and multiple referents" (Viveiros de Castro 2004: 4). For Amerindians the human form is universally shared by different ontological worlds. Thus, famously, jaguars see themselves as persons and human blood as manioc beer.

⁸ As Strathern puts it; 'When I write about exchange of perspectives, for instance, I have in mind the image of a Hagen man handing over an item (shells, pigs, money) with the expectation of a return gift and thus, with the counterflow contained in the same gesture' (1999:15).

⁹ At the time of ethnographic fieldwork both Apple and Facebook's data centres were little more than construction sites. The perimeter of these sites was tightly securitised and photographs were prohibited. The secrecy that envelops these projects also extends to a lack of visual representation, beyond official architectural renderings produced by the corporations themselves.

¹⁰ According to our discussions with legal experts versed in the EU's GDPR, locating data within the EU's borders, while not necessary for US tech corporations in terms of the details of the legislation, does make sense in terms of the prohibitive consequences associated with lack of compliance.

¹¹ Big-Tech is a common industry term for the western world's top five technology companies. It refers to Apple, Google, Facebook, Amazon, and Microsoft, but excludes Chinese companies. Having already secured deals with Apple, Facebook, and Google, IID is actively lobbying Amazon and Microsoft. In the rest of the paper, we will use the term 'Big-Tech' as a placeholder for the large US tech corporations locating data centres in Denmark. We have only generated ethnographic materials on the datacentres of Apple and Facebook, and while it is clear that there are many differences between these two corporations, it is also clear that a similar pattern is emerging in terms of their politics of data location. That is, there is a similarity in the practices and discourses that these corporations adopt when dealing with the Danish state. This is not only the case in terms of their political economy, their negotiation strategy, and their resource demands, it also includes the effects they are having on energy and digitalisation policy, as well as the economic and discursive impacts they are having in the parts of the country where they are located.

¹² In an extended interview, the CEO of Global Connect used high-speed financial trading in the US as an example of why proximity is important. As trading becomes more algorithmic, micro second differences in transmission times can make all the difference to the profit portfolios of investment companies. As a result, financial services companies increasingly locate in close proximity to trading sites and technologies. The same logic is being deployed in Denmark in terms of data traders, managers, and brokers.

¹³ The term data-driven circulates widely within industry and the public sector. It designates companies, organizations, and institutions that heavily rely on the generation, accumulation, and analysis of data to run their business.

¹⁴ These processes are already beginning to play out. A new subsea fibre optic data cable - known as Havfrue (mermaid) - will be operational by mid 2019 and directly connect the US to Ireland and Denmark. It will increase Denmark's digital capacity by a factor of six. The consortium behind the cable is made up of Facebook, Google and an Irish infrastructure company

¹⁵ See <https://politiken.dk/indland/art5765405/Skaber-Apple-et-mirakel-p%C3%A5-en-mark-ved-Viborg>, accessed 27 January 2018.

¹⁶ This was a meet and greet conference organised by Facebook's main contractor MACE in May 2017. It brought together a range of suppliers and sub-suppliers within the construction, technology and business sectors.

¹⁷ One remnant of this 'power' is the location of one of the country's two High Courts just outside the town.

¹⁸ <http://animatingviborg.dk/>

¹⁹ <https://rctom.hbs.org/submission/apple-inc-powered-by-100-renewable-energy/>, accessed 26 January 2018.

²⁰ Denmark has been ranked first in the world by the OECD for electricity security. As a consequence, Apple's data centres will be built without back-up diesel generators, a first for the company, with estimated savings running into millions of dollars.

²¹ After the controversial phasing out of the PSO tax (an electricity tax used to fund much of Denmark's green transition and, particularly, investments in offshore windmill farms) energy prices are now very competitive vis a vis other European states.

²² http://www.stm.dk/p_14594.html, accessed 1 November 2017.

²³ But such proclamations of full renewability are part of a series of displacements, as the carbon energy used in China to make Apple devices is cut away from the rhetoric of renewables that envelops their data centres in Europe and the US.

²⁴ Another component of this legitimacy strategy is the emergence of Google's *Learning house* in Copenhagen. This collaboration between Google and Copenhagen municipality facilitates digital event nights, where citizens are invited into municipal offices to upgrade their digital skills. It could be argued that such setups also facilitate local state institutions and big-tech in exchanging services for legitimacy.