Risk, transnational regulation and the public good:

insights from internet address management

Jeanette Hofmann shows how moral conceptions of public good underpin technical controversies on the internet space

Without drawing much public attention yet, the Internet is at risk of running out of Internet addresses. The pool of unallocated addresses could dry out as early as July 2012. In the face of the pending crisis, controversies among experts are flaring over the right courses of regulatory action and the risks they might involve. My research shows that the competing perceptions of risk in this domain resonate with different notions of the public good.

Communication services such as telephony or postal mail require a universal addressing system in order to connect people. Well known examples are telephone numbers, postcodes or house numbers. The addressing system of the Internet has been likened to a language that enables global interaction across different network architectures. Without such a uniform language, the Internet wouldn't exist. The introduction of the technical standard defining the Internet address space, Internet Protocol version 4 (IPv4), is considered the 'date of birth' of the Internet.

From a regulatory point of view, the address space of the Internet differs from that of older communication infrastructures such as the telephone networks in several ways. First, users hardly ever notice it because it is hidden. Internet users don't type numbers to access a webpage, they type names which resolve into numbers. For example, 'www.lse.ac.uk' may resolve into '158.143.29.38'. Second, the address space of the Internet is finite. While the number space of telephone networks can be expanded by a digit when it reaches its capacity limits, the address space of the Internet cannot but needs to be replaced by a new addressing system. Considering the number of Internet users, this is a truly complex task. A third important difference concerns ownership. While the telephone networks' number space is kept under state regulatory responsibility, the Internet address space is a common pool resource. The global reach of the address space and its non-proprietary character

raise the question of control. Who regulates the use of a global resource not owned by anyone?

The Internet address space is governed by five regional membership organisations each covering one continent. The Regional Internet Registries are independent of national governments or intergovernmental organisations. Their members consist mainly of Internet Service Providers, who are today the main 'users' of Internet addresses. The Regional Internet Registries have two roles: they allocate addresses to their members in line with the address policies set by their members, and they maintain a database, the registry, which records information about the holders of Internet addresses. Due to the constant need to set or adjust address policies, regulatory communities have formed both within and across the regions which discuss policy proposal over the Internet. Most of the active participants are technical experts with a leaning for the political implications of address policies.

The pending depletion of Internet addresses

Although the addressing space allows for more than 4 billion unique addresses, Internet addresses have become a scarce resource. In the 1990s, a new and much larger address space was developed to cope with this problem. However, in the absence of a global regulatory framework, no organisation was authorised and no plan devised to coordinate this major transition from the present to the future address space. Organisations did not adopt the new addressing standard and preferred to rely on IPv4. Due to the continuous growth of the Internet, the global demand for IPv4 addresses is accelerating and will soon exceed the remaining supply. According to recent calculations, the Internet may run out of unallocated addresses by June 2012. Since global connectivity will require the use of both types of addresses in the foreseeable future, it is expected that the demand for IPv4 addresses will persist for at least a decade after the pool of unallocated addresses has run dry.

The upcoming depletion of the Internet address space has been likened to the impact of the 1970s gasoline shortages on the industrial society. It is feared that the lack of addresses would not only

seriously hamper the future growth of the Internet but also put the governing structure of the address space at risk. The regulatory authority of the Regional Internet Registries is based on their monopoly in handing out addresses. Once the address pool is exhausted, the Internet registries have lost their means of enforcing policies. Against this background, the Internet Registries have been discussing various ways of alleviating the upcoming address shortage, for example, by reclaiming allocated addresses that are not in use. One particularly controversial policy proposal concerns the creation of a market for Internet addresses.

This proposal is based on the assumption that a significant share of the address space is underused and that monetarisation would provide incentives to offer addresses for sale. A higher utilisation efficiency is expected to extend the supply of IPv4 addresses by several years. However, Internet addresses have so far been allocated as loans based on a documented need. Holders of addresses are regarded as custodians who are obliged to return excess addresses. The creation of a market would thus represent a sea change in the governance of Internet resources.

At a time when the members of the Regional Internet Registries are debating the pros and cons of a market for Internet addresses, the actual consequences of the address space depletion are a matter of speculation. Regulatory activities for the Internet are facing the fragility of order and authority in the – nonetheless preferred – absence of an intervening state. The notion of risk plays an important role in the debates about the possible implications of address trading. For want of reliable data, the experts need to form their own opinions on the risks involved, their respective causes and means of prevention. As the passionate controversies show, many different risks can be associated with the address shortage and one of the few common denominators in this complex situation is the focus on regulatory action. The plurality of risks discussed by the Regional Internet Registries can be grouped into the risk of doing nothing and the risk of doing and thus changing something.

OUT OF STOCK

The risks of doing nothing and of changing something

The advocates of creating a market argue that a black market for IPv4 addresses is evolving right now. By refusing to accept the reality of address trading, in other words by *doing nothing*, they suggest, the Regional Internet Registries put at risk their policy authority and relevance. The proponents of a market expect that after the exhaustion of the remaining address space, the use and ownership of addresses will no longer be governed by regulatory policies but by logic of economic scarcity that imposes its own rules and incentives of circulation.

In this view, the risk of a black market would for now affect the Internet Registries and the database they maintain but ultimately the entire Internet infrastructure. As one of the authors of the market proposal points out, Internet addresses are odd objects that can be as easily copied as stolen. Without a functioning registry and a reliable database that accurately reflects the actual ownership of addresses, Internet addresses may begin to move and multiply without any control. As a consequence of a black market that evades the registry, addresses would lose their uniqueness and degrade into mere strings of numbers. A black market would also imply risks for the prospective buyers as they couldn't be sure that their purchases are not used by someone else. Chaos in the address space, however, would eventually endanger the Internet.

The opponents of a market for Internet addresses offer a very different risk scenario. In their view, combating a black market by means of creating an open market could lead to numerous undesirable side-effects and thus additional risks. For example, the trading of addresses may transform the common pool resource into an asset with the effect that the address space would be no longer governed by industry consensus but by property rights, tax and antitrust law. The creation of a market could thus entail governmental intervention resulting in the Internet industry's loss of its self-governance mandate.

Furthermore, monetarisation of Internet addresses is thought to corrode the community spirit and morals on which self-regulation has been based. Money is deemed to create opportunities for abuse and manipulation. For example, companies with large resources may hoard addresses for speculative purposes instead of returning excess resources to the Registries. The introduction of a market, indeed even the mere discussion of it, might be performative in the sense that it generates a monetary value for addresses where as yet there has been none. Once a market governs the movement of addresses, the Regional Internet Registries may find themselves without the authority to set or revise its rules and boundaries. New struggles over the address space could be the result.

Risks reflecting notions of the public good

The dangers ascribed to a market for Internet addresses suggest that in addition to the risks of *doing nothing* there are considerable risks related to *doing something*. The transformation of a shared public resource into a tradable good is regarded as dangerous, so dangerous in fact that to some observers the risk of a black market seems secondary. Put in a more abstract way, the anticipation and assessment of risks do not centre on one specific danger or harm but are in competing bundles of conflicting expectations, forebodings and conclusions. Some of the anticipated harms such as governmental intervention or the distortion of the community spirit can be, and are indeed, attributed to more than one course of action. The causal links between risks and regulatory action are not simply given and obvious, they need to be agreed upon. Hence, the development of a coherent and consensual understanding of the risks at hand turns out to be an important step in regulatory action.

It seems striking that all technical experts involved are selective in their perception of risks. While the proponents of address trading believe that a black market is already evolving out there, the opponents express doubts about both its existence and inevitability. For the latter group, a black market can be prevented by regulation whereas the former group expects regulatory authority to fade away

sooner or later. The Internet Registry members who prioritise the risk of a black market, regard the integrity of the address database as the most crucial registry function in need of protection. The Registry members who privilege risks attributed to the monetarisation and proprietarisation of Internet addresses, regard their common pool resource status and the related governance model as the core institution that need to be preserved.

The potential harm mobilised in support of or opposition to specific courses of action is by no means trivial. They pertain to central institutions, values and procedures of the policy field such as the integrity of the address space, the definition of addresses as a public good or the tradition of self-regulation. What is believed to be at stake here is nothing less than the foundation of the Internet and its governing structure. Mary Douglas has coined the phrase 'constitutional dialogue' to grasp the reflective, self-assuring elements of public controversies about risks. Constitutional dialogues, in her view, concern dangers that affect the 'life and limb' of a community.

Facing the exhaustion of the address pool, the Internet Registries may have reached a crossroad. The continuation of the existing regulatory process no longer goes without saying. A new and, perhaps, reduced understanding of the Registry's role might be needed in the near future. In this situation, both groups focus on dangers that concern what they see as the *core of the social order* or the *public good*. Seen through the lens of cultural theory, important moments of choice are flagged as dangers to the social order of a community, in this case, the experts who are managing the Internet's address space. Risks are moralised by linking them to what is regarded as unacceptable behaviour, that is, *doing something* or *doing nothing* respectively.

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