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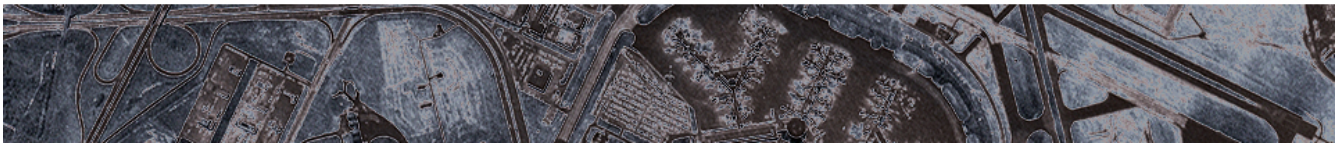

FCJ-220 Imperial Infrastructures and Asia beyond Asia: Data Centres, State Formation and the Territoriality of Logistical Media

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Abstract: This article examines the growth over the past decade in the construction of data centres in the Asian region. Also known as colocation centres or server farms, data centres integrate society with an economy whose technical infrastructure is defined by storage, processing and transmission. Less focussed on the scale of the computational city, the territoriality of data is such that in terms of technical operations, labour performance and the materiality of data the locational specificity of 'Asia' is brought into question. Moreover, the capacity of data centres to operate as sovereign entities external to or in conjunction with the state can be understood as a form of infrastructural imperialism. A focus on infrastructure as it bears upon the composition and territorial scope of the state unshackles state formation from classical varieties of political thought and social imaginaries that assume territory and state as tied to the geographic borders of the nation. The article considers the implications of thinking Asia through the infrastructure of data centres, arguing that the territoriality of data contests the territory of sovereign states in Asia and beyond.

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How do the technical operations and infrastructural properties of data centres produce new territorial configurations that depart from and challenge the territorial borders of the nation-state? And what is distinct about such formations within the Asian region? These are the core questions that guide my thinking on digital infrastructures as a novel instantiation of imperial power. This is a power not beholden to the logic of the sovereign state, though it may take on attributes of the state such as the authority to decide and the power to govern economy and space, society and culture. It is a power that may also overlap with policy making and the ideological contours of the state. [1] And while such power may manifest chiefly in metropolitan, urban settings, its computational dimensions lend it an elasticity not reducible to the scale of cities. The pursuit of public-private partnerships, taxation incentives to attract foreign investment, a ready supply of technical expertise and low wage agreements for service labour, relatively stable political systems and generous land concessions are some of the typical arrangements that feature over the past thirty years or so that has seen the conjunction of state and firm in ways frequently

aligned with neoliberal governance and economy. To make such associations is also to acknowledge the intersection of ubiquitous media with labour, life and a broad range of economic transactions driven by the transmission of data. Accompanying the transmission of data are hardware operations of processing and storage, all of which take us to the data centre as a key infrastructural site in the spatial and temporal organisation of world economies and routines of daily life.

The data centre can be considered imperial insofar as it commands a power to connect agencies and their economic interests in ways that stretch across the territory of cities, nation-states and continents. As a region undergoing rapid expansion in the business of constructing data centres, Asia is positioning itself within a new geopolitical and economic constellation endowed with a capacity to govern and control global data economies and financial transactions on planetary and, indeed, extra-planetary scales. Satellite communication and space exploration also require the facility of the data centre. The interoperability between data transmissions and transactions occurs in tandem with technical specifications and information architectures related to Internet protocols, storage media, cable infrastructure, database systems and hardware design. Also relevant are juridical frameworks specific to the regulatory regimes of nation-states and commercial trade agreements.

However, when speaking of the territoriality of data centres it is inaccurate to invoke the idea of Asia as a region in as much as the geocultural and geopolitical borders that comprise a regional space contained by cultural and political imaginaries along with various political-economic organisations and trade-driven agreements (e.g. ASEAN, SAPTA, FTAAP) do not map neatly on to the infrastructural space of data centres whose locations happen to be within Asia. Depending on operational requirements, contractual conditions and commercial interests, the provenance of data may be territorially distinct at sovereign, geopolitical levels from the location of its storage. More specifically, then, the Asia of data storage, transmission and processing facilities consists in part of a string of locations within cities and countries that, while geopolitically belonging to the Asian region, are spatially tied through political economy and protocological interoperability to similar facilities distributed across the world.

The refrain of this article asks what is special about communications infrastructure such as data centres that lends itself to a territorial propensity? And can this tendency be considered a form of infrastructural imperialism beyond or autonomous from both the state and corporation? Moreover, does territory precede infrastructure – the planet as substrate to the propensity of cables – or does infrastructure produce the world as territory? As John Durham Peters deduces, 'infrastructural media are media that stand under' (2015: 33). If technological properties are ontologically prior to the state and corporation, questions of state formation and global economy can be approached from the perspective of logistical media and the infrastructure of its operations. But they do not sit in isolation from the environments with which they are enmeshed. Logistical media are activated as orientation systems in the instance of the arrangement between software, infrastructure and labour. The article examines how the territoriality of power manifests through communications infrastructure such as data centres to produce a new sovereign entity that I term *the logistical state*.

In sum, then, I will proceed with the following hypothesis: territoriality consists of operational practices specific to infrastructural systems and technical devices, the effect of which produce territory as spatial arrangements and temporal dynamics that may contest or conflict with state-based claims to control over the bounded space of the nation and its sovereign extensions. I consider the implications for conceiving

Asia as a geocultural and geopolitical formation by focusing on the territory and territoriality of state formation wrought by imperial infrastructures of logistical media.

The Territory and Territoriality of Power

One of the key yet little commented on Snowden revelations in 2013 of the United States' National Security Agency's (NSA) PRISM program is that it inaugurated a new regime of territorial power based upon the aggregation and analysis of data in real-time. Territory is understood here as spatial and temporal regimes specific to the operation of data. Territory is thus not limited or reducible to the geographic and political borders of the nation-state. The geoeconomic and geopolitical transformation of spatial calculation is, as Deborah Cowen argues, central to 'the work of logistics [which] is concerned precisely with the production of space beyond territory' (2014: 51). Framed within a technics of territory, the Snowden revelations also suggest a new kind of empire and machinic imperialism in terms of the use of communications infrastructure for data sharing and surveillance as systems of logistical control. As Internet entrepreneur Kim Dotcom (2013) notes, the 'Five Eyes Alliance' between intelligence agencies in the U.S., Canada, Australia, New Zealand and the U.K. 'effectively permits those governments to circumvent the prohibition against gathering data on their own citizens by sharing information across the Five Eyes intelligence community'. The data and information shared on a NSA operated spy cloud shows how these intelligence agencies are working together to overcome legal and geographic limitations of the nation in their own state-based democratic contexts. Along with the tech companies in collusion with NSA (Facebook, Google, Microsoft, Yahoo, Apple and Dropbox), we can assume other aligned countries might act or be acting already in similar ways. The capacity of the PRISM program to exploit vulnerabilities in real-time at the level of communication links between data centres further extends a general definition of logistical media. Moreover, it points us in the direction of communications infrastructure as it relates to the production of territory.

For centuries territory has been synonymous with the contest of power. Conventionally understood as a bounded space of varying scales, Stuart Elden, in his book *The Birth of Territory*, argues for a more critical appraisal of territory as it bears upon the authority of the state. Elden proposes an investigation of historical dimensions and conditions of possibility not typically featuring in studies of the state as a 'bordered power-container' (Giddens, quoted in Elden, 2013: 3). But as Elden notes of John Agnew's identification of the 'territorial trap', the spatiality of power need not be reduced to the territory of the state. The territory of data centres includes not just the geography of cables that span its operations; it might also be understood in a more diagrammatic sense as consisting of elements or entities and their capacities brought into relation. Such a notion of territory also suggests a more flexible comprehension of time and space that can be termed *territoriality*. One could inquire, for example, not only into the temporality of low-latency networks special to high frequency trading, but also into the labour regimes that construct data centres, assemble its hardware, undertake technical maintenance and administer platform operations. The temporal rhythm and spatial circumstance of each of these jobs is not independent of the spatial configuration and temporal propensity of data centres. The 24/7 maintenance of servers, for instance, may combine onsite technicians with remote network operators residing in different time zones.

Such examples illustrate the ways in which the territory and territoriality of data centres is both enabled and defined by multiple spatial layers in conjunction with variable circuits of time. Part of the scalar dimension of data centres is not territorial in the geographic sense but is rather derived from amassing

colossal amounts of data that enable the centralisation of analytic and economic power. 'For the data-driven world', as Gary Hall (2015) notes, 'is one in which the data *centre* dominates'. While there is design variation in how data centres are constructed from one site to the next, this doesn't mean that power doesn't concentrate. If climatic considerations were the only determining factor in deciding where to locate data centres then countries like Iceland and Norway and not Hong Kong and Singapore would index the geopolitics of data. Data exchange coupled with standardisation creates concentrations of power, thus firms colocate within particular facilities. [2] The capacity of data centres to operate as sovereign entities instantiates infrastructural imperialism in the form of logistical empires.

There is thus both a territory and territoriality to logistical media and infrastructural power from which geopolitical implications and media-theoretical propositions emerge. As a political technology of containment, logistical media produce new forms of territory that govern the movement and economy of data tied to labour, finance and things. Territoriality, by contrast, consists of the production of space and time beyond the constraints of bounded space specific to the borders of the nation-state. The movement of data, operation of software and design of infrastructure is enforced through juridical regimes that encode the territoriality of logistical media with legal protocols bringing logistical operations in relation to institutional settings of both state and suprastate legal apparatuses. [3] The policy, technical and legal architecture of intellectual property regimes (copyright, patents, trademarks) generates economy, culture and even subjectivity underscored by multiple fronts of dispute within geopolitical and geocultural spaces of connection and disconnection.

Territoriality, in other words, involves the work of producing complex arrangements and systems of transmission and exchange that operate on both spatial scales and temporal horizons. Importantly, territoriality also consists of spatio-temporal practices not reducible to the sovereign authority of states. An example of this consists of forms of territoriality produced through reappropriating infrastructural technologies such as radio telescopes, which in the case of experiments such as radioqualia and Acoustic.Space.Lab foreground how infrastructures of communication forge sonic geographies generated from the acoustic soundwaves retrieved from outer space. [4] Elden suggests that rather than understanding territoriality as 'the condition or status of territory', it can also be analysed as 'a mode of operating toward that territory' (2013: 4). If territoriality is about operational practices that stem from and, in turn, produce territory as new spatialities, then logistical media provide an empirico-analyical device that give insight into such processes.

Understanding media in such a way involves a shift away from an ontological concept of technology that focuses exclusively on technical properties as the drivers of change and instead casts such considerations within a broader constellation of processes that include cultural practices, epistemic objects and institutional routines (see Horn, 2008). The geotechnical arrangements of infrastructural imperialism in an age of fibre optic cables, data centres and low-latency computing lend logistical media its pervasive quality. Such infrastructure not only conditions the possibility of a logistical world gone awry, its technical properties are coupled with a computational force and political economy of data analytics and integrated technologies that saturate every surface and substrate of organic life and inorganic matter (see Hörl, 2015).

When communications infrastructure is not synonymous with the state, nor even exclusive to the private sector (since throughout the history of communication technologies there are frequent examples of public-private partnerships to fund the construction of infrastructure), we might shift the unit of analysis from

political or commercial form – which is an analysis of institutional apparatuses and political economy – and instead focus on what Keller Easterling (2014) calls the disposition or propensity of infrastructure space and what medium theorists tend to call the properties of technological forms. [5] This becomes a question of ontology derived from the activity of organisation. Daniel Gethmann and Florian Sprenger frame this nicely with regard to telegraphic cables: 'The cable supplies the world with an idea of its connectivity'. [6] Here, the ontological dimension of cable infrastructure is integrated with or immanent to its substrate, the territoriality of the planet. Arguably, the ontology of cable at both material and conceptual levels conditions the possibility for the world to know itself through relations. The move from technological propensity to planetary knowledge registers the difficulty of teasing out the distinction between ontology and epistemology.

In 'exposing the evidence of the infrastructural operating system' (Easterling, 2014: 21), we can also speculate on the ruins of infrastructure. Whether it is decommissioned cables and data centres made obsolete, or earlier communications infrastructure such as destroyed satellite antennae, or even the hacking of algorithmic architectures that orchestrate the financial transactions of high frequency trading, the infrastructures of power are surpassed by the march of history. Like the general critique of infrastructure, such a view shares something with Jussi Parikka's summary of the legacy of twentieth century philosophical thought: 'only once things fail, *then* you start to see their complexity' (2015: 98). This is also an axiom at the core of cybernetic systems that are engineered as logistical media. To think of the ruins of logistical infrastructure is a form of immanent critique. This is particularly the case with artistic practices that collectively repurpose infrastructure for projects never programmed into the blueprints of their initial conception.

The question of how knowledge is organised and, subsequently, how labour is managed is also part of this story. In developing a critique of data-driven capitalism, what can we learn from the ways in which knowledge is produced and organised within a technical apparatus? How central is infrastructure to such developments and how might the ruins of a logistical future be reappropriated from the slumber of disregard as a resource with which to imagine and practice counter-systems that are not beholden to technologies of capture that define the current conjuncture? First, it is necessary to establish how infrastructures of communication as technologies of power are involved in the production and organisation of territory. In foregrounding the relation between infrastructure and organisation, the case of data centres provides another point of entry into the production of technical knowledge as a foundation of infrastructural power. As the Invisible Committee observe in their analysis of political insurrection and logistics, '*power no longer resides in the institutions… power now resides in the infrastructures of this world*' (2015: 82-83).

Logistical Media and the Situation of Data

In probing the question of logistical media – of the political geography of infrastructures and the material force of their situation – we might ask where the data centres are located and whether this has any bearing on the design of business imaginaries of cloud-based economies. The static mass of data centres is lodged in dirt and concrete and seemingly without an object of acceleration required to meet Newton's second law of motion. There would seem, therefore, to be no obvious material force generated from their situation. Yet the speed with which data moves along the cables extending from data centres across oceanic and continental territories does, by contrast, rely on post-Newtonian and non-mechanical physics. Herein lies

the paradoxical force of the situation of data centres: they are static in terms of infrastructural location, but at the operational level they are mobile in terms of the acceleration and transmission of data.

At another register, the situation here also refers both to the setting within which we find ourselves, and the predicament that attends such placement. This is the force of determination. It offers a refuge for those in need of identity (and allocates one to you whether you like it or not), and it imposes terrible constraints upon our desire for freedom. But as Stefan Heidenreich astutely observes, 'Materiality of media does not need to consist in solid objects only. *Whatever transfers a force through space or time should be considered*' (2015: 140; my emphasis). As is so often the case with data centres and cloud computing, 'The fundamental material layer often goes unnoticed, even though it sets some basic conditions for all communication based upon it'. For Heidenreich, critical attention should be turned toward the impact of standards and protocols and the ways in which they 'enforce material-independent constraints' (2015: 14). This takes us to the politics and economy of enterprise software systems. But it also allows us to think of how data centres exert change and transformation upon economies through the velocity of data as a result of their processing operations and the materiality of cables. And perhaps also the more immaterial force they exert through their material presence as perceptible objects prompting responses to issues of security, surrounding economies, labouring subjectivities and so forth.

Indeed, what sort of data traffics through different data centres distributed in strategic locations throughout the world? Are there juridical regimes specific to different types of data? How is the provenance of data complicated in legal ways by the location of its storage? What sort of protocols of hardware and storage are required for, say, financial data as distinct from the data collected by the state or military apparatus, or produced from what Soenke Zehle (2012) terms the 'logistical lifestreams' that define our social media worlds? And to what extent do the technical operations, geography of location and political economy specific to different data centres determine the types of businesses and organisational practices dependent on hosting services? These are questions that also go some way toward designing a media theory of data centres, which are a key communications infrastructure for the logistical processes of contemporary capitalism and global supply chains. But there are no definitive one-size-fits-all answers here. Sometimes *difference makes a difference* (see Bateson, 1972). And sometimes it doesn't.

The data centre as communications infrastructure extends from bricks-and-mortar of the building, the specific cabling, monitoring, security and fire safety mechanisms of its internal operations, the training regimes (e.g. Cisco networking certification) required of its human operators, the kinds of specific computing devices engineered to optimise rack space and save costs (e.g. 1RU servers), the 'hardened' software operating systems (usually Linux or other UNIX variants), the software utilities used to monitor, route, load balance and optimise bandwidth and network traffic, the algorithms that ensure security, redundancy and optimisation in the writing of data to disc – the list could go on. Many of these are necessarily standardised and the pathways from military to financial to broader commercial application and back again are often complex, circuitous and seemingly ad hoc (but for the strong geographic concentrations of these various industries in parts of the U.S. and elsewhere). A media theory of data centres would, therefore, need to accommodate the apparently paradoxical situation of both differentiation (by technical operation, geography and political economy) and standardisation. [7]

The Traffic of Data

Frequently hidden from view until it breaks down, the geography of communications infrastructure that drives global economies also defines new territories of power. As Matthew Tiesen (2012) explains in his account of high-frequency trading (HFT) and the spaces of finance capital, 'In light of HFT's appetite for unlimited speeds and unlimited financial-arbitrage opportunities, the central nodes of the global finance network – London, New York, Chicago, Tokyo, etc. – are becoming its peripheries insofar as these days it's the spaces in between the exchanges where the real action occurs – or has the potential to occur'. And as Michael Lewis (2014) makes clear in *Flash Boys: A Wall Street Revolt* (a book whose peculiar genre fuses straightforward reporting with the anxious pace of a conspiratorial thriller), the relation between the geography of fibre optic cable and algorithmic capitalism is determinate in the economy of high-frequency trading. The 'co-location' of exchange servers with the computers of high-frequency trading firms function to minimise the journey of data, resulting in a form of insider trading that always outpace the efforts of brokers, hedge-fund managers and ordinary traders. While there is nothing especially new about the impact of finance driven capitalism on labour – Rudolf Hilferding, John Hobson and later Vladimir Lenin identified how over a century ago the structural force of financialisation and imperialism is the basis of 'organised capitalism' – I would nonetheless suggest that data centres register an intensification of such processes. Bringing critical attention to the coupling of algorithmic capitalism with data centres instantiates a materiality that helps demystify the abstraction often associated with processes of capital accumulation. Although such a move also invites further mystification: how to study the inaccessibility of data centres as an infrastructural object? And how to even begin analysing the algorithmic architectures specific to HFT and other computational operations of capital?

Vincent Mosco (2014: 71-72) notes that 40 percent of data centres are located in the United States, with Scandinavian countries and Canada attractive options due to their cool climate and abundance of water supplies, which along with 'their bandwidth Internet connections, political stability and financial incentives' are key to offsetting energy costs associated with air-conditioning (Mosco 2014: 36). Yet the growth over the past ten years or so in the construction of data centres around the world, particularly within the Asian region, signals an historic and paradigmatic shift from the extraction of surplus value from labour as a core structural dynamic of the capitalist mode of production to an arguably novel form of surplus data within an economy of algorithmic capitalism that at first appears less dependent on the subject of labour. This is especially the case with high frequency trading, where the nano-speed of trade operates beyond the threshold of perception and with minimal human oversight or intervention.

The once strategic function of telegraphic cable landing stations are no longer necessary with the introduction of new technical forms of networked communication such as fibre optic cables. The technical realisation that particular infrastructural forms of networked communication are not sustainable is registered in the shift from telegraphic cable stations as relay nodes to point of presence beyond the station. Cable stations, in other words, are no longer essential infrastructural nodes for accessing fibre optic signals. The technical development of undersea branching units in effect shifts the cable station offshore, resulting in what Nicole Starosielski (2015: 124) terms new models of dispersion for signal traffic. The eventual obsolescence of infrastructure is something we should be attuned to for the possibilities of reoccupation and experimental reengineering.

From this geotechnical perspective, then, infrastructure complicates the passage of state formation and

may privilege empire as the organisation of power on the basis of both technical propensities and economic interests. The point at which undersea cables make contact with shore at cable stations becomes a form of imperial occupation. As Starosielski maintains, 'The cable station became the critical geopolitical node for all transoceanic traffic: it was a cable colony intended to be self-sufficient and culturally insular, autonomous from its surrounding geography' (2015: 111). For Starosielski, the telegraphic cable station of the nineteenth century was not shrouded in anything like the secrecy that surrounds the cable stations that support the landing of oceanic fibre optic cables. So it is not cables *per se* that prompt a secrecy of operations as much as the commercial interests and political agendas that increasingly populate the twentieth century across a range of media forms, including telephony, broadcast media and satellite communications (see Schiller, 2011).

In the case of cable landing stations as they relate to data centres, a geography of proximity prevails between these two infrastructural forms in the interest of maximising low-latency networks able to service economies of speed required for a range of sectors, especially those in finance and high frequency trading. These are heavily securitised spaces whose labour regimes are at once localised and frequently gendered with male technicians servicing the severs, while remote workers engage in the drudgery of chores such as data entry and the like on the part of clients whose operations may be based anywhere in the world. The more high-end of corporate IT labour is not immune from the shifting geographies of data centres. As Mosco points out, when a company puts its servers in a data centre or goes down the path of software-as-a-service, it is often enough the case that the IT department is closed, leaving corporate IT labour swimming in search of another job – which may mean abandoning the sector and retraining or joining the ranks of the unemployed (see Mosco, 2014: 163-167). But such impacts on labour by technological developments and political economic practices are not a foregone conclusion. The widely projected unemployment trends forecast by various iterations of outsourcing and automation have often been defied by counter-trends within the sector. A more obvious case is the need for endless reskilling and insecurity implied by technological churn – server administrators become corporate IT strategists, IT support staff become trainers and teachers and so forth.

The Geography of Data Centres

In updating the question of infrastructure and the constitution of the state as a multifarious complex of actors overseeing the management of people, finance and things, we might specifically address the structural force and operational capacity of data centres. Certainly there has long been a crucial labour cost related to questions of infrastructure and geography, as we can note in the protracted struggle by German labour union ver.di in its demands for better working conditions in Amazon's warehouses. Infrastructure, it turns out, can itself be highly mobile, flexible and able to be relocated for legal and political reasons. Indeed, politics is entirely relevant to the strategic decisions around the geography of investment related to data centres. As one consultant on IT infrastructure in the Asia Pacific advises, 'most countries in Asia are lucrative markets to set up and grow businesses, barring a few which have political and technological environments as deterrent factors' (IDC, 2014). But politics here usually consists of more force when it is wielded by the sovereign power of the state rather than labour unions. Google's exit from Beijing in 2010 was frequently reported as an act of Western corporate defiance and social justice against China's insistence on censoring search engine results, but it was nonetheless a submission to sovereign control and a humiliating retreat from the centre of contemporary capitalism. And of course there's also a business reality to Google's decision to quit China. As one report in *Forbes* magazine noted in 2010 following the

withdrawal of Google, the more innovative local search engine Baidu 'only increased its market share, going from 47% in mid-2006 to 64% today' (Fannin, 2010).

Over the past few years Taiwan, Hong Kong and Singapore have become strategic sites for investment in storage facilities for cloud computing. Companies like Google have built data centres in Taiwan and Singapore to accommodate the rapid growth of Internet users across the Asian region. As reported in *PCWorld*,

> While the Taiwan data center is on 15 hectares of land [in central Taiwan], the Singapore data center in Jurong West is built on a smaller area of close to 2.5 hectares. It is designed as Google's first urban, multi-story data center, and is in the neighborhood of a local primary school and publicly-run housing. (Ribeiro, 2013)

Local authorities are keen to attract such business, which they expect will produce a range of spin-off benefits for local firms. As Google Taiwan's managing director Chien Lee-feng remarked in 2012 following the announcement of the USD $300 million Google facility in September 2011 (with USD $700 million slated for long-term investment in the region), 'We anticipate this data center will evolve into a [cloud-computing technology] hub and will create a supply chain here in Taiwan' (Wang, 2012). By the time of its completion in December 2013, the budget for the Taiwan investment had risen to USD $600 million (see Chiu, 2013). It is hard not to also see the move of Google to Taiwan and investments in Hong Kong as a quasi-subversive repositioning for a re-entry into the People's Republic of China.

The *Taipei Times* goes on to report that 'Google's local suppliers include Quanta Computer Inc (廣達電□), which supplies servers to Google, and Nanya Technology Corp (南亞科技), which supplies memory chips used in servers' (Wang, 2012). Data centres, then, are key components of global logistics industries and reshape the economy of cities in terms of the composition of labour, the integration of manufacturing and service industries, and the formulation of trade and communications policies designed to attract investment. After abandoning plans for the construction of a data centre in Tseung Kwan O Industrial Estate in the New Territories, the two Google data centres in Taiwan and Singapore produce a geography of the cloud that includes the six data centres in the United States along with two in Europe and another opened in Chile in early 2015. One might suppose that the high temperatures in Taiwan's hot summers along with the potential instability of weather associated with its typhoon season might act as a deterrent for infrastructural investment in the country. But it turns out such climatic variations provide a basis for Google to tout its green credentials and innovative design in its 'use of a night-time cooling and thermal energy storage system that cools large quantities of water at night' (*Huffington Post*, 2012). But the issue of electricity consumption required for running data centres is not insignificant. As my colleague Tanya Notley (2014) has noted (along with others researching electronic waste, such as Jennifer Gabrys, Richard Maxwell and Toby Miller), 'Server farms currently use more than 1.5% of the world's total electricity (and rising) with more than half of this energy used in the cooling process'. A public policy study on green energy use for data centres notes that since 2000, 'the overall rate of energy consumption for U.S. data centers, sourced primarily from polluting energy, has grown at an average rate of 14 percent per year' (Kavitz et al., 2009).

A data centre is not necessarily a data centre. Which is to say that the technical and material specifications of data centres depend upon the type of data being hosted. We know that data centres offering low-latency networks are the preferred choice for high frequency trading, which, as Donald MacKenzie (2014: 28) notes,

takes place in around 15 data centres around the world (most of which are located in the U.S. and Europe). But low-latency networks are not an economic priority or technical possibility for all data centre operations, where energy costs related to the cooling of servers are a key factor in the determination of business margins. The specific requirements of data centres built for hosting and mining cryptocurrencies such as Bitcoin offer a clear example of the variation in capacity and function of data centres. Bitcoin currency is generated through the marvels of blockchain processing – 'the distributed ledger that keeps track of all transactions made using the Bitcoin cryptocurrency' (O'Dwyer, 2015). [8]

To effectively mine more Bitcoins from the blockchain requires greater computational power. And this is what purpose built data centres offer. In the days when Bitcoin was riding high, the cost of leasing data centre space wasn't such an issue. But once the plunge had set in around early 2015, alternative facilities were required with server functions more tailored to the different processing needs specific to Bitcoin mining. [9] Early in 2015 BitFury Group, one of the largest companies specialising in high-density hardware used in Bitcoin mining, made a takeover bid for Hong Kong's Allied Control – a start-up known for using immersion cooling in the mining of Bitcoins (see Miller, 2015). This two-phase cooling technique involves removing heat from semi-conductors used for mining Bitcoin transactions with a supposedly non-ozone depleting liquid solution base of fluoroketone developed by 3M (a U.S.-based global firm stemming from Minnesota Mining and Manufacturing Co., founded in 1902), who claim up to 97 percent savings with their Novec Engineering Fluid compared to traditional air-cooling methods. [10] Not requiring the proximity to landing cable connections that make possible low-latency networks in HFT, data centres specialising in Bitcoin mining can therefore broaden the geography of infrastructure as it relates to the construction of data centres. With a data centre in Iceland, BitFury announced in June 2015 that it was acquiring a 185,000 square meter privatised plot of land in the Republic of Georgia to build a mega data centre to host its Bitcoin mining hardware. Along with low energy costs and a competitive labour market, BitFury has partnered with the 'Georgian Co-Investment Fund, a $6 billion private equity investor in companies interested in business opportunities in the country' (Sverdlik, 2015).

Variations in infrastructural requirements begin to indicate a media theory of data centres that decomposes the singular data centre into a typology. Certainly service offerings are significant here, although there is often little differentiation to be found at this level. More significant are the infrastructural capacities of data centres, which can be distinguished at the level of hardware in terms of low-latency to processing power. These sort of factors then impact on decisions over where a data centre is built, its size and whether adjacent land may be valuable to acquire. Think, for instance, of how real-estate in close proximity to data centres supporting high frequency trading may be strategic to purchase in terms of blocking access to potential competitors wishing to make use of low-latency cables. Or, in the case of Bitcoin mining where energy costs associated with processing power and computational cycles are important, a typology of data centres may foreground external factors related to environmental conditions or government authorities able to provide attractive investment packages for the construction of specialised data centres.

A fully developed media theory of data centres would address the operational capacities of data centres on their own terms. Such an undertaking would partly be a study of the technical as a foundation for developing concepts rather than relying exclusively on transposing the washed out buzz from philosophy or political theory to the technical object of research. And it might also be a study in how the ontology of data (to go philosophical) and the materiality of infrastructure have territorial propensities. How, in other

words, do cables, servers, cooling systems, data processing and analytics and the labour of their servicing (when not automated) produce a form of data sovereignty beyond the state? And for an inquiry such as the one of interest to this article, how might a logistical dimension be special to such operations?

Questions such as these point us toward a more general target of critique – the operation and organisation of infrastructural and logistical power. Whether such authority is wielded by corporations or the state is less important than the fact of its existence as a force that is often extremely difficult to identify but is no less present in its effects. The accumulation of infrastructural power is all well and good for clients with an interest in minimising latency for commercial purposes, but how might others not in the business of data services and the pursuit of commerce exploit these infrastructures to support more radical agendas? Can we envisage our own artistic practices or critical research, for instance, as having some use for colocation services? These are not questions that I have ready answers to, so I signal them here as markers for future research. Suffice to say that the artistic practice of producing blueprints of an imaginary future provides one technique of subtraction from infrastructural power and the society of tracking, indexing the obsolescence of control and the rerouting of capture into models of psychogeographic displacement. But before moving to this article's conclusion, it is first necessary to identify the organisation of power coincident with digital infrastructures of capture and coordination.

The Logistical State and Infrastructural Imperialism

How does infrastructure constitute the state? In setting up the foundations for a theory of the state, Max Weber follows Leon D. Trotksy: 'Every state is founded on force'. This classical definition of the state is often translated and interpreted as the state's monopoly on violence and has informed much theorisation of the state throughout the twentieth and twenty-first centuries. [11] Weber makes the important additional qualification that brings population – or what he prefers to term 'community' – and territory into the orbit of state power: 'The state is the human community that, within a defined territory – and the key word here is "territory" – (successfully) claims the *monopoly of legitimate force* for itself' (Weber, 2008: 156; emphasis in original). What might it mean to think the state, territory and population as they intersect with processes of informatisation and, more specifically, the geography of data centres? If territory consists of the organisation of power across spatial scales and technical systems, then what are the implications of infrastructure for a theory of the state? And how might we think the temporal properties special to the optimisation of speed (low-latency) within data centres? Such questions begin to alter the baseline Weberian model of the state that has informed so much theorising of the state, whether in radical or conservative veins. Approaching the question and constitution of the state in such a way involves foregrounding the production of territory through infrastructure – rather than a monopoly on violence or exertion of force – and thus contributes a media-theoretical perspective to scholarship on state formation. A focus on infrastructure as it bears upon the composition and territorial scope of the state unshackles state formation from classical varieties of political thought and social imaginaries that assume territory and state as tied to the geographic borders of the nation. I am not suggesting an infrastructural approach eclipses the extensive and diverse theorisation of the state so much as further complicates the organisational logic of power attributed to the state as an entity of transformation.

If, as Jürgen Osterhammel submits, 'Empires are structures of rule on a large scale' (2015: 424), then what does it mean to approach both politics and the political from within an imperial horizon? Such a proposition invites us to think the work of organisation, the collective design of strategies and tactics of

intervention on planetary scales when empires are made imperial through digital infrastructures of communication. Of course the imperial dimension of empire is not exclusive to digital infrastructures. As Harold Innis's writings on empire and communications attest, experiments in statehood in the form of imperial bureaucracies were facilitated by space-biased media such as papyrus and the time-biased media of parchment (treated animal skins) supporting the maintenance of an ecclesiastical hierarchy in the ancient Byzantine empire (see Heyer, 2003: 50; see also Innis, 1986). Architecture and sculpture also indexed the imperial power of empire within ancient cultures (see Heyer, 2003: 80). Built forms such as the Egyptian pyramids could be witnessed for the symbolic authority they command over time.

By dramatic contrast, the imperial power of data centres is nowhere to be seen. Hidden away in purpose built facilities or retrofitted warehouses, data centres blend into the urban fabric when they are not in secret or very remote locations. As infrastructure of seeming invisibility, their network of cables nonetheless marks out territories of control with computational processes signalling the occupation of time in ways calculable to the interests of capital. One might very reasonably attribute such features, more or less, to the corpus of modern communication technologies since the advent of electronic telegraphy. The abstraction of communication power has indeed defined the epoch of modernity and the time of our time (see Castells, 2009). When situated within such a lineage, data centres may not present as especially novel in their mode of abstraction. Indeed, one can draw various parallels between telegraphy and data centres. But they register an intensification of technical processes and structural tendencies with regard to the exertion of logistical media as a form of infrastructural imperialism.

The situation of data infrastructures holds a substantive force in the making of territoriality. But how might an account of infrastructural power retain a notion of imperialism that is not beholden to the territorial extension of the nation-state? This is not to ignore the constitutive relation between nation-states and large corporations with interests in communications infrastructure. Google's exit from mainland China in 2010 hasn't stopped IBM, Microsoft and Amazon, who are among the largest players in cloud service, taking advantage of China's burgeoning industry in the construction of data centres. Typically, these arrangements involve a suite of government incentives with pledges by the global corporations to support local and regional economies with software and platform services along with support programs, for example, in the form of start-up incubators. But this isn't a one-way street of major players exploiting nation-states to their benefit; as the termination of Google's operations in China made clear, along with the Snowden revelations, companies in the business of communications infrastructure can still be highly vulnerable to the whims of the nation-state.

However, my interest here is a different one. Conflicts in technical standards and protocols that determine how data centres connect and disconnect from each other and associated client networks suggest that spatial conceptions of territory give way to, or at least run in tandem with, the non-spatial territory of technical knowledge and the properties of hardware in conjunction with the temporality of interface design and data transmission. Policy architectures also come into play here. Relevant examples would include the ratification of Internet governance between suprastate institutions and member states of international agreements such as the WTO's Agreement on Trade-Related Aspect of Intellectual Property Rights (TRIPS), or ICANN's management of Internet protocol addresses and Domain Name Systems, which involves input from representatives of the 111 member states comprising the Governmental Advisory Committee.

When multiplied in such ways, territory not only unbundles the coupling of the state and its geographic

borders, it also evades any easy or straightforward analytical capacity to contain an object of investigation and critique. To contain an object within the imaginary of the nation-state is a mistake. Often enough the polis usurps the imaginary of sovereign power commanded by the state. [12] By interrogating infrastructure such as data centres and, as discussed earlier, their prehistory in the form of electric telegraphy, one begins to question 'whether modern communications technology made empires more stable' (Osterhammel, 2015: 425). Counter-systems and methods, Osterhammel reminds us, are present as a disruptive force that test the monopoly of infrastructure presupposed by both state and non-state authorities as quasi-rivals in the territorial control of data. [13]

For Weber, the modern state is defined sociologically 'by reference to a specific *means* that is proper to it' (2008: 156). The state, in other words, involves a capacity – political or otherwise – that is specific to the territory of its operation. Territory, here, is to be distinguished from the sovereign territory of states. The U.S. military, for example, operates beyond U.S. territory. In this regard, the operation determines the territory of the state. And infrastructure, as I have been arguing, provides the structure that makes operations possible. The means proper to the state is the method of the state, its content comprises a technology of governance that belongs to and is the property of the state. Extending far beyond sovereign territories, infrastructures of communication constitute another layer of sovereignty that offer a different analytical rubric when not subsumed under the expansionist agendas of statehood. When cast in such a way, we can begin to translate what is in effect the ontological dimension of the state – the *means proper to it* – in ways that address how infrastructural operations are central to the formation of the *logistical state*. Of relevance here is the political and economic geography and technical operation of data centres. Such considerations might revive a critique of the state based on its support of commercial data centres through financial levers such as attractive corporate tax breaks, generous land leases, flexible labour regulations and free trade zones among other forms of state subsidy funded by national citizenries, not to forget lines of revenue generated by the efforts of non-citizens residing in the territory of the state. To speak of the capacity of the state in these terms is also to conceive of a logistical state.

Communications Technology and the Logisitical State

Within an Innisian framework the 'territorial state' of ancient civilisations and their empires was predisposed toward a spatial or temporal bias as a result of the material properties of prevailing transport systems and communication technologies. [14] And this made them vulnerable to external forces able to exploit such infrastructural oversight or limits to capacity. The logistical state, by contrast, encompasses both of these dimensions simultaneously. The global networks of supply chains expand the territorial reach of producers and suppliers required for the operation of the logistical state. Enterprise resource planning (ERP) software systems calibrate labour productivity and coordinate the movement of goods and finance in real-time and data centres store, process and transmit the data integral to logistical operations governed by computational systems. These are the infrastructural components that generate the possibility of imperial rule for the logistical state. Importantly, the spatial and temporal dimensions described here are not synchronic or spatial equivalents. Time and space is peculiar to each, forming layers or, more likely, a complex undulation of planes that overlap and intersect on some occasions while colliding and disconnecting on others.

The logistical state evolves from what Maurizio Lazzarato identifies in post-war Europe as the social state (*Sozialstaat*), which in turn is a departure from the nation-state: 'The social state is a new kind of state that

has little to do with the nation-state whose loss of autonomy led to its gradual but inevitable disappearance which Schmitt laments' (2015: 52). Lazzarato suggests that the adoption of and identification with the concept of the social state across Europe after World War II 'is symptomatic of a profound change in the nature and exercise of sovereignty'. At the core of this change lies the determinate force of the economy, science and industry, around which the 'political and administrative systems of society' must adapt (Lazzarato, 2015: 52). This reading by Lazzarato of the liberal social state is not to be confused with the social democratic state, a model of governance peculiar to post-war Europe that has become synonymous with the social-welfare state and its crisis following the advent of neoliberalism. For Lazzarato, the social state has already forged a pact with capital.

It should be no surprise that Australia, Canada, New Zealand, the United States, Chile and Japan, following its defeat in the second world war, were leading proponents of the social state. These are countries that historically and to this day have played a role as laboratories in the testing of social and political models designed to extract value from the social relations of production. Technological developments were key to the capacity of colonial empires to appropriate value through processes of capital accumulation. Earlier infrastructural systems on a planetary scale such as electrical telegraphy were notable for their traffic in information related to the pulse of stock markets. The connection of ticker tape to telegraphic signals in 1867 allowed for the continuous registration of fluctuations in market prices (see Standage, 2013: 175). But sovereign states may also refuse to submit to the planetary impulse of technological forms and the external interests – corporate or otherwise – that hitch a ride. States can prohibit the use of infrastructure for the extraction of value if it intervenes, symbolically or otherwise, with its other operations. Again, the Google-China dispute is a case in point, where the PRC exerted the authority to decide that the search engine was violating its Internet censorship laws.

Fusing with finance capital (from rent to tax to speculation, derivatives and other forms of algorithmic trading), the logistical state might also be characterised as a variation of the finance state. However, the intensity of its mode of expropriation suggests that the logistical state is also more than this, which is to say that it is not reducible to financialisation alone. The logistical state, constituted in part by the spatial and temporal properties of infrastructure and their media of operation, is one that extracts new forms of value from populations and dispersing of this value – initially as data and later as financial products and services – through circuits of movement governed by protocols of storage, transmission and processing special to data centres. But importantly, the state does not operate or manage data centres like it previously did in many countries with regard to utilities such as national broadcast media in radio, television and telephony. Instead, the state decides to buy into data centres, including for military purposes.

No doubt there is a danger here of replacing older theories of state formation with a new infrastructuralism. Common to both approaches is an account of the production of subjectivity, either in terms of the constitution of the state-subject (both citizens and non-citizens) or of the logistical agent whose capacity to act is determined by the parametric settings of technical infrastructures of communication and transportation. Within Anglo-American and European traditions of jurisprudence, the territoriality of the state and its declarations of a right to govern is conjoined with the rights of capital to claims over property. Such a pairing has lead to countless instances of dispute and conflict, many of which situate civil society actors as intermediaries in both liberal-democratic and authoritarian states.

Conclusion

In the context of algorithmic capitalism, this article has explored how data infrastructures in the early twenty-first century can be read with regard to their territorial operations. If we take the question of agency as a point of departure to address the peculiarities of our infrastructural present, this does not dispense with the problematic of sovereign power. In our digital present, the infrastructural imperialism of data centres is notably different in terms of a political-technical logic in which the system of nineteenth century colonial mercantilism no longer prevails. This means that infrastructure and territory are not aligned according to the imperatives of empire in which the hegemony of the nation-state and its control of territory was key. Instead, we start to see how a form of infrastructural power predicated on the political economy of data and the territoriality of the logistical state begins to emerge.

While China, Hong Kong, Taiwan and Singapore have been key sites in recent years for the expansion of data centre industries, the conceptual and theoretical work on these installations has not been sensitive to their territorial implications. The territoriality of data is such that in terms of technical operations, labour performance and the materiality of data the locational specificity of 'Asia' is brought into question. Moreover, the capacity of data centres to operate as sovereign entities external to or in conjunction with the state can be understood as a form of infrastructural imperialism.

The extent to which Asia-led globalisation can be thought of as planetary forms of economic and institutional power derived from the hegemony of nation-states and their architectures of alignment such as free trade agreements, special economic zones, public-private partnerships and the like is rendered in material and imaginary ways when considered in terms of logistical practices comprising infrastructural systems, software operations and labour regimes. There is no straightforward architecture of control at work here. Take, for example, my earlier account of BitFury's purpose built data centre in the Republic of Georgia. With its takeover of Hong Kong start-up Allied Control, BitFury subsumed 'Asian' research and development on immersion cooling systems for the mining of Bitcoins. Asian branded knowledge, in effect, is then made operable within the sovereign space of Georgia – a country historically wedged between Soviet, German and Ottoman empires in the early twentieth century.

In focusing on the infrastructural making of space, however, one might begin to ask whether such instances of fairly standard political economy within the commercial sector can also be understood as technological registrations of Asia beyond Asia. If so, then Asia-led globalisation begins to be understood not as a centrifugal force expanding out into the world, but rather as a much more dispersed and uneven manifestation of power generated from technical requirements coinciding within state sanctioned architectures of commercial accommodation. Fibre optic grids of cabling traverse space in patterned ways, duplicating to an extent the imperial cartographies of colonial telegraphic communications infrastructure. But again, such cable infrastructures do not conform to the spatiality of regions or areas as they are typically understood. Similarly, knowledge production and political economy combine on variegated spatial scales, casting assertions of cohesive geopolitical power in highly uncertain ways. It is in these senses that *media determine our situation* (Kittler).

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Notes

This articles draws on and extends material from my book, *Software, Infrastructure, Labor* (2016).

[1] Of course policy making occurs across a range of institutional settings, many of which comprise non-state actors. Importantly, however, the state form has far from vanished or diminished. Rather, it has undergone a period of extended transformation. Later I elaborate one of its various manifestations in terms of the emergent *logistical state*.

[2] It almost goes without saying that in a world of data transactions, culture is largely irrelevant and formats are everything. I leave open the space of qualification, since culture is not entirely irrelevant – there are, for example, strong cultural dimensions that inform engineering practices specific to hardware and software design.

[3] For Saskia Sassen (2013), territoriality is understood as 'the legal construct encasing the sovereign authority of the state over its territory' (21). Importantly, for Sassen, 'territoriality, the legal construct, is not on a one to one with territory – the latter can deborder the legal construct and in this process show us something about the territorial itself' (23).

[4] Radio Astronomy, http://www.radio-astronomy.net/index.htm. See also http://radioqualia.va.com.au/documentation/spacelab/ and http://acoustic.space.re-lab.net/lab/history.html

[5] 'Disposition is the character or propensity of an organization that results from all its activity' (Easterling, 2014: 21).

[6] 'Das Kabel liefert der Welt eine Idee ihrer eigenen Verbundenheit' (Gethmann and Sprenger, 2013: 16).

[7] Thanks to Liam Magee for his input into this passage.

[8] See also the MoneyLab project, an initiative of the Institute of Network Cultures, Amsterdam, http://networkcultures.org/moneylab/

[9] Following a collapse in Bitcoin value over the second half of 2015, there has been a 50 percent surge in

prices. Some observers attribute this recovery to domestic factors in China, including a devaluation of the Renminbi (Yuan) with stresses in Chinese stock markets fuelling a turn to Bitcoin by investors (see Bovairdm, 2016).

[10] See 'Two-Phase Immersion Cooling', 3M, http://www.3m.com/3M/en_US/novec/products/engineered-fluids/immersion-cooling/

[11] And indeed such concepts of the state extend into the 21st century in the work of anarchist critique of bureaucracy and the state by the likes of David Graeber: 'The police truncheon is precisely the point where the state's bureaucratic imperative for imposing simple administrative schema and its monopoly on coercive force come together' (2015: 80).

[12] Or, in a case like Beijing – the political capital of the People's Republic of China – there is an interplay between polis and state that operates in technical, geographic and imaginary ways. This became particularly clear to me during the Beijing Olympics in 2008, when many of the world's global media were gathered to report not only on the sporting event, but also daily social and cultural life in the megacity. Reporters who should have known better would consistently write about the "Great Firewall of China," which periodically blocked social media sites like Facebook and Twitter along with liberal media sites like *The Guardian* and Wikipedia. What these reporters failed to understand was that the Chinese government implemented a digital policy in uneven ways across the territory of the nation-state. In many provinces outside of Beijing, there was no problem to access sites reported as a so-called threat to the authority of Chinese rule. But the government understood very well the metonymic operation between the polis and the nation, which was especially amplified with national and global media events such as the Olympics. The city, in other words, performed the imaginary work of a government in control. It was not necessary to extend control mechanisms beyond the city since most reporters would not venture outside this territorial imaginary.

[13] 'By no means did colonial authorities always have a monopoly over the transfer of information; their adversaries employed similar methods as well as countersystems, from the bush drum to the internet' (Osterhammel, 2015: 425).

[14] On the territorial state, see Branch (2014).

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