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## Global Flow Security Working Papers

### *Chapter 3*

### Flow Security in the Digital Age

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*Everything flows and nothing stays.*  
- Heraclitus

#### **Introduction**

Global and regional orders are increasingly premised on and shaped by global flows. Many of these flows have a hub-and-spoke mobility dynamic. Namely, states distinguish themselves with regard to the mobility of people, goods, and services based on their ability to act as central hubs or relay nodes for such defining global flows as trade, resources, and finance. This means that the local intensity and regularity of such flows is increasingly a crucial indicator of a state's economic viability and its political influence. Securing steady access to such global flows poses a different set of domestic and foreign policy challenges to states in general, and especially to smaller states, than the challenges posed by the traditional Westphalian model, which has been rooted in territorial notions of international order. States are increasingly caught in a cross-current between these two co-existing realities, as the dynamic, flow-centric model emerges and the older territorial state-centric model recedes. Global non-state actors and circulation of activities are challenging traditional state-based geopolitics, rendering old policy solutions – e.g. national self-reliance and related national strategies – increasingly ineffective.

Despite the dynamism of these global forces, nation-based identities will likely continue to provide central and identifying organizing concepts. The central question has to do with finding a way for a country to develop the appropriate conditions to identify and establish access-points to key global

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flows. How can decision-makers create local conditions that facilitate access for their country to global value chains and the global marketplace of ideas? The policy challenge for states is to make the country fruitful as a riverbed for global flows. How can a state become a 'flow-facilitator'? What actors and whose standards are going to have secure or commanding positions in the global maritime, air, and space realms, each of which is increasingly wired into the cyber commons?

For smaller states, the central question is how to influence and adapt to these power conditions. Flows can also have negative influences, of course, and in this respect, decision-makers are also challenged to find ways to ameliorate the impact of the negative entrepreneurship associated with illicit shadow flows.

### **Emerging Geosecurity, Resilience, and Black Hubs**

Political world maps usually point out two types of human artifacts: borders encircling states and land-based logistics networks, i.e. roads, bridges and railways. Much of modern geostrategy has so far been fixed on borders and territories. However, this prevalent imagery can be contrasted with an alternative vision that has historic roots and is again becoming more relevant. This alternative can be exemplified by imperial Rome's territorial imagination.<sup>2</sup> The limits of the empire were not precise in the contemporary sense that modern-day states find it important to demarcate and secure clear borders. To an important degree, Rome's reach was limited by its main roads and various access routes. Most of its legions were based in such a way as to secure and keep open these main arteries of the empire. It may be argued that the increasing transformation of the contemporary world order towards a system of circulatory flows is predisposed to rediscover this old Roman meaning of security.

Today and in the foreseeable future, there is a growing focus on securing the sites, spaces, technologies, and practices of flows.<sup>3</sup> The aim of this 'flow security' is to control access to and from the main global flows that connect remote extremities to regional centers or spokes on the one hand, and those regional spokes with the main global hubs on the other hand. Securing access to and ensuring the openness of such flow changes the meaning of security. Traditionally, spatial or territorial entities – e.g. states – were secured. Now, these temporal flow-like processes need to be secured. The regularity of a flow's steady rhythm and the regularity of its pulse indicate a high level of security.

This era of global flows may be seen as a golden age of interdependence, but it also poses clear challenges and can cause significant anxieties. The main global arteries guarantee wide access to

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<sup>2</sup> Andrew Lintott, "What was the 'Imperium Romanum'?" *Greece and Rome*, 28(1), 1981, p. 65.

<sup>3</sup> E. g. Peter Adey, "Secured and sorted mobilities: Examples from the airport," *Surveillance and Society*, 1(1), 2004, pp. 500-519.

the most remote regional and global peripheries. This access is often seen as bringing with it many benefits, such as links to production sites, financial centers, knowledge hubs, and security producers. Participation in these flow activities also catalyzes the diffusion of norms, practices, and standards. This fosters learning, shapes governance, and influences how "flow practices" – e.g. interoperabilities, norms, and standards – develop in the future.

On the other hand, growing concerns about cyber-crime, terrorism and human trafficking indicate that there is a much darker side to this emerging age of flows. For instance, unsanctioned or unsecured access to global flows via cybercrime can be a huge vulnerability for a state or a region. Decision-makers are increasingly preoccupied with preventing or mitigating possible disruptions, breakdowns and contagions. These challenges, in turn, are generating more innovative notions of resilience.

Global cyber flows – much like rivers – mold the terrain in which they occur, in terms of both human and physical landscape. They create opportunities for both legitimate and illegitimate activity, and their interaction shapes physical political economies, for instance regional/global flow-hubs such as Silicon Valley.

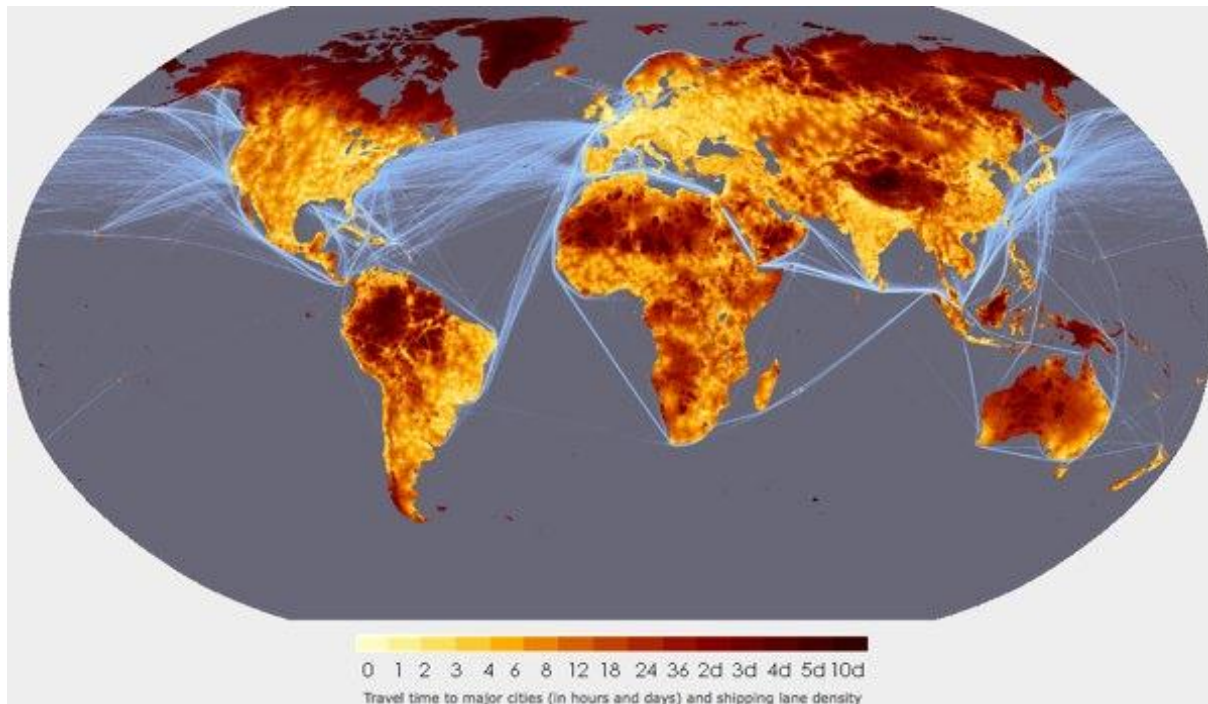
In addition, cyber flows, much like other flows, are characterized by constant flux. They create confluences of patterns, interact with and disrupt old flow systems, and can facilitate the bypassing of existing interlinkages. In the words of Arjun Appadurai, global flows are disjunctive and chaotic because they “follow increasingly nonisomorphic paths” and the “sheer speed, scale, and volume of [...] flows are now so great that the disjunctures have become central to the politics of global culture.” In this regard, the term "disjunctive" refers to flows being able to dis-connect or reorient localities from their traditional connections on a territory-oriented geographical map, and to connect or re-connect such localities with other centers that may be more relevant to a region's vitality than localities that may be physically closer.

Cyber-enabled social networking, for instance, is reconfiguring the global space. Facebook's world map of its fabric of 'friends' show how the social network is unevenly distributed across the globe. Taking the disjunctive effect fully in account, a Facebook-centric map illustrates the geography-shaping power of flows, pinpointing Palo Alto California as the global center of gravity in terms of 'friendship' flows. Other places are arranged according to their closeness in terms of 'friends'.

Akin to this process of 'hubbing,' other forms of cyber flows re-contextualize some hub-sites as parts of the flow(s) rather than as parts of their geographical contexts. They start to live as much or more from the flow than from their physical location. The disjunctive effects of the emerging

new maps are plentiful. In Figure 1's global remoteness map, it is possible to see how the speed of physical access – in hours and days – can rearrange the relevance of the global political map to a major city of 50,000 inhabitants or more.

**Figure I: Global Remoteness Map**



*Source: Joint Research Centre of the European Commission*

Although the disjunctive effect refers to the power of flows to reshape geopolitics and geoeconomics, it should be noted that – as in the above maps – it is usually directed towards the existing global distribution of power and hierarchies. The map of cyber flows, for instance, highlights existing power hubs in the United States and in western Europe, rather than any radical redistribution of power.

One dramatic effect of such flows, however, has to do with their ability to contest unitary national identities. If publics and elites in a particular region understand that the vibrancy, prosperity and security of their region may be more related to the vibrancy, prosperity and security of other regions beyond their current national borders, as compared to regions within their own country, new political and economic dynamics may emerge.

Another dramatic effect of such flows has to do with their ability to pinpoint emerging types of global exposure and vulnerability. The unwanted effects of flows are clear. Illicit flows of

criminal activity disrupt and alter communities. Legitimate global flows may suffer from various interruptions and shocks wherever they occur. Integrated logistics solutions involving sea, air, space, and cyber modalities are in a constant reactive mode, experiencing different types of “shocks.”

As digital modality comes to affect most aspects of life, cyber flows are essential for the proper functioning of the overall system of flows that transports goods, people, and information across the globe. The security of the underlying flow system – i.e. flow security<sup>4</sup> - is dependent on the general hub-and-spoke network structure. Although highly directed, such currents can be susceptible to ‘eddies’ that create over-flows, by-flows, and side-whirls that can interfere with or disrupt the intended flow of the mainstream. We have all experienced these as unexpected delays, interruptions or cancellations. These disruptions distract and frustrate. They can cost time, energy and money. They take us offline, make us wait, or cause us to try alternative routes. The nature and frequency of such flow problems can highlight the relative power of a particular region, entity, group or individual to connect; their relative remoteness from the main global hubs; and thus their relative resilience. Such disruptions may be measured in milliseconds, but can have outsized social, economic and geopolitical consequences; they have the potential to alter the global political map.

Illegal shadow flows – e.g. of drug smuggling, arms trade, money laundering, human trafficking, and cybercrime – are gaining in importance and can be powerful in shaping local contours of power. For instance, it used to be that criminal organizations had a parasitic relationship with the local polity in which they were based. Today, however, such criminal activity may create symbiotic relationships with regional, national or international reach, and perhaps lower the incentive or ability of local authorities to completely paralyze or kill it off. Central American drug flows are illustrative of this dynamic.

## **Figure 2: Global Cocaine Flows**

*Source: UNODC World Drug Report 2010.*

The above map shows the flow of cocaine from production sites in Latin America to markets mainly in the United States, but also in Europe. The disjunctive effect is intense. It shows how networked organizations can live off the flow itself instead of local polities. This gives them immense economic and political power compared to those state and local polities that exist along

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<sup>4</sup> E.g. “Without necessarily making territorial security less important, I would argue that “flow security” is the true challenge for the decades to come.” Swedish Foreign Minister Carl Bildt in Mexico City, February 8, 2010; <http://www.sweden.gov.se/sb/d/7417/a/139273>.

the flow. These phenomena are generating destructive and crisis-inducing effects in many parts of the world; new approaches are needed to address them.

The speed and scale of flows are important factors determining their overall impact. They are influenced especially by business practices. For example, the cyber-dependent, just-in-time business model relies on regular and planned access to materials and products. Factories need not spend resources on storage since they can count on the logistic flows that deliver in pre-calculated ways. This means that factories are increasingly dependent on the regular flows of materials and resources. The logistics of the flows gain importance at the expense of local resilience and autonomy. Similar to the dependency on the just-in-time business model, actors are increasingly reliant on the existence of cyber flows that allow instantaneous access. From inventory systems and sales sites to information transfers, peoples' lives are intertwined with the regularity of global digital data flows. The scope of cyber space assets – linked to data networks – such as satellites and launching systems even enables navigation by both ships and aircraft. The flows of materials and goods reshape the map by allowing new models of arranging everyday life irrespective of distance.<sup>5</sup> Moreover, the rhythms and tempos of these flows are becoming the main dynamos of life for people who are most directly affected by such flows. The intensification – the pulse – of inter-local processes is becoming regularized. This regular humming of global flows is needed to support contemporary lifestyles, as can be seen in modern consumer societies. Haphazardness or disruptions can be indicative of lesser access or more peripheral location of a person or community in the emerging global hierarchy of power. The degree of regularization – of the flows in and out, and the absence of counter-flows, disruptions, and turbulences – is a key measure of the power to adapt to and harness successfully such global processes.

The system of flows requires secured access points. Harbors, airports, fiber optic cables, cloud servers and satellite launching capabilities are examples of such access points. The range of these access points facilities integration into the flows. Sustained capacity to tap into the flow requires interoperable technologies – e.g. airports able to handle different types of planes and computer systems able to work with extensive cross-border passenger information. Interoperability poses demands also to education systems, as people have to know the standards by which world-class flows take place. The standards created elsewhere have to be understood and applied. In some cases, new standards can be either developed or innovated. However, this norm entrepreneurship is more likely to happen near the global knowledge production hubs that have research and development as well as academic research clusters.

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<sup>5</sup> David Held et al., *Global Transformations: Politics, Economics and Culture* (Stanford, CA: Stanford University Press, 1999). p. 15.

The entanglement between localities at distance and the whole system is remaking the geopolitical map. The global map of flows shows considerable unevenness; access to flows is distributed unequally. Access points are clustered around places where there is major economic activity: “The world has long been – and still is – a space where economic and political relations are very uneven; it is filled with lumps, places where power coalesces surrounded by those where it does not, places where social relations become dense amid others that are diffuse. Structures and networks penetrate certain places and do certain things with great intensity, but their effects tail off elsewhere.”<sup>6</sup>

The major global harbors, airport hubs, and digital companies, and their associated cloud servers, tend to be located near each other. These regions also have production facilities, financial centers, major universities, and security producers such as effective state armies or private security providers. These regions allow life to be insured by companies that can reduce the risk of adverse events. They also have internet security actors who can facilitate the maintenance of steady cyber connections.

The standardization, interoperability, and access points are based on integrated material technologies and know-how. These technologies, in turn, create structural pressures for new types of political arrangements. Political solidarity has tended to be shaped by the ideologies of nation-states, and after the Cold War by liberal democracy. Now political solidarities can cross state boundaries, as in the case of social media communities such as Facebook and Twitter. People can spend hours of their day online, participating in communities that cross national boundaries. The corporations that maintain these cyber connections do not exist in a political vacuum, even though their independent power to determine such things as people's privacy is widening. The judicial and regulatory frameworks within which they operate, however, are provided by states or supra- and international organizations. The power of such entities to construct and enforce such frameworks, in turn, is quite differentially distributed. The states with major access hubs and standards power create rules for other. In this sense, the United States remains in a predominant position, although its ability to act as a single unitary actor is made harder by the increasingly predominant influence of actors and lobbyists who that represent these emerging dynamic global processes. For smaller states, the power of international organizations, and coalitions with more powerful states, have become increasingly vital.

The emergence of the flow world – in which a person may be more engaged with such flows than with their local surroundings – contains also dystopian characteristics. Besides the global

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<sup>6</sup> Frederick Cooper, *Colonialism in Question: Theory, Knowledge, History* (Berkeley: University of California Press, 2005), pp.91–92.

hubs and spokes, there are 'black holes' that may form a system of anti-hubs.<sup>7</sup> In these politically or regulatory failing or failed anti-hubs, access to mainstream flows may be minimal, while access to illicit or illegal shadow flows may be open and unregulated. These black hubs, in turn can have their own satellite system of 'black spokes' that facilitate flows of drugs and human trafficking and are catalysts for instability. Spokes are composed of places where cyber security is not maintained and computer systems are vulnerable to acting as relay stations for broader attacks.

The Democratic Republic of Congo, for example, has been in a state of failure for 20 years. However, its vast mineral deposits have been flowing out of the country and ending up in such high-added value products as mobile phones. These shadow flows have supported local criminal, terror, and rebel groups and sustained high levels of corruption among state officials.

In a related way, Nigeria is an important point of origin for many cyber scams; it may be considered to be a black hub of cyber because its authorities lack the will and ability to tackle cybercrime.<sup>8</sup> Nigeria is often used as identifiable source of the email scams because the country has a reputation for being corrupt, which "makes the strange tales of dodgy lawyers, sudden death and orphaned fortunes seem plausible in the first place."<sup>9</sup> Nigeria's perceived corruptness makes the country and its IP-addresses useful as a hub for cyber-scammers.

These examples offer simplified accounts of the "dark web." Besides scammers, there is a growing online trade in stolen identity and credit information. This trade in credit data – and in goods such as drugs and medicines – is conducted by internet crime networks that can be located anywhere on the globe. Although the servers are usually outside of the United States and money is laundered through tax havens, the individuals or groups running them can be in or near legitimate cyber-hubs, where the necessary technical and financial know-how exists. From this perspective, the black hub-and-spoke system can hide the perpetrators, who can go to great lengths to disguise their real location, and thus creates a serious attribution problem. In addition, most shadow networks operate along the same routes and means as sanctioned systems, making it hard to separate geographically illicit networks from licit flows. Such black flows such as drugs or human trafficking can even operate in reverse, i.e. instead of transporting people and goods from peripheries to hubs, they often are in the business of moving people and products from hubs to the peripheries of world hierarchy.

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<sup>7</sup> Michel-Rolph Trouillot, "The Anthropology of the State in the Age of Globalization: Close Encounters of the Deceptive Kind," *Current Anthropology*, Vol 42(1), 2001, p. 129; James Ferguson, *Global Shadows: Africa in the Neoliberal World Order* (Duke University Press Books, 2006).

<sup>8</sup> The scams related to Nigeria come either from inside the country or from the adjoining countries. Cormac Harley, "Why do Nigerian Scammers Say They are from Nigeria?" <http://research.microsoft.com/pubs/167719/WhyFromNigeria.pdf>.

<sup>9</sup> *The Economist*, "Blatancy and latency- Why internet scams seem so obvious," available at <http://www.economist.com/node/21557726>.



The overlap among different legitimate and shadow flows can generate powerful and often contradictory gravitational forces in the localities where these flows connect. Such flows rely on a secure environment, yet may bring with them immense vulnerabilities. They can empower and disempower, create opportunities or disadvantages for particular entities, groups or individuals in a given location, and thus can be transformative for geopolitics.

### Flow Security and Power

The key to understanding the political ramifications of global flows is to examine their intimate relationship with power. Flows characterize the crosscutting feature of the interconnected global domain. The relative ability to command such flows, control their paths and practices, and find ways to adapt to them can signify power or lack of it. Arguably, the global dynamic of interconnection is increasingly the basis of modern life, irrespective of state boundaries. However, this mobile fabric is not evenly spread throughout the global sphere. Its corridors are highly differentiated and structured in ways that mirror the world order and its distribution of power. Based on material technologies and on socially shared practices of interoperability, they follow a hub and spoke pattern akin to that of international air travel.<sup>10</sup> However, one should not forget that the emergence of the flows does not take place in a historical or conceptual vacuum. In several ways, the developments in Western geostrategy and geopolitics have long contained scenarios where power has been seen in terms of flows and mobilities.

Power and mobility can be seen as highly interchangeable concepts in the canon of Western modernity. The most influential manifestations of the “flow and power nexus” are U.S. geostrategic imageries. For instance, the mythical notion of ‘frontier’ provides a case of how United States has seen itself as a power on the move.<sup>11</sup> Power, in this sense, is moving power, i.e. power to produce, maintain, and secure continuous mobility. This ‘mobility as power’ theme fits well what Daileda concludes under the heading “America on the move”: “transportation in all its modes embodies the uniquely American ideal of Manifest Destiny”.<sup>12</sup> Daileda continues to make

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<sup>10</sup> The tight conceptual bridge between imperial governance structures and hub and spoke political architecture is often made in the research literature (e.g. Alexander Motryl, “Why empires re-emerge: imperial collapse and imperial revival in comparative perspective,” *Comparative Politics*, 31 (2), 1999; Hafner-Burton et al., “Network Analysis for International Relations,” *International Organization*, 63(3), 2009. For example, Nicola Phillips in *U.S. Power and the Politics of Economic Governance in the Americas* (2005, p. 3) sees a distinctly “hub and spoke” set of regionalist arrangements in the Americas that has allowed the U.S. to “capture control of the governance agenda and to ensure that the regional economic regime takes a form consistent with U.S. interest and preferences.”

<sup>11</sup> E.g. John R. Eperjesi, *The Imperialist Imaginary: Visions of Asia and Pacific in American Culture* (Dartmouth: Dartmouth College Press, 2004), p. 59.

<sup>12</sup> D. A. Daileda, “America on the move,” in N. Solomon and R. Ivey, eds., *Architecture: Celebrating the Past, Designing the Future* (New York: Visual Reference Publications, 2008), p. 225.

a point about exceptionality of air-mobility as the new 'final' frontier: "...air travel made distance a completely manageable obstacle." Nearly instantaneous cyber flows can be placed along this continuum of managing distance. Technologies for the management of crossing distance have generated not only highly regulated but also regular form of power and governance, and thus become tools in the process of controlling, ordering, and managing the consequences of human interaction. Moreover, such tools can be both material and ideational.

In other words, flow security and power are closely related to mobility management practices and embedded technologies. Sustained, effective governance – both national and global – derives from and is dependent on the engineering of various technologies of mobility. This governance mentality of mobile power has been developing towards a relatively de-territorial and de-centralized global system of asymmetric interdependence.<sup>13</sup> From this mobility-centered paradigm, scenarios of interdependence are developing beyond the static spatiality inherent in the term 'network' towards conceptualizing global processes in terms of flows and circulations. Visions for evolving global structures of power are less and less static. The imagery is more dynamic and fluid, focused on flows – regular and unstable – that are becoming increasingly significant, and suggest that in such systems even the nodal points may move.<sup>14</sup> This imagery's fluidity and flexibility is accordingly far from the geopolitical maps of Cold War times.

Emerging flows have a logic that is hard to control by territorial entities such as states, unless those entities are prepared and able to transform themselves, at least partially, into flow-like entities. Moreover, global flows are generating their own expressive language, which is becoming increasingly central to how actors' power and security are benchmarked and evaluated. How smooth is a particular state's or region's access to the global flow-dynamic? How well are the access points secured? How resilient are they and how well is their continuity guaranteed? How they can secure a more stable hold on these often moving hubs? Are they willing and able to attract the building of further access points (harbors, airports, data cables, cloud servers, etc.)?

Flow specificities are becoming increasingly expressive. Various actors and publics are trying to make sense of their regional and global surroundings through the increasingly nuanced and

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<sup>13</sup> E.g. M. Hardt and A. Negri, *Empire* (Cambridge, MA: Harvard University Press, 2001), pp. xi-xiii, 160; J. Urry, "Aeromobilities and the global," in Saulo Cwerner, Sven Kesselring and John Urry, eds., *Aeromobilities* (London and New York: Routledge, 2009), p. 34.

<sup>14</sup> Robert D. Kaplan, in "How We Would Fight China" (2005, p. 53) calls aircraft carriers "the supreme icon of American wealth and power, the aircraft carrier" and Michael Horowitz, in *The Diffusion of Military Power: Causes and Consequences for International Politics* (2010, p. 65) declares that "short of the atomic bomb, nothing signifies the power of a great nation like ... a fleet of aircraft carriers". See also Norman Friedman, *British Carrier Aviation: The Evolution of the Ships and Their Aircraft*, (London: Naval Institute Press, 1988), p. 384.

sophisticated language of flow movements – e.g. regularity, resilience, disturbances, disruptions, and counter-flows. More and more, actors are exploring their wider political identities and connections in a world of flows. The answers to the question “Who am ‘I’, ‘you’, ‘we’ and ‘they’” are increasingly related to the sense and feel of being part of things, people and ideas coursing through global flow systems. Citizens are sensing their global position and the health of their region or country through the ease at which they can travel, find information, do business, maintain social relationships, use the banking system, or order goods online. And as technological systems and flow practices become ever more deeply integrated into modern life support systems, tolerance of disruption is shrinking.

The tendency of individuals or communities to use flows as indicators of their relative position in the global hierarchy of power explains one focal point of the nexus between mobility and political power. The global position of a state -- and actors within it -- is increasingly dependent on (ir)regularities of its access points to key global flows.

Global flows themselves can also create new contexts for crisis. Problems with underwater digital cables have caused widespread disruptions in banking systems. Ongoing piracy off the coast of West Africa or in the waters of Indonesia demonstrates the potential ramifications of a flow disruption and, on the other hand, the growing importance of good resilience practices by the maritime shipping industry. Local, regional, or even global crises can be sparked by flow-related problems. From this perspective, the root causes of a particular crisis may not be local, but they can have dramatic local impact.

Besides bringing new types of 'flow crises,' the flows paradigm offers a new perspective to more traditional forms of crises, as the flow dimension is increasingly present in such crises. This dimension can manifest itself in a number of ways. First, there is increasing recognition that flow-related dynamics can contribute to local crisis by creating particular political economies reliant on transnational circulation of, for instance, soldiers, funds, weapons, blood resources (minerals, drugs, etc.), and refugees, and that both licit and illicit or shadow flows can and often do take place in the same flow corridors. Second, there is a growing awareness of the various ways in which a territorial political crisis may spill over to disrupt the steadiness of global flows. State failure in Somalia, for instance, manifested itself as piracy disrupting the southern maritime corridor of the global economy that runs through the Gulf of Aden, resulting in several multinational counter-piracy military efforts. The piracy problem, and the nature of the response, may be seen as possible portents of future *flow crisis management* mechanisms. Third, as access to global flows becomes increasingly imperative to states, different sanction regimes are becoming part of emerging flow politics. Sanctions on Iran, for instance, are forcing the country out of global flow dynamics and, therefore, denying it important sources of financial and political capital. Just as the 'carrot' of enabling access to global flows is important, so is the 'stick' of denying or disrupting access to such flows, in terms of conditioning state or group behavior.

In addition to crises in flows themselves, circulatory and flexible flows can become a constitutive feature of local violent crisis. Greater attention is being paid to the notion that global flows are often connected with local security and order. These flows, in turn, are also significant mechanisms supporting the prevailing world order and most visible articulations of power.<sup>15</sup> The overall mobility system is a beacon of modern, liberal, and cosmopolitan ideals of diffused power.<sup>16</sup> Nonetheless, in many cases such liberal, cosmopolitan spaces can be enabled by, or themselves enable, illiberal structures of security and power.<sup>17</sup>

### **Flows as Contexts for Geopolitical Innovation and Transformation**

Global critical infrastructure may be seen as dynamic contexts of cognition and ideas as well as people, goods, and information. They move physically, yet also cognitively, culturally, and politically. Knox et al., citing Castells,<sup>18</sup> calls them “spaces of flows” that emphasize temporal qualities such as process, speed, fluidity, improvisation, and flexibility over more static notions of space and networks.<sup>19</sup> On the other hand, flows are particularly susceptible to mutual resonances and dissonances. Mobility systems are perpetually in constant reactive mode of experiencing different types of disruptions. This condition has been referred to as ‘constant-shock syndrome’: “There is no doubt that the public has become highly sensitized to risk, both real and perceived.”<sup>20</sup> The flows themselves are in a continual state of reflexivity, self-monitoring, and self-repair. The flow’s underlying mechanisms fails here and there, even as it interacts with other currents.

The tempos and pulses of the flow are such that, besides producing a sense of sequential monotony, they can bring forth consonant contrivances within a broader temporal context of social interaction.<sup>21</sup> Adey,<sup>22</sup> drawing from Urry (2003) and Deleuze (1988), highlights the

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<sup>15</sup> Urry, op. cit., p. 32; Adey, Peter et al., "Flying Lessons: Exploring the social and cultural geographies of global air travel," *Progress in Human Geography*, 31(2), 2007, p. 780.

<sup>16</sup> Gillian Fuller and Ross Harley, *Aviopolis: A Book About Airports* (London: Blackdog Publications, 2005); S. Kesselring, "Global transfer points: The making of airports in the mobile risk society," in S.B. Cwerner, S. Kesselring and J. Urry, eds., *Aeromobilities*. (London: Routledge, 2008), p. 86.

<sup>17</sup> E.g. Giorgio Agamben, 1998, *Homo sacer: Sovereign power and bare life*. (Stanford, CA: Stanford University Press), p. 123; Michael Dillon and Julian Reid, "Global governance, liberal peace and complex emergency," *Alternatives*, 25(1), 2000, p. 117.

<sup>18</sup> Manuel Castells, *The Information Age: Economy, Society and Culture, Vol. I: The Rise of the Network Society* (Oxford: Blackwell, 1996).

<sup>19</sup> Knox et al., "Rites of passage: Organization as an excess of flows," *Scandinavian Journal of Management*, 2007, pp. 23, 266.

<sup>20</sup> *Ibid.*, p. 266.

<sup>21</sup> International air traffic flows provide well-experienced examples of the constant interferences across a wide spectrum of possibilities: “The accumulation of factors - 9/11, the bombings in Bali and the Philippines, the Iraq war - meant that the arrival of the ‘killer mystery virus [SARS]’ hit a nerve that was well and truly

endless possibilities inherent in the process of flow-related emergence: "...speed and slowness means that is difficult to know" what will end up happening, what combination of events will take place. Experimentation with different positions at the flow-hubs produces predictable yet not determined results; hubs become *avant garde* playpens of both technological and geopolitical experimentation. From the perspective of designers and users, the overall flow systems provide a very different playing field than that offered by traditional nation-states. The overall combinatorial play is constant. It is about experimenting and innovating. However, it is also about random processes such as shutdowns, disruptions, and accidents. On the whole it is about designing and gauging how the 'Legos' of the mobility 'playpens' can be arranged and combined and how they cannot, even if we experiment and try very hard.

### ***Case Study: The Emergence of Millisecond Geopolitics***

Although the revolution in information technologies poses major challenges to big and small states, the basics of cyber-geopolitics are becoming clearer. The United States is the central node through which most digital information flows. Major U.S. digital companies, from Amazon and Apple to Microsoft and Google, have created popular services via efficient digital routes. The likelihood of an email from London to Manchester or from Stockholm to Moscow passing through a U.S.-affiliated actor is high. This creates pressures for smaller states to collaborate in cyber surveillance matters with more capable private and public actors. At the same time, the tools that can be used by other government authorities from other states may collide with certain principles, such as privacy protection, important to those smaller states. The business interests of companies from third countries – e.g. from Russia or China – can also weigh in the calculation of different government authorities as they plan their national cyber strategies.

The geopolitical practice in cyber has been seen as replicating the existing state of affairs since the end of the Cold War: states, especially the bigger ones, are establishing their parallel structures in cyberspace. However, the cyber aspect highlights a new vision of world order based as much on the geopolitics of milliseconds as on strategy based on geographies. These two tendencies are relatively reinforcing, since the ability of communicate more instantaneously is not distributed evenly. It reflects the existing hierarchical world order that places the United States and the West at the center of the map, even as some other countries or regions are making significant gains in comparison with older geopolitical actors.

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exposed" (Thomas 2003, 30). Airlines are vulnerable to world economic (e.g. 2008 recession) and geopolitical (e.g. 9/11) events as well as to pandemics (e.g. SARS), natural catastrophes (e.g. the ash cloud episode), and accidents (e.g. the crash of the plane carrying the Polish political elite). Besides these types of accented eddies, the aero-mobility dynamic mediates and reflects other more explicitly political dynamics. Some of these are quite situational/random, yet others are by now relatively well established.

<sup>22</sup> Peter Adey, "Airports, mobility and the calculative architecture of affective control," *Geoforum*, 39(2), 2008. p. 447.

Trading in financial products needs increasingly speedy connections across global financial hubs, and is driving the development of the geopolitics of milliseconds. This practice drives global technological innovation, but it will also have local or regional effects, for instance in the Baltic Sea region, as its practices seep into broader political and security discourse.

Contrary to often-repeated slogans, the global digital information network is not instantaneous. Einstein's theory of relativity gave the universe a finite speed. The speed of light was determined to be the ceiling. 300 km per millisecond is also the maximum speed at which information flows in the global arteries of the digital realm. This limit on the transmission of information might seem trivial. Yet, every millisecond counts in the cyber commons. A few milliseconds can be as important to transactions of global exchanges in London (banking), New York (stocks) and Chicago (financial futures) as the week that could be saved for maritime shipping by opening up the Northern Sea Route. The speed of information flows is becoming increasingly imperative as a factor influencing the location and profitability of the connections to major financial systems.<sup>23</sup>

The complexities of the intertwined financial system are affected by underlying digital networks. For example, the Chicago-based futures exchanges influence how stock markets move in New York. Any upgrades in one place resonate across the entire global trading system. This complexity opens more room for taking advantage of almost infinitesimal differences in time and discrepancies in setting prices. The better temporally-enabled servers and situationally-aware algorithms are able to detect these anomalies, the better they can exploit them. The cyber-based financial arms race is based on these underlying factors. The practice of high-frequency trading is seen as a cause for market volatility, and was implicated at least one major incident. The so-called flash crash in May 2010 shaved about 10% off of the trade market value in matter of a few moments. Besides leading to lightning-fast and sometimes significant market reactions, the practice is seen as conducive to unfair market practices. Some firms get more privileged positions in the markets because they can buy into speedier access. The risks of market manipulation grow. The feeding of wrong information can echo across the markets in highly damaging ways when the system is calibrated to react automatically, in a split second, when new information becomes available. Regulators are considering new guidelines and restrictions, yet the challenges of real-time responses are apparent.

As a general rule of thumb, one's gains from financial trading via data flows decrease the weaker one's processing power and the further one's distance from major trading hubs. The connections between Stockholm and London or Helsinki and New York do not take place through a straight path that would have been optimized for Swedish or Finnish users. Furthermore, even such optimization would not be able to eradicate the actual geographical distance between Sweden or Finland and the major financial hubs. Geography still matters to the geopolitics of milliseconds.

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<sup>23</sup> In 2007, it was estimated that, for a New York major brokerage firm, one millisecond advantage translates into profits worth \$100 million a year ("Wall Street's Quest to Process Data at the Speed of Light", Richard Martin, April 21, 2007. [www.informationweek.com/news](http://www.informationweek.com/news)).

More remote locations are in a disadvantageous position; it is hard for them to match the gravitational pull of the financial hubs on those interested in the fastest and most powerful connections. Advantages have to be gleaned from other aspects of cyber-related economies.

The logic of milliseconds is an increasingly influential driver in the building of transatlantic fiber optic cables. Transmission speeds between London – a traditional relay station of financial transactions – and New York – the most diverse financial hub – are especially vital. Having privileged access to these cables is expensive. However, any new cable that can shave off milliseconds from the average transatlantic transmission speed of about 64 milliseconds is financially viable, despite the initial investments required, which are in the hundreds of millions of euros. Lucrative trading opportunities can be opened up with speedier connections, better processing power, and optimized algorithms. Benefits outweigh expenses.

The race to build new cables or upgrade existing ones is based on the principle that shorter is faster. Latency time is measured by the temporal difference between starting a transaction and completing it. This means that one key factor is the length of the cable, since the speed of time is finite. Every kilometer of cable counts. The logic of shortness is vital in calculating routes for future cables. However, this logic also carries some risks. Cables that run through shallow waters may be more exposed to human or natural disruption, whether from fishing or from whales and sharks, and may be more susceptible to espionage and surreptitious tapping. Deeper lines are more costly, since they need protective layers – e.g. steel covers -- or need to be dug into the sea floor.

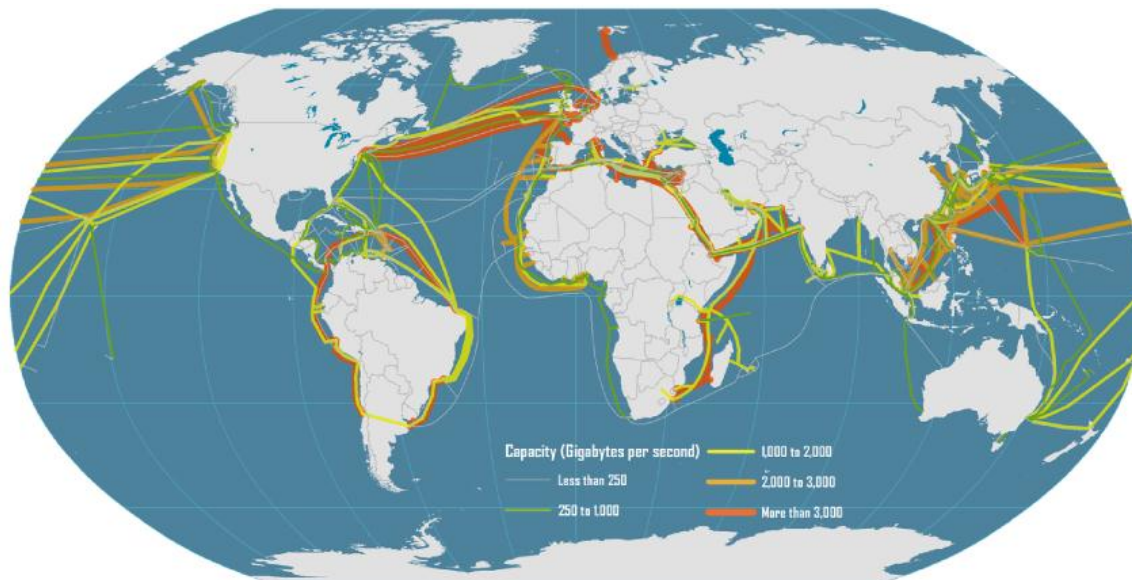
Another driver of the race for milliseconds is the need to respond to the changing habits of people, whose demand for more rapid and thicker bandwidth transfer of data and video is crowding existing networks.

In response to these demands, innovations in technology continue, since information transfer speed is influenced not only by distance but by processing power and efficiency of algorithms in encoding and decoding. Even as high-frequency trading continues to develop via fiber-optic cables, other technologies are emerging. A chain of microwave dishes, for instance, can replace or complement an infrastructure of fiber-optic cables, especially where the costs of building new land-based cables can be very high, for instance in urban environments. Wireless technologies are becoming the new norm in digital communication outside the special but highly profitable field of high-frequency trading. The technology based on microwaves is well-known, as it was used by telephone operators already in the 1970s. The idea is simple. Whereas land-based cables have to take into account the specific topography of a terrain, a microwave tower is better able to approach the ideal of straight line. There are some additional risks, for instance bad weather or poor data capacity, that limit the possible uses of such new networks. The building of the land-based microwave route also requires significant investment, and takes time as permits are needed

to place the dishes on tall structures in different jurisdictions. The straight-line logic does not give much room for make it easy to obtain building and other permits. Moreover, fiber optic networks can carry thousand times more information than a system based on microwaves. Nonetheless, a microwave system at the margin can make a difference, and despite all these hurdles, the race is on to build a transatlantic microwave network that would enable superfast trading. It would be supported by a system of barges, drones, balloons, and/or satellites. Many such plans are secret and proprietary, and even when such projects may be realized they might remain known only to their investors and users.

A second alternative or complement to high-fiber optic cables is also being developed. Laser technology, first developed by the U.S. military for the communication among aircraft, offers advantages over microwave connections because laser beams are less affected by weather. Its reliability is close to that of fiber optic networks.

**Figure 3: Map of global submarine cable networks**



Source: [https://people.hofstra.edu/geotrans/eng/media\\_maps.html](https://people.hofstra.edu/geotrans/eng/media_maps.html)

These new technologies and practices are spreading from the United States to Europe and to Asian financial centers. Microwave connections, for instance, have recently been built between strategic hubs such as Frankfurt and London. Along this route, laser technology is also likely to become established practice in a matter of months. This has almost halved the latency time associated with fiber optic cables. The distance between these two major financial hubs has been halved; whereas the distance used to be about 4 milliseconds, it is now just a bit more than 2 milliseconds. In this sense, the two cities are closer than ever and their communities of traders intimately intertwined. The route has now more than one competing network owned by U.S. and Europe-based companies.



These innovations means that high-frequency trading practices that prevail in the United States are likely to spread also in Europe as newer technologies are introduced. In the United States such practices constitute the majority of all trade, and now account for a large plurality of transactions in London and Frankfurt. High-frequency trading is still small scale in the Nordic exchanges based in Stockholm. However, its rapid growth is a driver for the building of new connections between Stockholm and London/Frankfurt and between Stockholm and Moscow. The planned cable connection across the Arctic sea to Asia can be also seen as opening one more opportunity for high-frequency trading.

Another important element of the race to win milliseconds is to move servers closer to the exchanges' data centers. This logic of co-location seems to increase the hubbing-effect in the cyber-dependent financial system: servers are attracted to servers. The closer they are to each other, the greater their potential advantage over microwave and laser technologies. High-frequency trading companies are directly wiring their connections and servers into the heart of the exchanges.

The advantage of a single millisecond can generate significant profit. This is a high stake game of relative gains. Not only do you need a fast connection, you need a connection faster than that of your competitors. This means that for a company based in the Nordic area, latency times are much longer than for competitors in London and Frankfurt-based companies. They are at an inherent disadvantage, which means that some business and trading models are not available to actors located in more peripheral regions.

There are other practices, however, that can be sustained in more remote locations. For example, Finland has a relative advantageous location as a relay point between East Asia and Europe, as is borne out by the country's air-traffic infrastructure. Finland can also gain from business models for fiber optic networks that are not built around high-frequency trading, for instance those based more on connecting cloud-servers and serving users who need bandwidth- heavy formats.

Moreover, the ability to exploit asynchronous stock values financially is not limited to places with speedier connections, such as London and Frankfurt. On a smaller scale, the potential for exploitation exists between any exchanges. In this sense, the logic of milliseconds should also drive Stockholm-based trading actors. The connections between Moscow and Stockholm, which have improved, offer opportunities for beneficial value proposals.<sup>24</sup> This also drives the need for better connections to Germany and the UK along a straighter line across the seas. Such connections also offer alternatives to Moscow-based traders since they would shave milliseconds off of a

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<sup>24</sup> The London Stock Exchange trades Russian securities in its IOB market. These securities are also traded in Moscow, thereby opening possibilities for arbitrage. For example, the stocks of Gazprom are listed in both, leading to small differences in the value of the same security that can be exploited if you have a faster connection than others.

connection between Moscow and London or between Moscow and Frankfurt.<sup>25</sup> The exploitation of emerging and developing markets is a key driver for the building of Northern-European fiber optic networks. The emerging of new trading practices in Europe is changing perceptions that northern Europe is disadvantaged with regard to cyber market access. Much depends on how well Nordic capitals and other business centers are connected to as many as possible hubs as possible.

### **Cyberflows as Geopolitical Drivers in the 21<sup>st</sup> Century**

The cyber commons is an important driver of current and emerging flow connectedness. Cyber-attacks and the vulnerabilities that enable them have been steadily increasing. According to Cisco's annual report on cyber security, the attacks are at unprecedented levels.<sup>26</sup> However, despite growing risks related to cybercrime, the overall infrastructure development is driven more by such factors as technological innovation and new business potential inherent in the cyber commons.

To truly understand the background factors, the key developing communities of practice needs to be mapped. For example, the state system is under heavy pressure from the cyber dimensions of peoples' interaction. It is adapting by trying to devise access strategies at the national level. States are connected political entities that have resources at their disposal to assist in building infrastructure. They can be instrumental in shaping societal agendas through their research and development strategies. Some are reformulating their national security strategies towards emerging security conceptualizations such as resilience, agility, adaptation, and preparedness. These newer national security practices are constitutive elements of “cyber-ization.” If the hardware is detached from this community of state practice, the underlying trends become much harder to discern. Similarly, without greater understanding of the motivations and methods of different hacker communities – i.e. criminals, terrorists, or states – risk mapping and horizon scanning are relatively meaningless.

The geography of cyberspace includes countless companies operating cloud-servers, social networking sites and banking systems that are accessible to actors of all shapes and sizes. Distance is relatively inconsequential in the near-instantaneous cyber context, yet the politics of power and the race to gain financial advantage still matter. These are not evenly distributed in the map. Historically-embedded national contexts and belief system, state capabilities and wealth, and ethnic and religious patterns are examples of older geopolitical notions that still matter in at the age of global internet. Actors new and old are located on the political map, which also sheds insight also into the structures and hierarchies of cyberspace. On the other hand, state boundaries are not easily replicated in cyberspace. While there are some attempts, such as the Chinese national

<sup>25</sup> Indirectly, Helsinki benefits from the new Swedish connection to Moscow built by TMX Atrium (owned by Canadian company TMX), and the recent faster connections between Stockholm and London. Moscow traders - based on Micex-RTS exchange - can connect much more directly with London - about 40 milliseconds faster.

<sup>26</sup> Cisco, *Annual Report on Cyber Security*, 2013,

[http://www.cisco.com/web/offer/gist\\_tty2\\_asset/Cisco\\_2014\\_ASR.pdf](http://www.cisco.com/web/offer/gist_tty2_asset/Cisco_2014_ASR.pdf)

firewall and internal cyber censorship, to do so, on the whole such efforts are rather feeble and futile, as they are easily bypassed by people with knowledge.

This complexity can be reduced if the various activities in the cyber context are seen as embedded in communities of practice. These communities establish, maintain, develop, and innovate intertwined practices where such activities as social networking, cyber defense, or global logistics take place. Without understanding the transnational communities of practice, any insights into cyber are context-less and overall technological. Any risk analysis that does not take into account the communities of digital information flows is bound to lead into paralyzing complexity of hundreds of thousands of possible vulnerabilities. Only by understanding cyber as a part of overall human activities and motivation it is possible to evaluate the actual likelihood of disruptive behavior caused e.g. by credit card fraud or power struggles between states. Purely passive, self-contained and self-focused, internet security is difficult to achieve if the nature and range of possible exploiters is not known. The maxim "know thy enemy" is very relevant in the world of cyber geopolitics.